# Sysmac Catalogue

Fully integrated platform

5th Edition

**OMRON**

**sysmac**
always in control
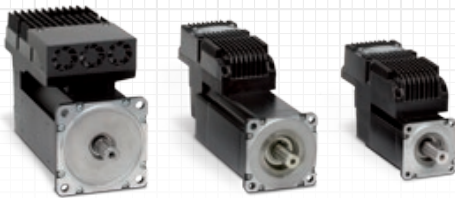
# News

## Sysmac controllers

### NX7 series
- High performance CPU that includes two synchronized motion cores controlling up to 256 axes

### NJ1 series
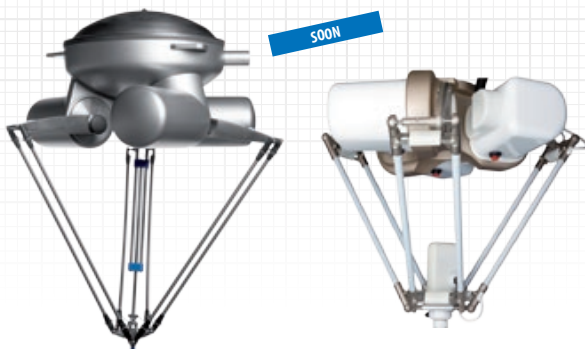- New CPU for compact and simple machines

## Servo system

### Integrated Servo motors
- Motor and drive integrated for space optimization and installation simplification
- Torque range from 2.55 to 25 Nm

## Robot

SOON

### Delta robot series
- Delta robot IP69K
- Mini Delta robot IP67
- Delta robot XXL

# Sysmac Catalogue

This catalogue is a selection and design tool helping you to create fast, flexible and reliable machines. Sysmac automation platform provides an scalable and integrated solution for factory automation and real-time machine control. The Sysmac studio software tool provides one Integrated Development Environment for configuration, programming, simulation and monitoring.

## Content

# Omron provides tailored solutions

## Flexible and integrated production business models

In today's globalized manufacturing environment, diverse and complex challenges arise and need to be overcome. The global market rapidly changes, and manufacturing companies are under increasing pressure to supply products in a timely manner that satisfy a wide variety of consumer needs. Omron industrial automation makes efficient, flexible and cost effective manufacturing possible.

### Innovation
• New technology for smart manufacturing
• Collaboration between humans and machines
• Environmentally safe products

### Productivity
• Integrated systems for optimized manufacturing
• Production data available in real-time
• In-line quality inspection: zero defects

### Flexibility
• Quick product changeovers
• Openness and third party connectivity
• Scalable systems for optimum solutions

### Reliability
• Non-stop processes, 24/7 operation
• Extended product lifecycle

### Globalization
• Products meet global standards
• Local support for training, repairs and spare-parts supply
• Engineering environment compliance with global standards

✔ Through automation, **Omron** supports the advancement of manufacturing and contributes to a sustainable society by providing environmentally safe products
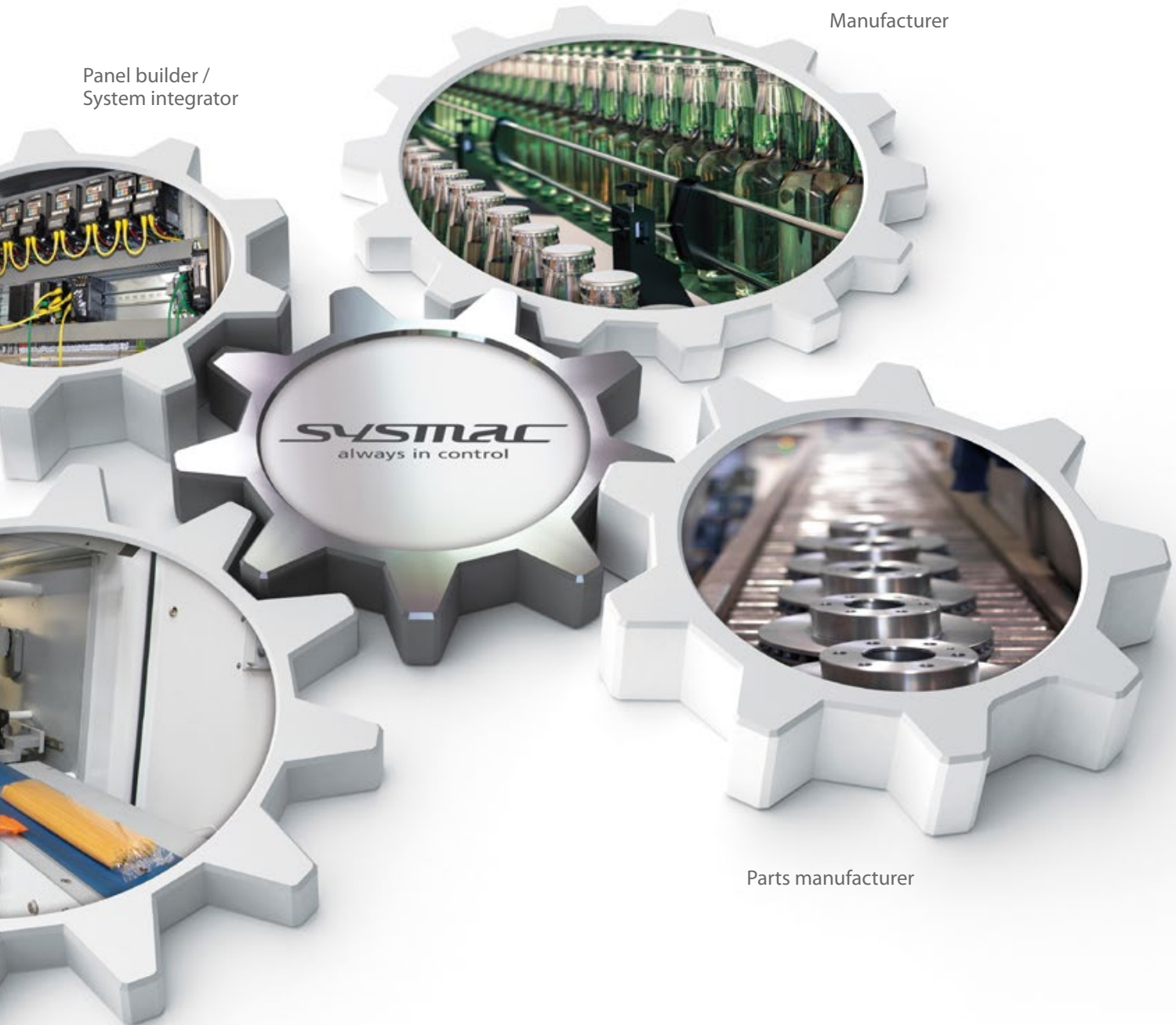
Machine / Equipment builder

The **Sysmac** technology platform ensures a flexible and integrated production business model

Manufacturer

Panel builder / System integrator

*sysmac*
always in control

Parts manufacturer

# Sysmac: A fully integrated platform

## Integration and Functionality

Sysmac is an integrated automation platform dedicated to providing complete control and management of your automation plant. At the core of this platform, the Machine Controller series offers synchronous control of all machine devices and advanced functionality such as motion, robotics and database connectivity. This multidisciplinary concept allows you to simplify solution architecture, reduce programming and optimize productivity.

FACTORY
AUTOMATION

MACHINE
CONTROL

Machine Automation Controller

## Motion

Filling line

- · Motion Control: Integrated within the IDE, and operating in real-time
- · Standard PLCopen Function Blocks plus Omron generated motion FB's
- · Direct Synchronous control for Position, Speed and Torque

## Safety

Assembly

- · All safety related data is synchronized with the whole network
- · Safety functions such as muting, guard locking, EDM and valve monitoring are simple to manage

**One Integrated Development Environment software** for Configuration, Programming, Simulation and Monitoring

## Information technologies

**Smart factory**

**IT devices**

**Offices HHQQ**

**Sales force**
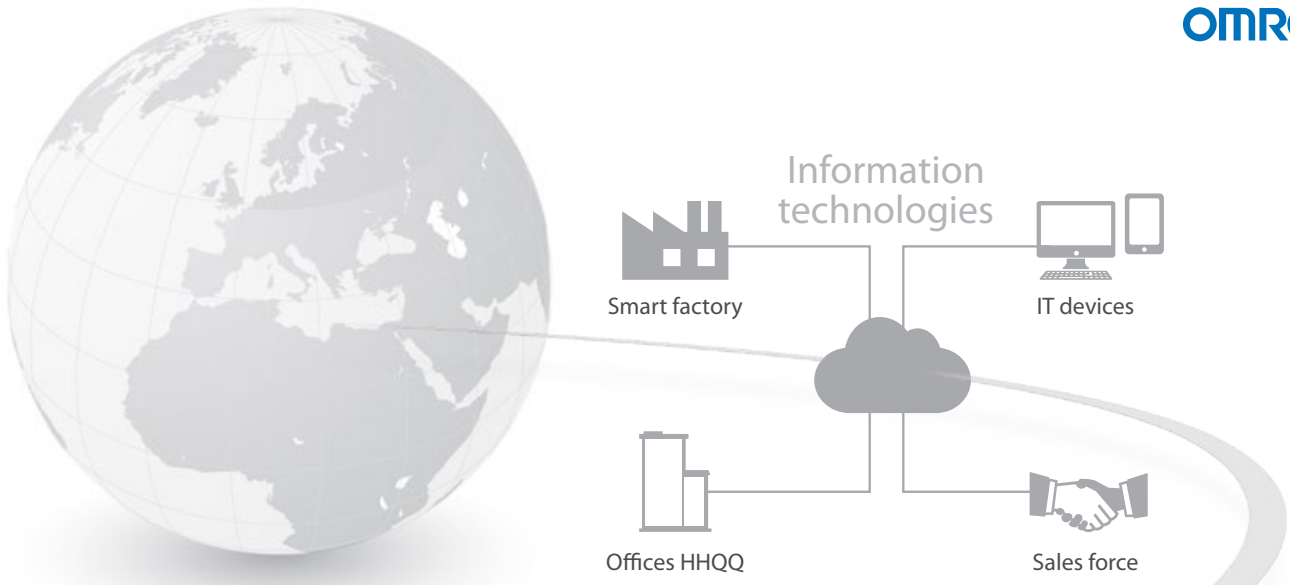
## Information


Pills blister packing

- Sysmac communicates in real-time with Databases such as SQL
- Secure Data: In the event of a server going down or losing communications, data is automatically stored in internal memory
- Sysmac operates with Databases at high speed [1000 table element/ 100 ms] ensuring realistic Big Data Processing to improve productivity and aid predictive maintenance etc.

✓ **Integrated Automation Control:**
The Sysmac platform is scalable and provides the performance and functionality for a wide range of solutions from simple machines through to manufacturing cells

## Vision
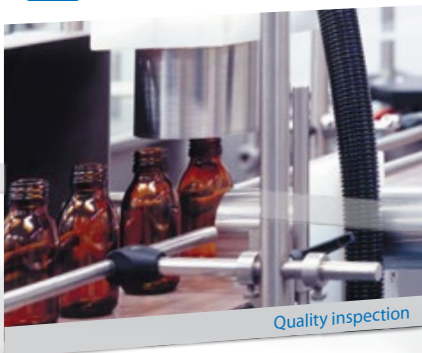

Quality inspection

- Higher resolution images available without increasing the vision processing time
- Shape search technology: Provides more stable and accurate object detection for Pick & Place projects
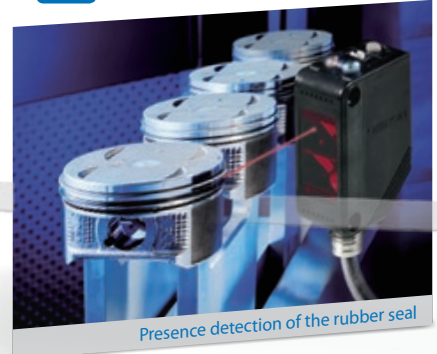
## Robotics


© ETR 300
Pick & Place

- Up to 8 Delta robots with one controller
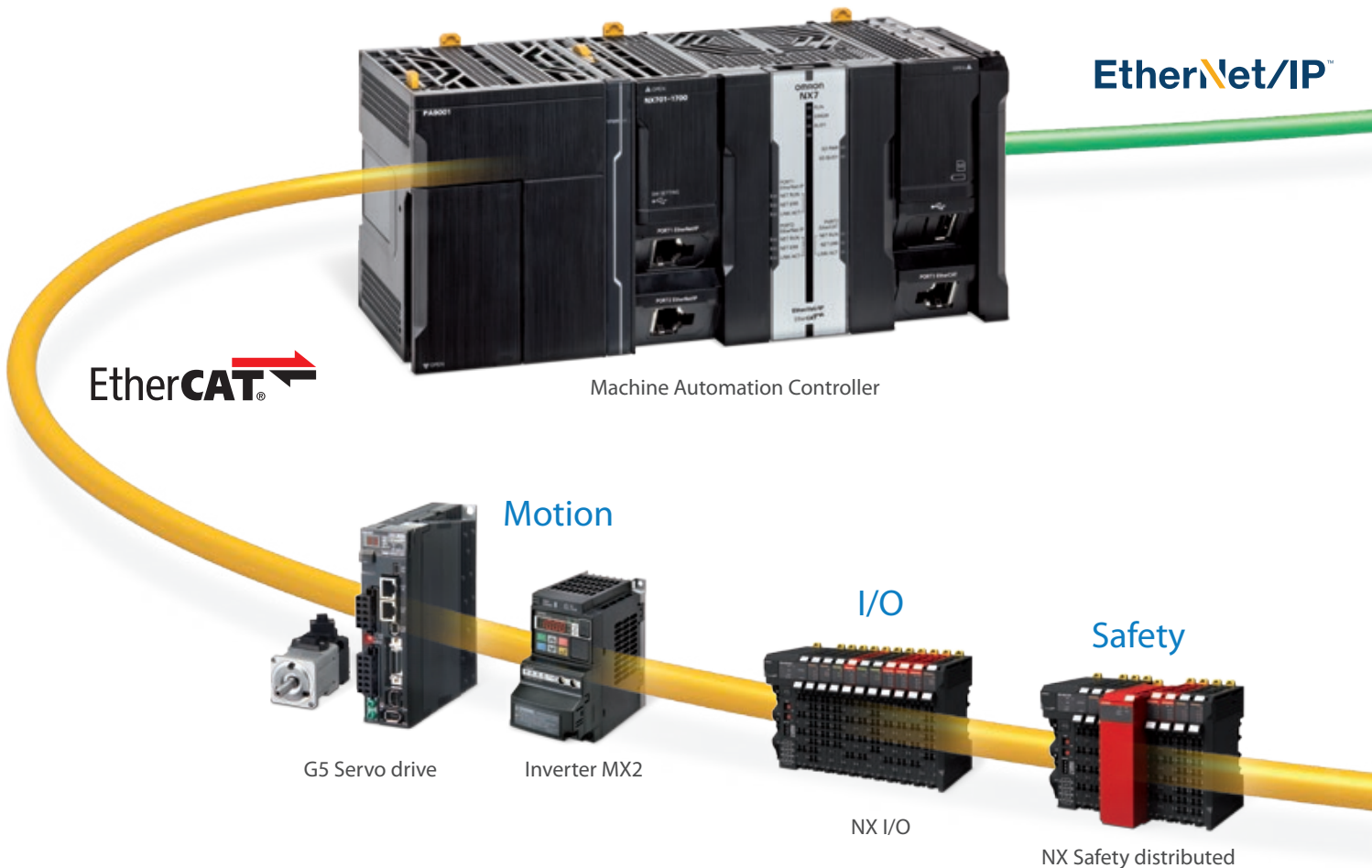- Time-based Robotic Function Blocks make programming easier

## Sensing


Presence detection of the rubber seal

- Full control of the process parameter setting and predictive maintenance functions
- High precision detection and positioning data synchronized on the network

# One Connection

## Seamless machine control and factory automation

One machine control through one connection and one software is how we define the Sysmac automation platform. The Machine Automation Controller integrates logic, motion, safety, robotics, vision, information, visualization and networking under one software: Sysmac Studio. This one software provides a true Integrated Development Environment (IDE) that also includes a custom 3D motion simulation tool. The machine controller comes standard with built-in EtherCAT and EtherNet/IP. The two networks with one connection purpose is the perfect match between fast real time machine control and data plant management.



**EtherNet/IP**

**EtherCAT**

Machine Automation Controller

**Motion**

**I/O**

**Safety**

G5 Servo drive          Inverter MX2

NX I/O

NX Safety distributed

## EtherCAT - Machine Control

· Fastest cycle time: 125 µs
· Up to 256 synchronized axes
· 512 slaves
· Embedded in Omron servo drive, inverter, I/O, Safety, Vision and Sensing
· Uses standard STP Ethernet cable with RJ45 connectors

Information technologies

Smart factory

IT devices

Big Data

Offices HHQQ

Sales force

SQL-Database

Software

Sysmac Studio

Visualization

NA HMI

Sysmac Studio

PLCopen motion control

PLCopen safety

MathWorks Partner

Microsoft SQL Server
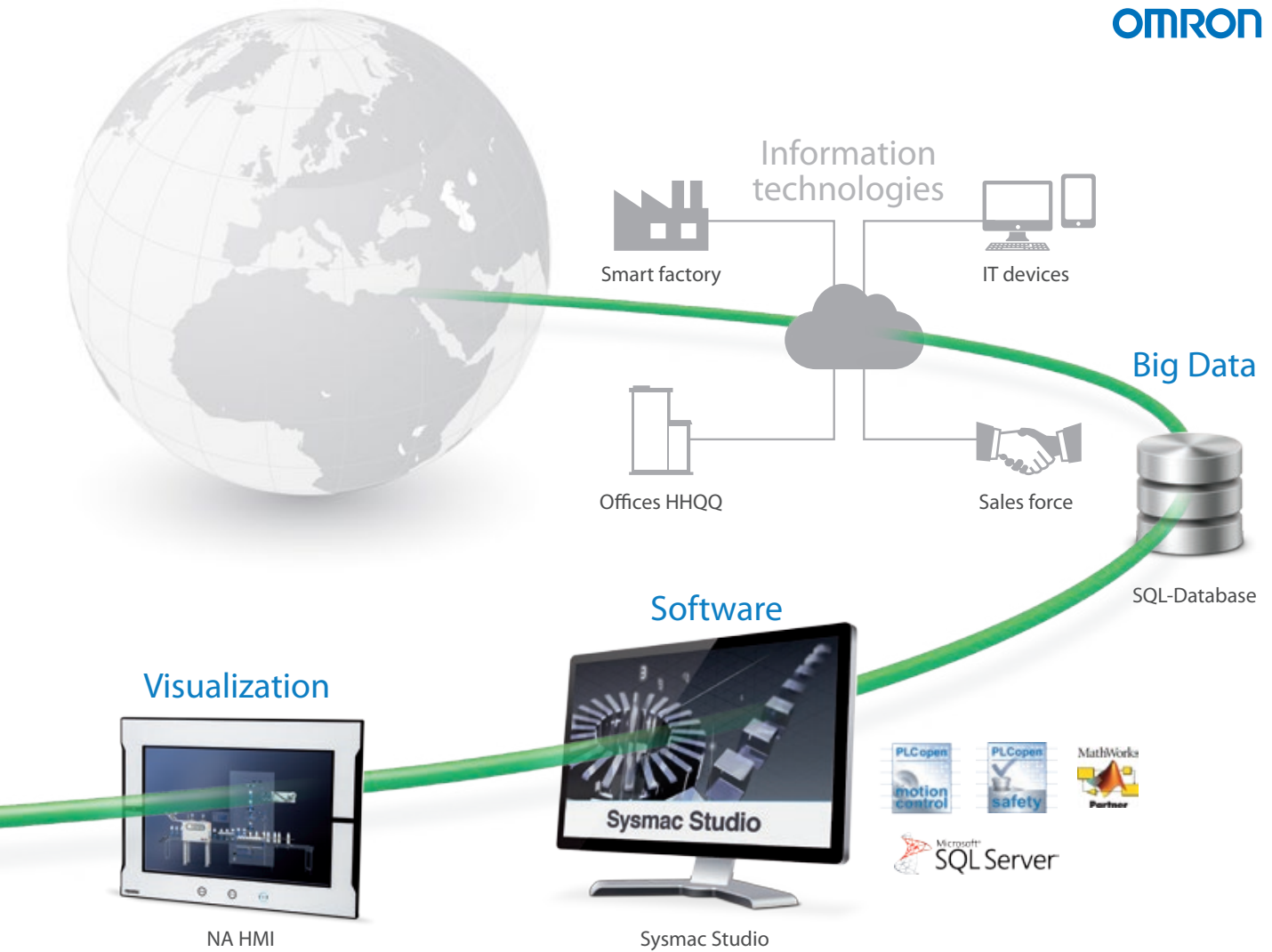
**Ethernet - Factory Automation**
· Peer-to-Peer controller communication
· Interface with Sysmac Studio , NA HMI  or SCADA software
· Database connection for Microsoft SQL Server,  Oracle, IBM DB2, MySQL
  and Firebird
· FTP server

Vision

Robotics

Sensing

FH

FQ-M

Delta robot

ZW Displacement Sensor

N-Smart Fiber/ Laser/ Contact sensor
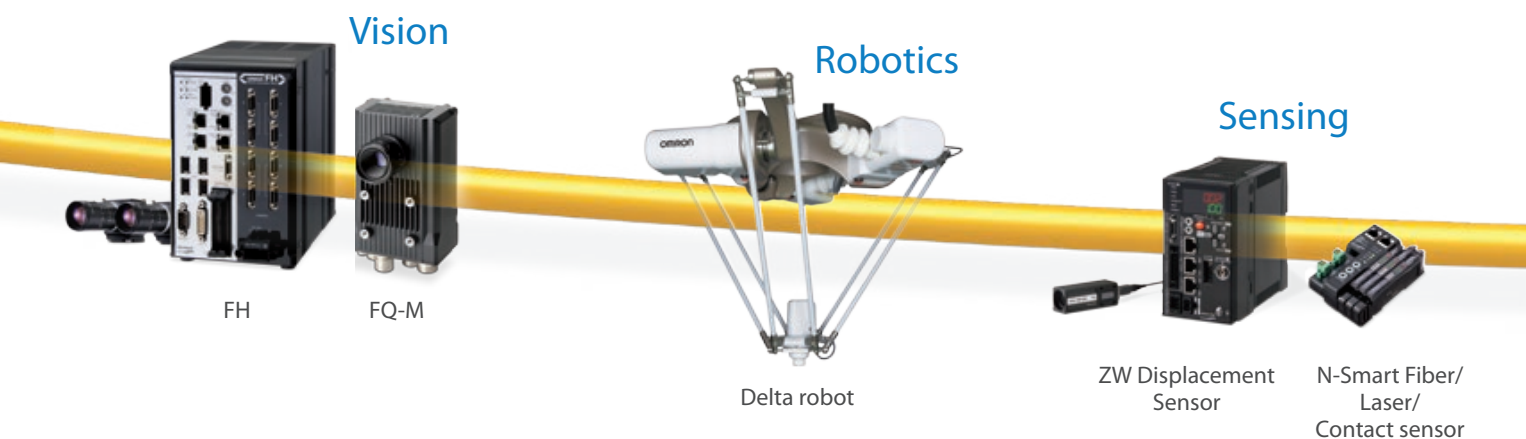
# One Software

## One Integrated Development Environment Software

Created to give you complete control over your automation system, Sysmac Studio integrates configuration, programming and monitoring. Graphics-oriented configuration allows quick set-up of the controller, field devices and networks while machine and motion programming based on IEC standard and PLCopen Function Blocks for Motion Control cuts programming time. Smart Editor with On-line debugging helps quick and error free programming. Advanced simulation of sequence and motion control, and data trace reduce machine tuning and set-up.

## Programming

Multi-tasking and fully compliant with IEC 61131-3 standard. The program editor includes smart support functions such as syntax error check and clear color segregation of variables and symbols. ST instructions can be directly written in Ladder programs thanks to in-line ST function.
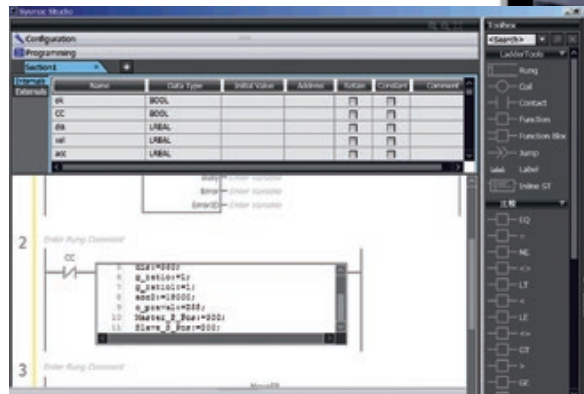
## Motion control

The graphical CAM editor allows quick implementation of complex motion profiles. CAM tables can be modified on the fly. A PLCopen Function Blocks for the Motion Control library are available to implement general purpose motion control.
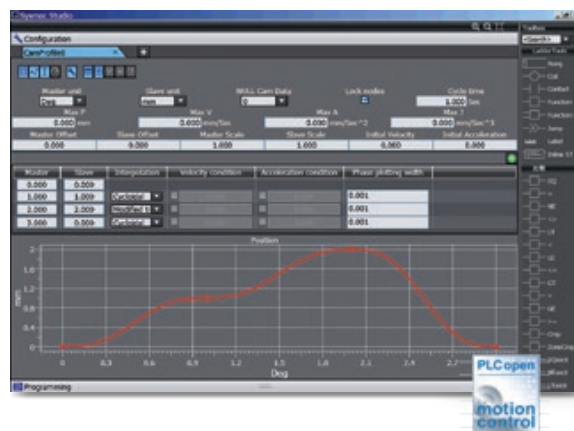
## Safety

The Function Block Diagram editor includes 46 safety FB/FN. Conforms with IEC 61131-3 standard programming and PLCopen Function Blocks for Safety.

## Information

Projects can generate a huge volume of data, but thanks to the Sysmac Database Connectivity FB library, this data can be analyzed and acted on in real-time.

Microsoft **SQL Server**
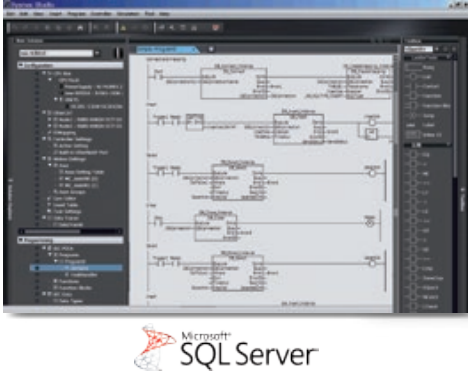
## Simulation

Motion trajectories in 3D can be pre-tested with advanced simulation of sequence and motion control. Simulation of single Function Blocks, POU's (Program Organization Unit) or the entire program can be performed. In addition all standard features such as Break & Step are available.
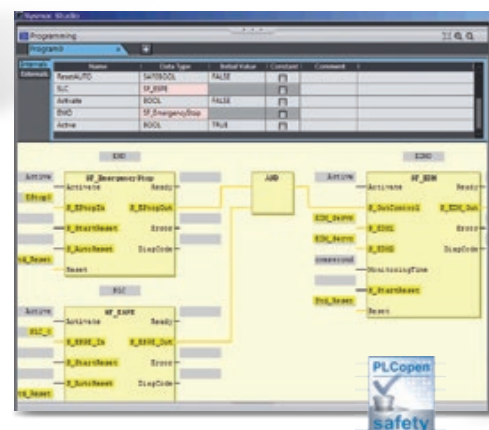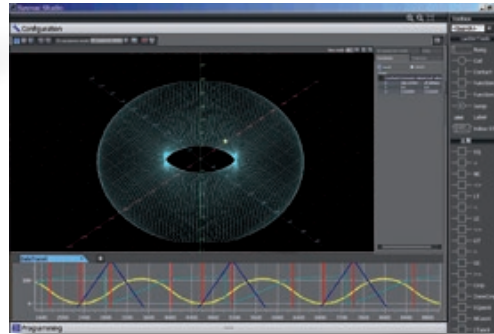
**Studio**

## HMI

Design your own IAG's (Intelligent Application Gadgets) using the machine parts collection. It is also possible to embed code within an IAG using VB.net standard functionality. The Simulator in the Sysmac Studio allows you to test the NA application with the Machine Controller program.
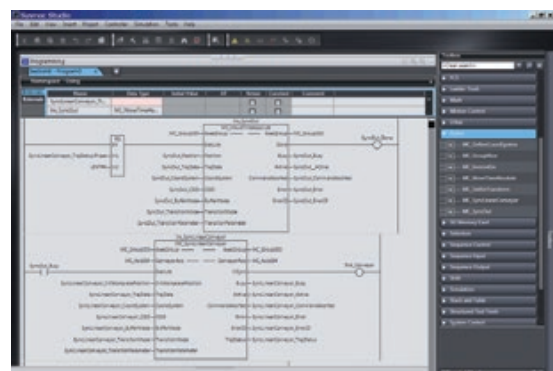
## Robotics

Integrated robotics Function Block library for Delta 2 and Delta 3 control. A 3D simulator is also integrated in the Sysmac Studio, visualizing and reproducing the Delta robot trajectory.
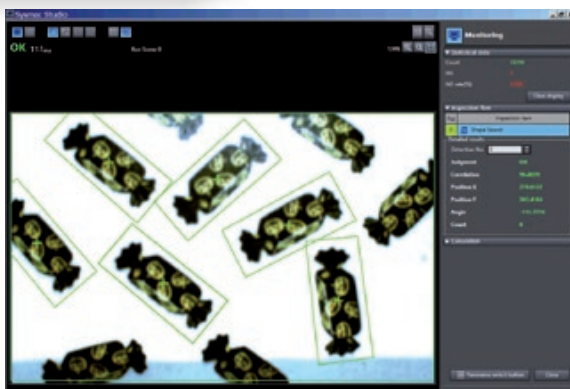
## Vision

Just drag & drop any processing items to build a program for image processing.

## Sysmac Studio
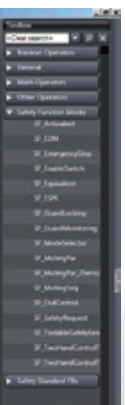
# One Machine Controller

## Complete and robust machine automation

The Machine Automation Controller is at the heart of the Sysmac platform. One integrated machine controller that offers speed, flexibility and scalability of software centric architecture without compromising on the traditional reliability and robustness that you have come to expect from Omron PLCs. The Machine Controller is designed to meet extreme machine control requirements in terms of motion control speed and accuracy, communication, security and robust system. You just create…

### Application libraries
· FB library option for packaging engineering (Rotary Knife, Winder/Unwinder, Temperature Control...)

### System robustness
· One event log for controller, field devices and networks
· Standard PLC system check: Watch-Dog Timer, memory check, network topology check, etc.

### Machine automation controller features
· Fastest system cycle: 125 µs
· Up to 256 synchronized axes
· Synchronized control of all machine network devices
· Multi-tasking programs
· In-line ST, Structured Text and Ladder mixed in the same program
· Full control of Axes Group Position
· System Backup and Restore
· Built-in EtherCAT and EtherNet/IP ports
· CE and cULus global standards

### Hardware design
· Architecture based on new Intel CPU
· The most compact controller in its class
· Built-in USB port and SD card slot

✔ Scalability, performance, robustness… Choose the most suitable CPU for your application!

| | NX7 | NJ5 | NJ3 | NJ1 |
|---|---|---|---|---|
| Fastest Cycle Time | 125 µs | 500 µs | 500 µs | 1 ms |
| Real axes | 256 axes | 64 axes | 8 axes | 2 axes |
| EtherCAT slaves | 512 | 192 | 192 | 64 |
| Motion Core | Two synchronized Motion Cores | Synchronized Motion Core | Synchronized Motion Core | Synchronized Motion Core |

## EtherNet/IP™

**Standard Factory network**
- Programming
- Other Machine controllers
- HMI / SCADA
- IT systems
- Standard Protocols and Services: TCP/IP, FTP, NTP, SNMP
- CIP protocol
- Database connection FB's for Microsoft SQL Server, Oracle, IBM DB2, MySQL and Firebird
- Built-in SECS/GEM communications functionality

## EtherCAT®

**Standard Machine network**
- Servos
- Inverters
- Robotics
- Vision systems
- Distributed I/O
- Integrated Safety
- Sensing

**Standard programming**
- Fully conforms with IEC 61131-3 standards
- PLCopen Function Blocks for Motion Control

# NA HMI Series

## The next generation of machine interface

An HMI that is dynamic, intuitive and predictive makes industrial machines more attractive and competitive. The new Omron HMI enables faster, more efficient control and monitoring - and a more natural, proactive relationship between operator and machine. The design has been based on real applications and customer requirements, a future- proofed, scalable platform that will evolve with their ever-changing needs, allowing real time reaction to events. As part of the system family, the NA Series is fully aware of the total machine.

### Hardware design
- Architecture based on Intel
- Fan-less cooling
- Water and dust proof design – IP65
- SD card slot for transfer/store projects and data logging

### Connectivity
- 3 x USB ports: USB memory and programming
- 2 x Ethernet ports: for machine network / IT systems and programming

### NA machine interface features
- Architecture based on Intel
- Widescreen models: 7, 9, 12 and 15 inches
- 1280 x 800 high resolution display
- One integrated project in the Sysmac Studio: NX7/NJ Controller, Safety, Vision and Machine interface
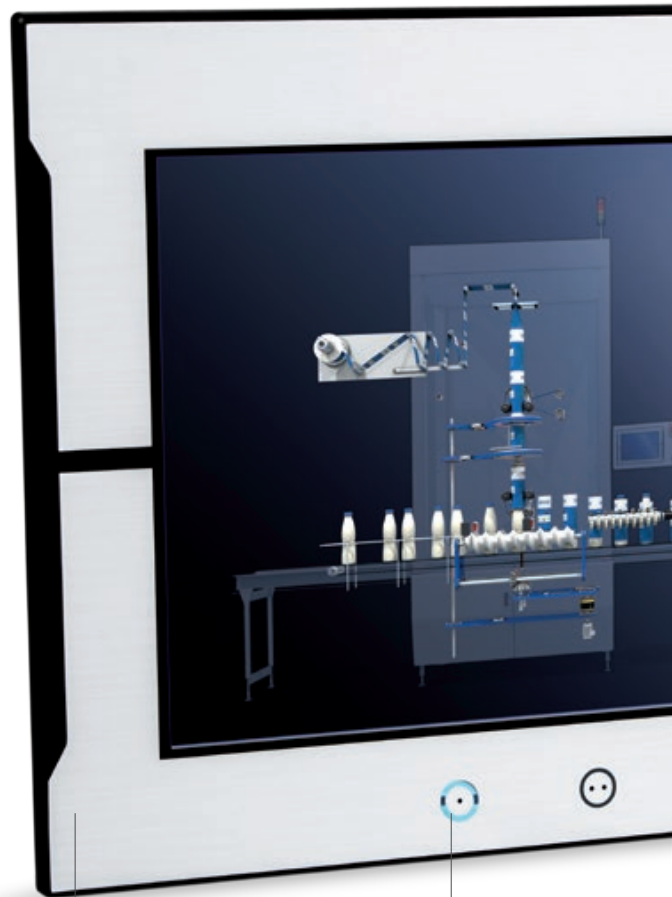
Black and Silver frame color

Programmable Function Keys

15"

9"

12"

7"

## Scalable solution
· Display size from 7-inch up to 15-inch
· Widescreen in all models
· 1280 x 800 resolution for the 12-inch and 15-inch models
· 800 x 480 resolution for the 7-inch and 9-inch models
· Available in black and silver frame colors

## Machine interface
· Touch screen
· 3 x Programmable Function Keys
· Multimedia including PDF files and video

## IAG – Intelligent Application Gadgets
· Graphics collection from the machine parts
· Embedded code within an IAG with the VB.net standard functionality
· Make your own  IAG collection and share them between projects, like a Function Block

RUN/ERR led indicator

myTemperature

mySpeed

RunMotor (Boolean bStatus)
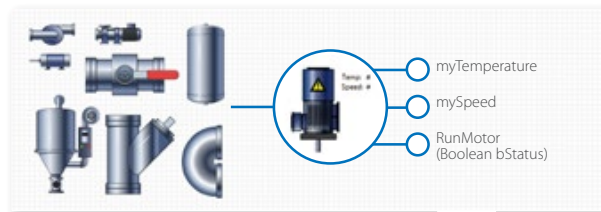
## Sysmac Studio
· NA HMI programming as a device in the Sysmac Studio
· NX7/NJ controller variables (Tags) in the NA project
· Multiple-access level security with password protection
· Visual Basic programming with VB.net
· NA application testing with the NX7/NJ program via the Simulator in the Sysmac Studio

# NX I/O

## Speed and accuracy for machine performance

Based on an internal high-speed bus running in synchronization with the EtherCAT network and using the time-stamp function, the NX I/O can be controlled with microsecond accuracy and with nanosecond resolution. The I/O range consists of over 90 models including position control, temperature inputs and integrated safety.

### EtherCAT connectivity
- Distributed clock to ensure I/O response with less than 1 µs jitter
- Safety over EtherCAT (FSoE)

### EtherCAT coupler
- Up to 1024 byte input / 1024 byte output
- Automatic backup/restore of all I/O unit parameters. Except Safety Control unit and Safety I/O units

### Digital I/O
- Units for 4, 8 or 16 points
- Standard, high-speed and time-stamp models
- Relay outputs, NO only or NO+NC
- 240 V AC inputs
- 16- and 32-point units with MIL connector

### Serial communication
- Units for RS232C or RS422A/485 serial communication interface

### NX I/O features
- NsynX technology provides deterministic I/O response with nanosecond resolution
- Digital I/O: high-speed and time-stamp models (NsynX)
- Analogue I/O: high performance models offer 10 µs conversion time per channel and 1:30000 resolution
- Detachable front connector with push-in type screwless terminals on all NX I/O units
- On/Offline configuration, simulation, and unified troubleshooting in the Sysmac Studio software

- High signal density; up to 16 I/O points in 12 mm width

## NsynX technology

- The NsynX technology is provided by the internal high-speed bus synchronized with the EtherCAT network. This technology is designed for machine control and includes:
- I/O units with distributed clock
- High-speed I/O units synchronized with the EtherCAT cycle
- I/O units with Time-Stamp function (accuracy < 1 µs )

### Time Stamp sequence example

EtherCAT cycle

| | 500 µs | | 500 µs | | 500 µs |

NJ Controller

I/O Refresh · I/O Refresh · I/O Refresh

NX I/O

IN

Time Stamp

4578043 ns · 52371800 ns

OUT
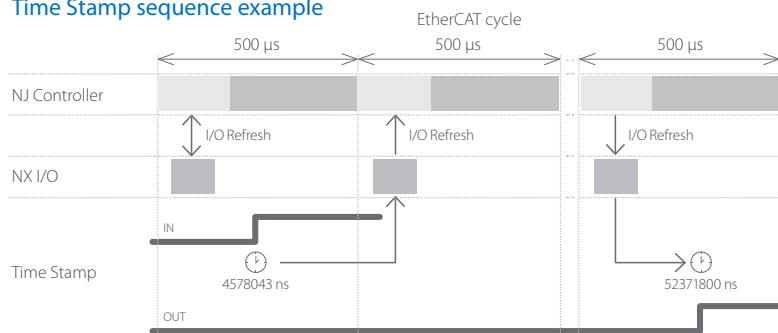
Accurate control of input events and perfect control of output with nanosecond resolution
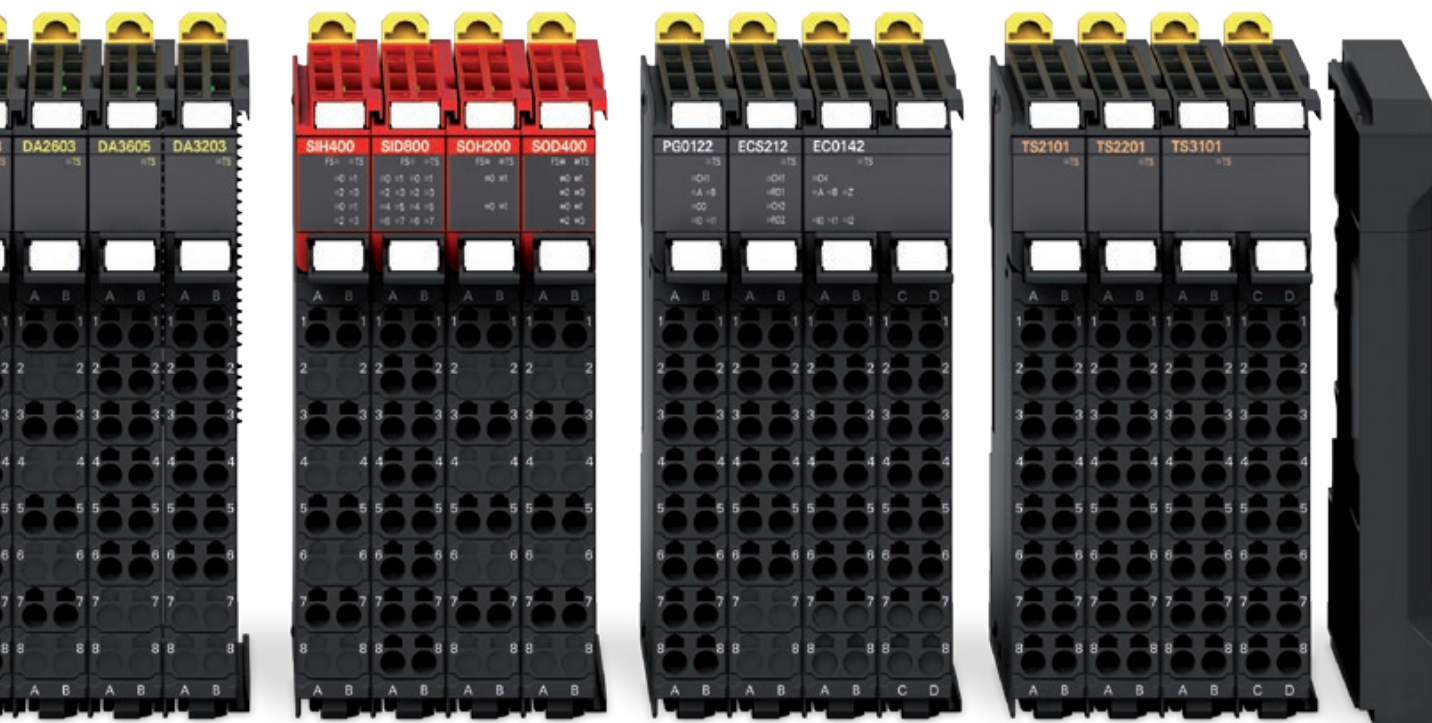
### Analogue I/O
- +/-10V voltage and 4-20 mA current signals
- 2, 4 or 8 channels per input unit
- 2 or 4 channels per output unit
- Standard and high-performance models

### Safety I/O
- Up to 8 safety input points per unit
- Freea allocation of the Safety I/O units on the internal high speed bus.

### Position interface
- Encoder input units for connection of external axes to the Sysmac system
- Incremental and absolute encoder support
- Positioning control unit with pulse train output

### Temperature Inputs
- Thermocouple or RTD inputs, 2 or 4 per unit

### End Cover

- Fast and secure screwless push-in connections
- Removable I/O connectors for easy pre-wiring, testing and system maintenance

# NX Safety distributed

## Integrated safety into machine automation

The Sysmac platform integrates a safety solution within our one connection and one software concept. One connection is realized through the use of Safety over EtherCAT -FSoE- protocol. The One software is achieved by using the Sysmac Studio for configuration, programming and maintenance. The NX safety system consists of safety controller and safety I/O units. Both the safety controller and safety I/O can be freely distributed in an I/O rack throughout the network, mixing them in any combination with standard NX I/O.
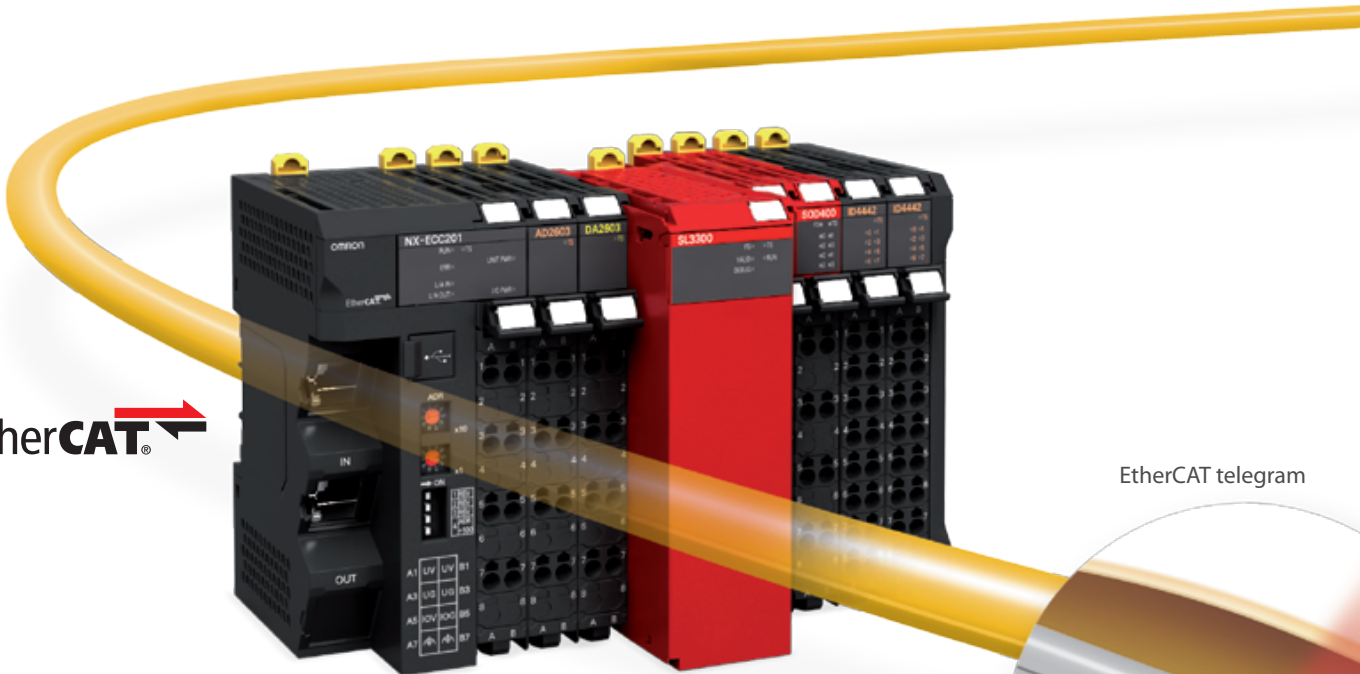
EtherCAT telegram

### NX Safety controller
· The safety controller variables are part of the NX7/NJ controller project
· Flexibility and reusability of the programming code

Safety over
EtherCAT

### NX Safety features
· The safety controller meets PLe according to the ISO 13849-1 and SIL3 according to IEC 61508
· Flexible system lets you freely mix safety controller and safety I/O units with standard NX I/O
· Integration in One software, Sysmac Studio
· Certified programs can be reused, which reduces the amount of verification work

Functional
Safety
Type
Approved

TÜVRheinland®
CERTIFIED

www.tuv.com
ID 0600000000

ISO 13849-1, PLe

IEC 61508, SIL3

## Safety integration in One software

- Integrated Development Environment in Sysmac Studio provides one common software for hardware configuration, programming and maintenance of the Sysmac platform
- 46 safety FB/FN conforming with IEC 61131-3 standard programming
- PLCopen Function Blocks for safety

Machine Automation Controller
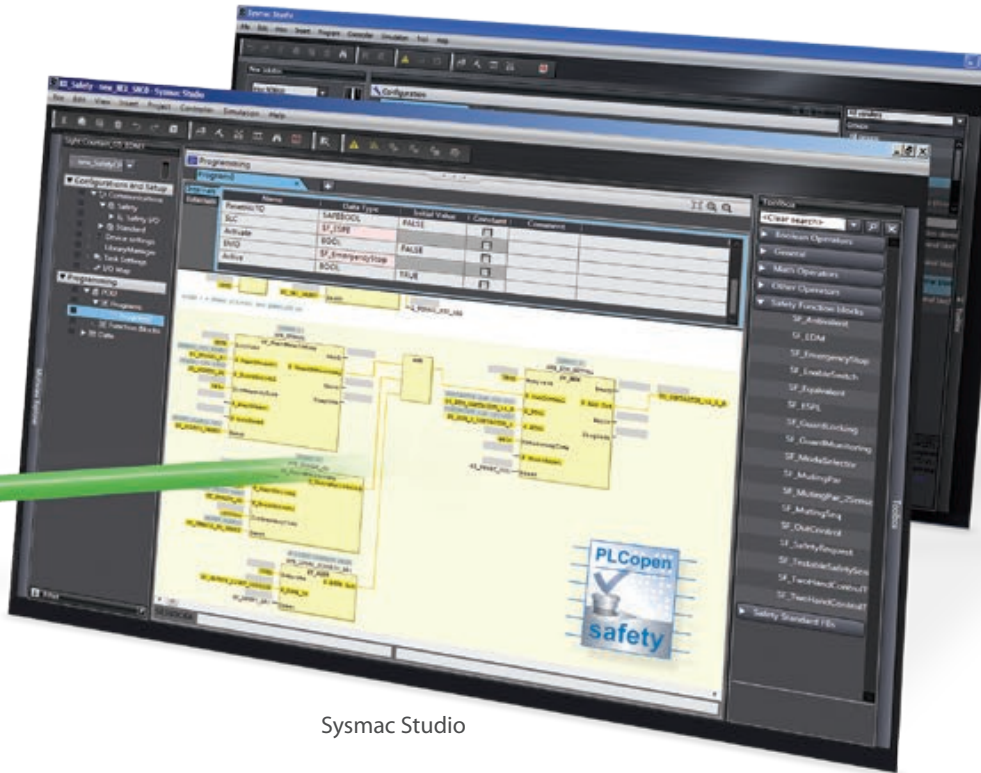
Sysmac Studio

## Safety over EtherCAT frame

| CDM | Safe data | CRC_O | Safe data | CRC_1 | ... | Conn ID |
| --- | --- | --- | --- | --- | --- | --- |

## NX Safety I/O

- Up to 8 safety input points per unit
- High connectivity I/O units for direct connection to a variety of devices
- I/O data monitoring in the NX7/NJ controller project

# G5 Servo system

## At the heart of every great machine

Great machines are born from a perfect match between control and mechanics. G5 gives you that extra edge to build more accurate, faster, smaller and safer machines.

**EtherCAT**

### EtherCAT connectivity
- Compliant with CoE -CiA402 Drive profile-
- Cyclic Synchronous Position, Velocity and Torque modes
- Embedded Gear Ratio, Homing and Profile Position mode
- Distributed clock to ensure high precision synchronization

### Safety conformance
- PL-d according ISO 13849-1
- STO: IEC61800-5-2
- SIL2 according to EN61508

## G5 servo system features
- Compact size servo drives with EtherCAT connectivity built-in
- High-response frequency of 2 kHz
- Load vibration suppression
- Embedded Safety conforming ISO 13849-1 Performance Level d
- Advanced tuning algorithms (Anti-vibration function, torque feedforward, disturbance observer)
- Wide range of linear and rotary servo motors

## Improved rotary motors

- Low cogging torque servo motors
- High accuracy provided by 20 bit encoder
- Motors and connectors with IP67
- Large range of motors from 0.16 Nm up to 96 Nm nominal torque (224 Nm peak)
- Standard and high inertia motors
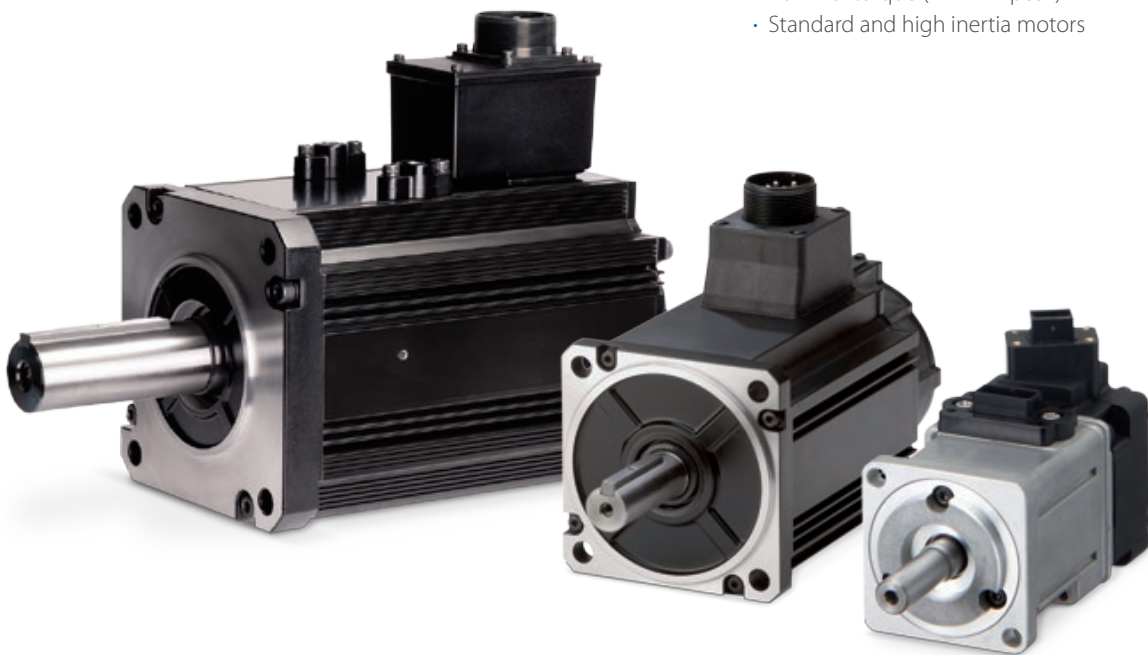
## Ironless linear motors

- Compact, efficient design
- Excellent force-to-weight ratio
- No latching force

## Iron-core linear motors

- Compact, flat design
- Optimum ratio between force and volume
- Weight-optimized magnetic track

# MX2 and RX Inverter series

## Drive solution for machine automation

Thanks to its advanced design and algorithms, the MX2 inverter provides smooth control down to zero speed, plus precise operation for cyclic operations and torque control capability in open loop. The RX series combines high performance, application functionality and customisation to match the precise requirements. Both, the MX2 and RX inverter series are fully integrated within the Omron Sysmac automation platform.

### Torque control in open loop
· Ideal for low to medium torque applications
· Can replace a flux vector inverter or servo drive in suitable systems

### Quick response to load fluctuation
· Stable control without decreasing machine speed improves quality and productivity
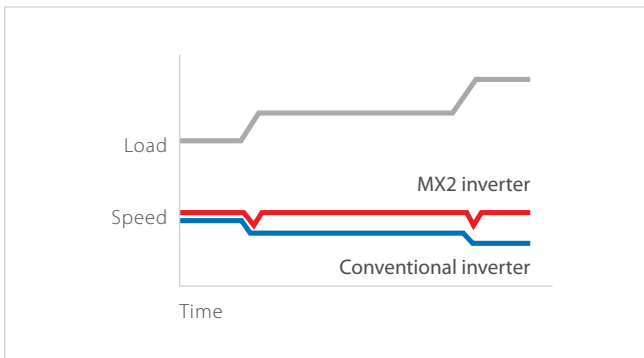
MX2

### MX2 features
· Power range up to 15 kW
· Torque control in open loop, ideal for low to medium torque applications
· 200% starting torque near stand-still operation (0.5 Hz)
· Double rating VT 120%/1 min and CT 150%/1 min
· IM and PM motor control
· Drive Programming software tool
· 24 VDC backup supply for control board and communications
· Built-in application functionality (i.e. Brake control)

Motor efficiency control
· Double rating VT 120%/1 min and CT 150%/1 min
· Energy saving function

200% starting torque
· Near stand-still operation
· High starting torque in open loop
· Control of fast cyclic loads

EtherCAT®

RX

## (Example of Speed vs. Torque Characteristics: RX series type)



Torque (Percentage of Rating) vs. Rotation Speed (rpm)
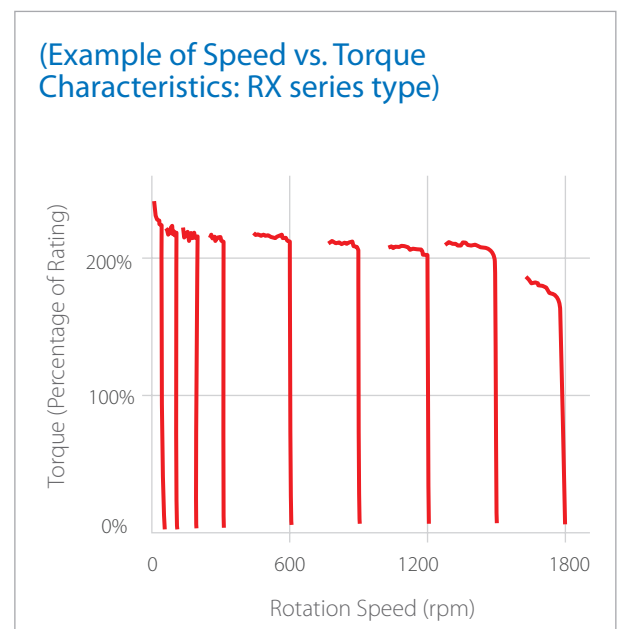
### RX features
· Power range up to 132 kW
· Sensor-less and closed-loop vector control
· High starting torque in open-loop (200% at 0.3 Hz)
· Full torque at 0 Hz in closed-loop
· Double rating VT 120%/1 min and CT 150%/1 min
· Drive Programming software tool
· Built-in application functionality (i.e. ELS - Electronic Line Shaft-)

# FQ-M Vision sensor

## Designed for object tracking

The FQ-M series is a vision sensor designed specifically for pick and place applications. It comes with EtherCAT embedded and can be configured and monitored from Sysmac Studio software. The FQ-M series is compact, fast and includes an incremental encoder input for easy tracking and calibration.

### Advanced shape search technology
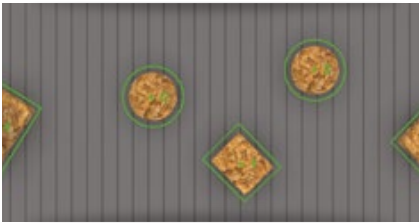


Varying material ie. shiny
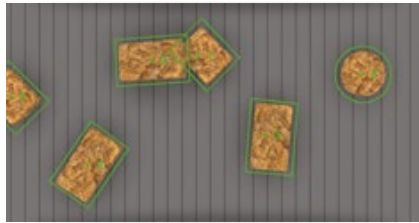


Overlapping products



Product detection:
10 pcs with rotation < 200 ms

### Detection
· Up to 5000 pieces per minute with 360 degree rotation
· Stable and robust detection under changeable environmental conditions

### Design
· Camera and image processing in one
· Standard C-mount lenses; choose the field of view and focus distance you need
· Variety of industrial connector types (angled, straight) for correct mounting
· EtherCAT port for object tracking
· Ethernet port for advanced configuration and monitoring
· Vision sensor with encoder input for tracking function

### Software tool
· Fully integrated within the Sysmac Studio software tool
· Intuitive and icon driven set-up and configuration
· Trending and logging function



75 mm

110 mm

**EtherCAT.**

# FH Vision system

## Flexible solution for machine vision

The FH vision system is optimized to detect the position and orientation of any object at high speed and with high accuracy. The built-in EtherCAT communications enable reliable and easy networking with motion control, increasing the overall machine performance. A flexible machine vision tailored for quality inspection.

### Flexible machine vision
· Over 100 processing items including 1D code, 2D code and OCR
· Inspection of scratches and defects
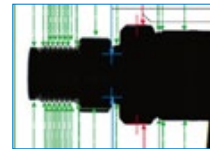
Dimension check          Character and code reading

### Multiple inspection
· Powerful 4-core i7 parallel processor
· Up to 8 camera by one controller

Focal shift     Contrast     Chips

Hidden     Overlapping     Thinning and thickening
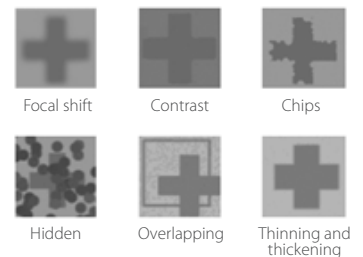
### Advanced shape search technology
· Differences of the work piece
· Dust and dirt conditions
· Detection of overlapping objects
· Changing ambient environment

EtherCAT

### Wide camera range
· Up to 12 Mpixel
· High speed CMOS camera
· Use different fields of vision and at any angle

# ZW Measurement Sensor

## Ultra-compact, Lightweight sensor measures any material

The ZW confocal fiber displacement sensor delivers stable, non-contact in-line measurements of height, thickness and other dimensions. It solves the problems of traditional laser triangulation sensors: deviation between different material with inclination tolerance. The compact sensing head has no electronic parts to eliminate problems of installation space and mutual interference, electrical/magnetic noise, temperature rise and mechanical positioning. The EtherCAT interfaces integrates height and position coordinates for profile mapping.

- Ultra-compact sensing head: 24x24mm weighs only 105g
- High flexibility fiber optic cable from sensor to controller - up to 32m
- Mount sensing head one time - no need to re-tune for changing materials
- Separate amplifier provides white LED light source, spectroscope and processor to convert reflected color light to distance
- Stable measurements for any material - glass, stainless steel, mirror, white ceramic and PCB substrates
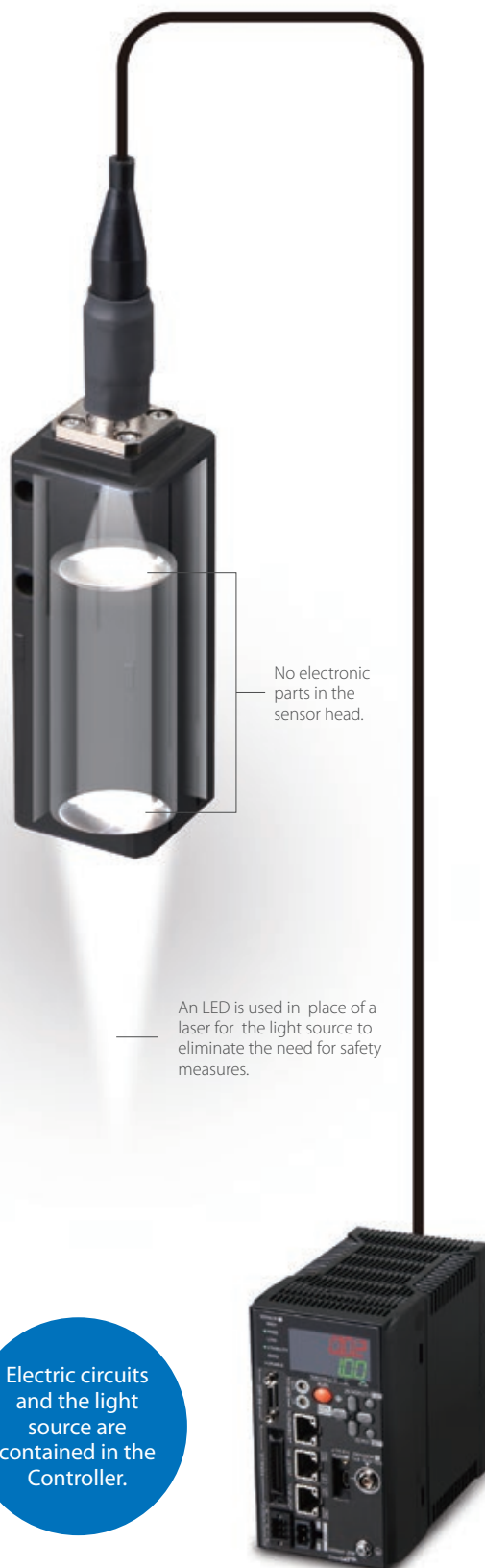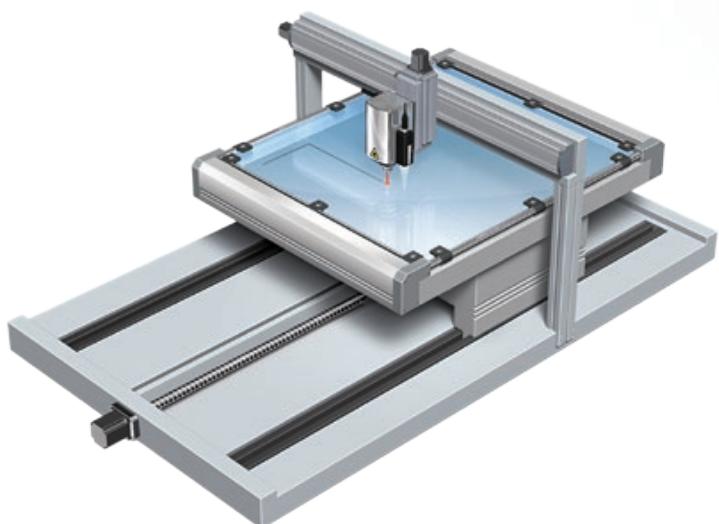
No electronic parts in the sensor head.

An LED is used in place of a laser for the light source to eliminate the need for safety measures.

Electric circuits and the light source are contained in the Controller.

# N-Smart Series

## Various Sensors Connected over EtherCAT

The N-Smart Lineup of Next-generation Fiber Sensors, Laser Sensors and Contact Sensors will quickly solve your problems and therefore increase equipment operation rates and minimize downtime with optimum cost performance.

E3NX-FA
Fiber Amplifier Units

E3NC-S
Ultra-compact CMOS
Laser Sensors

N-Smart Amplifier Units
Easy application with consistent operating procedures.

**N-Smart**

Presence | Detection | Measurement

E3NC-L
Compact
Laser Sensors

E3NW
Sensor
Communications Units

EtherCAT

Applications with Many Sensors:
More convenience and even lower costs with a network.

E9NC-T
Smart Contact Sensor

## Features

· Ultra-easy Advanced Smart Tuning with the push of a button
· More stable detection of high-speed workpieces
· Predictive Maintenance to reduce downtime
· Highly visible white LED display
· E3NX-FA has 1.5x the sensing distance of conventional amplifiers

Master | E3NW-ECT
Sensor Communications Unit

EtherCAT

··· Max 30
Sensors *2

Inter-Unit Network
**DS-Bus** *1
PAT.P

··· Max 10
Sensors

··· Max 10
Sensors

··· Max 18
DS Units
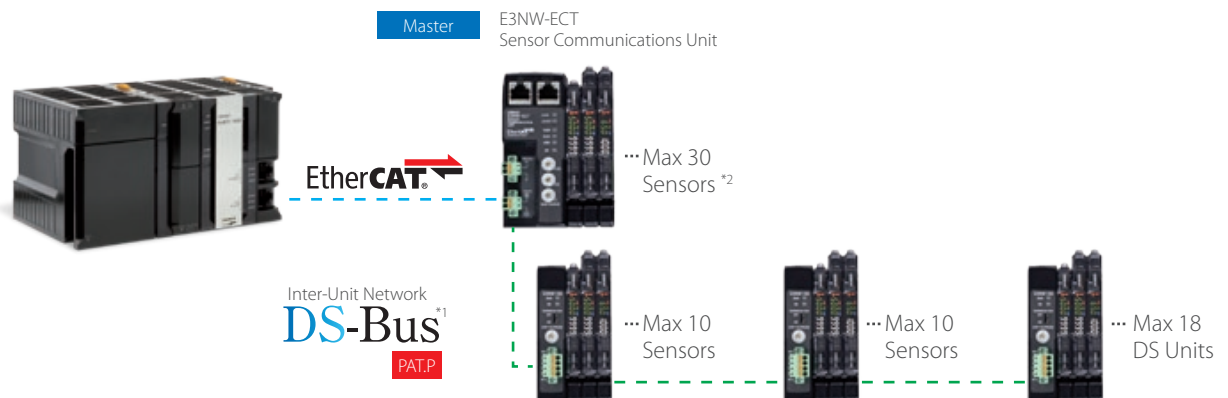
*1 The DS-Bus is an OMRON inter-Unit net-work communications protocol, that connects the E3NW-ECT Sensor Communications Unit and E3NW-DS Distributed Sensor Units.
*2 Each E3NW Node supports a maximum of 30 total sensors, including DS-Bus sensors.

# Service and support
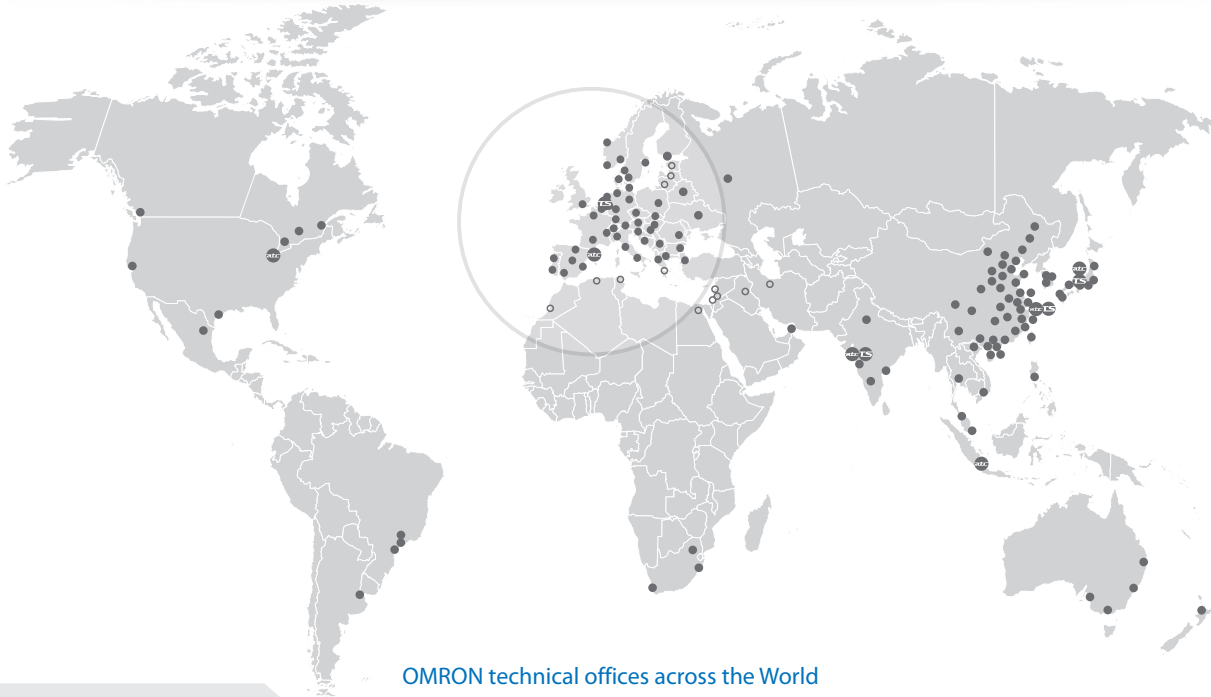


OMRON technical offices across the World

**Automation Center**
Kusatsu (JPN), Shanghai (CHN), Barcelona (ESP),
Jakarta (IDN), Mumbai (IND), Chicago (USA)

**Tsunagi laboratory**
Kusatsu (JPN), Shanghai (CHN),
Den Bosch (NL), Mumbai (IND)

● Technical office    ○ Premium Partner

## PRESENCE

## COMPETENCE

### OMRON
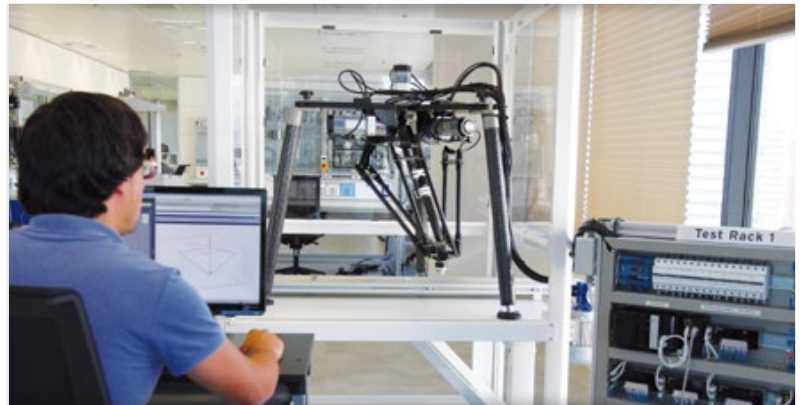




### Design

Our wide network of machine automation specialists will help you to select the right automation architecture and products to meet your requirements. Our flat structure based on expert-to-expert contact ensures that you will have ONE accountable and responsible expert to deal with on your complete project.

### Proof of concept

As your project matures make use of our Automation centers to test and catch-up with technology trends in motion, robotics, networking, safety, quality control etc. Make use of our Tsunagi (connectivity) laboratory to interface, test and validate your complete system with our new machine network (EtherCAT) and factory network (EtherNet/IP).

We will assign a dedicated application engineer to assist with initial programming and proof testing of the critical aspects of your automation system. Our application engineers have in-depth expertise in and knowledge of networks, PLCs, motion, safety and HMIs when applied to machine automation.

Oslo
Stockholm
Helsinki
Estonia
Gothenburg
Latvia
Århus
Malmö
Lithuania
Moscow
Copenhagen
Hamburg
Amsterdam
Düsseldorf
Milton Keynes
Berlin
Warsaw
DEN BOSCH
Frankfurt
Brussels
Stuttgart
Krakow
Munich
Prague
Paris
Piestany
Nantes
Vienna
Rotkreuz
Budapest
Lyon
Lausanne
Velenje
Bucharest
Vitoria
Milan
Zagreb
Pleven
Porto
Bologna
Belgrade
BARCELONA
Sofia
Lisbon
Terni
Skopje
Istanbul
Madrid
Valencia
Athens
Sevilla
Alger
Tunis
Casablanca

CONFIDENCE → ASSURANCE

## Development

During your prototyping phase you will need flexibility in technical support, product supply and exchange. We will assign an inside sales contact to help you source the correct products fast during your prototyping phase.

## Commissioning

With our world-wide network for service and support the export of your product is made simple, we will support you on-site with your customer, anywhere in the world. We can arrange a liaison sales engineer to facilitate training, spare parts supply or even machine commissioning. All this in a localised language with localised documentation – giving you complete peace of mind.

## Serial production

As your production increases we will engage in supplying you within 24hrs and repairing within 3 days. All our products are global products meeting global standards - CE, cULus, NK, LR -

# Sysmac family

| MACHINE CONTROLLER | | | |
|---|---|---|---|
| **Model** NX7 | NJ5 | NJ3 | NJ1 |
| Fastest cycle time | 125 µs | 500 µs | 500 µs | 1 ms |
| Number of axes | 256, 128 | 64, 32, 16 | 8, 4 | 2, 0 |
| Task | Multi-tasking program | | | |
| Motion core | 2 synchronized motion cores | Synchronized motion core | | |
| Functions | • Logic sequence<br>• Motion | • Logic sequence<br>• Motion<br>• Robotics<br>• Database Connection<br>• SECS/GEM | • Logic sequence<br>• Motion | • Logic sequence<br>• Motion |
| Software tool | Sysmac Studio | | | |
| Programming languages | • Ladder<br>• Structured Text<br>• In-Line ST | | | |
| Standard programming | • IEC 61131-3<br>• PLCopen Function Blocks for Motion Control | | | |
| Program capacity | 80 MB | 20 MB | 5 MB | 3 MB |
| SD memory card | SD and SDHC memory card | | | |
| Built-in port | • EtherNet/IP<br>• EtherCAT<br>• USB 2.0 | | | |
| EtherCAT slaves | 512 | 192 | 192 | 64 |
| Servo drive | Accurax G5/EtherCAT | | | |
| Motion control | • Axes groups interpolation and single axis moves<br>• Electronic cams and gearboxes<br>• Direct position control for axis and groups | | | |
| Robotics | -- | Up to 8 Delta Robot control | -- | -- |
| Supported SQL servers | -- | • Microsoft SQL Server<br>• Oracle<br>• IBM DB2<br>• MySQL<br>• Firebird | -- | -- |
| Local I/O | - | CJ series units | | |
| Remote I/O | NX I/O units/EtherCAT | | | |
| Mounting | DIN rail | | | |
| Global standards | CE, cULus | CE, cULus, NK, LR | | |
| Ordering information | P072 Sysmac Catalogue - www.industrial.omron.eu/en/products/downloads | | | |

## MACHINE INTERFACE

| Model | NA5-15W | NA5-12W | NA5-9W | NA5-7W |
|---|---|---|---|---|
| Display | TFT colour LCD | | | |
| Display size | 15-inch widescreen | 12-inch widescreen | 9-inch widescreen | 7-inch widescreen |
| Resolution | 1280 x 800 pixels | | 800 x 480 pixels | |
| Display colour | 24 bit full colour | | | |
| Operator input | • Touch screen<br>• 3 programmable function keys | | | |
| Built-in port | • 2 x  Ethernet<br>• 3 x  USB 2.0 | | | |
| Power requirements | 19.2 to 28.8 VDC | | | |
| Software tool | Sysmac Studio | | | |
| IP ratings | Front panel IP65 | | | |
| Memory card | SD and SDHC memory card | | | |
| Features | • Multiple-access level security with password protection<br>• Visual Basic programming with VB.net<br>• Integrated simulator in the Sysmac Studio | | | |
| Options | Black and silver frame colours | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

## I/O



| Model | NX Series I/O | GX Series I/O |
|---|---|---|
| Type | Modular I/O | Block I/O |
| Network specification | EtherCAT coupler unit | EtherCAT built-in |
| Number of units | • Up to 63 I/O units<br>• Max. 1024 bytes in + 1024 bytes out | Block I/O expandable with one digital I/O unit<br>(16 points + 16 points) |
| I/O types | • Digital I/O<br>• Analog I/O<br>• Encoder input<br>• Pulse output<br>• Temperature sensor input<br>• Safety control | • Digital I/O<br>• Analog I/O<br>• Encoder input<br>• Expansion unit |
| I/O connection | • Screwless push-in terminals (All units)<br>• MIL connectors (Option for units with 16 and 32 digital I/O points) | M3 screw terminals (1- or 3- wire DI) |
| Features | • Automatic and manual address setting<br>• Standard and high-speed inputs<br>• Digital input filtering<br>• Removable push-in I/O terminals<br>• Synchronous I/O updates using Distributed Clock<br>• I/O units with Time Stamp function<br>• High signal density: 16 digital or 8 analog signals in 12 mm width | • Automatic and manual address setting<br>• High-speed input<br>• Digital input filtering<br>• Removable I/O terminals<br>• Expandable digital I/O |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## SAFETY



| Model | NX safety controller | NX safety input unit | NX safety output unit |
|---|---|---|---|
| Network specification | FSoE – Safety over EtherCAT | | |
| Performance level | PLe (EN ISO 13849-1) | | |
| Safety integrity level | SIL3 (IEC 61508) | | |
| PFH | 4.4E-10 | 3.80E-10 | 8.80E-10 |
| PFD | 7.0E-06 (20 years) | 6.6E-06 | 7.9E-06 |
| TM (Mission time) | 20 years | | |
| Programming | • IEC 61131-3 standard<br>• 79 Safety FB/FUN | – | – |
| Safety connections | 32 connections (NX-SL3300 safety CPU)<br>128 connections (NX-SL3500 safety CPU) | – | – |
| I /O signal | – | • 4 points<br>• 8 points | • 2 points<br>• 4 points |
| Number of test outputs | – | 2 | – |
| I/O connection | Screwless push-in terminals | | |
| Maximum load current | – | – | • 2 A<br>• 0.5 A |
| Features | • Freely mix with standard NX I/O<br>• Flexibility and reusability of the programming code<br>• Variables are part of the NX7/NJ controller project | • Freely mix with standard NX I/O<br>• High connectivity for direct connection to safety input devices<br>• I/O data monitoring in the NX7/NJ controller project | |
| Mounting | DIN rail | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | |

## SERVO SYSTEM



| Model | **Accurax G5 servo drive** | |
|---|---|---|
| Type | Rotary servo drive | Linear servo drive |
| Ratings 230 V single-phase | 100 W to 1.5 kW | 200 W to 1.5 kW |
| Ratings 400 V three-phase | 600 W to 15 kW | 600 W to 5 kW |
| Applicable servomotor | Accurax G5 rotary motors | Accurax linear motors |
| Position, speed and torque control | EtherCAT | |
| Safety approvals | • PLd (EN ISO 13849-1)<br>• SIL2 (IEC 61508) | |
| Safety function | STO | |
| Full closed loop | Built-in | N/A |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |



| Model | **Accurax G5 rotary motor** | | | | **Accurax G5 high inertia rotary motor** | | |
|---|---|---|---|---|---|---|---|
| Rated speed | 3,000 rpm | 2,000 rpm | 1,500 rpm | 1,000 rpm | 3,000 rpm | 2,000 rpm | 1,500 rpm |
| Maximum speed | 4,500 to 6,000 rpm | 3,000 rpm | 2,000 to 3,000 rpm | 2,000 rpm | 5,000 rpm | 3,000 rpm | 1,500 to 3,000 rpm |
| Rated torque | 0.16 Nm to 15.9 Nm | 1.91 Nm to 23.9 Nm | 47.8 Nm to 95.5 Nm | 8.59 Nm to 57.3 Nm | 0.64 Nm to 2.4 Nm | 4.77 Nm to 23.9 Nm | 47.8 Nm |
| Sizes | 50 W to 5 kW | 400 W to 5 kW | 7,5 kW to 15 kW | 900 W to 6 kW | 200 W to 750 W | 1 kW to 5 kW | 7,5 kW |
| Applicable servo drive | Accurax G5 rotary servo drive | | | | | | |
| Encoder resolution | 20-bit incremental/<br>17-bit absolute | | 17-bit absolute | 20-bit incremental/<br>17-bit absolute | | | 17-bit absolute |
| IP rating | IP67 | | | | IP65 | IP67 | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | | | | |



| Model | **Accurax linear motor** | |
|---|---|---|
| Type | Iron-core linear motor | Ironless linear motor |
| Continuous force range | 48 N to 760 N | 29 N to 423 N |
| Peak force range | 105 N to 2000 N | 100 N to 2100 N |
| Maximum speed | 1 to 10 m/s | 1.2 to 16 m/s |
| Magnetic attraction force | 300 N to 4440 N | Zero |
| Applicable servo drive | Accurax G5 linear drive | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## SERVO SYSTEM

| Model | Integrated servo motor | | | |
|---|---|---|---|---|
| Rated torque | 25 Nm | 11,7 Nm | 4,3 Nm to 5 Nm | 2,55 Nm to 3,2 Nm |
| Frame size | 190 mm | 142 mm | 100 mm | 80 mm |
| Rated speed | 3,000 rpm | | | |
| Maximum speed | 4,000 rpm | | | |
| Encoder resolution | 15-bit incremental/18-bit absolute | | | |
| IP rating | IP65 | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

## FREQUENCY INVERTERS

| Model | RX | MX2 |
|---|---|---|
| 400 V three-phase | 0.4 kW to 132 kW | 0.4 to 15 kW |
| 200 V three-phase | 0.4 kW to 55 kW | 0.1 kW to 15 kW |
| 200 V single-phase | N/A | 0.1 kW to 2.2 kW |
| Control method | Sensor-less and closed-loop vector control | · V/F control<br>· Sensor-less vector control |
| Torque features | · 200% at 0.0 Hz (CLV)<br>· 150% at 0.3 Hz (OLV) | · 200% at 0.5 Hz |
| Connectivity | EtherCAT option board | |
| Logic Programming | Standard Firmware | |
| Customisation options | – | IP54 enclosure |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## ROBOTS

| Model | Accurax linear motor axis |
|---|---|
| Type | Linear motor axis |
| Continuous force range | 48 N to 760 N |
| Peak force range | 105 N to 2,000 N |
| Maximum speed | 5 m/s |
| Magnetic attraction force | 300 N to 4,440 N |
| Applicable servo drive | Accurax G5 linear drive |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads |

| Model | Delta robot IP69K | Delta robot IP67 | Mini Delta robot IP67 | Mini Delta robot IP65 |
|---|---|---|---|---|
| Type | Washdown Delta robot series | | | |
| Max. Payload | 3 Kg | | 2 Kg | 1 Kg |
| Degrees of freedom | 3 + 1 (rotation optional) | | | |
| Rated working range | Ø 1,100 x 250 mm (Max. 400) | Ø 1,100 x 300 mm (Max. 450) | Ø 650 x 150 mm (Max. 250) | Ø 500 x 155 mm / Ø 450 x 135 mm (with rotational axis) |
| Cycle time | "25/305/25 mm (0 .1 kg): Up to 150 c cycle/ min" | | "25/305/25 mm (0 .1 kg): Up to 200 c cycle/ min" | |
| Position repeatability | ± 0.2 mm (X, Y, Z) | | ± 0.1 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) |
| Angular repeatability | ± 0.3° (q) | ± 0.1° (q) | | ± 0.3° (q) |
| Protection class | IP69K | IP67 | | IP65 (Stainless steel + Titanium) |
| Rotational axis type | Shaft mounting | Tool Center Point mounting - Low or High inertia - | Tool Center Point mounting - Low or High inertia - | Shaft mounting |
| Option | - | Anti-collision detection | Anti-collision detection | - |
| Machine controller | NJ5 Robotics | | | |
| Servo drive | Accurax G5 rotary servo drive - EtherCAT | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

| Model | Delta robot XXL | Delta robot XL | Delta robot | Mini Delta robot |
|---|---|---|---|---|
| Type | Delta robot series | | | |
| Max. Payload | 8 Kg | 2 Kg | | 1 Kg |
| Degrees of freedom | 3 + 1 (rotation optional) | | | |
| Rated working range | Ø 1,600 x 350 mm (Max. 550) | Ø 1,300 x 250 mm (Max. 400) | Ø 1,100 x 250 mm (Max. 400) | Ø 500 x 155 mm / Ø 450 x 135 mm (with rotational axis) |
| Cycle time | "25/300/25 mm (8 kg): Up to 60 c cycle/ min 200/1000/200 mm (8 kg): Up to 35 cycle/ min" | "25/305/25 mm (0 .1 kg): Up to 120 c cycle/ min" | 25/305/25 mm (0 .1 kg): Up to 150 c cycle/ min | 25/305/25 mm (0 .1 kg): Up to 200 c cycle/ min |
| Position repeatability | ± 1 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) | ± 0.3 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) |
| Angular repeatability | ± 0.3° (q) | | ± 0.4° (q) | ± 0.3° (q) |
| Protection class | IP65 | | | |
| Rotational axis type | Shaft mounting | | | |
| Machine controller | NJ5 Robotics | | | |
| Servo drive | Accurax G5 rotary servo drive - EtherCAT | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

## VISION



| Model | FQ-M | FH |
|---|---|---|
| Description | Designed for object tracking | Flexible machine vision |
| Interface | EtherCAT and Ethernet built-in | EtherCAT, Ethernet, USB and serial ports built-in, SD card |
| Inspection items | Shape search, search labelling, edge position | Over 100 processing items |
| Registered scenes | 32 | |
| Image processing method | Real colour or monochrome | |
| Camera resolution | 752 x 480 | 4096 x 3072 |
| Features | · Fast and powerful object recognition<br>· Encoder input for object tracking and calibration<br>· Contour based object detection<br>· Sysmac Studio software for vision system operation and setting | · Powerful 4-core i7 parallel processor<br>· High speed CMOS camera<br>· Up to 8 camera by one controller<br>· Advanced shape search technology |
| Software | Sysmac Studio | |
| Supply voltage | 24 VDC | |
| Digital I/O | 9 in/5 out | 17 in/37 out |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## SENSING



| Model | ZW Series | N-Smart series | E3X/E3C/E2C |
|---|---|---|---|
| Type | Displacement sensor | Fiber/Laser/Contact sensor | Fiber/Laser/Proximity sensor |
| Measurement methods | White Light Confocal Fiber Principle | – | – |
| Applications | Height, thickness | – | – |
| Surfaces | Diffuse, shiny, mirror, glass, black rubber, metal, ceramics | – | – |
| Measurement range | · Min: 7 ± 0.3 mm,<br>· Max: 40 ± 6 mm | – | – |
| Resolution | 0.01 µm to 0.25 µm | – | – |
| Linearity | ± 0.8 µm to 7 µm | – | – |
| Special features | · Ethernet built-in<br>· EtherCAT built-in<br>· RS-232C<br>· Analog VDC/mA<br>· Sysmac Studio | · High speed transmission of I/O-signals and incident values<br>· Up to 30 amplifiers on one communication unit<br>· Synchronized signal transmission<br>· Slave unit for decentralized machine installation | · High speed transmission of I/O-signals<br>· Up to 30 amplifiers on one communication unit |
| Network specification | – | EtherCAT communication unit | |
| Connectable sensors | – | Up to 30 | |
| Amplifier types | – | · E3NX-FA0<br>· E3NC-LA0<br>· E3NC-SA0<br>· E9NC-TA0 | · E3X-HD0<br>· E3X-DA0-S<br>· E3X-MDA0<br>· E3C-LDA0<br>· E2C-EDA0 |
| Mounting | – | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | |

## SOFTWARE



| Model | **Sysmac Studio** |
|---|---|
| | • The Sysmac Studio provides one design and operation environment for configuration, programming, simulation and monitoring<br>• One software for motion, logic sequencing, safety, vision and HMI<br>• Fully compliant with open standard IEC 61131-3<br>• Supports Ladder, Structured Text and In-Line ST programming with a rich instruction set<br>• CAM editor for easy programming of complex motion profiles<br>• One simulation tool for sequence and motion in a 3D environment<br>• Advanced security function with 32 digit security password<br>• PLCopen Function Blocks for Motion Control and Safety |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads |

## ETHERNET AND ETHERCAT MEDIA



| Model | **Ethernet switch** | |
|---|---|---|
| Number of ports | 5 | 3 |
| Functions | • QoS for EtherNet/IP<br>• Auto MDI/MDIX<br>• Failure detection: Broadcast storm and LSI error detection 10/100BASE-TX, Auto-Negotiation | • QoS for EtherNet/IP<br>• Auto MDI/MDIX |
| Power requirements | 24 VDC (±5%) | |
| Dimension | 48 x 78 x 90 mm | 25 x 78 x 90 mm |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |



| Model | **EtherCAT junction slave (Branching unit)** | |
|---|---|---|
| Number of ports | 6 | 3 |
| Functions | • Power, Link/Act indicators<br>• Auto MDI/MDIX<br>• Reference clock | |
| Power requirements | 24 VDC (−15% to +20%) | |
| Dimension | 48 x 78 x 90 mm | 25 x 78 x 90 mm |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

# Main content

## Sysmac Automation Platform

**NX7□**

# NX7 series machine controller

## Sysmac controller - NX7 series

The NX7 series is a high performance machine controller that includes two synchronized motion cores controlling up to 256 axes.

- Fastest cycle time: 125 µs
- Number of axes: 256, 128
- Two synchronized motion cores
- Functions: Logic sequence and Motion
- Multi-tasking
- Built-in EtherCAT and two EtherNet/IP (1 Gbps) ports
- Fully conforms to IEC 61131-3 standards
- Certified PLCopen function blocks for motion control

## System configuration



sysmac
always in control

NA HMI — Factory network 1 — Sysmac Studio

EtherNet/IP

NX7 series

EtherNet/IP — EtherCAT — Axis 1  Axis 2  Axis 3  ...up to 256 axes

IT devices, Information Systems... — Factory network 2 (Segregated from network 1)

Accurax G5 servo motors

Up to 512 EtherCAT slaves

FH vision — MX2 inverter — Safety over EtherCAT — NX I/O

NX I/O + NX safety distributed

PLCopen motion control

PLCopen safety

# OMRON
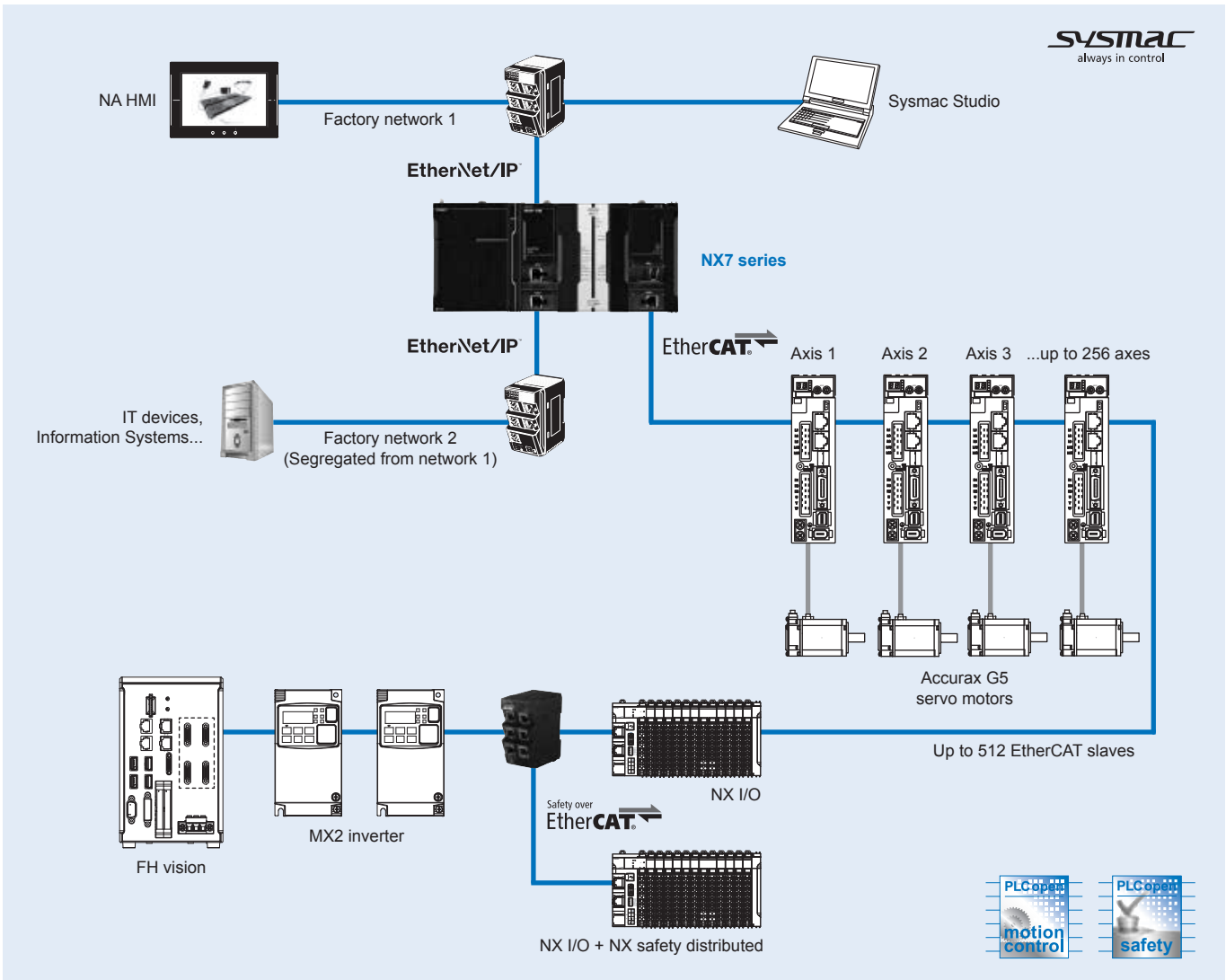
## Specifications

### General specifications

| Item | | NX7□ CPU Unit |
|---|---|---|
| Enclosure | | Mounted in a panel |
| Grounding | | Less than 100 Ω |
| CPU unit dimensions (H × D × W) | | 100 mm × 100 mm × 132 mm |
| Weight | | 880 g (including end cover) |
| Power consumption | | 40 W (including SD Memory card and end cover) |
| Operation environment | Ambient operating temperature | 0 to 55°C |
| | Ambient operating humidity | 10% to 90% (with non condensation) |
| | Atmosphere | Must be free from corrosive gases |
| | Ambient storage temperature | –25 to 70°C (excluding battery) |
| | Altitude | 2,000 m or less |
| | Pollution degree | 2 or less: Conforms to JIS B3502 and IEC 61131-2. |
| | Noise immunity | 2 kV on power supply line (conforms to IEC 61000-4-4.) |
| | Overvoltage category | Category II: Conforms to JIS B3502 and IEC 61131-2 |
| | EMC immunity level | Zone B |
| | Vibration resistance | Conforms to IEC60068-2-6<br>5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz.<br>Acceleration of 9.8 m/s$^2$ for 100 min in X, Y and Z directions (10 sweeps of 10 min each = 100 min total) |
| | Shock resistance | Conforms to IEC60068-2-27<br>147 m/s$^2$, 3 times in X, Y and Z directions (100 m/s$^2$ for relay output units) |
| Battery | Life | 2.5 years (at 25°C, power ON time rate 0% (power OFF)) |
| | Model | CJ1W-BAT01 |
| Applicable standards | | Conforms to cULus, NK, LR, EC directives, RCM and KC registration. |

### Performance specifications

| Item | | | NX701-1600 | NX701-1700 |
|---|---|---|---|---|
| Processing time | Instruction execution time | LOAD instructions | 0.42 ns | |
| | | Math instructions (for long real data) | 3.2 ns | |
| Programming | Program capacity[1] | Size | 80 MB | |
| | | POU definition | 6,000 | |
| | | POU instance | 48,000 | |
| | Variables capacity | No retain attribute | Size: 256 MB<br>Number: 360,000 | |
| | | Retain attribute | Size: 4 MB<br>Number: 40,000 | |
| | Data type | Number | 8,000 | |
| Unit configuration | Maximum number of connectable NX units on the system | | 4,000 (on NX EtherCAT communication coupler unit) | |
| | Number of expansion racks | | 0 | |
| | Power supply unit for CPU rack and expansion racks | Model | NX-PA9001<br>NX-PD7001 | |
| | | Power OFF detection time — AC power supply | 30 to 45 ms | |
| | | Power OFF detection time — DC power supply | 5 to 20 ms | |
| Motion control | Number of controlled axes | Number of real axes[2] | 128 axes max. | 256 axes max. |
| | | Number of total axes[3] | 128 axes max. | 256 axes max. |
| | | Linear interpolation control | 4 axes max. per axes group | |
| | | Circular interpolation control | 2 axes per axes group | |
| | Number of axes groups | | 64 groups max. | |
| | Position units | | Pulses, millimeters, micrometers, nanometers, degrees or inches | |
| | Override factors | | 0.00% or 0.01% to 500.00% | |
| | Motion control period | | Same as process data communications period of EtherCAT communications | |
| | Cams | Number of cam data points | 65,535 points max. per cam table / 1,048,560 points max. for all cam tables | |
| | | Number of cam tables | 640 tables max. | |
| Communications | Peripheral USB port | Supported services | Sysmac Studio connection | |
| | | Physical layer | USB 2.0-compliant B-type connector | |
| | | Transmission distance | 5 m max. | |

| Item | | | | NX701-1600 | NX701-1700 |
|---|---|---|---|---|---|
| Communications | Built-in EtherNet/IP port | | Number of ports | 2 | |
| | | | Physical layer | 10BASE-T/100BASE-TX/1000BASE-T | |
| | | | Frame length | 1514 max. | |
| | | | Media access method | CSMA/CD | |
| | | | Modulation | Baseband | |
| | | | Topology | Star | |
| | | | Baud rate | 1 Gbps (1000BASE-T) | |
| | | | Transmission media | STP (shielded, twisted-pair) cable of Ethernet category 5, 5e or higher | |
| | | | Transmission distance | 100 m max. (distance between Ethernet switch and node) | |
| | | | Cascade connections number | There are no restrictions if an switching hub is used | |
| | | CIP service: Tag data links (cyclic communications) | Number of connections | 256 per port, total 512 | |
| | | | Packet interval[*4] | 0.5 to 10,000 ms in 0.5-ms increments. Can be set for each connection. | |
| | | | Permissible communications band | 40,000 pps[*5] (including heartbeat) | |
| | | | Number of tag sets | 256 per port, total 512 | |
| | | | Tag types | Network variables | |
| | | | Number of tags | 8 (7 tags if controller status is included in the tag set.) | |
| | | | Link data size per node | 369,664 bytes max. (total size for all tags.) | |
| | | | Data size per connection | 1,444 bytes max. | |
| | | | Number of registrable tag sets | 256 per port, total 512 (1 connection = 1 tag set) | |
| | | | Tag set size | 1,444 bytes max. (two bytes are used if controller status is included in the tag set.) | |
| | | | Multi-cast packet filter[*6] | Supported. | |
| | | CIP message service: Explicit messages | Class 3 (number of connections) | 128 per port, total 256 (clients plus server) | |
| | | | UCMM (non-connection type) | Number of clients that can communicate at one time: 32 per port, total 64 Number of servers that can communicate at one time: 32 per port, total 64 | |
| | Built-in EtherCAT port | | Number of TCP socket service | 30 max. | |
| | | | Communications standard | IEC 61158, Type 12 | |
| | | | EtherCAT master specifications | Class B (feature pack motion control compliant) | |
| | | | Physical layer | 100BASE-TX | |
| | | | Modulation | Baseband | |
| | | | Baud rate | 100 Mbps (100Base-TX) | |
| | | | Duplex mode | Automatic | |
| | | | Topology | Line, daisy chain and branching | |
| | | | Transmission media | Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum tape and braiding) | |
| | | | Transmission distance | Distance between nodes: 100 m max. | |
| | | | Number of slaves | 512 max. | |
| | | | Process data size | Inputs/Outputs: 11,472 bytes max. | |
| | | | Process data size per slave | Inputs/Outputs: 1,434 bytes max. | |
| | | | Communications period | • Primary periodic task: 125 μs, 250 μs to 8 ms (in 250 μs increments) <br> • Priority-5 periodic task: 125 μs, 250 μs to 100 ms (in 250 μs increments) | |
| | | | Sync jitter | 1 μs max. | |
| Internal clock | | | | At ambient temperature of 55°C: –3.5 to +0.5 min error per month At ambient temperature of 25°C: –1.5 to +1.5 min error per month At ambient temperature of 0°C: –3 to +1 min error per month | |

[*1] This is the capacity for the execution objects and variable tables (including variable names).
[*2] This is the total number of axes that are set as servo axes or encoder axes and are also set as used axes.
[*3] This is the total for all axis types.
[*4] Data is updated on the line in the specified interval regardless of the number of nodes.
[*5] Means packets per second, i.e., the number of communication packets that can be sent or received in one second.
[*6] An IGMP client is mounted for the EtherNet/IP port. If an Ethernet switch that supports IGMP snooping is used, filtering of unnecessary multicast packets is performed.

# OMRON

## Function specifications

| Item | | | NX7☐ CPU Unit |
|---|---|---|---|
| Tasks | Function | Function | I/O refreshing and the user program are executed in units that are called tasks.<br>Tasks are used to specify execution conditions and execution priority. |
| | | Periodically executed tasks | Maximum number of primary periodic tasks: 1<br>Maximum number of periodic tasks: 4 |
| | | Conditionally executed tasks | Maximum number of even tasks: 32<br>When active even task instruction is executed or when condition expression for variable is met. |
| Programming | POUs (program organization units) | Programs | POUs that are assigned to tasks. |
| | | Function blocks | POUs that are used to create objects with specific conditions. |
| | | Functions | POUs that are used to create an object that determine unique outputs for the inputs, such as for data processing. |
| | Programming languages | Types | Ladder diagrams[*1] and structured text (ST). |
| | Namespaces | | A concept that is used to group identifiers for POU definitions. |
| | Variables | External access of variables | Network variables (the function which allows access from the HMI, host computers or other controllers) |
| | Data types | Basic data types | BOOL, BYTE, WORD, DWORD, LWORD, INT, SINT, DINT, LINT, UINT, USINT, UDINT, ULINT, REAL, LREAL, TIME (durations), DATE, TIME_OF_DAY, DATE_AND_TIME and STRING (text strings) |
| | | Derivative data types | Structures, unions, enumerations |
| | | Structures — Function | A derivative data type that groups together data with different variable types.<br>Number of members: 2,048 max.<br>Nesting levels: 8 max. |
| | | Structures — Member data types | Basic data types, structures, unions, enumerations, array variables |
| | | Structures — Specifying member offsets | You can use member offsets to place structure members at any memory locations.[*3] |
| | | Unions — Function | A derivative data type that groups together data with different variable types.<br>Number of members: 4 max. |
| | | Unions — Member data types | BOOL, BYTE, WORD, DWORD and LWORD. |
| | | Enumerations — Function | A derivative data type that uses text strings called enumerators to express variable values. |
| | Data type attributes | Array specifications — Function | An array is a group of elements with the same data type. You specify the number (subscript) of the element from the first element to specify the element.<br>Number of dimensions: 3 max.<br>Number of elements: 65,535 max. |
| | | Array specifications for FB instances | Supported. |
| | | Range specifications | You can specify a range for a data type in advance. The data type can take only values that are in the specified range. |
| | | Libraries | User libraries. |
| Motion control | Control modes | | Position control, velocity control, torque control |
| | Axis types | | Servo axes, virtual servo axes, encoder axes and virtual encoder axes |
| | Positions that can be managed | | Command positions and actual positions |
| | Single-axis | Single-axis position contol — Absolute positioning | Positioning is performed for a target position that is specified with an absolute value. |
| | | Single-axis position contol — Relative positioning | Positioning is performed for a specified travel distance from the command current position. |
| | | Single-axis position contol — Interrupt feeding | Positioning is performed for a specified travel distance from the position where an interrupt input was received from an external input. |
| | | Single-axis position contol — Cyclic synchronous absolute positioning | The function which output command positions in every control period in the position control mode. |
| | | Single-axis velocity control — Velocity control | Velocity control is performed in position control mode. |
| | | Single-axis velocity control — Cyclic synchronous velocity control | A velocity command is output each control period in the velocity control mode. |
| | | Single-axis torque control — Torque control | The torque of the motor is controlled. |
| | | Single-axis synchronized control — Starting cam operation | A cam motion is performed using the specified cam table. |
| | | Single-axis synchronized control — Ending cam operation | The cam motion for the axis that is specified with the input parameter is ended. |
| | | Single-axis synchronized control — Starting gear operation | A gear motion with the specified gear ratio is performed between a master axis and slave axis. |
| | | Single-axis synchronized control — Positioning gear operation | A gear motion with the specified gear ratio and sync position is performed between a master axis and slave axis. |
| | | Single-axis synchronized control — Ending gear operation | The specified gear motion or positioning gear motion is ended. |
| | | Single-axis synchronized control — Synchronous positioning | Positioning is performed in sync with a specified master axis. |
| | | Single-axis synchronized control — Master axis phase shift | The phase of a master axis in synchronized control is shifted. |
| | | Single-axis synchronized control — Combining axes | The command positions of two axes are added or subtracted and the result is output as the command position. |
| | | Single-axis manual operation — Powering the servo | The servo in the servo drive is turned ON to enable axis motion. |
| | | Single-axis manual operation — Jogging | An axis is jogged at a specified target velocity. |

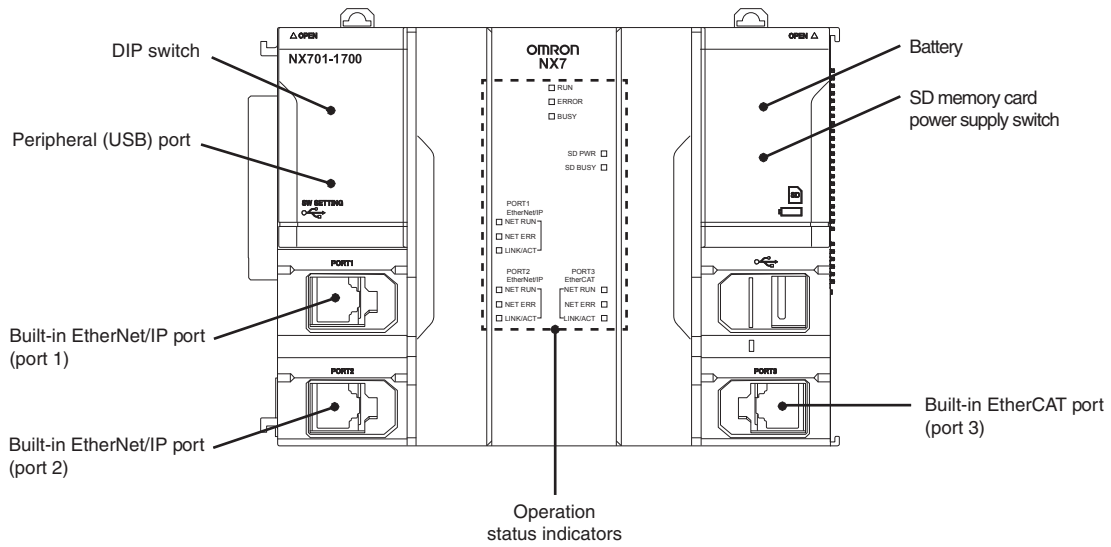| Item | | | | NX7□ CPU Unit |
|---|---|---|---|---|
| Motion control | Single-axis | Auxiliary functions for single-axis control | Resetting axis errors | Axes errors are cleared. |
| | | | Homing | A motor is operated and the limit signals, home proximity signal, and home signal are used to define home. |
| | | | Homing with parameter | Specifying the parameter, a motor is operated and the limit signals, home proximity signal and home signal are used to define home. |
| | | | High-speed homing | Positioning is performed for an absolute target position of 0 to return to home. |
| | | | Stopping | An axis is decelerated to a stop at the specified rate. |
| | | | Immediately stopping | An axis is stopped immediately. |
| | | | Override factors | The target velocity of an axis can be changed. |
| | | | Changing the current position | The command current position or actual current position of an axis can be changed to any position. |
| | | | Enabling external latches | The position of an axis is recorded when a trigger occurs. |
| | | | Disabling external latches | The current latch is disabled. |
| | | | Zone monitoring | You can monitor the command position or actual position of an axis to see when it is within a specified range (zone). |
| | | | Enabling digital cam switches | You can turn a digital output ON and OFF according to the position of an axis. |
| | | | Monitoring axis following error | You can monitor whether the difference between the command positions or actual positions of two specified axes exceeds a threshold value. |
| | | | Resetting the following error | The error between the command current position and actual current position is set to 0. |
| | | | Torque limit | The torque control function of the servo drive can be enabled or disabled and the torque limits can be set to control the output torque. |
| | | | Position compensation | The function which compensate the position for the axis in operation. |
| | | | Start velocity | You can set the initial velocity when axis motion starts. |
| | Axes groups | Multi-axes coordinated control | Absolute linear interpolation | Linear interpolation is performed to a specified absolute position. |
| | | | Relative linear interpolation | Linear interpolation is performed to a specified relative position. |
| | | | Circular 2D interpolation | Circular interpolation is performed for two axes. |
| | | | Axes group cyclic synchronous absolute positioning | A positioning command is output each control period in Position control mode. |
| | | Auxiliary functions for multi-axes coordinated control | Resetting axes group errors | Axes group errors and axis errors are cleared. |
| | | | Enabling axes groups | Motion of an axes group is enabled. |
| | | | Disabling axes groups | Motion of an axes group is disabled. |
| | | | Stopping axes groups | All axes in interpolated motion are decelerated to a stop. |
| | | | Immediately stopping axes groups | All axes in interpolated motion are stopped immediately. |
| | | | Setting axes group override factors | The blended target velocity is changed during interpolated motion. |
| | | | Reading axes group positions | The command current positions and actual current positions of an axes group can be read. |
| | | | Changing the axes in a group | The composition axes parameter in the axes group parameters can be overwritten temporarily. |
| | Common items | Cams | Setting cam table properties | The end point index of the cam table that is specified in the input parameter is changed. |
| | | | Saving cam tables | The cam table that is specified with the input parameter is saved in non-volatile memory in the CPU unit. |
| | | | Generating cam tables | The cam table that is specified with the input parameter is generated from the cam property and cam mode. |
| | | Parameters | Writing MC settings | Some of the axis parameters or axes group parameters are overwritten temporarily. |
| | | | Changing axis parameters | You can access and change the axis parameters from the user program. |

| Item | | | | NX7□ CPU Unit |
|---|---|---|---|---|
| Motion control | Auxiliary functions | Count modes | | You can select either linear mode (finite length) or rotary mode (infinite length). |
| | | Unit conversions | | You can set the display unit for each axis according to the machine. |
| | | Acceleration/ deceleration control | Automatic acceleration/ deceleration control | Jerk is set for the acceleration/deceleration curve for an axis motion or axes group motion. |
| | | | Changing the acceleration and deceleration rates | You can change the acceleration or deceleration rate even during acceleration or deceleration. |
| | | In-position check | | You can set an in-position range and in-position check time to confirm when positioning is completed. |
| | | Stop method | | You can set the stop method to the immediate stop input signal or limit input signal. |
| | | Re-execution of motion control instructions | | You can change the input variables for a motion control instruction during execution and execute the instruction again to change the target values during operation. |
| | | Multi-execution of motion control instructions (buffer mode) | | You can specify when to start execution and how to connect the velocities between operations when another motion control instruction is executed during operation. |
| | | Continuous axes group motions (transition mode) | | You can specify the transition mode for multi-execution of instructions for axes group operation. |
| | | Monitoring functions | Software limits | Software limits are set for each axis. |
| | | | Following error | The error between the command current value and the actual current value is monitored for an axis. |
| | | | Velocity, acceleration/deceleration rate, torque, interpolation velocity and interpolation acceleration/deceleration rate | You can set warning values for each axis and each axes group. |
| | | Absolute encoder support | | You can use an OMRON Accurax-G5 series servomotor with an absolute encoder to eliminate the need to perform homing at startup. |
| | | Input signal logic inversion | | You can inverse the logic of immediate stop input signal, positive limit input signal, negative limit input signal or home proximity input signal. |
| | External interface signals | | | The servo drive input signals listed on below are used. Home signal, home proximity signal, positive limit signal, negative limit signal, immediate stop signal and interrupt input signal. |
| Unit (I/O) management | EtherCAT slaves | Number of slaves | | 512 max. |
| Communications | Peripheral USB port | | | A port for communications with various kinds of support software running on a personal computer. |
| | EtherNet/IP port | Communication protocol | | TCP/IP, UDP/IP |
| | | CIP communications service | Tag data links | Programless cyclic data exchange is performed with the devices on the EtherNet/IP network. |
| | | | Message communications | CIP commands are sent to or received from the devices on the EtherNet/IP network. |
| | | TCP/IP applications | Socket services | Data is sent to and received from any node on EtherNet using the UDP or TCP protocol. Socket communications instructions are used. |
| | | | FTP client | File can be read from or written to computers to other Ethernet nodes from the CPU unit. FTP client communications instructions are used. |
| | | | FTP server | Files can be read from or written to the SD memory card in the CPU unit from computers at other Ethernet nodes. |
| | | | Automatic clock adjustment | Clock information is read from the NTP server at the specified time or at specified interval after the power supply to the CPU unit is turned ON. The internal clock time in the CPU unit is updated with the read time. |
| | | | SNMP agent | Built-in EtherNet/IP port internal status information is provided to network management software that uses an SNMP manager. |
| | EtherCAT port | Supported services | Process data communications | A communication method to exchange control information in cyclic communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | | SDO communications | A communication method to exchange control information in noncyclic event communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | Network scanning | | Information is read from connected slave devices and the slave configuration is automatically generated. |
| | | DC (distributed clock) | | Time is synchronized by sharing the EtherCAT system time between all EtherCAT devices (including the master). |
| | | Packet monitoring | | The frames that are sent by the master and the frames that are received by the master can be saved. The data that is saved can be viewed with WireShark or other applications. |
| | | Enable/disable settings for slaves | | The slaves can be enabled or disabled as communications targets. |
| | | Disconnecting/connecting slaves | | Temporarily disconnects a slave from the EtherCAT network for maintenance, such as for replacement of the slave and then connects the slave again. |
| | | Supported application protocol | CoE | SDO messages of the CAN application can be sent to slaves via EtherCAT. |
| | Communications instructions | | | The following instructions are supported: CIP communications instructions, socket communications instructions, SDO message instructions and FTP client instructions. |
| Operation management | RUN output contacts | | | The output on the power supply unit turns ON in RUN mode. |

| Item | | | | NX7☐ CPU Unit |
|---|---|---|---|---|
| System management | Event logs | Categories | | Events are recorded in the following logs:<br>• System event log<br>• Access event log<br>• User-defined event log |
| | | Number of events per event log | | 1,024 max. |
| Debugging | Online editing | | | Programs, function blocks, functions and global variables can be changed online. Different operators can change different POUs across a network. |
| | Forced refreshing | Forced refreshing | | The user can force specific variables to TRUE or FALSE. |
| | | Number of forced variables | For EtherCAT slaves | 64 max. |
| | MC test Run | | | Motor operation and wiring can be checked from the Sysmac Studio. |
| | Synchronization | | | The project file in the Sysmac Studio and the data in the CPU unit can be made the same when online. |
| | Differentiation monitoring | Differentiation monitoring | | Rising/falling edge of contacts can be monitored. |
| | | Number of contacts | | 8 max. |
| | Data tracing | Types | Single triggered trace | When the trigger condition is met, the specified number of samples are taken and then tracing stops automatically. |
| | | | Continuous trace | Data tracing is executed continuously and the trace data is collected by the Sysmac Studio. |
| | | Number of simultaneous data trace | | 4 max. |
| | | Number of records | | 10,000 max. |
| | | Sampling | Number of sampled variables | 192 variables max. |
| | | Timing of sampling | | Sampling is performed for the specified task period, at the specified time or when a sampling instruction is executed. |
| | | Triggered traces | Triggered traces | Trigger conditions are set to record data before and after an event. |
| | | | Trigger conditions | When BOOL variable changes to TRUE or FALSE.<br>Comparison of non-BOOL variable with a constant.<br>  Comparison method: Equals (=), greater than (>), greater than or equals (≥), less than (<), less than or equals (≤), not equal (≠). |
| | | | Delay | Trigger position setting: A slider is used to set the percentage of sampling before and after the trigger condition is met. |
| | Simulation | | | The operation of the CPU unit is emulated in the Sysmac Studio. |
| Reliability | Self-diagnosis | Controller error levels | | Major fault, partial fault, minor fault, observation and information. |
| | | User-defined errors | User-defined errors | User-defined errors are registered in advance and then records are created by executing instructions. |
| | | | Levels | 8 levels |
| Security | Protecting software assets and preventing operating mistakes | CPU unit names and serial IDs | | When going online to a CPU Unit from the Sysmac Studio, the CPU Unit name in the project is compared to the name of the CPU Unit being connected to. |
| | | Protection | User program transfer with no restoration information | You can prevent reading data in the CPU unit from the Sysmac Studio. |
| | | | CPU unit write protection | You can prevent writing data to the CPU unit from the Sysmac Studio or SD memory card. |
| | | | Overall project file protection | You can use passwords to protect .smc files from unauthorized opening on the Sysmac Studio. |
| | | | Data protection | You can use passwords to protect POUs on the Sysmac Studio. |
| | | Verification of operation authority | Verification of operation authority | Online operations can be restricted by operation rights to prevent damage to equipment or injuries that may be caused by operating mistakes. |
| | | | Number of groups | 5 |
| | | Verification of user program execution ID | | The user program cannot be executed without entering a user program execution ID from the Sysmac Studio for the specific hardware (CPU unit). |
| SD memory card | Storage type | | | SD memory card, SDHC memory card |
| | Application | Automatic transfer from SD memory card | | The data in the autoload folder on an SD memory card is automatically loaded when the power supply to the controller is turned ON. |
| | | SD memory card operation instructions | | You can access SD memory cards from instructions in the user program. |
| | | File operations from the Sysmac Studio | | You can perform file operations for Controller files in the SD memory card and read/write standard document files on the computer. |
| | | SD memory card life expiration detection | | Notification of the expiration of the life of the SD memory card is provided in a system-defined variable and event log. |
| Backup | SD memory card backup functions | Operation | Using front switch | You can use front switch to backup, compare or restore data. |
| | | | Using system-defined variable | You can use system-defined variables to backup or compare data. |
| | | | Memory card operations dialog box | Backup and verification operations can be performed from the SD memory card operations dialog box on the Sysmac Studio. |
| | | | Using instruction | Backup operation can be performed by using instruction. |
| | | Protection | Backing up data to the SD memory card | Prohibit SD memory card backup functions. |
| | Sysmac Studio controller backup functions | | | Backup, restore and verification operations for units can be performed from the Sysmac Studio. |

*1 Inline ST is supported (Inline ST is ST that is written as an element in a ladder diagram).

# OMRON

## Nomenclature

### NX7 CPU unit



DIP switch

Peripheral (USB) port

Built-in EtherNet/IP port
(port 1)

Built-in EtherNet/IP port
(port 2)

Battery

SD memory card
power supply switch

Built-in EtherCAT port
(port 3)

Operation
status indicators

### 100 to 240 VAC power supply unit (NX-PA9001)



AC input L1

AC input L2

LG

GR

RUN output

POWER indicator

Connector
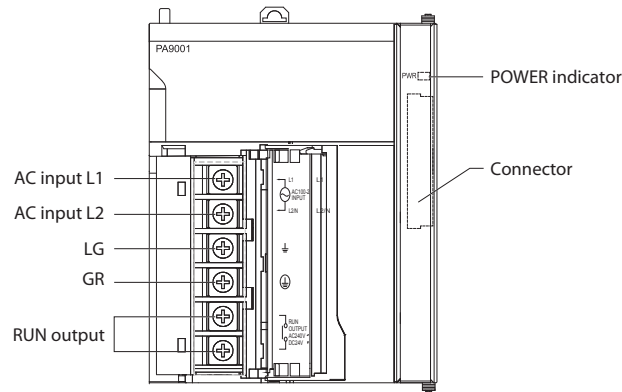
### 24 VDC power supply unit (NX-PD7001)



+ (DC input)

- (DC input)

LG

GR

RUN output

POWER indicator

Connector
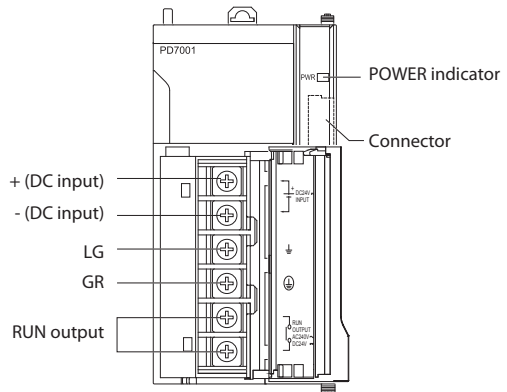
## Dimensions

### Power supply unit (NX-PA9001/PD7001)
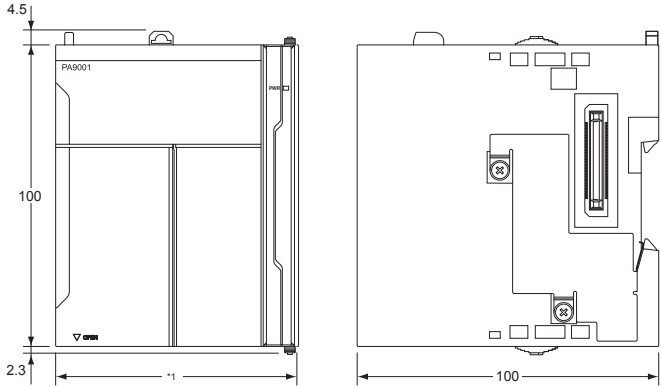


Note: 1. This dimension depends on the selected power supply unit:
- 51 mm: NX-PD7001
- 80 mm: NX-PA9001

### NX7 CPU unit
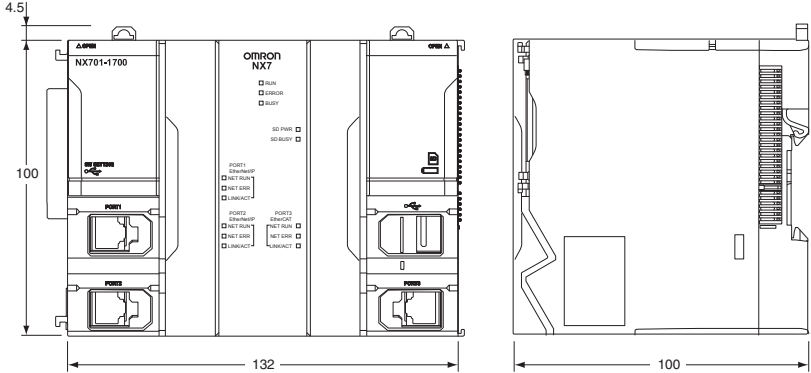


### End cover (NX-END01)
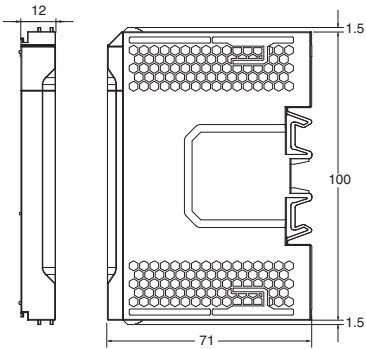


### Mounting height
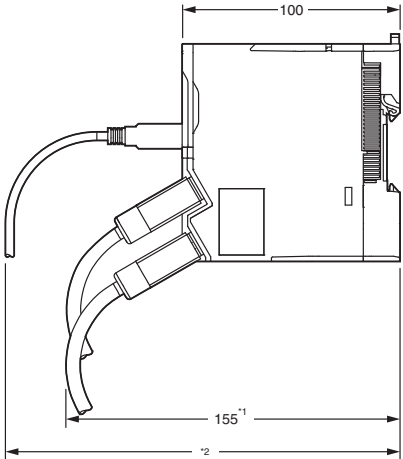


Note: 1. This is the dimension from the back of the unit to the communication cables:
- 155 mm: When an XS6G-T421-1 connector is used.
2. This dimension depends on the specifications of the commercially available USB cable.

# OMRON

## Ordering information

### NX7 series system
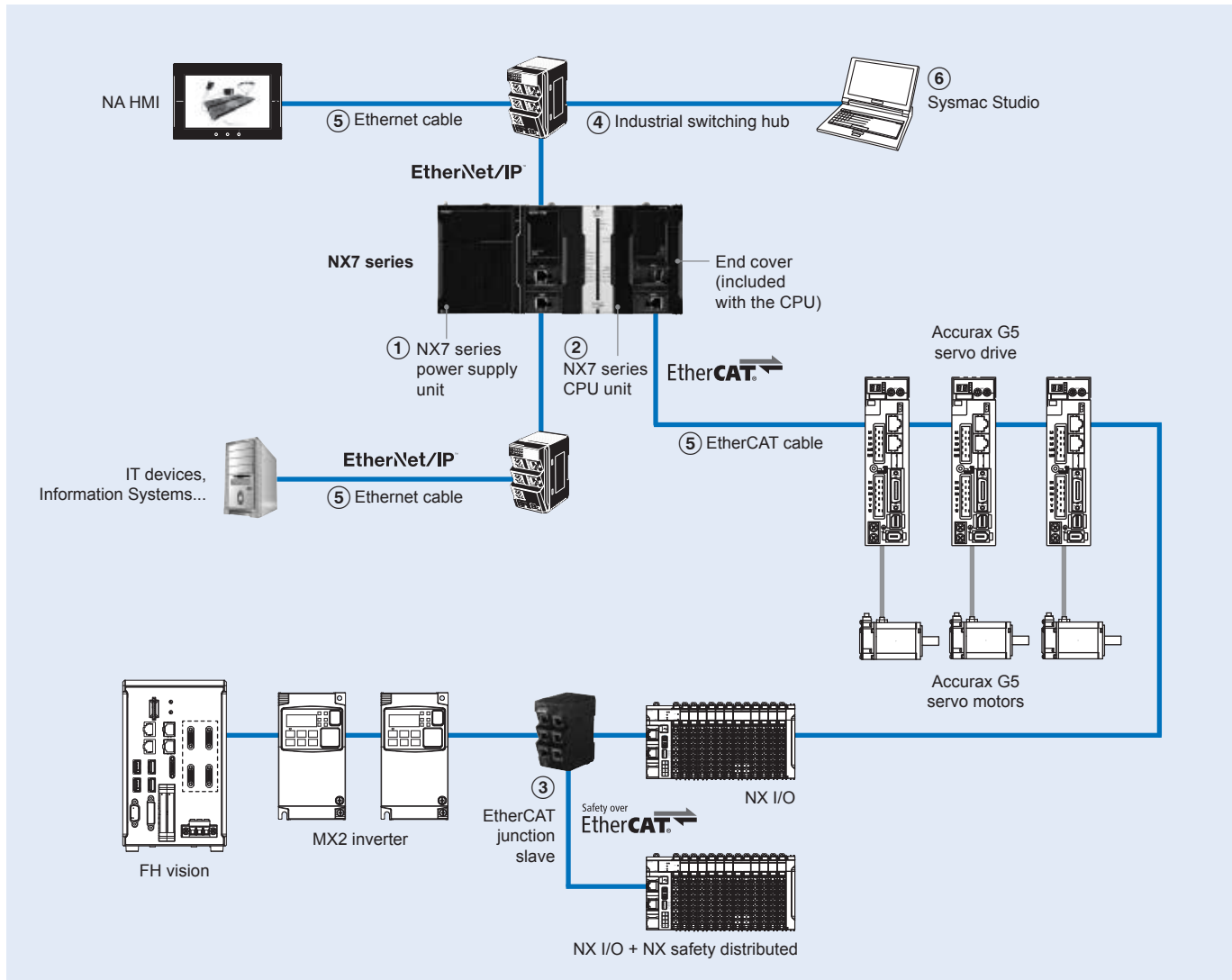


### Power supply units

| Symbol | Description | Output capacity | RUN output | Model |
| | | Total | | |
|---|---|---|---|---|
| ① | 100 to 240 VAC power supply unit for NX7 CPU | 90 W | Supported | NX-PA9001 |
| | 24 VDC power supply unit for NX7 CPU | 70 W | | NX-PD7001 |

### NX7 series CPU units

| Symbol | CPU | Program capacity | Variables capacity | Specifications | Number of axes | Model |
|---|---|---|---|---|---|---|
| ② | NX701 | 80 MB | 4 MB: Retained 256 MB: Not retained | Power consumption: 40 W | 256 | NX701-1700 |
| | | | | | 128 | NX701-1600 |

**Note:** The end cover unit NX-END01 is included with the CPU unit.

### EtherCAT junction slave

| Symbol | Name | No. of ports | Power supply voltage | Current consumption (A) | Dimensions (W x D x H) | Weight | Model | Appearance |
|---|---|---|---|---|---|---|---|---|
| ③ | EtherCAT junction slave | 3 | 20.4 to 28.8 VDC (24 VDC −15 to 20%) | 0.08 | 25 mm × 78 mm × 90 mm | 165 g | GX-JC03 | |
| | | 6 | | 0.17 | 48 mm × 78 mm × 90 mm | 220 g | GX-JC06 | |

**Note: 1.** Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC□81/□82.

    **2.** EtherCAT junction slave cannot be used for Ethernet/IP and Ethernet.

## Industrial switching hub

| Symbol | Specifications | | | | Accessories | Current consumption (A) | Model | Appearance |
|--------|------------|------------|------------|---|-------------|-------------------------|-------|------------|
| | Functions | | No. of ports | Failure detection | | | | |
| ④ | Quality of Service (QoS): EtherNet/IP control data priority. Failure detection: Broadcast storm and LSI error detection 10/100 BASE-TX, Auto-Negotiation | | 3 | No | Power supply connector | 0.08 | W4S1-03B | |
| | | | 5 | No | | 0.12 | W4S1-05B | |
| | | | 5 | Yes | Power supply connector and connector for informing error | 0.12 | W4S1-05C | |

## Recommended EtherCAT and EtherNet/IP communication cables

| Symbol | Item | | | Manufacturer | Colour | Cable length (m) | Model |
|--------|------|---|---|--------------|--------|------------------|-------|
| ⑤ | Ethernet patch cable | Cat 6a, AWG27, 4-pair cable Cable sheath material: LSZH[*1] **Note:** This cable is available in yellow, green and blue colours. | Standard type Cable with connectors on both ends (RJ45/RJ45) | OMRON | Yellow | 0.2 | XS6W-6LSZH8SS20CM-Y |
| | | | | | | 0.3 | XS6W-6LSZH8SS30CM-Y |
| | | | | | | 0.5 | XS6W-6LSZH8SS50CM-Y |
| | | | | | | 1 | XS6W-6LSZH8SS100CM-Y |
| | | | | | | 1.5 | XS6W-6LSZH8SS150CM-Y |
| | | | | | | 2 | XS6W-6LSZH8SS200CM-Y |
| | | | | | | 3 | XS6W-6LSZH8SS300CM-Y |
| | | | | | | 5 | XS6W-6LSZH8SS500CM-Y |
| | | | | | | 7.5 | XS6W-6LSZH8SS750CM-Y |
| | | | | | | 10 | XS6W-6LSZH8SS1000CM-Y |
| | | | | | | 15 | XS6W-6LSZH8SS1500CM-Y |
| | | | | | | 20 | XS6W-6LSZH8SS2000CM-Y |
| | | | | | Green | 0.2 | XS6W-6LSZH8SS20CM-G |
| | | | | | | 0.3 | XS6W-6LSZH8SS30CM-G |
| | | | | | | 0.5 | XS6W-6LSZH8SS50CM-G |
| | | | | | | 1 | XS6W-6LSZH8SS100CM-G |
| | | | | | | 1.5 | XS6W-6LSZH8SS150CM-G |
| | | | | | | 2 | XS6W-6LSZH8SS200CM-G |
| | | | | | | 3 | XS6W-6LSZH8SS300CM-G |
| | | | | | | 5 | XS6W-6LSZH8SS500CM-G |
| | | | | | | 7.5 | XS6W-6LSZH8SS750CM-G |
| | | | | | | 10 | XS6W-6LSZH8SS1000CM-G |
| | | | | | | 15 | XS6W-6LSZH8SS1500CM-G |
| | | | | | | 20 | XS6W-6LSZH8SS2000CM-G |
| | | Cat 5, AWG26, 4-pair cable Cable sheath material: PUR[*1] | Standard type Cable with connectors on both ends (RJ45/RJ45) | | Green | 0.5 | XS6W-5PUR8SS50CM-G |
| | | | | | | 1 | XS6W-5PUR8SS100CM-G |
| | | | | | | 1.5 | XS6W-5PUR8SS150CM-G |
| | | | | | | 2 | XS6W-5PUR8SS200CM-G |
| | | | | | | 3 | XS6W-5PUR8SS300CM-G |
| | | | | | | 5 | XS6W-5PUR8SS500CM-G |
| | | | | | | 7.5 | XS6W-5PUR8SS750CM-G |
| | | | | | | 10 | XS6W-5PUR8SS1000CM-G |
| | | | | | | 15 | XS6W-5PUR8SS1500CM-G |
| | | | | | | 20 | XS6W-5PUR8SS2000CM-G |
| | | Cat5, AWG22, 2-pair cable | Rugged type Cable with connectors on both ends (RJ45/RJ45) | | Grey | 0.3 | XS5W-T421-AMD-K |
| | | | | | | 0.5 | XS5W-T421-BMD-K |
| | | | | | | 1 | XS5W-T421-CMD-K |
| | | | | | | 2 | XS5W-T421-DMD-K |
| | | | | | | 3 | XS5W-T421-EMD-K |
| | | | | | | 5 | XS5W-T421-GMD-K |
| | | | | | | 10 | XS5W-T421-JMD-K |
| | | | | | | 15 | XS5W-T421-KMD-K |

| Symbol | Item | | | Manufacturer | Colour | Cable length (m) | Model |
|---|---|---|---|---|---|---|---|
| ⑤ | Ethernet patch cable | Cat5, AWG22, 2-pair cable | Rugged type Cable with connectors on both ends (M12 straight/RJ45) | OMRON | Grey | 0.3 | XS5W-T421-AMC-K |
| | | | | | | 0.5 | XS5W-T421-BMC-K |
| | | | | | | 1 | XS5W-T421-CMC-K |
| | | | | | | 2 | XS5W-T421-DMC-K |
| | | | | | | 3 | XS5W-T421-EMC-K |
| | | | | | | 5 | XS5W-T421-GMC-K |
| | | | | | | 10 | XS5W-T421-JMC-K |
| | | | | | | 15 | XS5W-T421-KMC-K |
| | | | Rugged type Cable with connectors on both ends (M12 L right angle/RJ45) | | Grey | 0.3 | XS5W-T422-AMC-K |
| | | | | | | 0.5 | XS5W-T422-BMC-K |
| | | | | | | 1 | XS5W-T422-CMC-K |
| | | | | | | 2 | XS5W-T422-DMC-K |
| | | | | | | 3 | XS5W-T422-EMC-K |
| | | | | | | 5 | XS5W-T422-GMC-K |
| | | | | | | 10 | XS5W-T422-JMC-K |
| | | | | | | 15 | XS5W-T422-KMC-K |
| | Ethernet installation cable | Cat 5, SF/UTP, 4 × 2 × AWG 24/1 (solid core), Polyurethane (PUR) | | Weidmüller | Green | 100 | WM IE-5IC4x2xAWG24/1-PUR |
| | | Cat 5, SF/UTP, 4 × 2 × AWG 26/7 (stranded core), Polyurethane (PUR) | | | Green | 100 | WM IE-5IC4x2xAWG26/7-PUR |
| | Connectors | RJ45 metallic connector For AWG22 to AWG26 | | | – | – | WM IE-T0-RJ45-FH-BK |
| | | RJ45 plastic connector For AWG22 to AWG24 | | OMRON | – | – | XS6G-T421-1 |
| | RJ45 socket | DIN-rail mount socket to terminate installation cable in the cabinet | | Weidmüller | – | – | WM IE-T0-RJ45-FJ-B |

## WE70 FA wireless LAN units

| Name | Area | Type | Model | Appearance |
|---|---|---|---|---|
| WE70 FA wireless LAN units | Europe | Access point (Master) | WE70-AP-EU | |
| | | Client (Slave) | WE70-CL-EU | |
| Directional magnetic-base antenna | | 1 set with two antennas, 2.4 GHz/5 GHz Dual-band compatible | WE70-AT001H | |
| DIN rail mounting bracket | | For TH35 7.5 | WT30-FT001 | |
| | | For TH35 15 | WT30-FT002 | |
| Antenna extension cable | | 5 m | WE70-CA5M | |

**Note:** Special versions are available for USA, Canada, China and Japan.

## Accessories (included with the CPU unit)

| Specifications | | Model | Appearance |
|---|---|---|---|
| SD memory card | 2 GB | HMC-SD291 | |
| | 4 GB | HMC-SD491 | |
| DIN track | Length: 0.5 m; height: 7.3 mm | PFP-50N | |
| | Length: 1 m; height: 7.3 mm | PFP-100N | |
| | Length: 1 m; height: 16 mm | PFP-100N2 | |
| Battery for NX7/NJ CPU unit (The battery is included with the CPU unit) | | CJ1W-BAT01 | |
| End cover (The end cover is included with the CPU unit. Necessary to be connected to the right end of the CPU rack) | | NX-END01 | |
| Fan unit (The fan unit is included with the CPU unit) | | NX-FAN01 | |

## Computer software

| Symbol | Specifications | Model |
|---|---|---|
| ⑥ | Sysmac Studio version 1.13 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## NJ5□, NJ3□, NJ1□

# NJ series machine controller

### Sysmac controller - NJ series

The NJ series is an scalable machine controller for logic sequence and motion control that includes options for advanced functions such as robotics and database connection.

- Fastest cycle time: 500 μs
- Number of axes: 64, 32, 16, 8, 4, 2
- Synchronized motion core
- Functions: Logic sequence, Motion, Robotics, Database connection and SECS/GEM
- Up to 8 Delta robot control
- DB connection: SQL client for Microsoft SQL server, Oracle, IBM DB2, MySQL, Firebird
- Multi-tasking
- Built-in EtherCAT and EtherNet/IP ports



## System configuration

## Specifications

### General specifications

| Item | | NJ☐ CPU Unit |
|---|---|---|
| Enclosure | | Mounted in a panel |
| Grounding | | Less than 100 Ω |
| CPU unit dimensions (H × D × W) | | 90 mm × 90 mm × 90 mm |
| Weight | | 550 g (including end cover) |
| Current consumption | | 5 VDC, 1.90 A (including SD Memory card and end cover) |
| Operation environment | Ambient operating temperature | 0 to 55°C |
| | Ambient operating humidity | 10% to 90% (with non condensation) |
| | Atmosphere | Must be free from corrosive gases |
| | Ambient storage temperature | –20 to 75°C (excluding battery) |
| | Altitude | 2,000 m or less |
| | Pollution degree | 2 or less: Conforms to JIS B3502 and IEC 61131-2. |
| | Noise immunity | 2 kV on power supply line (conforms to IEC 61000-4-4.) |
| | Overvoltage category | Category II: Conforms to JIS B3502 and IEC 61131-2 |
| | EMC immunity level | Zone B |
| | Vibration resistance | Conforms to IEC60068-2-6<br>5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz.<br>Acceleration of 9.8 m/s$^2$ for 100 min in X, Y and Z directions (10 sweeps of 10 min each = 100 min total) |
| | Shock resistance | Conforms to IEC60068-2-27<br>147 m/s$^2$, 3 times in X, Y and Z directions (100 m/s$^2$ for relay output units) |
| Battery | Life | 5 years at 25°C |
| | Model | CJ1W-BAT01 |
| Applicable standards | | Conforms to cULus, NK, LR, EC directives, C-Tick and KC registration[1]. |

[1]. Supported only by the CPUs with unit version 1.01 or higher.

### Performance specifications

#### Common performance specifications

| Item | | | NJ5☐ CPU Unit | NJ3☐ CPU Unit | NJ1☐ CPU Unit |
|---|---|---|---|---|---|
| Processing speed | Execution time | Ladder diagram instructions (LD, AND, OR and OUT) | 1.9 ns | 3.0 ns | 3.3 ns (5.0 ns max.) |
| | | Math instructions (LREAL) | 26 ns | 42 ns | 70 ns |
| Programming | Program capacity[1] | Size | 20 MB | 5 MB | 3 MB |
| | | POU definition | 3,000 | 750 | 450 |
| | | POU instance | 9,000 (Sysmac Studio v.1.06 or higher) / 6,000 (Sysmac Studio v.1.05 or lower) | 3,000 (Sysmac Studio v.1.05 or higher) / 1,500 (Sysmac Studio v.1.04 or lower) | 1,800 |
| | Variables capacity | No retain attribute[2] | Size: 4 MB<br>Number: 90,000 | Size: 2 MB<br>Number: 22,500 | |
| | | Retain attribute[3] | Size: 2 MB<br>Number: 10,000 | Size: 0.5 MB<br>Number: 5,000 (Sysmac Studio v.1.05 or higher) / 2,500 (Sysmac Studio v.1.04 or lower) | Size: 0.5 MB<br>Number: 5,000 |
| | Data type | Number | 2,000 | 1,000 | |
| | Memory for CJ-Series units (can be specified with AT specifications for variables.) | CIO area | 6,144 words (CIO 0 to CIO 6143) | | |
| | | Work area | 512 words (W0 to W511) | | |
| | | Holding area | 1,536 words (H0 to H1535) | | |
| | | DM area | 32,768 words (D0 to D32767) | | |
| | | EM area | 32,768 words × 25 banks (E0_00000 to E18_32767) | 32,768 words × 4 banks (E0_00000 to E3_32767) | |
| Unit configuration | Maximum number of connectable CJ units | | Maximum per CPU rack or expansion rack: 10 units<br>Maximum number of units per system: 40 units | | |
| | Number of expansion racks | | 3 max. | | |
| | I/O Capacity (CJ units) | | 2,560 points max. | | |
| | Power supply to CPU rack and expansion racks | Model | NJ-P☐3001 | | |
| | | Power OFF detection time — AC power supply | 30 to 45 ms | | |
| | | Power OFF detection time — DC power supply | 22 to 25 ms | | |
| Motion control | Number of controlled axes | Number of real axes[4] | NJ501-☐5☐0: 64 axes max.<br>NJ501-☐4☐0: 32 axes max.<br>NJ501-☐3☐0: 16 axes max. | NJ301-1200: 8 axes max.<br>NJ301-1100: 4 axes max. | NJ101-1000: 2 axes max.<br>NJ101-9000: 0 |
| | | Number of total axes[5] | NJ501-☐5☐0: 64 axes max.<br>NJ501-☐4☐0: 32 axes max.<br>NJ501-☐3☐0: 16 axes max. | NJ301-1200: 15 axes max.<br>NJ301-1100: 15 axes max. | NJ101-1000: 6 axes max.<br>NJ101-9000: 0 |
| | | Linear interpolation control | 4 axes max. per axes group | | |
| | | Circular interpolation control | 2 axes per axes group | | |
| | Number of axes groups | | 32 groups max. | | |
| | Position units | | Pulses, millimeters, micrometers, nanometers, degrees or inches | | |

| Item | | | NJ5☐ CPU Unit | NJ3☐ CPU Unit | NJ1☐ CPU Unit |
|---|---|---|---|---|---|
| Motion control | Override factors | | 0.00% or 0.01% to 500.00% | | |
| | Motion control period | | Same as process data communications period of EtherCAT communications | | |
| | Cams | Number of cam data points | 65,535 points max. per cam table / 1,048,560 points max. for all cam tables | 65,535 points max. per cam table / 262,140 points max. for all cam tables | |
| | | Number of cam tables | 640 tables max. | 160 tables max. | |
| Communications | Peripheral USB port | Supported services | Sysmac Studio connection | | |
| | | Physical layer | USB 2.0-compliant B-type connector | | |
| | | Transmission distance | 5 m max. | | |
| | Built-in EtherNet/IP port | Physical layer | 10 Base-T or 100 Base-TX | | |
| | | Media access method | CSMA/CD | | |
| | | Modulation | Baseband | | |
| | | Topology | Star | | |
| | | Baud rate | 100 Mbps (100Base-TX) | | |
| | | Transmission media | STP (shielded, twisted-pair) cable of Ethernet category 5, 5e or higher | | |
| | | Transmission distance | 100 m max. (distance between Ethernet switch and node) | | |
| | | Cascade connections number | There are no restrictions if an switching hub is used | | |
| | | CIP service: Tag data links (cyclic communications) — Number of connections | 32 | | |
| | | Packet Interval[6] | 10 to 10,000 ms in 1.0-ms increments.[7] Can be set for each connection. (Data will be refreshed at the set interval, regardless of the number of nodes.) | | |
| | | Permissible communications band | 3,000 pps[8][9] (including heartbeat) | | |
| | | Number of tag sets | 32 | | |
| | | Tag types | Network variables (CIO, Work, Holding, DM and EM Areas.) | | |
| | | Number of tags | 8 (7 tags if controller status is included in the tag set.) | | |
| | | Link data size per node | 19,200 bytes max. (total size for all tags.) | | |
| | | Data size per connection | 600 bytes max. | | |
| | | Number of registrable tag sets | 32 max. (1 connection = 1 tag set) | | |
| | | Tag set size | 600 bytes max. (two bytes are used if controller status is included in the tag set.) | | |
| | | Multi-cast packet filter[10] | Supported. | | |
| | | CIP message service: Explicit messages — Class 3 (number of connections) | 32 (clients plus server) | | |
| | | UCMM (non-connection type) | Number of clients that can communicate at one time: 32 max. Number of servers that can communicate at one time: 32 max. | | |
| | | Number of TCP socket service | 30 max.[11] | | |
| | Built-in EtherCAT port | Communications standard | IEC 61158, Type 12 | | |
| | | EtherCAT master specifications | Class B (feature pack motion control compliant) | | |
| | | Physical layer | 100BASE-TX | | |
| | | Modulation | Baseband | | |
| | | Baud rate | 100 Mbps (100BASE-TX) | | |
| | | Duplex mode | Automatic | | |
| | | Topology | Line, daisy chain and branching | | |
| | | Transmission media | Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum tape and braiding) | | |
| | | Transmission distance | Distance between nodes: 100 m max. | | |
| | | Number of slaves | 192 max. | | 64 max. |
| | | Process data size | Inputs/Outputs: 5,736 bytes max. (However, the maximum number of process data frames is 4) | | |
| | | Process data size per slave | Inputs/Outputs: 1,434 bytes max. | | |
| | | Communications period | 500/1,000/2,000/4,000 μs | 1,000/2,000/4,000 μs | |
| | | Sync jitter | 1 μs max. | | |
| Internal clock | | | At ambient temperature of 55°C: –3.5 to +0.5 min error per month At ambient temperature of 25°C: –1.5 to +1.5 min error per month At ambient temperature of 0°C: –3 to +1 min error per month | | |

[1]. This is the capacity for the execution objects and variable tables (including variable names).
[2]. Words for CJ-series units in the CIO and work areas are not included.
[3]. Words for CJ-series units in the holding, DM and EM areas are not included.
[4]. This is the total number of axes that are set as servo axes or encoder axes and are also set as used axes.
[5]. This is the total for all axis types. The maximum number of axes of the CPU unit version 1.05 or lower is 8 axes (NJ301-1200), 4 axes (NJ301-1100).
[6]. Data is updated on the line in the specified interval regardless of the number of nodes.
[7]. The packet interval of the CPU unit version 1.02 or lower is 10 to 10,000 ms in 1.0 ms increments.
[8]. Means packets per second, i.e., the number of communication packets that can be sent or received in one second.
[9]. The permissible communications band of the CPU unit version 1.02 or lower is 1,000 pps.
[10]. An IGMP client is mounted for the EtherNet/IP port. If an Ethernet switch that supports IGMP snooping is used, filtering of unnecessary multicast packets is performed.
[11]. The maximum number of TCP socket service of the CPU unit version 1.02 or lower is 16.

## Performance specifications for CPU units with robotic functionality

| Item | | | NJ5☐ CPU Unit | | | |
|------|---|---|------|---|---|---|
| | | | NJ501-4500 | NJ501-4400 | NJ501-4300 | NJ501-4310[*1] |
| Motion control | Robotics | Delta robot | 3 + 1 (optional rotational axis) axes per robot | | | |
| | | Number of Delta robots | 8 Delta robots max. (depending on the number of axes supported by the CPU) | | | |

[*1.] The NJ501-4310 CPU unit only supports one Delta robot.

**Note:** For robot control by NJ501-4☐☐0, use the Accurax G5 servo drive with built-in EtherCAT communications, absolute encoder and brake.

## Performance specifications for CPU units with database connection

| Item | | | NJ5☐ CPU Unit | | |
|------|---|---|------|---|---|
| | | | NJ501-1520 | NJ501-1420 | NJ501-1320 |
| Programming | Memory for CJ-series units (can be specified with AT specifications for variables) | EM area | 32,768 words × 25 banks[*1] (E0_00000 to E18_32767) | | |

[*1.] When the spool function is enabled, the DB connection service uses E9_0 to E18_32767.

## Function specifications

### Common function specifications

| Item | | | NJ☐ CPU Unit |
|------|---|---|------|
| Tasks | Function | Function | I/O refreshing and the user program are executed in units that are called tasks.<br>Tasks are used to specify execution conditions and execution priority. |
| | | Periodically executed tasks | Maximum number of primary periodic tasks: 1<br>Maximum number of periodic tasks: 3 |
| | | Conditionally executed tasks[*1] | Maximum number of even tasks: 32<br>When active even task instruction is executed or when condition expression for variable is met. |
| | Setup | System service monitoring settings | The execution interval and the percentage of the total user program execution time are monitored for the system services (processes that are executed by the CPU Unit separate from task execution). |
| Programming | POUs (program organization units) | Programs | POUs that are assigned to tasks. |
| | | Function blocks | POUs that are used to create objects with specific conditions. |
| | | Functions | POUs that are used to create an object that determine unique outputs for the inputs, such as for data processing. |
| | Programming languages | Types | Ladder diagrams[*2] and structured text (ST). |
| | Namespaces[*3] | | A concept that is used to group identifiers for POU definitions. |
| | Variables | External access of variables | Network variables (the function which allows access from the HMI, host computers or other controllers) |
| | Data types | Basic data types | BOOL, BYTE, WORD, DWORD, LWORD, INT, SINT, DINT, LINT, UINT, USINT, UDINT, ULINT, REAL, LREAL, TIME (durations), DATE, TIME_OF_DAY, DATE_AND_TIME and STRING (text strings) |
| | | Derivative data types | Structures, unions, enumerations |
| | | Structures · Function | A derivative data type that groups together data with different variable types.<br>Number of members: 2,048 max.<br>Nesting levels: 8 max. |
| | | Structures · Member data types | Basic data types, structures, unions, enumerations, array variables |
| | | Structures · Specifying member offsets | You can use member offsets to place structure members at any memory locations.[*3] |
| | | Unions · Function | A derivative data type that enables access to the same data with different data types.<br>Number of members: 4 max. |
| | | Unions · Member data types | BOOL, BYTE, WORD, DWORD and LWORD. |
| | | Enumerations · Function | A derivative data type that uses text strings called enumerators to express variable values. |
| | Data type attributes | Array specifications · Function | An array is a group of elements with the same data type. You specify the number (subscript) of the element from the first element to specify the element.<br>Number of dimensions: 3 max.<br>Number of elements: 65,535 max. |
| | | Array specifications for FB instances | Supported. |
| | | Range specifications | You can specify a range for a data type in advance. The data type can take only values that are in the specified range. |
| | | Libraries | User libraries. |
| Motion control[*4] | Control modes | | Position control, velocity control, torque control |
| | Axis types | | Servo axes, virtual servo axes, encoder axes and virtual encoder axes |
| | Positions that can be managed | | Command positions and actual positions |
| | Single-axis | Single-axis position contol · Absolute positioning | Positioning is performed for a target position that is specified with an absolute value. |
| | | Single-axis position contol · Relative positioning | Positioning is performed for a specified travel distance from the command current position. |
| | | Single-axis position contol · Interrupt feeding | Positioning is performed for a specified travel distance from the position where an interrupt input was received from an external input. |
| | | Single-axis position contol · Cyclic synchronous absolute positioning[*1] | The function which output command positions in every control period in the position control mode. |

| Item | | | | NJ☐ CPU Unit |
|------|---|---|---|--------------|
| Motion control[9] | Single-axis | Single-axis velocity control | Velocity control | Velocity control is performed in position control mode. |
| | | | Cyclic synchronous velocity control | A velocity command is output each control period in the velocity control mode. |
| | | Single-axis torque control | Torque control | The torque of the motor is controlled. |
| | | Single-axis synchronized control | Starting cam operation | A cam motion is performed using the specified cam table. |
| | | | Ending cam operation | The cam motion for the axis that is specified with the input parameter is ended. |
| | | | Starting gear operation | A gear motion with the specified gear ratio is performed between a master axis and slave axis. |
| | | | Positioning gear operation | A gear motion with the specified gear ratio and sync position is performed between a master axis and slave axis. |
| | | | Ending gear operation | The specified gear motion or positioning gear motion is ended. |
| | | | Synchronous positioning | Positioning is performed in sync with a specified master axis. |
| | | | Master axis phase shift | The phase of a master axis in synchronized control is shifted. |
| | | | Combining axes | The command positions of two axes are added or subtracted and the result is output as the command position. |
| | | Single-axis manual operation | Powering the servo | The servo in the servo drive is turned ON to enable axis motion. |
| | | | Jogging | An axis is jogged at a specified target velocity. |
| | | Auxiliary functions for single-axis control | Resetting axis errors | Axes errors are cleared. |
| | | | Homing | A motor is operated and the limit signals, home proximity signal, and home signal are used to define home. |
| | | | Homing with parameter[1] | Specifying the parameter, a motor is operated and the limit signals, home proximity signal and home signal are used to define home. |
| | | | High-speed homing | Positioning is performed for an absolute target position of 0 to return to home. |
| | | | Stopping | An axis is decelerated to a stop at the specified rate. |
| | | | Immediately stopping | An axis is stopped immediately. |
| | | | Override factors | The target velocity of an axis can be changed. |
| | | | Changing the current position | The command current position or actual current position of an axis can be changed to any position. |
| | | | Enabling external latches | The position of an axis is recorded when a trigger occurs. |
| | | | Disabling external latches | The current latch is disabled. |
| | | | Zone monitoring | You can monitor the command position or actual position of an axis to see when it is within a specified range (zone). |
| | | | Enabling digital cam switches[5] | You can turn a digital output ON and OFF according to the position of an axis. |
| | | | Monitoring axis following error | You can monitor whether the difference between the command positions or actual positions of two specified axes exceeds a threshold value. |
| | | | Resetting the following error | The error between the command current position and actual current position is set to 0. |
| | | | Torque limit | The torque control function of the servo drive can be enabled or disabled and the torque limits can be set to control the output torque. |
| | | | Position compensation | The function which compensate the position for the axis in operation. |
| | | | Start velocity[6] | You can set the initial velocity when axis motion starts. |
| | Axes groups | Multi-axes coordinated control | Absolute linear interpolation | Linear interpolation is performed to a specified absolute position. |
| | | | Relative linear interpolation | Linear interpolation is performed to a specified relative position. |
| | | | Circular 2D interpolation | Circular interpolation is performed for two axes. |
| | | | Axes group cyclic synchronous absolute positioning | A positioning command is output each control period in Position control mode.[3] |

| Item | | | | NJ☐ CPU Unit |
|---|---|---|---|---|
| Motion control[9] | Axes groups | Auxiliary functions for multi-axes coordinated control | Resetting axes group errors | Axes group errors and axis errors are cleared. |
| | | | Enabling axes groups | Motion of an axes group is enabled. |
| | | | Disabling axes groups | Motion of an axes group is disabled. |
| | | | Stopping axes groups | All axes in interpolated motion are decelerated to a stop. |
| | | | Immediately stopping axes groups | All axes in interpolated motion are stopped immediately. |
| | | | Setting axes group override factors | The blended target velocity is changed during interpolated motion. |
| | | | Reading axes group positions | The command current positions and actual current positions of an axes group can be read.[3] |
| | | | Changing the axes in a group | The composition axes parameter in the axes group parameters can be overwritten temporarily.[3] |
| | Common items | Cams | Setting cam table properties | The end point index of the cam table that is specified in the input parameter is changed. |
| | | | Saving cam tables | The cam table that is specified with the input parameter is saved in non-volatile memory in the CPU unit. |
| | | | Generating cam tables[7] | The cam table that is specified with the input parameter is generated from the cam property and cam mode. |
| | | Parameters | Writing MC settings | Some of the axis parameters or axes group parameters are overwritten temporarily. |
| | | | Changing axis parameters[7] | You can access and change the axis parameters from the user program. |
| | Auxiliary functions | Count modes | | You can select either linear mode (finite length) or rotary mode (infinite length). |
| | | Unit conversions | | You can set the display unit for each axis according to the machine. |
| | | Acceleration/ deceleration control | Automatic acceleration/ deceleration control | Jerk is set for the acceleration/deceleration curve for an axis motion or axes group motion. |
| | | | Changing the acceleration and deceleration rates | You can change the acceleration or deceleration rate even during acceleration or deceleration. |
| | | In-position check | | You can set an in-position range and in-position check time to confirm when positioning is completed. |
| | | Stop method | | You can set the stop method to the immediate stop input signal or limit input signal. |
| | | Re-execution of motion control instructions | | You can change the input variables for a motion control instruction during execution and execute the instruction again to change the target values during operation. |
| | | Multi-execution of motion control instructions (buffer mode) | | You can specify when to start execution and how to connect the velocities between operations when another motion control instruction is executed during operation. |
| | | Continuous axes group motions (transition mode) | | You can specify the transition mode for multi-execution of instructions for axes group operation. |
| | | Monitoring functions | Software limits | Software limits are set for each axis. |
| | | | Following error | The error between the command current value and the actual current value is monitored for an axis. |
| | | | Velocity, acceleration/deceleration rate, torque, interpolation velocity and interpolation acceleration/deceleration rate | You can set warning values for each axis and each axes group. |
| | | Absolute encoder support | | You can use an OMRON Accurax-G5 series servomotor with an absolute encoder to eliminate the need to perform homing at startup. |
| | | Input signal logic inversion[6] | | You can inverse the logic of immediate stop input signal, positive limit input signal, negative limit input signal or home proximity input signal. |
| | External interface signals | | | The servo drive input signals listed on below are used. Home signal, home proximity signal, positive limit signal, negative limit signal, immediate stop signal and interrupt input signal. |
| Unit (I/O) management | NX units[6] | | | You can use NX units through the communication coupler unit. |
| | CJ-series units | Maximum number of units | | 40 |
| | | Basic I/O units | Chattering and noise countermeasures | Input response times are set. |
| | | | Load short-circuit protection and I/O disconnection detection | Alarm information for basic I/O units is read. |
| | EtherCAT slaves | Number of slaves | | NJ5/NJ3: 192 max. NJ1: 64 max. |
| | | Basic I/O | Chattering and noise countermeasures | Input response times are set. |

| Item | | | | NJ☐ CPU Unit |
|---|---|---|---|---|
| Communications | Peripheral USB port | | | A port for communications with various kinds of support software running on a personal computer. |
| | EtherNet/IP port | Communication protocol | | TCP/IP, UDP/IP |
| | | CIP communications service | Tag data links | Programless cyclic data exchange is performed with the devices on the EtherNet/IP network. |
| | | | Message communications | CIP commands are sent to or received from the devices on the EtherNet/IP network. |
| | | TCP/IP applications | Socket services | Data is sent to and received from any node on EtherNet using the UDP or TCP protocol. Socket communications instructions are used. |
| | | | FTP client[7] | File can be read from or written to computers to other Ethernet nodes from the CPU unit. FTP client communications instructions are used. |
| | | | FTP server | Files can be read from or written to the SD memory card in the CPU unit from computers at other Ethernet nodes. |
| | | | Automatic clock adjustment | Clock information is read from the NTP server at the specified time or at specified interval after the power supply to the CPU unit is turned ON. The internal clock time in the CPU unit is updated with the read time. |
| | | | SNMP agent | Built-in EtherNet/IP port internal status information is provided to network management software that uses an SNMP manager. |
| | EtherCAT port | Supported services | Process data communications | A communication method to exchange control information in cyclic communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | | SDO communications | A communication method to exchange control information in noncyclic event communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | Network scanning | | Information is read from connected slave devices and the slave configuration is automatically generated. |
| | | DC (distributed clock) | | Time is synchronized by sharing the EtherCAT system time between all EtherCAT devices (including the master). |
| | | Packet monitoring | | The frames that are sent by the master and the frames that are received by the master can be saved. The data that is saved can be viewed with WireShark or other applications. |
| | | Enable/disable settings for slaves | | The slaves can be enabled or disabled as communications targets. |
| | | Disconnecting/connecting slaves | | Temporarily disconnects a slave from the EtherCAT network for maintenance, such as for replacement of the slave and then connects the slave again. |
| | | Supported application protocol | CoE | SDO messages of the CAN application can be sent to slaves via EtherCAT. |
| | Communications instructions | | | The following instructions are supported: CIP communications instructions, socket communications instructions, SDO message instructions, no-protocol communications instructions, protocol macro instructions and FTP client instructions[7]. |
| Operation management | RUN output contacts | | | The output on the NJ-P☐3001 power supply unit turns ON in RUN mode. |
| System management | Event logs | Categories | | Events are recorded in the following logs:<br>• System event log<br>• Access event log<br>• User-defined event log |
| | | Number of events per event log | | NJ5: 1,024 max.<br>NJ3/NJ1: 512 max. |
| Debugging | Online editing | | | Programs, function blocks, functions and global variables can be changed online. Different operators can change different POUs across a network. |
| | Forced refreshing | Forced refreshing | | The user can force specific variables to TRUE or FALSE. |
| | | Number of forced variables | For EtherCAT slaves | 64 max. |
| | | | For CJ-series units | 64 max. |
| | MC test Run | | | Motor operation and wiring can be checked from the Sysmac Studio. |
| | Synchronization | | | The project file in the Sysmac Studio and the data in the CPU unit can be made the same when online. |
| | Differentiation monitoring[1] | Differentiation monitoring[1] | | Rising/falling edge of contacts can be monitored. |
| | | Number of contacts[1] | | 8 max. |
| | Data tracing | Types | Single triggered trace | When the trigger condition is met, the specified number of samples are taken and then tracing stops automatically. |
| | | | Continuous trace | Data tracing is executed continuously and the trace data is collected by the Sysmac Studio. |
| | | Number of simultaneous data trace | | NJ5: 4 max[8].<br>NJ3/NJ1: 2 max. |
| | | Number of records | | 10,000 max. |
| | | Sampling | Number of sampled variables | NJ5: 192 variables max.<br>NJ3/NJ1: 48 variables max. |
| | | Timing of sampling | | Sampling is performed for the specified task period, at the specified time or when a sampling instruction is executed. |
| | | Triggered traces | Triggered traces | Trigger conditions are set to record data before and after an event. |
| | | | Trigger conditions | When BOOL variable changes to TRUE or FALSE.<br>Comparison of non-BOOL variable with a constant.<br>Comparison method: Equals (=), greater than (>), greater than or equals (≥), less than (<), less than or equals (≤), not equal (≠). |
| | | | Delay | Trigger position setting: A slider is used to set the percentage of sampling before and after the trigger condition is met. |
| | Simulation | | | The operation of the CPU unit is emulated in the Sysmac Studio. |
| Reliability | Self-diagnosis | Controller error levels | | Major fault, partial fault, minor fault, observation and information. |
| | | User-defined errors | User-defined errors | User-defined errors are registered in advance and then records are created by executing instructions. |
| | | | Levels | 8 levels |

| Item | | | | NJ☐ CPU Unit |
|---|---|---|---|---|
| Security | Protecting software assets and preventing operating mistakes | CPU unit names and serial IDs | | When going online to a CPU Unit from the Sysmac Studio, the CPU Unit name in the project is compared to the name of the CPU Unit being connected to. |
| | | Protection | User program transfer with no restoration information | You can prevent reading data in the CPU unit from the Sysmac Studio. |
| | | | CPU unit write protection | You can prevent writing data to the CPU unit from the Sysmac Studio or SD memory card. |
| | | | Overall project file protection | You can use passwords to protect .smc files from unauthorized opening on the Sysmac Studio. |
| | | | Data protection | You can use passwords to protect POUs on the Sysmac Studio.[*3] |
| | | Verification of operation authority | Verification of operation authority | Online operations can be restricted by operation rights to prevent damage to equipment or injuries that may be caused by operating mistakes. |
| | | | Number of groups | 5[*9] |
| | | Verification of user program execution ID | | The user program cannot be executed without entering a user program execution ID from the Sysmac Studio for the specific hardware (CPU unit). |
| SD memory card | Storage type | | | SD memory card, SDHC memory card |
| | Application | Automatic transfer from SD memory card[*1] | | The data in the autoload folder on an SD memory card is automatically loaded when the power supply to the controller is turned ON. |
| | | SD memory card operation instructions | | You can access SD memory cards from instructions in the user program. |
| | | File operations from the Sysmac Studio | | You can perform file operations for Controller files in the SD memory card and read/write standard document files on the computer. |
| | | SD memory card life expiration detection | | Notification of the expiration of the life of the SD memory card is provided in a system-defined variable and event log. |
| Backup[*1] | SD memory card backup functions | Operation | Using front switch | You can use front switch to backup, compare or restore data. |
| | | | Using system-defined variable | You can use system-defined variables to backup or compare data. |
| | | | Memory card operations dialog box | Backup and verification operations can be performed from the SD memory card operations dialog box on the Sysmac Studio. |
| | | | Using instruction[*7] | Backup operation can be performed by using instruction. |
| | | Protection | Backing up data to the SD memory card | Prohibit SD memory card backup functions. |
| | Sysmac Studio controller backup functions | | | Backup, restore and verification operations for units can be performed from the Sysmac Studio. |

*1. Supported only by the CPU units with unit version 1.03 or higher.
*2. Inline ST is supported (Inline ST is ST that is written as an element in a ladder diagram).
*3. Supported only by the CPU units with unit version 1.01 or higher.
*4. The NJ101-9000 CPU unit doesn't support motion control.
*5. Supported only by the CPU units with unit version 1.06 or higher.
*6. Supported only by the CPU units with unit version 1.05 or higher.
*7. Supported only by the CPU units with unit version 1.08 or higher.
*8. Maximum number of simultaneous data trace of the NJ501-1☐20 CPU unit version 1.08 or higher is 2.
*9. When the NJ501 CPU units with unit version 1.00 is used, this value becomes two.

## Function specifications for CPU units with robotic functionality

| Item | | | | NJ501-4☐☐0 CPU Unit |
|---|---|---|---|---|
| Robot control functions | Axes group | Multi-axes coordinated control | Robot parameter settings | Sets the parameters (such as kinematics type and link length) for the robot. |
| | | | Time-specified absolute positioning command | Moves the robot to a specified position in a specified time. |
| | | | Synchronization with conveyor | Makes the active TCP follow a workpiece on the conveyor performing the conveyor tracking function. |
| | | | Robot jog | Jogs a robot defined by an axes group according the selected target velocity, coordinate system and TCP. |
| | | | Transition mode and buffering | Select the method to use between robot instructions to perform smooth trajectories. |
| | Auxiliary functions | Multi-axes coordinated control | User coordinate system | Two types of coordinate systems, Machine Coordinate System (MCS) and User Coordinate System (UCS) can be used for robots. |
| | | | Robot tool | Defines multiple TCP's (Tool Center Point) for the robots. |
| | | | Inverse kinematics | Transforms the coordinate values (X, Y, Z) of the robot's TCP to the coordinate values of each axis. |
| | | Monitoring functions | Monitor | Reads the current position and current velocity of the robot. |
| | | | Workspace check | Checks if the robot is moving within the definable working volume. |

## Function specifications for CPU units with database connection

| Item | | NJ501-1□20 CPU Unit |
|---|---|---|
| Supported port | | Built-in EtherNet/IP port |
| Supported DB | | Microsoft Corporation: SQL Server 2008/2008 R2/2012<br>Oracle Corporation: Oracle Database 10g/11g<br>International Business Machines Corporation: DB2 for Linux, UNIX and Windows 9.5/9.7/10.1/10.5<br>Oracle Corporation: MySQL Community Edition 5.1/5.5/5.6[*1]<br>Firebird Foundation Incorporated: Firebird 2.1/2.5 |
| Number of DB connections (number of databases that can be connected at the same time) | | 3 connections max.[*2] |
| Instruction | Supported operations | The following operations can be performed by executing DB connection instructions in the NJ series CPU units. Inserting records (INSERT), updating records (UPDATE), retrieving records (SELECT) and deleting records (DELETE) |
| | Number of columns in an INSERT/ UPDATE/SELECT operations | SQL server: 1,024 columns max.<br>Oracle/DB2/MySQL/Firebird: 1,000 columns max. |
| | Number of records in the output of a SELECT operation | 65,535 elements max.<br>4 MB max. |
| | Number of DB Map Variables for which a mapping can be created | SQL server: 60 variables max.<br>Oracle/DB2/MySQL: 30 variables max.<br>Firebird: 15 variables max.<br>Even if the number of DB Map Variables has not reached the upper limit, the total number of members of structures used as data type of DB Map Variables is 10,000 members max. |
| Run mode of the DB connection service | | Operation mode or Test mode:<br>• Operation mode: When each instruction is executed, the service actually accesses the DB.<br>• Test mode: When each instruction is executed, the service ends the instruction normally without accessing the DB actually. |
| Spool function | | Used to store the SQL statements when an error occurred and resend the statements when the communications are recovered from the error.<br>Spool capacity: 1 MB[*3] |
| Operation log function | | The following three types of logs can be recorded:<br>• Execution log: Log for tracing the executions of the DB connection service.<br>• Debug log: Detailed log for SQL statement executions of the DB connection service.<br>• SQL execution failure log: Log for execution failures of SQL statements in the DB. |
| DB connection service shutdown function | | Used to shut down the DB connection service after automatically saving the operation log files into the SD memory card. |

[*1]. The supported storage engines of the DB are InnoDB and MyISAM.
[*2]. When two or more DB connections are established, the operation cannot be guaranteed if you set different database types for the connections.
[*3]. Refer to "NJ-Series database connection CPU units user's manual (W527)" for more information.

**Note:** DB2, MySQL and Firebird connections are supported only by the CPU units version 1.08 or higher and the Sysmac Studio version 1.09 or higher.

## Function specifications for CPU units with SECS/GEM communications

| Item | NJ501-1340 CPU Unit |
|---|---|
| Supported port | Built-in EtherNet/IP port |
| Supported standard[*1] | The unit conforms to the following SEMI standards:<br>E37-0303, E37.1-0702, E5-0707 and E30-0307 |
| Fundamental GEM requirement | State model, equipment processing state, host-initiated S1, F13/F14 scenario, event notification, on-line identification, error message, control (operator initiated), documentation |
| Additional GEM capability | Establish communications, dynamic event report configuration, variable data collection, trace data collection, status data collection, alarm management, remote control, equipment constant, process recipe management[*2], material movement, equipment terminal service, clock, limit monitoring, spooling, control (host initiated) |
| User defined message | You can create non-GEM compliant communication messages and have host communications |
| GEM specific instruction | The unit supports 29 instructions to perform the following:<br>• Changing the GEM service status<br>• Setting HSMS communications<br>• Reporting events and alarms<br>• Acknowledging host commands and enhanced remote commands<br>• Changing equipment constants<br>• Uploading and downloading process programs<br>• Sending and acknowledging equipment terminal messages<br>• Requesting to change time<br>• Sending user-defined messages<br>• Getting SECS communications log |
| GEM service log | Can record the following information:<br>• HSMS communication log: Keeps log of HSMS communication operations<br>• SECS message log: Keeps log of SECS-II communication messages<br>• Execution log: Keeps log of executions of GEM instructions[*2] |
| Shutting down the GEM service | Saves the spool data and GEM service log records into an SD memory card and ends the GEM service |

[*1]. E42 recipes, large process programs and E139 recipes are not supported.
[*2]. The capability is not available when no SD memory card is mounted.

# OMRON

## Nomenclature

### NJ CPU unit

CPU unit operation indicators

SD memory card connector

DIP switch
(inside the battery compartment)

Battery compartment

RUN
ERROR
BUSY

SD PWR
SD BUSY

OMRON
NJ501-1500

PORT1
EtherNet/IP

NET RUN
NET ERR
LINK/ACT

PORT2
EtherCAT

NET RUN
NET ERR
LINK/ACT

EtherNet/IP
EtherCAT

OPEN SW SETTING

Peripheral (USB) port

Built-in EtherNet/IP port
operation indicators

Built-in EtherNet/IP port

Built-in EtherCAT port

Built-in EtherCAT port
operation indicators

### 100 to 240 VAC power supply unit (NJ-PA3001)

PA3001

PWR

POWER indicator

AC input

L1
AC100-240V
INPUT
L2/N

LG

GR

RUN output

RUN
OUTPUT
AC240V
DC24V

Unit connector

### 24 VDC power supply unit (NJ-PD3001)

PD3001

PWR

POWER indicator

+ (DC input)

– (DC input)

+ DC24V
INPUT

LG

GR

RUN output

RUN
OUTPUT
AC240V
DC24V

Unit connector

## Dimensions

**NJ-Series system (NJ-P☐3001 + NJ☐01-☐☐☐☐ + one I/O unit + CJ1W-TER01)**
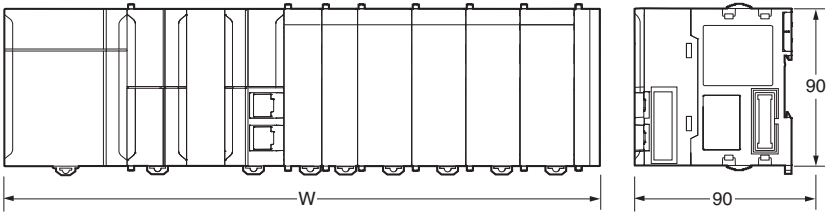


| No. of units mounted with 31-mm width | Rack width (mm) |
|---|---|
| | With NJ CPU |
| 1 | 205.7 |
| 2 | 236.7 |
| 3 | 267.7 |
| 4 | 298.7 |
| 5 | 329.7 |
| 6 | 360.7 |
| 7 | 391.7 |
| 8 | 422.7 |
| 9 | 453.7 |
| 10 | 484.7 |

**Power supply unit (NJ-PA3001/PD3001)**
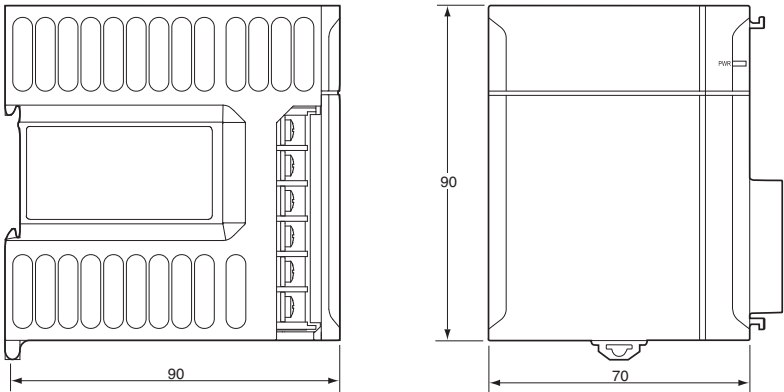


**NJ CPU unit**



**End cover (CJ1W-TER01)**



**CJ units**

I/O connector     Fujitsu connector     MIL connector     M3 screw and screwless type connector
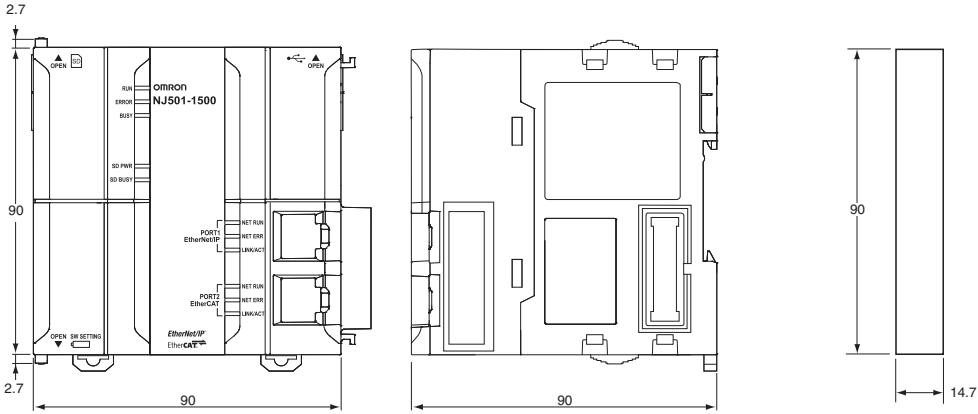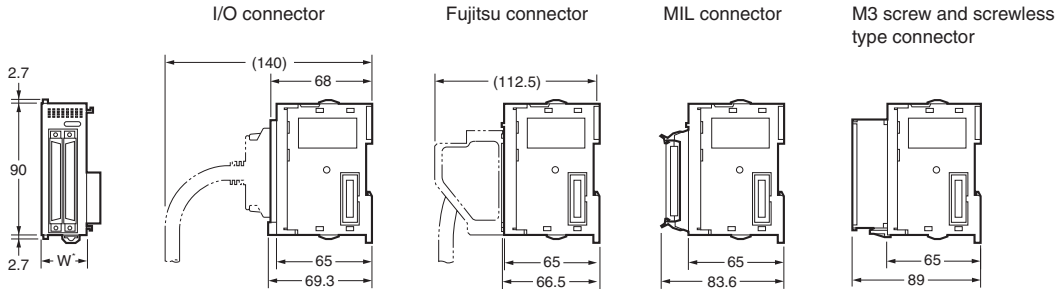


* Refer to the CJ unit tables in the ordering information section for the specific unit width.

# OMRON

## Mounting dimensions



(Units: mm)
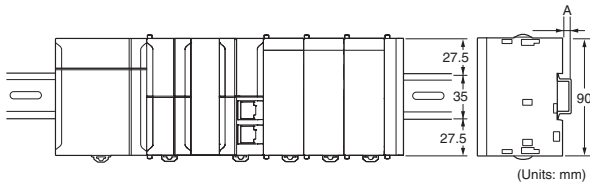
| DIN track model number | A |
|---|---|
| PFP-100N2 | 16 mm |
| PFP-100N | 7.3 mm |
| PFP-50N | 7.3 mm |

## Mounting height



Approx. 100 to 150 mm

90 mm

## Expansion cable



R ≥ 69 mm
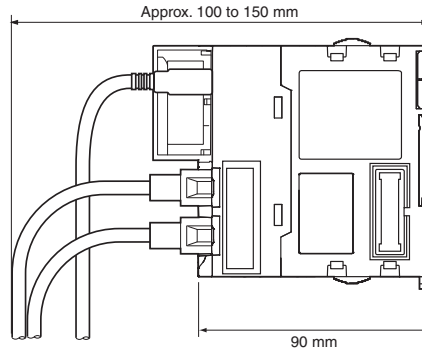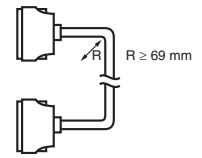
**Note:**
1. Consider the following points when expanding the configuration:
   - The total length of I/O connecting cable must not be exceed 12 m.
   - I/O Connecting cables require the bending radius indicates below.
2. Outer diameter of expansion cable: 8.6 mm.

## Power supply units current consumption

### Checking current and power consumption

After selecting a power supply unit based on considerations such as the power supply voltage, calculate the current and power requirements for each rack.

**Condition 1:** Current requirements

There are two voltage groups for internal power consumption: 5 V and 24 V.
Current consumption at 5 V (internal logic power supply)
Current consumption at 24 V (relay driving power supply)

**Condition 2:** Power requirements

For each rack, the upper limits are determined for the current and power that can be provided to the mounted units. Design the system so that the total current consumption for all the mounted units does not exceed the maximum total power or the maximum current supplied for the voltage groups shown in the following tables.

The maximum current and total power supplied for CPU racks and expansion racks according to the power supply unit model are shown below.

| Power supply units | Max. current supplied | | | (C) Max. total power supplied |
|---|---|---|---|---|
| | (A) 5 VDC CPU racks[*1] | (A) 5 VDC expansion rack | (B) 24 VDC | |
| NJ-PA3001 | 6.0 A | 6.0 A | 1.0 A | 30 W |
| NJ-PD3001 | 6.0 A | 6.0 A | 1.0 A | 30 W |

[*1]. Including supply to the CPU unit.

**Note:**
1. For CPU racks, include the CPU unit current and power consumption in the calculations. When expanding, also include the current and power consumption of the I/O control unit in the calculations.
2. For expansion racks, include the I/O interface unit current and power consumption in the calculations.

Conditions 1 and 2 are below must be satisfied.

**Condition 1:** Maximum current
(1) Total unit current consumption at 5 V ≤ (A) value
(2) Total unit current consumption at 24 V ≤ (B) value

**Condition 2:** Maximum power
(1) × 5 V + (2) × 24 V ≤ (C) value

### Example: Calculating total current and power consumption

When the following units are mounted to a NJ series CPU rack using a NJ-PA3001 power supply unit.

| Unit type | Model | Quantity | Voltage group | |
|---|---|---|---|---|
| | | | 5 V | 24 V |
| CPU unit | NJ501-1500 | 1 | 1.90 A | – |
| I/O control unit | CJ1W-IC101 | 1 | 0.02 A | – |
| Basic I/O units (input units) | CJ1W-ID211 | 2 | 0.08 A | – |
| | CJ1W-ID231 | 2 | 0.09 A | – |
| Basic I/O units (output units) | CJ1W-OC201 | 2 | 0.09 A | 0.048 A |
| Special I/O unit | CJ1W-DA041 | 1 | 0.12 A | – |
| CPU bus unit | CJ1W-SCU22 | 1 | 0.29 A | – |
| Current consumption | Total | | 1.90 A + 0.02 A + 0.08 A × 2 + 0.09 A × 2 + 0.09 A × 2 + 0.12 A + 0.29 A | 0.048 A × 2 |
| | Result | | 2.85 A (≤ 6.0 A) | 0.096 A (≤ 1.0 A) |
| Power consumption | Total | | 2.85 A × 5 V = 14.25 W | 0.096 A × 24 V = 2.3 W |
| | Result | | 14.25 W + 2.3 W = 16.55 W (≤ 30 W) | |

**Note:** For details on unit current consumption, refer to ordering information.

## Ordering information

### NJ series system



NA HMI

SQL database

⑩ Sysmac Studio

Industrial switching hubs ⑧

⑨ Ethernet cable

EtherNet/IP™

Microsoft® SQL Server®

**NJ series**

End cover (included with the CPU)

① NJ series power supply unit

② NJ series CPU unit

③ CJ series units

⑨ EtherCAT cable

EtherCAT.

Accurax G5 servo drive

MX2 inverter

⑦ EtherCAT junction Slave

Safety over EtherCAT.

NX I/O + NX safety distributed

FH vision

Accurax G5 servo motors

Accurax linear motors

### NJ series expansion racks



NJ series CPU unit

④ I/O control unit

NJ series power supply unit

CPU rack

Units: 10 max.

⑤ I/O interface unit

⑥ I/O connecting cable

NJ series power supply unit

Expansion rack

Units: 10 max.

Total cable length ≤12 m

⑤ I/O interface unit

⑥ I/O connecting cable

NJ series power supply unit

Expansion rack

Up to 3 expansion racks

Units: 10 max.

⑤ I/O interface unit

⑥ I/O connecting cable

NJ series power supply unit

Expansion rack

Units: 10 max

**NJ series machine controller**

# OMRON

## Power supply units

| Symbol | Name | Output capacity | | | RUN output | Model |
|---|---|---|---|---|---|---|
| | | 5 VDC | 24 VDC | Total | | |
| ① | 100 to 240 VAC power supply unit for NJ CPU | 6.0 A | 1.0 A | 30 W | Supported | NJ-PA3001 |
| | 24 VDC power supply unit for NJ CPU | | | | | NJ-PD3001 |

**Note:** Power supply units for the CJ Series cannot be used as a power supply for a CPU rack of the NJ System or as a power supply for an expansion rack.

## NJ series CPU units

| Symbol | CPU | Program capacity | Variables capacity | Specifications | Functionalities | | | | | Number of axes | Model |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Sequence | Motion | DB connection | Robotics | SECS/GEM | | |
| ② | NJ501 | 20 MB | 2 MB: Retained 4 MB: Not retained | I/O capacity: 2,560 points | ● | ● | ● | ● | | 16 | NJ501-4320 |
| | | | | | ● | ● | ● | | | 64 | NJ501-1520 |
| | | | | CPU rack: 10 units max. | ● | ● | ● | | | 32 | NJ501-1420 |
| | | | | | ● | ● | ● | | | 16 | NJ501-1320 |
| | | | | Expansion rack: 10 units max. | ● | ● | | ● | | 64 | NJ501-4500 |
| | | | | (Up to 3 expansion racks) | ● | ● | | ● | | 32 | NJ501-4400 |
| | | | | | ● | ● | | ● | | 16 | NJ501-4300 |
| | | | | 40 units max. per system (CPU rack + 3 expansion racks) | ● | ● | | ● | | 16 | NJ501-4310[1] |
| | | | | | ● | ● | | | ● | 16 | NJ501-1340 |
| | | | | Current consumption: 1.90 A at 5 VDC | ● | ● | | | | 64 | NJ501-1500 |
| | | | | | ● | ● | | | | 32 | NJ501-1400 |
| | | | | | ● | ● | | | | 16 | NJ501-1300 |
| | NJ301 | 5 MB | 0.5 MB: Retained 2 MB: Not retained | | ● | ● | | | | 8 | NJ301-1200 |
| | | | | | ● | ● | | | | 4 | NJ301-1100 |
| | NJ101 | 3 MB | | | ● | ● | | | | 2 | NJ101-1000 |
| | | | | | ● | | | | | 0 | NJ101-9000 |

[1]. The NJ501-4310 CPU unit only supports one Delta robot.

**Note:** The end cover unit CJ1W-TER01 is included with the CPU unit.

## CJ series digital I/O units

| Symbol | Points | Type | Rated voltage | Rated current | Width | Remarks | Current consumption (A) | | Connection type | Model |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 5 VDC | 24 VDC | | |
| ③ | 8 | AC input | 240 VAC | 10 mA | 31 mm | – | 0.08 | – | M3 | CJ1W-IA201 |
| | 16 | | 120 VAC | 7 mA | 31 mm | – | 0.09 | – | M3 | CJ1W-IA111 |
| | 8 | DC input | 24 VDC | 10 mA | 31 mm | – | 0.08 | – | M3 | CJ1W-ID201 |
| | 16 | | 24 VDC | 7 mA | 31 mm | – | 0.08 | – | M3 | CJ1W-ID211 |
| | | | | | 31 mm | | | | Screwless | CJ1W-ID211(SL) |
| | 16 | | 24 VDC | 7 mA | 31 mm | Fast-response (15 µs is ON, 90 µs is OFF) | 0.13 | – | M3 | CJ1W-ID212 |
| | 16 | | 24 VDC | 7 mA | 31 mm | Inputs start interrupt tasks in PLC program | 0.08 | – | M3 | CJ1W-INT01 |
| | 16 | | 24 VDC | 7 mA | 31 mm | Latches pulses down to 50 µs pulse width | 0.08 | – | M3 | CJ1W-IDP01 |
| | 32 | | 24 VDC | 4.1 mA | 20 mm | – | 0.09 | – | Fujitsu | CJ1W-ID231 |
| | 32 | | 24 VDC | 4.1 mA | 20 mm | – | 0.09 | – | MIL | CJ1W-ID232 |
| | 32 | | 24 VDC | 4.1 mA | 20 mm | Fast-response (15 µs is ON, 90 µs is OFF) | 0.20 | – | MIL | CJ1W-ID233 |
| | 64 | | 24 VDC | 4.1 mA | 31 mm | – | 0.09 | – | Fujitsu | CJ1W-ID261 |
| | 64 | | 24 VDC | 4.1 mA | 31 mm | – | 0.09 | – | MIL | CJ1W-ID262 |
| | 8 | Triac output | 250 VAC | 0.6 mA | 31 mm | – | 0.22 | – | M3 | CJ1W-OA201 |
| | 8 | Relay contact output | 250 VAC | 2 A | 31 mm | – | 0.09 | 0.048 | M3 | CJ1W-OC201 |
| | | | | | 31 mm | | | | Screwless | CJ1W-OC201(SL) |
| | 16 | | 250 VAC | 2 A | 31 mm | – | 0.11 | 0.096 | M3 | CJ1W-OC211 |
| | | | | | 31 mm | | | | Screwless | CJ1W-OC211(SL) |
| | 8 | DC output (sink) | 12 to 24 VDC | 2 A | 31 mm | – | 0.09 | – | M3 | CJ1W-OD201 |
| | 8 | | 12 to 24 VDC | 0.5 A | 31 mm | – | 0.10 | – | M3 | CJ1W-OD203 |
| | 16 | | 12 to 24 VDC | 0.5 A | 31 mm | – | 0.10 | – | M3 | CJ1W-OD211 |
| | | | | | 31 mm | | | | Screwless | CJ1W-OD211(SL) |
| | 16 | | 24 VDC | 0.5 A | 31 mm | Fast-response (15 µs is ON, 80 µs is OFF) | 0.15 | – | M3 | CJ1W-OD213 |
| | 32 | | 12 to 24 VDC | 0.5 A | 20 mm | – | 0.14 | – | Fujitsu | CJ1W-OD231 |
| | 32 | | 12 to 24 VDC | 0.5 A | 20 mm | – | 0.14 | – | MIL | CJ1W-OD233 |
| | 32 | | 24 VDC | 0.5 A | 20 mm | Fast-response (15 µs is ON, 80 µs is OFF) | 0.22 | – | MIL | CJ1W-OD234 |
| | 64 | | 12 to 24 VDC | 0.3 A | 31 mm | – | 0.17 | – | Fujitsu | CJ1W-OD261 |
| | 64 | | 12 to 24 VDC | 0.3 A | 31 mm | – | 0.17 | – | MIL | CJ1W-OD263 |
| | 8 | DC output (source) | 24 VDC | 2 A | 31 mm | Short-circuit protection | 0.11 | – | M3 | CJ1W-OD202 |
| | 8 | | 24 VDC | 0.5 A | 31 mm | Short-circuit protection | 0.10 | – | M3 | CJ1W-OD204 |
| | 16 | | 24 VDC | 0.5 A | 31 mm | Short-circuit protection | 0.10 | – | M3 | CJ1W-OD212 |
| | | | | | 31 mm | | | | Screwless | CJ1W-OD212(SL) |
| | 32 | | 24 VDC | 0.3 A | 20 mm | Short-circuit protection | 0.15 | – | MIL | CJ1W-OD232 |
| | 64 | | 24 VDC | 0.3 A | 31 mm | – | 0.17 | – | MIL | CJ1W-OD262 |
| | 16 + 16 | DC in + out (source) | 24 VDC | 0.5 A | 31 mm | – | 0.13 | – | MIL | CJ1W-MD232 |
| | 16 + 16 | DC in + out (sink) | 24 VDC | 0.5 A | 31 mm | – | 0.13 | – | Fujitsu | CJ1W-MD231 |
| | 16 + 16 | | 24 VDC | 0.5 A | 31 mm | – | 0.13 | – | MIL | CJ1W-MD233 |
| | 32 + 32 | | 24 VDC | 0.3 A | 31 mm | – | 0.14 | – | Fujitsu | CJ1W-MD261 |
| | 32 + 32 | | 24 VDC | 0.3 A | 31 mm | – | 0.14 | – | MIL | CJ1W-MD263 |
| | 32 + 32 | DC in + out (TTL) | 5 VDC | 35 mA | 31 mm | – | 0.19 | – | MIL | CJ1W-MD563 |

**Note:** MIL = Connector according to MIL-C-83503 (compatible with DIN 41651/IEC 60603-1).

## CJ series analogue I/O and control units

| Symbol | Points | Type | Ranges | Resolution | Accuracy[1] | Conversion time | Width | Remarks | Current (A) 5 V | Current (A) 24 V | Connection type | Model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ③ | 4 | Universal analogue input | 0 to 5 V, 1 to 5 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, K, J, T, L, R, S, B, Pt100, Pt1000, JPt100 | V/I: 1/12,000 T/C: 0.1°C RTD: 0.1°C | V: 0.3% I: 0.3% T/C: 0.3% RTD: 0.3% | 250 ms/4 points | 31 mm | Universal inputs, with zero/span adjustment, configurable alarms, scaling, sensor error detection | 0.32 | – | M3 | CJ1W-AD04U |
| | | | | | | | | | | | Screwless | CJ1W-AD04U(SL) |
| | 4 | Analogue input | 0 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA | 1/8,000 | V: 0.2% I: 0.4% | 250 µs/point | 31 mm | Offset/gain adjustment, peak hold, moving average, alarms | 0.42 | – | M3 | CJ1W-AD041-V1 |
| | | | | | | | | | | | Screwless | CJ1W-AD041-V1(SL) |
| | 4 | High-speed analogue input | 1 to 5 V, 0 to 10 V, –5 to 5 V, –10 to 10 V, 4 to 20 mA | 1/40,000 | V: 0.2% I: 0.4% | 35 µs/4 points | 31 mm | Direct conversion (CJ2H special instruction) | 0.52 | – | M3 | CJ1W-AD042 |
| | 8 | Analogue input | 1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA | 1/8,000 | V: 0.2% I: 0.4% | 250 µs/point | 31 mm | Offset/gain adjustment, peak hold, moving average, alarms | 0.42 | – | M3 | CJ1W-AD081-V1 |
| | | | | | | | | | | | Screwless | CJ1W-AD081-V1(SL) |
| | 2 | Analogue output | 0 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA | 1/4,000 | V: 0.3% I: 0.5% | 1 ms/point | 31 mm | Offset/gain adjustment, output hold | 0.12 | 0.14 | M3 | CJ1W-DA021 |
| | | | | | | | | | | | Screwless | CJ1W-DA021(SL) |
| | 4 | Analogue output | 1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA | 1/4,000 | V: 0.3% I: 0.5% | 1 ms/point | 31 mm | Offset/gain adjustment, output hold | 0.12 | 0.2 | M3 | CJ1W-DA041 |
| | | | | | | | | | | | Screwless | CJ1W-DA041(SL) |
| | 4 | High-speed analogue output | 1 to 5 V, 0 to 10 V, –10 to 10 V | 1/40,000 | 0.3% | 35 µs/4 points | 31 mm | Direct conversion (CJ2H special instruction) | 0.40 | – | M3 | CJ1W-DA042V |
| | 8 | Voltage output | 1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V | 1/8,000 | 0.3% | 250 µs/point | 31 mm | Offset/gain adjustment, output hold | 0.14 | 0.14 | M3 | CJ1W-DA08V |
| | | | | | | | | | | | Screwless | CJ1W-DA08V(SL) |
| | 8 | Current output | 4 to 20 mA | 1/8,000 | 0.5% | 250 µs/point | 31 mm | Offset/gain adjustment, output hold | 0.14 | 0.17 | M3 | CJ1W-DA08C |
| | | | | | | | | | | | Screwless | CJ1W-DA08C(SL) |
| | 4 + 2 | Analogue in + out | 1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA | 1/8,000 | in: 0.2% out: 0.3% | 1 ms/point | 31 mm | Offset/gain adjustment, scaling, peak hold, moving average, alarms, output hold | 0.58 | – | M3 | CJ1W-MAD42 |
| | | | | | | | | | | | Screwless | CJ1W-MAD42(SL) |
| | 4 | Universal analogue input | DC voltage, DC current, thermocouple, Pt100/Pt1000, potentiometer | 1/256,000 | 0.05% | 60 ms/4 points | 31 mm | All inputs individually isolated, configurable alarms, maintenance functions, user-defined scaling, zero/span adjustment | 0.30 | – | M3 | CJ1W-PH41U |
| | 2 | Process input | 4 to 20 mA, 0 to 20 mA, 0 to 10 V, –10 to 10 V, 0 to 5 V, –5 to 5 V, 1 to 5 V, 0 to 1.25 V, 1.25 to 1.25 V | 1/64,000 | 0.05% | 5 ms/point | 31 mm | Configurable alarms, maintenance functions, user-defined scaling, zero/span adjustment, square root, totaliser | 0.18 | 0.09 | M3 | CJ1W-PDC15 |
| | 6 | Temperature control loops, thermocouple | K-type (–200 to 1,300°C) J-type (–100 to 850°C) | 0.1°C | 0.5% | 40 ms/point | 31 mm | Basic I/O unit, setup by DIP switches, adjustable filtering 10/50/60 Hz | 0.22 | – | M3 | CJ1W-TS561 |
| | | | | | | | | | | | Screwless | CJ1W-TS561(SL) |
| | 6 | Temperature control loops | Pt100 (–200 to 650°C) Pt1000 (–200 to 650°C) | 0.1°C | 0.5% | 40 ms/point | 31 mm | Basic I/O unit, setup by DIP switches, adjustable filtering 10/50/60 Hz | 0.25 | – | M3 | CJ1W-TS562 |
| | | | | | | | | | | | Screwless | CJ1W-TS562(SL) |
| | 2 | Temperature control loops, thermocouple | B, J, K, L, R, S, T | 0.1°C | 0.3% | 500 ms total | 31 mm | Open collector NPN outputs | 0.25 | – | M3 | CJ1W-TC003 |
| | 2 | Temperature control loops, thermocouple | B, J, K, L, R, S, T | 0.1°C | 0.3% | 500 ms total | 31 mm | Open collector PNP outputs | 0.25 | – | M3 | CJ1W-TC004 |
| | 2 | Temperature control loops | Pt100, JPt100 | 0.1°C | 0.3% | 500 ms total | 31 mm | Open collector NPN outputs | 0.25 | – | M3 | CJ1W-TC103 |
| | 2 | Temperature control loops | Pt100, JPt100 | 0.1°C | 0.3% | 500 ms total | 31 mm | Open collector PNP outputs | 0.25 | – | M3 | CJ1W-TC104 |

[1]. Accuracy for voltage and current inputs/outputs as percentage of full scale and typical value at 25°C ambient temperature (consult the operation manual for details)
Accuracy for temperature inputs/outputs as percentage of process value and typical value at 25°C ambient temperature (consult the operation manual for details)

**NJ series machine controller**

## CJ series special I/O units

| Symbol | Channels | Type | Signal type | Width | Remarks | Current consumption (A) | | Connection type | Model |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5 V | 24 V | | |
| ③ | 2 | 500 kHz Counter | 24 V, line driver | 31 mm | 2 configurable digital inputs + outputs | 0.28 | – | Fujitsu | CJ1W-CT021 |
| | 4 | 100 kHz Counter | Line driver, 24 V via terminal block | | Target values trigger interrupt to CPU | 0.32 | – | 1 × MIL (40 pt) | CJ1W-CTL41-E |

## CJ series communication units

| Symbol | Type | Ports | Data transfer | Protocols | Width | Current consumption (A) | | Connection type | Model |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5 V | 24 V | | |
| ③ | Serial communications units | 2 × RS-232C | High-speed | CompoWay/F, host link, NT link, Modbus, user-defined | 31 mm | 0.28 | – | 9 pin D-Sub | CJ1W-SCU22 |
| | | 2 × RS-422A/RS-485 | | | 31 mm | 0.28 | – | 9 pin D-Sub | CJ1W-SCU32 |
| | | 1 × RS-232C + 1 × RS-422/RS-485 | | | 31 mm | 0.28 | – | 9 pin D-Sub | CJ1W-SCU42 |
| | EtherNet/IP | 1 × 100 Base-Tx | – | EtherNet/IP, UDP, TCP/IP, FTP server, SNTP, SNMP | 31 mm | 0.41 | – | RJ45 | CJ1W-EIP21[1] |
| | DeviceNet | 1 × CAN | – | DeviceNet | 31 mm | 0.29 | – | 5-p detachable | CJ1W-DRM21 |
| | CompoNet | 4-wire, data + power to slaves (Master) | – | CompoNet (CIP-based) | 31 mm | 0.4 | – | 4-p detachable IDC or screw | CJ1W-CRM21[2] |
| | PROFIBUS-DP | 1 × RS-485 (Master) | – | DP, DPV1 | 31 mm | 0.40 | – | 9 pin D-Sub | CJ1W-PRM21 |
| | | 1 × RS-485 (Slave) | – | DP | 31 mm | 0.40 | – | | CJ1W-PRT21 |
| | PROFINET-IO | 1 × 100 Base-Tx | – | PROFINET-IO controller, FINS/UDP | 31 mm | 0.42 | – | RJ45 | CJ1W-PNT21 |
| | RS-422A converter accessory | RS-232C to RS-422A/RS-485 signal converter. Mounts directly on serial port | | | | | | 9 pin D-Sub to screw clamp terminals | CJ1W-CIF11 |

[1]. Supported only by the EtherNet/IP units with unit version 2.1 or later, CPU units with unit version 1.01 or later and the Sysmac Studio version 1.02 or higher.
[2]. Supported only by the CPU units with unit version 1.01 or higher and the Sysmac Studio version 1.02 or higher.

## CJ series ID sensor units

| Symbol | Type | Specifications | | | | Current consumption (A) | | Model |
|---|---|---|---|---|---|---|---|---|
| | | Connected ID systems | No. of connected R/W heads | External power supply | No. of unit numbers allocated | 5 V | 24 V | |
| ③ | ID sensor units | V680-Series RFID system | 1 | Not required | 1 | 0.26[1] | 0.13[1] | CJ1W-V680C11 |
| | | | 2 | | 2 | 0.32 | 0.26 | CJ1W-V680C12 |

[1]. To use a V680-H01 antenna, refer to the V680 Series RFID system catalog (Cat. No. Q151)

**Note:** The data transfer function using intelligent I/O commands can not be used.

## Expansion racks

### CJ series I/O control unit (mounted on CPU rack when connecting expansion racks)

| Symbol | Name | Connecting cable | Connected Unit | Width | Current consumption (A) | | Model |
|---|---|---|---|---|---|---|---|
| | | | | | 5 V | 24 V | |
| ④ | CJ-Series I/O control unit | CS1W-CN☐☐3 | CJ1W-II101 | 20 mm | 0.02 A | – | CJ1W-IC101 |

**Note:** Mount to the right of the power supply unit.

### CJ series I/O interface unit (mounted on expansion rack)

| Symbol | Name | Connecting cable | Width | Current consumption (A) | | Model |
|---|---|---|---|---|---|---|
| | | | | 5 V | 24 V | |
| ⑤ | CJ-Series I/O interface unit | CS1W-CN☐☐3 | 31 mm | 0.13 A | - | CJ1W-II101 |

**Note:** Mount to the right of the power supply unit.

### I/O connecting cables

| Symbol | Name | Specifications | | Model |
|---|---|---|---|---|
| ⑥ | I/O connecting cable | • Connects an I/O control unit on NJ series CPU rack to an I/O interface unit on a NJ series expansion rack. or • Connects an I/O interface unit on NJ series expansion rack to an I/O interface unit on another NJ series expansion rack. | Cable length: 0.3 m | CS1W-CN313 |
| | | | Cable length: 0.7 m | CS1W-CN713 |
| | | | Cable length: 2 m | CS1W-CN223 |
| | | | Cable length: 3 m | CS1W-CN323 |
| | | | Cable length: 5 m | CS1W-CN523 |
| | | | Cable length: 10 m | CS1W-CN133 |
| | | | Cable length: 12 m | CS1W-CN133-B2 |

## EtherCAT junction slave

| Symbol | Name | No. of ports | Power supply voltage | Current consumption (A) | Dimensions (W × D × H) | Weight | Model | Appearance |
|---|---|---|---|---|---|---|---|---|
| ⑦ | EtherCAT junction slave | 3 | 20.4 to 28.8 VDC (24 VDC –15 to 20%) | 0.08 | 25 mm × 78 mm × 90 mm | 165 g | GX-JC03 | |
| | | 6 | | 0.17 | 48 mm × 78 mm × 90 mm | 220 g | GX-JC06 | |

**Note:** 1. Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC☐81/☐82.
2. EtherCAT junction slave cannot be used for Ethernet/IP and Ethernet.

## Industrial switching hubs

| Symbol | Specifications | | | Accessories | Current consumption (A) | Model | Appearance |
|---|---|---|---|---|---|---|---|
| | Functions | No. of ports | Failure detection | | | | |
| ⑧ | Quality of Service (QoS): EtherNet/IP control data priority. Failure detection: Broadcast storm and LSI error detection 10/100 BASE-TX, Auto-Negotiation | 3 | No | Power supply connector | 0.08 | W4S1-03B | |
| | | 5 | No | | 0.12 | W4S1-05B | |
| | | 5 | Yes | Power supply connector and connector for informing error | 0.12 | W4S1-05C | |

## Recommended EtherCAT and EtherNet/IP communication cables

| Symbol | Item | | | Manufacturer | Colour | Cable length (m) | Model |
|---|---|---|---|---|---|---|---|
| ⑨ | Ethernet patch cable | Cat 6a, AWG27, 4-pair cable Cable sheath material: LSZH[1] **Note:** This cable is available in yellow, green and blue colours. | Standard type Cable with connectors on both ends (RJ45/RJ45) | OMRON | Yellow | 0.2 | XS6W-6LSZH8SS20CM-Y |
| | | | | | | 0.3 | XS6W-6LSZH8SS30CM-Y |
| | | | | | | 0.5 | XS6W-6LSZH8SS50CM-Y |
| | | | | | | 1 | XS6W-6LSZH8SS100CM-Y |
| | | | | | | 1.5 | XS6W-6LSZH8SS150CM-Y |
| | | | | | | 2 | XS6W-6LSZH8SS200CM-Y |
| | | | | | | 3 | XS6W-6LSZH8SS300CM-Y |
| | | | | | | 5 | XS6W-6LSZH8SS500CM-Y |
| | | | | | | 7.5 | XS6W-6LSZH8SS750CM-Y |
| | | | | | | 10 | XS6W-6LSZH8SS1000CM-Y |
| | | | | | | 15 | XS6W-6LSZH8SS1500CM-Y |
| | | | | | | 20 | XS6W-6LSZH8SS2000CM-Y |
| | | | | | Green | 0.2 | XS6W-6LSZH8SS20CM-G |
| | | | | | | 0.3 | XS6W-6LSZH8SS30CM-G |
| | | | | | | 0.5 | XS6W-6LSZH8SS50CM-G |
| | | | | | | 1 | XS6W-6LSZH8SS100CM-G |
| | | | | | | 1.5 | XS6W-6LSZH8SS150CM-G |
| | | | | | | 2 | XS6W-6LSZH8SS200CM-G |
| | | | | | | 3 | XS6W-6LSZH8SS300CM-G |
| | | | | | | 5 | XS6W-6LSZH8SS500CM-G |
| | | | | | | 7.5 | XS6W-6LSZH8SS750CM-G |
| | | | | | | 10 | XS6W-6LSZH8SS1000CM-G |
| | | | | | | 15 | XS6W-6LSZH8SS1500CM-G |
| | | | | | | 20 | XS6W-6LSZH8SS2000CM-G |
| | | Cat 5, AWG26, 4-pair cable Cable sheath material: PUR[1] | Standard type Cable with connectors on both ends (RJ45/RJ45) | | Green | 0.5 | XS6W-5PUR8SS50CM-G |
| | | | | | | 1 | XS6W-5PUR8SS100CM-G |
| | | | | | | 1.5 | XS6W-5PUR8SS150CM-G |
| | | | | | | 2 | XS6W-5PUR8SS200CM-G |
| | | | | | | 3 | XS6W-5PUR8SS300CM-G |
| | | | | | | 5 | XS6W-5PUR8SS500CM-G |
| | | | | | | 7.5 | XS6W-5PUR8SS750CM-G |
| | | | | | | 10 | XS6W-5PUR8SS1000CM-G |
| | | | | | | 15 | XS6W-5PUR8SS1500CM-G |
| | | | | | | 20 | XS6W-5PUR8SS2000CM-G |
| | | Cat5, AWG22, 2-pair cable | Rugged type Cable with connectors on both ends (RJ45/RJ45) | | Grey | 0.3 | XS5W-T421-AMD-K |
| | | | | | | 0.5 | XS5W-T421-BMD-K |
| | | | | | | 1 | XS5W-T421-CMD-K |
| | | | | | | 2 | XS5W-T421-DMD-K |
| | | | | | | 3 | XS5W-T421-EMD-K |
| | | | | | | 5 | XS5W-T421-GMD-K |
| | | | | | | 10 | XS5W-T421-JMD-K |
| | | | | | | 15 | XS5W-T421-KMD-K |
| | | | Rugged type Cable with connectors on both ends (M12 straight/RJ45) | | Grey | 0.3 | XS5W-T421-AMC-K |
| | | | | | | 0.5 | XS5W-T421-BMC-K |
| | | | | | | 1 | XS5W-T421-CMC-K |
| | | | | | | 2 | XS5W-T421-DMC-K |
| | | | | | | 3 | XS5W-T421-EMC-K |
| | | | | | | 5 | XS5W-T421-GMC-K |
| | | | | | | 10 | XS5W-T421-JMC-K |
| | | | | | | 15 | XS5W-T421-KMC-K |

| Symbol | Item | | | Manufacturer | Colour | Cable length (m) | Model |
|---|---|---|---|---|---|---|---|
| ⑨ | Ethernet patch cable | Cat5, AWG22, 2-pair cable | Rugged type Cable with connectors on both ends (M12 L right angle/RJ45) | OMRON | Grey | 0.3 | XS5W-T422-AMC-K |
| | | | | | | 0.5 | XS5W-T422-BMC-K |
| | | | | | | 1 | XS5W-T422-CMC-K |
| | | | | | | 2 | XS5W-T422-DMC-K |
| | | | | | | 3 | XS5W-T422-EMC-K |
| | | | | | | 5 | XS5W-T422-GMC-K |
| | | | | | | 10 | XS5W-T422-JMC-K |
| | | | | | | 15 | XS5W-T422-KMC-K |
| | Ethernet installation cable | Cat 5, SF/UTP, 4 × 2 × AWG 24/1 (solid core), Polyurethane (PUR) | | Weidmüller | Green | 100 | WM IE-5IC4x2xAWG24/1-PUR |
| | | Cat 5, SF/UTP, 4 × 2 × AWG 26/7 (stranded core), Polyurethane (PUR) | | | Green | 100 | WM IE-5IC4x2xAWG26/7-PUR |
| | Connectors | RJ45 metallic connector For AWG22 to AWG26 | | | – | – | WM IE-T0-RJ45-FH-BK |
| | | RJ45 plastic connector For AWG22 to AWG24 | | OMRON | – | – | XS6G-T421-1 |
| | RJ45 socket | DIN-rail mount socket to terminate installation cable in the cabinet | | Weidmüller | – | – | WM IE-T0-RJ45-FJ-B |

[1]. The lineup features low smoke zero halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.

**Note:** Please be careful while cable processing, for EtherCAT, connectors on both ends should be shield connected and for EtherNet/IP, connectors on only one end should be shield connected.

## WE70 FA wireless LAN units

| Name | Area | Type | Model | Appearance |
|---|---|---|---|---|
| WE70 FA wireless LAN units | Europe | Access point (Master) | WE70-AP-EU | |
| | | Client (Slave) | WE70-CL-EU | |
| Directional magnetic-base antenna | | 1 set with two antennas, 2.4 GHz/5 GHz Dual-band compatible | WE70-AT001H | |
| DIN rail mounting bracket | | For TH35 7.5 | WT30-FT001 | |
| | | For TH35 15 | WT30-FT002 | |
| Antenna extension cable | | 5 m | WE70-CA5M | |

**Note:** Special versions are available for USA, Canada, China and Japan.

## NJ series options and accessories

| Specifications | | Model | Appearance |
|---|---|---|---|
| SD memory card | 2 GB | HMC-SD291 | |
| | 4 GB | HMC-SD491 | |
| DIN track | Length: 0.5 m; height: 7.3 mm | PFP-50N | |
| | Length: 1 m; height: 7.3 mm | PFP-100N | |
| | Length: 1 m; height: 16 mm | PFP-100N2 | |
| End plate to secure the units on the DIN track (2 pieces are included with the CPU unit and I/O interface unit) | | PFP-M (2 pcs) | |
| Battery for NX7/NJ CPU unit (The battery is included with the CPU unit) | | CJ1W-BAT01 | |
| End cover (The end cover is included with each CPU unit and I/O interface unit) | | CJ1W-TER01 | |

## Computer software

| Symbol | Specifications | | Model |
|---|---|---|---|
| ⑩ | Sysmac Studio [1] [2] | | SYSMAC-SE2□□□ |
| | License for the SECS/GEM configurator [3] | Software to make HSMS, SECSII and GEM settings for the NJ501 CPU units with SECS/GEM communications | WS02-GCTL1 |

[1]. For the NJ501-1340 CPU unit, Sysmac Studio version 1.11 or higher is needed.
[2]. For the NJ101 CPU units, Sysmac Studio version 1.13 or higher is needed.
[3]. SECS/GEM configurator files are included in the Sysmac Studio standard edition DVD.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_I180E-EN-05       In the interest of product improvement, specifications are subject to change without notice.
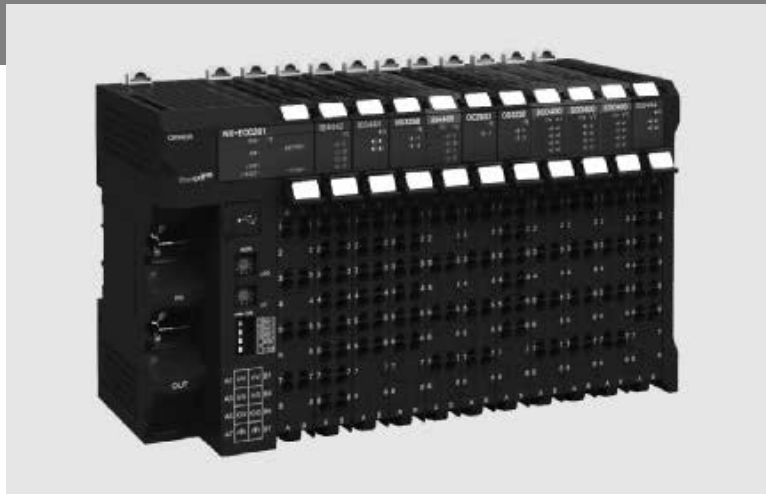
**OMRON**

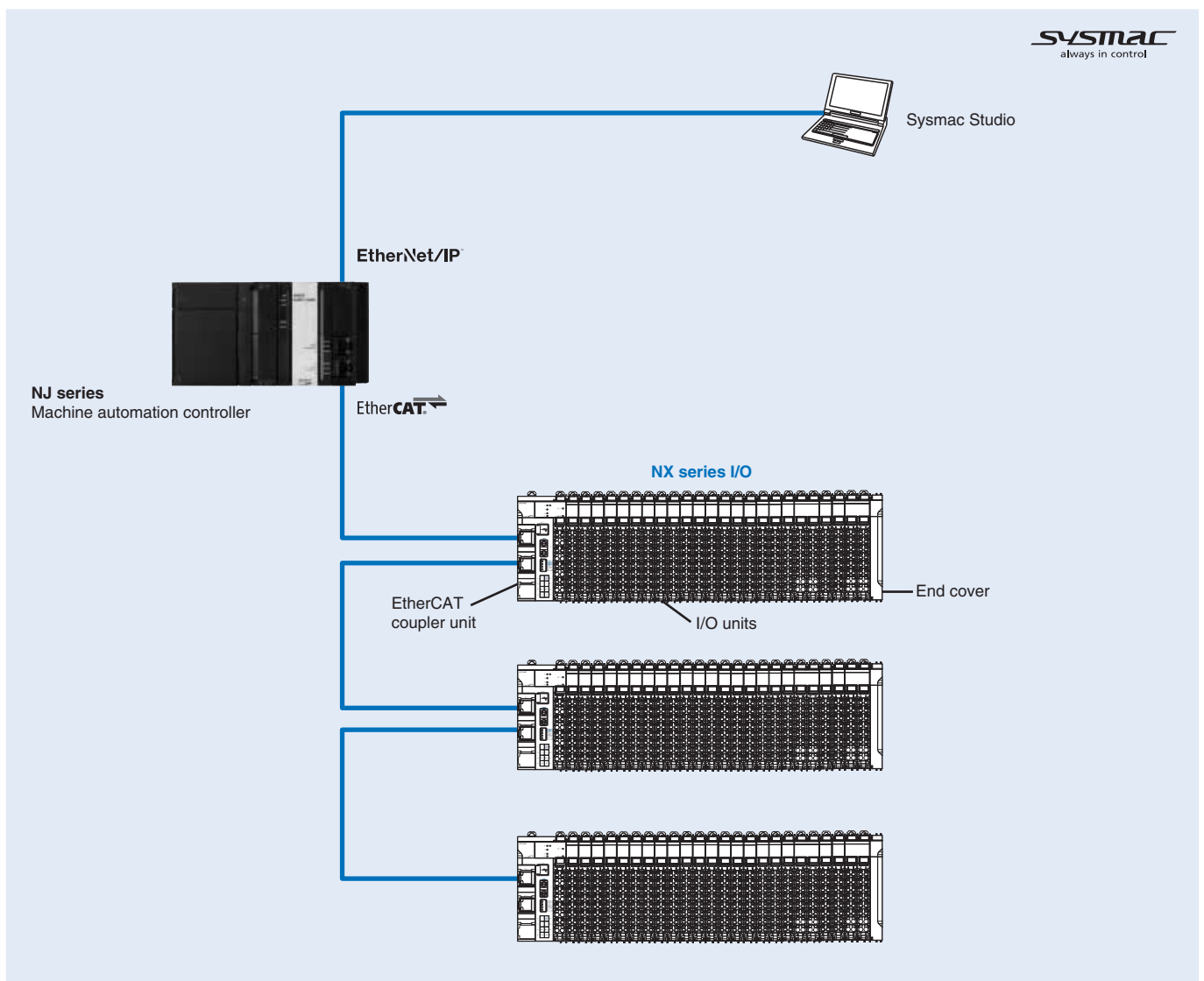## Speed and accuracy for machine performance

NX-Series I/O covers a full range of units, including standard and high-speed digital I/O's, various performance levels in analog I/O, encoder inputs and pulse outputs.

- Standard, high-speed and Time Stamp models
- Configuration by Sysmac Studio, via EtherCAT or by direct USB connection
- Detachable front connector with screwless push-in terminals for direct field wiring.
- Digital I/O models with 20/40 pin "flatcable" connectors for fast connection to custom wiring looms.
- High signal density: Up to 16 digital or 8 analog signals in 12 mm width

## System configuration



Sysmac Studio

EtherNet/IP

**NJ series**
Machine automation controller

EtherCAT

**NX series I/O**

EtherCAT coupler unit

I/O units

End cover

## Specifications

### General specifications

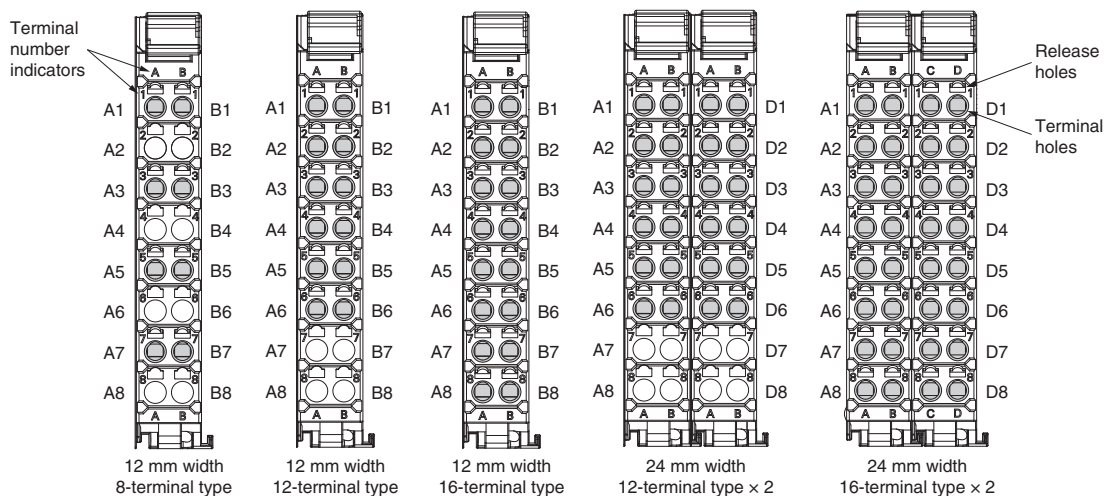| Item | | Specifications |
|---|---|---|
| Enclosure | | Mounted in a panel |
| Operating environment | Ambient operating temperature | 0 to 55°C |
| | Ambient operating humidity | 10% to 95% (with no condensation or icing) |
| | Atmosphere | Must be free from corrosive gases |
| | Ambient storage temperature | –25 to 70°C (with no condensation or icing) |
| | Altitude | 2,000 m max. |
| | Pollution degree | 2 or less: conforms to JIS B3502 and IEC 61131-2 |
| | Noise immunity | 2kV on power supply line: conforms to IEC 61000-4-4. |
| | Overvoltage category | Category II: Conforms to JIS B3502 and IEC 61131-2 |
| | EMC immunity level | Zone B |
| | Vibration resistance | Conforms to IEC 60068-2-6.<br>5 to 8.4 Hz with 3.5-mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s$^2$, 100 min each in X, Y and Z directions (10 sweeps of 10 min each = 100 min total) |
| | Shock resistance | Conforms to IEC 60068-2-27. 147 m/s$^2$, 3 times each in X, Y and Z directions |
| Applicable standards | | cULus: listed UL508 and ANSI/ISA 12.12.01<br>EC: EN 61131-2 and C-Tick3, KC: KC registration |

### Nomenclature

#### EtherCAT coupler unit
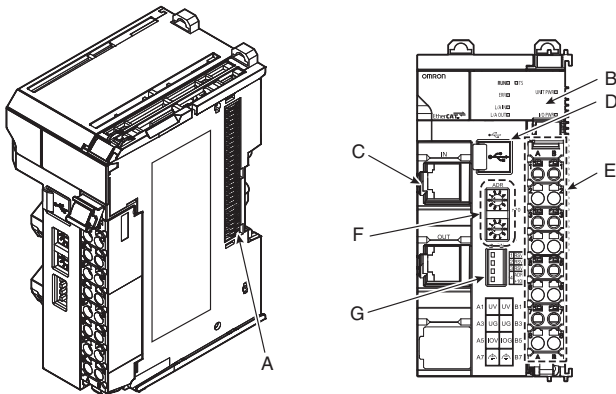


| Symbol | Name | Function |
|---|---|---|
| A | NX bus connector | This connector is used to connect each unit. |
| B | Indicators | The indicators show the current operating status of the unit. |
| C | Communication ports | These ports are connected to the communication cables of the EtherCAT networks.<br>There are two connectors, allowing daisy-chaining of communication units. |
| D | Peripheral USB port | This port is used to connect to the Sysmac Studio software. |
| E | Terminal block | The terminal block is used to connect external devices. The number of terminals depends on the type of unit. |
| F | Rotary switches | These rotary switches are used to set the node address.<br>The address is set in decimal. |
| G | DIP switch | The DIP switch is used to set the 100s digit of the node address of the EtherCAT coupler unit. |

#### Terminal block types



| 12 mm width<br>8-terminal type | 12 mm width<br>12-terminal type | 12 mm width<br>16-terminal type | 24 mm width<br>12-terminal type × 2 | 24 mm width<br>16-terminal type × 2 |

## EtherCAT communication specifications

| Item | Specifications |
|---|---|
| Communication standard | IEC 61158 Type 12 |
| Physical layer | 100BASE-TX (IEEE 802.3) |
| Modulation | Baseband |
| Baud rate | 100 Mbps |
| Topology | Depends on the specifications of the EtherCAT master |
| Transmission media | Category 5 or higher twisted-pair cable (recommended cable: double-shielded cable with foil and braiding, SF/UTP or S/FTP) |
| Transmission distance | Distance between nodes: 100 m or less |

## EtherCAT coupler unit

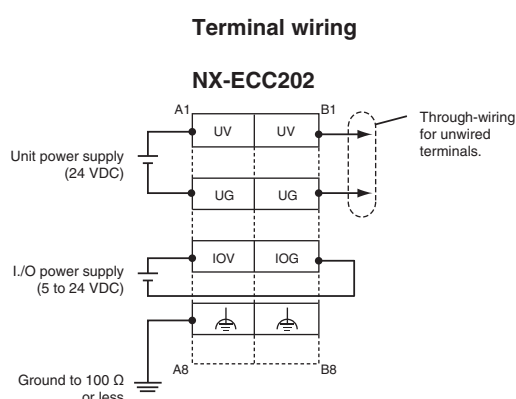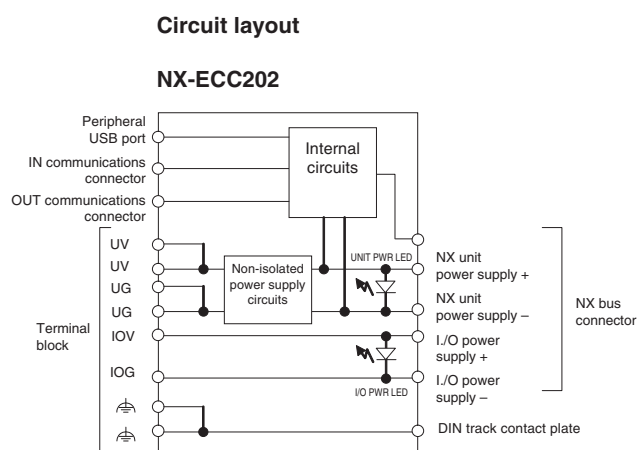| Item | | Specifications |
|---|---|---|
| Model | | NX-ECC202 |
| Number of connectable NX units | | 63 units max.[*1] |
| Send/receive PDO data sizes | | Input: 1024 bytes max. (including input data, status and unused areas)<br>Output: 1024 bytes max. (including output data and unused areas) |
| Mailbox data size | | Input/Output: 256 bytes |
| Mailbox | | Emergency messages, SDO requests and SDO information |
| Refreshing methods | | Free-run refreshing<br>I/O-synchronized refreshing<br>Time Stamp refreshing |
| Node address setting range | | 1 to 192[*2] |
| I/O jitter performance | | Inputs/Outputs: 1 $\mu$s max. |
| Communications cycle | | 250 to 100,000 $\mu$s[*3*4] |
| Unit power supply | Voltage | 24 VDC (20.4 to 28.8 VDC) |
| | Capacity | 10 W max. |
| | Efficiency | 70% |
| | Isolation method | No isolation between NX unit power supply and unit power supply terminals |
| | Unwired terminal current capacity | 4 A max. |
| I/O power supply | Voltage | 5 to 24 VDC (4.5 to 28.8 VDC)[*5] |
| | Maximum I/O current | 10 A max. |
| | Terminal current capacity | 10 A max. |
| Unit power consumption | | 1.45 W max. |
| Current consumption from I/O power supply | | 10 mA max. (for 24 VDC) |
| Dielectric strength | | 510 VAC for 1 min, leakage current: 5 mA max. (between isolated circuits) |
| Insulation resistance | | 100 VDC, 20 M$\Omega$ min. (between isolated circuits) |
| External connection terminals | | Connector for EtherCAT communications:<br>• RJ45 × 2 (shielded)<br>• IN: EtherCAT input data<br>• OUT: EtherCAT output data |
| | | Screwless push-in terminal (8 terminals)<br>For power supply unit, I/O power supply and grounding. Removable. |
| | | Peripheral USB port for Sysmac Studio connection:<br>• Physical layer: USB 2.0-compliant, B-type connector<br>• Transmission distance: 5 m max. |
| Terminal block type | | Screwless push-in terminal<br>8 terminals (A + B with FG) |
| Dimensions (W x H x D) | | 46 × 100 × 71 |
| Weight | | 150 g max. |

*1. Refer to the NX-safety control units user's manual (Cat.No. Z930) for the number of safety control units that can be connected.
*2. This specification applies to a connection to the built-in EtherCAT port on an NJ-series CPU unit.
*3. This depends on the specifications of the EtherCAT master. The values are as follows when you are connected to the built-in EtherCAT port on an NJ5-series CPU unit: 500 $\mu$s, 1,000 $\mu$s, 2,000 $\mu$s and 4,000 $\mu$s. Refer to the NJ-series CPU unit built-in EtherCAT port user's manual (Cat.No. W505) for the most recent specifications.
*4. This depends on the unit configuration.
*5. Use an output voltage that is appropriate for the I/O circuits of the NX units and the connected external devices.

### Circuit layout

**NX-ECC202**



### Terminal wiring

**NX-ECC202**

# OMRON

## Digital I/O unit

### Digital input unit (24 VDC)

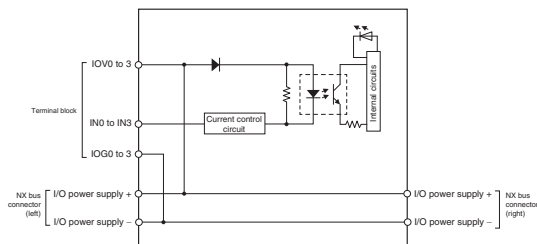| Item | Specifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | NX-ID3317 | NX-ID4342 | NX-ID5342 | NX-ID3343 | NX-ID3417 | NX-ID4442 | NX-ID5442 | NX-ID3443 |
| Name | DC input unit | | | | | | | |
| Internal I/O common | NPN | | | | PNP | | | |
| Capacity | 4 points | 8 points | 16 points | 4 points | 4 points | 8 points | 16 points | 4 points |
| Rated input voltage | 12 to 24 VDC (9 to 28.8 VDC) | 24 VDC (15 to 28.8 VDC) | | | 12 to 24 VDC (9 to 28.8 VDC) | 24 VDC (15 to 28.8 VDC) | | |
| Input current[1] | 6 mA | 3.5 mA | 2.5 mA | 3.5 mA | 6 mA | 3.5 mA | 2.5 mA | 3.5 mA |
| ON voltage | 9 VDC min. | 15 VDC min. | | | 9 VDC min. | 15 VDC min. | | |
| ON current | 3 mA min. | 3 mA min. | 2 mA min. | 3 mA min. | 3 mA min. | 3 mA min. | 2 mA min. | 3 mA min. |
| OFF voltage | 2 VDC max. | 5 VDC max. | | | 2 VDC max. | 5 VDC max. | | |
| OFF current | 1 mA max. | | 0.5 mA max. | 1 mA max. | 1 mA max. | | 0.5 mA max. | 1 mA max. |
| ON/OFF response time | 20 µs max./400 µs max. | | | 100 ns max. | 20 µs max./400 µs max. | | | 100 ns max. |
| Input filter time | Default setting: 1 ms[2] | | | Default setting: 8 µs[3] | Default setting: 1 ms[2] | | | Default setting: 8 µs[3] |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | | | |
| Isolation method | Photocoupler isolation | | | Digital isolator | Photocoupler isolation | | | Digital isolator |
| Unit power consumption | 0.50 W max. | 0.50 W max. | 0.55 W max. | 0.55 W max. | 0.50 W max. | 0.50 W max. | 0.55 W max. | 0.55 W max. |
| I/O power supply method | Supply from the NX bus | | | | | | | |
| I/O current consumption | No consumption | | | 30 mA max. | No consumption | | | 30 mA max. |
| Current capacity of I/O power supply terminal | 0.1 A/terminal max. | | Without I/O power supply terminals | 0.1 A/terminal max. | 0.1 A/terminal max. | | Without I/O power supply terminals | 0.1 A/terminal max. |
| I/O refreshing method | Switching synchronous I/O refreshing and free-run refreshing | | | | | | | |
| Terminal block type | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) |
| Dimensions (W x H x D) | 12 × 100 × 71 | | | | | | | |
| Weight | 65 g max. | | | | | | | |
| Disconnection/ short-circuit detection | Not supported | | | | | | | |
| Protective function | Not supported | | | | | | | |

*1. Typical rated current at 24 VDC.
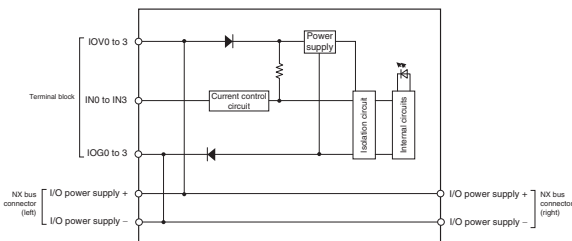*2. Input filter time: No filter, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 ms.
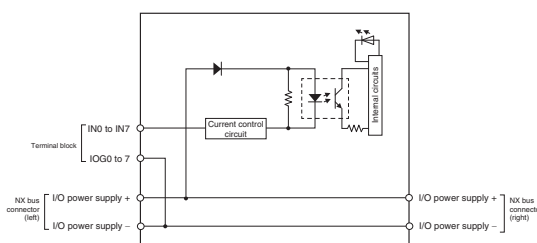*3. Input filter time: No filter, 1, 2, 4, 8, 16, 32, 64, 128, 256 µs.
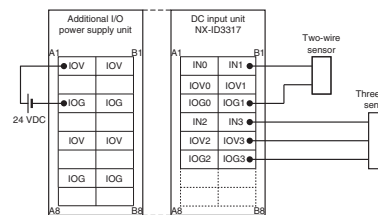
**Circuit layout**

**NX-ID3317**

**NX-ID3343**

**NX-ID4342**

**Terminal wiring**

**NX-ID3317**

**NX-ID3343**

**NX-ID4342**

## Circuit layout

### NX-ID5342

Internal circuits
Current control circuit
Terminal block IN0 to IN15
NX bus connector (left) — I/O power supply +, I/O power supply −
I/O power supply +, I/O power supply − — NX bus connector (right)

### NX-ID3417

IOV0 to 3
IN0 to IN3
Terminal block
Current control circuit
Internal circuits
IOG0 to 3
NX bus connector (left) — I/O power supply +, I/O power supply −
I/O power supply +, I/O power supply − — NX bus connector (right)

### NX-ID3443

IOV0 to 3
Power supply
IN0 to IN3
Terminal block
Current control circuit
Isolation circuit
Internal circuits
IOG0 to 3
NX bus connector (left) — I/O power supply +, I/O power supply −
I/O power supply +, I/O power supply − — NX bus connector (right)

### NX-ID4442

IOV0 to 7
IN0 to IN7
Terminal block
Current control circuit
Internal circuits
NX bus connector (left) — I/O power supply +, I/O power supply −
I/O power supply +, I/O power supply − — NX bus connector (right)

### NX-ID5442

Terminal block IN0 to IN15
Current control circuit
Internal circuits
NX bus connector (left) — I/O power supply +, I/O power supply −
I/O power supply +, I/O power supply − — NX bus connector (right)

## Terminal wiring

### NX-ID5342

| Additional I/O power supply unit | | I/O power supply connection unit | | I/O power supply connection unit | | DC input unit NX-ID5342 | | |
|---|---|---|---|---|---|---|---|---|
| A1 | B1 | A1 | B1 | A1 | B1 | A1 | B1 | |
| IOV | IOV | IOV | IOV | IOG | IOG | IN0 | IN1 | Two-wire sensor |
| | | IOV | IOV | IOG | IOG | IN2 | IN3 | |
| IOG | IOG | IOV | IOV | IOG | IOG | IN4 | IN5 | Three-wire sensor |
| | | IOV | IOV | IOG | IOG | IN6 | IN7 | |
| IOV | IOV | IOV | IOV | IOG | IOG | IN8 | IN9 | |
| | | IOV | IOV | IOG | IOG | IN10 | IN11 | |
| IOG | IOG | IOV | IOV | IOG | IOG | IN12 | IN13 | |
| | | IOV | IOV | IOG | IOG | IN14 | IN15 | |
| A8 | B8 | A8 | B8 | A8 | B8 | A8 | B8 | |

24 VDC

### NX-ID3417

| Additional I/O power supply unit | | DC input unit NX-ID3417 | | |
|---|---|---|---|---|
| A1 | B1 | A1 | B1 | |
| IOV | IOV | IN0 | IN1 | Two-wire sensor |
| | | IOV0 | IOV1 | |
| IOG | IOG | IOG0 | IOG1 | Three-wire sensor |
| | | IN2 | IN3 | |
| IOV | IOV | IOV2 | IOV3 | |
| | | IOG2 | IOG3 | |
| IOG | IOG | | | |
| A8 | B8 | A8 | B8 | |

24 VDC

### NX-ID3443

| Additional I/O power supply unit | | DC input unit NX-ID3443 | | |
|---|---|---|---|---|
| A1 | B1 | A1 | B1 | |
| IOV | IOV | IN0 | IN1 | Two-wire sensor |
| | | IOV0 | IOV1 | |
| IOG | IOG | IOG0 | IOG1 | Three-wire sensor |
| | | IN2 | IN3 | |
| IOV | IOV | IOV2 | IOV3 | |
| | | IOG2 | IOG3 | |
| IOG | IOG | | | |
| A8 | B8 | A8 | B8 | |

24 VDC

### NX-ID4442

| Additional I/O power supply unit | | I/O power supply connection unit | | DC input unit NX-ID4442 | | |
|---|---|---|---|---|---|---|
| A1 | B1 | A1 | B1 | A1 | B1 | |
| IOV | IOV | IOG | IOG | IN0 | IN1 | Two-wire sensor |
| | | IOG | IOG | IOV0 | IOV1 | |
| IOG | IOG | IOG | IOG | IN2 | IN3 | Three-wire sensor |
| | | IOG | IOG | IOV2 | IOV3 | |
| IOV | IOV | IOG | IOG | IN4 | IN5 | |
| | | IOG | IOG | IOV4 | IOV5 | |
| IOG | IOG | IOG | IOG | IN6 | IN7 | |
| | | IOG | IOG | IOV6 | IOV7 | |
| A8 | B8 | A8 | B8 | A8 | B8 | |

24 VDC

### NX-ID5442

| Additional I/O power supply unit | | I/O power supply connection unit | | I/O power supply connection unit | | DC input unit NX-ID5442 | | |
|---|---|---|---|---|---|---|---|---|
| A1 | B1 | A1 | B1 | A1 | B1 | A1 | B1 | |
| IOV | IOV | IOV | IOV | IOG | IOG | IN0 | IN1 | Two-wire sensor |
| | | IOV | IOV | IOG | IOG | IN2 | IN3 | |
| IOG | IOG | IOV | IOV | IOG | IOG | IN4 | IN5 | Three-wire sensor |
| | | IOV | IOV | IOG | IOG | IN6 | IN7 | |
| IOV | IOV | IOV | IOV | IOG | IOG | IN8 | IN9 | |
| | | IOV | IOV | IOG | IOG | IN10 | IN11 | |
| IOG | IOG | IOV | IOV | IOG | IOG | IN12 | IN13 | |
| | | IOV | IOV | IOG | IOG | IN14 | IN15 | |
| A8 | B8 | A8 | B8 | A8 | B8 | A8 | B8 | |

24 VDC

# OMRON

## Digital input unit (with time stamp function) (24 VDC)

| Item | Specifications | |
|---|---|---|
| Model | NX-ID3344 | NX-ID3444 |
| Name | DC input unit | |
| Internal I/O common | NPN | PNP |
| Capacity | 4 points | 4 points |
| Rated input voltage | 24 VDC (15 to 28.8 VDC) | |
| Input current[*1] | 3.5 mA | |
| ON voltage | 15 VDC min. | |
| ON current | 3 mA min. | |
| OFF voltage | 5 VDC max. | |
| OFF current | 1 mA max. | |
| ON/OFF response time | 100 ns max. | |
| Input filter time | No filter | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Digital isolator | |
| Unit power consumption | 0.55 W max. | |
| I/O power supply method | Supply from the NX bus | |
| I/O current consumption | 30 mA max. | |
| Current capacity of I/O power supply terminal | 0.1 A/terminal max. | |
| I/O refreshing method | Time Stamp | |
| Terminal block type | Screwless push-in terminal<br>12 terminals (A + B) | |
| Dimensions (W x H x D) | 12 × 100 × 71 | |
| Weight | 65 g max. | |
| Disconnection/short-circuit detection | Not supported | |
| Protective function | Not supported | |

*1. Typical rated current at 24 VDC.

### Circuit layout

#### NX-ID3344



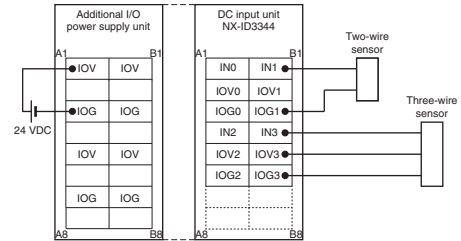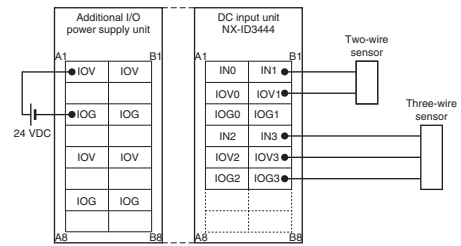#### NX-ID3444



### Terminal wiring

#### NX-ID3344



#### NX-ID3444

## Digital input unit (with MIL connector) (24 VDC)

| Item | Specifications | |
|---|---|---|
| Model | NX-ID5142-5 | NX-ID6142-5 |
| Name | DC input unit | |
| Internal I/O common | For both NPN/PNP | |
| Capacity | 16 points | 32 points |
| Rated input voltage | 24 VDC (15 to 28.8 VDC) | 24 VDC (19 to 28.8 VDC) |
| Input current[1] | 7 mA | 4.1 mA |
| ON voltage | 15 VDC min. | 19 VDC min. |
| ON current | 3 mA min. | |
| OFF voltage | 5 VDC max. | |
| OFF current | 1 mA max. | |
| ON/OFF response time | 20 $\mu$s max./400 $\mu$s max | |
| Input filter time | No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| Insulation resistance | 20 M$\Omega$ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Photocoupler isolation | |
| Unit power consumption | 0.55 W max. | 0.60 W max. |
| I/O power supply method | Supply from external source | |
| I/O current consumption | No consumption | |
| Current capacity of I/O power supply terminal | Without I/O power supply terminals | |
| I/O refreshing method | Switching synchronous I/O refreshing and free-run refreshing | |
| Terminal block type | MIL connector 20 terminals | MIL connector 40 terminals |
| Dimensions (W x H x D) | 30 × 100 × 71 | |
| Weight | 85 g max. | 90 g max. |
| Disconnection/ short-circuit detection | Not supported | |
| Protective function | Not supported | |

*1. Typical rated current at 24 VDC.

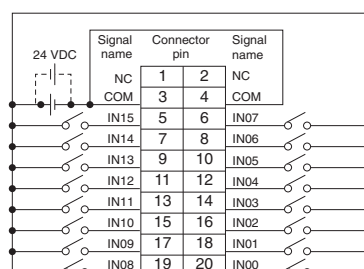### Circuit layout

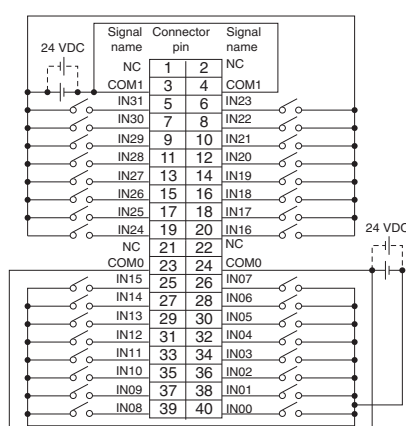#### NX-ID5142-5
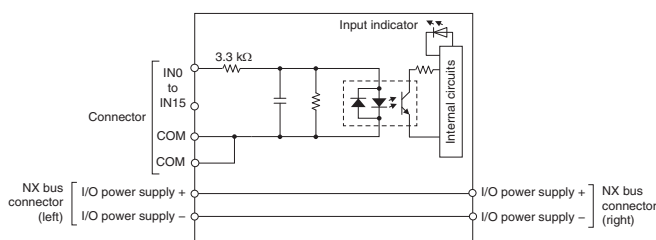


#### NX-ID6142-5
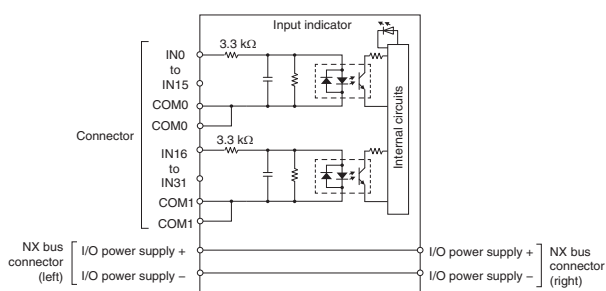


### Terminal wiring

#### NX-ID5142-5



- The polarity of the input power supply can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM), and set the same polarity for both pins.

#### NX-ID6142-5



- The polarity of the input power supply can be connected in either direction.
- Be sure to wire both pins 23 and 24 (COM0), and set the same polarity for both pins.
- Be sure to wire both pins 3 and 4 (COM1), and set the same polarity for both pins.
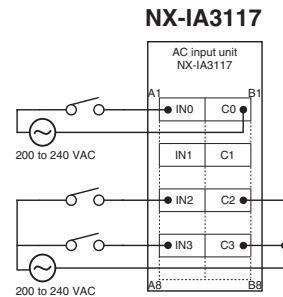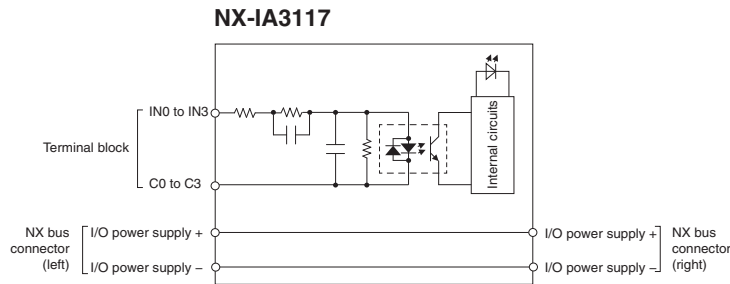
# OMRON

## Digital input unit (230 VAC)

| Item | Specifications |
|---|---|
| **Model** | **NX-IA3117** |
| **Name** | AC input unit |
| **Internal I/O common** | No polarity |
| **Capacity** | 4 points, independent contacts |
| **Rated input voltage** | 200 to 240 VAC, 50/60 Hz (170 to 264 VAC, ±3 Hz) |
| **Input current** | 9 mA (at 200 VAC, 50 Hz)<br>11 mA (at 200 VAC, 60 Hz) |
| **ON voltage** | 120 VAC min. |
| **ON current** | 4 mA min. |
| **OFF voltage** | 40 VAC max. |
| **OFF current** | 2 mA max. |
| **ON/OFF response time** | 10 ms max./40 ms max. |
| **Input filter time** | Default setting: 1 ms[*1] |
| **Dielectric strength** | Between each AC input circuit: AC3700V VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and functional ground terminal: 2300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and internal circuits: 2300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the internal circuit and the functional ground terminal: 510 VAC for 1 min at a leakage current of 5 mA max. |
| **Insulation resistance** | Between each AC input circuit: 20 MΩ min. (at 500 VDC)<br>Between the external terminals and functional ground terminal: 20 MΩ min. (at 500 VDC)<br>Between the external terminals and internal circuits: 20 MΩ min. (at 500 VDC)<br>Between the internal circuit and the functional ground terminal: 20 MΩ min. (at 100 VDC) |
| **Isolation method** | Photocoupler isolation |
| **Unit power consumption** | 0.5 W max. |
| **I/O power supply method** | Supply from external source |
| **I/O current consumption** | No consumption |
| **Current capacity of I/O power supply terminal** | Without I/O power supply terminals |
| **I/O refreshing method** | Free-run refreshing |
| **Terminal block type** | Screwless push-in terminal<br>8 terminals (A + B) |
| **Dimensions (W x H x D)** | 12 × 100 × 71 |
| **Weight** | 60 g max. |
| **Disconnection/ short-circuit detection** | Not supported |
| **Protective function** | Not supported |

*1. Input filter time: No filter, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 ms.
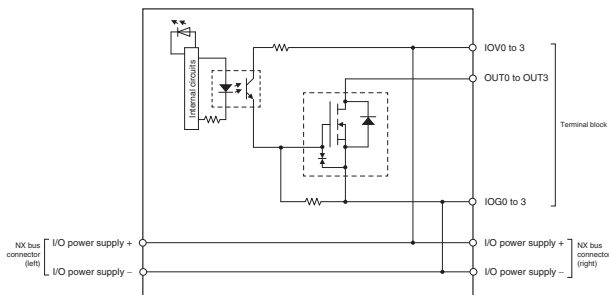
### Circuit layout

#### NX-IA3117



### Terminal wiring

#### NX-IA3117

## Digital output unit

| Item | Specifications | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | NX-OD3121 | NX-OD4121 | NX-OD5121 | NX-OD3153 | NX-OD3256 | NX-OD4256 | NX-OD5256 | NX-OD3257 |
| Name | Transistor output unit | | | | | | | |
| Internal I/O common | NPN | | | | PNP | | | |
| Capacity | 4 points | 8 points | 16 points | 4 points | 4 points | 8 points | 16 points | 4 points |
| Rated voltage | 12 to 24 VDC | | | 24 VDC | 24 VDC | | | |
| Operating load voltage | 10.2 to 28.8 VDC | | | 15 to 28.8 VDC | | | | |
| Maximum value of load current | 0.5 A/point, 2 A/NX unit | 0.5 A/point, 4 A/NX unit | | 0.5 A/point, 2 A/NX unit | 0.5 A/point, 2 A/NX unit | 0.5 A/point, 4 A/NX unit | | 0.5 A/point, 2 A/NX unit |
| Maximum inrush current | 4.0 A/point, 10 ms max. | | | | | | | |
| Leakage current | 0.1 mA max. | | | | | | | |
| Residual voltage | 1.5 V max. | | | | | | | |
| ON/OFF response time | 0.1 ms max./0.8 ms max. | | | 300 ns max. | 0.5 ms max./1.0 ms max. | | | 300 ns max. |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | | | |
| Isolation method | Photocoupler isolation | | | Digital isolator | Photocoupler isolation | | | Digital isolator |
| Unit power consumption | 0.55 W max. | 0.55 W max. | 0.65 W max. | 0.50 W max. | 0.55 W max. | 0.65 W max. | 0.70 W max. | 0.50 W max. |
| I/O power supply method | Supply from the NX bus | | | | | | | |
| I/O current consumption | 10 mA max. | 10 mA max. | 20 mA max. | 30 mA max. | 20 mA max. | 30 mA max. | 40 mA max. | 40 mA max. |
| Current capacity of I/O power supply terminal | 0.5 A/terminal max. | | Without I/O power supply terminals | 0.5 A/terminal max. | 0.5 A/terminal max. | | Without I/O power supply terminals | 0.5 A/terminal max. |
| I/O refreshing method | Switching synchronous I/O refreshing and free-run refreshing | | | | | | | |
| Terminal block type | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) |
| Dimensions (W x H x D) | 12 × 100 × 71 | | | | | | | |
| Weight | 70 g max. | | | | | | | |
| Disconnection/ short-circuit detection | Not supported | | | | | | | |
| Protective function | Not supported | | | | With load short-circuit protection | | | |

**Circuit layout**

**NX-OD3121**



**NX-OD3153**



This unit uses a push-pull output circuit.

**NX-OD4121**



**Terminal wiring**

**NX-OD3121**



**NX-OD3153**



**NX-OD4121**

# OMRON

## Circuit layout

### NX-OD5121



### NX-OD3256



### NX-OD3257



This unit uses a push-pull output circuit.
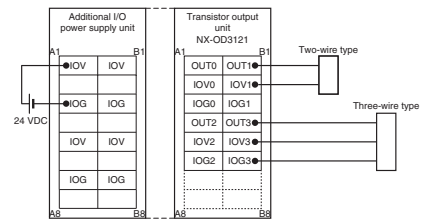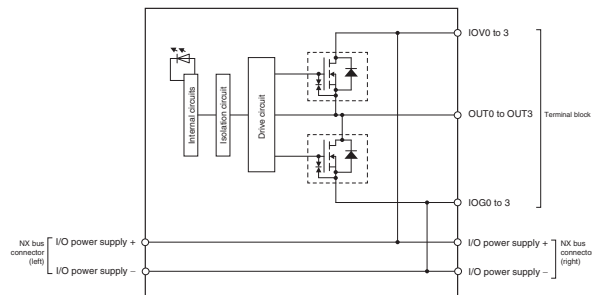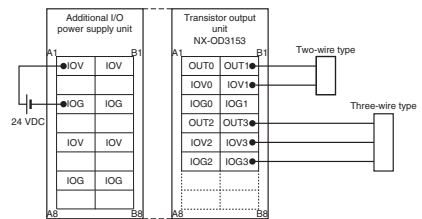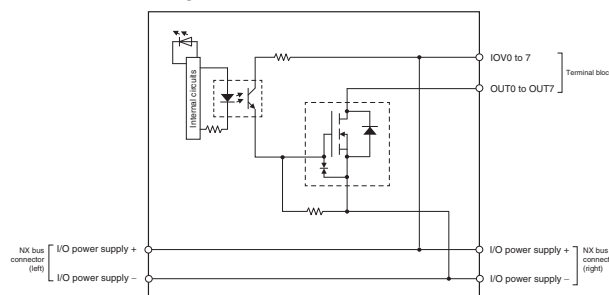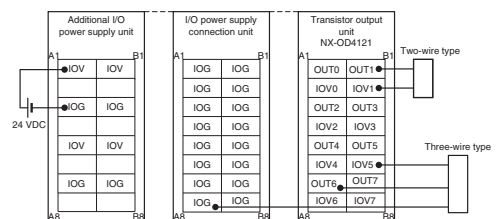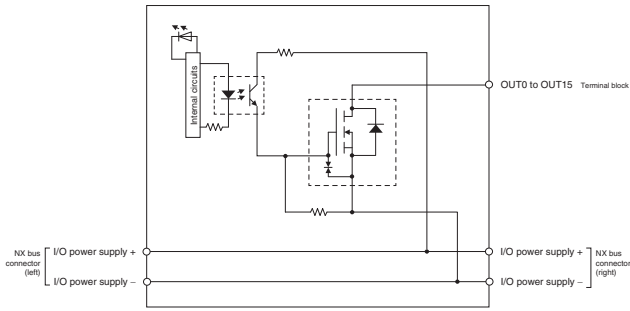
### NX-OD4256



### NX-OD5256



## Terminal wiring

### NX-OD5121
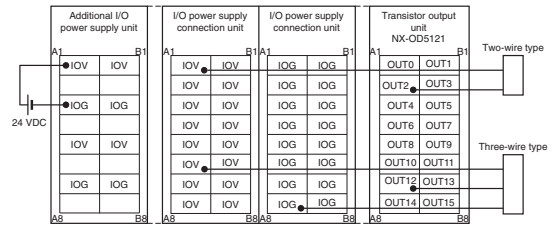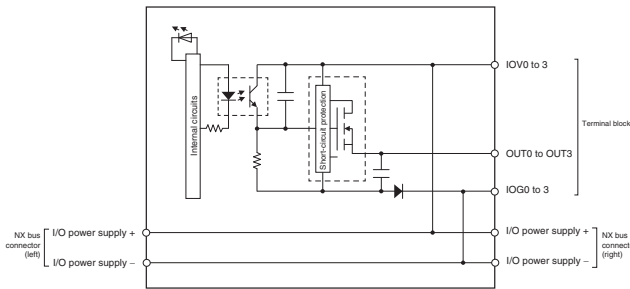


### NX-OD3256
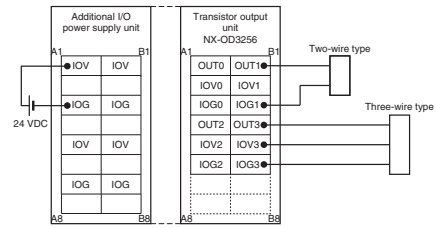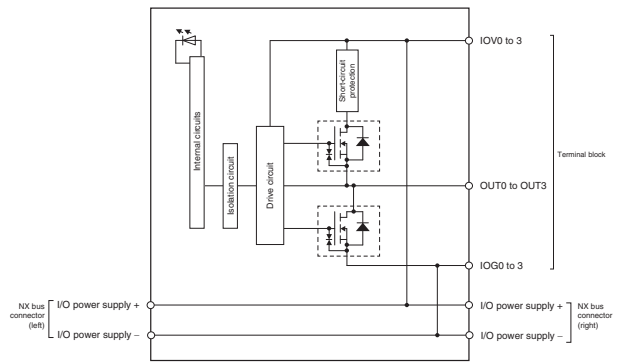


### NX-OD3257
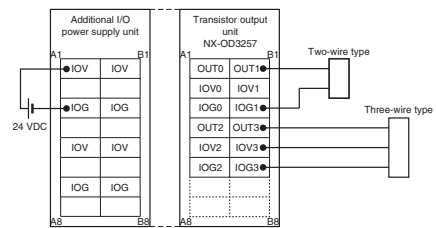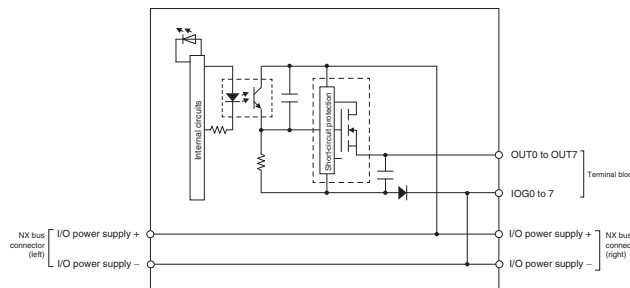


### NX-OD4256
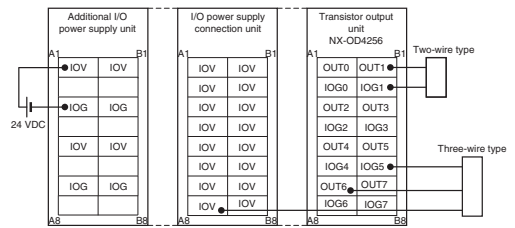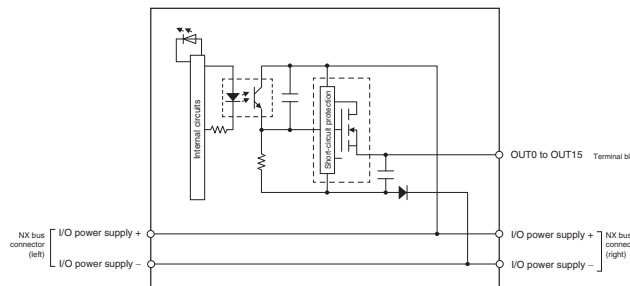


### NX-OD5256
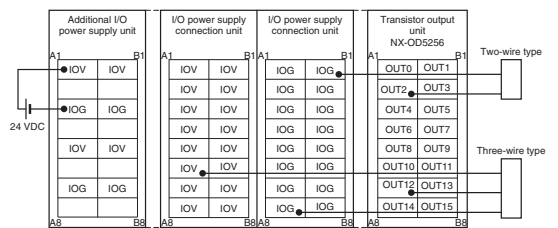
## Digital output unit (with Time Stamp function)

| Item | Specifications | |
|---|---|---|
| Model | **NX-OD2154** | **NX-OD2258** |
| Name | Transistor output unit | |
| Internal I/O common | NPN | PNP |
| Capacity | 2 points | 2 points |
| Rated voltage | 24 VDC | |
| Operating load voltage | 15 to 28.8 VDC | |
| Maximum value of load current | 0.5 A/point, 1 A/NX unit | |
| Maximum inrush current | 4.0 A/point, 10 ms max. | |
| Leakage current | 0.1 mA max. | |
| Residual voltage | 1.5 V max. | |
| ON/OFF response time | 300 ns max. | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Digital isolator | |
| Unit power consumption | 0.50 W max. | |
| I/O power supply method | Supply from the NX bus | |
| I/O current consumption | 30 mA max. | 40 mA max. |
| Current capacity of I/O power supply terminal | 0.5 A/terminal max. | |
| I/O refreshing method | Time Stamp | |
| Terminal block type | Screwless push-in terminal 8 terminals (A + B) | |
| Dimensions (W x H x D) | 12 × 100 × 71 | |
| Weight | 70 g max. | |
| Disconnection/ short-circuit detection | Not supported | |
| Protective function | Not supported | With load short-circuit protection |

### Circuit layout

#### NX-OD2154



This unit uses a push-pull output circuit.

#### NX-OD2258



This unit uses a push-pull output circuit.

### Terminal wiring

#### NX-OD2154



#### NX-OD2258

# OMRON

## Digital output unit (with MIL connector)

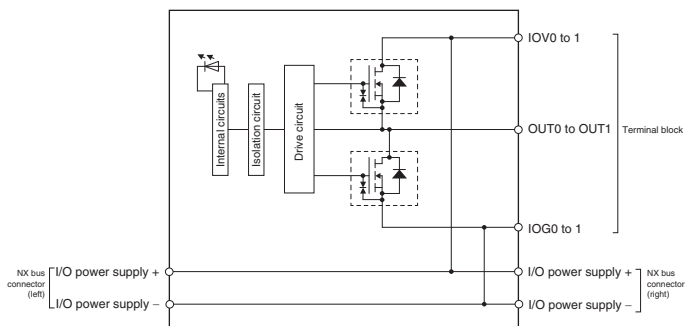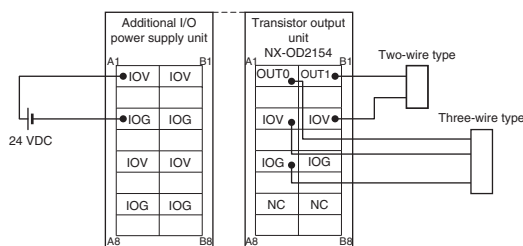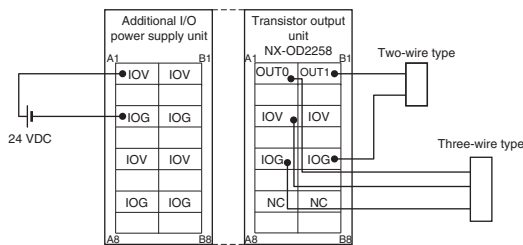| Item | Specifications | | | |
|---|---|---|---|---|
| **Model** | **NX-OD5121-5** | **NX-OD5256-5** | **NX-OD6121-5** | **NX-OD6256-5** |
| **Name** | Transistor output unit | | | |
| **Internal I/O common** | NPN | PNP | NPN | PNP |
| **Capacity** | 16 points | 16 points | 32 points | 32 points |
| **Rated voltage** | 12 to 24 VDC | 24 VDC | 12 to 24 VDC | 24 VDC |
| **Operating load voltage** | 10.2 to 28.8 VDC | 20.4 to 28.8 VDC | 10.2 to 28.8 VDC | 20.4 to 28.8 VDC |
| **Maximum value of load current** | 0.5 A/point, 2 A/NX unit | | 0.5 A/point, 2 A/common, 4 A/NX unit | |
| **Maximum inrush current** | 4.0 A/point, 10 ms max. | | | |
| **Leakage current** | 0.1 mA max. | | | |
| **Residual voltage** | 1.5 V max. | | | |
| **ON/OFF response time** | 0.1 ms max./0.8 ms max. | 0.5 ms max./1.0 ms max. | 0.1 ms max./0.8 ms max. | 0.5 ms max./1.0 ms max. |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) | | | |
| **Isolation method** | Photocoupler isolation | | | |
| **Unit power consumption** | 0.60 W max. | 0.70 W max. | 0.80 W max. | 1.0 W max. |
| **I/O power supply method** | Supply from external source | | | |
| **I/O current consumption** | 30 mA max. | 40 mA max. | 50 mA max. | 80 mA max. |
| **Current capacity of I/O power supply terminal** | Without I/O power supply terminals | | | |
| **I/O refreshing method** | Switching synchronous I/O refreshing and free-run refreshing | | | |
| **Terminal block type** | MIL connector 20 terminals | | MIL connector 40 terminals | |
| **Dimensions (W x H x D)** | 30 × 100 × 71 | | | |
| **Weight** | 80 g max. | 85 g max. | 90 g max. | 95 g max. |
| **Disconnection/ short-circuit detection** | Not supported | | | |
| **Protective function** | Not supported | With load short-circuit protection | Not supported | With load short-circuit protection |

### Circuit layout

#### NX-OD5121-5
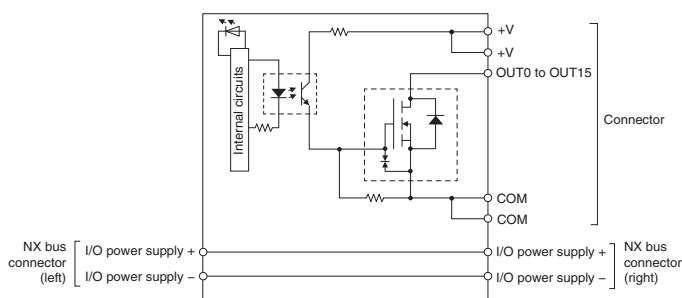


#### NX-OD5256-5
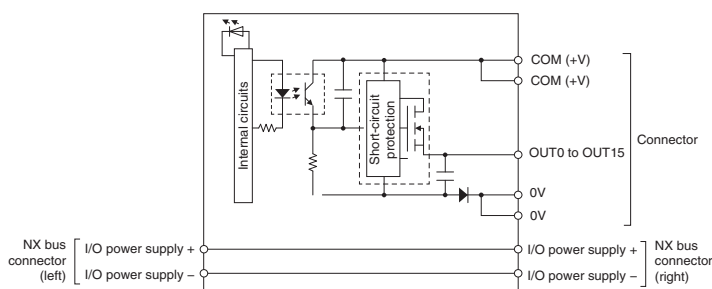


### Terminal wiring

#### NX-OD5121-5
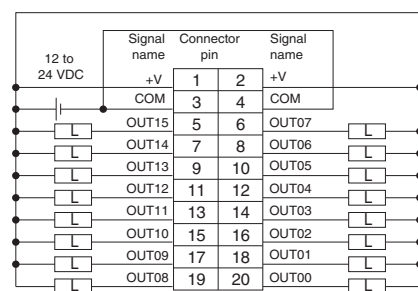


• Be sure to wire both pins 3 and 4 (COM).
• Be sure to wire both pins 1 and 2 (+V).

#### NX-OD5256-5
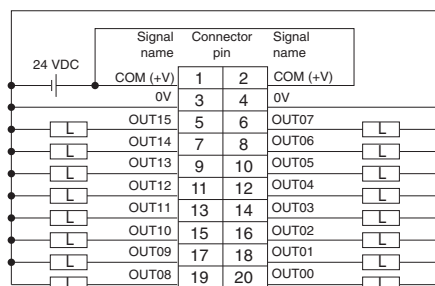


• Be sure to wire both pins 1 and 2 (COM (+V)).
• Be sure to wire both pins 3 and 4 (0V).

## Circuit layout

### NX-OD6121-5



## Terminal wiring

### NX-OD6121-5

| Signal name | Connector pin | | Signal name |
|---|---|---|---|
| +V1 | 1 | 2 | +V1 |
| COM1 | 3 | 4 | COM1 |
| OUT31 | 5 | 6 | OUT23 |
| OUT30 | 7 | 8 | OUT22 |
| OUT29 | 9 | 10 | OUT21 |
| OUT28 | 11 | 12 | OUT20 |
| OUT27 | 13 | 14 | OUT19 |
| OUT26 | 15 | 16 | OUT18 |
| OUT25 | 17 | 18 | OUT17 |
| OUT24 | 19 | 20 | OUT16 |
| +V0 | 21 | 22 | +V0 |
| COM0 | 23 | 24 | COM0 |
| OUT15 | 25 | 26 | OUT07 |
| OUT14 | 27 | 28 | OUT06 |
| OUT13 | 29 | 30 | OUT05 |
| OUT12 | 31 | 32 | OUT04 |
| OUT11 | 33 | 34 | OUT03 |
| OUT10 | 35 | 36 | OUT02 |
| OUT09 | 37 | 38 | OUT01 |
| OUT08 | 39 | 40 | OUT00 |
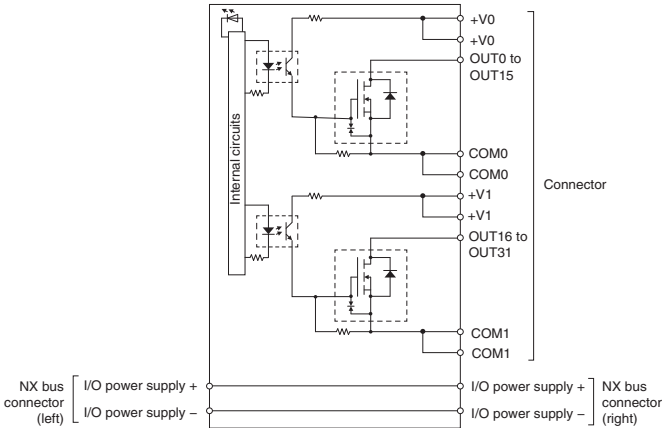
• Be sure to wire both pins 21 and 22 (+V0).
• Be sure to wire both pins 23 and 24 (COM0).
• Be sure to wire both pins 1 and 2 (+V1).
• Be sure to wire both pins 3 and 4 (COM1).

### NX-OD6256-5



### NX-OD6256-5

| Signal name | Connector pin | | Signal name |
|---|---|---|---|
| COM1 (+V) | 1 | 2 | COM1 (+V) |
| 0V1 | 3 | 4 | 0V1 |
| OUT31 | 5 | 6 | OUT23 |
| OUT30 | 7 | 8 | OUT22 |
| OUT29 | 9 | 10 | OUT21 |
| OUT28 | 11 | 12 | OUT20 |
| OUT27 | 13 | 14 | OUT19 |
| OUT26 | 15 | 16 | OUT18 |
| OUT25 | 17 | 18 | OUT17 |
| OUT24 | 19 | 20 | OUT16 |
| COM0 (+V) | 21 | 22 | COM0 (+V) |
| 0V0 | 23 | 24 | 0V0 |
| OUT15 | 25 | 26 | OUT07 |
| OUT14 | 27 | 28 | OUT06 |
| OUT13 | 29 | 30 | OUT05 |
| OUT12 | 31 | 32 | OUT04 |
| OUT11 | 33 | 34 | OUT03 |
| OUT10 | 35 | 36 | OUT02 |
| OUT09 | 37 | 38 | OUT01 |
| OUT08 | 39 | 40 | OUT00 |
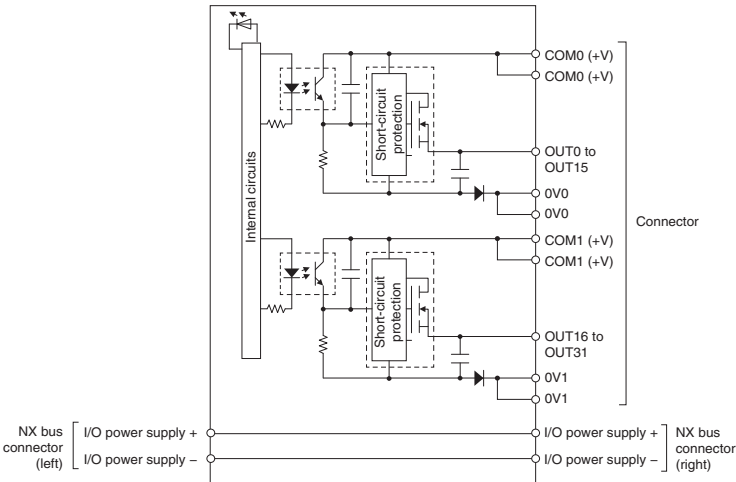
• Be sure to wire both pins 21 and 22 (COM0 (+V)).
• Be sure to wire both pins 1 and 2 (COM1 (+V)).
• Be sure to wire both pins 23 and 24 (0V0).
• Be sure to wire both pins 3 and 4 (0V1).

# OMRON

## Relay output unit

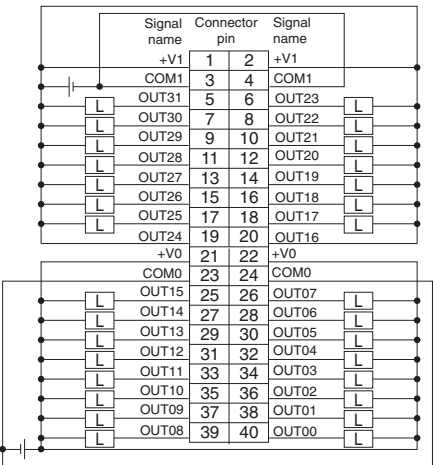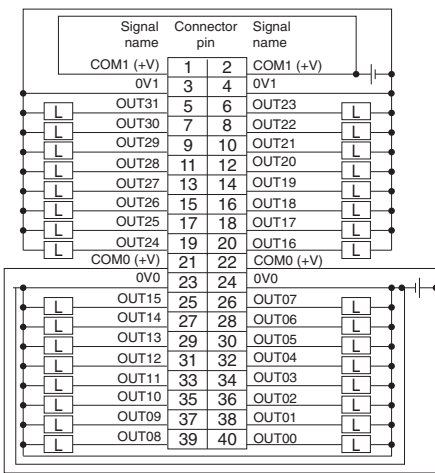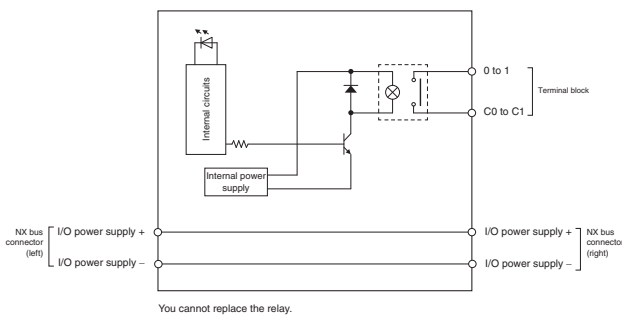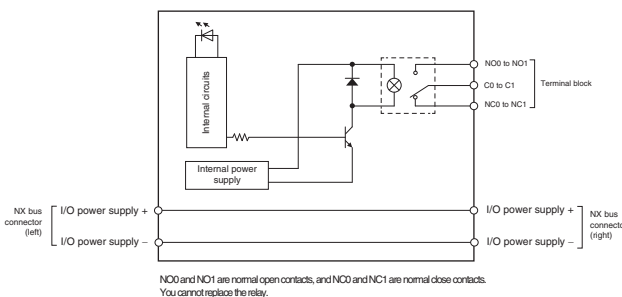| Item | Specifications | |
|---|---|---|
| Model | NX-OC2633 | NX-OC2733 |
| Name | Relay output unit | |
| Relay type | N.O. contact | N.O. + N.C. contact |
| Capacity | 2 points, independent contacts | |
| Max. switching capacity | 250 VAC/2 A (cos Ø = 1), 250 VAC/2 A (cos Ø = 0.4), 24 VDC/2 A, 4 A/unit | |
| Min. switching capacity | 5 VDC, 1 mA | |
| ON/OFF response time | 15 ms max. | |
| Relay service life | Electrical: 100,000 operations[*1]<br>Mechanical: 20,000,000 operations | |
| Dielectric strength | Between A1/B1 terminals and A3/B3 terminals:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and GR terminal:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and internal circuits:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the internal circuit and GR terminal:<br>510 VAC for 1 min at a leakage current of 5 mA max. | Between A1/3, B1/3 terminals and A5/7, B5/7 terminals:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and functional ground terminal:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the external terminals and internal circuits:<br>2,300 VAC for 1 min at a leakage current of 5 mA max.<br>Between the internal circuit and functional ground terminal:<br>510 VAC for 1 min at a leakage current of 5 mA max. |
| Insulation resistance | Between A1/B1 terminals and A3/B3 terminals:<br>20 MΩ min. (500 VDC)<br>Between the external terminals and internal circuits:<br>20 MΩ min. (500 VDC)<br>Between the internal circuit and GR terminal:<br>20 MΩ min. (100 VDC)<br>Between the external terminals and GR terminal:<br>20 MΩ min. (500 VDC) | Between A1/3, B1/3 terminals and A5/7, B5/7 terminals:<br>20 MΩ min. (500 VDC)<br>Between the external terminals and functional ground terminal:<br>20 MΩ min. (500 VDC)<br>Between the external terminals and internal circuits:<br>20 MΩ min. (500 VDC)<br>Between the internal circuit and functional ground terminal:<br>20 MΩ min. (100 VDC) |
| Vibration resistance | Conforms to IEC60068-2-6.<br>5 to 8.4 Hz with amplitude of 3.5 mm, 8.4 to 150 Hz, acceleration of 9.8 m/s$^2$, 100 min each in X, Y and Z directions (10 sweeps of 10 min each =100 min total) | |
| Shock resistance | 100 m/s$^2$, 3 times each in X, Y and Z directions | |
| Isolation method | Relay isolation | |
| Unit power consumption | 0.80 W max. | 0.95 W max. |
| I/O power supply method | Supply from external source | |
| I/O current consumption | No consumption | |
| Current capacity of I/O power supply terminal | Without I/O power supply terminals | |
| I/O refreshing method | Free-run refreshing | |
| Terminal block type | Screwless push-in terminal<br>8 terminals (A + B) | |
| Dimensions (W x H x D) | 12 × 100 × 71 | |
| Weight | 65 g max. | 70 g max. |
| Disconnection/ short-circuit detection | Not supported | |
| Protective function | Not supported | |

*1. Electrical service life will vary depending on the current value. Refer to "NX-series digital I/O units user's manual" for details.

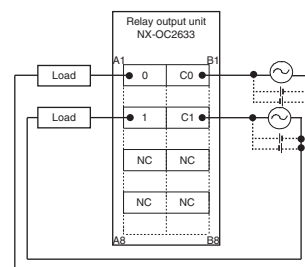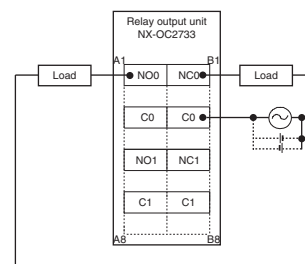### Circuit layout

#### NX-OC2633



You cannot replace the relay.

#### NX-OC2733



NO0 and NO1 are normal open contacts, and NC0 and NC1 are normal close contacts.
You cannot replace the relay.

### Terminal wiring

#### NX-OC2633



#### NX-OC2733

## Digital I/O unit (with MIL connector)

| Item | Specifications | |
|---|---|---|
| Model | NX-MD6121-5 | NX-MD6256-5 |
| Name | DC input/transistor output unit | |
| Capacity | 16 inputs/16 outputs | |
| **Output section (CN1)** Internal I/O common | NPN | PNP |
| Rated voltage | 12 to 24 VDC | 24 VDC |
| Operating load voltage | 10.2 to 28.8 VDC | 20.4 to 28.8 VDC |
| Maximum value of load current | 0.5 A/point, 2 A/NX unit | |
| Maximum inrush current | 4.0 A/point, 10 ms max. | |
| Leakage current | 0.1 mA max. | |
| Residual voltage | 1.5 V max. | |
| ON/OFF response time | 0.1 ms max./0.8 ms max. | 0.5 ms max./1.0 ms max. |
| **Input section (CN2)** Internal I/O common | For both NPN/PNP | |
| Rated input voltage | 24 VDC (15 to 28.8 VDC) | |
| Input current[1] | 7 mA | |
| ON voltage | 15 VDC min. | |
| ON current | 3 mA min. | |
| OFF voltage | 5 VDC max. | |
| OFF current | 1 mA max. | |
| ON/OFF response time | 20 $\mu$s max./400 $\mu$s max | |
| Input filter time | No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| Insulation resistance | 20 M$\Omega$ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Photocoupler isolation | |
| Unit power consumption | 0.70 W max. | 0.75 W max. |
| I/O power supply method | Supply from external source | |
| I/O current consumption | 30 mA max. | 40 mA max. |
| Current capacity of I/O power supply terminal | Without I/O power supply terminals | |
| I/O refreshing method | Switching synchronous I/O refreshing and free-run refreshing | |
| Terminal block type | 2 MIL connectors 20 terminals | |
| Dimensions (W x H x D) | 30 × 100 × 71 | |
| Weight | 105 g max. | 110 g max. |
| Disconnection/ short-circuit detection | Not supported | |
| Protective function | Not supported | With load short-circuit protection |

*1. Typical rated current at 24 VDC.

**Circuit layout**

**NX-MD6121-5 CN1 (left) output circuit**



**CN2 (right) input circuit**
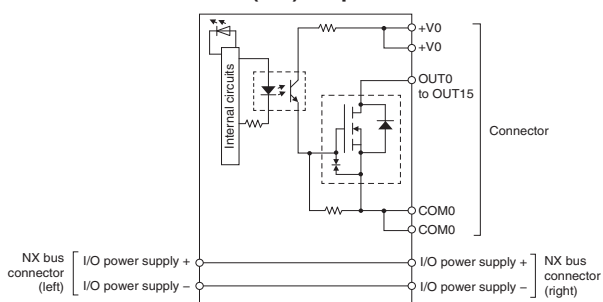


**Terminal wiring**

**NX-MD6121-5 CN1 (left) output terminal**
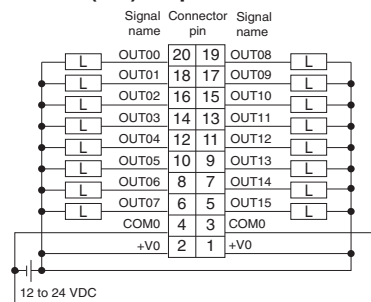


• Be sure to wire both pins 3 and 4 (COM0) of CN1.
• Be sure to wire both pins 1 and 2 (+V0) of CN1.
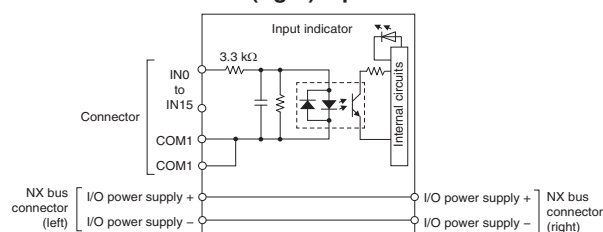
**CN2 (right) input terminal**
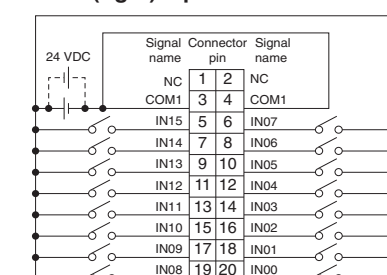


• The polarity of the input power supply of CN2 can be connected in either direction.
• Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

# OMRON

**Circuit layout**

**NX-MD6256-5
CN1 (left) output circuit**
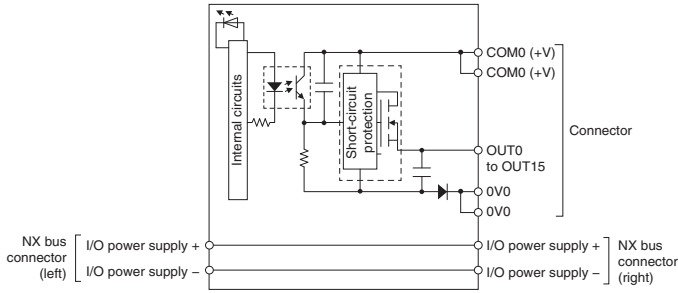


**CN2 (right) input circuit**



**Terminal wiring**

**NX-MD6256-5
CN1 (left) output terminal**

| Signal name | Connector pin | | Signal name |
|---|---|---|---|
| OUT00 | 20 | 19 | OUT08 |
| OUT01 | 18 | 17 | OUT09 |
| OUT02 | 16 | 15 | OUT10 |
| OUT03 | 14 | 13 | OUT11 |
| OUT04 | 12 | 11 | OUT12 |
| OUT05 | 10 | 9 | OUT13 |
| OUT06 | 8 | 7 | OUT14 |
| OUT07 | 6 | 5 | OUT15 |
| COM0 (+V) | 4 | 3 | COM0 (+V) |
| 0V0 | 2 | 1 | 0V0 |

24 VDC
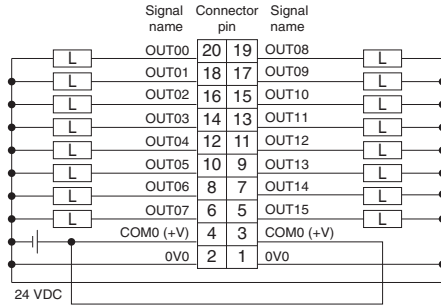
- Be sure to wire both pins 3 and 4 (COM0 (+V)) of CN1.
- Be sure to wire both pins 1 and 2 (0V0) of CN1.

**CN2 (right) input terminal**
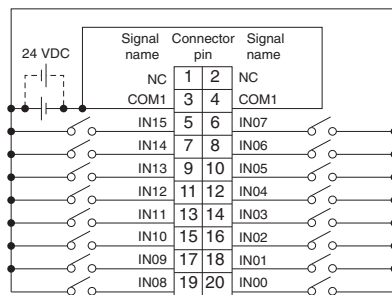
24 VDC

| Signal name | Connector pin | | Signal name |
|---|---|---|---|
| NC | 1 | 2 | NC |
| COM1 | 3 | 4 | COM1 |
| IN15 | 5 | 6 | IN07 |
| IN14 | 7 | 8 | IN06 |
| IN13 | 9 | 10 | IN05 |
| IN12 | 11 | 12 | IN04 |
| IN11 | 13 | 14 | IN03 |
| IN10 | 15 | 16 | IN02 |
| IN09 | 17 | 18 | IN01 |
| IN08 | 19 | 20 | IN00 |

- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

## Analog I/O unit

### Current input unit

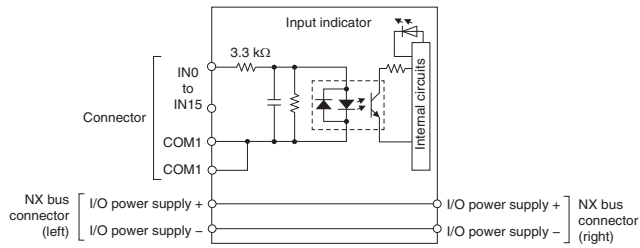| Item | Specifications | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | NX-AD2203 | NX-AD3203 | NX-AD4203 | NX-AD2204 | NX-AD3204 | NX-AD4204 | NX-AD2208 | NX-AD3208 | NX-AD4208 |
| Name | Current input unit | | | | | | | | |
| Input range | 4 to 20 mA | | | | | | | | |
| Input method | Single-ended input | | | Differential input | | | | | |
| Capacity | 2 points | 4 points | 8 points | 2 points | 4 points | 8 points | 2 points | 4 points | 8 points |
| Input conversion range | –5% to 105% (full scale) | | | | | | | | |
| Absolute maximum rating | ±30 mA | | | | | | | | |
| Input impedance | 250 Ω min. | 250 Ω min. | 85 Ω min. | 250 Ω min. | 250 Ω min. | 85 Ω min. | 250 Ω min. | 250 Ω min. | 85 Ω min. |
| Resolution | 1/8,000 (full scale) | | | | | | 1/30,000 (full scale) | | |
| Overall accuracy 25°C | ±0.2% (full scale) | | | | | | ±0.1% (full scale) | | |
| Overall accuracy 0 to 55°C | ±0.4% (full scale) | | | | | | ±0.2% (full scale) | | |
| Conversion time | 250 μs/point | | | | | | 10 μs/point | | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | | | | |
| Isolation method | Between the input and the NX bus: Power = Transformer, Signal = Digital isolator (no isolation between inputs) | | | | | | | | |
| Unit power consumption | 0.90 W max. | 0.90 W max. | 1.05 W max. | 0.90 W max. | 0.90 W max. | 1.05 W max. | 0.90 W max. | 0.95 W max. | 1.10 W max. |
| I/O power supply method | Supply from the NX bus | | | No supply | | | | | |
| I/O current consumption | No consumption | | | | | | | | |
| Current capacity of I/O power supply terminal | 0.1 A/terminal max. | | | Without I/O power supply terminals | | | | | |
| I/O refreshing method | Free-run refreshing | | | | | | Switching synchronous I/O refreshing and free-run refreshing | | |
| Terminal block type | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) |
| Dimensions (W x H x D) | 12 × 100 × 71 | | | | | | | | |
| Weight | 70 g max. | | | | | | | | |
| Input disconnection detection | Supported | | | | | | | | |

### Circuit layout

#### NX-AD2203
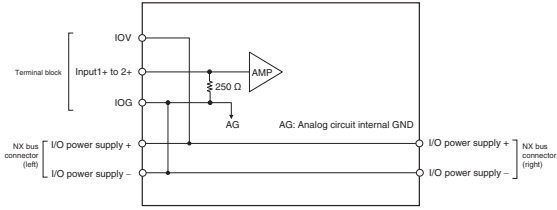


#### NX-AD3203
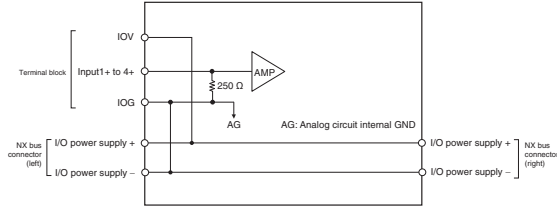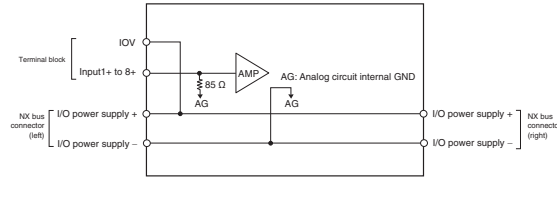


#### NX-AD4203



### Terminal wiring

#### NX-AD2203



#### NX-AD3203



#### NX-AD4203

# OMRON
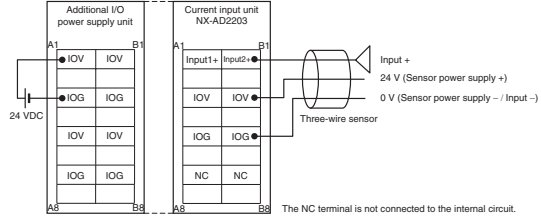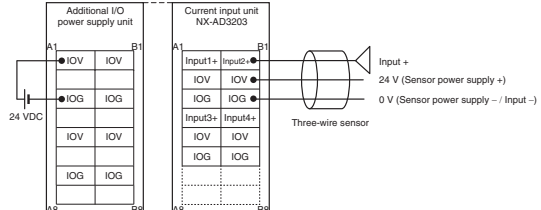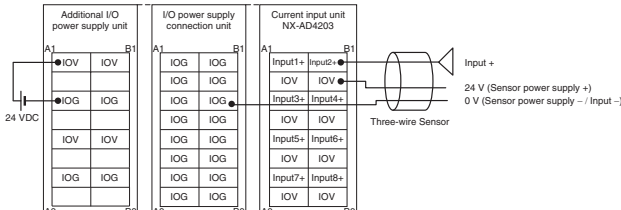
## Circuit layout

### NX-AD2204/NX-AD2208
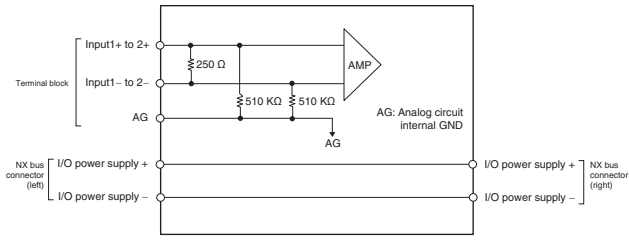


### NX-AD3204/NX-AD3208
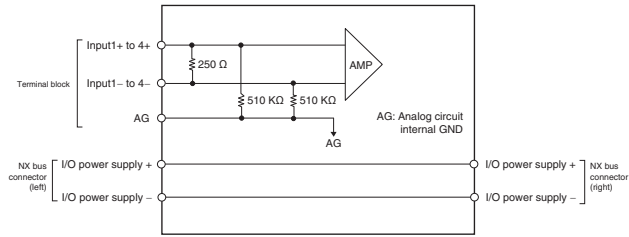


### NX-AD4204/NX-AD4208
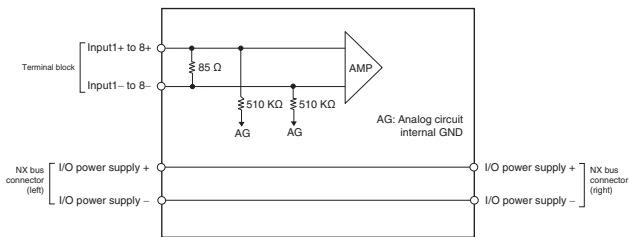


## Terminal wiring

### NX-AD2204/NX-AD2208



AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

### NX-AD3204/NX-AD3208



AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

### NX-AD4204/NX-AD4208

## Voltage input unit

| Item | Specifications | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | NX-AD2603 | NX-AD3603 | NX-AD4603 | NX-AD2604 | NX-AD3604 | NX-AD4604 | NX-AD2608 | NX-AD3608 | NX-AD4608 |
| Name | Voltage input unit | | | | | | | | |
| Input range | −10 to 10 V | | | | | | | | |
| Input method | Single-ended input | | | Differential input | | | | | |
| Capacity | 2 points | 4 points | 8 points | 2 points | 4 points | 8 points | 2 points | 4 points | 8 points |
| Input conversion range | −5% to 105% (full scale) | | | | | | | | |
| Absolute maximum rating | ±15 V | | | | | | | | |
| Input impedance | 1 MΩ min. | | | | | | | | |
| Resolution | 1/8,000 (full scale) | | | | | | 1/30,000 (full scale) | | |
| Overall accuracy — 25°C | ±0.2% (full scale) | | | | | | ±0.1% (full scale) | | |
| Overall accuracy — 0 to 55°C | ±0.4% (full scale) | | | | | | ±0.2% (full scale) | | |
| Conversion time | 250 µs/point | | | | | | 10 µs/point | | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | | | | |
| Isolation method | Between the input and the NX bus: Power = Transformer, Signal = Digital isolator (no isolation between inputs) | | | | | | | | |
| Unit power consumption | 1.05 W max. | 1.10 W max. | 1.15 W max. | 1.05 W max. | 1.10 W max. | 1.15 W max. | 1.05 W max. | 1.10 W max. | 1.15 W max. |
| I/O power supply method | Supply from the NX bus | | | No supply | | | | | |
| I/O current consumption | No consumption | | | | | | | | |
| Current capacity of I/O power supply terminal | 0.1 A/terminal max. | | | Without I/O power supply terminals | | | | | |
| I/O refreshing method | Free-run refreshing | | | | | | Switching synchronous I/O refreshing and free-run refreshing | | |
| Terminal block type | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 16 terminals (A + B) |
| Dimensions (W x H x D) | 12 × 100 × 71 | | | | | | | | |
| Weight | 70 g max. | | | | | | | | |
| Input disconnection detection | Not supported | | | | | | | | |

**Circuit layout**

**NX-AD2603**
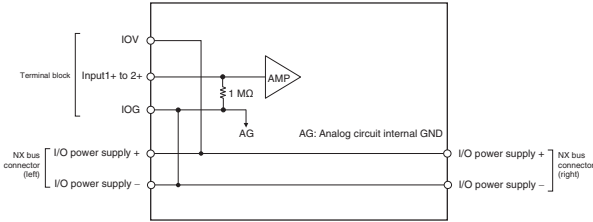


**NX-AD3603**



**NX-AD4603**



**Terminal wiring**

**NX-AD2603**



**NX-AD3603**



**NX-AD4603**

# OMRON
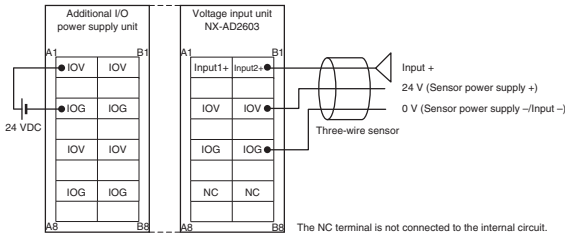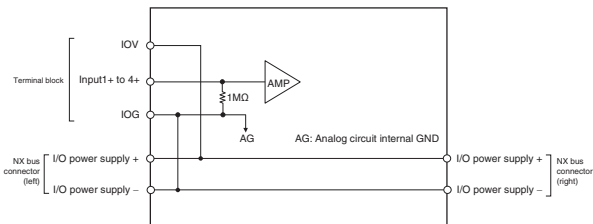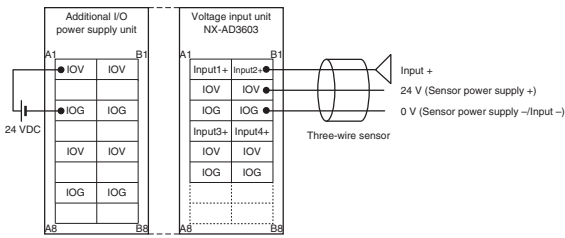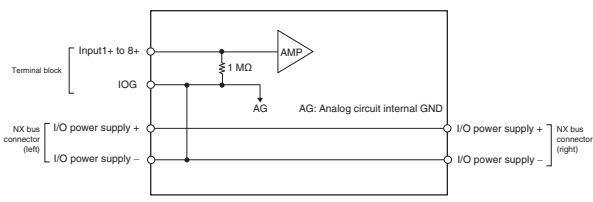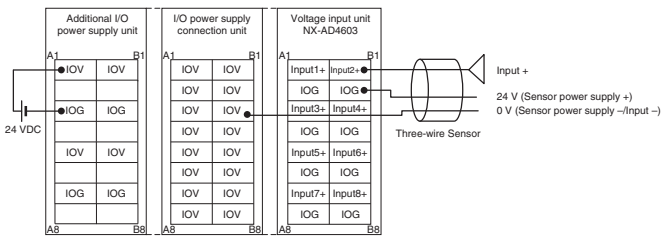
## Circuit layout

### NX-AD2604/NX-AD2608

Terminal block
Input1+ to 2+
Input1− to 2−
AG
510 KΩ  510 KΩ
AMP
AG
AG: Analog circuit internal GND

NX bus connector (left)
I/O power supply +
I/O power supply −

I/O power supply +
I/O power supply −
NX bus connector (right)

### NX-AD3604/NX-AD3608

Terminal block
Input1+ to 4+
Input1− to 4−
AG
510 KΩ  510 KΩ
AMP
AG
AG: Analog circuit internal GND

NX bus connector (left)
I/O power supply +
I/O power supply −

I/O power supply +
I/O power supply −
NX bus connector (right)

### NX-AD4604/NX-AD4608

Terminal block
Input1+ to 8+
Input1− to 8−
510 KΩ  510 KΩ
AMP
AG  AG
AG: Analog circuit internal GND

NX bus connector (left)
I/O power supply +
I/O power supply −

I/O power supply +
I/O power supply −
NX bus connector (right)

## Terminal wiring

### NX-AD2604/NX-AD2608

Voltage input unit
NX-AD260□

| A1 | | B1 |
| Input1+ | Input2+● | |
| Input1− | Input2−● | |
| | | |
| AG | AG | |
| | | |
| NC | NC | |
| A8 | | B8 |

Input +
Input −

AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

### NX-AD3604/NX-AD3608

Voltage input unit
NX-AD360□

| A1 | | B1 |
| Input1+ | Input2+● | |
| Input1− | Input2−● | |
| Input3+ | Input4+ | |
| Input3− | Input4− | |
| AG | AG | |
| AG | AG | |
| A8 | | B8 |

Input +
Input −

AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

### NX-AD4604/NX-AD4608

Voltage input unit
NX-AD460□

| A1 | | B1 |
| Input1+ | Input2+● | |
| Input1− | Input2−● | |
| Input3+ | Input4+ | |
| Input3− | Input4− | |
| Input5+ | Input6+ | |
| Input5− | Input6− | |
| Input7+ | Input8+ | |
| Input7− | Input8− | |
| A8 | | B8 |

Input +
Input −

## Current output unit

| Item | Specifications | | | |
|---|---|---|---|---|
| **Model** | **NX-DA2203** | **NX-DA3203** | **NX-DA2205** | **NX-DA3205** |
| **Name** | Current output unit | | | |
| **Output range** | 4 to 20 mA | | | |
| **Capacity** | 2 points | 4 points | 2 points | 4 points |
| **Output conversion range** | –5% to 105% (full scale) | | | |
| **Allowable load resistance** | 600 Ω min. | 350 Ω min. | 600 Ω min. | 350 Ω min. |
| **Resolution** | 1/8,000 (full scale) | | 1/30,000 (full scale) | |
| **Overall accuracy** **25°C** | ±0.3% (full scale) | | ±0.1% (full scale) | |
| **0 to 55°C** | ±0.6% (full scale) | | ±0.3% (full scale) | |
| **Conversion time** | 250 µs/point | | 10 µs/point | |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) | | | |
| **Isolation method** | Between the input and the NX bus: Power = Transformer, Signal = Digital isolator (no isolation between inputs) | | | |
| **Unit power consumption** | 1.75 W max. | 1.80 W max. | 1.75 W max. | 1.80 W max. |
| **I/O power supply method** | Supply from the NX bus | | | |
| **I/O current consumption** | No consumption | | | |
| **Current capacity of I/O power supply terminal** | 0.1 A/terminal max. | | | |
| **I/O refreshing method** | Free-run refreshing | | Switching synchronous I/O refreshing and free-run refreshing | |
| **Terminal block type** | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) |
| **Dimensions (W x H x D)** | 12 × 100 × 71 | | | |
| **Weight** | 70 g max. | | | |

### Circuit layout

#### NX-DA2203/DA2205



#### NX-DA3203/DA3205



### Terminal wiring

#### NX-DA2203/DA2205



#### NX-DA3203/DA3205

# OMRON

## Voltage output unit

| Item | Specifications | | | |
|---|---|---|---|---|
| Model | NX-DA2603 | NX-DA3603 | NX-DA2605 | NX-DA3605 |
| Name | Voltage output unit | | | |
| Output range | –10 to 10 V | | | |
| Capacity | 2 points | 4 points | 2 points | 4 points |
| Output conversion range | –5% to 105% (full scale) | | | |
| Allowable load resistance | 5 kΩ min. | | | |
| Output impedance | 0.5 Ω max. | | | |
| Resolution | 1/8,000 (full scale) | | 1/30,000 (full scale) | |
| Overall accuracy 25°C | ±0.3% (full scale) | | ±0.1% (full scale) | |
| Overall accuracy 0 to 55°C | ±0.5% (full scale) | | ±0.3% (full scale) | |
| Conversion time | 250 µs/point | | 10 µs/point | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | |
| Isolation method | Between the input and the NX bus: Power = Transformer, Signal = Digital isolator (no isolation between inputs) | | | |
| Unit power consumption | 1.10 W max. | 1.25 W max. | 1.10 W max. | 1.25 W max. |
| I/O power supply method | Supply from the NX bus | | | |
| I/O current consumption | No consumption | | | |
| Current capacity of I/O power supply terminal | 0.1 A/terminal max. | | | |
| I/O refreshing method | Free-run refreshing | | Switching synchronous I/O refreshing and free-run refreshing | |
| Terminal block type | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) | Screwless push-in terminal 8 terminals (A + B) | Screwless push-in terminal 12 terminals (A + B) |
| Dimensions (W x H x D) | 12 × 100 × 71 | | | |
| Weight | 70 g max. | | | |

## Circuit layout

### NX-DA2603/DA2605



### NX-DA3603/DA3605
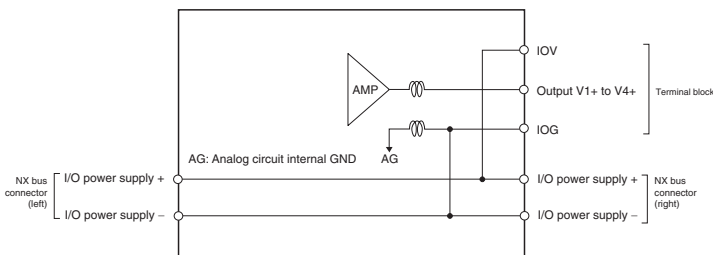


## Terminal wiring

### NX-DA2603/DA2605
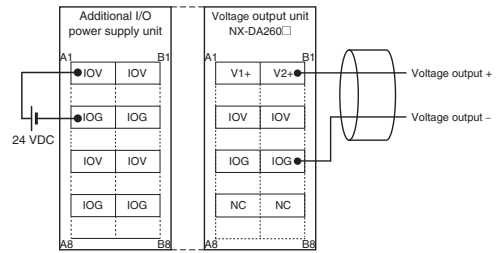


### NX-DA3603/DA3605
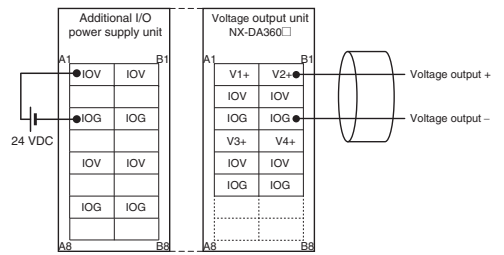
## Temperature input unit

### Thermocouple input unit

| Item | Specifications | | | | | |
|---|---|---|---|---|---|---|
| Model | NX-TS2101 | NX-TS3101 | NX-TS2102 | NX-TS3102 | NX-TS2104 | NX-TS3104 |
| Name | Thermocouple type | | | | | |
| Capacity | 2 points | 4 points | 2 points | 4 points | 2 points | 4 points |
| Temperature sensor | K, J, T, E, L, U, N, R, S, B, WRe5-26, PLII | | K, J, T, E, L, U, N, R, S, WRe5-26, PLII | | | |
| Input conversion range | ±20°C of the input range | | | | | |
| Input detection current | Approx. 0.1 µA | | | | | |
| Input impedance | 20 KΩ min. | | | | | |
| Absolute maximum rating | ±130 mV | | | | | |
| Resolution | 0.1°C max.[*1] | | 0.01°C max. | | 0.001°C max. | |
| Warm-up period | 30 minutes | | 45 minutes | | | |
| Reference accuracy and temperature coefficient | **Conversion time** | 250 ms | | 10 ms | | 60 ms | |
| | **Temperature range** | K, N (–200 to 1,300°C) <br> J (–200 to 1,200°C) <br> T (–200 to 400°C) <br> E (–200 to 1,000°C) <br> L (–200 to 900°C) <br> U (–200 to 600°C) <br> R, S (–50 to 1,700°C) <br> B (0 to 1,800°C) <br> WRe5-26 (0 to 2,300°C) <br> PLII (0 to 1,300°C) | | K, N (–200 to 1,300°C) <br> K (-20 to 600°C, high resolution) <br> J (–200 to 1,200°C) <br> J (–20 to 600°C, high resolution) <br> T (–200 to 400°C) <br> E (–200 to 1,000°C) <br> L (–200 to 900°C) <br> U (–200 to 600°C) <br> R, S (–50 to 1,700°C) <br> WRe5-26 (0 to 2,300°C) <br> PLII (0 to 1,300°C) | | | |
| | **Accuracy[*2]** | K/J/E/L/N/R/S/PLII (±0.1%) <br> T (±0.2%) <br> U (±0.15%) <br> WRe5-26 (±0.05%) | | T (±0.22%) <br> R/S (±0.19%) <br> N (±0.11%) <br> U (±0.09%) <br> K/J/E/L/WRe5-26/PLII (±0.05%) | | | |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | |
| Isolation method | Between the input and the NX bus: <br> Power = Transformer, <br> Signal = Photocoupler <br> Between inputs: <br> Power = Transformer, <br> Signal = Photocoupler | | Between the input and the NX bus: <br> Power = Transformer, <br> Signal = Digital isolator <br> Between inputs: <br> Power = Transformer <br> Signal = Digital isolator | | | |
| Unit power consumption | 0.90 W max. | 1.30 W max. | 0.80 W max. | 1.10 W max. | 0.80 W max. | 1.10 W max. |
| I/O power supply method | No supply | | | | | |
| I/O current consumption | No consumption | | | | | |
| Current capacity of I/O power supply terminal | Without I/O power supply terminals | | | | | |
| I/O refreshing method | Free-run refreshing | | | | | |
| Terminal block type | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] |
| Dimensions (W x H x D) | 12 × 100 × 71 | 24 × 100 × 71 | 12 × 100 × 71 | 24 × 100 × 71 | 12 × 100 × 71 | 24 × 100 × 71 |
| Weight | 70 g max. | 140 g max. | 70 g max. | 140 g max. | 70 g max. | 140 g max. |

*1. The resolution is 0.2°C max. when the input type is R, S or W.
*2. Accuracy for temperature inputs as percentatge of process value and typical value 25°C ambient temperature (refer to the user's manual for detailed information).

## Terminal wiring

### NX-TS2101/TS2102/TS2104
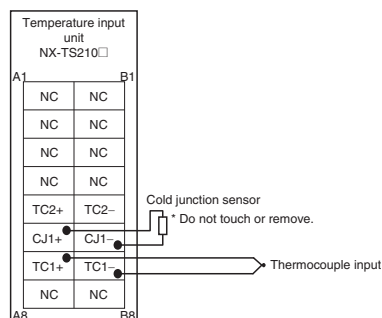


### NX-TS3101/TS3102/TS3104

# OMRON

## Resistance thermometer input unit

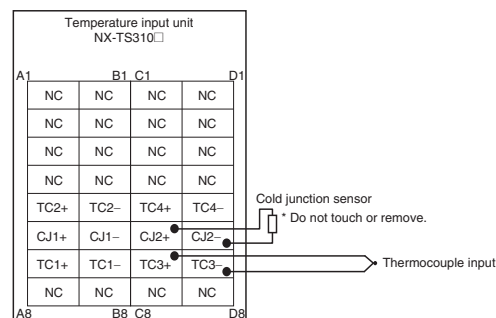| Item | | Specifications | | | | | |
|---|---|---|---|---|---|---|---|
| Model | | NX-TS2201 | NX-TS3201 | NX-TS2202 | NX-TS3202 | NX-TS2204 | NX-TS3204 |
| Name | | Resistance thermometer type | | | | | |
| Capacity | | 2 points | 4 points | 2 points | 4 points | 2 points | 4 points |
| Temperature sensor | | Pt100 (three-wire)/Pt1000 (three-wire) | | Pt100 (three-wire) | | Pt100 (three-wire)/Pt1000 (three-wire) | |
| Input conversion range | | ±20°C of the input range | | | | | |
| Input detection current | | Approx. 0.25 mA | | | | | |
| Resolution | | 0.1°C max. | | 0.01ºC max. | | 0.001ºC max. | |
| Effect of conductor resistance | | 0.06°C/$\Omega$ max. (also 20 $\Omega$ max.) | | | | | |
| Warm-up period | | 10 minutes | | 30 minutes | | | |
| Reference accuracy and temperature coefficient | Conversion time | 250 ms | | 10 ms | | 60 ms | |
| | Temperature range | −200 to 850°C | | | | | |
| | Accuracy[1] | ±0.1% | | ±0.05% | | | |
| Dielectric strength | | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | |
| Insulation resistance | | 20 M$\Omega$ min. between isolated circuits (at 100 VDC) | | | | | |
| Isolation method | | Between the input and the NX bus: Power = Transformer Signal = Photocoupler Between inputs: Power = Transformer Signal = Photocoupler | | Between the input and the NX bus: Power = Transformer Signal = Digital isolator Between inputs: Power = Transformer Signal = Digital isolator | | | |
| Unit power consumption | | 0.90 W max. | 1.30 W max. | 0.75 W max. | 1.05 W max. | 0.75 W max. | 1.05 W max. |
| I/O power supply method | | No supply | | | | | |
| I/O current consumption | | No consumption | | | | | |
| Current capacity of I/O power supply terminal | | Without I/O power supply terminals | | | | | |
| I/O refreshing method | | Free-run refreshing | | | | | |
| Terminal block type | | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] | Screwless push-in terminal 16 terminals (A + B) | Screwless push-in terminal 16 terminals x 2 [(A + B) & (C + D)] |
| Dimensions (W x H x D) | | 12 × 100 × 71 | 24 × 100 × 71 | 12 × 100 × 71 | 24 × 100 × 71 | 12 × 100 × 71 | 24 × 100 × 71 |
| Weight | | 70 g max. | 140 g max. | 70 g max. | 130 g max. | 70 g max. | 130 g max. |

*1. Accuracy for temperature inputs as percentatge of process value and typical value 25ºC ambient temperature (refer to the user's manual for detailed information).

## Terminal wiring
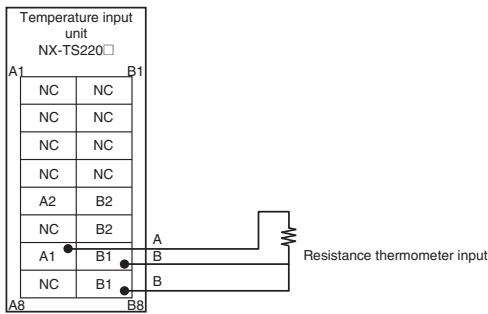
### NX-TS2201/TS2202/TS2204



### NX-TS3201/TS3202/TS3204
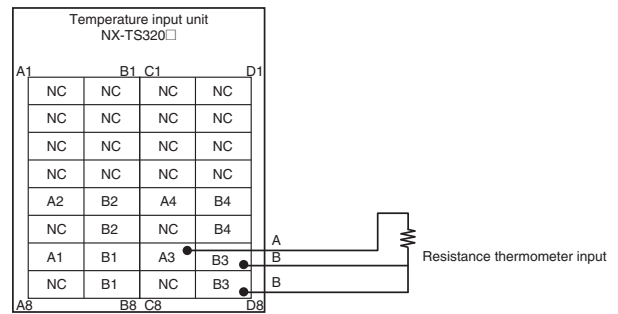
## Position interface unit

### Incremental encoder input unit

| Item | | | Specifications | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | | NX-EC0112 | NX-EC0122 | NX-EC0212 | NX-EC0222 | NX-EC0132 | NX-EC0142 |
| Name | | | Incremental encoder input unit | | | | | |
| Number of channels | | | 1 channel | | 2 channels | | 1 channel | |
| Input signals | | | Counter: Phases A, B and Z External inputs: 3 | | Counter: Phases A, B and Z External inputs: None | | Counter: Phases A, B and Z External inputs: 3 | |
| Input form | Type | | NPN type 500 kHz | PNP type 500 kHz | NPN type 500 kHz | PNP type 500 kHz | Line driver, 4 MHz | |
| | Specifications | Voltage | 20.4 to 28.8 VDC (24 VDC +20%/–15%) ON voltage: 19.6 VDC min./3 mA min. OFF voltage: 4.0 VDC max./1 mA max. | | | | EIA standard RS-422-A line driver levels Impedance: 120 Ω ±5% | |
| | | Current | 4.2 mA (24 VDC) | | | | Level input voltage: $V_{IT+}$: 0.1 V min. $V_{IT-}$: 0.1 V min. Hysteresis voltage: Vhys $(V_{IT+} - V_{IT-})$: 60 Mv | |
| | | 5 V power supply for encoder | – | | | | Output voltage: 5 VDC ±5% Output current: 500 mA max. | |
| | | Maximum response frequency | Phases A and B: Single-phase 500 kHz (phase difference pulse input × 4: 125 kHz), Phase Z: 125 kHz | | | | Phases A and B: Single-phase 4 MHz (phase differential pulse input × 4: 1 MHz), Phase Z: 1 MHz | |
| Counting units | | | Pulses | | | | | |
| Pulse input method | | | Phase difference pulse (multiplication × 2/4), pulse + direction inputs or up and down pulse inputs | | | | | |
| Counter range | | | –2,147,483,648 to 2,147,483,647 pulses | | | | | |
| Counter functions | Type | | Ring counter or linear counter | | | | | |
| | Controls | | Gate control, counter reset and counter preset | | | | | |
| | Latch function | | Two external input latches and one internal latch | | | | | |
| | Measurements | | Pulse rate measurement and pulse period measurement | | | | | |
| External input specifications | Input voltage | | 20.4 to 28.8 VDC (24 VDC +20%/–15%) | | – | | 20.4 to 28.8 VDC (24 VDC +20%/–15%) | |
| | Input current | | 4.6 mA (24 VDC) | | – | | 3.5 mA (24 VDC) | |
| | ON voltage/ON current | | 15 VDC min./3 mA min. | | – | | 15 VDC min./3 mA min. | |
| | OFF voltage/OFF current | | 4.0 VDC max./1 mA max. | | – | | 5.0 VDC max./1 mA max. | |
| | ON/OFF response time | | 1 μs max./2 μs max. | | – | | 1 μs max./1 μs max. | |
| | Internal I/O common | | NPN | PNP | – | | NPN | PNP |
| Dielectric strength | | | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | | | | |
| Insulation resistance | | | 20 MΩ min. between isolated circuits (at 100 VDC) | | | | | |
| Isolation method | | | Photocoupler isolation | | | | Digital isolator | |
| Unit power consumption | | | 0.85 W max. | 0.95 W max. | 0.85 W max. | 0.95 W max. | 0.95 W max. | 1.05 W max. |
| I/O power supply source | | | Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%) | | | | | |
| Current consumption from I/O power supply | | | None | | | | 30 mA | |
| Current capacity of I/O power supply terminal | | | 0.3 A max. per terminal for encoder supply section and 0.1 A max. per terminal for other sections | | 0.3 A max. per terminal | | 0.1 A max. per terminal | |
| I/O refreshing method | | | Free-run refreshing or synchronous I/O refreshing[*1] | | | | | |
| Terminal block type | | | Screwless push-in terminal 16 terminals (A + B) | | Screwless push-in terminal 12 terminals (A + B) | | Screwless push-in terminal 12 terminals x 2 [(A + B) x 2] | |
| Dimensions (W x H x D) | | | 12 × 100 × 71 | | 12 × 100 × 71 | | 24 × 100 × 71 | |
| Weight | | | 70 g | | 70 g | | 130 g | |
| Failure detection | | | None | | | | | |
| Protection | | | None | | | | | |

*1. The I/O refreshing method is automatically set according to the connected communication unit and CPU unit.

**Circuit layout**

**Terminal wiring**

**NX-EC0112**

**NX-EC0112**



**NX-EC0122**

**NX-EC0122**

**Circuit layout**
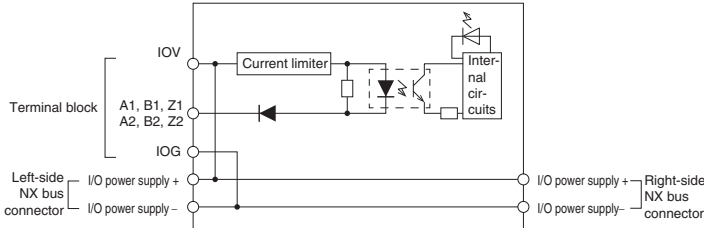
**Terminal wiring**

### NX-EC0212

### NX-EC0212

Terminal block | IOV | Current limiter | Internal circuits
A1, B1, Z1 A2, B2, Z2
IOG

Left-side NX bus connector | I/O power supply + | I/O power supply + | Right-side NX bus connector
I/O power supply − | I/O power supply −

A1 | B1 | Encoder 1
Z1 | NC
IOV | IOV
IOG | IOG
Encoder 2 | A2 | B2
Z2 | NC

### NX-EC0222

### NX-EC0222

Terminal block | IOV | Current limiter | Internal circuits
A1, B1, Z1 A2, B2, Z2
IOG

Left-side NX bus connector | I/O power supply + | I/O power supply + | Right-side NX bus connector
I/O power supply − | I/O power supply −

A1 | B1 | Encoder 1
Z1 | NC
IOV | IOV
IOG | IOG
Encoder 2 | A2 | B2
Z2 | NC

### NX-EC0132/EC0142

### NX-EC0132/EC0142

**Encoder Input (NX-EC0132/EC0142)**

No isolation: 5 V

Terminal block | A−, B−, Z−
120 Ω | Isolation circuit | Internal circuits
A+, B+, Z+

No isolation: 5 V GND
Non-isolated power supply
No isolation: 5 V
No isolation: 5 V GND

Encoder power supply output, 5 V | Terminal block
Encoder power supply output, 0 V

Left-side NX bus connector | I/O power supply + | I/O power supply + | Right-side NX bus connector
I/O power supply − | I/O power supply −

Sensor 1 | I0 | I1 | A+ | B+ | Encoder
IOV | IOV | A− | B−
Sensor 2 | IOG | IOG | Z+ | 5V
I2 | NC | Z− | 0V
Sensor 3 | IOV | NC | NC | NC
IOG | NC | NC | NC

**External Inputs (NX-EC0132)**

Terminal block | IOV | Power supply | Internal circuits
A, B, Z I0 to I2 | Current limiter | Isolation circuit
IOG

Left-side NX bus connector | I/O power supply + | I/O power supply + | Right-side NX bus connector
I/O power supply − | I/O power supply −

**External Inputs (NX-EC0142)**

Terminal block | IOV | Power supply | Internal circuits
A, B, Z I0 to I2 | Current limiter | Isolation circuit
IOG

Left-side NX bus connector | I/O power supply + | I/O power supply + | Right-side NX bus connector
I/O power supply − | I/O power supply −

## SSI input unit

| Item | Specifications | |
|---|---|---|
| **Model** | NX-ECS112 | NX-ECS212 |
| **Name** | SSI input unit | |
| **Number of channels** | 1 channel | 2 channels |
| **Input signals** | External inputs: 2 data input (D+, D–) External outputs: 2 clock output (C+, C–) | |
| **I/O interface** | Synchronous serial interface (SSI), 2 MHz | |
| **Clock output** | EIA standard RS-422-A line driver levels | |
| **Data input** | EIA standard RS-422-A line receiver levels | |
| **Maximum data length** | 32 bits (the single-turn, multi-turn and status data length can be set) | |
| **Coding method** | No conversion, binary code or gray code | |
| **Baud rate** | 100 kHz, 200 kHz, 300 kHz, 400 kHz, 500 kHz, 1.0 MHz, 1.5 MHz or 2.0 MHz | |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| **Isolation method** | Digital isolator | |
| **Unit power consumption** | 0.85 W max. | 0.90 W max. |
| **I/O power supply source** | Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%) | |
| **Current consumption from I/O power supply** | 20 mA | 30 mA |
| **Current capacity of I/O power supply terminal** | 0.3 A max. per terminal | |
| **I/O refreshing method** | Free-run refreshing or synchronous I/O refreshing[1] | |
| **Terminal block type** | Screwless push-in terminal 12 terminals (C + D) | Screwless push-in terminal 12 terminals (C + D) |
| **Dimensions (W x H x D)** | 12 x 100 x 71 | |
| **Weight** | 65 g | |
| **Maximum transmission distance[2]** | 100 kHz (400 m), 200 kHz (190 m), 300 kHz (120 m), 400 kHz (80 m), 500 kHz (60 m), 1.0 MHz (25 m), 1.5 MHz (10 m) or 2.0 MHz (5 m) | |
| **Failure detection** | None | |
| **Protection** | None | |

*1. The I/O refreshing method is automatically set according to the connected communication unit and CPU unit.
*2. The maximum transmission distance for an SSI input unit depends on the baud rate due to the delay that can result from the responsiveness of the connected encoder and cable impedance. The maximum transmission distance is only a guideline. Review the specifications for the cables and encoders in the system and evaluate the operation of the equipment before use.

**Circuit layout**

**NX-ECS112**



**NX-ECS212**



**Terminal wiring**

**NX-ECS112**



**NX-ECS212**

# OMRON
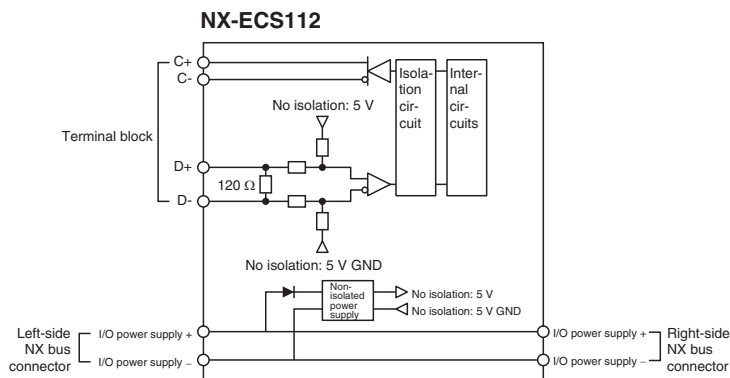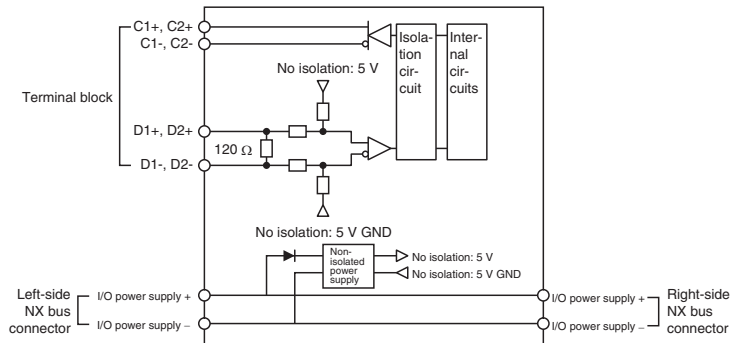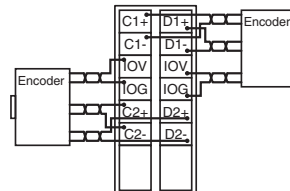
## Pulse output unit

| Item | | Specifications | |
|---|---|---|---|
| Model | | NX-PG0112 | NX-PG0122 |
| Name | | Pulse output unit | |
| Number of axes | | 1 axis | |
| I/O signals | | External inputs: 2 general-purpose inputs<br>External outputs: 3 (forward direction pulse, reverse direction pulse and a general-purpose outputs) | |
| Control method | | Open-loop control through pulse train output | |
| Controlled drive | | Servo drive with a pulse train input or a stepper motor drive | |
| Pulse output form | | Open collector output | |
| Control unit | | Pulses | |
| Maximum pulse output speed | | 500 kpps | |
| Pulse output method | | Forward/reverse direction pulse outputs or pulse + direction outputs | |
| Position control range | | –2,147,483,648 to 2,147,483,647 pulses | |
| Velocity control range | | 1 to 500,000 pps | |
| Positioning[*1] | Single-axis position control | Absolute positioning, relative positioning and interrupt feeding | |
| | Single-axis velocity control | Velocity control (velocity feeding in position control mode) | |
| | Single-axis synchronized control | Cam operation and gear operation | |
| | Single-axis manual operation | Jogging | |
| | Auxiliary function for single-axis control | Homing, stopping and override changes | |
| External input specifications | Input voltage | 20.4 to 28.8 VDC (24 VDC +20%/–15%) | |
| | Input current | 4.6 mA (24 VDC) | |
| | ON voltage/ON current | 15 VDC min./3 mA min. | |
| | OFF voltage/OFF current | 4.0 VDC max./1 mA max. | |
| | ON/OFF response time | 1 $\mu$s max./2 $\mu$s max. | |
| | Internal I/O common processing | NPN | PNP |
| External output specifications | Rated voltage | 24 VDC (15 to 28.8 VDC) | |
| | Maximum load current | 30 mA | |
| | ON/OFF response time | 5 $\mu$s max./5 $\mu$s max. | |
| | Internal I/O common processing | NPN | PNP |
| | Residual voltage | 1.0 V max. | |
| | Leakage current | 0.1 mA | |
| Dielectric strength | | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| Insulation resistance | | 20 M$\Omega$ min. between isolated circuits (at 100 VDC) | |
| Isolation method | | External inputs: Photocoupler isolation<br>External outputs: Digital isolator | |
| Unit power consumption | | 0.8 W max. | 0.9 W max. |
| I/O power supply source | | Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%) | |
| Current consumption from I/O power supply | | 20 mA | |
| Current capacity of I/O power supply terminal | | 0.1 A max. per terminal | |
| Cable length | | 3 m max. | |
| I/O refreshing method | | Synchronous I/O refreshing[*2] | |
| Terminal block type | | Screwless push-in terminal<br>16 terminals (A + B) | |
| Dimensions (W x H x D) | | 12 × 100 × 71 | |
| Weight | | 70 g | |
| Failure detection | | None | |
| Protection | | None | |

*1. These functions are supported when you also use the MC function module in the NJ-series CPU unit. Refer to the NJ-series CPU unit motion control user's manual (Cat.No. W507) for details. A pulse output unit only outputs pulses during the control period based on commands received at a fixed period. Target position calculations (distribution calculations) for acceleration/deceleration control or for each control period must be performed on the controller that is connected as the host.
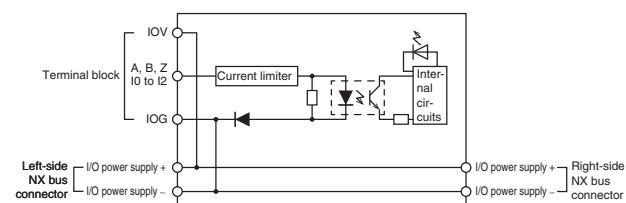*2. The I/O refreshing method is automatically set according to the connected communication unit and CPU unit.

## Circuit layout

### NX-PG0112

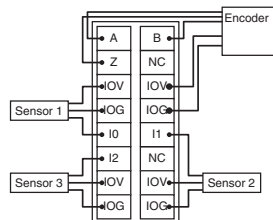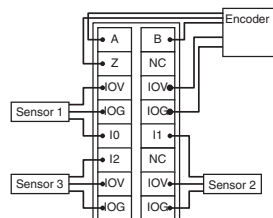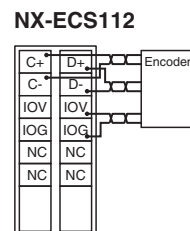**Pulse Output and External Output**



**External Inputs**



### NX-PG0122

**Pulse Output and External Output**
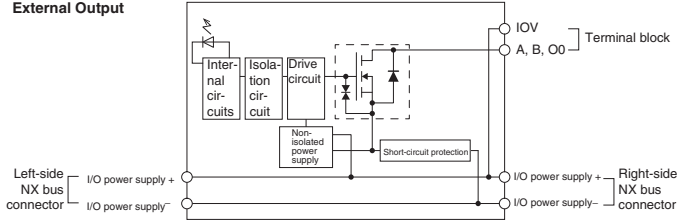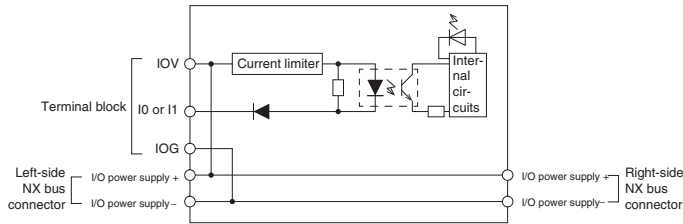


**External Inputs**



## Terminal wiring

### NX-PG0112



### NX-PG0122

# OMRON
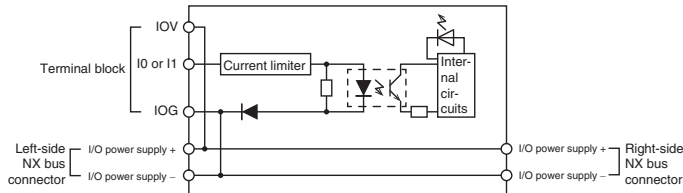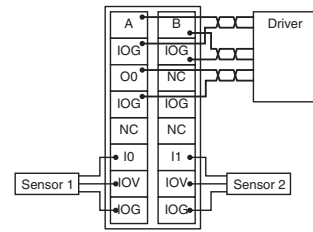
## Power unit

### NX bus power supply unit

| Item | Specifications |
|---|---|
| **Model** | **NX-PD1000** |
| **Name** | NX bus power supply unit |
| **Power supply voltage** | 24 VDC (20.4 to 28.8 VDC) |
| **NX unit power supply capacity** | 10 W max. (refer to installation orientation and restrictions for details) |
| **NX unit power supply efficiency** | 70% |
| **Unwired terminal current capacity** | 4 A max. (including the current of through wiring) |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) |
| **Isolation method** | No-isolation |
| **Unit power consumption** | 0.45 W max. |
| **I/O current consumption** | No consumption |
| **Terminal block type** | Screwless push-in terminal<br>8 terminals (A + B with FG) |
| **Dimensions (W x H x D)** | 12 × 100 × 71 |
| **Weight** | 65 g max. |

Circuit layout

**NX-PD1000**

Terminal wiring

**NX-PD1000**



### I/O power feed unit

| Item | Specifications | |
|---|---|---|
| **Model** | **NX-PF0630** | **NX-PF0730** |
| **Name** | Additional I/O power supply unit | |
| **Power supply voltage** | 5 to 24 VDC (4.5 to 28.8 VDC)[*1] | |
| **I/O power supply maximum current** | 4 A | 10 A |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| **Isolation method** | No-isolation | |
| **Unit power consumption** | 0.45 W max. | |
| **I/O current consumption** | 10 mA max. | |
| **Current capacity of I/O power supply terminal** | 4 A max. | 10 A max. |
| **Terminal block type** | Screwless push-in terminal<br>8 terminals (A + B) | |
| **Dimensions (W x H x D)** | 12 × 100 × 71 | |
| **Weight** | 65 g max. | |

*1. Use an output voltage that is appropriate for the I/O circuits of the NX units and the connected external devices.

Circuit layout

**NX-PF0630/PF0730**

Terminal wiring

**NX-PF0630/PF0730**
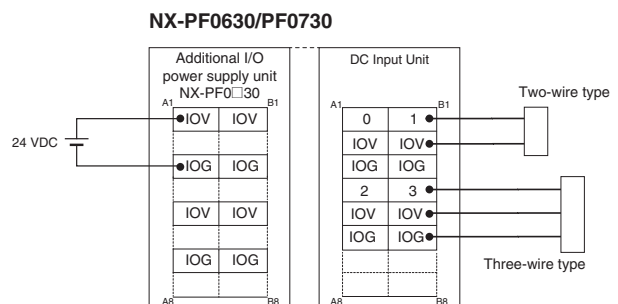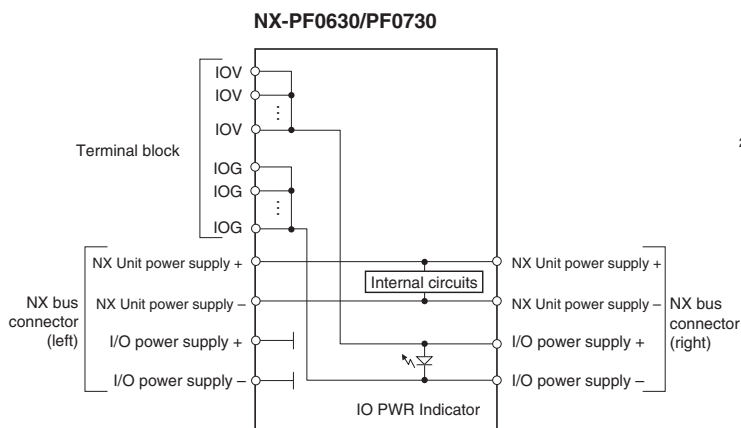
## I/O power supply connection unit

| Item | Specifications | | |
|---|---|---|---|
| **Model** | **NX-PC0010** | **NX-PC0020** | **NX-PC0030** |
| **Name** | I/O power supply connection unit | | |
| **Dielectric strength** | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. | | |
| **Insulation resistance** | 20 MΩ min. between isolated circuits (at 100 VDC) | | |
| **Isolation method** | No-isolation | | |
| **Unit power consumption** | 0.45 W max. | | |
| **I/O current consumption** | No consumption | | |
| **Current capacity of I/O power supply terminal** | 4 A/terminal max. | | |
| **Terminal block type** | Screwless push-in terminal 16 terminals (A + B) | | |
| **Number of I/O power supply terminals** | IOG: 16 terminals | IOV: 16 terminals | IOG: 8 terminals IOV: 8 terminals |
| **Dimensions (W x H x D)** | 12 × 100 × 71 | | |
| **Weight** | 65 g max. | | |

**Circuit layout**

**NX-PC0010**
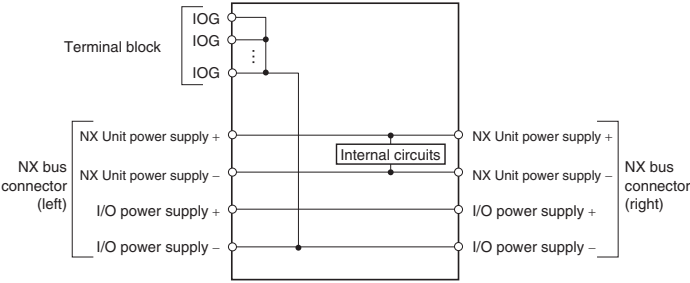


**NX-PC0020**



**NX-PC0030**



**Terminal wiring**

**NX-PC0010**



**NX-PC0020**



**NX-PC0030**

# OMRON
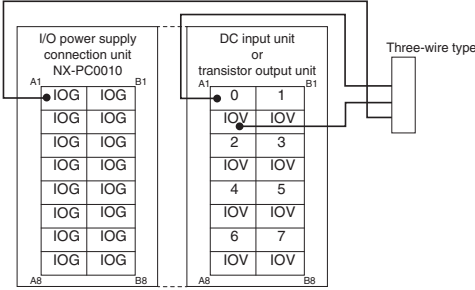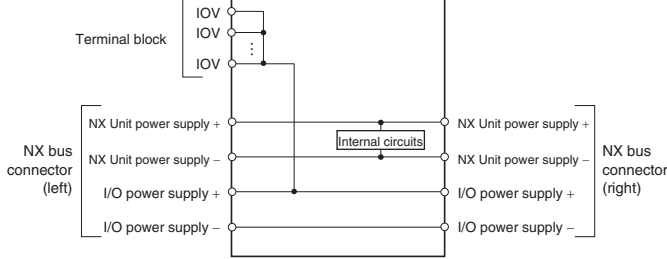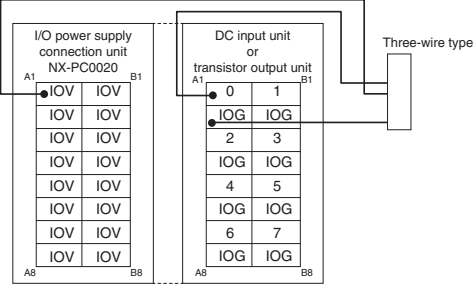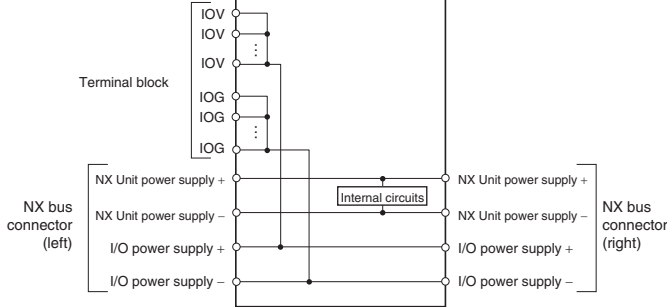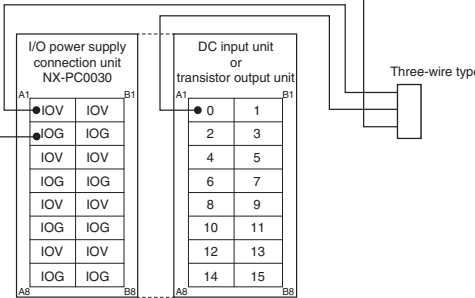
## System unit

### Shield connection unit (grounding terminal)

| Item | Specifications |
|---|---|
| Model | NX-TBX01 |
| Name | Shield connection unit |
| Dielectric strength | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max. |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) |
| Isolation method | Isolation between the SHLD functional ground terminal and internal circuit: no-isolation |
| Unit power consumption | 0.45 W max. |
| I/O current consumption | No consumption |
| Terminal block type | Screwless push-in terminal<br>16 terminals (A + B with FG) |
| Number of shield terminals | 14 terminals (the following two terminals are Functional Ground terminals) |
| Dimensions (W x H x D) | 12 × 100 × 71 |
| Weight | 65 g max. |

**Circuit layout**

**NX-TBX01**



**Terminal wiring**

**NX-TBX01**

## Dimensions

### EtherCAT coupler unit
### NX-ECC202



### I/O unit with screwless push-in terminal
#### 12 mm width



#### 24 mm width



### I/O unit with MIL connector
#### 1 connector with 20 terminals



#### 1 connector with 40 terminals

# OMRON

## 2 connectors with 20 terminals

16.1

1.5

100

58.3

1.5

104.5

27.85

8.9

19.1

30

32.1

65.2

71

89.52

## End cover unit
### NX-END01

12

1.5

100

1.5

71

## Ordering information

### EtherCAT coupler unit

| Type | Signal type | Specifications | Channels | Max. I/O power supply | Width | Model |
|------|-------------|----------------|----------|----------------------|-------|-------|
| EtherCAT communication coupler (firmware version 1.1 or higher) | EtherCAT slave | Up to 63 I/O units<br>Max. 1024 bytes in + 1024 bytes out<br>Supports distributed clock | 2 | 10.0 A | 46 mm | NX-ECC202 |

### I/O unit

#### Digital I/O

| Type | Channels, signal type | Performance[*1], I/O refresh method | Connection type[*2] | Width | Model | NPN type[*3] |
|------|----------------------|-----------------------------------|--------------------|-------|-------|-------------|
| DC digital input | 4 inputs, 3-wire connection | High-speed synchronous time stamp | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3444 | NX-ID3344 |
| | | High-speed synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3443 | NX-ID3343 |
| | | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3417 | NX-ID3317 |
| | 8 inputs, 2-wire connection | Synchronous/free run | Screwless push-in (NX-TBA162) | 12 mm | NX-ID4442 | NX-ID4342 |
| | 16 inputs, 1-wire connection | Synchronous/free run | Screwless push-in (NX-TBA162) | 12 mm | NX-ID5442 | NX-ID5342 |
| | | Synchronous/free run | 1 x 20-pin MIL connector | 30 mm | NX-ID5142-5 | NX-ID5142-5 |
| | 32 inputs, 1-wire connection | Synchronous/free run | 1 x 40-pin MIL connector | 30 mm | NX-ID6142-5 | NX-ID6142-5 |
| AC digital input | 4 inputs, 200-240 VAC, 50/60 Hz | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-IA3117 | - |
| DC digital output | 2 outputs 0.5 A, 3-wire connection | High-speed synchronous time stamp | Screwless push-in (NX-TBA082) | 12 mm | NX-OD2258 | NX-OD2154 |
| | 4 outputs 0.5 A, 3-wire connection | High-speed synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-OD3257 | NX-OD3153 |
| | | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-OD3256 | NX-OD3121 |
| | 8 outputs 0.5 A, 2-wire connection | Synchronous/free run | Screwless push-in (NX-TBA162) | 12 mm | NX-OD4256 | NX-OD4121 |
| | 16 outputs 0.5 A, 1-wire connection | Synchronous/free run | Screwless push-in (NX-TBA162) | 12 mm | NX-OD5256 | NX-OD5121 |
| | | Synchronous/free run | 1 x 20-pin MIL connector | 30 mm | NX-OD5256-5 | NX-OD5121-5 |
| | 32 outputs 0.5 A, 1-wire connection | Synchronous/free run | 1 x 40-pin MIL connector | 30 mm | NX-OD6256-5 | NX-OD6121-5 |
| Relay digital output | 2 outputs, N.O., 2.0 A | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-OC2633 | - |
| | 2 outputs, N.O. + N.C., 2.0 A | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-OC2733 | - |
| DC Digital I/O | 16 inputs + 16 outputs, 1-wire connection + common | Synchronous/free run | 2 x 20-pin MIL connector | 30 mm | NX-MD6256-5 | NX-MD6121-5 |

*1. Digital I/O performance, ON/OFF delay:
   **High speed PNP/NPN input:** 100 ns/100 ns
   **Standard PNP/NPN input:** 0.02 ms/0.4 ms
   **AC input:** 10 ms/40 ms
   **High speed PNP/NPN output:** 300 ns/300 ns
   **Standard PNP output:** 0.5 ms/1.0 ms
   **Standard NPN output:** 0.1 ms/0.8 ms
   **Relay output:** 15 ms/15 ms
*2. Units with Screwless push-in connections are supplied with the appropriate terminal connector. Units with MIL connectors are supplied without matching plugs.
*3. Model codes are for PNP type signals (positive switching, 0V common). Most models are also available as NPN type (negative switching, 24V common). Inputs of MIL connector versions can be used as NPN or PNP.

#### Analog I/O

| Type | Signal type | Performance, I/O refresh method | Channels | Connection type[*1] | Width | Model |
|------|-------------|--------------------------------|----------|--------------------|-------|-------|
| Analog input | 4 to 20 mA single ended | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2203 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3203 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4203 |
| | 4 to 20 mA differential | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2204 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3204 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4204 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2208 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3208 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4208 |
| | ±10 V single ended | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2603 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3603 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4603 |
| | ±10 V differential | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2604 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3604 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4604 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2608 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3608 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4608 |
| Analog output | 4 to 20 mA | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2203 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3203 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2205 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3205 |
| | ±10 V | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2603 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3603 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2605 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3605 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

# OMRON

## Temperature input

| Type | Signal type | Performance, I/O refresh method | Channels | Connection type[1] | Width | Model |
|---|---|---|---|---|---|---|
| Temperature sensor input | Thermocouple type B/E/J/K/L/N/R/S/T/U/WRe5-26/PLII | 0.1°C resolution, 200 ms/unit Free run | 2 | Screwless push-in terminal block(s), with cold junction sensor, calibrated individually at the factory | 12 mm | NX-TS2101 |
| | | | 4 | | 24 mm | NX-TS3101 |
| | | 0.01°C resolution, 10 ms/unit Free run | 2 | | 12 mm | NX-TS2102 |
| | | | 4 | | 24 mm | NX-TS3102 |
| | | 0.001°C resolution, 60 ms/unit Free run | 2 | | 12 mm | NX-TS2104 |
| | | | 4 | | 24 mm | NX-TS3104 |
| | RTD type Pt100 (3wire)/Pt1000/Ni508.4 | 0.1°C resolution, 200 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2201 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3201 |
| | | 0.01°C resolution, 10 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2202 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3202 |
| | | 0.001°C resolution, 60 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2204 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3204 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector. Units with MIL connectors are supplied without matching plugs.

## Position interface

| Type | Channels, signal type | Performance, I/O refresh method | Connection type[1] | Width | Model | NPN type[2] |
|---|---|---|---|---|---|---|
| Encoder input | 1 SSI encoder, 2 MHz | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ECS112 | - |
| | 2 SSI encoders, 2 MHz | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ECS212 | - |
| | 1 incremental encoder line driver 4 MHz + 3 digital inputs (1 μs) | Synchronous/free run | Screwless push-in (NX-TBA122 + NX-TBB122) | 24 mm | NX-EC0142 | NX-EC0132 |
| | 1 incremental encoder open collector 500 kHz + 3 digital inputs (1 μs) | Synchronous/free run | Screwless push-in (NX-TBA162) | 12 mm | NX-EC0122 | NX-EC0112 |
| | 2 incremental encoders open collector 500 kHz | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-EC0222 | NX-EC0212 |
| Pulse output | 1 Pulse up/down or pulse/direction open collector 500 kHz + 2 digital inputs + 1 digital output (1 μs) | Synchronous | Screwless push-in (NX-TBA162) | 12 mm | NX-PG0122 | NX-PG0112 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector. Units with MIL connectors are supplied without matching plugs.
*2. Model codes are for PNP type signals (positive switching, 0V common). Most models are also available as NPN type (negative switching, 24V common). Inputs of MIL connector versions can be used as NPN or PNP.

## Power/System unit

| Type | Description | Connection type[1] | Width | Model |
|---|---|---|---|---|
| NX bus power supply unit | 24 VDC input, non-isolated | Screwless push-in (NX-TBC082) | 12 mm | NX-PD1000 |
| I/O power feed unit | For separation of groups, up to 4 A | Screwless push-in (NX-TBA082) | 12 mm | NX-PF0630 |
| | For separation of groups, up to 10 A | Screwless push-in (NX-TBA082) | 12 mm | NX-PF0730 |
| I/O power supply connection unit | 16 × IOV | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0020 |
| | 16 × IOG | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0010 |
| | 8 × IOV + 8 × IOG | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0030 |
| Shield connection unit | Grounding terminal, 16 points | Screwless push-in (NX-TBC162) | 12 mm | NX-TBX01 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Accessories

| Type | Description | Connection type | Width | Model |
|---|---|---|---|---|
| End cover | Included with communication coupler | - | 12 mm | NX-END01 |
| Terminal block (replacement front connector) | With 8 wiring terminals (A + B) | Screwless push-in | 12 mm | NX-TBA082 |
| | With 8 wiring terminals (A + B with FG) | Screwless push-in | 12 mm | NX-TBC082 |
| | With 12 wiring terminals (A + B) | Screwless push-in | 12 mm | NX-TBA122 |
| | With 12 wiring terminals (C + D) | Screwless push-in | 12 mm | NX-TBB122 |
| | With 16 wiring terminals (A + B) | Screwless push-in | 12 mm | NX-TBA162 |
| | With 16 wiring terminals (C + D) | Screwless push-in | 12 mm | NX-TBB162 |
| | With 16 wiring terminals (A + B with FG) | Screwless push-in | 12 mm | NX-TBC162 |
| DIN rail insulation spacers | Set of 3 pcs | - | - | NX-AUX01 |
| Terminal block coding pins | For 10 units (Terminal block: 30 pins, unit: 30 pins) | - | - | NX-AUX02 |
| End plate | To secure the units on the DIN track | - | - | PFP-M |

## Machine controller

| Name | | Model |
|---|---|---|
| NJ-series (firmware version 1.09 or higher[1]) | CPU unit | NJ501-□ |
| | | NJ301-□ |
| | Power supply unit | NJ-PA3001 (220 VDC) |
| | | NJ-PD3001 (24 VDC) |

*1. Please contact your OMRON representative for compatibility between the NJ-series firmware version 1.08 or lower and NX I/O units.

## Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.10 or higher[1] | SYSMAC-SE2□□□ |

*1. Please contact your OMRON representative for compatibility between the Sysmac Studio version 1.09 or lower and NX I/O units.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat.No.SysCat_I182E-EN-03　　In the interest of product improvement, specifications are subject to change without notice.

**GX-□**

# GX series I/O

### High-speed remote I/O terminals

The GX-Series I/O units provide an extensive line-up of digital I/O terminals, analogue I/O terminals and encoder input terminals.

* Easy set-up: automatic and manual address setting
* Digital I/O terminals with high-speed input functionality, ON/OFF delay of 200 μs max.
* Digital input filters prevent malfunction when status is unstable due to chattering or noise
* Removable I/O terminal for easy maintenance
* Expandable digital I/Os

## System configuration



SYSMAC
always in control

EtherNet/IP™

Sysmac Studio

**NJ series**
Machine automation controller

EtherCAT.

**GX series**

Digital I/O terminals    Expansion units

Analog I/O terminals

Encoder input terminal

# OMRON
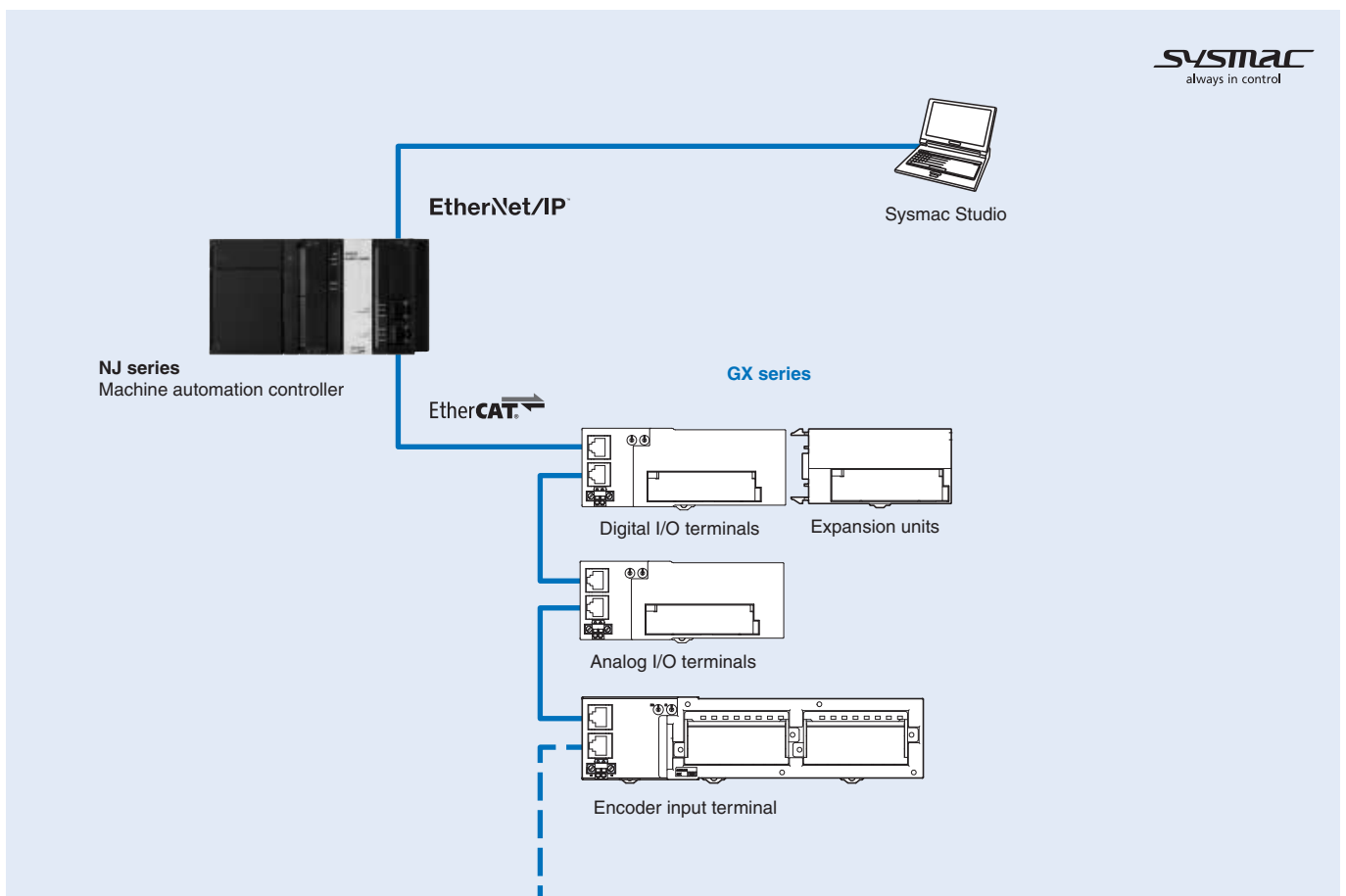
## Type designation

# GX-ID1612

EtherCAT remote I/O terminal GX-Series

**Type**
- ID: DC input
- OD: DC output
- MD: DC input/output
- OC: Relay output
- AD: Analog input
- DA: Analog output
- EC: Encoder input

**Number of I/O**
- 02: 2 points (2CH)
- 04: 4 points (4CH)
- 16: 16 points
- 32: 32 points

**Connecting**
- 1: Screw (Common) (2-tier terminal block)
- 2: Screw (Divided common) (3-tier terminal block)

**Input/Output Type**

| Code | Digital I/O type | Analog I/O type | Encoder input type |
|---|---|---|---|
| 1 | NPN | – | Open collector |
| 2 | PNP | – | – |
| 4 | – | – | Line driver |
| 7 | – | Current/voltage | – |

## Specifications

### General specifications

| GX-Series | Specification |
|---|---|
| Unit power supply voltage | 24 VDC –15% to +10% (20.4 to 26.4 VDC) |
| I/O power supply voltage | 24 VDC –15% to +10% (20.4 to 26.4 VDC) |
| Noise resistance | Conforms to IEC 61000-4-4, 2 kV (power line) |
| Vibration resistance | Malfunction 10 to 60 Hz with amplitude of 0.7 mm, 60 to 150 Hz and 50 m/s$^2$ in X, Y and Z directions for 80 minutes <Relay Output Unit GX-OC1601 only> 10 to 55 Hz with double-amplitude of 0.7 mm |
| Impact resistance | 150 m/s$^2$ with amplitude of 0.7 mm <Relay Output Unit GX-OC1601 only> 100 m/s$^2$ (3 times each in 6 directions on 3 axes) |
| Dielectric strength | 600 VAC (between isolated circuits) |
| Isolation resistance | 20 MΩ or more (between isolated circuits) |
| Ambient operating temperature | –10 to 55ºC |
| Operating humidity | 25% to 85% (with no condensation) |
| Operating atmosphere | No corrosive gases |
| Storage temperature | –25 to 65ºC |
| Storage humidity | 25% to 85% (with no condensation) |
| Terminal block screws tightening torque[1] | M3 wiring screws: 0.5 Nm M3 terminal block mounting screws: 0.5 Nm |
| Mounting method | 35-mm DIN track mounting |

[1] Applicable only to 2-tier terminal block and 3-tier terminal block type slaves.

### EtherCAT communications specifications

| Item | Specification |
|---|---|
| Communication protocol | Dedicated protocol for EtherCAT |
| Modulation | Base band |
| Baud rate | 100 Mbps |
| Physical layer | 100BASE-TX (IEEE802.3) |
| Connectors | RJ45 shielded connector × 2 CN IN: EtherCAT input CN OUT: EtherCAT output |
| Communications media | Category 5 or higher (cable with double, aluminum tape and braided shielding is recommended.) |
| Communications distance | Distance between nodes (slaves): 100 m max. |
| Noise resistance | Conforms to IEC 61000-4-4, 1 kV or higher |
| Node address setting method | Set with decimal rotary switch or Sysmac Studio |
| Node address range | 1 to 99: Set with rotary switch 1 to 65535: Set with Sysmac Studio |
| LED display | PWR × 1 L/A IN (Link/Activity IN) × 1 L/A OUT (Link/Activity OUT) × 1 RUN × 1 ERR × 1 |
| Process data | Fixed PDO mapping |
| PDO size/mode | 2 bits to 256 bytes |
| Mailbox | Emergency messages, SDO requests, SDO responses and SDO information |
| SYNCHRONIZATION mode | Digital I/O slave unit and analog I/O slave unit: Free Run mode (asynchronous) Encoder input slave unit: DC mode 1 |

**Digital I/O**

## 16-point input (1-wire connection)

| Item | Specification | |
|------|---------------|---|
| | **GX-ID1611** | **GX-ID1621** |
| **Input capacity** | 16 points | |
| **Internal I/O common** | NPN | PNP |
| **ON voltage** | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| **OFF voltage** | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| **OFF current** | 1.0 mA max. | |
| **Input current** | 6.0 mA max./input (at 24 VDC) 3.0 mA max./input (at 17 VDC) | |
| **ON delay** | 0.1 ms max. | |
| **OFF delay** | 0.2 ms max. | |
| **Input filter value** | Without filter, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms (Default setting: 1 ms) | |
| **Number of circuits per common** | 16 points/common | |
| **Input indicators** | LED display (yellow) | |
| **Isolation method** | Photocoupler isolation | |
| **I/O power supply method** | Supply by I/O power supply | |
| **Unit power supply current consumption** | 90 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **I/O power supply current consumption** | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **Weight** | 180 g max. | |
| **Expansion functions** | Enabled | |
| **Short-circuit protection function** | No | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488)..

## 16-point output (1-wire connection)

| Item | Specification | |
|------|---------------|---|
| | **GX-OD1611** | **GX-OD1621** |
| **Output capacity** | 16 points | |
| **Rated current (ON current)** | 0.5 A/output, 4.0 A/common | |
| **Internal I/O common** | NPN | PNP |
| **Residual voltage** | 1.2 V max. (0.5 VDC, between each output terminal and the G terminal) | 1.2 V max. (0.5 VDC, between each output terminal and the V terminal) |
| **Leakage current** | 0.1 mA max. | |
| **ON delay** | 0.5 ms max. | |
| **OFF delay** | 1.5 ms max. | |
| **Number of circuits per common** | 16 points/common | |
| **Output indicators** | LED display (yellow) | |
| **Isolation method** | Photocoupler isolation | |
| **I/O power supply method** | Supply by I/O power supply | |
| **Unit power supply current consumption** | 90 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **I/O power supply current consumption** | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **Weight** | 180 g max. | |
| **Expansion functions** | Enabled | |
| **Output handling for communications errors** | Select either hold or clear | |
| **Short-circuit protection function** | No | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488).

## 16 relay outputs

| Item | Specification |
|------|---------------|
| | **GX-OC1601** |
| **Output capacity** | 16 points |
| **Mounted relays** | NY-5W-K-IE (Fujitsu Component) (See Note) |
| **Rated load** | Resistance load 250 VAC, 2 A/output, common 8 A 30 VDC, 2 A/output, common 8 A |
| **Rated ON current** | 3 A/output |
| **Maximum contact voltage** | 250 VAC, 125 VDC |
| **Maximum contact current** | 3 A/output |
| **Maximum switching capacity** | 750 VAAC, 90 WDC |
| **Minimum applicable load (reference value)** | 5 VDC, 1 mA |
| **Mechanical service life** | 20,000,000 operations min. |
| **Electrical service life** | 100,000 operations min. |
| **Number of circuits per common** | 16 points/common |
| **Output indicators** | LED display (yellow) |
| **Isolation method** | Relay isolation |
| **I/O power supply method** | The relay drive power is supplied from the unit power supply. |
| **Unit power supply current consumption** | 210 mA max. (for 20.4 to 26.4 VDC power supply voltage) |
| **Weight** | 290 g max. |
| **Expansion functions** | Enabled |

| Item | Specification |
|---|---|
| | GX-OC1601 |
| Output handling for communications errors | Select either hold or clear |
| Short-circuit protection function | No |

**Note:** For the specification of individual relay, refer to the datasheet of published by manufacturers.

## 8-point input and 8-point output (1-wire connection)

| Item | Specification | |
|---|---|---|
| | GX-MD1611 | GX-MD1621 |
| **General Specifications** | | |
| Internal I/O common | NPN | PNP |
| I/O indicators | LED display (yellow) | |
| Unit power supply current consumption | 80 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | 190 g max. | |
| Expansion functions | No | |
| Short-circuit protective function | No | |
| **Input Section** | | |
| Input capacity | 8 points | |
| ON voltage | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| OFF voltage | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| OFF current | 1.0 mA max. | |
| Input current | 6.0 mA max./input (at 24 VDC) 3.0 mA max./input (at 17 VDC) | |
| ON delay | 0.1 ms max. | |
| OFF delay | 0.2 ms max. | |
| Input filter value | Without filter, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms (Default setting: 1 ms) | |
| Number of circuits per common | 8 points/common | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| I/O power supply current consumption | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **Output Section** | | |
| Output capacity | 8 points | |
| Rated output current | 0.5 A/output, 2.0 A/common | |
| Residual voltage | 1.2 V max. (0.5 VDC, between each output terminal and the G terminal) | 1.2 V max. (0.5 VDC, between each output terminal and the V terminal) |
| Leakage current | 0.1 mA max. | |
| ON delay | 0.5 ms max. | |
| OFF delay | 1.5 ms max. | |
| Number of circuits per common | 8 points/common | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| I/O power supply current consumption | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Output handling for communications errors | Select either hold or clear | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488).

## 16-point input (3-wire connection)

| Item | Specification | |
|---|---|---|
| | GX-ID1612 | GX-ID1622 |
| Input capacity | 16 points | |
| Internal I/O common | NPN | PNP |
| ON voltage | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| OFF voltage | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| OFF current | 1.0 mA max. | |
| Input current | 6.0 mA max./input (at 24 VDC) 3.0 mA max./input (at 17 VDC) | |
| ON delay | 0.1 ms max. | |
| OFF delay | 0.2 ms max. | |
| Input filter value | Without filter, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms (Default setting: 1 ms) | |
| Number of circuits per common | 8 points/common | |
| Input indicators | LED display (yellow) | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| Input device supply current | 100 mA/point | |
| Unit power supply current consumption | 90 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| I/O power supply current consumption | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | 370 g max. | |
| Expansion functions | No | |
| Short-circuit protection function | No | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488).

OMRON

## 16-point output (3-wire connection)

| Item | Specification | |
|---|---|---|
| | GX-OD1612 | GX-OD1622 |
| Output capacity | 16 points | |
| Rated current (ON current) | 0.5 A/output, 4.0 A/common | |
| Internal I/O common | NPN | PNP |
| Residual voltage | 1.2 V max.<br>(0.5 VDC, between each output terminal and the G terminal) | 1.2 V max.<br>(0.5 VDC, between each output terminal and the V terminal) |
| Leakage current | 0.1 mA max. | |
| ON delay | 0.5 ms max. | |
| OFF delay | 1.5 ms max. | |
| Number of circuits per common | 8 points/common | |
| Output indicators | LED display (yellow) | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| Output device supply current | 100 mA/point | |
| Unit power supply current consumption | 90 mA max.<br>(for 20.4 to 26.4 VDC power supply voltage) | |
| I/O power supply current consumption | 5 mA max.<br>(for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | 370 g max. | |
| Expansion functions | No | |
| Output handling for communications errors | Select either hold or clear | |
| Short-circuit protection function | No | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488).

## 8-point input and 8-point output (3-wire connection)

| Item | Specification | |
|---|---|---|
| | GX-MD1612 | GX-MD1622 |
| **General Specifications** | | |
| Internal I/O common | NPN | PNP |
| I/O indicators | LED display (yellow) | |
| Unit power supply current consumption | 90 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | 370 g max. | |
| Expansion functions | No | |
| Short-circuit protective function | No | |
| **Input Section** | | |
| Input capacity | 8 points | |
| ON voltage | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| OFF voltage | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| OFF current | 1.0 mA max. | |
| Input current | 6.0 mA max./input (at 24-VDC)<br>3.0 mA max./input (at 17-VDC) | |
| ON delay | 0.1 ms max. | |
| OFF delay | 0.2 ms max. | |
| Input filter value | Without filter, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms (Default setting: 1 ms) | |
| Number of circuits per common | 8 points/common | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| Input device supply current | 100 mA/point | |
| I/O power supply current consumption | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| **Output Section** | | |
| Output capacity | 8 points | |
| Rated output current | 0.5 A/output, 2.0 A/common | |
| Residual voltage | 1.2 V max.<br>(0.5 VDC, between each output terminal and the G terminal) | 1.2 V max.<br>(0.5 VDC, between each output terminal and the V terminal) |
| Leakage current | 0.1 mA max. | |
| ON delay | 0.5 ms max. | |
| OFF delay | 1.5 ms max. | |
| Number of circuits per common | 8 points/common | |
| Isolation method | Photocoupler isolation | |
| I/O power supply method | Supply by I/O power supply | |
| Output device supply current | 100 mA/point | |
| I/O power supply current consumption | 5 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Output handling for communications errors | Select either hold or clear | |

**Note:** For the I/O power supply current value to V and G terminals, refer to GX Series Operation Manual (Cat. No. W488).

GX series I/O                                                                                                                109

# OMRON

## Analog I/O

### Analogue input

| Item | | Specification | |
|---|---|---|---|
| | | GX-AD0471 | |
| | | Voltage input | Current input |
| Input capacity | | 4 points (possible to set number of enabled channels) | |
| Input range | | 0 to 5 V<br>1 to 5 V<br>0 to 10 V<br>−10 to +10 V | 4 to 20 mA |
| Input range setting method | | Input range switch: Common to input CH1/CH2, common to input CH3/CH4<br>SDO communication: Possible to set input CH1 to CH4 individually | |
| Maximum signal input | | ±15 V | ±30 mA |
| Input Impedance | | 1 MΩ min. | Approx. 250 Ω |
| Resolution | | 1/8000 (full scale) | |
| Overall accuracy | 25°C | ±0.3% FS | ±0.4% FS |
| | −10 to 55°C | ±0.6% FS | ±0.8% FS |
| Analog conversion cycle | | 500 μs/input when 4 points are used: 2 ms max. | |
| A/D converted data | | Other than ±10 V: 0000 to 1F40 Hex full scale (0 to 8000)<br>±10 V: F060 to 0FA0 Hex full scale (−4000 to +4000)<br>A/D conversion range: ±5% FS of the above data ranges. | |
| Isolation method | | Photocoupler isolation (between input and communications lines)<br>No isolation between input signals | |
| Unit power supply current consumption | | 120 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | | 180 g max. | |
| Accessories | | Four short-circuit metal fixtures (for current input)[1] | |

[1] Short-circuit metal fixtures are used for current input only, but store in a safe place when using for voltage inputs as well.

### Analogue output

| Item | | Specification | |
|---|---|---|---|
| | | GX-DA0271 | |
| | | Voltage output | Current output |
| Output capacity | | 2 points (possible to set number of enabled channels) | |
| Output range | | 0 to 5 V<br>1 to 5 V<br>0 to 10 V<br>−10 to +10 V | 4 to 20 mA |
| Output range setting method | | Output range switch, SDO communication: Possible to set outputs CH1 and CH2 separately | |
| External output allowable load resistance | | 5 KΩ min. | 600 Ω max. |
| Resolution | | 1/8000 (full scale) | |
| Overall accuracy | 25°C | ±0.4% FS | |
| | −10 to 55°C | ±0.8% FS | |
| Analog conversion cycle | | 500 μs/input when 2 points are used: 1 ms max. | |
| D/A converted data | | Other than ±10 V: 0000 to 1F40 Hex full scale (0 to 8000)<br>±10 V: F060 to 0FA0 Hex full scale (−4000 to +4000)<br>D/A conversion range: ±5% FS of the above data ranges. | |
| Isolation method | | Photocoupler isolation (between output and communications lines)<br>No isolation between output signals | |
| Unit power supply current consumption | | 150 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | | 190 g max. | |

## Encoder input

### Open collector input

| Item | Specification | | |
|---|---|---|---|
| | GX-EC0211 | | |
| **Terminal specifications** | | | |
| Counter point | 2 points | | |
| Input signal | Counter phase A<br>Counter phase B<br>Counter phase Z<br>Latch input (A/B)<br>Counter reset input | | |
| Counter enabled status display | LED display (green) | | |
| Input indicators | LED display (yellow) | | |
| Unit power supply current consumption | 130 mA max. (for 20.4 to 26.4 VDC power supply voltage) | | |
| Weight | 390 g max. | | |
| **Pulse input specifications** | | | |
| | Counter phase A/B | | Counter phase Z | |
| Input voltage | 20.4 to 26.4 VDC<br>(24 VDC −15 to +10%) | 4.5 to 5.5 VDC<br>(5 VDC ±5%) | 20.4 to 26.4 VDC<br>(24 VDC −15 to +10%) | 4.5 to 5.5 VDC<br>(5 VDC ±5%) |
| Input current | 8.4 mA (at 24 VDC) | 8.6 mA (at 5 VDC) | 8.4 mA (at 24 VDC) | 8.6 mA (at 5 VDC) |
| ON voltage | 19.6 V min. | 4.5 V min. | 18.6 V min. | 4.5 V min. |
| OFF voltage | 4 V max. | 1.5 V max. | 4 V max. | 1.5 V max. |

| Item | Specification | | | |
|---|---|---|---|---|
| | GX-EC0211 | | | |
| Input restriction resistance | 2.7 KΩ | 430 Ω | 2.7 KΩ | 430 Ω |
| Maximum response frequency | Single phase 500 kHz (phase difference Multiplication × 4, 125 kHz) | | 125 kHz | |
| Filter switching | NA | | NA | |
| Latch/reset input specifications | | | | |
| | Latch input (A/B) | | Reset input | |
| Internal I/O common | NPN | | | |
| Input voltage | 20.4 to 26.4 VDC (24 VDC −15 to +10%) | | 20.4 to 26.4 VDC (24 VDC −15 to +10%) | |
| Input impedance | 4.0 KΩ | | 3.3 KΩ | |
| Input current | 5.5 mA (at 24 VDC) | | 7 mA (at 24 VDC) | |
| ON voltage/ON current | 17.4 VDC min./3 mA min. | | 14.4 VDC min./3 mA min. | |
| OFF voltage/OFF current | 5 VDC max./1 mA max. | | 5 VDC max./1 mA max. | |
| ON response time | 3 μs max. | | 15 μs max. | |
| OFF response time | 3 μs max. | | 90 μs max. | |

## Line driver input

| Item | Specification | |
|---|---|---|
| | GX-EC0241 | |
| Terminal specifications | | |
| Counter point | 2 points | |
| Input signal | Counter phase A Counter phase B Counter phase Z Latch input (A/B) Counter reset input | |
| Counter enabled status display | LED display (green) | |
| Input indicators | LED display (yellow) | |
| Unit power supply current consumption | 100 mA max. (for 20.4 to 26.4 VDC power supply voltage) | |
| Weight | 390 g max. | |
| Pulse input specifications | | |
| | Counter phase A/B | Counter phase Z |
| Input voltage | EIA standard RS-422-A line driver level | |
| Input impedance | 120 Ω ±5% | |
| gH level input voltage | 0.1 V | |
| gL level input voltage | −0.1 V | |
| Hysteresis voltage | 60 mV | |
| Maximum response frequency | Single phase 4 MHz (phase difference Multiplication × 4, 1 MHz) | 1 MHz |
| Filter switching | NA | |
| Latch/reset input specifications | | |
| | Latch input (A/B) | Reset input |
| Internal I/O common | PNP | |
| Input voltage | 20.4 to 26.4 VDC (24 VDC −15 to +10%) | 20.4 to 26.4 VDC (24 VDC −15 to +10%) |
| Input impedance | 4.0 KΩ | 3.3 KΩ |
| Input current | 5.5 mA (at 24 VDC) | 7 mA (at 24 VDC) |
| ON voltage/ON current | 17.4 VDC min./3 mA min. | 14.4 VDC min./3 mA min. |
| OFF voltage/OFF current | 5 VDC max./1 mA max. | 5 VDC max./1 mA max. |
| ON response time | 3 μs max. | 15 μs max. |
| OFF response time | 3 μs max. | 90 μs max. |

## Expansion units

### 8-point input

| Item | Specification | |
|---|---|---|
| | XWT-ID08 | XWT-ID08-1 |
| Internal I/O common | NPN | PNP |
| I/O capacity | 8 inputs | |
| ON voltage | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| OFF voltage | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| OFF current | 1.0 mA max. | |
| Input current | At 24 VDC: 6.0 mA max./input At 17 VDC: 3.0 mA max./input | |
| ON delay | 1.5 ms max. | |
| OFF delay | 1.5 ms max. | |
| Number of circuits per common | 8 inputs/common | |
| Communications power supply current consumption | 5 mA | |
| Weight | 80 g max. | |

# OMRON

## 16-point input

| Item | Specification | |
|---|---|---|
| | **XWT-ID16** | **XWT-ID16-1** |
| **Internal I/O common** | NPN | PNP |
| **I/O capacity** | 16 inputs | |
| **ON voltage** | 15 VDC min. (between each input terminal and the V terminal) | 15 VDC min. (between each input terminal and the G terminal) |
| **OFF voltage** | 5 VDC max. (between each input terminal and the V terminal) | 5 VDC max. (between each input terminal and the G terminal) |
| **OFF current** | 1.0 mA max. | |
| **Input current** | At 24 VDC: 6.0 mA max./input<br>At 17 VDC: 3.0 mA max./input | |
| **ON delay** | 1.5 ms max. | |
| **OFF delay** | 1.5 ms max. | |
| **Number of circuits per common** | 16 inputs/common | |
| **Communications power supply current consumption** | 10 mA | |
| **Weight** | 120 g max. | |

## 8-point output

| Item | Specification | |
|---|---|---|
| | **XWT-OD08** | **XWT-OD08-1** |
| **Internal I/O common** | NPN | PNP |
| **I/O capacity** | 8 outputs | |
| **Rated output current** | 0.5 A/output, 2.0 A/common | |
| **Residual voltage** | 1.2 V max.<br>(0.5 A DC, between each output terminal and the G terminal) | 1.2 V max.<br>(0.5 A DC, between each output terminal and the V terminal) |
| **Leakage current** | 0.1 mA max. | |
| **ON delay** | 0.5 ms max. | |
| **OFF delay** | 1.5 ms max. | |
| **Number of circuits per common** | 8 outputs/common | |
| **Communications power supply current consumption** | 5 mA | |
| **Weight** | 80 g max. | |

## 16-point output-point

| Item | Specification | |
|---|---|---|
| | **XWT-OD16** | **XWT-OD16-1** |
| **Internal I/O common** | NPN | PNP |
| **I/O capacity** | 16 outputs | |
| **Rated output current** | 0.5 A/output, 4.0 A/common | |
| **Residual voltage** | 1.2 V max.<br>(0.5 A DC, between each output terminal and the G terminal) | 1.2 V max.<br>(0.5 A DC, between each output terminal and the V terminal) |
| **Leakage current** | 0.1 mA max. | |
| **ON delay** | 0.5 ms max. | |
| **OFF delay** | 1.5 ms max. | |
| **Number of circuits per common** | 16 outputs/common | |
| **Communications power supply current consumption** | 10 mA | |
| **Weight** | 120 g max. | |

## Dimensions

### Digital I/O

#### GX-ID1611/ID1621, GX-OD1611/OD1621
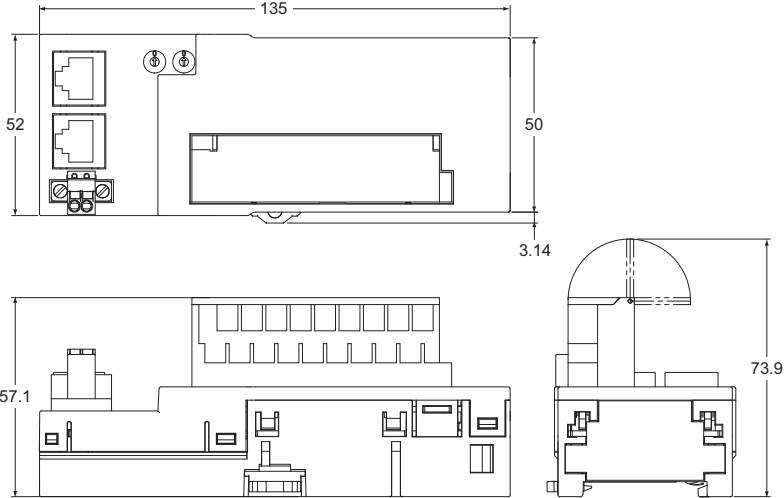


#### GX-OC1601



#### GX-MD1611/MD1621

# OMRON
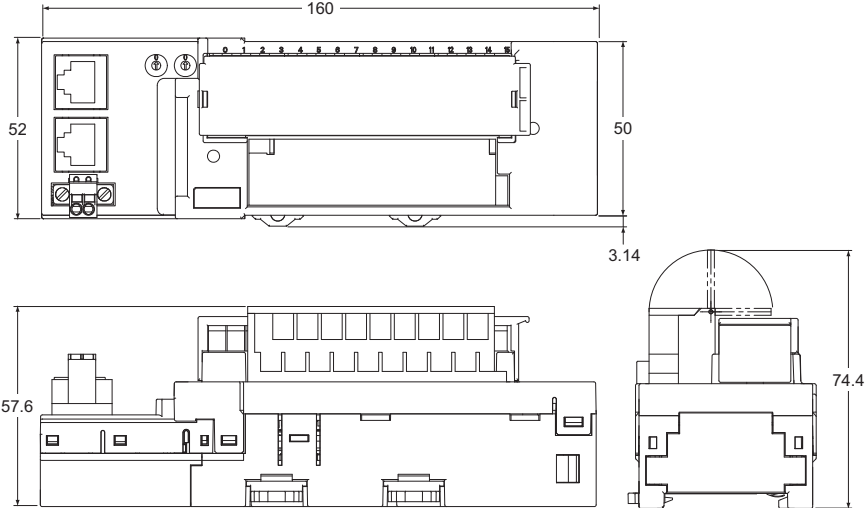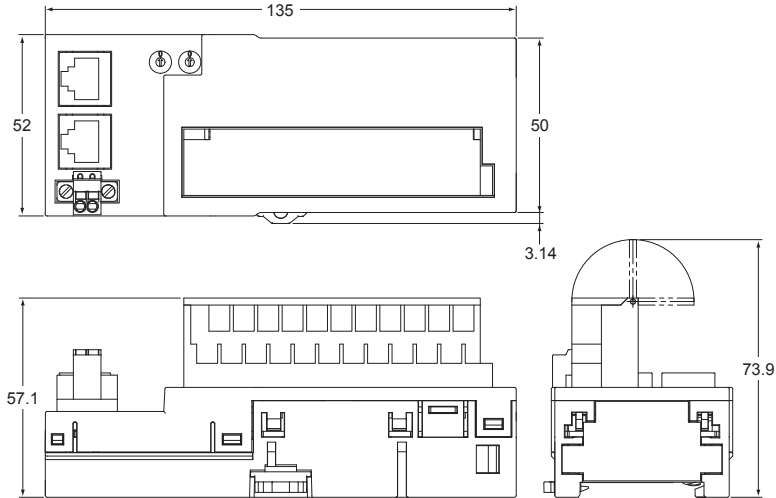
## GX-ID1612/ID1622, GX-OD1612/OD1622, GX-MD1612/MD1622
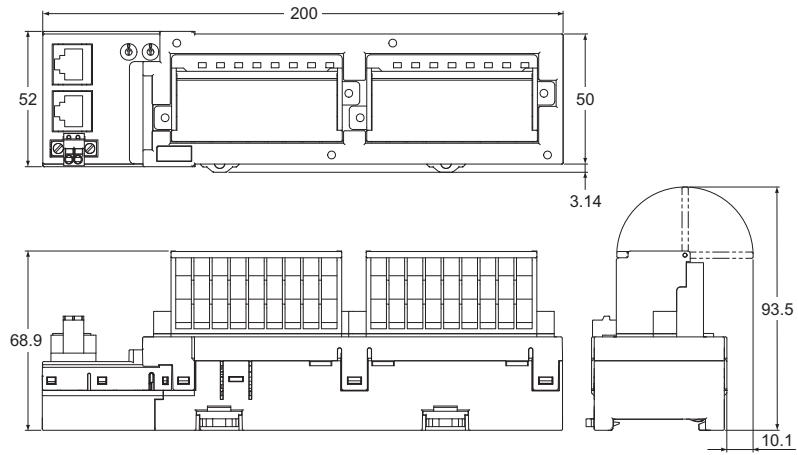


## Analog I/O

### GX-AD0471/DA0271
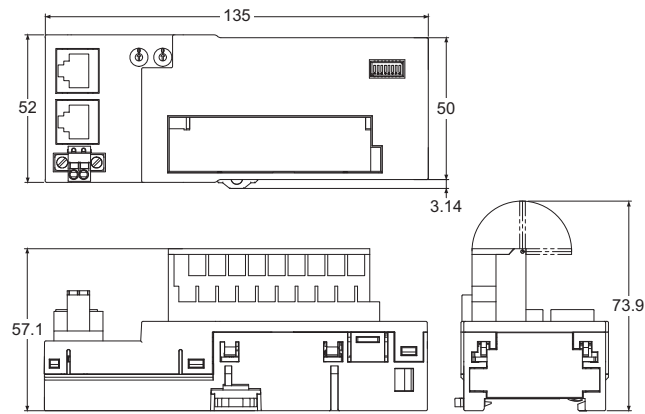


## Encoder input

### GX-EC0211/EC0241
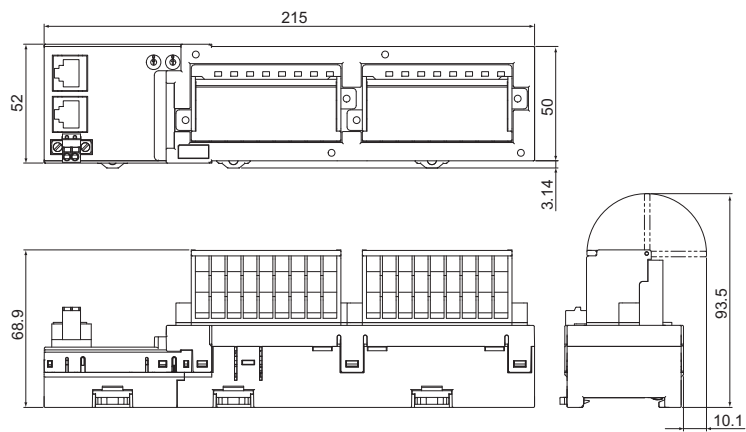


## Expansion units

### XWT-ID08/ID08-1, XWT-OD08/OD08-1
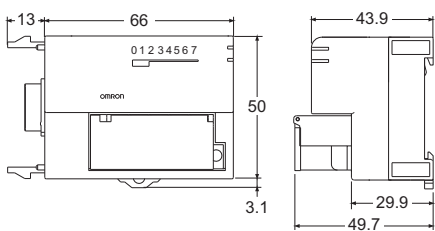


### XWT-ID16/ID16-1, XWT-OD16/OD16-1
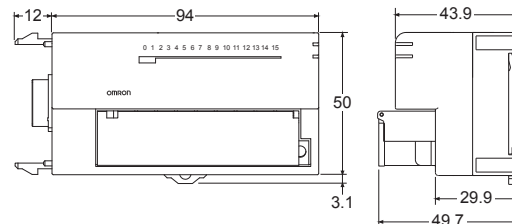
## Ordering information

### Digital I/O

| Description | Specification | Model |
|---|---|---|
| 16-point NPN input | 24 VDC, 6 mA, 1-wire connection, expandable with one XWT unit | GX-ID1611 |
| 16-point PNP input | 24 VDC, 6 mA, 1-wire connection, expandable with one XWT unit | GX-ID1621 |
| 16-point NPN output | 24 VDC, 500 mA, 1-wire connection, expandable with one XWT unit | GX-OD1611 |
| 16-point PNP output | 24 VDC, 500 mA, 1-wire connection, expandable with one XWT unit | GX-OD1621 |
| 8-point input and 8-point output, NPN | 24 VDC, 6 mA input, 500 mA output, 1-wire connection | GX-MD1611 |
| 8-point input and 8-point output, PNP | 24 VDC, 6 mA input, 500 mA output, 1-wire connection | GX-MD1621 |
| 16-point NPN input | 24 VDC, 6 mA, 3-wire connection | GX-ID1612 |
| 16-point PNP input | 24 VDC, 6 mA, 3-wire connection | GX-ID1622 |
| 16-point NPN output | 24 VDC, 500 mA, 3-wire connection | GX-OD1612 |
| 16-point PNP output | 24 VDC, 500 mA, 3-wire connection | GX-OD1622 |
| 8-point input and 8-point output, NPN | 24 VDC, 6 mA input, 500 mA output, 3-wire connection | GX-MD1612 |
| 8-point input and 8-point output, PNP | 24 VDC, 6 mA input, 500 mA output, 3-wire connection | GX-MD1622 |
| 16-point relay output | 250 VAC, 2 A, 1-wire connection, expandable with one XWT unit | GX-OC1601 |

### Analog I/O

| Description | Specification | Model |
|---|---|---|
| 4-Channel analogue input, current/voltage | 10 V, 0 to 10 V, 0 to 5 V, 1 to 5 V, 4 to 20 mA | GX-AD0471 |
| 2-Channel analogue output, current/voltage | 10 V, 0 to 10 V, 0 to 5 V, 1 to 5 V, 4 to 20 mA | GX-DA0271 |

### Encoder input

| Description | Specification | Model |
|---|---|---|
| 2 encoder open collector inputs | 500 kHz Open collector input | GX-EC0211 |
| 2 encoder line-driver inputs | 4 MHz Line driver input | GX-EC0241 |

### Expansion units

| Description | Specification | Model |
|---|---|---|
| 8-point NPN input expansion unit | 24 VDC, 6 mA | XWT-ID08 |
| 8-point PNP input expansion unit | 24 VDC, 6 mA | XWT-ID08-1 |
| 8-point NPN output expansion unit | 24 VDC, 500 mA | XWT-OD08 |
| 8-point PNP output expansion unit | 24 VDC, 500 mA | XWT-OD08-1 |
| 16-point NPN input expansion unit | 24 VDC, 6 mA | XWT-ID16 |
| 16-point PNP input expansion unit | 24 VDC, 6 mA | XWT-ID16-1 |
| 16-point NPN output expansion unit | 24 VDC, 500 mA | XWT-OD16 |
| 16-point PNP output expansion unit | 24 VDC, 500 mA | XWT-OD16-1 |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_P21E-EN-01B   In the interest of product improvement, specifications are subject to change without notice.

## NX-S□

# NX integrated safety

### Integrated safety into machine automation

- The safety controller meets Category 4, PLe according to the ISO 13849-1 and SIL3 according to the IEC 61508
- Flexible system lets you freely mix safety controller and safety I/O units with standard NX I/O
- High connectivity I/O units for direct connection to a variety of devices
- Scalable CPUs for 32 or 128 safety connections
- Up to 8 safety input points per unit
- Safety function blocks conforming with IEC 61131-3 standard programming
- PLCopen function blocks for safety
- Integration in one software, Sysmac Studio

**Safety controller**

**Safety I/O**

## System configuration

**Sysmac** always in control

Sysmac Studio

**EtherNet/IP**

**NJ series**
Machine automation controller

**EtherCAT.**

**NX series I/O**

Safety over
**EtherCAT.**

**Safety controller**     **Safety I/O units**

**Safety I/O units**

Accurax G5
servo drive

MX2 inverter

FQ-M
vision

Accurax G5
servo motors

Accurax
linear motors
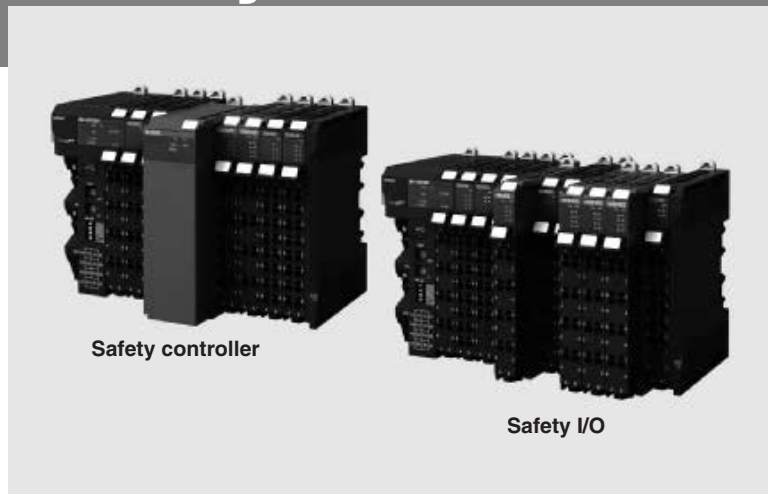
# OMRON
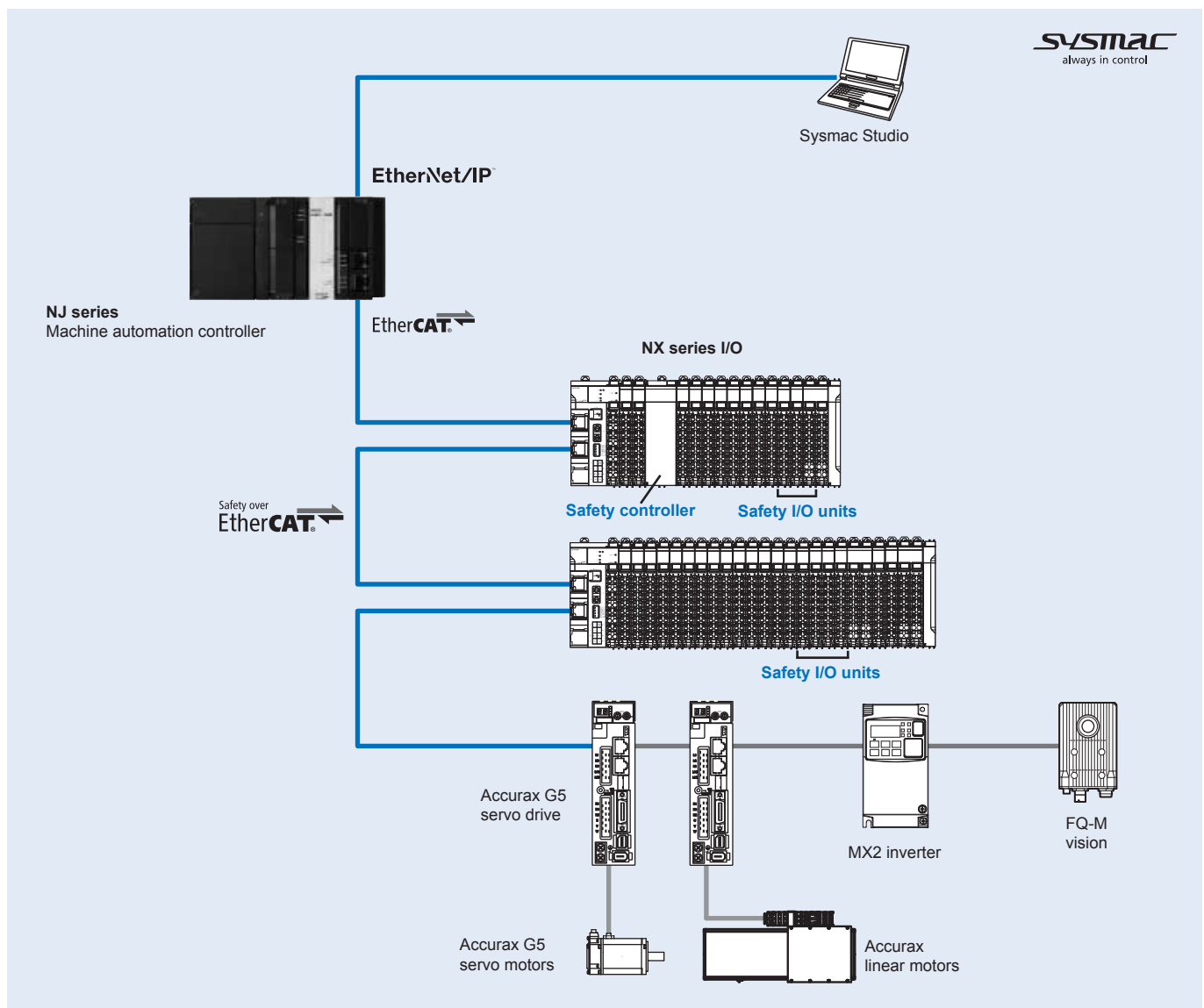
## Specifications

### Regulations and standards

| Certification body | Standards | |
|---|---|---|
| TÜV Rheinland[*1] | EN ISO 13849-1: 2008 + AC: 2009<br>EN ISO 13849-2: 2012<br>IEC 61508 parts 1-7: 2010<br>EN 62061: 2005<br>EN 61131-2: 2007<br>EN ISO 13850: 2008<br>EN 60204-1: 2006 + A1: 2009 + AC: 2010 | EN 61000-6-2: 2005<br>EN 61000-6-4: 2007<br>NFPA 79: 2012<br>ANSI RIA 15.06-1999<br>ANSI B11.19-2010<br>UL1998<br>IEC 61326-3-1: 2008 |
| UL | cULus: Listed (UL508) and ANSI/ISA 12.12.01 | |

*1. Certification was received for applications in which OMRON FSoE devices are connected to each other.

The NX-series Safety Control Units allow you to build a safety control system that meets the following standards.
- Requirements for SIL 3 (Safety Integrity Level 3) in IEC 61508, EN 62061, Safety Standard for Safety Instrumented Systems (Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems)
- Requirements for PLe (Performance Level e) and for safety category 4 in EN ISO13849-1

The NX-series Safety Control Units are also registered for C-Tick and KC compliance.

### General specifications

| Item | | Specifications |
|---|---|---|
| Enclosure | | Mounted in a panel |
| Grounding method | | Ground to 100 Ω or less |
| Operating environment | Ambient operating temperature | 0 to 55°C |
| | Ambient operating humidity | 10% to 95% (with no condensation or icing) |
| | Atmosphere | No corrosive gases |
| | Ambient storage temperature | –25 to 70°C (with no condensation or icing) |
| | Altitude | 2,000 m max. |
| | Pollution degree | 2 or less: Conforms to JIS B3502 and IEC 61131-2 |
| | Noise immunity | Compliant with IEC 61131-2<br>2 kV on power supply line (compliant with IEC 61000-4-4) |
| | Insulation class | Class III (SELV) |
| | Overvoltage category | Category II: Conforms to JIS B3502 and IEC 61131-2 |
| | EMC immunity level | Zone B |
| | Vibration resistance | Compliant with IEC 60068-2-6<br>5 to 8.4 Hz, 3.5-mm amplitude, 8.4 to 150 Hz, acceleration: 9.8 m/s$^2$ for 100 minutes each in X, Y and Z directions (time coefficient: 10 minutes x coefficient factor 10 = total time 100 min.) |
| | Shock resistance | Compliant with IEC 60068-2-27<br>147 m/s$^2$, 3 times each in X, Y and Z directions |
| | Insulation resistance | 20 MΩ between isolated circuits (at 100 VDC) |
| | Dielectric strength | 510 VAC for 1 min between isolated circuits, leakage current: 5 mA max. |
| Installation method | | DIN track (IEC 60715 TH35-7.5/TH35-15) |
| Applicable standards | | EN ISO 13849-1, 13849-2: 2008 PLe/Safety Category 4<br>IEC 61508: 2010 SIL 3, EN 62061: 2005 SIL CL3<br>UL 1988<br>cULus: listed (UL508), ANSI/ISA 12.12.01<br>EC: EN 61131-2, C-Tick, KC: KC Registration |

## Nomenclature

### Safety controller unit
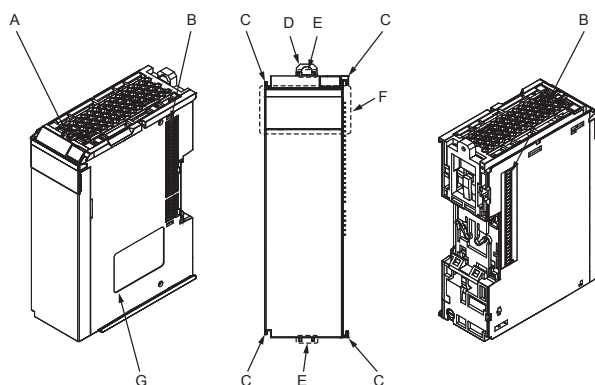


| Symbol | Name | Function |
|---|---|---|
| A | Marker installation location | These are where markers are attached. OMRON markers are attached when the unit is shipped. You can also attach commercially available markers. |
| B | NX bus connector | This is the NX-series bus connector. It is used to connect an NX-series safety I/O unit or other NX unit. |
| C | Unit hookup guide | This guide is used to connect the unit to another unit. |
| D | DIN track mounting hooks | These hooks are used for installation on a DIN track. |
| E | Unit pull out tabs | Place your fingers on these tabs to pull out the unit. |
| F | Indicators | The indicators show the current operating status of the NX unit and signal I/O status. The number of indicators depend on the NX unit. |
| G | Unit specifications | The specifications of the NX unit are given here. |

### Safety controller unit

| Item | Specifications | |
|---|---|---|
| Model | NX-SL3300 | NX-SL3500 |
| Name | Safety CPU unit | |
| Maximum number of safety I/O points | 256 points | 1024 points |
| Program capacity | 512 KB | 2048 KB |
| Number of safety master connections | 32 | 128 |
| External connection terminals | None | |
| Unit power consumption | 0.90 W max. | |
| I/O power supply system | Not supplied | |
| I/O current consumption | No consumption | |
| Current capacity of I/O power supply terminal | No I/O power supply terminals | |
| I/O refreshing method | Free-run refreshing | |
| Dimensions (W × H × D) | 30 × 100 × 71 | |
| Weight | 75 g max. | |

# OMRON

## Safety I/O unit

### Safety input unit

| Item | Specifications | |
|---|---|---|
| Model | NX-SIH400 | NX-SID800 |
| Name | Advanced safety input unit | Safety input unit |
| Number of safety inputs | 4 points | 8 points |
| Number of test outputs | 2 points | |
| Internal I/O common | Sinking (PNP) | |
| Rated input voltage | 24 VDC | |
| OMRON special safety input devices | Can be connected | Cannot be connected |
| Number of safety slave connections | 1 | |
| Safety input current | 4.5 mA | 3.0 mA |
| Safety input ON voltage | 11 VDC min. | 15 VDC min. |
| Safety input OFF voltage/OFF current | 5 VDC max., 1 mA max. | |
| Test output type | Sourcing outputs (PNP) | |
| Rated current of test outputs | 25 mA max. | 50 mA max. |
| Residual ON voltage of test outputs | 1.2 V max. | |
| Leakage current of test outputs | 0.1 mA max. | |
| Dielectric strength | 510 VAC for 1 min between isolated circuits, leakage current: 5 mA max. | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Photocoupler isolation | |
| Unit power consumption | 0.70 W max. | 0.75 W max. |
| I/O power supply system | Power supplied through the NX bus | |
| I/O current consumption | 20 mA max. | |
| Current capacity of I/O power supply terminal | No applicable terminals | |
| I/O refreshing method | Free-run refreshing | |
| Terminal block type | Screwless push-in terminals 8 terminals (A + B) | Screwless push-in terminals 16 terminals (A + B) |
| Dimensions (W × H × D) | 12 × 100 × 71 | |
| Weight | 70 g max. | |
| Maximum cable length | Devices with mechanical contacts: 400 m, other devices: 100 m | |
| Protective functions | Overvoltage protection circuit and ground fault detection (test outputs) | |

### Circuit layout

#### NX-SIH400
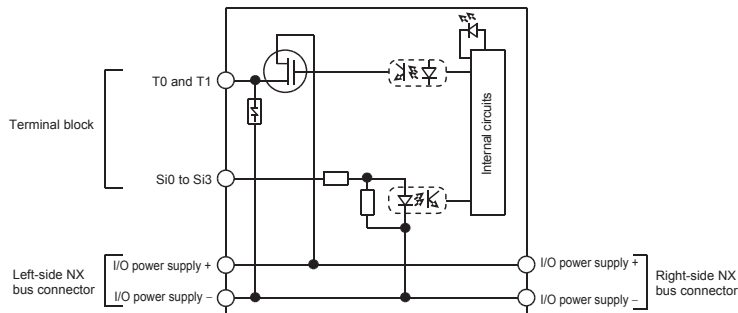


#### NX-SID800
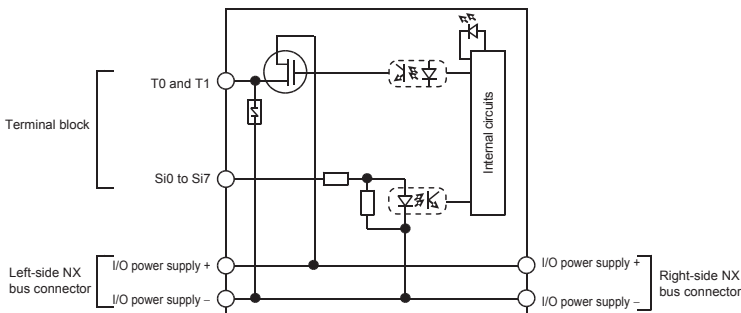


### Terminal wiring

#### NX-SIH400
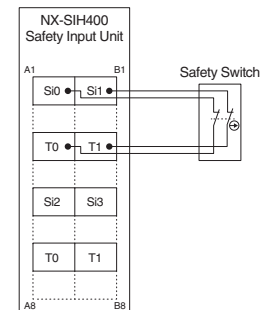


#### NX-SID800
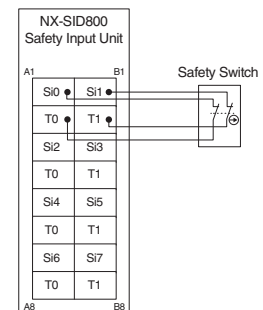
## Safety output unit

| Item | Specifications | |
|---|---|---|
| Model | NX-SOH200 | NX-SOD400 |
| Name | High-current safety output unit | Safety output unit |
| Number of safety outputs | 2 points | 4 points |
| Internal I/O common | Sourcing outputs (PNP) | |
| Maximum load current | 2.0 A/point, 4.0 A/unit at 40ºC, 2.5 A/unit at 55ºC. The maximum load current depends on the installation orientation and ambient temperature. | 0.5 A/point and 2.0 A/unit |
| Rated voltage | 24 VDC | |
| Number of safety slave connections | 1 | |
| Safety output ON residual voltage | 1.2 V max. | |
| Safety output OFF residual voltage | 2 V max. | |
| Safety output leakage current | 0.1 mA max. | |
| Dielectric strength | 510 VAC for 1 min between isolated circuits, leakage current: 5 mA max. | |
| Insulation resistance | 20 MΩ min. between isolated circuits (at 100 VDC) | |
| Isolation method | Photocoupler isolation | |
| Unit power consumption | 0.70 W max. | 0.75 W max. |
| I/O power supply system | Power supplied through the NX bus | |
| I/O current consumption | 40 mA max. | 60 mA max. |
| Current capacity of I/O power supply terminal | IOG: 2 A max./terminal | IOG (A3 and B3): 2 A max./terminal, IOG (A7 and B7): 0.5 A max./terminal |
| I/O refreshing method | Free-run refreshing | |
| Terminal block type | Screwless push-in terminals 8 terminals (A + B) | |
| Dimensions (W × H × D) | 12 × 100 × 71 | |
| Weight | 65 g max. | |
| Maximum cable length | 100 m | |
| Protective functions | Overvoltage protection circuit and ground fault detection | |

### Circuit layout

#### NX-SOH200
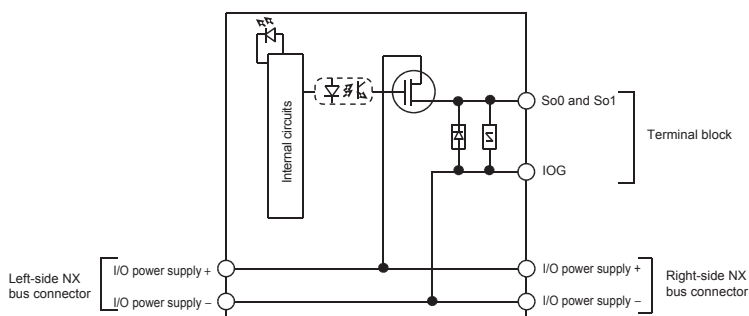


#### NX-SOD400



### Terminal wiring

#### NX-SOH200



#### NX-SOD400

# OMRON
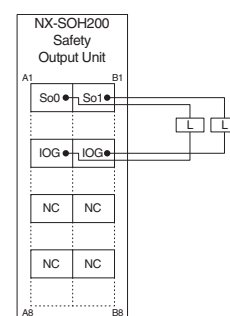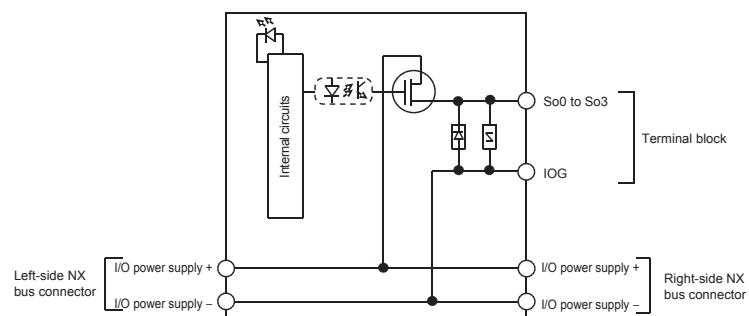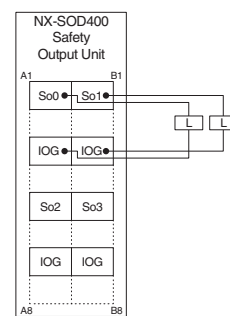
## Dimensions

### EtherCAT coupler unit
#### NX-ECC202
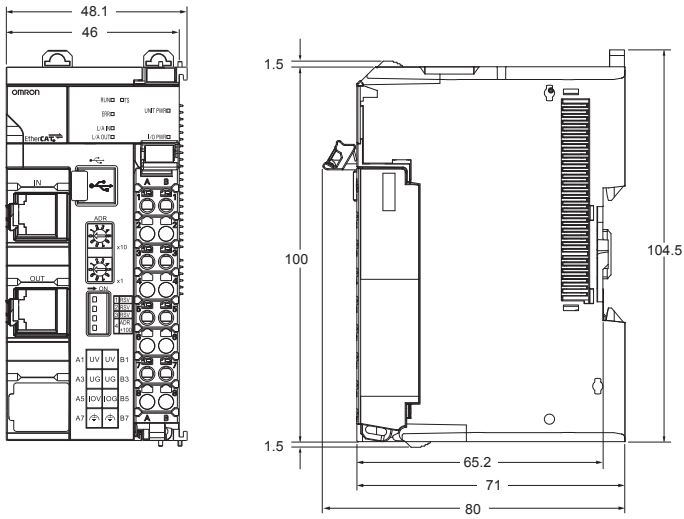


### Safety controller unit
#### NX-SL3300/SL3500
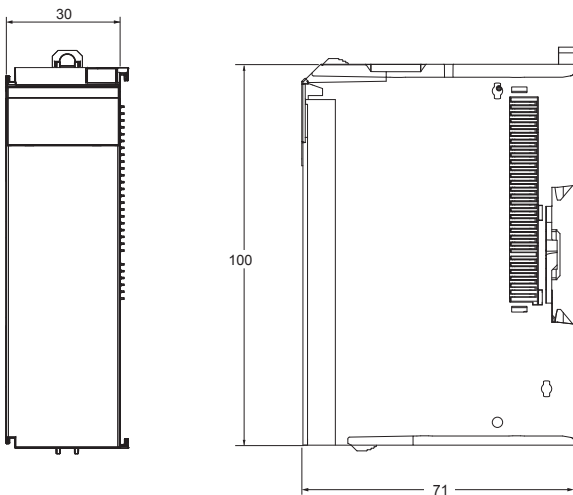


### Safety I/O unit
#### 12 mm width
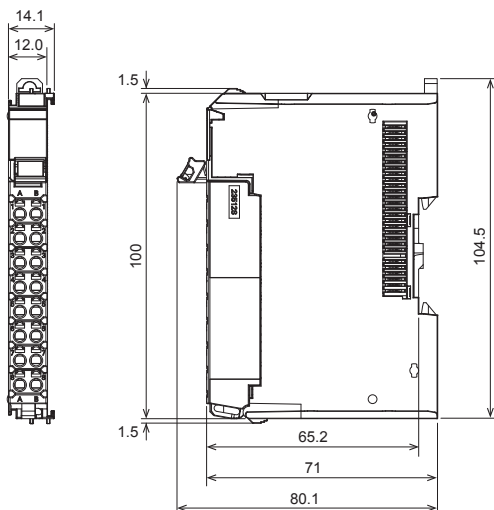


### End cover unit (included with the EtherCAT coupler unit)
#### NX-END01

## Ordering information

### EtherCAT coupler unit

| Type | Signal type | Specifications | Channels | Max. I/O power supply | Width | Model |
|---|---|---|---|---|---|---|
| EtherCAT communication coupler (firmware version 1.1 or higher) | EtherCAT slave | Up to 63 I/O units<br>Max. 1024 bytes in + 1024 bytes out<br>Supports distributed clock | 2 | 10.0 A | 46 mm | NX-ECC202 |

### Safety controller unit

| Type | Safety master connections | Safety I/O points | Program capacity | Width | Model |
|---|---|---|---|---|---|
| Safety CPU | 32 | 256 points max. | 512 KB | 30 mm | NX-SL3300 |
| | 128 | 1024 points max. | 2048 KB | 30 mm | NX-SL3500 |

### Safety I/O unit

#### Safety input unit

| Type | Signal type | Safety slave connections | Safety inputs | Test outputs | Width | Model |
|---|---|---|---|---|---|---|
| Safety input | PNP type | 1 | 4 points | 2 points | 12 mm | NX-SIH400 |
| | | | 8 points | 2 points | 12 mm | NX-SID800 |

#### Safety output unit

| Type | Signal type | Safety slave connections | Safety outputs | Width | Model |
|---|---|---|---|---|---|
| Safety output | PNP type | 1 | 2 points | 12 mm | NX-SOH200 |
| | | | 4 points | 12 mm | NX-SOD400 |

### System unit

| Type | Specifications | Width | Model |
|---|---|---|---|
| End cover | Included with communication coupler | 12 mm | NX-END01 |

### Accessories

| Name | Specifications | Model |
|---|---|---|
| Terminal block coding pins | For 10 units (Terminal block: 30 pins, unit: 30 pins) | NX-AUX02 |
| Terminal block | Replacement front connector with 8 wiring terminals (A + B) | NX-TBA082 |
| | Replacement front connector with 16 wiring terminals (A + B) | NX-TBA162 |

### Computer software

| Name | Model |
|---|---|
| Sysmac Studio version 1.08 or higher[1] | SYSMAC-SE2□□□ |

*1. Please contact your OMRON representative for compatibility between the Sysmac Studio version 1.07 or lower and NX I/O units.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat.No.SysCat_I183E-EN-02A      In the interest of product improvement, specifications are subject to change without notice.

**R88D-KN☐☐☐-ECT**

# Accurax G5 rotary drive

**Accurate motion control in a compact size servo drive family. EtherCAT and safety built-in.**

- Safety conforming ISO13849-1 PL-d
- High-response frequency of 2 kHz
- High resolution provided by 20 bits encoder
- External encoder input for full closed loop
- Real time auto-tuning
- Advanced tuning algorithms (Anti-vibration function, torque feedforward, disturbance observer)

### Ratings
- 230 VAC single-phase 100 W to 1.5 kW (8.59 Nm)
- 400 VAC three-phase 600 W to 15 kW (95.5 Nm)

accuraX

## System configuration



Sysmac always in control

EtherNet/IP

Sysmac Studio

**NJ series**
Machine automation controller

EtherCAT

**Accurax G5 servo drive**

Up to 100 m

Power cable          Encoder cable

**Standard servo motor**
3000 rpm (50 W - 750 W)

**High inertia servo motor**
3000 rpm (200 W - 750 W)

**Standard servo motor**
3000 rpm (1 kW - 5 kW)
2000 rpm (400 W - 5 kW)
1000 rpm (900 W - 3 kW)

**High inertia servo motor**
2000 rpm (1 kW - 5 kW)

**Standard servo motor**
1500 rpm (7.5 kW - 15 kW)
1000 rpm (4.5 kW - 6 kW)

**High inertia servo motor**
1500 rpm (7.5 kW)

# OMRON

## Servo motor supported

### Standard servo motors

| Accurax G5 rotary servo motor | | | | | | Servo drive model |
|---|---|---|---|---|---|---|
| | Voltage | Speed | Rated torque | Capacity | Model | G5 EtherCAT |
|  | 230 V | 3000 min⁻¹ | 0.16 Nm | 50 W | R88M-K05030(H/T)-□ | R88D-KN01H-ECT |
| | | | 0.32 Nm | 100 W | R88M-K10030(H/T)-□ | R88D-KN01H-ECT |
| | | | 0.64 Nm | 200 W | R88M-K20030(H/T)-□ | R88D-KN02H-ECT |
| | | | 1.3 Nm | 400 W | R88M-K40030(H/T)-□ | R88D-KN04H-ECT |
| | | | 2.4 Nm | 750 W | R88M-K75030(H/T)-□ | R88D-KN08H-ECT |
| | | | 3.18 Nm | 1000 W | R88M-K1K030(H/T)-□ | R88D-KN15H-ECT |
| | | | 4.77 Nm | 1500 W | R88M-K1K530(H/T)-□ | R88D-KN15H-ECT |
| 230 V (1 kW - 1.5 kW) 400 V (400 W - 5 kW) | 400 V | | 2.39 Nm | 750 W | R88M-K75030(F/C)-□ | R88D-KN10F-ECT |
| | | | 3.18 Nm | 1000 W | R88M-K1K030(F/C)-□ | R88D-KN15F-ECT |
| | | | 4.77 Nm | 1500 W | R88M-K1K530(F/C)-□ | R88D-KN15F-ECT |
| | | | 6.37 Nm | 2000 W | R88M-K2K030(F/C)-□ | R88D-KN20F-ECT |
| | | | 9.55 Nm | 3000 W | R88M-K3K030(F/C)-□ | R88D-KN30F-ECT |
| | | | 12.7 Nm | 4000 W | R88M-K4K030(F/C)-□ | R88D-KN50F-ECT |
| | | | 15.9 Nm | 5000 W | R88M-K5K030(F/C)-□ | R88D-KN50F-ECT |
| | 230 V | 2000 min⁻¹ | 4.77 Nm | 1000 W | R88M-K1K020(H/T)-□ | R88D-KN10H-ECT |
| | | | 7.16 Nm | 1500 W | R88M-K1K520(H/T)-□ | R88D-KN15H-ECT |
| | 400 V | | 1.91 Nm | 400 W | R88M-K40020(F/C)-□ | R88D-KN06F-ECT |
| | | | 2.86 Nm | 600 W | R88M-K60020(F/C)-□ | R88D-KN06F-ECT |
| | | | 4.77 Nm | 1000 W | R88M-K1K020(F/C)-□ | R88D-KN10F-ECT |
| | | | 7.16 Nm | 1500 W | R88M-K1K520(F/C)-□ | R88D-KN15F-ECT |
| | | | 9.55 Nm | 2000 W | R88M-K2K020(F/C)-□ | R88D-KN20F-ECT |
| | | | 14.3 Nm | 3000 W | R88M-K3K020(F/C)-□ | R88D-KN30F-ECT |
| | | | 19.1 Nm | 4000 W | R88M-K4K020(F/C)-□ | R88D-KN50F-ECT |
| 7.5 kW - 15 kW | | | 23.9 Nm | 5000 W | R88M-K5K020(F/C)-□ | R88D-KN50F-ECT |
| | | 1500 min⁻¹ | 47.8 Nm | 7500 W | R88M-K7K515C-□ | R88D-KN75F-ECT |
| | | | 70.0 Nm | 11000 W | R88M-K11K015C-□ | R88D-KN150F-ECT |
| | | | 95.5 Nm | 15000 W | R88M-K15K015C-□ | R88D-KN150F-ECT |
|  | 230 V | 1000 min⁻¹ | 8.59 Nm | 900 W | R88M-K90010(H/T)-□ | R88D-KN15H-ECT |
| | 400 V | | 8.59 Nm | 900 W | R88M-K90010(F/C)-□ | R88D-KN15F-ECT |
| | | | 19.1 Nm | 2000 W | R88M-K2K010(F/C)-□ | R88D-KN30F-ECT |
| | | | 28.7 Nm | 3000 W | R88M-K3K010(F/C)-□ | R88D-KN50F-ECT |
| | | | 43.0 Nm | 4500 W | R88M-K4K510C-□ | R88D-KN50F-ECT |
| | | | 57.3 Nm | 6000 W | R88M-K6K010C-□ | R88D-KN75F-ECT |

### High inertia servo motors

| Accurax G5 rotary servo motor | | | | | | Servo drive model |
|---|---|---|---|---|---|---|
| | Voltage | Speed | Rated torque | Capacity | Model | G5 EtherCAT |
|  200 W - 750 W | 230 V | 3000 min⁻¹ | 0.64 Nm | 200 W | R88M-KH20030(H/T)-□ | R88D-KN02H-ECT |
| | | | 1.3 Nm | 400 W | R88M-KH40030(H/T)-□ | R88D-KN04H-ECT |
| | | | 2.4 Nm | 750 W | R88M-KH75030(H/T)-□ | R88D-KN08H-ECT |
|  1 kW - 5 kW | 400 V | 2000 min⁻¹ | 4.77 Nm | 1000 W | R88M-KH1K020(F/C)-□ | R88D-KN10F-ECT |
| | | | 7.16 Nm | 1500 W | R88M-KH1K520(F/C)-□ | R88D-KN15F-ECT |
| | | | 9.55 Nm | 2000 W | R88M-KH2K020(F/C)-□ | R88D-KN20F-ECT |
| | | | 14.3 Nm | 3000 W | R88M-KH3K020(F/C)-□ | R88D-KN30F-ECT |
| | | | 19.1 Nm | 4000 W | R88M-KH4K020(F/C)-□ | R88D-KN50F-ECT |
| | | | 23.9 Nm | 5000 W | R88M-KH5K020(F/C)-□ | R88D-KN50F-ECT |
|  7.5 kW | | 1500 min⁻¹ | 47.8 Nm | 7500 W | R88M-KH7K515C-□ | R88D-KN75F-ECT |

## Type designation

**Servo drive**

R88D-KN01H-ECT

- Model
  - ECT: EtherCAT comms

Accurax G5 Series servo drive ——

Drive Type ——

N: Network type

Capacity and Voltage

| Voltage | Code | Output |
|---------|------|--------|
| 230 V | 01H | 100 W |
| | 02H | 200 W |
| | 04H | 400 W |
| | 08H | 750 W |
| | 10H | 1 kW |
| | 15H | 1.5 kW |
| 400 V | 06F | 600 W |
| | 10F | 1.0 kW |
| | 15F | 1.5 kW |
| | 20F | 2.0 kW |
| | 30F | 3.0 kW |
| | 50F | 5.0 kW |
| | 75F | 7.5 kW |
| | 150F | 15.0 kW |

## Servo drive specifications

**Single-phase, 230 V**

| Servo drive type | R88D-KN | 01H-ECT | 02H-ECT | 04H-ECT | 08H-ECT | 10H-ECT | 15H-ECT |
|---|---|---|---|---|---|---|---|
| Applicable servo motor | R88M-K☐ | 05030(H/T)-☐ | 20030(H/T)-☐ | 40030(H/T)-☐ | 75030(H/T)-☐ | 1K020(H/T)-☐ | 1K030(H/T)-☐ |
| | | 10030(H/T)-☐ | – | – | – | – | 1K530(H/T)-☐ |
| | | – | – | – | – | – | 1K520(H/T)-☐ |
| | | – | – | – | – | – | 90010(H/T)-☐ |
| Max. applicable motor capacity W | | 100 | 200 | 400 | 750 | 1000 | 1500 |
| Continuous output current Arms | | 1.2 | 1.6 | 2.6 | 4.1 | 5.9 | 9.4 |
| Input power Main circuit | | Single-phase/3-phase, 200 to 240 VAC +10 to −15%  (50/60 Hz) | | | | | |
| Supply Control circuit | | Single-phase, 200 to 240 VAC +10 to −15%  (50/60 Hz) | | | | | |
| Control method | | IGBT-driven PWM method, sinusoidal drive | | | | | |
| Feedback | | Serial encoder (incremental/absolute value) | | | | | |
| Usage/storage temperature | | 0 to 55°C/−20 to 65°C | | | | | |
| Usage/storage humidity | | 90% RH or less (non-condensing) | | | | | |
| Altitude | | 1000 m or less above sea level | | | | | |
| Vibration/shock resistance (max.) | | 5.88 m/s$^2$ 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s$^2$ | | | | | |
| Configuration | | Base mounted | | | | | |
| Approx. weight kg | | 0.8 | 1.1 | 1.6 | | 1.8 | |

**Three-phase, 400 V**

| Servo drive type | R88D-KN | 06F-ECT | 10F-ECT | 15F-ECT | 20F-ECT | 30F-ECT | 50F-ECT | 75F-ECT | 150F-ECT |
|---|---|---|---|---|---|---|---|---|---|
| Applicable servo motor | R88M-K☐ | 40020(F/C)-☐ | 75030(F/C)-☐ | 1K030(F/C)-☐ | 2K030(F/C)-☐ | 3K030(F/C)-☐ | 4K030(F/C)-☐ | 6K010C-☐ | 11K015C-☐ |
| | | 60020(F/C)-☐ | 1K020(F/C)-☐ | 1K530(F/C)-☐ | 2K020(F/C)-☐ | 3K020(F/C)-☐ | 5K030(F/C)-☐ | 7K515C-☐ | 15K015C-☐ |
| | | – | – | 1K520(F/C)-☐ | – | 2K010(F/C)-☐ | 4K020(F/C)-☐ | – | – |
| | | – | – | 90010(F/C)-☐ | – | – | 5K020(F/C)-☐ | – | – |
| | | – | – | – | – | – | 4K510C-☐ | – | – |
| | | – | – | – | – | – | 3K010(F/C)-☐ | – | – |
| Max. applicable motor capacity kW | | 0.6 | 1.0 | 1.5 | 2.0 | 3.0 | 5.0 | 7.5 | 15.0 |
| Continuous output current Arms | | 1.5 | 2.9 | 4.7 | 6.7 | 9.4 | 16.5 | 22.0 | 33.4 |
| Input power Main circuit | | 3-phase, 380 to 480 VAC +10 to −15% (50/60 Hz) | | | | | | | |
| Supply Control circuit | | 24 VDC ±15% | | | | | | | |
| Control method | | IGBT-driven PWM method, sinusoidal drive | | | | | | | |
| Feedback Serial encoder | | Incremental or absolute encoder | | | | | | Absolute encoder | |
| Usage/storage temperature | | 0 to 55°C/−20 to +65°C | | | | | | | |
| Usage/storage humidity | | 90% RH or less (non-condensing) | | | | | | | |
| Altitude | | 1000 m or less above sea level | | | | | | | |
| Vibration/shock resistance (max.) | | 5.88 m/s$^2$ 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s$^2$ | | | | | | | |
| Configuration | | Base mounted | | | | | | | |
| Approx. weight kg | | 1.9 | | 2.7 | | 4.7 | | 13.5 | 21.0 |

## General specifications

| Performance | Frequency characteristics | 2 kHz |
|---|---|---|
| **EtherCAT interface** Command input | | EtherCAT commands (for sequence, motion, data setting/reference, monitor, adjustment, and other commands). |
| Drive Profile[*1] | | CSP, CSV, CST, Homing and Position Profile modes (CiA402 Drive Profile)<br>Homing mode<br>Position profile mode<br>Dual touch probe function (Latch function)<br>Torque limit function |
| **I/O signal** Sequence input signal | | Multi-function input × 8 by parameter setting (forward/reverse drive prohibition, emergency stop, external latch, origin proximity, forward/reverse torque limit, general purpose monitor input). |
| Sequence output signal | | 1 × servo drive error output<br>2 × multi-function outputs by parameters setting (servo ready, brake release, torque limit detection, zero speed detection, warning output, position completion, error clear attributed, programmable output) |
| **Integrated functions** USB communications | Interface | Personal computer/Connector mini-USB |
| | Communications standard | Compliant with USB 2.0 standard |
| | Function | Parameter setting, status monitoring and tuning |
| EtherCAT communications | Communications protocol | IEC 61158 Type 12, IEC 61800-7 |
| | Physical layer | 100BASE-TX (IEEE802.3) |
| | Connectors | RJ45 × 2<br>ECAT IN: EtherCAT input × 1<br>ECAT OUT: EtherCAT output × 1 |
| | Communications media | Category 5 or higher (cable with double, aluminium tape and braided shielding is recommended) |
| | Communications distance | Distance between nodes: 100 m max. |
| | LED indicators | RUN × 1<br>ERR × 1<br>L/A IN (Link/Activity IN) × 1<br>L/A OUT (Link/activity OUT) × 1 |
| Autotuning | | Automatic motor parameter setting. One parameter rigidity setting. Inertia detection. |
| Dynamic brake (DB) | | Built-in. Operates during main power OFF, servo alarm, servo OFF or overtravel. |
| Regenerative processing | | Internal resistor included in models from 600 W to 5 kW. Regenerative resistor externally mounted (option). |
| Overtravel (OT) prevention function | | DB stop, deceleration stop or coast to stop during P-OT, N-OT operation |
| Encoder divider function | | Gear ratio |
| Protective functions | | Overcurrent, overvoltage, undervoltage, overspeed, overload, encoder error, overheat… |
| Analog monitor functions for supervision | | Analog monitor of motor speed, speed reference, torque reference, command following error, analog input…<br>The monitoring signals to output and their scaling can be specified with parameters.<br>Number of channels: 2 (Output voltage: ±10V DC) |
| Panel operator | Display functions | 2 × digit 7-segment LED display shows the drive status, alarm codes, parameters… |
| | Switches | 2 × rotary switches for setting the node address |
| CHARGE lamp | | Lits when the main circuit power supply is turned ON. |
| Safety terminal | Functions | Safety Torque OFF function to cut off the motor current and stop the motor. Output signal for failure monitoring function. |
| | Conformed standards | EN ISO13849-1:2008 (PL- d, Performance Level d), IEC61800-5 -2:2007 (function STO, Safe Torque OFF), EN61508:2001 (Safety Integrity Level 2, SIL2), EN954-1:1996 (CAT3). |
| External encoder feedback | | Serial signal and line-driver A-B-Z encoder for full-closed control |

[*1] The CSV, CST and Homing modes are supported in the servo drive with version 2.0 or higher. The Position profile mode is supported in the servo drive version 2.1 or higher

## Servo drive part names



**Note:** The above picture shows 230 V servo drives models only. The 400 V servo drives have 24 VDC power input terminals for control circuit instead of L1C and L2C terminals.

### I/O specifications

#### Terminals specifications

| Symbol | Name | Function |
|---|---|---|
| L1<br>L2<br>L3 | Main power supply input terminal | AC power input terminals for the main circuit<br><br>**Note:** for single-phase servo drives connect the power supply input to L1 and L3. |
| L1C<br>L2C | Control power supply input terminal | AC power input terminals for the control circuit<br>(for 200 V single/three-phase servo drives only). |
| 24 V<br>0 V | | DC power input terminals for the control circuit<br>(for 400 V three-phase servo drives only). |
| B1<br>B2<br>B3 | External regeneration resistor connection terminals | Servo drives 200 V below 750 W and 400 V above 5 kW: no internal resistor is connected. Leave B2 and B3 open. Connect an external regenerative resistor between B1 and B2.<br><br>Servo drives from 600 W to 5 kW: short-circuit in B2 and B3 for internal regenerative resistor. If the internal regenerative resistor is insufficient, connect an external regenerative resistor between B1 and B2 and remove the wire between B2 and B3. |
| DB1<br>DB2 | Dynamic brake resistance control terminals | For 7.5 kW and 15 kW servo drives: These terminals are used to control the MC for externally connected dynamic brake resistance. Connect them if required. |
| DB3<br>DB4 | | For 7.5 kW servo drive: Normally DB3 and DB4 are connected. When using an externally connected Dynamic Brake Unit, remove the short bar from between DB3 and DB4. |
| U<br>V<br>W | Servo motor connection terminals | Terminals for outputs to the servomotor. |

#### I/O signals (CN1) - input signals

| Pin No. | Signal name | Function | |
|---|---|---|---|
| 6 | I-COM | ± pole of external DC power. The power must use 12 to 24 V (±5%) | |
| 5 | E-STOP | Emergency stop | The signal name shows the factory setting. The function can be changed by parameter setting. |
| 7 | P-OT | Forward run prohibited | |
| 8 | N-OT | Reverse run prohibited | |
| 9 | DEC | Origin proximity | |
| 10 | EXT3 | External latch input 3 | |
| 11 | EXT2 | External latch input 2 | |
| 12 | EXT1 | External latch input 1 | |
| 13 | SI-MON0 | General purpose monitor input 0 | |
| 14 | BTP-I | Connecting pin for the absolute encoder backup battery. Do not connect when a battery is connected to the encoder cable (CN2 connector). | |
| 15 | BTN-I | | |
| 17 | – | Terminals not used. Do not connect. | |
| 18 | – | | |
| 19 | – | | |
| 20 | – | | |
| 21 | – | | |
| 22 | – | | |
| 23 | – | | |
| 24 | – | | |
| - | PCL | Forward torque limit | The function of input signals allocated to pins 5 and 7 to 13 can be changed with these options by parameters settings. |
| | NCL | Reverse torque limit | |
| | SI-MON1 | General-purpose monitor input 1 | |
| | SI-MON2 | General-purpose monitor input 2 | |
| Shell | FG | Shield ground. Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell. | |
| 16 | GND | Signal ground. It is insulated with power supply (I-COM) for the control signal in the servo drive. | |

#### I/O signals (CN1) - output signals

| Pin No. | Signal name | Function | |
|---|---|---|---|
| 1 | BRK-OFF+ | External brake release signal | |
| 2 | BRK-OFF | | |
| 25 | S-RDY+ | Servo ready: ON when there is no servo alarm and control/main circuit power supply is ON | |
| 26 | S-RDY– | | |
| 3 | ALM+ | Servo alarm: Turns OFF when an error is detected | |
| 4 | ALM– | | |
| – | INP1 | Position complete output 1 | The function of output signals allocated to pins 1, 2, 25 and 26 can be changed with these options by parameters settings |
| | TGON | Speed detection | |
| | T_LIM | Torque limit | |
| | ZSP | Zero speed | |
| | VCMP | Speed command status | |
| | INP2 | Position complete output 2 | |
| | WARN1 | Warning 1 | |
| | WARN2 | Warning 2 | |
| | PCMD | Position command status | |
| | V_LIM | Speed limit | |
| | ALM-ATB | Error clear attribute | |
| | R-OUT1 | Programmable output 1 | |
| | R-OUT2 | Programmable output 2 | |

# OMRON

## External encoder connector (CN4)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | E5V | External scale power supply output. Use at 5.2 V ±5% and at or below 250 mA. |
| 2 | E0V | This is connected to the control circuit ground connected to connector CN1. |
| 3 | PS | External scale signal I/O (serial signal). |
| 4 | /PS | |
| 5 | EXA | External scale signal input (Phase A, B, and Z signals). Performs the input and output of phase A, B and Z signals. |
| 6 | /EXA | |
| 7 | EXB | |
| 8 | /EXB | |
| 9 | EXZ | |
| 10 | /EXZ | |
| Shell | FG | Shield ground |

## Monitor connector (CN5)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | AM1 | Analog monitor output 1. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor.<br>Default setting: Motor rotation speed 1 V/(1000 r/min). |
| 2 | AM2 | Analog monitor output 2. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor.<br>Default setting: Motor rotation speed 1 V/(1000 r/min). |
| 3 | GND | Ground for analog monitors 1,2. |
| 4 | – | Terminals not used. Do not connect. |
| 5 | – | |
| 6 | – | |

## Safety connector (CN8)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | – | Not used. Do not connect |
| 2 | – | |
| 3 | SF1– | Safety input 1 & 2. This input turns OFF the power transistor drive signals in the servo drive to cut off the current output to the motor. |
| 4 | SF1+ | |
| 5 | SF2– | |
| 6 | SF2+ | |
| 7 | EDM– | A monitor signal is output to detect a safety function failure. |
| 8 | EDM+ | |
| Shell | FG | Frame ground. |

## Dimensions

### Servo drives

#### R88D-KN01H/02H-ECT (230 V, 100 to 200 W)
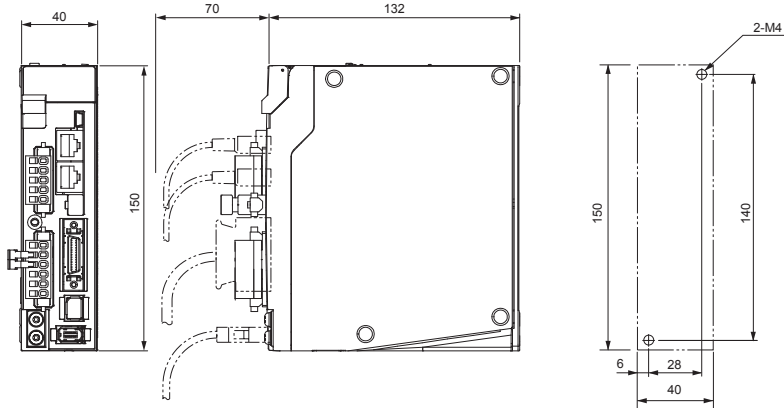


#### R88D-KN04H-ECT (230 V, 400 W)
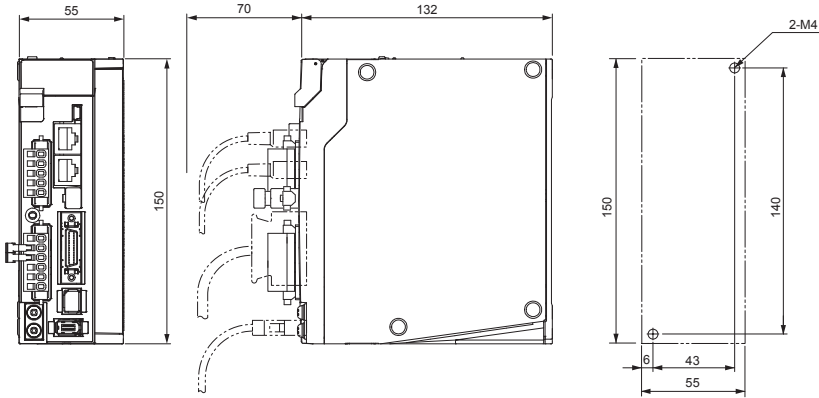


#### R88D-KN08H-ECT (230 V, 750 W)
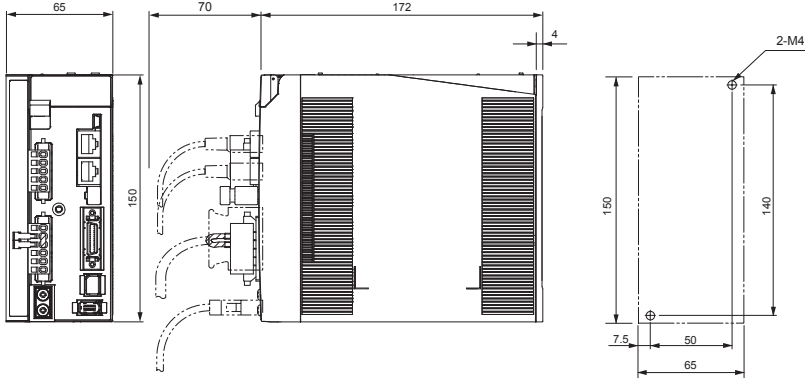


#### R88D-KN10H/15H-ECT (230 V, 1 to 1.5 kW)

# OMRON
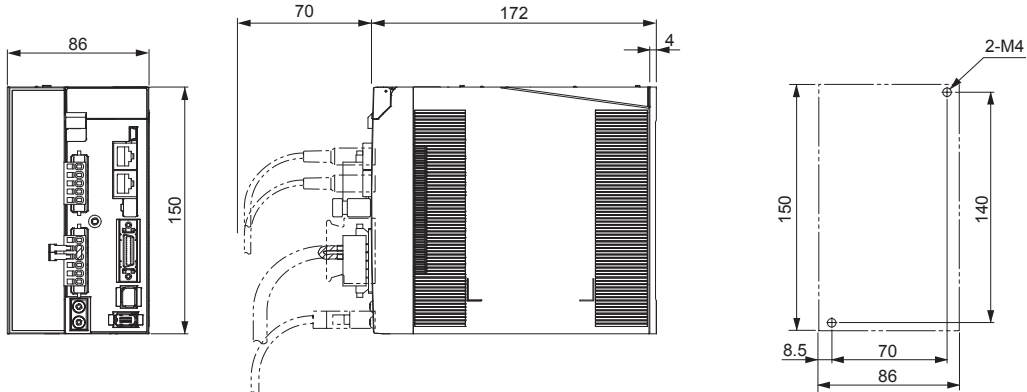
## R88D-KN06F/10F/15F-ECT (400 V, 600 W to 1.5 kW)
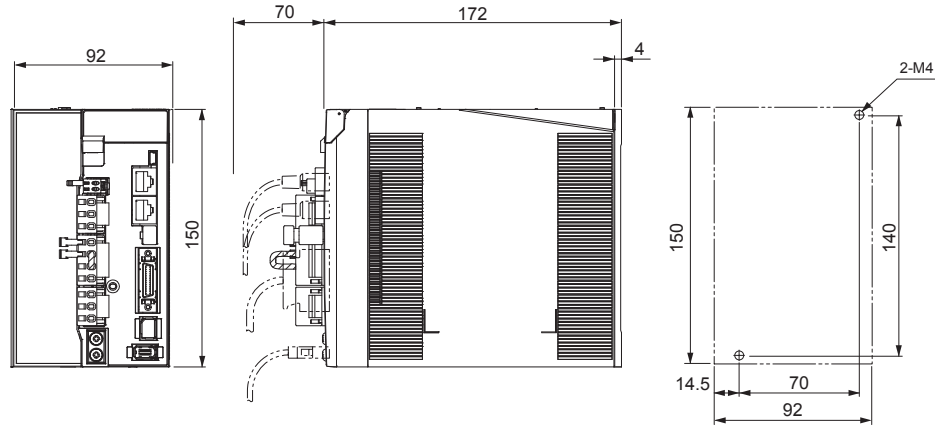


## R88D-KN20F-ECT (400 V, 2 kW)
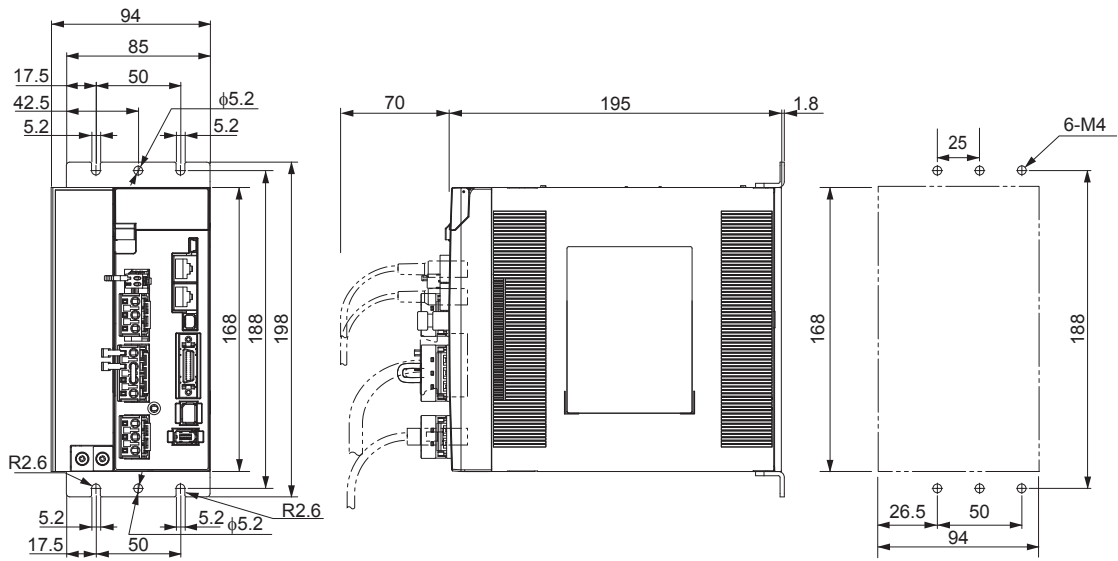


## R88D-KN30F/50F-ECT (400 V, 3 to 5 kW)
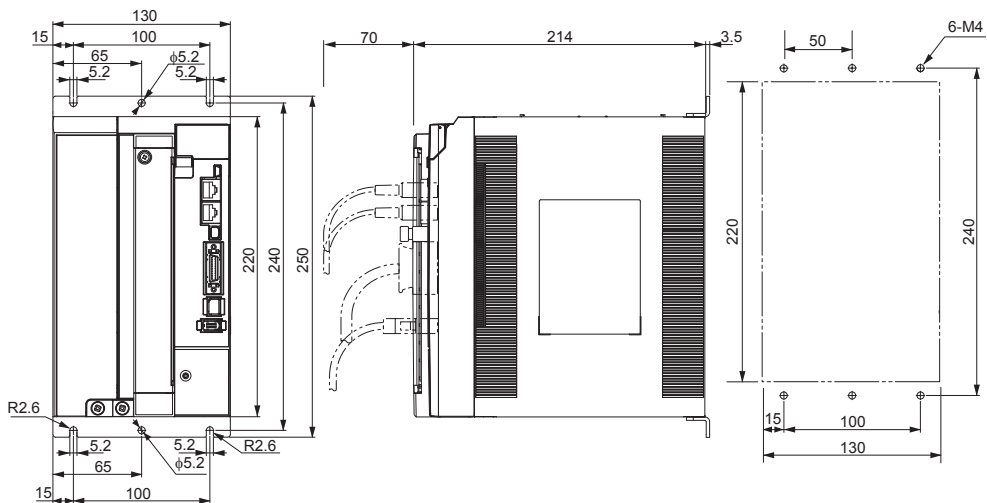
### R88D-KN75F-ECT (400 V, 7.5 kW)
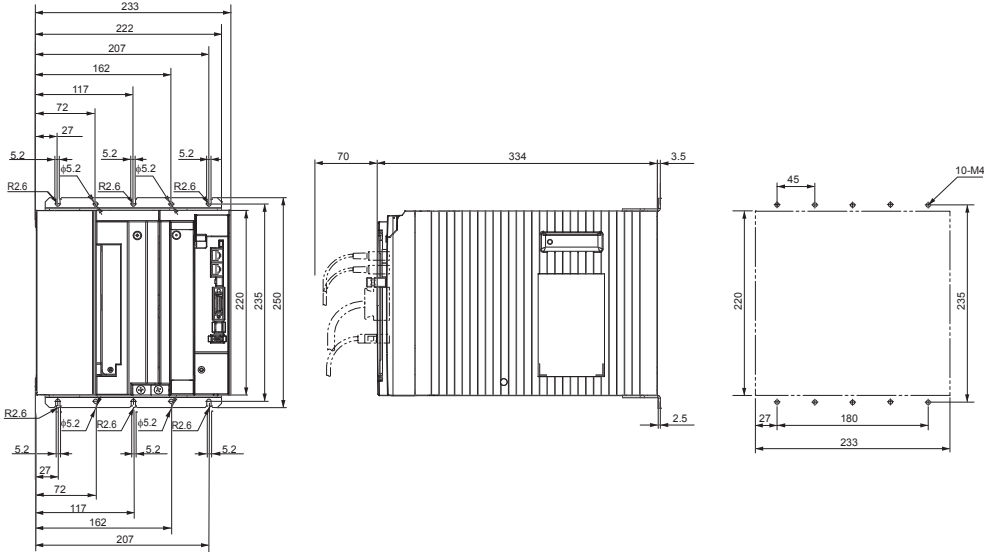


### R88D-KN150F-ECT (400 V, 15 kW)



**Filters**

| Filter model | External dimensions | | | Mount dimensions | |
|---|---|---|---|---|---|
| | **H** | **W** | **D** | **M1** | **M2** |
| R88A-FIK102-RE | 190 | 42 | 44 | 180 | 20 |
| R88A-FIK104-RE | 190 | 57 | 30 | 180 | 30 |
| R88A-FIK107-RE | 190 | 64 | 35 | 180 | 40 |
| R88A-FIK114-RE | 190 | 86 | 35 | 180 | 60 |
| R88A-FIK304-RE | 196 | 92 | 40 | 186 | 70 |
| R88A-FIK306-RE | 238 | 94 | 40 | 228 | 70 |
| R88A-FIK312-RE | 291 | 130 | 40 | 278 | 100 |
| R88A-FIK330-RE | 310 | 233 | 50 | 293 | 180 |
| R88A-FIK350-RE | 506 | 261 | 52 | 491 | 200 |
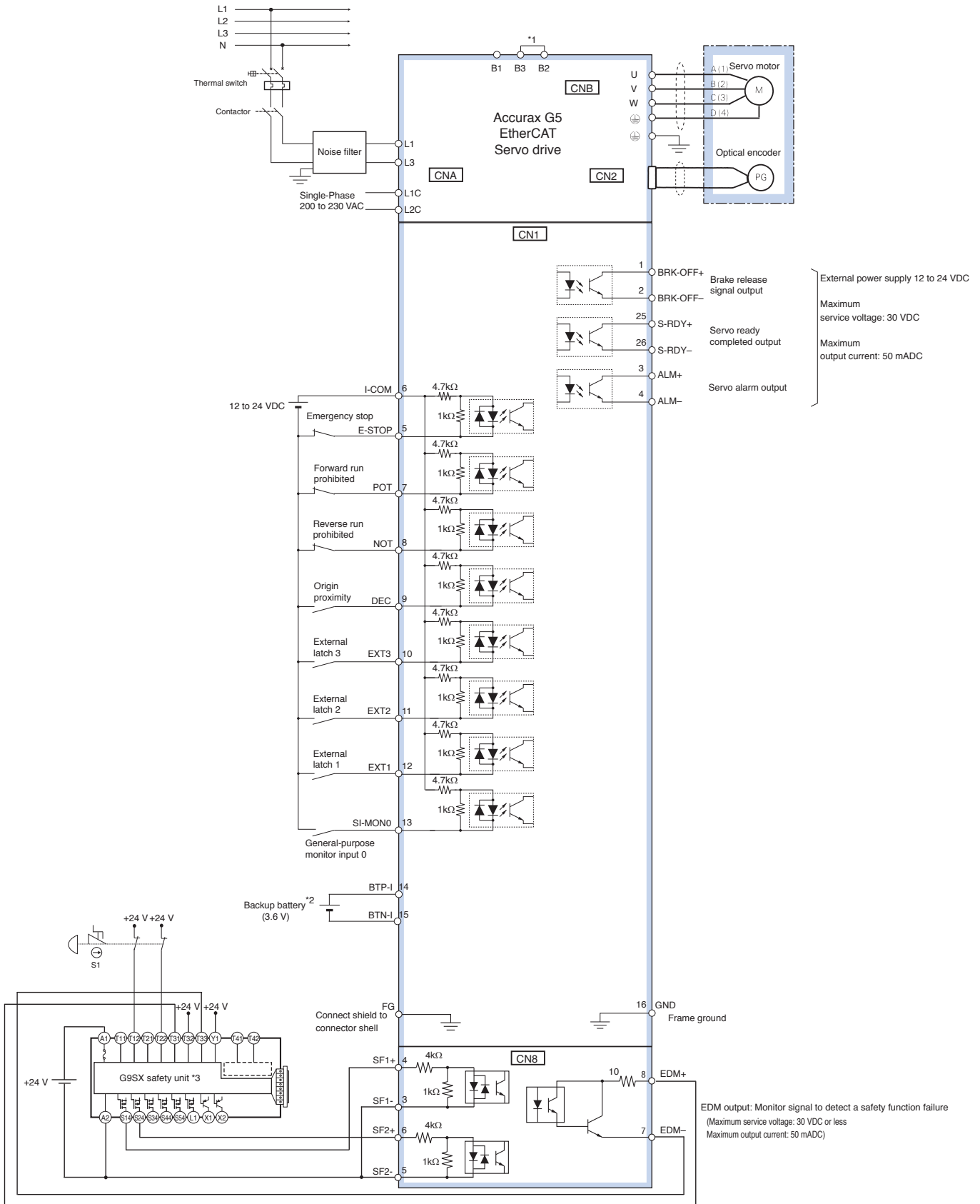
# OMRON

### Single-phase, 230 VAC



*1 For servo drives from 750 W, B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.

*2 For use only with an absolute encoder. If a backup battery is connected to CN1 I/O connector, an encoder cable with a battery is not required.

*3 Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

## Three-phase, 400 VAC
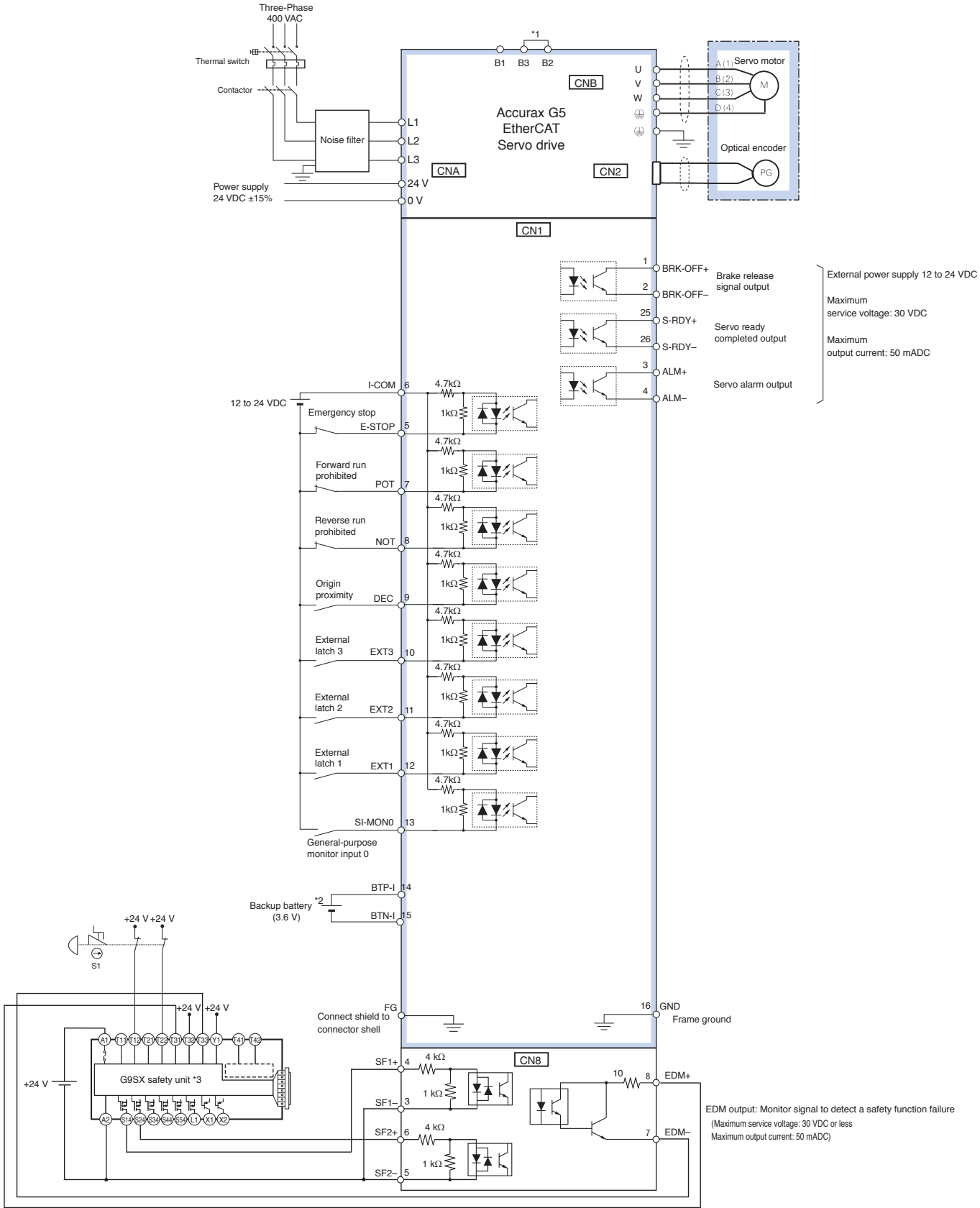


*1 For servo drives from 600 W to 5 kW, B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.

*2 For use only with an absolute encoder. If a backup battery is connected to CN1 I/O connector, an encoder cable with a battery is not required.

*3 Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

## Ordering information

### Accurax G5 series EtherCAT reference configuration



**Note:** The symbols ①②③④⑤... show the recommended sequence to select the components in Accurax G5 servo system

### Servo motors, power & encoder cables

**Note:** ①② Refer to the Accurax G5 servo motor chapter for servomotor, motor cables or connectors selection

### Servo drives

| Symbol | Specifications | | Servo drive models | ① Compatible G5 series rotary servo motors | |
|---|---|---|---|---|---|
| | | | | **Standard models** | **High inertia models** |
| ③ | 1 phase 230 VAC | 100 W | R88D-KN01H-ECT | R88M-K05030(H/T)-□ | – |
| | | | | R88M-K10030(H/T)-□ | – |
| | | 200 W | R88D-KN02H-ECT | R88M-K20030(H/T)-□ | R88M-KH20030(H/T)-□ |
| | | 400 W | R88D-KN04H-ECT | R88M-K40030(H/T)-□ | R88M-KH40030(H/T)-□ |
| | | 750 W | R88D-KN08H-ECT | R88M-K75030(H/T)-□ | R88M-KH75030(H/T)-□ |
| | | 1.0 kW | R88D-KN10H-ECT | R88M-K1K020(H/T)-□ | – |
| | | 1.5 kW | R88D-KN15H-ECT | R88M-K1K030(H/T)-□ | – |
| | | | | R88M-K1K530(H/T)-□ | – |
| | | | | R88M-K1K520(H/T)-□ | – |
| | | | | R88M-K90010(H/T)-□ | – |
| | 3 phase 400 VAC | 600 W | R88D-KN06F-ECT | R88M-K40020(F/C)-□ | – |
| | | | | R88M-K60020(F/C)-□ | – |
| | | 1.0 kW | R88D-KN10F-ECT | R88M-K75030(F/C)-□ | – |
| | | | | R88M-K1K020(F/C)-□ | R88M-KH1K020(F/C)-□ |
| | | 1.5 kW | R88D-KN15F-ECT | R88M-K1K030(F/C)-□ | – |
| | | | | R88M-K1K530(F/C)-□ | – |
| | | | | R88M-K1K520(F/C)-□ | R88M-KH1K520(F/C)-□ |
| | | | | R88M-K90010(F/C)-□ | – |
| | | 2.0 kW | R88D-KN20F-ECT | R88M-K2K030(F/C)-□ | – |
| | | | | R88M-K2K020(F/C)-□ | R88M-KH2K020(F/C)-□ |
| | | 3.0 kW | R88D-KN30F-ECT | R88M-K3K030(F/C)-□ | – |
| | | | | R88M-K3K020(F/C)-□ | R88M-KH3K020(F/C)-□ |
| | | | | R88M-K2K010(F/C)-□ | – |
| | | 5.0 kW | R88D-KN50F-ECT | R88M-K4K030(F/C)-□ | – |
| | | | | R88M-K5K030(F/C)-□ | – |
| | | | | R88M-K4K020(F/C)-□ | R88M-KH4K020(F/C)-□ |
| | | | | R88M-K5K020(F/C)-□ | R88M-KH5K020(F/C)-□ |
| | | | | R88M-K4K510C-□ | – |
| | | | | R88M-K3K010(F/C)-□ | – |
| | | 7.5 kW | R88D-KN75F-ECT | R88M-K6K010C-□ | – |
| | | | | R88M-K7K515C-□ | R88M-KH7K515C-□ |
| | | 15 kW | R88D-KN150F-ECT | R88M-K11K015C-□ | – |
| | | | | R88M-K15K015C-□ | – |

**Signals cables for I/O general purpose (CN1)**

| Symbol | Description | Connect to | | Model |
|---|---|---|---|---|
| ④ | I/O connector kit (26 pins) | For I/O general purpose | – | R88A-CNW01C |
| ⑤ | I/O signals cable | For I/O general purpose | 1 m | R88A-CPKB001S-E |
| | | | 2 m | R88A-CPKB002S-E |
| ⑥ | Terminal block cable | For I/O general purpose | 1 m | XW2Z-100J-B34 |
| | | | 2 m | XW2Z-200J-B34 |
| ⑦ | Terminal block (M3 screw and for pin terminals) | | – | XW2B-20G4 |
| | Terminal block (M3.5 screw and for fork/round terminals) | | – | XW2B-20G5 |
| | Terminal block (M3 screw and for fork/round terminals) | | – | XW2D-20G6 |

**External encoder cable (CN4)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑧ | External encoder cable | 5 m | R88A-CRKM005SR-E |
| | | 10 m | R88A-CRKM010SR-E |
| | | 20 m | R88A-CRKM020SR-E |

**Analog monitor (CN5)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑨ | Analog monitor cable | 1 m | R88A-CMK001S |

**USB personal computer cable (CN7)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑩ | USB mini-connector cable | 2 m | AX-CUSBM002-E |

**Cable for safety (CN8)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑪ | Safety cable | 3 m | R88A-CSK003S-E |

**Machine controller**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑫ | NJ-series | CPU unit | NJ501-1500 (64 axes) |
| | | | NJ501-1400 (32 axes) |
| | | | NJ501-1300 (16 axes) |
| | | | NJ301-1200 (8 axes) |
| | | | NJ301-1100 (4 axes) |
| | | Power supply unit | NJ-PA3001 (220 VAC) |
| | | | NJ-PD3001 (24 VDC) |

**External regenerative resistor**

| Symbol | Regenerative resistor unit model | Specifications |
|---|---|---|
| ⑬ | R88A-RR08050S | 50 Ω, 80 W |
| | R88A-RR080100S | 100 Ω, 80 W |
| | R88A-RR22047S | 47 Ω, 220 W |
| | R88A-RR50020S | 20 Ω, 500 W |

**Filters**

| Symbol | Applicable servodrive | Filter model | Manufacturer | Rated current | Leakage current | Rated voltage |
|---|---|---|---|---|---|---|
| ⑭ | R88D-KN01H-ECT, R88D-KN02H-ECT | R88A-FIK102-RE | Rasmi Electronics Ltd. | 2.4 A | 3.5 mA | 250 VAC single-phase |
| | R88D-KN04H-ECT | R88A-FIK104-RE | | 4.1 A | 3.5 mA | |
| | R88D-KN08H-ECT | R88A-FIK107-RE | | 6.6 A | 3.5 mA | |
| | R88D-KN10H-ECT, R88D-KN15H-ECT | R88A-FIK114-RE | | 14.2 A | 3.5 mA | |
| | R88D-KN06F-ECT, R88D-KN10F-ECT, R88D-KN15F-ECT | R88A-FIK304-RE | | 4 A | 0.3 mA / 32 mA[1] | 400 VAC three-phase |
| | R88D-KN20F-ECT | R88A-FIK306-RE | | 6 A | 0.3 mA / 32 mA[1] | |
| | R88D-KN30F-ECT, R88D-KN50F-ECT | R88A-FIK312-RE | | 12.1 A | 0.3 mA / 32 mA[1] | |
| | R88D-KN75F-ECT | R88A-FIK330-RE | | 22 A | 0.3 mA / 40 mA[1] | |
| | R88D-KN150F-ECT | R88A-FIK350-RE | | 44 A | 2 mA / 130 mA[1] | |

1. Momentary peak leakage current for the filter at switch-on/off.

**Connectors**

| Specifications | Model |
|---|---|
| External encoder connector (for CN4) | R88A-CNK41L |
| Safety I/O signal connector (for CN8) | R88A-CNK81S |

**Computer software**

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.0 or higher | SYSMAC-SE2☐☐☐ |
| CX-Drive version 2.10 or higher | CX-DRIVE 2.10 |
| CX-One software package including CX-Drive 2.10 or higher | CX-ONE |

**Note:** If CX-One is installed on the same computer as Sysmac Studio, it must be CX-One v4.2 or higher.

# OMRON

# Accurax G5 rotary motor

**Servo family for accurate motion control.
Power range extended up to 15 kW.**

- Standard and high inertia servo motor models
- Peak torque 300% of rated torque during 3 seconds or more depending on model
- High resolution serial encoder provided by 20 bits encoder
- IP67 protection in all models
- Ultra-light and compact size motor
- Low speed ripple and low torque ripple due to low torque cogging
- Various shaft, brake and seal options
  **Ratings**
- 230 VAC from 50 W to 1.5 kW
  (rated torque from 0.16 to 8.59 Nm)
- 400 VAC from 400 W to 15 kW
  (rated torque from 1.91 Nm to 95.5 Nm)

accuraX

## System configuration

(Refer to servo drive chapter)
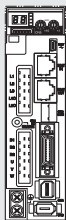
**Accurax G5 servo drive**
EtherCAT model

**Standard servo motors**

Power cable

Encoder cable

sysmac
always in control

3000 rpm (50 W to 750 W)

3000 rpm (750 W to 5 kW)
2000 rpm (400 W to 5 kW)
1000 rpm (900 W to 3 kW)

Power cable

Encoder cable

1500 rpm (7.5 kW to 15 kW)
1000 rpm (4.5 kW to 6 kW)

**High inertia servo motors**

Power cable

Encoder cable

3000 rpm (200 W to 750 W)

Power cable

Encoder cable

2000 rpm (1 kW to 5 kW)

1500 rpm (7.5 kW)

# OMRON
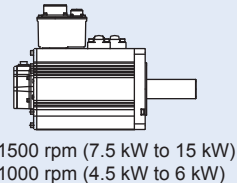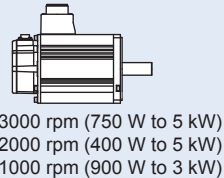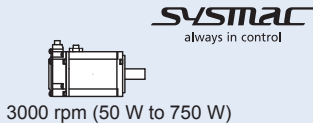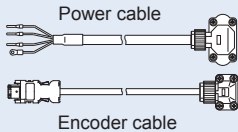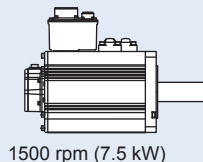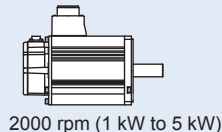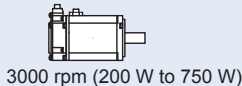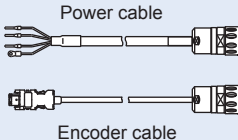
## Servo motor / servo drive combination

### Standard servo motors

| | | | Accurax G5 rotary servo motor | | | | Servo drive model |
|---|---|---|---|---|---|---|---|
| | Voltage | Speed | Rated torque | Capacity | Model | | G5 EtherCAT |
|  | 230 V | 3000 min⁻¹ | 0.16 Nm | 50 W | R88M-K05030(H/T)-□ | | R88D-KN01H-ECT |
| | | | 0.32 Nm | 100 W | R88M-K10030(H/T)-□ | | R88D-KN01H-ECT |
| | | | 0.64 Nm | 200 W | R88M-K20030(H/T)-□ | | R88D-KN02H-ECT |
| | | | 1.3 Nm | 400 W | R88M-K40030(H/T)-□ | | R88D-KN04H-ECT |
| | | | 2.4 Nm | 750 W | R88M-K75030(H/T)-□ | | R88D-KN08H-ECT |
|  | | | 3.18 Nm | 1000 W | R88M-K1K030(H/T)-□ | | R88D-KN15H-ECT |
| | | | 4.77 Nm | 1500 W | R88M-K1K530(H/T)-□ | | R88D-KN15H-ECT |
| | 400 V | | 2.39 Nm | 750 W | R88M-K75030(F/C)-□ | | R88D-KN10F-ECT |
| | | | 3.18 Nm | 1000 W | R88M-K1K030(F/C)-□ | | R88D-KN15F-ECT |
| | | | 4.77 Nm | 1500 W | R88M-K1K530(F/C)-□ | | R88D-KN15F-ECT |
| 230V (1 kW - 1.5 kW) 400V (400 W - 5 kW) | | | 6.37 Nm | 2000 W | R88M-K2K030(F/C)-□ | | R88D-KN20F-ECT |
| | | | 9.55 Nm | 3000 W | R88M-K3K030(F/C)-□ | | R88D-KN30F-ECT |
| | | | 12.7 Nm | 4000 W | R88M-K4K030(F/C)-□ | | R88D-KN50F-ECT |
| | | | 15.9 Nm | 5000 W | R88M-K5K030(F/C)-□ | | R88D-KN50F-ECT |
|  | 230 V | 2000 min⁻¹ | 4.77 Nm | 1000 W | R88M-K1K020(H/T)-□ | | R88D-KN10H-ECT |
| | | | 7.16 Nm | 1500 W | R88M-K1K520(H/T)-□ | | R88D-KN15H-ECT |
| | 400 V | | 1.91 Nm | 400 W | R88M-K40020(F/C)-□ | | R88D-KN06F-ECT |
| | | | 2.86 Nm | 600 W | R88M-K60020(F/C)-□ | | R88D-KN06F-ECT |
| | | | 4.77 Nm | 1000 W | R88M-K1K020(F/C)-□ | | R88D-KN10F-ECT |
| | | | 7.16 Nm | 1500 W | R88M-K1K520(F/C)-□ | | R88D-KN15F-ECT |
| 7.5 KW - 15 kW | | | 9.55 Nm | 2000 W | R88M-K2K020(F/C)-□ | | R88D-KN20F-ECT |
| | | | 14.3 Nm | 3000 W | R88M-K3K020(F/C)-□ | | R88D-KN30F-ECT |
| | | | 19.1 Nm | 4000 W | R88M-K4K020(F/C)-□ | | R88D-KN50F-ECT |
| | | | 23.9 Nm | 5000 W | R88M-K5K020(F/C)-□ | | R88D-KN50F-ECT |
| | 400 V | 1500 min⁻¹ | 47.8 Nm | 7500 W | R88M-K7K515C-□ | | R88D-KN75F-ECT |
| | | | 70.0 Nm | 11000 W | R88M-K11K015C-□ | | R88D-KN150F-ECT |
| | | | 95.5 Nm | 15000 W | R88M-K15K015C-□ | | R88D-KN150F-ECT |
|  | 230 V | 1000 min⁻¹ | 8.59 Nm | 900 W | R88M-K90010(H/T)-□ | | R88D-KN15H-ECT |
| | 400 V | | 8.59 Nm | 900 W | R88M-K90010(F/C)-□ | | R88D-KN15F-ECT |
| | | | 19.1 Nm | 2000 W | R88M-K2K010(F/C)-□ | | R88D-KN30F-ECT |
| | | | 28.7 Nm | 3000 W | R88M-K3K010(F/C)-□ | | R88D-KN50F-ECT |
| | | | 43.0 Nm | 4500 W | R88M-K4K510C-□ | | R88D-KN50F-ECT |
| | | | 57.3 Nm | 6000 W | R88M-K6K010C-□ | | R88D-KN75F-ECT |

### High inertia servo motors

| | | | Accurax G5 rotary servo motor | | | | Servo drive model |
|---|---|---|---|---|---|---|---|
| | Voltage | Speed | Rated torque | Capacity | Model | | G5 EtherCAT |
|  | 230 V | 3000 min⁻¹ | 0.64 Nm | 200 W | R88M-KH20030(H/T)-□ | | R88D-KN02H-ECT |
| | | | 1.3 Nm | 400 W | R88M-KH40030(H/T)-□ | | R88D-KN04H-ECT |
| | | | 2.4 Nm | 750 W | R88M-KH75030(H/T)-□ | | R88D-KN08H-ECT |
|  | 400 V | 2000 min⁻¹ | 4.77 Nm | 1000 W | R88M-KH1K020(F/C)-□ | | R88D-KN10F-ECT |
| | | | 7.16 Nm | 1500 W | R88M-KH1K520(F/C)-□ | | R88D-KN15F-ECT |
| | | | 9.55 Nm | 2000 W | R88M-KH2K020(F/C)-□ | | R88D-KN20F-ECT |
| 1 kW - 5 kW | | | 14.3 Nm | 3000 W | R88M-KH3K020(F/C)-□ | | R88D-KN30F-ECT |
| | | | 19.1 Nm | 4000 W | R88M-KH4K020(F/C)-□ | | R88D-KN50F-ECT |
|  | | | 23.9 Nm | 5000 W | R88M-KH5K020(F/C)-□ | | R88D-KN50F-ECT |
| 7.5 KW | | 1500 min⁻¹ | 47.8 Nm | 7500 W | R88M-KH7K515C-□ | | R88D-KN75F-ECT |

Note: 1. For servo motor and cables part numbers refer to ordering information at the end of this chapter
2. Refer to the servo drive chapter for drive options selection and detailed specifications

## Servo motor type designation

**Standard servo motors**

# R88M-K05030H-BOS2

Accurax G5 servomotor

Capacity

| 050 | 50 W |
|---|---|
| 100 | 100 W |
| 200 | 200 W |
| 400 | 400 W |
| 600 | 600 W |
| 750 | 750 W |
| 900 | 900 W |
| 1K0 | 1 kW |
| 1K5 | 1.5 kW |
| 2K0 | 2 kW |
| 3K0 | 3 kW |
| 4K0 | 4 kW |
| 4K5 | 4.5 kW |
| 5K0 | 5 kW |
| 6K0 | 6 kW |
| 7K5 | 7.5 kW |
| 11K0 | 11 kW |
| 15K0 | 15 kW |

Rated Speed (r/min)

| 10 | 1000 |
|---|---|
| 15 | 1500 |
| 20 | 2000 |
| 30 | 3000 |

Shaft end specifications

| Blank | Straight shaft, no key |
|---|---|
| S2 | Straight, key, tapped (standard) |

Oil seal specifications

| Blank | No oil seal |
|---|---|
| O | Oil seal |

Brake specifications

| Blank | No brake |
|---|---|
| B | Brake |

Voltage and encoder specifications

H: 230 V and 20-bit incremental encoder

T: 230 V and 17-bit absolute encoder

F: 400 V and 20-bit incremental encoder

C: 400 V and 17-bit absolute encoder

**High inertia servo motors**

# R88M-KH1K020F-BS1-D

Accurax G5 high inertia servomotor

Capacity

| 200 | 200 W |
|---|---|
| 400 | 400 W |
| 750 | 750 W |
| 1K0 | 1 kW |
| 1K5 | 1.5 kW |
| 2K0 | 2 kW |
| 3K0 | 3 kW |
| 4K0 | 4 kW |
| 5K0 | 5 kW |
| 7K5 | 7.5 kW |

Rated Speed (r/min)

| 15 | 1500 |
|---|---|
| 20 | 2000 |
| 30 | 3000 |

Circular connector (only for 230 V models)

Shaft end specifications

| Blank | Straight shaft, no key |
|---|---|
| S1 | 400 V motor models - Shaft end with key (standard) |
| S2 | 230 V motor models - Straight, key, tapped (standard) |

Brake specifications

| Blank | No brake |
|---|---|
| B | Brake |

Voltage and encoder specifications

H: 230 V and 20-bit incremental encoder

T: 230 V and 17-bit absolute encoder

F: 400 V and 20-bit incremental encoder

C: 400 V and 17-bit absolute encoder

## Servo motor specifications

### Standard servo motors 3000 r/min, 230 V

#### Ratings and specifications

| Voltage | | 230 V | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Servo motor model R88M-K□ | 20-bit incremental encoder | 05030H-□ | 10030H-□ | 20030H-□ | 40030H-□ | 75030H-□ | 1K030H-□ | 1K530H-□ |
| | 17-bit absolute encoder | 05030T-□ | 10030T-□ | 20030T-□ | 40030T-□ | 75030T-□ | 1K030T-□ | 1K530T-□ |
| Rated output | W | 50 | 100 | 200 | 400 | 750 | 1000 | 1500 |
| Rated torque | Nm | 0.16 | 0.32 | 0.64 | 1.3 | 2.4 | 3.18 | 4.77 |
| Instantaneous peak torque | Nm | 0.48 | 0.95 | 1.91 | 3.8 | 7.1 | 9.55 | 14.3 |
| Rated current | A (rms) | 1.1 | 1.1 | 1.5 | 2.4 | 4.1 | 6.6 | 8.2 |
| Instantaneous max. current | A (rms) | 4.7 | 4.7 | 6.5 | 10.2 | 17.4 | 28 | 35 |
| Rated speed | min$^{-1}$ | 3000 | | | | | | |
| Max. speed | min$^{-1}$ | 6000 | | | | | 5000 | |
| Torque constant | N·m/A | 0.11±10% | 0.21±10% | 0.31±10% | 0.39±10% | 0.42±10% | 0.37 | 0.45 |
| Rotor moment of inertia (JM) | kg·m$^2$×10$^{-4}$ (without brake) | 0.025 | 0.051 | 0.14 | 0.26 | 0.87 | 2.03 | 2.84 |
| | kg·m$^2$×10$^{-4}$ (with brake) | 0.027 | 0.054 | 0.16 | 0.28 | 0.97 | 2.35 | 3.17 |
| Allowable load moment of inertia (JL) | Multiple of (JM) | 30[*1] | | | | 20[*1] | 15[*1] | |
| Rated power rate | kW/s (without brake) | 10.1 | 19.9 | 29.0 | 62.4 | 65.6 | 49.8 | 80.1 |
| | kW/s (with brake) | 9.4 | 18.8 | 25.4 | 58 | 58.8 | 43 | 71.8 |
| Allowable radial load | N | 68 | | 245 | | | 490 | |
| Allowable thrust load | N | 58 | | 98 | | | 196 | |
| Approx. mass | kg (without brake) | 0.32 | 0.47 | 0.82 | 1.2 | 2.3 | 3.5 | 4.4 |
| | kg (with brake) | 0.53 | 0.68 | 1.3 | 1.7 | 3.1 | 4.5 | 5.4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Brake specifications** | Rated voltage | 24 VDC ±10% | | | | | | |
| | Holding brake moment of inertia J | kg·m$^2$×10$^{-4}$ | 0.002 | | 0.0018 | | 0.33 | | |
| | Power consumption (at 20°C) | W | 7 | | 9 | | 17 | 19 | |
| | Current consumption (at 20°C) | A | 0.3 | | 0.36 | | 0.70±10% | 0.81±10% | |
| | Static friction torque | N·m (minimum) | 0.29 | | 1.27 | | 2.5 | 7.8 | |
| | Rise time for holding torque | ms (max.) | 35 | | 50 | | | | |
| | Release time | ms (max) | 20 | | 15 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Basic specifications** | Time Rating | Continuous | | | | | | |
| | Insulation class | Type B | | | | | Type F | |
| | Ambient operating/ storage temperature | 0 to 40°C/–20 to 65°C | | | | | | |
| | Ambient operating/ storage humidity | 20 to 80% (non-condensing) | | | | | 20 to 85% (non-condensing) | |
| | Vibration class | V-15 | | | | | | |
| | Insulation resistance | 20 MΩ min. at 500 VDC between the power terminals and FG terminal | | | | | | |
| | Enclosure | Totally-enclosed, self-cooling, IP67 (excluding shaft opening) | | | | | | |
| | Vibration resistance | Vibration acceleration 49 m/s² | | | | | | |
| | Mounting | Flange-mounted | | | | | | |

[*1] Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

#### Torque-speed characteristics

R88M-K05030H/T (50 W)
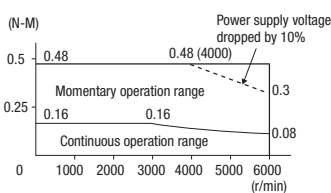


R88M-K10030H/T (100 W)
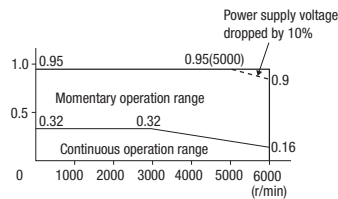


R88M-K20030H/T (200 W)
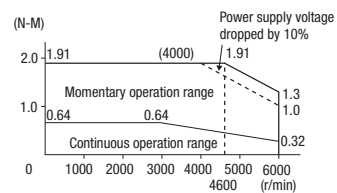


R88M-K40030H/T (400 W)
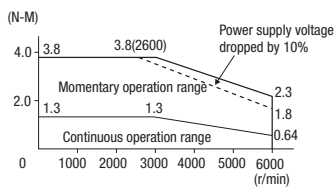


R88M-K75030H/T (750 W)
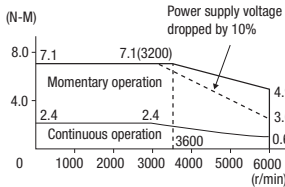


R88M-K1K030H/T (1 kW)
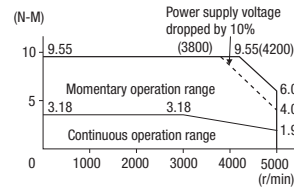


R88M-K1K530H/T (1.5 kW)
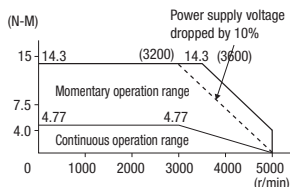
## Standard servo motors 3000 r/min, 400 V

### Ratings and specifications

| Voltage | | 400 V | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Servo motor model R88M-K□ | 20-bit incremental encoder | 75030F-□ | 1K030F-□ | 1K530F-□ | 2K030F-□ | 3K030F-□ | 4K030F-□ | 5K030F-□ |
| | 17-bit absolute encoder | 75030C-□ | 1K030C-□ | 1K530C-□ | 2K030C-□ | 3K030C-□ | 4K030C-□ | 5K030C-□ |
| Rated output | W | 750 | 1000 | 1500 | 2000 | 3000 | 4000 | 5000 |
| Rated torque | N·m | 2.39 | 3.18 | 4.77 | 6.37 | 9.55 | 12.7 | 15.9 |
| Instantaneous peak torque | N·m | 7.16 | 9.55 | 14.3 | 19.1 | 28.6 | 38.2 | 47.7 |
| Rated current | A (rms) | 2.4 | 3.3 | 4.2 | 5.7 | 9.2 | 9.9 | 12 |
| Instantaneous max. current | A (rms) | 10 | 14 | 18 | 24 | 39 | 42 | 51 |
| Rated speed | min⁻¹ | | | | 3000 | | | |
| Max. speed | min⁻¹ | | | 5000 | | | 4500 | |
| Torque constant | N·m/A | 0.78 | 0.75 | 0.89 | 0.87 | 0.81 | 0.98 | |
| Rotor moment of inertia (JM) | kg·m²×10⁻⁴ (without brake) | 1.61 | 2.03 | 2.84 | 3.68 | 6.5 | 12.9 | 17.4 |
| | kg·m²×10⁻⁴ (with brake) | 1.93 | 2.35 | 3.17 | 4.01 | 7.85 | 14.2 | 18.6 |
| Allowable load moment of inertia (JL) | Multiple of (JM) | 20*¹ | | | 15*¹ | | | |
| Rated power rate | kW/s (without brake) | 35.5 | 49.8 | 80.1 | 110 | 140 | 126 | 146 |
| | kW/s (with brake) | 29.6 | 43 | 71.8 | 101 | 116 | 114 | 136 |
| Allowable radial load | N | | | 490 | | | 784 | |
| Allowable thrust load | N | | | 196 | | | 343 | |
| Approx. mass | kg (without brake) | 3.1 | 3.5 | 4.4 | 5.3 | 8.3 | 11 | 14 |
| | kg (with brake) | 4.1 | 4.5 | 5.4 | 6.3 | 9.4 | 12.6 | 16 |

| Brake specifications | Rated voltage | | 24 VDC ±10% | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Holding brake moment of inertia J | kg·m²×10⁻⁴ | | | 0.33 | | | | 1.35 |
| | Power consumption (at 20°C) | W | 17 | | 19 | | | 22 | |
| | Current consumption (at 20°C) | A | 0.70±10% | | 0.81±10% | | | 0.90±10% | |
| | Static friction torque | N.m (minimum) | 2.5 | | 7.8 | | 11.8 | 16.1 | |
| | Rise time for holding torque | ms (max.) | | | 50 | | | 110 | |
| | Release time | ms (max) | | | 15 | | | 50 | |

| Basic specifications | Time Rating | Continuous |
|---|---|---|
| | Insulation class | Type F |
| | Ambient operating/ storage temperature | 0 to 40°C/–20 to 65°C |
| | Ambient operating/ storage humidity | 20% to 85% (non-condensing) |
| | Vibration class | V-15 |
| | Insulation resistance | 20 MΩ min. at 500 VDC between the power terminals and FG terminal |
| | Enclosure | Totally-enclosed, self-cooling, IP67(excluding shaft opening) |
| | Vibration resistance | Vibration acceleration 49 m/s² |
| | Mounting | Flange-mounted |

*¹ Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

### Torque-speed characteristics

R88M-K75030F/C (750 W)



R88M-K1K030F/C (1 kW)



R88M-K1K530F/C (1.5 kW)



R88M-K2K030F/C (2 kW)



R88M-K3K030F/C (3 kW)



R88M-K4K030F/C (4 kW)



R88M-K5K030F/C (5 kW)

## Standard servo motors 2000 r/min, 230 V/400 V

### Ratings and specifications

| Voltage | | 230 V | | 400 V | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Servo motor model R88M-K☐ | 20-bit incremental encoder | 1K020H-☐ | 1K520H-☐ | 40020F-☐ | 60020F-☐ | 1K020F-☐ | 1K520F-☐ | 2K020F-☐ | 3K020F-☐ | 4K020F-☐ | 5K020F-☐ |
| | 17-bit absolute encoder | 1K020T-☐ | 1K520T-☐ | 40020C-☐ | 60020C-☐ | 1K020C-☐ | 1K520C-☐ | 2K020C-☐ | 3K020C-☐ | 4K020C-☐ | 5K020C-☐ |
| Rated output | W | 1000 | 1500 | 400 | 600 | 1000 | 1500 | 2000 | 3000 | 4000 | 5000 |
| Rated torque | N·m | 4.77 | 7.16 | 1.91 | 2.86 | 4.77 | 7.16 | 9.55 | 14.3 | 19.1 | 23.9 |
| Instantaneous peak torque | N·m | 14.3 | 21.5 | 5.73 | 8.59 | 14.3 | 21.5 | 28.7 | 43 | 57.3 | 71.6 |
| Rated current | A (rms) | 5.7 | 9.4 | 1.2 | 1.5 | 2.8 | 4.7 | 5.9 | 8.7 | 10.6 | 13 |
| Instantaneous max. current | A (rms) | 24 | 40 | 4.9 | 6.5 | 12 | 20 | 25 | 37 | 45 | 55 |
| Rated speed | min⁻¹ | | | | | 2000 | | | | | |
| Max. speed | min⁻¹ | | | | | 3000 | | | | | |
| Torque constant | N·m/A | 0.63 | 0.58 | 1.27 | 1.38 | 1.27 | 1.16 | 1.27 | 1.18 | 1.40 | 1.46 |
| Rotor moment of inertia (JM) | kg·m²×10⁻⁴ (without brake) | 4.60 | 6.70 | 1.61 | 2.03 | 4.60 | 6.70 | 8.72 | 12.9 | 37.6 | 48 |
| | kg·m²×10⁻⁴ (with brake) | 5.90 | 7.99 | 1.90 | 2.35 | 5.90 | 7.99 | 10 | 14.2 | 38.6 | 48.8 |
| Max. load moment of inertia (JL) | Multiple of (JM) | | | | | 10*¹ | | | | | |
| Rated power rate | kW/s (without brake) | 49.5 | 76.5 | 22.7 | 40.3 | 49.5 | 76.5 | 105 | 159 | 97.1 | 119 |
| | kW/s (with brake) | 38.6 | 64.2 | 19.2 | 34.8 | 38.6 | 64.2 | 91.2 | 144 | 94.5 | 117 |
| Allowable radial load | N | | | | 490 | | | | | 784 | |
| Allowable thrust load | N | | | | 196 | | | | | 343 | |
| Approx. mass | kg (without brake) | 5.2 | 6.7 | 3.1 | 3.5 | 5.2 | 6.7 | 8 | 11 | 15.5 | 18.6 |
| | kg (with brake) | 6.7 | 8.2 | 4.1 | 4.5 | 6.7 | 8.2 | 9.5 | 12.6 | 18.7 | 21.8 |

| Brake specifications | Rated voltage | | 24 VDC ±10% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Holding brake moment inertia (J) kg·m²×10⁻⁴ | | | 1.35 | | | | | | 4.7 | | |
| | Power consumption (20°C) | W | 14 | 19 | 17 | | 14 | | 19 | | 22 | 31 |
| | Current consumption (20°C) | A | 0.59±10% | 0.79±10% | 0.70±10% | | 0.59±10% | | 0.79±10% | | 0.90±10% | 1.3±10% | 1.3±10% |
| | Static friction torque | N.m (minimum) | 4.9 | 13.7 | 2.5 | | 4.9 | | 13.7 | | 16.2 | 24.5 |
| | Rise time for holding torque | ms (max.) | 80 | 100 | 50 | | 80 | | 100 | | 110 | 80 |
| | Release time | ms (max) | 70 | 50 | 15 | | 70 | | 50 | | | 25 |

| Basic specifications | Time Rating | Continuous |
|---|---|---|
| | Insulation class | Type F |
| | Ambient operating/ storage temperature | 0 to 40°C/–20 to 85°C |
| | Ambient operating/ storage humidity | 20% to 85% (non-condensing) |
| | Vibration class | V-15 |
| | Insulation resistance | 20 MΩ min. at 500 VDC between the power terminals and FG terminal |
| | Enclosure | Totally-enclosed, self-cooling, IP67 (excluding shaft opening) |
| | Vibration resistance | Vibration acceleration 49 m/s² |
| | Mounting | Flange-mounted |

*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

### Torque-speed characteristics

R88M-K1K020H/T (230V, 1 kW)



R88M-K1K520H/T (230V, 1.5 kW)



R88M-K40020F/C (400V, 400 W)



R88M-K60020F/C (400V, 600 W)



R88M-K1K020F/C (400V, 1 kW)



R88M-K1K520F/C (400V, 1.5 kW)



R88M-K2K020F/C (400V, 2 kW)



R88M-K3K020F/C (400V, 3 kW)



R88M-K4K020F/C (400V, 4 kW)



R88M-K5K020F/C (400V, 5 kW)

## Standard servo motors 1500 r/min, 400 V

### Ratings and specifications

| Applied voltage | | 400 V | | |
|---|---|---|---|---|
| Servo motor model R88M-K☐ | 17-bit absolute encoder | 7K515C-☐ | 11K015C-☐ | 15K015C-☐ |
| Rated output | W | 7500 | 11000 | 15000 |
| Rated torque | N·m | 47.8 | 70.0 | 95.5 |
| Instantaneous peak torque | N·m | 119.0 | 175.0 | 224.0 |
| Rated current | A (rms) | 22.0 | 27.1 | 33.1 |
| Instantaneous max. current | A (rms) | 83 | 101 | 118 |
| Rated speed | min⁻¹ | | 1500 | |
| Max. speed | min⁻¹ | 3000 | 2000 | |
| Torque constant | N·m/A | 1.54 | 1.84 | 2.10 |
| Rotor moment of inertia (JM) | kg·m²×10⁻⁴ (without brake) | 101 | 212 | 302 |
| | kg·m²×10⁻⁴ (with brake) | 107 | 220 | 311 |
| Allowable load moment of inertia (JL) | Multiple of (JM) | | 10*1 | |
| Rated power rate | kW/s (without brake) | 226 | 231 | 302 |
| | kW/s (with brake) | 213 | 223 | 293 |
| Allowable radial load | N | 1176 | 2254 | |
| Allowable thrust load | N | 490 | 686 | |
| Approx. mass | kg (without brake) | 36.4 | 52.7 | 70.2 |
| | kg (with brake) | 40.4 | 58.9 | 76.3 |
| Brake specifications — Rated voltage | | 24VDC ±10% | | |
| Holding brake moment of inertia J | kg·m²×10⁻⁴ | 4.7 | 7.1 | |
| Power consumption (at 20°C) | W | 34 | 26 | |
| Current consumption (at 20°C) | A | 1.4±10% | 1.08±10% | |
| Static friction torque | N.m (minimum) | 58.8 | 100 | |
| Rise time for holding torque | ms (max.) | 150 | 300 | |
| Release time | ms (max) | 50 | 140 | |
| Basic specifications — Time Rating | | Continuous | | |
| Insulation class | | Type F | | |
| Ambient operating/ storage temperature | | 0 to 40°C/–20 to 65°C | | |
| Ambient operating/ storage humidity | | 20% to 85% RH (non-condensing) | | |
| Vibration class | | V-15 | | |
| Insulation resistance | | 20 MΩ min. at 500 VDC between the power terminals and FG terminal | | |
| Enclosure | | Totally-enclosed, self-cooling, IP67 (excluding shaft opening) | | |
| Vibration resistance | | Vibration acceleration 49 m/s² | | |
| Mounting | | Flange-mounted | | |

*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.
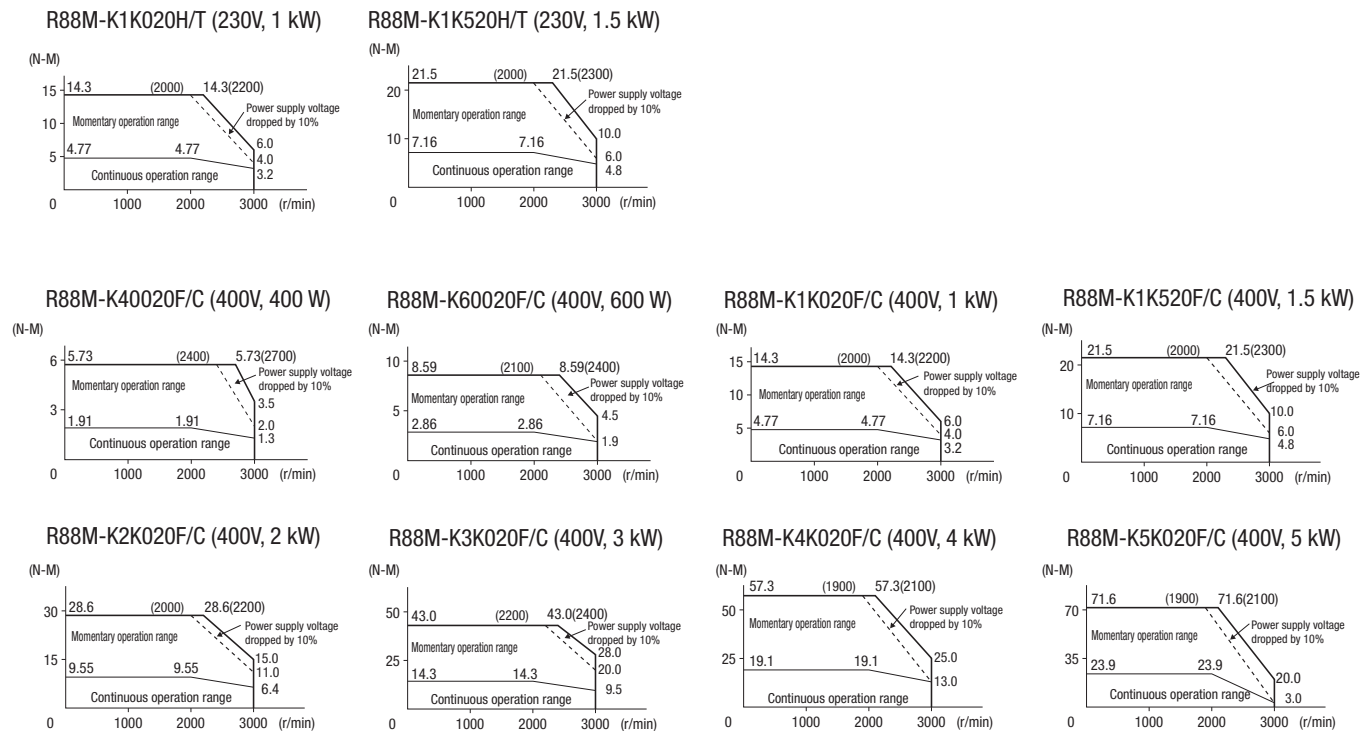
### Torque-speed characteristics

R88M-K7K515C (7.5 kW)



R88M-K11K015C (11 kW)



R88M-K15K015C (15 kW)

# OMRON

## Standard servo motors 1000 r/min, 230 V/400 V

### Ratings and specifications

| Applied voltage | | 230 V | 400 V | | | | |
|---|---|---|---|---|---|---|---|
| Servo motor model R88M-K□ | 20-bit incremental encoder | 90010H-□ | 90010F-□ | 2K010F-□ | 3K010F-□ | | |
| | 17-bit absolute encoder | 90010T-□ | 90010C-□ | 2K010C-□ | 3K010C-□ | 4K510C-□ | 6K010C-□ |
| Rated output | W | 900 | 900 | 2000 | 3000 | 4500 | 6000 |
| Rated torque | N·m | 8.59 | | 19.1 | 28.7 | 43.0 | 57.3 |
| Instantaneous peak torque | N·m | 19.3 | | 47.7 | 71.7 | 107.0 | 143.0 |
| Rated current | A (rms) | 7.6 | 3.8 | 8.5 | 11.3 | 14.8 | 19.4 |
| Instantaneous max. current | A (rms) | 24 | 12 | 30 | 40 | 55 | 74 |
| Rated speed | min⁻¹ | 1000 | | | | | |
| Max. speed | min⁻¹ | 2000 | | | | | |
| Torque constant | N·m/A | 0.86 | 1.72 | 1.76 | 1.92 | 2.05 | 2.08 |
| Rotor moment of inertia (JM) | kg·m²×10⁻⁴ (without brake) | 6.70 | | 30.3 | 48.4 | 79.1 | 101 |
| | kg·m²×10⁻⁴ (with brake) | 7.99 | | 31.4 | 49.2 | 84.4 | 107 |
| Allowable load moment of inertia (JL) | Multiple of (JM) | 10*1 | | | | | |
| Rated power rate | kW/s (without brake) | 110 | | 120 | 170 | 233 | 325 |
| | kW/s (with brake) | 92.4 | | 116 | 167 | 219 | 307 |
| Allowable radial load | N | 686 | | 1176 | 1470 | | 1764 |
| Allowable thrust load | N | 196 | | 490 | | | 588 |
| Approx. mass | kg (without brake) | 6.7 | | 14 | 20 | 29.4 | 36.4 |
| | kg (with brake) | 8.2 | | 17.5 | 23.5 | 33.3 | 40.4 |

| | | | |
|---|---|---|---|
| **Brake specifications** | Rated voltage | | 24VDC ±10% |
| | Holding brake moment of inertia J | kg·m²×10⁻⁴ | 1.35 … 4.7 |
| | Power consumption (at 20°C) | W | 19 … 31 … 34 |
| | Current consumption (at 20°C) | A | 0.79±10% … 1.3±10% … 1.4±10% |
| | Static friction torque | N.m (minimum) | 13.7 … 24.5 … 58.8 |
| | Rise time for holding torque | ms (max.) | 100 … 80 … 150 |
| | Release time | ms (max) | 50 … 25 … 50 |
| **Basic specifications** | Time Rating | | Continuous |
| | Insulation class | | Type F |
| | Ambient operating/ storage temperature | | 0 to 40°C/–20 to 65°C |
| | Ambient operating/ storage humidity | | 20% to 85% RH (non-condensing) |
| | Vibration class | | V-15 |
| | Insulation resistance | | 20 MΩ min. at 500 VDC between the power terminals and FG terminal |
| | Enclosure | | Totally-enclosed, self-cooling, IP67 (excluding shaft opening) |
| | Vibration resistance | | Vibration acceleration 49 m/s2 |
| | Mounting | | Flange-mounted |

*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

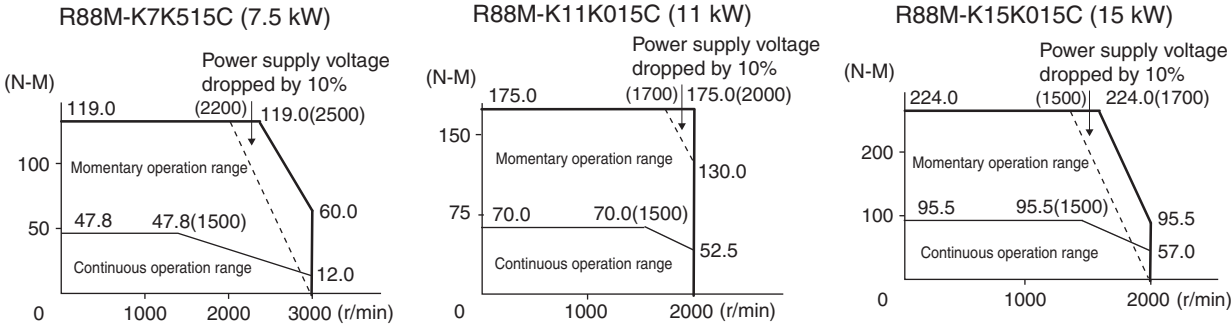### Torque-speed characteristics

R88M-K90010H/T/F/C



R88M-K2K010F/C



R88M-K3K010F/C



R88M-K4K510C



R88M-K6K010C

### High inertia servo motors 3000 r/min, 230 V

## Ratings and specifications

| Voltage | | 230 V | | |
|---|---|---|---|---|
| Servo motor model R88M-KH☐ | 20-bit incremental encoder | 20030H-☐ | 40030H-☐ | 75030H-☐ |
| | 17-bit absolute encoder | 20030T-☐ | 40030T-☐ | 75030T-☐ |
| Rated output | W | 200 | 400 | 750 |
| Rated torque | N·m | 0.64 | 1.3 | 2.4 |
| Instantaneous peak torque | N·m | 1.91 | 3.8 | 7.1 |
| Rated current | A (rms) | 1.6 | 2.6 | 4.0 |
| Instantaneous max. current | A (rms) | 6.9 | 11.0 | 17.0 |
| Rated speed | min$^{-1}$ | 3000 | | |
| Max. speed | min$^{-1}$ | 5000 | | 4500 |
| Torque constant | N·m/A | 0.29±10% | 0.36±10% | 0.45±10% |
| Rotor moment of inertia (JM) | kg·m$^2$×10$^{-4}$ (without brake) | 0.42 | 0.67 | 1.51 |
| | kg·m$^2$×10$^{-4}$ (with brake) | 0.45 | 0.70 | 1.61 |
| Allowable load moment of inertia (JL) | Multiple of (JM) | 30 [1] | | 20 [1] |
| Rated power rate | kW/s (without brake) | 9.58 | 24.1 | 37.7 |
| | kW/s (with brake) | 9.06 | 23.3 | 35.3 |
| Allowable radial load | N | 245 | | 392 |
| Allowable thrust load | N | 98 | | 147 |
| Approx. mass | kg (without brake) | 0.96 | 1.4 | 2.5 |
| | kg (with brake) | 1.4 | 1.8 | 3.3 |

| | | | | |
|---|---|---|---|---|
| Brake specifications | Rated voltage | 24 VDC ±5% | | |
| | Holding brake moment of inertia J kg·m$^2$×10$^{-4}$ | 0.018 | | 0.075 |
| | Power consumption (at 20°C) W | 9 | | 10 |
| | Current consumption (at 20°C) A | 0.36 | | 0.42 |
| | Static friction torque N.m (minimum) | 1.27 | | 2.45 |
| | Rise time for holding torque ms (max.) | 50 | | 70 |
| | Release time ms (max) | 15 | | 20 |
| Basic specifications | Time Rating | Continuous | | |
| | Insulation class | Type B | | |
| | Ambient operating/ storage temperature | 0 to 40°C/–20 to 65°C | | |
| | Ambient operating/ storage humidity | 20% to 85% RH (non-condensing) | | |
| | Vibration class | V-15 | | |
| | Insulation resistance | 20 MΩ min. at 500 VDC between the power terminals and FG terminal | | |
| | Enclosure | Totally-enclosed, self-cooling, IP65 (excluding shaft opening and lead wire ends) | | |
| | Vibration resistance | Vibration acceleration 49 m/s$^2$ | | |
| | Mounting | Flange-mounted | | |

[1] Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.
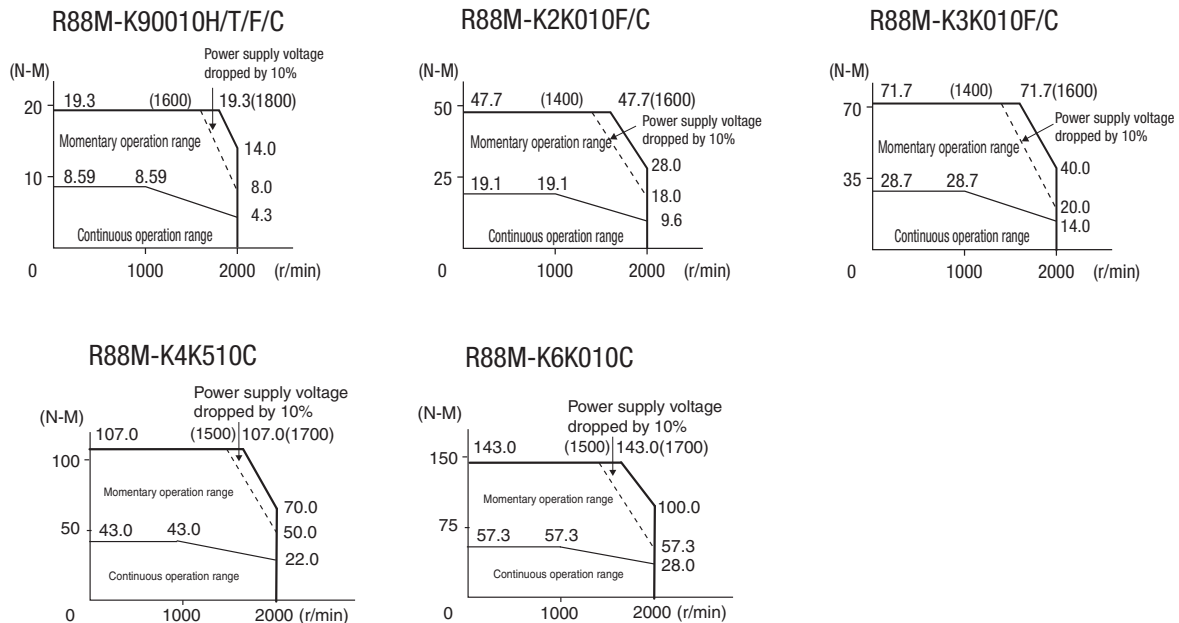
## Torque-speed characteristics

R88M-KH20030H/T (230 V, 200 W)
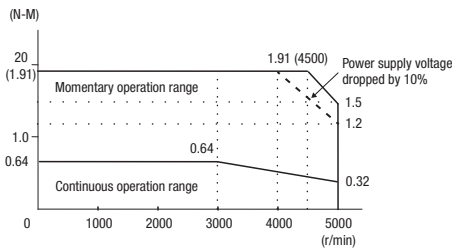


R88M-KH40030H/T (230 V, 400 W)
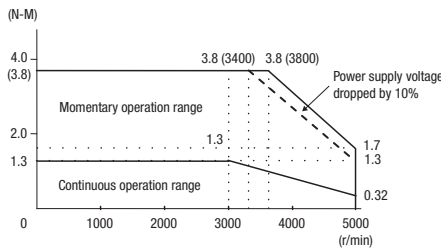


R88M-KH75030H/T (230 V, 750 W)

# OMRON
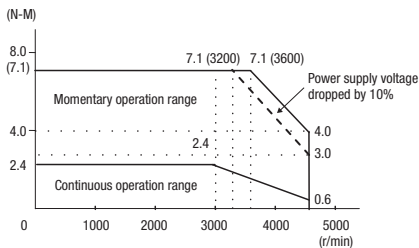
## High inertia servo motors 2000 and 1500 r/min, 400 V

### Ratings and specifications

| R/min, Voltage | | 2000r/min, 400 V | | | | | | 1500r/min, 400 V |
|---|---|---|---|---|---|---|---|---|
| Servo motor model R88M-KH☐ | 20-bit incremental encoder | 1K020F-☐ | 1K520F-☐ | 2K020F-☐ | 3K020F-☐ | 4K020F-☐ | 5K020F-☐ | |
| | 17-bit absolute encoder | 1K020C-☐ | 1K520C-☐ | 2K020C-☐ | 3K020C-☐ | 4K020C-☐ | 5K020C-☐ | 7K515C-☐ |
| Rated output | W | 1000 | 1500 | 2000 | 3000 | 4000 | 5000 | 7500 |
| Rated torque | N·m | 4.77 | 7.16 | 9.55 | 14.3 | 19.1 | 23.9 | 47.8 |
| Instantaneous peak torque | N·m | 14.3 | 21.5 | 28.6 | 43.0 | 57.3 | 71.6 | 119 |
| Rated current | A (rms) | 2.9 | 4.7 | 5.5 | 8.0 | 10.5 | 13.0 | 22.0 |
| Instantaneous max. current | A (rms) | 12 | 20 | 24 | 34 | 45 | 55 | 83 |
| Rated speed | min⁻¹ | | | | 2000 | | | 1500 |
| Max. speed | min⁻¹ | | | | 3000 | | | 3000 |
| Torque constant | N·m/A | 1.27 | 1.16 | 1.31 | 1.34 | 1.38 | 1.39 | 1.54 |
| Rotor moment of inertia (JM) | kg·m²×10⁻⁴ (without brake) | 24.7 | 37.1 | 57.8 | 90.2 | 112 | 162 | 273 |
| | kg·m²×10⁻⁴ (with brake) | 26.0 | 38.4 | 62.9 | 95.3 | 117 | 167 | 279 |
| Max. load moment of inertia (JL) | Multiple of (JM) | | | | 5 [*1] | | | |
| Rated power rate | kW/s (without brake) | 9.2 | 13.8 | 15.8 | 22.7 | 32.5 | 35.1 | 86.7 |
| | kW/s (with brake) | 8.8 | 13.4 | 14.5 | 21.5 | 31.1 | 34.1 | 85.1 |
| Allowable radial load | N | | 490 | | | 784 | | 1176 |
| Allowable thrust load | N | | 196 | | | 343 | | 490 |
| Approx. mass | kg (without brake) | 6.7 | 8.6 | 12.2 | 16.0 | 18.6 | 23.0 | 42.3 |
| | kg (with brake) | 8.1 | 10.1 | 15.5 | 19.2 | 21.8 | 26.2 | 46.2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Brake specifications | Rated voltage | 24 VDC ±10% | | | | | | |
| | Holding brake moment inertia (J) kg·m²×10⁻⁴ | | 1.35 | | | 4.7 | | |
| | Power consumption (20°C) W | 14 | 19 | | 31 | | | 34 |
| | Current consumption (20°C) A | 0.59±10% | 0.79±10% | | 1.30±10% | | | 1.40±10% |
| | Static friction torque N.m (minimum) | 4.9 | 13.7 | | 24.5 | | | 58.8 |
| | Rise time for holding torque ms (max.) | 80 | 100 | | 80 | | | 150 |
| | Release time ms (max) | 70 | 50 | | 25 | | | 50 |

| | | |
|---|---|---|
| Basic specifications | Time Rating | Continuous |
| | Insulation class | Type F |
| | Ambient operating/ storage temperature | 0 to 40°C/–20 to 65°C |
| | Ambient operating/ storage humidity | 20% to 85% RH (non-condensing) |
| | Vibration class | V-15 |
| | Insulation resistance | 20 MΩ min. at 500 VDC between the power terminals and FG terminal |
| | Enclosure | Totally-enclosed, self-cooling, IP67 (excluding shaft opening) |
| | Vibration resistance | Vibration acceleration 49 m/s² |
| | Mounting | Flange-mounted |

[*1] Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

## Torque-speed characteristics

R88M-KH1K020F/C (400V, 1 kW)
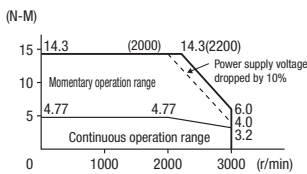
R88M-KH1K520F/C (400V, 1.5 kW)
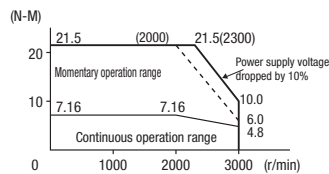
R88M-KH2K020F/C (400V, 2 kW)
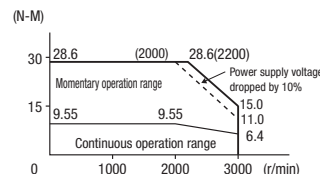
R88M-KH3K020F/C (400V, 3 kW)
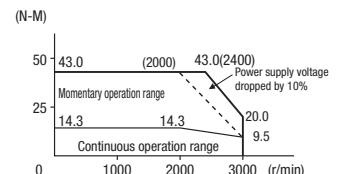
R88M-KH4K020F/C (400V, 4 kW)
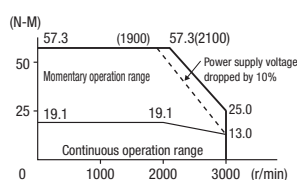
R88M-KH5K020F/C (400V, 5 kW)
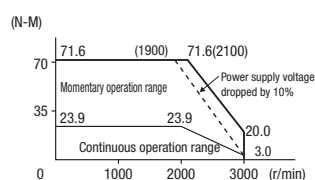
R88M-KH7K515C (7.5 kW)
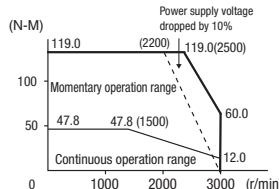
## Dimensions

### Standard servo motors

#### Type 3000 r/min motors (230 V, 50 to 100 W)

| Dimensions (mm) | Without brake | | With brake | | LN | Shaft end dimensions | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Model | LL | LM | LL | LM | | Tap × Depth | Without brake | With brake |
| R88M-K05030(H/T)-□S2 | 72 | 48 | 102 | 78 | 23 | M3 × 6L | 0.32 | 0.53 |
| R88M-K10030(H/T)-□S2 | 92 | 68 | 122 | 98 | 43 | | 0.47 | 0.68 |



Models with brake

Models without brake
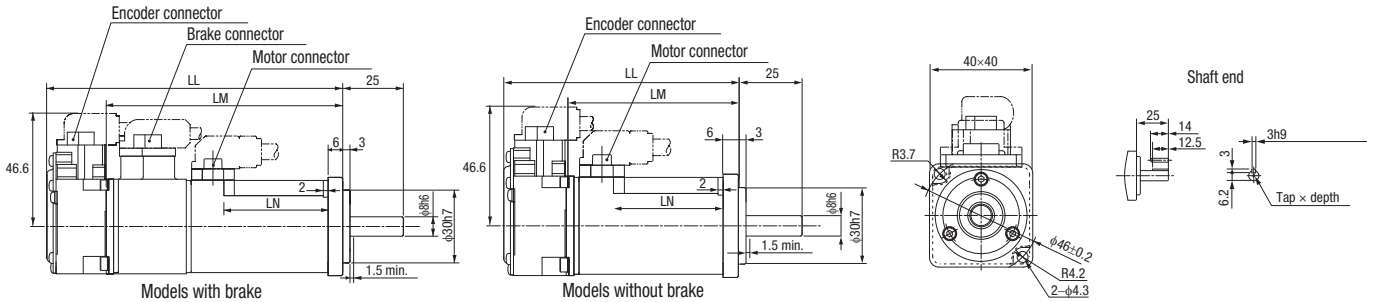
Shaft end

#### Type 3000 r/min motors (230 V, 200 to 750 W)

| Dimensions (mm) | Without brake | | | With brake | | | LR | Flange surface | | | | | | Shaft end dimensions | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | LL | LM | KL1 | LL | LM | KL1 | | LB | LC | LD | LE | LG | LZ | S | K | QK | H | B | T | Tap × Depth | Without brake | With brake |
| R88M-K20030(H/T)-□S2 | 79.5 | 56.5 | 52.5 | 116 | 93 | 52.5 | 30 | 50h7 | 60 | 70 | 3 | 6.5 | 4.5 | 11h6 | 20 | 18 | 8.5 | 4h9 | 4 | M4 × 8L | 0.82 | 1.3 |
| R88M-K40030(H/T)-□S2 | 99 | 76 | 52.5 | 135.5 | 112.5 | 52.5 | | | | | | | | 14h6 | 25 | 22.5 | 11 | 5h9 | 5 | M5 × 10L | 1.2 | 1.7 |
| R88M-K75030(H/T)-□S2 | 112.2 | 86.2 | 60 | 148.2 | 122.2 | 61.6 | 35 | 70h7 | 80 | 90 | | 8 | 6 | 19h6 | | 22 | 15.5 | 6h9 | 6 | | 2.3 | 3.1 |



Model with brake

Model without brake

Shaft end

#### Type 3000 r/min motors (230 V, 1 to 1.5 kW/400 V, 750 W to 5 kW)

| Dimensions (mm) | | Without brake | | | | | With brake | | | | | LR | Flange surface | | | | | | Shaft end dimensions | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model R88M-K□ | LL | LM | KB1 | KB2 | KL1 | LL | LM | KB1 | KB2 | KL1 | | LA | LB | LC | LD | LE | LG | S | Tap × Depth | K | QK | H | B | T | Without brake | With brake |
| 230 | 1K030(H/T)-□S2 | 141 | 97 | 66 | 119 | 101 | 168 | 124 | 66 | 146 | 101 | 55 | 135 | 95h7 | 100 | 115 | 3 | 10 | 19h6 | M5 × 12L | 45 | 42 | 15.5 | 6h9 | 6 | 3.5 | 4.5 |
| | 1K530(H/T)-□S2 | 159.5 | 115.5 | 84.5 | 137.5 | | 186.5 | 142.5 | 84.5 | 164.5 | | | | | | | | | | | | | | | | 4.4 | 5.4 |
| 400 | 75030(F/C)-□S2 | 131.5 | 87.5 | 56.5 | 109.5 | | 158.5 | 114.5 | 53.5 | 136.5 | 103 | | | | | | | | | | | | | | | 3.1 | 4.1 |
| | 1K030(F/C)-□S2 | 141 | 97 | 66 | 119 | | 168 | 124 | 63 | 146 | | | | | | | | | | | | | | | | 3.5 | 4.5 |
| | 1K530(F/C)-□S2 | 159.5 | 115.5 | 84.5 | 137.5 | | 186.5 | 142.5 | 81.5 | 164.5 | | | | | | | | | | | | | | | | 4.4 | 5.4 |
| | 2K030(F/C)-□S2 | 178.5 | 134.5 | 103.5 | 156.5 | | 205.5 | 161.5 | 100.5 | 183.5 | | | | | | | | | | | | | | | | 5.3 | 6.3 |
| | 3K030(F/C)-□S2 | 190 | 146 | 112 | 168 | 113 | 215 | 171 | 112 | 193 | 113 | | 162 | 110h7 | 120 | 145 | | 12 | 22h6 | | | 41 | 18 | 8h9 | 7 | 8.3 | 9.4 |
| | 4K030(F/C)-□S2 | 208 | 164 | 127 | 186 | 118 | 233 | 189 | 127 | 211 | 118 | 65 | 165 | | 130 | | 6 | | 24h6 | M8 × 20L | 55 | 51 | 20 | | | 11 | 12.6 |
| | 5K030(F/C)-□S2 | 243 | 199 | 162 | 221 | | 268 | 224 | 162 | 246 | | | | | | | | | | | | | | | | 14 | 16 |



Shaft end

**Accurax G5 rotary motor**
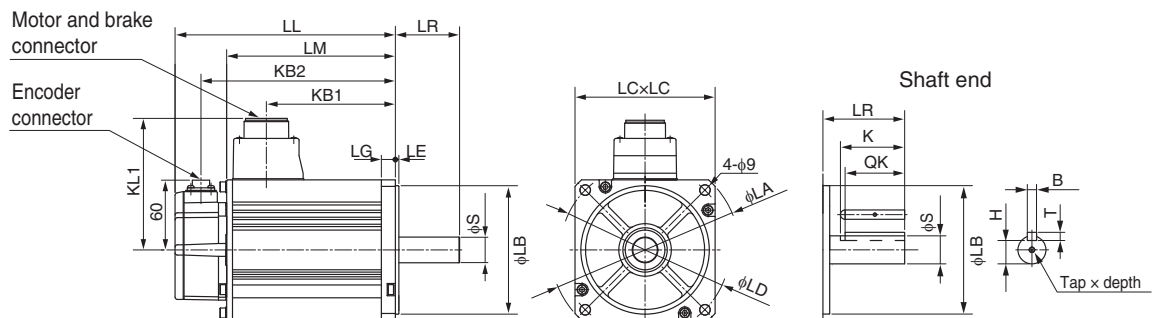
## Type 2000 r/min motors (230 V, 1 to 1.5 kW/400 V, 400 W to 5 kW)

| Dimensions (mm) | | Without brake | | | | | With brake | | | | | LR | Flange surface | | | | | | | Shaft end dimensions | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model R88M-K□ | LL | LM | KB1 | KB2 | KL1 | LL | LM | KB1 | KB2 | KL1 | | LA | LB | LC | LD | LE | LG | LZ | S | Tap × Depth | K | QK | H | B | T | Without brake | With brake |
| 230 | 1K020(H/T)-□S2 | 138 | 94 | 60 | 116 | 116 | 163 | 119 | 60 | 141 | 116 | 55 | 165 | 110h7 | 130 | 145 | 6 | 12 | 9 | 22h6 | M5× 12L | 45 | 41 | 18 | 8h9 | 7 | 5.2 | 6.7 |
| | 1K520(H/T)-□S2 | 155.5 | 111.5 | 77.5 | 133.5 | | 180.5 | 136.5 | 77.5 | 158.5 | | | | | | | | | | | | | | | | | 6.7 | 8.2 |
| 400 | 40020(F/C)-□S2 | 131.5 | 87.5 | 56.5 | 109.5 | 101 | 158.5 | 114.5 | 53.5 | 136.5 | 103 | | 135 | 95h7 | 100 | 115 | 3 | 10 | | 19h6 | | | 42 | 15.5 | 6h9 | 6 | 3.1 | 4.1 |
| | 60020(F/C)-□S2 | 141 | 97 | 66 | 119 | | 168 | 124 | 63 | 146 | | | | | | | | | | | | | | | | | 3.5 | 4.5 |
| | 1K020(F/C)-□S2 | 138 | 94 | 60 | 116 | 116 | 163 | 119 | 57 | 141 | 118 | | 165 | 110h7 | 130 | 145 | 6 | 12 | | 22h6 | | | 41 | 18 | 8h9 | 7 | 5.2 | 6.7 |
| | 1K520(F/C)-□S2 | 155.5 | 111.5 | 77.5 | 133.5 | | 180.5 | 136.5 | 74.5 | 158.5 | | | | | | | | | | | | | | | | | 6.7 | 8.2 |
| | 2K020(F/C)-□S2 | 173 | 129 | 95 | 151 | | 198 | 154 | 92 | 176 | | | | | | | | | | | | | | | | | 8 | 9.5 |
| | 3K020(F/C)-□S2 | 208 | 164 | 127 | 186 | 118 | 233 | 189 | 127 | 211 | | 65 | | | | | | | | 24h6 | M8× 20L | 55 | 51 | 20 | | | 11 | 12.6 |
| | 4K020(F/C)-□S2 | 177 | 133 | 96 | 155 | 140 | 202 | 158 | 96 | 180 | 140 | 70 | 233 | 114.3h7 | 176 | 200 | 3.2 | 18 | 13.5 | 35h6 | M12 × 25L | | 50 | 30 | 10h9 | 8 | 15.5 | 18.7 |
| | 5K020(F/C)-□S2 | 196 | 152 | 115 | 174 | | 221 | 177 | 115 | 199 | | | | | | | | | | | | | | | | | 18.6 | 21.8 |
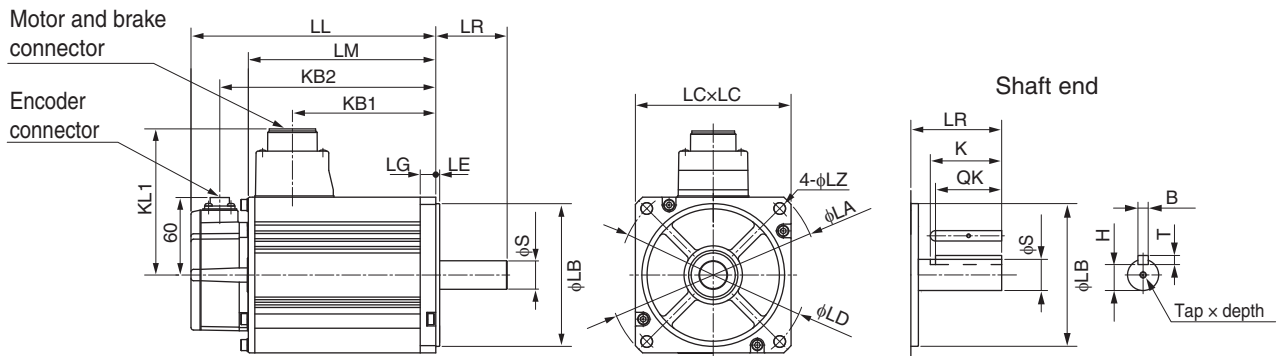
Motor and brake connector
Encoder connector
LL, LR, LM, KB2, KB1, LG, LE, KL1, 60, φS, φLB

LC×LC, 4-φLZ, φLA, φLD

Shaft end
LR, K, QK, φS, φLB, B, H, T, Tap × depth

## Type 1500 r/min motors (400 V, 7.5 kW)

| Dimensions (mm) | | Without brake | | | | | | | With brake | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model R88M-K□ | LL | LM | KB1 | KB2 | L1 | L2 | L3 | LL | LM | KB1 | KB2 | L1 | L2 | L3 | Whithout brake | With brake |
| 400 | 7K515C-□S2 | 312 | 268 | 219 | 290 | 117.5 | 117.5 | 149 | 337 | 293 | 253 | 315 | 117.5 | 152.5 | 183 | 36.4 | 40.4 |

Motor connector
Brake connector (for model with brake only)
Encoder connector
44, LL, LM, KB2, KB1, L3, L2, L1, 113, 48, 110, 61.5, 24, 3.2, 184, 60, 176×176, 43.5, 43.5, 2 min., Boss insertion positon, φ42h6, φ114.3h7

4-φ13.5, φ233, φ200

Shaft end
113, 96, 90, 45, M4, through, 12h9, 8, 37 0 -0.2, M16, φ114.3h7, (depth 32 min.)
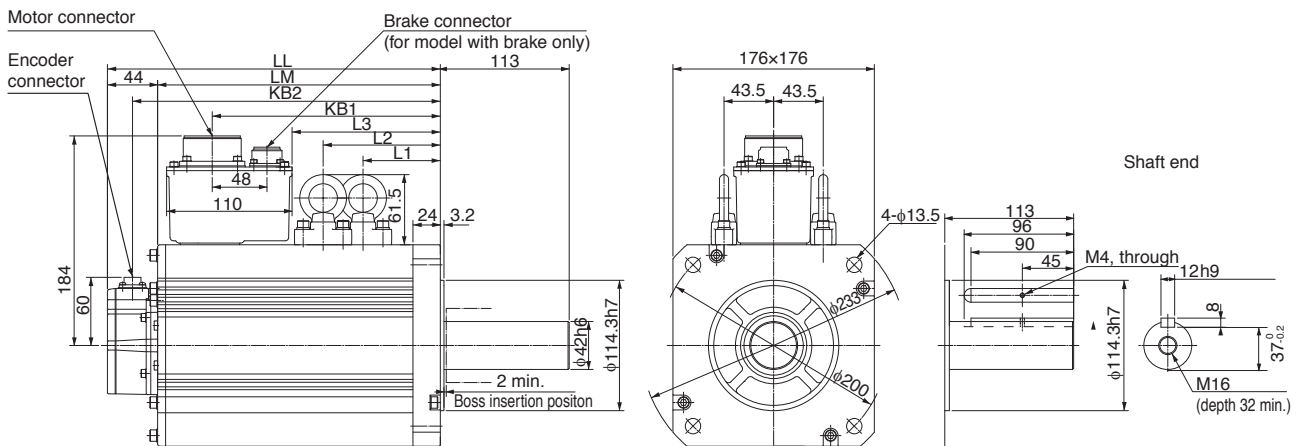
## Type 1500 r/min motors (400 V, 11 to 15 kW)

| Dimensions (mm) | | Without brake | | | | | | | With brake | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model<br>R88M-K□ | LL | LM | KB1 | KB2 | L1 | L2 | L3 | LL | LM | KB1 | KB2 | L1 | L2 | L3 | Whithout brake | With brake |
| 400 | 11K015C-□S2 | 316 | 272 | 232 | 294 | 124.5 | 124.5 | 162 | 364 | 320 | 266 | 342 | 124.5 | 159.5 | 196 | 52.7 | 58.9 |
| | 15K015C-□S2 | 384 | 340 | 300 | 362 | 158.5 | 158.5 | 230 | 432 | 388 | 334 | 410 | 158.5 | 193.5 | 264 | 70.2 | 76.3 |
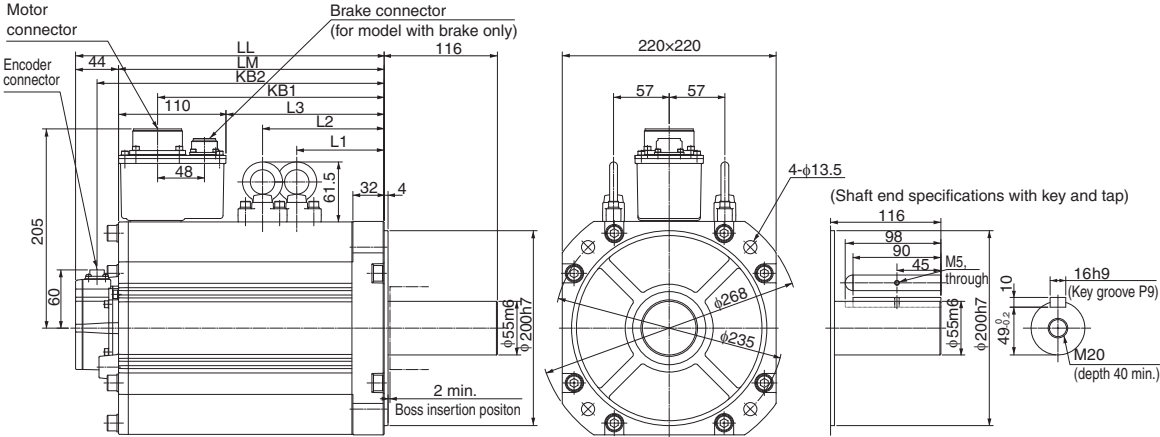


## Type 1000 r/min motors (230 V, 900 W/400 V, 900 W to 3 kW)

| Dimensions (mm) | | Without brake | | | | | With brake | | | | | LR | Flange surface | | | | | | | Shaft end dimensions | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model<br>R88M-K□ | LL | LM | KB1 | KB2 | KL1 | LL | LM | KB1 | KB2 | KL1 | | LA | LB | LC | LD | LE | LG | LZ | S | Tap×Depth | K | QK | H | B | T | Without brake | With brake |
| 230 | 90010(H/T)-□S2 | 155.5 | 111.5 | 77.5 | 133.5 | 116 | 180.5 | 136.5 | 77.5 | 158.5 | 116 | 70 | 165 | 110h7 | 130 | 145 | 6 | 12 | 9 | 22h6 | M5×12L | 45 | 41 | 18 | 8h9 | 7 | 6.7 | 8.2 |
| 400 | 90010(F/C)-□S2 | | | | | | | | 74.5 | | 118 | | | | | | | | | | | | | | | | | |
| | 2K010(F/C)-□S2 | 163.5 | 119.5 | 82.5 | 141.5 | 140 | 188.5 | 144.5 | 82.5 | 166.5 | 140 | 80 | 233 | 114.3h7 | 176 | 200 | 3.2 | 18 | 13.5 | 35h6 | M12×25L | 55 | 50 | 30 | 10h9 | 8 | 14 | 17.5 |
| | 3K010(F/C)-□S2 | 209.5 | 165.5 | 128.5 | 187.5 | | 234.5 | 190.5 | 128.5 | 212.5 | | | | | | | | | | | | | | | | | 20 | 23.5 |

# OMRON
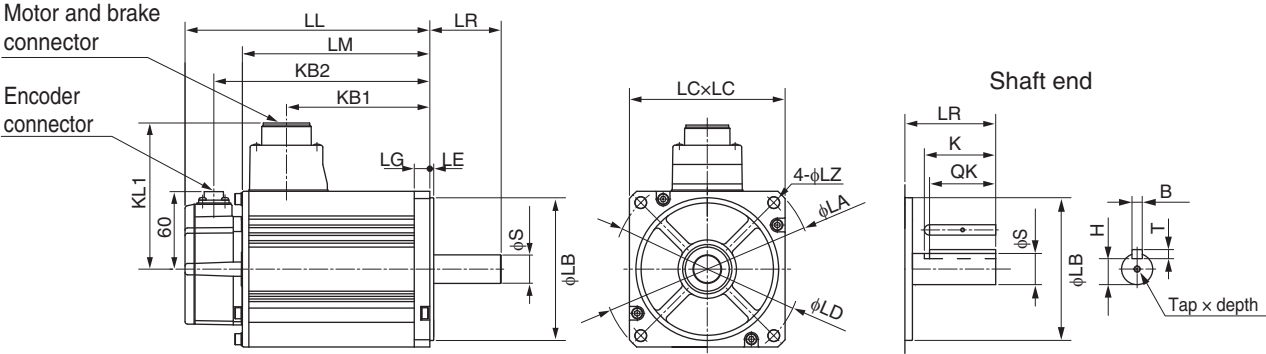
## Type 1000 r/min motors (400 V, 4.5 kW)

| Dimensions (mm) | | Without brake | | | | | | With brake | | | | | | Approx. mass (Kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model R88M-K▯ | LL | LM | KB1 | KB2 | L1 | L2 | LL | LM | KB1 | KB2 | L1 | L2 | Without brake | With brake |
| 400 | 4K510C-▯S2 | 266 | 222 | 185 | 244 | 98 | 98 | 291 | 247 | 185 | 269 | 98 | 133 | 29.4 | 33.3 |
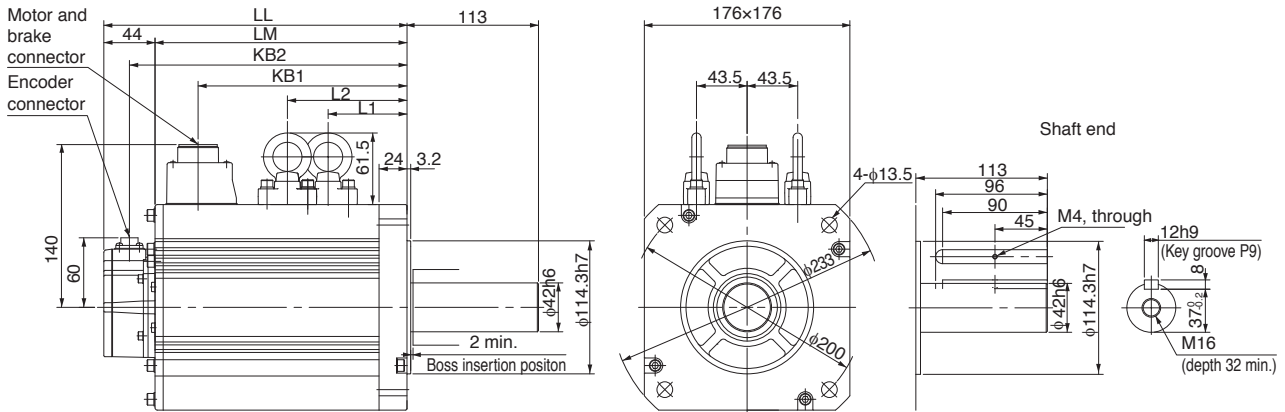


## Type 1000 r/min motors (400 V, 6 kW)

| Dimensions (mm) | | Without brake | | | | | | | With brake | | | | | | | Approx. mass (Kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model R88M-K▯ | LL | LM | KB1 | KB2 | L1 | L2 | L3 | LL | LM | KB1 | KB2 | L1 | L2 | L3 | Without brake | With brake |
| 400 | 6K010C-▯S2 | 312 | 268 | 219 | 290 | 117.5 | 117.5 | 149 | 337 | 293 | 253 | 315 | 117.5 | 152.5 | 183 | 36.4 | 40.4 |

## High inertia servo motors

### Type 3000 r/min motors (230 V, 200 W to 750 W)

| Voltage | Model R88M-KH□ | Without brake | | With brake | | KB1 | LR | Flange surface | | | | | Shaft end dimensions | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | LL | L | LL | | | LA | LB | LC | LG | LZ | S | Tap x Depth | K | QK | H | B | T | Without brake | With brake |
| 230 | 20030(H/T)-□S2-D | 129 | 99 | 165.5 | 135.5 | 42 | 30 | 70 | 50h7 | 60 | 6.5 | 4.5 | 11h6 | M4×8L | 20 | 18 | 8.5 | 4h9 | 4 | 0.96 | 1.4 |
| | 40030(H/T)-□S2-D | 148.5 | 118.5 | 185 | 155 | 61.5 | | | | | | | 14h6 | M5×10L | 25 | 22.5 | 11 | 5h9 | 5 | 1.4 | 1.8 |
| | 75030(H/T)-□S2-D | 162.2 | 127.2 | 199.2 | 164.2 | 67.2 | 35 | 90 | 70h7 | 80 | 8 | 6 | 19h6 | M5×10L | 25 | 22 | 15.5 | 6h9 | 6 | 2.5 | 3.3 |
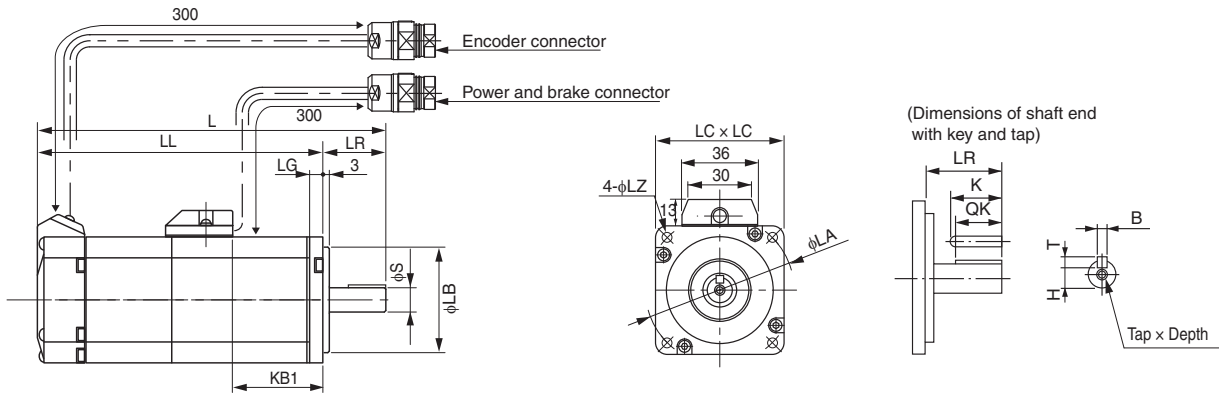


Encoder connector wiring
Cable length 300±30
Connector optional
Made by Hypertac
SRUC-17G-MRWN040 (MALE)

| Encoder connector | |
|---|---|
| Pin No. | Signal |
| 1 | BAT - (0 V) |
| 2 | BAT + |
| 3 | S + |
| 4 | S - |
| 5 to 7 | Free |
| 8 | E5V (power supply) |
| 9 | E0V (power supply) |
| 10 to 17 | Free |
| Connector case | FG (Ground) |

*Note: Pins 1 and 2 used only for motors with ABS encoder.

Mating connector:
Plug type: SPOC-17H-FRON169 (FEMALE)

Power and brake connector wiring
Cable length 300±30
Connector optional
Made by Hypertac
SRUC-06J-MSCN236 (MALE)
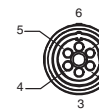
| Power and brake connector | |
|---|---|
| Pin No. | Output |
| 1 | Phase U |
| 2 | Phase V |
| 3 | Phase W |
| 4 | *Brake terminal |
| 5 | *Brake terminal |
| 6 | FG (ground) |

*Note: Pins 4 and 5 used only for motors with brake.

Mating connector:
Plug type: SPOC-06K-FSDN169 (FEMALE)

### Type 2000 r/min motors (400 V, 1 kW to 5 kW)

| Voltage | Model R88M-KH□ | Without brake | | | | | With brake | | | | | LR | Flange surface | | | | | | | Shaft end dimensions | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LL | LM | KB1 | KB2 | KL1 | LL | LM | KB1 | KB2 | KL1 | | LA | LB | LC | LD | LE | LG | LZ | S | K | QK | H | B | T | Without brake | With brake |
| 400 | 1K020(F/C)-□S1 | 173 | 129 | 95 | 151 | 116 | 201 | 157 | 92 | 179 | 118 | 70 | 165 | 110h7 | 130 | 145 | 6 | 12 | 9 | 22h6 | 45 | 41 | 18 | 8h9 | 7 | 6.7 | 8.1 |
| | 1K520(F/C)-□S1 | 190.5 | 146.5 | 112.5 | 168.5 | | 218.5 | 174.5 | 109.5 | 196.5 | | | | | | | | | | | | | | | | | 8.6 | 10.1 |
| | 2K020(F/C)-□S1 | 177 | 133 | 96 | 155 | 140 | 206 | 162 | 96 | 184 | 140 | 80 | 233 | 114.3h7 | 176 | 200 | 3.2 | 18 | 13.5 | 35h6 | 55 | 50 | 30 | 10h9 | 8 | 12.2 | 15.5 |
| | 3K020(F/C)-□S1 | 196 | 152 | 115 | 174 | | 225 | 181 | 115 | 203 | | | | | | | | | | | | | | | | | 16.0 | 19.2 |
| | 4K020(F/C)-□S1 | 209.5 | 165.5 | 128.5 | 187.5 | | 238.5 | 194.5 | 128.5 | 216.5 | | | | | | | | | | | | | | | | | 18.6 | 21.8 |
| | 5K020(F/C)-□S1 | 238.5 | 194.5 | 157.5 | 216.5 | | 267.5 | 223.5 | 157.5 | 245.5 | | | | | | | | | | | | | | | | | 23.0 | 26.2 |

# OMRON

## Type 1500 r/min motors (400 V, 7.5 kW)

| Dimensions (mm) | | Without brake | | | | | | | With brake | | | | | | | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Model<br><br>R88M-KH☐ | LL | LM | KB1 | KB2 | L1 | L2 | L3 | LL | LM | KB1 | KB2 | L1 | L2 | L3 | Without brake | With brake |
| 400 | 7K515C-☐S1 | 357 | 313 | 264 | 335 | 146.5 | 146.5 | 194 | 382 | 338 | 298 | 360 | 146.5 | 181.5 | 228 | 42.3 | 46.2 |
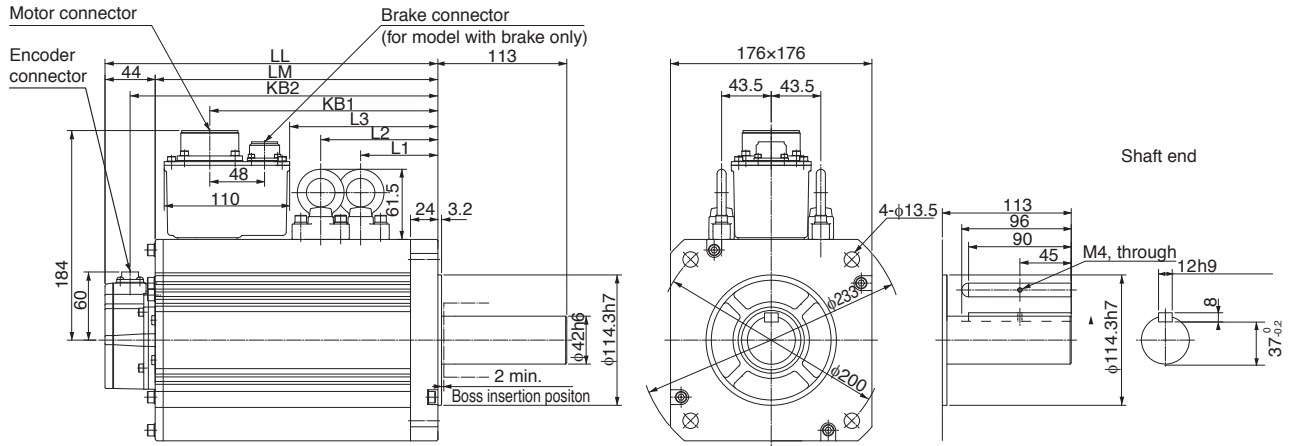
## Ordering information
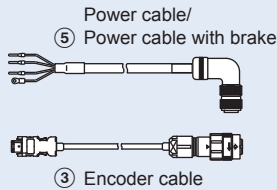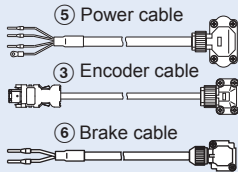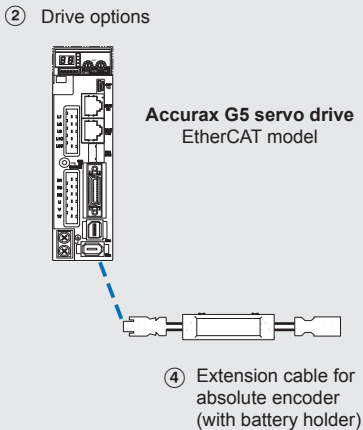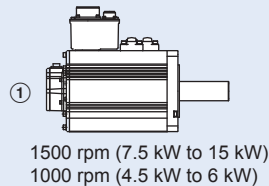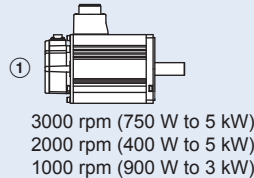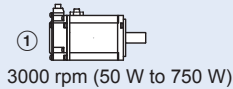
**Standard servo motors**

⑤ Power cable

③ Encoder cable

⑥ Brake cable

① 3000 rpm (50 W to 750 W)

② Drive options

**Accurax G5 servo drive**
EtherCAT model

Power cable/
⑤ Power cable with brake

③ Encoder cable

① 3000 rpm (750 W to 5 kW)
2000 rpm (400 W to 5 kW)
1000 rpm (900 W to 3 kW)

① 1500 rpm (7.5 kW to 15 kW)
1000 rpm (4.5 kW to 6 kW)

④ Extension cable for absolute encoder (with battery holder)

**High inertia servo motors**

Power cable/
⑤ Power cable with brake

③ Encoder cable

① 3000 rpm (200 W to 750 W)

Power cable/
⑤ Power cable with brake

③ Encoder cable

① 2000 rpm (1 kW to 5 kW)

① 1500 rpm (7.5 kW)
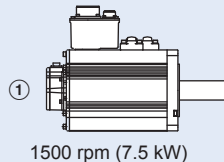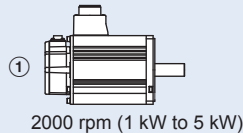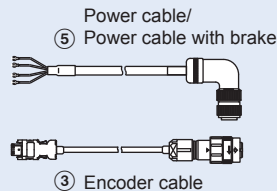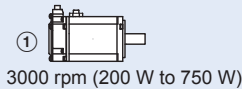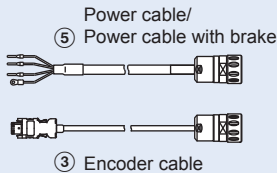
**Note:** The symbols ①②③... show the recommended sequence to select the servo motor and cables

**Servo motor**

① Select motor from R88M-K or R88M-KH families using motor tables in next pages.

**Servo drive**

② Refer to Accurax G5 servo drive chapter for detailed drive specifications and selection of drive accessories.

# OMRON

## Standard servo motors

### Servo motors 3000 r/min (50 to 5000 W)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 230 V | Incremental encoder (20 bit)\n\nStraight shaft with key and tap | Without brake | 0.16 Nm | 50 W | R88M-K05030H-S2 | R88D-KN01H-ECT |
| | | | | 0.32 Nm | 100 W | R88M-K10030H-S2 | R88D-KN01H-ECT |
| | | | | 0.64 Nm | 200 W | R88M-K20030H-S2 | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-K40030H-S2 | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-K75030H-S2 | R88D-KN08H-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030H-S2 | R88D-KN15H-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530H-S2 | R88D-KN15H-ECT |
| 230 V (50 to 750 W) | | | With brake | 0.16 Nm | 50 W | R88M-K05030H-BS2 | R88D-KN01H-ECT |
| | | | | 0.32 Nm | 100 W | R88M-K10030H-BS2 | R88D-KN01H-ECT |
| | | | | 0.64 Nm | 200 W | R88M-K20030H-BS2 | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-K40030H-BS2 | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-K75030H-BS2 | R88D-KN08H-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030H-BS2 | R88D-KN15H-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530H-BS2 | R88D-KN15H-ECT |
| | | Absolute encoder (17 bit)\n\nStraight shaft with key and tap | Without brake | 0.16 Nm | 50 W | R88M-K05030T-S2 | R88D-KN01H-ECT |
| | | | | 0.32 Nm | 100 W | R88M-K10030T-S2 | R88D-KN01H-ECT |
| | | | | 0.64 Nm | 200 W | R88M-K20030T-S2 | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-K40030T-S2 | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-K75030T-S2 | R88D-KN08H-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030T-S2 | R88D-KN15H-ECT |
| 230 V (1 kW to 1.5 kW)\n400 V (750 W to 5 kW) | | | | 4.77 Nm | 1500 W | R88M-K1K530T-S2 | R88D-KN15H-ECT |
| | | | With brake | 0.16 Nm | 50 W | R88M-K05030T-BS2 | R88D-KN01H-ECT |
| | | | | 0.32 Nm | 100 W | R88M-K10030T-BS2 | R88D-KN01H-ECT |
| | | | | 0.64 Nm | 200 W | R88M-K20030T-BS2 | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-K40030T-BS2 | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-K75030T-BS2 | R88D-KN08H-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030T-BS2 | R88D-KN15H-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530T-BS2 | R88D-KN15H-ECT |
| | 400 V | Incremental encoder (20 bit)\n\nStraight shaft with key and tap | Without brake | 2.39 Nm | 750 W | R88M-K75030F-S2 | R88D-KN10F-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030F-S2 | R88D-KN15F-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530F-S2 | R88D-KN15F-ECT |
| | | | | 6.37 Nm | 2000 W | R88M-K2K030F-S2 | R88D-KN20F-ECT |
| | | | | 9.55 Nm | 3000 W | R88M-K3K030F-S2 | R88D-KN30F-ECT |
| | | | | 12.7 Nm | 4000 W | R88M-K4K030F-S2 | R88D-KN50F-ECT |
| | | | | 15.9 Nm | 5000 W | R88M-K5K030F-S2 | R88D-KN50F-ECT |
| | | | With brake | 2.39 Nm | 750 W | R88M-K75030F-BS2 | R88D-KN10F-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030F-BS2 | R88D-KN15F-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530F-BS2 | R88D-KN15F-ECT |
| | | | | 6.37 Nm | 2000 W | R88M-K2K030F-BS2 | R88D-KN20F-ECT |
| | | | | 9.55 Nm | 3000 W | R88M-K3K030F-BS2 | R88D-KN30F-ECT |
| | | | | 12.7 Nm | 4000 W | R88M-K4K030F-BS2 | R88D-KN50F-ECT |
| | | | | 15.9 Nm | 5000 W | R88M-K5K030F-BS2 | R88D-KN50F-ECT |
| | | Absolute encoder (17 bit)\n\nStraight shaft with key and tap | Without brake | 2.39 Nm | 750 W | R88M-K75030C-S2 | R88D-KN10F-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030C-S2 | R88D-KN15F-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530C-S2 | R88D-KN15F-ECT |
| | | | | 6.37 Nm | 2000 W | R88M-K2K030C-S2 | R88D-KN20F-ECT |
| | | | | 9.55 Nm | 3000 W | R88M-K3K030C-S2 | R88D-KN30F-ECT |
| | | | | 12.7 Nm | 4000 W | R88M-K4K030C-S2 | R88D-KN50F-ECT |
| | | | | 15.9 Nm | 5000 W | R88M-K5K030C-S2 | R88D-KN50F-ECT |
| | | | With brake | 2.39 Nm | 750 W | R88M-K75030C-BS2 | R88D-KN10F-ECT |
| | | | | 3.18 Nm | 1000 W | R88M-K1K030C-BS2 | R88D-KN15F-ECT |
| | | | | 4.77 Nm | 1500 W | R88M-K1K530C-BS2 | R88D-KN15F-ECT |
| | | | | 6.37 Nm | 2000 W | R88M-K2K030C-BS2 | R88D-KN20F-ECT |
| | | | | 9.55 Nm | 3000 W | R88M-K3K030C-BS2 | R88D-KN30F-ECT |
| | | | | 12.7 Nm | 4000 W | R88M-K4K030C-BS2 | R88D-KN50F-ECT |
| | | | | 15.9 Nm | 5000 W | R88M-K5K030C-BS2 | R88D-KN50F-ECT |

## Servo motors 2000 r/min (1 to 5 kW)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 230 V | Incremental encoder (20 bit)<br><br>Straight shaft with key and tap | Without brake | 4.77 Nm | 1000 W | R88M-K1K020H-S2 | R88D-KN10H-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520H-S2 | R88D-KN15H-ECT |
| | | | With brake | 4.77 Nm | 1000 W | R88M-K1K020H-BS2 | R88D-KN10H-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520H-BS2 | R88D-KN15H-ECT |
| | | Absolute encoder (17 bit)<br><br>Straight shaft with key and tap | Without brake | 4.77 Nm | 1000 W | R88M-K1K020T-S2 | R88D-KN10H-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520T-S2 | R88D-KN15H-ECT |
| | | | With brake | 4.77 Nm | 1000 W | R88M-K1K020T-BS2 | R88D-KN10H-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520T-BS2 | R88D-KN15H-ECT |
| | 400 V | Incremental encoder (20 bit)<br><br>Straight shaft with key and tap | Without brake | 1.91 Nm | 400 W | R88M-K40020F-S2 | R88D-KN06F-ECT |
| | | | | 2.86 Nm | 600 W | R88M-K60020F-S2 | R88D-KN06F-ECT |
| | | | | 4.77 Nm | 1000 W | R88M-K1K020F-S2 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520F-S2 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-K2K020F-S2 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-K3K020F-S2 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-K4K020F-S2 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-K5K020F-S2 | R88D-KN50F-ECT |
| | | | With brake | 1.91 Nm | 400 W | R88M-K40020F-BS2 | R88D-KN06F-ECT |
| | | | | 2.86 Nm | 600 W | R88M-K60020F-BS2 | R88D-KN06F-ECT |
| | | | | 4.77 Nm | 1000 W | R88M-K1K020F-BS2 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520F-BS2 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-K2K020F-BS2 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-K3K020F-BS2 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-K4K020F-BS2 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-K5K020F-BS2 | R88D-KN50F-ECT |
| | | Absolute encoder (17 bit)<br><br>Straight shaft with key and tap | Without brake | 1.91 Nm | 400 W | R88M-K40020C-S2 | R88D-KN06F-ECT |
| | | | | 2.86 Nm | 600 W | R88M-K60020C-S2 | R88D-KN06F-ECT |
| | | | | 4.77 Nm | 1000 W | R88M-K1K020C-S2 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520C-S2 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-K2K020C-S2 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-K3K020C-S2 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-K4K020C-S2 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-K5K020C-S2 | R88D-KN50F-ECT |
| | | | With brake | 1.91 Nm | 400 W | R88M-K40020C-BS2 | R88D-KN06F-ECT |
| | | | | 2.86 Nm | 600 W | R88M-K60020C-BS2 | R88D-KN06F-ECT |
| | | | | 4.77 Nm | 1000 W | R88M-K1K020C-BS2 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-K1K520C-BS2 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-K2K020C-BS2 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-K3K020C-BS2 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-K4K020C-BS2 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-K5K020C-BS2 | R88D-KN50F-ECT |

## Servo motors 1500 r/min (7.5 to 15 KW)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 400 V | Absolute encoder (17 bit)<br><br>Straight shaft with key and tap | Without brake | 47.8 Nm | 7500 W | R88M-K7K515C-S2 | R88D-KN75F-ECT |
| | | | | 70.0 Nm | 11000 W | R88M-K11K015C-S2 | R88D-KN150F-ECT |
| | | | | 95.5 Nm | 15000 W | R88M-K15K015C-S2 | R88D-KN150F-ECT |
| | | | With brake | 47.8 Nm | 7500 W | R88M-K7K515C-BS2 | R88D-KN75F-ECT |
| | | | | 70.0 Nm | 11000 W | R88M-K11K015C-BS2 | R88D-KN150F-ECT |
| | | | | 95.5 Nm | 15000 W | R88M-K15K015C-BS2 | R88D-KN150F-ECT |

### Servo motors 1000 r/min (900 to 6000 W)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 230 V | Incremental encoder (20 bit) Straight shaft with key and tap | No brake | 8.59 Nm | 900 W | R88M-K90010H-S2 | R88D-KN15H-ECT |
| | | | With brake | 8.59 Nm | 900 W | R88M-K90010H-BS2 | R88D-KN15H-ECT |
| | | Absolute encoder (17 bit) Straight shaft with key and tap | No brake | 8.59 Nm | 900 W | R88M-K90010T-S2 | R88D-KN15H-ECT |
| | | | With brake | 8.59 Nm | 900 W | R88M-K90010T-BS2 | R88D-KN15H-ECT |
| | 400 V | Incremental encoder (20 bit) Straight shaft with key and tap | No brake | 8.59 Nm | 900 W | R88M-K90010F-S2 | R88D-KN15F-ECT |
| | | | | 19.1 Nm | 2000 W | R88M-K2K010F-S2 | R88D-KN30F-ECT |
| | | | | 28.7 Nm | 3000 W | R88M-K3K010F-S2 | R88D-KN50F-ECT |
| | | | With brake | 8.59 Nm | 900 W | R88M-K90010F-BS2 | R88D-KN15F-ECT |
| | | | | 19.1 Nm | 2000 W | R88M-K2K010F-BS2 | R88D-KN30F-ECT |
| | | | | 28.7 Nm | 3000 W | R88M-K3K010F-BS2 | R88D-KN50F-ECT |
| | | Absolute encoder (17 bit) Straight shaft with key and tap | No brake | 8.59 Nm | 900 W | R88M-K90010C-S2 | R88D-KN15F-ECT |
| | | | | 19.1 Nm | 2000 W | R88M-K2K010C-S2 | R88D-KN30F-ECT |
| | | | | 28.7 Nm | 3000 W | R88M-K3K010C-S2 | R88D-KN50F-ECT |
| | | | | 43.0 Nm | 4500 W | R88M-K4K510C-S2 | R88D-KN50F-ECT |
| | | | | 57.3 Nm | 6000 W | R88M-K6K010C-S2 | R88D-KN75F-ECT |
| | | | With brake | 8.59 Nm | 900 W | R88M-K90010C-BS2 | R88D-KN15F-ECT |
| | | | | 19.1 Nm | 2000 W | R88M-K2K010C-BS2 | R88D-KN30F-ECT |
| | | | | 28.7 Nm | 3000 W | R88M-K3K010C-BS2 | R88D-KN50F-ECT |
| | | | | 43.0 Nm | 4500 W | R88M-K4K510C-BS2 | R88D-KN50F-ECT |
| | | | | 57.3 Nm | 6000 W | R88M-K6K010C-BS2 | R88D-KN75F-ECT |

900 W to 3 kW

4.5 kW to 6 kW

## High inertia servo motors

### Servo motors 3000 r/min (200 to 750 W)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 230 V | Incremental encoder (20 bit) Straight shaft with key and tap | Without brake | 0.64 Nm | 200 W | R88M-KH20030H-S2-D | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-KH40030H-S2-D | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-KH75030H-S2-D | R88D-KN08H-ECT |
| | | | With brake | 0.64 Nm | 200 W | R88M-KH20030H-BS2-D | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-KH40030H-BS2-D | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-KH75030H-BS2-D | R88D-KN08H-ECT |
| | | Absolute encoder (17 bit) Straight shaft with key and tap | Without brake | 0.64 Nm | 200 W | R88M-KH20030T-S2-D | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-KH40030T-S2-D | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-KH75030T-S2-D | R88D-KN08H-ECT |
| | | | With brake | 0.64 Nm | 200 W | R88M-KH20030T-BS2-D | R88D-KN02H-ECT |
| | | | | 1.3 Nm | 400 W | R88M-KH40030T-BS2-D | R88D-KN04H-ECT |
| | | | | 2.4 Nm | 750 W | R88M-KH75030T-BS2-D | R88D-KN08H-ECT |

### Servo motors 2000 r/min (1 to 5 kW)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 400 V | Incremental encoder (20 bit) Shaft end with key | Without brake | 4.77 Nm | 1000 W | R88M-KH1K020F-S1 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-KH1K520F-S1 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-KH2K020F-S1 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-KH3K020F-S1 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-KH4K020F-S1 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-KH5K020F-S1 | R88D-KN50F-ECT |
| | | | With brake | 4.77 Nm | 1000 W | R88M-KH1K020F-BS1 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-KH1K520F-BS1 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-KH2K020F-BS1 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-KH3K020F-BS1 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-KH4K020F-BS1 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-KH5K020F-BS1 | R88D-KN50F-ECT |
| | | Absolute encoder (17 bit) Shaft end with key | Without brake | 4.77 Nm | 1000 W | R88M-KH1K020C-S1 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-KH1K520C-S1 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-KH2K020C-S1 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-KH3K020C-S1 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-KH4K020C-S1 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-KH5K020C-S1 | R88D-KN50F-ECT |
| | | | With brake | 4.77 Nm | 1000 W | R88M-KH1K020C-BS1 | R88D-KN10F-ECT |
| | | | | 7.16 Nm | 1500 W | R88M-KH1K520C-BS1 | R88D-KN15F-ECT |
| | | | | 9.55 Nm | 2000 W | R88M-KH2K020C-BS1 | R88D-KN20F-ECT |
| | | | | 14.3 Nm | 3000 W | R88M-KH3K020C-BS1 | R88D-KN30F-ECT |
| | | | | 19.1 Nm | 4000 W | R88M-KH4K020C-BS1 | R88D-KN50F-ECT |
| | | | | 23.9 Nm | 5000 W | R88M-KH5K020C-BS1 | R88D-KN50F-ECT |
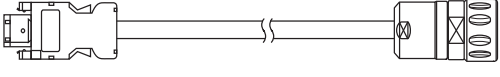
## Servo motors 1500 r/min (7.5 kW)

| Symbol | Specifications | | | | | Servo motor model | Compatible servo drives ② |
|---|---|---|---|---|---|---|---|
| | Voltage | Encoder and design | | Rated torque | Capacity | | G5 EtherCAT |
| ① | 400 V | Absolute encoder (17 bit) | Without brake | 47.8 Nm | 7500 W | R88M-KH7K515C-S1 | R88D-KN75F-ECT |
| | | Shaft end with key | With brake | 47.8 Nm | 7500 W | R88M-KH7K515C-BS1 | R88D-KN75F-ECT |
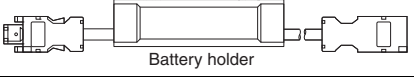
## Encoder cables

### For absolute and incremental encoders
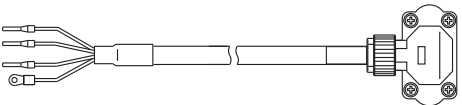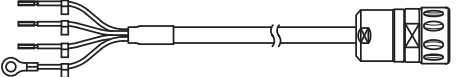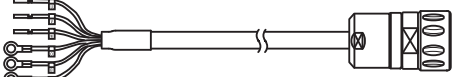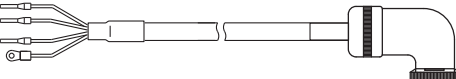
| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ③ | Encoder cable for servomotors R88M-K(050/100/200/400/750)30(H/T)□ | 1.5 m | R88A-CRKA001-5CR-E |  |
| | | 3 m | R88A-CRKA003CR-E | |
| | | 5 m | R88A-CRKA005CR-E | |
| | | 10 m | R88A-CRKA010CR-E | |
| | | 15 m | R88A-CRKA015CR-E | |
| | | 20 m | R88A-CRKA020CR-E | |
| | Encoder cable for servomotors R88M-KH(200/400/750)30(H/T)□ | 3 m | R88A-CRWA003C-DE |  |
| | | 5 m | R88A-CRWA005C-DE | |
| | | 10 m | R88A-CRWA010C-DE | |
| | | 15 m | R88A-CRWA015C-DE | |
| | | 20 m | R88A-CRWA020C-DE | |
| | Encoder cable for servomotors R88M-K(1K0/1K5)30(H/T)□ R88M-K(750/1K0/1K5/2K0/3K0/4K0/5K0)30(F/C)□ R88M-K(400/600/1K0/1K5/2K0/3K0/4K0/5K0)20□ R88M-K(7K5/11K0/15K0)15□ R88M-K(900/2K0/3K0/4K5/6K0)10□ R88M-KH(1K0/1K5/2K0/3K0/4K0/5K0)20(F/C)□ R88M-KH7K515C□ | 1.5 m | R88A-CRKC001-5NR-E |  |
| | | 3 m | R88A-CRKC003NR-E | |
| | | 5 m | R88A-CRKC005NR-E | |
| | | 10 m | R88A-CRKC010NR-E | |
| | | 15 m | R88A-CRKC015NR-E | |
| | | 20 m | R88A-CRKC020NR-E | |

**Note:** For servomotors fitted with an absolute encoder you have to add the extension battery cable R88A-CRGD0R3C□ (see below) or connect a backup battery in the CN1 I/O connector.

### Absolute encoder battery cable (encoder extension cable only)

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ④ | Absolute encoder battery cable | Battery not included 0.3 m | R88A-CRGD0R3C-E |  Battery holder |
| | | Battery included 0.3 m | R88A-CRGD0R3C-BS-E | |
| | Absolute encoder backup battery | 2,000 mA.h 3.6 V — | R88A-BAT01G |  |

## Power cables

| Symbol | Specifications | | | Model | Appearance |
|---|---|---|---|---|---|
| ⑤ | For 200 V servomotors R88M-K(050/100/200/400/750)30(H/T)-□□S2 **Note:** for servomotors with brake R88M-K(050/100/200/400/750)30(H/T)-BS2, the separate brake cable R88A-CAKA□□□BR-E is needed | Power cable only (without brake) | 1.5 m | R88A-CAKA001-5SR-E |  |
| | | | 3 m | R88A-CAKA003SR-E | |
| | | | 5 m | R88A-CAKA005SR-E | |
| | | | 10 m | R88A-CAKA010SR-E | |
| | | | 15 m | R88A-CAKA015SR-E | |
| | | | 20 m | R88A-CAKA020SR-E | |
| | For 200 V servomotors R88M-KH(200/400/750)30(H/T)-□□S2 | without brake | 3 m | R88A-CAWA003S-DE |  |
| | | | 5 m | R88A-CAWA005S-DE | |
| | | | 10 m | R88A-CAWA010S-DE | |
| | | | 15 m | R88A-CAWA015S-DE | |
| | | | 20 m | R88A-CAWA020S-DE | |
| | | with brake | 3 m | R88A-CAWA003B-DE |  |
| | | | 5 m | R88A-CAWA005B-DE | |
| | | | 10 m | R88A-CAWA010B-DE | |
| | | | 15 m | R88A-CAWA015B-DE | |
| | | | 20 m | R88A-CAWA020B-DE | |
| | For 200 V servomotors R88M-K(1K0/1K5)30(H/T)-□□S2 R88M-K(1K0/1K5)20(H/T)-□□S2 R88M-K90010(H/T)-□□S2 | without brake | 1.5 m | R88A-CAGB001-5SR-E |  |
| | | | 3 m | R88A-CAGB003SR-E | |
| | | | 5 m | R88A-CAGB005SR-E | |
| | | | 10 m | R88A-CAGB010SR-E | |
| | | | 15 m | R88A-CAGB015SR-E | |
| | | | 20 m | R88A-CAGB020SR-E | |
| | | with brake | 1.5 m | R88A-CAGB001-5BR-E |  |
| | | | 3 m | R88A-CAGB003BR-E | |
| | | | 5 m | R88A-CAGB005BR-E | |
| | | | 10 m | R88A-CAGB010BR-E | |
| | | | 15 m | R88A-CAGB015BR-E | |
| | | | 20 m | R88A-CAGB020BR-E | |

| Symbol | Specifications | | | Model | Appearance |
|--------|----------------|---|---|-------|------------|
| ⑤ | For 400 V servomotors<br>R88M-K(750/1K0/1K5/2K)30(F/C)-□□S2<br>R88M-K(400/600/1K0/1K5/2K0)20(F/C)-□□S2<br>R88M-K90010(F/C)-□□S2<br>R88M-KH(1K0/1K5)20(F/C)-□S1 | without brake | 1.5 m | R88A-CAGB001-5SR-E | |
| | | | 3 m | R88A-CAGB003SR-E | |
| | | | 5 m | R88A-CAGB05SR-E | |
| | | | 10 m | R88A-CAGB010SR-E | |
| | | | 15 m | R88A-CAGB015SR-E | |
| | | | 20 m | R88A-CAGB020SR-E | |
| | | with brake | 1.5 m | R88A-CAKF001-5BR-E | |
| | | | 3 m | R88A-CAKF003BR-E | |
| | | | 5 m | R88A-CAKF005BR-E | |
| | | | 10 m | R88A-CAKF010BR-E | |
| | | | 15 m | R88A-CAKF015BR-E | |
| | | | 20 m | R88A-CAKF020BR-E | |
| | For 400 V servomotors<br>R88M-KH2K020(F/C)-□S1 | without brake | 1.5 m | R88A-CAKC001-5SR-E | |
| | | | 3 m | R88A-CAKC003SR-E | |
| | | | 5 m | R88A-CAKC005SR-E | |
| | | | 10 m | R88A-CAKC010SR-E | |
| | | | 15 m | R88A-CAKC015SR-E | |
| | | | 20 m | R88A-CAKC020SR-E | |
| | | with brake | 1.5 m | R88A-CAKF001-5BR-E | |
| | | | 3 m | R88A-CAKF003BR-E | |
| | | | 5 m | R88A-CAKF005BR-E | |
| | | | 10 m | R88A-CAKF010BR-E | |
| | | | 15 m | R88A-CAKF015BR-E | |
| | | | 20 m | R88A-CAKF020BR-E | |
| | For 400 V servomotors<br>R88M-K(3K0/4K0/5K0)30(F/C)-□□S2<br>R88M-K(3K0/4K0/5K0)20(F/C)-□□S2<br>R88M-K(2K0/3K0)10(F/C)-□□S2<br>R88M-K4K510C-□□S2<br>R88M-KH(3K0/4K0/5K0)20(F/C)-□S1 | without brake | 1.5 m | R88A-CAGD001-5SR-E | |
| | | | 3 m | R88A-CAGD003SR-E | |
| | | | 5 m | R88A-CAGD005SR-E | |
| | | | 10 m | R88A-CAGD010SR-E | |
| | | | 15 m | R88A-CAGD015SR-E | |
| | | | 20 m | R88A-CAGD020SR-E | |
| | | with brake | 1.5 m | R88A-CAGD001-5BR-E | |
| | | | 3 m | R88A-CAGD003BR-E | |
| | | | 5 m | R88A-CAGD005BR-E | |
| | | | 10 m | R88A-CAGD010BR-E | |
| | | | 15 m | R88A-CAGD015BR-E | |
| | | | 20 m | R88A-CAGD020BR-E | |
| | For 400 V servomotors<br>R88M-K6K010C-□□S2<br>R88M-K7K515C-□□S2<br>R88M-KH7K515C-□S1<br>**Note:** for servomotors with brake R88M-K(6K010/7K515)C-BS2 and R88M-KH7K515C-BS1 the separate brake cable R88A-CAGE□□□BR-E is needed | Power cable only (without brake) | 1.5 m | R88A-CAKE001-5SR-E | |
| | | | 3 m | R88A-CAKE003SR-E | |
| | | | 5 m | R88A-CAKE005SR-E | |
| | | | 10 m | R88A-CAKE010SR-E | |
| | | | 15 m | R88A-CAKE015SR-E | |
| | | | 20 m | R88A-CAKE020SR-E | |
| | For 400 V servomotors<br>R88M-K(11K0/15K0)15C-□□S2<br>**Note:** for servomotors with brake R88M-K(11K0/15K0)15C-BS2, the separate brake cable R88A-CAGE□□□BR-E is needed | Power cable only (without brake) | 1.5 m | R88A-CAKG001-5SR-E | |
| | | | 3 m | R88A-CAKG003SR-E | |
| | | | 5 m | R88A-CAKG005SR-E | |
| | | | 10 m | R88A-CAKG010SR-E | |
| | | | 15 m | R88A-CAKG015SR-E | |
| | | | 20 m | R88A-CAKG020SR-E | |

**Brake cables (for 200 V 50 to 750 W servo motors and 400 V 6 to 15 kW servo motors)**

| Symbol | Specifications | | Model | Appearance |
|--------|----------------|---|-------|------------|
| ⑥ | Brake cable only.<br>For 200 V servo motors with brake<br>R88M-K(050/100/200/400/750)30(H/T)-BS2 | 1.5 m | R88A-CAKA001-5BR-E | |
| | | 3 m | R88A-CAKA003BR-E | |
| | | 5 m | R88A-CAKA005BR-E | |
| | | 10 m | R88A-CAKA010BR-E | |
| | | 15 m | R88A-CAKA015BR-E | |
| | | 20 m | R88A-CAKA020BR-E | |
| | Brake cable only.<br>For 400 V servo motors with brake<br>R88M-K6K010C-BS2<br>R88M-K(7K5/11K0/15K0)15C-BS2<br>R88M-KH7K515C-BS1 | 1.5 m | R88A-CAGE001-5BR-E | |
| | | 3 m | R88A-CAGE003BR-E | |
| | | 5 m | R88A-CAGE005BR-E | |
| | | 10 m | R88A-CAGE0010BR-E | |
| | | 15 m | R88A-CAGE015BR-E | |
| | | 20 m | R88A-CAGE020BR-E | |

## Connectors for encoder, power and brake cables

| Specifications | | Applicable Servomotor | Model |
|---|---|---|---|
| Connectors for making encoder cables | Drive side (CN2) | All models | R88A-CNW01R |
| | Motor side | R88M-K(050/100/200/400/750)30(H/T)□ | R88A-CNK02R |
| | Motor side | R88M-KH(200/400/750)□ | SPOC-17H-FRON169 |
| | Motor side | R88M-K(1K0/1K5)30(H/T)□<br>R88M-K(750/1K0/1K5/2K0/3K0/4K0/5K0)30(F/C)□<br>R88M-K(400/600/1K0/1K5/2K0/3K0/4K0/5K0)20□<br>R88M-K(900/2K0/3K0)10□<br>R88M-K(4K5/6K0)10C-□<br>R88M-K(7K5/11K0/15K0)15C-□<br>R88M-KH(1K0/1K5/2K0/3K0/4K0/5K0/7K5)□ | R88A-CNK04R |
| Connectors for making power cables | Motor side | R88M-K(050/100/200/400/750)30(H/T)□ | R88A-CNK11A |
| | Motor side | R88M-KH(200/400/750)30(H/T)□ | SPOC-06K-FSDN169 |
| | Motor side | R88M-K(1K0/1K5)30(H/T)-S2<br>R88M-K(1K0/1K5)20(H/T)-S2<br>R88M-K90010(H/T)-S2<br>R88M-K(750/1K0/1K5/2K0)30(F/C)-S2,<br>R88M-K(400/600/1K0/1K5/2K0)20(F/C)-S2<br>R88M-K90010(F/C)-S2<br>R88M-KH(1K0/1K5)20(F/C)-S1 | MS3108E20-4S |
| | Motor side | R88M-K(1K0/1K5)30(H/T)-BS2<br>R88M-K(1K0/1K5)20(H/T)-BS2<br>R88M-K90010(H/T)-BS2 | MS3108E20-18S |
| | Motor side | R88M-K(750/1K0/1K5/2K0/3K0/4K0/5K0)30(F/C)-BS2<br>R88M-K(400/600/1K0/1K5/2K0/3K0/4K0/5K0)20(F/C)-BS2<br>R88M-K(900/2K0/3K0)10(F/C)-BS2<br>R88M-K4K510C-BS2<br>R88M-KH(1K0/1K5/2K0/3K0/4K0/5K0)20(F/C)-BS1 | MS3108E24-11S |
| | Motor side | R88M-K(3K0/4K0/5K0)30(F/C)-S2<br>R88M-K(3K0/4K0/5K0)20(F/C)-S2<br>R88M-K(2K0/3K0)10(F/C)-S2<br>R88M-K4K510C-S2<br>R88M-KH(2K0/3K0/4K0/5K0)20(F/C)-S1 | MS3108E22-22S |
| | Motor side | R88M-K6K010C-□<br>R88M-K(7K5/11K0/15K0)15C-□<br>R88M-KH7K515C-□S1 | MS3108E32-17S |
| Connector for brake cable | Motor side | R88M-K(050/100/200/400/750)30(H/T)-BS2 | R88A-CNK11B |
| | Motor side | R88M-K6K010C-BS2<br>R88M-K(7K5/11K0/15K0)15C-BS2<br>R88M-KH7K515C-BS1 | MS3108E14S-2S |

**Note: 1.** All cables listed are flexible and shielded (except the R88A-CAKA□□-BR-E which is only a flexible cable).
     **2.** All connectors and cables listed have IP67 class (except R88A-CNW01R connector and R88A-CRGD0R3C cable).

# OMRON

**R88D-KN□□□-ECT-L**

# Accurax G5 linear drive

**Accurate motion control in a compact size servo drive family. EtherCAT and safety built-in.**

- Ironless and iron-core motor types
- Safety conforming ISO13849-1 PL-d
- High-response frequency of 2 kHz
- High resolution serial encoder for greater accuracy provided by 20 bits encoder
- Real time auto-tuning
- Advanced tuning algorithms (Anti-vibration function, torque feedforward, disturbance observer)

**Ratings**

- Iron-core motors - 48 to 760 N (2000 N peak force)
- Ironless motors - 29 to 423 N (2100 N peak force)

accuraX

## System configuration



sysmac
always in control

Sysmac Studio

EtherNet/IP™

**NJ series**
Machine automation controller

EtherCAT®

**Accurax G5 linear servo drive**

Up to 100 m

Power cable

Encoder cable

**Ironless linear motor**

**Iron-core linear motor**

**Accurax linear motor axis**

# OMRON
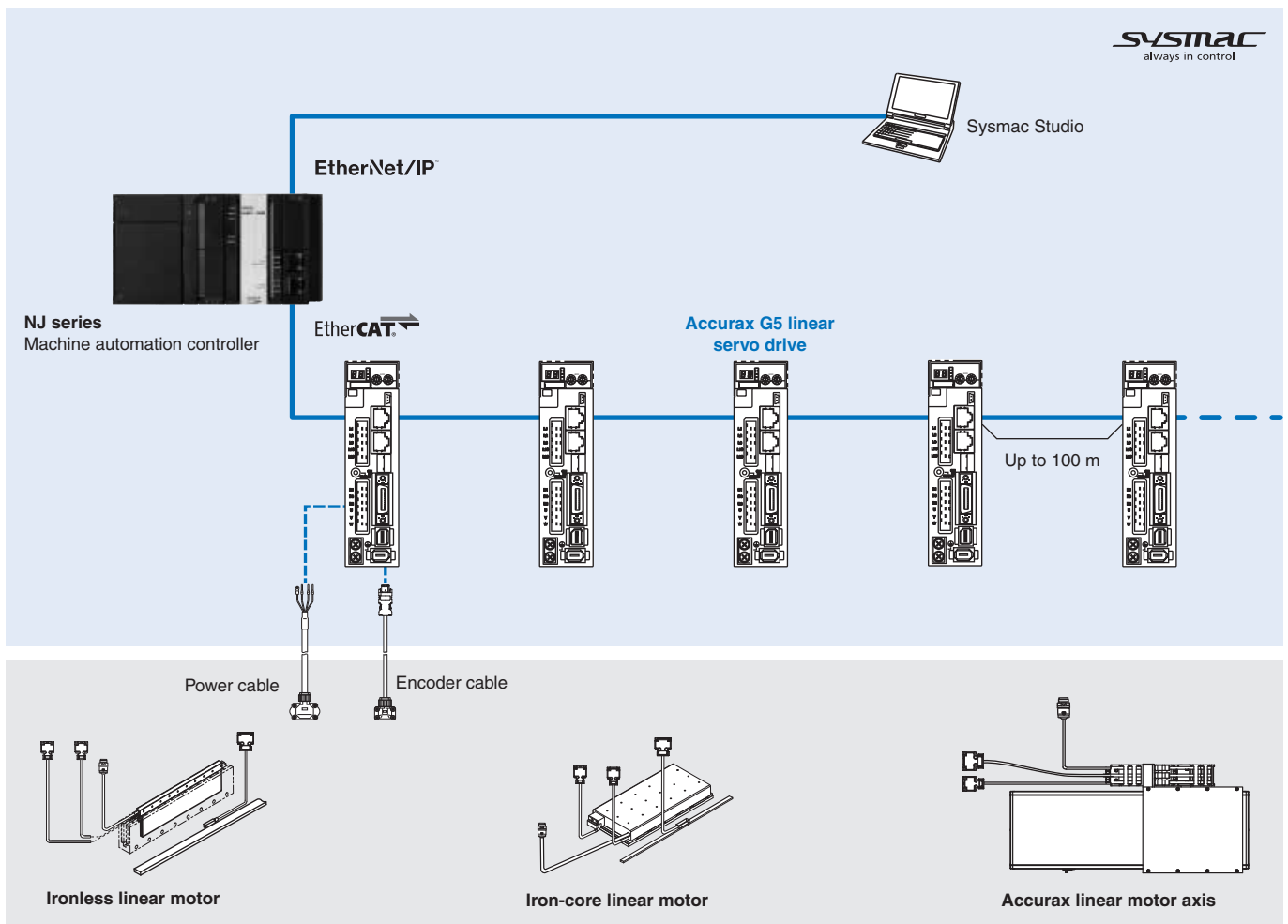
## Servo motor supported

| Linear servo motor | | | | Accurax G5 linear drive EtherCAT model | |
|---|---|---|---|---|---|
| **Type** | **Rated force** | **Peak force** | **Model** | **230V** | **400V** |
| **Linear motor coil** | | | | | |
| R88L-EC-FW-□ Iron-core motors<br><br>230 V/400 V | 48 N | 105 N | R88L-EC-FW-0303-ANPC | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | R88L-EC-FW-0306-ANPC | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | R88L-EC-FW-0606-ANPC | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | R88L-EC-FW-0609-ANPC | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | R88L-EC-FW-0612-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | R88L-EC-FW-1112-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | R88L-EC-FW-1115-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 48 N | 105 N | R88L-EC-FW-0303-APLC | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | R88L-EC-FW-0306-APLC | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | R88L-EC-FW-0606-APLC | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | R88L-EC-FW-0609-APLC | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | R88L-EC-FW-0612-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | R88L-EC-FW-1112-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | R88L-EC-FW-1115-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| R88L-EC-GW-□ Ironless motors<br><br>230 V | 29 N | 100 N | R88L-EC-GW-0303-ANPS | R88D-KN02H-ECT-L | – |
| | 58 N | 200 N | R88L-EC-GW-0306-ANPS | R88D-KN08H-ECT-L | – |
| | 87 N | 300 N | R88L-EC-GW-0309-ANPS | R88D-KN10H-ECT-L | – |
| | 70 N | 240 N | R88L-EC-GW-0503-ANPS | R88D-KN02H-ECT-L | – |
| | 140 N | 480 N | R88L-EC-GW-0506-ANPS | R88D-KN04H-ECT-L | – |
| | 210 N | 720 N | R88L-EC-GW-0509-ANPS | R88D-KN08H-ECT-L | – |
| | 141 N | 700 N | R88L-EC-GW-0703-ANPS | R88D-KN04H-ECT-L | – |
| | 282 N | 1400 N | R88L-EC-GW-0706-ANPS | R88D-KN08H-ECT-L | – |
| | 423 N | 2100 N | R88L-EC-GW-0709-ANPS | R88D-KN10H-ECT-L | – |
| | 29 N | 100 N | R88L-EC-GW-0303-APLS | R88D-KN02H-ECT-L | – |
| | 58 N | 200 N | R88L-EC-GW-0306-APLS | R88D-KN08H-ECT-L | – |
| | 87 N | 300 N | R88L-EC-GW-0309-APLS | R88D-KN10H-ECT-L | – |
| | 70 N | 240 N | R88L-EC-GW-0503-APLS | R88D-KN02H-ECT-L | – |
| | 140 N | 480 N | R88L-EC-GW-0506-APLS | R88D-KN04H-ECT-L | – |
| | 210 N | 720 N | R88L-EC-GW-0509-APLS | R88D-KN08H-ECT-L | – |
| | 141 N | 700 N | R88L-EC-GW-0703-APLS | R88D-KN04H-ECT-L | – |
| | 282 N | 1400 N | R88L-EC-GW-0706-APLS | R88D-KN08H-ECT-L | – |
| | 423 N | 2100 N | R88L-EC-GW-0709-APLS | R88D-KN10H-ECT-L | – |
| **Accurax linear motor axis** | | | | | |
| R88L-EA-AF-□ Linear motor axis | 48 N | 105 N | R88L-EA-AF-0303-□ | R88D-KN02H-ECT-L | R88D-KN10F-ECT-L |
| | 96 N | 210 N | R88L-EA-AF-0306-□ | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | R88L-EA-AF-0606-□ | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | R88L-EA-AF-0609-□ | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | R88L-EA-AF-0612-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | R88L-EA-AF-1112-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | R88L-EA-AF-1115-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |

## Type designation

**Servo drive**

# R88D-KN01H-ECT-L

Accurax G5 series servo drive

Drive type
N: Network type

Linear drive

Model
ECT: EtherCAT comms

Capacity and voltage

| Voltage | Code | Output |
|---|---|---|
| 230 V | 01H | 100 W |
| | 02H | 200 W |
| | 04H | 400 W |
| | 08H | 750 W |
| | 10H | 1 kW |
| | 15H | 1.5 kW |
| 400 V | 06F | 600 W |
| | 10F | 1.0 kW |
| | 15F | 1.5 kW |
| | 20F | 2.0 kW |
| | 30F | 3.0 kW |

## Servo drive specifications

### Single-phase, 230 V

| Linear servo drive type | R88D-KN | 02H-ECT-L | 04H-ECT-L | 08H-ECT-L | 10H-ECT-L | 15H-ECT-L |
|---|---|---|---|---|---|---|
| Applicable linear servo motor | R88L-EC- | FW-0303 | FW-0306 | FW-0606 | FW-0609 | FW-0612 |
| | | GW-0303 | GW-0506 | GW-0306 | GW-0309 | FW-1112 |
| | | – | GW-0703 | GW-0509 | GW-0709 | – |
| | | – | – | GW-0706 | – | – |
| Power | W | 200 | 400 | 750 | 1000 | 1500 |
| Continuous output current | Arms | 1.6 | 2.6 | 4.1 | 5.9 | 9.4 |
| Max. output current | Arms | 4.8 | 7.8 | 12.3 | 16.9 | 28.2 |
| Input power — Main circuit | | Single-phase/3-phase, 200 to 240 VAC +10% to −15% (50/60 Hz) | | | | |
| Supply — Control circuit | | Single-phase, 200 to 240 VAC +10% to −15% (50/60 Hz) | | | | |
| Control method | | IGBT-driven PWM method, sinusoidal drive | | | | |
| Feedback | | Serial encoder (incremental/absolute value) | | | | |
| Usage/storage temperature | | 0 to 55°C/−20 to 65°C | | | | |
| Usage/storage humidity | | 90% RH or less (non-condensing) | | | | |
| Altitude | | 1000 m or less above sea level | | | | |
| Vibration/shock resistance (max.) | | 5.88 m/s$^2$ 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s$^2$ | | | | |
| Configuration | | Base mounted | | | | |
| Approx. weight | kg | 0.8 | 1.1 | 1.6 | 1.8 | |

### Three-phase, 400 V

| Linear servo drive type | R88D-KN | 06F-ECT-L | 10F-ECT-L | 15F-ECT-L | 20F-ECT-L | 30F-ECT-L |
|---|---|---|---|---|---|---|
| Applicable linear servo motor | R88L-EC- | FW-0303 | FW-0303 | FW-0606 | FW-0609 | FW-0612 |
| | | – | FW-0306 | – | – | FW-1112 |
| | | – | – | – | – | FW-1115 |
| Power | kW | 0.6 | 1 | 1.5 | 2 | 3 |
| Continuous output current | Arms | 1.5 | 2.9 | 4.7 | 6.7 | 9.4 |
| Max. output current | Arms | 6.4 | 8.7 | 14.1 | 19.7 | 28.2 |
| Input power — Main circuit | | 3-phase, 380 to 480 VAC +10 to −15% (50/60Hz) | | | | |
| Supply — Control circuit | | 24 VDC ±15% | | | | |
| Control method | | IGBT-driven PWM method, sinusoidal drive | | | | |
| Feedback — Serial encoder | | Incremental or absolute encoder | | | | |
| Usage/storage temperature | | 0 to 55°C/−20 to 65°C | | | | |
| Usage/storage humidity | | 90% RH or less (non-condensing) | | | | |
| Altitude | | 1000 m or less above sea level | | | | |
| Vibration/shock resistance (max.) | | 5.88 m/s$^2$ 10 to 60 Hz (Continuous operation at resonance point is not allowed)/19.6 m/s$^2$ | | | | |
| Configuration | | Base mounted | | | | |
| Approx. weight | kg | 1.9 | | | 2.7 | 4.7 |

## General specifications

| Performance | Frequency characteristics | 2 kHz |
|---|---|---|
| **EtherCAT interface** Command input | | EtherCAT commands (for sequence, motion, data setting/reference, monitor, adjustment, and other commands). |
| CiA402 Drive profile | | Cyclic synchronous position mode<br>Cyclic synchronous velocity mode<br>Cyclic synchronous torque mode<br>Touch probe function<br>Torque limit function<br>Homing mode |
| **I/O signal** Sequence input signal | | - Multi-function input × 8 by parameter setting (forward/reverse drive prohibition, emergency stop, external latch, origin proximity, forward/reverse torque limit, general purpose monitor inputs). |
| Sequence output signal | | 1 × servo drive error output<br>2 × multi-function outputs by parameters setting (servo ready, brake release, speed limit detection, force limit detection, zero speed detection, warning output, position completion, error clear attributed, remote output, speed detection, position command status, speed command status) |
| **Integrated functions** USB communications | Interface | Personal computer/Connector mini-USB |
| | Communications standard | Compliant with USB 2.0 standard |
| | Function | Parameter setting and status monitoring |
| EtherCAT communications | Communications protocol | IEC 61158 Type 12, IEC 61800-7 |
| | Physical layer | 100BASE-TX (IEEE802.3) |
| | Connectors | RJ45 × 2<br>ECAT IN: EtherCAT input × 1<br>ECAT OUT: EtherCAT output × 1 |
| | Communications media | Category 5 or higher (cable with double, aluminium tape and braided shielding is recommended) |
| | Communications distance | Distance between nodes: 100 m max. |
| | LED indicators | RUN × 1<br>ERR × 1<br>L/A IN (Link/Activity IN) × 1<br>L/A OUT (Link/activity OUT) × 1 |
| Automatic load inertia detection | | Automatic motor parameter setting. One parameter rigidity setting. |
| Dynamic brake (DB) | | Built-in. Operates during main power OFF, servo alarm, servo OFF or overtravel. |
| Regenerative processing | | Internal resistor included in models from 600 W to 5 kW. Regenerative resistor externally mounted (option). |
| Overtravel (OT) prevention function | | DB stop, deceleration stop or coast to stop during P-OT, N-OT operation |
| Encoder divider function | | Optional division possible |
| Protective functions | | Overcurrent, overvoltage, undervoltage, overspeed, overload, encoder error, overheat... |
| Analog monitor functions for supervision | | Analog monitor of motor speed, speed reference, torque reference, command following error, analog input ...<br>The monitoring signals to output and their scaling can be specified with parameters.<br>Number of channels: 2 (Output voltage: ±10 VDC) |
| Panel operator | Display functions | 2 × digit 7-segment LED display shows the drive status, alarm codes, parameters... |
| | Switches | 2 × rotary switches for setting the node address |
| CHARGE lamp | | Lits when the main circuit power supply is turned ON. |
| Safety terminal | Functions | Safety Torque OFF function to cut off the motor current and stop the motor. Output signal for failure monitoring function. |
| | Conformed standards | EN ISO13849-1:2008 (PL- d, Performance Level d), IEC61800-5 -2:2007 (function STO, Safe Torque OFF), EN61508:2001 (Safety Integrity Level 2, SIL2), EN954-1:1996 (CAT3). |
| External encoder feedback | | Serial signal and line-driver A-B-Z encoder |

## Servo drive part names



**Note:** The above picture shows 230 V servo drives models only. The 400 V servo drives have 24 VDC power input terminals for control circuit instead of L1C and L2C terminals.

## I/O specifications

### Terminals specifications

| Symbol | Name | Function |
|---|---|---|
| L1 | Main power supply input terminal | AC power input terminals for the main circuit |
| L2 | | |
| L3 | | **Note:** for single-phase servo drives connect the power supply input to L1 and L3. |
| L1C | Control power supply input terminal | AC power input terminals for the control circuit (for 200V single/three-phase servo drives only). |
| L2C | | |
| 24 V | | DC power input terminals for the control circuit (for 400V three-phase servo drives only). |
| 0 V | | |
| B1 | External regeneration resistor connection terminals | Servo drives below 750 W: no internal resistor is connected. Leave B2 and B3 open. Connect an external regenerative resistor between B1 and B2. |
| B2 | | |
| B3 | | Servo drives from 750 W to 5 kW: short-circuit in B2 and B3 for internal regenerative resistor. If the internal regenerative resistor is insufficient, connect an external regenerative resistor between B1 and B2 and remove the wire between B2 and B3. |
| U | Servo motor connection terminals | Terminals for outputs to the servomotor. |
| V | | |
| W | | |

### I/O signals (CN1) - input signals

| Pin No. | Signal name | Function | |
|---|---|---|---|
| 6 | I-COM | ± pole of external DC power. The power must use 12 V to 24 V (±5%) | |
| 5 | E-STOP | Emergency stop | The signal name shows the factory setting. The function can be changed by parameter setting. |
| 7 | P-OT | Forward run prohibited | |
| 8 | N-OT | Reverse run prohibited | |
| 9 | DEC | Origin proximity | |
| 10 | EXT3 | External latch input 3 | |
| 11 | EXT2 | External latch input 2 | |
| 12 | EXT1 | External latch input 1 | |
| 13 | SI-MON0 | General purpose monitor input 0 | |
| 14 | – | Terminals not used. Do not connect. | |
| 15 | – | | |
| 17 | – | | |
| 18 | – | | |
| 19 | – | | |
| 20 | – | | |
| 21 | – | | |
| 22 | – | | |
| 23 | – | | |
| 24 | – | | |
| – | PCL | Forward force limit | The function of input signals allocated to pins 5 and 7 to 13 can be changed with these options by parameters settings. |
| | NCL | Reverse force limit | |
| | SI-MON1 | General-purpose monitor input 1 | |
| | SI-MON2 | General-purpose monitor input 2 | |
| Shell | FG | Shield ground. Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell. | |
| 16 | GND | Signal ground. It is insulated with power supply (I-COM) for the control signal in the servo drive. | |

### I/O signals (CN1) - output signals

| Pin No. | Signal name | Function | |
|---|---|---|---|
| 1 | BRK-OFF+ | External brake release signal | |
| 2 | BRK-OFF | | |
| 25 | S-RDY+ | Servo ready: ON when there is no servo alarm and control/main circuit power supply is ON | |
| 26 | S-RDY– | | |
| 3 | ALM+ | Servo alarm: Turns OFF when an error is detected | |
| 4 | ALM– | | |
| – | INP1 | Position complete output 1 | The function of output signals allocated to pins 1, 2, 25 and 26 can be changed with these options by parameters settings |
| | TGON | Motor speed detection | |
| | F_LIMIT | Force limit detection | |
| | ZSP | Zero speed | |
| | VCMP | Speed conformity output | |
| | WARN1 | Warning 1 | |
| | WARN2 | Warning 2 | |
| | PCMD | Position command status | |
| | INP2 | Position complete output 2 | |
| | VLIMIT | Speed limit detection | |
| | ALM-ATB | Error clear attribute | |
| | VCMD | Speed command status | |
| | R-OUT1 | Remote output 1 | |
| | R-OUT2 | Remote output 1 | |

## External encoder connector (CN4)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | E5V | External scale power supply output. Use at 5.2 V ±5% and at or below 250 mA. |
| 2 | E0V | This is connected to the control circuit ground connected to connector CN1. |
| 3 | PS | External scale signal I/O (serial signal). |
| 4 | /PS | |
| 5 | EXA | External scale signal input (Phase A, B, and Z signals). Performs the input and output of phase A, B and Z signals. |
| 6 | /EXA | |
| 7 | EXB | |
| 8 | /EXB | |
| 9 | EXZ | |
| 10 | /EXZ | |
| Shell | FG | Shield ground |

## Monitor connector (CN5)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | AM1 | Analog monitor output 1. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor.<br>Default setting: Motor rotation speed 1 V/(500 mm/s). |
| 2 | AM2 | Analog monitor output 2. Outputs the analog signal for the monitor. Use the parameters setting to select the output to monitor.<br>Default setting: Motor rotation speed 1 V/(33% of nominal force). |
| 3 | GND | Ground for analog monitors 1,2. |
| 4 | – | Terminals not used. Do not connect. |
| 5 | – | |
| 6 | – | |

## Safety connector (CN8)

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | – | Not used. Do not connect. |
| 2 | – | |
| 3 | SF1– | Safety input 1 & 2. This input turns OFF the power transistor drive signals in the servo drive to cut off the current output to the motor. |
| 4 | SF1+ | |
| 5 | SF2– | |
| 6 | SF2+ | |
| 7 | EDM– | A monitor signal is output to detect a safety function failure. |
| 8 | EDM+ | |
| Shell | FG | Frame ground. |

## Dimensions

### Servo drives

#### R88D-KN02H-ECT-L (230 V, 200 W)
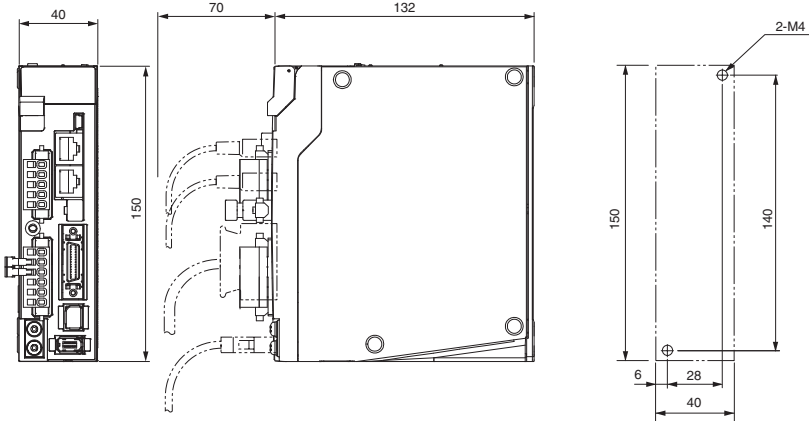


#### R88D-KN04H-ECT-L (230 V, 400 W)
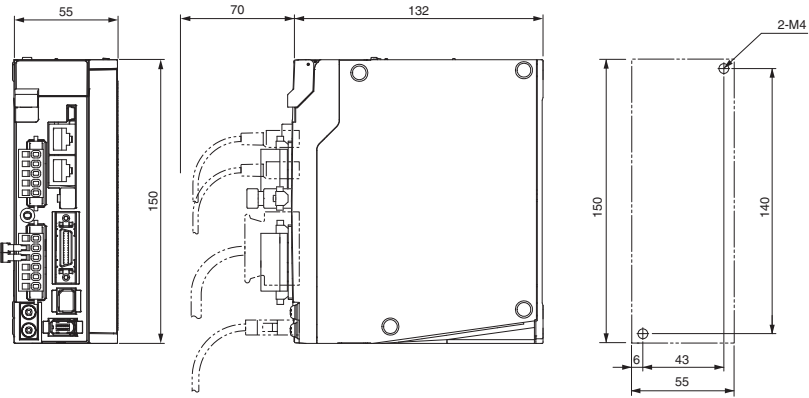


#### R88D-KN08H-ECT-L (230 V, 800 W)
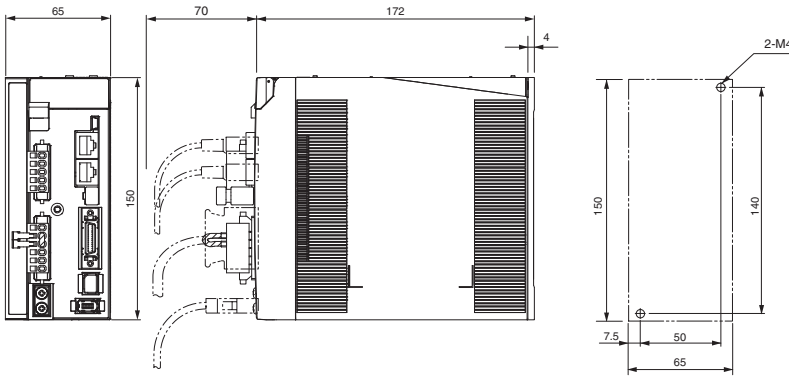


#### R88D-KN10H/15H-ECT-L (230 V, 1 to 1.5 kW)
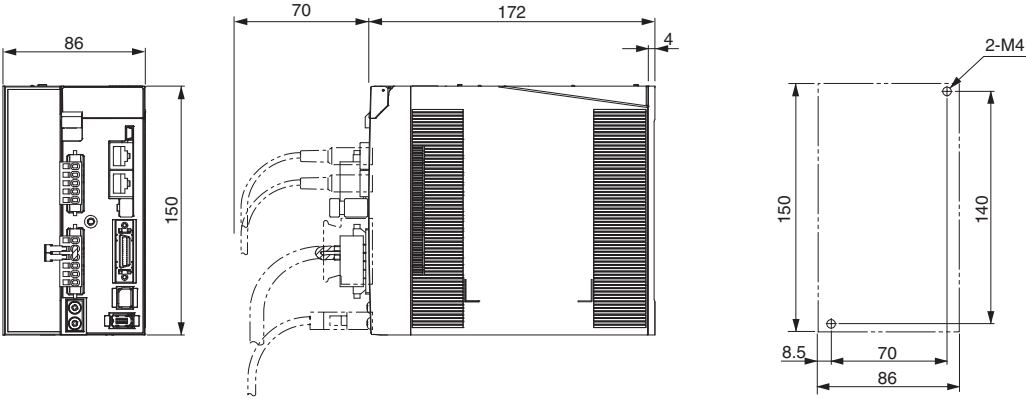
## R88D-KN06F/10F/15F-ECT-L (400 V, 600 W to 1.5 kW)
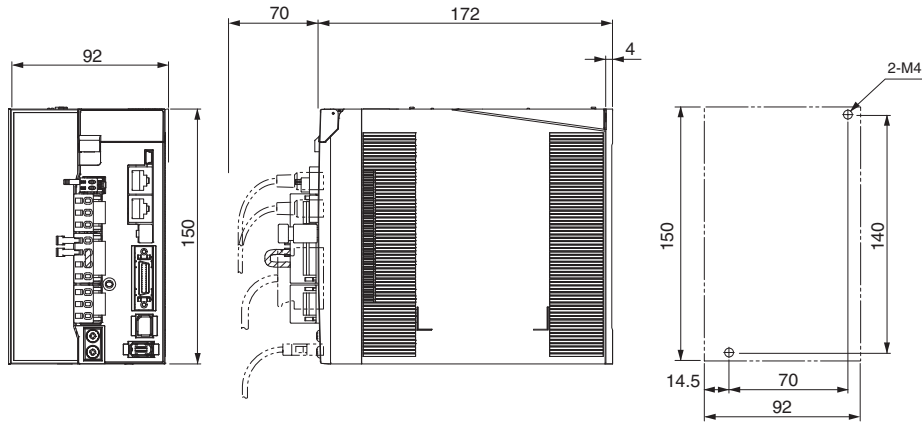


## R88D-KN20F-ECT-L (400 V, 2 kW)
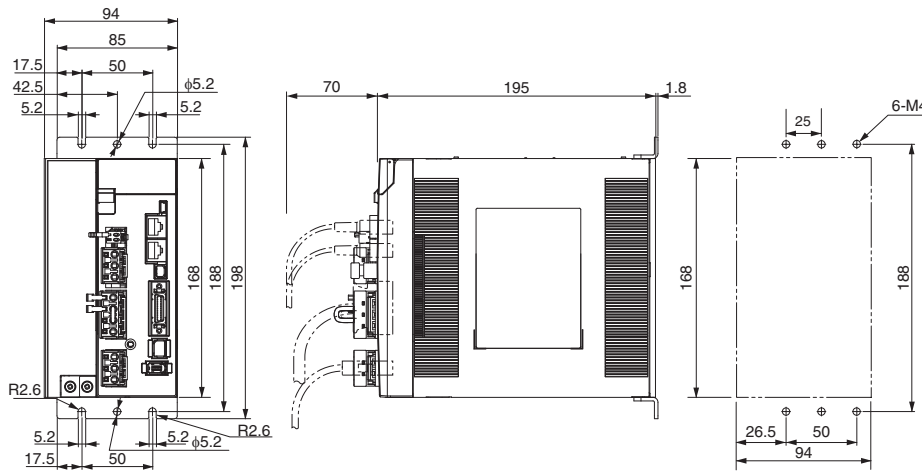


## R88D-KN30F-ECT-L (400V, 3 kW)



### Filters

| Filter model | External dimensions | | | Mount dimensions | |
|---|---|---|---|---|---|
| | H | W | D | M1 | M2 |
| R88A-FIK102-RE | 190 | 42 | 44 | 180 | 20 |
| R88A-FIK104-RE | 190 | 57 | 30 | 180 | 30 |
| R88A-FIK107-RE | 190 | 64 | 35 | 180 | 40 |
| R88A-FIK114-RE | 190 | 86 | 35 | 180 | 60 |
| R88A-FIK304-RE | 196 | 92 | 40 | 186 | 70 |
| R88A-FIK306-RE | 238 | 94 | 40 | 228 | 70 |
| R88A-FIK312-RE | 291 | 130 | 40 | 278 | 100 |

## Installation

### Single-phase, 230 VAC



L1
L2
L3
N

Thermal switch

Contactor

Noise filter

Single-Phase
200 to 230 VAC

*1
B1  B3  B2

CNB

Accurax G5
EtherCAT
servo drive

CNA

CN2

CN1

U
V
W

A (1)  Servo motor
B (2)
C (3)    M
D (4)

Optical encoder

PG

10 Ω 1    BRK-OFF+     Brake release
2          BRK-OFF−     signal output

10 Ω 25   S-RDY+       Servo ready
26         S-RDY−       completed output

10 Ω 3    ALM+         Servo alarm output
4          ALM−

External power supply 12 to 24 VDC

Maximum
service voltage: 30 VDC

Maximum
output current: 50 mADC

I-COM  6    4.7 kΩ

12 to 24 VDC

Emergency stop
E-STOP  5   4.7kΩ

Forward run
prohibited
POT  7      4.7kΩ

Reverse run
prohibited
NOT  8      4.7kΩ

Origin
proximity
DEC  9      4.7kΩ

External
latch 3  EXT3  10   4.7kΩ

External
latch 2  EXT2  11   4.7kΩ

External
latch 1  EXT1  12   4.7kΩ

SI-MON0  13

General-purpose
monitor input 0

1kΩ

+24 V +24 V

S1

+24 V +24 V

+24 V

G9SX safety unit *2

A1  T11 T12 T21 T22 T31 T32 T33 Y1  T41 T42
A2  S14 S24 S34 S44 L1  X1  X2

FG   Connect shield to
connector shell

SF1+  4   4kΩ
1kΩ
SF1−  3

CN8

SF2+  6   4kΩ
1kΩ
SF2−  5

16  GND
Frame ground

10   8   EDM+

7   EDM−

EDM output: Monitor signal to detect a safety function failure
(Maximum service voltage: 30 VDC or less
Maximum output current: 50 mADC)

*1  For servo drives from 750 W, B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an
external regenerative resistor between B1 and B2.
*2  Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

## Three-phase, 400 VAC



*1 Normally B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.
*2 Wiring diagram example using the G9SX safety unit. If a safety unit is not used, keep the factory safety bypass connector installed in the CN8.

**Note:** The input function of pins 5 and 7 to 13, and output function of pins 1, 2, 25 and 26, can be changed via parameter settings.

## Ordering information

### Accurax G5 series EtherCAT reference configuration



① Ironless
② Cables
① Iron-core
⑮ Serial converter
① Linear motor axis

③ Accurax G5 series EtherCAT servo drive

Sysmac Studio

Filter ⑭

External regenerative resistor ⑬

CN5
⑨ Analog monitor cable
CN7
⑩ USB cable
CN6
EtherNet/IP
⑫ Machine controller
EtherCAT
CN8
⑪ Safety cable
④ I/O signals connector
CN1
⑤ I/O signals cable
⑥
CN4
⑧ External encoder cable
CN2
⑦ Terminal block for I/O signals

**R88D-KN□□□-ECT**

**Note:** The symbols ①②③④⑤... show the recommended sequence to select the components in Accurax G5 servo system

### Servo motors, power & encoder cables

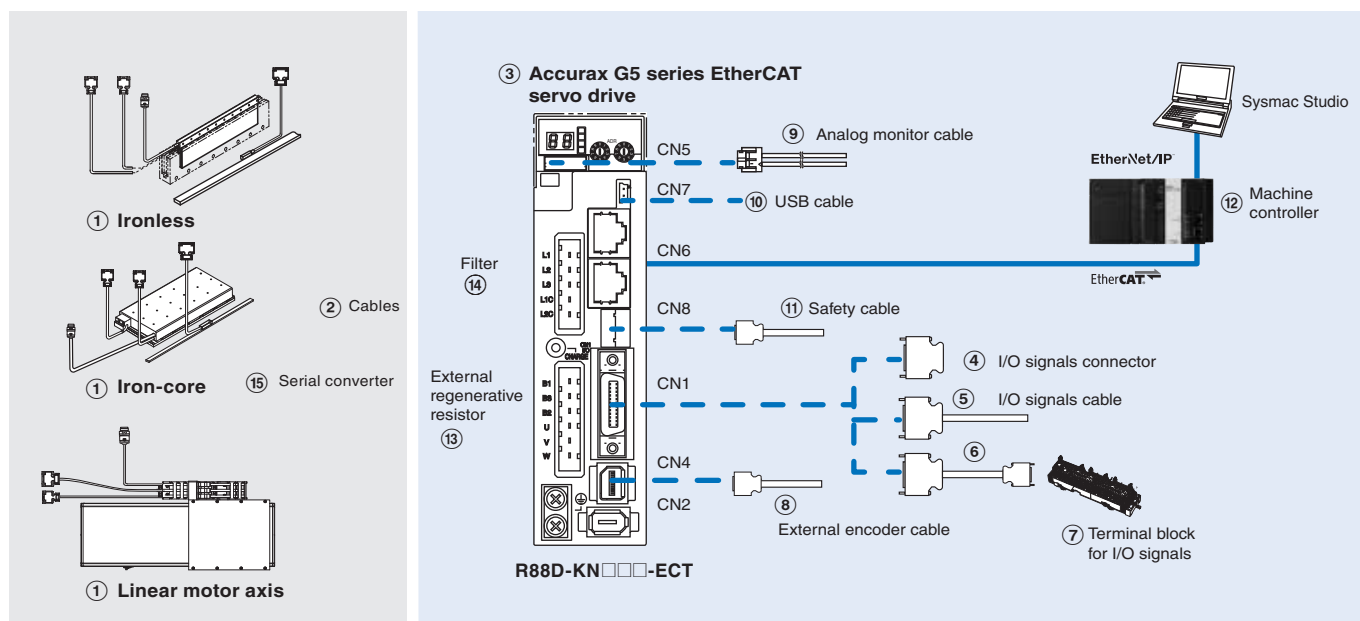**Note:** ①② Refer to the Accurax linear motor chapter for linear motor, cables or connectors selection

### Servo drives

| Symbol | Specifications | Servo drive models | ① Compatible Accurax G5 Linear motors | | |
|--------|----------------|--------------------|---------------|------------------|-------------------|
| | | | Iron-core motors | Ironless motors | Linear motor axis |
| ③ | 1 phase 230 VAC | R88D-KN02H-ECT-L | R88L-EC-FW-0303-□ | R88L-EC-GW-0303-□ | R88L-EA-AF-0303-□ |
| | | | | R88L-EC-GW-0503-□ | |
| | | R88D-KN04H-ECT-L | R88L-EC-FW-0306-□ | R88L-EC-GW-0506-□ | R88L-EA-AF-0306-□ |
| | | | | R88L-EC-GW-0703-□ | |
| | | R88D-KN08H-ECT-L | R88L-EC-FW-0606-□ | R88L-EC-GW-0306-□ | R88L-EA-AF-0606-□ |
| | | | | R88L-EC-GW-0509-□ | |
| | | | | R88L-EC-GW-0706-□ | |
| | | R88D-KN10H-ECT-L | R88L-EC-FW-0609-□ | R88L-EC-GW-0309-□ | R88L-EA-AF-0609-□ |
| | | | | R88L-EC-FW-0709-□ | |
| | | R88D-KN15H-ECT-L | R88L-EC-FW-0612-□ | – | R88L-EA-AF-0612-□ |
| | | | R88L-EC-FW-1112-□ | | R88L-EA-AF-1112-□ |
| | | | R88L-EC-FW-1115-□ | | R88L-EA-AF-1115-□ |
| | 3 phase 400 VAC | R88D-KN06F-ECT-L | R88L-EC-FW-0303-□ | – | - |
| | | R88D-KN10F-ECT-L | R88L-EC-FW-0306-□ | – | R88L-EA-AF-0303-□ |
| | | | | | R88L-EA-AF-0306-□ |
| | | R88D-KN15F-ECT-L | R88L-EC-FW-0606-□ | – | R88L-EA-AF-0606-□ |
| | | R88D-KN20F-ECT-L | R88L-EC-FW-0609-□ | – | R88L-EA-AF-0609-□ |
| | | R88D-KN30F-ECT-L | R88L-EC-FW-0612-□ | – | R88L-EA-AF-0612-□ |
| | | | R88L-EC-FW-1112-□ | | R88L-EA-AF-1112-□ |
| | | | R88L-EC-FW-1115-□ | | R88L-EA-AF-1115-□ |

### Signals cables for I/O general purpose (CN1)

| Symbol | Description | Connect to | | Model |
|--------|-------------|------------|---|-------|
| ④ | I/O connector kit (26 pins) | For I/O general purpose | – | R88A-CNW01C |
| ⑤ | I/O signals cable | For I/O general purpose | 1 m | R88A-CPKB001S-E |
| | | | 2 m | R88A-CPKB002S-E |
| ⑥ | Terminal block cable | For I/O general purpose | 1 m | XW2Z-100J-B34 |
| | | | 2 m | XW2Z-200J-B34 |
| ⑦ | Terminal block (M3 screw and for pin terminals) | | – | XW2B-20G4 |
| | Terminal block (M3.5 screw and for fork/round terminals) | | – | XW2B-20G5 |
| | Terminal block (M3 screw and for fork/round terminals) | | – | XW2D-20G6 |

**External encoder cable (CN4)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑧ | External encoder cable | 5 m | R88A-CRKM005SR-E |
| | | 10 m | R88A-CRKM010SR-E |
| | | 20 m | R88A-CRKM020SR-E |

**Analog monitor (CN5)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑨ | Analog monitor cable | 1 m | R88A-CMK001S |

**USB personal computer cable (CN7)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑩ | USB mini-connector cable | 2 m | AX-CUSBM002-E |

**Cable for safety (CN8)**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑪ | Safety cable | 3 m | R88A-CSK003S-E |

**Machine controller**

| Symbol | Name | | Model |
|---|---|---|---|
| ⑫ | NJ series | CPU unit | NJ501-1500 (64 axes) |
| | | | NJ501-1400 (32 axes) |
| | | | NJ501-1300 (16 axes) |
| | | | NJ301-1200 (8 axes) |
| | | | NJ301-1100 (4 axes) |
| | | Power supply unit | NJ-PA3001 (220 VAC) |
| | | | NJ-PD3001 (24 VDC) |

**External regenerative resistor**

| Symbol | Regenerative resistor unit model | Specifications |
|---|---|---|
| ⑬ | R88A-RR08050S | 50 Ω, 80 W |
| | R88A-RR080100S | 100 Ω, 80 W |
| | R88A-RR22047S | 47 Ω, 220 W |
| | R88A-RR50020S | 20 Ω, 500 W |

**Filters**

| Symbol | Applicable servodrive | Filter model | Manufacturer | Rated current | Leakage current | Rated voltage |
|---|---|---|---|---|---|---|
| ⑭ | R88D-KN02H-ECT-L | R88A-FIK102-RE | Rasmi Electronics Ltd. | 2.4 A | 3.5 mA | 250 VAC single-phase |
| | R88D-KN04H-ECT-L | R88A-FIK104-RE | | 4.1 A | 3.5 mA | |
| | R88D-KN08H-ECT-L | R88A-FIK107-RE | | 6.6 A | 3.5 mA | |
| | R88D-KN10H-ECT-L, R88D-KN15H-ECT-L | R88A-FIK114-RE | | 14.2 A | 3.5 mA | |
| | R88D-KN06F-ECT-L, R88D-KN10F-ECT-L, R88D-KN15F-ECT-L | R88A-FIK304-RE | | 4 A | 0.3 mA/32 mA[*1] | 400 VAC three-phase |
| | R88D-KN20F-ECT-L | R88A-FIK306-RE | | 6 A | 0.3 mA/32 mA[*1] | |
| | R88D-KN30F-ECT-L | R88A-FIK312-RE | | 12.1 A | 0.3 mA/32 mA[*1] | |

[*1] Momentary peak leakage current for the filter at switch-on/off.

**Connectors**

| Specifications | Model |
|---|---|
| External encoder connector (for CN4) | R88A-CNK41L |
| Safety I/O signal connector (for CN8) | R88A-CNK81S |

**Computer software**

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.0 or higher | SYSMAC-SE2□□□ |
| CX-Drive version 2.60 or higher | CX-DRIVE 2.60 |

**Note:** If CX-One is installed on the same computer as Sysmac Studio, it must be CX-One v4.2 or higher

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_I165E-EN-02C     In the interest of product improvement, specifications are subject to change without notice.

**R88L-EC-FW/GW-□**

# Accurax linear motor

**New linear motors with optimised efficiency**

Iron-core motors for high speed and high duty cycle operations and Ironless motors for cogging-free and high dynamic applications. Both motor and families deliver unparalleled accuracy and performance benefits.

- Ironless and iron-core types available
- High dynamic and precise positioning
- Compact and flat design iron-core motors
- Excellent force-to-weight ratio ironless motors
- Weight-optimised magnet track
- Optional digital hall-sensor and connectors
- Temperature sensors included
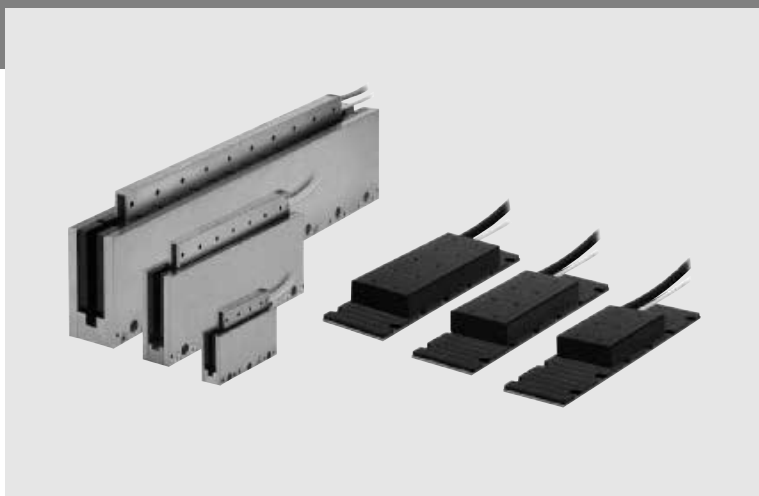
**Ratings**

- Iron-core motors - 48 to 760 N (2000 N peak force)
- Ironless motors - 29 to 423 N (2100 N peak force)

## System configuration



**(Refer to servo drive chapter)**

sysmac
always in control

**Accurax G5 servo drive**
EtherCAT model



Hall Sensor
Temp. Sensor
Power
Motor coil R88L-EC-GW
Encoder
Magnet track R88L-EC-GM

**Ironless linear motor**



Motor coil R88L-EC-FW
Magnet track R88L-EC-FM
Hall Sensor
Temp. Sensor
Power
Encoder

**Iron-core linear motor**

# OMRON
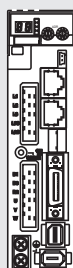
## Linear motor / Servo drive combination

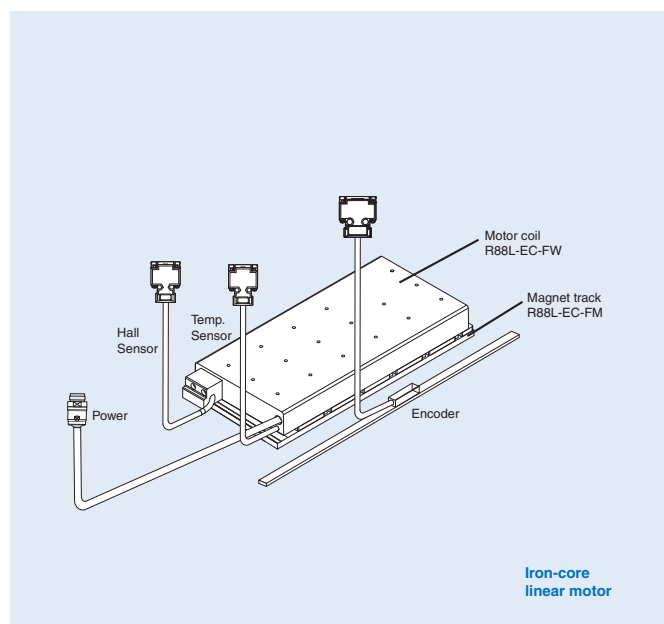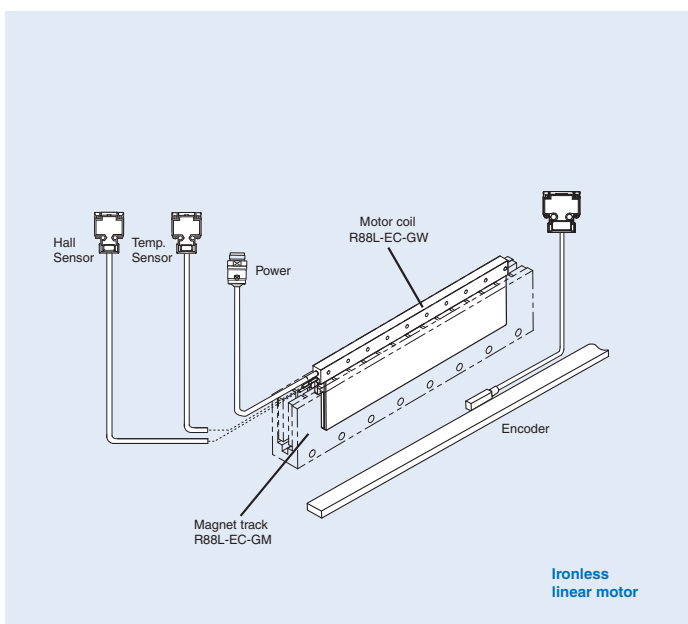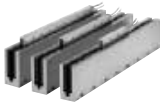| Linear motor coil | | | | Linear Servo drive | |
| --- | --- | --- | --- | --- | --- |
| | | | | Accurax G5 EtherCAT model | |
| Type | Rated force | Peak force | Model | 230V | 400V |
| R88L-EC-FW-□ Iron-core motors  230 V/400 V | 48 N | 105 N | R88L-EC-FW-0303-ANPC | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | R88L-EC-FW-0306-ANPC | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | R88L-EC-FW-0606-ANPC | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | R88L-EC-FW-0609-ANPC | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | R88L-EC-FW-0612-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | R88L-EC-FW-1112-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | R88L-EC-FW-1115-ANPC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 48 N | 105 N | R88L-EC-FW-0303-APLC | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | R88L-EC-FW-0306-APLC | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | R88L-EC-FW-0606-APLC | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | R88L-EC-FW-0609-APLC | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | R88L-EC-FW-0612-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | R88L-EC-FW-1112-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | R88L-EC-FW-1115-APLC | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| R88L-EC-GW-□ Ironless motors  230 V | 29 N | 100 N | R88L-EC-GW-0303-ANPS | R88D-KN02H-ECT-L | – |
| | 58 N | 200 N | R88L-EC-GW-0306-ANPS | R88D-KN08H-ECT-L | – |
| | 87 N | 300 N | R88L-EC-GW-0309-ANPS | R88D-KN10H-ECT-L | – |
| | 70 N | 240 N | R88L-EC-GW-0503-ANPS | R88D-KN02H-ECT-L | – |
| | 140 N | 480 N | R88L-EC-GW-0506-ANPS | R88D-KN04H-ECT-L | – |
| | 210 N | 720 N | R88L-EC-GW-0509-ANPS | R88D-KN08H-ECT-L | – |
| | 141 N | 700 N | R88L-EC-GW-0703-ANPS | R88D-KN04H-ECT-L | – |
| | 282 N | 1400 N | R88L-EC-GW-0706-ANPS | R88D-KN08H-ECT-L | – |
| | 423 N | 2100 N | R88L-EC-GW-0709-ANPS | R88D-KN10H-ECT-L | – |
| | 29 N | 100 N | R88L-EC-GW-0303-APLS | R88D-KN02H-ECT-L | – |
| | 58 N | 200 N | R88L-EC-GW-0306-APLS | R88D-KN08H-ECTL | – |
| | 87 N | 300 N | R88L-EC-GW-0309-APLS | R88D-KN10H-ECT-L | – |
| | 70 N | 240 N | R88L-EC-GW-0503-APLS | R88D-KN02H-ECT-L | – |
| | 140 N | 480 N | R88L-EC-GW-0506-APLS | R88D-KN04H-ECT-L | – |
| | 210 N | 720 N | R88L-EC-GW-0509-APLS | R88D-KN08H-ECT-L | – |
| | 141 N | 700 N | R88L-EC-GW-0703-APLS | R88D-KN04H-ECT-L | – |
| | 282 N | 1400 N | R88L-EC-GW-0706-APLS | R88D-KN08H-ECT-L | – |
| | 423 N | 2100 N | R88L-EC-GW-0709-APLS | R88D-KN10H-ECT-L | – |

## Type designation

**Linear motor coil**

R88L-EC-FW-0303-ANPC

Accurax linear motor component

| Motor type | |
| --- | --- |
| Code | Specifications |
| FW | Iron-core motor coil |
| GW | Ironless motor coil |

| Magnet width | |
| --- | --- |
| Code | Specifications |
| 03 | 30 mm active magnet width |
| 05 | 50 mm active magnet width |
| 06 | 60 mm active magnet width |
| 07 | 70 mm active magnet width |
| 11 | 110 mm active magnet width |

| Coil model | |
| --- | --- |
| Code | Specifications |
| 03 | 3-coil model |
| 06 | 6-coil model |
| 09 | 9-coil model |
| 12 | 12-coil model |
| 15 | 15-coil model |

| Motor series | |
| --- | --- |
| Code | Specifications |
| C | Compact (Iron-core models) |
| S | Standard (Ironless models) |

| Connector options | |
| --- | --- |
| Code | Specifications |
| NP | No connectors |
| PL | With connectors |

Design Revision No.

## Magnet track

R88L-EC-FM-03□□□-A

Accurax linear motor component

| Magnet track type | |
|---|---|
| Code | Specifications |
| FM | Iron-core magnet track |
| GM | Ironless magnet track |

| Magnet width | |
|---|---|
| Code | Specifications |
| 03 | 30 mm active magnet width |
| 05 | 50 mm active magnet width |
| 06 | 60 mm active magnet width |
| 07 | 70 mm active magnet width |
| 11 | 110 mm active magnet width |

Design Revision No.

Length of magnet track in mm

## Hall sensor

R88L-EC-FH-NNNN-A

Accurax linear motor component

| Hall sensor type | |
|---|---|
| Code | Specifications |
| FH | Iron-core digital Hall-sensor |
| GH | Ironless digital Hall-sensor |

| Magnet width for Ironless type | |
|---|---|
| Code | Specifications |
| 03 | 30 mm active magnet width |
| 05 | 50 mm active magnet width |
| 07 | 70 mm active magnet width |
| NN | Placeholder |

Design Revision No.

Placeholder

# Linear servomotor specifications

## Iron-core motors R88L-EC-FW-□ (230/400 VAC)

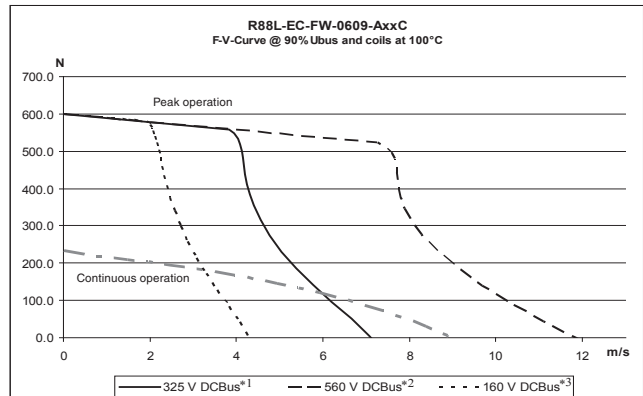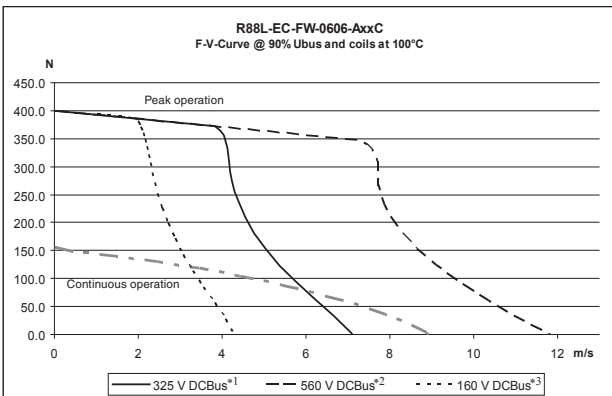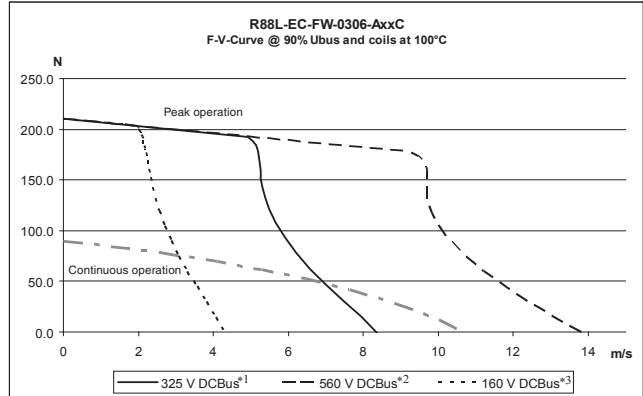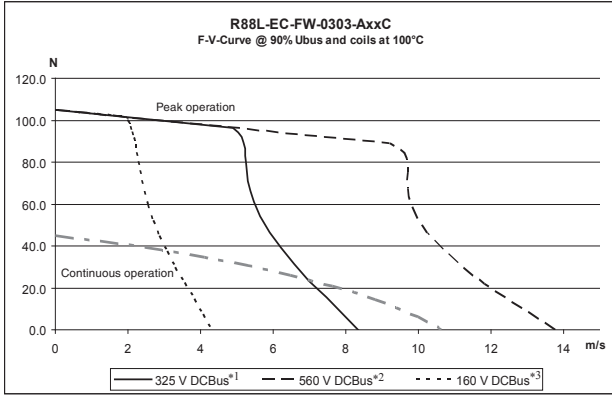| Voltage | | 230/400V | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Linear motor model | R88L-EC-FW-□ | 0303-□ | 0306-□ | 0606-□ | 0609-□ | 0612-□ | 1112-□ | 1115-□ |
| Maximum speed (100 V) | m/s | 2,5 | | 2 | | | 1 | |
| Maximum speed (200 V) | m/s | 5 | | 4 | | | 2 | |
| Maximum speed (400 V) | m/s | 10 | | 8 | | | 4 | |
| Peak force[1] | N | 105 | 210 | 400 | 600 | 800 | 1600 | 2000 |
| Peak current[1] | Arms | 3.1 | 6.1 | 10 | 15 | 20 | 20 | 25 |
| Continuous force[2] | N | 48 | 96 | 160 | 240 | 320 | 608 | 760 |
| Continuous current[2] | Arms | 1.24 | 2.4 | 3.4 | 5.2 | 6.9 | 6.5 | 8.2 |
| Motor force constant | N/A$_{rms}$ | 39.7 | | 46.5 | | | 93 | |
| BEMF | V/m/s | 32 | | 38 | | | 76 | |
| Motor constant | N/$\sqrt{W}$ | 9.75 | 13.78 | 19.49 | 23.87 | 27.57 | 41.47 | 46.37 |
| Phase resistance | $\Omega$ | 5.34 | 2.68 | 1.83 | 1.23 | 0.92 | 1.6 | 1.29 |
| Phase Inductance | mH | 34.7 | 17.4 | 13.7 | 9.2 | 6.9 | 12.8 | 10.3 |
| Electrical time constant | ms | 6,5 | | 7,5 | | | 8 | |
| Max. cont. power dissipation (all coils) | W | 32 | 63 | 88 | 131 | 175 | 279 | 349 |
| Thermal resistance | K/W | 2.20 | 1.10 | 0.78 | 0.52 | 0.39 | 0.23 | 0.18 |
| Thermal time constant | s | 110 | | 124 | | | 126 | |
| Magnetic attraction force | N | 300 | 500 | 1020 | 1420 | 1820 | 3640 | 4440 |
| Magnet pole pitch | mm | 24 | | | | | | |
| Weight coil unit[3] | kg | 0.48 | 0.78 | 1.31 | 1.84 | 2.37 | 4.45 | 5.45 |
| Weight magnet track | kg/m | 2.1 | | 3.8 | | | 10.5 | |
| Dimension cooling plate (l × w × h) | mm | 238×220×10 | | 250×287×12 | | | 371×330×14 | |
| Protection methods[4] | | Temperature sensors (KTY-83/121 & PTC 110C), self cooling | | | | | | |
| Hall sensor | | Digital (optional) | | | | | | |
| Insulation class | | Class B | | | | | | |
| Max. bus voltage | | 560 VDC | | | | | | |
| Insulation resistance | | 500 VDC, min. 10 M$\Omega$ | | | | | | |
| Di-electric strength | | 2750V for 1sec | | | | | | |
| Max. allowable coil temperature | | 130°C | | | | | | |
| Ambient humidity | | 20 to 80% (non-condensing) | | | | | | |
| Max. allowable magnet temperature | | 70°C | | | | | | |

[1] Coil temperature rising by 6K/s.
[2] Values at 100°C coil temperature and magnets at 25°C. Coil unit must be attached to the given cooling plate sizes in the table and an airstream of 2.5 m/s (25°C) has to be applied.
[3] Weight without connector and cable.
[4] I²t has to be set properly for high current applications.

All other values at 25°C (±10%).

# OMRON

## Force-speed characteristics

### R88L-EC-FW-0303-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-0306-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-0606-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-0609-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-0612-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-1112-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C



### R88L-EC-FW-1115-AxxC
F-V-Curve @ 90% Ubus and coils at 100°C
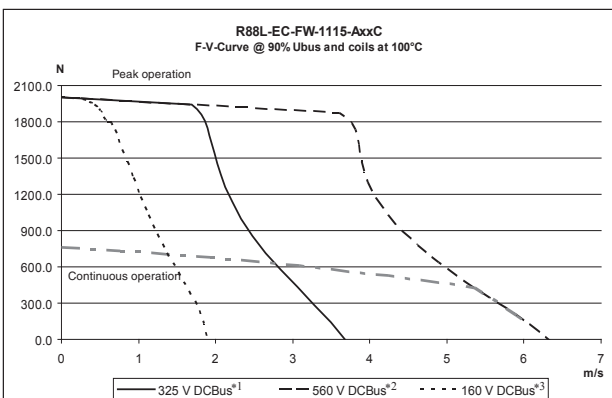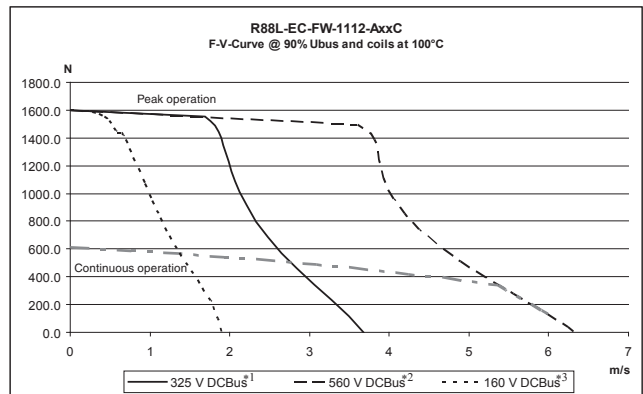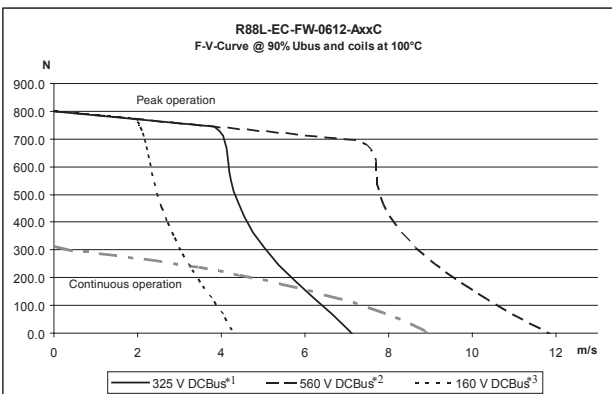


[1] The DCBus voltage corresponds to an AC voltage input ($V_{ACIN}$) of 235 V or more.
[2] The DCBus voltage corresponds to an AC voltage input ($V_{ACIN}$) of 400 V or more.
[3] The DCBus voltage corresponds to an AC voltage input ($V_{ACIN}$) of 115 V or more.

**Note:** The DCBus value is calculated from the below formula (where is the AV voltage drop in the DC Bus):

$$DCBuS = V_{ACIN} \times \sqrt{2} - \Delta V$$

## Ironless motors R88L-EC-GW-☐ (230 VAC)

| Voltage | | 230V | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Linear motor model | R88L-EC-GW-☐ | 0303-☐ | 0306-☐ | 0309-☐ | 0503-☐ | 0506-☐ | 0509-☐ | 0703-☐ | 0706-☐ | 0709-☐ |
| Maximum speed (100V) | m/s | 8 | | | 2.2 | | | 1.2 | | |
| Maximum speed (200V) | m/s | 16 | | | 4.4 | | | 2.4 | | |
| Peak force[1] | N | 100 | 200 | 300 | 240 | 480 | 720 | 700 | 1400 | 2100 |
| Peak current[1] | Arms | 5 | 10 | 15 | 3.5 | 7.0 | 10.5 | 5.6 | 11.3 | 16.9 |
| Continuous force[2] | N | 29 | 58 | 87 | 70 | 140 | 210 | 141 | 282 | 423 |
| Continuous current[2] | Arms | 1.5 | 2.9 | 4.4 | 1.03 | 2.1 | 3.1 | 1.14 | 2.27 | 3.4 |
| Motor force constant | N/A$_{rms}$ | 19.9 | | | 68 | | | 124 | | |
| BEMF | V/m/s | 16 | | | 55.5 | | | 101 | | |
| Motor constant | N/$\sqrt{W}$ | 5.07 | 7.16 | 8.78 | 9.74 | 13.77 | 17.13 | 18.15 | 25.67 | 32.02 |
| Phase resistance | Ω | 5.5 | 2,8 | 1.8 | 15.9 | 8 | 5,3 | 15.8 | 7.9 | 5.3 |
| Phase Inductance | mH | 1.8 | 0.9 | 0.6 | 13 | 6.5 | 4.2 | 28 | 14 | 9 |
| Electrical time constant | ms | 0.35 | | | 0.8 | | | 1.8 | | |
| Max. cont. power dissipation (all coils) | W | 47 | 95 | 142 | 67 | 134 | 200 | 82 | 165 | 247 |
| Thermal resistance[2] | K/W | 1.8 | 0.90 | 0.6 | 1.3 | 0.65 | 0.43 | 1.04 | 0.52 | 0.35 |
| Thermal time constant | s | 36 | | | 72 | | | 156 | | |
| Magnetic attraction force | N | 0 | | | | | | | | |
| Magnet pole pitch | mm | 30 | | | 42 | | | 57 | | |
| Weight coil unit[3] | kg | 0.084 | 0.162 | 0.240 | 0.25 | 0.47 | 0.69 | 0.55 | 0.95 | 1.35 |
| Weight magnet track | kg/m | 4.8 | | | 11.2 | | | 24 | | |
| Protection methods[4] | | Temperature sensors NTC10k, PTC110C, self cooling | | | | | | | | |
| Hall sensor | | Digital (optional) | | | | | | | | |
| Insulation class | | Class B | | | | | | | | |
| Max. bus voltage | | 325 VDC | | | | | | | | |
| Insulation resistance | | 500 VDC, min. 10 MΩ | | | | | | | | |
| Di-electric strength | | 2250 V for 1 sec | | | | | | | | |
| Max. allowable coil temperature | | 110°C | | | | | | | | |
| Ambient humidity | | 20 to 80% non-condensing | | | | | | | | |
| Max. allowable magnet temperature | | 70°C | | | | | | | | |

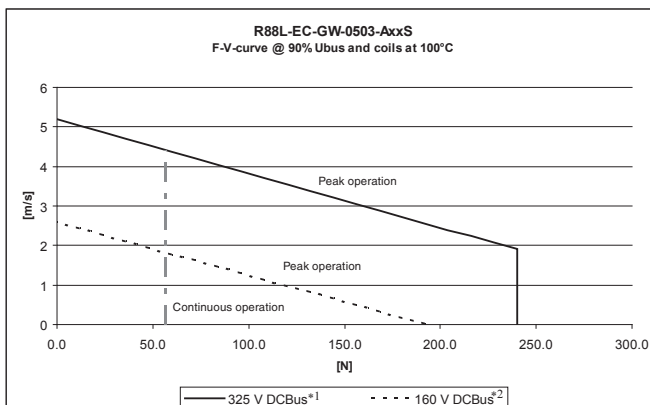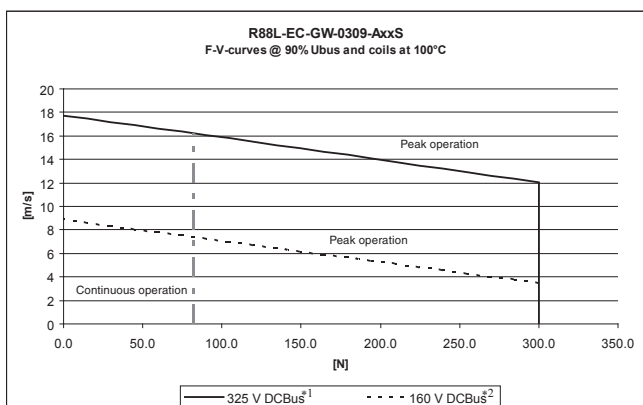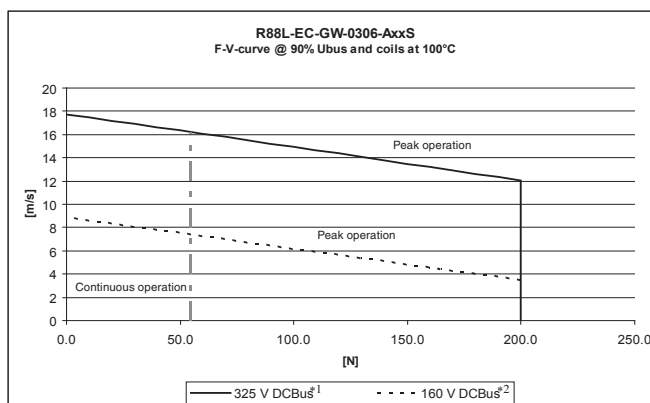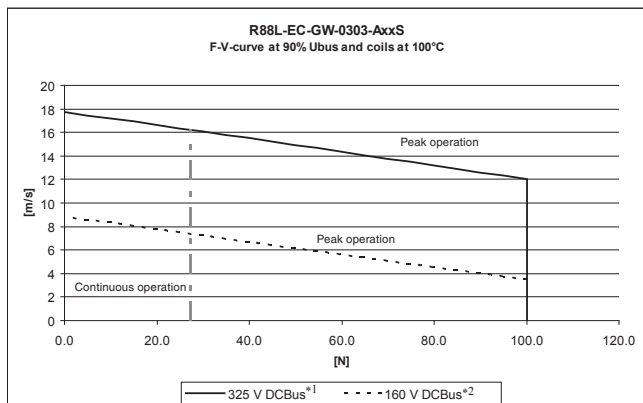[1] Coil temperature rising 03-series by 40K/s, 05-series by 20K/s and 07-series by 20K/s.
[2] Values at 110°C coil temperature and magnets at 25°C. Coil unit installed on a water-cooled aluminium surface. Attention: All other values at 25°C. Values can have a tolerance of 10%.
[3] Weight without connector and cable.
[4] I²t has to be set properly for high current overload applications.

All other values at 25ºC (±10%).

## Force-speed characteristics
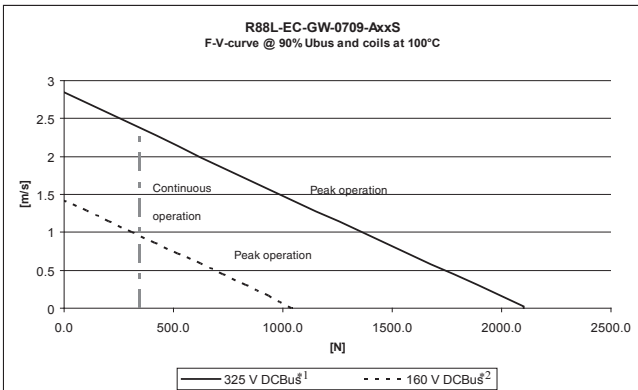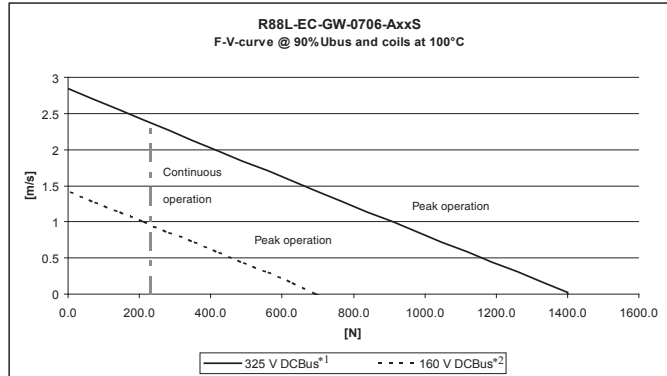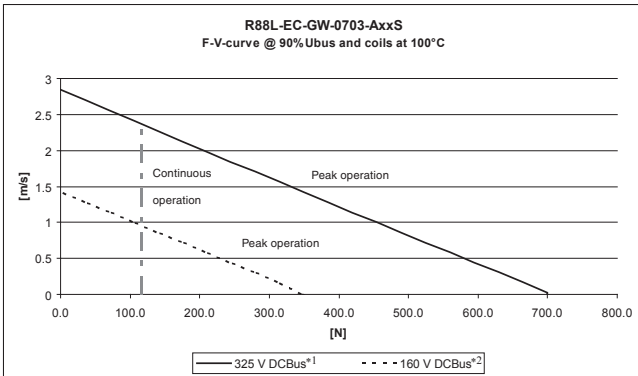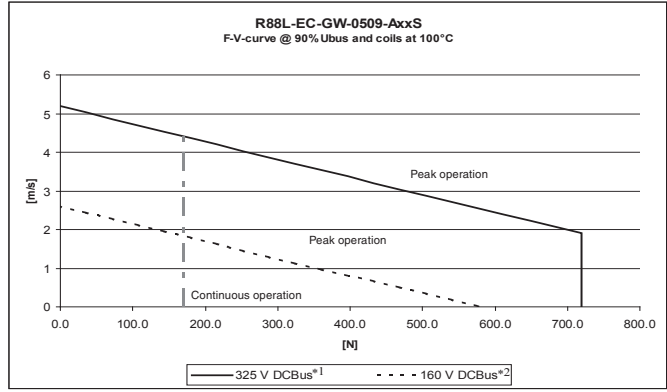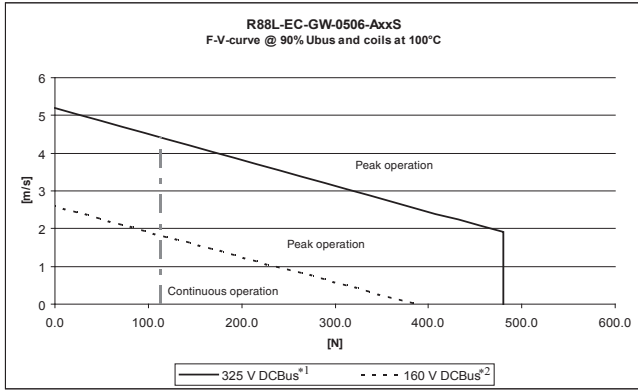


R88L-EC-GW-0303-AxxS
F-V-curve at 90% Ubus and coils at 100°C



R88L-EC-GW-0306-AxxS
F-V-curve @ 90% Ubus and coils at 100°C



R88L-EC-GW-0309-AxxS
F-V-curves @ 90% Ubus and coils at 100°C



R88L-EC-GW-0503-AxxS
F-V-curve @ 90% Ubus and coils at 100°C

R88L-EC-GW-0506-AxxS
F-V-curve @ 90% Ubus and coils at 100°C



R88L-EC-GW-0509-AxxS
F-V-curve @ 90% Ubus and coils at 100°C



R88L-EC-GW-0703-AxxS
F-V-curve @ 90% Ubus and coils at 100°C



R88L-EC-GW-0706-AxxS
F-V-curve @ 90% Ubus and coils at 100°C



R88L-EC-GW-0709-AxxS
F-V-curve @ 90% Ubus and coils at 100°C

*1 The DCBus voltage corresponds to an AC voltage input ($V_{ACIN}$) of 235V or more.
*2 The DCBus voltage corresponds to an AC voltage input ($V_{ACIN}$) of 115V or more.

**Note:** The DCBus value is calculated from the below formula:

$$DCBuS = V_{ACIN} \times \sqrt{2} - \Delta V$$

## Dimensions

### Iron-core R88L-EC-FW-03□

#### Motor coil

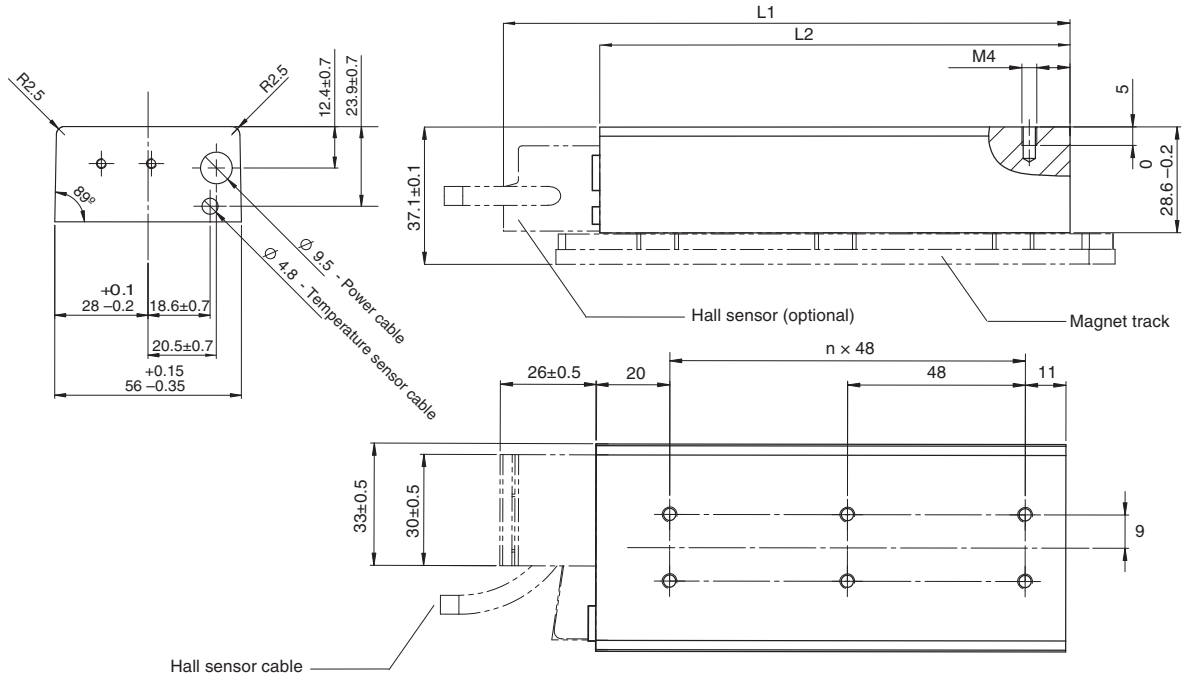| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-FW-0303-□ | 105 ±0.5 | 79 +0.15/−0.35 | 1 |
| R88L-EC-FW-0306-□ | 153 ±0.5 | 127 +0.15/−0.35 | 2 |

Motor coil dimensions with magnet track and hall sensor (optional)

Units: mm

Wiring specifications for motor with connectors
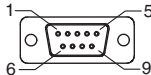
Cable length 500±30
Connector optional
Made by Hypertac
LRRA06AMRPN182 (MALE)
Pin article code: 021.279.1020

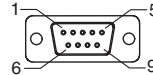| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black-1 | Phase U |
| 2 | Black-2 | Phase V |
| 3 | Green/Yellow | Ground |
| 4 | Black-3 | Phase W |
| 5 | Not used | – |
| 6 | Not used | – |

Mating connector:
Plug type: LPRA06BFRBN170

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | KTY |
| 9 | Yellow | KTY |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

#### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-FM-03096-A | 96 | 1 | 2.1 |
| R88L-EC-FM-03144-A | 144 | 2 | |
| R88L-EC-FM-03384-A | 384 | 7 | |

# OMRON
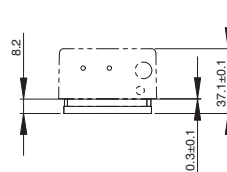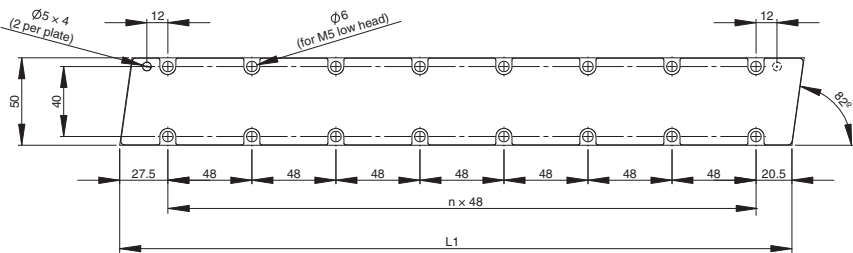
## Iron-core R88L-EC-FW-06□

### Motor coil

| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-FW-0606-□ | 153 ±0.5 | 127 +0.15/−0.35 | 2 |
| R88L-EC-FW-0609-□ | 201 ±0.5 | 175 +0.15/−0.35 | 3 |
| R88L-EC-FW-0612-□ | 249 ±0.5 | 223 +0.15/−0.35 | 4 |

Motor coil dimensions with magnet track and hall sensor (optional)



Units: mm

Wiring specifications for motor with connectors

Cable length 500±30
Connector optional
Made by Hypertac
LRRA06AMRPN182 (MALE)
Pin article code: 021.279.1020

| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black-1 | Phase U |
| 2 | Black-2 | Phase V |
| 3 | Green/Yellow | Ground |
| 4 | Black-3 | Phase W |
| 5 | Not used | – |
| 6 | Not used | – |

Mating connector:
Plug type: LPRA06BFRBN170

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | KTY |
| 9 | Yellow | KTY |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5 V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-FM-06192-A | 192 | 3 | 3.8 |
| R88L-EC-FM-06288-A | 288 | 5 | |
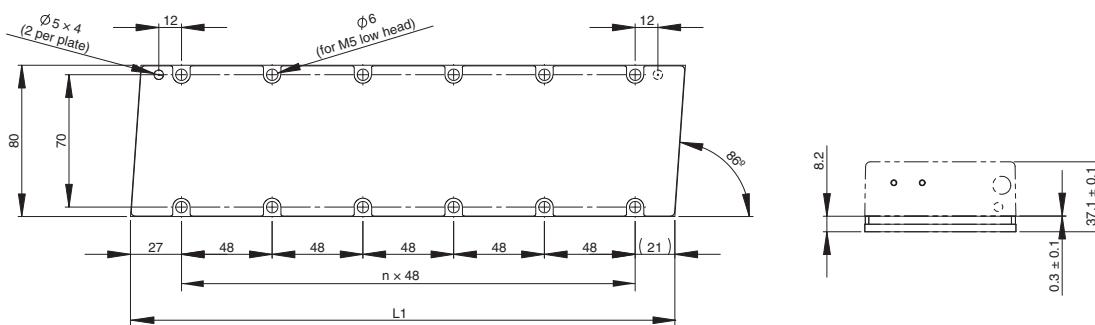
## Iron-core R88L-EC-FW-11□

### Motor coil

| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-FW-1112-□ | 249 ±0.5 | 223 +0.15/−0.35 | 4 |
| R88L-EC-FW-1115-□ | 297 ±0.5 | 271 +0.15/−0.35 | 5 |

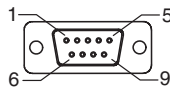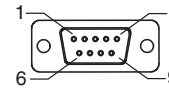Motor coil dimensions with magnet track and hall sensor (optional)



Units: mm

Wiring specifications for motor with connectors

Cable length 500±30
Connector optional
Made by Hypertac
LRRA06AMRPN182 (MALE)
Pin article code: 021.279.1020

| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black-1 | Phase U |
| 2 | Black-2 | Phase V |
| 3 | Green/Yellow | Ground |
| 4 | Black-3 | Phase W |
| 5 | Not used | – |
| 6 | Not used | – |

Mating connector:
Plug type: LPRA06BFRBN170

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | KTY |
| 9 | Yellow | KTY |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5 V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-FM-11192-A | 192 | 3 | 10.5 |
| R88L-EC-FM-11288-A | 288 | 5 | |



**Accurax linear motor**

# OMRON
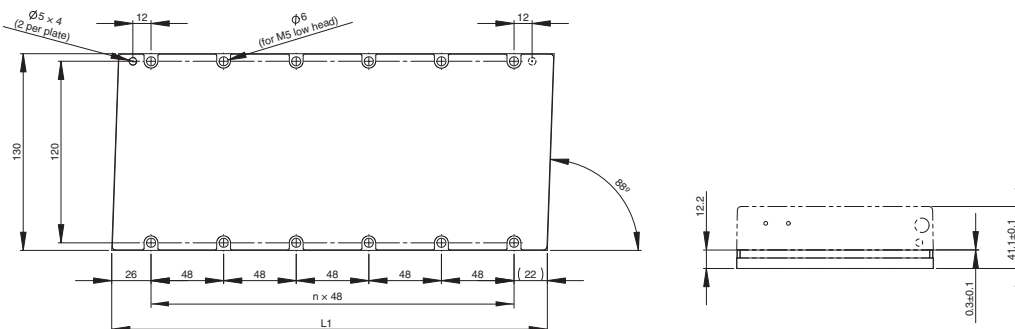
## Ironless R88L-EC-GW-03☐

### Motor coil

| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-GW-0303-☐ | 95.4 | 78 | 3 |
| R88L-EC-GW-0306-☐ | 155.4 | 138 | 6 |
| R88L-EC-GW-0309-☐ | 215.4 | 198 | 9 |

Motor with magnet track (separate order no.)
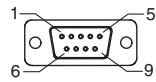
Motor with hall sensor (optional)

Units: mm

Wiring specifications for motor with connectors

Cable length 1000±30
Connector optional
Made by Hypertac
SROC06JMSCN169 (MALE)
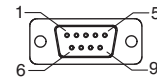Pin article code: 021.423.1020

| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black | Phase U |
| 2 | Red | Phase V |
| 3 | White | Phase W |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | Green | Ground |

Mating connector:
Plug type: SPOC06KFSDN169

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | NTC |
| 9 | Yellow | NTC |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5 V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-GM-03090-A | 90 | 2 | 4.8 |
| R88L-EC-GM-03120-A | 120 | 3 | |
| R88L-EC-GM-03390-A | 390 | 12 | |
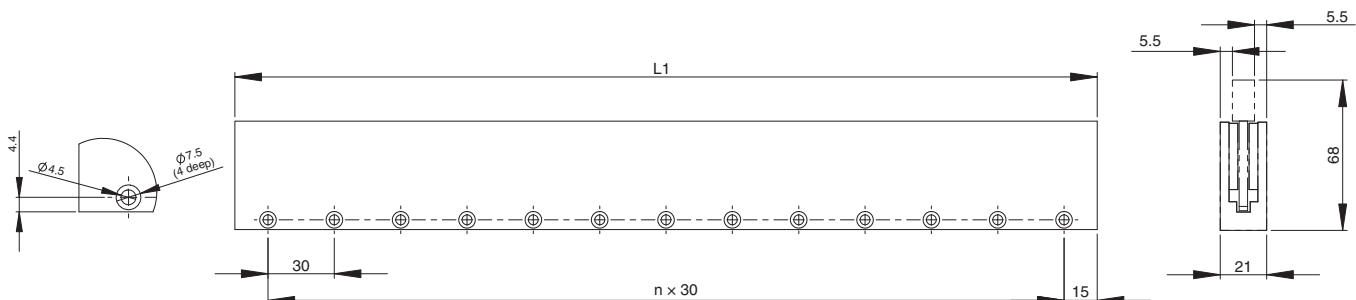
## Ironless R88L-EC-GW-05☐

### Motor coil

| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-GW-0503-☐ | 123.4 | 106 | 3 |
| R88L-EC-GW-0506-☐ | 207.4 | 190 | 6 |
| R88L-EC-GW-0509-☐ | 291.4 | 274 | 9 |

Motor with magnet track (separate order no.)

Motor with hall sensor (optional)

Units: mm

Wiring specifications for motor with connectors

Cable length 1000±30
Connector optional
Made by Hypertac
SROC06JMSCN169 (MALE)
Pin article code: 021.423.1020

| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black | Phase U |
| 2 | Red | Phase V |
| 3 | White | Phase W |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | Green | Ground |

Mating connector:
Plug type: SPOC06KFSDN169

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | NTC |
| 9 | Yellow | NTC |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

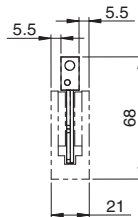| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5 V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-GM-05126-A | 126 | 2 | 11.2 |
| R88L-EC-GM-05168-A | 168 | 3 | |
| R88L-EC-GM-05210-A | 210 | 4 | |
| R88L-EC-GM-05546-A | 546 | 12 | |

# OMRON
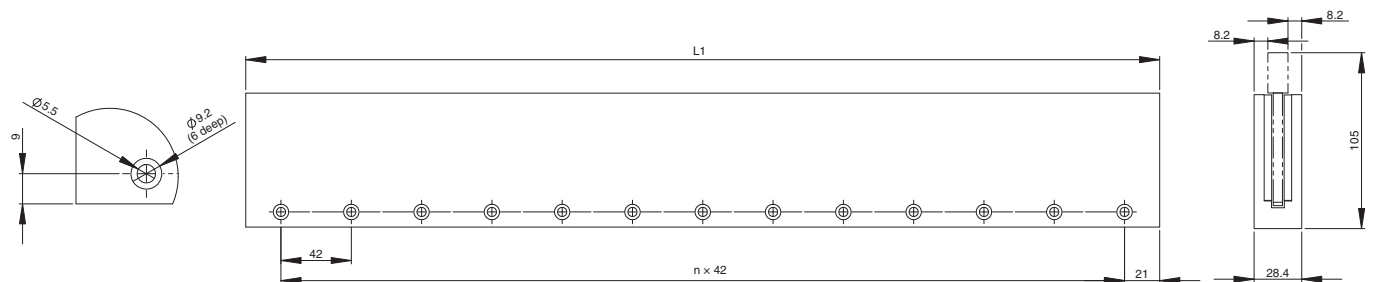
## Ironless R88L-EC-GW-07□

### Motor coil

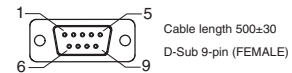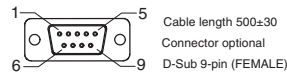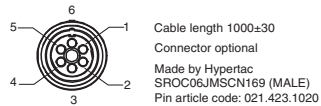| Model | L1 (mm) | L2 (mm) | n |
|---|---|---|---|
| R88L-EC-GW-0703-□ | 151.4 | 134 | 3 |
| R88L-EC-GW-0706-□ | 265.4 | 248 | 6 |
| R88L-EC-GW-0709-□ | 379.4 | 362 | 9 |



Motor with magnet track (separate order no.)

Motor with hall sensor (optional)

Units: mm

Wiring specifications for motor with connectors

Cable length 1000±30
Connector optional
Made by Hypertac
SROC06JMSCN169 (MALE)
Pin article code: 021.423.1020

| Power connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Black | Phase U |
| 2 | Red | Phase V |
| 3 | White | Phase W |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | Green | Ground |

Mating connector:
Plug type: SPOC06KFSDN169

Cable length 500±30
Connector optional
D-Sub 9-pin (FEMALE)

| Temperature sensor connector | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Not used | – |
| 2 | Not used | – |
| 3 | Not used | – |
| 4 | Not used | – |
| 5 | Not used | – |
| 6 | White | PTC |
| 7 | Brown | PTC |
| 8 | Green | NTC |
| 9 | Yellow | NTC |
| Case | Shield | – |

Cable length 500±30
D-Sub 9-pin (FEMALE)

| Hall sensor connector (optional) | | |
|---|---|---|
| Pin No. | Wire | Function |
| 1 | Brown | 5V |
| 2 | Red | Hall U |
| 3 | Grey | Hall V |
| 4 | Yellow | Hall W |
| 5 | White | GND |
| 6 | Not used | Not used |
| 7 | Not used | Not used |
| 8 | Not used | Not used |
| 9 | Not used | Not used |
| Case | Shield | – |

### Magnet track

| Model | L1 (mm) | n | Approx. weight (kg/m) |
|---|---|---|---|
| R88L-EC-GM-07114-A | 114 | 1 | 25.5 |
| R88L-EC-GM-07171-A | 171 | 2 | |
| R88L-EC-GM-07456-A | 456 | 7 | |

## Optional serial converter unit

### Specifications

| Serial converter model R88A- | | SC01K-E | SC02K-E |
|---|---|---|---|
| Description | | Serial converter from 1 Vpp to G5 serial data transmission and with hall sensor input | |
| Temperature sensor | | KTY sensor detection of iron-core motor coil | NTC sensor detection of ironless motor coil |
| Electrical characteristics | Power supply voltage | 5 VDC, max. 250 mA supplied by the drive | |
| | Standard resolution | Interpolation factor 100 plus quadrature count | |
| | Max. input frequency | 400 kHz 1 Vpp | |
| | Analog input signals (cos, sin, Ref) | Differential input amplitude: 0.4 V to 1.2 V Input signal level: 1.5 V to 3.5 V | |
| | Output signals | Position data, hall & temperature sensor information, and alarms | |
| | Output method | Serial data transmission | |
| | Transmission cycle | <42 µs | |
| Mechanical characteristics | Vibration resistance | 98 m/s$^2$ max. (1 to 2500 Hz) in three directions | |
| | Shock resistance | 980 m/s$^2$, (11 ms) two times in three directions | |
| Environmental conditions | Operating temperature | 0 to 55°C | |
| | Storage temperature | –20 to +80°C | |
| | Humidity | 20% to 90% relative humidity (without condensation) | |



| CN4 | Pin No. | Signal |
|---|---|---|
| Serial data output to linear servo drive | 1 | PS |
| | 2 | /PS |
| | 3 | Not used |
| | 4 | Not used |
| | 5 | Not used |
| | 6 | Not used |
| | 7 | Not used |
| | 8 | 5 V |
| | 9 | 0 V |
| Connector D-Sub 15-pin (male) | 10 | Not used |
| | 11 | Not used |
| | 12 | Not used |
| | 13 | Not used |
| | 14 | Not used |
| | 15 | Inner shield |
| | Case | Shield |

| CN3 | Pin No. | Signal |
|---|---|---|
| Temperature sensor interface without Hall sensor | 1 | Not used |
| | 2 | Not used |
| | 3 | Not used |
| | 4 | Not used |
| | 5 | Not used |
| | 6 | PTC |
| | 7 | PTC |
| | 8 | KTY/ NTC |
| Connector D-Sub 9-pin (female) | 9 | KTY/NTC |
| | Case | Shield |

| CN1 | Pin No. | Signal |
|---|---|---|
| Encoder input 1Vpp with programmable lines NUMERIK JENA standard | 1 | SDA* |
| | 2 | SCL* |
| | 3 | Not used |
| | 4 | /Ref signal (U0–) |
| | 5 | /Cos signal (U2–) |
| | 6 | /Sin signal (U1–) |
| | 7 | Not used |
| | 8 | 5 V |
| | 9 | 0 V |
| Connector D-Sub 15-pin (female) | 10 | Not used |
| | 11 | Not used |
| | 12 | Ref signal (U0) |
| | 13 | Cos signal (U2) |
| | 14 | Sin signal (U1) |
| | 15 | Inner shield (IS) |
| | Case | Shield |

| CN2 | Pin No. | Signal |
|---|---|---|
| Hall & temperature sensors interface | 1 | 5V |
| | 2 | Hall U |
| | 3 | Hall V |
| | 4 | Hall W |
| | 5 | GND |
| | 6 | PTC |
| | 7 | PTC |
| | 8 | KTY/NTC |
| Connector D-Sub 9-pin (female) | 9 | KTY/NTC |
| | Case | Shield |

*Reserved. Please do not use

**Note:** As the 6,7,8,9 pins in the CN2 and CN3 connectors are internally wired, the Temperature sensor can be connected to both connectors. When the Hall sensor is also required, use the same cable for Hall & Temperature signals and the CN2 connector.

# Ordering information

**(Refer to servo drive chapter)**

④ Servo drive options

Accurax G5 servo drive
EtherCAT model

⑥ Serial converter cable

⑥ A/B pulse encoder cable

⑤ Optional serial converter unit

⑦ Power cable

⑨ Optional hall sensor extension cable

⑨ Optional temp. sensor extension cable

⑧ Optional SinCos encoder extension cable

SinCos encoder

A/B pulse encoder

③ Hall sensor

Temp. sensor

Power

② Magnet track
R88L-EC-FM

SinCos encoder/AB pulse encoder

① Iron-core coil motor
R88L-EC-FW

**Iron-core and ironless linear motors**
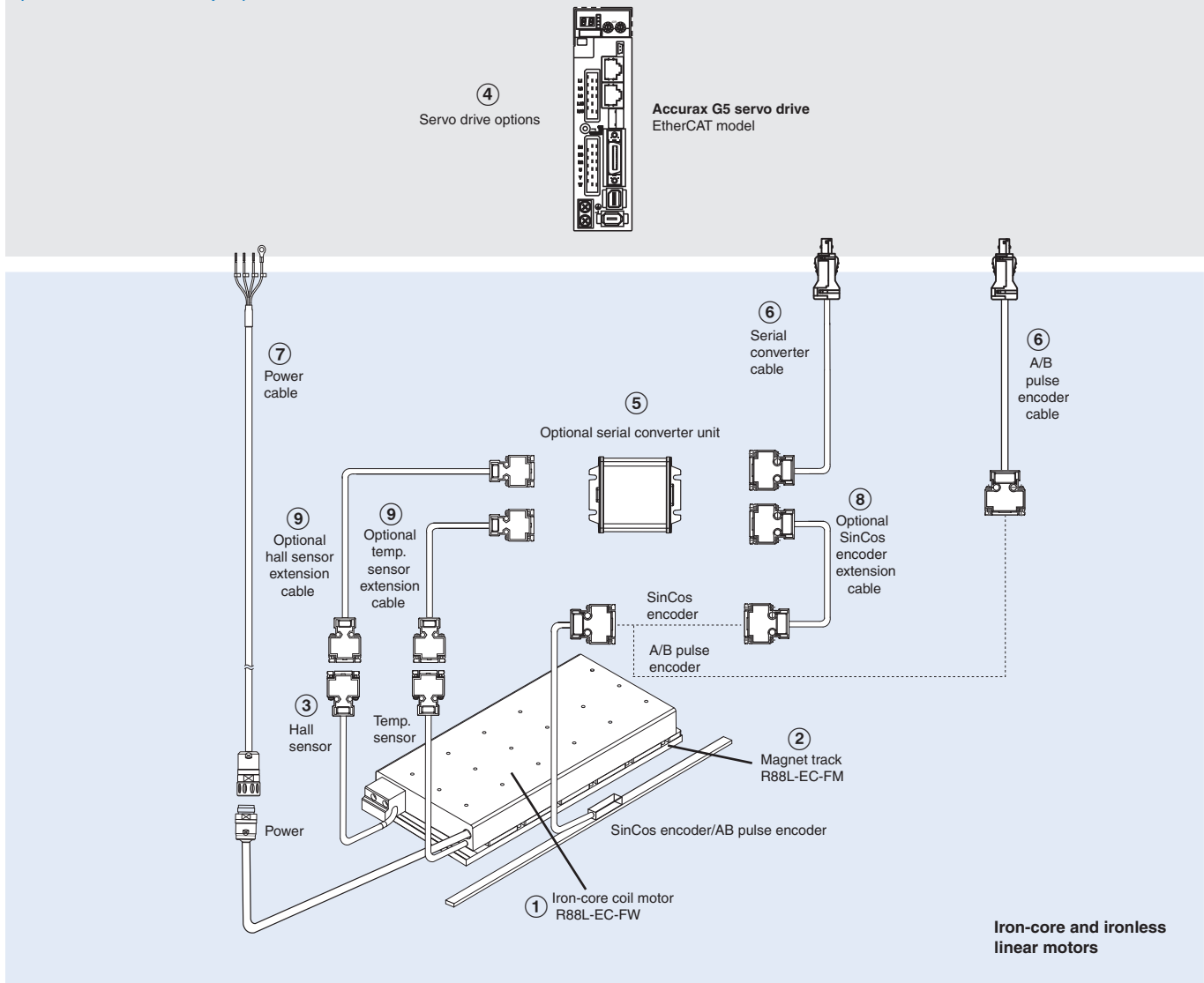
**Note:** The symbols ①②③... show the recommended sequence to select the linear motor, cables and serial converter for a linear motor system.

**Linear motors**

## R88L-EC-FW-□ Iron-core type

**230 VAC single phase/three phase, 400 VAC three phase**

| Linear motor parts | | | | | | | Linear Servo drive | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | ④ **Accurax G5 EtherCAT** | |
| **Symbol** | **Rated force** | **Peak force** | ① **Iron-core motor coil** | | ② **Magnet track** | ③ **Hall Sensor** | **230 V** | **400 V** |
| ①② ③④ | 48 N | 105 N | Coil without connectors | R88L-EC-FW-0303-ANPC | R88L-EC-FM-03096-A R88L-EC-FM-03144-A R88L-EC-FM-03384-A | R88L-EC-FH-NNNN-A | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | | R88L-EC-FW-0306-ANPC | | | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | | R88L-EC-FW-0606-ANPC | R88L-EC-FM-06192-A R88L-EC-FM-06288-A | | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | | R88L-EC-FW-0609-ANPC | | | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | | R88L-EC-FW-0612-ANPC | | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | | R88L-EC-FW-1112-ANPC | R88L-EC-FM-11192-A R88L-EC-FM-11288-A | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | | R88L-EC-FW-1115-ANPC | | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 48 N | 105 N | Coil with connectors | R88L-EC-FW-0303-APLC | R88L-EC-FM-03096-A R88L-EC-FM-03144-A R88L-EC-FM-03384-A | | R88D-KN02H-ECT-L | R88D-KN06F-ECT-L |
| | 96 N | 210 N | | R88L-EC-FW-0306-APLC | | | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 400 N | | R88L-EC-FW-0606-APLC | R88L-EC-FM-06192-A R88L-EC-FM-06288-A | | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 600 N | | R88L-EC-FW-0609-APLC | | | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 800 N | | R88L-EC-FW-0612-APLC | | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1600 N | | R88L-EC-FW-1112-APLC | R88L-EC-FM-11192-A R88L-EC-FM-11288-A | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2000 N | | R88L-EC-FW-1115-APLC | | | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |

### R88L-EC-GW-□ Ironless type

**230 VAC single phase/three phase**

| Type | Rated force | Peak force | ① Ironless motor coil | | ② Magnet track | ③ Hall Sensor | Linear Servo drive<br>④ Accurax G5 EtherCAT<br>230V |
|---|---|---|---|---|---|---|---|
| ①②<br>③④ | 29 N | 100 N | Coil without connectors | R88L-EC-GW-0303-ANPS | R88L-EC-GM-03090-A | R88L-EC-GH-03NN-A | R88D-KN02H-ECT-L |
| | 58 N | 200 N | | R88L-EC-GW-0306-ANPS | R88L-EC-GM-03120-A | | R88D-KN08H-ECT-L |
| | 87 N | 300 N | | R88L-EC-GW-0309-ANPS | R88L-EC-GM-03390-A | | R88D-KN10H-ECT-L |
| | 70 N | 240 N | | R88L-EC-GW-0503-ANPS | R88L-EC-GM-05126-A | R88L-EC-GH-05NN-A | R88D-KN02H-ECT-L |
| | 140 N | 480 N | | R88L-EC-GW-0506-ANPS | R88L-EC-GM-05546-A | | R88D-KN04H-ECT-L |
| | 210 N | 720 N | | R88L-EC-GW-0509-ANPS | R88L-EC-GM-05168-A<br>R88L-EC-GM-05210-A | | R88D-KN08H-ECT-L |
| | 141 N | 700 N | | R88L-EC-GW-0703-ANPS | R88L-EC-GM-07114-A | R88L-EC-GH-07NN-A | R88D-KN04H-ECT-L |
| | 282 N | 1400 N | | R88L-EC-GW-0706-ANPS | R88L-EC-GM-07171-A | | R88D-KN08H-ECT-L |
| | 423 N | 2100 N | | R88L-EC-GW-0709-ANPS | R88L-EC-GM-07456-A | | R88D-KN10H-ECT-L |
| | 29 N | 100 N | Coil with connectors | R88L-EC-GW-0303-APLS | R88L-EC-GM-03090-A | R88L-EC-GH-03NN-A | R88D-KN02H-ECT-L |
| | 58 N | 200 N | | R88L-EC-GW-0306-APLS | R88L-EC-GM-03120-A | | R88D-KN08H-ECT-L |
| | 87 N | 300 N | | R88L-EC-GW-0309-APLS | R88L-EC-GM-03390-A | | R88D-KN10H-ECT-L |
| | 70 N | 240 N | | R88L-EC-GW-0503-APLS | R88L-EC-GM-05126-A | R88L-EC-GH-05NN-A | R88D-KN02H-ECT-L |
| | 140 N | 480 N | | R88L-EC-GW-0506-APLS | R88L-EC-GM-05546-A | | R88D-KN04H-ECTL |
| | 210 N | 720 N | | R88L-EC-GW-0509-APLS | R88L-EC-GM-05168-A<br>R88L-EC-GM-05210-A | | R88D-KN08H-ECT-L |
| | 141 N | 700 N | | R88L-EC-GW-0703-APLS | R88L-EC-GM-07114-A | R88L-EC-GH-07NN-A | R88D-KN04H-ECTL |
| | 282 N | 1400 N | | R88L-EC-GW-0706-APLS | R88L-EC-GM-07171-A | | R88D-KN08H-ECT-L |
| | 423 N | 2100 N | | R88L-EC-GW-0709-APLS | R88L-EC-GM-07456-A | | R88D-KN10H-ECT-L |

## Servo drive
④ Refer to Accurax G5 servo drive chapter for detailed drive specifications and selection of drive accessories.

## Serial converter unit

| Symbol | Specifications | Model |
|---|---|---|
| ⑤ | Serial converter unit from 1 Vpp to G5 serial data transmission (with KTY sensor detection of iron-core motor coil) | R88A-SC01K-E |
| | Serial converter unit from 1 Vpp to G5 serial data transmission (with NTC sensor detection of ironless motor coil) | R88A-SC02K-E |

**Note:** If no temperature sensor is needed, then it does not matter which converter you use.

## Serial converter cable to servo drive
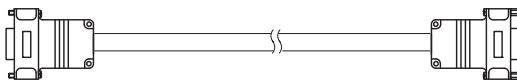
| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑥ | Accurax G5-Linear drive to serial converter cable.<br>(Connectors R88A-CNK41L and DB-15) | 1.5 m | R88A-CRKN001-5CR-E | |
| | | 3 m | R88A-CRKN003CR-E | |
| | | 5 m | R88A-CRKN005CR-E | |
| | | 10 m | R88A-CRKN010CR-E | |
| | | 15 m | R88A-CRKN015CR-E | |
| | | 20 m | R88A-CRKN020CR-E | |

**Note:** This cable can be used also for A/B pulse encoder Numerik Jena standard pinout.
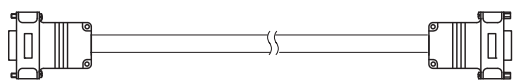
## Power cable

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑦ | For iron-core linear motors<br>R88L-EC-FW-0303-□<br>R88L-EC-FW-0306-□ | 1.5 m | R88A-CAWK001-5S-DE | |
| | | 3 m | R88A-CAWK003S-DE | |
| | | 5 m | R88A-CAWK005S-DE | |
| | | 10 m | R88A-CAWK010S-DE | |
| | | 15 m | R88A-CAWK015S-DE | |
| | | 20 m | R88A-CAWK020S-DE | |
| | For iron-core linear motors<br>R88L-EC-FW-0606-□<br>R88L-EC-FW-0609-□<br>R88L-EC-FW-0612-□<br>R88L-EC-FW-1112-□<br>R88L-EC-FW-1115-□ | 1.5 m | R88A-CAWL001-5S-DE | |
| | | 3 m | R88A-CAWL003S-DE | |
| | | 5 m | R88A-CAWL005S-DE | |
| | | 10 m | R88A-CAWL010S-DE | |
| | | 15 m | R88A-CAWL015S-DE | |
| | | 20 m | R88A-CAWL020S-DE | |
| | For ironless linear motors<br>R88L-EC-GW-□ | 1.5 m | R88A-CAWB001-5S-DE | |
| | | 3 m | R88A-CAWB003S-DE | |
| | | 5 m | R88A-CAWB005S-DE | |
| | | 10 m | R88A-CAWB010S-DE | |
| | | 15 m | R88A-CAWB015S-DE | |
| | | 20 m | R88A-CAWB020S-DE | |

## Linear encoder cable to serial converter

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑧ | Extension cable for **Numerik Jena** linear encoder to R88A-SC0□K-E serial converter (Connector DB-15) (This extension cable is optional) | 1.5 m | R88A-CFKA001-5CR-E | |
| | | 3 m | R88A-CFKA003CR-E | |
| | | 5 m | R88A-CFKA005CR-E | |
| | | 10 m | R88A-CFKA010CR-E | |
| | | 15 m | R88A-CFKA015CR-E | |
| | Extension cable for **Renishaw** linear encoder to R88A-SC0□K-E serial converter (Connector DB-15) (This extension cable is optional) | 1.5 m | R88A-CFKC001-5CR-E | |
| | | 3 m | R88A-CFKC003CR-E | |
| | | 5 m | R88A-CFKC005CR-E | |
| | | 10 m | R88A-CFKC010CR-E | |
| | | 15 m | R88A-CFKC015CR-E | |
| | Extension cable for **Heidenhain** linear encoder to R88A-SC0□K-E serial converter (Connector DB-15) (This extension cable is optional) | 1.5 m | R88A-CFKD001-5CR-E | |
| | | 3 m | R88A-CFKD003CR-E | |
| | | 5 m | R88A-CFKD005CR-E | |
| | | 10 m | R88A-CFKD010CR-E | |
| | | 15 m | R88A-CFKD015CR-E | |

## Hall and temperature sensors cable to serial converter

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑨ | Extension cable from hall and temperature sensors to R88A-SC0□K-E serial converter. (Connector DB-9) (This extension cable is optional) | 1.5 m | R88A-CFKB001-5CR-E | |
| | | 3 m | R88A-CFKB003CR-E | |
| | | 5 m | R88A-CFKB005CR-E | |
| | | 10 m | R88A-CFKB010CR-E | |
| | | 15 m | R88A-CFKB015CR-E | |

## Connectors

| Specification | Model |
|---|---|
| Accurax G5 servo drive encoder connector (for CN4) | R88A-CNK41L |
| Hypertac power cable connector IP67 for iron-core linear motors | LPRA-06B-FRBN170 |
| Hypertac power cable connector IP67 for ironless linear motors | SROC06JMSCN169 |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_I160E-EN-02A    In the interest of product improvement, specifications are subject to change without notice.

**R88E-AECT□, R88S-EAD□**

# Integrated servo motor

## Motor and drive integrated for space optimization

- Wide range of motors from 2.55 Nm to 25 Nm
- 3000 rpm rated speed
- Peak torque 300% of rated torque
- IP65 protection
- Space-saving. Panel reduction
- Simplified wiring compared to conventional servos
- EtherCAT connectivity. Integration in Sysmac Automation Platform
- Energy saving by sharing DC Bus
- Incremental and multiturn absolute encoder options
- Embedded I/O's for dedicated or general purpose

### Ratings
- From 880 W to 7.85 kW (rated torque from 2.55 Nm to 25 Nm)
- Power supply: Input 400 VAC (up to 40 A output)

EtherCAT

## System configuration

**Control panel**

EtherNet/IP    Factory network    NA HMI

Sysmac
always in control

**NJ series**
Machine automation controller

EtherCAT

**DC power supply unit**

Local I/O

**Integrated servo motor**

560 VDC / 24 VDC logic

# OMRON
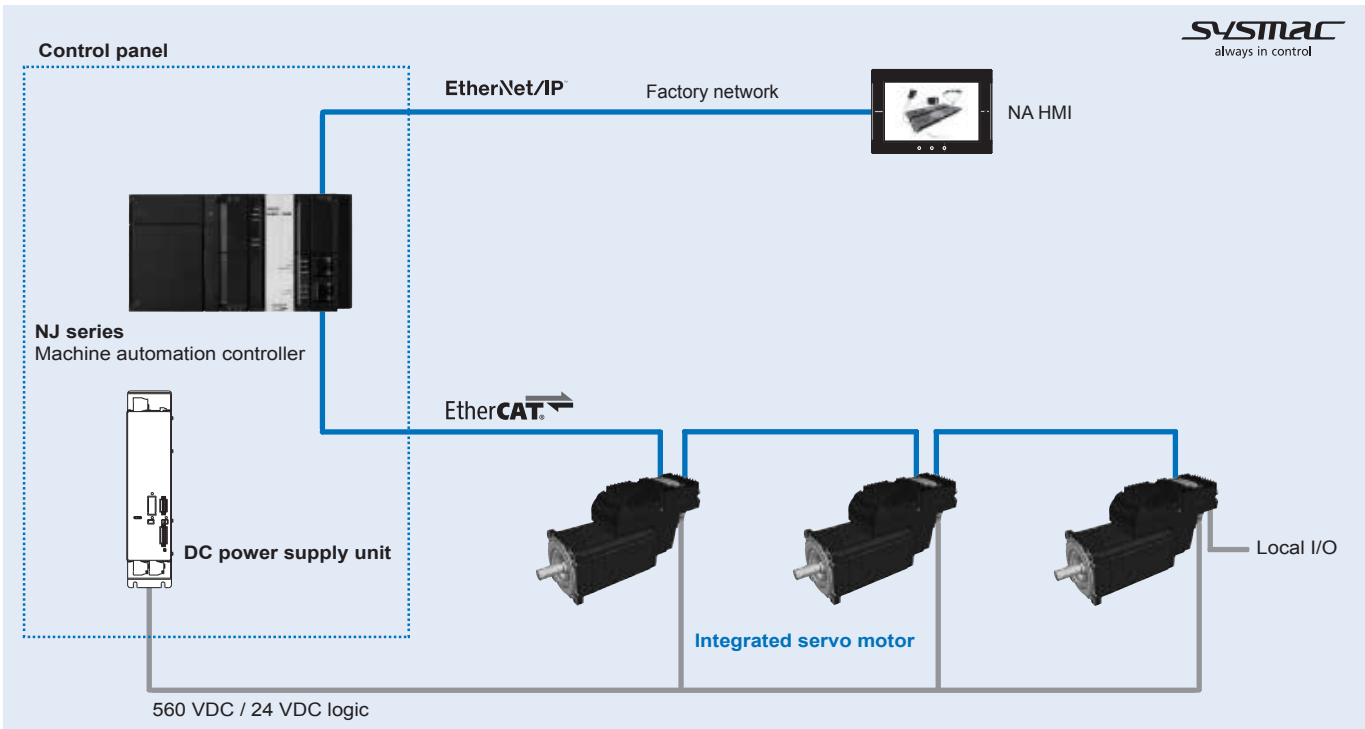
## Type designation

**Integrated servo motor**

### R88E-AECT0530D-BS2

Integrated servo motor series

EtherCAT communication

Motor rated torque

| 02 | 2.55 Nm |
|----|---------|
| 03 | 3.2 Nm |
| 04 | 4.3 Nm |
| 05 | 5.0 Nm |
| 11 | 11.7 Nm |
| 25 | 25 Nm |

Shaft end specifications

| Blank | Straight shaft, no key |
|-------|------------------------|
| S2 (standard) | Straight, key, tapped |

Brake specifications

| Blank | No brake |
|-------|----------|
| B | Brake |

Encoder specifications

| D | Incremental encoder |
|---|---------------------|
| E | Multiturn absolute encoder |

Rated speed: 3000 r/min

**DC power supply unit**

### R88S-EAD20R

Power supply unit for
Integrated servo motor

Power input specifications

D: 400 V 3-phase rated

Regeneration circuit

| Blank | No regeneration circuit |
|-------|-------------------------|
| R | Integrated regeneration circuit |

Rated output current

| 20 | 20 ADC output current |
|----|------------------------|
| 40 | 40 ADC output current |

## Integrated servo motor specifications

**Integrated servo motor 3000 r/min, 560 VDC**

### Ratings and specifications

| Voltage | | 560 VDC | | | | | |
|---|---|---|---|---|---|---|---|
| **Integrated servo motor model R88E-AECT□** | Incremental encoder | 0230D-□ | 0330D-□ | 0430D-□ | 0530D-□ | 1130D-□ | 2530D-□ |
| | Multiturn absolute encoder | 0230E-□ | 0330E-□ | 0430E-□ | 0530E-□ | 1130E-□ | 2530E-□ |
| Rated output | W | 880 | 1000 | 1350 | 1570 | 3670 | 7850 |
| Rated torque | N·m | 2.55 | 3.2 | 4.3 | 5 | 11.7 | 25 |
| Instantaneous peak torque | N·m | 8.4 | 12 | 22 | 22 | 45 | 70 |
| Rated current at rated speed | A (DC) | 1.8 | 2.15 | 2.85 | 3.3 | 7.7 | 16.5 |
| Instantaneous max. current | A (DC) | 5.55 | 7.9 | 14.5 | 14.5 | 30 | 46 |
| Rated speed | min$^{-1}$ | 3000 | | | | | |
| Rotor moment of inertia (JM) | kg·m$^2$×10$^{-4}$ (without brake) | 1.16 | 1.58 | 2.8 | 4 | 11.5 | 74 |
| | kg·m$^2$×10$^{-4}$ (with brake) | 1.38 | 1.80 | 3.6 | 5.06 | 13.2 | 106 |
| Max. radial load | N | 350 | 350 | 626 | 626 | 700 | 1000 |
| Max. axial load | N | 110 | 110 | 225 | 225 | 70 | 100 |
| Approx. mass | kg (without brake) | 4.1 | 5.1 | 6.7 | 8 | 17 | 38 |
| | kg (with brake) | 4.8 | 5.8 | 7.9 | 9.2 | 18.5 | 43 |
| **Brake** Holding brake moment of inertia J | kg·m$^2$×10$^{-4}$ | 0.22 | 0.22 | 0.8 | 1.06 | 1.7 | 32 |
| Current consumption | A | 0.50 | 0.50 | 0.75 | 0.75 | 1.0 | 0.85 |
| Static friction torque | N·m | 4.5 | 4.5 | 9 | 9 | 15 | 47 |
| **Logic** Rated voltage | Without brake | 24 VDC (-15%, +15%) | | | | | |
| | With brake | 24 VDC (-10%, +6%) | | | | | |
| Internal protection | | Fuse: 4 A-T not replaceable | | | | | |
| Current consumption | | Nominal 250 mA, max. 500 mA | | | | | |
| **Basic** IP rating | | IP65 | | | | | |
| Number of poles | | 8 poles | | | | | 10 poles |
| Insulation class | | Type F | | | | | |
| Ambient operating/storage temperature | | 0 to 40°C/–20 to 70°C | | | | | |
| Ambient operating/storage humidity | | 5% to 95% (without condensation) | | | | | |
| Ventilation | | Natural | | | | Forced with integrated fans | |
| Shock resistance | | According to IEC 60068-2-27 (3 shock per direction, 11 ms, 14g on 3 axes) | | | | | |
| Vibration resistance | | According to IEC 60068-2-6 (5 to 500 Hz, 2g on 3 axes) | | | | | |
| **Encoder** Incremental | | 15-bit turn | | | | | |
| Absolute multiturn | | 20-bit resolution (18-bit real accuracy) | | | | | |

### Torque-speed characteristics
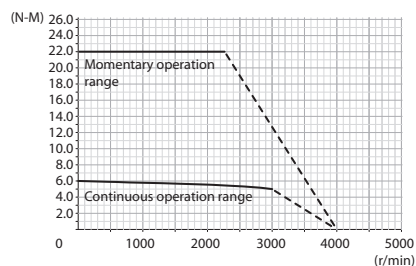
R88E-AECT0230D/E (880 W)
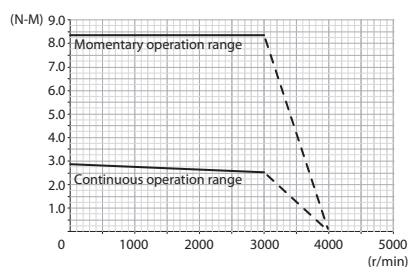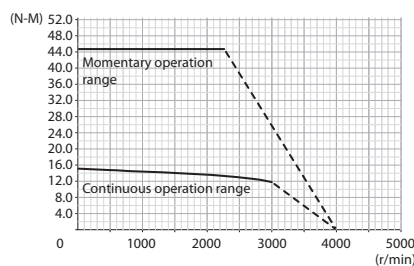


R88E-AECT0330D/E (1 kW)
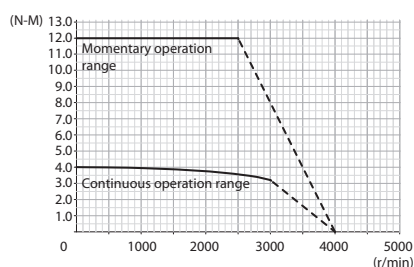


R88E-AECT0430D/E (1.35 kW)
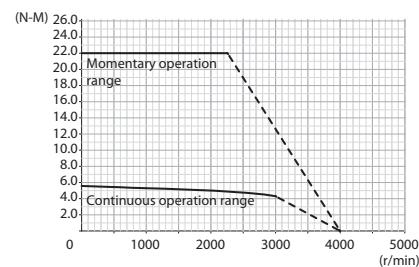


R88E-AECT0530D/E (1.57 kW)



R88E-AECT1130D/E (3.67 kW)



R88E-AECT2530D/E (7.85 kW)

# OMRON
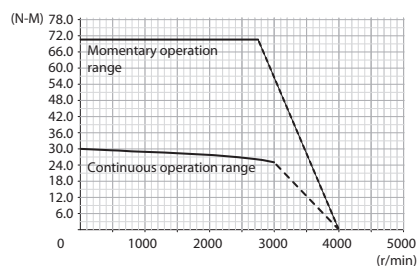
## Integrated servo motor nomenclature

**I/O specifications**
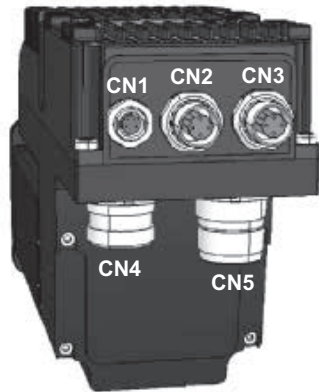


R88E-AECT0230/0330/
0430/0530 models



R88E-AECT1130/2530 models

### Auxiliary - RS232 serial port (CN1)

| Symbol | Signal name | Description |
|--------|-------------|-------------|
| 1 | TX232 | Transmit data RS232 |
| 2 | RX232 | Receive data RS232 |
| 3 | NC | Not used. Do not connect |
| 4 | GND_COM | Ground RS232 |
| Chassis | PE | Protection earth |

### Main bus - ECT (CN2-OUT/CN3-IN)

| Symbol | Signal name | Description |
|--------|-------------|-------------|
| 1 | TX Data+ | Transmit data (+) |
| 2 | RX Data+ | Receive data (+) |
| 3 | TX Data- | Transmit data (-) |
| 4 | RX Data- | Receive data (-) |
| Chassis | PE | Protection earth |

### DC power supply and logic supply (CN5)

| Symbol | Signal name | Description |
|--------|-------------|-------------|
| 1 | HV- | DC power supply (negative pole) |
| 3 | - | Not used. Do not connect |
| 4 | HV+ | DC power supply (positive pole) |
| T | PE | Protection earth |
| A | /STOP | Safety loop (the signal is at reversed logic) |
| B | 0V | Ground logic supply |
| C | IN9 | Digital input 9 |
| D | +24 V | +24 VDC logic supply |
| Chassis | PE | Protection earth |

### Input/Output signals (CN4)

| Symbol | Signal name | Description |
|--------|-------------|-------------|
| 1 | IN/OUT1- | Differential line driver digital input/output 1 (-) |
| 2 | IN/OUT2- | Differential line driver digital input/output 2 (-) |
| 3 | AN_IN- | Analog input (-) |
| 4 | AN_IN+ | Analog input (+) |
| 5 | IN/OUT2+ | Differential line driver digital input/output 2 (+) |
| 6 | GND_5V | Ground of +5V |
| 7 | +5V | +5V supply (max 150mA) for auxiliary encoder |
| 8 | IN8 | Digital input 8 PNP 24V |
| 9 | OUT5 | Digital output 5 PNP 24V |
| 10 | IN/OUT3 | Digital input/output 3 PNP 24V |
| 11 | IN7 | Digital input 7 PNP 24V |
| 12 | IN/OUT0- | Differential line driver digital input/output 0 (-) |
| 13 | IN/OUT0+ | Differential line driver digital input/output 0 (+) |
| 14 | IN/OUT1+ | Differential line driver digital input/output 1 (+) |
| 15 | IN4 | Digital input 4 PNP 24V |
| 16 | OUT4 | Digital output 4 PNP 24V |
| 17 | OUT6 | Digital output 6 PNP 24V |
| 18 | IN6 | Digital input 6 PNP 24V |
| 19 | IN5 | Digital input 5 PNP 24V (the function simulated GND is available) |
| Chassis | PE | Protection earth |

**LED and rotary switch specifications**
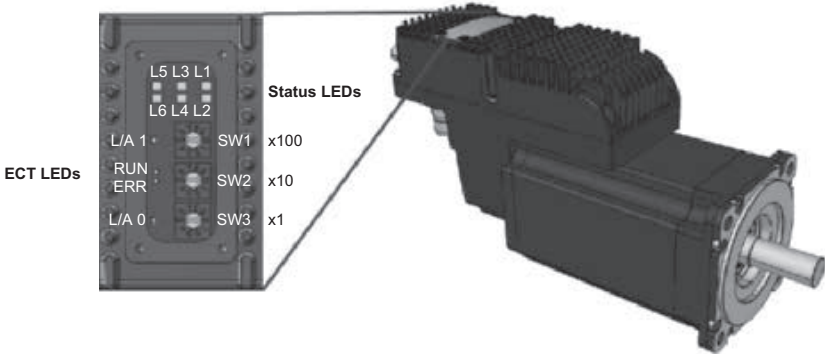


| Name | | Description |
|---|---|---|
| LED | L1, L2 | Drive status (fault, warning, enabling) |
| | L3, L5 | Reserved (LED OFF) |
| | L4 | Overload (I2T) status |
| | L6 | Input status /STOP |
| | L/A 0 | Status of the physical link/activity of the EtherCAT port on the CN3 connector |
| | L/A 1 | Status of the physical link/activity of the EtherCAT port on the CN2 connector |
| | ERR | EtherCAT error LED (ERR) |
| | RUN | EtherCAT run LED (RUN) |
| Rotary switch | SW1 | EtherCAT user address (station alias) x100 |
| | SW2 | EtherCAT user address (station alias) x10 |
| | SW3 | EtherCAT user address (station alias) x1 |

# Integrated servo motor dimensions

### R88E-AECT0230□/0330□ (880 W to 1 kW)

| Dimensions (mm) | | Without brake | | With brake | | Flange | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Voltage | Model | LM | LL | LM | LL | | Without brake | With brake |
| 560 VDC | R88E-AECT0230□ | 115 | 231.3 | 157 | 273.3 | 80 | 4.1 | 4.8 |
| | R88E-AECT0330□ | 140 | 256.3 | 182 | 298.3 | | 5.1 | 5.8 |

# OMRON
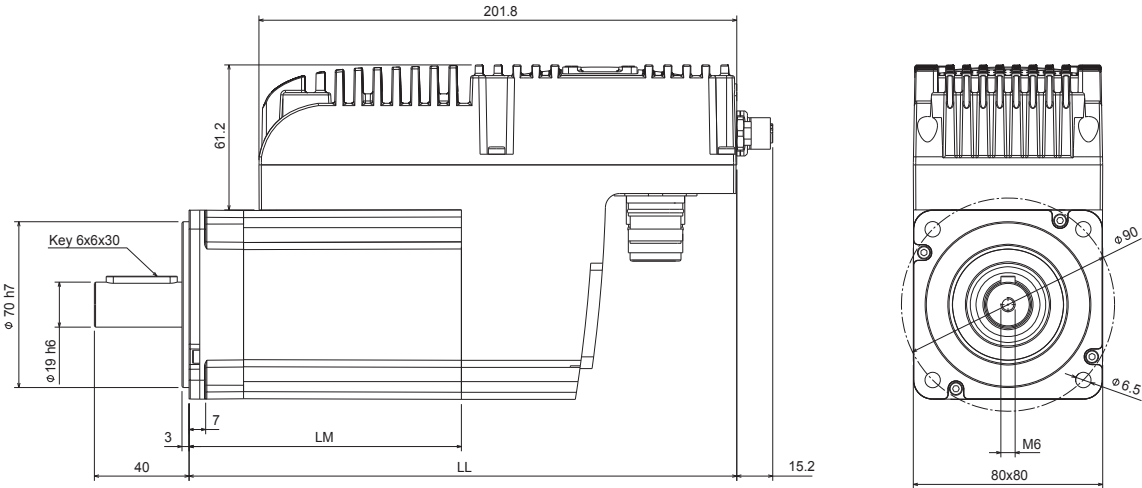
## R88E-AECT0430□/0530□ (1.35 kW to 1.57 kW)

| Dimensions (mm) | | Without brake | | With brake | | Flange | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Voltage | Model | LM | LL | LM | LL | | Without brake | With brake |
| 560 VDC | R88E-AECT0430□ | 135.5 | 251.8 | 186 | 302.3 | 100 | 6.7 | 7.9 |
| | R88E-AECT0530□ | 165.5 | 281.8 | 216 | 332.3 | | 8.0 | 9.2 |
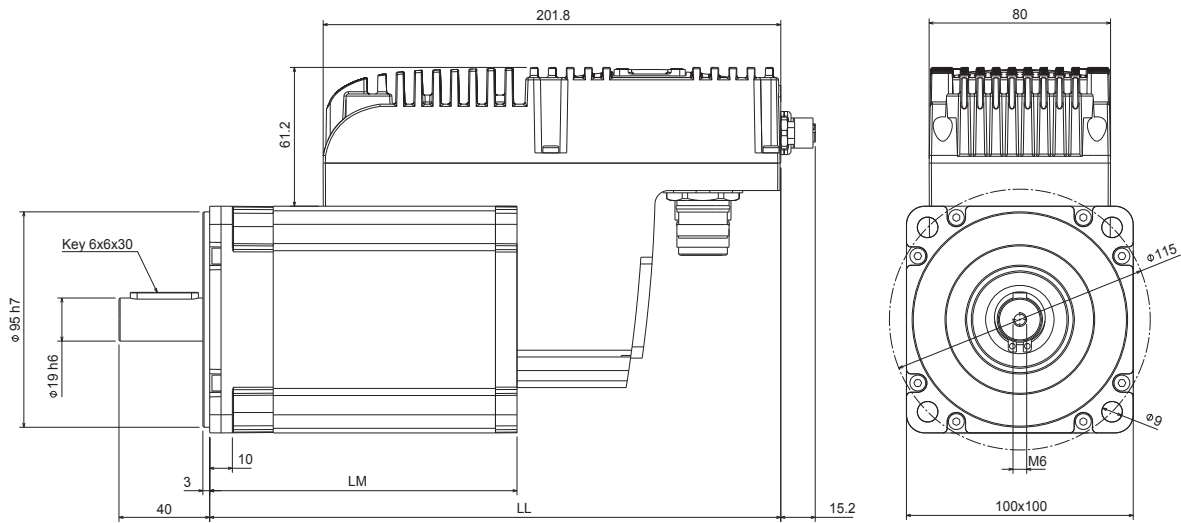


## R88E-AECT1130□ (3.67 kW)

| Dimensions (mm) | | Without brake | | With brake | | Flange | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Voltage | Model | LM | LL | LM | LL | | Without brake | With brake |
| 560 VDC | R88E-AECT1130□ | 238 | 363 | 268 | 388 | 142 | 17 | 18.5 |
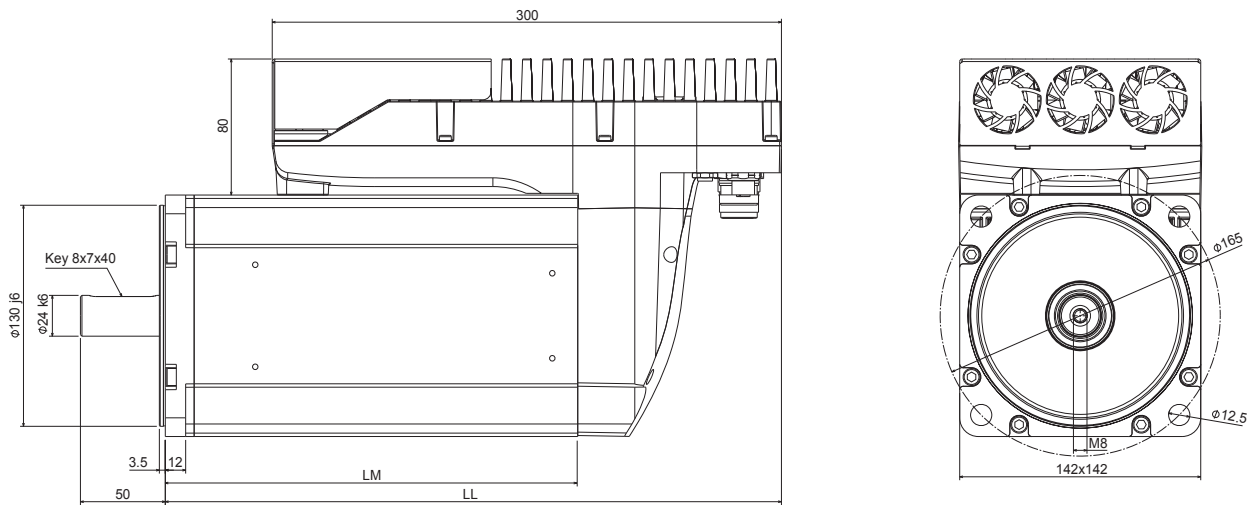
## R88E-AECT2530□ (7.85 kW)

| Dimensions (mm) | | Without brake | | With brake | | Flange | Approx. mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| Voltage | Model | LM | LL | LM | LL | | Without brake | With brake |
| 560 VDC | R88E-AECT2530□ | 303.5 | 423.5 | 333.5 | 453.5 | 190 | 38 | 43 |
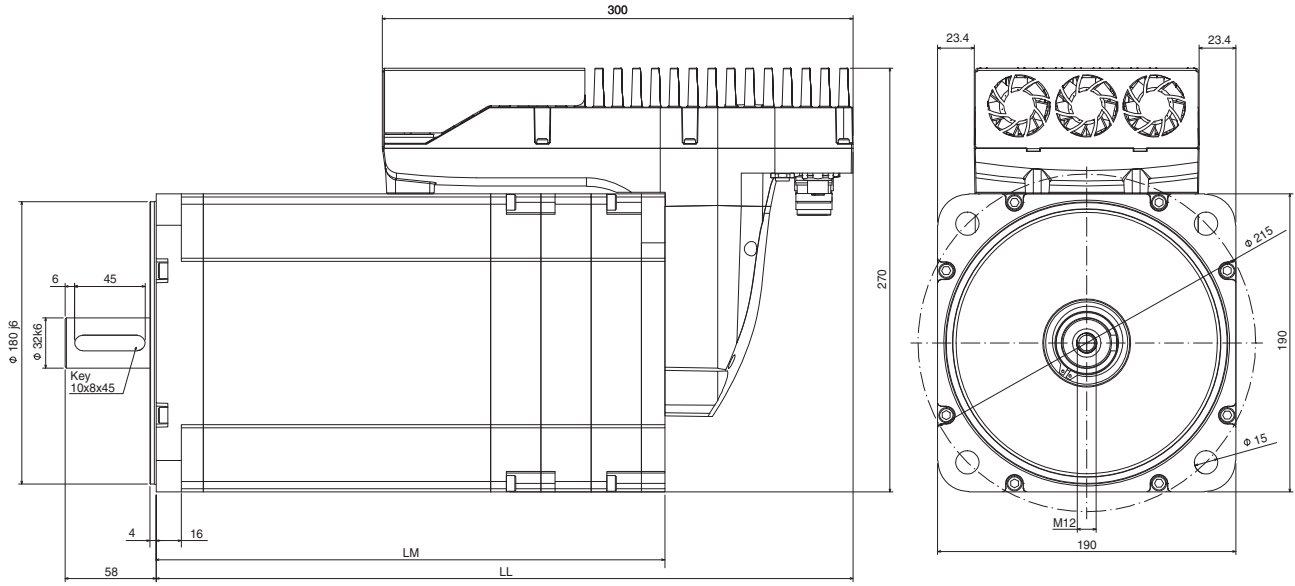


## DC power supply unit specifications

| DC power supply unit model R88S-EAD□ | | 20R | | | 40R | | |
|---|---|---|---|---|---|---|---|
| Three-phase rated voltage | VAC | 230 | 400 | 480 | 230 | 400 | 480 |
| Absolute range voltage | | 180 to 520 VAC, 50/60 Hz | | | | | |
| Unbalance voltage | | <3% of the main voltage | | | | | |
| Main filter | | Integrated | | | | | |
| Line fuses: quick acting (by user) | | 32 A - I2T max = 700 A$^2$s | | | 50 A - I2T max = 1300 A$^2$s | | |
| Input current[*1] | Arms | 22 | 25 | 23 | 42.5 | 47 | 42 |
| Input current with power chokes | Arms | - | 17[*2] | - | - | 34[*3] | - |
| Rated output voltage | VDC | 324 | 564 | 677 | 324 | 564 | 677 |
| Rated output current | A | 20 | 20 | 16.7 | 40 | 40 | 33 |
| Max. current (≤ 5 sec) | A | 40 | 40 | 33.4 | 80 | 80 | 66 |
| Rated output power | kW | 6.5 | 11.3 | 11.3 | 13 | 22.5 | 22.5 |
| Pulse power (≤ 5 sec) | kW | 13 | 22.6 | 22.6 | 26 | 46 | 46 |
| Internal capacitance | uF | 940 | | | 1500 | | |
| Thermal dissipation (without brake dissipation) | W | 100 | | | 200 | | |
| Logic | Rated voltage | 24 VDC, ±10% | | | | | |
| | Internal protection | Fuse: 4 AT, reverse polarity | | | | | |
| | Current consumption | 0.6 A (digital output OFF)[*4] | | | | | |
| | Digital output | Type: PNP<br>Output voltage / current: 24 VDC / 0.3 A | | | | | |
| Relay | Rated voltage | 30 VAC / VDC | | | | | |
| | Rated current | Max. 1 A | | | | | |
| Braking circuit | | Maximum pulse current: 50 A<br>Maximum switch on threshold: 785 VDC<br>Hysteresis threshold: 20 VDC<br>Pulse power rating: 20 kW (0.3 sec)<br>Minimum braking resistor: 17 Ω | | | | | |
| Internal braking resistor | | Resistance: 33 Ω<br>Power rating: 120 W continuous | | | | | |
| Power and logic protection | | Overload output current: > 2 rated output current (t = 5 sec)<br>Short circuit brake circuit: yes<br>Overload brake energy / Overload charge energy: yes / yes<br>Cable current limit: > 1.3 cable current limit (t = 1 hour)<br>Under voltage / Over voltage HVDC: < 100 VDC / > 830 VDC<br>Over temperature: Power (> 90ºC), Logic (> 85ºC)<br>Under voltage LOGIC: < 18.3 VDC | | | | | |
| Ambient temperature | | +5 to +40ºC, 90% RH or less (without condensation) | | | | | |

[*1] Input current without line inductance.
[*2] Value with a line inductance of 1 mH.
[*3] Value with a line inductance of 0.5 mH.
[*4] 1.4 A for 100 ms when AC line is applied to the DC power supply unit.

# OMRON

## DC power supply unit nomenclature

**Connector specifications**

**PE connection**

**x2 Power line**
1: L1
2: L2
3: L3
4: PE

**x3 Logic**
1: +24 V
2: +24 V
3: GND

**x6 COM**
1 and 2: -
Between 3 and 4: RS232
5: GND_COM
6: TX232
7: RX232
8: Shield

**x1 Brake resistor**
Between 1 and 2: Internal
Between 2 and 3: External

**x5 IN/OUT**
1: IN0 (reset fault)
2: OUT0 (HVDC ready)
3: OUT1 (VAC line state)
4: OUT2 (fault)
Between 5 and 6: RTO contact

**FGC switch**
Connect/disconnect the internal
filter to ground terminal

**x7 Power output**
1: +HVDC
2: -HVDC

**x8 Power output**
1: +HVDC
2: -HVDC

**LED specifications**

| Name | | Description |
|------|--------|-------------|
| LED | 24V | Logic voltage (with or without voltage) |
| | CPU status | CPU status (doesn't work, firmware mode, boot mode, in reset) |
| | Power status | Power status (power off, operating, warning, fault) |
| | Brake status | Brake status (without brake, with brake) |

## DC power supply unit dimensions

**R88S-EAD20R/40R**



FAN ONLY FOR R88S-EAD40

# OMRON
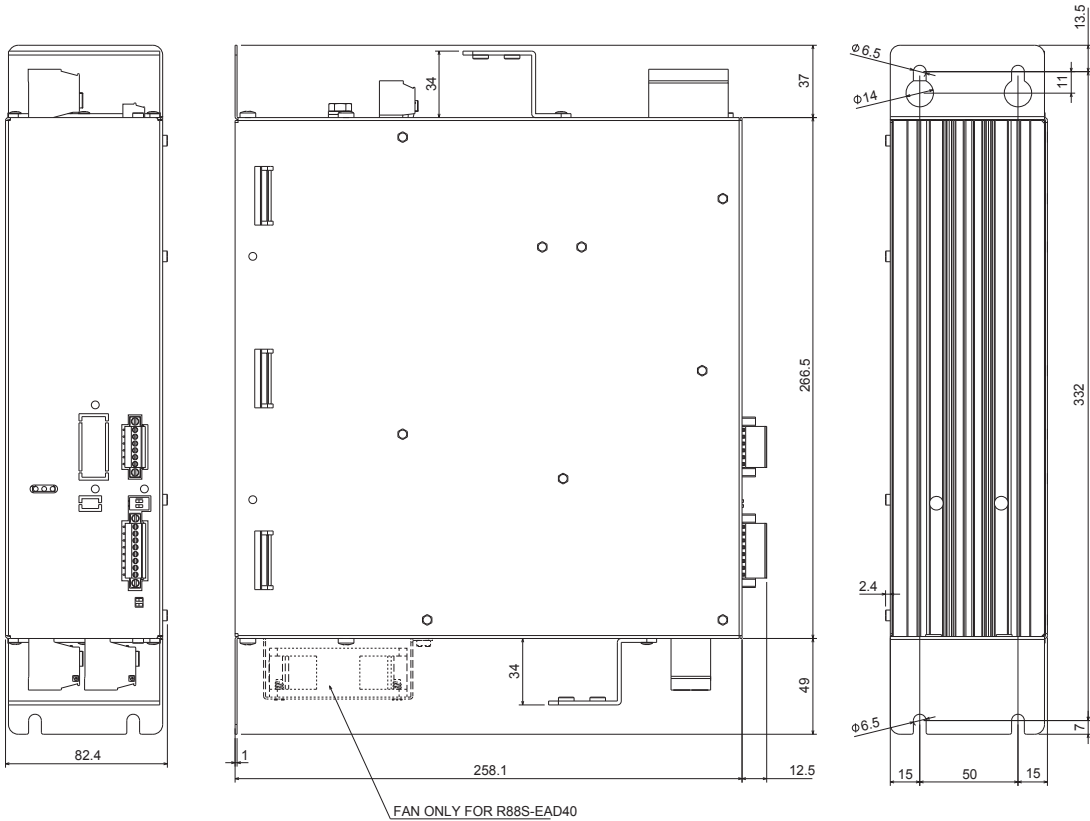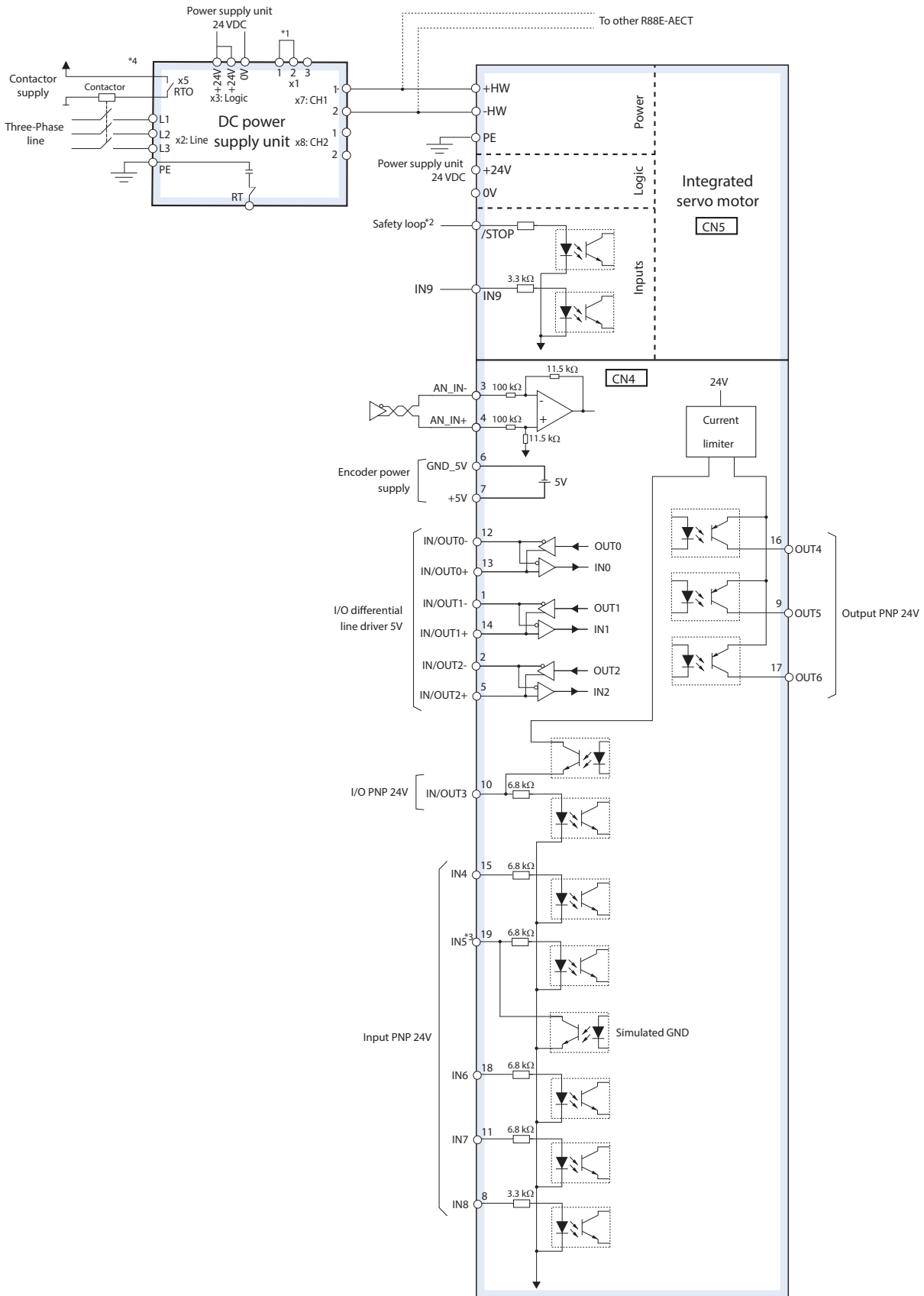
*1  1 and 2 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between 1 and 2 and connect an external regenerative resistor between 2 and 3.
*2  If security device is not used, connect /STOP to +24V.
*3  IN5 can be used as GND.
*4  Important to install a contactor that removes the supply in case of power supply unit error.

## Ordering information

**Control panel**

EtherNet/IP™    Factory network    NA HMI

**NJ series**
Machine automation controller

EtherCAT.    ③ EtherCAT cable

② 
**DC power supply unit**

⑤ I/O cable

① **Integrated servo motor**

560 VDC / 24 VDC logic    ④ Power cable

### Integrated servo motor

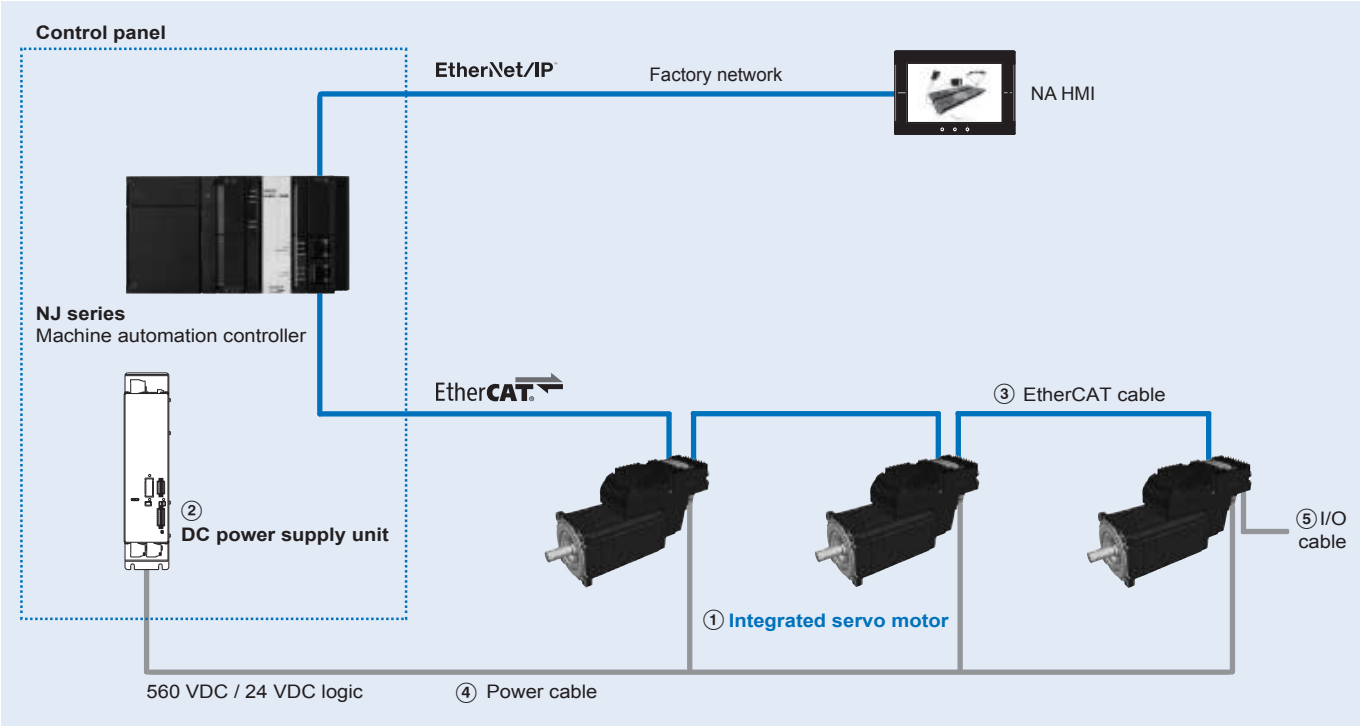| Symbol | Specifications | | | | Rated torque | Capacity | Model |
|--------|---------------|---|---|---|--------------|----------|-------|
| | Voltage | Encoder and design | | | | | |
| ① | 560 VDC | Incremental encoder | Without brake | Straight shaft with key | 2.55 Nm | 880 W | R88E-AECT0230D-S2 |
| | | | | | 3.2 Nm | 1000 W | R88E-AECT0330D-S2 |
| | | | | | 4.3 Nm | 1350 W | R88E-AECT0430D-S2 |
| | | | | | 5.0 Nm | 1570 W | R88E-AECT0530D-S2 |
| | | | | | 11.7 Nm | 3670 W | R88E-AECT1130D-S2 |
| | | | | | 25 Nm | 7850 W | R88E-AECT2530D-S2 |
| | | | With brake | | 2.55 Nm | 880 W | R88E-AECT0230D-BS2 |
| | | | | | 3.2 Nm | 1000 W | R88E-AECT0330D-BS2 |
| | | | | | 4.3 Nm | 1350 W | R88E-AECT0430D-BS2 |
| | | | | | 5.0 Nm | 1570 W | R88E-AECT0530D-BS2 |
| | | | | | 11.7 Nm | 3670 W | R88E-AECT1130D-BS2 |
| | | | | | 25 Nm | 7850 W | R88E-AECT2530D-BS2 |
| | | Multiturn absolute encoder | Without brake | | 2.55 Nm | 880 W | R88E-AECT0230E-S2 |
| | | | | | 3.2 Nm | 1000 W | R88E-AECT0330E-S2 |
| | | | | | 4.3 Nm | 1350 W | R88E-AECT0430E-S2 |
| | | | | | 5.0 Nm | 1570 W | R88E-AECT0530E-S2 |
| | | | | | 11.7 Nm | 3670 W | R88E-AECT1130E-S2 |
| | | | | | 25 Nm | 7850 W | R88E-AECT2530E-S2 |
| | | | With brake | | 2.55 Nm | 880 W | R88E-AECT0230E-BS2 |
| | | | | | 3.2 Nm | 1000 W | R88E-AECT0330E-BS2 |
| | | | | | 4.3 Nm | 1350 W | R88E-AECT0430E-BS2 |
| | | | | | 5.0 Nm | 1570 W | R88E-AECT0530E-BS2 |
| | | | | | 11.7 Nm | 3670 W | R88E-AECT1130E-BS2 |
| | | | | | 25 Nm | 7850 W | R88E-AECT2530E-BS2 |

### DC power supply unit

| Symbol | Specifications | | | | Model |
|--------|---------------|---|---|---|-------|
| | Voltage input | Output current | Output power | Regeneration circuit | |
| ② | 400 V 3-phase | 20 A | 11.3 kW | Integrated | R88S-EAD20R |
| | | 40 A | 22.5 kW | | R88S-EAD40R |

## Cables

| Symbol | Specifications | | | Model | Appearance |
|---|---|---|---|---|---|
| ③ | EtherCAT cables | EtherCAT RJ45 to M12 cable (M12 straight) | 0.3 m | XS5W-T421-AMC-K | |
| | | | 0.5 m | XS5W-T421-BMC-K | |
| | | | 1 m | XS5W-T421-CMC-K | |
| | | | 2 m | XS5W-T421-DMC-K | |
| | | | 3 m | XS5W-T421-EMC-K | |
| | | | 5 m | XS5W-T421-GMC-K | |
| | | | 10 m | XS5W-T421-JMC-K | |
| | | | 15 m | XS5W-T421-KMC-K | |
| | | EtherCAT RJ45 to M12 cable (M12 L right angle) | 0.3 m | XS5W-T422-AMC-K | |
| | | | 0.5 m | XS5W-T422-BMC-K | |
| | | | 1 m | XS5W-T422-CMC-K | |
| | | | 2 m | XS5W-T422-DMC-K | |
| | | | 3 m | XS5W-T422-EMC-K | |
| | | | 5 m | XS5W-T422-GMC-K | |
| | | | 10 m | XS5W-T422-JMC-K | |
| | | | 15 m | XS5W-T422-KMC-K | |
| | | EtherCAT M12 to M12 cable (M12 straight) | 0.5 m | XS5W-T421-BM2-K | |
| | | | 1 m | XS5W-T421-CM2-K | |
| | | | 2 m | XS5W-T421-DM2-K | |
| | | | 3 m | XS5W-T421-EM2-K | |
| | | | 5 m | XS5W-T421-GM2-K | |
| | | | 10 m | XS5W-T421-JM2-K | |
| | | | 15 m | XS5W-T421-KM2-K | |
| | | EtherCAT M12 to M12 cable (M12 L right angle) | 0.5 m | XS5W-T422-BM2-K | |
| | | | 1 m | XS5W-T422-CM2-K | |
| | | | 2 m | XS5W-T422-DM2-K | |
| | | | 3 m | XS5W-T422-EM2-K | |
| | | | 5 m | XS5W-T422-GM2-K | |
| | | | 10 m | XS5W-T422-JM2-K | |
| | | | 15 m | XS5W-T422-KM2-K | |
| ④ | Power cables for Integrated servo motor with straight connector | | 1.5 m | R88A-CDEA001-5-E | |
| | | | 3 m | R88A-CDEA003-E | |
| | | | 5 m | R88A-CDEA005-E | |
| | | | 10 m | R88A-CDEA010-E | |
| | | | 15 m | R88A-CDEA015-E | |
| | | | 20 m | R88A-CDEA020-E | |
| ⑤ | I/O cables with straight connector | | 1 m | R88A-CPEA001S-E | |
| | | | 2 m | R88A-CPEA002S-E | |
| | | | 5 m | R88A-CPEA005S-E | |
| - | Serial port cables | For Integrated servo motor with straight connector | 2 m | R88A-CCEA002P2-E | |
| | | For DC power supply unit with straight connector | 2 m | R88A-CCSE002P2-E | |

## Accessories

| Specifications | | | Model |
|---|---|---|---|
| Connectors for making power cables | | M23 straight connector | R88A-CNEA01P-E |
| | | M23 right angle 90º connector | R88A-CNEA02P-E |
| Connectors for making I/O cables | | M23 straight connector | R88A-CNEA01C-E |
| | | M23 right angle 90º connector | R88A-CNEA02C-E |
| Blind plugs | For EtherCAT connectors | IP65 blind plug for M12 socket | R88A-PCVEA01-E |
| | For Power and I/O connectors | IP67 blind plug for M23 socket | R88A-PCVEA02-E |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

**R88L-EA-AF-□**

# Accurax linear motor axis

## Advanced linear motor axis

High-efficiency iron-core linear motors and magnet tracks in a wide range of over 100 standard linear motor axis.

- Low moving mass to ensure a high degree of dynamism
- Optimized stroke/product length ratio
- Up to 5 m/s maximum speed with 1 µm repeatability
- Compact and efficiency oriented design
- Highly versatile and ready-to-use

## Ratings

- 230/400 VAC 48 to 760 N (2000 N peak force)

## System configuration

**(Refer to servo drive chapter)**

**Accurax G5 servo drive**
EtherCAT model

**sysmac**
always in control

Servo drive options

Serial converter cable

Power cable

Serial converter unit (optional)

Linear encoder cable extension (optional)

Power

Linear encoder

Hall & temperature sensors extension cable (optional)

Hall & temperature sensors

**Accurax linear motor axis**

# OMRON
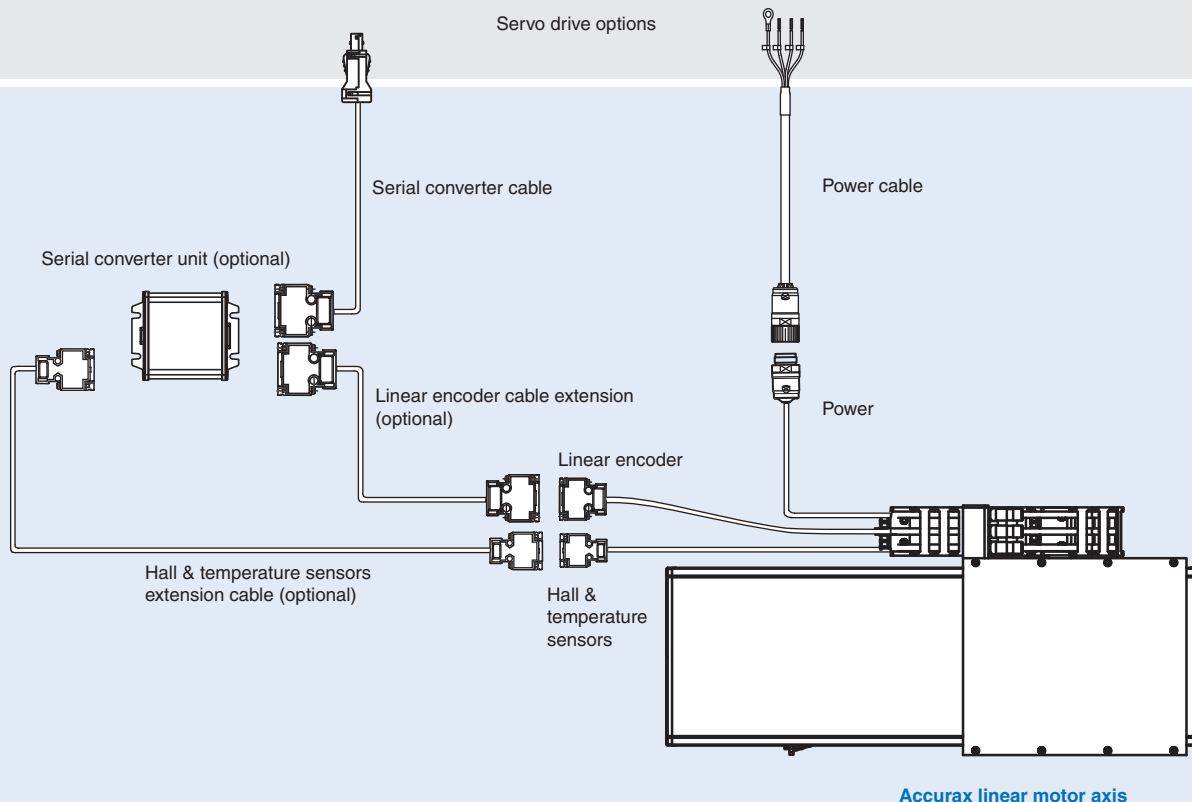
## Linear motor/servo drive combination

| Linear axis | | | | | Linear servo drive | |
|---|---|---|---|---|---|---|
| | | | | | Accurax G5 EtherCAT | |
| Type | Voltage | Rated force | Peak force | Model | 230 V | 400 V |
| R88L-EA-AF-□ Linear motor axis | 230/ 400 V | 48 N | 105 N | R88L-EA-AF-0303-□ | R88D-KN02H-ECT-L | R88D-KN10F-ECT-L |
| | | 96 N | 210 N | R88L-EA-AF-0306-□ | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | | 160 N | 400 N | R88L-EA-AF-0606-□ | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | | 240 N | 600 N | R88L-EA-AF-0609-□ | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | | 320 N | 800 N | R88L-EA-AF-0612-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | | 608 N | 1600 N | R88L-EA-AF-1112-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | | 760 N | 2000 N | R88L-EA-AF-1115-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |

## Type designation

**Linear motor axis**

R88L - EA - AF - 0303 - 0110 - □

Accurax linear motor axis

Customised versions

Stroke lenght
(for effective stroke distances available see dimensions section)

| Iron-core linear motor model | |
|---|---|
| Code | Specifications |
| 0303 | 30 mm active magnet width, 3 coil |
| 0306 | 30 mm active magnet width, 6 coil |
| 0606 | 60 mm active magnet width, 6 coil |
| 0609 | 60 mm active magnet width, 9 coil |
| 0612 | 60 mm active magnet width, 12 coil |
| 1112 | 110 mm active magnet width, 12 coil |
| 1115 | 110 mm active magnet width, 15 coil |

**Note:** The standard linear motor axis includes 1 Vpp SinCos encoder. For another encoder options or customized versions of linear axis please contact your OMRON representative.

## Linear servomotor specifications

### Linear motor axis R88L-EA-AF-□ (230/400 VAC)

| Voltage | | 230/400 VAC | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Linear axis model | R88L-EA-AF-□ | 0303-□ | 0306-□ | 0606-□ | 0609-□ | 0612-□ | 1112-□ | 1115-□ |
| **Motor specifications** — Linear servo motor coil used | R88L-EC-FW- | 0303 | 0306 | 0606 | 0609 | 0612 | 1112 | 1115 |
| Peak force[1] | N | 105 | 210 | 400 | 600 | 800 | 1600 | 2000 |
| Peak current[1] | $A_{rms}$ | 3.1 | 6.1 | 10 | 15 | 20 | 20 | 25 |
| Continuous force[2] | N | 48 | 96 | 160 | 240 | 320 | 608 | 760 |
| Continuous current[2] | $A_{rms}$ | 1.2 | 2.5 | 3.4 | 5.2 | 6.9 | 6.5 | 8.2 |
| Motor force constant | $N/A_{rms}$ | 39.7 | | 46.5 | | | 93.0 | |
| BEMF | V/m/s | 32 | | 38 | | | 76 | |
| Motor constant | $N/\sqrt{W}$ | 9.75 | 13.78 | 19.49 | 23.87 | 27.57 | 41.47 | 46.37 |
| Phase resistance | $\Omega$ | 5.34 | 2.68 | 1.83 | 1.23 | 0.92 | 1.6 | 1.29 |
| Phase Inductance | mH | 34.7 | 17.4 | 13.7 | 9.2 | 6.9 | 12.8 | 10.3 |
| Electrical time constant | ms | 6.5 | | 7.5 | | | 8 | |
| Pole pitch | mm | 24 | | | | | | |
| **Mechanics** — Weight of moving part | kg | 3.1 | 3.9 | 5.4 | 6.7 | 7.9 | 13.7 | 15.9 |
| Recommended horizontal payload[3] | kg | 5 | | 15 | | | 35 | |
| Uni-directional repeatability[3] | µm | ±1 | | | | | | |
| Max. allowable speed | m/s | 5 | | | | | | |
| Min./max. standard stroke | mm | 110/2126 | 158/2078 | 110/2126 | 158/2078 | 110/2030 | 110/2126 | 158/2174 |
| Stroke increment | mm | 96 | | | | | | |
| **Feedback** — Encoder type | | 1 Vptp SIN/COS & Reference mark, metalcase, optical, incremental | | | | | | |
| Encoder resolution | | 20 µm | | | | | | |
| Accuracy class | | ±5 µm/m | | | | | | |
| Hall sensor | | Digital, TTL signals | | | | | | |
| **Other specifications** — Protection methods[4] | | Temperature sensors (KTY-83/121 & PTC 110C), self cooling | | | | | | |
| Hall-Sensor supply | | 5 to 24 VDC, 25 mA | | | | | | |
| Encoder reading head supply | | 5 VDC, max. 250 mA | | | | | | |
| Insulation class | | Class B | | | | | | |
| Max. bus voltage | | 560 VDC | | | | | | |
| Insulation resistance | | 500 VDC, min. 10 MΩ | | | | | | |
| Ambient humidity | | 20 to 80% (non-condensing) | | | | | | |
| Altitude | | 1000 m | | | | | | |
| Max. allowable magnet temperature | | 70°C | | | | | | |

[1] Coil temperature rising by 6K/s.
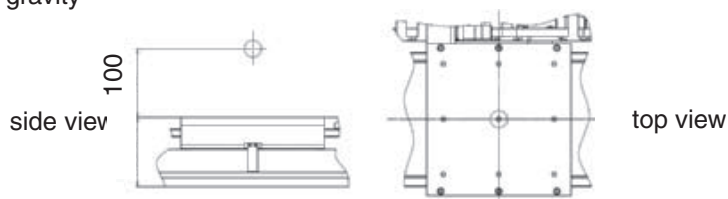[2] Values at 100°C coil temperature and magnets at 25°C. An airstream of 2.5 m/s (25°C) has to be applied.
[3] Referring to the center of gravity, for higher payload or different position of payload please contact your OMRON representative.
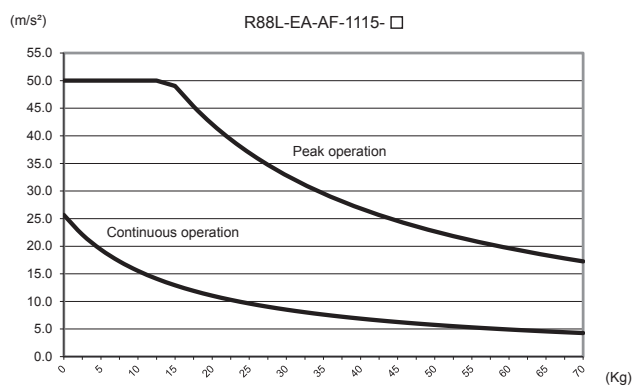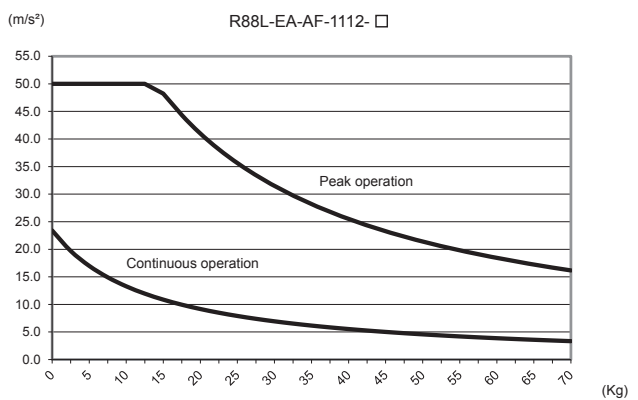[4] $I^2t$ has to be set properly for high current applications.

All other values at 25°C (±10%).

Centre of gravity

100

side view

top view

# OMRON

## Acceleration-payload characteristics

### R88L-EA-AF-0303-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-0306-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-0606-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-0609-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-0612-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-1112-□
(m/s²)

Peak operation

Continuous operation

### R88L-EA-AF-1115-□
(m/s²)

Peak operation

Continuous operation

**Note:** The values on the above curves are calculated based on the below formula and with horizontal orientation:

$$Acceleration = (Force - Force_{Friction})/Weigth_{Total}$$

## Dimensions

### R88L-EA-AF-0303-□ (230/400 VAC)

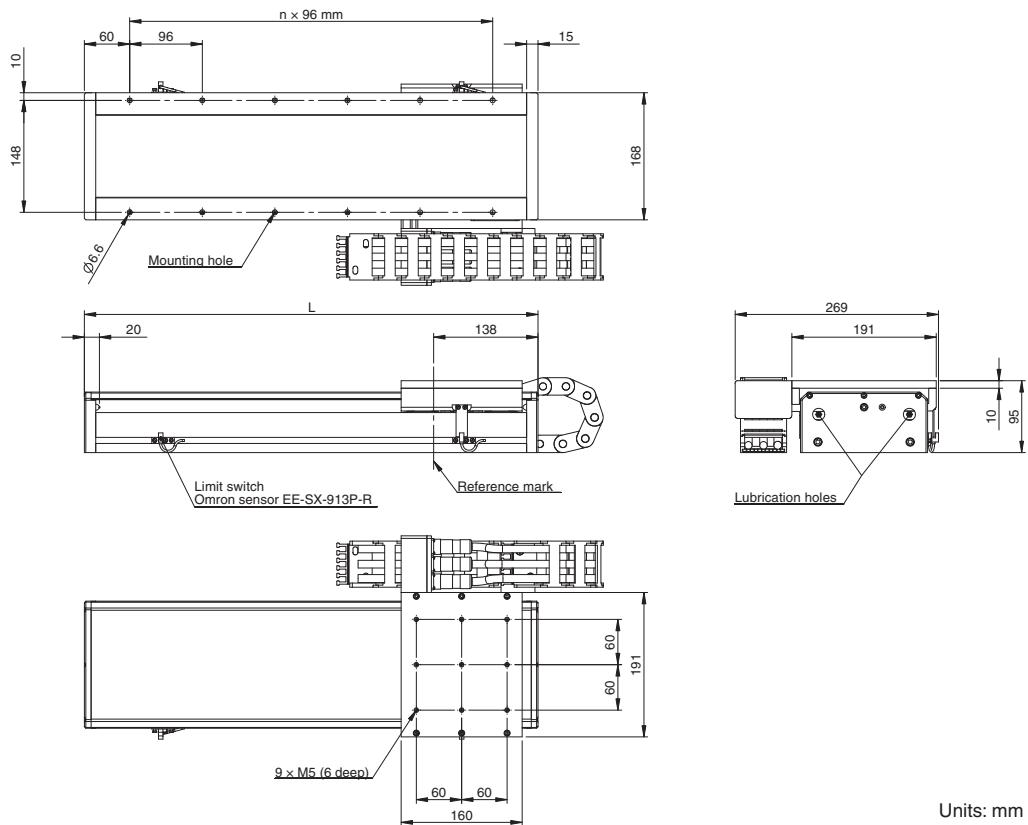| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-0303-0110 | 110 | 312 | 2 | 6 | 3.1 | 9.5 |
| R88L-EA-AF-0303-0206 | 206 | 408 | 3 | 8 | 3.1 | 10.9 |
| R88L-EA-AF-0303-0302 | 302 | 504 | 4 | 10 | 3.1 | 12.4 |
| R88L-EA-AF-0303-0398 | 398 | 600 | 5 | 12 | 3.1 | 13.8 |
| R88L-EA-AF-0303-0494 | 494 | 696 | 6 | 14 | 3.1 | 15.2 |
| R88L-EA-AF-0303-0590 | 590 | 792 | 7 | 16 | 3.1 | 16.7 |
| R88L-EA-AF-0303-0686 | 686 | 888 | 8 | 18 | 3.1 | 18.1 |
| R88L-EA-AF-0303-0782 | 782 | 984 | 9 | 20 | 3.1 | 19.6 |
| R88L-EA-AF-0303-0878 | 878 | 1080 | 10 | 22 | 3.1 | 21.0 |
| R88L-EA-AF-0303-0974 | 974 | 1176 | 11 | 24 | 3.1 | 22.5 |
| R88L-EA-AF-0303-1070 | 1070 | 1272 | 12 | 26 | 3.1 | 23.9 |
| R88L-EA-AF-0303-1166 | 1166 | 1368 | 13 | 28 | 3.1 | 25.4 |
| R88L-EA-AF-0303-1262 | 1262 | 1464 | 14 | 30 | 3.1 | 26.8 |
| R88L-EA-AF-0303-1358 | 1358 | 1560 | 15 | 32 | 3.1 | 28.2 |
| R88L-EA-AF-0303-1454 | 1454 | 1656 | 16 | 34 | 3.1 | 29.7 |
| R88L-EA-AF-0303-1550 | 1550 | 1752 | 17 | 36 | 3.1 | 31.1 |
| R88L-EA-AF-0303-1646 | 1646 | 1848 | 18 | 38 | 3.1 | 32.6 |
| R88L-EA-AF-0303-1742 | 1742 | 1944 | 19 | 40 | 3.1 | 34.0 |
| R88L-EA-AF-0303-1838 | 1838 | 2040 | 20 | 42 | 3.1 | 35.5 |
| R88L-EA-AF-0303-1934 | 1934 | 2136 | 21 | 44 | 3.1 | 36.9 |
| R88L-EA-AF-0303-2030 | 2030 | 2232 | 22 | 46 | 3.1 | 38.3 |
| R88L-EA-AF-0303-2126 | 2126 | 2328 | 23 | 48 | 3.1 | 39.8 |



Mounting hole

Ø6.6

n × 96 mm

Limit switch Omron sensor EE-SX-913P-R

Reference mark

Lubrication holes

9 × M5 (6 deep)

Units: mm

**Hall sensor & temperature cable**

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

**Encoder cable**

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal ($U_0-$) |
| 5 | /Cos signal ($U_2-$) |
| 6 | /Sin signal ($U_1-$) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal ($U_0$) |
| 13 | Cos signal ($U_2$) |
| 14 | Sin signal ($U_1$) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

**Power cable**

Cable length 500 mm approx.
Connector Hypertac
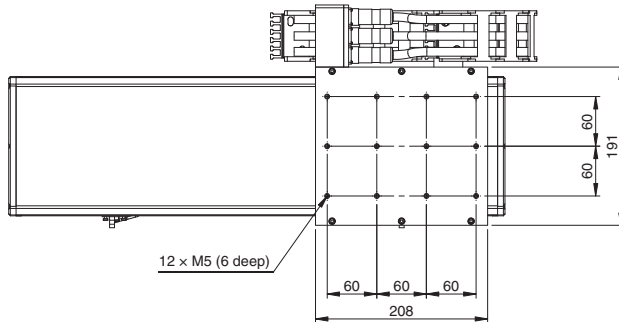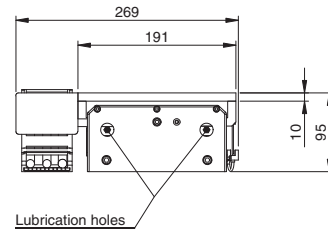LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

# OMRON

## R88L-EA-AF-0306-□ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-0306-0158 | 158 | 408 | 3 | 8 | 3.9 | 11.6 |
| R88L-EA-AF-0306-0254 | 254 | 504 | 4 | 10 | 3.9 | 13.1 |
| R88L-EA-AF-0306-0350 | 350 | 600 | 5 | 12 | 3.9 | 14.5 |
| R88L-EA-AF-0306-0446 | 446 | 696 | 6 | 14 | 3.9 | 15.9 |
| R88L-EA-AF-0306-0542 | 542 | 792 | 7 | 16 | 3.9 | 17.4 |
| R88L-EA-AF-0306-0638 | 638 | 888 | 8 | 18 | 3.9 | 18.8 |
| R88L-EA-AF-0306-0734 | 734 | 984 | 9 | 20 | 3.9 | 20.3 |
| R88L-EA-AF-0306-0830 | 830 | 1080 | 10 | 22 | 3.9 | 21.7 |
| R88L-EA-AF-0306-0926 | 926 | 1176 | 11 | 24 | 3.9 | 23.2 |
| R88L-EA-AF-0306-1022 | 1022 | 1272 | 12 | 26 | 3.9 | 24.6 |
| R88L-EA-AF-0306-1118 | 1118 | 1368 | 13 | 28 | 3.9 | 26.1 |
| R88L-EA-AF-0306-1214 | 1214 | 1464 | 14 | 30 | 3.9 | 27.5 |
| R88L-EA-AF-0306-1310 | 1310 | 1560 | 15 | 32 | 3.9 | 28.9 |
| R88L-EA-AF-0306-1406 | 1406 | 1656 | 16 | 34 | 3.9 | 30.4 |
| R88L-EA-AF-0306-1502 | 1502 | 1752 | 17 | 36 | 3.9 | 31.8 |
| R88L-EA-AF-0306-1598 | 1598 | 1848 | 18 | 38 | 3.9 | 33.3 |
| R88L-EA-AF-0306-1694 | 1694 | 1944 | 19 | 40 | 3.9 | 34.7 |
| R88L-EA-AF-0306-1790 | 1790 | 2040 | 20 | 42 | 3.9 | 36.2 |
| R88L-EA-AF-0306-1886 | 1886 | 2136 | 21 | 44 | 3.9 | 37.6 |
| R88L-EA-AF-0306-1982 | 1982 | 2232 | 22 | 46 | 3.9 | 39.0 |
| R88L-EA-AF-0306-2078 | 2078 | 2328 | 23 | 48 | 3.9 | 40.5 |



Mounting hole

Limit switch
Omron sensor EE-SX-913P-R

Reference mark

Lubrication holes

12 × M5 (6 deep)

Units: mm

### Hall sensor & temperature cable

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

### Encoder cable

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal (U0-) |
| 5 | /Cos signal (U2-) |
| 6 | /Sin signal (U1-) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal (U0) |
| 13 | Cos signal (U2) |
| 14 | Sin signal (U1) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

### Power cable

Cable length 500 mm approx.
Connector Hypertac
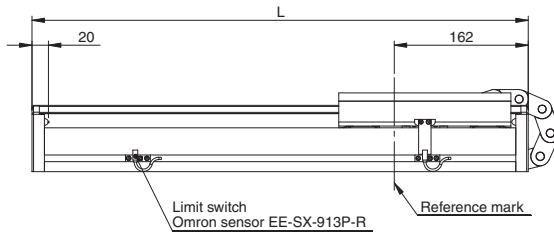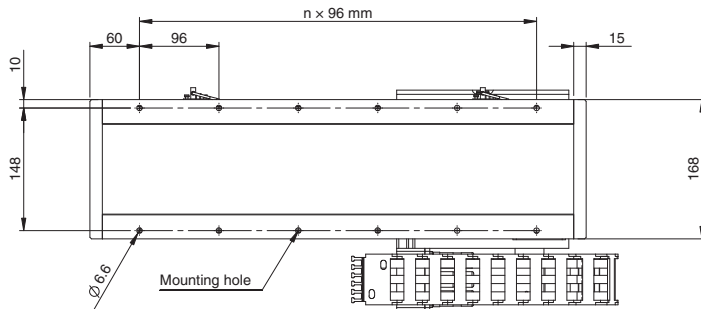LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

## R88L-EA-AF-0606-☐ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-0606-0110 | 110 | 360 | 3 | 8 | 5.4 | 14.1 |
| R88L-EA-AF-0606-0206 | 206 | 456 | 4 | 10 | 5.4 | 15.9 |
| R88L-EA-AF-0606-0302 | 302 | 552 | 5 | 12 | 5.4 | 17.6 |
| R88L-EA-AF-0606-0398 | 398 | 648 | 6 | 14 | 5.4 | 19.3 |
| R88L-EA-AF-0606-0494 | 494 | 744 | 7 | 16 | 5.4 | 21.0 |
| R88L-EA-AF-0606-0590 | 590 | 840 | 8 | 18 | 5.4 | 22.8 |
| R88L-EA-AF-0606-0686 | 686 | 936 | 9 | 20 | 5.4 | 24.5 |
| R88L-EA-AF-0606-0782 | 782 | 1032 | 10 | 22 | 5.4 | 26.2 |
| R88L-EA-AF-0606-0878 | 878 | 1128 | 11 | 24 | 5.4 | 28.0 |
| R88L-EA-AF-0606-0974 | 974 | 1224 | 12 | 26 | 5.4 | 29.7 |
| R88L-EA-AF-0606-1070 | 1070 | 1320 | 13 | 28 | 5.4 | 31.4 |
| R88L-EA-AF-0606-1166 | 1166 | 1416 | 14 | 30 | 5.4 | 33.2 |
| R88L-EA-AF-0606-1262 | 1262 | 1512 | 15 | 32 | 5.4 | 34.9 |
| R88L-EA-AF-0606-1358 | 1358 | 1608 | 16 | 34 | 5.4 | 36.6 |
| R88L-EA-AF-0606-1454 | 1454 | 1704 | 17 | 36 | 5.4 | 38.4 |
| R88L-EA-AF-0606-1550 | 1550 | 1800 | 18 | 38 | 5.4 | 40.1 |
| R88L-EA-AF-0606-1646 | 1646 | 1896 | 19 | 40 | 5.4 | 41.8 |
| R88L-EA-AF-0606-1742 | 1742 | 1992 | 20 | 42 | 5.4 | 43.6 |
| R88L-EA-AF-0606-1838 | 1838 | 2088 | 21 | 44 | 5.4 | 45.3 |
| R88L-EA-AF-0606-1934 | 1934 | 2184 | 22 | 46 | 5.4 | 47.0 |
| R88L-EA-AF-0606-2030 | 2030 | 2280 | 23 | 48 | 5.4 | 48.8 |
| R88L-EA-AF-0606-2126 | 2126 | 2376 | 24 | 50 | 5.4 | 50.5 |



Mounting hole

Limit switch
OMRON Sensor EE-SX-913P-R

Reference mark

Lubrication holes

9 × M6 (8 deep)

Units: mm

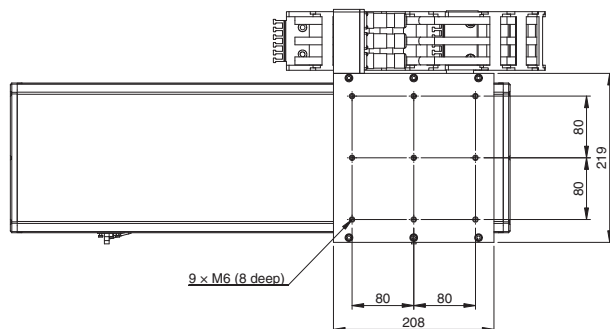**Hall sensor & temperature cable**

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

**Encoder cable**

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal ($U_0-$) |
| 5 | /Cos signal ($U_2-$) |
| 6 | /Sin signal ($U_1-$) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal ($U_0$) |
| 13 | Cos signal ($U_2$) |
| 14 | Sin signal ($U_1$) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

**Power cable**

Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
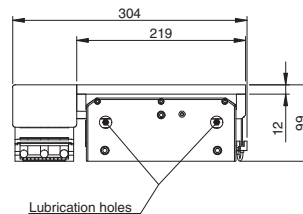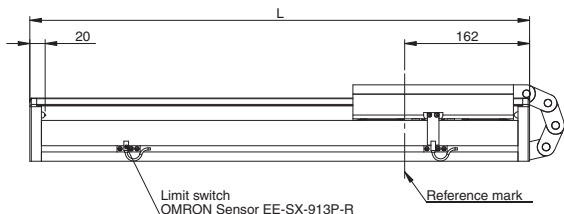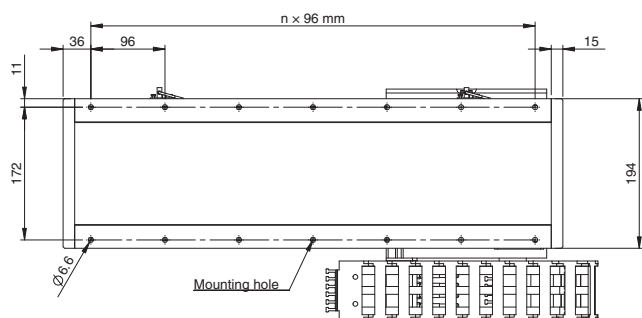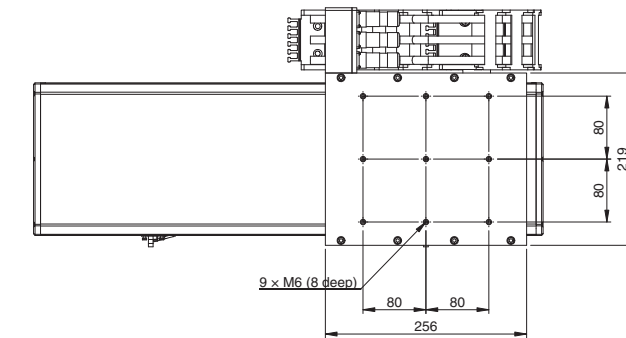Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

# OMRON

## R88L-EA-AF-0609-☐ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-0609-0158 | 158 | 456 | 4 | 10 | 6.7 | 17.2 |
| R88L-EA-AF-0609-0254 | 254 | 552 | 5 | 12 | 6.7 | 18.9 |
| R88L-EA-AF-0609-0350 | 350 | 648 | 6 | 14 | 6.7 | 20.6 |
| R88L-EA-AF-0609-0446 | 446 | 744 | 7 | 16 | 6.7 | 22.3 |
| R88L-EA-AF-0609-0542 | 542 | 840 | 8 | 18 | 6.7 | 24.1 |
| R88L-EA-AF-0609-0638 | 638 | 936 | 9 | 20 | 6.7 | 25.8 |
| R88L-EA-AF-0609-0734 | 734 | 1032 | 10 | 22 | 6.7 | 27.5 |
| R88L-EA-AF-0609-0830 | 830 | 1128 | 11 | 24 | 6.7 | 29.3 |
| R88L-EA-AF-0609-0926 | 926 | 1224 | 12 | 26 | 6.7 | 31.0 |
| R88L-EA-AF-0609-1022 | 1022 | 1320 | 13 | 28 | 6.7 | 32.7 |
| R88L-EA-AF-0609-1118 | 1118 | 1416 | 14 | 30 | 6.7 | 34.5 |
| R88L-EA-AF-0609-1214 | 1214 | 1512 | 15 | 32 | 6.7 | 36.2 |
| R88L-EA-AF-0609-1310 | 1310 | 1608 | 16 | 34 | 6.7 | 37.9 |
| R88L-EA-AF-0609-1406 | 1406 | 1704 | 17 | 36 | 6.7 | 39.7 |
| R88L-EA-AF-0609-1502 | 1502 | 1800 | 18 | 38 | 6.7 | 41.4 |
| R88L-EA-AF-0609-1598 | 1598 | 1896 | 19 | 40 | 6.7 | 43.1 |
| R88L-EA-AF-0609-1694 | 1694 | 1992 | 20 | 42 | 6.7 | 44.9 |
| R88L-EA-AF-0609-1790 | 1790 | 2088 | 21 | 44 | 6.7 | 46.6 |
| R88L-EA-AF-0609-1886 | 1886 | 2184 | 22 | 46 | 6.7 | 48.3 |
| R88L-EA-AF-0609-1982 | 1982 | 2280 | 23 | 48 | 6.7 | 50.1 |
| R88L-EA-AF-0609-2078 | 2078 | 2376 | 24 | 50 | 6.7 | 51.8 |

n × 96 mm

36 · 96 · 15 · 11 · 172 · 194 · Ø6.6

Mounting hole

L · 20 · 186 · 304 · 219 · 12 · 99

Limit swith
OMRON Sensor EE-SX-913P-R

Reference mark

Lubrication holes

80 · 80 · 219

9 × M6 (8 deep)

80 · 80 · 256

Units: mm

### Hall sensor & temperature cable

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

### Encoder cable

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal (U0−) |
| 5 | /Cos signal (U2−) |
| 6 | /Sin signal (U1−) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal (U0) |
| 13 | Cos signal (U2) |
| 14 | Sin signal (U1) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

### Power cable

Cable length 500 mm approx.
Connector Hypertac
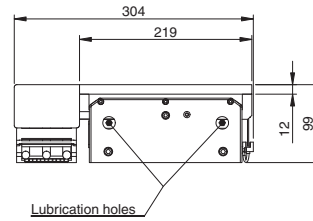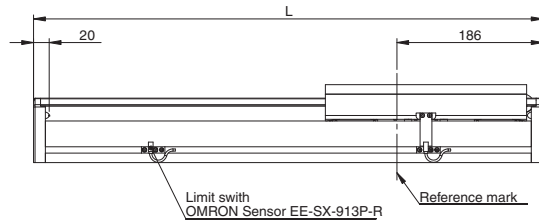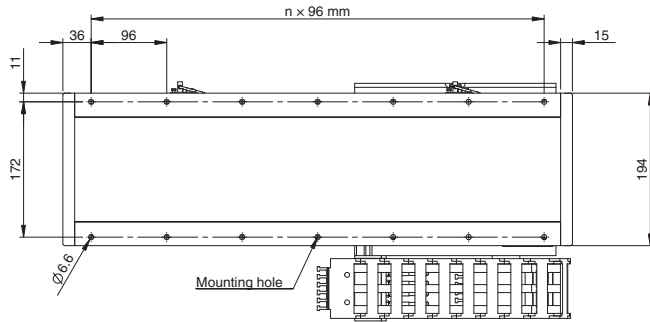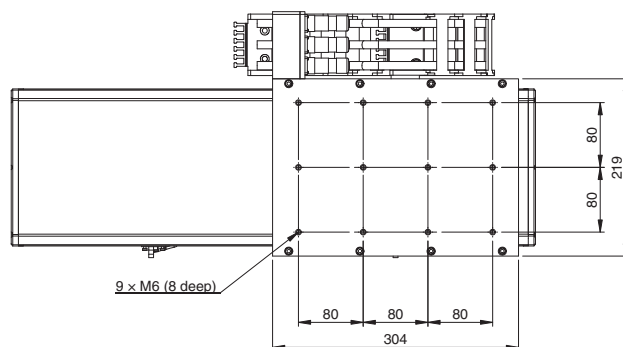LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

## R88L-EA-AF-06012-□ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-0612-0110 | 110 | 456 | 4 | 10 | 7.9 | 18.3 |
| R88L-EA-AF-0612-0206 | 206 | 552 | 5 | 12 | 7.9 | 20.0 |
| R88L-EA-AF-0612-0302 | 302 | 648 | 6 | 14 | 7.9 | 21.7 |
| R88L-EA-AF-0612-0398 | 398 | 744 | 7 | 16 | 7.9 | 23.4 |
| R88L-EA-AF-0612-0494 | 494 | 840 | 8 | 18 | 7.9 | 25.2 |
| R88L-EA-AF-0612-0590 | 590 | 936 | 9 | 20 | 7.9 | 26.9 |
| R88L-EA-AF-0612-0686 | 686 | 1032 | 10 | 22 | 7.9 | 28.6 |
| R88L-EA-AF-0612-0782 | 782 | 1128 | 11 | 24 | 7.9 | 30.4 |
| R88L-EA-AF-0612-0878 | 878 | 1224 | 12 | 26 | 7.9 | 32.1 |
| R88L-EA-AF-0612-0974 | 974 | 1320 | 13 | 28 | 7.9 | 33.8 |
| R88L-EA-AF-0612-1070 | 1070 | 1416 | 14 | 30 | 7.9 | 35.6 |
| R88L-EA-AF-0612-1166 | 1166 | 1512 | 15 | 32 | 7.9 | 37.3 |
| R88L-EA-AF-0612-1262 | 1262 | 1608 | 16 | 34 | 7.9 | 39.0 |
| R88L-EA-AF-0612-1358 | 1358 | 1704 | 17 | 36 | 7.9 | 40.8 |
| R88L-EA-AF-0612-1454 | 1454 | 1800 | 18 | 38 | 7.9 | 42.5 |
| R88L-EA-AF-0612-1550 | 1550 | 1896 | 19 | 40 | 7.9 | 44.2 |
| R88L-EA-AF-0612-1646 | 1646 | 1992 | 20 | 42 | 7.9 | 46.0 |
| R88L-EA-AF-0612-1742 | 1742 | 2088 | 21 | 44 | 7.9 | 47.7 |
| R88L-EA-AF-0612-1838 | 1838 | 2184 | 22 | 46 | 7.9 | 49.4 |
| R88L-EA-AF-0612-1934 | 1934 | 2280 | 23 | 48 | 7.9 | 50.2 |
| R88L-EA-AF-0612-2030 | 2030 | 2376 | 24 | 50 | 7.9 | 52.9 |



Mounting hole

Limit switch
OMRON Sensor EE-SX-913P-R

Reference mark

Lubrication holes

9 × M6 (8 deep)

Units: mm

### Hall sensor & temperature cable

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

### Encoder cable

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal (U0−) |
| 5 | /Cos signal (U2−) |
| 6 | /Sin signal (U1−) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal (U0) |
| 13 | Cos signal (U2) |
| 14 | Sin signal (U1) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

### Power cable

Cable length 500 mm approx.
Connector Hypertac
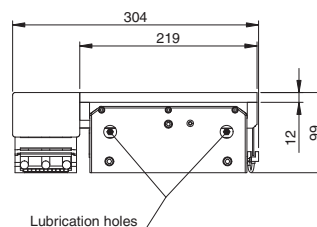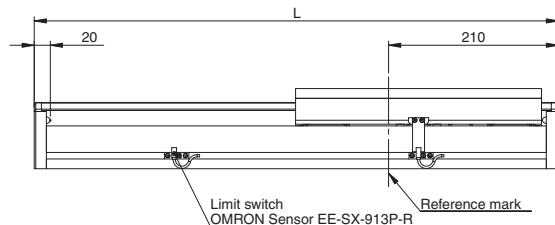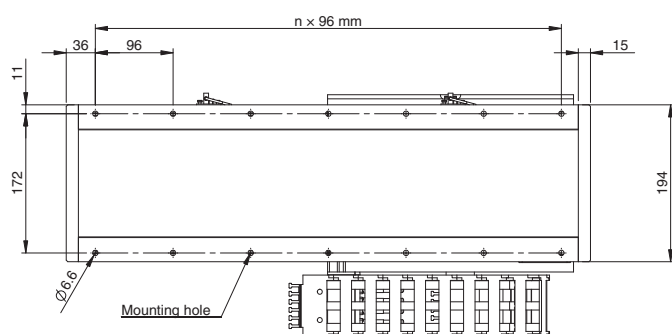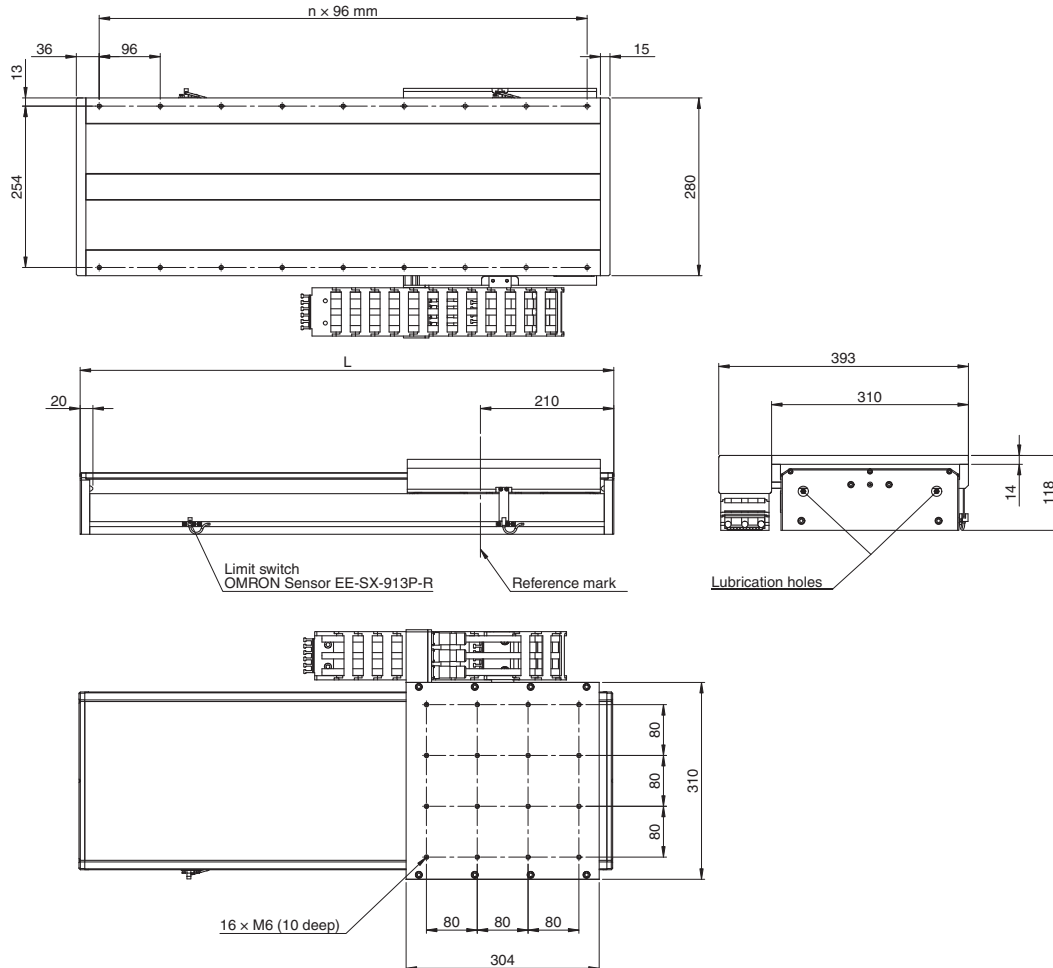LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

**Accurax linear motor axis**

# OMRON

## R88L-EA-AF-1112-□ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-1112-0110 | 110 | 456 | 4 | 10 | 13.7 | 31.9 |
| R88L-EA-AF-1112-0206 | 206 | 552 | 5 | 12 | 13.7 | 35.2 |
| R88L-EA-AF-1112-0302 | 302 | 648 | 6 | 14 | 13.7 | 38.5 |
| R88L-EA-AF-1112-0398 | 398 | 744 | 7 | 16 | 13.7 | 41.7 |
| R88L-EA-AF-1112-0494 | 494 | 840 | 8 | 18 | 13.7 | 45.0 |
| R88L-EA-AF-1112-0590 | 590 | 936 | 9 | 20 | 13.7 | 48.3 |
| R88L-EA-AF-1112-0686 | 686 | 1032 | 10 | 22 | 13.7 | 51.5 |
| R88L-EA-AF-1112-0782 | 782 | 1128 | 11 | 24 | 13.7 | 54.8 |
| R88L-EA-AF-1112-0878 | 878 | 1224 | 12 | 26 | 13.7 | 58.1 |
| R88L-EA-AF-1112-0974 | 974 | 1320 | 13 | 28 | 13.7 | 61.3 |
| R88L-EA-AF-1112-1070 | 1070 | 1416 | 14 | 30 | 13.7 | 64.6 |
| R88L-EA-AF-1112-1166 | 1166 | 1512 | 15 | 32 | 13.7 | 67.9 |
| R88L-EA-AF-1112-1262 | 1262 | 1608 | 16 | 34 | 13.7 | 71.1 |
| R88L-EA-AF-1112-1358 | 1358 | 1704 | 17 | 36 | 13.7 | 74.4 |
| R88L-EA-AF-1112-1454 | 1454 | 1800 | 18 | 38 | 13.7 | 77.7 |
| R88L-EA-AF-1112-1550 | 1550 | 1896 | 19 | 40 | 13.7 | 80.9 |
| R88L-EA-AF-1112-1646 | 1646 | 1992 | 20 | 42 | 13.7 | 84.2 |
| R88L-EA-AF-1112-1742 | 1742 | 2088 | 21 | 44 | 13.7 | 87.5 |
| R88L-EA-AF-1112-1838 | 1838 | 2184 | 22 | 46 | 13.7 | 90.8 |
| R88L-EA-AF-1112-1934 | 1934 | 2280 | 23 | 48 | 13.7 | 94.0 |
| R88L-EA-AF-1112-2030 | 2030 | 2376 | 24 | 50 | 13.7 | 97.3 |
| R88L-EA-AF-1112-2126 | 2126 | 2472 | 25 | 52 | 13.7 | 100.6 |



Limit switch
OMRON Sensor EE-SX-913P-R

Reference mark

Lubrication holes

16 × M6 (10 deep)

Units: mm

### Hall sensor & temperature cable

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

### Encoder cable

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal (U0-) |
| 5 | /Cos signal (U2-) |
| 6 | /Sin signal (U1-) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal (U0) |
| 13 | Cos signal (U2) |
| 14 | Sin signal (U1) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

### Power cable

Cable length 500 mm approx.
Connector Hypertac
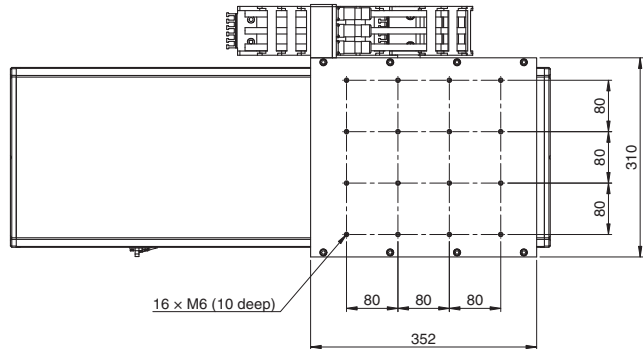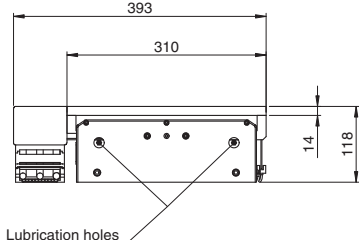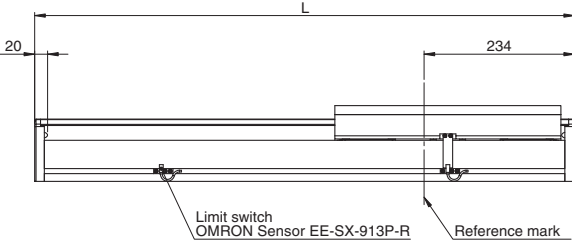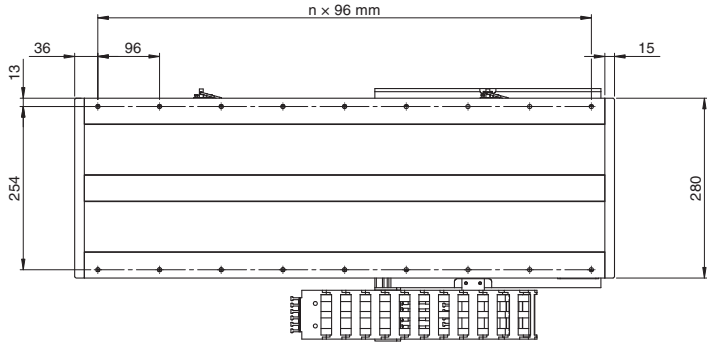LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170

## R88L-EA-AF-1115-□ (230/400 VAC)

| Linear axis model | Effective stroke in mm | L in mm | n | Nº of mounting holes | Weight of moving table including motor coil (kg) | Weight of the complete axis (kg) |
|---|---|---|---|---|---|---|
| R88L-EA-AF-1115-0158 | 158 | 552 | 5 | 12 | 15.9 | 37.4 |
| R88L-EA-AF-1115-0254 | 254 | 648 | 6 | 14 | 15.9 | 40.6 |
| R88L-EA-AF-1115-0350 | 350 | 744 | 7 | 16 | 15.9 | 43.9 |
| R88L-EA-AF-1115-0446 | 446 | 840 | 8 | 18 | 15.9 | 47.2 |
| R88L-EA-AF-1115-0542 | 542 | 936 | 9 | 20 | 15.9 | 50.4 |
| R88L-EA-AF-1115-0638 | 638 | 1032 | 10 | 22 | 15.9 | 53.7 |
| R88L-EA-AF-1115-0734 | 734 | 1128 | 11 | 24 | 15.9 | 57.0 |
| R88L-EA-AF-1115-0830 | 830 | 1224 | 12 | 26 | 15.9 | 60.2 |
| R88L-EA-AF-1115-0926 | 926 | 1320 | 13 | 28 | 15.9 | 63.5 |
| R88L-EA-AF-1115-1022 | 1022 | 1416 | 14 | 30 | 15.9 | 66.8 |
| R88L-EA-AF-1115-1118 | 1118 | 1512 | 15 | 32 | 15.9 | 70.0 |
| R88L-EA-AF-1115-1214 | 1214 | 1608 | 16 | 34 | 15.9 | 73.3 |
| R88L-EA-AF-1115-1310 | 1310 | 1704 | 17 | 36 | 15.9 | 76.6 |
| R88L-EA-AF-1115-1406 | 1406 | 1800 | 18 | 38 | 15.9 | 79.8 |
| R88L-EA-AF-1115-1502 | 1502 | 1896 | 19 | 40 | 15.9 | 83.1 |
| R88L-EA-AF-1115-1598 | 1598 | 1992 | 20 | 42 | 15.9 | 86.4 |
| R88L-EA-AF-1115-1694 | 1694 | 2088 | 21 | 44 | 15.9 | 89.6 |
| R88L-EA-AF-1115-1790 | 1790 | 2184 | 22 | 46 | 15.9 | 92.9 |
| R88L-EA-AF-1115-1886 | 1886 | 2280 | 23 | 48 | 15.9 | 96.2 |
| R88L-EA-AF-1115-1982 | 1982 | 2376 | 24 | 50 | 15.9 | 99.4 |
| R88L-EA-AF-1115-2078 | 2078 | 2472 | 25 | 52 | 15.9 | 102.7 |
| R88L-EA-AF-1115-2174 | 2174 | 2568 | 26 | 54 | 15.9 | 106.0 |

n × 96 mm

36   96   15   13   254   280

L   20   234   393   310   14   118

Limit switch
OMRON Sensor EE-SX-913P-R   Reference mark   Lubrication holes

80   80   80   310   80   80   80   352

16 × M6 (10 deep)

Units: mm

**Hall sensor & temperature cable**

Cable length 500 mm approx.
Connector D-Sub 9 pins (male)

| Pin No. | Name |
|---|---|
| 1 | 5 V |
| 2 | Hall U |
| 3 | Hall V |
| 4 | Hall W |
| 5 | GND |
| 6 | PTC |
| 7 | PTC |
| 8 | KTY |
| 9 | KTY |
| Case | Shield |

**Encoder cable**

Cable length 500 mm approx.
Connector D-Sub 15 pins (male)

| Pin No. | Signal |
|---|---|
| 1 | SDA* |
| 2 | SCL* |
| 3 | Not used |
| 4 | /Ref signal (U0-) |
| 5 | /Cos signal (U2-) |
| 6 | /Sin signal (U1-) |
| 7 | Not used |
| 8 | 5 V |
| 9 | 0 V |
| 10 | Not used |
| 11 | Not used |
| 12 | Ref signal (U0) |
| 13 | Cos signal (U2) |
| 14 | Sin signal (U1) |
| 15 | Inner shield (IS) |
| Case | Shield |

*Reserved. Please do not use

**Power cable**

Cable length 500 mm approx.
Connector Hypertac
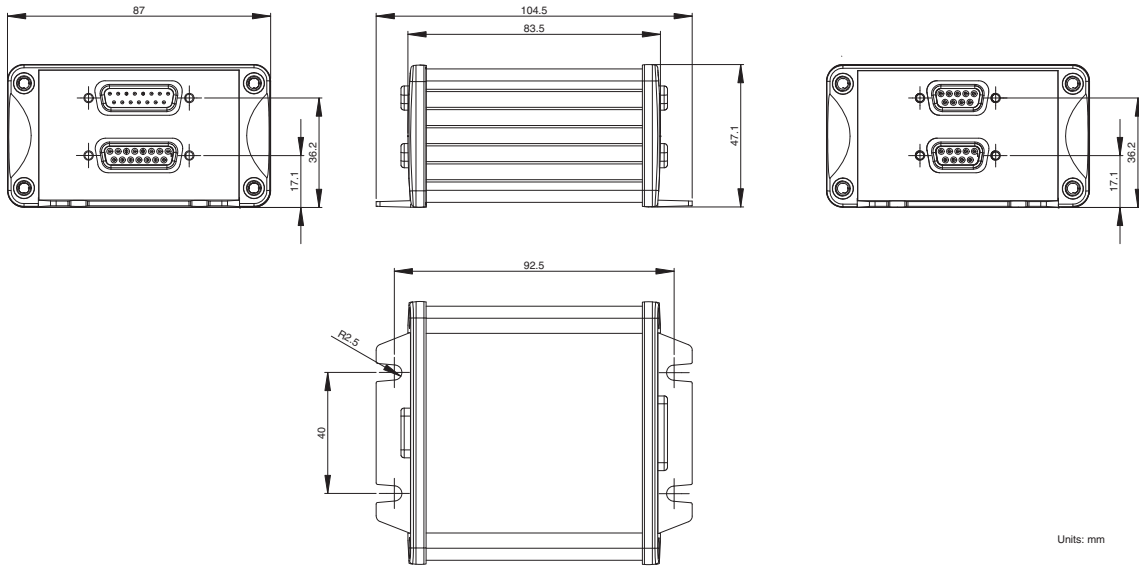LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

| Pin No. | Name |
|---|---|
| 1 | Phase U |
| 2 | Phase V |
| 3 | Ground |
| 4 | Phase W |
| 5 | Not used |
| 6 | Not used |

Mating connector:
Plug type: LPRA06BFRBN170
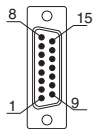
## Optional serial converter unit

### Specifications

| Serial converter model R88A- | SC01K-E | SC02K-E |
|---|---|---|
| Description | Serial converter from 1 Vpp to G5 serial data transmission and with hall sensor input | |
| Temperature sensor | KTY sensor detection of iron-core motor coil | NTC sensor detection of ironless motor coil |
| Electrical characteristics | Power supply voltage | 5 VDC, max. 250 mA supplied by the drive |
| | Standard resolution | Interpolation factor 100 plus quadrature count |
| | Max. input frequency | 400 kHz 1 Vpp |
| | Analog input signals (cos, sin, Ref) | Differential input amplitude: 0.4 V to 1.2 V Input signal level: 1.5 V to 3.5 V |
| | Output signals | Position data, hall & temperature sensor information, and alarms |
| | Output method | Serial data transmission |
| | Transmission cycle | <42 μs |
| Mechanical characteristics | Vibration resistance | 98 m/s$^2$ max. (1 to 2500 Hz) in three directions |
| | Shock resistance | 980 m/s$^2$, (11 ms) two times in three directions |
| Environmental conditions | Operating temperature | 0 to 55°C |
| | Storage temperature | −20 to 80°C |
| | Humidity | 20% to 90% relative humidity (without condensation) |

Units: mm

| CN4 Serial data output to linear servo drive | | Pin No. | Signal |
|---|---|---|---|
| | | 1 | PS |
| | | 2 | /PS |
| | | 3 | Not used |
| | | 4 | Not used |
| | | 5 | Not used |
| | | 6 | Not used |
| | | 7 | Not used |
| | | 8 | 5 V |
| | | 9 | 0 V |
| | | 10 | Not used |
| | | 11 | Not used |
| | | 12 | Not used |
| | | 13 | Not used |
| | | 14 | Not used |
| | | 15 | Inner shield |
| Connector D-Sub 15-pin (male) | | Case | Shield |

| CN3 Temperature sensor interface without hall sensor | | Pin No. | Signal |
|---|---|---|---|
| | | 1 | Not used |
| | | 2 | Not used |
| | | 3 | Not used |
| | | 4 | Not used |
| | | 5 | Not used |
| | | 6 | PTC |
| | | 7 | PTC |
| | | 8 | KTY/ NTC |
| | | 9 | KTY/NTC |
| Connector D-Sub 9-pin (female) | | Case | Shield |

| CN1 Encoder input 1Vpp with programmable lines NUMERIK JENA standard | | Pin No. | Signal |
|---|---|---|---|
| | | 1 | SDA* |
| | | 2 | SCL* |
| | | 3 | Not used |
| | | 4 | /Ref signal (U0–) |
| | | 5 | /Cos signal (U2–) |
| | | 6 | /Sin signal (U1–) |
| | | 7 | Not used |
| | | 8 | 5 V |
| | | 9 | 0 V |
| | | 10 | Not used |
| | | 11 | Not used |
| | | 12 | Ref signal (U0) |
| | | 13 | Cos signal (U2) |
| | | 14 | Sin signal (U1) |
| | | 15 | Inner shield (IS) |
| Connector D-Sub 15-pin (female) | | Case | Shield |

*Reserved. Please do not use

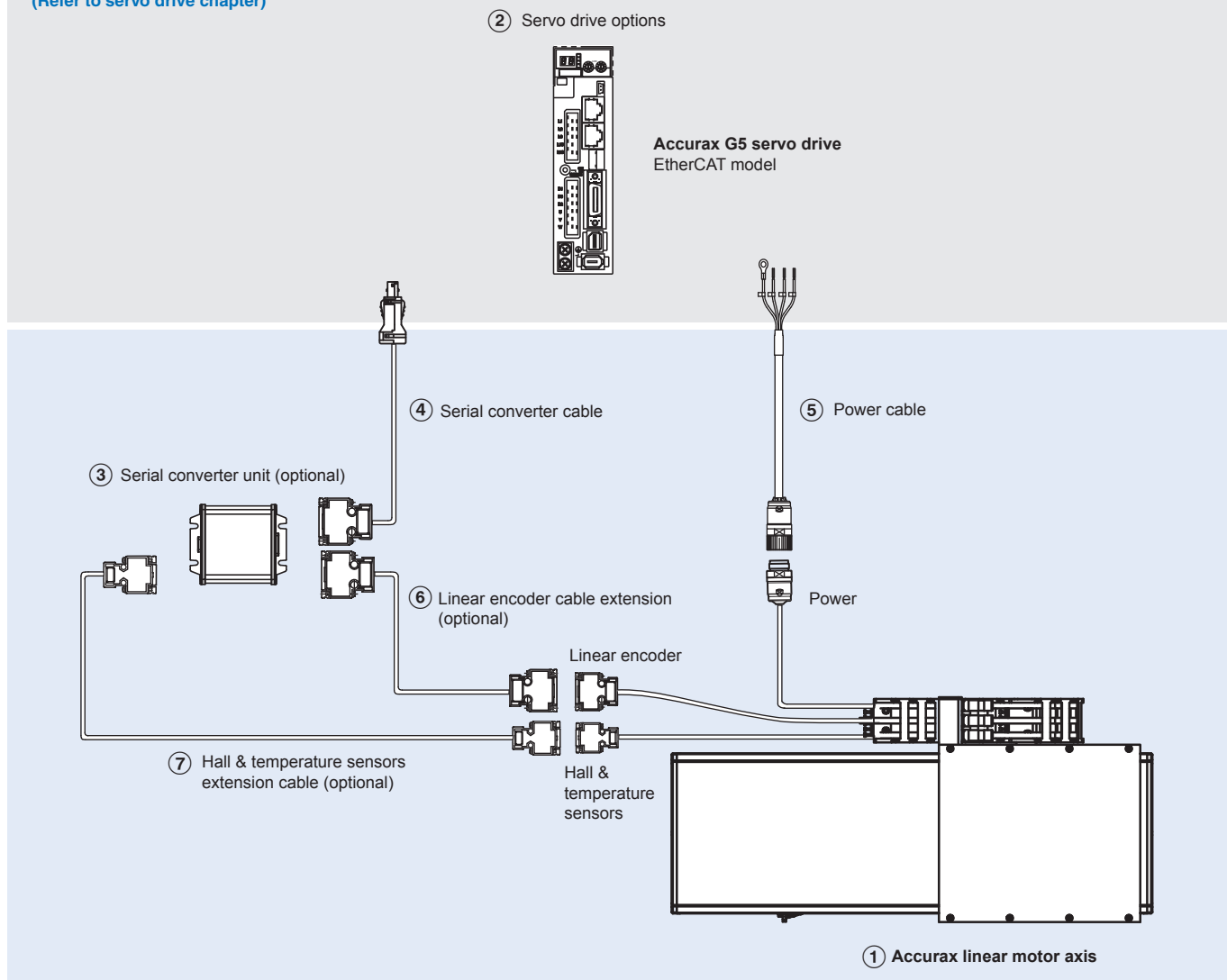| CN2 Hall & temperature sensors interface | | Pin No. | Signal |
|---|---|---|---|
| | | 1 | 5 V |
| | | 2 | Hall U |
| | | 3 | Hall V |
| | | 4 | Hall W |
| | | 5 | GND |
| | | 6 | PTC |
| | | 7 | PTC |
| | | 8 | KTY/ NTC |
| | | 9 | KTY/ NTC |
| Connector D-Sub 9-pin (female) | | Case | Shield |

**Note:** As the 6, 7, 8, 9 pins in the CN2 and CN3 connectors are internally wired, the temperature sensor can be connected to both connectors. When the hall sensor is also required, use the same cable for hall & temperature signals and the CN2 connector.

## Ordering information

**(Refer to servo drive chapter)**

② Servo drive options

**Accurax G5 servo drive**
EtherCAT model

④ Serial converter cable

⑤ Power cable

③ Serial converter unit (optional)

⑥ Linear encoder cable extension (optional)

Linear encoder

Power

⑦ Hall & temperature sensors extension cable (optional)

Hall & temperature sensors

① **Accurax linear motor axis**

**Note:** The symbols ①②③... show the recommended sequence to select the servomotor, cables and serial converter for a linear motors system.

**Linear motor axis**

**R88L-EA-AF-□**

**230 VAC single phase/400 VAC three phase**

| Symbol | Specifications | | ① Linear motor axis model | ② Linear servo drive | |
|---|---|---|---|---|---|
| | Rated force | Peak force | | Accurax G5 EtherCAT | |
| | | | | 230 V | 400 V |
| ①② | 48 N | 120 N | R88L-EA-AF-0303-□ | R88D-KN02H-ECT-L | R88D-KN10F-ECT-L |
| | 96 N | 240 N | R88L-EA-AF-0306-□ | R88D-KN04H-ECT-L | R88D-KN10F-ECT-L |
| | 160 N | 450 N | R88L-EA-AF-0606-□ | R88D-KN08H-ECT-L | R88D-KN15F-ECT-L |
| | 240 N | 675 N | R88L-EA-AF-0609-□ | R88D-KN10H-ECT-L | R88D-KN20F-ECT-L |
| | 320 N | 900 N | R88L-EA-AF-0612-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 608 N | 1800 N | R88L-EA-AF-1112-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |
| | 760 N | 2250 N | R88L-EA-AF-1115-□ | R88D-KN15H-ECT-L | R88D-KN30F-ECT-L |

**Note:** For effective stroke distances available see dimensions section.
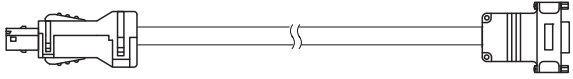
# OMRON

## Servo drive

② Refer to Accurax G5 servo drive chapter for detailed drive specifications and selection of drive accessories.
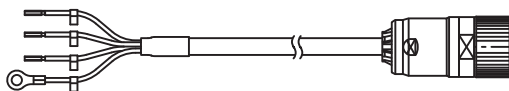
## Serial converter unit

| Symbol | Specifications | Model |
|---|---|---|
| ③ | Serial converter unit from 1 Vpp to G5 serial data transmission (with KTY sensor detection of iron-core motor coil) | R88A-SC01K-E |
| | Serial converter unit from 1 Vpp to G5 serial data transmission (with NTC sensor detection of ironless motor coil) | R88A-SC02K-E |

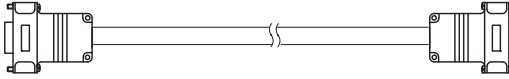**Note:** If no temperature sensor is needed, then it does not matter which converter you use.

## Serial converter cable to servo drive

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ④ | Accurax G5 drive to serial converter cable. (Connectors R88A-CNK41L and DB-15) | 1.5 m | R88A-CRKN001-5CR-E | |
| | | 3 m | R88A-CRKN003CR-E | |
| | | 5 m | R88A-CRKN005CR-E | |
| | | 10 m | R88A-CRKN010CR-E | |
| | | 15 m | R88A-CRKN015CR-E | |
| | | 20 m | R88A-CRKN020CR-E | |
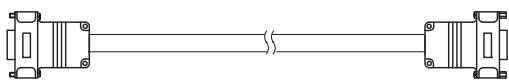
## Power cable

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑤ | For linear motor axis R88L-EA-AF-0303-☐ R88L-EA-AF-0306-☐ | 1.5 m | R88A-CAWK001-5S-DE | |
| | | 3 m | R88A-CAWK003S-DE | |
| | | 5 m | R88A-CAWK005S-DE | |
| | | 10 m | R88A-CAWK010S-DE | |
| | | 15 m | R88A-CAWK015S-DE | |
| | | 20 m | R88A-CAWK020S-DE | |
| | For linear motor axis R88L-EA-AF-0606-☐ R88L-EA-AF-0609-☐ R88L-EA-AF-0612-☐ R88L-EA-AF-1112-☐ R88L-EA-AF-1115-☐ | 1.5 m | R88A-CAWL001-5S-DE | |
| | | 3 m | R88A-CAWL003S-DE | |
| | | 5 m | R88A-CAWL005S-DE | |
| | | 10 m | R88A-CAWL010S-DE | |
| | | 15 m | R88A-CAWL015S-DE | |
| | | 20 m | R88A-CAWL020S-DE | |

## Linear encoder cable to serial converter

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑧ | Extension cable from linear encoder to serial converter. (Connector DB-15) (This extension cable is optional) | 1.5 m | R88A-CFKA001-5CR-E | |
| | | 3 m | R88A-CFKA003CR-E | |
| | | 5 m | R88A-CFKA005CR-E | |
| | | 10 m | R88A-CFKA010CR-E | |
| | | 15 m | R88A-CFKA015CR-E | |

## Hall and temperature sensors cable to serial converter

| Symbol | Specifications | | Model | Appearance |
|---|---|---|---|---|
| ⑦ | Extension cable from hall and temperature sensors to serial converter. (Connector DB-9) (This extension cable is optional) | 1.5 m | R88A-CFKB001-5CR-E | |
| | | 3 m | R88A-CFKB003CR-E | |
| | | 5 m | R88A-CFKB005CR-E | |
| | | 10 m | R88A-CFKB010CR-E | |
| | | 15 m | R88A-CFKB015CR-E | |

## Connectors

| Specification | Model |
|---|---|
| Accurax G5 servo drive encoder connector (for CN4) | R88A-CNK41L |
| Hypertac power cable connector IP67 | LPRA-06B-FRBN170 |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

# OMRON

# Delta robot

## The fastest picking system integrated in the Sysmac platform

- Robot control integrated in the NJ robotics controller
- Control of up to 8 robots by one controller
- Degrees of freedom: 3 + 1 (rotational axis optional)
- Up to 200 cycle per minute
- Models from 450 to 1,600 mm working range
- Payload range: 1 to 8 kg
- Different types of Delta robot arms
- IP class range: IP65, IP67, IP69K
- Anti-collision detection option

## System configuration



**Note:** Servo motors included in the Delta robot.

# OMRON
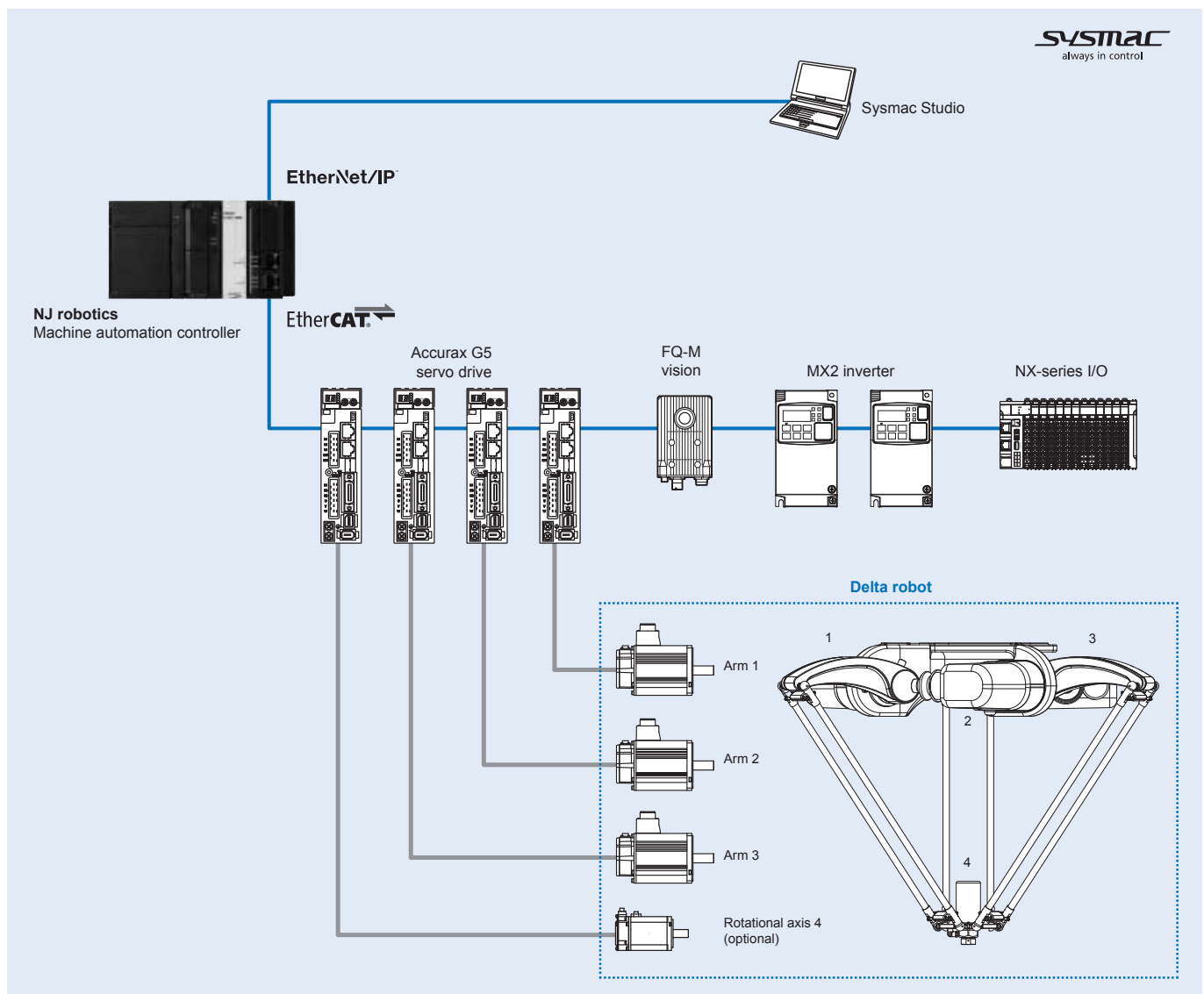
## Specifications

### Washdown Delta robot IP69K specifications

| Model | | | CR_UGD4_R_HD☐ | CR_UGD4_NR_HD☐ |
|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 1100 mm | |
| | Z axis (stroke)[*1] | | 250 mm (maximum Ø 1100 mm) / 400 mm (center Ø 670 mm) | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K1K030T-BS2-V2 | |
| | | Capacity | 1000 W | |
| | Rotational axis 4 | Model | R88M-K75030T-BS2 | – |
| | | Capacity | 750 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.2 mm | |
| | θ axis | | ±0.3 deg | – |
| Maximum payload | | | 3 kg | |
| Maximum through-put[*3] | | | 150 CPM[*4] | |
| θ axis maximum torque | | | According to the servo motor | – |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| Noise level | | | < 68 dB (A) | |
| Ambient temperature | | | Operating: 5°C to 45°C<br>Storage: -25°C to 60°C | |
| Relative humidity | | | Max. 90% | |
| Protection class | | | IP69K | |
| Weight (kg) | | | 100 kg | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.

### Washdown Delta robot IP67 specifications

| Model | | | R6Y31110H03067NJ5 | R6Y31110L03067NJ5 | R6Y30110S03067NJ5 |
|---|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 1100 mm | | |
| | Z axis (stroke)[*1] | | 300 mm (maximum Ø 1100 mm) / 450 mm (center Ø 580 mm) | | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K1K030T-BS2 | | |
| | | Capacity | 1000 W | | |
| | Rotational axis 4 | Model | R88M-K10030T-S2 | R88M-K05030T-S2 | – |
| | | Capacity | 100 W | 50 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.2 mm | | |
| | θ axis | | ±0.1 deg | | – |
| Maximum payload | | | 3 kg | | |
| Maximum through-put[*3] | | | 150 CPM[*4] | | |
| θ axis tolerable moment of inertia[*5] | | | 0.035 kgm$^2$ | 0.01 kgm$^2$ | – |
| User tubing (outer diameter) | | | Ø 6 | | |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | | |
| Noise level | | | < 73.7 dB (A) | | |
| Ambient temperature | | | 0 to 45°C | | |
| Relative humidity | | | Max. 85% | | |
| Protection class | | | IP67 | | |
| Weight (kg) | | | 75 kg | | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] There are limits to acceleration coefficient settings.

## Washdown Mini Delta robot IP67 specifications

| Model | | | R6Y31065H02067NJ5 | R6Y31065L02067NJ5 | R6Y30065S02067NJ5 |
|---|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 650 mm | | |
| | Z axis (stroke)[*1] | | 150 mm (maximum Ø 650 mm) / 250 mm (center Ø 480 mm) | | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K40030T-BS2 | | |
| | | Capacity | 400 W | | |
| | Rotational axis 4 | Model | R88M-K10030T-S2 | R88M-K05030T-S2 | – |
| | | Capacity | 100 W | 50 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.1 mm | | |
| | θ axis | | ±0.1 deg | | – |
| Maximum payload | | | 2 kg | | |
| Maximum through-put[*3] | | | 200 CPM[*4] | | |
| θ axis tolerable moment of inertia[*5] | | | 0.035 kgm$^2$ | 0.01 kgm$^2$ | – |
| User tubing (outer diameter) | | | Ø 6 | | |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | | |
| Noise level | | | < 64.5 dB (A) | | |
| Ambient temperature | | | 0 to 45°C | | |
| Relative humidity | | | Max. 85% | | |
| Protection class | | | IP67 | | |
| Weight (kg) | | | 32 kg | | |

[*1] For further details please check the dimensional drawing in the next section.

[*2] This is the value at a constant ambient temperature.

[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.

[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.

[*5] There are limits to acceleration coefficient settings.

## Washdown Mini Delta robot IP65 specifications

| Model | | | CR_UGD4MINI_R_TS | CR_UGD4MINI_NR_TS |
|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 500 mm | |
| | Z axis (stroke)[*1] | | 135 mm (maximum Ø 450 mm) | 155 mm (maximum Ø 500 mm) |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K40030T-BS2 | |
| | | Capacity | 400 W | |
| | Rotational axis 4 | Model | R88M-K40030T-BS2 | – |
| | | Capacity | 400 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.2 mm | |
| | θ axis | | ±0.3 deg | – |
| Maximum payload | | | 1 kg | |
| Maximum through-put[*3] | | | 200 CPM[*4] | |
| θ axis maximum torque | | | According to the servo motor | – |
| User tubing (outer diameter) | | | Ø 8[*5] | |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| Noise level | | | < 68 dB (A) | |
| Ambient temperature | | | 5°C to 45°C | |
| Relative humidity | | | Max. 90% | |
| Protection class | | | IP65 | |
| Weight (kg) | | | 25 kg | |

[*1] For further details please check the dimensional drawing in the next section.

[*2] This is the value at a constant ambient temperature.

[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.

[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.

[*5] Only for the air suctioning. The air injection is not allowed.

# OMRON

## Delta robot XXL specifications

| Model | | | CR_UGD4_XXLH_R | CR_UGD4_XXLH_NR |
|---|---|---|---|---|
| **Working volume** | X, Y axis (stroke) | | Ø 1600 mm | |
| | Z axis (stroke)[*1] | | 350 mm (maximum Ø 1600 mm) / 550 mm (center Ø 815 mm) | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| **Servo motor** | Arm 1, 2, 3 | Model | R88M-K3K030C-BS2 | |
| | | Capacity | 3000 W | |
| | Rotational axis 4 | Model | R88M-K1K030C-BS2 | – |
| | | Capacity | 1000 W | – |
| **Repeatability**[*2] | X, Y, Z axis | | ±1 mm | |
| | θ axis | | ±0.3 deg | – |
| **Maximum payload** | | | 8 kg | |
| **Maximum through-put**[*3] | | | 80 CPM[*4] | |
| **θ axis maximum torque** | | | According to the servo motor | – |
| **User tubing (outer diameter)** | | | Ø 8[*5] | |
| **Travel limit** | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| **Noise level** | | | < 70 dB (A) | |
| **Ambient temperature** | | | 5°C to 45°C | |
| **Relative humidity** | | | Max. 90% | |
| **Protection class** | | | IP65 | |
| **Weight (kg)** | | | 115 kg | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] Only for the air suctioning. The air injection is not allowed.

## Delta robot XL specifications

| Model | | | CR_UGD4_XL_R | CR_UGD4_XL_NR |
|---|---|---|---|---|
| **Working volume** | X, Y axis (stroke) | | Ø 1300 mm | |
| | Z axis (stroke)[*1] | | 250 mm (maximum Ø 1300 mm) / 400 mm (center Ø 875 mm) | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| **Servo motor** | Arm 1, 2, 3 | Model | R88M-K1K030T-BS2 | |
| | | Capacity | 1000 W | |
| | Rotational axis 4 | Model | R88M-K1K030T-BS2 | – |
| | | Capacity | 1000 W | – |
| **Repeatability**[*2] | X, Y, Z axis | | ±0.2 mm | |
| | θ axis | | ±0.3 deg | – |
| **Maximum payload** | | | 2 kg | |
| **Maximum through-put**[*3] | | | 120 CPM[*4] | |
| **θ axis maximum torque** | | | According to the servo motor | – |
| **User tubing (outer diameter)** | | | Ø 8[*5] | |
| **Travel limit** | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| **Noise level** | | | < 68 dB (A) | |
| **Ambient temperature** | | | 5°C to 45°C | |
| **Relative humidity** | | | Max. 90% | |
| **Protection class** | | | IP65 | |
| **Weight (kg)** | | | 65 kg | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] Only for the air suctioning. The air injection is not allowed.

## Delta robot specifications

| Model | | | CR_UGD4_R | CR_UGD4_NR |
|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 1100 mm | |
| | Z axis (stroke)[*1] | | 250 mm (maximum Ø 1100 mm) / 400 mm (center Ø 580 mm) | |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K1K030T-BS2 | |
| | | Capacity | 1000 W | |
| | Rotational axis 4 | Model | R88M-K1K030T-BS2 | – |
| | | Capacity | 1000 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.3 mm | |
| | θ axis | | ±0.4 deg | – |
| Maximum payload | | | 2 kg | |
| Maximum through-put[*3] | | | 150 CPM[*4] | |
| θ axis maximum torque | | | According to the servo motor | – |
| User tubing (outer diameter) | | | Ø 8[*5] | |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| Noise level | | | < 68 dB (A) | |
| Ambient temperature | | | 5°C to 45°C | |
| Relative humidity | | | Max. 90% | |
| Protection class | | | IP65 | |
| Weight (kg) | | | 65 kg | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] Only for the air suctioning. The air injection is not allowed.

## Mini Delta robot specifications

| Model | | | CR_UGD4MINI_R | CR_UGD4MINI_NR |
|---|---|---|---|---|
| Working volume | X, Y axis (stroke) | | Ø 500 mm | |
| | Z axis (stroke)[*1] | | 135 mm (maximum Ø 450 mm) | 155 mm (maximum Ø 500 mm) |
| | θ axis (rotation angle) | | ±180 deg (default setting, it can be changed) | – |
| Servo motor | Arm 1, 2, 3 | Model | R88M-K40030T-BS2 | |
| | | Capacity | 400 W | |
| | Rotational axis 4 | Model | R88M-K40030T-BS2 | – |
| | | Capacity | 400 W | – |
| Repeatability[*2] | X, Y, Z axis | | ±0.2 mm | |
| | θ axis | | ±0.3 deg | – |
| Maximum payload | | | 1 kg | |
| Maximum through-put[*3] | | | 200 CPM[*4] | |
| θ axis maximum torque | | | According to the servo motor | – |
| User tubing (outer diameter) | | | Ø 8[*5] | |
| Travel limit | | | 1. Soft limit, 2. Mechanical stopper (X, Y, Z axis) | |
| Noise level | | | < 68 dB (A) | |
| Ambient temperature | | | 5°C to 45°C | |
| Relative humidity | | | Max. 90% | |
| Protection class | | | IP65 | |
| Weight (kg) | | | 25 kg | |

[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
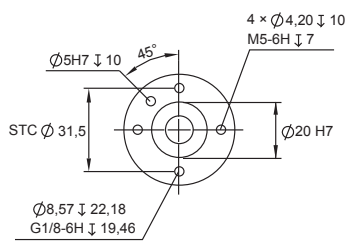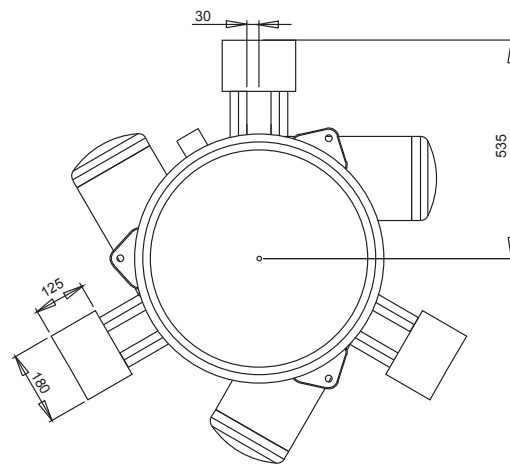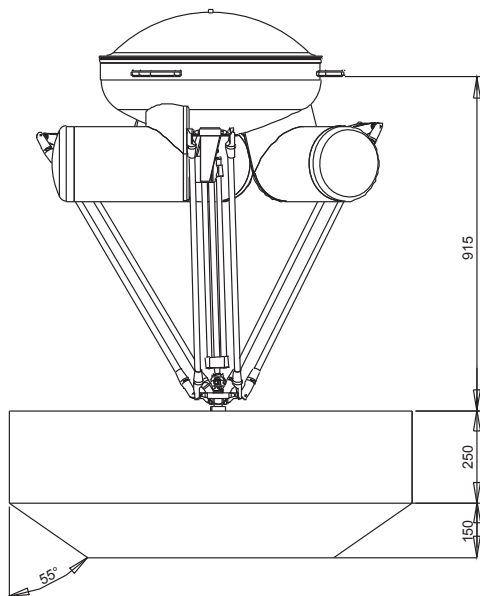[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
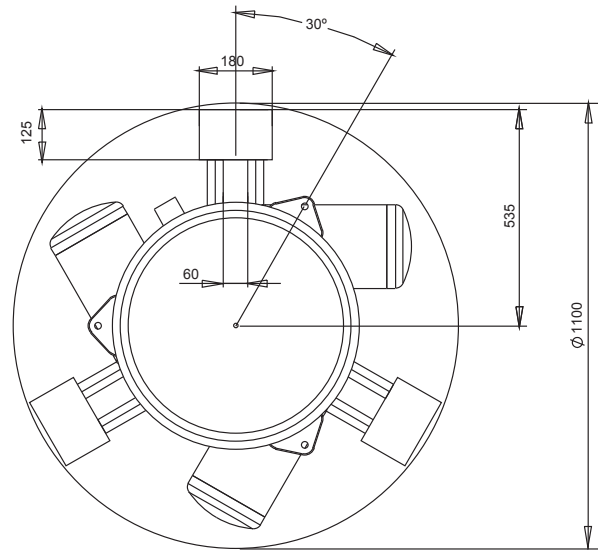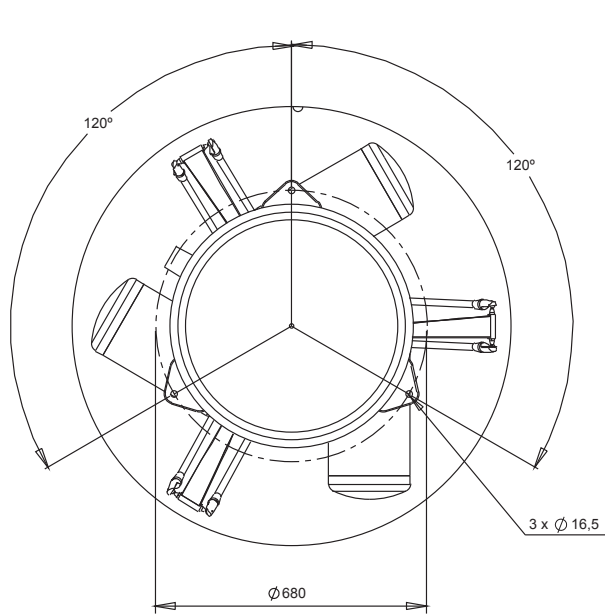[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] Only for the air suctioning. The air injection is not allowed.

# OMRON
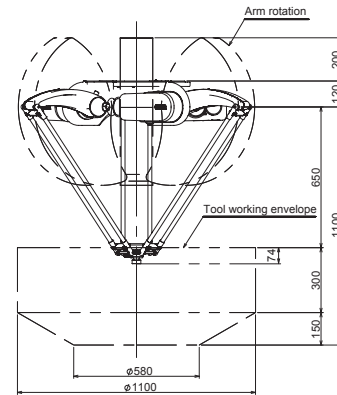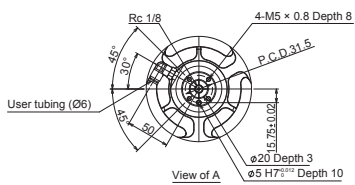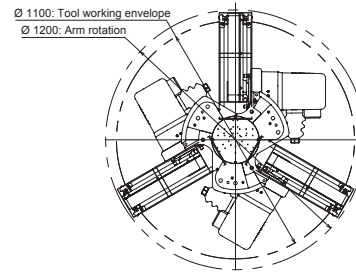
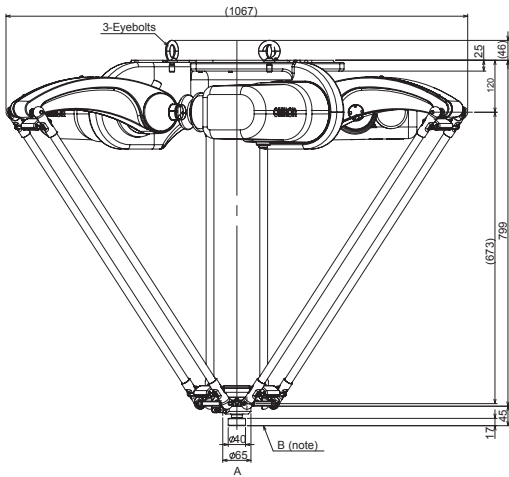## Dimensions

**Washdown Delta robot IP69K dimensions**

**CR_UGD4_□R_HD□**

Gripper dimensions

## Washdown Delta robot IP67 dimensions
### R6Y31110□03067NJ5 (3 axes + 1 rotational axis)



155

Do not attach any tube to robot cable.

M4 ground terminal

ø220

P.C.D.400

M4 × 0.7 Depth 8
(For securing cable)

6-ø16 Depth 25

6-M12 × 1.75 Depth 25

Locations of eyebolts (Ø50)
for lifting to be taken into
account for mounting area

3 shaded areas,
available for mounting

MOUNTING SURFACE DETAIL

3-Eyebolts

(1067)

25
(46)
120
799
(673)
22
45

ø42
ø65
B (note)
A

Robot wiring interference area

(350)
(80)

Ø 1100: Tool working envelope
Ø 1200: Arm rotation

Arm rotation

200
120
650
1100
300
150

Tool working envelope

74

ø580
ø1100

Rc1/8

4-M5 × 0.8 Depth 8

P.C.D.31.5

15.75±0.02

User tubing (Ø6)

Ø20 Depth 3
Ø5 H7 Depth 10

View of A

**Note:** The three areas of the robot base are available for mounting. Leave other area unoccupied for other needs (e.g. wiring). Also note the locations of the eyebolts when designing a mounting frame. Any part of end-effector should not stick out above the surface of B.
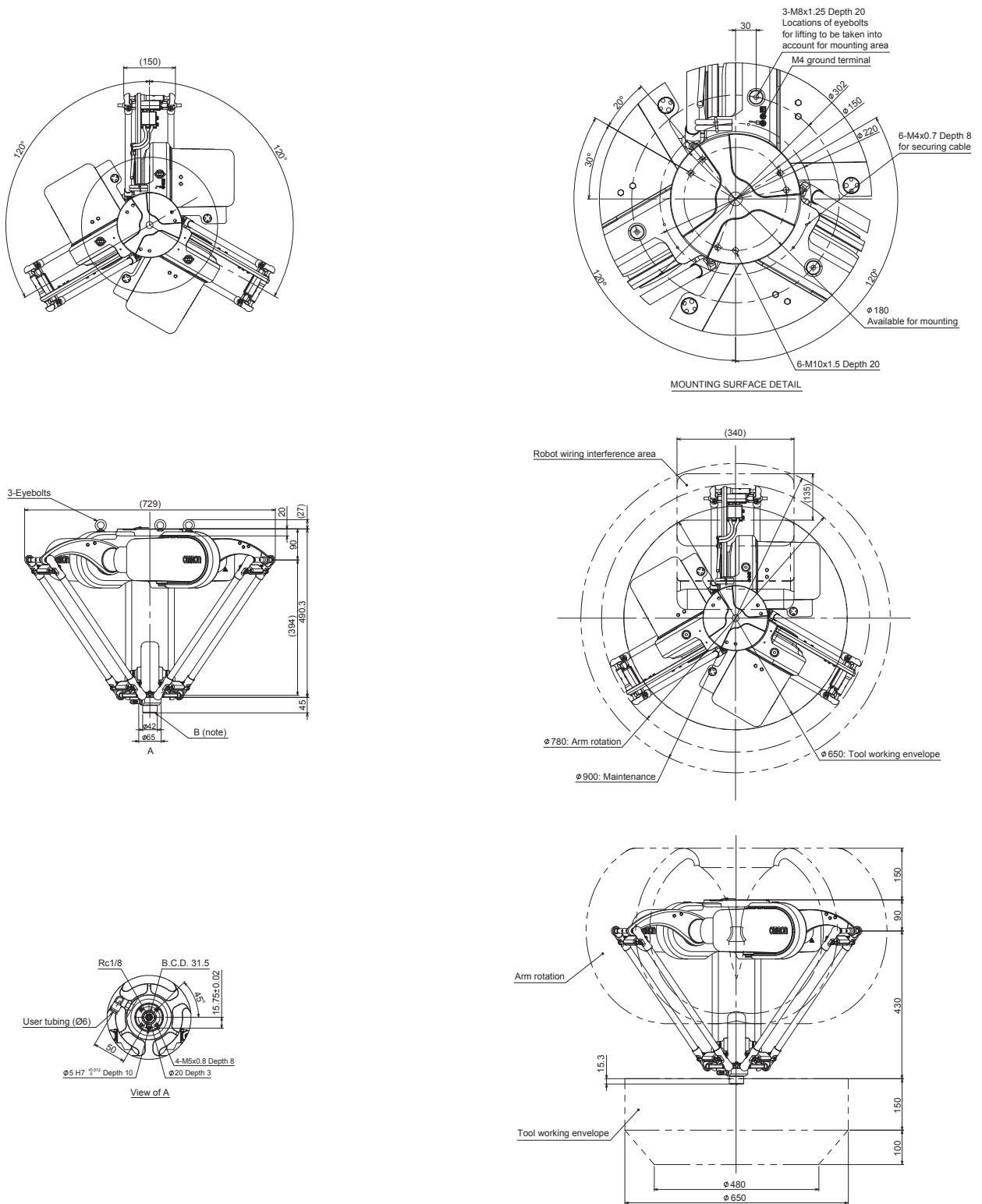
# OMRON

## R6Y30110S03067NJ5 (3 axes)



Top view with 155 and 120° angle dimensions



MOUNTING SURFACE DETAIL

M4 ground terminal

M4 × 0.7 Depth 8
(For securing cable)

6-ø16 Depth 25

6-M12 × 1.75 Depth 25

Locations of eyebolts (Ø50)
for lifting to be taken into
account for mounting area

3 shaded areas,
available for mounting

P.C.D.400



(1067)

3-Eyebolts

B (note)

ø40
ø65

A



Rc 1/8

4-M5 × 0.8 Depth 8

P.C.D.31.5

User tubing (Ø6)

ø20 Depth 3
ø5 H7 Depth 10

View of A



Ø 1100: Tool working envelope
Ø 1200: Arm rotation



Arm rotation

Tool working envelope

ø580
ø1100

**Note:** The three areas of the robot base are available for mounting. Leave other area unoccupied for other needs (e.g. wiring). Also note the locations of the eyebolts when designing a mounting frame. Any part of end-effector should not stick out above the surface of B.
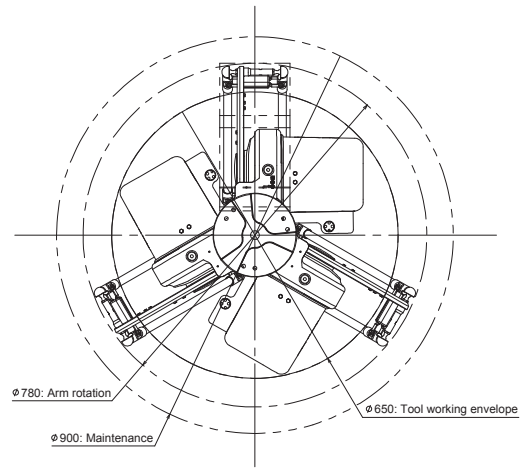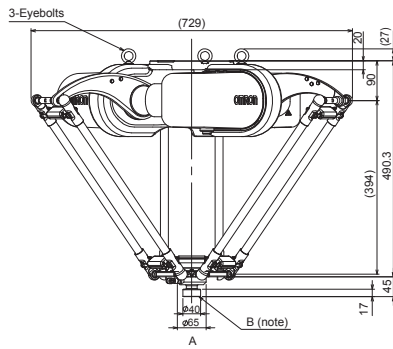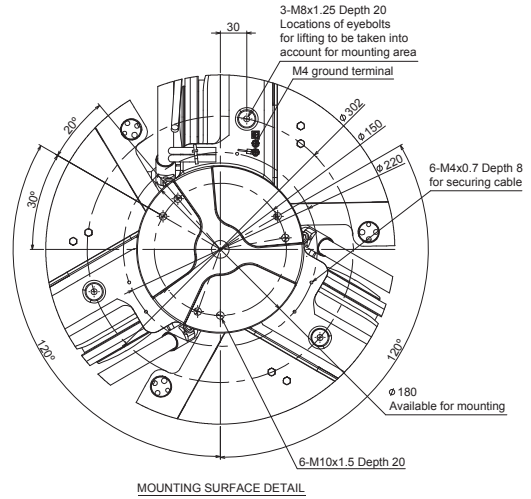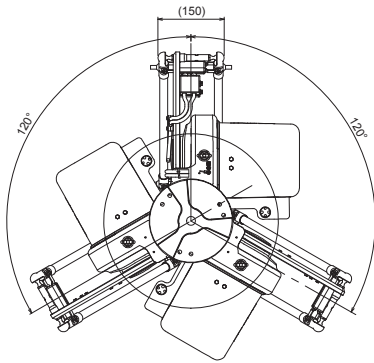
Robot

## Washdown Mini Delta robot IP67 dimensions
### R6Y31065□02067NJ5 (3 axes + 1 rotational axis)



3-M8x1.25 Depth 20
Locations of eyebolts
for lifting to be taken into
account for mounting area

M4 ground terminal

ø302
ø150
ø220

6-M4x0.7 Depth 8
for securing cable

ø180
Available for mounting

6-M10x1.5 Depth 20

MOUNTING SURFACE DETAIL

3-Eyebolts

(729)

(150)

Robot wiring interference area

ø780: Arm rotation
ø900: Maintenance
ø650: Tool working envelope

Rc1/8    B.C.D. 31.5
User tubing (Ø6)
ø5 H7 Depth 10    4-M5x0.8 Depth 8
ø20 Depth 3

View of A

Arm rotation

Tool working envelope

ø480
ø650

**Note:** Mounting area should be smaller than 180 mm diameter to avoid collision with robot cable. Frame of base should not be in the arm moving area. Any part of end-effector should not stick out above the surface of B.

# OMRON

## R6Y30065S02067NJ5 (3 axes)



3-M8x1.25 Depth 20
Locations of eyebolts
for lifting to be taken into
account for mounting area

M4 ground terminal

30

Ø302
Ø150
Ø220

6-M4x0.7 Depth 8
for securing cable

Ø180
Available for mounting

6-M10x1.5 Depth 20

MOUNTING SURFACE DETAIL

3-Eyebolts

(729)
20
(27)
90
(394)
490.3
45
17
Ø40
Ø65
B (note)
A
(150)

120°
120°

Ø780: Arm rotation
Ø900: Maintenance
Ø650: Tool working envelope

Rc1/8
B.C.D. 31.5
15.75±0.02
User tubing (Ø6)
50
Ø5 H7 Depth 10
4-M5x0.8 Depth 8
Ø20 Depth 3

View of A

Arm rotation

Tool working envelope

120
90
430
15.3
150
100
Ø480
Ø650

**Note:** Mounting area should be smaller than 180 mm diameter to avoid collision with robot cable. Frame of base should not be in the arm moving area. Any part of end-effector should not stick out above the surface of B.
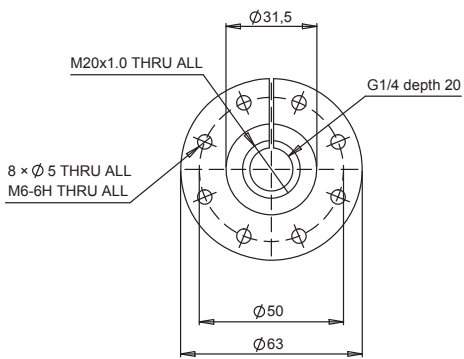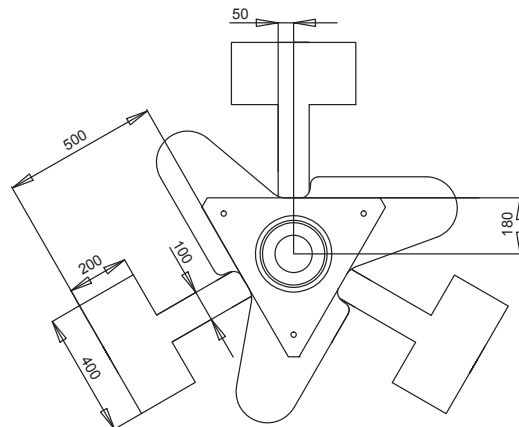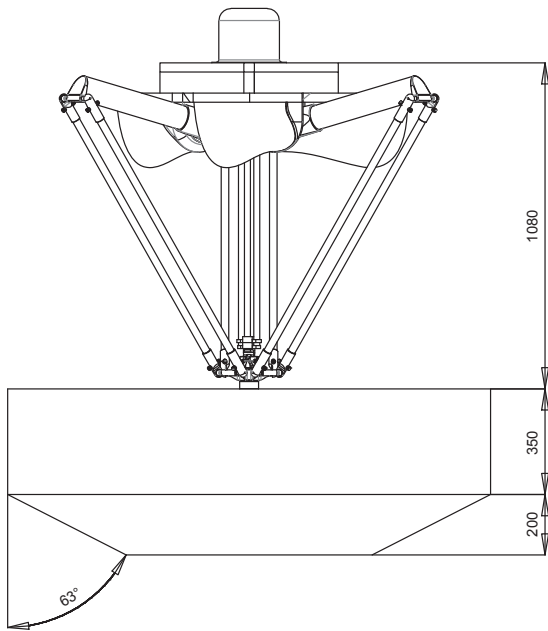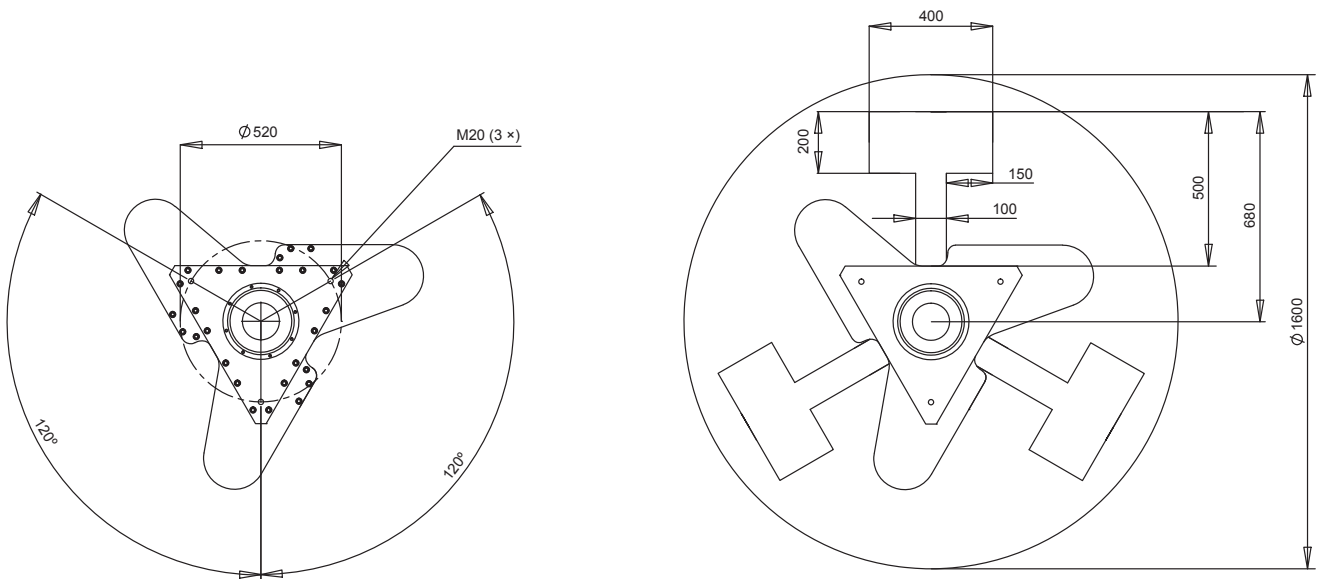
# OMRON

**Delta robot XXL dimensions**
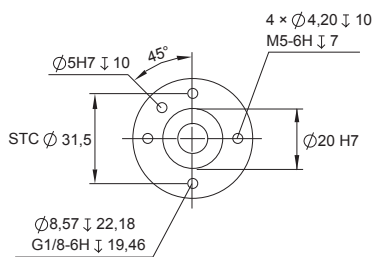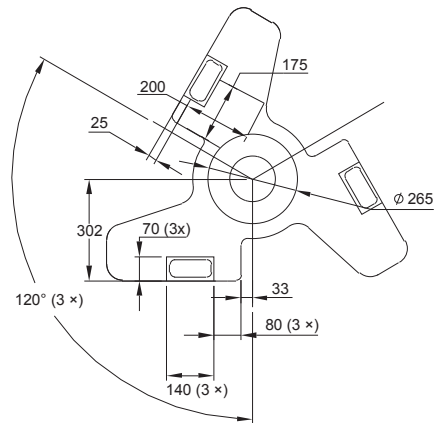**CR_UGD4_XXLH_□R**

Ø 520

M20 (3 ×)

120°

120°

400

200

150

100

500

680

Ø 1600

1080

350

200

63°

50

500

200

100

400

180

Ø 31,5

M20x1.0 THRU ALL

G1/4 depth 20

8 × Ø 5 THRU ALL
M6-6H THRU ALL

Ø 50

Ø 63

Gripper dimensions

# OMRON

**Delta robot XL dimensions**

**CR_UGD4_XL_□R**



STC∅ 740

M16 (5 ×)

32,2

120°  120°

368,6

243

329,5  350,5

∅1300

150

42

100

50

150

440

250

175

200

25

302

70 (3x)

120° (3 ×)

33

80 (3 ×)

140 (3 ×)

∅ 265

850

250

150

55°

440

150

250

150

200

100

42

75

4 × ∅ 4,20 ⌿ 10
M5-6H ⌿ 7

∅5H7 ⌿ 10

45°

STC ∅ 31,5

∅20 H7

∅8,57 ⌿ 22,18
G1/8-6H ⌿ 19,46
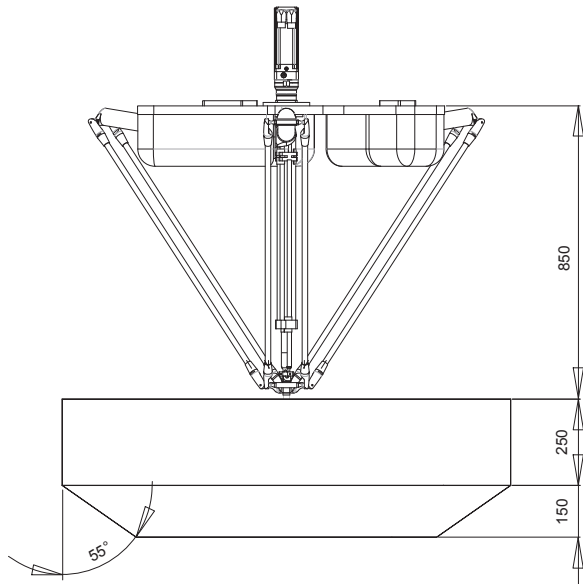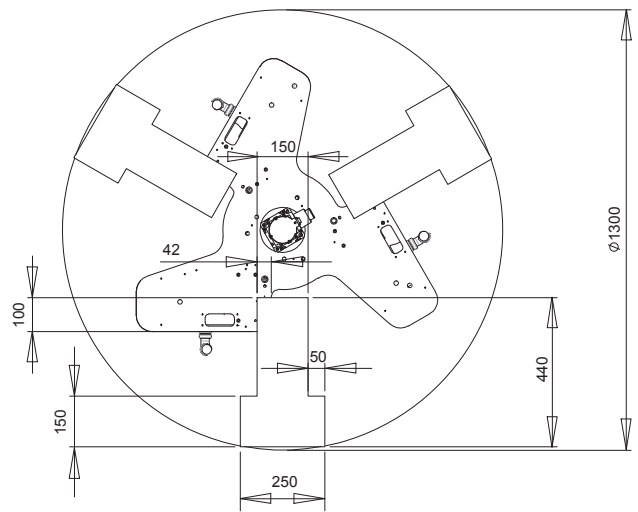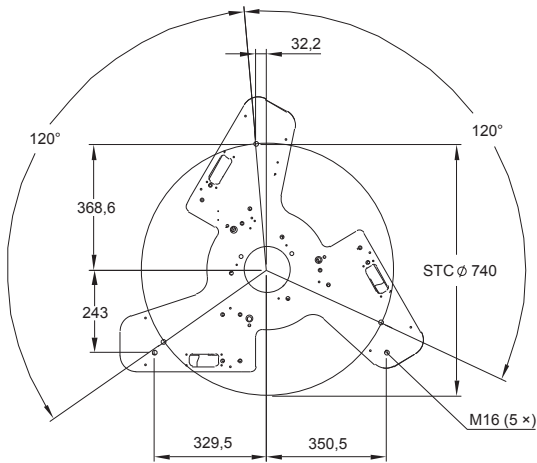
Gripper dimensions

**Delta robot dimensions**

**CR_UGD4_☐R**



STC ⌀ 740

M16 (5 ×)

32,2

120°

120°

368,6

243

329,5

350,5

⌀1100

150

40

100

130

100

335

350

160

198

750

250

150

60°

175

200

25

⌀ 265

302

70 (3x)

33

120° (3 ×)

80 (3 ×)

140 (3 ×)

4 × ⌀ 4,20 ↧ 10
M5-6H ↧ 7

⌀5H7 ↧ 10

45°

STC ⌀ 31,5

⌀20 H7

⌀8,57 ↧ 22,18
G1/8-6H ↧ 19,46

Gripper dimensions

335

130

350

150

200

100

40

75

# OMRON
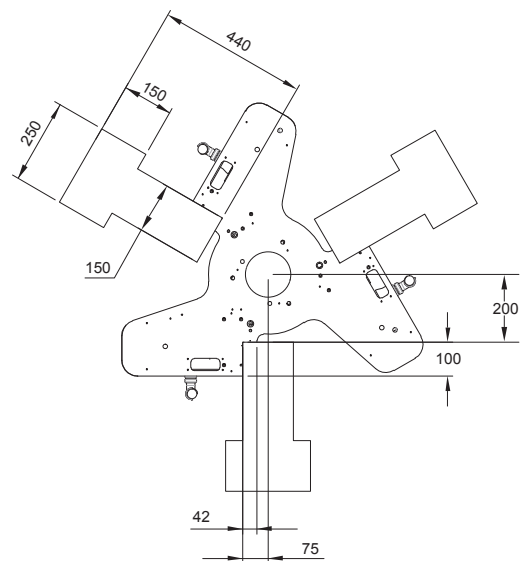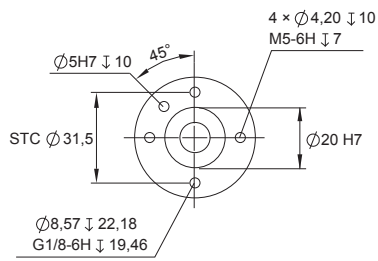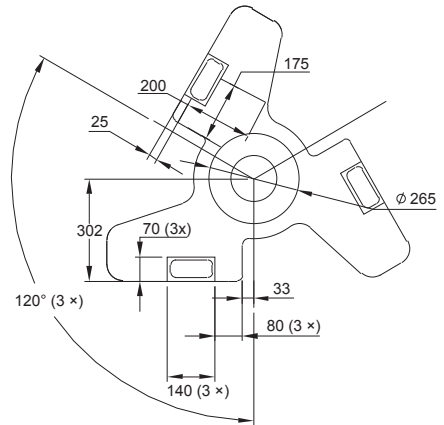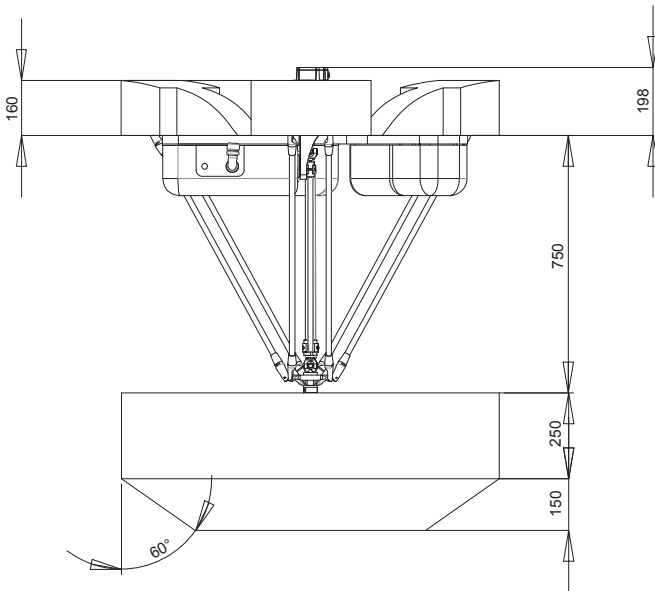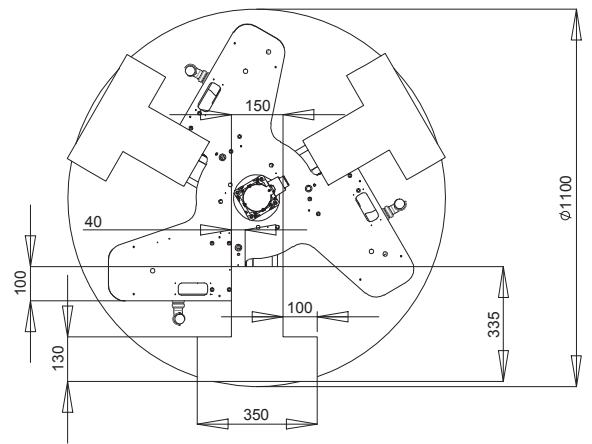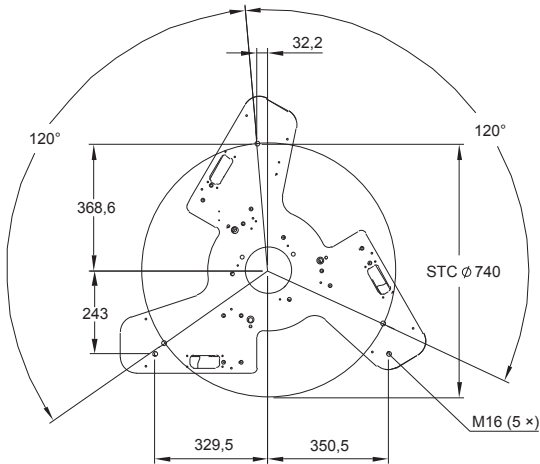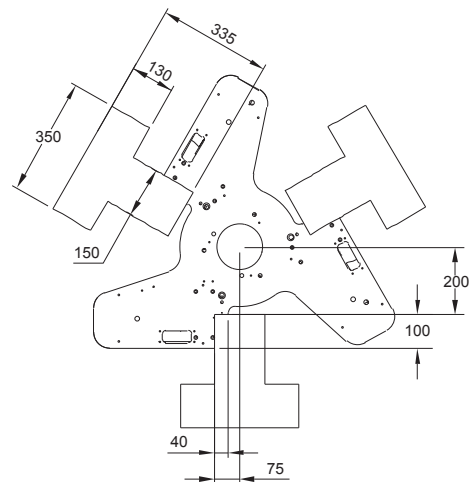
## Washdown Mini Delta robot IP65 / Mini Delta robot dimensions
## CR_UGD4MINI_□R□
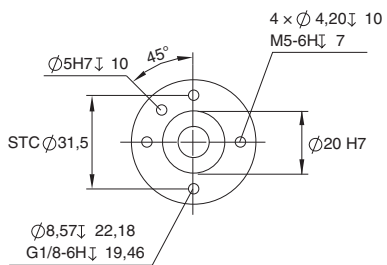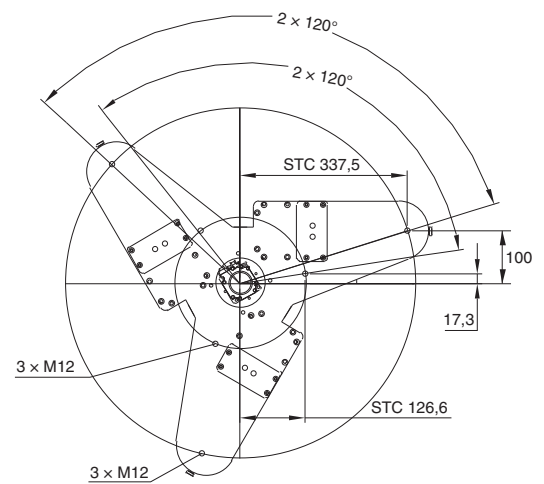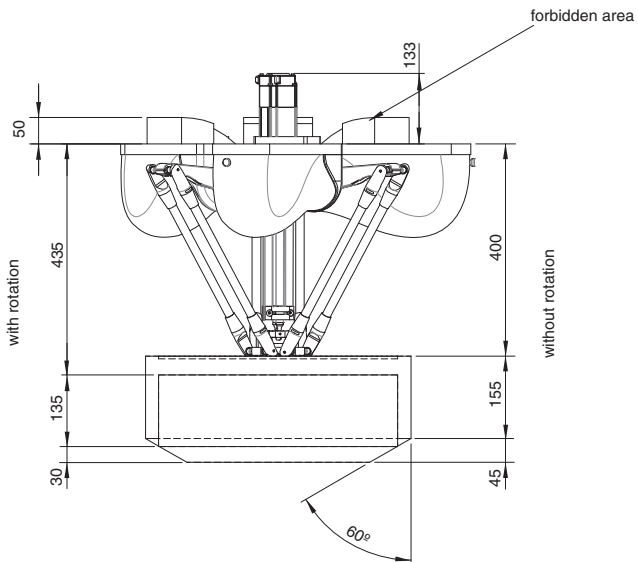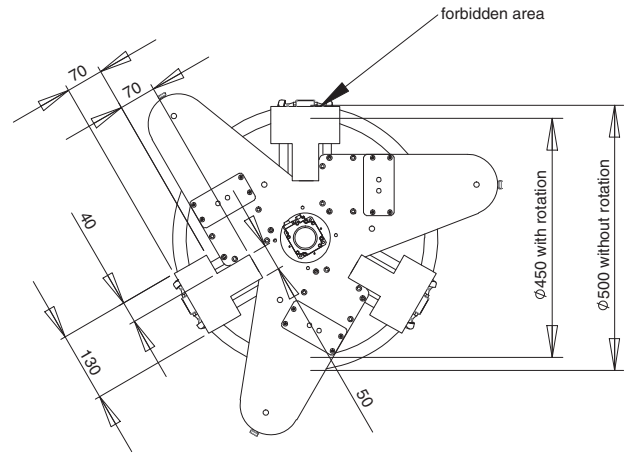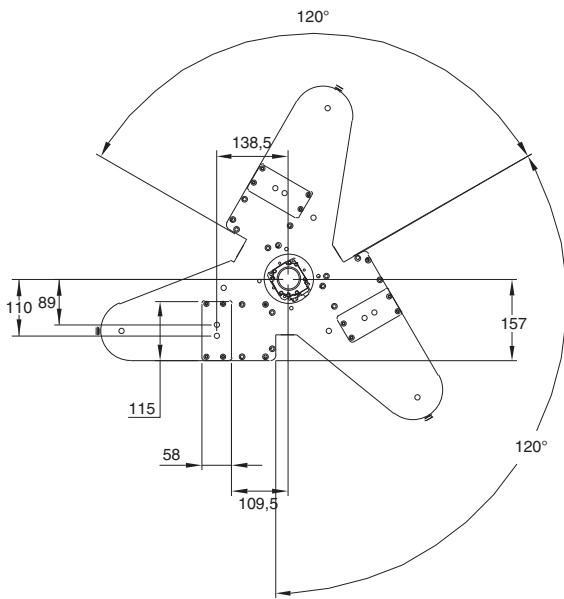


Gripper dimensions
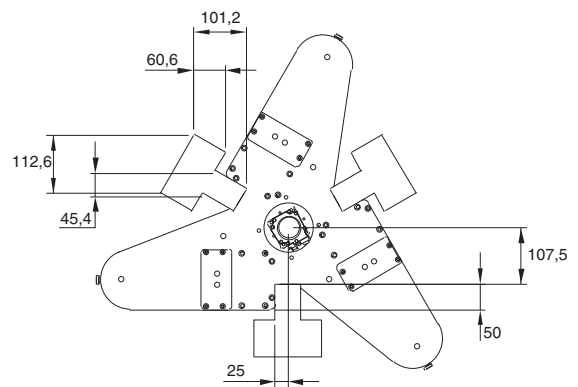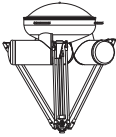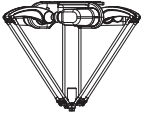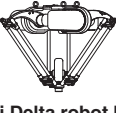
# OMRON

## Ordering information



**Sysmac Studio**

**EtherNet/IP**

⑦ Machine controller

**EtherCAT**

② Accurax G5 servo drive

⑥ FQ-M vision

NX-series I/O

④ Extension cable for absolute encoder (with battery holder)

⑤ Power cable

③ Encoder cable

① **Delta robot**

Arm 1

Arm 2

Arm 3

Rotational axis 4 (optional)

**Note:** Servo motors included in the Delta robot.

**Delta robot**

# OMRON
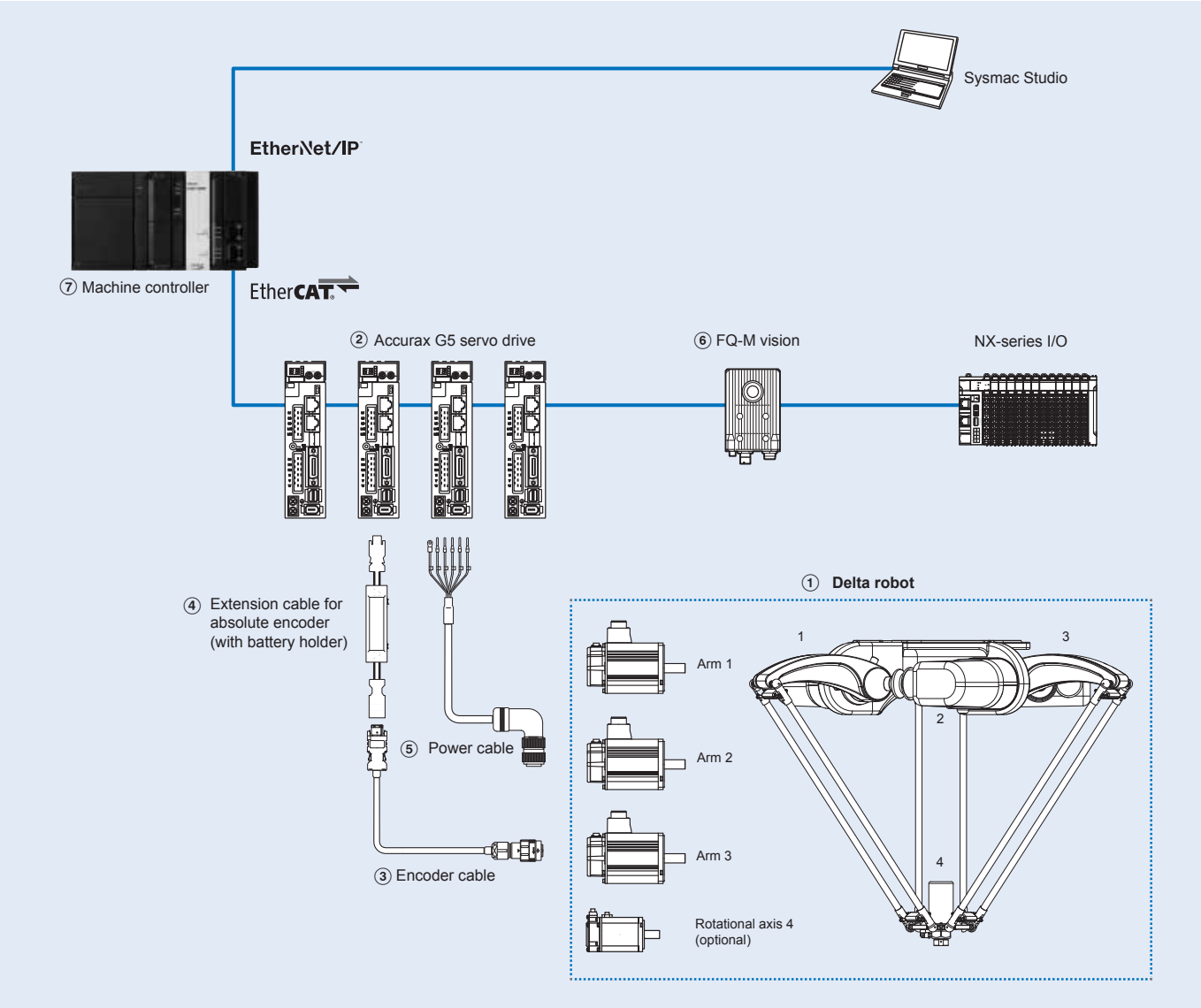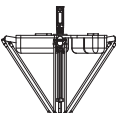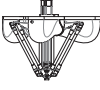
## Washdown Delta robot series

| Symbol | Model | Cable length | Max. payload | Working range | Description | Axis | Applicable servo ② drive |
|---|---|---|---|---|---|---|---|
| ① **Delta robot IP69K** | CR_UGD4_R_HD3<br>CR_UGD4_R_HD5<br>CR_UGD4_R_HD10<br>CR_UGD4_R_HD15<br>CR_UGD4_R_HD20 | 3 m<br>5 m<br>10 m<br>15 m<br>20 m | 3 kg | Ø 1100 x 250 mm | 3 + 1 axes<br>Hygienic Design<br>(only this robot includes the cables) | Arm 1 | R88D-KN15H-ECT |
| | | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | | Arm 3 | R88D-KN15H-ECT |
| | | | | | | Rotational 4 | R88D-KN08H-ECT |
| | CR_UGD4_NR_HD3<br>CR_UGD4_NR_HD5<br>CR_UGD4_NR_HD10<br>CR_UGD4_NR_HD15<br>CR_UGD4_NR_HD20 | 3 m<br>5 m<br>10 m<br>15 m<br>20 m | | | 3 axes<br>Hygienic Design<br>(only this robot includes the cables) | Arm 1 | R88D-KN15H-ECT |
| | | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | | Arm 3 | R88D-KN15H-ECT |
| ① **Delta robot IP67** | R6Y31110H03067NJ5 | | 3 kg | Ø 1100 x 450 mm | 3 + 1 axes<br>(high inertia rotational axis) | Arm 1 | R88D-KN15H-ECT |
| | | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | | Arm 3 | R88D-KN15H-ECT |
| | | | | | | Rotational 4 | R88D-KN01H-ECT |
| | R6Y31110L03067NJ5 | | | | 3 + 1 axes<br>(low inertia rotational axis) | Arm 1 | R88D-KN15H-ECT |
| | | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | | Arm 3 | R88D-KN15H-ECT |
| | | | | | | Rotational 4 | R88D-KN01H-ECT |
| | R6Y30110S03067NJ5 | | | | 3 axes | Arm 1 | R88D-KN15H-ECT |
| | | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | | Arm 3 | R88D-KN15H-ECT |
| ① **Mini Delta robot IP67** | R6Y31065H02067NJ5 | | 2 kg | Ø 650 x 250 mm | 3 + 1 axes<br>(high inertia rotational axis) | Arm 1 | R88D-KN04H-ECT |
| | | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | | Arm 3 | R88D-KN04H-ECT |
| | | | | | | Rotational 4 | R88D-KN01H-ECT |
| | R6Y31065L02067NJ5 | | | | 3 + 1 axes<br>(low inertia rotational axis) | Arm 1 | R88D-KN04H-ECT |
| | | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | | Arm 3 | R88D-KN04H-ECT |
| | | | | | | Rotational 4 | R88D-KN01H-ECT |
| | R6Y30065S02067NJ5 | | | | 3 axes | Arm 1 | R88D-KN04H-ECT |
| | | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | | Arm 3 | R88D-KN04H-ECT |
| ① **Mini Delta robot IP65** | CR_UGD4MINI_R_TS | | 1 kg | Ø 450 x 135 mm | 3 + 1 axes | Arm 1 | R88D-KN04H-ECT |
| | | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | | Arm 3 | R88D-KN04H-ECT |
| | | | | | | Rotational 4 | R88D-KN04H-ECT |
| | CR_UGD4MINI_NR_TS | | | Ø 500 x 155 mm | 3 axes | Arm 1 | R88D-KN04H-ECT |
| | | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | | Arm 3 | R88D-KN04H-ECT |

## Delta robot series

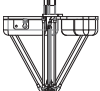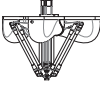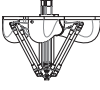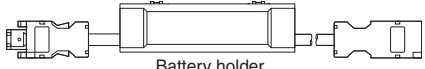| Symbol | Model | Max. payload | Working range | Description | Axis | Applicable servo ② drive |
|---|---|---|---|---|---|---|
| ① **Delta robot XXL** | CR_UGD4_XXLH_R | 8 kg | Ø 1600 x 550 mm | 3 + 1 axes | Arm 1 | R88D-KN30F-ECT |
| | | | | | Arm 2 | R88D-KN30F-ECT |
| | | | | | Arm 3 | R88D-KN30F-ECT |
| | | | | | Rotational 4 | R88D-KN15F-ECT |
| | CR_UGD4_XXLH_NR | | | 3 axes | Arm 1 | R88D-KN30F-ECT |
| | | | | | Arm 2 | R88D-KN30F-ECT |
| | | | | | Arm 3 | R88D-KN30F-ECT |
| ① **Delta robot XL** | CR_UGD4_XL_R | 2 kg | Ø 1300 x 400 mm | 3 + 1 axes | Arm 1 | R88D-KN15H-ECT |
| | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | Arm 3 | R88D-KN15H-ECT |
| | | | | | Rotational 4 | R88D-KN15H-ECT |
| | CR_UGD4_XL_NR | | | 3 axes | Arm 1 | R88D-KN15H-ECT |
| | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | Arm 3 | R88D-KN15H-ECT |
| ① **Delta robot** | CR_UGD4_R | 2 kg | Ø 1100 x 400 mm | 3 + 1 axes | Arm 1 | R88D-KN15H-ECT |
| | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | Arm 3 | R88D-KN15H-ECT |
| | | | | | Rotational 4 | R88D-KN15H-ECT |
| | CR_UGD4_NR | | | 3 axes | Arm 1 | R88D-KN15H-ECT |
| | | | | | Arm 2 | R88D-KN15H-ECT |
| | | | | | Arm 3 | R88D-KN15H-ECT |
| ① **Mini Delta robot** | CR_UGD4MINI_R | 1 kg | Ø 450 x 135 mm | 3 + 1 axes | Arm 1 | R88D-KN04H-ECT |
| | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | Arm 3 | R88D-KN04H-ECT |
| | | | | | Rotational 4 | R88D-KN04H-ECT |
| | CR_UGD4MINI_NR | | Ø 500 x 155 mm | 3 axes | Arm 1 | R88D-KN04H-ECT |
| | | | | | Arm 2 | R88D-KN04H-ECT |
| | | | | | Arm 3 | R88D-KN04H-ECT |

## Encoder cables
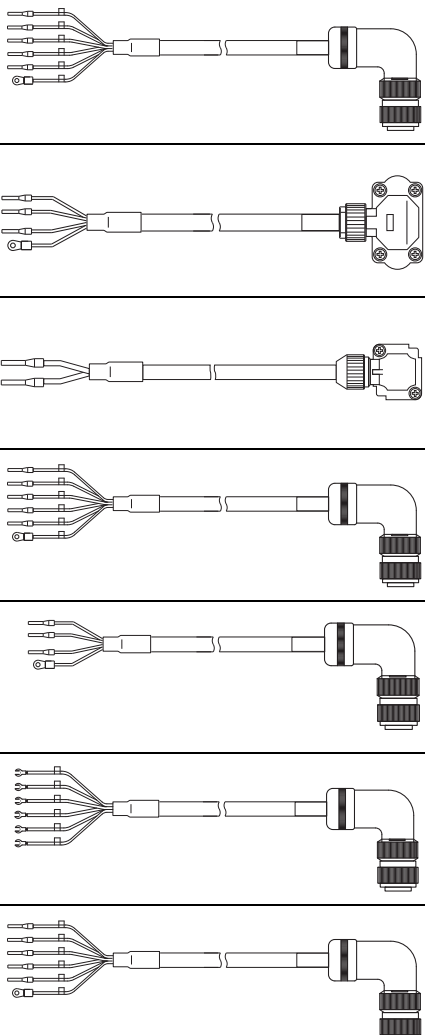
| Symbol | Applicable Delta robots | | Model | Appearance |
|---|---|---|---|---|
| ③ | *1 CR_UGD4_☐_HD☐ (Arm 1, 2, 3)<br>R6Y3☐110☐03067NJ5<br>CR_UGD4_XXLH<br>CR_UGD4_XL<br>CR_UGD4 | 1.5 m | R88A-CRKC001-5NR-E | |
| | | 3 m | R88A-CRKC003NR-E | |
| | | 5 m | R88A-CRKC005NR-E | |
| | | 10 m | R88A-CRKC010NR-E | |
| | | 15 m | R88A-CRKC015NR-E | |
| | | 20 m | R88A-CRKC020NR-E | |
| | *1 CR_UGD4_☐_HD☐ (Rotational axis 4)<br>R6Y3☐065☐02067NJ5<br>CR_UGD4MINI_☐_TS<br>CR_UGD4MINI | 1.5 m | R88A-CRKA001-5CR-E | |
| | | 3 m | R88A-CRKA003CR-E | |
| | | 5 m | R88A-CRKA005CR-E | |
| | | 10 m | R88A-CRKA010CR-E | |
| | | 15 m | R88A-CRKA015CR-E | |
| | | 20 m | R88A-CRKA020CR-E | |

*1. The CR_UGD4_☐_HD☐ models include the encoder cables.

## Absolute encoder battery cable (encoder extension cable only)

| Symbol | Specifications | | | Model | Appearance |
|---|---|---|---|---|---|
| ④ | Absolute encoder battery cable | Battery not included | 0.3 m | R88A-CRGD0R3C-E | |
| | | Battery included | 0.3 m | R88A-CRGD0R3C-BS-E | Battery holder |
| | Absolute encoder backup battery | 2.000 mA.h, 3.6 V | – | R88A-BAT01G | |

## Power and brake cables

| Symbol | Applicable Delta robots | | | | Model | Appearance |
|---|---|---|---|---|---|---|
| ⑤ *1 | CR_UGD4_☐☐_HD☐ | Arm 1, 2, 3 | Power cable with brake | 1.5 m | R88A-CAGB001-5BR-E | |
| | | | | 3 m | R88A-CAGB003BR-E | |
| | | | | 5 m | R88A-CAGB005BR-E | |
| | | | | 10 m | R88A-CAGB010BR-E | |
| | | | | 15 m | R88A-CAGB015BR-E | |
| | | | | 20 m | R88A-CAGB020BR-E | |
| | | Rotational axis 4 | Power cable without brake | 1.5 m | R88A-CAKA001-5SR-E | |
| | | | | 3 m | R88A-CAKA003SR-E | |
| | | | | 5 m | R88A-CAKA005SR-E | |
| | | | | 10 m | R88A-CAKA010SR-E | |
| | | | | 15 m | R88A-CAKA015SR-E | |
| | | | | 20 m | R88A-CAKA020SR-E | |
| | | | Brake cable | 1.5 m | R88A-CAKA001-5BR-E | |
| | | | | 3 m | R88A-CAKA003BR-E | |
| | | | | 5 m | R88A-CAKA005BR-E | |
| | | | | 10 m | R88A-CAKA010BR-E | |
| | | | | 15 m | R88A-CAKA015BR-E | |
| | | | | 20 m | R88A-CAKA020BR-E | |
| | R6Y3☐110☐03067NJ5 | Arm 1, 2, 3 | Power cable with brake | 1.5 m | R88A-CAGB001-5BR-E | |
| | | | | 3 m | R88A-CAGB003BR-E | |
| | | | | 5 m | R88A-CAGB005BR-E | |
| | | | | 10 m | R88A-CAGB010BR-E | |
| | | | | 15 m | R88A-CAGB015BR-E | |
| | | | | 20 m | R88A-CAGB020BR-E | |
| | | Rotational axis 4 | Power cable without brake | 1.5 m | R88A-CAGB001-5SR-E | |
| | | | | 3 m | R88A-CAGB003SR-E | |
| | | | | 5 m | R88A-CAGB005SR-E | |
| | | | | 10 m | R88A-CAGB010SR-E | |
| | | | | 15 m | R88A-CAGB015SR-E | |
| | | | | 20 m | R88A-CAGB020SR-E | |
| | CR_UGD4_XXLH | Arm 1, 2, 3 | Power cable with brake | 1.5 m | R88A-CAGD001-5BR-E | |
| | | | | 3 m | R88A-CAGD003BR-E | |
| | | | | 5 m | R88A-CAGD005BR-E | |
| | | | | 10 m | R88A-CAGD010BR-E | |
| | | | | 15 m | R88A-CAGD015BR-E | |
| | | | | 20 m | R88A-CAGD020BR-E | |
| | | Rotational axis 4 | Power cable with brake | 1.5 m | R88A-CAKF001-5BR-E | |
| | | | | 3 m | R88A-CAKF003BR-E | |
| | | | | 5 m | R88A-CAKF005BR-E | |
| | | | | 10 m | R88A-CAKF010BR-E | |
| | | | | 15 m | R88A-CAKF015BR-E | |
| | | | | 20 m | R88A-CAKF020BR-E | |

| Symbol | Applicable Delta robots | | | | Model | Appearance |
|---|---|---|---|---|---|---|
| ⑤ | CR_UGD4_XL<br>CR_UGD4 | Arm 1, 2, 3 and rotational axis 4 | Power cable with brake | 1.5 m | R88A-CAGB001-5BR-E | |
| | | | | 3 m | R88A-CAGB003BR-E | |
| | | | | 5 m | R88A-CAGB005BR-E | |
| | | | | 10 m | R88A-CAGB010BR-E | |
| | | | | 15 m | R88A-CAGB015BR-E | |
| | | | | 20 m | R88A-CAGB020BR-E | |
| | R6Y3□065□02067NJ5 | Arm 1, 2, 3 | Power cable without brake | 1.5 m | R88A-CAKA001-5SR-E | |
| | | | | 3 m | R88A-CAKA003SR-E | |
| | | | | 5 m | R88A-CAKA005SR-E | |
| | | | | 10 m | R88A-CAKA010SR-E | |
| | | | | 15 m | R88A-CAKA015SR-E | |
| | | | | 20 m | R88A-CAKA020SR-E | |
| | | | Brake cable | 1.5 m | R88A-CAKA001-5BR-E | |
| | | | | 3 m | R88A-CAKA003BR-E | |
| | | | | 5 m | R88A-CAKA005BR-E | |
| | | | | 10 m | R88A-CAKA010BR-E | |
| | | | | 15 m | R88A-CAKA015BR-E | |
| | | | | 20 m | R88A-CAKA020BR-E | |
| | | Rotational axis 4 | Power cable without brake | 1.5 m | R88A-CAGB001-5SR-E | |
| | | | | 3 m | R88A-CAGB003SR-E | |
| | | | | 5 m | R88A-CAGB005SR-E | |
| | | | | 10 m | R88A-CAGB010SR-E | |
| | | | | 15 m | R88A-CAGB015SR-E | |
| | | | | 20 m | R88A-CAGB020SR-E | |
| | CR_UGD4MINI_□_TS<br>CR_UGD4MINI | Arm 1, 2, 3 and rotational axis 4 | Power cable without brake | 1.5 m | R88A-CAKA001-5SR-E | |
| | | | | 3 m | R88A-CAKA003SR-E | |
| | | | | 5 m | R88A-CAKA005SR-E | |
| | | | | 10 m | R88A-CAKA010SR-E | |
| | | | | 15 m | R88A-CAKA015SR-E | |
| | | | | 20 m | R88A-CAKA020SR-E | |
| | | | Brake cable | 1.5 m | R88A-CAKA001-5BR-E | |
| | | | | 3 m | R88A-CAKA003BR-E | |
| | | | | 5 m | R88A-CAKA005BR-E | |
| | | | | 10 m | R88A-CAKA010BR-E | |
| | | | | 15 m | R88A-CAKA015BR-E | |
| | | | | 20 m | R88A-CAKA020BR-E | |

*1. The CR_UGD4_□_HD□ models include the power and brake cables.

## Vision

| Name | Type | | Model |
|---|---|---|---|
| ⑥ FQ-M series | Color | NPN | FQ-MS120-ECT |
| | | PNP | FQ-MS125-ECT |
| | Monochrome | NPN | FQ-MS120-M-ECT |
| | | PNP | FQ-MS125-M-ECT |

## Machine controller

| Name | | Functions | Delta robot | Axes | Model |
|---|---|---|---|---|---|
| ⑦ NJ Robotics | CPU unit | Logic sequence, motion, robotics and database connection | Control of up to 8 Delta robot depending on the number of axes supported by the CPU | 16 | NJ501-4320 |
| | | Logic sequence, motion and robotics | | 64 | NJ501-4500 |
| | | | | 32 | NJ501-4400 |
| | | | | 16 | NJ501-4300 |
| | | | Control of one Delta robot | 16 | NJ501-4310 |
| | Power supply unit | | | | NJ-PA3001 (220 VAC) |
| | | | | | NJ-PD3001 (24 VDC) |

## Accessories

| Name | Applicable Delta robots | Specifications | Model |
|---|---|---|---|
| Anti-collision detection option | R6Y3□110□03067NJ5<br>R6Y3□065□02067NJ5 | Connectors mounted between the TCP flange and the arms | R6YACAD01 |

## Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.03 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat.No.SysCat_I193E-EN-04      In the interest of product improvement, specifications are subject to change without notice.

# 3G3RX☐

# RX frequency inverter

## Customised to your machine

- Up to 132 kW
- High starting torque in open loop: 200% at 0.3Hz
- Full torque at 0 Hz in closed loop
- Sensor-less and vector closed-loop control
- Double rating VT 120%/1 min and CT 150%/1 min
- Built-in EMC filter
- Built-in application functionality
- Indexer functionality
- Automatic energy saving
- Micro-surge voltage suppression
- CE, cULus, RoHS

## Ratings

- 200 V Class three-phase 0.4 to 55 kW
- 400 V Class three-phase 0.4 to 132 kW

## System configuration



*1 The 5 lines LCD digital operator is provided with the inverter from factory.
*2 When a communication option board is mounted, there are two options: mount a blind cover or a LED digital operator.

# OMRON

## Type designation

```
3 G 3 R X - A 4 0 0 4 - E 1 F
```

RX series

A: IP20
B: IP00

Voltage:
2: Three-phase 200 VAC
4: Three-phase 400 VAC

Max. applicable motor output
004: 0,4kW
⌇
13K: 132 kW

E: Europe standard

F: Built-in filter

### 200 V class

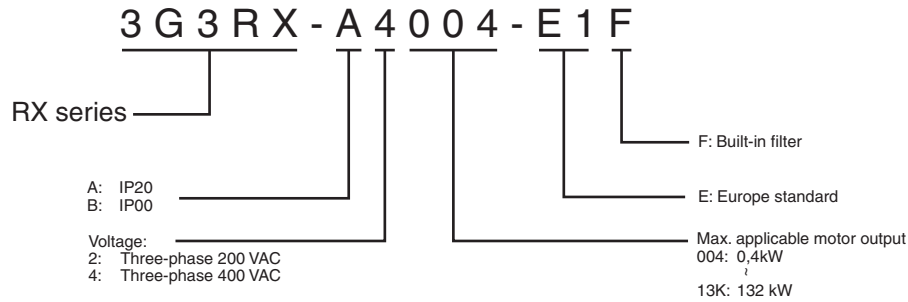| Three-phase: 3G3RX-□ | | | A2004 | A2007 | A2015 | A2022 | A2037 | A2055 | A2075 | A2110 | A2150 | A2185 | A2220 | A2300 | A2370 | A2450 | A2550 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. applicable motor 4P kW[*1] | | at CT | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
| | | at VT | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 |
| Output characteristics | Inverter capacity kVA | 200 V at CT | 1.0 | 1.7 | 2.5 | 3.6 | 5.7 | 8.3 | 11 | 15.9 | 22.1 | 26.3 | 32.9 | 41.9 | 50.2 | 63 | 76.2 |
| | | 200 V at VT | 1.3 | 2.1 | 3.2 | 4.1 | 6.7 | 10.4 | 15.2 | 20 | 26.3 | 29.4 | 39.1 | 49.5 | 59.2 | 72.7 | 93.5 |
| | | 240 V at CT | 1.2 | 2.0 | 3.1 | 4.3 | 6.8 | 9.9 | 13.3 | 19.1 | 26.6 | 31.5 | 39.4 | 50.2 | 60.2 | 75.6 | 91.4 |
| | | 240 V at VT | 1.5 | 2.6 | 3.9 | 5.0 | 8.1 | 12.4 | 18.2 | 24.1 | 31.5 | 35.3 | 46.9 | 59.4 | 71 | 87.2 | 112.2 |
| | Rated output current (A) | at CT | 3.0 | 5.0 | 7.5 | 10.5 | 16.5 | 24 | 32 | 46 | 64 | 76 | 95 | 121 | 145 | 182 | 220 |
| | | at VT | 3.7 | 6.3 | 9.4 | 12 | 19.6 | 30 | 44 | 58 | 73 | 85 | 113 | 140 | 169 | 210 | 270 |
| | Max. output voltage | | Proportional to input voltage: 0 to 240 V | | | | | | | | | | | | | | |
| | Max. output frequency | | 400 Hz | | | | | | | | | | | | | | |
| Power supply | Rated input voltage and frequency | | 3-phase 200 to 240 V 50/60 Hz | | | | | | | | | | | | | | |
| | Allowable voltage fluctuation | | −15% to +10% | | | | | | | | | | | | | | |
| | Allowable frequency fluctuation | | 5% | | | | | | | | | | | | | | |
| Braking | Regenerative braking | | Internal BRD circuit (external discharge resistor) | | | | | | | | | | External regenerative braking unit | | | | |
| | Minimum connectable resistance | | 50 | 50 | 35 | 35 | 35 | 16 | 10 | 10 | 7.5 | 7.5 | 5 | | | | |
| Protective structure | | | IP20 | | | | | | | | | | | | | | |
| Cooling method | | | Forced air cooling | | | | | | | | | | | | | | |

[*1] Based on a standard 3-Phase standard motor.

### 400 V class

| Three-phase: 3G3RX-□ | | | A4004 | A4007 | A4015 | A4022 | A4040 | A4055 | A4075 | A4110 | A4150 | A4185 | A4220 | A4300 | A4370 | A4450 | A4550 | B4750 | B4900 | B411K | B413K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. applicable motor 4P kW[*1] | | at CT | 0.4 | 0.75 | 1.5 | 2.2 | 4.0 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 | 132 |
| | | at VT | 0.75 | 1.5 | 2.2 | 4.0 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 | 132 | 160 |
| Output characteristics | Inverter capacity kVA | 400 V at CT | 1.0 | 1.7 | 2.5 | 3.6 | 6.2 | 9.7 | 13.1 | 17.3 | 22.1 | 26.3 | 33.2 | 40.1 | 51.9 | 63 | 77.6 | 103.2 | 121.9 | 150.3 | 180.1 |
| | | 400 V at VT | 1.3 | 2.1 | 3.3 | 4.6 | 7.7 | 11 | 15.2 | 20.9 | 25.6 | 30.4 | 39.4 | 48.4 | 58.8 | 72.7 | 93.5 | 110.8 | 135 | 159.3 | 200.9 |
| | | 480 V at CT | 1.2 | 2.0 | 3.1 | 4.3 | 7.4 | 11.6 | 15.8 | 20.7 | 26.6 | 31.5 | 39.9 | 48.2 | 62.3 | 75.6 | 93.1 | 128.3 | 146.3 | 180.4 | 216.1 |
| | | 480 V at VT | 1.5 | 2.5 | 4.0 | 5.5 | 9.2 | 13.3 | 18.2 | 24.1 | 30.7 | 36.5 | 47.3 | 58.1 | 70.6 | 87.2 | 112.2 | 133 | 162.1 | 191.2 | 241.1 |
| | Rated output current (A) | at CT | 1.5 | 2.5 | 3.8 | 5.3 | 9.0 | 14 | 19 | 25 | 32 | 38 | 48 | 58 | 75 | 91 | 112 | 149 | 176 | 217 | 260 |
| | | at VT | 1.9 | 3.1 | 4.8 | 6.7 | 11.1 | 16 | 22 | 29 | 37 | 43 | 57 | 70 | 85 | 105 | 135 | 160 | 195 | 230 | 290 |
| | Max. output voltage | | Proportional to input voltage: 0 to 480 V | | | | | | | | | | | | | | | | | | |
| | Max. output frequency | | 400 Hz | | | | | | | | | | | | | | | | | | |
| Power supply | Rated input voltage and frequency | | 3-phase 380 to 480 V 50/60 Hz | | | | | | | | | | | | | | | | | | |
| | Allowable voltage fluctuation | | −15% to +10% | | | | | | | | | | | | | | | | | | |
| | Allowable frequency fluctuation | | 5% | | | | | | | | | | | | | | | | | | |
| Braking | Regenerative braking | | Internal BRD circuit (external discharge resistor) | | | | | | | | | | External regenerative braking unit | | | | | | | |
| | Minimum connectable resistance | | 100 | 100 | 100 | 100 | 70 | 70 | 35 | 35 | 24 | 24 | 20 | | | | | | | | |
| Protective structure | | | IP20 | | | | | | | | | | | | | | | IP00 | | | |
| Cooling method | | | Forced air cooling | | | | | | | | | | | | | | | | | | |

[*1] Based on a standard 3-Phase standard motor.

## Common specifications

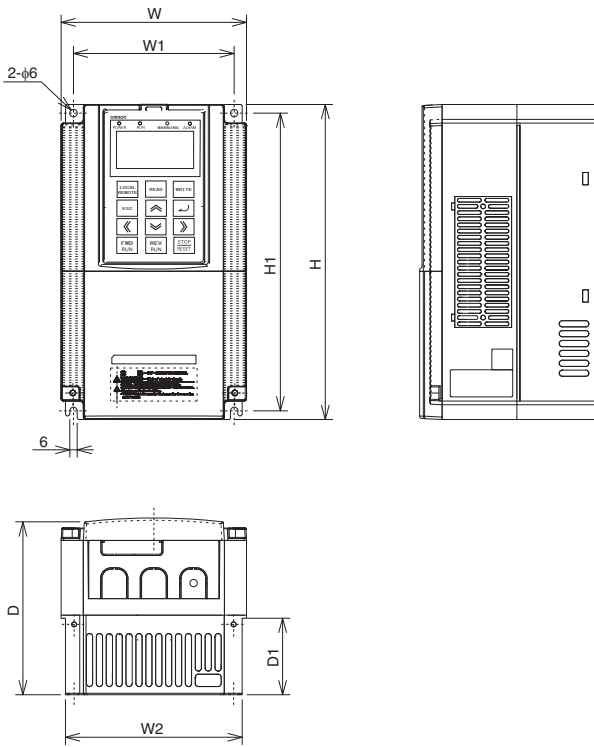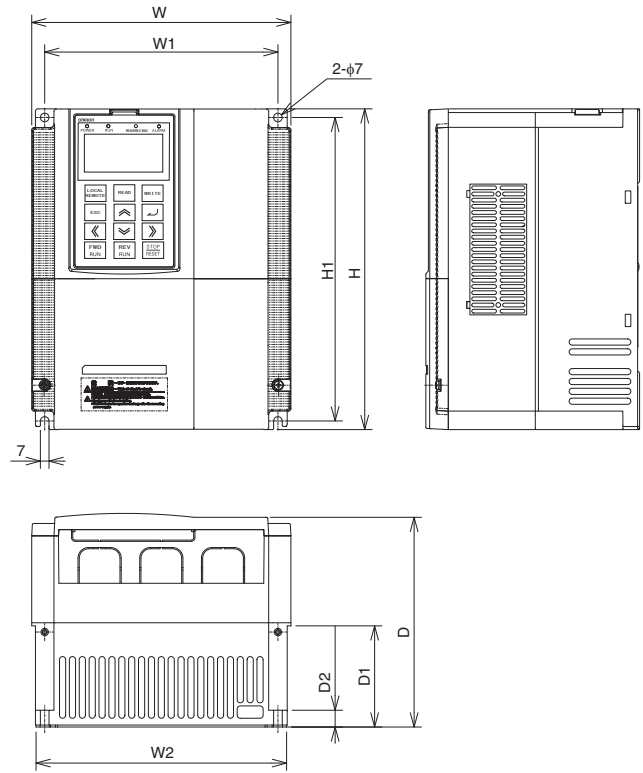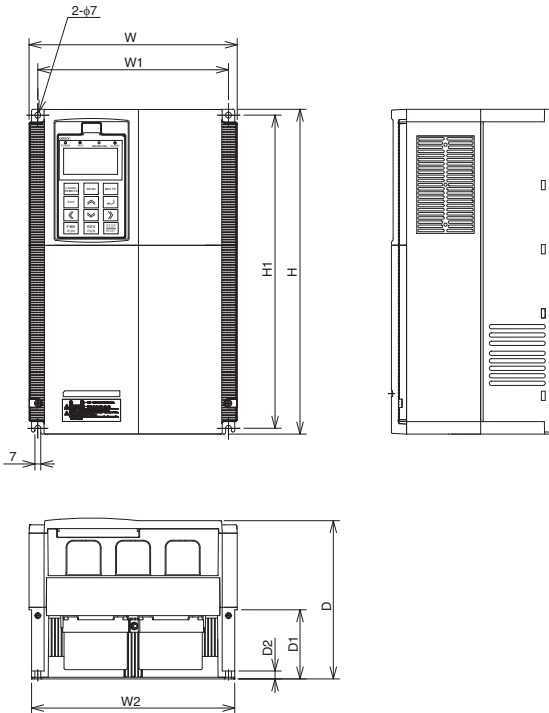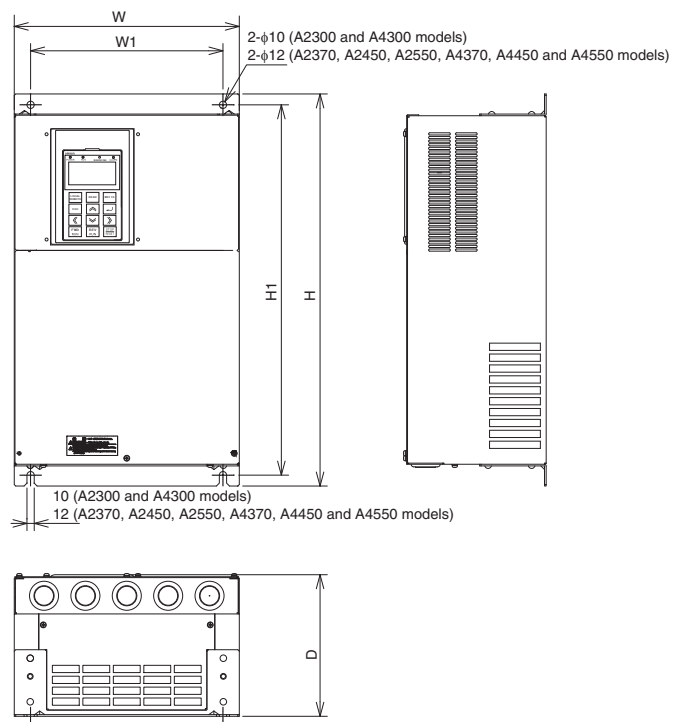| Model number 3G3RX | | Specifications |
|---|---|---|
| Control functions | Motor control | Phase-to-phase sinusoidal pulse with modulation PWM (Sensorless vector control, close loop vector with motor feedback, V/F) |
| | Control mode | Speed, torque and indexer functionality |
| | Output frequency range | 0.10 to 400.00 Hz |
| | Frequency precision | Digital set value: ±0.01% of the max. frequency |
| | | Analogue set value: ±0.2% of the max. frequency (25 ±10°C) |
| | Resolution of frequency set value | Digital set value: 0.01 Hz |
| | | Analog input: 12 bit |
| | Resolution of output frequency | 0.01Hz |
| | Starting torque | 150%/0.3 Hz (under sensor-less vector control or sensor-less vector control at 0 Hz) |
| | | 200%/Torque at 0 Hz (under sensor-less vector control at 0Hz, when a motor size one rank lower than specified is connected) |
| | Overload capability | 150%/60 s, 200%/3 s for CT; 120%/60 s VT |
| | Frequency set value | 0 to 10 VDC (10 KΩ), –10 to 10 VDC (10 KΩ), 4 to 20 mA (100 Ω), EtherCAT communications |
| | V/f Characteristics | V/f optionally changeable at base frequencies of 30 to 400 Hz, V/f braking constant torque, reduction torque, sensor-less vector control, sensor-less vector control at 0 Hz |
| Functionality | Inputs signals | 8 terminals, NO/NC switchable, sink/source logic switchable<br>[Terminal function] 8 functions can be selected from among 61.<br>Reverse (RV), Multi-step speed setting binary 1 (CF1), Multi-step speed setting binary 2 (CF2), Multi-step speed setting binary 3 (CF3), Multi-step speed setting binary 4 (CF4), Jogging (JG), DC injection braking (DB), 2nd control (SET), 2-step acceleration/deceleration (2CH), Free-run stop (FRS), External trip (EXT), USP function (USP), Commercial switching (CS), Soft lock (SFT), Analog input switching (AT), 3rd control (SET3), Reset (RS), 3-wire start (STA), 3-wire stop (STP), 3-wire forward/reverse (F/R), PID enabled/disabled (PID), PID integral reset (PIDC), Control gain switching (CAS), UP/DWN function accelerated (UP), UP/DWN function decelerated (DWN), UP/DWN function data clear (UDC), Forced operator (OPE), Multi-step speed setting bit 1 (SF1), Multi-step speed setting bit 2 (SF2), Multi-step speed setting bit 3 (SF3), Multi-step speed setting bit 4 (SF4), Multi-step speed setting bit 5 (SF5), Multi-step speed setting bit 6 (SF6), Multi-step speed setting bit 7 (SF7), Overload limit switching (OLR), Torque limit enabled (TL), Torque limit switching 1 (TRQ1), Torque limit switching 2 (TRQ2), P/PI switching (PPI), Brake confirmation (BOK), Orientation (ORT), LAD cancel (LAC), Position deviation clear (PCLR), Pulse train position command input permission (STAT), Frequency addition function (ADD), Forced terminal block (F-TM), Torque reference input permission (ATR), Integrated power clear (KHC), Servo ON (SON), Preliminary excitation (FOC), Analog command on hold (AHD), Position command selection 1 (CP1), Position command selection 2 (CP2), Position command selection 3 (CP3), Zero return limit signal (ORL), Zero return startup signal (ORG), Forward driving stop (FOT), Reverse driving stop (ROT), Speed/Position switching (SPD), Pulse counter (PCNT), Pulse counter clear (PCC), No allocation (no) |
| | Output signals | 5 open collector output terminals: NO/NC switchable, sink/source logic switchable<br>1 relay (SPDT contact) output terminal: NO/NC switchable<br>[Terminal function] 6 functions can be selected from among 45.<br>Signal during RUN (RUN), Constant speed arrival signal (FA1), Over set frequency arrival signal (FA2), Overload warning (OL), Excessive PID deviation (OD), Alarm signal (AL), Set-frequency-only arrival signal (FA3), Overtorque (OTQ), Signal during momentary power interruption (IP), Signal during undervoltage (UV), Torque limit (TRQ), RUN time exceeded (RNT), Power ON time exceeded (ONT), Thermal warning (THM), Brake release (BRK), Brake error (BER), 0-Hz signal (ZS), Excessive speed deviation (DSE), Position ready (POK), Set frequency exceeded 2 (FA4), Set frequency only 2 (FA5), Overload warning 2 (OL2), Analog FV disconnection detection (FVDc), Analog FI disconnection detection (FIDc), Analog FE disconnection detection (FEDc), PID FB status output (FBV), Network error (NDc), Logic operation output 1 (LOG1), Logic operation output 2 (LOG2), Logic operation output 3 (LOG3), Logic operation output 4 (LOG4), Logic operation output 5 (LOG5), Logic operation output 6 (LOG6), Capacitor life warning (WAC), Cooling fan life warning (WAF), Starting contact signal (FR), Fin overheat warning (OHF), Light load detection signal (LOC), Operation ready (IRDY), Forward run (FWR), Reverse run (RVR), Fatal fault (MJA), Window comparator FV (WCFV), Window comparator FI (WCFI), Window comparator FE (WCFE), Alarm codes 0 to 3 (AC0 to AC3) |
| | Standard functions | V/f free setting (7), Upper/lower frequency limit, Frequency jump, Curve acceleration/deceleration, Manual torque boost level/break, Energy-saving operation, Analog meter adjustment, Starting frequency, Carrier frequency adjustment, Electronic thermal function, (free setting available), External start/end (frequency/rate), Analog input selection, Trip retry, Restart during momentary power interruption, Various signal outputs, Reduced voltage startup, Overload limit, Initialization value setting, Automatic deceleration at power-off, AVR function, Automatic acceleration/deceleration, Auto tuning (Online/Offline), High torque multi-motor operation control (sensor-less vector control of two monitors with one inverter) |
| | Analogue inputs | Analogue inputs 0 to 10 V and –10 to 10 V (10 KΩ), 4 to 20 mA (100 Ω) |
| | Analogue outputs | Analog voltage output, Analog current output, Pulse train output |
| | Accel/Decel times | 0.01 to 3600.0 s (line/curve selection) |
| | Display | Status indicator LED's Run, Program, Power, Alarm, Hz, Amps, Volts, % |
| | | Digital operator: Available to monitor 23 items, output current, output frequency… |
| Protection functions | Motor overload protection | Electronic Thermal overload relay and PTC thermistor input |
| | Instantaneous overcurrent | 200% of rated current for 3 seconds |
| | Overload | 150% for 1 minute |
| | Overvoltage | 800 V for 400 V type and 400 V for 200 V type |
| | Momentary power loss | Decelerates to stop with DC bus controlled, coast to stop |
| | Cooling fin overheat | Temperature monitor and error detection |
| | Stall prevention level | Stall prevention during acceleration, deceleration and constant speed |
| | Ground fault | Detection at power on |
| | Power charge indication | On when voltage between P and N is higher than 45 V |
| Ambient conditions | Degree of protection | IP20/IP00 |
| | Ambient humidity | 90% RH or less (without condensation) |
| | Storage temperature | –20°C to +65°C (short-term temperature during transportation) |
| | Ambient temperature | –10°C to 50°C |
| | Installation | Indoor (no corrosive gas, dust, etc.) |
| | Installation height | Max. 1000 m |
| | Vibration | 3G3RX-A☐004 to A☐220, 5.9 m/s² (0.6G), 10 to 55 Hz<br>3G3RX-A☐300 to B☐13K, 2.94 m/s² (0.3G), 10 to 55 Hz |

# OMRON

## Dimensions

Figure 1



Figure 2



Figure 3



Figure 4



2-φ10 (A2300 and A4300 models)
2-φ12 (A2370, A2450, A2550, A4370, A4450 and A4550 models)

10 (A2300 and A4300 models)
12 (A2370, A2450, A2550, A4370, A4450 and A4550 models)
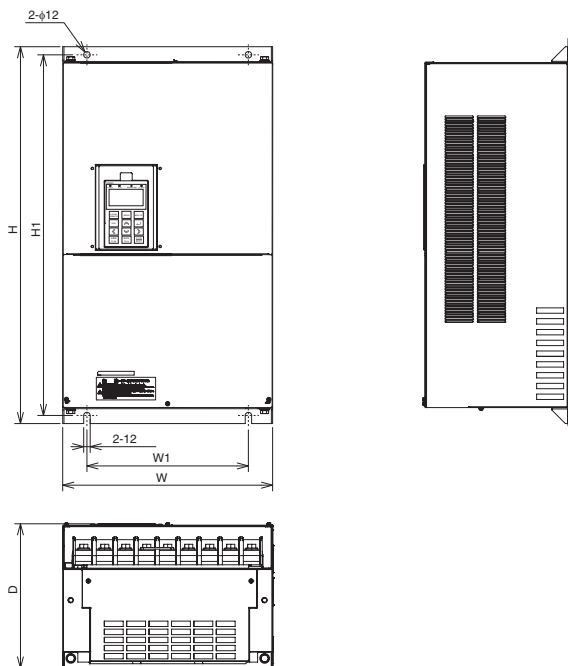
Figure 5



| Voltage class | Inverter model 3G3RX☐ | Figure | Dimensions in mm | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | W | W1 | W2 | H | H1 | D | D1 | D2 | Weight (kg) |
| Three-phase 200 V | A2004 | 1 | 150 | 130 | 143 | 255 | 241 | 140 | 62 | – | 3.5 |
| | A2007 | | | | | | | | | | |
| | A2015 | | | | | | | | | | |
| | A2022 | | | | | | | | | | |
| | A2037 | | | | | | | | | | |
| | A2055 | 2 | 210 | 189 | 203 | 260 | 246 | 170 | 82 | 13.6 | 6 |
| | A2075 | | | | | | | | | | |
| | A2110 | | | | | | | | | | |
| | A2150 | 3 | 250 | 229 | 244 | 390 | 376 | 190 | 83 | 9.5 | 14 |
| | A2185 | | | | | | | | | | |
| | A2220 | | | | | | | | | | |
| | A2300 | 4 | 310 | 265 | – | 540 | 510 | 195 | – | – | 20 |
| | A2370 | | 390 | 300 | – | 550 | 520 | 250 | – | – | 30 |
| | A2450 | | | | | | | | | | |
| | A2550 | | 480 | 380 | – | 700 | 670 | 250 | – | – | 43 |
| Three-phase 400 V | A4004 | 1 | 150 | 130 | 143 | 255 | 241 | 140 | 62 | – | 3.5 |
| | A4007 | | | | | | | | | | |
| | A4015 | | | | | | | | | | |
| | A4022 | | | | | | | | | | |
| | A4040 | | | | | | | | | | |
| | A4055 | 2 | 210 | 189 | 203 | 260 | 246 | 170 | 82 | 13.6 | 6 |
| | A4075 | | | | | | | | | | |
| | A4110 | | | | | | | | | | |
| | A4150 | 3 | 250 | 229 | 244 | 390 | 376 | 190 | 83 | 9.5 | 14 |
| | A4185 | | | | | | | | | | |
| | A4220 | | | | | | | | | | |
| | A4300 | 4 | 310 | 265 | – | 540 | 510 | 195 | – | – | 22 |
| | A4370 | | 390 | 300 | – | 550 | 520 | 250 | – | – | 30 |
| | A4450 | | | | | | | | | | |
| | A4550 | | | | | | | | | | |
| | B4750 | 5 | 390 | 300 | – | 700 | 670 | 270 | – | – | 60 |
| | B4900 | | | | | | | | | | |
| | B411K | | 480 | 380 | – | 740 | 710 | 270 | – | – | 80 |
| | B413K | | | | | | | | | | |

---

**RX frequency inverter**

# OMRON

## Rasmi filters

**Footprint dimensions**     **Book type dimensions**     **Block type dimensions**
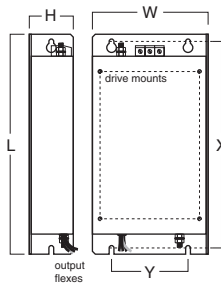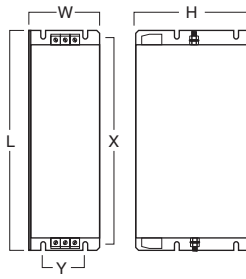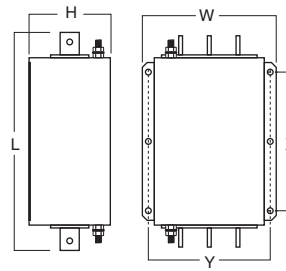
| Voltage | Inverter model | Rasmi model | Dimensions | | | | | | Filter type | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | W | H | X | Y | M | | |
| 3×200 V | 3G3RX-A2004 | AX-FIR2018-RE | 305 | 152 | 45 | 290 | 110 | M5 | Footprint | 2.0 |
| | 3G3RX-A2007 | | | | | | | | | |
| | 3G3RX-A2015 | | | | | | | | | |
| | 3G3RX-A2022 | | | | | | | | | |
| | 3G3RX-A2037 | | | | | | | | | |
| | 3G3RX-A2055 | AX-FIR2053-RE | 320 | 212 | 56 | 296 | 189 | M6 | | 2.5 |
| | 3G3RX-A2075 | | | | | | | | | |
| | 3G3RX-A2110 | | | | | | | | | |
| | 3G3RX-A2150 | AX-FIR2110-RE | 455 | 110 | 240 | 414 | 80 | – | Book type | 8.0 |
| | 3G3RX-A2185 | | | | | | | | | |
| | 3G3RX-A2220 | | | | | | | | | |
| | 3G3RX-A2300 | AX-FIR2145-RE | | | | | | | | 8.6 |
| | 3G3RX-A2370 | AX-FIR3250-RE | 386 | 260 | 135 | 240 | 235 | – | Block type | 13 |
| | 3G3RX-A2450 | | | | | | | | | |
| | 3G3RX-A2550 | AX-FIR3320-RE | | | | | | | | 13.2 |
| 3×400 V | 3G3RX-A4004 | AX-FIR3010-RE | 305 | 152 | 45 | 290 | 110 | M5 | Footprint | 1.4 |
| | 3G3RX-A4007 | | | | | | | | | |
| | 3G3RX-A4015 | | | | | | | | | |
| | 3G3RX-A4022 | | | | | | | | | |
| | 3G3RX-A4040 | | | | | | | | | |
| | 3G3RX-A4055 | AX-FIR3030-RE | 312 | 212 | 50 | 296 | 189 | M6 | | 2.2 |
| | 3G3RX-A4075 | | | | | | | | | |
| | 3G3RX-A4110 | | | | | | | | | |
| | 3G3RX-A4150 | AX-FIR3053-RE | 451 | 252 | 60 | 435 | 229 | M6 | | 4.5 |
| | 3G3RX-A4185 | | | | | | | | | |
| | 3G3RX-A4220 | | | | | | | | | |
| | 3G3RX-A4300 | AX-FIR3064-RE | 598 | 310 | 70 | 578 | 265 | M8 | | 7.0 |
| | 3G3RX-A4370 | AX-FIR3100-RE | 486 | 110 | 240 | 414 | 80 | – | Book type | 8.0 |
| | 3G3RX-A4450 | AX-FIR3130-RE | | | | | | | | 8.6 |
| | 3G3RX-A4550 | | | | | | | | | |
| | 3G3RX-B4750 | AX-FIR3250-RE | 386 | 260 | 135 | 240 | 235 | – | Block type | 13.0 |
| | 3G3RX-B4900 | | | | | | | | | |
| | 3G3RX-B411K | AX-FIR3320-RE | | | | | | | | 13.2 |
| | 3G3RX-B413K | | | | | | | | | |

## Input AC reactor
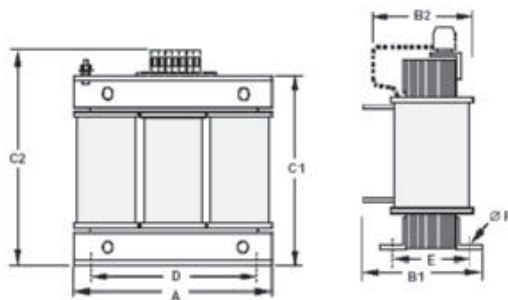


| Voltage | Reference | Dimensions | | | | | | | | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B1 | B2 | C1 | C2 | D | E | F | |
| 200 V | AX-RAI02800100-DE | 120 | | 80 | | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAI00880200-DE | | | | | | | | | |
| | AX-RAI00350335-DE | 180 | – | 85 | – | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAI00180670-DE | | | | | | | | | |
| | AX-RAI00091000-DE | | | | | 205 | | | | 6.5 |
| | AX-RAI00071550-DE | | | 105 | | 205 | | 85 | | 11.7 |
| | AX-RAI00042300-DE | 240 | 130 | – | 210 | – | 200 | 75 | | 16.0 |
| 400 V | AX-RAI07700050-DE | 120 | | 70 | | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAI03500100-DE | | | 80 | | | | 62 | | 2.35 |
| | AX-RAI01300170-DE | | | | | | | | | 2.5 |
| | AX-RAI00740335-DE | 180 | – | 85 | – | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAI00360500-DE | | | | | 205 | | | | 6.5 |
| | AX-RAI00290780-DE | | | 105 | | | | 85 | | 11.7 |
| | AX-RAI00191150-DE | 240 | | 110 | | 275 | 200 | 75 | | 16.0 |
| | AX-RAI00111850-DE | | | | | | | | | |
| | AX.RAI00072700-DE | | 165 | – | 210 | – | | 110 | | 27.0 |

## DC reactor

Figure 1

Figure 2
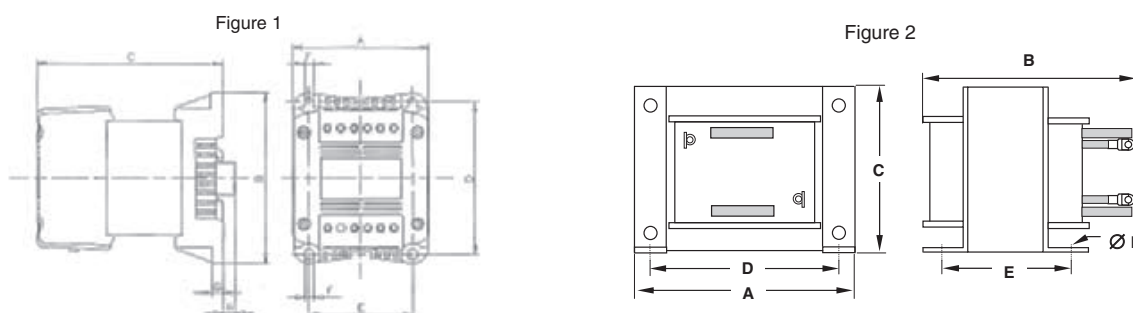


| 200 V | | | | | | | | | | | 400 V | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference AX-RC | Fig | Dimensions | | | | | | | | kg | Reference AX-RC | Fig | Dimensions | | | | | | | | kg |
| | | A | B | C | D | E | F | G | H | | | | A | B | C | D | E | F | G | H | |
| 10700032-DE | | | | 96 | | | | | | 1.22 | 43000020-DE | | | | 96 | | | | | | 1.22 |
| 06750061-DE | | 84 | 113 | 105 | 101 | 66 | 5 | 7.5 | 2 | 1.60 | 27000030-DE | | 84 | 113 | 105 | 101 | 66 | 5 | 7.5 | 2 | 1.60 |
| 03510093-DE | | | | | | | | | | | 14000047-DE | | | | | | | | | | |
| 02510138-DE | | | | 116 | | | | | | 1.95 | 10100069-DE | | | | 116 | | | | | | 1.95 |
| 01600223-DE | 1 | 108 | 135 | 124 | 120 | 82 | 6.5 | | 9.5 | 3.20 | 06400116-DE | 1 | 108 | 135 | 133 | 120 | 82 | 6.5 | | 9.5 | 3.70 |
| 01110309-DE | | 120 | 152 | 136 | 135 | 94 | | 9.5 | | 5.20 | 04410167-DE | | 120 | 152 | 136 | 135 | 94 | 7 | 9.5 | | 5.20 |
| 00840437-DE | | | | 146 | | | 7 | | – | 6.00 | 03350219-DE | | | | 146 | | | | | – | 6.00 |
| 00590614-DE | | 150 | 177 | 160 | 160 | 115 | | 2 | | 11.4 | 02330307-DE | | 150 | 177 | 160 | 160 | 115 | 7 | 2 | | 11.4 |
| 00440859-DE | | | | 182.6 | | | | | | 14.3 | 01750430-DE | | | | 182.6 | | | | | | 14.3 |
| 00301275-DE | | 195 | 161 | 162.5 | 185 | 88 | 10 | | | 17.0 | 01200644-DE | | 195 | 161 | 162.5 | 185 | 88 | 10 | | | 17.0 |
| 00231662-DE | | | 196 | | | 123 | | | | 25.5 | 00920797-DE | | | 196 | | | 123 | | | | 25.5 |
| 00192015-DE | 2 | | 188 | | | 109 | – | – | | 34.0 | 00741042-DE | | | 188 | | | 109 | | | | 34.0 |
| 00162500-DE | | 240 | 198 | 200 | 228 | 119 | 12 | | | 38.0 | 00611236-DE | | 240 | 198 | 200 | 228 | 119 | | | | 38.0 |
| 00133057-DE | | | 228 | | | 149 | | | | 42.0 | 00501529-DE | 2 | | 228 | | | 149 | 12 | – | – | 42.0 |
| | | | | | | | | | | | 00372094-DE | | | | | | | | | | 48.0 |
| | | | | | | | | | | | 00312446-DE | | 300 | 216 | 250 | 288 | 133 | | | | 67.0 |
| | | | | | | | | | | | 00252981-DE | | | | | | | | | | |
| | | | | | | | | | | | 00213613-DE | | | 236 | | | 153 | | | | 79.0 |

# OMRON

## Output AC reactor



| Reference | Dimensions | | | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|
| | A | B1 | B2 | C1 | C2 | D | E | F | |
| AX-RAO11500026-DE | 120 | – | 70 | – | 120 | 80 | 52 | 5.5 | 1.78 |
| AX-RAO07600042-DE | 120 | – | 70 | – | 120 | 80 | 52 | 5.5 | 1.78 |
| AX-RAO04100075-DE | 120 | – | 80 | – | 120 | 80 | 62 | 5.5 | 2.35 |
| AX-RAO03000105-DE | 120 | – | 80 | – | 120 | 80 | 62 | 5.5 | 2.35 |
| AX-RAO01830160-DE | 180 | – | 85 | – | 190 | 140 | 55 | 6 | 5.5 |
| AX-RAO01150220-DE | 180 | – | 85 | – | 190 | 140 | 55 | 6 | 5.5 |
| AX-RAO00950320-DE | 180 | – | 85 | – | 205 | 140 | 55 | 6 | 6.5 |
| AX-RAO00630430-DE | 180 | – | 95 | – | 205 | 140 | 65 | 6 | 9.1 |
| AX-RAO00490640-DE | 180 | – | 95 | – | 205 | 140 | 65 | 6 | 9.1 |
| AX-RAO00390800-DE | 240 | – | 110 | – | 275 | 200 | 75 | 6 | 16.0 |
| AX-RAO00330950-DE | 240 | – | 110 | – | 275 | 200 | 75 | 6 | 16.0 |
| AX-RAO00251210-DE | 240 | – | 110 | – | 275 | 200 | 75 | 6 | 16.0 |
| AX-RAO00191450-DE | 240 | – | 120 | – | 275 | 200 | 85 | 6 | 18.6 |
| AX-RAO00161820-DE | 240 | – | 150 | – | 275 | 200 | 110 | 6 | 27.0 |
| AX-RAO00132200-DE | 240 | 165 | – | 210 | – | 200 | 110 | 6 | 27.0 |
| AX-RAO16300038-DE | 120 | – | 70 | – | 120 | 80 | 52 | 5.5 | 1.78 |
| AX-RAO11800053-DE | 120 | – | 80 | – | 120 | 80 | 52 | 5.5 | 2.35 |
| AX-RAO07300080-DE | 120 | – | 80 | – | 120 | 80 | 62 | 5.5 | 2.35 |
| AX-RAO04600110-DE | 180 | – | 85 | – | 190 | 140 | 55 | 6 | 5.5 |
| AX-RAO03600160-DE | 180 | – | 85 | – | 205 | 140 | 55 | 6 | 6.5 |
| AX-RAO02500220-DE | 180 | – | 95 | – | 205 | 140 | 55 | 6 | 9.1 |
| AX-RAO02000320-DE | 180 | – | 105 | – | 205 | 140 | 85 | 6 | 11.7 |
| AX-RAO01650400-DE | 240 | – | 110 | – | 275 | 200 | 75 | 6 | 16.0 |
| AX-RAO01300480-DE | 240 | – | 120 | – | 275 | 200 | 85 | 6 | 18.6 |
| AX-RAO01030580-DE | 240 | – | 120 | – | 275 | 200 | 85 | 6 | 18.6 |
| AX-RAO00800750-DE | 240 | – | 120 | – | 275 | 200 | 110 | 6 | 27.0 |
| AX-RAO00680900-DE | 240 | – | 150 | – | 275 | 200 | 110 | 6 | 27.0 |
| AX-RAO00531100-DE | 240 | – | 150 | – | 275 | 200 | 110 | 6 | 27.0 |
| AX-RAO00401490-DE | 300 | – | 165 | – | 320 | 200 | 125 | 6 | 44.0 |
| AX-RAO00331760-DE | 300 | – | 165 | – | 320 | 200 | 125 | 6 | 44.0 |
| AX-RAO00262170-DE | 360 | 230 | – | 300 | – | 300 | 145 | 8 | 70.0 |
| AX-RAO00212600-DE | 360 | 230 | – | 300 | – | 300 | 145 | 8 | 70.0 |

## Chokes

| Reference | D diameter | Motor KW | Dimensions | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | W | H | X | Y | m | |
| AX-FER2102-RE | 21 | < 2.2 | 85 | 22 | 46 | 70 | – | 5 | 0.1 |
| AX-FER2515-RE | 25 | < 15 | 105 | 25 | 62 | 90 | – | 5 | 0.2 |
| AX-FER5045-RE | 50 | < 45 | 150 | 50 | 110 | 125 | 30 | 5 | 0.7 |
| AX-FER6055-RE | 60 | < 55 | 200 | 65 | 170 | 180 | 45 | 6 | 1.7 |
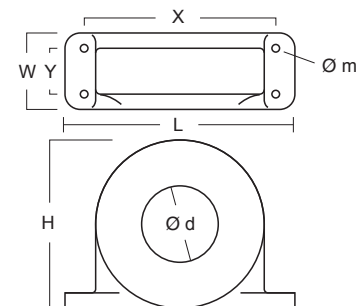
## Braking unit dimensions

| Reference | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | B | B1 | H | H1 | T | S |
| AX-BCR4015045-TE | 82.5 | 40.5 | 150 | 138 | 220 | 6 |
| AX-BCR4017068-TE | | | | | | |
| AX-BCR2035090-TE | 130 | 64.5 | 205 | 193 | 208 | 6 |
| AX-BCR2070130-TE | | | | | | |
| AX-BCR4035090-TE | | | | | | |
| AX-BCR4070130-TE | | | | | | |
| AX-BCR4090240-TE | 131 | 64.5 | 298 | 280 | 300 | 9 |



## Resistor dimensions

AX-REM00K1xxx



Fig 1



Fig 2
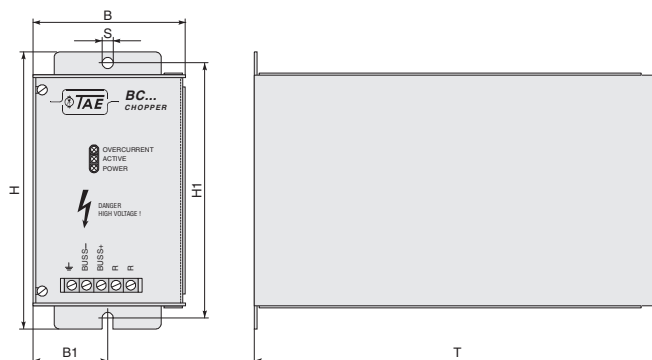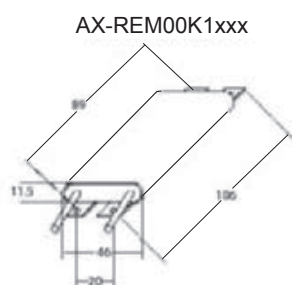


Fig 3
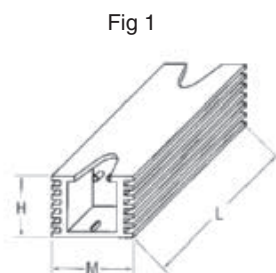


Fig 4
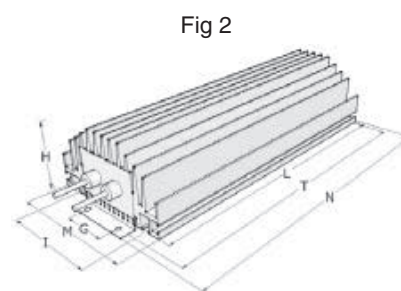


Fig 5
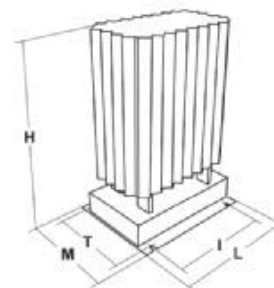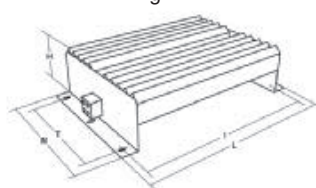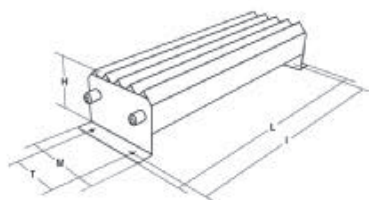


| Type | Fig. | Dimensions | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | L | H | M | I | T | G | N | kg |
| AX-REM00K2070-IE | 1 | 105 | 27 | 36 | 94 | – | – | – | 0.2 |
| AX-REM00K2120-IE | | | | | | | | | |
| AX-REM00K2200-IE | | | | | | | | | |
| AX-REM00K4075-IE | | 200 | 27 | 36 | 189 | – | – | – | 0.425 |
| AX-REM00K4035-IE | | | | | | | | | |
| AX-REM00K4030-IE | | | | | | | | | |
| AX-REM00K5120-IE | | 260 | 27 | 36 | 249 | – | – | – | 0.58 |
| AX-REM00K6100-IE | | 320 | 27 | 36 | 309 | – | – | – | 0.73 |
| AX-REM00K6035-IE | | | | | | | | | |
| AX-REM00K9070-IE | 2 | 200 | 61 | 100 | 74 | 211 | 40 | 230 | 1.41 |
| AX-REM00K9020-IE | | | | | | | | | |
| AX-REM00K9017-IE | | | | | | | | | |
| AX-REM01K9070-IE | 3 | 365 | 73 | 105 | 350 | 70 | – | – | 4 |
| AX-REM01K9017-IE | | | | | | | | | |
| AX-REM02K1070-IE | 4 | 310 | 100 | 240 | 295 | 210 | – | – | 7 |
| AX-REM02K1017-IE | | | | | | | | | |
| AX-REM03K5035-IE | | 365 | 100 | 240 | 350 | 210 | – | – | 8 |
| AX-REM03K5010-IE | | | | | | | | | |
| AX-REM19K0006-IE | 5 | 206 | 350 | 140 | 190 | 50 | – | – | 8.1 |
| AX-REM19K0008-IE | | | | | | | | | |
| AX-REM19K0020-IE | | | | | | | | | |
| AX-REM19K0030-IE | | | | | | | | | |
| AX-REM38K0012-IE | | 306 | 350 | 140 | 290 | 50 | – | – | 14.5 |

# OMRON

## Standard connections
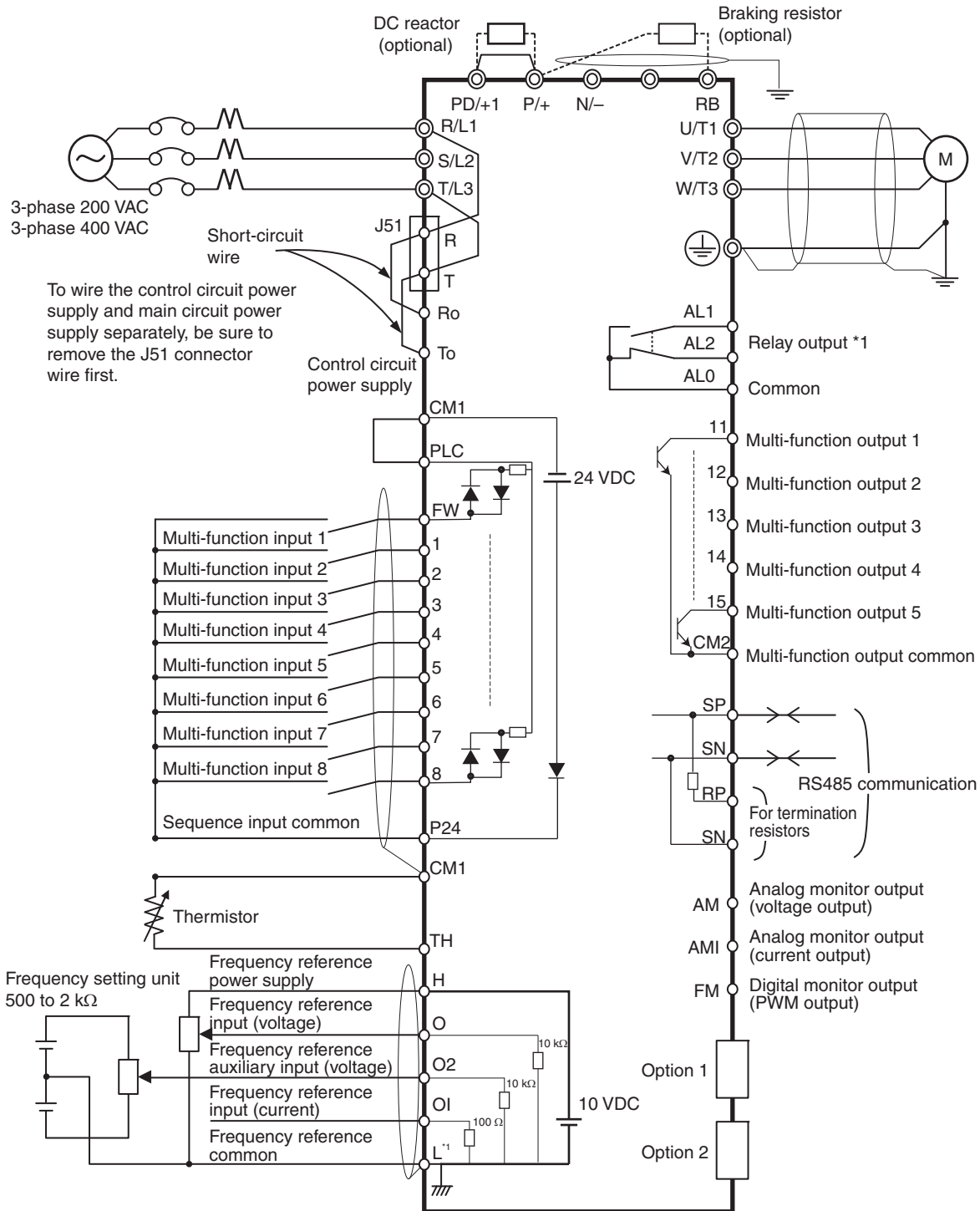


*1 L is the common reference for analog input and also for analog output.

## Terminal block specifications

| Terminal | Name | Function (signal level) |
|---|---|---|
| R/L1, S/L2, T/L3 | Main circuit power supply input | Used to connect line power to the drive. |
| U/T1, V/T2, W/T3 | Inverter output | Used to connect the motor |
| PD/+1, P/+ | External DC reactor terminal | Normally connected by the short-circuit bar. Remove the short-circuit bar between +1 and P/+2 when a DC reactor is connected. |
| P/+, RB | Braking resistor connection terminals | Connect option braking resistor (if a braking torque is required) |
| P/+, N/– | Regenerative braking unit connection terminal | Connect optional regenerative braking units. |
| ⏚ | Grounding | For grounding (grounding should conform to the local grounding code.) |

## Control circuit

| Type | No. | Signal name | Function | Signal level |
|---|---|---|---|---|
| **Frequency reference input** | **H** | Frequency reference power supply | 10 VDC 20 mA max | |
| | **O** | Voltage frequency reference input | 0 to 12 VDC (10 kΩ) | |
| | **O2** | Voltage auxiliary frequency reference | 0 to ±12 VDC (10 kΩ) | |
| | **OI** | Current frequency reference input | 4 to 20 mA (100 Ω) | |
| | **L** | Frequency reference common | Common terminal for analog monitor (AM, AMI) terminals | |
| **Monitor Output** | **AM** | Multi-function analog voltage output | Factory setting: Output frequency | 2 mA max |
| | **AMI** | Multi-function analog current output | Factory setting: Output frequency | 4 to 20 mA (max imp 250 Ω) |
| | **FM** | PWM monitor output | Factory setting: Output frequency | 0 to 10 VDC Max 3.6 kHz |
| **Power Supply** | **P24** | Internal 24 VDC | Power supply for contact input signal | 100 mA max |
| | **CM1** | Input common | Common terminal for P24, TH and FM digital monitor | |
| **Function selection** | **FW** | Forward rotation command terminal | Motor runs in forwards direction when FW is ON | 27 VDC max Input imped 4.7 kΩ Max current 5.6 mA On: 18 VDC or more |
| | **1** | Multi-function input | Factory setting: Reverse (RV) | |
| | **2** | | Factory setting: External trip (EXT) | |
| | **3** | | Factory setting: Reset (RS) | |
| | **4** | | Factory setting: Multi-step speed reference 1 (CF1) | |
| | **5** | | Factory setting: Multi-step speed reference 2 (CF2) | |
| | **6** | | Factory setting: Jogging (JG) | |
| | **7** | | Factory setting: Second control (SET) | |
| | **8** | | Factory setting: No allocation (NO) | |
| | **PLC** | Multi-function input common | Sink logic: Short-circuiting P24 and PLC<br>Source logic: Short-circuiting PLC and CM1<br>With external supply remove short-circuit bar | |
| **Status/Factor** | **11** | Multi-function output | Factory setting: During Run (RUN) | 27 VDC max 50 mA max |
| | **12** | | Factory setting: 0 Hz signal (ZS) | |
| | **13** | | Factory setting: Overload warning (OL) | |
| | **14** | | Factory setting: Overtorque (OTQ) | |
| | **15** | | Factory setting: Constant speed arrival (FA1) | |
| | **CM2** | Multi-function output common | Common terminal for multi-function output terminals 11 to 15 | |
| **Relay output** | **AL1** | Relay output (Normally close) | Factory setting: Alarm output (AL)<br><br>Under normal operation<br>MA-MC open<br>MB-MC close | R load<br>AL1-AL0<br>250 VAC 2 A<br>AL2-AL0<br>250 VAC 1 A<br>I load<br>250 VAC 0.2 A |
| | **AL2** | Relay output (Normally open) | | |
| | **AL0** | Relay output common | | |
| **Sensor** | **TH** | External thermistor input terminal | SC terminal functions as the common terminal<br>100 mW minimum<br>Impedance at temperature error: 3 kΩ | 0 to 8 VDC |
| **Comms** | **SP** | RS485 Modbus terminals | – | Differential input |
| | **SN** | | | |
| | **RP** | RS485 terminating resistor terminals | – | - |
| | **SN** | | | |

# OMRON

## Inverter heat loss

### Three-phase 200 V class

| Model 3G3RX- | | A2004 | A2007 | A2015 | A2022 | A2037 | A2055 | A2075 | A2110 | A2150 | A2185 | A2220 | A2300 | A2370 | A2450 | A2550 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter capacity kVA | 200 V | 1.0 | 1.7 | 2.5 | 3.6 | 5.7 | 8.3 | 11.0 | 15.9 | 22.1 | 26.3 | 32.9 | 41.9 | 50.2 | 63.0 | 76.2 |
| | 240 V | 1.2 | 2.0 | 3.1 | 4.3 | 6.8 | 9.9 | 13.3 | 19.1 | 26.6 | 31.5 | 39.4 | 50.2 | 60.2 | 75.6 | 91.4 |
| Rated current (A) | | 3.0 | 5.0 | 7.5 | 10.5 | 16.5 | 24 | 32 | 46 | 64 | 76 | 95 | 121 | 145 | 182 | 220 |
| Heat loss W | Losses at 70% load | 64 | 76 | 102 | 127 | 179 | 242 | 312 | 435 | 575 | 698 | 820 | 1100 | 1345 | 1625 | 1975 |
| | Losses at 100% load | 70 | 88 | 125 | 160 | 235 | 325 | 425 | 600 | 800 | 975 | 1150 | 1550 | 1900 | 2300 | 2800 |
| Efficiency at rated output | | 85.1 | 89.5 | 92.3 | 93.2 | 94.0 | 94.4 | 94.6 | 94.8 | 94.9 | 95.0 | 95.0 | 95.0 | 95.1 | 95.1 | 95.1 |
| Cooling Method | | Forced-air-cooling | | | | | | | | | | | | | | |

### Three-phase 400 V class

| Model 3G3RX- | | A4004 | A4007 | A4015 | A4022 | A4040 | A4055 | A4075 | A4110 | A4150 | A4185 | A4220 | A4300 | A4370 | A4450 | A4550 | B4750 | B4900 | B411K | B413K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter capacity kVA | 400 V | 1.0 | 1.7 | 2.5 | 3.6 | 6.2 | 9.7 | 13.1 | 17.3 | 22.1 | 26.3 | 33.2 | 40.1 | 51.9 | 63.0 | 77.6 | 103.2 | 121.9 | 150.3 | 180.1 |
| | 480 V | 1.2 | 2.0 | 3.1 | 4.3 | 7.4 | 11.6 | 15.8 | 20.7 | 26.6 | 31.5 | 39.9 | 48.2 | 62.3 | 75.6 | 93.1 | 123.8 | 146.3 | 180.4 | 216.1 |
| Rated current (A) | | 1.5 | 2.5 | 3.8 | 5.3 | 9.0 | 14 | 19 | 25 | 32 | 38 | 48 | 58 | 75 | 91 | 112 | 149 | 176 | 217 | 260 |
| Heat loss W | Losses at 70% load | 64 | 76 | 102 | 127 | 179 | 242 | 312 | 435 | 575 | 698 | 820 | 1100 | 1345 | 1625 | 1975 | 2675 | 3375 | 3900 | 4670 |
| | Losses at 100% load | 70 | 88 | 125 | 160 | 235 | 325 | 425 | 600 | 800 | 975 | 1150 | 1550 | 1900 | 2300 | 2800 | 3800 | 4800 | 5550 | 6650 |
| Efficiency at rated output | | 85.1 | 89.5 | 92.3 | 93.2 | 94.0 | 64.4 | 94.6 | 94.8 | 94.9 | 95.0 | 95.0 | 95.0 | 95.1 | 95.1 | 95.1 | 95.2 | 95.2 | 95.2 | 95.2 |
| Cooling Method | | Forced-air-cooling | | | | | | | | | | | | | | | | | | |
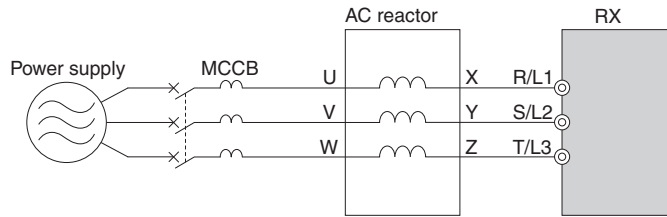
## Input AC reactor



| 3 phase 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW | Reference | Current value A | Inductance mH | Max. applicable motor output kW | Reference | Current value A | Inductance mH |
| 0.4 to 1.5 | AX-RAI02800100-DE | 10.0 | 2.8 | 0.4 to 1.5 | AX-RAI07700050-DE | 5.0 | 7.7 |
| 2.2 to 3.7 | AX-RAI00880200-DE | 20.0 | 0.88 | 2.2 to 3.7 | AX-RAI03500100-DE | 10.0 | 3.5 |
| 5.5 to 7.5 | AX-RAI00350335-DE | 33.5 | 0.35 | 5.5 to 7.5 | AX-RAI01300170-DE | 17.0 | 1.3 |
| 11.0 to 15.0 | AX-RAI00180670-DE | 67.0 | 0.18 | 11.0 to 15.0 | AX-RAI00740335-DE | 33.5 | 0.74 |
| 18.5 to 22.0 | AX-RAI00091000-DE | 100.0 | 0.09 | 18.5 to 22.0 | AX-RAI00360500-DE | 50.0 | 0.36 |
| 30.0 to 37.0 | AX-RAI00071550-DE | 155.0 | 0.07 | 30.0 to 37.0 | AX-RAI00290780-DE | 78.0 | 0.29 |
| 45.0 to 55.0 | AX-RAI00042300-DE | 230.0 | 0.04 | 45.0 to 55.0 | AX-RAI00191150-DE | 115.0 | 0.19 |
| | | | | 75.0 to 90.0 | AX-RAI00111850-DE | 185.0 | 0.11 |
| | | | | 110.0 to 132.0 | AX.RAI00072700-DE | 270.0 | 0.07 |

## DC reactor
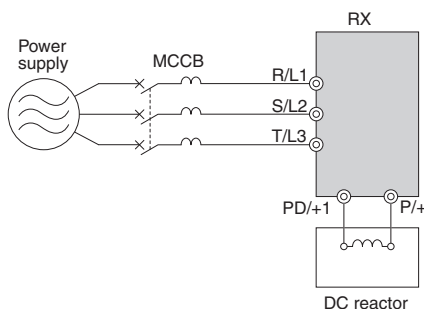


| 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW | Reference | Current value A | Inductance mH | Max. applicable motor output kW | Reference | Current value A | Inductance mH |
| 0.4 | AX-RC10700032-DE | 3.2 | 10.70 | 0.4 | AX-RC43000020-DE | 2.0 | 43.00 |
| 0.7 | AX-RC06750061-DE | 6.1 | 6.75 | 0.7 | AX-RC27000030-DE | 3.0 | 27.00 |
| 1.5 | AX-RC03510093-DE | 9.3 | 3.51 | 1.5 | AX-RC14000047-DE | 4.7 | 14.00 |
| 2.2 | AX-RC02510138-DE | 13.8 | 2.51 | 2.2 | AX-RC10100069-DE | 6.9 | 10.10 |
| 3.7 | AX-RC01600223-DE | 22.3 | 1.60 | 4.0 | AX-RC06400116-DE | 11.6 | 6.40 |
| 5.5 | AX-RC01110309-DE | 30.9 | 1.11 | 5.5 | AX-RC04410167-DE | 16.7 | 4.41 |
| 7.5 | AX-RC00840437-DE | 43.7 | 0.84 | 7.5 | AX-RC03350219-DE | 21.9 | 3.35 |
| 11.0 | AX-RC00590614-DE | 61.4 | 0.59 | 11.0 | AX-RC02330307-DE | 30.7 | 2.33 |
| 15.0 | AX-RC00440859-DE | 85.9 | 0.44 | 15.0 | AX-RC01750430-DE | 43.0 | 1.75 |
| 18.5 to 22 | AX-RC00301275-DE | 127.5 | 0.30 | 18.5 to 22 | AX-RC01200644-DE | 64.4 | 1.20 |
| 30 | AX-RC00231662-DE | 166.2 | 0.23 | 30 | AX-RC00920797-DE | 79.7 | 0.92 |
| 37 | AX-RC00192015-DE | 201.5 | 0.19 | 37 | AX-RC00741042-DE | 104.2 | 0.74 |
| 45 | AX-RC00162500-DE | 250.0 | 0.16 | 45 | AX-RC00611236-DE | 123.6 | 0.61 |
| 55 | AX-RC00133057-DE | 305.7 | 0.13 | 55 | AX-RC00501529-DE | 152.9 | 0.50 |
| | | | | 75 | AX-RC00372094-DE | 209.4 | 0.37 |
| | | | | 90 | AX-RC00312446-DE | 244.6 | 0.31 |
| | | | | 110 | AX-RC00252981-DE | 298.1 | 0.25 |
| | | | | 132 | AX-RC00213613-DE | 361.3 | 0.21 |

## Output AC reactor

| 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW* | Reference | Current value A | Inductance mH | Max. applicable motor output kW[*1] | Reference | Current value A | Inductance mH |
| 0.4 | AX-RAO11500026-DE | 2.6 | 11.50 | 0.4 to 1.5 | AX-RAO16300038-DE | 3.8 | 16.30 |
| 0.75 | AX-RAO07600042-DE | 4.2 | 7.60 | | | | |
| 1.5 | AX-RAO04100075-DE | 7.5 | 4.10 | | | | |
| 2.2 | AX-RAO03000105-DE | 10.5 | 3.00 | 2.2 | AX-RAO11800053-DE | 5.3 | 11.80 |
| 3.7 | AX-RAO01830160-DE | 16.0 | 1.83 | 4.0 | AX-RAO07300080-DE | 8.0 | 7.30 |
| 5.5 | AX-RAO01150220-DE | 22.0 | 1.15 | 5.5 | AX-RAO04600110-DE | 11.0 | 4.60 |
| 7.5 | AX-RAO00950320-DE | 32.0 | 0.95 | 7.5 | AX-RAO03600160-DE | 16.0 | 3.60 |
| 11 | AX-RAO00630430-DE | 43.0 | 0.63 | 11 | AX-RAO02500220-DE | 22.0 | 2.50 |
| 15 | AX-RAO00490640-DE | 64.0 | 0.49 | 15 | AX-RAO02000320-DE | 32.0 | 2.00 |
| 18.5 | AX-RAO00390800-DE | 80.0 | 0.39 | 18.5 | AX-RAO01650400-DE | 40.0 | 1.65 |
| 22 | AX-RAO00330950-DE | 95.0 | 0.33 | 22 | AX-RAO01300480-DE | 48.0 | 1.30 |
| 30 | AX-RAO00251210-DE | 121.0 | 0.25 | 30 | AX-RAO01030580-DE | 58.0 | 1.03 |
| 37 | AX-RAO00191450-DE | 145.0 | 0.19 | 37 | AX-RAO00800750-DE | 75.0 | 0.80 |
| 45 | AX-RAO00161820-DE | 182.0 | 0.16 | 45 | AX-RAO00680900-DE | 90.0 | 0.68 |
| 55 | AX-RAO00132200-DE | 220.0 | 0.13 | 55 | AX-RAO00531100-DE | 110.0 | 0.53 |
| | | | | 75 | AX-RAO00401490-DE | 149.0 | 0.40 |
| | | | | 90 | AX-RAO00331760-DE | 176.0 | 0.33 |
| | | | | 110 | AX-RAO00262170-DE | 217.0 | 0.26 |
| | | | | 132 | AX-RAO00212600-DE | 260.0 | 0.21 |

[*1] These motor sizes are for heavy duty applications.

## Braking unit

| Voltage | Reference | Specifications | | | | Minimum connectable resistor (Ohms) |
|---|---|---|---|---|---|---|
| | | Permanent | | Peak (5 s max) | | |
| | | Current (A) | Brake power (kVA) | Current (A) | Brake power (kVA) | |
| 200 V | AX-BCR2035090-TE | 35 | 13 | 90 | 32 | 4 |
| | AX-BCR2070130-TE | 70 | 25 | 130 | 47 | 2.8 |
| 400 V | AX-BCR4015045-TE | 15 | 11 | 45 | 33 | 16 |
| | AX-BCR4017068-TE | 17 | 13 | 68 | 51 | 11 |
| | AX-BCR4035090-TE | 35 | 26 | 90 | 67 | 8.5 |
| | AX-BCR4070130-TE | 70 | 52 | 130 | 97 | 5.5 |
| | AX-BCR4090240-TE | 90 | 67 | 240 | 180 | 3.2 |

# OMRON
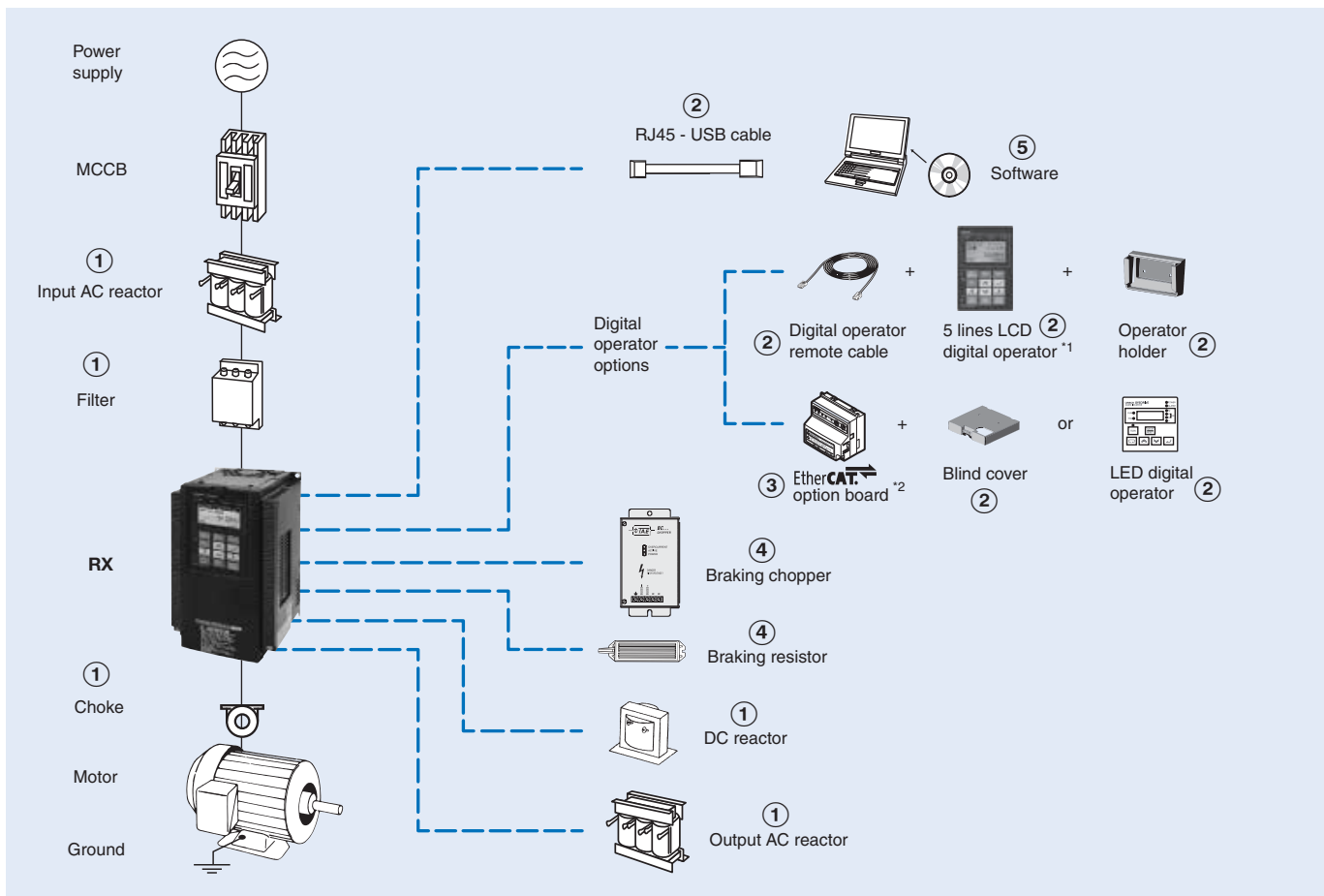
## Ordering information



*1 The 5 lines LCD digital operator is provided with the inverter from factory.
*2 When a communication option board is mounted, there are two options: mount a blind cover or a LED digital operator.

### 3G3RX

| Specifications | | | | | Model | Specifications | | | | | Model |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage class | Constant torque | | Variable torque | | Standard | Voltage class | Constant torque | | Variable torque | | Standard |
| | Max motor kW | Rated current A | Max motor kW | Rated current A | | | Max motor kW | Rated current A | Max motor kW | Rated current A | |
| Three-phase 200 V | 0.4 | 3.0 | 0.75 | 3.7 | 3G3RX-A2004-E1F | Three-phase 400 V | 0.4 | 1.5 | 0.75 | 1.9 | 3G3RX-A4004-E1F |
| | 0.75 | 5.0 | 1.5 | 6.3 | 3G3RX-A2007-E1F | | 0.75 | 2.5 | 1.5 | 3.1 | 3G3RX-A4007-E1F |
| | 1.5 | 7.5 | 2.2 | 9.4 | 3G3RX-A2015-E1F | | 1.5 | 3.8 | 2.2 | 4.8 | 3G3RX-A4015-E1F |
| | 2.2 | 10.5 | 4.0 | 12 | 3G3RX-A2022-E1F | | 2.2 | 5.3 | 4.0 | 6.7 | 3G3RX-A4022-E1F |
| | 4.0 | 16.5 | 5.5 | 19.6 | 3G3RX-A2037-E1F | | 4.0 | 9.0 | 5.5 | 11.1 | 3G3RX-A4040-E1F |
| | 5.5 | 24 | 7.5 | 30 | 3G3RX-A2055-E1F | | 5.5 | 14 | 7.5 | 16 | 3G3RX-A4055-E1F |
| | 7.5 | 32 | 11 | 44 | 3G3RX-A2075-E1F | | 7.5 | 19 | 11 | 22 | 3G3RX-A4075-E1F |
| | 11 | 46 | 15 | 58 | 3G3RX-A2110-E1F | | 11 | 25 | 15 | 29 | 3G3RX-A4110-E1F |
| | 15 | 64 | 18.5 | 73 | 3G3RX-A2150-E1F | | 15 | 32 | 18.5 | 37 | 3G3RX-A4150-E1F |
| | 18.5 | 76 | 22 | 85 | 3G3RX-A2185-E1F | | 18.5 | 38 | 22 | 43 | 3G3RX-A4185-E1F |
| | 22 | 95 | 30 | 113 | 3G3RX-A2220-E1F | | 22 | 48 | 30 | 57 | 3G3RX-A4220-E1F |
| | 30 | 121 | 37 | 140 | 3G3RX-A2300-E1F | | 30 | 58 | 37 | 70 | 3G3RX-A4300-E1F |
| | 37 | 145 | 45 | 169 | 3G3RX-A2370-E1F | | 37 | 75 | 45 | 85 | 3G3RX-A4370-E1F |
| | 45 | 182 | 55 | 210 | 3G3RX-A2450-E1F | | 45 | 91 | 55 | 105 | 3G3RX-A4450-E1F |
| | 55 | 220 | 75 | 270 | 3G3RX-A2550-E1F | | 55 | 112 | 75 | 135 | 3G3RX-A4550-E1F |
| | | | | | - | | 75 | 149 | 90 | 160 | 3G3RX-B4750-E1F |
| | | | | | | | 90 | 176 | 110 | 195 | 3G3RX-B4900-E1F |
| | | | | | | | 110 | 217 | 132 | 230 | 3G3RX-B411K-E1F |
| | | | | | | | 132 | 260 | 160 | 290 | 3G3RX-B413K-E1F |

### ① Line filters

| Rasmi Line filter | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **200V** | | | | | **400V** | | | | |
| Model 3G3RX-☐ | Reference | Rated current (A) | Leakage Nom/max | kg | Model 3G3RX-☐ | Reference | Rated current (A) | Leakage Nom/max | kg |
| A2004/A2007/A2015/ A2022/A2037 | AX-FIR2018-RE | 18 | 0.7/40 mA | 2.0 | A4004/A4007/A4015/ A4022/A4040 | AX-FIR3010-RE | 10 | 0.3/40 mA | 1.9 |
| A2055/A2075/A2110 | AX-FIR2053-RE | 53 | 0.7/40 mA | 2.5 | A4055/A4075/A4110 | AX-FIR3030-RE | 30 | 0.3/40 mA | 2.2 |
| A2150/A2185/A2220 | AX-FIR2110-RE | 110 | 1.2/70 mA | 8.0 | A4150/A4185/A4220 | AX-FIR3053-RE | 53 | 0.8/70 mA | 4.5 |
| A2300 | AX-FIR2145-RE | 145 | 1.2/70 mA | 8.6 | A4300 | AX-FIR3064-RE | 64 | 3/160 mA | 7.0 |
| A2370/A2450 | AX-FIR3250-RE | 250 | 6/300 mA | 13.0 | A4370 | AX-FIR3100-RE | 100 | 2/130 mA | 8.0 |
| A2550 | AX-FIR3320-RE | 320 | 6/300 mA | 13.2 | A4450/A4550 | AX-FIR3130-RE | 130 | 2/130 mA | 8.6 |
| - | | | | | A4750/A4900 | AX-FIR3250-RE | 250 | 10/500 mA | 13.0 |
| | | | | | A411K/A413K | AX-FIR3320-RE | 320 | 10/500 mA | 13.2 |

### ① Input AC reactors

| Voltage | | | |
|---|---|---|---|
| **3-phase 200 VAC** | | **3-phase 400 VAC** | |
| Inverter Model 3G3RX-☐ | AC Reactor Reference | Inverter Model 3G3RX-☐ | AC Reactor Reference |
| A2004/A2007/A2015 | AX-RAI02800100-DE | A4004/A4007/A4015 | AX-RAI07700050-DE |
| A2022/A2037 | AX-RAI00880200-DE | A4022/A4040 | AX-RAI03500100-DE |
| A2055/A2075 | AX-RAI00350335-DE | A4055/A4075 | AX-RAI01300170-DE |
| A2110/A2150 | AX-RAI00180670-DE | A4110/A4150 | AX-RAI00740335-DE |
| A2185/A2220 | AX-RAI00091000-DE | A4185/A4220 | AX-RAI00360500-DE |
| A2300/A2370 | AX-RAI00071550-DE | A4300/A4370 | AX-RAI00290780-DE |
| A2450/A2550 | AX-RAI00042300-DE | A4450/A4550 | AX-RAI00191150-DE |
| | | A4750/A4900 | AX-RAI00111850-DE |
| | | A411K/A413K | AX.RAI00072700-DE |

### ① DC reactors

| Voltage | | | |
|---|---|---|---|
| **3-phase 200 VAC** | | **3-phase 400 VAC** | |
| Inverter Model 3G3RX-☐ | AC Reactor Reference | Inverter Model 3G3RX-☐ | AC Reactor Reference |
| A2004 | AX-RC10700032-DE | A4004 | AX-RC43000020-DE |
| A2007 | AX-RC06750061-DE | A4007 | AX-RC27000030-DE |
| A2015 | AX-RC03510093-DE | A4015 | AX-RC14000047-DE |
| A2022 | AX-RC02510138-DE | A4022 | AX-RC10100069-DE |
| A2037 | AX-RC01600223-DE | A4040 | AX-RC06400116-DE |
| A2055 | AX-RC01110309-DE | A4055 | AX-RC04410167-DE |
| A2075 | AX-RC00840437-DE | A4075 | AX-RC03350219-DE |
| A2110 | AX-RC00590614-DE | A4110 | AX-RC02330307-DE |
| A2150 | AX-RC00440859-DE | A4150 | AX-RC01750430-DE |
| A2185/A2220 | AX-RC00301275-DE | A4185/A4220 | AX-RC01200644-DE |
| A2300 | AX-RC00231662-DE | A4300 | AX-RC00920797-DE |
| A2370 | AX-RC00192015-DE | A4370 | AX-RC00741042-DE |
| A2450 | AX-RC00162500-DE | A4450 | AX-RC00611236-DE |
| A2550 | AX-RC00133057-DE | A4550 | AX-RC00501529-DE |
| | | A4750 | AX-RC00372094-DE |
| | | A4900 | AX-RC00312446-DE |
| | | A411K | AX-RC00252981-DE |
| | | A413K | AX-RC00213613-DE |

### ① Chokes

| Model | Diameter | Description |
|---|---|---|
| AX-FER2102-RE | 21 | For 2.2 kW motors or below |
| AX-FER2515-RE | 25 | For 15 kW motors or below |
| AX-FER5045-RE | 50 | For 45 kW motors or below |
| AX-FER6055-RE | 60 | For 55 kW motors or above |

### ① Output AC reactor

| Voltage | | | |
|---|---|---|---|
| **200V** | | **400V** | |
| Model 3G3RX-☐ | Reference | Model 3G3RX-☐ | Reference |
| A2004 | AX-RAO11500026-DE | A4004/A4007/A4015 | AX-RAO16300038-DE |
| A2007 | AX-RAO07600042-DE | | |
| A2015 | AX-RAO04100075-DE | | |
| A2022 | AX-RAO03000105-DE | A4022 | AX-RAO11800053-DE |
| A2037 | AX-RAO01830160-DE | A4040 | AX-RAO07300080-DE |
| A2055 | AX-RAO01150220-DE | A4055 | AX-RAO04600110-DE |

# OMRON

| Voltage | | | |
|---|---|---|---|
| **200V** | | **400V** | |
| **Model 3G3RX-☐** | **Reference** | **Model 3G3RX-☐** | **Reference** |
| A2075 | AX-RAO00950320-DE | A4075 | AX-RAO03600160-DE |
| A2110 | AX-RAO00630430-DE | A4110 | AX-RAO02500220-DE |
| A2150 | AX-RAO00490640-DE | A4150 | AX-RAO02000320-DE |
| A2185 | AX-RAO00390800-DE | A4185 | AX-RAO01650400-DE |
| A2220 | AX-RAO00330950-DE | A4220 | AX-RAO01300480-DE |
| A2300 | AX-RAO00251210-DE | A4300 | AX-RAO01030580-DE |
| A2370 | AX-RAO00191450-DE | A4370 | AX-RAO00800750-DE |
| A2450 | AX-RAO00161820-DE | A4450 | AX-RAO00680900-DE |
| A2550 | AX-RAO00132200-DE | A4550 | AX-RAO00531100-DE |
| | | A4750 | AX-RAO00401490-DE |
| | | A4900 | AX-RAO00331760-DE |
| | | A411K | AX-RAO00262170-DE |
| | | A413K | AX-RAO00212600-DE |

**Note:** This table corresponds with HD rating. When ND is used, please choose the reactor for the next size inverter.

## ② Accessories

| Types | Appearance | Model | Description |
|---|---|---|---|
| Remote digital operator | | 3G3AX-OP05 | 5 Line LCD digital operator with copy function[1] |
| | | 3G3AX-OP05-H-E | Operator holder (for inside cabinet mounting) |
| | | 3G3AX-OP01 | LED remote digital operator |
| | | 4X-KITmini | Mounting kit |
| LED digital operator | | 3G3AX-OP03 | To be used in combination with communication option boards |
| Blind cover | | 3G3AX-OP05-B-E | |
| Cables | | 3G3AX-CAJOP300-EE | 3 m remote digital operator cable |
| | - | USB-CONVERTERCABLE | RJ45 to USB connection cable |
| | | 3G3AX-PCACN2 | |

[1]  This digital operator is provided with the RX inverter from factory.

## ③ Option boards

| Types | Model | Description | Functions |
|---|---|---|---|
| Encoder Feedback | 3G3AX-PG | PG speed controller option card | Phase A,B and Z pulse (differential pulse) inputs (RS-422)<br>Pulse train position command input (RS-422)<br>Pulse monitor output (RS-422)<br>PG frequency range: 100 kHz max |
| Communication option board | 3G3AX-RX-ECT | EtherCAT option card | Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current... through communications with the host controller. |

### ④ Braking unit, braking resistor unit

| Voltage | Max. motor kW | Inverter 3G3RX□ 3-phase | Braking Unit AX-BCR□ | Connectable min. resistance Ω | Inverter mounted type (3%ED, 10 sec max) Type AX- | Resist Ω | Braking torque % | External resistor 10%ED (10 sec max for built-in, 5 sec max for Braking Unit) Type AX- | Resist Ω | Braking torque % |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 V (single-/three-phase) | 0.55 | 2004 | Built-in | 50 | REM00K1200-IE | 200 | 180 | REM00K1200-IE | 200 | 180 |
| | 1.1 | 2007 | | | | | 100 | REM00K2070-IE | 70 | 200 |
| | 1.5 | 2015 | | 35 | REM00K2070-IE | 70 | 140 | REM00K4075-IE | 75 | 130 |
| | 2.2 | 2022 | | | | | 90 | REM00K4035-IE | 35 | 180 |
| | 4.0 | 2037 | | | REM00K4075-IE | 75 | 50 | REM00K6035-IE | 35 | 100 |
| | 5.5 | 2055 | | 16 | REM00K4035-IE | 35 | 75 | REM00K9020-IE | 20 | 150 |
| | 7.5 | 2075 | | 10 | | | 55 | REM01K9017-IE | 17 | 110 |
| | 11.0 | 2110 | | | REM00K6035-IE | 35 | 40 | REM02K1017-IE | 17 | 75 |
| | 15.0 | 2150 | | 7.5 | REM00K9017-IE | 17 | 55 | REM03K5010-IE | 10 | 95 |
| | 18.5 | 2185 | | | REM03K5010-IE | 10 | 75 | REM19K0008-IE | 8 | 95 |
| | 22.0 | 2220 | | 5 | | | 65 | | | 80 |
| | 30.0 | 2300 | 2035090-TE | 4 | – | | | REM19K0006-IE | 6 | 80 |
| | 37.0 | 2370 | | | | | | | 6 | 60 |
| | 45.0 | 2450 | 2070130-TE | 2.8 | | | | 2 × REM19K0006-IE | 3 | 105 |
| | 55.0 | 2550 | | | | | | | 3 | 85 |
| 400 V (three-phase) | 0.55 | 4004 | Built-in | 100 | REM00K1400-IE | 400 | 200 | REM00K1400-IE | 400 | 200 |
| | 1.1 | 4007 | | | | | 200 | REM00K1200-IE | 200 | 190 |
| | 1.5 | 4015 | | | REM00K1200-IE | 200 | 190 | REM00K5120-IE | 120 | 200 |
| | 2.2 | 4022 | | | REM00K2200-IE | 200 | 130 | REM00K6100-IE | 100 | 140 |
| | 4.0 | 4040 | | 70 | REM00K2120-IE | 120 | 120 | REM00K9070-IE | 70 | 150 |
| | 5.5 | 4055 | | | REM00K4075-IE | 75 | 140 | REM01K9070-IE | 70 | 110 |
| | 7.5 | 4075 | | 35 | | | 100 | REM02K1070-IE | 70 | 75 |
| | 11.0 | 4110 | | | REM00K6100-IE | 100 | 50 | REM03K5035-IE | 35 | 110 |
| | 15.0 | 4150 | | 24 | REM00K9070-IE | 70 | 55 | REM19K0030-IE | 30 | 100 |
| | 18.5 | 4185 | | | REM03K5035-IE | 35 | 90 | | | 85 |
| | 22.0 | 4220 | | 20 | | | 75 | REM19K0020-IE | 20 | 95 |
| | 30.0 | 4300 | 4015045-TE | 16 | – | | | REM19K0020-IE | 20 | 95 |
| | 37.0 | 4370 | 4017068-TE | 11 | | | | REM38K0012-IE | 15 | 125 |
| | 45.0 | 4450 | | | | | | | | 100 |
| | 55.0 | 4550 | 4035090-TE | 8.5 | | | | 2 × REM19K0020-IE | 10 | 100 |
| | 75.0 | 4750 | | | | | | 3 × REM19K0030-IE | 10 | 75 |
| | 90.0 | 4900 | 4070130-TE | 5.5 | | | | 2 × REM38K0012-IE | 6 | 105 |
| | 110.0 | 411K | 4090240-TE | 3.2 | | | | 3 × REM38K0012-IE | 4 | 125 |
| | 132.0 | 413K | | | | | | | | 105 |

### ⑤ Computer software

| Types | Model | Description | Installation |
|---|---|---|---|
| Software | CX-Drive | Computer software | Configuration and monitoring software tool |
| | CX-One | Computer software | Configuration and monitoring software tool |
| | €Saver | Computer software | Software tool for Energy Saving calculation |

# 3G3MX2□

# MX2 frequency inverter

## Born to drive machines
- Current vector control
- High starting torque: 200% at 0.5 Hz
- Double rating VT 120%/1 min and CT 150%/1 min
- IM & PM motor control
- Torque control in open loop vector
- Positioning functionality
- Built-in application functionality (i.e. Brake control)
- Safety embedded compliant with ISO13849-1 (double input circuit and external device monitor EDM)
- USB port for PC programming
- 24 VDC backup supply for control board
- RoHS, CE, cULus

## Ratings
- 200 V Class single-phase 0.1 to 2.2 kW
- 200 V Class three-phase 0.1 to 15.0 kW
- 400 V Class three-phase 0.4 to 15.0 kW

## System configuration



Power supply

MCCB

Input AC reactor

Filter

MX2

Choke

Motor

Ground

USB cable

Software

Remote operator extension cable

LCD 5 lines remote operator

Installation accessory

Communication option board

EtherCAT

Braking resistor

DC reactor

Output AC reactor

sysmac
always in control

# OMRON
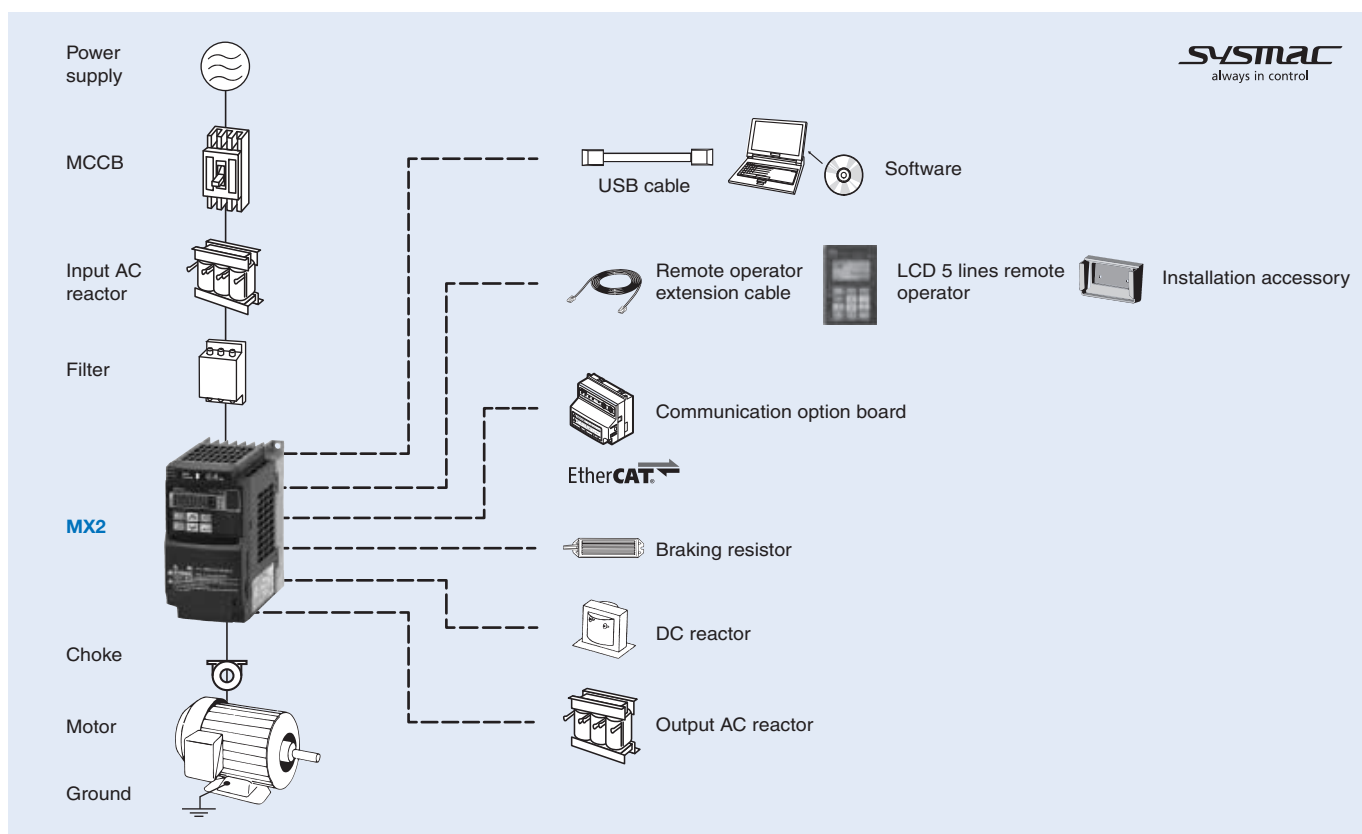
## Specifications

**Type designation**

$$3G3MX2-AB002-\square-E\square$$

MX2 series

A: IP20
D: IP54 (Includes Class 2 EMC filter)

Voltage:
B: Single-phase 200 VAC
2: Three-phase 200 VAC
4: Three-phase 400 VAC

Max. applicable motor output
002: 0,2 kW
~
150: 15,0 kW

P: Finless

E: Europe standard

C: IP54 ready for customization
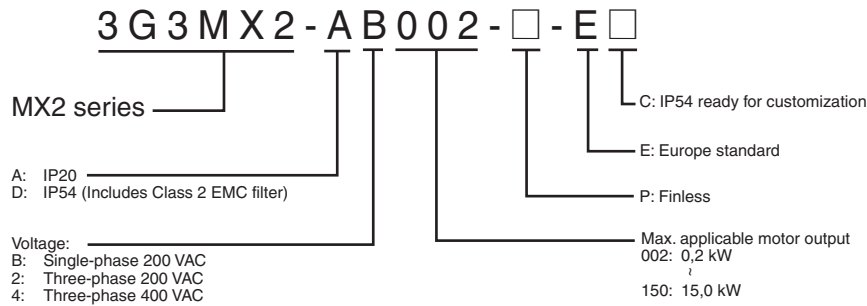
### 200 V class

| Single-phase: 3G3MX2-□ | | B001 | B002 | B004 | B007*1 | B015 | B022 | – | – | – | – | – |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Three-phase: 3G3MX2-□ | | 2001 | 2002 | 2004 | 2007 | 2015 | 2022 | 2037 | 2055 | 2075 | 2110 | 2150 |
| Motor kW*2 | For VT setting | 0.2 | 0.4 | 0.55 | 1.1 | 2.2 | 3.0 | 5.5 | 7.5 | 11 | 15 | 18.5 |
| | For CT setting | 0.1 | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 |
| Output characteristics | Inverter capacity kVA 200 VT | 0.4 | 0.6 | 1.2 | 2.0 | 3.3 | 4.1 | 6.7 | 10.3 | 13.8 | 19.3 | 23.9 |
| | 200 CT | 0.2 | 0.5 | 1.0 | 1.7 | 2.7 | 3.8 | 6.0 | 8.6 | 11.4 | 16.2 | 20.7 |
| | 240 VT | 0.4 | 0.7 | 1.4 | 2.4 | 3.9 | 4.9 | 8.1 | 12.4 | 16.6 | 23.2 | 28.6 |
| | 240 CT | 0.3 | 0.6 | 1.2 | 2.0 | 3.3 | 4.5 | 7.2 | 10.3 | 13.7 | 19.5 | 24.9 |
| | Rated output current (A) at VT | 1.2 | 1.9 | 3.5 | 6.0 | 9.6 | 12.0 | 19.6 | 30.0 | 40.0 | 56.0 | 69.0 |
| | Rated output current (A) at CT | 1.0 | 1.6 | 3.0 | 5.0 | 8.0 | 11.0 | 17.5 | 25.0 | 33.0 | 47.0 | 60.0 |
| | Max. output voltage | Proportional to input voltage: 0 to 240 V | | | | | | | | | | |
| | Max. output frequency | 400 Hz | | | | | | | | | | |
| Power supply | Rated input voltage and frequency | Single-phase 200 to 240 V 50/60 Hz / 3-phase 200 to 240 V 50/60 Hz | | | | | | | | | | |
| | Allowable voltage fluctuation | −15% to +10% | | | | | | | | | | |
| | Allowable frequency fluctuation | 5% | | | | | | | | | | |
| Braking torque | At short-time deceleration / At capacitor feedback | 100%: <50Hz / 50%: <60Hz | | | | 70%: <50Hz / 50%: <60Hz | | Approx 20% | – | | | |
| Cooling method | | Self cooling*3 | | | | | | Forced-air-cooling | | | | |

*1 Three phase model use forced-air-cooling but single phase model is self cooling.
*2 Based on a standard 3-Phase standard motor.
*3 Forced air cooling for IP54 models.

### 400 V class

| Three-phase: 3G3MX2-□ | | 4004 | 4007 | 4015 | 4022 | 4030 | 4040 | 4055 | 4075 | 4110 | 4150 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor kW*1 | For VT setting | 0.75 | 1.5 | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 | 11 | 15 | 18.5 |
| | For CT setting | 0.4 | 0.75 | 1.5 | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 | 11 | 15 |
| Output characteristics | Inverter capacity kVA 380 VT | 1.3 | 2.6 | 3.5 | 4.5 | 5.7 | 7.3 | 11.5 | 15.1 | 20.4 | 25.0 |
| | 380 CT | 1.1 | 2.2 | 3.1 | 3.6 | 4.7 | 6.0 | 9.7 | 11.8 | 15.7 | 20.4 |
| | 480 VT | 1.7 | 3.4 | 4.4 | 5.7 | 7.3 | 9.2 | 14.5 | 19.1 | 25.7 | 31.5 |
| | 480 CT | 1.4 | 2.8 | 3.9 | 4.5 | 5.9 | 7.6 | 12.3 | 14.9 | 19.9 | 25.7 |
| | Rated output current (A) at VT | 2.1 | 4.1 | 5.4 | 6.9 | 8.8 | 11.1 | 17.5 | 23.0 | 31.0 | 38.0 |
| | Rated output current (A) at CT | 1.8 | 3.4 | 4.8 | 5.5 | 7.2 | 9.2 | 14.8 | 18.0 | 24.0 | 31.0 |
| | Max. output voltage | Proportional to input voltage: 0 to 480 V | | | | | | | | | |
| | Max. output frequency | 400 Hz | | | | | | | | | |
| Power supply | Rated input voltage and frequency | 3-phase 380 to 480 V 50/60 Hz | | | | | | | | | |
| | Allowable voltage fluctuation | −15% to +10% | | | | | | | | | |
| | Allowable frequency fluctuation | 5% | | | | | | | | | |
| Braking torque | At short-time deceleration *2 / At capacitor feedback | 100%: <50Hz / 50%: <60Hz | | | | 70%: <50Hz / 50%: <60Hz | | – | | | |
| Cooling method | | Self cooling*2 | | Forced-air-cooling | | | | | | | |

*1 Based on a standard 3-Phase standard motor.
*2 Forced air cooling for IP54 models.

## Common specifications

| Model number 3G3MX2 | | Specifications |
|---|---|---|
| Control functions | Control methods | Phase-to-phase sinusoidal pulse with modulation PWM (Sensorless vector control, V/F) |
| | Output frequency range | 0.10 to 400.00 Hz |
| | Frequency precision | Digital set value: ±0.01% of the max. frequency |
| | | Analogue set value: ±0.2% of the max. frequency (25±10°C) |
| | Resolution of frequency set value | Digital set value: 0.01 Hz |
| | | Analogue set value: 1/1000 of maximum frequency |
| | Resolution of output frequency | 0.01Hz |
| | Starting torque | 200%/0.5 Hz |
| | Overload capability | Dual rating: Heavy duty (CT): 150% for 1 minute Normal Duty (VT): 120% for 1 minute |
| | Frequency set value | 0 to 10 VDC (10 KΩ), 4 to 20 mA (100 Ω), RS485 Modbus, Network options |
| | V/f Characteristics | Constant/ reduced torque, free V/f |
| Functionality | Inputs signals | FW (forward run command), RV (reverse run command), CF1~CF4 (multi-stage speed setting), JG (jog command), DB (external braking), SET (set second motor), 2CH (2-stage accel./decel. command), FRS (free run stop command), EXT (external trip), USP (startup function), CS (commercial power switchover), SFT (soft lock), AT (analog input selection), RS (reset), PTC (thermistor thermal protection), STA (start), STP (stop), F/R (forward/reverse), PID (PID disable), PIDC (PID reset), UP (remote control up function), DWN (remote control down function), UDC (remote control data clear), OPE (operator control), SF1~SF7 (multi-stage speed setting; bit operation), OLR (overload restriction), TL (torque limit enable), TRQ1 (torque limit changeover1), TRQ2 (torque limit changeover2), BOK (Braking confirmation), LAC (LAD cancellation), PCLR (position deviation clear), ADD (add frequency enable), F-TM (force terminal mode), ATR (permission of torque command input), KHC (Cumulative power clear), MI1~MI7 (general purpose inputs for Drive Programming), AHD (analog command hold), CP1~CP3 (multistage-position switches), ORL (limit signal of zero-return), ORC (trigger signal of zero-return), SPD (speed/position changeover), GS1~GS2 (STO inputs, safety related signals), 485 (Starting communication signal), PRG (executing Drive Programming), HLD (retain output frequency), ROK (permission of run command), EB (rotation direction detection of B-phase), DISP (display limitation), OP (option control signal), NO (no function), PSET (preset position) |
| | Output signals | RUN (run signal), FA1~FA5 (frequency arrival signal), OL,OL2 (overload advance notice signal), OD (PID deviation error signal), AL (alarm signal), OTQ (over/under torque threshold), UV (under-voltage), TRQ (torque limit signal), RNT (run time expired), ONT (power ON time expired), THM (thermal warning), BRK (brake release), BER (brake error), ZS (0Hz detection), DSE (speed deviation excessive), POK (positioning completion), ODc (analog voltage input disconnection), OIDc (analog current input disconnection), FBV (PID second stage output), NDc (network disconnect detection), LOG1~LOG3 (Logic output signals), WAC (capacitor life warning), WAF (cooling fan warning), FR (starting contact), OHF (heat sink overheat warning), LOC (Low load), MO1~MO3 (general outputs for Drive Programming), IRDY (inverter ready), FWR (forward operation), RVR (reverse operation), MJA (major failure), WCO (window comparator O), WCOI (window comparator OI), FREF (frequency command source), REF (run command source), SETM (second motor in operation), EDM (STO (safe torque off) performance monitor), OP (option control signal), NO (no function) |
| | Standard functions | Free-V/f, manual/automatic torque boost, output voltage gain adjustment, AVR function, reduced voltage start, motor data selection, auto-tuning, motor stabilization control, reverse running protection, simple position control, simple torque control, torque limiting, automatic carrier frequency reduction, energy saving operation, PID function, non-stop operation at instantaneous power failure, brake control, DC injection braking, dynamic braking (BRD), frequency upper and lower limiters, jump frequencies, curve accel and decel (S, U, inversed U,EL-S), 16-stage speed profile, fine adjustment of start frequency, accel and decel stop, process jogging, frequency calculation, frequency addition, 2-stage accel/decel, stop mode selection, start/end freq., analog input filter, window comparators, input terminal response time, output signal delay/hold function, rotation direction restriction, stop key selection, software lock, safe stop function, scaling function, display restriction, password function, user parameter, initialization, initial display selection, cooling fan control, warning, trip retry, frequency pull-in restart, frequency matching, overload restriction, over current restriction, DC bus voltage AVR |
| | Analogue inputs | 2 analogue inputs 0 to 10 V (10 KΩ), 4 to 20 mA (100 Ω) |
| | Pulse train input terminal | 0 to 24 V, up to 32 kHz |
| | Accel/Decel times | 0.01 to 3,600.0 s (line/curve selection), 2nd accel/decel setting available |
| | Display | Status indicator LED's Run, Program, Alarm, Power, Hz, Amps |
| | | Digital operator: Available to monitor 32 items: frequency reference, output current, output frequency… |
| Protection functions | Motor overload protection | Electronic Thermal overload relay and PTC thermistor input |
| | Instantaneous overcurrent | 200% of rated current |
| | Overload | Dual rating: Heavy duty (CT): 150% for 1 minute Normal Duty (VT): 120% for 1 minute |
| | Overvoltage | 800 V for 400 V type and 400 V for 200 V type |
| | Undervoltage | 345 V for 400 V type and 172.5 V for 200 V type |
| | Momentary power loss | Following items are selectable: Alarm, decelerates to stop, decelerates to stop with DC bus controlled, restart |
| | Cooling fin overheat | Temperature monitor and error detection |
| | Stall prevention level | Stall prevention during acceleration/deceleration and constant speed |
| | Ground fault | Detection at power-on |
| | Power charge indication | On when power is supplied to the control part |
| Ambient conditions | Degree of protection | IP20, Varnish coating on PCB & IP54 (For 3G3MX2-D□ type) |
| | Ambient humidity | 90% RH or less (without condensation) |
| | Storage temperature | −20°C to 65°C (short-term temperature during transportation) |
| | Ambient temperature[1] | −10°C to 50°C (Both the carrier frequency and output current need to be reduced over 40°C) |
| | Installation | Indoor (no corrosive gas, dust, etc.) |
| | Installation height | Max. 1,000 m |
| | Vibration | 5.9 m/s$^2$ (0.6G), 10 to 55 Hz |

[1] Some types of 3G3MX2-D requires special derating depending on installation conditions and carrier frequency selected. Check the manual for details.
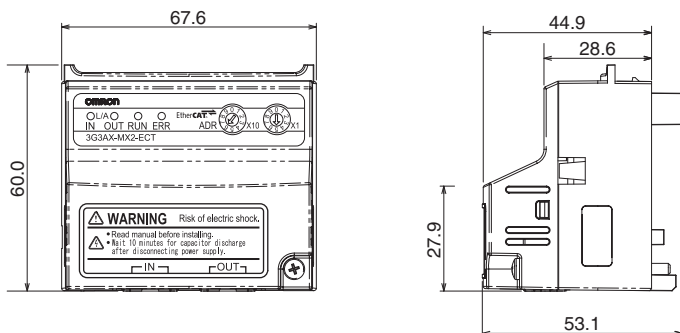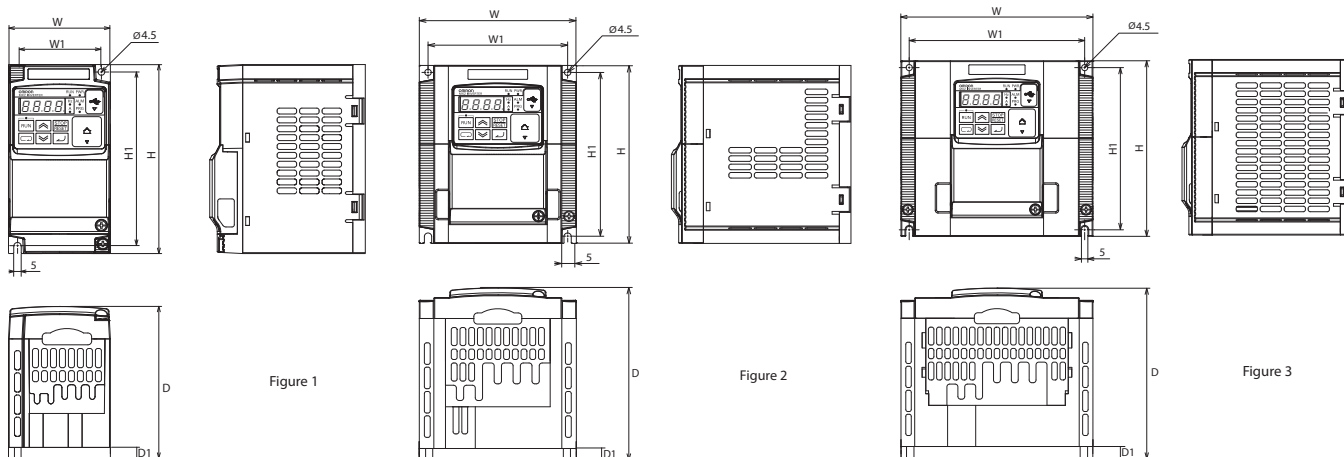
## Dimensions

### Standard models (IP20)



Figure 1
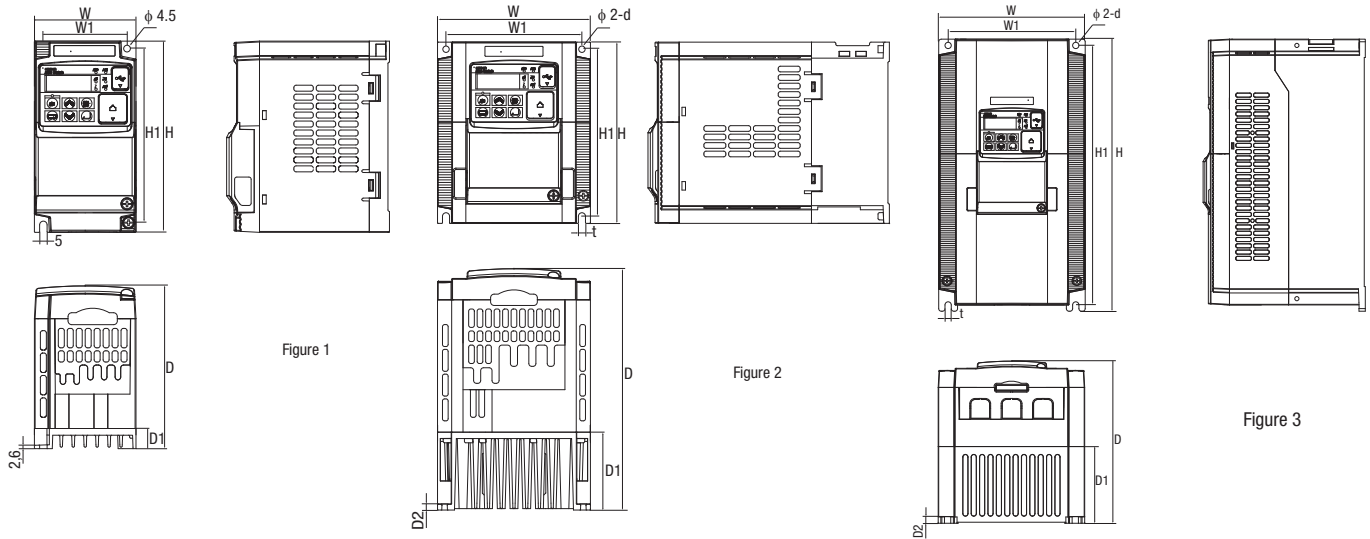
Figure 2

Figure 3

| Voltage class | Inverter model 3G3MX2-A☐ | Figure | Dimensions in mm | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | W | W1 | H | H1 | t | D | D1 | D2 | d | Weight (kg) |
| Single-phase 200 V | B001-E | 1 | 68 | 56 | 128 | 118 | – | 109 | 13.5 | – | – | 1.0 |
| | B002-E | | | | | | | | | | | 1.0 |
| | B004-E | | | | | | | 122.5 | 27 | | | 1.1 |
| | B007-E | 2 | 108 | 96 | 128 | 118 | | 170.5 | 55 | 4.4 | 4.5 | 1.4 |
| | B015-E | | | | | | | | | | | 1.8 |
| | B022-E | | | | | | | | | | | 1.8 |
| Three-phase 200 V | 2001-E | 1 | 68 | 56 | 128 | 118 | – | 109 | 13.5 | – | – | 1.0 |
| | 2002-E | | | | | | | | | | | 1.0 |
| | 2004-E | | | | | | | 122.5 | 27 | | | 1.1 |
| | 2007-E | | | | | | | 145.5 | 50 | | | 1.2 |
| | 2015-E | 2 | 108 | 96 | 128 | 118 | | 170.5 | 55 | 4.4 | 4.5 | 1.6 |
| | 2022-E | | | | | | | | | | | 1.8 |
| | 2037-E | 3 | 140 | 128 | 128 | 118 | 5 | 170.5 | 55 | 4.4 | | 2.0 |
| | 2055-E | | 140 | 122 | 260 | 248 | 6 | 155 | 73.3 | 6 | 6 | 3.0 |
| | 2075-E | | | | | | | | | | | 3.4 |
| | 2110-E | | 180 | 160 | 296 | 284 | 7 | 175 | 97 | 5 | 7 | 5.1 |
| | 2150-E | | 220 | 192 | 350 | 336 | 7 | 175 | 84 | 5 | 7 | 7.4 |
| Three-phase 400 V | 4004-E | 2 | 108 | 96 | 128 | 118 | – | 143.5 | 28 | – | – | 1.5 |
| | 4007-E | | | | | | | 170.5 | 55 | | | 1.6 |
| | 4015-E | | | | | | | 170.5 | | | | 1.8 |
| | 4022-E | | | | | | | | | | | 1.9 |
| | 4030-E | | | | | | | | | | | 1.9 |
| | 4040-E | 3 | 140 | 128 | 128 | 118 | 5 | 170.5 | 55 | 4.4 | 4.5 | 2.1 |
| | 4055-E | | | 122 | 260 | 248 | 6 | 155 | 73.3 | 6 | 6 | 3.5 |
| | 4075-E | | | | | | | | | | | 3.5 |
| | 4110-E | | 180 | 160 | 296 | 284 | 7 | 175 | 97 | 5 | 7 | 4.7 |
| | 4150-E | | | | | | | | | | | 5.2 |

### Option board



**Note:** Option boards could be fitted inside the IP54 model.

## Finless models



Figure 1

Figure 2

Figure 3

| Voltage class | Inverter model 3G3MX2-A□ | Figure | Dimensions in mm | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | W | W1 | H | H1 | D | D1 | Weight (kg) |
| Single-phase 200 V | B001-P-E | 1 | 68 | 56 | 128 | 118 | 103 | 7.5 | 1.1 |
| | B002-P-E | | | | | | | | |
| | B004-P-E | | | | | | | | |
| | B007-P-E | 2 | 108 | 96 | 128 | 118 | 123 | 7.5 | 1.8 |
| | B015-P-E | | | | | | | | |
| | B022-P-E | | | | | | | | |
| Three-phase 200 V | 2001-P-E | 1 | 68 | 56 | 128 | 118 | 103 | 7.5 | 1.1 |
| | 2002-P-E | | | | | | | | |
| | 2004-P-E | | | | | | | | |
| | 2007-P-E | | | | | | | | |
| | 2015-P-E | 2 | 108 | 96 | 128 | 118 | 123 | 7.5 | 1.8 |
| | 2022-P-E | | | | | | | | |
| | 2037-P-E | 3 | 140 | 128 | 128 | 118 | 123 | 7.5 | 2.1 |
| Three-phase 400 V | 4004-P-E | 2 | 108 | 96 | 128 | 118 | 123 | 7.5 | 1.8 |
| | 4007-P-E | | | | | | | | |
| | 4015-P-E | | | | | | | | |
| | 4022-P-E | | | | | | | | |
| | 4030-P-E | | | | | | | | |
| | 4040-P-E | 3 | 140 | 128 | 128 | 118 | 123 | 7.5 | 2.1 |

**IP54 models**
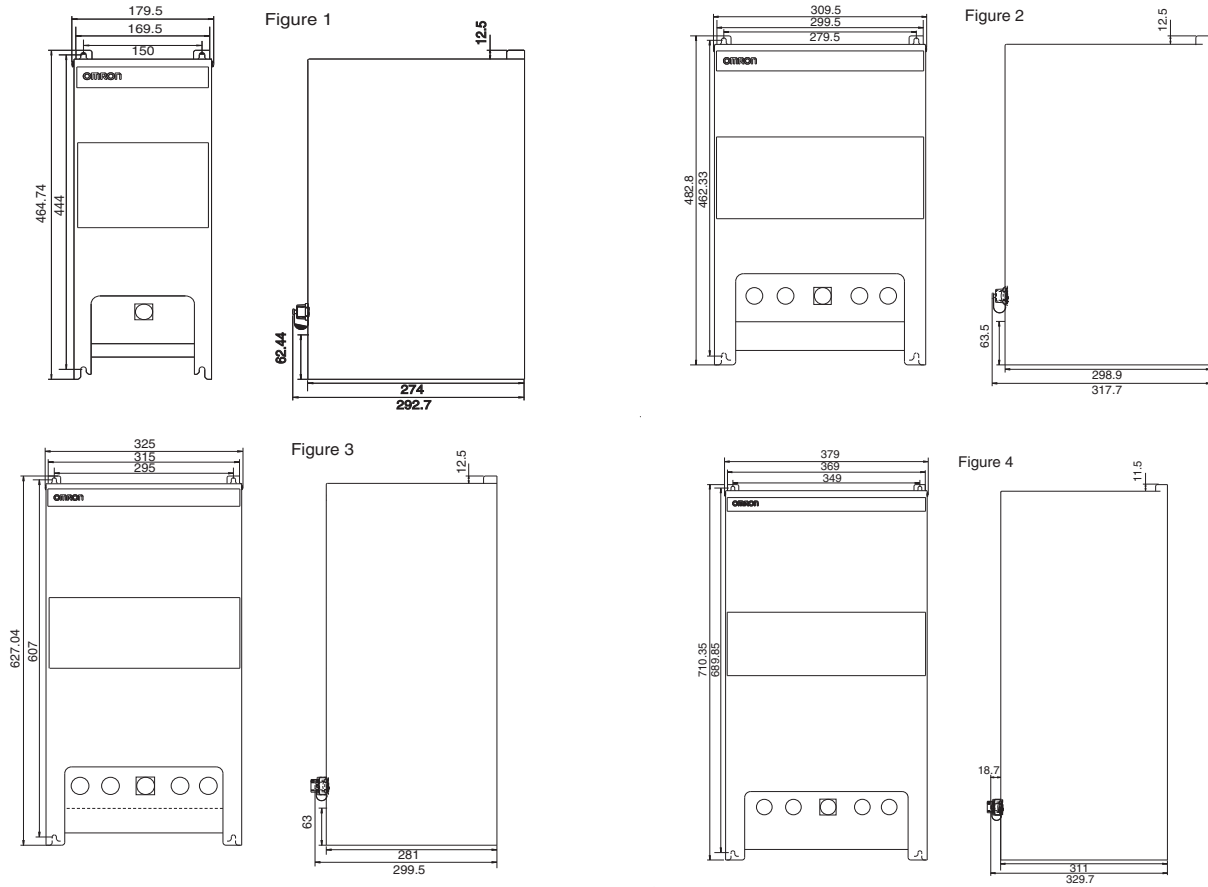


| Figure 1 | Figure 2 | Figure 3 | Figure 4 |
|---|---|---|---|
| 3G3MX2-DB001-E | 3G3MX2-DB001-EC | 3G3MX2-D2055-EC | 3G3MX2-D2110-EC |
| 3G3MX2-DB002-E | 3G3MX2-DB002-EC | 3G3MX2-D2075-EC | 3G3MX2-D2150-EC |
| 3G3MX2-DB004-E | 3G3MX2-DB004-EC | 3G3MX2-D4055-EC | 3G3MX2-D4110-EC |
| 3G3MX2-D2001-E | 3G3MX2-DB007-EC | 3G3MX2-D4075-EC | 3G3MX2-D4150-EC |
| 3G3MX2-D2002-E | 3G3MX2-DB015-EC | | |
| 3G3MX2-D2004-E | 3G3MX2-DB022-EC | | |
| 3G3MX2-D2007-E | 3G3MX2-D2001-EC | | |
| | 3G3MX2-D2002-EC | | |
| | 3G3MX2-D2004-EC | | |
| | 3G3MX2-D2007-EC | | |
| | 3G3MX2-D2015-EC | | |
| | 3G3MX2-D2022-EC | | |
| | 3G3MX2-D2037-EC | | |
| | 3G3MX2-D4004-EC | | |
| | 3G3MX2-D4007-EC | | |
| | 3G3MX2-D4015-EC | | |
| | 3G3MX2-D4022-EC | | |
| | 3G3MX2-D4030-EC | | |
| | 3G3MX2-D4040-EC | | |

## Rasmi footprint filters

| Rasmi model | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| | | W | H | L | X | Y | M |
| 1×200 V | AX-FIM1010-RE☐ | 71 | 45 | 169 | 156 | 51 | M4 |
| | AX-FIM1014-RE☐ | 111 | 50 | 169 | 156 | 91 | M4 |
| | AX-FIM1024-RE☐ | 111 | 50 | 169 | 156 | 91 | M4 |
| 3×200 V | AX-FIM2010-RE☐ | 82 | 50 | 194 | 181 | 62 | M4 |
| | AX-FIM2020-RE☐ | 111 | 50 | 169 | 156 | 91 | M4 |
| | AX-FIM2030-RE☐ | 144 | 50 | 174 | 161 | 120 | M4 |
| | AX-FIM2060-RE☐ | 150 | 52 | 320 | 290 | 122 | M5 |
| | AX-FIM2080-RE☐ | 188 | 62 | 362 | 330 | 160 | M5 |
| | AX-FIM2100-RE☐ | 220 | 62 | 415 | 380 | 192 | M6 |
| 3×400 V | AX-FIM3005-RE☐ | 114 | 46 | 169 | 156 | 96 | M4 |
| | AX-FIM3010-RE☐ | 114 | 46 | 169 | 156 | 96 | M4 |
| | AX-FIM3014-RE☐ | 144 | 50 | 174 | 161 | 120 | M4 |
| | AX-FIM3030-RE☐ | 150 | 52 | 306 | 290 | 122 | M5 |
| | AX-FIM3050-RE☐ | 182 | 62 | 357 | 330 | 160 | M5 |



drive mounts

output flexes
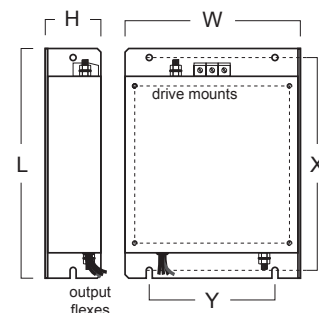
## Schaffner footprint filters

| Schaffner model | | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | W | H | L | X | Y | A | B | M |
| 1×200 V | AX-FIM1010-SE☐ | 70 | 40 | 166 | 156 | 51 | 150 | 50 | M5 |
| | AX-FIM1014-SE☐ | 110 | 45 | 166 | 156 | 91 | 150 | 80 | M5 |
| | AX-FIM1024-SE☐ | 110 | 50 | 166 | 156 | 91 | 150 | 80 | M5 |
| 3×200 V | AX-FIM2010-SE☐ | 80 | 40 | 191 | 181 | 62 | 150 | 50 | M5 |
| | AX-FIM2020-SE☐ | 110 | 50 | 166 | 156 | 91 | 150 | 80 | M5 |
| | AX-FIM2030-SE☐ | 142 | 50 | 171 | 161 | 120 | 150 | 112 | M5 |
| | AX-FIM2060-SE☐ | 140 | 55 | 304 | 290 | 122 | 286 | 112 | M5 |
| | AX-FIM2080-SE☐ | 180 | 55 | 344 | 330 | 160 | 323 | 140 | M5 |
| | AX-FIM2100-SE☐ | 220 | 65 | 394 | 380 | 192 | 376 | 180 | M5 |
| 3×400 V | AX-FIM3005-SE☐ | 110 | 50 | 166 | 156 | 91 | 150 | 80 | M5 |
| | AX-FIM3010-SE☐ | 110 | 50 | 166 | 156 | 91 | 150 | 80 | M5 |
| | AX-FIM3014-SE☐ | 142 | 50 | 171 | 161 | 120 | 150 | 112 | M5 |
| | AX-FIM3030-SE☐ | 140 | 55 | 304 | 290 | 122 | 286 | 112 | M5 |
| | AX-FIM3050-SE☐ | 180 | 55 | 344 | 330 | 160 | 323 | 140 | M5 |
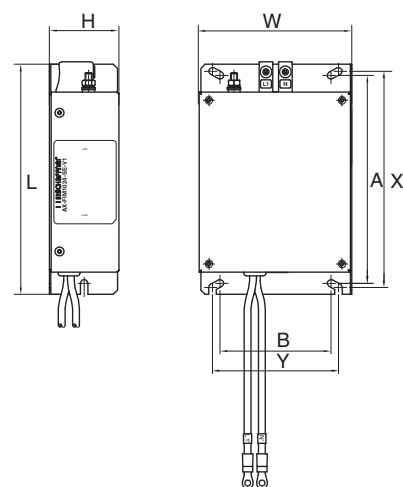


## Input AC reactor
### Single-phase

| Voltage | Reference | Dimensions | | | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | |
| 200 V | AX-RAI02000070-DE | 84 | 113 | 96 | 101 | 66 | 5 | 7.5 | 2 | 1.22 |
| | AX-RAI01700140-DE | 84 | 113 | 116 | 101 | 66 | 5 | 7.5 | 2 | 1.95 |
| | AX-RAI01200200-DE | 84 | 113 | 131 | 101 | 66 | 5 | 7.5 | 2 | 2.55 |
| | AX-RAI00630240-DE | 84 | 113 | 116 | 101 | 66 | 5 | 7.5 | 2 | 1.95 |
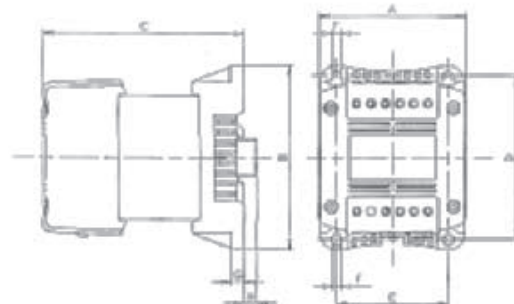


### Three-phase

| Voltage | Reference | Dimensions | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|
| | | A | B2 | C2 | D | E | F | |
| 200 V | AX-RAI02800080-DE | 120 | 70 | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAI00880200-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAI00350335-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAI00180670-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
| 400 V | AX-RAI07700050-DE | 120 | 70 | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAI03500100-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAI01300170-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.50 |
| | AX-RAI00740335-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
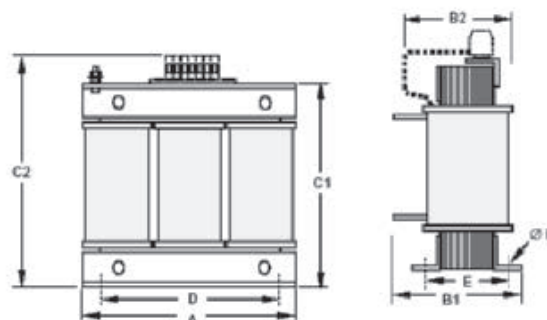
## DC reactor

| Voltage | Reference | Dimensions | | | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | |
| 200 V | AX-RC21400016-DE | 84 | 113 | 96 | 101 | 66 | 5 | 7.5 | 2 | 1.22 |
| | AX-RC10700032-DE | | | | | | | | | |
| | AX-RC06750061-DE | | | 105 | | | | | | 1.60 |
| | AX-RC03510093-DE | | | | | | | | | |
| | AX-RC02510138-DE | | | 116 | | | | | | 1.95 |
| | AX-RC01600223-DE | 108 | 135 | 124 | 120 | 82 | 6.5 | 9.5 | 9.5 | 3.20 |
| | AX-RC01110309-DE | 120 | 152 | 136 | 135 | 94 | 7 | | – | 5.20 |
| | AX-RC00840437-DE | | | 146 | | | | | | 6.00 |
| | AX-RC00590614-DE | 150 | 177 | 160 | 160 | 115 | | 2 | | 11.4 |
| | AX-RC00440859-DE | | | 182.6 | | | | | | 14.3 |
| 400 V | AX-RC43000020-DE | 84 | 113 | 96 | 101 | 66 | 5 | 7.5 | 2 | 1.22 |
| | AX-RC27000030-DE | | | 105 | | | | | | 1.60 |
| | AX-RC14000047-DE | | | | | | | | | |
| | AX-RC10100069-DE | | | 116 | | | | | | 1.95 |
| | AX-RC08250093-DE | | | 131 | | | | | | 2.65 |
| | AX-RC06400116-DE | 108 | 135 | 133 | 120 | 82 | 6.5 | 9.5 | 9.5 | 3.70 |
| | AX-RC04410167-DE | 120 | 152 | 136 | 135 | 94 | 7 | | – | 5.20 |
| | AX-RC03350219-DE | | | 146 | | | | | | 6.00 |
| | AX-RC02330307-DE | 150 | 177 | 160 | 160 | 115 | 7 | 2 | | 11.4 |
| | AX-RC01750430-DE | | | 182.6 | | | | | | 14.3 |
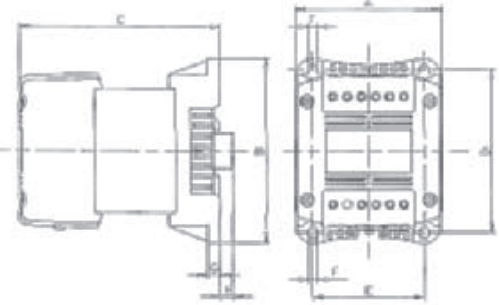
## Output AC reactor

| Voltage | Reference | Dimensions | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|
| | | A | B2 | C2 | D | E | F | |
| 200 V | AX-RAO11500026-DE | 120 | 70 | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAO07600042-DE | 120 | 70 | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAO04100075-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAO03000105-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAO01830180-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAO01150220-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAO00950320-DE | 180 | 85 | 205 | 140 | 55 | 6 | 6.5 |
| | AX-RAO00630430-DE | 180 | 95 | 205 | 140 | 65 | 6 | 9.1 |
| | AX-RAO00490640-DE | 180 | 95 | 205 | 140 | 65 | 6 | 9.1 |
| 400 V | AX-RAO16300038-DE | 120 | 70 | 120 | 80 | 52 | 5.5 | 1.78 |
| | AX-RAO11800053-DE | 120 | 80 | 120 | 80 | 52 | 5.5 | 2.35 |
| | AX-RAO07300080-DE | 120 | 80 | 120 | 80 | 62 | 5.5 | 2.35 |
| | AX-RAO04600110-DE | 180 | 85 | 190 | 140 | 55 | 6 | 5.5 |
| | AX-RAO03600160-DE | 180 | 85 | 205 | 140 | 55 | 6 | 6.5 |
| | AX-RAO02500220-DE | 180 | 95 | 205 | 140 | 55 | 6 | 9.1 |
| | AX-RAO02000320-DE | 180 | 105 | 205 | 140 | 85 | 6 | 11.7 |
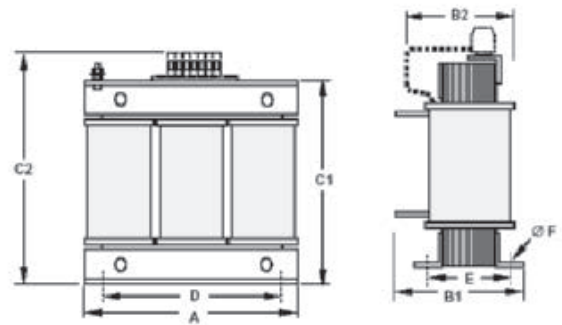
## Chokes

| Reference | D diameter | Motor kW | Dimensions | | | | | | Weight kg |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | W | H | X | Y | m | |
| AX-FER2102-RE | 21 | < 2.2 | 85 | 22 | 46 | 70 | – | 5 | 0.1 |
| AX-FER2515-RE | 25 | < 15 | 105 | 25 | 62 | 90 | – | 5 | 0.2 |
| AX-FER5045-RE | 50 | < 45 | 150 | 50 | 110 | 125 | 30 | 5 | 0.7 |
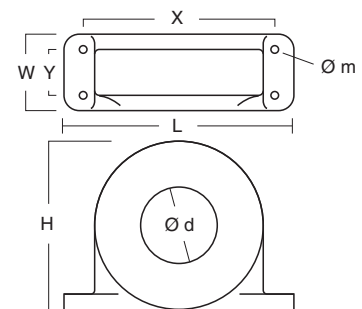
**Resistor dimensions**
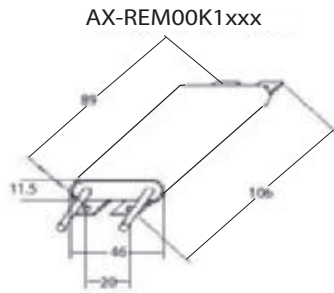
AX-REM00K1xxx



Fig 1
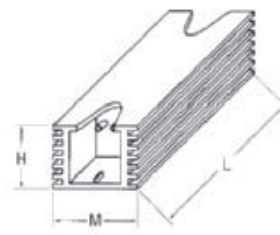


Fig 2
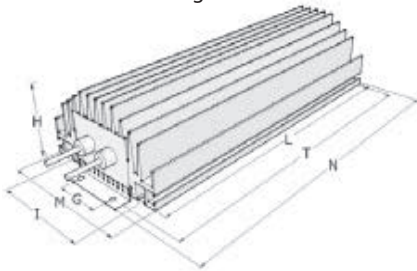


Fig 3
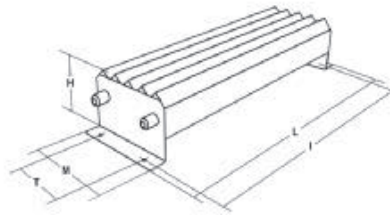


Fig 4
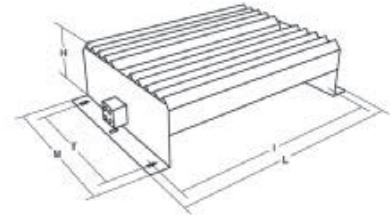


| Type | Fig. | Dimensions | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | L | H | M | I | T | G | N | kg |
| AX-REM00K1400-IE | 1 | 105 | 27 | 36 | 94 | - | - | - | 0.2 |
| AX-REM00K2070-IE | | | | | | | | | |
| AX-REM00K2120-IE | | | | | | | | | |
| AX-REM00K2200-IE | | | | | | | | | |
| AX-REM00K4075-IE | | 200 | 27 | 36 | 189 | - | - | - | 0.425 |
| AX-REM00K4035-IE | | | | | | | | | |
| AX-REM00K4030-IE | | | | | | | | | |
| AX-REM00K5120-IE | | 260 | 27 | 36 | 249 | - | - | - | 0.58 |
| AX-REM00K6100-IE | | 320 | 27 | 36 | 309 | - | - | - | 0.73 |
| AX-REM00K6035-IE | | | | | | | | | |
| AX-REM00K9070-IE | 2 | 200 | 61 | 100 | 74 | 211 | 40 | 230 | 1.41 |
| AX-REM00K9020-IE | | | | | | | | | |
| AX-REM00K9017-IE | | | | | | | | | |
| AX-REM01K9070-IE | 3 | 365 | 73 | 105 | 350 | 70 | - | - | 4 |
| AX-REM01K9017-IE | | | | | | | | | |
| AX-REM02K1070-IE | 4 | 310 | 100 | 240 | 295 | 210 | - | - | 7 |
| AX-REM02K1017-IE | | | | | | | | | |
| AX-REM03K5035-IE | | 365 | 100 | 240 | 350 | 210 | - | - | 8 |
| AX-REM03K5010-IE | | | | | | | | | |

# OMRON

## Standard connections



## Terminal block specifications

| Terminal | Name | Function (signal level) |
|---|---|---|
| **R/L1, S/L2, T/L3** | Main circuit power supply input | Used to connect line power to the drive.<br>Drives with single-phase 200 V input power use only terminals R/L1 and N (T/L3), terminal S/L2 is not available for these units |
| **U/T1, V/T2, W/T3** | Inverter output | Used to connect the motor |
| **PD/+1, P/+** | External DC reactor terminal | Normally connected by the short-circuit bar. Remove the short-circuit bar between +1 and P/+2 when a DC reactor is connected. |
| **P/+, N/-** | Regenerative braking unit terminal | Connect optional regenerative braking units (If a braking torque is required) |
| **P/+, RB** | Braking resistor terminals | Connect option braking resistor (if a braking torque is required) |
| ⏚ | Grounding | For grounding (Grounding should conform to the local grounding code.) |

## Control circuit

| Type | No. | Signal name | Function | Signal level |
|---|---|---|---|---|
| Digital input signals | PLC | Intelligent input common | Source type: connecting [P24] to [1]-[7] turns inputs ON<br>Sink type: connecting [L] to [1]-[7] turns inputs ON | – |
| | P24 | Internal 24 VDC | 24 VDC, 30mA | 24 VDC, 100 mA |
| | 1 | Multi-function Input selection 1 | Factory setting: Forward/Stop | 27 VDC max |
| | 2 | Multi-function Input selection 2 | Factory setting: Reverse/Stop | |
| | 3/GS1 | Multi-function Input selection 3/safe stop input 1 | Factory setting: External trip | |
| | 4/GS2 | Multi-function Input selection 4/safe stop input 2 | Factory setting: Reset | |
| | 5/PTC | Multi-function Input selection 5/PTC thermistor input | Factory setting: Multi-step speed reference 1 | |
| | 6 | Multi-function input selection 6 | Factory setting: Multi-step speed reference 2 | |
| | 7/EB | Multi-function input selection 7/Pulse train input B | Factory setting: Jog | |
| | L | Multi-function Input selection common (in upper row) | – | – |
| Pulse train | EA | Pulse train input A | Factory setting: Speed reference | 32 kHz max<br>5 to 24 VDC |
| | EO | Pulse train output | LAD frequency | 10 VDC 2 mA<br>32 kHz max |
| Analog input signal | H | Frequency reference power supply | 10 VDC 10 mA max | |
| | O | Voltage frequency reference signal | 0 to 10 VDC (10 kΩ) | |
| | OI | Current frequency reference signal | 4 to 20 mA (250 Ω) | |
| | L | Frequency reference common (bottom row) | – | – |
| Digital output signals | 11/EDM | Discrete logic output 1/EDM output | Factory setting: During Run | 27 VDC, 50 mA max<br>EDM based on<br>ISO13849-1 |
| | 12 | Discrete logic output 2 | Factory setting: Frequency arrival type 1 | |
| | CM2 | GND logic output | – | |
| | AL0 | Relay commom contact | Factory setting: Alarm signal<br>Under normal operation<br>AL1 - AL0 Closed<br>AL2 - AL0 Open | R load<br>250 VAC 2.5 A<br>30 VDC 3.0 A<br>I load<br>250 VAC 0.2 A<br>30 VDC 0.7 A |
| | AL1 | Relay contact, normally open | | |
| | AL2 | Relay contact, normally closed | | |
| Monitor signal | AM | Analog voltage output | Factory setting: LAD frequency | 0 to 10 VDC 1 mA |
| Comms | SP | Serial communication terminal | RS485 Modbus communication | |
| | SN | | | |

## Side by side mounting
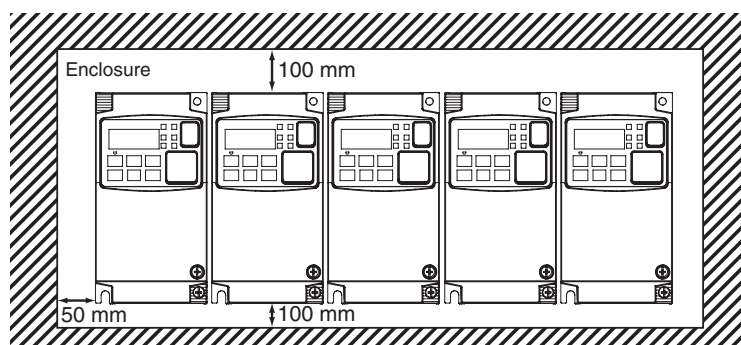


## Inverter heat loss

### Single-phase 200 V class

| Model 3G3MX2 | | AB001 | AB002 | AB004 | AB007 | AB015 | AB022 |
|---|---|---|---|---|---|---|---|
| Inverter capacity kVA | 200V VT | 0.4 | 0.6 | 1.2 | 2.0 | 3.3 | 4.1 |
| | 200V CT | 0.2 | 0.5 | 1.0 | 1.7 | 2.7 | 3.8 |
| | 240V VT | 0.4 | 0.7 | 1.4 | 2.4 | 3.9 | 4.9 |
| | 240V CT | 0.3 | 0.6 | 1.2 | 2.0 | 3.3 | 4.5 |
| Rated current (A) VT | | 1.2 | 1.9 | 3.4 | 6.0 | 9.6 | 12.0 |
| Rated current (A) CT | | 1.0 | 1.6 | 3.0 | 5.0 | 8.0 | 11.0 |
| Total heat loss | | 12 | 22 | 30 | 48 | 79 | 104 |
| Efficiency at rated load | | 89.5 | 90 | 93 | 94 | 95 | 95.5 |
| Cooling method | | Self cooling | | | Forced-air-cooling | | |

# OMRON

## Three-phase 200 V class

| Model 3G3MX2 | | A2001 | A2002 | A2004 | A2007 | A2015 | A2022 | A2037 | A2055 | A2075 | A2110 | A2150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter capacity kVA | 200 VT | 0.4 | 0.6 | 1.2 | 2.0 | 3.3 | 4.1 | 6.7 | 10.3 | 13.8 | 19.3 | 23.9 |
| | 200 CT | 0.2 | 0.5 | 1.0 | 1.7 | 2.7 | 3.8 | 6.0 | 8.6 | 11.4 | 16.2 | 20.7 |
| | 240 VT | 0.4 | 0.7 | 1.4 | 2.4 | 3.9 | 4.9 | 8.1 | 12.4 | 16.6 | 23.2 | 28.6 |
| | 240 CT | 0.3 | 0.6 | 1.2 | 2.0 | 3.3 | 4.5 | 7.2 | 10.3 | 13.7 | 19.5 | 24.9 |
| Rated current (A) VT | | 1.2 | 1.9 | 3.4 | 6.0 | 9.6 | 12.0 | 19.6 | 30.0 | 40.0 | 56.0 | 69.0 |
| Rated current (A) CT | | 1.0 | 1.6 | 3.0 | 5.0 | 8.0 | 11.0 | 17.5 | 25.0 | 33.0 | 47.0 | 60.0 |
| Total heat loss | | 12 | 22 | 30 | 48 | 79 | 104 | 154 | 229 | 313 | 458 | 625 |
| Efficiency at rated load | | 89.5 | 90 | 93 | 94 | 95 | 95.5 | 96 | 96 | 96 | 96 | 96 |
| Cooling method | | Self cooling | | | Forced-air-cooling | | | | | | | |

## Three-phase 400 V class

| Model 3G3MX2 | | A4004 | A4007 | A4015 | A4022 | A4030 | A4040 | A4055 | A4075 | A4110 | A4150 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inverter capacity kVA | 380V VT | 1.3 | 2.6 | 3.5 | 4.5 | 5.7 | 7.3 | 11.5 | 15.1 | 20.4 | 25.0 |
| | 380V CT | 1.1 | 2.2 | 3.1 | 3.6 | 4.7 | 6.0 | 9.7 | 11.8 | 15.7 | 20.4 |
| | 480V VT | 1.7 | 3.4 | 4.4 | 5.7 | 7.3 | 9.2 | 14.5 | 19.1 | 25.7 | 31.5 |
| | 480V CT | 1.4 | 2.8 | 3.9 | 4.5 | 5.9 | 7.6 | 12.3 | 14.9 | 19.9 | 25.7 |
| Rated current (A) VT | | 2.1 | 4.1 | 5.4 | 6.9 | 8.8 | 11.1 | 17.5 | 23.0 | 31.0 | 38.0 |
| Rated current (A) CT | | 1.8 | 3.4 | 4.8 | 5.5 | 7.2 | 9.2 | 14.8 | 18.0 | 24.0 | 31.0 |
| Total heat loss | | 35 | 56 | 96 | 116 | 125 | 167 | 229 | 296 | 411 | 528 |
| Efficiency at rated load | | 92 | 93 | 94 | 95 | 96 | 96 | 96 | 96.2 | 96.4 | 96.6 |
| Cooling method | | Self cooling | | Forced-air-cooling | | | | | | | |

## Input AC reactor
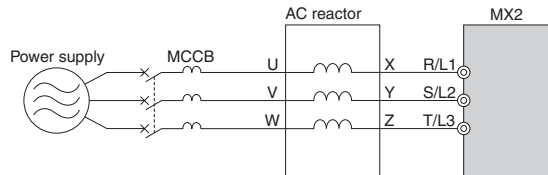


| 1-phase 200 V class | | | | 3-phase 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW | Reference | Current value A | Induc-tance mH | Max. applicable motor output kW | Reference | Current value A | Induc-tance mH | Max. applicable motor output kW | Reference | Current value A | Induc-tance mH |
| 0.4 | AX-RAI02000070-DE | 7.0 | 2.0 | 1.5 | AX-RAI02800080-DE | 8.0 | 2.8 | 1.5 | AX-RAI07700050-DE | 5.0 | 7.7 |
| 0.75 | AX-RAI01700140-DE | 14.0 | 1.7 | 3.7 | AX-RAI00880200-DE | 20.0 | 0.88 | 4.0 | AX-RAI03500100-DE | 10.0 | 3.5 |
| 1.5 | AX-RAI01200200-DE | 20.0 | 1.2 | 7.5 | AX-RAI00350335-DE | 33.5 | 0.35 | 7.5 | AX-RAI01300170-DE | 17.0 | 1.3 |
| 2.2 | AX-RAI00630240-DE | 24.0 | 0.63 | 15 | AX-RAI00180670-DE | 67.0 | 0.18 | 15 | AX-RAI00740335-DE | 33.5 | 0.74 |

## DC reactor
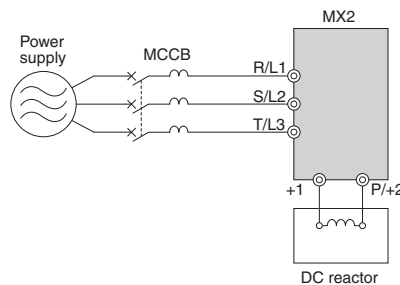


| 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW | Reference | Current value A | Inductance mH | Max. applicable motor output kW | Reference | Current value A | Inductance mH |
| 0.2 | AX-RC21400016-DE | 1.6 | 21.4 | 0.4 | AX-RC43000020-DE | 2.0 | 43.0 |
| 0.4 | AX-RC10700032-DE | 3.2 | 10.7 | 0.7 | AX-RC27000030-DE | 3.0 | 27.0 |
| 0.7 | AX-RC06750061-DE | 6.1 | 6.75 | 1.5 | AX-RC14000047-DE | 4.7 | 14.0 |
| 1.5 | AX-RC03510093-DE | 9.3 | 3.51 | 2.2 | AX-RC10100069-DE | 6.9 | 10.1 |
| 2.2 | AX-RC02510138-DE | 13.8 | 2.51 | 3.0 | AX-RC08250093-DE | 9.3 | 8.25 |
| 3.7 | AX-RC01600223-DE | 22.3 | 1.60 | 4.0 | AX-RC06400116-DE | 11.6 | 6.40 |
| 5.5 | AX-RC01110309-DE | 30.9 | 1.11 | 5.5 | AX-RC04410167-DE | 16.7 | 4.41 |
| 7.5 | AX-RC00840437-DE | 43.7 | 0.84 | 7.5 | AX-RC03350219-DE | 21.9 | 3.35 |
| 11.0 | AX-RC00590614-DE | 61.4 | 0.59 | 11.0 | AX-RC02330307-DE | 30.7 | 2.33 |
| 15.0 | AX-RC00440859-DE | 85.9 | 0.44 | 15.0 | AX-RC01750430-DE | 43.0 | 1.75 |

## Output AC reactor

| 200 V class | | | | 400 V class | | | |
|---|---|---|---|---|---|---|---|
| Max. applicable motor output kW | Reference | Current value A | Inductance mH | Max. applicable motor output kW | Reference | Current value A | Inductance mH |
| 0.4 | AX-RAO11500026-DE | 2.6 | 11.50 | 1.5 | AX-RAO16300038-DE | 3.8 | 16.30 |
| 0.75 | AX-RAO07600042-DE | 4.2 | 7.60 | | | | |
| 1.5 | AX-RAO04100075-DE | 7.5 | 4.10 | | | | |
| 2.2 | AX-RAO03000105-DE | 10.5 | 3.00 | 2.2 | AX-RAO11800053-DE | 5.3 | 11.80 |
| 3.7 | AX-RAO01830160-DE | 16.0 | 1.83 | 4.0 | AX-RAO07300080-DE | 8.0 | 7.30 |
| 5.5 | AX-RAO01150220-DE | 22.0 | 1.15 | 5.5 | AX-RAO04600110-DE | 11.0 | 4.60 |
| 7.5 | AX-RAO00950320-DE | 32.0 | 0.95 | 7.5 | AX-RAO03600160-DE | 16.0 | 3.60 |
| 11 | AX-RAO00630430-DE | 43.0 | 0.63 | 11 | AX-RAO02500220-DE | 22.0 | 2.50 |
| 15 | AX-RAO00490640-DE | 64.0 | 0.49 | 15 | AX-RAO02000320-DE | 32.0 | 2.00 |

## Ordering information
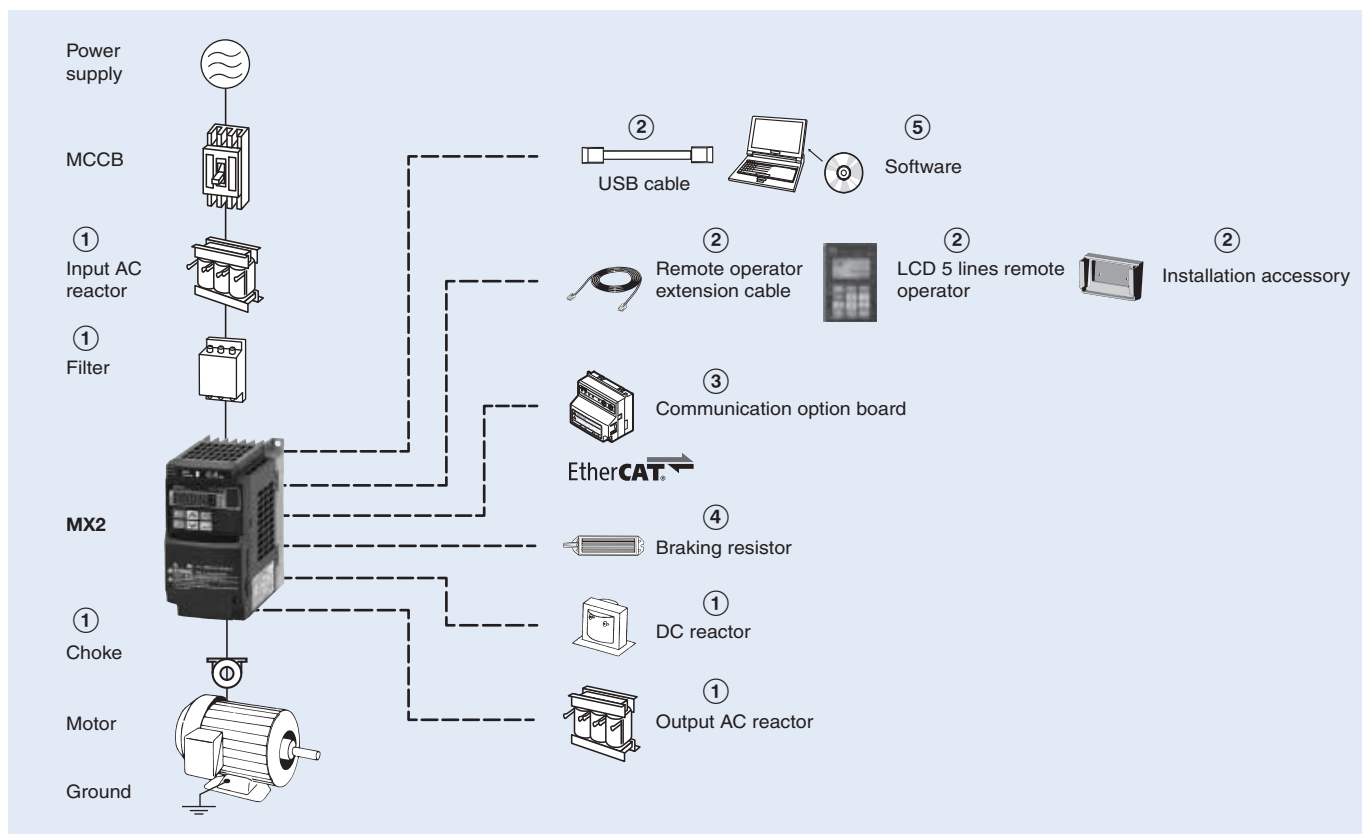


### 3G3MX2

| Specifications | | | | Model | | |
|---|---|---|---|---|---|---|
| Voltage class | Constant torque | | Variable torque | | Standard (IP20) | Finless | IP54 |
| | Max motor kW | Rated current A | Max motor kW | Rated current A | | | |

| Voltage class | Max motor kW | Rated current A | Max motor kW | Rated current A | Standard (IP20) | Finless | IP54 |
|---|---|---|---|---|---|---|---|
| Single-phase 200 V | 0.1 | 1.0 | 0.2 | 1.2 | 3G3MX2-AB001-E | 3G3MX2-AB001-P-E | 3G3MX2-DB001-E/EC |
| | 0.2 | 1.6 | 0.4 | 1.9 | 3G3MX2-AB002-E | 3G3MX2-AB002-P-E | 3G3MX2-DB002-E/EC |
| | 0.4 | 3.0 | 0.55 | 3.5 | 3G3MX2-AB004-E | 3G3MX2-AB004-P-E | 3G3MX2-DB004-E/EC |
| | 0.75 | 5.0 | 1.1 | 6.0 | 3G3MX2-AB007-E | 3G3MX2-AB007-P-E | 3G3MX2-DB007-EC |
| | 1.5 | 8.0 | 2.2 | 9.6 | 3G3MX2-AB015-E | 3G3MX2-AB015-P-E | 3G3MX2-DB015-EC |
| | 2.2 | 11.0 | 3.0 | 12.0 | 3G3MX2-AB022-E | 3G3MX2-AB022-P-E | 3G3MX2-DB022-EC |
| Three-phase 200 V | 0.1 | 1.0 | 0.2 | 1.2 | 3G3MX2-A2001-E | 3G3MX2-A2001-P-E | 3G3MX2-D2001-E/EC |
| | 0.2 | 1.6 | 0.4 | 1.9 | 3G3MX2-A2002-E | 3G3MX2-A2002-P-E | 3G3MX2-D2002-E/EC |
| | 0.4 | 3.0 | 0.55 | 3.5 | 3G3MX2-A2004-E | 3G3MX2-A2004-P-E | 3G3MX2-D2004-E/EC |
| | 0.75 | 5.0 | 1.1 | 6.0 | 3G3MX2-A2007-E | 3G3MX2-A2007-P-E | 3G3MX2-D2007-E/EC |
| | 1.5 | 8.0 | 2.2 | 9.6 | 3G3MX2-A2015-E | 3G3MX2-A2015-P-E | 3G3MX2-D2015-EC |
| | 2.2 | 11.0 | 3.0 | 12.0 | 3G3MX2-A2022-E | 3G3MX2-A2022-P-E | 3G3MX2-D2022-EC |
| | 3.7 | 17.5 | 5.5 | 19.6 | 3G3MX2-A2037-E | 3G3MX2-A2037-P-E | 3G3MX2-D2037-EC |
| | 5.5 | 25.0 | 7.5 | 30.0 | 3G3MX2-A2055-E | - | 3G3MX2-D2055-EC |
| | 7.5 | 33.0 | 11 | 40.0 | 3G3MX2-A2075-E | - | 3G3MX2-D2075-EC |
| | 11 | 47.0 | 15 | 56.0 | 3G3MX2-A2110-E | - | 3G3MX2-D2110-EC |
| | 15 | 60.0 | 18.5 | 69.0 | 3G3MX2-A2150-E | - | 3G3MX2-D2150-EC |
| Three-phase 400 V | 0.4 | 1.8 | 0.75 | 2.1 | 3G3MX2-A4004-E | 3G3MX2-A4004-P-E | 3G3MX2-D4004-EC |
| | 0.75 | 3.4 | 1.5 | 4.1 | 3G3MX2-A4007-E | 3G3MX2-A4007-P-E | 3G3MX2-D4007-EC |
| | 1.5 | 4.8 | 2.2 | 5.4 | 3G3MX2-A4015-E | 3G3MX2-A4015-P-E | 3G3MX2-D4015-EC |
| | 2.2 | 5.5 | 3.0 | 6.9 | 3G3MX2-A4022-E | 3G3MX2-A4022-P-E | 3G3MX2-D4022-EC |
| | 3.0 | 7.2 | 4.0 | 8.8 | 3G3MX2-A4030-E | 3G3MX2-A4030-P-E | 3G3MX2-D4030-EC |
| | 4.0 | 9.2 | 5.5 | 11.1 | 3G3MX2-A4040-E | 3G3MX2-A4040-P-E | 3G3MX2-D4040-EC |
| | 5.5 | 14.8 | 7.5 | 17.5 | 3G3MX2-A4055-E | - | 3G3MX2-D4055-EC |
| | 7.5 | 18.0 | 11 | 23.0 | 3G3MX2-A4075-E | - | 3G3MX2-D4075-EC |
| | 11 | 24.0 | 15 | 31.0 | 3G3MX2-A4110-E | - | 3G3MX2-D4110-EC |
| | 15 | 31.0 | 18.5 | 38.0 | 3G3MX2-A4150-E | - | 3G3MX2-D4150-EC |

# OMRON

## ① Line filters

| Inverter | | Standard line filter | | | | Low leakage line filter | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Rasmi | | Schaffner | | Rasmi | | Schaffner | |
| Voltage | Model 3G3MX2-□ | Reference AX-FIM | Current (A) | Reference AX-FIM | Current (A) | Reference AX-FIM | Current (A) | Reference AX-FIM | Current (A) |
| 1Phase 200 VAC | AB001 / AB002 / AB004 | 1010-RE | 10 | 1010-SE-V1 | 8 | 1010-RE-LL | 10 | 1010-SE-LL | 10 |
| | AB007 | 1014-RE | 14 | 1014-SE-V1 | 14 | 1014-RE-LL | 14 | 1014-SE-LL | 14 |
| | AB015 / AB022 | 1024-RE | 24 | 1024-SE-V1 | 27 | 1024-RE-LL | 24 | 1024-SE-LL | 24 |
| 3Phase 200 VAC | A2001 / A2002 / A2004 / A2007 | 2010-RE | 10 | 2010-SE-V1 | 7.8 | 2010-RE-LL | 10 | - | - |
| | A2015 / A2022 | 2020-RE | 20 | 2020-SE-V1 | 16 | 2020-RE-LL | 20 | 2020-SE-LL | 20 |
| | A2037 | 2030-RE | 30 | 2030-SE-V1 | 25 | 2030-RE-LL | 30 | 2030-SE-LL | 30 |
| | A2055 / A2075 | 2060-RE | 60 | 2060-SE-V1 | 50 | 2060-RE-LL | 60 | 2060-SE-LL | 50 |
| | A2110 | 2080-RE | 80 | 2080-SE-V1 | 70 | 2080-RE-LL | 80 | - | - |
| | A2150 | 2100-RE | 100 | 2100-SE-V1 | 75 | 2100-RE-LL | 100 | - | - |
| 3Phase 400 VAC | A4004 / A4007 | 3005-RE | 5 | 3005-SE-V1 | 6 | 3005-RE-LL | 5 | 3005-SE-LL | 5 |
| | A4015 / A4022 / A4030 | 3010-RE | 10 | 3010-SE-V1 | 12 | 3010-RE-LL | 10 | 3010-SE-LL | 10 |
| | A4040 | 3014-RE | 14 | 3014-SE-V1 | 15 | 3014-RE-LL | 14 | 3014-SE-LL | 15 |
| | A4055 / A4075 | 3030-RE | 30 | 3030-SE-V1 | 29 | 3030-RE-LL | 30 | 3030-SE-LL | 30 |
| | A4110 / A4150 | 3050-RE | 50 | 3050-SE-V1 | 48 | 3050-RE-LL | 50 | 3050-SE-LL | 50 |

## ① Input AC reactors

| Inverter | | AC Reactor |
|---|---|---|
| Voltage | Model 3G3MX2-□ | Reference |
| 1-Phase 200 VAC | AB002 / AB004 | AX-RAI02000070-DE |
| | AB007 | AX-RAI01700140-DE |
| | AB015 | AX-RAI01200200-DE |
| | AB022 | AX-RAI00630240-DE |
| 3-Phase 200 VAC | A2002 / A2004 / A2007 | AX-RAI02800080-DE |
| | A2015 / A2022 / A2037 | AX-RAI00880200-DE |
| | A2055 / A2075 | AX-RAI00350335-DE |
| | A2110 / A2150 | AX-RAI00180670-DE |
| 3-Phase 400 VAC | A4004 / A4007 / A4015 | AX-RAI07700050-DE |
| | A4022 / A4030 / A4040 | AX-RAI03500100-DE |
| | A4055 / A4075 | AX-RAI01300170-DE |
| | A4110 / A4150 | AX-RAI00740335-DE |

## ① DC reactors

| 200V 1-phase | | 200V 3-phase | | 400V 3-phase | |
|---|---|---|---|---|---|
| Inverter | DC Reactor | Inverter | DC Reactor | Inverter | DC Reactor |
| 3G3MX2-AB001 | AX-RC10700032-DE | 3G3MX2-A2001 | AX-RC21400016-DE | 3G3MX2-A4004 | AX-RC43000020-DE |
| 3G3MX2-AB002 | | 3G3MX2-A2002 | | 3G3MX2-A4007 | AX-RC27000030-DE |
| 3G3MX2-AB004 | AX-RC06750061-DE | 3G3MX2-A2004 | AX-RC10700032-DE | 3G3MX2-A4015 | AX-RC14000047-DE |
| 3G3MX2-AB007 | AX-RC03510093-DE | 3G3MX2-A2007 | AX-RC06750061-DE | 3G3MX2-A4022 | AX-RC10100069-DE |
| 3G3MX2-AB015 | AX-RC02510138-DE | 3G3MX2-A2015 | AX-RC03510093-DE | 3G3MX2-A4030 | AX-RC08250093-DE |
| 3G3MX2-AB022 | AX-RC01600223-DE | 3G3MX2-A2022 | AX-RC02510138-DE | 3G3MX2-A4040 | AX-RC06400116-DE |
| | | 3G3MX2-A2037 | AX-RC01600223-DE | 3G3MX2-A4055 | AX-RC04410167-DE |
| | | 3G3MX2-A2055 | AX-RC01110309-DE | 3G3MX2-A4075 | AX-RC03350219-DE |
| – | | 3G3MX2-A2075 | AX-RC00840437-DE | 3G3MX2-A4110 | AX-RC02330307-DE |
| | | 3G3MX2-A2110 | AX-RC00590614-DE | 3G3MX2-A4150 | AX-RC01750430-DE |
| | | 3G3MX2-A2150 | AX-RC00440859-DE | – | |

## ① Chokes

| Model | Diameter | Description |
|---|---|---|
| AX-FER2102-RE | 21 | For 2.2 KW motors or below |
| AX-FER2515-RE | 25 | For 15 KW motors or below |
| AX-FER5045-RE | 50 | For 45 KW motors or below |

## ① Output AC reactor

| Inverter | | AC Reactor |
|---|---|---|
| Voltage | Model 3G3MX2-□ | Reference |
| 200 VAC | AB001 / AB002 / AB004 A2001 / A2002 / A2004 | AX-RAO11500026-DE |
| | AB007 / A2007 | AX-RAO07600042-DE |
| | AB015 / A2015 | AX-RAO04100075-DE |
| | AB022 / A2022 | AX-RAO03000105-DE |
| | A2037 | AX-RAO01830160-DE |
| | A2055 | AX-RAO01150220-DE |
| | A2075 | AX-RAO00950320-DE |
| | A2110 | AX-RAO00630430-DE |
| | A2150 | AX-RAO00490640-DE |
| 400 VAC | A4004 / A4007 / A4015 | AX-RAO16300038-DE |
| | A4022 | AX-RAO11800053-DE |
| | A4030 / A4040 | AX-RAO07300080-DE |
| | A4055 | AX-RAO04600110-DE |
| | A4075 | AX-RAO03600160-DE |
| | A4110 | AX-RAO02500220-DE |
| | A4150 | AX-RAO02000320-DE |

## ② Accessories

| Types | Model | Description | Functions |
|---|---|---|---|
| Digital operator | AX-OP05-E | LCD remote operator | 5 Line LCD remote operator with copy function, cable length max. 3m. |
| | 3G3AX-CAJOP300-EE | Remote operator cable | 3 meters cable for connecting remote operator |
| | 3G3AX-OP01 | LED remote operator | LED remote operator, cable length max. 3m |
| | 4X-KITMINI | Mounting kit for LED operator | Mounting kit for LED operator on panel |
| | 3G3AX-OP05-H-E | Operator holder | Holder to put the AX-OP05-E inside of the cabinet |
| Accessories | AX-CUSBM002-E | PC configuration cable | Mini USB to USB connector cable |

## ③ Communication option boards

| Model | Description | Functions |
|---|---|---|
| 3G3AX-MX2-ECT | EtherCAT option card | Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through communications with the host controller. |

## ④ Braking unit, braking resistor unit

| Inverter | | | | | Braking resistor unit | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | Max. motor kW | Inverter 3G3MX2□ | | Connectable min. resistance Ω | Inverter mounted type (3% ED, 10 sec max) | | Braking torque % | Inverter mounted type (10% ED, 10 sec max) | | Braking torque % |
| | | 1-phase | 3-phase | | Type AX- | Resist Ω | | Type AX- | Resist Ω | |
| 200 V (Single-/Three-phase) | 0.12 | B001 | 2001 | 100 | REM00K1400-IE | 400 | 200 | REM00K1400-IE | 400 | 200 |
| | 0.25 | B002 | 2002 | | | | 180 | | | 180 |
| | 0.55 | B004 | 2004 | | REM00K1200-IE | 200 | 180 | REM00K1200-IE | 200 | 180 |
| | 1.1 | B007 | 2007 | 50 | | | 100 | REM00K2070-IE | 70 | 200 |
| | 1.5 | B015 | 2015 | | REM00K2070-IE | 70 | 140 | REM00K4075-IE | 75 | 130 |
| | 2.2 | B022 | 2022 | 35 | | | 90 | REM00K4035-IE | 35 | 180 |
| | 4.0 | – | 2040 | | REM00K4075-IE | 75 | 50 | REM00K6035-IE | 35 | 100 |
| | 5.5 | – | 2055 | 20 | REM00K4035-IE | 35 | 75 | REM00K9020-IE | 20 | 150 |
| | 7.5 | – | 2075 | 17 | | | 55 | REM01K9017-IE | 17 | 110 |
| | 11 | – | 2110 | | REM00K6035-IE | 35 | 40 | REM02K1017-IE | 17 | 75 |
| | 15 | – | 2150 | 10 | REM00K9017-IE | 17 | 55 | REM03K5010-IE | 10 | 95 |
| 400 V (Three-phase) | 0.55 | – | 4004 | 180 | REM00K1400-IE | 400 | 200 | REM00K1400-IE | 400 | 200 |
| | 1.1 | – | 4007 | | | | 200 | | | 200 |
| | 1.5 | – | 4015 | | REM00K1200-IE | 200 | 190 | REM00K2200-IE | 200 | 190 |
| | 2.2 | – | 4022 | 100 | REM00K2200-IE | 200 | 130 | REM00K5120-IE | 120 | 200 |
| | 3.0 | – | 4030 | | REM00K2120-IE | 120 | 160 | | | 160 |
| | 4.0 | – | 4040 | | | | 120 | REM00K6100-IE | 100 | 140 |
| | 5.5 | – | 4055 | 70 | REM00K4075-IE | 75 | 140 | REM00K9070-IE | 70 | 150 |
| | 7.5 | – | 4075 | | | | 100 | REM01K9070-IE | 70 | 110 |
| | 11 | – | 4110 | | REM00K6100-IE | 100 | 50 | REM02K1070-IE | 70 | 75 |
| | 15 | – | 4150 | 35 | REM00K9070-IE | 70 | 55 | REM03K5035-IE | 35 | 110 |

# OMRON

## ⑤ Computer software

| Types | Model | Description | Specification |
|---|---|---|---|
| Software | CX-Drive | Computer software | Configuration and monitoring software tool |
| | CX-One | Computer software | Configuration and monitoring software tool |
| | €Saver | Computer software | Software tool for Energy Saving calculation |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

# FH series

# Vision system



## Flexible solution for machine vision

The FH vision systems are specifically intended for seamless integration with PLC's, motion controllers and robotic control systems increasing the overall machine performance.

- Powerful 4-core i7 parallel processor
- Fast EtherCAT communications
- The new Shape Search III processing item enables fast, precise and stable measurements
- 24 types of camera with up to 12 Mpixel
- Over 100 processing items including 1D code, 2D code and OCR
- Easy integration into an machine monitor with .NET user interface controls

## System configuration



Sysmac
always in control

Sysmac Studio

FZ5 sensor controller

Ethernet

Industrial switching hubs

NJ series
Machine automation controller

EtherCAT.

FH sensor controller

Accurax G5 servo drive

MX2 inverter

NX series I/O

Cameras

Accurax G5 servo motor

# OMRON
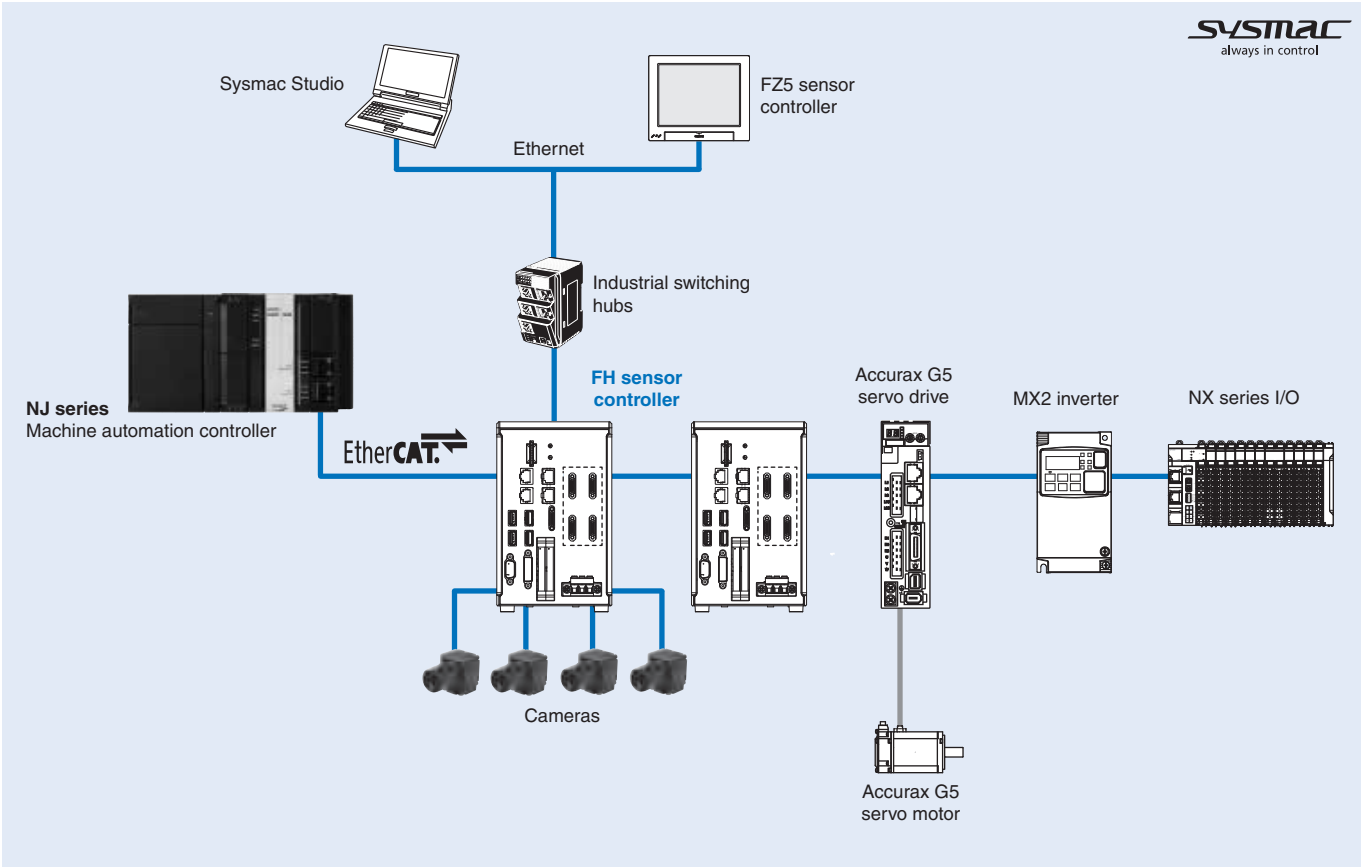
## Specifications

### FH sensor controller specifications

| Type | | | High-speed controllers (4 core) | | | Standard controllers (2 core) | | |
|---|---|---|---|---|---|---|---|---|
| Model | | NPN | FH-3050 | FH-3050-10 | FH-3050-20 | FH-1050 | FH-1050-10 | FH-1050-20 |
| | | PNP | | | | | | |
| Main functions | Controller type | | Box-type controllers | | | | | |
| | High-grade processing items | | No | | | | | |
| | No. of cameras | | 2 | 4 | 8 | 2 | 4 | 8 |
| | Processing resolution | Connected to a 300,000-pixel camera | 640 (H) x 480 (V) | | | | | |
| | | Connected to a 2 million-pixel camera | 2040 (H) x 1088 (V) | | | | | |
| | | Connected to a 4 million-pixel camera | 2040 (H) x 2048 (V) | | | | | |
| | | Connected to a 12 million-pixel camera | 4084 (H) x 3072 (V) | | | | | |
| | No. of scenes | | 128 | | | | | |
| | Number of logged images[1] | Connected to a intelligent compact camera | Connected to 1 camera (color): 232, Connected to 2 camera (color): 116 Connected to 3 camera (color): 77, Connected to 4 camera (color): 58 Connected to 5 camera (color): 46, Connected to 6 camera (color): 38 Connected to 7 camera (color): 33, Connected to 8 camera (color): 29 | | | | | |
| | | Connected to a 300,000-pixel camera | Connected to 1 camera (color): 270, Connected to 1 camera (monochrome): 272 Connected to 2 camera (color): 135, Connected to 2 camera (monochrome): 136 Connected to 3 camera (color/monochrome): 90 Connected to 4 camera (color): 67, Connected to 4 camera (monochrome): 68 Connected to 5 camera (color/monochrome): 54 Connected to 6 camera (color/monochrome): 45 Connected to 7 camera (color/monochrome): 38 Connected to 8 camera (color): 33, Connected to 8 camera (monochrome): 34 | | | | | |
| | | Connected to a 2 million-pixel camera | Connected to 1 camera (color/monochrome): 37, Connected to 2 camera (color/monochrome): 18 Connected to 3 camera (color/monochrome): 12, Connected to 4 camera (color/monochrome): 9 Connected to 5 camera (color/monochrome): 7, Connected to 6 camera (color/monochrome): 6 Connected to 7 camera (color/monochrome): 5, Connected to 8 camera (color/monochrome): 4 | | | | | |
| | | Connected to a 4 million-pixel camera | Connected to 1 camera (color/monochrome): 20, Connected to 2 camera (color/monochrome): 10 Connected to 3 camera (color/monochrome): 6, Connected to 4 camera (color/monochrome): 5 Connected to 5 camera (color/monochrome): 4, Connected to 6 camera (color/monochrome): 3 Connected to 7 camera (color/monochrome): 2, Connected to 8 camera (color/monochrome): 2 | | | | | |
| | | Connected to a 12 million-pixel camera | Connected to 1 camera (color/monochrome): 6, Connected to 2 camera (color/monochrome): 3 Connected to 3 camera (color/monochrome): 2, Connected to 4 camera (color/monochrome): 2 | | | | | |
| | Operation | | Mouse or similar device | | | | | |
| | Settings | | Create series of processing steps by editing the flowchart (help messages provided) | | | | | |
| External interface | Serial communications | | RS-232C: 1 CH | | | | | |
| | Ethernet communications | | No protocol (TCP/UDP) 1000BASE-T | | | | | |
| | | | 1 port | 2 port | 2 port | 1 port | 2 port | 2 port |
| | EtherNet/IP communications | | Ethernet port baud rate: 1 Gbps (1000BASE-T) | | | | | |
| | EtherCAT communications | | EtherCAT protocol (100BASE-TX) | | | | | |
| | Parallel I/O | | (In the 2-line random trigger mode) 17 inputs (STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DSA0 to 1, DI0 to 7, DI_LINE0) 37 outputs (RUN0 to 1, READY 0 to 1, BUSY0 to 1, OR0 to 1, ERROR0 to 1, GATE0 to 1, STGOUT0/SHTOUT0, STGOUT1/SHTOUT1, STGOUT2 to 7, DO0 to 15, ACK) (In the 5-line to 8-line random trigger mode) 19 inputs (STEP0 to 7, DI_LINE0 to 2, DI0 to 7) 34 outputs (READY0 to 7, BUSY0 to 7, OR0 to 7, ACK, ERROR, STGOUT/SHTOUT0 to 7) | | | | | |
| | Encoder interface | | RS422-A line driver level Phase A/B: single-phase 4 MHz (multiplying phase difference of 1MHz by 4 times) Phase Z: 1 MHz | | | | | |
| | Monitor interface | | DVI-I output IF x 1ch | | | | | |
| | USB interface | | 4 channels (supports USB 1.1 and 2.0) | | | | | |
| | SD card interface | | SDHC card of Class 4 or higher rating is recommended | | | | | |
| Ratings | Power supply voltage | | 20.4 to 26.4 VDC | | | | | |
| | Current consumption (at 24 VDC)[2] | Connected to a intelligent compact camera — 2 cameras | 5.0 A max. | 5.4 A max. | 6.4 A max. | 4.7 A max. | 5.0 A max. | 5.9 A max. |
| | | 4 cameras | - | 7.0 A max. | 8.1 A max. | - | 6.5 A max. | 7.5 A max. |
| | | 8 cameras | - | - | 11.5 A max. | - | - | 10.9 A max. |
| | | Connected to a 300,000-pixel camera, 2/4/5/12 million-pixel camera — 2 cameras | 4.1 A max. | 4.2 A max. | 5.2 A max. | 3.6 A max. | 3.7 A max. | 4.5 A max. |
| | | 4 cameras | - | 4.8 A max. | 5.6 A max. | - | 4.3 A max. | 5.0 A max. |
| | | 8 cameras | - | - | 6.8 A max. | - | - | 6.2 A max. |
| | Insulation resistance | | Between DC power supply and controller FG: 20 MΩ or higher (rated voltage 250 V) | | | | | |
| Operation environment | Noise immunity | Fast transient burst — DC power supply | Direct infusion: 2 KV, Pulse rising: 5 ns, Pulse width: 50 ns Burst continuation time: 15 ms/0.75 ms, Period: 300 ms, Application time: 1 min | | | | | |
| | | I/O line | Cramp: 1 KV, Pulse rising: 5 ns, Pulse width: 50 ns Burst continuation time: 15 ms/0.75 ms, Period: 300 ms, Application time: 1 min | | | | | |
| | Ambient temperature range | | Operating: 0 to 50ºC Storage: -20 to 65ºC (with no icing or condensation) | | | | | |
| | Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | | | | | |
| | Ambient atmosphere | | No corrosive gases | | | | | |
| | Grounding | | Type D grounding (100Ω or less grounding resistance) Conventional type 3 grounding | | | | | |
| | Degree of protection | | IEC60529 IP20 | | | | | |

| Type | | | High-speed controllers (4 core) | | | Standard controllers (2 core) | | |
|---|---|---|---|---|---|---|---|---|
| Model | | NPN | FH-3050 | FH-3050-10 | FH-3050-20 | FH-1050 | FH-1050-10 | FH-1050-20 |
| | | PNP | | | | | | |
| Dimen-sions | Dimensions | | 190 x 115 x 182.5 mm | | | | | |
| | Weight | | Approx. 3.2 kg | Approx. 3.4 kg | Approx. 3.4 kg | Approx. 3.2 kg | Approx. 3.4 kg | Approx. 3.4 kg |
| | Case materials | | Cover: zinc-plated steel plate, side plate: aluminium (A6063) | | | | | |
| Accessories | | | Controller (1) / User manual (one Japanese and one English versions) / Instruction installation manual (1) / Power supply terminal block connector (1) / Ferrite core (2, FH-3050 and FH-1050), (4, FH-3050-10 and FH-1050-10), (8, FH-3050-20 and FH-1050-20) | | | | | |

*1. The image logging capacity changes when multiple cameras of different types are connected at the same time.
*2. The current consumption when the maximum number of cameras supported by each controller are connected. If a lighting controller model is connected to a lamp, the current consumption is as high as when an intelligent compact CMOS camera is connected.

## Camera specifications

### High-speed CMOS camera

| Model | FH-SM | FH-SC | FH-SM02 | FH-SC02 | FH-SM04 | FH-SC04 | FH-SM12 | FH-SC12 |
|---|---|---|---|---|---|---|---|---|
| Image elements | 1/3-inch CMOS image elements | | 2/3-inch CMOS image elements | | 1-inch CMOS image elements | | 1.76-inch CMOS image elements | |
| Color/Monochrome | Monochrome | Color | Monochrome | Color | Monochrome | Color | Monochrome | Color |
| Effective pixels | 640 (H) x 480 (V) | | 2040 (H) x 1088 (V) | | 2040 (H) x 2048 (V) | | 4084 (H) x 3072 (V) | |
| Imaging area H x V (opposing corner) | 4.8 x 3.6 (6.0 mm) | | 11.26 x 5.98 (12.76 mm) | | 11.26 x 11.26 (15.93 mm) | | 22.5 x 16.9 (28.14 mm) | |
| Pixel size | 7.4 (μm) x 7.4 (μm) | | 5.5 (μm) x 5.5 (μm) | | 5.5 (μm) x 5.5 (μm) | | 5.5 (μm) x 5.5 (μm) | |
| Electronic shutter function | Shutter speeds can be set from 20 μs to 100 ms | | Shutter speeds can be set from 25 μs to 100 ms | | | | Shutter speeds can be set from 60 μs to 100 ms | |
| Partial function | 1 to 480 lines | 2 to 480 lines | 1 to 1088 lines | 2 to 1088 lines | 1 to 2048 lines | 2 to 2048 lines | 4 to 3072 lines (4-line increments) | |
| Frame rate (image read time) | 308 fps (3.3 ms) | | 219 fps (4.6 ms)*1 | | 118 fps (8.5 ms)*1 | | 38.9 fps (25.7 ms)*1 | |
| Lens mounting | C mount | | | | | | M42 mount | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | | | | | | | |
| Ambient temperature range | Operating: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation) | | | | | | | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | | | | | | |
| Weight | Approx. 105 g | | Approx. 110 g | | | | Approx. 320 g | |
| Accessories | Instruction manual | | | | | | | |

*1. Frame rate in high speed mode when the camera is connected using two camera cables.

### Digital CCD camera

| Model | FZ-S | FZ-SC | FZ-S2M | FZ-SC2M | FZ-S5M2 | FZ-SC5M2 |
|---|---|---|---|---|---|---|
| Image elements | Interline transfer reading all pixels 1/3-inch CCD image elements | | Interline transfer reading all pixels 1/1.8-inch CCD image elements | | Interline transfer reading all pixels 2/3-inch CCD image elements | |
| Color/Monochrome | Monochrome | Color | Monochrome | Color | Monochrome | Color |
| Effective pixels | 640 (H) x 480 (V) | | 1600 (H) x 1200 (V) | | 2448 (H) x 2044 (V) | |
| Imaging area H x V (opposing corner) | 4.8 x 3.6 (6.0 mm) | | 7.1 x 5.4 (8.9 mm) | | 8.4 x 7.1 (11 mm) | |
| Pixel size | 7.4 (μm) x 7.4 (μm) | | 4.4 (μm) x 4.4 (μm) | | 3.45 (μm) x 3.45 (μm) | |
| Electronic shutter function | Select shutter speeds from 20 μs to 100 ms | | | | | |
| Partial function | 12 to 480 lines | | 12 to 1200 lines | | 12 to 2044 lines | |
| Frame rate (image read time) | 80 fps (12.5 ms) | | 30 fps (33.3 ms) | | 16 fps (62.5 ms) | |
| Lens mounting | C mount | | | | | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | | | | | |
| Ambient temperature range | Operating: 0 to 50ºC Storage: -25 to 65ºC (with no icing or condensation) | | Operating: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation) | | | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | | | | |
| Weight | Approx. 55 g | | Approx. 76 g | | Approx. 140 g | |
| Accessories | Instruction manual | | | | | |

### Small digital CCD camera

| Model | FZ-SF | FZ-SFC | FZ-SP | FZ-SPC |
|---|---|---|---|---|
| Image elements | Interline transfer reading all pixels, 1/3-inch CCD image elements | | | |
| Color/Monochrome | Monochrome | Color | Monochrome | Color |
| Effective pixels | 640 (H) x 480 (V) | | | |
| Imaging area H x V (opposing corner) | 4.8 x 3.6 (6.0 mm) | | | |
| Pixel size | 7.4 (μm) x 7.4 (μm) | | | |
| Electronic shutter function | Select shutter speeds from 20 μs to 100 ms | | | |
| Partial function | 12 to 480 lines | | | |
| Frame rate (image read time) | 80 fps (12.5 ms) | | | |
| Lens mounting | Special mount (M10.5 P0.5) | | | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | | | |
| Ambient temperature range | Operating: 0 to 50ºC (camera amp), 0 to 45ºC (camera head) Storage: -25 to 65ºC (with no icing or condensation) | | | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | | |
| Weight | Approx. 150 g | | | |
| Accessories | Instruction manual, installation bracket, four mounting brackets (M2) | | Instruction manual | |

# OMRON

## High-speed CCD camera

| Model | FZ-SH | FZ-SHC |
|---|---|---|
| Image elements | Interline transfer reading all pixels, 1/3-inch CCD image elements | |
| Color/Monochrome | Monochrome | Color |
| Effective pixels | 640 (H) x 480 (V) | |
| Imaging area H x V (opposing corner) | 4.8 x 3.6 (6.0 mm) | |
| Pixel size | 7.4 (μm) x 7.4 (μm) | |
| Electronic shutter function | Select shutter speeds from 1/10 to 1/50,000 s | |
| Partial function | 12 to 480 lines | |
| Frame rate (image read time) | 204 fps (4.9 ms) | |
| Field of vision, installation distance | Selecting a lens according to the field of vision and installation distance | |
| Ambient temperature range | Operating: 0 to 40ºC<br>Storage: -25 to 65ºC (with no icing or condensation) | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | |
| Weight | Approx. 105 g | |
| Accessories | Instruction manual | |

## Intelligent compact CMOS camera

| Model | FZ-SQ010F | FZ-SQ050F | FZ-SQ100F | FZ-SQ100N |
|---|---|---|---|---|
| Image elements | 1/3-inch CMOS image elements | | | |
| Color/Monochrome | Color | | | |
| Effective pixels | 752 (H) x 480 (V) | | | |
| Imaging area H x V (opposing corner) | 4.51 x 2.88 (5.35 mm) | | | |
| Pixel size | 6.0 (μm) x 6.0 (μm) | | | |
| Shutter function | 1/250 to 1/32,258 | | | |
| Partial function | 8 to 480 lines | | | |
| Frame rate (image read time) | 60 fps | | | |
| Field of vision | 7.5 x 4.7 to 13 x 8.2 mm | 13 x 8.2 to 53 x 33 mm | 53 x 33 to 240 x 153 mm | 29 x 18 to 300 x 191 mm |
| Installation distance | 38 to 60 mm | 56 to 215 mm | 220 to 970 mm | 32 to 380 mm |
| LED class[*1][*1] | Risk Group 2 | | | |
| Ambient temperature range | Operating: 0 to 50ºC<br>Storage: -25 to 65ºC | | | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | | |
| Weight | Approx. 150 g | | Approx. 140 g | |
| Accessories | Instruction manual, mounting bracket (FQ-XL), polarizing filter attachment (FQ-XF1) and warning label | | | |

*1. Applicable standards: IEC62471-2.

## LCD monitor specifications

| Model | FZ-M08 |
|---|---|
| Size | 8.4 inches |
| Type | Liquid crystal color TFT |
| Resolution | 1,024 x 768 dots |
| Input signal | Analog RGB video input, 1 channel |
| Power supply voltage | 21.6 to 26.4 VDC |
| Current consumption | Approx. 0.7 A max. |
| Ambient temperature range | Operating: 0 to 50ºC<br>Storage: -25 to 65ºC (with no icing or condensation) |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) |
| Weight | Approx. 1.2 kg |
| Accessories | Instruction sheet and 4 mounting brackets |

## EtherCAT communication specifications

| Item | | Specifications |
|---|---|---|
| Communications standard | | IEC61158 Type 12 |
| Physical layer | | 100BASE-TX (IEEE802.3) |
| Modulation | | Base band |
| Baud rate | | 100 Mbps |
| Topology | | Depends on the specifications of the EtherCAT master |
| Transmission media | | Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum type and braiding) |
| Transmission distance | | Distance between nodes: 100 m or less |
| Node address setting | | 00 to 9 |
| External connection terminals | | RJ45 x 2 (shielded), IN: EtherCAT input data, OUT: EtherCAT output data |
| Send/receive PDO data sizes | Input | 56 to 280 bytes/line (including input data, status and unused areas). Up to 8 lines can be set[*1] |
| | Output | 28 bytes/line (including output data and unused areas). Up to 8 lines can be set[*1] |
| Mailbox data size | Input | 512 bytes |
| | Output | 512 bytes |
| Mailbox | | Emergency messages, SDO requests and SDO information |
| Refreshing methods | | I/O-synchronized refreshing (DC) |

*1. This depends on the upper limit of the master.

## Nomenclature

**FH sensor controller (4 camera type)**
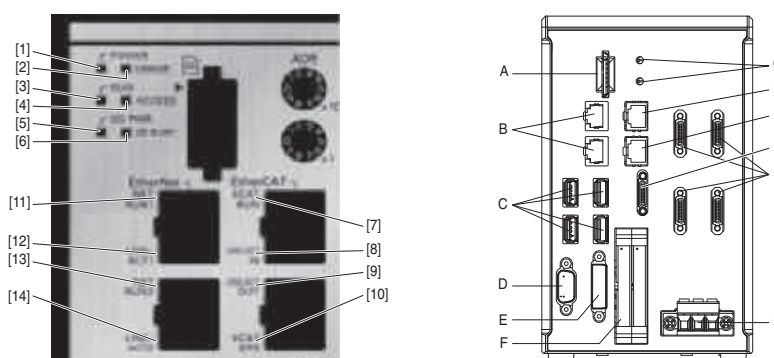


| | Name | Description |
|---|---|---|
| [1] | POWER LED | Lit while power is ON |
| [2] | ERROR LED | Lit when an error has occurred |
| [3] | RUN LED | Lit while the controller is in measurement mode |
| [4] | ACCESS LED | Lit while the memory is accessed |
| [5] | SD POWER LED | Lit while the power is supplied to the SD card and the card is usable |
| [6] | SD BUSY LED | Blinks while the SD memory card is accessed |
| [7] | EtherCAT RUN LED | Lit while EtherCAT communications are usable |
| [8] | EtherCAT LINK/ACT IN LED | Lit when connected with an EtherCAT device, and blinks while performing communications |
| [9] | EtherCAT LINK/ACT OUT LED | Lit when connected with an EtherCAT device, and blinks while performing communications |
| [10] | EtherCAT ERR LED | Lit when EtherCAT communications have become abnormal |
| [11] | EtherNet NET RUN1 LED | Lit while EtherNet communications are usable |
| [12] | EtherNet NET LINK/ACK1 LED | Lit when connected with an EtherNet device, and blinks while performing communications |
| [13] | EtherNet NET RUN2 LED | Lit when EtherNet communications are usable |
| [14] | EtherNet NET LINK/ACK2 LED | Lit when connected with an EtherNet device, and blinks while performing communications |

| | Name | Description |
|---|---|---|
| A | SD memory card installation connector | Install the SD memory card. Do not plug or unplug the SD card during measurement operation Otherwise measurement time may be affected or data may be destroyed |
| B | EtherNet connector | Connect an EtherNet device |
| C | USB connector | Connect a USB device. Do not plug or unplug it during measurement operation Otherwise measurement time may be affected or data may be destroyed |
| D | RS-232C connector | Connect an external device such as programmable controller |
| E | DVI-I connector | Connect a monitor |
| F | I/O connector (control lines, data lines) | Connect the controller to external devices such as a sync sensor and PLC |
| G | EtherCAT address setup volume | Used to set a node address (00 to 99) as an EtherCAT communication device |
| H | EtherCAT communication connector (IN) | Connect the opposed EtherCAT device |
| I | EtherCAT communication connector (OUT) | Connect the opposed EtherCAT device |
| J | Encoder connector | Connect an encoder |
| K | Camera connector | Connect cameras |
| L | Power supply terminal connector | Connect a DC power supply. Wire the controller independently on other devices. Wire the ground line Be sure to ground the controller alone. Perform wiring using the attached power supply connector |

# OMRON

## Dimensions

### FH sensor controller



Four, M4 mounting holes with a depth of 4.5 mm

141
24
143
19.5

The 2-camera type has only one Ethernet connector

The 2-camera type has only two camera connectors, and the 8-camera type has eight camera connectors

Four, M4 mounting holes with a depth of 4.5 mm

190
141
24
19.2
143
20.1
182.5

Four, M3 mounting holes with a depth of 4.5 mm

38.1
66.2
94
26.7
148.5
10.5
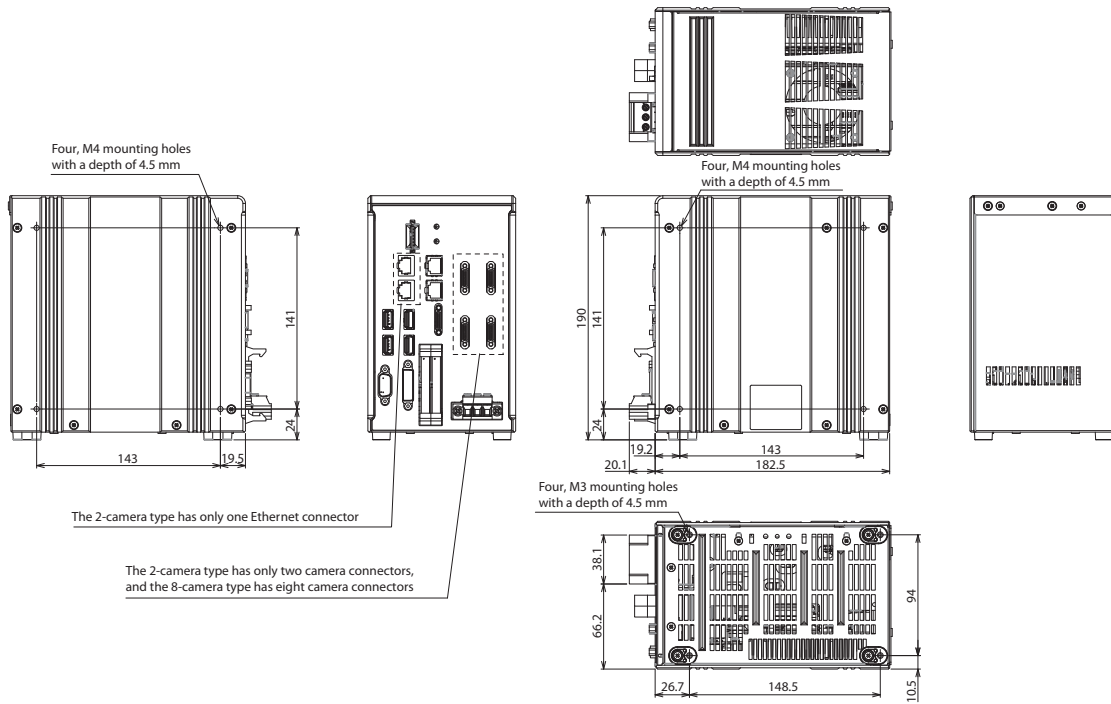
### Camera

### High-speed CMOS camera

**300,000-pixel camera**

FH-SC
FH-SM

12  22.7
25
16.8

Four, M4 mounting holes with a depth of 4.0 mm

40
30
40
7
34

Four, M4 mounting holes with a depth of 4.0 mm

38
12  22.7  8.2
7
32 dia.
25
16.8
27
11.1

Four, M4 mounting holes with a depth of 4.0 mm

1"-32UNF
(C MOUNT)

(20)
(7.4)

13  19
9.5

Two, M4 mounting holes with a depth of 5.5 mm

1/4" 20UNC with a depth of 5.5 mm
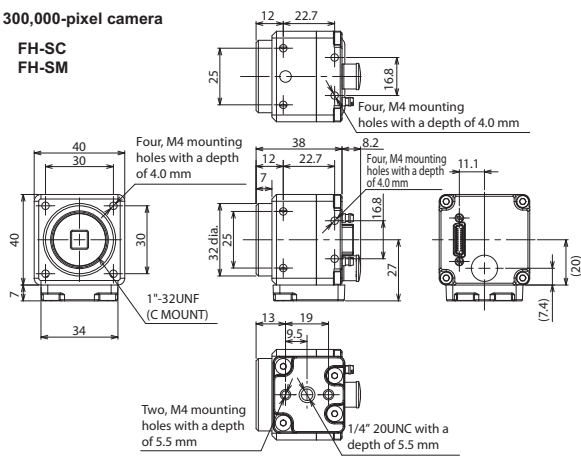
**2 million-pixel camera**

FH-SC02
FH-SM02

**4 million-pixel camera**

FH-SC04
FH-SM04

14.5  22.7
25
16.8

Four, M4 mounting holes with a depth of 4.0 mm

40
30
40
7
34

Four, M4 mounting holes with a depth of 4.0 mm

1"-32UNF
(C MOUNT)

40.5
14.5  22.7  (8.2)
9.5
32 dia.
25
16.8
27
22.2

Four, M4 mounting holes with a depth of 4.0 mm

(20)
(7.4)

15.5  19
9.5

Two, M4 mounting holes with a depth of 5.5 mm

1/4" 20UNC with a depth of 5.5 mm
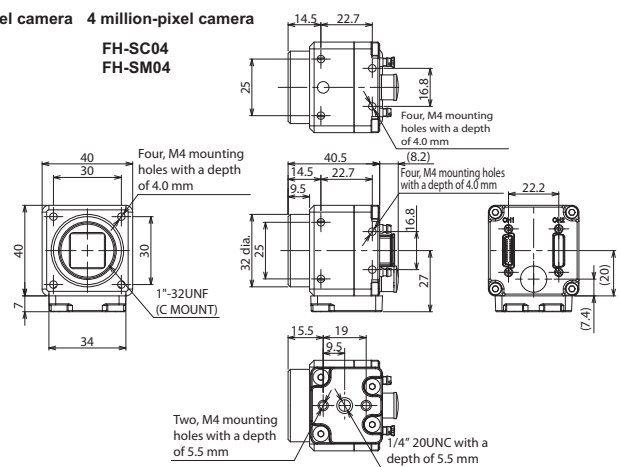
**12 million-pixel camera**

FH-SC12
FH-SM12

Four, M4 mounting holes with a depth of 5.0 mm (For Fmount adapter)

Four, M4 mounting holes with a depth of 5.0 mm

M42 x P1.0 holes with a depth of 6.5 mm (M42 MOUNT)

43.6
58
68
43.6
58
68

OPTICAL AXIS

35
5  31

Four, M4 mounting holes with a depth of 5.0 mm

Four, M4 mounting holes with a depth of 5.0 mm

10
40
35
5
31
40  (5)

IMAGE AREA

36
(22)
(12)

LED

5  31

Four, M4 mounting holes with a depth of 5.0 mm

35

Vision

## Digital CCD camera

**300,000-pixel camera**
FZ-SC
FZ-S

**2 million-pixel camera**
FZ-SC2M
FZ-S2M

**5 million-pixel camera**
FZ-SC5M2
FZ-S5M2

## Small digital CCD camera

**Camera head**

**Flat camera**
FZ-SFC
FZ-SF

**Pen-shaped camera**
FZ-SPC
FZ-SP

**Camera amplifier**
**Can be used for both flat cameras and pen-shaped cameras**

## High-speed CCD camera

FZ-SHC
FZ-SH

# OMRON

## Intelligent compact CMOS camera

**Narrow view / Standard**
**FZ-SQ010F**
**FZ-SQ050F**

Optical axis

46

45

67

Polarizing Filter Attachment

11
38
(57)
8
4.8

(94.8)
32
9

(25)

44

20

Mounting Bracket *1

1/4-20UNC Depth: 6
Four, M4 Depth: 6

20
38
42

**Mounting Hole Dimensions**
Two, 4.5 dia.

20±0.1

Tightening torque: 1.2 N·m
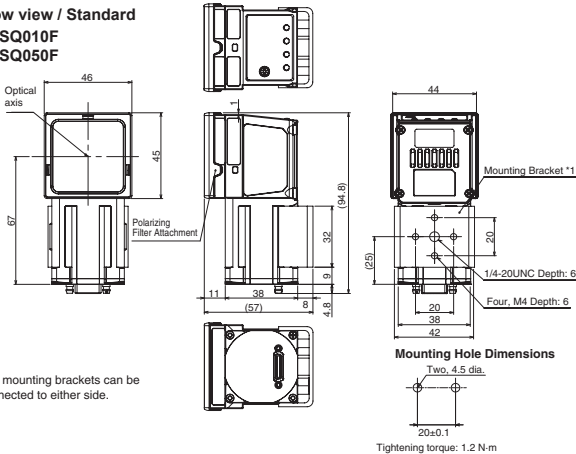
*1. The mounting brackets can be connected to either side.

**Wide View**
**FZ-SQ100F (long-distance)**
**FZ-SQ100N (short-distance)**

Optical axis

46

45

67

Polarizing Filter Attachment

3
38
(49)
8
4.8

(94.8)
32
9

(25)

44

20

Mounting Bracket *1

1/4-20UNC Depth: 6
Four, M4 Depth: 6

20
38
42

**Mounting Hole Dimensions**
Two, 4.5 dia.

20±0.1

Tightening torque: 1.2 N·m
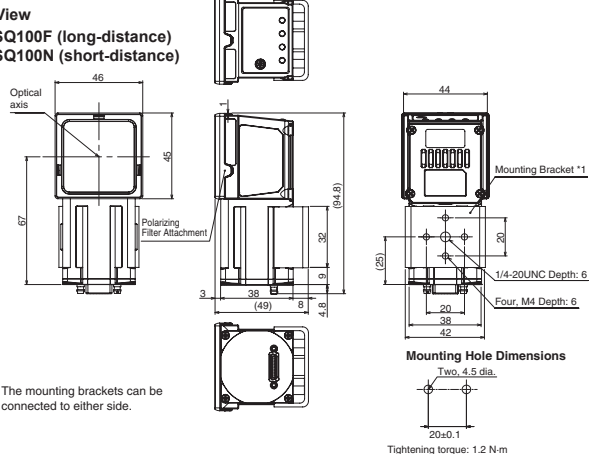
*1. The mounting brackets can be connected to either side.

## LCD monitor

**FZ-M08**

(6)

(103.5)

(85.5)

(38)
(12.5)
(129.4)
171

(130)
(172)
230

220

Mountable plate thickness: 1.6 to 5.0 mm

40
(31.5)

161
(173.4)
(185)

75
26

Four, M4

75

(90)
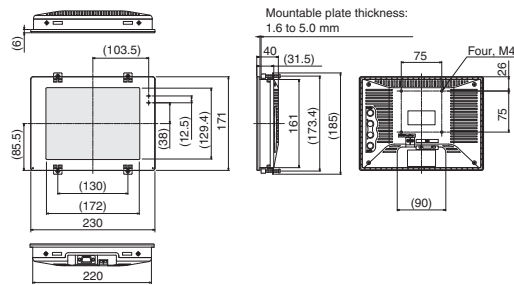
## Optical chart

### High-speed CMOS camera FH-S□12, 12-million pixel



3Z4S-LE [    ]

VS-L1828/M42-10
VS-L2526/M42-10
VS-L3528/M42-10
VS-L5028/M42-10
VS-L8540/M42-10
VS-L10028/M42-10

Camera distance (mm)

Field of vision (mm)
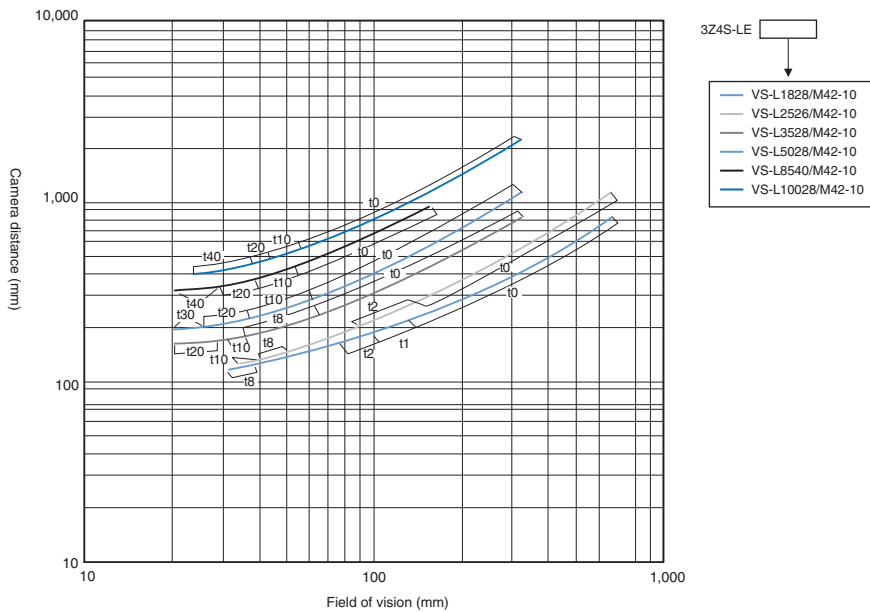
## High-speed CMOS camera FH-S☐04, 4 million-pixel



3Z4S-LE

| | |
|---|---|
| —— | VS-0618H1 |
| —— | VS-0814H1 |
| —— | VS-1214H1 |
| —— | VS-1614H1 |
| —— | VS-2514H1 |
| —— | VS-3514H1 |
| —— | VS-5018H1 |
| —— | SV-7525H |
| —— | SV-10028H |
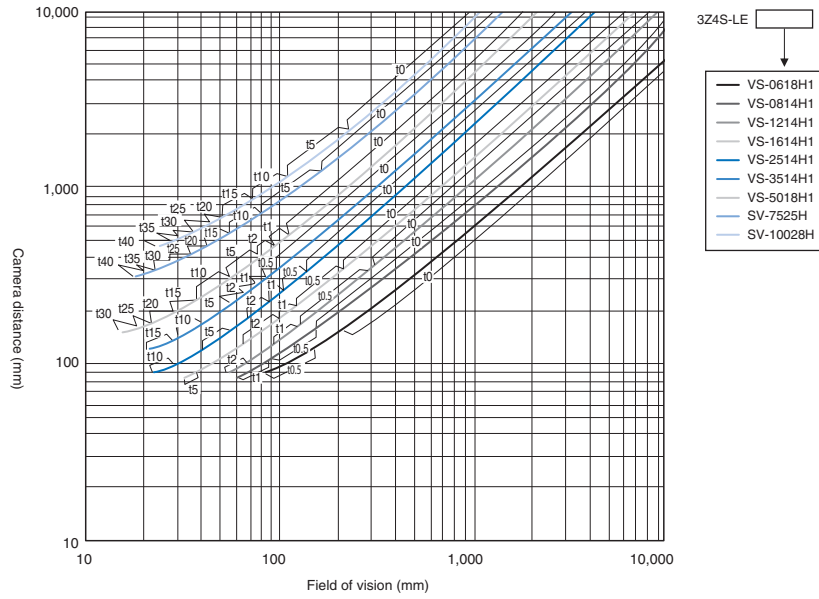
## High-speed CMOS camera FH-S☐02, 2 million-pixel
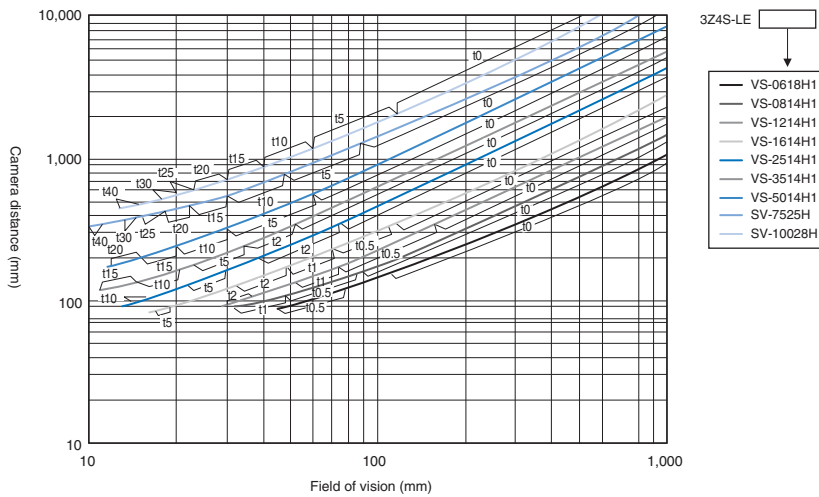


3Z4S-LE

| | |
|---|---|
| —— | VS-0618H1 |
| —— | VS-0814H1 |
| —— | VS-1214H1 |
| —— | VS-1614H1 |
| —— | VS-2514H1 |
| —— | VS-3514H1 |
| —— | VS-5014H1 |
| —— | SV-7525H |
| —— | SV-10028H |

## High-speed CMOS camera FH-S☐ / High-speed CCD camera FZ-SH☐ / Digital CCD camera FZ-S☐, 300,000-pixel



3Z4S-LE

| | |
|---|---|
| —— | SV-0614V |
| —— | SV-0813V |
| —— | SV-1214V |
| —— | SV-1614V |
| —— | SV-2514V |
| —— | SV-3518V |
| —— | SV-5018V |
| —— | SV-7527V |
| ---- | SV-10035V |

# OMRON
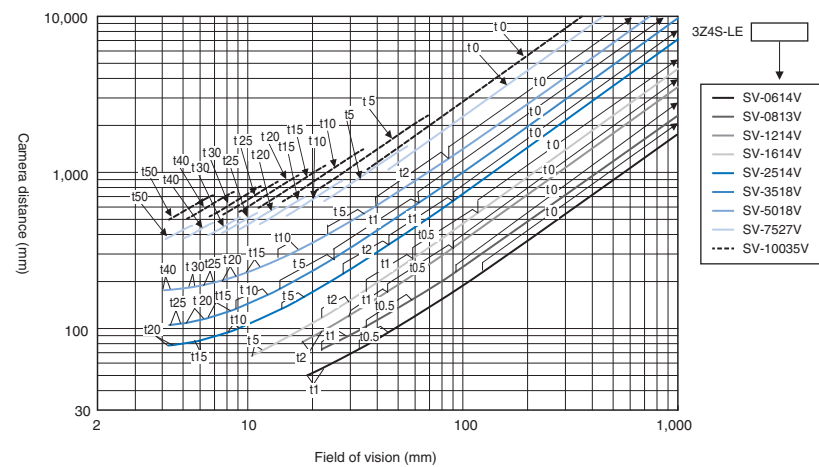
## Digital CCD camera FZ-S□5M2, 5 million-pixel
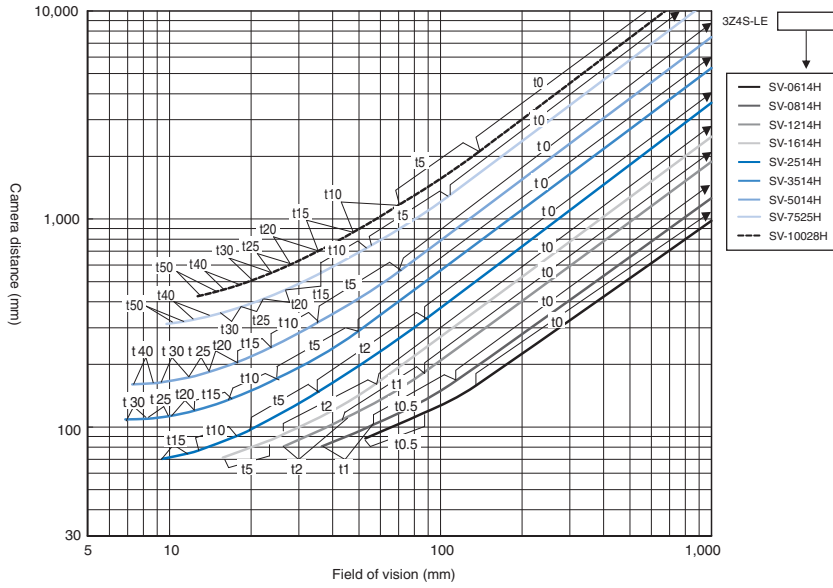


## Digital CCD camera FZ-S□2M, 2 million-pixel
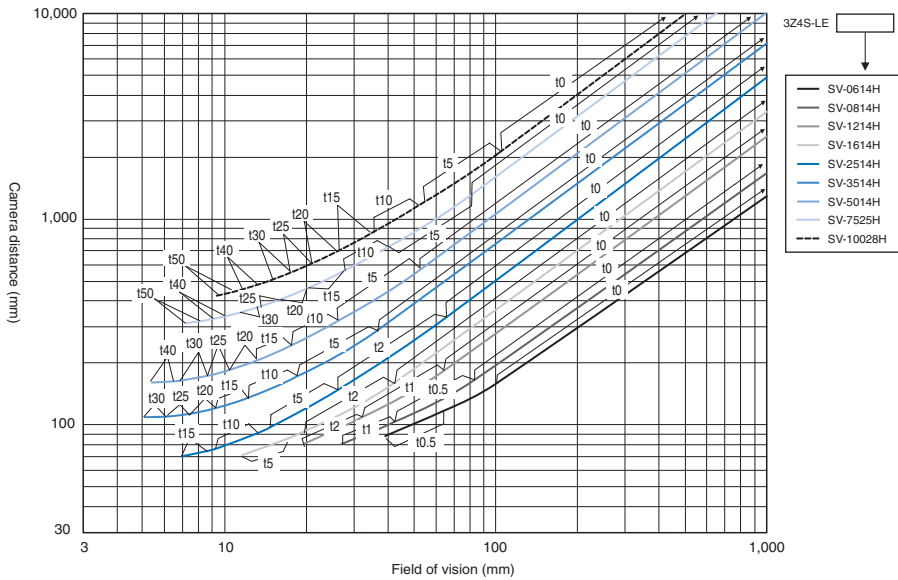


## Small digital CCD camera FZ-SF□, FZ-SP□, 300,000-pixel
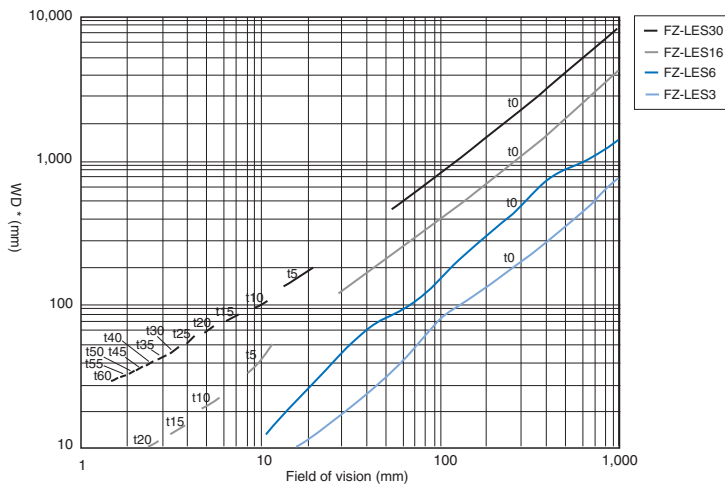


* The vertical axis represents WD, not installation distance.

**High-speed CMOS camera FH-S□ / High-speed CCD camera FZ-SH□ / Digital CCD camera FZ-S□, 300,000-pixel (vibrations and shocks resistant)**
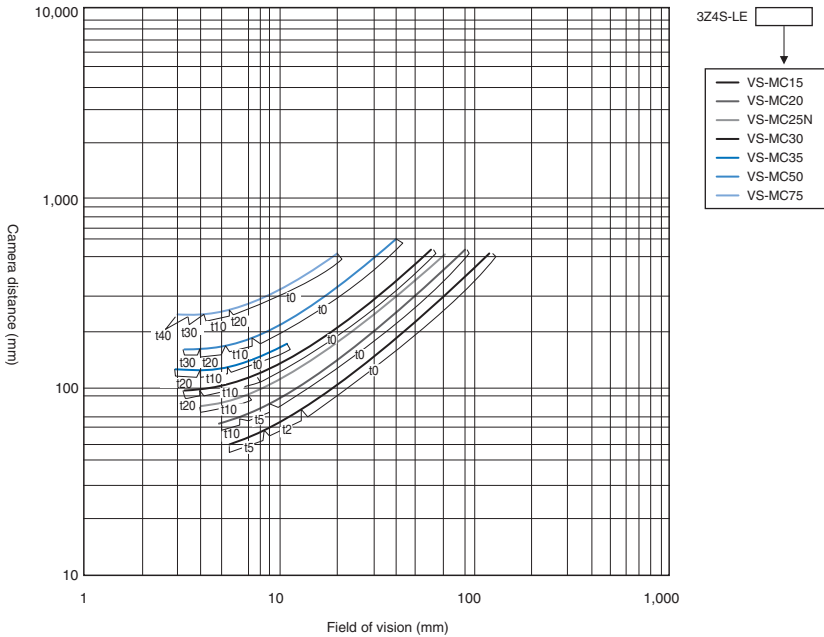


**Digital CCD camera FZ-S□5M2, 5 million-pixel (vibrations and shocks resistant)**

# OMRON
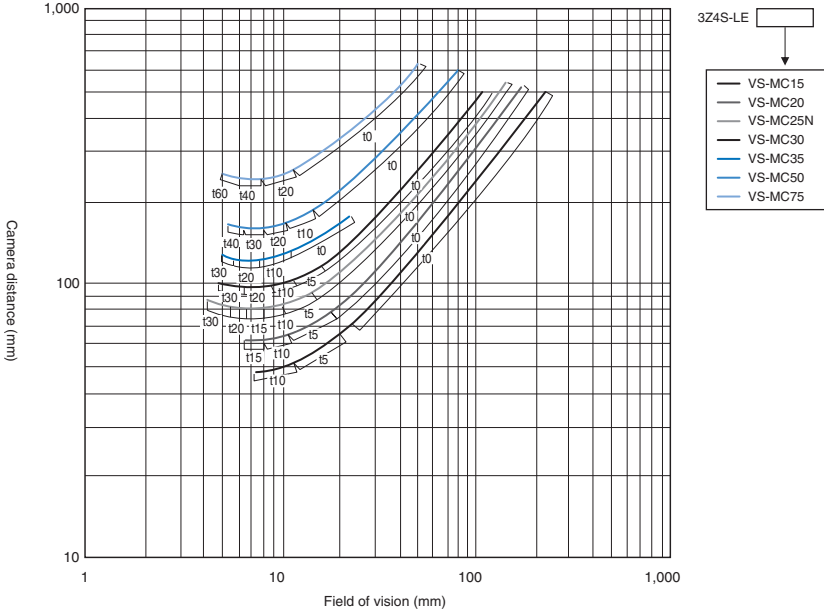
**Digital CCD camera FZ-S☐2M, 2 million-pixel (vibrations and shocks resistance)**
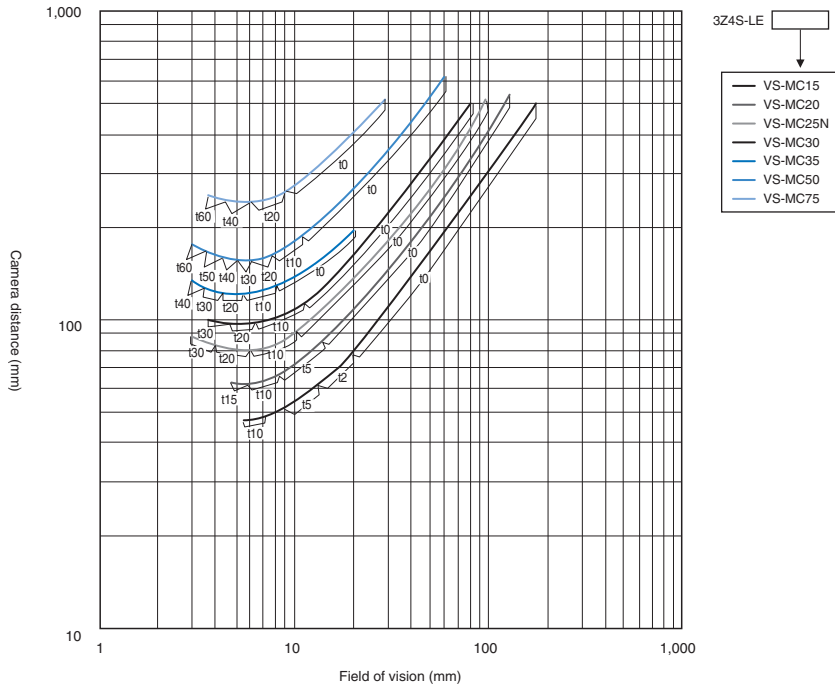


## Meaning of optical chart

The X axis of the optical chart shows the field of vision (mm)[1], and the Y axis of the optical chart shows the camera installation distance (mm).[2]
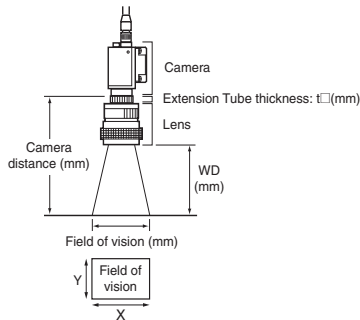


*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2. The vertical axis represents WD for small cameras.

## Intelligent compact CMOS camera

- **Narrow View**
  **FZ-SQ010F**
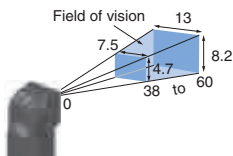


- **Standard**
  **FZ-SQ050F**
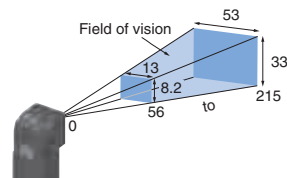


- **Wide View (Long-distance)**
  **FZ-SQ100F**
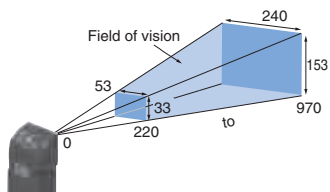


- **Wide View (Short-distance)**
  **FZ-SQ100N**
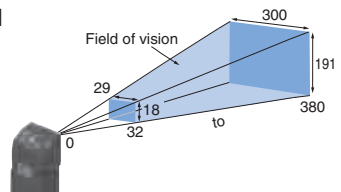
## Ordering information

### Sensor controller

| Type | CPU | No. of cameras | Output | Model | Appearance |
|------|-----|----------------|--------|-------|------------|
| Box-type controllers | High-speed controllers (4 core) | 2 | NPN/PNP | FH-3050 | |
| | | 4 | NPN/PNP | FH-3050-10 | |
| | | 8 | NPN/PNP | FH-3050-20 | |
| | Standard controllers (2 core) | 2 | NPN/PNP | FH-1050 | |
| | | 4 | NPN/PNP | FH-1050-10 | |
| | | 8 | NPN/PNP | FH-1050-20 | |

### Camera

| Type | Specifications | | Image read time | Model | Appearance |
|------|----------------|---|-----------------|-------|------------|
| High-speed CMOS camera (Lens required) | 12 million-pixel[*1] | Color | 25.7 ms[*2] | FH-SC12 | |
| | | Monochrome | | FH-SM12 | |
| | 4 million-pixel | Color | 8.5 ms[*2] | FH-SC04 | |
| | | Monochrome | | FH-SM04 | |
| | 2 million-pixel | Color | 4.6 ms[*2] | FH-SC02 | |
| | | Monochrome | | FH-SM02 | |
| | 300,000-pixel | Color | 3.3 ms[*2] | FH-SC | |
| | | Monochrome | | FH-SM | |
| Digital CCD camera (Lens required) | 5 million-pixel | Color | 62.5 ms | FZ-SC5M2 | |
| | | Monochrome | | FZ-S5M2 | |
| | 2 million-pixel | Color | 33.3 ms | FZ-SC2M | |
| | | Monochrome | | FZ-S2M | |
| | 300,000-pixel | Color | 12.5 ms | FZ-SC | |
| | | Monochrome | | FZ-S | |
| Small digital CCD camera (Lenses for small camera required) | 300,000-pixel flat type | Color | 12.5 ms | FZ-SFC | |
| | | Monochrome | | FZ-SF | |
| | 300,000-pixel pen type | Color | | FZ-SPC | |
| | | Monochrome | | FZ-SP | |
| High-speed CCD camera (Lens required) | 300,000-pixel | Color | 4.9 ms | FZ-SHC | |
| | | Monochrome | | FZ-SH | |
| Intelligent compact CMOS camera (Camera + manual focus lens + high power lighting) | Narrow view | Color | 16.7 ms | FZ-SQ010F | |
| | Standard view | | | FZ-SQ050F | |
| | Wide view (long-distance) | | | FZ-SQ100F | |
| | Wide view (short-distance) | | | FZ-SQ100N | |

*1. Up to four cameras can be connected to one controller. Up to eight cameras other than 12 million-pixel cameras can be connected to a FH-3050-20 or FH-1050-20.
*2. When connected using two camera cables.

# OMRON

## Lenses

### C-mount lens for 1/3-inch image sensor

| Type | Specifications | | | | | Model | Appearance/Dimensions (mm) |
|---|---|---|---|---|---|---|---|
| | Focal length | Brightness | Filter size | Max. sensor size | Mount | | |
| C-mount lens for 1/3-inch image sensor (Recommend: FZ-S□/ FZ-SH□/FH-S□) | 6 mm | F1.4 | M27.0 P0.5 | 1/3 inch | C-mount | 3Z4S-LE SV-0614V | 29 dia. 30.0 |
| | 8 mm | F1.3 | M25.5 P0.5 | | | 3Z4S-LE SV-0813V | 28 dia. 34.0 |
| | 12 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-1214V | 29 dia. 29.5 |
| | 16 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-1614V | 29 dia. 24.0 |
| | 25 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-2514V | 29 dia. 24.5 |
| | 35 mm | F1.8 | M27.0 P0.5 | | | 3Z4S-LE SV-3518V | 29 dia. 33.5[WD: ∞] to 37.5[WD:300] |
| | 50 mm | F1.8 | M30.5 P0.5 | | | 3Z4S-LE SV-5018V | 32 dia. 37.0[WD: ∞] to 39.4[WD:1000] |
| | 75 mm | F2.7 | M30.5 P0.5 | | | 3Z4S-LE SV-7527V | 32 dia. 42.0[WD: ∞] to 44.4[WD:1000] |
| | 100 mm | F3.5 | M30.5 P0.5 | | | 3Z4S-LE SV-10035V | 32 dia. 43.9[WD: ∞] to 46.3[WD:1000] |

### C-mount lens for 2/3-inch image sensor

| Type | Specifications | | | | | Model | Appearance/Dimensions (mm) |
|---|---|---|---|---|---|---|---|
| | Focal length | Brightness | Filter size | Max. sensor size | Mount | | |
| C-mount lens for 2/3-inch image sensor (Recommend: FZ-S□2M/ FZ-S□5M2) | 6 mm | F1.4 | M40.5 P0.5 | 2/3 inch | C-mount | 3Z4S-LE SV-0614H | 42 dia. 57.5 |
| | 8 mm | F1.4 | M35.5 P0.5 | | | 3Z4S-LE SV-0814H | 39 dia. 52.5 |
| | 12 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-1214H | 30 dia. 51.0 |
| | 16 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-1614H | 30 dia. 47.5 |
| | 25 mm | F1.4 | M27.0 P0.5 | | | 3Z4S-LE SV-2514H | 30 dia. 36.0 |
| | 35 mm | F1.4 | M35.5 P0.5 | | | 3Z4S-LE SV-3514H | 44 dia. 45.5 |
| | 50 mm | F1.4 | M40.5 P0.5 | | | 3Z4S-LE SV-5014H | 44 dia. 57.5 |
| | 75 mm | F2.5 | M34.0 P0.5 | 1 inch | | 3Z4S-LE SV-7525H[1] | 36 dia. 42.0[WD: ∞] to 54.6[WD:1200] |
| | 100 mm | F2.8 | M37.5 P0.5 | | | 3Z4S-LE SV-10028H[1] | 39 dia. 66.5[WD: ∞] to 71.6[WD:2000] |

*1. 3Z4S-LE SV-7525H and 3Z4S-LE SV-10028H can also be used for FH-S□02/FH-S□04.

## C-mount lens for 1-inch image sensor

| Type | Specifications | | | | | Model | Appearance/Dimensions (mm) |
|---|---|---|---|---|---|---|---|
| | Focal length | Brightness | Filter size | Max. sensor size | Mount | | |
| C-mount lens for 1-inch image sensor (Recommend: FH-S□02/ FH-S□04[*1]) | 6 mm | F1.8 | Can not be used with a filter | 1 inch | C-mount | 3Z4S-LE VS-0618H1 | 64.5 dia. 57.2 |
| | 8 mm | F1.4 | M55.0 P0.75 | | | 3Z4S-LE VS-0814H1 | 57 dia. 59 |
| | 12 mm | F1.4 | M35.5 P0.5 | | | 3Z4S-LE VS-1214H1 | 38 dia. 48.0[WD:∞] to 48.5[WD:300] |
| | 16 mm | F1.4 | M30.5 P0.5 | | | 3Z4S-LE VS-1614H1 | 38 dia. 42.5[WD:∞] to 43.3[WD:300] |
| | 25 mm | F1.4 | M30.5 P0.5 | | | 3Z4S-LE VS-2514H1 | 38 dia. 33.5[WD:∞] to 35.6[WD:300] |
| | 35 mm | F1.4 | M30.5 P0.5 | | | 3Z4S-LE VS-3514H1 | 38 dia. 35.0[WD:∞] to 39.1[WD:300] |
| | 50 mm | F1.8 | M40.5 P0.5 | | | 3Z4S-LE VS-5018H1 | 44 dia. 44.5[WD:∞] to 49.5[WD:500] |

*1. 3Z4S-LE SV-7525H with focal length of 75 mm and 3Z4S-LE SV-10028H with local length of 100 mm are also available.

## M42-mount lens for large image sensor

| Type | Specifications | | | | | Model | Appearance/Dimensions (mm) |
|---|---|---|---|---|---|---|---|
| | Focal length | Brightness | Filter size | Max. sensor size | Mount | | |
| M42-mount lens for large image sensor (Recommend: FH-S□12) | 18 mm | F2.8 | M55.0 P0.75 | 1.8 inch | M42-mount | 3Z4S-LE VS-L1828/M42-10 | 58.5 dia. 94 |
| | 25 mm | F2.6 | M55.0 P0.75 | | | 3Z4S-LE VS-L2526/M42-10 | 58.5 dia. 80 |
| | 35 mm | F2.8 | M62.0 P0.75 | | | 3Z4S-LE VS-L3528/M42-10 | 64.5 dia. 108 |
| | 50 mm | F2.8 | M62.0 P0.75 | | | 3Z4S-LE VS-L5028/M42-10 | 66 dia. 94.5 |
| | 85 mm | F4.0 | M52.0 P0.75 | | | 3Z4S-LE VS-L8540/M42-10 | 55.5 dia. 129.5 |
| | 100 mm | F2.8 | M52.0 P0.75 | | | 3Z4S-LE VS-L10028/M42-10 | 54 dia. 134.5 |

## Lens for small camera

| Type | Specifications | | Model | Appearance/Dimensions (mm) |
|---|---|---|---|---|
| | Focal length | Brightness | | |
| Lens for small camera | 3 mm | F2.0 | FZ-LES3 | 12 dia. 16.4 |
| | 6 mm | F2.0 | FZ-LES6 | 12 dia. 19.7 |
| | 16 mm | F3.4 | FZ-LES16 | 12 dia. 23.1 |
| | 30 mm | F3.4 | FZ-LES30 | 12 dia. 25.5 |

# OMRON

## Vibrations and shocks resistant, C-mount lens for 2/3-inch image sensor

| Type | Specifications | | | | | | Model | Appearance/ Dimensions (mm) |
|------|------|------|------|------|------|------|------|------|
| | Focal length | Filter size | Optical magnifi-cation | Iris range[2]/ Depth of field (mm)[3] | Max.sensor size | Mount | | |
| Vibrations and shocks resistant C-mount lens for 2/3-inch image sensor (Recommend: FZ-S☐/ FZ-S☐2M/FZ-S☐5M2/ FZ-SH☐/FH-S☐) | 15 mm | M27.0 P0.5 | 0.03 x | **Max. aperture:** 183.1 **F5.6:** 512.7 **F8:** 732.4 | 2/3 inch | C-mount | 3Z4S-LE VS-MC15-☐[1] | 31 dia. 25.4[0.03×] to 29.5[0.3×] |
| | | | 0.2 x | **Max. aperture:** 4.8 **F5.6:** 13.4 **F8:** 19.2 | | | | |
| | | | 0.3 x | **Max. aperture:** 2.3 **F5.6:** 6.5 **F8:** 9.2 | | | | |
| | 20 mm | M27.0 P0.5 | 0.04 x | **Max. aperture:** 110.8 **F5.6:** 291.2 **F8:** 416.0 | | | 3Z4S-LE VS-MC20-☐[1] | 31 dia. 23.0[0.04×] to 30.5[0.4×] |
| | | | 0.25 x | **Max. aperture:** 3.4 **F5.6:** 9.0 **F8:** 12.8 | | | | |
| | | | 0.4 x | **Max. aperture:** 1.5 **F5.6:** 3.9 **F8:** 5.6 | | | | |
| | 25 mm | M27.0 P0.5 | 0.05 x | **Max. aperture:** 67.2 **F5.6:** 188.2 **F8:** 268.8 | | | 3Z4S-LE VS-MC25N-☐[1] | 31 dia. 26.5[0.05×] to 38.0[0.5×] |
| | | | 0.25 x | **Max. aperture:** 3.2 **F5.6:** 9.0 **F8:** 12.8 | | | | |
| | | | 0.5 x | **Max. aperture:** 1.0 **F5.6:** 2.7 **F8:** 3.8 | | | | |
| | 30 mm | M27.0 P0.5 | 0.06 x | **Max. aperture:** 47.1 **F5.6:** 131.9 **F8:** 188.4 | | | 3Z4S-LE VS-MC30-☐[1] | 31 dia. 24.0[0.06×] to 35.7[0.45×] |
| | | | 0.15 x | **Max. aperture:** 8.2 **F5.6:** 22.9 **F8:** 32.7 | | | | |
| | | | 0.45 x | **Max. aperture:** 1.1 **F5.6:** 3.2 **F8:** 4.6 | | | | |
| | 35 mm | M27.0 P0.5 | 0.26 x | **Max. aperture:** 2.8 **F5.6:** 8.4 **F8:** 11.9 | | | 3Z4S-LE VS-MC35-☐[1] | 31 dia. 32.0[0.26×] to 45.7[0.65×] |
| | | | 0.3 x | **Max. aperture:** 2.2 **F5.6:** 6.5 **F8:** 9.2 | | | | |
| | | | 0.65 x | **Max. aperture:** 0.6 **F5.6:** 1.7 **F8:** 2.5 | | | | |
| | 50 mm | M27.0 P0.5 | 0.08 x | **Max. aperture:** 33.8 **F5.6:** 75.6 **F8:** 108.0 | | | 3Z4S-LE VS-MC50-☐[1] | 31 dia. 44.5[0.08×] to 63.9[0.48×] |
| | | | 0.2 x | **Max. aperture:** 6.0 **F5.6:** 13.4 **F8:** 19.2 | | | | |
| | | | 0.48 x | **Max. aperture:** 1.3 **F5.6:** 2.9 **F8:** 4.1 | | | | |
| | 75 mm | M27.0 P0.5 | 0.14 x | **Max. aperture:** 17.7 **F5.6:** 26.1 **F8:** 37.2 | | | 3Z4S-LE VS-MC75-☐[1] | 31 dia. 70.0[0.14×] to 105.5[0.62×] |
| | | | 0.2 x | **Max. aperture:** 9.1 **F5.6:** 13.4 **F8:** 19.2 | | | | |
| | | | 0.62 x | **Max. aperture:** 1.3 **F5.6:** 1.9 **F8:** 2.7 | | | | |

*1. Insert the iris range into ☐ in the model number as follows:
   F = Aperture: Blank
   F = 5.6 = FN056
   F = 8 = FN080
*2. F-number can be selected from maximum aperture, 5.6 and 8.0.
*3. When circle of least confusion is 40 μm.

## Extension tubes

| Type | Specifications | Model |
|---|---|---|
| For M42-mount lens[1] | Set of 5 tubes: 20 mm, 10 mm, 8 mm, 2 mm and 1 mm<br>Maximum outer diameter: 47.5 mm dia. | 3Z4S-LE VS-EXR/M42 |
| For C-mount lens[1] | Set of 7 tubes: 40 mm, 20 mm, 10 mm, 5 mm, 2.0 mm, 1.0 mm and 0.5 mm<br>Maximum outer diameter: 30 mm dia. | 3Z4S-LE SV-EXR |
| For small digital CCD camera | Set of 3 tubes: 15 mm, 10 mm and 5 mm<br>Maximum outer diameter: 12 mm dia. | FZ-LESR |

*1. Do not use the 0.5 mm, 1.0 mm and 2.0 mm extension tubes attached to each other. Since these extension tubes are placed over the threaded section of the lens or other extension tube, the connection may loosen when more than one 0.5 mm, 1.0 mm or 2.0 mm extension tube are used together. Reinforcement is required to protect against vibration when extension tubes exceeding 30 mm are used. When using the extension tube, check it the actual device before using it.

## Camera accessories

| Type | Specifications | | | Model | Appearance |
|---|---|---|---|---|---|
| External lighting | | | | FLV Series | - |
| | | | | FL Series | |
| Lighting controller (Required to control external lighting from a controller) | For FLV-Series | Camera mount lighting controller | One channel | FLV-TCC1 | |
| | | | Four channels | FLV-TCC4 | |
| | | Analog lighting controller | | FLV-ATC Series | |
| | For FL-Series | Camera mount lighting controller | | FL-TCC1 | |
| For intelligent compact camera | Mounting bracket | | | FQ-XL | |
| | Mounting brackets | | | FQ-XL2 | |
| | Polarizing filter attachment | | | FQ-XF1 | |
| Mounting bracket | For FZ-S☐ | | | FZ-S-XLC | - |
| | For FZ-S☐2M | | | FZ-S2M-XLC | |
| | For FZ-S☐5M2 | | | FZ-S5M-XLC | |
| | For FZ-SH☐ | | | FZ-SH-XLC | |
| | For FH-S☐12 | | | FH-SM12-XLC | |

## Cables

| Type | Specifications | Model | Appearance |
|---|---|---|---|
| Camera cable | Standard camera cable<br>Cable length: 2 m, 5 m or 10 m[1] | FZ-VS | |
| | Bend resistant camera cable<br>Cable length: 2 m, 5 m or 10 m[1] | FZ-VSB | |
| | Right-angle camera cable[2]<br>Cable length: 2 m, 5 m or 10 m[1] | FZ-VSL | |
| | Long distance camera cable<br>Cable length: 15 m[1] | FZ-VS2 | |
| | Long distance right-angle camera cable<br>Cable length: 15 m[1] | FZ-VSL2 | |
| Cable extension unit | Up to two extension units and three cables can be connected<br>(Maximum cable length: 45 m[2]) | FZ-VSJ | |
| Monitor cable | Cable length: 2 m or 5 m<br>(When you connect a LCD monitor FZ-M08 to FH sensor controller, please use it in combination with a DVI-I-RGB conversion connector FH-VMRGB) | FZ-VM | |
| DVI-I-RGB conversion connector | | FH-VMRGB | |
| Parallel I/O cable[3] | Cable length: 2 m | XW2Z-S013-2 | |
| | Cable length: 5 m | XW2Z-S013-5 | |
| Parallel I/O cable for connector-terminal conversion unit[3] | Cable length: 0.5 m | XW2Z-050EE | |
| | Cable length: 1 m | XW2Z-100EE | |
| | Cable length: 1.5 m | XW2Z-150EE | |
| | Cable length: 2 m | XW2Z-200EE | |
| | Cable length: 3 m | XW2Z-300EE | |
| | Cable length: 5 m | XW2Z-500EE | |

# OMRON

| Type | Specifications | Model | Appearance |
|------|----------------|-------|------------|
| Connector-terminal block conversion units, general-purpose devices | Wiring method: Phillips screw | XW2R-J34G-T | |
| | Wiring method: Slotted screw (rise up) | XW2R-E34G-T | |
| | Wiring method: Push-in spring | XW2R-P34G-T | |
| Encoder cable for line-driver | Cable length: 1,5 m | FH-VR | |

*1. The maximum cable length depends on the camera being connected, and the model and length of the cable being used. When a high-speed CMOS camera FH-S□02/-S□04 is used in the high speed mode of transmission speed, two camera cables are required.

*2. This cable has an L-shaped connector on the camera end.

*3. 2 cables are required for all I/O signals.

## Accessories

| Type | Specifications | Model | Appearance |
|------|----------------|-------|------------|
| LCD monitor | For box-type controllers | FZ-M08 | |
| USB memory | 2 GB | FZ-MEM2G | |
| | 8 GB | FZ-MEM8G | |
| SD card | 2 GB | HMC-SD291 | |
| | 4 GB | HMC-SD491 | |
| VESA attachment | For installing the LCD integrated-type controller | FZ-VESA | |
| Desktop controller stand | For installing the LCD integrated-type controller | FZ-DS | |
| Display / USB switcher | | FZ-DU | |

## Development environment

Please purchase a CD-ROM and licenses the first time you purchase the Application Producer. CD-ROM's and licenses are available individually.
The license does not include the CD-ROM.

| Product | Specifications | | | Model |
|---------|----------------|--|--|-------|
| | Description | Number of licenses | Media | |
| Application Producer | Software components that provide a development environment to further customize the standard controller features of the FH series.<br>System requirements:<br>• CPU: Intel Pentium Processor (SSE2 or higher)<br>• OS: Windows 7/8 (32-bit/64-bit version)<br>• .NET Framework: .NET Framework 3.5 or higher<br>• Memory: At least 2 GB RAM, at least 2 GB available disk space<br>• Browser: Microsoft® Internet Explorer 6.0 or higher<br>• Display: XGA (1024 x 768), true color (32-bit) or higher<br>• Optical drive: CD/DVD drive<br>The following software is required to customize the software:<br>Microsoft® Visual Studio® 2012/2010/2008 Professional | - (Media only) | CD-ROM | FH-AP1 |
| | | 1 license | - | FH-AP1L |

## Computer software

| Item | Model |
|------|-------|
| Sysmac Studio version 1.07 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat.No.SysCat_Q031-E2-02      In the interest of product improvement, specifications are subject to change without notice.

## FQ-M series

# Vision sensor

### Designed for object tracking

The new FQ-M Series is a vision sensor designed specifically for pick and place applications.

- Camera, image processing and connectivity in one
- Shape based object detection
- Connectivity with EtherCAT/Ethernet
- Encoder input for object tracking and easy calibration
- Up to 5000 pieces per minute with 360 degree rotation
- Flexible data output depending on the output devices

## System configuration



Sysmac always in control

Sysmac Studio *

Touch Finder *

Ethernet

Industrial switching hubs

NJ series Machine automation controller

EtherCAT

FQ-M vision

Accurax G5 servo drive

MX2 inverter

NX series I/O

Accurax G5 servo motor
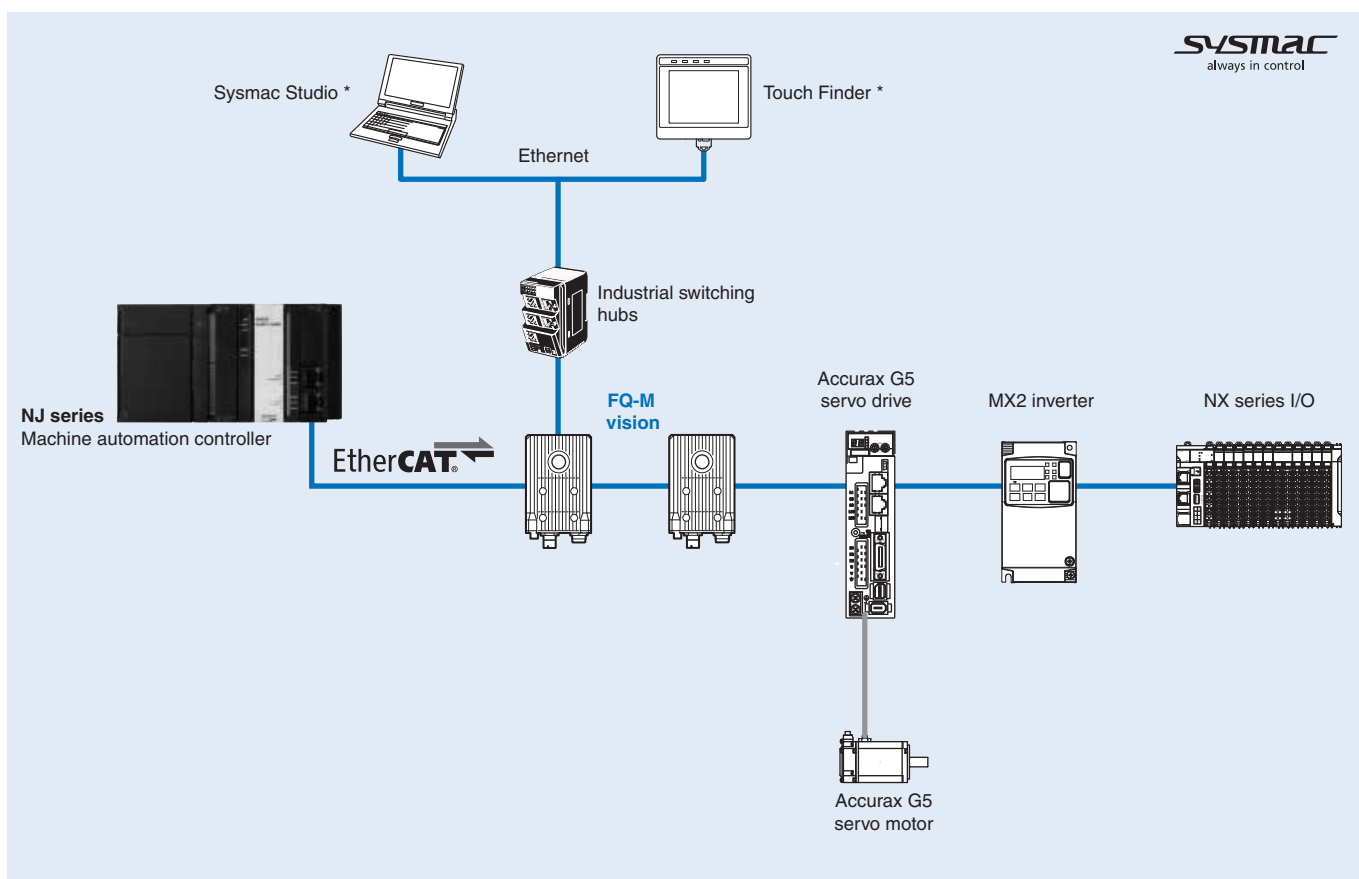
\* Sysmac Studio and Touch Finder can not be used together. When both are connected, Sysmac Studio will have a priority. When you use the Sysmac Studio Standard Edition and connect the FQ-M Series and the Machine Automation Controller NJ-Series, connect them with a general-purpose Ethernet cable or a USB cable.

**1.** EtherCAT and Ethernet (PLC Link) can not be used simultaneously.
**2.** It is not possible to configure and adjust the FQ-M via an NJ-Series controller, when they are connected via an EtherCAT network. For configuration and adjustment of FQ-M, connect the FQ-M and a computer or a Touch Finder via an Ethernet network.

# OMRON

## Specifications

### Sensor specifications

| Item | Type | EtherCAT communication function provided | |
| | | Color | Monochrome |
|---|---|---|---|
| **Model** | NPN | FQ-MS120-ECT | FQ-MS120-M-ECT |
| | PNP | FQ-MS125-ECT | FQ-MS125-M-ECT |
| **Field of vision, installation distance** | | Selecting a lens according to the field of vision and installation distance. Refer to *"Optical Chart"* page | |
| **Main functions** | Inspection items | Shape search, Search, Labeling, Edge position | |
| | Number of simultaneous inspections | 32 | |
| | Number of registered scenes | 32 | |
| **Image input** | Image processing method | Real color | Monochrome |
| | Image elements | 1/3-inch color CMOS | 1/3-inch monochrome CMOS |
| | Image filter | High dynamic range (HDR) and white balance | High dynamic range (HDR) |
| | Shutter | Electronic shutter; select shutter speeds from 1/10 to 1/30000 (sec) | |
| | Processing resolution | 752 (H) × 480 (V) | |
| | Pixel size | 6.0 (μm) × 6.0 (μm) | |
| | Frame rate (image read time) | 60 fps (16.7 ms) | |
| **External Lightings** | Connecting method | Connection via a strobe light controller | |
| | Connectable lighting | FL Series | |
| **Data logging** | Measurement data | In Sensor: Max. 32000 items[1] | |
| | Images | In Sensor: 20 images[1] | |
| **Measurement trigger** | | I/O trigger, Encoder trigger, Communications trigger (Ethernet No-protocol, PLC Link or EtherCAT) | |
| **I/O specifications** | Input signals | 9 signals<br>• Single measurement input (TRIG)<br>• Error clear input (IN0)<br>• Error counter reset input (IN1)<br>• Encoder input (A±, B±, Z±)[2] | |
| | Output signals | 5 signals[3]<br>• OUT0 Overall judgement output (OR)<br>• OUT1 Control output (BUSY)<br>• OUT2 Error output (ERROR)<br>• OUT3 Shutter output (SHTOUT)<br>• OUT4 Strobe trigger output (STGOUT) | |
| | Ethernet specifications | 100BASE-TX/10BASE-TX | |
| | EtherCAT specifications | Dedicated protocol for EtherCAT 100BASE-TX | |
| | Connection method | Special connector cables<br>• Power supply and I/O: 1 special connector I/O cable<br>• Touch Finder, Computer and Ethernet: 1 Ethernet cable<br>• EtherCAT: 2 EtherCAT cable | |
| **LED display** | LED display | • OR: Judgment result indicator<br>• ERR: Error indicator<br>• BUSY: BUSY indicator<br>• ETN: Ethernet communications indicator | |
| | EtherCAT display | • L/A IN (Link/Activity IN) × 1<br>• L/A OUT (Link/Activity OUT) × 1<br>• RUN × 1<br>• ERR × 1 | |
| **Ratings** | Power supply voltage | 21.6 to 26.4 VDC (including ripple) | |
| | Insulation resistance | Between all lead wires and case: 0.5 MΩ (at 250 V) | |
| | Current consumption | 450 mA max. (When the FL-Series Strobe controller and lighting are used)<br>250 mA max. (When external lighting is not used) | |
| **Environmental immunity** | Ambient temperature range | Operating: 0 to 50°C, Storage: −20 to 65°C (with no icing or condensation) | |
| | Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | |
| | Ambient atmosphere | No corrosive gas | |
| | Vibration resistance (destruction) | 10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 8 min each, 10 times | |
| | Shock resistance (destruction) | 150 m/s$^2$ 3 times each in 6 direction (up, down, right, left, forward and backward) | |
| | Degree of protection | IEC60529 IP40 | |
| **Materials** | | Case: aluminium die casting, Rear cover: aluminium plate | |
| **Weight** | | Approx. 480 g (Sensor only) | |
| **Accessories** | | Instruction Manual | |

[1] If a Touch Finder is used, results can be saved up to the capacity of an SD card.
[2] Encoder input specifications
[3] The five output signals can be allocated for the judgements of individual inspection items.

**Pulse input specifications (when an open collector type encoder is used)**

| Item | | Specifications | | |
|---|---|---|---|---|
| **Input voltage** | | 24 VDC ±10% | 12 VDC ±10% | 5 VDC ±5% |
| **Input current** | | 4.8 mA (at 24 VDC, typical value) | 2.4 mA (at 12 VDC, typical value) | 1.0 mA (at 5 VDC, typical value) |
| **NPN** | ON voltage[1] | 4.8 V max. | 2.4 V max. | 1.0 V max. |
| | OFF voltage[2] | 19.2 V min. | 9.6 V min. | 4.0 V min. |
| **PNP** | ON voltage[1] | 19.2 V min. | 9.6 V min. | 4.0 V min. |
| | OFF voltage[2] | 4.8 V max. | 2.4 V max. | 1.0 V max. |

| Item | Specifications |
|---|---|
| Maximum response frequency[*3] | 50 kHz (I/O cable: when the FQ-MWD005 or FQ-MWDL005 cables is used) 20 kHz (I/O cable: when the FQ-MWD010 or FQ-MWDL010 cables is used) |
| Input impedance | 5.1 kΩ |

[*1] ON voltage: Voltage to change from OFF to ON state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
[*2] OFF voltage: Voltage to change from ON to OFF state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
[*3] Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

**Pulse input specifications (when a line-driver output type encoder is used)**

| Item | Specifications |
|---|---|
| Input voltage | EIA standard RS-422-A line driver level |
| Input impedance [*1] | 120 Ω ±5% |
| Differential input voltage | 0.2 V min. |
| Hysteresis voltage | 50 mV |
| Maximum response frequency [*2] | 200 kHz (I/O cable: when the FQ-MWD005, FQ-MWDL005, FQ-MWD010 or FQ-MWDL010 cable is used) |

[*1] When terminating resistance function is used.
[*2] Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

## Touch Finder specifications

| Item | | Type | Model with DC power supply | Model with AC/DC/battery power supply |
|---|---|---|---|---|
| | | Model | FQ-MD30 | FQ-MD31 |
| Number of connectable sensors | | | 2 max. | |
| Main functions | Types of measurement displays | | Last result display, last NG display, trend monitor, histograms | |
| | Types of display images | | Through, frozen, zoom-in and zoom-out images | |
| | Data logging | | Measurement results, measured images | |
| | Menu language | | English, Japanese | |
| Indications | LCD | Display device | 3.5-inch TFT color LCD | |
| | | Pixels | 320 × 240 | |
| | | Display colors | 16,777,216 | |
| | Backlight | Life expectancy[*1] | 50,000 hours at 25°C | |
| | | Brightness adjustment | Provided | |
| | | Screen saver | Provided | |
| | Indicators | Power indicator (color: green) | POWER | |
| | | Error indicator (color: red) | ERROR | |
| | | SD card access indicator (color: yellow) | SD ACCESS | |
| | | Charge indicator (color: orange) | – | CHARGE |
| Operation interface | Touch screen | Method | Resistance film | |
| | | Life expectancy[*2] | 1,000,000 operations | |
| External interface | Ethernet | | 100 BASE-TX/10 BASE-T | |
| | SD card | | Omron SD card (Model: HMC-SD291) or a SDHC card of Class4 or higher rating is recommended | |
| Ratings | Power supply voltage | DC power connection | 20.4 to 26.4 VDC (including ripple) | |
| | | AC adapter connection | – | 100 to 240 VAC, 50/60 Hz |
| | | Battery connection | – | FQ-BAT1 Battery (1 cell, 3.7 V) |
| | Continuous operation on Battery[*3] | | – | 1.5 h |
| | Current consumption | | DC power connection: 0.2 A | |
| | Insulation resistance | | Between all lead wires and case: 0.5 MΩ (at 250 V) | |
| Environmental immunity | Ambient temperature range | | Operating: 0 to 50°C Storage: –25 to 65°C (with no icing or condensation) | Operating: 0 to 50°C when mounted to DIN Track or panel 0 to 40°C when operated on a Battery Storage: –25 to 65°C (with no icing or condensation) |
| | Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | |
| | Ambient atmosphere | | No corrosive gas | |
| | Vibration resistance (destruction) | | 10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times | |
| | Shock resistance (destruction) | | 150 m/s² 3 times each in 6 direction (up, down, right, left, forward and backward) | |
| | Degree of protection | | IEC 60529 IP20 | |
| Dimensions | | | 95 × 85 × 33 mm | |
| Materials | | | Case: ABS | |
| Weight | | | Approx. 270 g (without Battery and hand strap) | |
| Accessories | | | Touch Pen (FQ-XT), Instruction Manual | |

[*1] This is a guideline for the time required for the brightness to diminish to half the initial brightness at room temperature and humidity. No guarantee is implied. The life of the backlight is greatly affected by the ambient temperature and humidity. It will be shorter at lower or higher temperature.
[*2] This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
[*3] This value is only a guideline. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

# OMRON

## Battery specifications

| Item<br>Model | FQ-BAT1 |
|---|---|
| Battery type | Secondary lithium ion battery |
| Nominal capacity | 1800 mAh |
| Rated voltage | 3.7 V |
| Dimensions | 35.3 × 53.1 × 11.4 mm |
| Ambient temperature range | Operating: 0 to 40°C<br>Storage: –25 to 65°C (with no icing or condensation) |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) |
| Charging method | Charged in Touch Finder (FQ-MD31)<br>AC adapter (FQ-AC□) is required |
| Charging time[1] | 2.0 h |
| Battery backup life[2] | 300 charging cycles |
| Weight | 50 g max. |

[1] This value is only a guideline. No guarantee is implied. The value will be afected by operating conditions.

[2] This is a guideline for the time required for the capacity of the Battery to be reduced to 60% of the initial capacity. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

## FQ-M series EtherCAT communications specifications

| Item | Specifications |
|---|---|
| Communication standard | IEC 61158 Type 12 |
| Physical layer | 100BASE-TX (IEEE802.3) |
| Connector | M12 × 2<br>E-CAT IN: EtherCAT (IN)<br>E-CAT OUT: EtherCAT (OUT) |
| Communications media | Use the cables for FQ-MWN□□ or FQ-WN□□ series |
| Communications distance | Use the communication cable within the length of FQ-MWN□□ or FQ-WN□□ series cables |
| Process data | Variable PDO Mapping |
| Mailbox (CoE) | Emergency messages, SDO requests, SDO responses and SDO information |
| Distributed clock | Synchronization with DC mode 1 |
| LED display | L/A IN (Link/Activity IN) × 1<br>L/A OUT (Link/Activity OUT) × 1<br>RUN × 1<br>ERR × 1 |

## Nomenclature

### Sensor
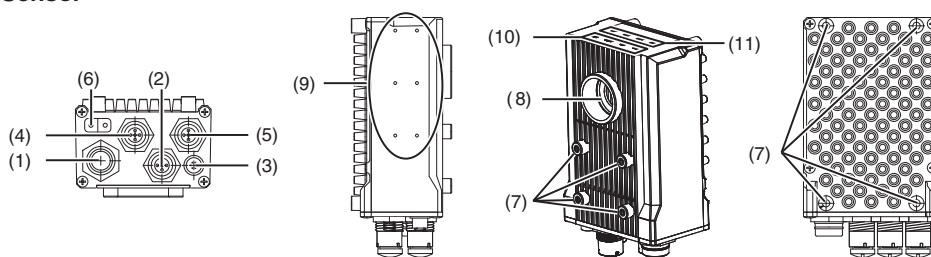


| No. | Name | Description |
|---|---|---|
| (1) | I/O Cable connector | An I/O Cable is used to connect the sensor to the power supply and external I/O. |
| (2) | Ethernet connector | An Ethernet cable is used to connect the sensor to external devices such as PLCs, the Touch Finder or computers. |
| (3) | Lighting connector | Connect an external lighting (strobe controller). |
| (4) | EtherCAT connector (IN)* | Connect an EtherCAT compatible device. |
| (5) | EtherCAT connector (OUT)* | Connect an EtherCAT compatible device. |
| (6) | Node address switch* | Set the node address for EtherCAT communications. |
| (7) | Installation holes | Holes to install and secure the camera. |
| (8) | C-mount lens connection part | Install the C-Mount lens in this part. Determine the field of view depending on the measurement target and select a suitable CCTV lens (C-mounting lens). |

| No. | Name | | Description |
|---|---|---|---|
| (9) | Strobe controller connection holes | | Install the strobe controller in this part. FL-TCC1 can be mounted. |
| (10) | Measurement process operation indicators | OR | Lit in orange while OR signal is ON. |
| | | ETN | Lit in orange while in Ethernet communications. |
| | | ERROR | Lit in red when an error occurs. |
| | | BUSY | Lit in green while the sensor is processing. |
| (11) | EtherCAT operation indicators | L/A IN | Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data IN). |
| | | L/A OUT | Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data OUT). |
| | | ECAT RUN | Lit in green when EtherCAT communications is available. |
| | | ECAT ERROR | Lit in red when an EtherCAT communications error occurs. |

* FQ-MS □□□-ECT and FQ-MS □□□-M-ECT only.

### Touch Finder
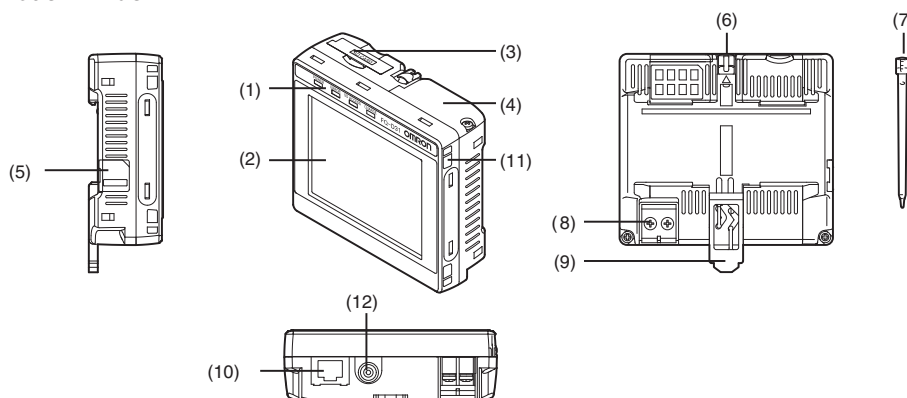


| No. | Name | | Description |
|---|---|---|---|
| (1) | Operation indicators | POWER | Lights green when the Touch Finder is turned ON. |
| | | ERROR | Lights red when an error occurs. |
| | | SD ACCESS | Lights yellow when an SD card is inserted. Flashes yellow when the SD card is being accessed. |
| | | CHARGE* | Lights orange when the Battery is charging. |
| (2) | LCD/touch pannel | | Displays the setting menu, measurement results and images input by the camera |
| (3) | SD card slot | | An SD card can be inserted. |
| (4) | Battery cover* | | The Battery is inserted behind this cover. Remove the cover when mounting or removing the Battery. |
| (5) | Power supply switch | | Turns on the Touch Finder. |

| No. | Name | Description |
|---|---|---|
| (6) | Touch pen holder | The touch pen can be stored here when it is not being used. |
| (7) | Touch pen | Used to operate the touch panel. |
| (8) | DC power supply connector | Used to connect a DC power supply. |
| (9) | Slider | Used to mount the Touch Finder to a DIN Track. |
| (10) | Ethernet port | Used when connecting the Touch Finder to the sensor with an Ethernet cable. Insert the connector until in locks in place. |
| (11) | Strap holder | This is a holder for attaching the strap. |
| (12) | AC power supply connector* | Use to connect the AC adapter. |

* Applicable to the FQ-MD31 only.

# OMRON

## Dimensions

### Sensor

#### FQ-MS12□-ECT/MS12□-M-ECT



MOUNTING SCREW HOLES (1)

98±0.1
50±0.1
4-4.5 dia.

25.4 OPTICAL AXIS
50
25
4.6
98
4-M4 DEPTH 8.5 max.

6-M2 DEPTH 4.5 max.
50.5
5

4.55 25.25
15.05
(5)
23.45 28
12.5
10.35

MOUNTING SCREW HOLES (2)
4-4.5 dia.
36±0.1
30±0.1

110
(30)
10.7
OPTICAL AXIS
4-M4 DEPTH 7 max.
75
18
36
33
63 30
8.7
22.08

### Touch Finder

#### FQ-MD30/MD31



20
44.5

95
70
*1
33
35.5
14
27.9
23.8
12.1
13.5 15
85
52.9

27
10
17.3
19.2
*1

Panel mounting adapter *2
(36.9)
(2)
3.5 31.6
116
95
116
85
(133.4)
(8.1)

Panel cutout dimensions
111±1
111±1
Panel
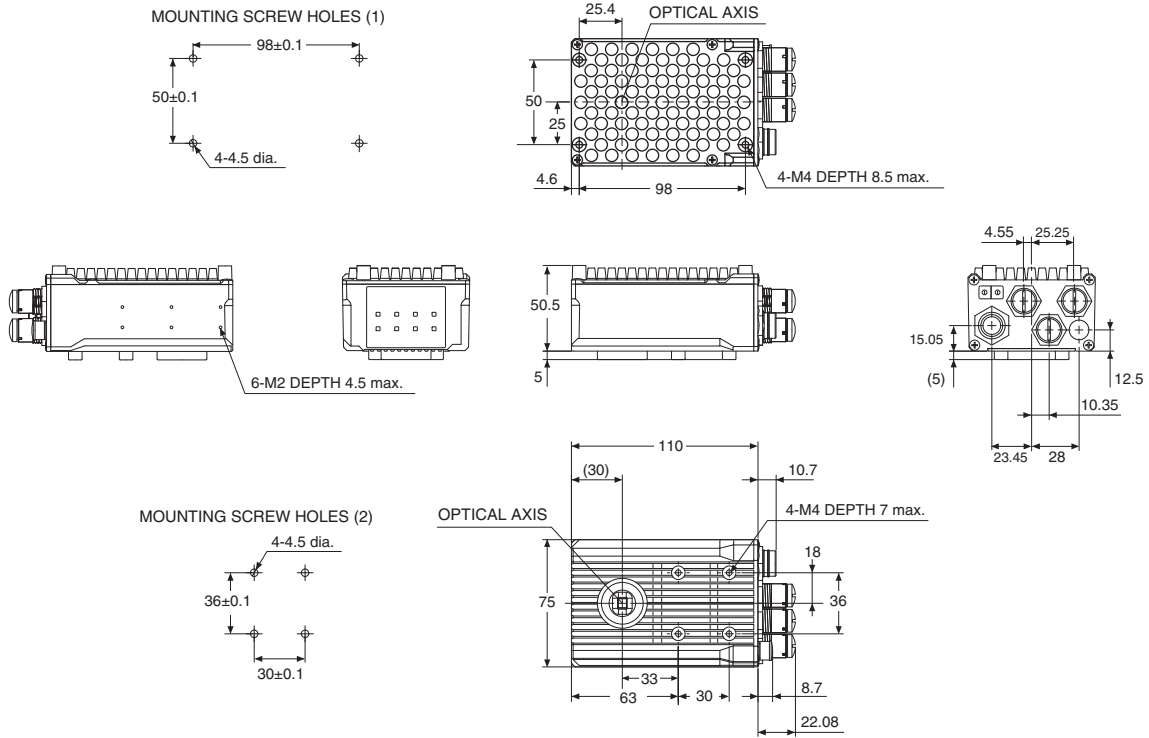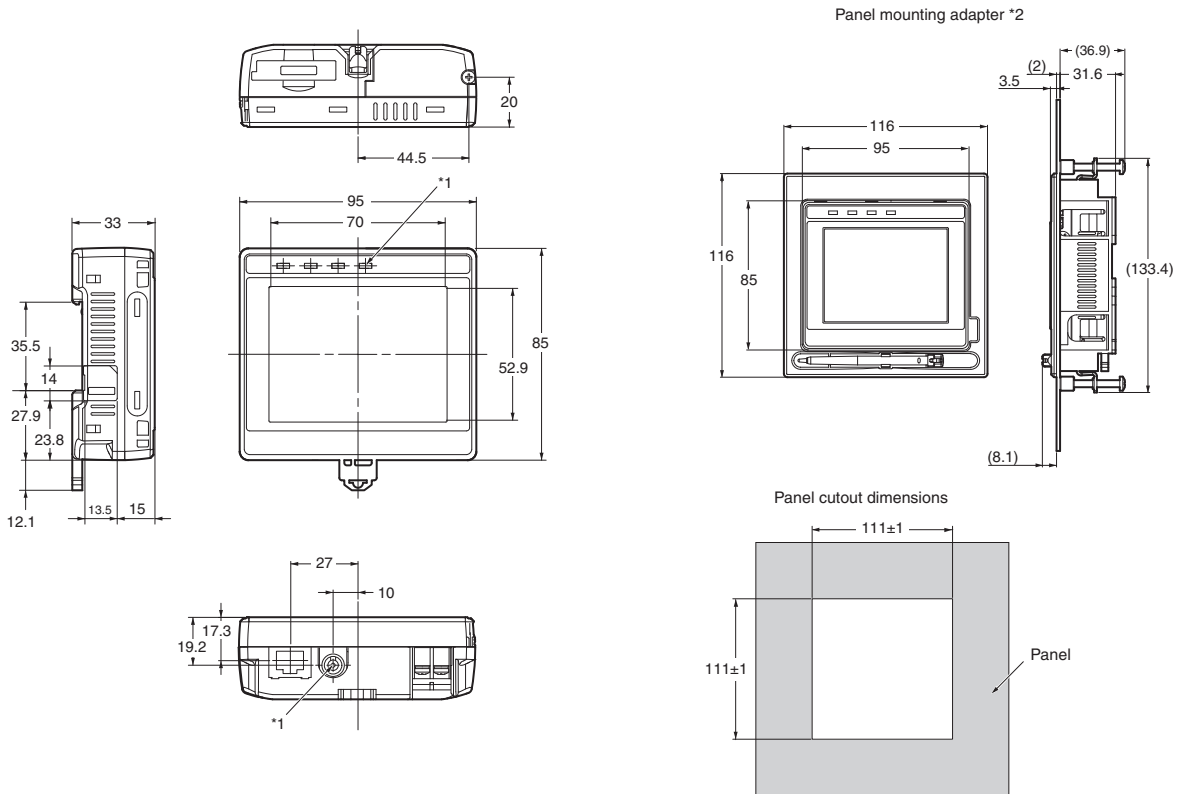
*1. Provided with FQ-MD31 only.

*2. The dimension of the panel mounting adapter does not include that of a FQ-MD□□.

## Cables

### For EtherCAT and Ethernet cable

Angle: M12 / Straight: RJ45
FQ-MWNL005/010

14.8 dia.
12 dia.
30.9
36.3
L *
(56.5)
(5)
35
19.5 dia.
6.5 dia.
35
(5)
(14.6)
(14)
19.5 dia.
ANGLED CONNECTOR M12
ETHERNET CONNECTOR RJ45
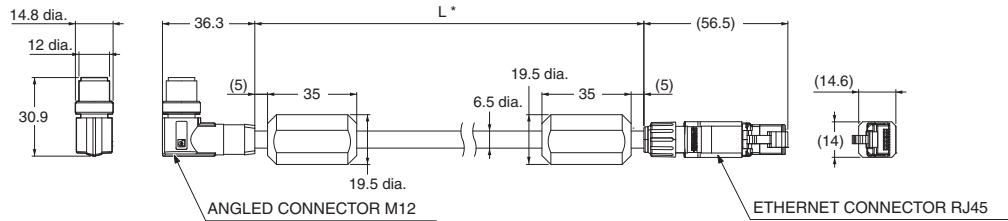
* Cable is available in 5 m/10 m

Straight type (M12/RJ45)
FQ-WN005/010

(44.7)
L *
(54.7)
(5)
35
6.5 dia.
19.5 dia.
35
(5)
(14.9 dia.)
19.5 dia.
(19.9)
CIRCULAR CONNECTOR M12
ETHERNET CONNECTOR RJ45
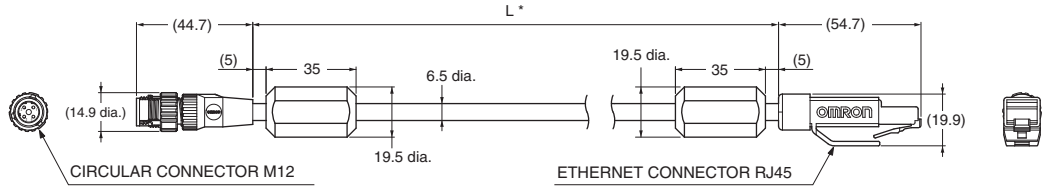
* Cable is available in 5 m/10 m

### For EtherCAT cable

Angle type (M12/M12)
FQ-MWNEL005/010

14.8 dia.
12 dia.
30.9
36.3
L *
36.3
(5)
35
19.5 dia.
6.5 dia.
35
(5)
19.5 dia.
ANGLED CONNECTOR M12
ANGLED CONNECTOR M12

* Cable is available in 5 m/10 m

Straight type (M12/M12)
FQ-MWNE005/010

(44.7)
L *
(44.7)
(5)
35
(19.5 dia.)
(19.5 dia.)
35
(5)
(14.9 dia.)
(14.9 dia.)
CIRCULAR CONNECTOR M12
CIRCULAR CONNECTOR M12
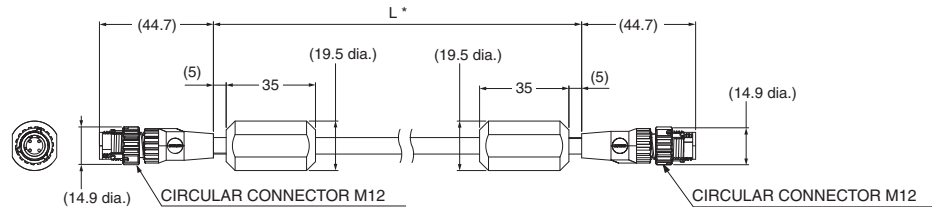
* Cable is available in 5 m/10 m

### I/O cables

Angle type
FQ-MWDL005/010

21 dia.
29.95
L *
41.7
(5)
35
8.5 dia.
19.5 dia.
ANGLED CONNECTOR M15
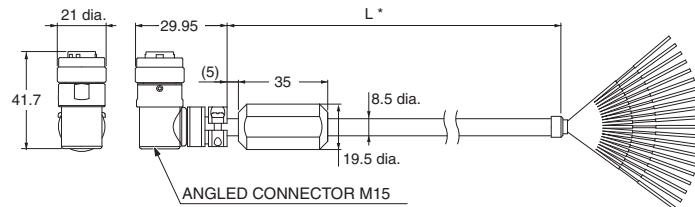
* Cable is available in 5 m/10 m

Straight type
FQ-MWD005/010
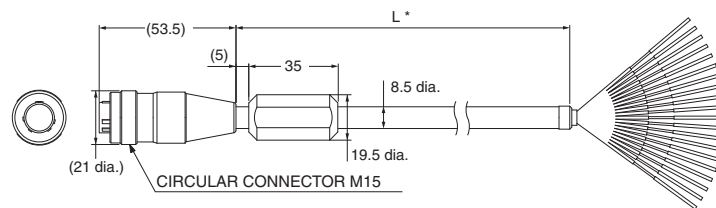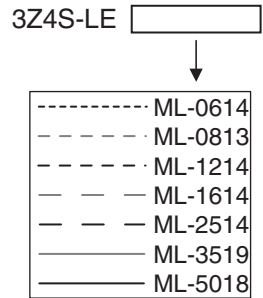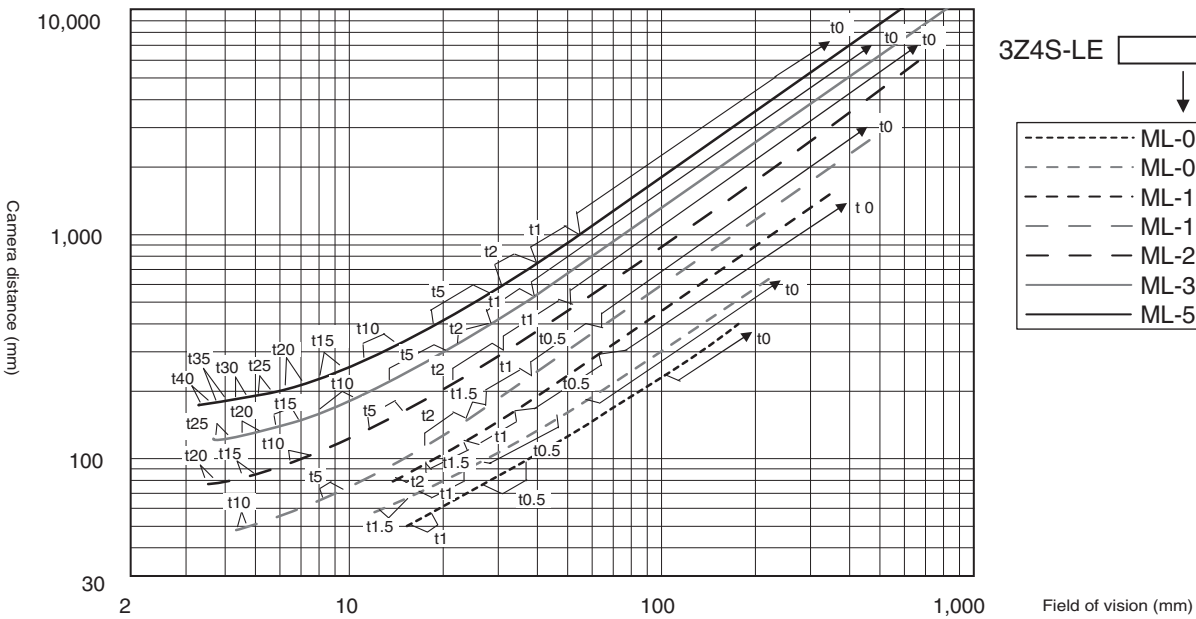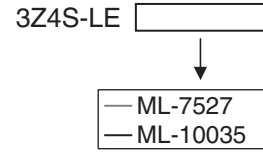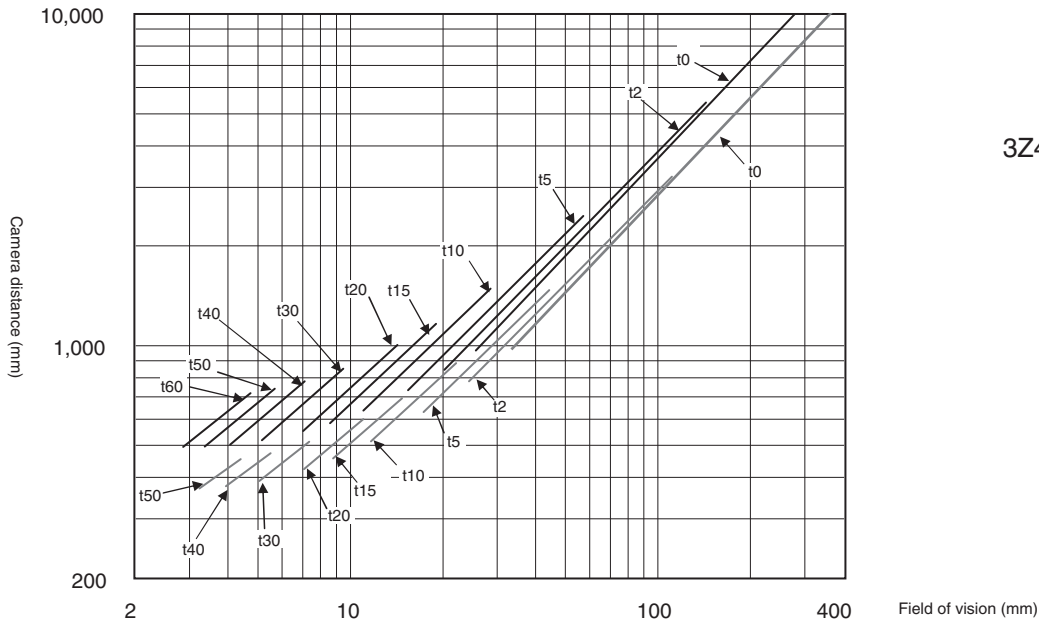
(53.5)
L *
(5)
35
8.5 dia.
19.5 dia.
(21 dia.)
CIRCULAR CONNECTOR M15

* Cable is available in 5 m/10 m

# OMRON

## Optical Chart



3Z4S-LE
- ML-7527
- ML-10035



3Z4S-LE
- ML-0614
- ML-0813
- ML-1214
- ML-1614
- ML-2514
- ML-3519
- ML-5018

### Meaning of optical chart

The X axis of the optical chart shows the field of vision (mm)[1], and the Y axis of the optical chart shows the camera installation distance (mm).[2]
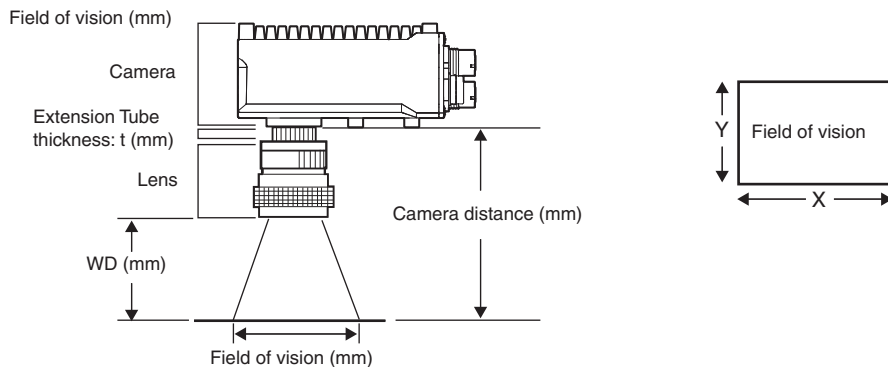


*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2. The vertical axis represents WD for small cameras.

## Ordering information
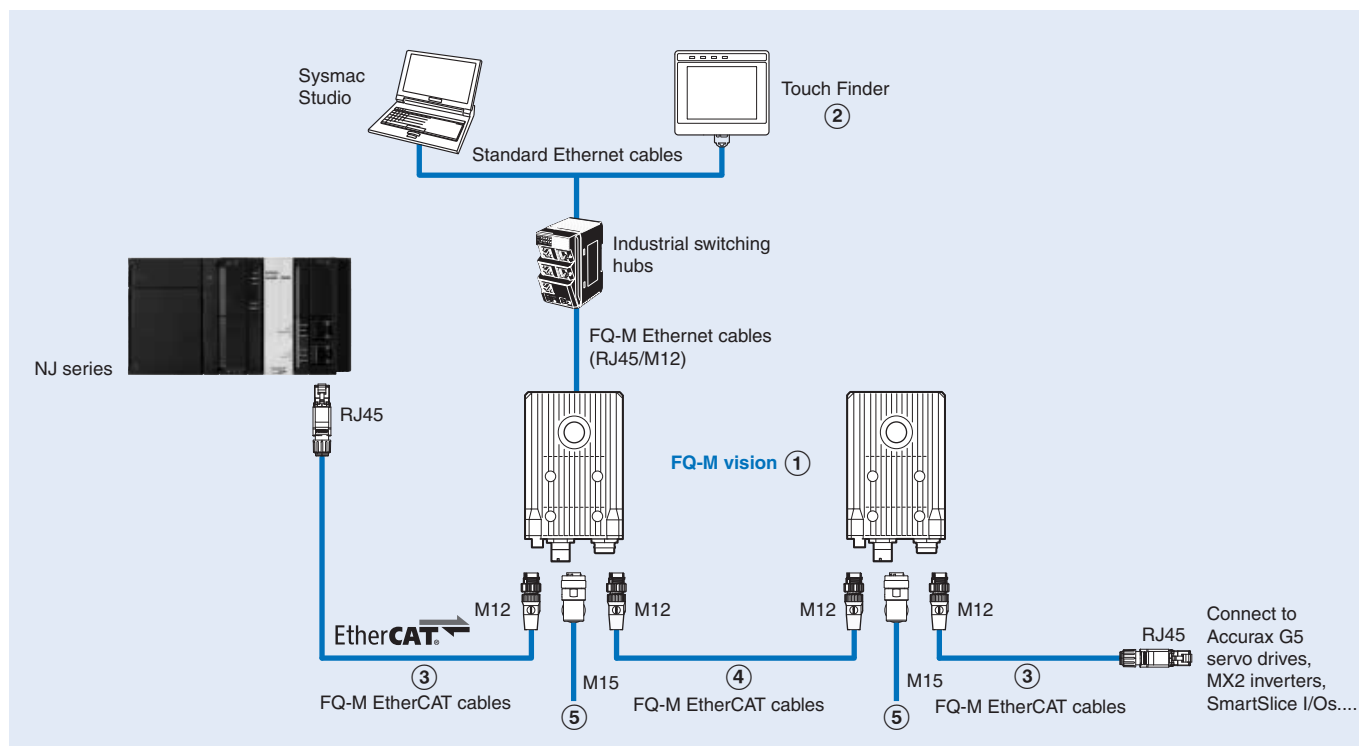


### Sensors

| Symbol | Type | | | Model | Appearance |
|---|---|---|---|---|---|
| ① | Color | NPN | EtherCAT communication function provided | FQ-MS120-ECT | |
| | | PNP | | FQ-MS125-ECT | |
| | Monochrome | NPN | | FQ-MS120-M-ECT | |
| | | PNP | | FQ-MS125-M-ECT | |

### Touch Finder

| Symbol | Type | Model | Appearance |
|---|---|---|---|
| ② | DC power supply | FQ-MD30 | |
| | AC/DC/battery[1] | FQ-MD31 | |

[1] AC Adapter and Battery are sold separately.

### Bend resistant cables for FQ-M series

| Symbol | Type | | Model | Appearance |
|---|---|---|---|---|
| ③ | For EtherCAT and Ethernet cable Angle: M12/Straight: RJ45 | Cable length: 5 m | FQ-MWNL005 | |
| | | Cable length: 10m | FQ-MWNL010 | |
| | For EtherCAT and Ethernet cable Straight type (M12/RJ45) | Cable length: 5 m | FQ-WN005-E | |
| | | Cable length: 10m | FQ-WN010-E | |
| ④ | For EtherCAT cable Angle type (M12/M12) | Cable length: 5 m | FQ-MWNEL005 | |
| | | Cable length: 10 m | FQ-MWNEL010 | |
| | For EtherCAT cable Straight type (M12/M12) | Cable length: 5 m | FQ-MWNE005 | |
| | | Cable length: 10 m | FQ-MWNE010 | |
| ⑤ | I/O Cables | Angle type | Cable length: 5 m | FQ-MWDL005 | |
| | | | Cable length: 10 m | FQ-MWDL010 | |
| | | Straight type | Cable length: 5 m | FQ-MWD005 | |
| | | | Cable length: 10 m | FQ-MWD010 | |

# OMRON

## Accessories for Touch Finder

| Type | | Model | Appearance |
|---|---|---|---|
| Panel mounting adapter | | FQ-XPM | |
| AC adapter (for models for DC/AC/Battery) | Plug type A, 125 V max. (PSE standard) | FQ-AC1 | |
| | Plug type A, 125 V max. (UL/CSA standard) | FQ-AC2 | |
| | Plug type A, 250 V max. (CCC mark standard) | FQ-AC3 | |
| | Plug type C, 250 V max. | FQ-AC4 | |
| | Plug type BF, 250 V max. | FQ-AC5 | |
| | Plug type O, 250 V max. | FQ-AC6 | |
| Battery (for models for DC/AC/Battery) | | FQ-BAT1 | |
| Touch pen (enclosed with Touch Finder) | | FQ-XT | |
| Strap | | FQ-XH | |
| SD Card (2 GB) | | HMC-SD291 | |

## Cameras peripheral devices

| Type | Specifications | Model |
|---|---|---|
| Cameras peripheral devices (CCTV Lens) | Focal distance: 6 mm, Focus: F1.4~close, Diameter: 30 mm | 3Z4S-LE ML-0614 |
| | Focal distance: 8 mm, Focus: F1.3~close, Diameter: 30 mm | 3Z4S-LE ML-0813 |
| | Focal distance: 12 mm, Focus: F1.4~close, Diameter: 30 mm | 3Z4S-LE ML-1214 |
| | Focal distance: 16 mm, Focus: F1.4~close, Diameter: 30 mm | 3Z4S-LE ML-1614 |
| | Focal distance: 25 mm, Focus: F1.4~close, Diameter: 30 mm | 3Z4S-LE ML-2514 |
| | Focal distance: 35 mm, Focus: F1.9~close, Diameter: 30 mm | 3Z4S-LE ML-3519 |
| | Focal distance: 50 mm, Focus: F1.8~close, Diameter: 32 mm | 3Z4S-LE ML-5018 |
| | Focal distance: 75 mm, Focus: F2.7~close, Diameter: 32 mm | 3Z4S-LE ML-7527 |
| | Focal distance: 100 mm, Focus: F3.5~close, Diameter: 32 mm | 3Z4S-LE ML-10035 |
| Extension tube[1] | Length: 0.5 mm | 3Z4S-LE ML-EXR0.5 |
| | Length: 1 mm | 3Z4S-LE ML-EXR1 |
| | Length: 2 mm | 3Z4S-LE ML-EXR2 |
| | Length: 5 mm | 3Z4S-LE ML-EXR5 |
| | Length: 10 mm | 3Z4S-LE ML-EXR10 |
| | Length: 20 mm | 3Z4S-LE ML-EXR20 |
| | Length: 40 mm | 3Z4S-LE ML-EXR40 |
| External lightings | | FL Series |
| Lighting controllers | For FL series | FL-TCC1 |

[1] To achieve 50 and 60 mm, please combine two extension tubes.

## Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.01 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

ZW-CE1□, ZW-S□

# Fiber displacement sensor

## The benefits of OMRON's white light confocal principle

- Small size and ultra-lightweight fiber displacement sensor
- Stable measurements for any material with same mounting position
- Robust sensor head structure
- Synchronous measurement with EtherCAT

## System configuration



Sysmac
always in control

Sysmac Studio

Ethernet/USB connection

**NJ series**
Machine automation controller

EtherCAT⇄

**Confocal fiber displacement sensor**

Controller

Controller

Controller

Sensor head

Sensor head

Sensor head

# OMRON
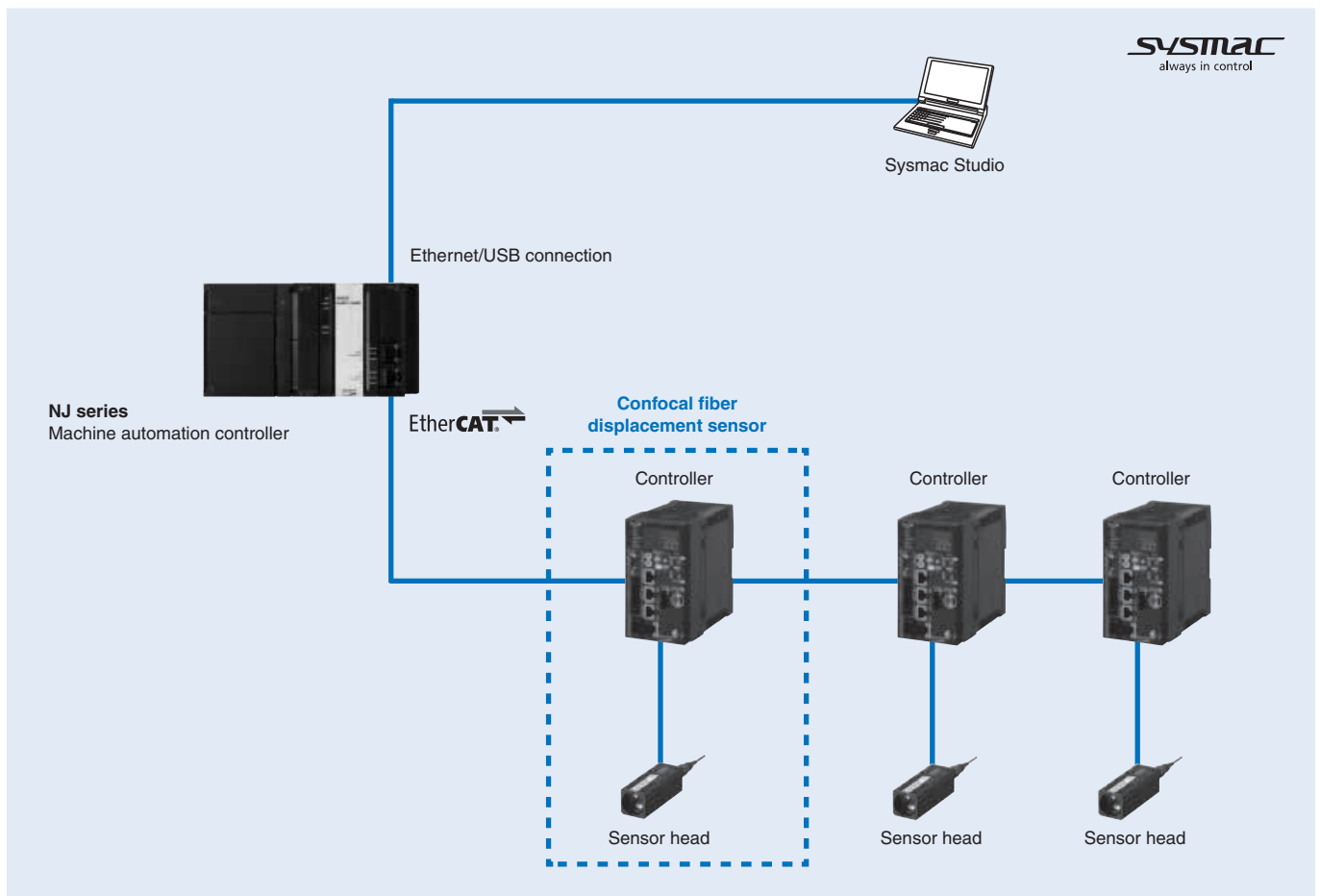
## Specifications

### Sensor head specifications

| Item | | ZW-S07 | ZW-S20 | ZW-S30 | ZW-S40 | ZW-SR07 | ZW-SR20 | ZW-SR40 |
|---|---|---|---|---|---|---|---|---|
| Measuring center distance | | 7 mm | 20 mm | 30 mm | 40 mm | 7 mm | 20 mm | 40 mm |
| Measuring range | | ±0.3 mm | ±1 mm | ±3 mm | ±6 mm | ±0.3 mm | ±1 mm | ±6 mm |
| Static resolution[*1] | | 0.25 μm | 0.25 μm | 0.25 μm | 0.25 μm | 0.25 μm | 0.25 μm | 0.25 μm |
| Linearity[*2] | | ±0.8 μm | ±1.2 μm | ±4.5 μm | ±7.0 μm | ±1.1 μm | ±1.6 μm | ±9.3 μm |
| Spot diameter[*3] | Near | 20 μm dia. | 45 μm dia. | 70 μm dia. | 90 μm dia. | 20 μm dia. | 45 μm dia. | 90 μm dia. |
| | Center | 18 μm dia. | 40 μm dia. | 60 μm dia. | 80 μm dia. | 18 μm dia. | 40 μm dia. | 80 μm dia. |
| | Far | 20 μm dia. | 45 μm dia. | 70 μm dia. | 90 μm dia. | 20 μm dia. | 45 μm dia. | 90 μm dia. |
| Measuring cycle | | 500 μs to 10 ms | | | | | | |
| Operating ambient illumination | | Illumination on object surface 10.000 lx or less: incandescent light | | | | | | |
| Ambient temperature range | | Operating: 0 to 50ºC, Storage: –15 to 60ºC (with no icing or condensation) | | | | | | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | | | | | | |
| Degree of protection | | IP40 (IEC60529) | | | | | | |
| Vibration resistance (destructive) | | 10 to 150 Hz, 0.35 mm single amplitude, 80 min each in X, Y and Z directions | | | | | | |
| Shock resistance (destructive) | | 150 m/s$^2$ 3 times each in six directions (up/down, left/right, forward/backward) | | | | | | |
| Temperature characteristic[*4] | | 0.6 μm/ºC (0.45 μm/ºC) | 1.5 μm/ºC (1.0 μm/ºC) | 2.8 μm/ºC (2.0 μm/ºC) | 4.8 μm/ºC (3.8 μm/ºC) | 0.6 μm/ºC (0.45 μm/ºC) | 1.5 μm/ºC (1.0 μm/ºC) | 4.8 μm/ºC (3.8 μm/ºC) |
| Materials | | Case: aluminium die-cast / Fiber cable sheat: PVC / Calibration ROM: PC | | | | | | |
| Fiber cable length | | 0.3 m, 2 m (flex-resistant cable) | | | | | | |
| Fiber cable minimum bending radius | | 20 mm | | | | | | |
| Insulation resistance (calibration ROM) | | Between case and all terminals: 20 MΩ (by 250 V megger) | | | | | | |
| Dielectric strength (calibration ROM) | | Between case and all terminals: 1000 VAC, 50/60 Hz, 1 min | | | | | | |
| Weight | | Approx. 105 g (chassis, fiber cable total) | | | | | | |
| Accessories included with sensor head | | Instruction sheet, fixing screw (M2) for calibration ROM, precautions for correct use | | | | | | |

[*1] Capacity value when OMRON standard mirror surface target is measured at the measurement center distance as the average of 4,096 times.
[*2] Material setting for the OMRON standard mirror surface target: error from an ideal straight line when measuring on mirror surface. The reference values for linearity when targets to measure other than the above are as in the below table:

| Item | ZW-S07 | ZW-S20 | ZW-S30 | ZW-S40 | ZW-SR07 | ZW-SR20 | ZW-SR40 |
|---|---|---|---|---|---|---|---|
| Grass | ±1.0 μm | ±1.2 μm | ±4.5 μm | ±7.0 μm | ±1.1 μm | ±1.6 μm | ±9.3 μm |
| SUS BA | ±1.2 μm | ±1.4 μm | ±5.5 μm | ±8.5 μm | ±1.2 μm | ±1.8 μm | ±9.3 μm |
| White ceramic | ±1.6 μm | ±1.7 μm | ±6.4 μm | ±9.5 μm | ±1.6 μm | ±1.9 μm | ±11.0 μm |

[*3] Capacity value defined by 1/e$^2$ (13.5%) of the center optical intensity in the measured area.
[*4] Temperature characteristic at the measurement center distance when fastened with an aluminium jig between the sensor head and the target and the sensor head and the controller are set in the same temperature environment. Figures in parentheses are converted values obtained by subtracting the effect of expansion or contraction of the aluminium jig itself.

### Controller specifications

| Item | | | ZW-CE10□ | ZW-CE15□ |
|---|---|---|---|---|
| Input/output type | | | NPN | PNP |
| Number of connected sensor heads | | | 1 per controller | |
| Sensor head compatibility | | | Available | |
| Light source for measurement | | | White LED | |
| Segment display | Main display | | 11-segment red display, 6 digits | |
| | Sub display | | 11-segment green display, 6 digits | |
| LED display | Status indicators | | HIGH (orange), PASS (green), LOW (orange), STABILITY (green), ZERO (green), ENABLE (green), THRESHOLD-H (orange), THRESHOLD-L (orange), RUN (green) | |
| | EtherCAT indicators | | L/A IN (Link Activity IN) (green), L/A OUT (Link Activity OUT) (green), ECAT RUN (green), ECAT ERR (red) | |
| External interface | Ethernet | | 100BASE-TX, 10BASE-T, no-protocol communications (TCP/UDP). EtherNet/IP™ | |
| | EtherCAT | | EtherCAT specific protocol 100BASE-TX | |
| | RS-232C | | 115,200 bps max. | |
| | Analog output terminal block | Analog voltage output (OUT1V) | –10 to +10 V, output impedance: 100 Ω | |
| | | Analog current output (OUT1A) | 4 to 20 mA, max. load resistance: 300 Ω | |
| | 32-pole extension connector | Judgment output (HIGH1/PASS1/LOW1) | Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA max. Residual voltage when turning ON: 1.2 V max. Leakage current when turning OFF: 0.1 mA max. | |
| | | BUSY output (BUSY1) | | |
| | | ALARM output (ALARM1) | | |
| | | ENABLE output (ENABLE) | | |
| | | LED OFF input (LED OFF1) | DC input system Input voltage: 24 VDC ±10% (21.6 to 26.4 VDC) Input current: 7 mA Typ. (24 VDC) Voltage/current when turning ON: 19 V/3 mA min. Voltage/current when turning OFF: 5 V/1 mA max. | |
| | | ZERO RESET input (ZERO) | | |
| | | TIMING output (TIMING1) | | |
| | | RESET output (RESET1) | | |
| | | Bank — Selected bank output (BANK_OUT 1 to 3) | Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA max. Residual voltage when turning ON: 1.2 V max. Leakage voltage when turning OFF: 0.1 mA max. | |
| | | Bank — Selected bank input (BANK_SEL 1 to 3) | DC input system Input voltage: 21.6 to 26 VDC Input current: 7 mA Typ. (24 VDC) Voltage/current when turning ON: 19 V/3 mA min. Voltage/current when turning OFF: 5 V/1 mA max. | |

| Item | | ZW-CE10☐ | ZW-CE15☐ |
|---|---|---|---|
| Main functions | Exposure time | Auto/Manual | |
| | Measuring cycle | 500 µs to 10 ms | |
| | Material setting | Standard/Mirror/Diffusion surfaces | |
| | Measurement item | Height/Thickness/Calculation | |
| | Filtering | Median/Average/Differentiation/High-pass/Low-pass/Band-pass | |
| | Outputs | Scaling/Different holds/Zero reset/Logging for a measured value | |
| | Display | Measured value/Threshold value/Analog output voltage or current value/Judgment result/Resolution/Exposure time | |
| | Number of configurable banks | 8 banks max. | |
| | Task process | Multi-task (up to 4 tasks per bank) | |
| | System | Save/Initialization/Display measurement information/Communication settings/Sensor head calibration/Key-lock/Trigger key input | |
| Ratings | Power supply voltage | 21.6 to 26.4 VDC (including ripple) | |
| | Current consumption | 600 mA max. | |
| | Insulation resistance | Across all lead wires and controller case: 20 MΩ (250 VDC megger) | |
| | Dielectric strength | Across all lead wires and controller case: 1000 VAC, 50/60 Hz, 1 min | |
| Environmental | Degree of protection | IP20 (IEC60529) | |
| | Vibration resistance (destructive) | 10 to 55 Hz, 0.35 mm single amplitude, 50 min each in X, Y and Z directions | |
| | Shock resistance (destructive) | 150 m/s$^2$, 3 times each in six directions (up/down, left/right, forward/backward) | |
| | Ambient temperature | Operating: 0 to 40ºC Storage: –15 to 60ºC (with no icing or condensation) | |
| | Ambient humidity | Operating and storage: 35% to 85% (with no condensation) | |
| Grounding | | D-type grounding (Grounding resistance of 100 Ω max.) **Note:** For conventional Class D grounding | |
| Materials | | Case: PC | |
| Weight | | Approx. 750 g (main unit only), Approx. 150 g (parallel cable) | |
| Accessories included with controller | | Instruction sheet, member registration sheet, parallel cable (ZW-XCP2E) | |

**Note:** Controllers with binary outputs are also available (ZW-CE10T/CE15T). Please contact your OMRON sales representative for details.

### EtherCAT communication specifications

| Item | Specifications |
|---|---|
| Communication standard | IEC61158 Type12 |
| Physical layer | 100BASE-TX (IEEE802.3) |
| Connectors | RJ45 × 2 ECAT IN: EtherCAT input ECAT OUT: EtherCAT output |
| Communication media | Category 5 or higher (cable with double, aluminium type and braided shielding) is recommended |
| Communication distance | Distance between nodes: 100 m max. |
| Process data | Variable PDO mapping |
| Mailbox (CoE) | Emergency messages, SDO requests, SDO responses, SDO information |
| Distributed clock | Synchronization in DC mode |
| LED display | L/A IN (Link Activity IN) × 1 L/A OUT (Link Activity OUT) × 1 ECAT RUN × 1 ECAT ERR × 1 |

## Dimensions

### Sensor head

#### Straight type: ZW-S07/S20/S30/S40



**Mounting hole dimensions**
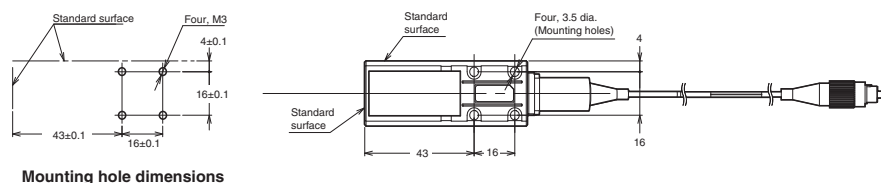
Note:

| Model | L | M | X |
|---|---|---|---|
| ZW-S07 | 7 | 0.3 | 12 |
| ZW-S20 | 20 | 1 | 11.8 |
| ZW-S30 | 30 | 3 | 11.7 |
| ZW-S40 | 40 | 6 | 11.7 |
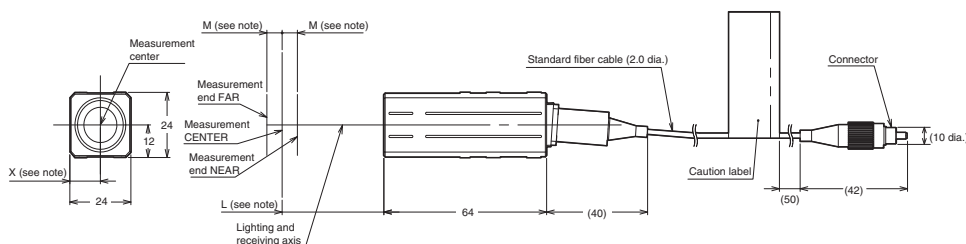
## Right-angle type: ZW-SR07/SR20/SR40
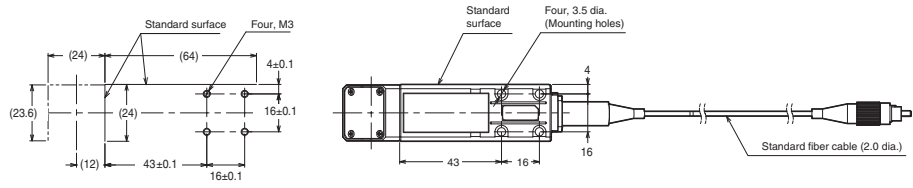


**Mounting hole dimensions**
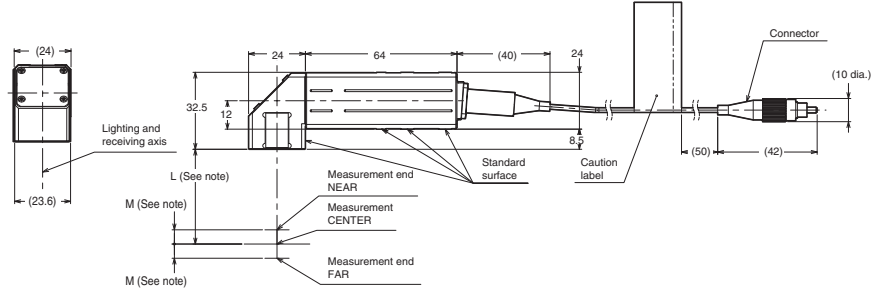
**Note:**

| Model | L | M |
|---|---|---|
| ZW-SR07 | 7 | 0.3 |
| ZW-SR20 | 20 | 1 |
| ZW-SR40 | 40 | 6 |

## Controller

### ZW-CE10□/CE15□



**Mounting hole dimensions**
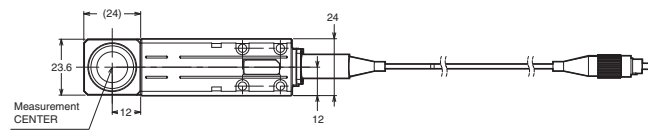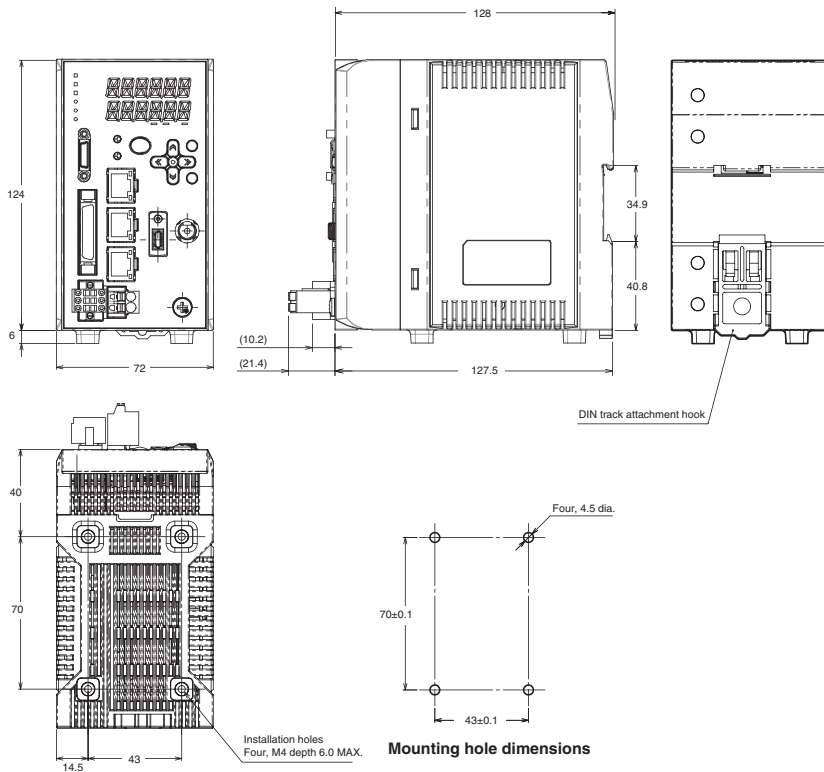
## Extension fiber cable

### ZW-XF02R/XF05R/XF10R/XF20R/XF30R
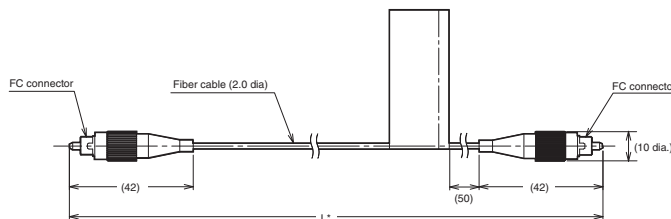


* The following table lists cable lengths per models.

| Model | Cable length | L |
|---|---|---|
| ZW-XF02R | 2 m | 2000±20 |
| ZW-XF05R | 5 m | 5000±50 |
| ZW-XF10R | 10 m | 10000±100 |
| ZW-XF20R | 20 m | 20000±200 |
| ZW-XF30R | 30 m | 30000±300 |

# Characteristic data

## Linearity characteristic by materials



+

Measurement center distance 0
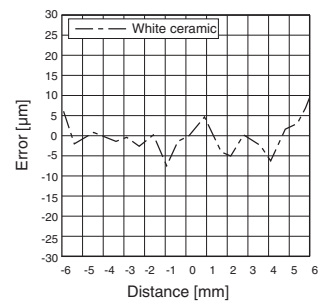
−

+

Measurement center distance 0

−
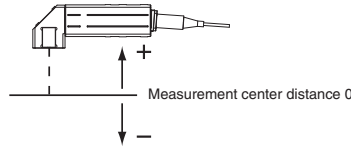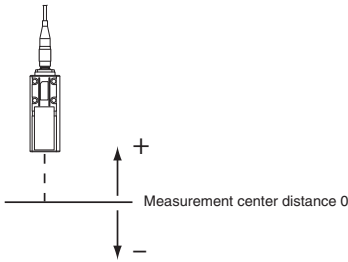
### ZW-S07

**Material setting: Normal**
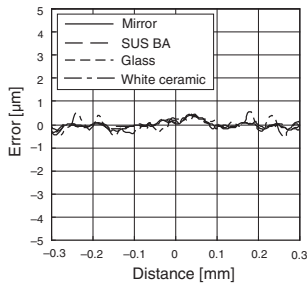


**Material setting: Mirror surface**
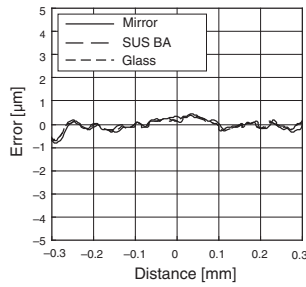


**Material setting: Diffusion surface**
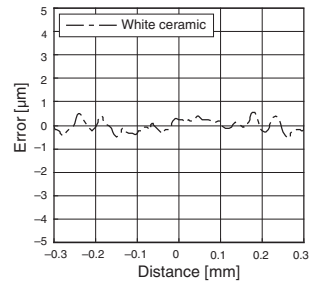


### ZW-S20

**Material setting: Normal**
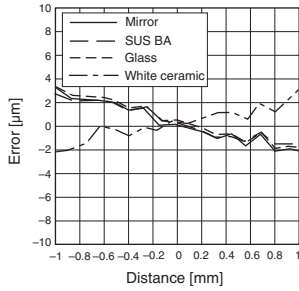


**Material setting: Mirror surface**
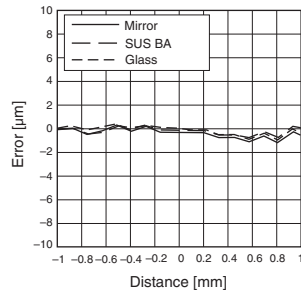


**Material setting: Diffusion surface**
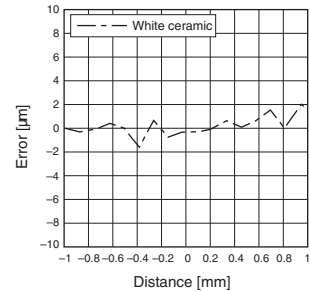


### ZW-S30

**Material setting: Normal**
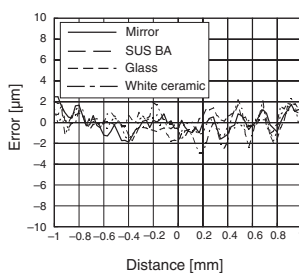


**Material setting: Mirror surface**
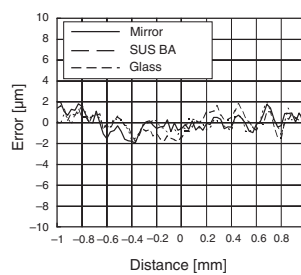


**Material setting: Diffusion surface**



### ZW-S40

**Material setting: Normal**



**Material setting: Mirror surface**



**Material setting: Diffusion surface**



**Fiber displacement sensor**
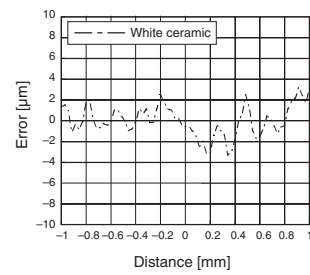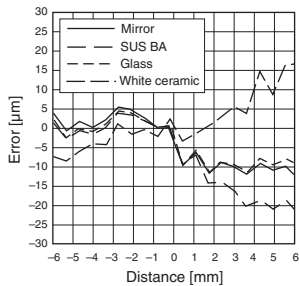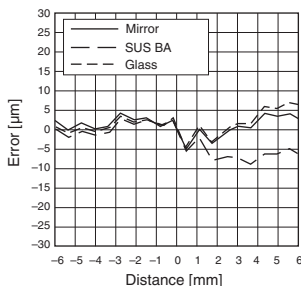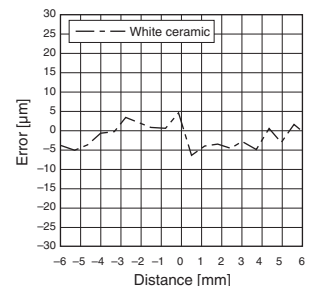
## ZW-SR07

### Material setting: Normal
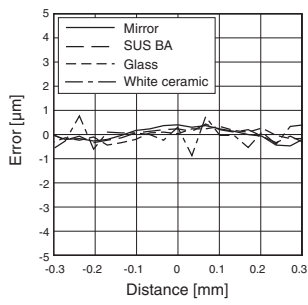


### Material setting: Mirror surface
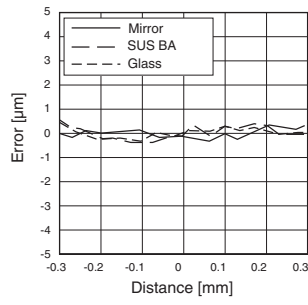


### Material setting: Diffusion surface
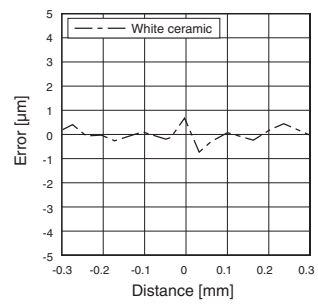


## ZW-SR20

### Material setting: Normal
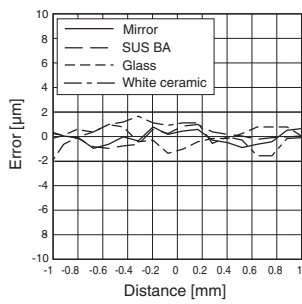


### Material setting: Mirror surface
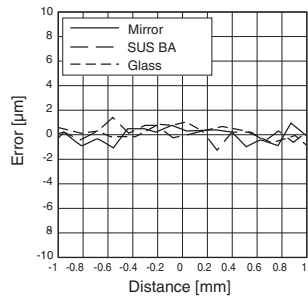


### Material setting: Diffusion surface
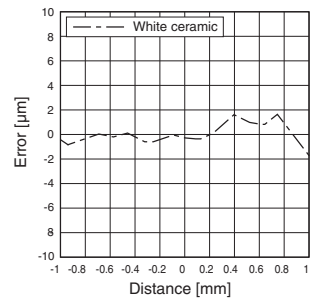


## ZW-SR40

### Material setting: Normal
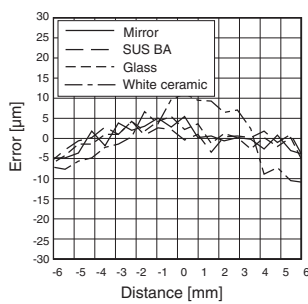


### Material setting: Mirror surface
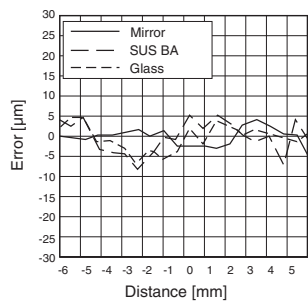


### Material setting: Diffusion surface

## Angle characteristic*

α direction    β direction

Model nameplate

α direction    β direction

Slope angle +    Slope angle +    Slope angle +    Slope angle +

Slope angle −    Slope angle −    Slope angle -    Slope angle -
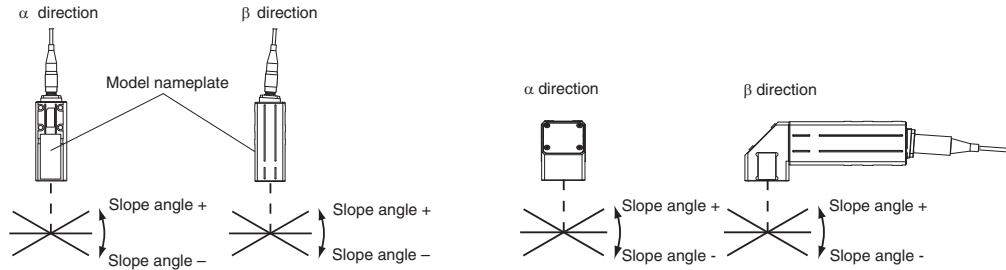
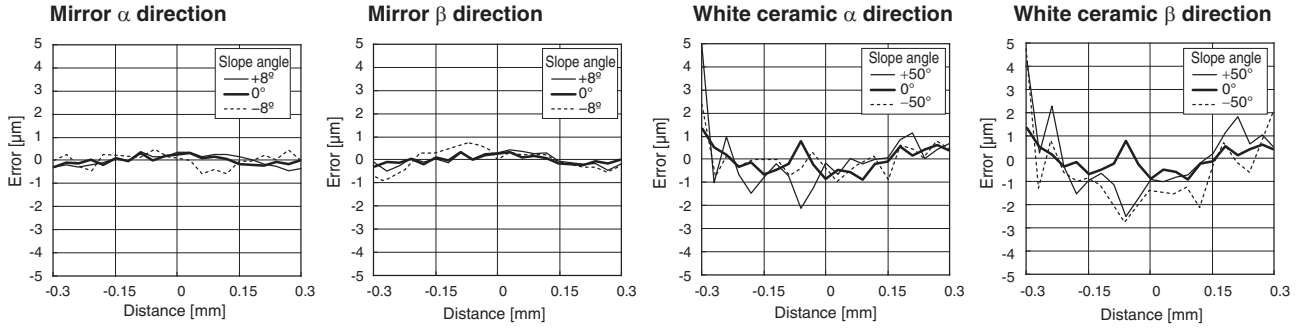* The above show the results after executing scaling.

### ZW-S07

**Mirror α direction**

Error [μm] / Distance [mm]

Slope angle
+8°
0°
-8°

**Mirror β direction**

Slope angle
+8°
0°
-8°

**White ceramic α direction**

Slope angle
+50°
0°
-50°

**White ceramic β direction**

Slope angle
+50°
0°
-50°

### ZW-S20

**Mirror α direction**

Slope angle
+8°
0°
−8°

**Mirror β direction**

Slope angle
+8°
0°
−8°

**White ceramic α direction**

Slope angle
+50°
0°
−50°

**White ceramic β direction**

Slope angle
+50°
0°
−50°

### ZW-S30

**Mirror α direction**

Slope angle
+6°
0°
−6°

**Mirror β direction**

Slope angle
+6°
0°
−6°

**White ceramic α direction**

Slope angle
+50°
0°
−50°

**White ceramic β direction**

Slope angle
+50°
0°
−50°

### ZW-S40

**Mirror α direction**

Slope angle
+5°
0°
−5°

**Mirror β direction**

Slope angle
+5°
0°
−5°

**White ceramic α direction**

Slope angle
+50°
0°
−50°

**White ceramic β direction**

Slope angle
+50°
0°
−50°

## ZW-SR07

**Mirror α direction**



**Mirror β direction**



**White ceramic α direction**



**White ceramic β direction**



## ZW-SR20

**Mirror α direction**



**Mirror β direction**



**White ceramic α direction**



**White ceramic β direction**



## ZW-SR40

**Mirror α direction**



**Mirror β direction**



**White ceramic α direction**



**White ceramic β direction**

## Ordering information



Sysmac Studio

Ethernet/USB connection

**NJ series**
Machine automation controller

EtherCAT.

**Confocal fiber displacement sensor**

② Controller     Controller     Controller

③ Extension fiber cable

① Sensor head     Sensor head     Sensor head

### Sensor head

| Symbol | Type | Measuring range | Spot diameter | Static resolution | Model | Appearance |
|---|---|---|---|---|---|---|
| ① | Straight type | 7 ±0.3 mm | 18 μm dia. | 0.01 μm[*1]/0.25 μm | ZW-S07 | |
| | | 20 ±1 mm | 40 μm dia. | 0.02 μm[*1]/0.25 μm | ZW-S20 | |
| | | 30 ±3 mm | 60 μm dia. | 0.06 μm[*1]/0.25 μm | ZW-S30 | |
| | | 40 ±6 mm | 80 μm dia. | 0.08 μm[*1]/0.25 μm | ZW-S40 | |
| | Right-angle type | 7 ±0.3 mm | 18 μm dia. | 0.25 μm | ZW-SR07 | |
| | | 20 ±1 mm | 40 μm dia. | 0.25 μm | ZW-SR20 | |
| | | 40 ±6 mm | 80 μm dia. | 0.25 μm | ZW-SR40 | |

[*1] The high resolution types are subject to the export control restrictions.

**Note:** When ordering, specify the cable length (0.3 m, 2.0 m).

### Controller

| Symbol | Power supply voltage | Output type | Model | Appearance |
|---|---|---|---|---|
| ② | 24 VDC | NPN | ZW-CE10[*1] | |
| | | | ZW-CE10T | |
| | | PNP | ZW-CE15[*1] | |
| | | | ZW-CE15T | |

[*1] The high resolution types are subject to the export control restrictions.

**Note:** Controller with binary outputs are also available (ZW-CE10T/CE15T). Please, contact your OMRON representative for more details.

## Cables

| Symbol | Item | Cable length | Model | Appearance |
|---|---|---|---|---|
| ③ | Sensor head to Controller Extension fiber cable (flexible cable) (fiber adapter ZW-XFC provided) | 2 m | ZW-XF02R | |
| | | 5 m | ZW-XF05R | |
| | | 10 m | ZW-XF10R | |
| | | 20 m | ZW-XF20R | |
| | | 30 m | ZW-XF30R | |
| | Fiber adapter (between sensor head pre-wired cable and extension fiber cable) | – | ZW-XFC | |
| | Parallel cable for ZW-CE1☐T 32-pole[1] (included with controller ZW-CE1☐T) | 2 m | ZW-XCP2E | |
| | RS-232C cable for personal computer | 2 m | ZW-XRS2 | |
| | RS-232C cable for PLC/programmable terminal | 2 m | ZW-XPT2 | |

[1] A parallel cable for controllers with binary outputs is also available (ZW-XCP2). Please contact your OMRON sales representative for details.

## Accessories

| Item | Model |
|---|---|
| Fiber connector cleaner | ZW-XCL |

**Note:** Place orders in units of boxes (contacting 10 units).

## Setting software

| Item | Model |
|---|---|
| Smart monitor ZW | ZW-SW101 |

## Computer software

| Item | Model |
|---|---|
| Sysmac Studio version 1.05 or higher | SYSMAC-SE2☐☐☐ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

**E3NW-□, E3NX-□, E3NC-□, E9NC-□**

# N-Smart series sensor

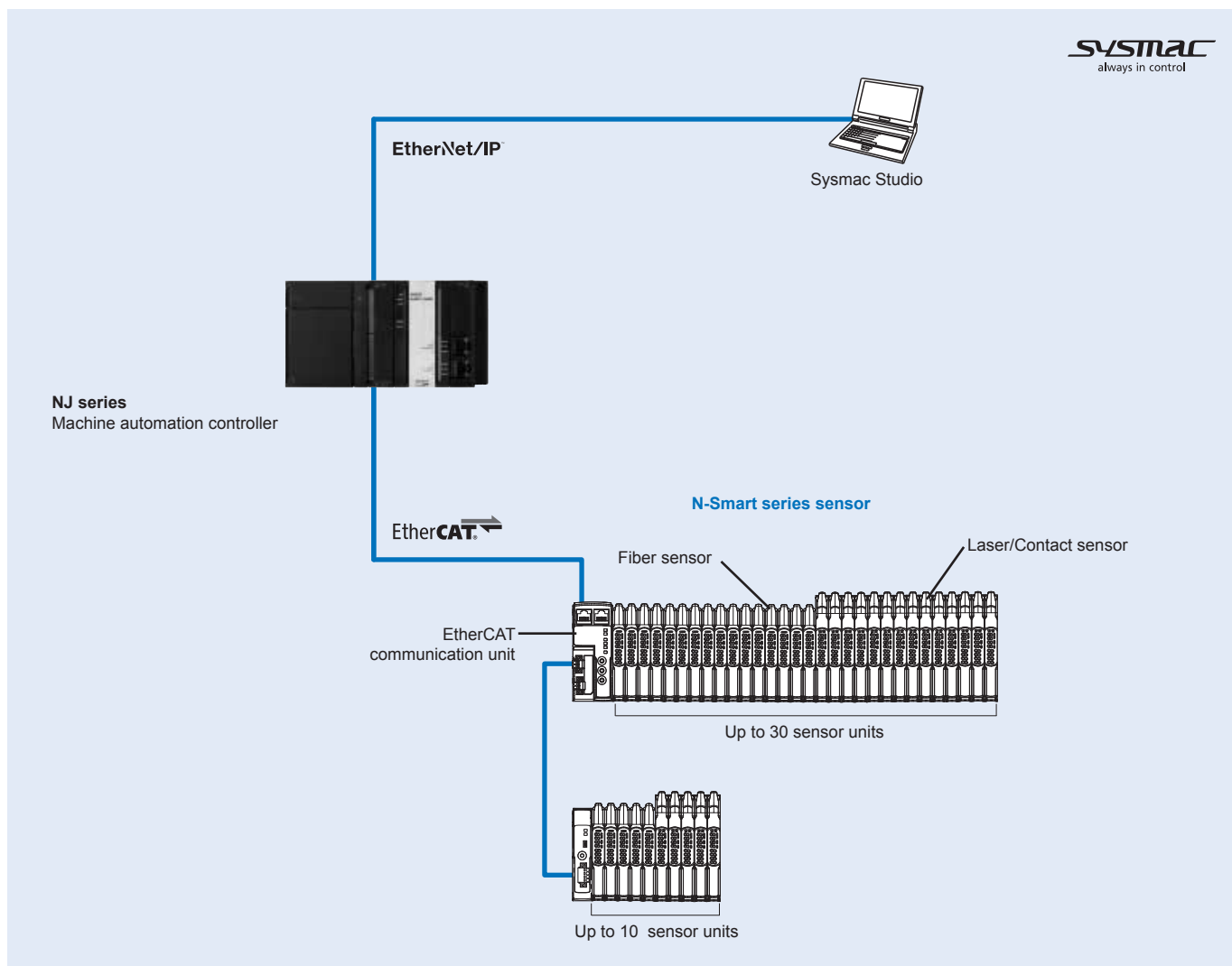## Easily connect fiber sensors, laser sensors and contact sensors to EtherCAT

- **E3NX-FA fiber sensors:** High performance fiber amplifier with increased dynamic range, resolution and sensing distance
- **E3NC-L compact laser sensors:** 3 types of head are available for long distance and variable spot type and minute spot type
- **E3NC-S ultra-compact CMOS laser sensors:** Stable detection from to glossy workpieces to black rubber with the industry's smallest body
- **E9NC-T contact sensors:** Unique ball spline mechanism for resistance to vibration and shock

## System configuration



Sysmac
always in control

EtherNet/IP

Sysmac Studio

**NJ series**
Machine automation controller

EtherCAT

**N-Smart series sensor**

Fiber sensor

Laser/Contact sensor

EtherCAT
communication unit

Up to 30 sensor units

Up to 10 sensor units

## Specifications

### Sensor communication unit and distributed sensor unit specifications

| Item | Specifications | |
|---|---|---|
| | Sensor communication unit | Distributed sensor unit |
| Model | E3NW-ECT | E3NW-DS |
| Power supply voltage | 24 VDC (20.4 to 26.4 V) | |
| Power and current consumption | 2.4 W max./100 mA max. | 2 W max./80 mA max. |
| Indicators | L/A IN indicator (green), L/A OUT indicator (green), PWR indicator (green), RUN indicator (green), ERROR indicator (red) and SS (sensor status) indicator (green/red) | RUN indicator (green) and SS (sensor status) indicator (green/red) |
| Vibration resistance (destruction) | 10 to 60 Hz with a 0.7 mm double amplitude, 50 m/s$^2$ at 60 to 150 Hz, for 1.5 hours each in X, Y and Z directions | |
| Shock resistance (destruction) | 150 m/s$^2$ for 3 times each in X, Y and Z directions | |
| Ambient temperature range | Operating: 0 to 55ºC[*1], Storage: -30 to 70ºC (with no icing or condensation) | |
| Ambient humidity range | Operating and storage: 25% to 85% (with no condensation) | |
| Max. connectable sensors | 30[*2] | 10 |
| Max. connectable distributed sensor | 8 | – |
| Insulation resistance | 20 MΩ min. (at 500 VDC) | |
| Dielectric strength | 500 VAC at 50/60 Hz for 1 minute | |
| Mounting method | 35-mm DIN track-mounting | |
| Weight (packed state/unit only) | Approx. 185 g / approx. 95 g | Approx. 160 g / approx. 40 g |
| Materials | Polycarbonate (PC) | |
| Accessories | Power supply connector, communication connector for E3NW-DS connection, DIN track end plates (2 pcs) and instruction manual | Power supply/communication connector, DIN track end plates (2 pcs), ferrite cores (2 pcs) and instruction manual |

[*1] Temperature limitations based on number of connected amplifier units: groups of 1 or 2 amplifier units: 0 to 55ºC, groups of 3 to 10 amplifier units: 0 to 50ºC, groups of 11 to 16 amplifier units: 0 to 45ºC, groups of 17 to 30 amplifier units: 0 to 40ºC.

[*2] You can connect up to 30 sensors total to the sensor communication units and distributed sensor units.

### Fiber amplifier unit specifications

| Item | | Specifications |
|---|---|---|
| Model | | E3NX-FA0 |
| Connection method | | Connector for sensor communication unit |
| Light source (wavelength) | | Red, 4-element LED (625 nm) |
| Power supply voltage | | Supplied from the connector through the sensor communication unit |
| Power consumption (at 24 VDC)[*1] | | Normal mode: 960 mW max. (current consumption: 40 mA max.) Eco ON: 720 mW max. (current consumption: 30 mA max.) Eco LO: 840 mW max. (current consumption: 35 mA max.) |
| Protection circuits | | Power supply reverse polarity protection and output short-circuit protection |
| Response time | Super-high speed mode (SHS)[*2] | Operate or reset: 32 μs |
| | High-speed mode (HS) | Operate or reset: 250 μs |
| | Standard mode (Stnd) | Operate or reset: 1 ms |
| | Giga-power mode (GIGA) | Operate or reset: 16 ms |
| Max. connectable units | | 30 |
| No. of unit for mutual interference prevention | Super-high speed mode (SHS)[*2] | 0 |
| | High-speed mode (HS) | 10 |
| | Standard mode (Stnd) | 10 |
| | Giga-power mode (GIGA) | 10 |
| Auto power control (APC) | | Always enabled |
| Functions | Dynamic power control (DPC) | Provided |
| | Receiver side timer | Select from timer disabled, OFF-delay, ON-delay, one-shot or ON-delay + OFF-delay timer: 1 to 9,999 ms |
| | Zero reset | Negative values can be displayed (threshold value is shifted) |
| | Resetting settings[*3] | Select from initial reset (default settings) or user reset (saved settings) |
| | Eco mode | Select from OFF (digital display lit), Eco ON (digital display no lit) or Eco LO (digital display dimmed) |
| | Bank switching | Select from banks 1 to 4 |
| | Power tuning | Select from ON or OFF |
| | Output 1 | Select from normal detection mode or area detection mode |
| | Output 2 | Select from normal detection mode, alarm output mode or error output mode |
| | Hysteresis width | Select from standard setting or user setting. For a user setting, the hysteresis width can be set from 0 to 9,999 |
| Ambient illumination (receiver side) | | Incandescent lamp: 20,000 lx max., Sunlight: 30,000 lx max. |
| Ambient temperature range | | Operating: 0 to 55ºC[*4], Storage: -30 to 70ºC (with no icing or condensation) |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) |
| Altitude | | 2,000 max. |
| Installation environment | | Pollution degree 3 (as per IEC 60947-1) |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute |
| Vibration resistance (destruction) | | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y and Z directions |
| Shock resistance (destruction) | | 150 m/s$^2$ for 3 times each in X, Y and Z directions |
| Weight (packed state/sensor only) | | Approx. 65 g / approx. 25 g |
| Materials | | Polycarbonate (PC) |
| Accessories | | Instruction manual |

[*1] At power supply voltage of 10 to 30 VDC: Normal mode: 1.080 mW max. (current consumption: 36 mA max. at 30 VDC, 108 mA max. at 10 VDC). Eco ON mode: 880 mW max. (current consumption: 28 mA max. at 30 VDC, 88 mA max. at 10 VDC). Eco LO mode: 980 mW max. (current consumption: 32 mA max. at 30 VDC, 98 mA max. at 10 VDC).

[*2] The mutual interference prevention function is disabled if the detection mode is set to super-high speed mode.

[*3] The bank is not reset by the user reset function or saved by the user save function.

[*4] When the number of connected unit is 11 or more, the ambient temperature is less than 50ºC.

# Laser amplifier unit specifications

| Item | | Specifications | |
|---|---|---|---|
| Model | | E3NC-LA0 | E3NC-SA0 |
| Connection method | | Connector for sensor communication unit | |
| Power supply voltage | | Supplied from the connector through the sensor communication unit | |
| Power consumption (at 24 VDC)[*1][*2] | | Normal mode: 1560 mW max. (current consumption: 65 mA max.)<br>Eco ON: 1320 mW max. (current consumption: 55 mA max.)<br>Eco LO: 1440 mW max. (current consumption: 60 mA max.) | Normal mode: 1920 mW max. (current consumption: 80 mA max.)<br>Eco ON: 1680 mW max. (current consumption: 70 mA max.)<br>Eco LO: 1800 mW max. (current consumption: 75 mA max.) |
| Indicators | | 7-segment displays (sub digital display: green, main digital display: white)<br>Display direction: Switchable between normal and reversed<br>OUT indicator (orange), L/D indicator (orange), ST indicator (blue), DPC indicator (green), ZERO indicator (green) and OUT selection indicator (orange) | |
| Protection circuits | | Power supply reverse polarity protection and output short-circuit protection | |
| Response time | Super-high speed mode (SHS)[*3] | Operate or reset: 80 μs | Operate or reset: 1.5 ms |
| | High-speed mode (HS) | Operate or reset: 250 μs | Operate or reset: 5 ms |
| | Standard mode (Stnd) | Operate or reset: 1 ms | Operate or reset: 10 ms |
| | Giga-power mode (GIGA) | Operate or reset: 16 ms | Operate or reset: 50 ms |
| Sensitivity adjustment | | Smart tuning (2-point tuning, full auto tuning, position tuning, maximum sensitivity tuning, power tuning or percentage tuning (–99% to +99%) or manual adjustment. | Smart tuning (2-point tuning, full auto tuning,1-point tuning, tuning without workpiece, 2-point area tuning, 1-point area tuning or area tuning without workpiece) or manual adjustment. |
| Max. connectable units | | 30 | |
| No. of unit for mutual interference prevention | Super-high speed mode (SHS)[*3] | 0 | 0 |
| | High-speed mode (HS) | 2 | 2 |
| | Standard mode (Stnd) | 2 | 2 |
| | Giga-power mode (GIGA) | 4 | 2 |
| Functions | Dynamic power control (DPC) | Provided | - |
| | Timer | Select from timer disabled, OFF-delay, ON-delay, one-shot or ON-delay + OFF-delay timer: 1 to 9,999 ms | |
| | Zero reset | Negative values can be displayed (threshold value is shifted) | |
| | Resetting settings[*4] | Select from initial reset (default settings) or user reset (saved settings) | |
| | Eco mode | Select from OFF (digital display lit), Eco ON (digital display no lit) or Eco LO (digital display dimmed) | |
| | Bank switching | Select from banks 1 to 4 | |
| | Power tuning | Select from ON or OFF | - |
| | Output 1 | Select from normal detection mode or area detection mode | Select from normal detection mode, area detection mode or hold mode |
| | Output 2 | Select from normal detection mode, alarm output mode or error output mode | Select from normal detection mode or error output mode |
| | Keep function[*5] | - | Select from ON or OFF |
| | Background suppression[*6] | - | Select from ON or OFF |
| | Hysteresis width | Select from standard setting or user setting | |
| Ambient temperature range | | Operating: 0 to 55ºC[*7], Storage: -30 to 70ºC (with no icing or condensation) | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | |
| Altitude | | 2,000 max. | |
| Installation environment | | Pollution degree 3 (as per IEC 60947-1) | |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) | |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute | |
| Vibration resistance (destruction) | | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y and Z directions | |
| Shock resistance (destruction) | | 150 m/s$^2$ for 3 times each in X, Y and Z directions | |
| Weight (packed state/amplifier unit only) | | Approx. 65 g / approx. 25 g | |
| Materials | | Polycarbonate (PC) | |
| Accessories | | Instruction manual | |

[*1] E3NC-LA0 amplifier: At power supply voltage of 10 to 30 VDC: Normal mode: 1650 mW max. (current consumption: 55 mA max. at 30 VDC, 115 mA max. at 10 VDC). Eco ON mode: 1410 mW max. (current consumption: 47 mA max. at 30 VDC, 95 mA max. at 10 VDC). Eco LO mode: 1530 mW max. (current consumption: 51 mA max. at 30 VDC, 105 mA max. at 10 VDC).

[*2] E3NC-SA0 amplifier: At power supply voltage of 10 to 30 VDC: Normal mode: 2250 mW max. (current consumption: 75 mA max. at 30 VDC, 145 mA max. at 10 VDC). Eco ON mode: 2010 mW max. (current consumption: 67 mA max. at 30 VDC, 125 mA max. at 10 VDC). Eco LO mode: 2130 mW max. (current consumption: 71 mA max. at 30 VDC, 135 mA max. at 10 VDC).

[*3] The mutual interference prevention function is disabled if the detection mode is set to super-high speed mode.

[*4] The bank is not reset by the user reset function or saved by the user save function.

[*5] The output for a measurement error is set. ON: The value of the output from before the measurement error is retained. OFF: The output is turned OFF when a measurement error occurs.

[*6] Only the sensing object is detected when tuning.

[*7] When the number of connected unit is 11 or more, the ambient temperature is less than 50ºC.

# OMRON

## Sensor head unit for E3NC-LA0 amplifier

| Item | | Specifications | | |
|---|---|---|---|---|
| Model | | E3NC-LH03 | E3NC-LH02 | E3NC-LH01 |
| Light source (wavelength)[*1] | | Visible semiconductor laser diode (660 nm), 1.35 mW (average output: 315 μW) (JIS class 1, IEC/EN class 1 and FDA class 1) | | |
| Sensing distance[*2] | Giga-power mode (GIGA) | 8 m | 1200 mm | 70±15 mm |
| | Standard mode (Stnd) | 6 m | 750 mm | |
| | High-speed mode (HS) | 3.5 m | 250 mm | |
| | Super-high speed mode (SHS) | 2 m | 200 mm | |
| Beam shape | | Spot | | |
| Beam size[*3] | | Approx. 2 mm dia. at 1 mm | Approx. 0.8 mm dia. at 300 mm | Approx. 0.1 mm dia. at 70 mm |
| Differential distance[*4] | | - | 10% of sensing distance max. | |
| Indicators | | OUT indicator (orange) and STABILITY indicator (green) | | |
| Ambient illumination (receiver side) | | Incandescence lamp: 10,000 lx max. Sunlight: 20,000 lx max. | | |
| Ambient temperature range | | Operating: −10 to 55ºC; Storage: −25 to 70ºC (with no icing or condensation) | | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | | |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) | | |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute | | |
| Vibration resistance (destruction) | | 10 to 55 Hz with a 1.5 mm double amplitude or 100 m/s$^2$ for 2 hours each in X, Y and Z directions | | |
| Shock resistance (destruction) | | 500 m/s$^2$ for 3 times each in X, Y and Z directions | | |
| Degree of protection | | IEC IP67 | IEC IP65 | |
| Connecting method | | Pre-wired connector (standard cable length: 2 m) | | |
| Weight (packed state/sensor head only) | Models with 2-m cable | Approx. 120 g / approx. 70 g | Approx. 115 g / approx. 65 g | |
| | Models with 5-m cable | Approx. 180 g / approx. 130 g | Approx. 175 g / approx. 125 g | |
| Materials | | Case: Polybutylene terephthalate (PBT) / Lens: Methacrylic resin (PMMA) / Cable: Vinyl chloride (PVC) | | |
| Accessories | | Instruction manual | | |

[*1] These sensors excluding the E3NC-LH03 model are classified as class 1 laser devices under IEC 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH (Center for Devices and Radiological Health) registration has been completed (Accession Number: 1220690).

[*2] The values were measured using the OMRON standard sensing object (white paper) for the E3NC-LH02 and E3NC-LH01 models. The values for the E3NC-LH03 model apply when an E39-R21, E39-R22, E39-RS10 or E39-RS11 reflector is used. Other reflectors are not recommended.

[*3] Defined at the 1/e$^2$ (13.5%) of the central intensity at the measurement distance. Measurement may be influenced if there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

[*4] Measured at the rated sensing distance.

## Sensor head unit for E3NC-SA0 amplifier

| Item | Specifications | | |
|---|---|---|---|
| Model | E3NC-SH250H | E3NC-SH250 | E3NC-SH100 |
| Light source (wavelength)[*1] | Visible semiconductor laser diode (660 nm), 1 mW (average output: 220 μW) (JIS class 2, IEC/EN class 2 and FDA class 2) | Visible semiconductor laser diode (660 nm), 0.5 mW (average output: 100 μW) (JIS class 1, IEC/EN class 1 and FDA class 1) | |
| Measurement range | 35 to 250 mm (display value: 350 to 2,500) | | 35 to 100 mm (display value: 350 to 1,000) |
| Standard detected level difference[*2] | 35 to 180 mm: 9 mm 180 to 250 mm: 25 mm | | 35 to 50 mm: 1.5 mm 50 to 100 mm: 3 mm |
| Beam size[*3] | Approx. 1 mm dia. at 250 mm | | Approx. 0.5 mm dia. at 100 mm |
| Indicators | OUT indicator (orange), STABILITY indicator (green) and ST indicator (blue) | | |
| Ambient illumination (receiver side) | Incandescent lamp: 4,000 lx max. Sunlight: 8,000 lx max. | Incandescent lamp: 2,000 lx max. Sunlight: 4,000 lx max. | Incandescent lamp: 4,000 lx max. Sunlight: 8,000 lx max. |
| Ambient temperature range | Operating: −10 to 55ºC; Storage: −25 to 70ºC (with no icing or condensation) | | |
| Ambient humidity range | Operating and storage: 35% to 85% (with no condensation) | | |
| Insulation resistance | 20 MΩ min. (at 500 VDC) | | |
| Dielectric strength | 1,000 VAC at 50/60 Hz for 1 minute | | |
| Vibration resistance (destruction) | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y and Z directions | | |
| Shock resistance (destruction) | 500 m/s$^2$ for 3 times each in X, Y and Z directions | | |
| Degree of protection | IEC IP67 | | |
| Connecting method | Pre-wired connector (standard cable length: 2 m) | | |
| Weight (packed state/sensor head only) | Approx. 125 g / approx. 75 g | | |
| Materials | Case: Polybutylene terephthalate (PBT) / Lens: Methacrylic resin (PMMA) / Cable: Vinyl chloride (PVC) | | |
| Accessories | Instruction manual, laser warning label (E3NC-SH250H model only) | | |

[*1] These sensors are classified as class 1 laser devices under IEC 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH (Center for Devices and Radiological Health) registration has been completed (Accession Number: 1220691).

[*2] The values were measured at the center of the sensing distance using OMRON's standard sensing object (white ceramic).

[*3] Beam size: Defined at the 1/e$^2$ (13.5%) of the central intensity at the measurement center distance. Measurement may be influenced if there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object. Also, when detecting a workpiece that is smaller than the beam size, a correct value may not be obtained.

**Note:** Incorrect detection may occur outside the measurement range if the object has a high reflection factor.

# OMRON

## Contact amplifier unit specifications

| Item | | Specifications |
|---|---|---|
| **Model** | | **E9NC-TA0** |
| **Connection method** | | Connector for sensor communication unit |
| **Power supply voltage** | | Supplied from the connector through the sensor communication unit |
| **Display resolution** | | 0.1 μm min. |
| **Power consumption (at 24 VDC)[*1]** | | Normal mode: 2040 mW max. (current consumption: 85 mA max.)<br>Eco ON: 1800 mW max. (current consumption: 75 mA max.)<br>Eco LO: 1920 mW max. (current consumption: 80 mA max.) |
| **Indicators** | | 7-segment displays (white)<br>GO indicator (orange), HIGH/LOW indicator (orange), NO/NC indicator (orange), PRST indicator (green) and ST indicator (blue) |
| **Protection circuits** | | Power supply reverse polarity protection and output short-circuit protection |
| **Response time** | **Super-high speed mode (SHS)** | Operate or reset: 3 ms |
| | **High-speed mode (HS)** | Operate or reset: 10 ms |
| | **Standard mode (Stnd)** | Operate or reset: 100 ms |
| | **Giga-power mode (GIGA)** | Operate or reset: 1,000 ms |
| **Threshold setting** | | Smart tuning (2-point area tuning, tolerance tuning, 2-point tuning, 1-point tuning) or manual adjustment |
| **No. of banks** | | 4 |
| **Max. connectable units** | | 30[*2] |
| **Functions** | **Output mode selection** | Normal output, hybrid output (output is performed according to the combination of the two bits used to specify HIGH, GO, LOW and error) |
| | **Preset** | Negative values can be displayed |
| | **Resetting settings[*3]** | Select from initial reset (default settings) or user reset (saved settings) |
| | **Eco mode[*4]** | Select from OFF (digital display lit), Eco ON (digital display no lit) or Eco LO (digital display dimmed) |
| | **Bank switching** | Select from banks 1 to 4 |
| | **Origin point use setting** | Select wether using the sensor head origin point or setting the point at power ON as origin |
| | **Direction** | Switchable |
| | **Output** | Select from normal sensing mode or area sensing mode |
| | **Display digits** | Settable in units ranging from 0.0001 mm to 1 mm |
| **Ambient temperature range** | | Operating: 0 to 55ºC[*5], Storage: -30 to 70ºC (with no icing or condensation) |
| **Ambient humidity range** | | Operating and storage: 35% to 85% (with no condensation) |
| **Insulation resistance** | | 20 MΩ min. (at 500 VDC) |
| **Dielectric strength** | | 1,000 VAC at 50/60 Hz for 1 minute |
| **Vibration resistance (destruction)** | | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y and Z directions |
| **Shock resistance (destruction)** | | 150 m/s$^2$ for 3 times each in X, Y and Z directions |
| **Weight (packed state/amplifier unit only)** | | Approx. 65 g / approx. 25 g |
| **Materials** | | Polycarbonate (PC) |
| **Accessories** | | Instruction manual |

[*1] At power supply voltage of 10 to 30 VDC: Normal mode: 2250 mW max. (current consumption: 75 mA max. at 30 VDC, 155 mA max. at 10 VDC). Eco ON mode: 2010 mW max. (current consumption: 67 mA max. at 30 VDC, 135 mA max. at 10 VDC). Eco LO mode: 2130 mW max. (current consumption: 71 mA max. at 30 VDC, 145 mA max. at 10 VDC).

[*2] When the sensors are connected to the NJ-series machine controller.

[*3] The bank is not reset by the user reset function or saved by the user save function.

[*4] Eco LO is supported for amplifier units manufactured in August 2014 or later.

[*5] When the number of connected unit is 11 or more, the ambient temperature is less than 50ºC.

# OMRON

## Sensor head unit for E9NC-TA0 amplifier

| Item | | Specifications | |
|---|---|---|---|
| Model | | E9NC-TH5☐ | E9NC-TH12☐ |
| Measuring range (moving range) | | 5 mm | 12 mm |
| Resolution | | 0.1 μm | |
| Precision[*1] | | 1 μm | |
| Measuring force[*1] | Upward | 0.35±0.25 N | 0.4±0.3 N |
| | Horizontal | 0.4±0.25 N | 0.5±0.3 N |
| | Downward | 0.45±0.25 N | 0.6±0.3 N |
| Indicator (preamplifier) | | Operation indicator (blue/red) | |
| Ambient temperature range | | Operating: -10 to 55ºC, Storage: -20 to 60ºC (with no icing or condensation) | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | |
| Maximum response speed | | 80 m/min | |
| Origin detection speed | | 80 m/min | |
| Origin position | | 1±0.5 mm from the spindle push-out position (the lowest point) | |
| Vibration resistance (destruction) | | 100 m/s$^2$ (20 to 2,000 Hz) 20 minutes each in X, Y and Z directions | |
| Shock resistance (destruction) | | 1,000 m/s$^2$ for 3 times each in X, Y and Z directions | |
| Degree of protection | Head | Right-angle air type: IEC IP67 (only when a hose elbow and air hose are connected) Straight type: - | |
| | Preamplifier | - | |
| Number of sliding operations | | 92 million times (based on OMRON's dedicated evaluation) | |
| Probe | | Carbide with a round surface, screw thread size: M2.5 | |
| Connecting method | | Pre-wired connector (2 m from the sensor head to the preamplifier) | |
| Materials | | Sensor head: Stainless steel (SUS303) / Rubber boot: Nitrile rubber (NBR) / Preamplifier: ABS / Probe contact point[*2]: Carbide / Cable: PVC / Hose elbow for air (right-angle air type only): Nickel-plated brass / Tightening nut (flanged type only): Stainless level (SUS410) / Wave dasher (flanged type only): SK5 | |
| Weight (packed state/sensor head only) | | Approx. 340 g / approx. 110 g | |
| Accessories | | Common: Wrench, instruction manual Right-angle air type: Hose elbow Flanged type: Tightening nut, wave dasher, clamp wrench, pin | |

[*1] These values were measured at an ambient temperature of 20ºC.
[*2] For the case of the provided E9NC-TB1 (3-dia. probe).

## EtherCAT communication specifications

| Item | Specifications |
|---|---|
| Communication protocol | Dedicated protocol for EtherCAT |
| Modulation | Base band method |
| Baud rate | 100 Mbps |
| Physical layer | 100BASE-TX (IEEE 802.3u) |
| Topology | Daisy chain |
| Communication media | STP category 5 or higher |
| Communication distance | Distance between nodes: 100 m max. |
| Noise immunity | Conforms to IEC 61000-4-4, 1 kV or higher |
| Node address setting method | Set with decimal rotary switch or software[*1] |
| Node address range | 000 to 192[*2] |

[*1] The software setting is used when the node address setting switches are set to 0.
[*2] The range depends on the EtherCAT master that is used. Refer to the "E3NW-ECT EtherCAT sensor communication unit operation manual (E429)" for details.
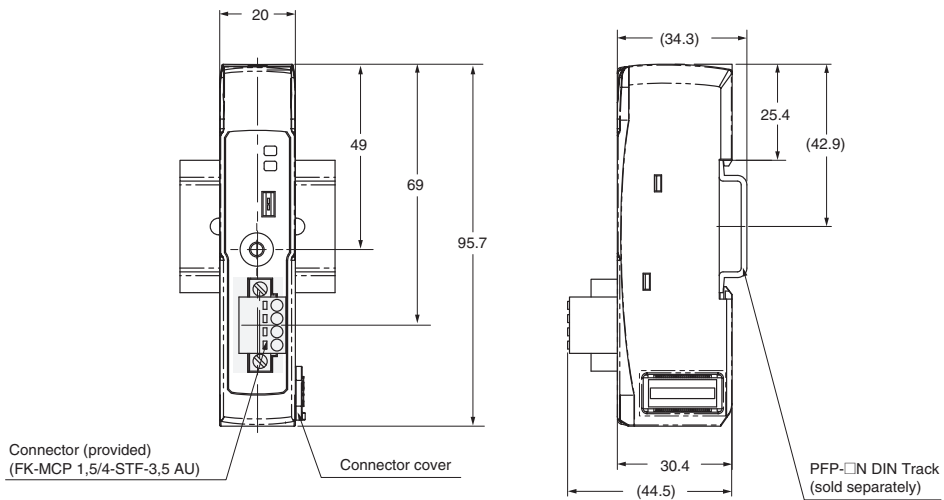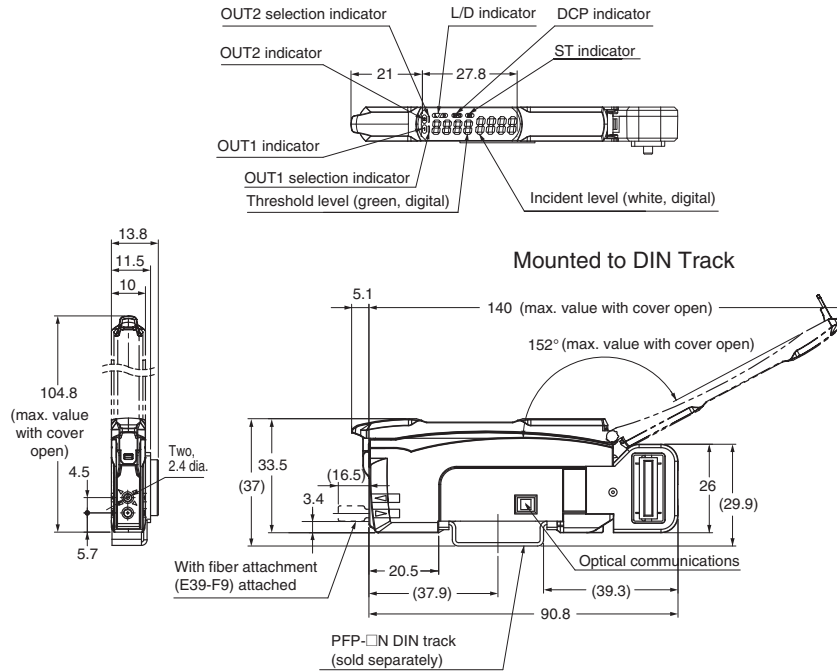
# OMRON

## Dimensions

### Sensor communication unit

### E3NW-ECT

Input communications connector
Output communications connector

IN    OUT

41
18
15.4
86.6
60.9
102.5
105.1
10
10

Communications connector (provided)
(FK-MCP 1,5/2-STF-3,5 AU)

Power supply connector (provided)
(FK-MCP 1,5/2-STF-3,5 AU)

13.5    9.5

Connector cover

38.8
(43)

(36.7)
32.2
(49.8)

32.5

PFP-□N DIN track (sold separately)

### Distributed sensor unit

### E3NW-DS

20
49
69
95.7

Connector (provided)
(FK-MCP 1,5/4-STF-3,5 AU)

Connector cover

(34.3)
25.4
(42.9)

30.4
(44.5)

PFP-□N DIN Track (sold separately)

**Fiber/Laser/Contact/Proximity sensors**

# OMRON

## Fiber amplifier unit
### E3NX-FA0

OUT2 selection indicator
L/D indicator
DCP indicator
OUT2 indicator
ST indicator
21
27.8
OUT1 indicator
OUT1 selection indicator
Threshold level (green, digital)
Incident level (white, digital)

13.8
11.5
10

104.8
(max. value
with cover
open)
Two,
2.4 dia.
4.5
5.7

With fiber attachment
(E39-F9) attached

Mounted to DIN Track

5.1
140 (max. value with cover open)
152° (max. value with cover open)
33.5
(37)
(16.5)
3.4
26
(29.9)
20.5
(37.9)
(39.3)
90.8

Optical communications

PFP-□N DIN track
(sold separately)

## Laser / Contact amplifier unit
### E3NC-LA0 / E3NC-SA0 / E9NC-TA0

**E3NC-LA0/SA0**

OUT2 selection indicator
L/D indicator
DCP indicator for E3NC-LA0
ZERO indicator for E3NC-SA0
OUT2 indicator
30.2
27.8
ST indicator
OUT1 indicator
OUT1 selection indicator
Threshold level (green, digital)
Incident level (white, digital) for E3NC-LA0
Measurement value (white, digital display) for E3NC-SA0

**E9NC-TA0**

NO/NC indicator
HIGH indicator
PRST indicator
GO indicator
30.2
27.8
ST indicator
LOW indicator
Measurement value display
(white, digital display)

13.8
11.5
10

114
(max. value with
cover open)

Mounted to DIN Track

2.6
159.7 (max. value with cover open)
152° (max. value with cover open)
33.5
(37)
26 (29.9)
32.1
(49.5)
(39.3)
102.4

Optical communications

PFP-□N DIN Track
(sold separately)

## Sensor head unit for E3NC-LA0 amplifier

### E3NC-LH03



OUT indicator
STABILITY indicator

27.5
21.5
3
2.9
12.4  12
36

Mounting Holes

Two, M3 holes
17±0.1
9.5±0.1

Emission and reception axis
10
6.2
1.2
6.6
10
25
23.5  9.5
17  20
Two, 3.2 dia. (mounting holes)
Emission and reception center

Vinyl-insulated cable
Two, 2.3-dia., 6 conductors
(Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm),
Standard cable length: 2 m, Minimum bending radius: 12 mm

12.8
Ferrite core*1
90±10
11.2
25

*1 A ferrite core is attached to the sensor head end of the cable attached to the E3NC-LH03 5M.

Connector
18
*2
6

*2 A blue ID tube is attached.

### E3NC-LH02



Emission axis
3  11.5
8.5
OUT indicator
12.4
28.9
STABILITY indicator

Mounting Holes

Two, M3
27±0.05
16±0.05

8
3.6  6.2
3.5
Emission center
11
10
12.2
18.5  12.3
3
Reception center
(Adjuster locked: 32.4, Unlocked: 33.7)
9.9  16
Two, 3.2 dia. (mounting holes)
33
3
27
5.5
15
9 dia.
Adjuster

Vinyl-insulated cable
Two, 2.3-dia. × 6 conductors (Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm), Standard cable length: 2 m, Minimum bending radius: 12 mm

Connector
18
*
6

* A blue ID tube is attached.

# OMRON

## E3NC-LH01

Emission axis

12.4

26.8



8

3.6 — 6.2

Emission center

2.7

6.2

16.9 · 11

18.5

12.3

Reception center

Vinyl-insulated cable
Two, 2.3-dia. × 6 conductors (Conductor cross-section:
0.08 mm², Insulation diameter: 0.38 mm), Standard cable
length: 2 m, Minimum bending radius: 12 mm

5.8 — 18

4

3.2 dia.
(mounting hole)

14

8

3.2

34.5

OUT indicator

11.5 — 8.5

3

STABILITY
indicator

### Mounting Holes

8±0.05

Two, M3

16 to 20

### Connector

18

6

* A blue ID tube is attached.

## Sensor head unit for E3NC-SA0 amplifier

### E3NC-SH250H / E3NC-SH250 / E3NC-SH100

*1 **E3NC-SH100**
L = 35 to 100 mm,
A = 15.92° to 5.67°

**E3NC-SH250H/SH250**
L = 35 to 250 mm,
A = 15.92° to 2.27°

Smart
tuning button

2 — 13.5

10.5

ST indicator

OUT indicator

13

21.5

STABILITY indicator

7

8

4

Reception center

9.9

7

6.5

11.6

19

8.35

Emission center

L *1 — 28.8

1.5

11

9.9

A° *1

25.4 · 27

41

11.6 Three, 3.2 dia.
(mounting holes)

3.3 — 16

Vinyl-insulated cable
4-dia. × 6 conductors (Conductor cross-section:
0.08 mm², Insulation diameter: 0.38 mm), Standard
cable length: 2 m, Minimum bending radius: 12 mm

### Mounting Holes

Three, M3

25.4±0.05

27±0.05

16±0.05

### Connector

18

*2

6

*2 A white ID tube is attached.

## Sensor head unit for E9NC-TA0 amplifier

### Figure 1: E9NC-TH□S

A

(2000)

(77.25)

Measurement area

70

66

8.1 · B · C

6 · 0.6 · D

(12 dia.)

(30)

15

11.5 dia.

10 · 18

Probe (Included)
(E9NC-TB1)

Spring washer

8 dia. ⁰₋₀.₀₀₉

Rubber boot (Included)

Sensor head

Vinyl-insulated round
cable 5 dia.

Preamplifier

Operation indicator
(blue/red) 2.5 dia.

Connector

## Figure 2: E9NC-TH☐L



When the hose elbow is attached

## Figure 3: E9NC-TH☐SF



Mounting hole (recommended): 9.7 dia. ±0.15

## Figure 4: E9NC-TH☐LF



When the hose elbow is attached

Mounting hole (recommended): 9.7 dia. ± 0.15

| Cable model | Figure | Dimensions (mm) | | | | | | | | Rubber boot model (included) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | A | B | C | D | E | F | G | Measurement area | |
| E9NC-TH5S | 1 | 82.8 | 14.2 | 11 | 49.5 | - | - | - | 17.3 to 22.3 | E9NC-G5 |
| E9NC-TH12S | | 109.7 | 24.9 | 19.5 | 57.2 | - | - | - | 21 to 33 | E9NC-G12 |
| E9NC-TH5L | 2 | 82.7 | 14.2 | 11 | 31.6 | - | - | - | 17.3 to 22.3 | E9NC-G5 |
| E9NC-TH12L | | 109.6 | 24.9 | 19.5 | 39.3 | - | - | - | 21 to 33 | E9NC-G12 |
| E9NC-TH5SF | 3 | 82.8 | 14.2 | - | - | 5.3 | 8.7 | 4 | 17.3 to 22.3 | E9NC-G5 |
| E9NC-TH12SF | | 109.7 | 24.9 | - | - | 8 | 5.8 | 5.7 | 21 to 33 | E9NC-G12 |
| E9NC-TH5LF | 4 | 82.7 | 14.2 | - | 24.6 | 5.3 | 8.7 | 4 | 17.3 to 22.3 | E9NC-G5 |
| E9NC-TH12LF | | 109.6 | 24.9 | - | 39.3 | 8 | 5.8 | 5.7 | 21 to 33 | E9NC-G12 |

**Note:** The minimum bending radius of the sensor head cable are 50 mm for repeated flexing and 20 mm for permanent bend.

Fiber/Laser/Contact/Proximity sensors

# OMRON

## Ordering information

### Communication unit

| Type | Power supply | Model | Appearance |
|------|-------------|-------|------------|
| Sensor communication unit for EtherCAT | 24 VDC, supplied from terminal block connector | E3NW-ECT[*1] |  |
| Distributed sensor unit | 24 VDC, supplied from terminal block connector through the sensor communication unit | E3NW-DS |  |

[*1] The E9NC-TA0 is supported for firmware version 1.03 or higher (sensor communication units manufactured in July 2014 or later).

### Amplifier unit

| Type | Power supply | Model | Appearance |
|------|-------------|-------|------------|
| Smart fiber amplifier unit | Supplied from the connector through the sensor communication unit and distributed unit | E3NX-FA0[*1] |  |
| Smart laser amplifier unit | | E3NC-LA0 | |
| Smart laser amplifier unit (CMOS type) | | E3NC-SA0 | |
| Smart contact amplifier unit | | E9NC-TA0 | |

[*1] For details on the sensors that you can connect, refer to E32 fiber units information in the OMRON website.

### Sensor head unit for E3NC-LA0 amplifier
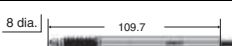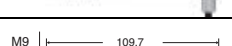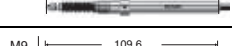
| Type | Beam shape | Sensing distance | Laser class | Cable length | Model | Appearance |
|------|-----------|-----------------|-------------|--------------|-------|------------|
| Coaxial retro-reflective with MSR function | Spot | 8 m[*1] | Class 1 | 2 m | E3NC-LH03 2M |  |
| | | | | 5 m | E3NC-LH03 5M | |
| Diffuse-reflective | Variable spot | 1.2 m | | 2 m | E3NC-LH02 2M |  |
| | | | | 5 m | E3NC-LH02 5M | |
| Limited-reflective | Spot | 70±15 mm | | 2 m | E3NC-LH01 2M | |
| | | | | 5 m | E3NC-LH01 5M | |

[*1] This value apply when an E39-R21, E39-R22, E39-RS10 or E39-RS11 reflector is used. The reflector is not included. Purchase a reflector separately to match the intended use of the sensor.

### Sensor head unit for E3NC-SA0 amplifier

| Type | Beam shape | Measurement range | Laser class | Cable length | Model | Appearance |
|------|-----------|-------------------|-------------|--------------|-------|------------|
| Distance-settable | Spot | 35 to 250 mm | Class 2 | 2 m | E3NC-SH250H 2M |  |
| | | | Class 1 | 2 m | E3NC-SH250 2M | |
| | | 35 to 100 mm | | 2 m | E3NC-SH100 2M | |

### Sensor head unit for E9NC-TA0 amplifier

| Type | Measuring range (moving range) | Resolution | Precision | Model | Appearance (head size) |
|------|-------------------------------|-----------|-----------|-------|------------------------|
| Straight type | 5 mm | 0.1 μm | 1 μm | E9NC-TH5S 2M | 8 dia. 82.8  |
| Right-angle air type | | | | E9NC-TH5L 2M | 8 dia. 82.7  |
| Flanged type/ straight type | | | | E9NC-TH5SF 2M | M9 82.8  |
| Flanged type/ right-angle air type | | | | E9NC-TH5LF 2M | M9 82.7  |
| Straight type | 12 mm | | | E9NC-TH12S 2M | 8 dia. 109.7  |
| Right-angle air type | | | | E9NC-TH12L 2M | 8 dia. 109.6  |
| Flanged type/ straight type | | | | E9NC-TH12SF 2M | M9 109.7  |
| Flanged type/ right-angle air type | | | | E9NC-TH12LF 2M | M9 109.6  |

**Note:** Connection cable between preamplifier and amplifier unit is not provided with the sensor head. Be sure to have the connection cable ready when using the sensor.

## Accessories

| Type | | Applicable sensor head | Model | Appearance |
|---|---|---|---|---|
| Mounting bracket | Mounting bracket: 1<br>Nut plate: 1<br>Philips screws (M3×18): 2 | E3NC-LH03 | E39-L190 | |
| | | E3NC-LH02 | E39-L185 | |
| | | E3NC-LH01 | E39-L186 | |
| | | E3NC-SH series | E39-L187 | |
| | | | E39-L188 | |
| | | E9NC-TH series | E39-L143 | |
| Probe | 3-dia. probe | E9NC-TH series | E9NC-TB1[*1] | |
| | Nylon probe | | E9NC-TB2 | |
| | Probe for flat surfaces | | E9NC-TB3 | |

[*1] The E9NC-TB1 is provided with the sensor head. Order replacements as required.

## Cables

| Type | Cable length | Model |
|---|---|---|
| Connection cable between preamplifier and E9NC-TA0 amplifier unit | 0.5 m | E9NC-TXC05 |
| | 5 m | E9NC-TXC5 |
| | 10 m | E9NC-TXC10 |
| | 20 m | E9NC-TXC20 |

## Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.05 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_E97E-EN-02    In the interest of product improvement, specifications are subject to change without notice.

# OMRON

**E3X-□, E3C-LDA0, E2C-EDA0**

# E3X/E3C/E2C series sensor

Fiber/Laser photoelectric/Proximity sensors

**Easily connect fiber sensors, laser photoelectric sensors and proximity sensors to EtherCAT**

- Most easy set up and operation by smart tuning and integration into Sysmac Studio
- Ultra high-speed communication of sensor output
- Sensor functions such as reading present values, changing settings and tuning are controlled by EtherCAT
- Up to 30 amplifiers can be connected

## System configuration



EtherNet/IP™

Sysmac Studio

**NJ series**
Machine automation controller

EtherCAT.

**E3X/E3C/E2C series sensor**

EtherCAT communication unit

Fiber/Laser photoelectric/Proximity amplifier units

Up to 30 units

# OMRON
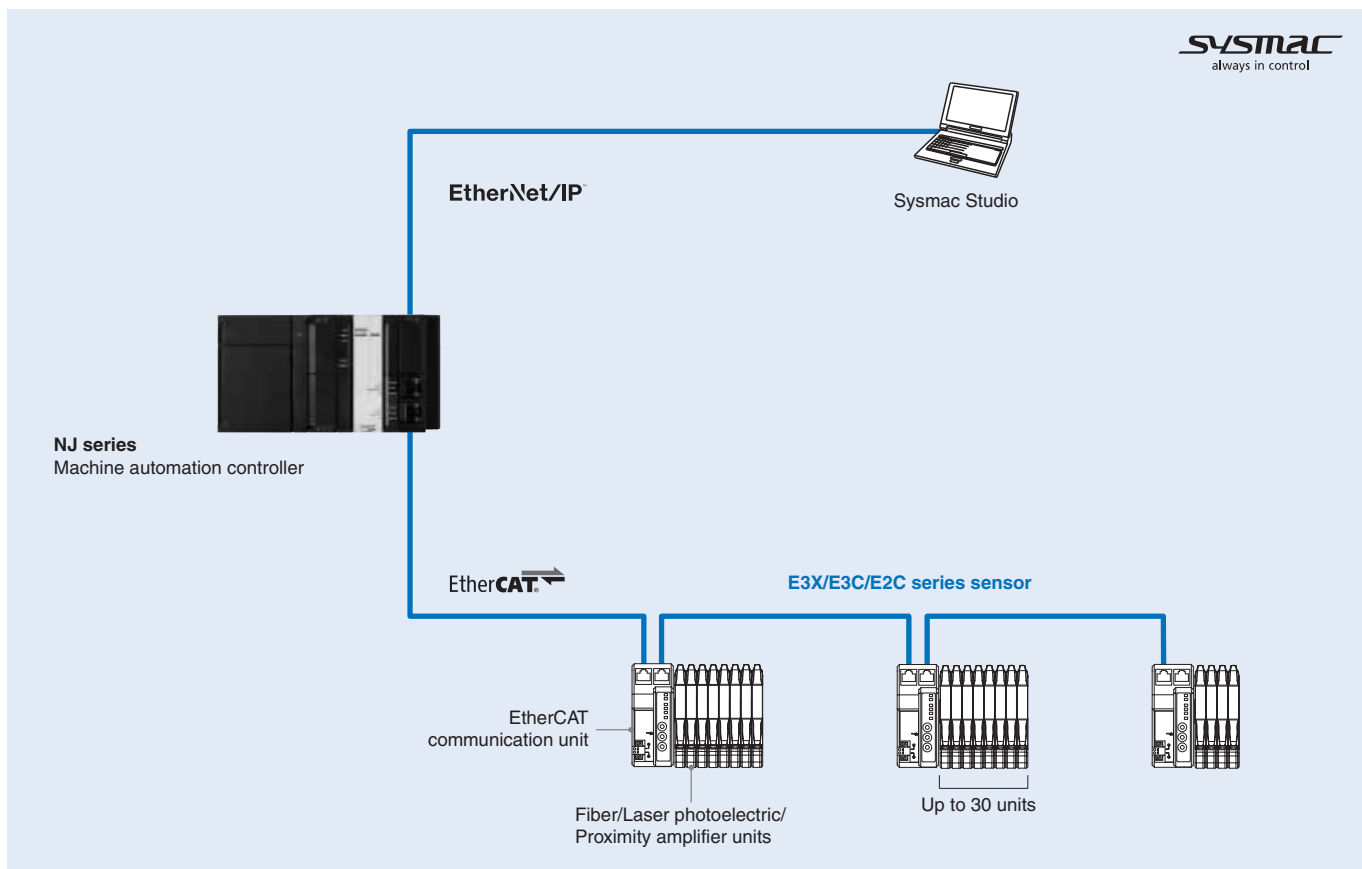
## Specifications

### EtherCAT communication unit specifications

| Item | Specifications |
|---|---|
| Model | E3X-ECT |
| Power supply voltage | 20.4 to 26.4 VDC |
| Power consumption | 2.4 W max. (not include sensors current)<br>100 mA max. at 24 VDC (not include sensors current) |
| Indicators | L/A IN (yellow), L/A OUT (yellow), PWR (green), RUN (green), ERROR (red), SS (sensor status) (green/red) |
| Vibration resistance | 10 to 150 Hz with double-amplitude of 0.7 mm or 50 m/s$^2$ for 80 minutes each in X, Y and Z directions |
| Shock resistance | 150 m/s$^2$, for 3 times each in 3 directions |
| Dielectric strength | 500 VAC at 50/60 Hz for 1 minute |
| Insulation resistance | 20 MΩ min. |
| Ambient operating temperature | 0 to 55°C |
| Ambient operating humidity | 25% to 85% (with no condensation) |
| Storage temperature | –30 to 70°C (with no icing or condensation) |
| Storage humidity | 25% to 85% (with no condensation) |
| Installation | Mounted on 35 mm DIN track |
| Accessories | Power supply connector, connector cover, DIN track end plates and instruction manual |
| Weight (packed state) | Approx. 220 g |

### Fiber amplifier unit specifications

| Item | | Specifications | | |
|---|---|---|---|---|
| Model | | E3X-HD0 | E3X-MDA0 | E3X-DA0-S |
| Connection method | | Connector for sensor communication unit | | |
| Light source (wavelength) | | Red, 4-element LED (625 nm) | Red LED (635 nm) | Red, 4-element LED (625 nm) |
| Power supply voltage | | 12 to 24 VDC, ±10%, ripple (P-P) 10% max | | |
| Power consumption | | Normal mode: 720 mW max.<br>(30 mA max. at 24 VDC, 60 mA max. at 12 VDC)<br>Power saving eco: 530 mW max.<br>(22 mA max. at 24 VDC, 44 mA max. at 12 VDC) | 1,080 mW max.<br>(45 mA max. at power supply voltage of 24 VDC) | Normal mode: 960 mW max.<br>(40 mA max. at 24 VDC, 80 mA max. at 12 VDC)<br>Power saving ECO1: 720 mW max.<br>(30 mA max. at 24 VDC, 60 mA max. at 12 VDC)<br>Power saving ECO2: 600 mW max.<br>(25 mA max. at 24 VDC, 50 mA max. at 12 VDC) |
| Protection circuits | | Power supply reverse polarity protection and output short-circuit protection | Power supply reverse polarity protection and output short-circuit protection | Power supply reverse polarity protection, output short-circuit protection and output reverse polarity protection |
| Response time | High-speed mode | Operate or reset: 250 μs | Operate or reset: 450 μs | Operate or reset: 250 μs |
| | Standard mode | Operate or reset: 1 ms | Operate or reset: 1 ms | Operate or reset: 1 ms |
| | Giga-power mode | Operate or reset: 16 ms | Operate or reset: 4 ms | – |
| | High-resolution mode | – | – | Operate or reset: 4 ms |
| | Tough mode | – | – | Operate or reset: 16 ms |
| Mutual interference prevention | | Possible for up to 10 units<br>(optical communications sync) | Possible for up to 9 units<br>(18 channels) | Possible for up to 10 units |
| Auto power control (APC) | | Always ON | | |
| Other functions | | Power tuning, differential detection, DPC, timer (OFF-delay, ON-delay or one-shot), zero reset, resetting settings and Eco mode | Power tuning, timer (OFF-delay, ON-delay or one-shot), zero reset, resetting settings, Eco mode and output setting | Power tuning, differential detection, timer (OFF-delay, ON-delay or ON-delay + OFF-delay timer), zero reset, resetting settings, Eco mode and output setting |
| Ambient illumination (receiver side) | | Incandescent lamp: 20,000 lux max., Sunlight: 30,000 lux max. | Incandescent lamp: 10,000 lux max., Sunlight: 20,000 lux max. | Incandescent lamp: 10,000 lux max., Sunlight: 20,000 lux max. |
| Connectable units | | 30 units max. (with E3X-ECT) | | |
| Ambient temperature range | | Operating:<br>  Groups of 1 to 2 amplifiers: 0 to 55 ºC<br>  Groups of 3 to 10 amplifiers: 0 to 50 ºC<br>  Groups of 11 to 16 amplifiers: 0 to 45 ºC<br>  Groups of 17 to 30 amplifiers: 0 to 40 ºC<br>Storage: –30 to 70°C (with no icing condensation) | | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | | |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) | | |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute | | |
| Vibration resistance | | Destruction: 10 to 150 Hz with 0.7 mm double amplitude for 80 minutes each in X, Y and Z directions | | |
| Shock resistance | | Destruction: 150 m/s$^2$, for 3 times each in X, Y and Z directions | | |
| Degree of protection | | IEC 60529 IP50 (with protective cover attached) | | |
| Weight (packed state) | | Approx. 65 g | Approx. 55 g | Approx. 55 g |
| Materials | Case | Heat-resistant ABS | Polybutylene terephthalate (PBT) | Polybutylene terephthalate (PBT) |
| | Cover | Polycarbonate (PC) | | |
| Accessories | | Instruction manual | | |

## Laser photoelectric amplifier unit specifications

| Item | | Specifications |
|---|---|---|
| Model | | E3C-LDA0 |
| Connection method | | Connector for sensor communication unit |
| Power supply voltage | | 12 to 24 VDC, ±10%, ripple (P-P) 10% max |
| Power consumption | | 1,080 mW max. (45 mA max. at power supply voltage of 24 VDC) |
| Protection circuits | | Power supply reverse polarity protection and output short-circuit protection |
| Response time | High-speed mode | Operate or reset: 250 μs |
| | Standard mode | Operate or reset: 1 ms |
| | High-resolution mode | Operate or reset: 4 ms |
| Mutual interference prevention | | Possible for up to 10 units |
| Auto power control (APC) | | Always ON |
| Other functions | | Differential detection, timer (OFF-delay, ON-delay or one-shot), zero reset, resetting settings, counter and output setting |
| Connectable units | | 30 units max. (with E3X-ECT) |
| Ambient temperature range | | Operating: <br>   Groups of 1 to 2 amplifiers: 0 to 55°C <br>   Groups of 3 to 10 amplifiers: 0 to 50°C <br>   Groups of 11 to 16 amplifiers: 0 to 45°C <br>   Groups of 17 to 30 amplifiers: 0 to 40°C <br> Storage: –30 to 70°C (with no icing condensation) |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute |
| Vibration resistance | | Destruction: 10 to 150 Hz with 0.7 mm double amplitude for 80 minutes each in X, Y and Z directions |
| Shock resistance | | Destruction: 150 m/s$^2$, for 3 times each in X, Y and Z directions |
| Degree of protection | | IEC 60529 IP50 (with protective cover attached) |
| Weight (packed state) | | Approx. 55 g |
| Materials | Case | Polybutylene terephthalate (PBT) |
| | Cover | Polycarbonate (PC) |
| Accessories | | Instruction manual |

## Proximity amplifier unit specifications

| Item | | Specifications |
|---|---|---|
| Model | | E2C-EDA0 |
| Connection method | | Connector for sensor communication unit |
| Power supply voltage | | 12 to 24 VDC, ±10%, ripple (P-P) 10% max |
| Power consumption | | 1,080 mW max. (45 mA max. at power supply voltage of 24 VDC) |
| Protection circuits | | Power supply reverse polarity protection and output short-circuit protection |
| Response time | High-speed mode | Operate or reset: 300 μs |
| | Standard mode | Operate or reset: 1 ms |
| | High-resolution mode | Operate or reset: 4 ms |
| Mutual interference prevention | | Possible for up to 5 units |
| Other functions | | Differential detection, timer (OFF-delay, ON-delay or one-shot), zero reset, resetting settings, hysteresis settings and output setting |
| Connectable units | | 30 units max. (with E3X-ECT) |
| Ambient temperature range | | Operating: <br>   Groups of 1 to 2 amplifiers: 0 to 55°C <br>   Groups of 3 to 5 amplifiers: 0 to 50°C <br>   Groups of 6 to 16 amplifiers: 0 to 45°C <br>   Groups of 17 to 30 amplifiers: 0 to 40°C <br> When used in combination with an E2C-EDR6-F: <br>   Groups of 3 to 4 amplifiers: 0 to 50°C <br>   Groups of 5 to 8 amplifiers: 0 to 45°C <br>   Groups of 9 to 16 amplifiers: 0 to 40°C <br>   Groups of 17 to 30 amplifiers: 0 to 35°C <br> Storage: –30 to 70°C (with no icing condensation) |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) |
| Insulation resistance | | 20 MΩ min. (at 500 VDC) |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute |
| Vibration resistance | | Destruction: 10 to 150 Hz with 0.7 mm double amplitude for 80 minutes each in X, Y and Z directions |
| Shock resistance | | Destruction: 150 m/s$^2$, for 3 times each in X, Y and Z directions |
| Degree of protection | | IEC 60529 IP50 (with protective cover attached) |
| Weight (packed state) | | Approx. 55 g |
| Materials | Case | Polybutylene terephthalate (PBT) |
| | Cover | Polycarbonate (PC) |
| Accessories | | Instruction manual |

# OMRON

## EtherCAT communication specifications

| Item | Specifications |
|---|---|
| Communication protocol | Dedicated protocol for EtherCAT |
| Modulation | Base band |
| Baud rate | 100 Mbps |
| Physical layer | 100BASE-TX (IEEE802.3) |
| Connectors | RJ45 shielded connector × 2/CN IN: EtherCAT input/CN OUT: EtherCAT output |
| Topology | Daisy chain |
| Communication media | Category 5 or higher (cable with double, aluminium tape and braided shielding is recommended) |
| Communication distance | Distance between nodes (slaves): 100 m max. |
| Noise resistance | Conforms to IEC 61000-4-4, 1 kV or higher |
| Node address setting method | Set with decimal rotary switch or Sysmac Studio |
| Node address range | 1 to 999: set with rotary switch/1 to 65,535: set with Sysmac Studio |
| LED display | PWR × 1/L/A IN (Link/Activity IN) × 1/L/A OUT (Link/Activity OUT) × 1/RUN × 1/ERR × 1 |
| Process data | Variable PDO mapping |
| PDO size/node | 36 byte max. |
| Mailbox | Emergency messages, SDO requests, SDO responses and SDO information |
| Synchronization mode | Free run mode or DC mode 1 |

# Dimensions

## EtherCAT communication unit

### E3X-ECT
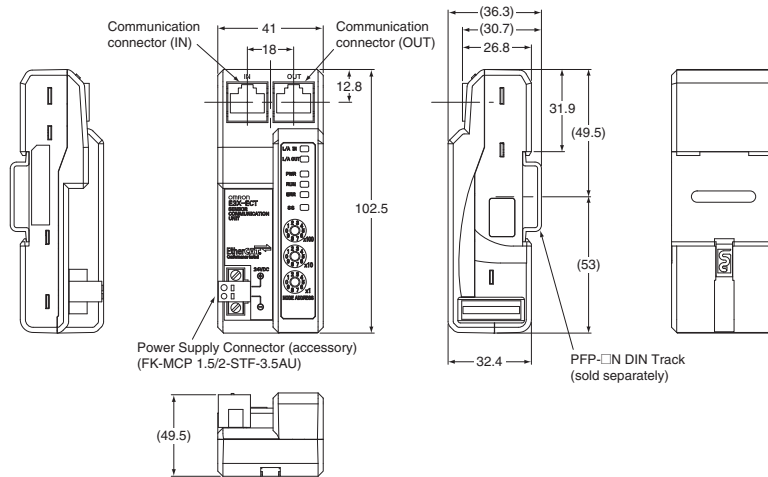


### Fiber amplifier unit

### E3X-HD0



DIN track mounting
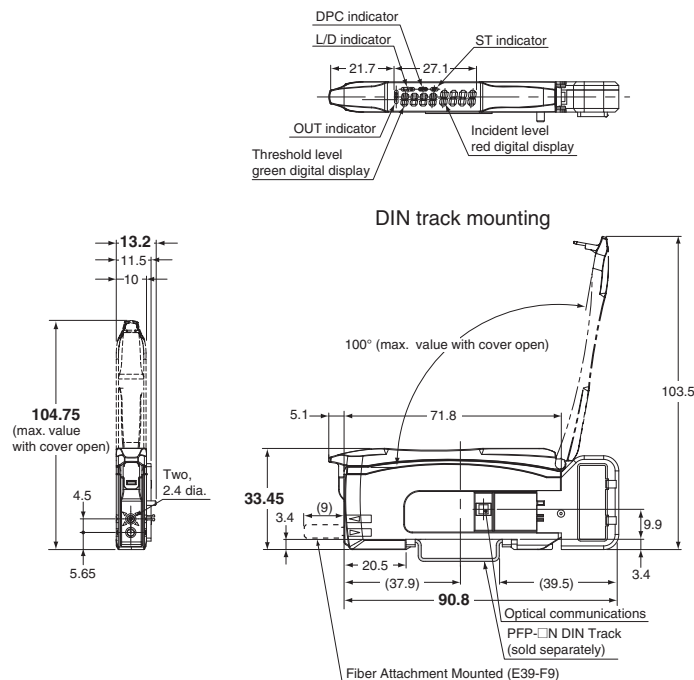
## E3X-MDA0
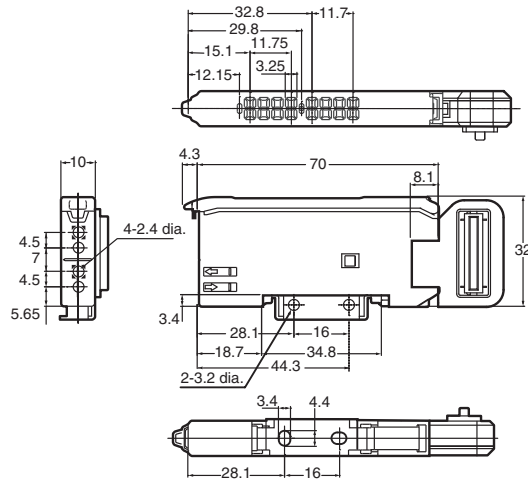
## E3X-DA0-S
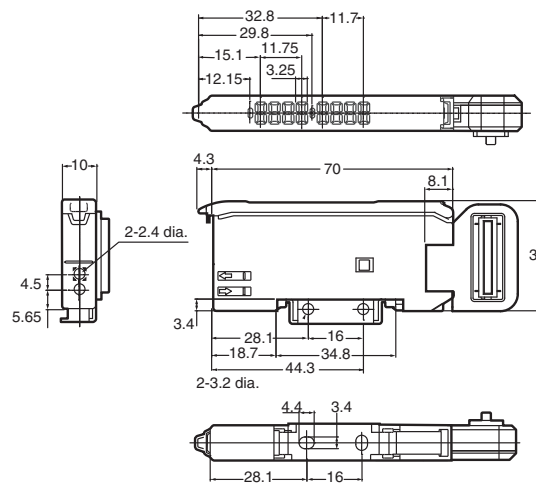
**Laser photoelectric/Proximity amplifier unit**

## E3C-LDA0 / E2C-EDA0

# OMRON
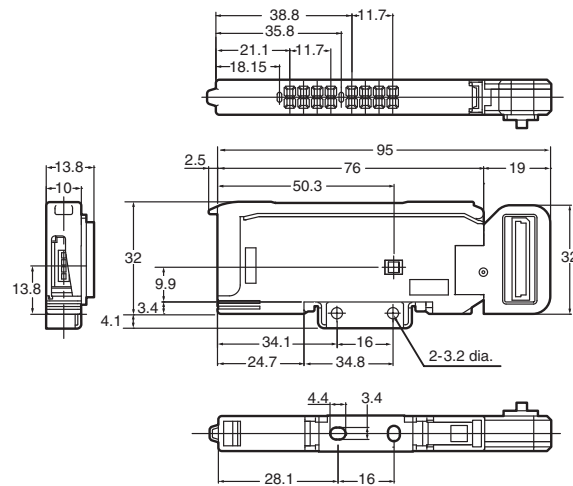
## Ordering information

### EtherCAT communication unit

| Type | Power supply voltage | Power supply | Model |
|---|---|---|---|
| EtherCAT communication unit | 24 VDC | Supplied from the connector | E3X-ECT |

**Note:** Please read and understand the important precautions and reminders described on the manuals (E413) of E3X-ECT, before attempting to start operation.

### Connectable amplifiers

| Type | Connection method | Power supply | Model |
|---|---|---|---|
| Standard fiber amplifier unit | Connect to a communication unit and amplifier units by connectors | Supplied from the connector through the communication unit | E3X-HD0[*1] |
| Two-channel fiber amplifier unit | | | E3X-MDA0[*1] |
| High-functionality fiber amplifier unit | | | E3X-DA0-S[*1] |
| Laser photoelectric amplifier unit | | | E3C-LDA0[*2] |
| Proximity amplifier unit | | | E2C-EDA0[*3] |

*1. These fiber amplifier units should be connected to a fiber unit (E32 series). For details on the sensors that you can connect, refer to product information on your OMRON website.

*2. This laser photoelectric amplifier unit should be connected to a laser photoelectric sensor head unit (E3C-LD series). For details on the sensors that you can connect, refer to product information on your OMRON website.

*3. This proximity amplifier unit should be connected to a proximity sensor head unit (E2C-ED series). For details on the sensors that you can connect, refer to product information on your OMRON website.

**Note:** Please read and understand the important precautions and reminders described on the instruction sheet bundled to the product, before attempting to start operation.

### EtherCAT communication cables

Refer to "Recommended EtherCAT and EtherNet/IP communication cables" in the NJ-Series controller section for the recommended cables.

### Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio version 1.02 or higher | SYSMAC-SE2□□□ |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## NA5☐

# NA series

### The next generation of machine interface

An HMI that is dynamic, intuitive and predictive makes industrial machines more attractive and competitive. Our Sysmac HMI enables faster, more efficient control and monitoring - and a more natural, proactive relationship between operator and machine.

- Widescreen in all models: 7, 9, 12 and 15 inches
- Up to 1280 x 800 high resolution display
- Multimedia including video and PDF
- NJ controller variables (Tags) in the NA project
- Multiple-access level security with password protection
- Visual Basic programming with VB.net

## System configuration



Sysmac

always in control

Sysmac Studio

EtherNet/IP

NA series
Machine interface

**NJ series**
Machine automation controller

EtherCAT.

Accurax G5
servo system

MX2 inverter

FQ-M
vision

NX I/O
NX safety

# OMRON

## Specifications

### General specifications

| Item | Specifications | | | |
|---|---|---|---|---|
| | NA5-15W☐ | NA5-12W☐ | NA5-9W☐ | NA5-7W☐ |
| Rated power supply | 24 VDC | | | |
| Allowable power supply voltage range | 19.2 to 28.8 VDC (24 VDC ±20%) | | | |
| Power consumption | 47 W max. | 45 W max. | 40 W max. | 35 W max. |
| Ambient operating temperature | 0 to 50ºC[*1][*2] | | | |
| Ambient storage temperature | -20 to 60ºC[*3] | | | |
| Ambient operating humidity | 10 to 90%[*2] (with non condensation) | | | |
| Atmosphere | Must be free from corrosive gases | | | |
| Pollution degree | 2 or less: JIS B 3502, IEC 61131-2 | | | |
| Noise immunity | 2 kV on power supply line (Conforms to IEC 61000-4-4) | | | |
| Vibration resistance (during operation) | Conforms to IEC 60068-2-6<br>5 to 8.4 Hz with 3.5 mm half amplitude and 8.4 to 150 Hz with 9.8 m/s$^2$ for 100 minutes each in X, Y and Z directions (time coefficient of 10 minutes x coefficient factor of 10 = total time of 100 min) | | | |
| Shock resistance (during operation) | Conforms to IEC 60028-2-27<br>147 m/s$^2$ 3 times each in X, Y and Z directions | | | |
| Dimensions (W x H x D) | 420 x 291 x 69 mm | 340 x 244 x 69 mm | 290 x 190 x 69 mm | 236 x 165 x 69 mm |
| Panel cutout dimensions | $392^{+1}_{0}$ x $268^{+1}_{0}$ mm (horizontal x vertical) Panel thickness: 1.6 to 6.0 mm | $310^{+1}_{0}$ x $221^{+1}_{0}$ mm (horizontal x vertical) Panel thickness: 1.6 to 6.0 mm | $261^{+1}_{0}$ x $166^{+1}_{0}$ mm (horizontal x vertical) Panel thickness: 1.6 to 6.0 mm | $197^{+0.5}_{0}$ x $141^{+0.5}_{0}$ mm (horizontal x vertical) Panel thickness: 1.6 to 6.0 mm |
| Weight | 3.2 kg max. | 2.3 kg max. | 1.7 kg max. | 1.3 kg max. |
| Degree of protection | Front-panel controls: IP65 oil-proof type, UL type 4X | | | |
| Battery life | 5 years at 25ºC<br>The RTC will be backed up for 5 days after the battery runs low. The RTC will be backed up by a super capacitor for 5 minutes after removing the old battery | | | |
| International standards | UL 508/CSA standard C22.2 No. 142[*4]<br>EMC Directive (2004/108/EC) EN 61131-2:2007<br>Shipbuilding standards LR, DNV and NK<br>IP65 oil-proof, UL type 4X (front panel only)<br>ANSI 12.12.01 Class 1 Division 2/CSA standard C22.2<br>RoHS Directive (2002/95/EC)<br>KC standards KN 61000-6-2:2012-06 for EMS and KN 61000-6-4:2012-06 for EMI<br>RCM | | | |

*1. The ambient operating temperature is subject to the following restrictions, depending on the mounting angle:
    The ambient operating temperature is 0 to 40ºC when the mounting angle is 0º or more and less than 45º to the horizontal.
    The ambient operating temperature is 0 to 50ºC when the mounting angle is 45º or more and 90º or less to the horizontal.
    The ambient operating temperature is 0 to 50ºC when the mounting angle is 90º or more and 135º or less to the horizontal.
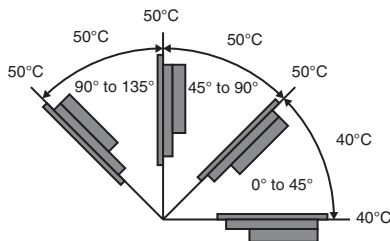


*2. Use the programmable terminal within the following temperature and humidity ranges:
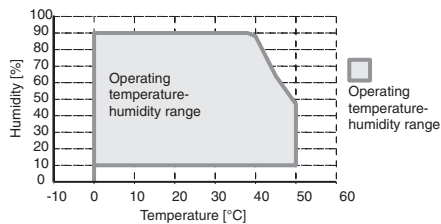


*3. Store the programmable terminal within the following temperature and humidity ranges:
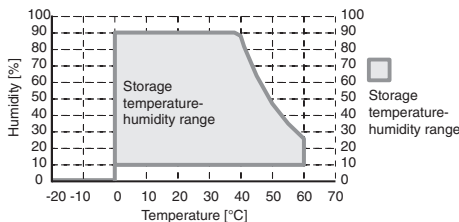


*4. Use power supply Class 2 to conform to UL standard.

Human machine interface

## Performance specifications

| Item | | | Specifications | | | |
|---|---|---|---|---|---|---|
| | | | NA5-15W□ | NA5-12W□ | NA5-9W□ | NA5-7W□ |
| Display | Display panel[1] | Display device | TFT LCD | | | |
| | | Screen size | 15.4 inches | 12.1 inches | 9.0 inches | 7.0 inches |
| | | Resolution | 1,280 x 800 pixels (horizontal x vertical) | | 800 x 480 pixels (horizontal x vertical) | |
| | | Colours | 16,770,000 colours (24 bit full colour) | | | |
| | | Effective display area | 331 x 207 mm (horizontal x vertical) | 261 x 163 mm (horizontal x vertical) | 197 x 118 mm (horizontal x vertical) | 152 x 91 mm (horizontal x vertical) |
| | | View angles | Left: 60º, Right: 60º, Top: 60º, Bottom: 60º | | | |
| | Backlight[2] | Life | 50,000 hours min.[3] | | | |
| | | Brightness adjustment | 200 levels | | | |
| | Front panel indicators[4] | RUN | Lit green: Normal operation<br>Lit red: Error | | | |
| Operation | Touch panel | Method | Analog resistance membrane (pressure sensitive) | | | |
| | | Resolution | 16,384 x 16,384 | | | |
| | | Life | 1,000,000 operations | | | |
| | Function keys[5] | | 3 inputs (capacitance inputs) | | | |
| Data capacity | User data capacity | | 256 MB | | | |
| External interfaces | Ethernet ports | Applications | Port 1: Connecting to factory network. NJ machine controller and VNC clients<br>Port 2: Sysmac Studio connection for programming | | | |
| | | Number of ports | 2 ports | | | |
| | | Compliant standards | IEEE 802.3i (10BASE-T), IEEE 802.3u (100BASE-TX) and IEEE 802.3ab (1000BASE-T) | | | |
| | | Transmission media | Shielded twisted-pair (STP) cable: Category 5, 5e or higher | | | |
| | | Transmission distance | 100 m | | | |
| | | Connector | RJ45 8P8C modular connector | | | |
| | USB host ports | Applications | USB memory device, keyboard or mouse | | | |
| | | Number of ports | 2 ports | | | |
| | | Compliant standards | USB 2.0 | | | |
| | | Transmission distance | 5 m max. | | | |
| | | Connector | Type-A connector | | | |
| | USB slave port | Applications | Sysmac Studio connection for programming | | | |
| | | Number of ports | 1 port | | | |
| | | Compliant standards | USB 2.0 | | | |
| | | Transmission distance | 5 m max. | | | |
| | | Connector | Type-B connector | | | |
| | Serial port[6] | Applications | Device connection | | | |
| | | Number of ports | 1 port | | | |
| | | Compliant standards | RS-232C | | | |
| | | Transmission distance | 15 m max. | | | |
| | | Connector | D-DUB 9-pin female connector | | | |
| | SD memory card slot | Applications | To transfer or store the project or to store log data | | | |
| | | Number of lots | 1 slot | | | |
| | | Compliant standards | SD/SDHC | | | |
| | Expansion unit connector[6] | Applications | Expansion unit | | | |
| | | Quantity | 1 | | | |

*1. There may be some defective pixels in the display. This is not a fault as long as the numbers of defective light and dark pixels fall within the following standard ranges:

| Model | Standard range |
|---|---|
| NA5-15W□<br>NA5-12W□<br>NA5-9W□<br>NA5-7W□ | Number of light and dark pixels: 10 or less.<br>(There must not be 3 consecutive light/dark pixels) |

*2. The backlight can be replaced at an OMRON maintenance base.

*3. This is the estimated time before brightness is reduced by half at room temperature and humidity. The life expectancy is drastically shortened if programmable terminal is used at high temperatures.
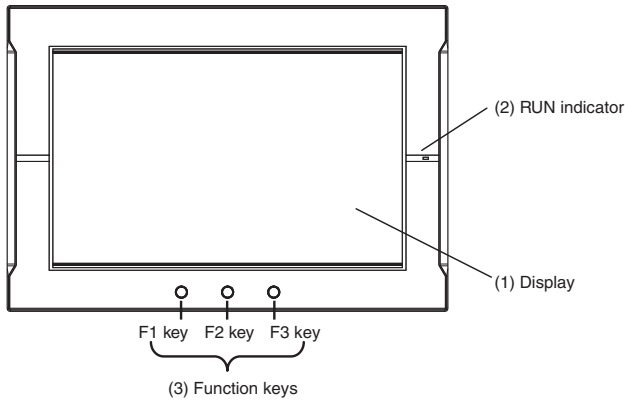
*4. The brightness of the front panel indicators is also adjustable when you adjust the brightness of the backlight.

*5. Each function key has blue indicator. The brightness of the function key indicators is also adjustable when you adjust the brightness of the backlight.
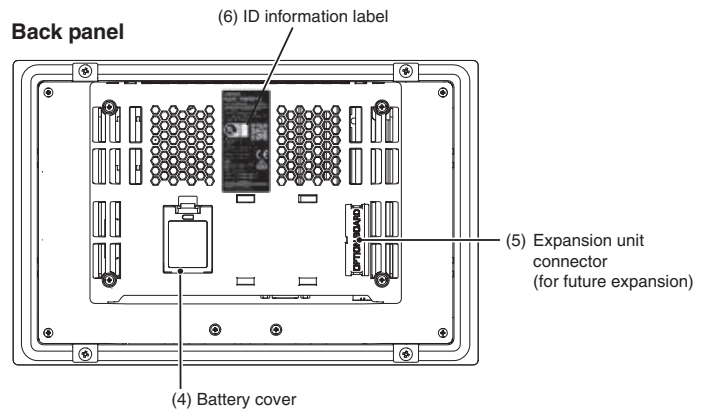
*6. The Serial port and Expansion unit connector are for future expansion.

# OMRON

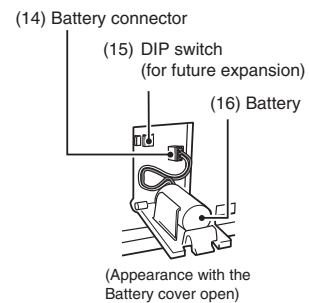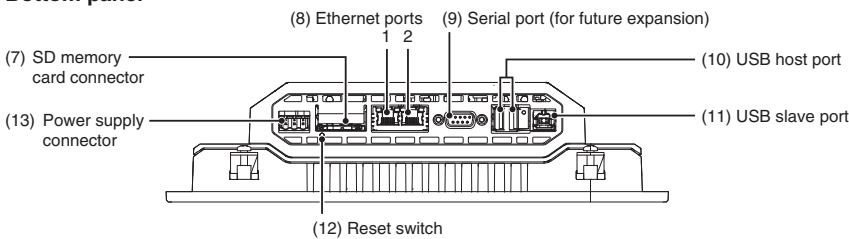## Nomenclature

**Front panel**



(2) RUN indicator

(1) Display

F1 key    F2 key    F3 key

(3) Function keys

**Back panel**

(6) ID information label



(5) Expansion unit connector (for future expansion)

(4) Battery cover

**Bottom panel**

(14) Battery connector

(15) DIP switch (for future expansion)

(16) Battery

(8) Ethernet ports 1 2

(9) Serial port (for future expansion)

(7) SD memory card connector

(10) USB host port

(13) Power supply connector

(11) USB slave port

(12) Reset switch

(Appearance with the Battery cover open)

| No. | Name | Description |
|---|---|---|
| 1 | Display | The entire display is a touch panel that also functions as an input device. |
| 2 | RUN indicator | The status of the indicator changes according to the status of the NA HMI. |
| 3 | Function keys | There are three function keys: F1, F2 and F3.<br>You can use the function keys as execution conditions for the actions for global or page events.<br>You can also use the function keys for interlocks. |
| 4 | Battery cover | Open this cover to replace the battery. |
| 5 | Expansion unit connector* | For future expansion. |
| 6 | ID information label | You can check the ID information of the NA HMI. |
| 7 | SD memory card connector | Insert an SD memory card here. |
| 8 | Ethernet port 1 | Connect a device other than the Sysmac Studio. |
|   | Ethernet port 2 | Connect mainly the Sysmac Studio. |
| 9 | Serial port | For use with VB.NET. |
| 10 | USB host port | Connect this port to a USB memory device, mouse, etc... |
| 11 | USB slave port | Connect the Sysmac Studio or other devices. |
| 12 | Reset switch | Use this switch to reset the NA HMI. |
| 13 | Power supply connector | Connect the accessory power supply connector and supply power. |
| 14 | Battery connector | Connect the connector on the backup battery here. |
| 15 | DIP switch* | For future expansion. (The DIP switch is on a PCB that is accessed by opening the battery cover).<br>Do not change any of the factory settings of the pins on the DIP switch. (Default setting: OFF) |
| 16 | Battery | This is the battery to backup the clock information in the NA HMI. |

* The Expansion unit connector and DIP switch are for future expansion.

## Dimensions

**NA5-15W□**

194.2
391

420
291
267
139.1
6
33.5
69.1

Cable connection dimensions

33.9
34.4
2.3
36
69.3

0
41.6
41.2
42
32.6  37
39.6  42.1
3
17
24.8
47.3
44
55.7
55
73
71

**NA5-12W□**

194.2
309

340
244
220
139.1
6
33.5
69.1

Cable connection dimensions

10.9
10.4
25.8
36
69.3

0
41.6
41.2
42
32.6  37  39.6  42.1
3
17
24.8
47.3
44
55.7
55
73
71

# OMRON
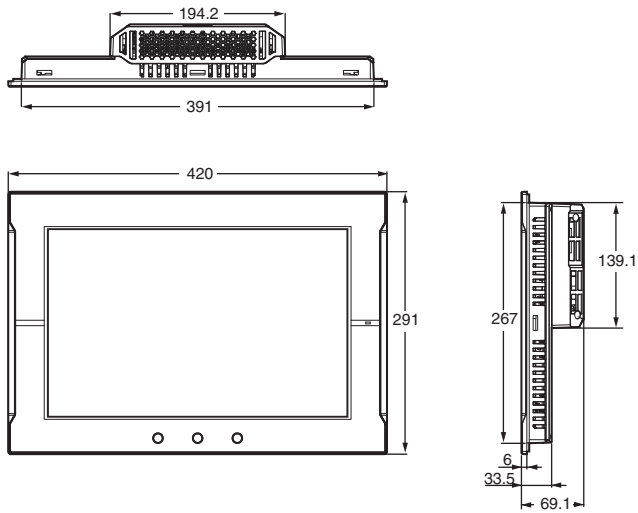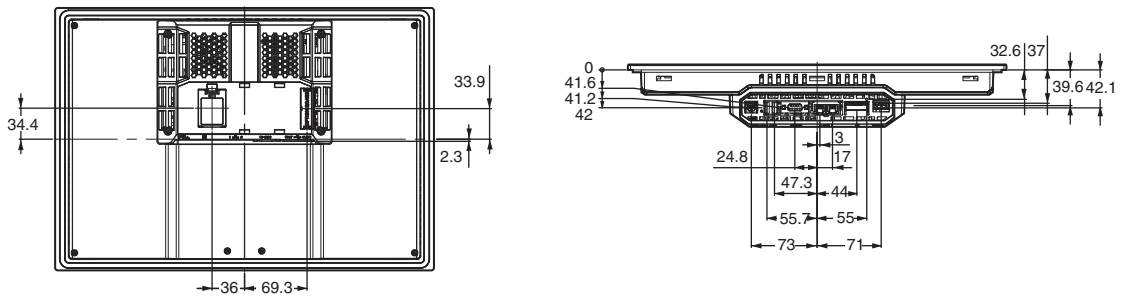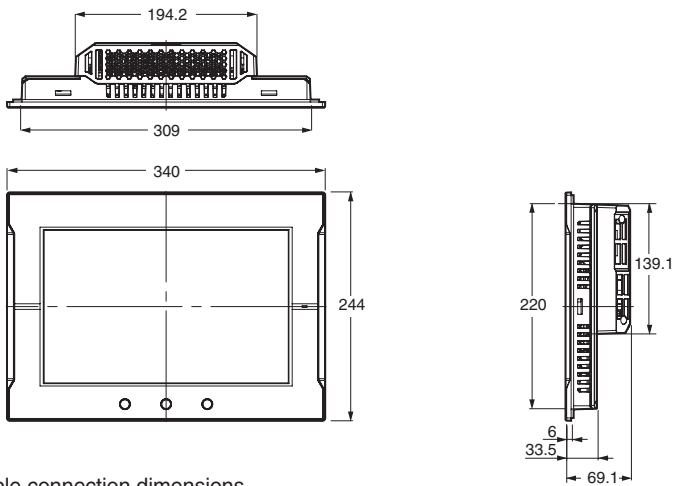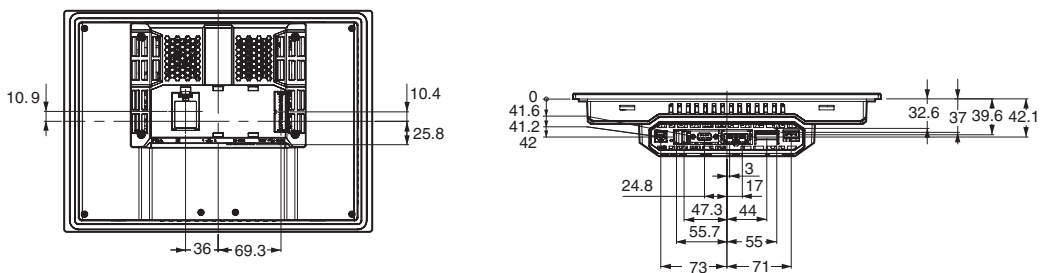
**NA5-9W☐**
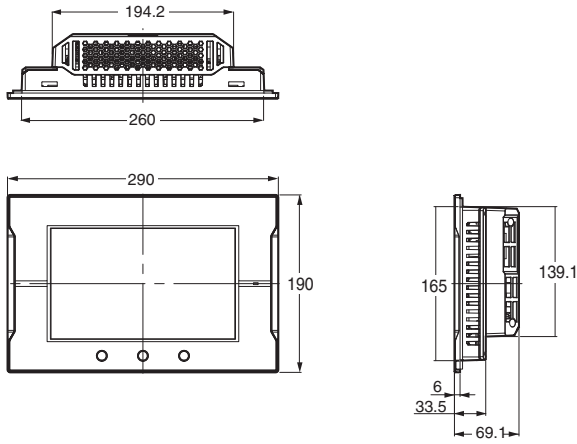


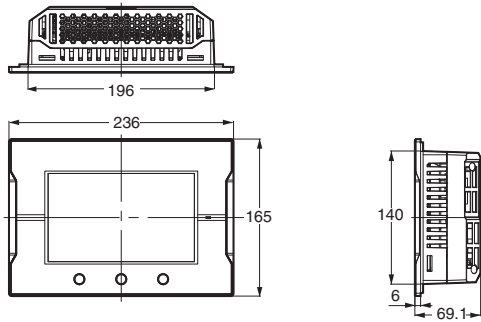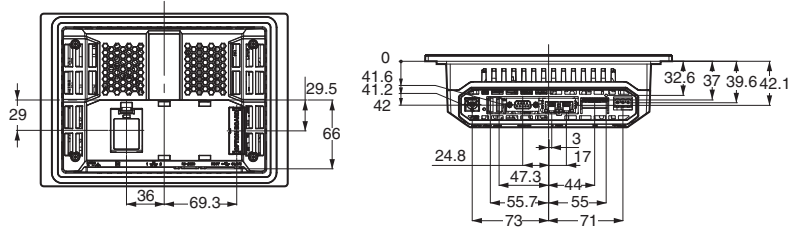Cable connection dimensions
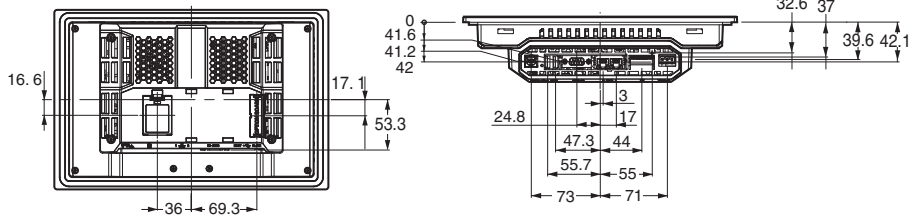


**NA5-7W☐**



Cable connection dimensions

## Ordering information

### Machine interface

| Type | Display | Colours | Resolution | Frame colours | Model |
|------|---------|---------|------------|---------------|-------|
| Machine interface | 15.4-inch widescreen TFT LCD | 24 bit full colour | 1280 x 800 pixels | Silver | NA5-15W101S |
| | | | | Black | NA5-15W101B |
| | 12.1-inch widescreen TFT LCD | | 1280 x 800 pixels | Silver | NA5-12W101S |
| | | | | Black | NA5-12W101B |
| | 9-inch widescreen TFT LCD | | 800 x 480 pixels | Silver | NA5-9W001S |
| | | | | Black | NA5-9W001B |
| | 7-inch widescreen TFT LCD | | 800 x 480 pixels | Silver | NA5-7W001S |
| | | | | Black | NA5-7W001B |

### Accessories

| Type | Specifications | | Model |
|------|----------------|---|-------|
| SD memory card | 2 GB | | HMC-SD291 |
| | 4 GB | | HMC-SD491 |
| USB memory | 2 GB | | FZ-MEM2G |
| | 8 GB | | FZ-MEM4G |
| Replacement battery | Battery life: 5 years (at 25ºC). This battery is provided as an accessory. | | CJ1W-BAT01 |
| Anti-reflection sheets | Attach a sheet to the screen to protect against diffused reflections and dirt. The entire sheet is colorless and transparent. Five sheets are provided in one set. | For NA5-15W | NA-15KBA04 |
| | | For NA5-12W | NA-12KBA04 |
| | | For NA5-9W | NA-9KBA04 |
| | | For NA5-7W | NA-7KBA04 |

### Computer software

| Specifications | Model |
|----------------|-------|
| Sysmac Studio version 1.10 or higher | SYSMAC-SE2□□□ |

# OMRON

# Sysmac Studio

## Sysmac Studio for machine creators

The Sysmac Studio provides one design and operation environment for configuration, programming, simulation and monitoring.

- One software for motion, logic sequencing, safety, vision and HMI
- Fully compliant with open standard IEC 61131-3
- Supports Ladder, Structured text and In-Line ST programming with a rich instruction set
- CAM editor for easy programming of complex motion profiles
- One simulation tool for sequence and motion in a 3D environment
- Advanced security function with 32 digit security password



**Sysmac Studio** Version **1.0**

© Copyright OMRON Corporation 2011 All Rights Reserved.
This program is protected by U.S. and international copyright laws as described in the About box.

## System requirements

| Item | Requirement |
|---|---|
| Operating system (OS)*1 *2 | Windows XP (Service Pack 3 or higher, 32-bit version) / Windows Vista (32-bit version) / Windows 7 (32-bit/64 bit version) / Windows 8 (32-bit/64-bit version) / Windows 8.1 (32-bit/64-bit version) |
| CPU | Windows computers with Celeron 540 (1.8 GHz) or faster CPU Core i5 M520 (2.4 GHz) or equivalent or faster recommended |
| Main memory*3 | 2 GB min. (4 GB min. recommended) |
| Recommended video memory / video card for using 3D motion trace | Video memory: 512 MB min. Video card: Either of the following video cards: • NVIDIA® GeForce® 200 series or higher • ATI RadeonHD5000 series or higher |
| Hard disk | At least 1.6 GB of available space |
| Display | XGA 1024 x 768, 16 million colors WXGA 1280 x 800 min. recommended |
| Disk drive | DVD-ROM drive |
| Communication ports | USB port corresponded to USB 2.0 or Ethernet port*4 |
| Supported languages*5 | Japanese, English, German, French, Italian, Spanish, simplified Chinese, traditional Chinese, Korean |

*1 Sysmac Studio operating system precaution: System requirements and hard disk space may vary with the system environment.

*2 The following restrictions apply when Sysmac Studio is used with Microsoft Windows Vista, Windows 7, Windows 8 or Windows 8.1.
  1) Some Help files cannot be accessed.
    The Help files can be accessed if the Help program distributed by Microsoft for Windows (WinHlp32.exe) is installed. Refer to the Microsoft homepage listed below or contact Microsoft for details on installing the file. (The download page is automatically displayed if the Help files are opened while the user is connected to the Internet.)
    http://support.microsoft.com/kb/917607/en-us
  2) The following restrictions apply to some application operations:

| Application | Restriction |
|---|---|
| CX-Designer | If a new Windows Vista, Windows 7, Windows 8 or Windows 8.1 font (e.g., Meiryo) is used in a project, the font size on labels may be bigger and protrude from the components if the project is transferred from CX-Designer running on a Windows XP or earlier OS to the NS/NSJ. |
| CX-Integrator/Network Configurator | Although you can install CPS files, EDS files, Expansion Modules and Interface Modules, the virtual store function of Windows Vista, Windows 7, Windows 8 or Windows 8.1 imposes the following restrictions on the use of the software after installation. • If another user logs in, the applications data will need to be installed again. • The CPS files will not be automatically updated. These restrictions will not exist if application data is installed using Run as Administrator. |

*3 The amount of memory required varies with the Support Software used in Sysmac Studio for the following Support Software. Refer to user documentation for individual Support Software for details. CX-Designer, CX-Protocol and Network Configurator.

*4 Refer to the hardware manual for your CPU unit for hardware connection methods and cables to connect the computer and CPU unit.

*5 Supported only by the Sysmac Studio version 1.01 or higher about German, French, Italian and Spanish. Supported only by the Sysmac Studio version 1.02 or higher about simplified Chinese, traditional Chinese and Korean.

# OMRON

## Function specifications

### Common specifications

| Item | | | Function | Sysmac Studio |
|---|---|---|---|---|
| Setting parameters | EtherCAT configuration and setup | – | You can create a configuration in the Sysmac Studio of the EtherCAT slaves connected to the built-in EtherCAT port of the NJ-series CPU unit and set the parameters for the EtherCAT masters and slaves. | All versions |
| | | Registering slaves | You can set up devices by dragging slaves from the device list displayed in the Toolbox pane to the locations where you want to connect them. | |
| | | Changing the coupler model | You change the model number or unit version of the coupler units. Use this function to change the model number and version of the coupler unit registered in the project to the new model number and version when replacing a coupler unit. | Ver. 1.09 or higher |
| | | Setting master parameters | You set the common parameters of the EtherCAT network (e.g., the fail-soft operation and wait time for slave startup settings.) | All versions |
| | | Setting slave parameters | You set the standard slave parameters and assign PDOs (process data objects). | |
| | | Comparing and merging network configuration information | The EtherCAT network configuration information in the NJ-series CPU unit and in the Sysmac Studio are compared and the differences are displayed. | |
| | | Transferring the network configuration information | The EtherCAT network configuration information is transferred to the NJ-series CPU unit. Or, the EtherCAT network configuration information in the NJ-series CPU unit is transferred to the Sysmac Studio and displayed in the EtherCAT editor. | |
| | | Installing ESI files | ESI (EtherCAT slave information) files are installed. | |
| | EtherCAT slave terminal configuration and setup | – | The configuration of any slave terminal that is connected to an EtherCAT network is created on the Sysmac Studio. The NX units that compose the slave terminal are set in the configuration. | Ver. 1.06 or higher |
| | | Registering NX units | A slave terminal is built by dragging NX units from the device list displayed in the Toolbox to the locations where you want to mount them. | |
| | | Setting NX units | The I/O allocations, mounting settings and unit operation settings of the NX units are edited. | |
| | | Displaying the width of a slave terminal configuration | The width and power consumption of a slave terminal are displayed based on the unit configuration information. | |
| | | Comparing and merging the slave terminal configuration information | When online, you can compare the configuration information in the project with the physical configuration. You can also select the missing units and add them to the project. | |
| | | Transferring the slave terminal configuration information | The unit configuration information is transferred to the CPU unit. | |
| | CPU/Expansion rack configuration and setup | – | You create the configuration in the Sysmac Studio of the Units mounted in the NJ-series CPU rack and Expansion racks and the special units. | All versions |
| | | Registering units | A rack is built by dragging units from the device list displayed in the Toolbox Pane to the locations where you want to mount them. | |
| | | Creating racks | An Expansion rack (power supply unit, I/O interface unit and end cover) is added. | |
| | | Switching unit displays | The model number, unit number and slot number are displayed. | |
| | | Setting special units | The input time constants are set for input units and parameters are set for special units. | |
| | | Displaying rack widths, current consumption and power consumption | The rack widths, current consumption and power consumption are displayed based on the unit configuration information. | |
| | | Comparing the CPU/Expansion rack configuration information with the physical configuration | When online, you can compare the configuration information in the project with the physical configuration. You can also select the missing units and add them. | |
| | | Transferring the CPU/Expansion rack configuration information | The unit configuration information is transferred to the CPU unit. The synchronize function is used. | |
| | | Printing the unit configuration information | The unit configuration information is printed. | |
| | Controller setup | – | The controller setup is used to change settings related to the operation of the controller. The controller setup contains PLC function module operation settings and built-in EtherNet/IP function module port settings. | |
| | | Operation settings | The startup mode, SD memory card diagnosis at startup, write protection at startup, controller error level changes[1] and other settings are made. | |
| | | Transferring operation settings | Use the synchronize operation to transfer the operation settings to the NJ-series CPU unit. | |
| | | Built-in EtherNet/IP port settings | These settings are made to perform communications using the built-in EtherNet/IP port of the NJ-series CPU unit. | |
| | | Transferring built-in EtherNet/IP port settings | Use the synchronize operation to transfer the built-in EtherNet/IP port settings to the NJ-series CPU unit. | |
| | Motion control setup | – | The motion control setup is used to create the axes to use in motion control instructions, assign those axes to servo drives and encoders and set axis parameters. | |
| | | Axis settings | Axes are added to the project. | |
| | | Axis setting table | The axis setting table is a table of all registered axis parameters. You can edit any axis parameters here just as you can on the axis settings tab page. | |
| | Axes group settings | – | You can setup axes to perform interpolated motions as an axes group. | |
| | | Axes group basic settings | Set the axes group number, wether to use the axes group, the composition and the composition axes. | |
| | | Operation settings | Set the interpolated velocity, the maximum interpolated acceleration and deceleration, and the interpolated operation settings. | |

| Item | | | Function | Sysmac Studio |
|---|---|---|---|---|
| Setting parameters | Cam data settings | – | The cam data settings are used to create electronic cam data. When you build the project for the controller, a cam table is created according to the cam data settings. | All versions |
| | | Registering cam data | Cam data settings are added to the project. | |
| | | Editing cam data | You can set properties and node points for cam data settings. | |
| | | Transferring cam data | You can select to transfer all or part of the cam data. | |
| | | Importing cam data settings | You can import cam data settings from a CSV file. | |
| | | Exporting cam data settings | You can export cam data to a CSV file. | |
| | | Registering cam definitions | You add new cam definitions to change cam table in the program. | Ver 1.09 or higher |
| | | Editing cam definitions | You set cam definitions. | |
| | | Transferring cam definitions | You transfer cam definitions to the controller. | |
| | | Exporting cam tables | You can export cam table to a CSV file. | All versions |
| | | Transferring cam tables from the controller to files | You can save a cam table in the NJ-series CPU unit to a CSV file. | |
| | | Transferring cam tables from files to the controller | You can transfer a cam table that is saved in a CSV file to update the contents of a cam table that is already in the NJ-series CPU unit. | |
| | | Superimposing cam table | You can superimpose the cam table from a CSV file on the cam profile curve position graph that is currently displayed. | |
| | Task setup | – | Programs are executed in tasks in an NJ-series CPU unit. The task settings define the execution period, the execution timing, the programs executed by the task, the I/O refreshing performed by the task and which variables to share between tasks. | |
| | | Registering tasks | The tasks, which are used to execute programs, are registered. | |
| | | Setting task I/O | The task I/O settings define what units the task should perform I/O refreshing for. | |
| | | Assigning programs | Program assignments define what programs a task will execute. | |
| | | Setting exclusive control of variables in tasks | You can specify if a task can write to its own values (known as a refreshing task) or if it can only access them (an accessing task) for global variables. This ensures concurrency for global variable values from all tasks that reference them. | |
| | I/O map settings | – | The I/O ports that correspond to the registered EtherCAT slaves and to the registered units on the CPU rack and Expansion racks are displayed. The I/O map is edited to assign variables to I/O ports. The variables are used in the user program. | |
| | | Displaying I/O ports | I/O ports are displayed based on the configuration information of the devices (slaves and units). | |
| | | Assigning variables | Variables are assigned to I/O ports. | |
| | | Creating device variables | Device variables are created in the I/O map. You can either automatically create a device variable or manually enter the device variable to create. | |
| | | Checking I/O assignments | The assignments of external I/O devices and variables are checked. | |
| | Vision sensor settings | | You can set and calibrate vision sensors. Refer to "**Vision sensor functions**" section for more details. | Ver. 1.01 or higher |
| | Displacement sensor settings | | You can set and calibrate displacement sensors. Refer to "**Displacement sensor functions**" section for more details. | Ver. 1.05 or higher |
| | DB connection function settings | | You can set and transfer the DB connection function settings. Refer to "**DB connection functions**" section for more details. | Ver 1.06 or higher with NJ501-1☐20 |
| | EtherNet/IP connection settings | | You can make settings related to tag data links (connections) in an EtherNet/IP network. Refer to "**EtherNet/IP connection functions**" section for more details. | Ver. 1.10 or higher |
| | EtherNet/IP slave terminal settings | | You can make and transfer settings for EtherNet/IP slave terminals. Refer to "**EtherNet/IP slave terminal functions**" section for more details. | Ver. 1.11 or higher |
| | NA-series programmable terminal (PT) settings | | You can make settings and transfer projects for NA-series programmable terminals. Refer to "**HMI functions**" section for more details. | Ver. 1.11 or higher |
| Programming | Instruction list (Toolbox) | | A hierarchy of the instructions that you can use is displayed in the Toolbox. You can drag the required instruction to a program in the Ladder editor or ST editor to insert the instruction, | All versions |
| | Programming ladder diagrams | – | Ladder diagram programming involves connecting rung components with connecting lines to build algorithms. Rung components and connecting lines are entered in the ladder editor. | |
| | | Starting the ladder editor | The ladder editor for the program is started. | |
| | | Adding and deleting sections | You can divide your ladder diagrams into smaller units for easier management. These units of division are called sections. | |
| | | Inserting rung components | You insert rung components in the ladder editor to create an algorithm. | |
| | | Inserting and deleting function blocks | You can insert a function block instruction or user-defined function block into the ladder editor. | |
| | | Inserting and deleting functions | You can insert a function instruction or user-defined function into the ladder editor. | |
| | | Inserting and deleting inline ST | You can insert a rung component in a ladder diagram to enable programming in ST. This allows you to include ST in a ladder diagram. | |
| | | Editing rung components | You can copy and paste rung components. | |
| | | Inserting and deleting jump labels and jumps | You can insert a jump label in the rung to jump and then specify that jump label when you insert a jump. | |
| | | Inserting and deleting bookmarks | You can add bookmarks to the beginning of rungs and move between them. | |
| | | Rung comments | You can add comments to rungs. | |
| | | Displaying rung errors | When you enter a rung component, the format is always checked and any mistakes are displayed as errors. If there are any errors, a red line is displayed between the rung number and the left bus bar. | |
| | | Entry assistance | When you enter instructions or parameters, each character that you enter from the keyboard narrows the list of candidates that is displayed for selection. | |
| | | Displaying variable comments [2] | A specified variable comment can be displayed with each variable of rung components on the ladder diagrams. You can change the length of the displayed variable comments to make them easier to read. [3] | Ver. 1.01 or higher |

| Item | | | Function | Sysmac Studio |
|---|---|---|---|---|
| Programming | Programming structured text | – | You combine different ST statements to build algorithms. | All versions |
| | | Starting the ST editor | The ST editor for programs or for functions/function blocks is started. | |
| | | Editing ST | You combine different ST statements to build algorithms. | |
| | | Entering calls to functions and function blocks | You can enter the first character of the instance name of the function or the function block in the ST Editor to call and enter a function or function block. | |
| | | Entering constants | You can enter constants in the ST editor. | |
| | | Entering comments | Enter "(*" at the beginning and "*)" at the end of any text to be treated as a comment in the ST editor. If you only want to comment out a single line, enter a double forward slash (//) at the beginning of the line. | |
| | | Copying, pasting and deleting ST elements | You can copy, paste and delete text strings. | |
| | | Indenting | You can indent nested statements to make them easier to read. | |
| | | Moving to a specified line | You can specify a line number to jump directly to that line. | |
| | | Bookmarks | You can add bookmarks to any lines and move between them. | |
| | | Entry assistance | When you enter instructions of parameters, each character that you enter from the keyboard narrows the list of candidates that is displayed for selection. | |
| | Variable manager | | A list of the variables in the global and local variable tables is displayed in a separate window. You can display variable usage, sort and filter the variables, edit and delete variables, or more variables while displaying another editing view. | Ver. 1.04 or higher |
| | Changing variable comments and data type comments | | You can globally change variable comments and data type comments to other comments. You can change the comments to different language for users in a different country. | |
| | Sorting and filtering variables | | You can sort and filter the variables in each variable table. | Ver 1.08 or higher |
| | Searching and replacing | | You can search for and replace strings in the data of a project. | All versions |
| | Retrace searching | | You can search for the program inputs and the input parameters to functions or function blocks that use the selected variable if the selected variable is used as a program output or as the output parameter of a function or function block. Also, you can search for the program outputs and the output parameters to functions or function blocks that use the selected variable if the selected variable is used as a program input or as the input parameter of a function or function block. | Ver. 1.01 or higher |
| | Jumping | | You can jump to the specified rung number or line number in the program. | All versions |
| | Building | – | The programs in the project are converted into a format that is executable in the NJ-series CPU unit. | |
| | | Rebuilding | A rebuild is used to build project programs that have already been built. | |
| | | Aborting a build operation | You can abort a build operation. | |
| | Creating applications for NA-series PT | | You can create and transfer pages and subroutines for NA-series programmable terminals. Refer to "**HMI functions**" section for more details. | Ver. 1.11 or higher |
| Reuse functions | Library | – | You can create functions, function block definitions, programs[*4] and data types in a library file to use them as objects in other projects. | Ver. 1.02 or higher |
| | | Creating libraries | You can create library files to enable using functions, function block definitions and data types in other projects. | |
| | | Using libraries | You can access and reuse objects from library files that were created in other projects. | |
| File operations | File options | Creating, opening, saving or rename a project file | You can create, open, save or save under a different name a project file. | All versions |
| | | Project update history management | You can assign numbers to projects to manage the project history. | Ver. 1.03 or higher |
| | | Exporting a project file | You can export a project to an .smc2 or .csm2 project file[*5]. You can also export a project to a previous project file format, i.e., .smc or .csm[*6]. | All versions |
| | | Importing a project file | You can import a project from an .smc2[*5], .csm2[*5], .smc or .csm[*6] project file. | |
| | | Importing a ST project file | Import of ST program files created by the Simulink® PLC Coder™ (version R2013a or higher) from MathWorks® Inc. | Ver. 1.04 or higher |
| | | Offline comparison | Compares the data for an open project with the data for a project file and displays the results. You can also compare the open project with an exported .smc2 or .smc project file. Or, you can merge detailed comparison results[*7]. | Ver. 1.02 or higher |
| | Cutting, copying and pasting | | You can cut, copy or paste items that are selected in the Multiview Explorer or any of the editors. | All versions |
| | Synchronize | | The project file in the computer is compared with the data in the online NJ-series CPU unit and any differences are displayed. You can specify the transfer direction for any type of data and transfer all of the data. | |
| | Batch transfer | | You transfer data between the computer and NJ-series CPU unit that are connected online. You can select the same data to transfer as in the synchronization operation. Unlike the synchronization, the data is transferred in the specified direction without displaying the comparison results. | Ver 1.09 or higher |
| | Printing | | You can print various data. You can select the items to print. | All versions |
| | Clear all memory | | The clear all memory menu command is used to initialize the user program, controller configurations and setup, and variables in the CPU unit to the defaults from the Sysmac Studio. | |
| | SD memory cards | – | The following procedures are used to execute file operations for the SD memory card mounted in the NJ-series CPU unit and to copy files between the SD memory card and computer. | |
| | | Formatting the SD memory card | The SD memory card is formatted. | |
| | | Displaying properties | The properties of the selected file or folder in the SD memory card is displayed. | |
| | | Copying files and folders in the SD memory card | The selected file or folder in the SD memory card is copied to the SD memory card. | |
| | | Copying files and folders between the SD memory card and the PC | The selected file or folder in the SD memory card is copied to the computer. Or, the selected file or folder in the computer is copied to the SD memory card. | |

| Item | | | Function | Sysmac Studio |
|---|---|---|---|---|
| Debugging | Monitoring | | Variables are monitored during ladder program execution. You can monitor the TRUE/FALSE status of inputs and outputs and the present values of variables in the NJ-series CPU unit. You can monitor operation on the ladder editor, ST editor, watch tab page or I/O map. | All versions |
| | Differential monitoring | | You can detect the number of times the specified BOOL variable or BOOL member changes to TRUE or FALSE and display the count in the differential monitor window. You can check if bits turn ON and OFF and the number of times that they turn ON and OFF. | Ver. 1.04 or higher |
| | Changing present values and TRUE/FALSE | | You can change the values of variables that are used in the user program and settings to any desired value and you can change program inputs and outputs to TRUE or FALSE. This allows you to check the operation of the user program and settings. | All versions |
| | Changing the present values of variables [8] | | You can change the present values of user-defined variables, system-defined variables and device variables as required. You can do this in the ladder editor, ST editor, watch tab page or I/O map. | |
| | Forced refreshing | | Forced refreshing allows the user to refresh external inputs and outputs with user-specified values from the Sysmac Studio. The specified value is retained even if the value of the variable is overwritten from the user program. You can use forced refreshing to force BOOL variables to TRUE or FALSE in the ladder editor, watch tab page or I/O map. | |
| | Online editing | | Online editing allows you to edit programs on systems that are currently in operation. Online editing can be used to edit only POUs and global variables. User-defined data types cannot be edited with online editing. | |
| | Cross reference tab page | | Cross references allow you to see the programs and locations where program elements (variables, data types, I/O ports, functions or function blocks) are used. You can view all locations where an element is used from this list. | |
| | Data tracing | – | Data tracing allows you to sample the specified variables and store the values of the variables in trace memory without any programming. You can choose between two continuous trace methods: a triggered trace, where you set a trigger condition and data is saved before and after that condition is meet, or a continuous trace, in which continuous sampling is performed without any trigger and the results are stored in a file on your computer. However, you can still display data retrieved on the Sysmac Studio and save those results to a file even if you use a triggered trace. These same functions can be used with the simulator as well. | |
| | | Setting sampling intervals | The interval to perform sampling on the target data is set. Sampling is performed for the specified task period, at the specified time, or when a trace sampling instruction is executed. | |
| | | Setting triggers | To perform a triggered trace, you set a condition to trigger sampling. A suitable trigger condition is set to record data before and after an event. | |
| | | Setting a continuous trace | The method to save the data traced during a continuous trace is set. | |
| | | Setting variables to sample | The variables to store in trace memory are registered. The sampling intervals can also be set. | |
| | | Starting and stopping tracing | The data trace settings are transferred to the NJ-series CPU unit and the tracing starts. If you selected *Trigger (Single)* as the trace type, tracing waits for the trigger to begin sampling. If you selected Continuous, sampling begins immediately and all traced data is transferred to the computer as it is gathered and saved to a file. | |
| | | Displaying trace results | You view the results of the traced data in either a chart or the 3D Motion Monitor. After sampling begins, sample data is immediately transferred and drawn on the graph. The trace target variable table shows the maximum, minimum and average values for each variable. You can change the line colors on the graph.[9] You can consecutively read and display continuous trace results from more than one file.[10] | |
| | | Exporting/importing trace results | Trace results are saved within your project automatically when you save the project on the Sysmac Studio. If you want to save this data as a separate file, you can export the data to a CSV file. You can import trace results that you have exported. | |
| | | Printing trace results | You can print out data trace settings along with digital and analog charts. | |
| | Debugging vision sensors | | You can debug the vision sensor offline. Refer to "**Vision sensor functions**" section for more details. | Ver. 1.01 or higher |
| | Debugging displacement sensors | | You can debug displacement sensors offline. Refer to "**Displacement sensor functions**" section for more details. | Ver. 1.05 or higher |
| Simulation | Programs for debugging | | You can create programs for debugging that are used only to execute simulations and specify virtual inputs for simulation. | All versions |
| | Executing a simulation | Selecting what to a simulate | You can select the programs to simulate from all of the programs in the Sysmac Studio. Programs can be dragged to select them. | |
| | | Setting breakpoints | You can set breakpoints to stop the simulation in the program editor. | |
| | | Executing and stopping simulations | You can control simulation execution to monitor the user program or to check operation through data tracing. Step execution and pausing are also possible. | |
| | | | You can perform a linked simulation between sequence control and continuous control (operations controlled by Simulink) to debug the sequence control program and continuous control program and continuous control program[11]. | Ver 1.09 or higher |
| | | Changing the simulation speed | You can change the execution speed. | All versions |
| | | Task period simulation | You can display the task periods. | |
| | | Batch transfer of the present values of variables | You can save the values of variables at specific times during simulations in a file, or you can write the values of variables that were saved in a file back to the simulator. This allows you to write the initial values of variables, e.g., for test applications, before you start a simulation. | Ver. 1.02 or higher |
| | | Integrated NS-series PT simulation[12] | You can simulate the linked operation of a sequence program and an NS-series programmable terminal to debug the sequence program and screen data offline. | |
| | | Simultaneous simulation of controller and NA-series PT | You can simultaneously simulate sequence control and NA-series PT operation, including displaying pages and subroutines created with Visual Basic and debugging the sequence programming. | Ver. 1.11 or higher |
| | Setting the virtual equipment | Creating 3D device models | You can create a 3D device model at the control target to monitor with the 3D motion monitor function. | All versions |
| | | 3D motion monitor display mode | You set the axis variables for each element of the 3D equipment model, and then set the 3D equipment into motion according to those axis motions. | |
| | | Displaying 2D paths | You can display the 2D paths of the markers for the projections in the 3D display. | |
| Monitoring information | Displaying unit production information | | You can display the production information of the NJ-series CPU unit and special units, including the models of the units and unit versions. | |
| | Monitoring task execution times | | You can monitor the execution time of each task when the user program is executed on a NJ-series CPU unit or in the simulator. When you are connected to the simulator, you can also monitor the real processing time of tasks. This allows you to perform a controller performance test. | |

| Item | | | Function | Sysmac Studio |
|---|---|---|---|---|
| Monitoring information | Troubleshooting | – | You can use troubleshooting to check the errors that occurred in the controller, display corrections for the errors and clear the errors. | All versions |
| | | Controller errors | Any current controller errors are displayed. (Observations and information are not displayed.) | |
| | | User-defined errors | Information is displayed on current errors. | |
| | | Controller event log | You can display a log of controller events (including controller errors and controller information). (You cannot display logs from EtherCAT slaves.) | |
| | | User-defined event log | The log of user-defined events that were stored for the create user-defined error (SetAlarm) instruction and the create user-defined Information (SetInfo) instruction is displayed. | |
| | | Event settings table | The event setting table is used to register the contents displayed on the Sysmac Studio on HMIs for user-defined events that occur for execution of the create user-defined error (SetAlarm) instruction and the create user-defined information (SetInfo) instruction. | |
| | User memory usage monitor | | An estimate of the space that is used by the user program that you are editing in the Sysmac Studio is displayed in relation to the size of the controller's memory. | |
| | Setting clock information | | You can read and set the NJ-series CPU unit's clock. The computer's clock information is also displayed. | |
| | DB connection function | | You can monitor information for the DB connection. Refer to "**DB connection functions**" section for more details. | Ver 1.06 or higher with NJ501-1□20 |
| Communications | Going online with a controller | | An online connection is established with the controller. You also can transfer a project from the connected controller to the computer with a simple operation without creating a new project or opening an existing project.[5] | All versions |
| | Checking for forced refreshing | | When you go offline, any forced refreshing is cleared. | |
| Maintenance | Changing the operating mode of the controller | | There are two operating modes for NJ-series controllers, depending on if control programs are executed or not. These are RUN mode and PROGRAM mode. | |
| | Resetting the controller | | The operations and status when the power supply to the controller is cycled are emulated. This can be performed only in PROGRAM mode. You cannot reset the controller in RUN mode. | |
| | Backup functions | – | You can back up, restore and compare the user program and other NJ-series controller data to replace hardware, such as the CPU unit, or to restore device data. | |
| | | Variables and memory backup | You can back up the contents of retained memory to a file and restore the contents of the backup file. You can individually select the retained variables to restore.[13] | |
| | | Controller backup | You can backup data (user program and settings, variable values, memory values, unit settings and slave settings) from a controller to a file and restore the backed up data from the file to the controller. | Ver. 1.04 or higher |
| | | SD memory card backup | You can backup the data in the NJ-series CPU unit to an SD memory card mounted in the controller or compare the data in the NJ-series controller to data in the SD memory card. | |
| | | Importing/exporting to/from backup files | You can import the data in a backup file created for a controller backup or SD memory card backup to a project. Also, you can export project data to a backup file. | |
| Security measures | Prevention of incorrect connections | Confirming NJ-series CPU unit names and serial IDs | If the name or the serial ID is different between the project and the NJ-series CPU unit when an online connection is established, a confirmation dialog box is displayed. | All versions |
| | Prevention of incorrect operation | Operation authority verification | You can set five operation authorities (administrator, planning engineer, maintainer, operator and observer) to restrict the operations that can be performed according to the operation authority of the user. | |
| | | Write protection of the CPU unit | You can prevent rewriting of data in the CPU unit from the Sysmac Studio. | |
| | Prevention of the theft of assets | Authentication of user program execution IDs | You can ensure that a user program cannot be operated on another CPU unit even if copied. | |
| | | User program transfer with no restoration information | The program source code is not transferred. If this option is selected, programs are not displayed even if uploaded from another computer. However, variables and settings are transferred even if this option is selected. | |
| | | Password protection for project files | You can place a password on the file to protect your assets. | |
| | | Data protection | You can set passwords for individual POUs (programs, functions and function block definitions) to prohibit displaying, changing and copying them. | Ver. 1.02 or higher |
| Window operation | Docking | | You can dock and undock configuration tab pages, program editors, watch tab pages, cross reference tab page and other window parts to/from the main Sysmac Studio window. | Ver 1.09 or higher |
| Online help | Sysmac Studio help system | | You can access Sysmac Studio operating procedures. | All versions |
| | Instructions reference | | Information is provided on how to use the instructions that are supported by the NJ-series CPU units. | |
| | System-defined variable reference | | You can display a list of descriptions of the system-defined variables that you can use on the Sysmac Studio. | |
| | Keyboard mapping reference | | You can display a list of convenient shortcut keys that you can use on the Sysmac Studio. | |

[1]  Changing event levels for controller errors is supported by version 1.04 or higher.

[2]  Displaying comments for members of arrays, structures and unions and displaying long comments for variables (up to five lines) are supported by version 1.04 or higher.

[3]  Changing the length of the displayed variable comments is supported by version 1.05 or higher.

[4]  Creating programs in a library file is supported by version 1.06 or higher.

[5]  Supported only by the Sysmac Studio version 1.08 or higher.

[6]  The .csm format is supported by version 1.04 or higher. The size of a csm file is smaller than the size of the smc file.

[7]  Merging detailed comparison results is supported by version 1.03 or higher.

[8]  Changing present values in the ladder editor or ST editor is supported by version 1.03 or higher.

[9]  Changing the colors of graph lines is supported by version 1.01 or higher.

[10]  Consecutively reading and displaying continuous trace results from more than one file is supported by version 1.05 or higher.

[11]  MATLAB®/Simulink R2013a or higher is required.

[12]  CX-Designer version 3.41 or higher is required.

[13]  Individual selection of the retained variables to restore is supported by version 1.05 or higher.

## DB connection functions

| Item | | Description |
|---|---|---|
| Setting parameters | DBMS settings | The database to connect is selected. |
| | Run mode setting of the DB connection service | The operation mode is selected to send SQL statements when DB connection instructions are executed or test mode is selected to not send SQL statements when DB connection instructions are executed. |
| | Spooling settings | You can set the service so that SQL statements are spooled when problems occur and resent when operation is restored. |
| | Operation log settings | Settings are made for the execution log for execution of the DB connection service, the debug log for execution of SQL statements for the DB connection service and the SQL execution failure log for SQL execution failures. |
| | Database connection service shutdown settings | Settings are made to control operation in order to end the DB connection service after automatically storing the operation log files on an SD memory card. |
| Programming | DB connection instructions | You can use the following DB connection instructions to write the user program for controlling the data in the database: DB_Insert (insert DB record), DB_Select (retrieve DB record), DB_Update (update DB record) and DB_Delete (delete DB record) |
| Monitoring information | Monitoring the DB connection service | The status of the DB connection service is monitored. |
| | Monitoring the DB connections | The status of each DB connection is monitored. |
| | Displaying the operation logs | The contents of the execution log, debug log and SQL execution failure log are displayed. |

**Note:** The DB connection service can be used if the NJ501-1☐20 is selected with Sysmac Studio version 1.06 or higher.

## Safety control unit functions

| Item | | | Description |
|---|---|---|---|
| Setting parameters | Safety I/O settings | Safety I/O settings | You make a setting for safety process data communications and connection with safety I/O devices. |
| | | Safety process data communications settings | You select safety I/O units to perform safety process data communications (FSoE communications) and make necessary settings. |
| | | Safety device allocation settings | You set the connection between safety I/O units and safety devices. |
| | Standard I/O settings | Exposed variable settings | You set wether to expose global variables of the safety CPU unit. The values of exposed variables can be referenced from NJ-series CPU units. |
| | | Standard process data communications[1] | You set the devices and ports of the standard I/O units for the exposed variables of the safety CPU unit. |
| | Safety task | Settings | You define the execution cycle and timing of the safety task and programs to be executed in the task. |
| | | Assigning programs | You assign safety programs to execute the task. |
| | I/O map settings | | The ports of safety I/O units used in safety process data communications are displayed. You assign device variables used in safety programs to the I/O ports. |
| Creating safety programs | Instruction list (Toolbox) | | A hierarchy of the functions and function blocks that you can use is displayed in the toolbox. You can drag the required functions and function blocks onto the FBD editor to insert it to a safety program. |
| | FBD programming | FBD programming | You connect variables, functions and function blocks with connecting lines to build networks. The FBD editor is used to enter them. |
| | | Adding FBD networks | You create FBD networks on the FBD editor to create algorithms. |
| | | Inserting/Deleting functions/ function blocks | You insert and delete functions and function blocks on the FBD editor. |
| | | Entry assistance | When you enter functions, function blocks or parameters, each character that you enter from the keyboard narrows the list of candidates that is displayed for selection. |
| | | Commenting out FBD networks | You can comment out each FBD network. When a network is commented out, it is no longer executed. |
| | Creating variables | | You create variables used in safety programs in the global or local variable table, |
| | Function Blocks | Function Blocks | You create user-defined function blocks. |
| | | Help reference[2] | You can display the user-defined function block help with the popup menu or shortcut key. |
| | | Export/import[2] | You can export/import user-defined function blocks. |
| | Searching and replacing | | You can search for and replace strings in the variable tables, programs and function blocks of a safety CPU unit. |
| Debugging | Monitoring | | Variables are monitored during safety program execution. You can monitor the present values of device variables assigned to safety I/O units and user-defined variables. The values can be monitored on the FBD editor or watch tab page. |
| | Changing the present values of variables | | You can change the present values of user-defined variables and device variables as required. You can do this on the FBD editor or watch tab page. |
| | Forced refreshing | | The inputs from external devices and outputs to external devices are refreshed with a specified value on the Sysmac Studio. The specified value is retained even if the value of the variable is overwritten from the user program. You can use forced refreshing on the FBD editor or watch tab page. |
| | Offline debugging[3] | | You can check if the control program logic works as designed in advance using a special debugging function for the Simulator without connecting online with the safety CPU unit. |
| | User memory usage monitor[4] | | The memory usage of the safety control system and usage of safety network such as I/O data size are displayed. |
| Safety | Safety validation | | You append the "safety-validated" information to a safety program when you can ensure safety of the program after you complete debugging. |
| | Changing operation mode | | There are four operating modes: PROGRAM mode, DEBUG mode (STOPPED), DEBUG mode (RUN) and RUN mode. The RUN mode can be selected only for the validated safety programs. |
| Security measures | Setting the node name | | You set a unique name for each safety CPU unit to confirm that you operate the correct safety CPU unit. |
| | Safety password | | You can prevent unauthorized access to safety functions of safety CPU units by setting a safety password for online operations that affect the safety functions. |
| | Data protection[2] | | You can set passwords for individual user-defined function block to prohibit displaying, changing them. |

[1] Supported if the EtherNet/IP coupler is selected with Sysmac Studio version 1.11 or higher.
[2] Supported only by the Sysmac Studio version 1.12 or higher.
[3] Supported only by the Sysmac Studio version 1.08 or higher.
[4] Supported only by the Sysmac Studio version 1.10 or higher.

**Note:** Supported only by Sysmac Studio version 1.07 or higher.

# OMRON

## HMI functions

### NA-series programmable terminals

| Item | | | Description |
|---|---|---|---|
| Parameter settings | Device | References | Devices, such as controllers, through which the NA-series PT can read and write information with communications are created on the Sysmac Studio and settings are made for them. |
| | | Displaying internal devices | Controllers that were created in the project are displayed. |
| | | Registering external devices | Devices, such as controllers, that were not created in the project are registered. The communications settings of the devices to communicate with the NA-series PT and information, such as variables and addresses within the devices that the NA-series PT will read and write, are also registered. |
| | Mapping variables | | The information on the devices registered in the device references, such as variables and addresses, are mapped to the global variables of the NA-series PT. |
| | Settings | HMI | Settings for NA-series PT operation are made. |
| | | Device | Settings, such as the startup page, default language, layout of the USB keyboard, automatic logout, screen saver, screen brightness and method to change to the system menu are made. |
| | | TCP/IP | Settings for the Ethernet port, that is built-in to the NA-series PT, are made. |
| | | FTP | Settings to communicate with FTP clients using the Ethernet port are made. |
| | | NTP | Settings to communicate with an NTP server using the Ethernet port are made. |
| | | FINS | Settings to communicate with devices that support FINS are made. |
| | | VNC | Settings to communicate with VNC clients using the Ethernet port are made. |
| | | Security | Settings, such as user registration and permissions to restrict NA-series PT operation and displays, are made. |
| | | User account settings | The user names, login passwords and permissions for each user to operate the NA-series PT are set. |
| | | Permission and access level settings | The range of information that can be accessed for different permissions are set. |
| | | Language | Language settings to perform multi-language displays on the NA-series PT are made. |
| Creating data and programming | Pages | Editing pages | The pages to display on the NA-series PT are edited. |
| | | Adding and deleting pages | Pages are added, deleted or copied with the Multiview Explorer. Pages can also be copied to other projects. |
| | | Adding and deleting page groups | Groups to organize and manage pages on the Multiview Explorer are added and deleted. Pages can be added to or moved to the groups. |
| | | Page properties settings | The page type, overlapping, background color, etc., are set in the Properties Window. |
| | | Changing the display language | If using multiple languages is set in the language settings, the resources displayed on the Page Editor are displayed in the language set for each resource. |
| | | Displaying object configuration | The objects and groups that were added to each page can be confirmed in a tree structure using the Page Explorer. |
| | | Adding objects | Objects, such as buttons or graphics, to display on a page are added by dragging them from the Toolbox to the Page Editor. |
| | | Grouping objects | Settings to operate multiple objects together as a group are made. |
| | | Aligning objects | Multiple objects are aligned. |
| | | Editing objects | Objects and groups can be copied within a page or to another page. Objects can also be deleted and locations, sizes, rotations and position relationships with other objects can be set. |
| | | Object property settings | Properties, such as the colors and shapes of objects and the mapped variables, can be changed. Properties are displayed and changed in the Properties Window. |
| | | Animation settings | Animation to modify dynamically the appearance of objects are set. Animation is displayed and changed in the Animation Window. |
| | | Event and action settings | The events that can be set for objects and the actions that can be executed when an event occurs are set. |
| | Programming with Visual Basic | Visual Basic | Subroutines are created with Visual Basic. |
| | | Language specifications | Visual Basic 2008 and .NET Compact Framework 3.5 are supported.[1] |
| | | Adding subroutine groups | Groups to organize and manage global subroutines on the Multiview Explorer are added or deleted. Subroutines can be added or moved to the groups. |
| | | Editing subroutines | Subroutines are created using the Code Editor, which is optimized for Visual Basic. |
| | | Bookmarks | Bookmark can be added to any code line and you can move between the bookmarks. |
| | | Data entry assistance | The characters that are entered from the keyboard are used to display candidates when entering the source code. |
| | User alarms | User alarms | Settings for detection conditions and displaying messages for user alarms are made. |
| | | Adding and deleting user alarm groups | Groups to organize and manage user alarms on the Multiview Explorer are added or deleted. User alarms can be created in the groups. |
| | | Registering and deleting user alarm | Setting for detection conditions for user alarms and displaying messages or popup pages are made for user alarm groups. |
| | | Copying user alarms | User alarms can be copied within a group or to another group. |
| | | Event and action settings | Events and the actions that are executed when the events occur are set for the user alarms. Displaying and changing the settings for events and actions is performed in the Events and Actions Window. |
| | Data logging | Data logging | Data logging is set to log specified data in the NA-series PT at the specified times. |
| | | Adding and deleting data sets | Data sets are added to perform data logging. |
| | | Log condition setting | Conditions to perform data logging and target global variables are set for the data sets. |
| | Recipes | Recipes | Data groups that are retained in the NA-series PT and can be switched for user requests are set. |
| | | Adding and deleting templates | Data storage locations, value ranges and data names are added or deleted. |
| | | Recipe data settings | The actual data is set for each recipe. |
| | Global events | | The events that are detected on any page and the actions that are executed when the events occur are set. |

| Item | | | Description |
|---|---|---|---|
| Creating data and programming | Resource management | Management | All of the character strings and graphics that are displayed on pages are managed. |
| | | Registering and deleting general character strings | The character strings that are displayed on pages are registered and deleted, except for character strings used for user alarms. |
| | | Registering and deleting character strings for user alarms | The character strings used for user alarms are added or deleted. |
| | | Registering and deleting document files | Document files that are displayed with the Document Viewer are set or deleted. |
| | | Registering and deleting image files | Image files that are displayed for objects are set or deleted. |
| | | Registering and deleting movies | Movie files that are displayed for Media Player objects are set or deleted. |
| | | Importing and exporting | The general character strings and alarm character strings can be imported and exported using Excel files. |
| | Searching and replacing | | You can search for and replace character strings in subroutines that are created with Visual Basic. |
| | Building | | The project is converted into a format that can be executed in the NA-series PT. |
| Reusability | IAGs | Intelligent application gadgets | Multiple objects and subroutines are combined to create a reusable object. |
| | | Creating IAGs | An IAG is created as a functional unit in an IAG project. |
| | | Creating IAG collection files | A created IAG is built and saved as a module that can be distributed and reused. |
| | | Using IAGs | IAG collection files are imported using the IAG Collection Manager. The imported IAGs are displayed in the Toolbox and can be used in the same way as other objects. |
| | Custom objects | Custom objects | The selected objects are registered in a reusable format in the Toolbox. |
| | | Registering custom objects | Objects or grouped objects are dragged to the Toolbox to register them. |
| | | Using custom objects | Custom objects are displayed on a page by dragging them from the Toolbox to the Page Editor. |
| File operations | Synchronization | | The data in the NA-series PT that is online is compared with the data in the Sysmac Studio. You can check the differences and then transfer the data after specifying the transfer direction. |
| | Transferring files via storage media | | The data in a storage media in the computer is compared with the data in the Sysmac Studio. You can check the differences and then transfer the data to the storage media. You can use the System Menu to transfer a saved project file to the NA-series PT. |
| | Clearing all memory | | All of the data except for the clock information is deleted from the NA-series PT. |
| Simulation | Executing simulations | | A project file on the computer is virtually executed to debug it. |
| | Setting and clearing breakpoints | | Breakpoints can be set at the specified positions in a subroutine. |
| | Synchronized simulation with Controller Simulator | | Sequence control and NA-series PT operation, such as displaying pages and subroutine operation, is simulated together to debug the application in the NA-series PT. |
| Setting clock information | | | The clock information in the NA-series PT can be checked and set. |
| Communications | Going online with NA-series PT | | The computer can be placed online with the NA-series PT. However, information in the NA-series PT, such as the values of variables, cannot be read. |
| | Upgrading system program | | When the Sysmac Studio is online with the NA-series PT, the system program in the NA-series PT can be upgraded as required. |
| Security | Preventing malfunctions | | If the name or serial ID of the project and the NA-series PT are different when the Sysmac Studio goes online, a confirmation dialog box is displayed. |
| | Preventing incorrect operations | | You can prevent data in the NA-series PT from being overwritten from the Sysmac Studio. |

[1] There are restrictions on the functions that can be used.

**Note:** Supported only by Sysmac Studio version 1.11 or higher.

# OMRON

## Vision sensor functions

### FQ-M vision sensor

| Item | | | Description |
|---|---|---|---|
| Setting parameters | Main edit | General settings | Displays and sets basic information of the sensor. |
| | | Sensor connection | Changes the connection status of the sensor, and sets the conditions for communications with the sensor. |
| | | Sensor control in online | Performs various controls for the sensor mode change, data transfer/save and monitoring. |
| | | Sensor error history | Displays and clears the error history of an online sensor. |
| | | Tool | Restarts and initializes the sensor, updates the firmware of the sensor, reads sensor data from a file, saves a sensor data to a file, prints the sensor parameters and displays help. |
| | Scene data edit | Image condition settings | Adjusts the image condition. |
| | | Specifies the calibration pattern | Sets a registered calibration pattern. |
| | | Registers inspection item | Registers the inspection item to use in the measurement. You can select from the following inspection items: edge position, search, labeling, shape search. |
| | | Calculation settings | Makes a setting for basic arithmetic operations and function operations using inspection item judgment results and measurement data. |
| | | Logging settings | Makes a setting for logging measurement results of inspection items and calculation results. |
| | | Output settings | Makes a setting for data to output to external devices. |
| | | Run settings | Switch sensor modes or monitors measurement results. |
| | Sensor system data edit | Trigger condition settings | Sets the trigger type and image timing. |
| | | I/O settings | Sets the conditions of output signals. You can check the status of I/O signal while online. |
| | | Encoder settings | Make settings for the encoder such as common encoder settings, ring counter settings and encoder trigger settings. |
| | | Ethernet communication settings | Makes Ethernet communication settings. You can select data communication from no-protocol data, PLC link data and programmable no-protocol data. |
| | | EtherCAT communication settings | Makes the EtherCAT communication settings according to the communication settings of the EtherCAT master. |
| | | Logging condition settings | Sets the conditions to log to the internal memory of sensor. |
| | | Sensor settings | Makes the settings for startup scene control function, password setting function and adjustment judgment function. |
| | Calibration scene data settings | | Calculates, views and edits the calibration parameters. The vision sensor supports general-purpose calibration and calibration for conveyor tracking. |
| Debugging | Offline debugging of sensor operation | | Simulates measurements offline without connecting to the vision sensor. You can use external image files and perform measurements under the conditions set in the offline settings, then display the results of those measurements. |
| | Offline debugging of the sensor control program and sensor operation | | Performs a linked simulation between the sequence control of an NJ-series controller and the operation of an FQ-M sensor in EtherCAT configuration systems. This allows you to debug operation offline from when measurements and other processing are performed for control signals such as measurement triggers through the output of processing results. |

**Note:** Supported only by the Sysmac Studio version 1.01 or higher.

### FH vision sensor

| Item | | | Description |
|---|---|---|---|
| Setting parameters | Main edit | Sensor information | Displays and sets basic information of the sensor. |
| | | Online | Changes the connection status of the sensor and performs various controls such as sensor restart and initialization. |
| | Line edit | Operation view | Monitors the measurement images of the sensor and detailed results of each process unit. |
| | | Scene maintenance view | Edits, manages and saves the scene groups and scenes. |
| | Scene data edit | Flow edit | Creates the process flow in combination of user-specified units. |
| | | Process unit edit | Edits each process unit. |
| | Sensor system data edit | Camera settings | Checks the camera connection status and sets the camera's imaging timing and communications speed. |
| | | Controller settings | Makes the system environment settings for the sensor. |
| | | Parallel I/O settings | Sets the conditions of output signals. |
| | | RS-232C/422 settings | Makes the RS232C/422 communications settings. |
| | | Ethernet communication settings | Makes the Ethernet communication settings. |
| | | EtherNet/IP communication settings | Makes the EtherNet/IP communication settings. |
| | | EtherCAT communication settings | Makes the EtherCAT communication settings. |
| | | Encoder settings | Makes the encoder settings. |
| | Tools | Communication command customization tool | Makes the settings for customized communication commands. |
| | | File saving tool | Copies and transfers the files in the sensor memory. |
| | | Calibration support tool | Checks the calibration information. |
| | | User data tool | Edits the data (user data) that can be shared and used in sensors. |
| | | Security setting tool[1] | Edits the security settings of the sensor. |
| | | Scene group save destination setting tool[1] | Sets the destination to save the scene group data. |
| | | Image file save tool[1] | Saves the logging images and image files stored in the sensor memory. |
| | | Registered image management tool[1] | Saves the images used for model registration and reference registration as registered images. |
| | | Reference position update tool[1] | Edits all reference positions of more than one processing unit. |
| | | Scene group data conversion tool[1] | Creates the scene group data with more than 128 scenes. |
| | | Scene control macro tool[1] | Makes a setting for complementing and expanding the measurement flow and scene control. |

| Item | | Description |
|---|---|---|
| Debugging | Offline debugging of sensor operation | Simulates measurements offline without connecting the sensor. You can use external image files and perform measurements under the conditions set in the offline settings, then display the results of those measurements. |
| | Offline debugging of sensor control program and sensor operation[2] | Simulates the linked operation of the sequence controls in the NJ-series controller and FH-series sensor operation for an EtherCAT system.<br>You can debug a series of operations offline to perform the measurement and other processing and output the results when a control signal such as measurement trigger is input to the sensor. |
| Security | Prevention of incorrect operation[3] | Prevents unauthorized access by setting an account password for online operations. |

[1] Supported only by the Sysmac Studio version 1.10 or higher.
[2] Supported only by the Sysmac Studio version 1.08 or higher.
[3] Supported only by the Sysmac Studio version 1.09 or higher.

**Note:** Supported only by the Sysmac Studio version 1.07 or higher.

## Displacement sensor functions

| Item | | | Description |
|---|---|---|---|
| Setting parameters | Main editing | General settings | Displays and sets basic information on the sensor. |
| | | Sensor connection | Changes the connection status of the sensor, and sets the conditions for communications with the sensor. |
| | | Online sensor control | Performs various controls for the sensor (e.g., changing the mode, controlling internal logging and monitoring). |
| | | Tools | Restarts and initializes the sensor, updates the firmware in the sensor, recovers ROM data, prints the sensor parameters and displays help. |
| | Editing bank data | Setting sensing conditions | Adjusts the light reception conditions for each measurement region. |
| | | Setting task conditions | Used to select the measurement items to use in measurements. You can select from the height, thickness or calculations.<br>The following are set for the measurement items: scaling, filters, holding, zero-resetting and judgement conditions. |
| | | Setting I/O conditions | Sets parameters for outputting judgements and analog values to external devices. |
| | | Sensor settings | Sets the following: ZW sensor controller's key lock, number of displayed digits below the decimal point, the bank mode, the analog output mode and timing/reset key inputs. |
| | | Ethernet communication settings | Sets up Ethernet communications and field bus parameters. |
| | | RS-232C communication settings | Sets up RS-232C communications. |
| | | Data output settings | Sets serial output parameters for holding values. |
| Debugging | | Offline debugging of sensor control programs and sensor operation | Performs a linked simulation between the sequence control of an NJ-series controller and the operation of a ZW sensor in EtherCAT configuration systems.<br>This allows you to simulate the operation of signals when timing signals and other control signals are input to the sensor to debug the control logic offline. |

**Note:** Supported only by the Sysmac Studio version 1.05 or higher.

## EtherNet/IP connection functions

| Item | | | Description |
|---|---|---|---|
| EtherNet/IP connection settings | Connection settings | | Functions related to tag data links (connection) settings in the EtherNet/IP network are provided. |
| | Setting connections | Editing tag sets | You create tags and tag sets using network variables. |
| | | Editing target devices | You add target devices to connect to. |
| | | Editing connections | You select tag sets from a list and create connections. |
| | | Adding EDS files | You can add the types of EtherNet/IP devices that can be set as targets. |
| | Transferring connections | Synchronized transfer and batch transfer | All the connection settings in the controller or the project are transferred at the same time. |
| | | Individual transfer and comparison | You can transfer or compare the connection settings of each EtherNet/IP device individually. |
| | Monitoring connections | Status monitor | The operating status of one or more connections is displayed. You can start or stop all the connections at the same time. |
| | | Tag/tag set monitor | The detailed operation information of tags and tag sets, such as the presence or absence of tags and connection times of tag sets, is displayed. |
| | | Ethernet information monitor | The detailed operation information of EtherNet/IP devices, such as bandwidth usage (pps), is displayed. |

**Note:** Supported only by the Sysmac Studio version 1.10 or higher.

## EtherNet/IP slave terminal functions

| Item | | Description |
|---|---|---|
| EtherNet/IP slave terminal configuration and setup | Configuration and setup | You create the configuration of slave terminal to be connected to the EtherNet/IP network on the Sysmac Studio and set the NX units that compose the slave terminal. |
| | Registering the NX units | You configure the slave terminal by dragging the NX units from the device list displayed in the toolbox to the positions where to mount the units. |
| | Setting the NX units | You edit the I/O allocation settings, mounting settings and unit operation settings of the NX units. |
| | Displaying the width of slave terminal configuration | The width and power consumption of the slave terminal configuration are displayed based on the unit configuration information. |
| | Comparing and merging the slave terminal configuration information | You can compare the configuration information on the project with actual configuration online, select the units with different information to correct and merge the information. |
| | Transferring the slave terminal configuration information | You transfer the unit configuration information to the slave terminal. |

**Note:** Supported only by the Sysmac Studio version 1.11 or higher.

# OMRON

## Web support services

| Category | Function |
|---|---|
| Online user registration | You can register online as a user of Sysmac Studio. |
| Automatic update | With the automatic update function of Sysmac Studio, the latest update information for your computer environment can be searched for and applied using the Internet.<br>Your Sysmac Studio can be constantly updated to the latest state. |

## Ordering information

### Automation software

Please purchase a DVD and licenses the first time you purchase the Sysmac Studio. DVD's and licenses are available individually.
The license does not include the DVD.

| Product | Specifications | | | Model |
|---|---|---|---|---|
| | Description | Number of licenses | Media | |
| Sysmac Studio Standard Edition Ver. 1.□□ | The Sysmac Studio is the software that provides an integrated environment for setting, programming, debugging and maintenance of machine automation controllers including the NJ-series, EtherCAT slave and the HMI.<br><br>Sysmac Studio runs on the following OS:<br>Windows XP (Service Pack 3 or higher, 32-bit version)<br>Windows Vista (32-bit version)<br>Windows 7 (32-bit/64-bit version)<br>Windows 8 (32-bit/64-bit version)<br>Windows 8.1 (32-bit/64-bit version) | – (Media only) | DVD[1] | SYSMAC-SE200D |
| | | 1 license | – | SYSMAC-SE201L |
| | | 3 licenses | – | SYSMAC-SE203L |
| | | 10 licenses | – | SYSMAC-SE210L |
| | | 30 licenses | – | SYSMAC-SE230L |
| | | 50 licenses | – | SYSMAC-SE250L |
| Sysmac Studio Vision Edition Ver. 1.□□[2],[4] | Sysmac Studio Vision Edition is a limited license that provides selected functions required for FQ-M series and FH-series vision sensor settings. | 1 license | – | SYSMAC-VE001L |
| Sysmac Studio Measurement Sensor Edition Ver. 1.□□[3],[4] | Sysmac Studio Measurement Sensor Edition is a limited license that provides selected functions required for ZW-series displacement sensor settings. | 1 license | – | SYSMAC-ME001L |
| | | 3 licenses | – | SYSMAC-ME003L |
| Sysmac Studio NX-I/O Edition Ver. 1.□□[4][5] | Sysmac Studio NX-I/O Edition is a limited license that provides selected functions required for EtherNet/IP coupler settings. | 1 license | – | SYSMAC-NE001L |

[1] The same media is used for both the Standard Edition and the Vision Edition.
[2] With the Vision Edition, you can use only the setup functions for FQ-M series and FH-series vision sensors.
[3] With the Measurement Sensor Edition, you can use only the setup functions for ZW-series displacement sensors.
[4] This product is a license only. You need the Sysmac Studio Standard Edition DVD media to install it.
[5] With the NX-I/O Edition, you can use only the setup functions for EtherNet/IP coupler.

**Note:** Site licenses are available for users who will run Sysmac Studio on multiple computers. Ask your OMRON sales representative for details.

### Components

#### DVD (SYSMAC-SE200D)

| Components | Details |
|---|---|
| Introduction | An introduction about components, installation/uninstallation, user registration and auto update of the Sysmac Studio is provided. |
| Setup disk (DVD-ROM) | 1 |

#### License (SYSMAC-SE2□□L/VE0□□L/ME0□□L/NE0□□L)

| Components | Details |
|---|---|
| License agreement | The license agreement gives the usage conditions and warranty for the Sysmac Studio. |
| License card | A model number, version, license number and number of licenses are described. |
| User registration card | Two cards are contained. One is for users in Japan and the other is for users in other countries. |

### Included support software

DVD media of Sysmac Studio includes the following support software:

| Included support software | | Outline |
|---|---|---|
| CX-Designer | Ver. 3.□□ | The CX-Designer is used to create screens for NS-series PTs. |
| CX-Integrator | Ver. 2.□□ | The CX-Integrator is used to set up FA networks. |
| CX-Protocol | Ver. 1.□□ | The CX-Protocol is used for protocol macros for serial communications units. |
| Network Configurator | Ver. 3.□□ | The Network Configurator is used for tag data links on the built-in EtherNet/IP port. |
| SECS/GEM Configurator[1] | Ver. 1.□□ | The SECS/GEM Configurator is used for SECS/GEM settings. |

[1] Please, purchase the required number of SECS/GEM Configurator licenses.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## WS02-□

# CX-Compolet/SYSMAC Gateway

## Specifications

### System requirements (CX-Compolet/SYSMAC Gateway)

| Item | Requirement | |
|---|---|---|
| Operating system (OS)<br>Japanese or English system | Microsoft Windows Vista (32-bit)<br>Microsoft Windows 7 (32-bit/64-bit[*1])<br>Microsoft Windows 8.1[*2] (32-bit/64-bit[*1])<br>Microsoft Windows Server 2003 (32-bit)<br>Microsoft Windows Server 2008 (32-bit/64-bit[*1]) or Microsoft Windows Server 2008R2 (64-bit[*1]) | |
| Personal computer | Windows computers with Intel (x86 processor) | Windows computers with Intel 32-bit (x86 processor) or 64-bit (x64 based processor) |
| CPU | Processor recommended by Microsoft<br>(1 GHz or faster recommended) | Processor recommended by Microsoft<br>(2 GHz or faster recommended) |
| Memory | 512 MB min. (1 GB min. recommended) | 1 GB min. (2 GB min. recommended) |
| Hard disk | At least 400 MB of available space | |

[*1] This software runs on WOW64 (Windows-On-Windows 64). Customer application must be run as 32-bit process.

[*2] The CX-Compolet version 1.4 or higher is required for Microsoft Windows 8.1.

**Note:** USB port on the PC can not be shared between SYSMAC Gateway and CX-One in Windows Vista or higher.

### Correspondence between controller models and connected networks

| Machine controller model | Personal computer side | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | RS-232C | | | | USB | Ethernet (LAN) | | Controller Link |
| | SYSWAY (Host Link C mode) | SYSWAY-CV (Host Link FINS) | CompoWay/F (master at PC) | Peripheral Bus | FINS | Ethernet (FINS) | EtherNet/IP | FINS |
| NJ5 CPU (unit version 1.01 or higher)[*1] | No | No | No | No | No | No | Yes[*2] | No |
| NJ3 CPU (unit version 1.01 or higher)[*1] | No | No | No | No | No | No | Yes[*2] | No |

[*1] To connect the NJ controller, CX-Compolet/SYSMAC Gateway version 1.31 or higher is required.

[*2] Tag data links between SYSMAC Gateway and the NJ-series CPU unit can be created within the CJ-series specifications for variable with basic data type, array variable and structure variable. SYSMAC Gateway memory allocation of structure variable is the same as the CJ-series.

## Ordering information

### CX-Compolet

| Product | Specifications | | Model |
|---|---|---|---|
| CX-Compolet[*1] | Software components that can make it easy to create programs for communications between a computer and controllers.<br>This packaged product bundles CX-Compolet and SYSMAC Gateway with 1 license each.<br>Supported execution environment: .NET Framework (1.1, 2.0, 3.0, 3.5 or 4.0)<br>Development environment: Visual Studio .NET[*2]/.NET2003/.NET2005/.NET2008/.NET2010<br>Development languages: Visual Basic .NET, Visual C# .NET, Visual Basic ver. 5/6[*3]<br>Supported communications: Equal to SYSMAC Gateway | 1 user license | CX-COMPOLET-EV1-01L |
| | | 5 user licenses | CX-COMPOLET-EV1-05L |
| | | 10 user licenses | CX-COMPOLET-EV1-10L |
| | | Site user license | CX-COMPOLET-EV1-XXL |

[*1] One license is required per computer.

[*2] Only the components compatible with CX-Compolet version 2003 are supported. A development environment of .NET2003 or higher is required for CIP communications.

[*3] Only functions provided by SYSMAC Compolet v2 as ActiveX controls are supported for Visual Basic version 5 or 6 (Windows XP only).

**Note:** Supported only by the NJ-series CPU units with unit version 1.01 or higher and the CX-Compolet version 1.31 or higher.

### SYSMAC Gateway

| Product | Specifications | Model |
|---|---|---|
| SYSMAC Gateway[*1] | Communications middleware for personal computers running Windows.<br>Supports CIP communications and tag data links (EtherNet/IP) in addition to FinsGateway functions.<br>This package includes SYSMAC Gateway with 1 license. (FinsGateway is also included.)<br>Supported communications: RS-232C, USB, Controller Link, SYSMAC LINK, Ethernet, EtherNet/IP | SYSMAC-GATEWAY-RUN-V1 |

[*1] One license is required per computer.

**Note:** Supported only by the NJ-series CPU units with unit version 1.01 or higher and the SYSMAC Gateway version 1.31 or higher.

**OMRON**

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat.No.SysCat_I184E-EN-01A    In the interest of product improvement, specifications are subject to change without notice.

| | Ethernet and EtherCAT cables | | | |
|---|---|---|---|---|
| |  |  |  |  |
| **Model** | Ethernet patch cable | | | |
| **Type** | Cable with standard connectors on both ends (RJ45/RJ45) | Cable with standard connectors on both ends (RJ45/RJ45) | Cable with rugged connectors on both ends (RJ45/RJ45) | Cable with rugged connectors on both ends (M12 Straight/ RJ45) |
| **Specifications** | • Cat 6a • 4 pair • Double shield S/FTP | • Cat 5 • 4 pair • Double shield SF/UTP | • Cat 5 • Quad-core • Double shield SF/UTP | • Cat 5 • Quad-core • Double shield SF/UTP |
| **Cable sheath material** | Low Smoke Zero Halogen (LSZH) | Polyurethane (PUR) | Polyvinylchloride (PVC) | Polyvinylchloride (PVC) |
| **Cable colour** | Yellow, blue and green | Green | Grey | Grey |
| **Length** | 0.2, 0.3, 0.5, 1.0, 1.5, 2.0, 3.0, 5.0, 7.5, 10, 15, 20 m | 0.5, 1.0, 1.5, 2.0, 3.0, 5.0, 7.5, 10, 15, 20 m | 0.3, 0.5, 1.0, 2.0, 3.0, 5.0, 10, 15 m | 0.3, 0.5, 1.0, 2.0, 3.0, 5.0, 10, 15 m |
| **Page** | 49, 67 | 49, 67 | 49, 67 | 49, 67 |

| | Ethernet and EtherCAT connectors | | |
|---|---|---|---|
| |  |  |  |
| **Model** | Ethernet field-mount plugs | | Ethernet socket |
| **Type** | Industrial RJ45 connector | Rugged RJ45 connector | Socket to terminate installation cable in the cabinet |
| **Specifications** | • Metal RJ45 • For AWG22 to AWG26 | • Plastic RJ45 • For AWG22 to AWG24 | • RJ45 socket • DIN-rail mount |
| **Cable colour** | Chrome | Black | Grey |
| **Dimension** | 52 mm | 52 mm | 60 × 17.5 × 67 mm |
| **Page** | 50, 68 | 50, 68 | 50, 68 |

| | Industrial Switching Hub | | |
|---|---|---|---|
| |  |  |  |
| **Model** | Ethernet switch | | |
| **Number of ports** | 5 | 5 | 3 |
| **Functions** | • QoS for EtherNet/IP • Auto MDI/MDIX • Failure detection: Broadcast storm and LSI error detection 10/100BASE-TX, Auto-Negotiation | • QoS for EtherNet/IP • Auto MDI/MDIX | • QoS for EtherNet/IP • Auto MDI/MDIX |
| **Power requirements** | 24 VDC (±5%) | 24 VDC (±5%) | 24 VDC (±5%) |
| **Dimension** | 48 × 78 × 90 mm | 48 × 78 × 90 mm | 25 × 78 × 90 mm |
| **Mounting** | DIN rail | DIN rail | DIN rail |
| **Page** | 49, 67 | 49, 67 | 49, 67 |

| | Ethernet and EtherCAT cables | | |
|---|---|---|---|
| |  |  |  |
| **Model** | Ethernet patch cable | Ethernet installation cable | |
| **Type** | Cable with rugged connectors on both ends (M12 Right angle/RJ45) | Cable without connectors | Cable without connectors |
| **Specifications** | • Cat 5<br>• Quad-core<br>• Double shield SF/UTP | • Cat 5<br>• 4×2×AWG24/1 (Solid core)<br>• Double shield SF/UTP | • Cat 5<br>• 4×2×AWG26/7 (Stranded core)<br>• Double shield SF/UTP |
| **Cable sheath material** | Polyvinylchloride (PVC) | Polyurethane (PUR) | Polyurethane (PUR) |
| **Cable colour** | Grey | Green | Green |
| **Length** | 0.3, 0.5, 1.0, 2.0, 3.0, 5.0, 10, 15 m | 100 m | 100 m |
| **Page** | 49, 67 | 49, 67 | 49, 67 |

| | EtherCAT branching unit | |
|---|---|---|
| |  |  |
| **Model** | EtherCAT junction slave | |
| **Number of ports** | 6 | 3 |
| **Functions** | • Power, Link/Act indicators<br>• Auto MDI/MDIX<br>• Reference clock | • Power, Link/Act indicators<br>• Auto MDI/MDIX<br>• Reference clock |
| **Power requirements** | 24 VDC (−15% to +20%) | 24 VDC (−15% to +20%) |
| **Dimension** | 48 × 78 × 90 mm | 25 × 78 × 90 mm |
| **Mounting** | DIN rail | DIN rail |
| **Page** | 48, 67 | 48, 67 |

# OMRON

# Technical documentation
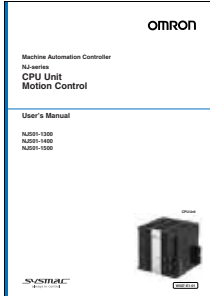
| | Product | Title | Cat. No. |
|---|---|---|---|
| Machine automation controller | NX-series CPU unit hardware | User manual | W535-E1 |
| | NJ-series CPU unit hardware | User Manual | W500-E1 |
| | NX/NJ-series CPU unit software | User Manual | W501-E1 |
| | NX/NJ-series CPU unit motion montrol | User Manual | W507-E1 |
| | NX/NJ-series CPU unit built-in EtherCAT port | User Manual | W505-E1 |
| | NX/NJ-series CPU unit built-in EtherNet/IP port | User Manual | W506-E1 |
| | NJ-series database connection CPU unit | User Manual | W527-E1 |
| | NJ-series SECS/GEM CPU unit | User manual | W528-E1 |
| | NJ-series CPU unit | Startup Guide | W513-E1 |
| | NJ-series CPU unit motion control | Startup Guide | W514-E1 |
| | NX/NJ-series instructions | Reference Manual | W502-E1 |
| | NX/NJ-series motion control instructions | Reference Manual | W508-E1 |
| | NX/NJ-series troubleshooting | Troubleshooting Manual | W503-E1 |
| | CJ-series analog I/O units for NJ-series CPU unit | Operation Manual | W490-E1 |
| | | Operation Manual | W498-E1 |
| | CJ-series temperature control units for NJ-series CPU unit | Operation Manual | W491-E1 |
| | CJ-series ID sensor units for NJ-series CPU unit | Operation Manual | Z317-E1 |
| | CJ-series high-speed counter units for NJ-series CPU unit | Operation Manual | W492-E1 |
| | CJ-series serial communications units for NJ-series CPU unit | Operation Manual | W494-E1 |
| | CJ-series EtherNet/IP units for NJ-series CPU unit | Operation Manual | W495-E1 |
| | CJ-series DeviceNet units for NJ-series CPU unit | Operation Manual | W497-E1 |
| | CJ-series CompoNet master units for NJ-series CPU unit | Operation Manual | W493-E1 |
| Software | Sysmac Studio | Operation Manual | W504-E1 |
| I/O | NX-series EtherCAT coupler unit | User Manual | W519-E1 |
| | NX-series EtherNet/IP coupler unit | User manual | W536-E1 |
| | NX-series digital I/O units | User Manual | W521-E1 |
| | NX-series analog I/O units | User Manual | W522-E1 |
| | NX-series position interface units | User Manual | W524-E1 |
| | NX-series system units | User Manual | W523-E1 |
| | NX-series | Data Reference Manual | W525-E1 |
| | GX-series | User Manual | W488-E1 |
| Safety | NX-series safety control units | User Manual | Z930-E1 |
| | | Reference Manual | Z931-E1 |
| Servo system | Accurax G5 EtherCAT rotary servo system | User Manual | I576-E1 |
| | Accurax G5 EtherCAT linear servo system | User Manual | I577-E1 |
| | Integrated servo motor | User manual | I103E-EN |
| Frequency inverter | MX2 inverter | User Manual | I570-E2 |
| | | Quick Start Guide | I129E-EN |
| | RX inverter | User Manual | I560-E2 |
| | | Quick Start Guide | I130E-EN |
| | MX2/RX EtherCAT communication unit | User Manual | I574-E1 |
| Vision | FH series vision system | User Manual | Z340-E1 |
| | FH series vision system processing item function | Reference Manual | Z341-E1 |
| | FH series vision system communication settings | User Manual | Z342-E1 |
| | FH series vision system for Sysmac Studio | Operation Manual | Z343-E1 |
| | FQ-M series specialized vision sensor for positioning | User Manual | Z314-E1 |
| Sensing | ZW displacement measurement sensor | User Manual | Z332-E1 |
| | N-Smart EtherCAT sensor communication unit | User Manual | E429-E1 |
| HMI | NA-series programmable terminals | Hardware Manual | V117-E1 |
| | | Software Manual | V118-E1 |
| | | Device Connection Manual | V119-E1 |
| | | Quick Start Guide | V120-E1 |

**www.industrial.omron.eu/en/products/downloads**

**OMRON**