OMRON

Sysmac Catalogue 2013

One Machine Control

SYSMAC
always in control

News

Controller

NJ series
NJ501 CPU with robotics functionality for Delta-3 control
NJ501 CPU with SQL client

I/O

NX I/O
Speed and accuracy for machine performance

Safety

NX Safety Control
Integrated safety into machine automation

Robot

Delta Robot
The fastest picking system integrated in the Sysmac platform

Sensing

ZW series
Compact and lighterweight fiber displacement sensor

N-Smart
Easily connect fiber and laser sensors to EtherCAT




Sysmac Catalogue

This document is a selection and design guide helping you to create fast, flexible and reliable machines. Sysmac Automation Platform provides an integrated solution consisting of the best in class machine controller working seamlessly with the best in class field devices across the fastest machine network in the market - EtherCAT. Sysmac Automation Platform is programmed, configured and simulated by one software - Sysmac Studio, and accessed through one connection, Ethernet/IP.

One Machine Control

Motion, Logic, Safety and Vision in one

One machine control through one connection and one software is how we define the new Sysmac automation platform. The new NJ machine automation controller integrates motion, logic sequencing, safety, vision and networking under one software: Sysmac Studio. This one software provides a true Integrated Development Environment (IDE) that includes a custom 3D motion simulation tool. The NJ 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.

One machine controller: NJ-Series

For complete control and management of your machine.
Logic and advanced motion control in one

One factory automation network : EtherNet/IP

For local or remote access to the complete machine

One machine network: EtherCAT

For real time control of servo drive, inverter, vision system and I/O

One software: Sysmac Studio

For configuration, programming, simulation and monitoring

One connection
One machine network

One connection via the NJ-Series controller allows seamless control and communication with both the machine and the factory. The new NJ-Series controllers join the world standard factory automation network, EtherNet/IP, with the best Ethernet-based machine control network, EtherCAT.

NJ-Series motion features

- Up to 64 axis control
- Complies with PLCopen Function Blocks for Motion Control
- Linear, circular and spiral (helical) interpolation
- Master slave functions: registration control, flying shear, etc.
- E-cam with on the fly change

NJ-Series sytem features

- System cycle: 32 axes axes/500 µs
- Programming and data types fully compliant with IEC 61131-3
- Multi-tasking program
- EtherCAT, EtherNet/IP embedded
- SD card slot and USB port built-in
- Works with most CJ-PLC modules
- 10 years maintenance free

EtherNet/IP: the ONE factory automation network

- Peer-to-Peer controller communication
- Interface with Sysmac Studio , NS HMI series or SCADA software
- SQL Client
- FTP server
- Support MATLAB®/Simulink® simulation software

EtherCAT: the ONE machine network

- Up to 192 slaves
- Fastest machine network on the market
- Noise immunity to stringent Omron standards
- Embedded in Omron servo drive, inverter, vision sensor and I/O
- Uses standard STP Ethernet cable with RJ45 connectors

Integrated safety into machine automation

- FSoE – Safety over EtherCAT
- Flexible system with distributed safety I/O
- Conforms with IEC61131-3 standard programming
- PLCopen Function Blocks for Safety

PLCopen motion control

MathWorks Partner

Microsoft SQL Server

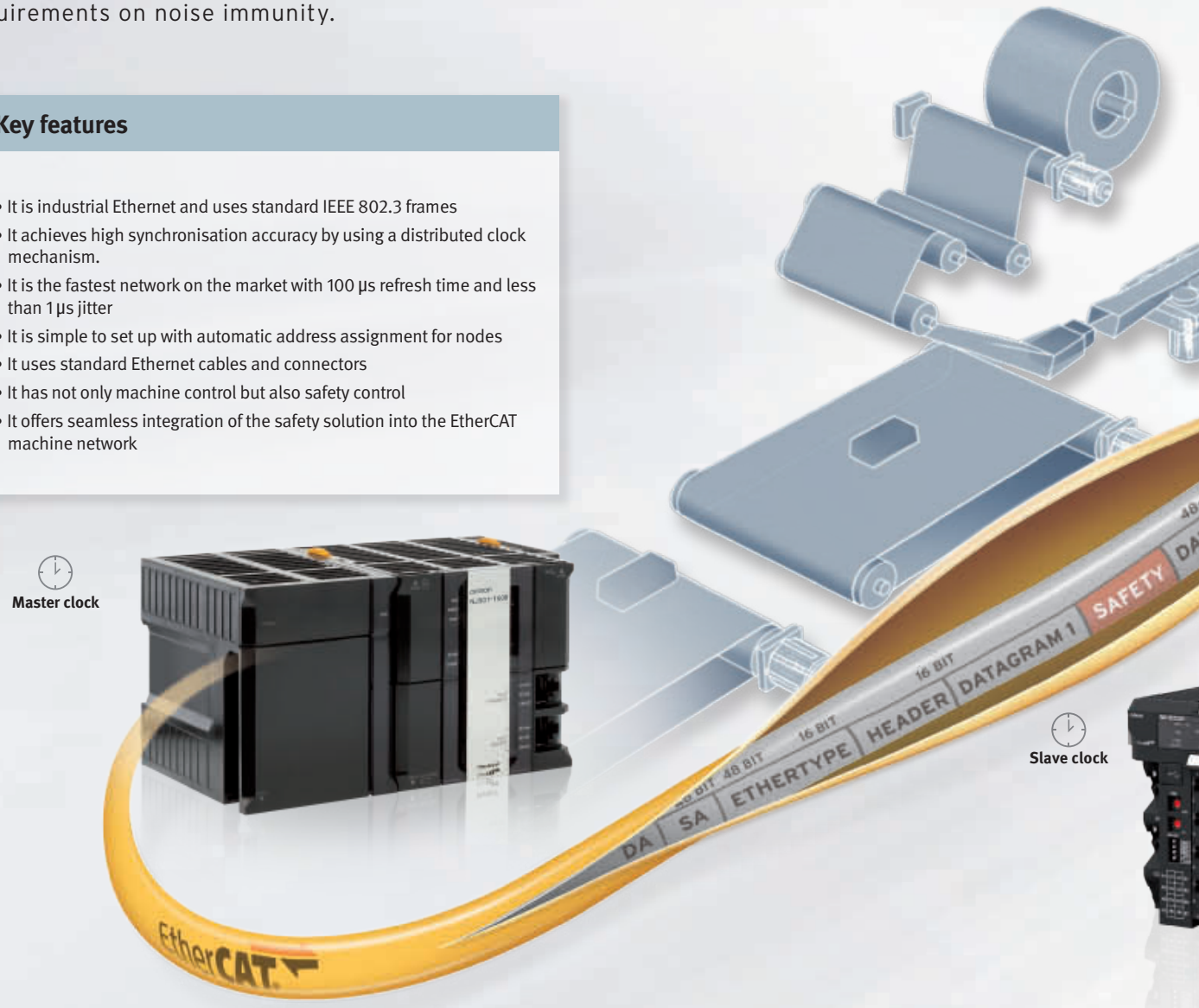
One connection

EtherCAT the optimal machine network

EtherCAT is the fastest emerging network for machine automation. It is Omron's de-facto machine network for our wide range of field and motion devices. It is Ethernet based, fast, accurate and highly efficient in terms of data transmission. All our EtherCAT devices have been designed and tested to meet Omron's stringent requirements on noise immunity.

Key features

- It is industrial Ethernet and uses standard IEEE 802.3 frames
- It achieves high synchronisation accuracy by using a distributed clock mechanism.
- It is the fastest network on the market with 100 µs refresh time and less than 1 µs jitter
- It is simple to set up with automatic address assignment for nodes
- It uses standard Ethernet cables and connectors
- It has not only machine control but also safety control
- It offers seamless integration of the safety solution into the EtherCAT machine network

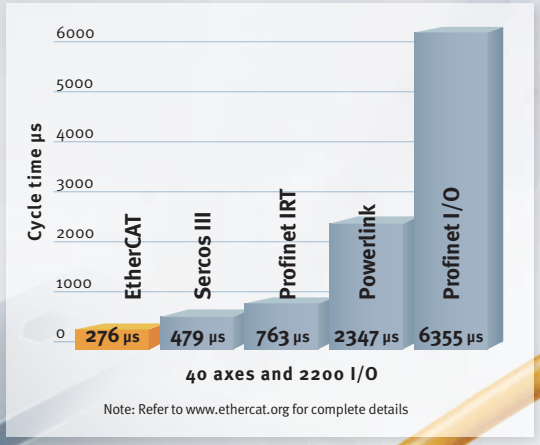


EtherCAT is Industrial Ethernet

The EtherCAT Telegram is contained in the Ethernet Data section of the IEEE 802.3 Ethernet frame. The frame travels through the media at 100 Mbps in full duplex mode.

Safety over EtherCAT (FSoE)

Seamless integration of the safety into machine automation. The FSoE frame is included in the EtherCAT process data. This system provides a flexible solution with distributed safety I/O.



Note: Refer to www.ethercat.org for complete details

NX Safety controller

NX Safety I/O

"On-the-fly" data exchange

The slave devices extract and/or insert data on the fly. This method assures the highest possible throughput.

Simple cabling: 100Base-TX

EtherCAT uses standard 100BASE-TX Ethernet communication very efficiently, over standard shielded Ethernet cables and connectors. No need for network switches in line topology.

Distributed clocks

The EtherCAT node slave measures the time difference between incoming and returning frame - timestamp-. With these timestamps the master can determine the propagation delay offset to the individual slave accurately. This mechanism ensures accurate synchronisation between devices with less than 1 µs jitter.

Flexible topology

With two EtherCAT ports on all devices, no additional switches are required to create a linear network. EtherCAT junctions can be used to build tree and star topologies, which provides section segregation isolation.

One software

Sysmac Studio for machine creators

Turning machine programmers into machine creators is the driving vision behind Sysmac Studio. Cutting programming, debugging and set-up time while maximising the functionality and performance of your machine is our ultimate goal. For this Sysmac Studio aims to offer ONE software for the complete machine. A software tool that only needs to be learned once, programmed, tested and tuned as one and secured as a whole.

Learn it ONCE
Develop it FAST
Test it as ONE
Secure it ALL

Learn it ONCE

» One software for motion, safety, drives and vision

» Fully compliant with open standard IEC 61131-3

» One design and operation environment for configuration, programming and monitoring

Develop it FAST

» Supports Ladder, Structured Text and In-Line ST programming with a rich instruction set

» CAM editor for easy programming of complex motion profiles

» Intuitive editor with auto-complete assistance for Ladder and Structured Text programming

» Supports the Simulink® environment for program code generation and simulation control systems

Test it as ONE

» One simulation tool for sequence and motion in a 3D environment

» Complete or partial program can be simulated and debugged

» Data trending for tuning and debugging

Secure it ALL

» Advanced security function with 32 digit security password.

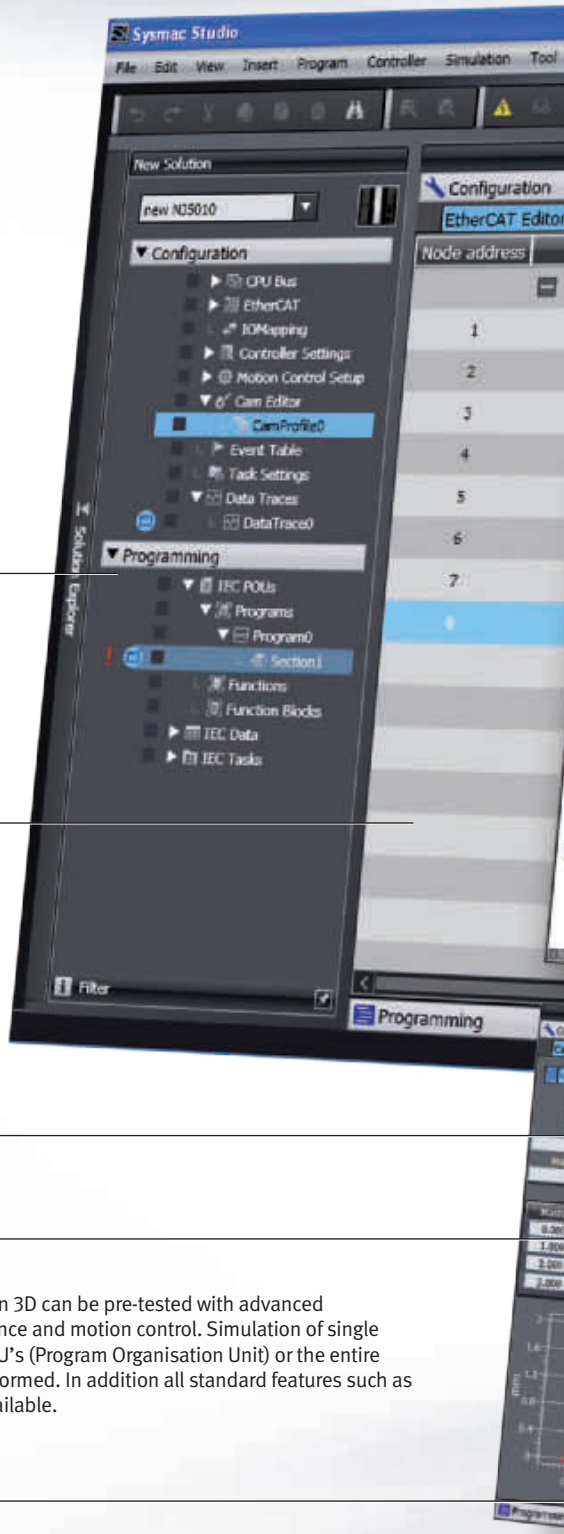
» Complete project or single Function Block can be protected

» Machine cloning prevention

One software

Sysmac Studio to develop machines

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.



Design and operability

Unified design environment is provided for programming, configuration and monitoring. It also offers intuitive navigation between control modes.

Configuration and monitoring for servo system

Parameter setting, monitoring and data trace for servo drive and inverter.

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.

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 Organisation Unit) or the entire program can be performed. In addition all standard features such as Break & Step are available.

Data tracing

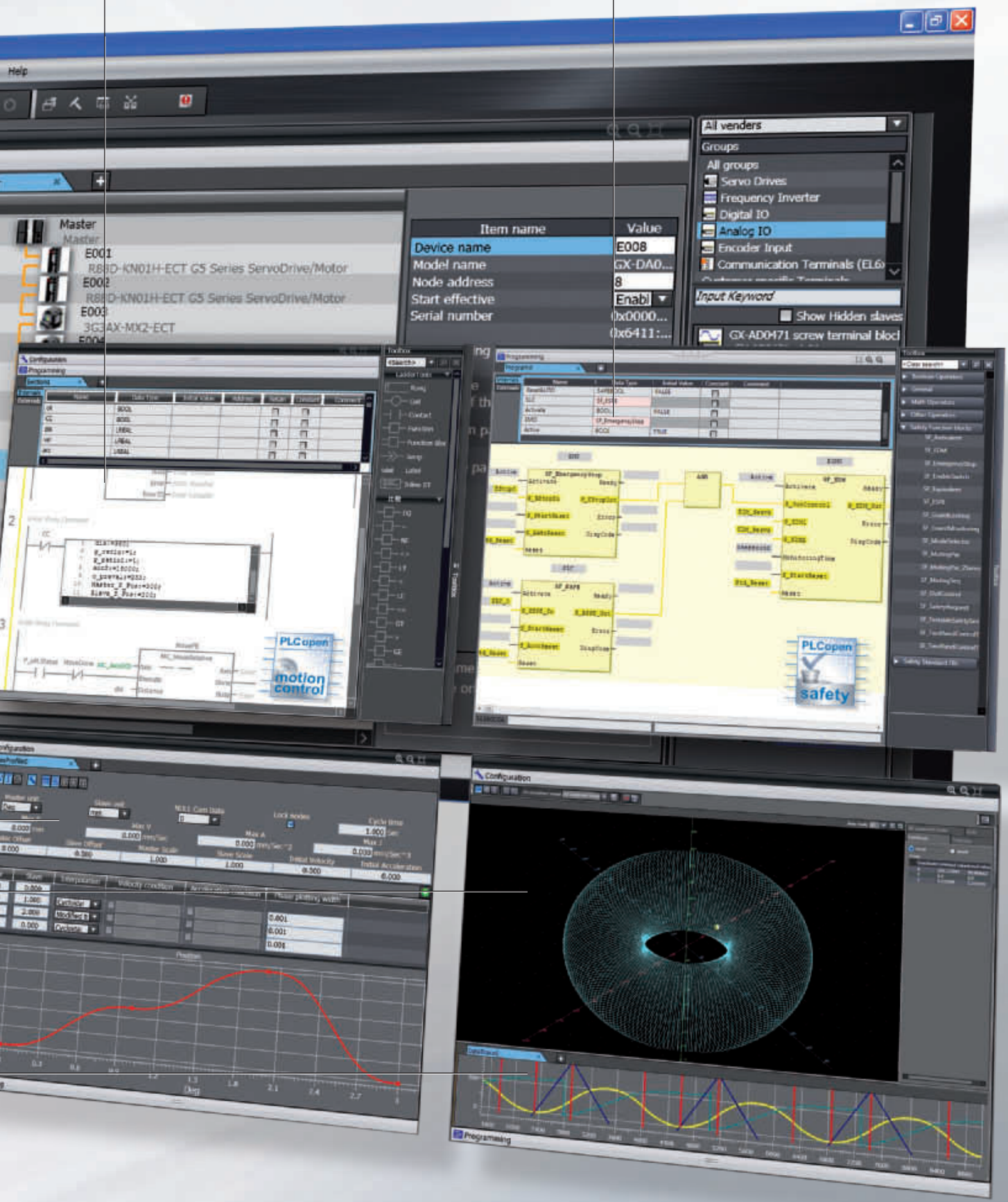
Easy system tuning thanks to integrated and synchronised data tracing of motion commands, position and speed feedback and I/O status and values.

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 colour segregation of variables and symbols. ST instructions can be directly written in Ladder programs thanks to in-line ST function.

Integrated safety programming

The Function Block Diagram editor includes 79 safety FB/FN. Conforms with IEC 61131-3 standard programming and PLCopen Function Blocks for Safety.



NJ-Series Machine Automation Controller

Complete and robust machine automation

The NJ-Series Machine Automation Controller is at the heart of the new 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 NJ-Series is designed to meet extreme machine control requirements in terms of motion control speed and accuracy, communication, security and robust system. You just create…

Motion control

- Up to 64 axis control
- Single axis moves and axes interpolation
- 32 axes / 500 µs cycle time
- Electronic cams and gearboxes
- E-cam with on-the-fly change
- Full control of Axes Group Position
- Control of up to 8 Delta robots in 2 ms/ 4 Delta robots in 1 ms
- Integrated robotics FB library for Delta-3 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.

NJ-Series controller features

- System cycle: 32 axes / 500 µs
- Motion controller supporting up to 64 servo axes
- EtherNet/IP and EtherCAT ports embedded
- Up to 192 EtherCAT Slaves (64 axes)
- Standard IEC 61131-3 programming
- Certified PLCopen Function Blocks for Motion Control
- Linear and circular interpolation
- Linear and infinite axes management
- Electronic Gear and CAM synchronisation
- Global standards CE, cULus, NK, LR

Machine control

- Complete integration of Logic, Motion, Safety and Vision
- Synchronous control of all machine network devices
- Multi-tasking programs
- In-line ST, Structured Text and Ladder mixed in one program
- I/O Capacity: 2,560 local points plus 192 EtherCAT slaves

Hardware design

- Architecture based on new Intel CPU
- The most compact controller in its class
- Built-in USB port and SD card slot
- Fan-less cooling
- Specific power supply design: safe shutdown, boot-up time < 12 s

Standard Factory network

- Programming
- Other Machine controllers
- HMI / SCADA
- IT systems
- Standard Protocols and Services: TCP/IP, FTP, NTP, SNMP
- CIP protocol
- DB_Connection FB's: SQL Client

EtherNet/IP™

Standard Machine network

- Servos
- Inverters
- Robotics
- Vision systems
- Distributed I/O

EtherCAT®

NJ Series

CPU Unit	Unit type			Axes
NJ501	Standard	NJ Robotics	NJ with SQL Client	16, 32, 64
NJ301	Standard			4, 8

Standard programming

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

PLCopen motion control

NX I/O

Speed and accuracy for machine performance

Based on an internal high-speed bus running in synchronisation 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 70 models including position control, temperature inputs and integrated safety.

EtherCAT®

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

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

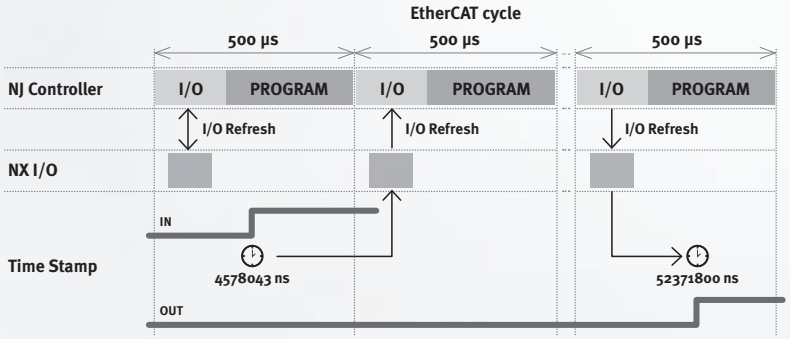
- High signal density; up to 16 I/O points in 12 mm width

NsynX technology

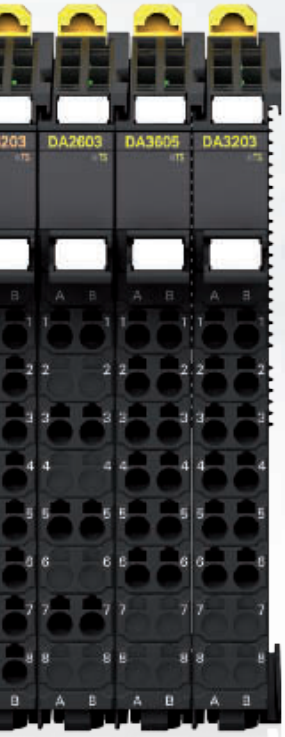
The NsynX technology is provided by the internal high-speed bus synchronised with the EtherCAT network. This technology is designed for machine control and includes:

- I/O units with distributed clock
- High-speed I/O units synchronised with the EtherCAT cycle
- I/O units with Time-Stamp function (accuracy < 1 µs)

Time Stamp sequence example



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
- Freely allocation of the Safety I/O units
- Freely 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

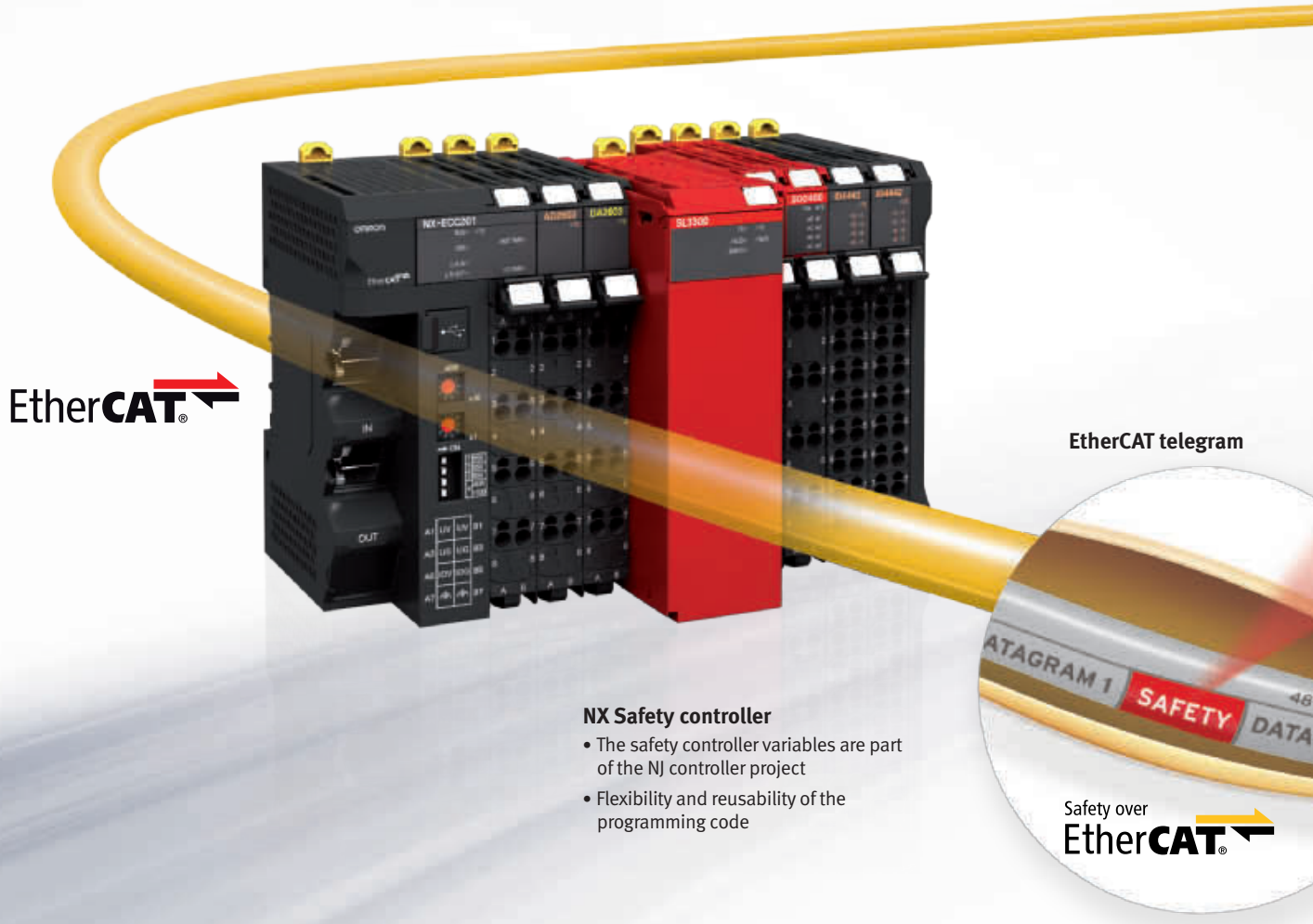
End Cover

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

NX Safety Control

Integrated safety into machine automation

The Sysmac platform integrates a safety solution within our one connection and one software concept. One connection is realised though 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.



NX Safety controller

- The safety controller variables are part of the NJ controller project
- Flexibility and reusability of the programming code

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

TÜVRheinland Functional Safety Type Approved FS

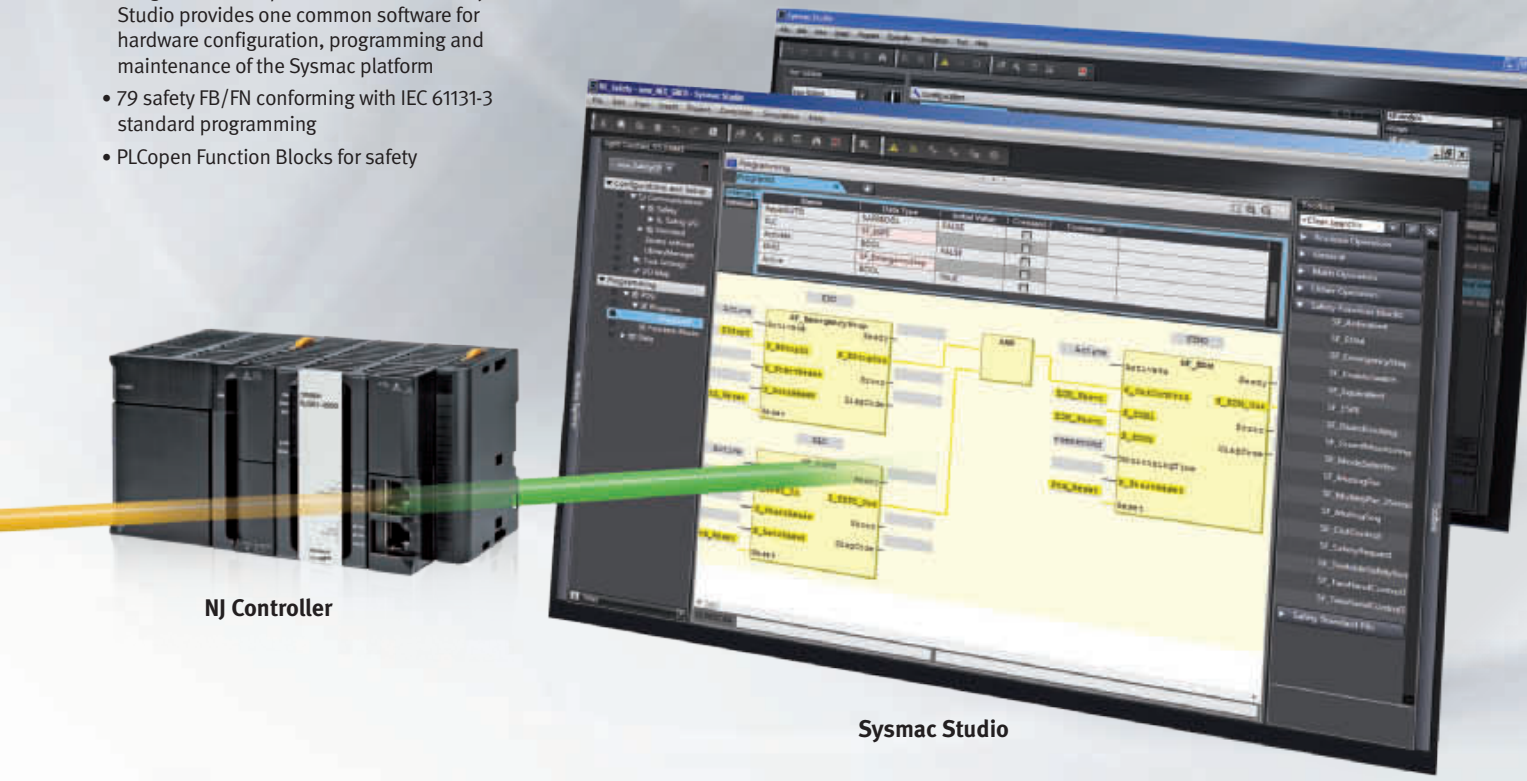
ISO 13849-1, PLe

IEC 61508, SIL3

Note: Scheduled to be certificated soon

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
- 79 safety FB/FN conforming with IEC 61131-3 standard programming
- PLCopen Function Blocks for safety



NJ Controller

Sysmac Studio

Safety over EtherCAT frame

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 NJ controller project

Accurax 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 synchronisation

Safety conformance

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

Accurax 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
- IP67 for all motors and connectors
- 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

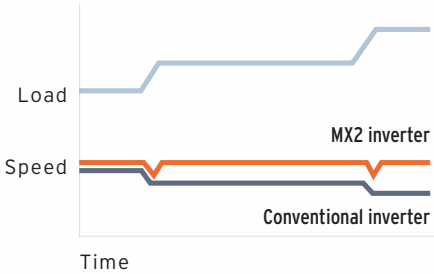
Thanks to its advanced design and algorithms, the MX2 inverter provides smooth control down to zero speed, plus precise operation for cyclic operations and torque control capability in open loop. The RX series combines high performance, application functionality and customisation to match the precise 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

EtherCAT®

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
- 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

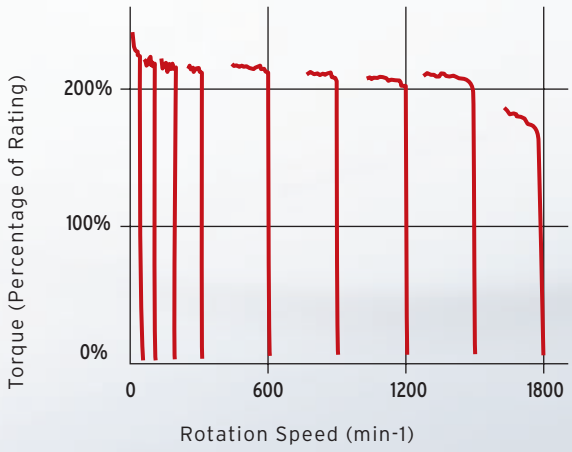
RX

EtherCAT®

200% starting torque

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

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



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
- Built-in application functionality (i.e. ELS - Electronic Line Shaft-)

FQ-M Vision Sensor

Designed for object tracking

The new 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.

EtherCAT®

Connectivity

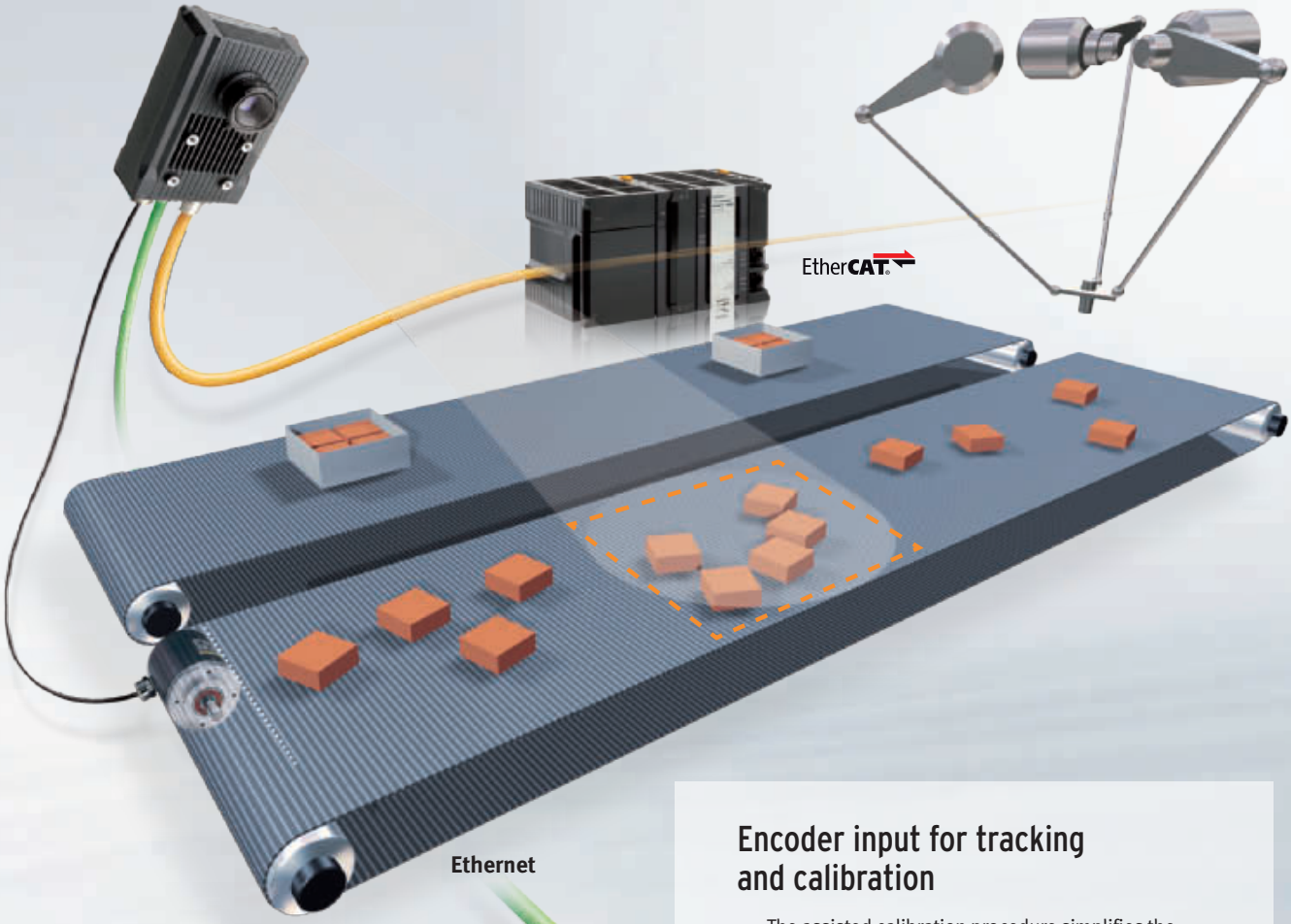
- EtherCAT port for object tracking
- Ethernet port for advanced configuration and monitoring
- Encoder input for accurate “on the fly tracking” and easy calibration
- Automatic strobe timing control

Detection

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

FQ-M features

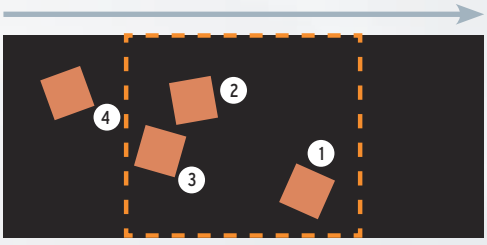
- Made specifically for tracking applications
- Designed to work within Sysmac integrated automation with embedded EtherCAT and integrated software tool
- Smart camera with EtherCAT: camera, image processing and connectivity in one
- Vision sensor with encoder input for tracking function
- Calibration function of the complete system
- Can inspect a wide range of objects
- Sysmac Studio software for vision system operation and setting



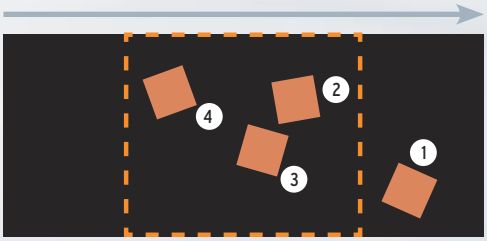
Encoder input for tracking and calibration

» The assisted calibration procedure simplifies the overall system set-up.

» Objects that overlap within more than one field of view are segregated and its data is ignored.



First shot: The position and orientation data of pieces 1, 2 and 3 are sent to the controller.



Next shot: Only the position and orientation data of piece 4 are sent to the controller.

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

Software tool

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

Service and Support

PRESENCE

OMRON technical offices across the World

Automation Center
Kusatsu (JPN), Shanghai (CHN), Barcelona (Spain), Fremont CA (USA)

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

Technical office

Premium partner

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.

CONFIDENCE

ASSURANCE

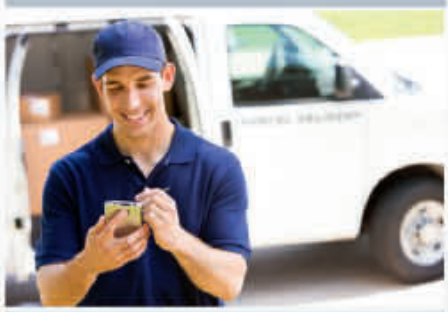
Development

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 -

Product overview

Controller

NJ3 CPU units
for 4 and 8 axes

NJ5 CPU units
for 16, 32 and 64 axes

NJ-Series
- Integration of Logic and Motion in one Intel CPU
- Scalable control: CPUs for 4, 8, 16, 32 and 64 axes
- New PLC Logic and Motion cores, 100% Omron quality
- IEC 61131-3 programming languages
- EtherCAT and EtherNet/IP ports embedded
- Certified PLCopen Function Blocks for Motion Control
- Reuse with most of the CJ-series I/O units

PLCopen motion control

I/O

NX I/O

NX I/O
- Over 70 models of I/O units including position control, temperature inputs and integrated safety
- High-speed I/O units synchronised with the EtherCAT cycle
- NsynX technology provides deterministic I/O response with nanosecond resolution
- Automatic backup/restore of all I/O unit parameters
- Detachable front connector with push-in type screw-less terminals in all NX I/O units
- Slim design: up to 16 I/O points in just 12 mm width

Safety

NX Safety

NX Safety
- The safety controller meets Category 4, 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
- Up to 8 safety input points per unit
- Safety Function Blocks conforming with IEC 61131-3 standard programming
- PLCopen Function Blocks for safety

Servo

Accurax G5 servo drive
- High-response frequency of 2 kHz
- Built-in safety conforming ISO 13849-1 Performance Level d
- High accuracy provided by 20 bit encoder
- Advanced vibration suppression functions

Accurax G5 servo motor
- Power range from 50 W to 15 kW
- IP67 protection
- Low cogging torque
- Standard and high inertia motors

Accurax Linear motor solutions
- Linear motor force range from 26.5 to 760 N
- Ironless and iron-core motor types available
- Wide range of over 100 standard linear motor axes

Inverter

MX2

- Power range up to 15 kW
- Torque control in open loop
- 200% starting torque
- Double rating VT 120%/1 min and CT 150%/1 min

RX

- 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

Vision and sensing

FQ-M series Vision Sensor

- Camera, vision and connectivity in one
- Compact vision sensor
- Designed for high speed pick and place
- Encoder tracking and smart calibration function
- Fast and powerful object recognition

ZW series displacement Sensor

- Compact and lighterweight fiber displacement sensor
- Stable measurements for any material with same mounting position
- Robust sensor head structure

N-Smart

E3NX-FA Fiber Sensors

- Auto adjustment to optimum light level with dynamic range of 40,000 times

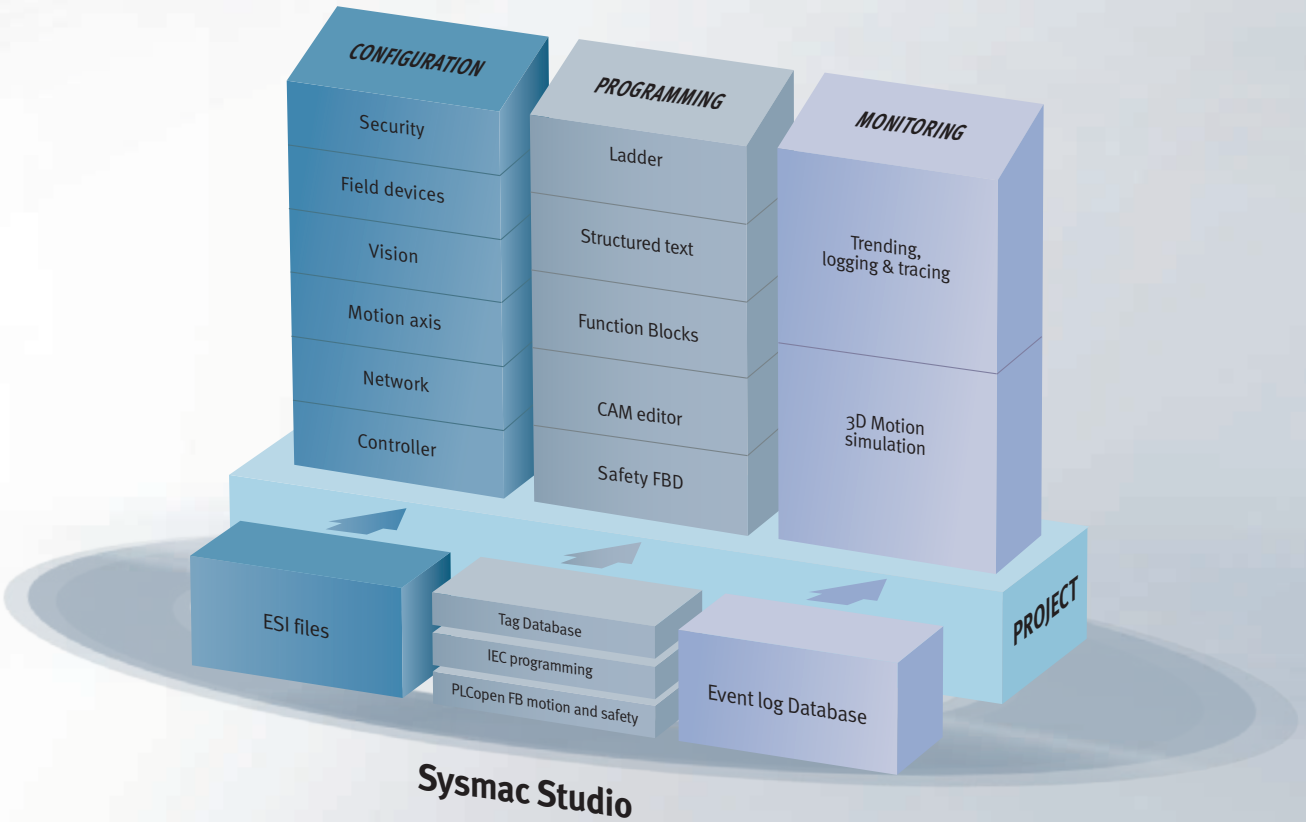
E3NC-L Compact Laser Sensors

- 2 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*

*Based on February 2013 OMRON investigation



Sysmac Studio

Main content

Sysmac automation platform

Selection table – Machine automation controller

	Machine automation controller			
				
Model	**NJ5**	**NJ5 Robotics**	**NJ5 with SQL client**	**NJ3**
Description	NJ5 series Machine Controller with Sequence and Motion functionality	NJ5 series Machine Controller with Sequence, Motion and Robotics functionality	NJ5 series Machine Controller with Sequence, Motion and SQL Client functionality	NJ3 series Machine Controller with Sequence and Motion functionality
Task	Multi-tasking program	Multi-tasking program	Multi-tasking program	Multi-tasking program
Software	Sysmac Studio	Sysmac Studio	Sysmac Studio	Sysmac Studio
Programming	• Ladder • Structured Text • In-Line ST	• Ladder • Structured Text • In-Line ST	• Ladder • Structured Text • In-Line ST	• Ladder • Structured Text • In-Line ST
Standard programming	• IEC 61131-3 • PLCopen Function Blocks for Motion Control	• IEC 61131-3 • PLCopen Function Blocks for Motion Control	• IEC 61131-3 • PLCopen Function Blocks for Motion Control	• IEC 61131-3 • PLCopen Function Blocks for Motion Control
Program capacity	20 MB	20 MB	20 MB	5 MB
SD Memory card	SD and SDHC Memory card	SD and SDHC Memory card	SD and SDHC Memory card	SD and SDHC Memory card
Built-in port	• EtherNet/IP • EtherCAT • USB 2.0	• EtherNet/IP • EtherCAT • USB 2.0	• EtherNet/IP • EtherCAT • USB 2.0	• EtherNet/IP • EtherCAT • USB 2.0
EtherCAT slaves	192	192	192	192
Number of axes	64, 32, 16	64, 32, 16	64, 32, 16	8, 4
Servo drive	Accurax G5/EtherCAT	Accurax G5/EtherCAT	Accurax G5/EtherCAT	Accurax G5/EtherCAT
Motion control	• Axes groups interpolation and Single axis moves • Electronic cams and gearboxes • Direct position control for axis and groups	• Axes groups interpolation and Single axis moves • Electronic cams and gearboxes • Direct position control for axis and groups • Up to 8 Delta Robot control	• Axes groups interpolation and Single axis moves • Electronic cams and gearboxes • Direct position control for axis and groups	• Axes groups interpolation and Single axis moves • Electronic cams and gearboxes • Direct position control for axis and groups
Local I/O	CJ series units	CJ series units	CJ series units	CJ series units
Remote I/O	NX I/O units/EtherCAT	NX I/O units/EtherCAT	NX I/O units/EtherCAT	NX I/O units/EtherCAT
Mounting	DIN rail	DIN rail	DIN rail	DIN rail
Global standards	CE, cULus, NK, LR	CE, cULus, NK, LR	CE, cULus, NK, LR	CE, cULus, NK, LR
Page	33	33	33	33

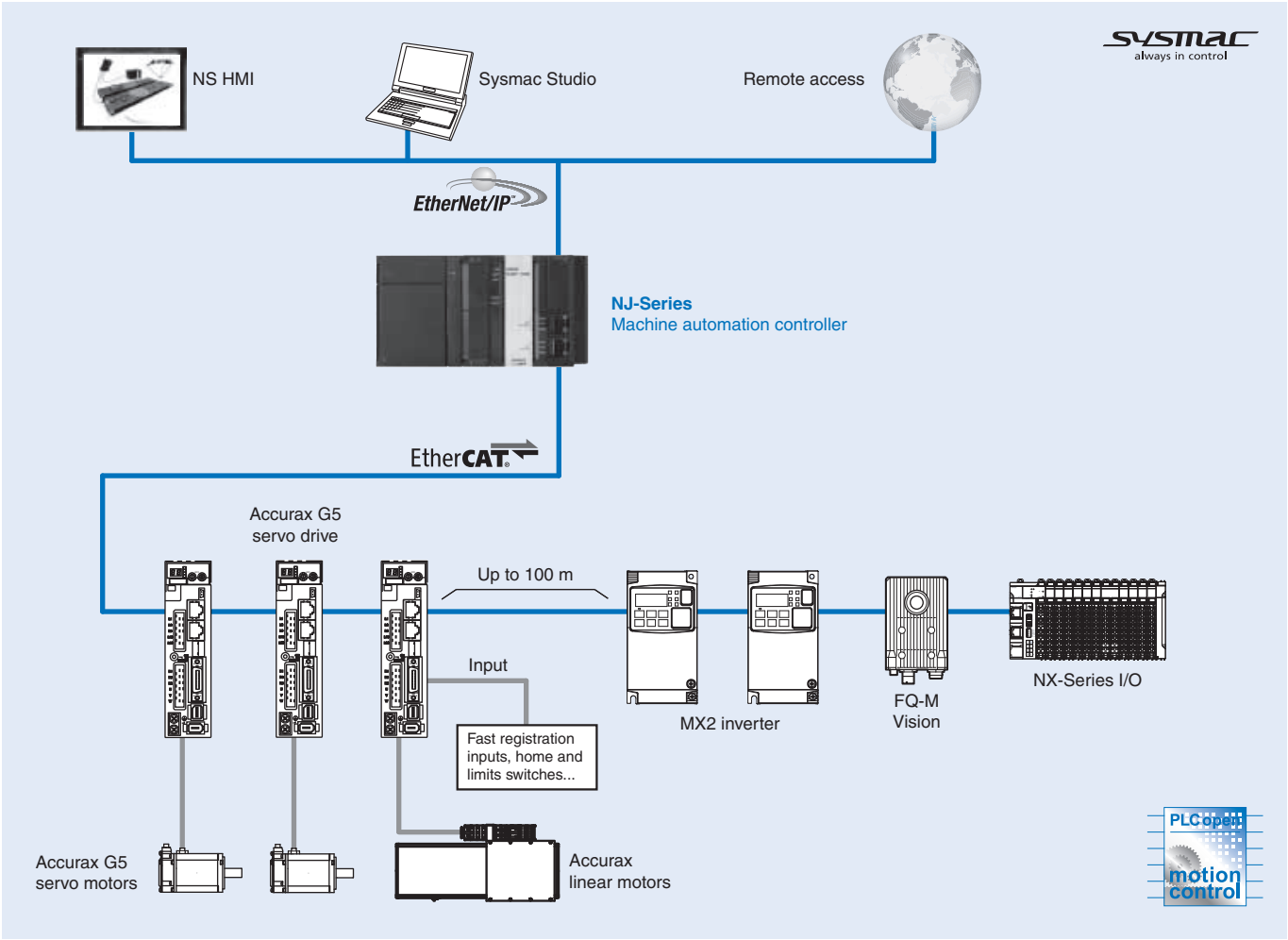
NJ3□, NJ5□

NJ-Series machine controller

Complete and robust machine automation
The NJ-Series is designed to meet extreme machine control requirements in terms of motion control speed and accuracy, communication, security and robustness.

- Integration of logic and motion in one Intel CPU
- Scalable control: CPUs for 4, 8, 16, 32 and 64 axes
- EtherCAT and EtherNet/IP ports embedded
- Fully conforms to IEC 61131-3 standards
- Certified PLCopen function blocks for motion control
- Linear, circular and spiral (helical) interpolation
- CPU units with SQL client and robotic functionality

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 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 5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz. 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 IEC60068-2-27 147 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 and EC directives.

Performance specifications (common specifications)

Item				NJ5□ CPU Unit			NJ3□ CPU Unit	
				NJ501-□5□0	NJ501-□4□0	NJ501-□3□0	NJ301-1200	NJ301-1100
Processing speed	Execution time	Ladder diagram instructions (LD, AND, OR and OUT)		1.9 ns min			3.0 ns min	
		Math instructions (LREAL)		26 ns min			42 ns min	
Programming	Program capacity*1			20 MB			5 MB	
	Memory capacity for variables	Retain attribute*2		2 MB			0.5 MB	
		No retain attribute*3		4 MB			2 MB	
	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 Units			Maximum per CPU rack or expansion rack: 10 units Entire controller: 40 units				
	Number of expansion racks			3 max.				
	I/O Capacity			2,560 points max. plus EtherCAT slave I/O capacity				
	Power supply to CPU rack and expansion racks	Model		NJ-P□3001 Power Supply Unit				
		Power OFF detection time	AC power supply	30 to 45 ms				
			DC power supply	22 to 25 ms				
Motion control	Number of controlled axes	Maximum number of axes		64 axes	32 axes	16 axes	8 axes	4 axes
		Linear interpolation control		4 axes max. per axes group				
		Circular interpolation control		2 axes per axes group				
	Number of axes groups			32 axes 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			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 (100 Base-TX)				
		Transmission media		Shielded, twisted-pair cable (STP): Category 5, 5e or higher				
		Transmission distance		100 m max. (distance between Ethernet switch and node)				
		Number of cascade connections		There are no restrictions if an EtherNet switch is used				

Item				NJ5□ CPU Unit			NJ3□ CPU Unit	
				NJ501-□5□0	NJ501-□4□0	NJ501-□3□0	NJ301-1200	NJ301-1100
Communications	Built-in EtherNet/IP port	CIP service: Tag data links (cyclic communications)	Number of connections	32				
			Packet Interval*4	10 to 10,000 ms in 1.0-ms increments. Can be set for each connection. (Data will be refreshed at the set interval, regardless of the number of nodes.)				
			Permissible communications band	1,000 pps*5 including heartbeat				
			Number of tag sets	32				
			Tag types	Network variables (CIO, Work, Holding, DM and EM Areas.)				
			Number of tags	8 (Seven tags if controller status is included in the tag set.)				
			Maximum link data size per node	19,200 bytes (total size for all tags.)				
			Maximum data size per connection	600 bytes (note: Data concurrency is maintained within each connection.)				
			Number of registrable tag sets	32 (1 connection = 1 tag set)				
			Maximum tag set size	600 bytes (two bytes are used if Controller status is included in the tag set.)				
			Changing tag data link parameters	Supported.*2 (when controller is in RUN mode)				
			Multi-cast packet filter*6	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.				
			CIP routing	Supported. Units through which CIP routing is supported: CS1W-EIP21, CJ1W-EIP21, CJ2H-CPU□□-EIP and CJ2M-CPU3□				
	Built-in EtherCAT port	Communications standard		IEC 61158, Type 12				
		EtherCAT master specifications		Class B (feature pack motion control compliant)				
		Physical layer		100 Base-TX				
		Modulation		Baseband				
		Baud rate		100 Mbps (100 Base-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.				
		Maximum number of slaves		192				
		Maximum process data size		Inputs: 5,736 bytes Outputs: 5,736 bytes However, the maximum number of process data frames is 4.				
		Maximum process data size per slave		Inputs: 1,434 bytes Outputs: 1,434 bytes				
		Communications period		500, 1000, 2000 or 4000 μs			1000, 2000 or 4000 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 holding, DM and EM areas are not included.

*3. Words for CJ-series units in the CIO and work areas are not included.

*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 communications 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.

Performance specifications for CPU units with robotic functionality

Item			NJ5□ CPU Unit		
			NJ501-4500	NJ501-4400	NJ501-4300
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)		

Performance specifications for CPU units with SQL server

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 specifications)

Item				NJ□ CPU Unit
Tasks	Function			I/O refresh and the user program can be executed in 2 type of tasks: • Primary periodic task: This task has the highest priority. It is always executed in the specified period. There is only one primary periodic task. • Periodic tasks: Periodic tasks are executed during the unused time between executions of the primary periodic task. There can be three periodic tasks.
	Setup	System service times		The execution interval and the percentage of the total user program execution time are set 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 *1 and structured text (ST).
	Variables	External access of variables		Network variables (the function which allows access from the HMI, host computers or other controllers)
	Array attribute	Array variables	Function	An array groups data with the same attributes so that it can be handled as a single unit of data. Number of dimensions: 3 max. Maximum number of elements: 65,535 Maximum size: No restrictions. (They are capacity restrictions to the total data size of variables.)
			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.
	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.)
		Directive data types	Direct derivative types	Structures, unions, enumerations
			Member data types	Basic data types, structures, unions, enumerations, array variables.
		Structures	Function	A derivative data type that groups together data with different variable types. Number of members: 2,048 max. Nesting levels: 8 max. Number of registered structures: No restrictions. Maximum size: No restrictions.
			Specifying member offsets	You can use member offsets to place structure members at any memory locations. *2
		Unions	Function	A derivative data type that enables access to the same data with different data types. Number of members: 4 max.
			Member data types	BOOL, BYTE, WORD, DWORD or LWORD.
		Enumerations	Function	A derivative data type that uses text strings called enumerators to express variable values.
Motion control functions	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.
			Relative positioning	Positioning is performed for a specified position from the command current position.
			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 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.

Item				NJ□ CPU Unit
Motion control functions	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.
			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.
			Immediately stopping	An axis is stopped immediately.
			Setting 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).
			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.
	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.*2
		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.*2
			Changing the axes in a axes group	The composition axes parameter in the axes group parameters can be overwritten temporarily.*2
	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-voltage memory in the CPU unit.
		Parameters	Writing MC settings	Some of the axis parameters or axes group parameters are overwritten temporarily.
	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 mode		You can set the Stop Mode to determine when the immediate stop input signal or limit input signal is valid.
		Re-execution of motion control functions		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.

Item				NJ□ CPU Unit
Motion control functions	Auxiliary functions	Monitoring functions	Software limits	The movement range of an axis is monitored.
			Following error	The error between the command current value and the actual current value is monitored for each axis.
			Velocity, acceleration rate, deceleration rate, torque, interpolation velocity, interpolation acceleration rate, and interpolation deceleration rate	You can set warning values for each axis and each axes group to monitor them.
		Absolute encoder support		You can use an OMRON G5-Series Servomotor with an Absolute Encoder to eliminate the need to perform homing at startup.
	External interface signals			The following Servo Drive input signals are used. Home signal, home proximity signal, positive limit signal, negative limit signal, immediate stop signal and interrupt input signal.
Unit (I/O) management	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	Maximum number of slaves		192
		Basic I/O	Chattering and noise countermeasures	Input response times are set.
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 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	Process data communications		Control information is exchanged in cyclic communications between the EtherCAT master and slaves.
		SDO communications		Control information is exchanged in noncyclic event communications between the EtherCAT master and slaves. SDO communications that are defined in the CANopen standard are used.
		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 (only NJ5)		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 that conform to the CANopen standard can be sent to slaves via EtherCAT.
	Communications instructions			The following instructions are supported: CIP communications instructions, SDO message instructions, no-protocol communications instructions, and protocol macro instructions.
Operation management	RUN output contacts			The NJ-P□3001 power supply unit turns ON in RUN mode.
System management functions	Event logs	Categories		Events are recorded in the following logs: • System event log • Access event log • User-defined event log
		Maximum number of events per event log		NJ5: 1,024 NJ3: 512

Item				NJ□ CPU Unit
Debugging	Online editing			Programs, function blocks, functions and global variables can be changed online, individual POUs can be changed by more than worker working across a network.
	Forced refreshing	Forced refreshing		The user can force specific variables to TRUE or FALSE.
		Maximum number of forced variables	Device variables for EtherCAT slaves	64
			Device variables for CJ-series units and variables with AT specifications	64
	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.
	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.
		Maximum number of simultaneous data trace		NJ5: 4 NJ3: 2
		Maximum number of records		10,000
		Sampling	Maximum number of sampled variables	NJ5: 192 variables NJ3: 48 variables
		Timing of sampling		Sampling is performed for the specified task period, at the specified time or when a sampling instruction is executed.
	Data tracing	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. Comparison of non-BOOL variable with a constant. 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. (Example: 20%/80%).
	Simulation			The operation of the CPU unit is emulated in the Sysmac Studio.
Maintenance	Connection to HMIs	Connected port		Built-in EtherNet/IP port.
	Sysmac Studio connection	Connected port		Peripheral USB port or built-in EtherNet/IP port.
Reliability functions	Self-diagnosis	Controller errors	Levels	Major fault, partial fault, minor fault, observation and information.
			Maximum number of message languages	2
		User-defined errors	User-defined errors	User-defined errors are registered in advance and then records are created by executing instructions.
			Levels	8 levels
			Maximum number of message languages	9
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. *2
		Verification of operation authority	Verification of operation authority	Online operations are restricted by operation rights to prevent damage to equipment or injuries that may be caused by operating mistakes.
			Number of groups	5 *3
		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 functions	Storage type			SD memory card (2GB max.), SDHC memory card
	Application	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.

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

*2. Supported only by the CPU units with unit version 1.01 or later.

*3. When the NJ501 CPU units with unit version 1.00 is used, this value becomes two.

Function specifications for CPU units with SQL server

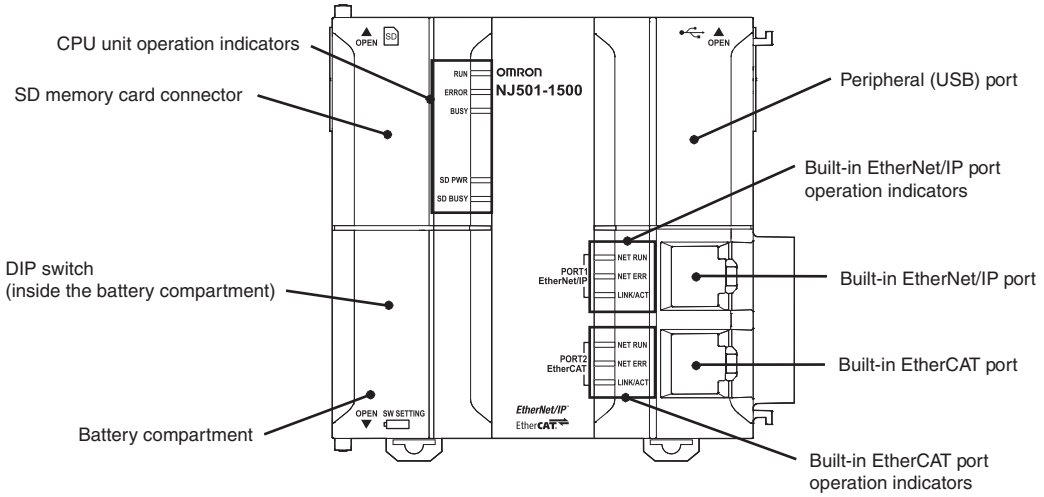
Item		NJ501-1□20 CPU Unit
Supported port		Built-in EtherNet/IP port
Supported DB		Microsoft Corporation: SQL Server 2008/2008 R2/2012 Oracle Corporation: Oracle Database 10g/11g
Number of DB connections (number of databases that can be connected at the same time)		3 connections max.*1
Instruction	Supported 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 operation	SQL server: 1,024 columns max. Oracle: 1,000 columns max.
	Number of columns in an UPDATE operation	SQL server: 1,024 columns max. Oracle: 1,000 columns max.
	Number of columns in a SELECT operation	SQL server: 1,024 columns max. Oracle: 1,000 columns max.
	Number of records in the output of a SELECT operation	65,535 elements max. 4 MB max.
Run mode of the DB connection service		Operation mode or Test mode: • Operation mode: when each instruction is executed, the service actually accesses the DB. • 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. Spool capacity: 1 MB*2
Operation log function		The following three types of logs can be recorded: • Execution log: Log for tracing the executions of the DB connection service. • Debug log: Detailed log for SQL statement executions of the DB connection service. • 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. When two or more DB connections are established, the operation cannot be guaranteed if you set different database types for the connections.

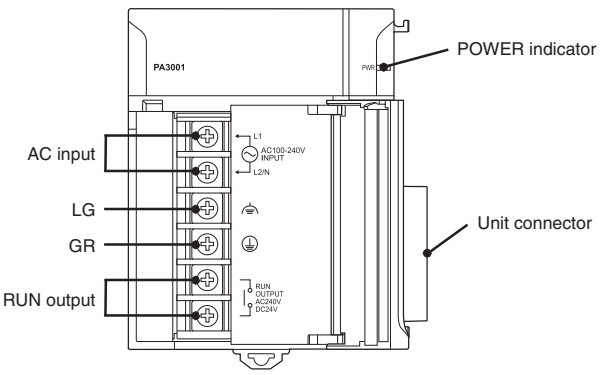
*2. Refer to “NJ-Series database connection CPU units user’s manual (W527)” for more information.

Nomenclature

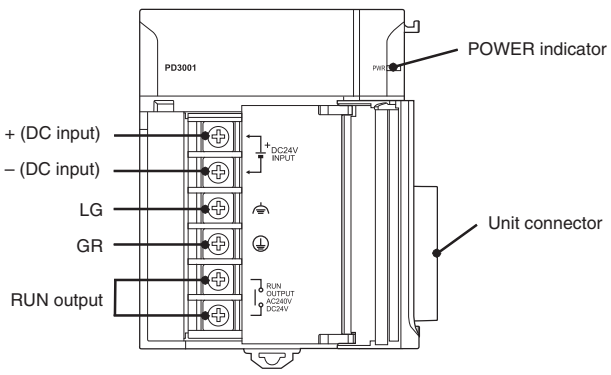
CPU unit (NJ501/301-□□□□)



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

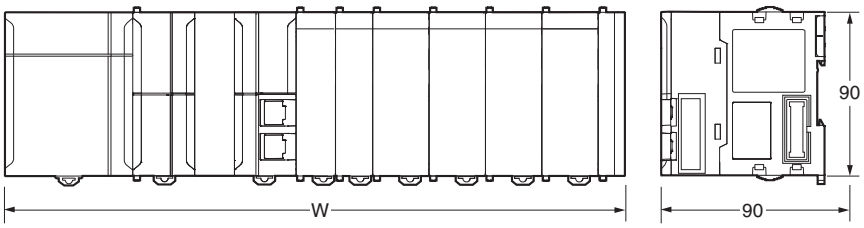


24 VDC power supply unit (NJ-PD3001)



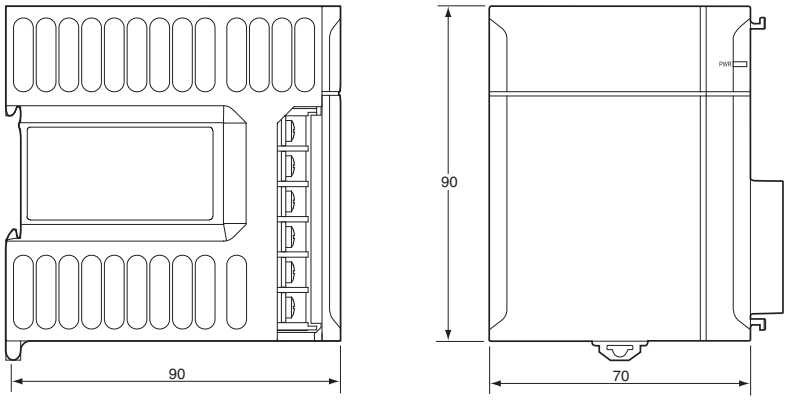
Dimensions

NJ-Series system (NJ-P□3001 + NJ501/301-□□□□ + one I/O unit + CJ1W-TER01)

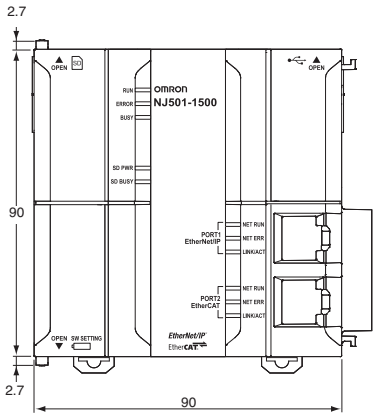


No. of units mounted with 31-mm width	Rack width (mm)
	With NJ501/301-□
1	205.7
2	236.7
3	267.7
4	298.7
5	329.7
6	360.7
7	391.7
8	422.7
9	453.7
10	484.7

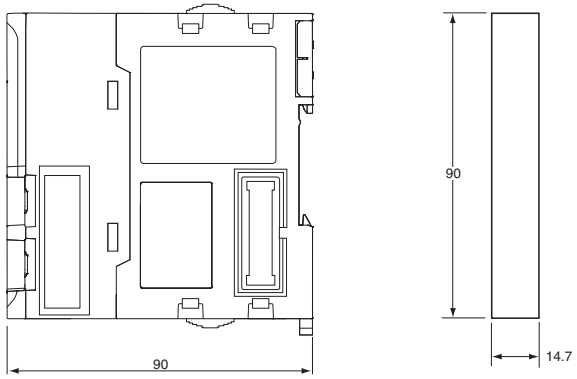
Power supply unit (NJ-PA3001/PD3001)



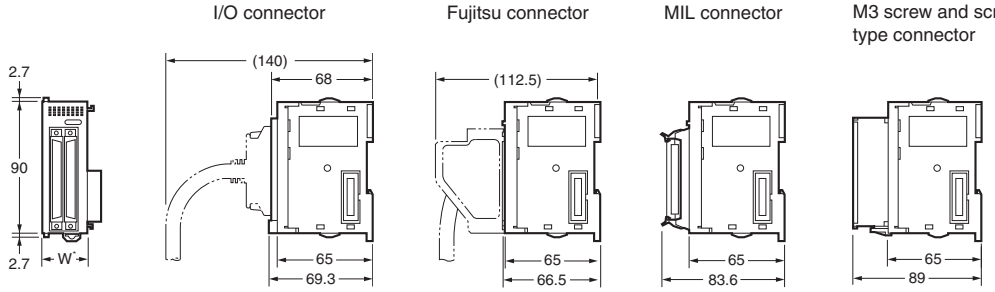
CPU unit (NJ501/301-□□□□)



End cover (CJ1W-TER01)

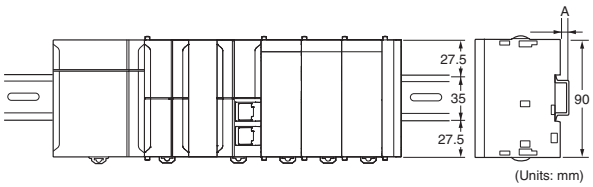


CJ units



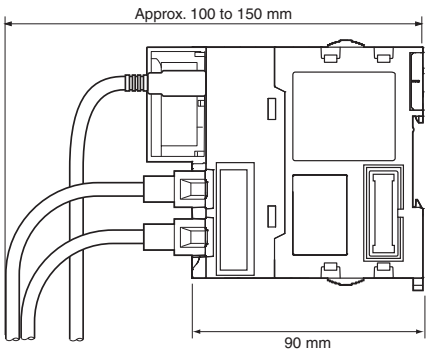
* Refer to the CJ unit tables in the ordering information section for the specific unit width.

Mounting dimensions

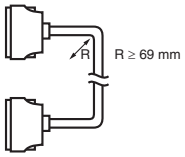


DIN track model number	A
PFP-100N2	16 mm
PFP-100N	7.3 mm
PFP-50N	7.3 mm

Mounting height



Expansion cable



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 requeriments 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*	(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

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) x 5 V + (2) x 24 V ≤ (C) value

* 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.

Example: Calculating total current and power consumption

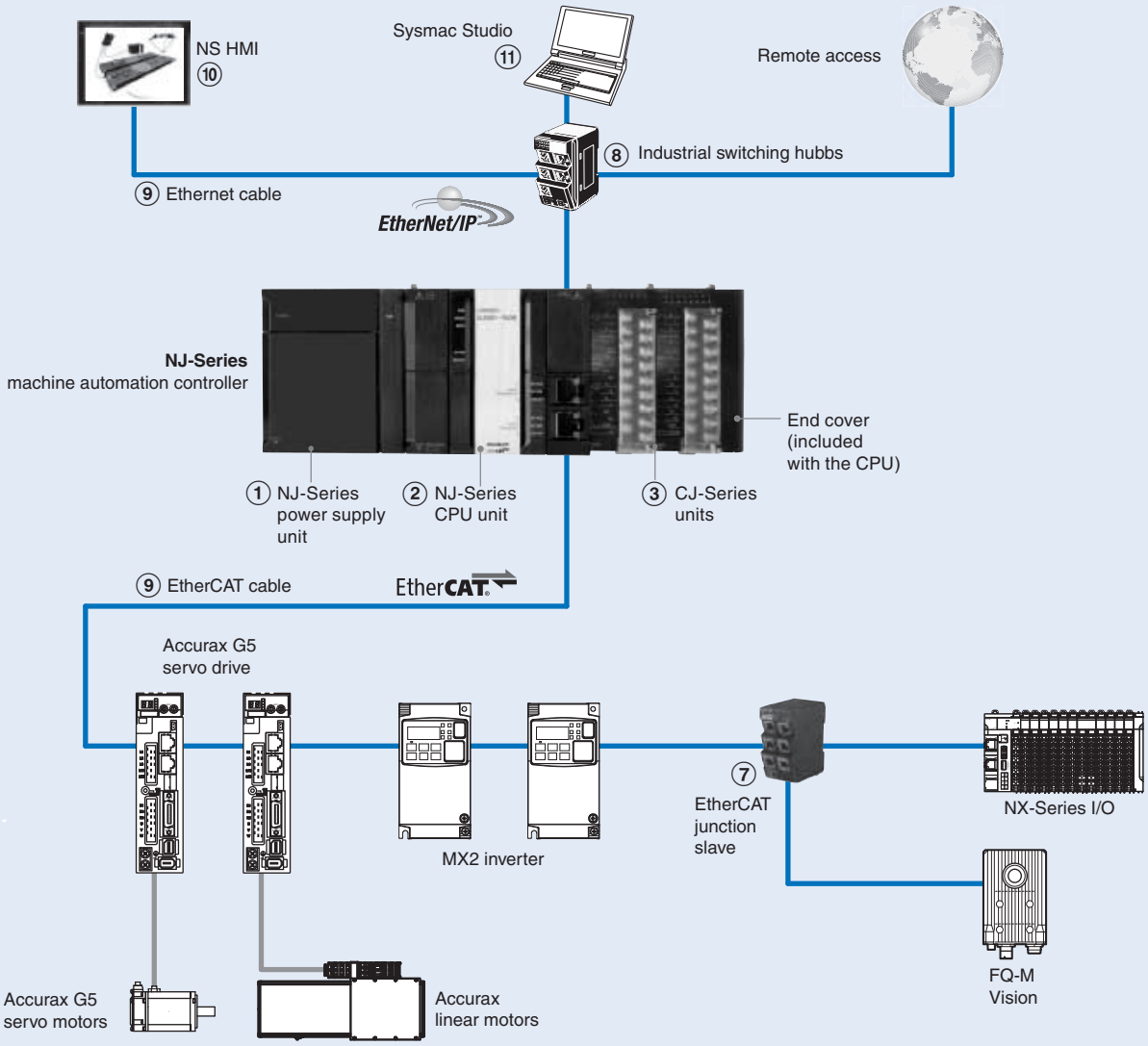
When the following units are mounted to a NJ-Series CPU rack using a NJ-PA3001 power supply unit.

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	0.28 A	–
Current consumption	Total		1.9 A + 0.02 A + 0.08 A x 2 + 0.09 A x 2 + 0.09 A x 2 + 0.12 A + 0.28	0.048 A x 2
	Result		2.84 A (≤ 6.0 A)	0.096 A (≤ 1.0 A)
Power consumption	Total		2.84 A x 5 V = 14.2 W	0.096 A x 24 V = 2.3 W
	Result		14.2 W + 2.3 W = 16.5 W (≤ 30 W)	

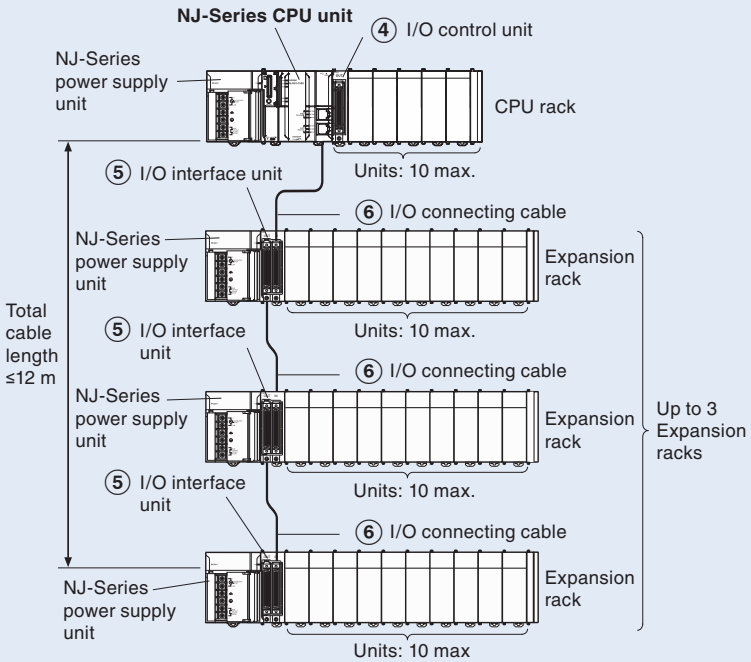
Note: 1. For details on unit current consumption, refer to ordering information.
2. CPU rack and expansion rack current consumption and width can be displayed in the Sysmac Studio software by selecting ***CPU/expansion racks*** from the ***configurations and setup*** in the Multiview Explorer.

Ordering information

NJ-Series system



NJ-Series expansion racks



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-Series	6.0 A	1.0 A	30 W	Supported	NJ-PA3001
	24 VDC power supply unit for NJ-Series					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 machine controller CPU units

Standard CPU units

Symbol	Name	Program capacity	Variables capacity	I/O capacity	No. of units	Current consumption		Number of axes	Model
						5 VDC	24 VDC		
②	NJ501 CPU unit	20 MB	2 MB: Retained 4 MB: Not retained	2,560 points	CPU rack: 10 units max. Expansion rack: 40 units max. (Up to 3 expansion racks)	1.90 A	–	64	NJ501-1500
								32	NJ501-1400
								16	NJ501-1300
	NJ301 CPU unit	5 MB	0.5 MB: Retained 2 MB: Not retained					8	NJ301-1200
								4	NJ301-1100

CPU units with robotic functionality

Symbol	Name	Program capacity	Variables capacity	I/O capacity	No. of units	Current consumption		Number of axes	Model
						5 VDC	24 VDC		
②	NJ501 CPU Unit	20 MB	2 MB: Retained 4 MB: Not retained	2,560 points	CPU rack: 10 units max. Expansion rack: 40 units max. (Up to 3 expansion racks)	1.90 A	–	64	NJ501-4500
								32	NJ501-4400
								16	NJ501-4300
									NJ501-4310*1

*1. The NJ501-4310 CPU unit only supports one delta robot.

CPU units with SQL client

Symbol	Name	Program capacity	Variables capacity	I/O capacity	No. of units	Current consumption		Number of axes	Model
						5 VDC	24 VDC		
②	NJ501 CPU Unit	20 MB	2 MB: Retained 4 MB: Not retained	2,560 points	CPU Rack: 10 units max. Expansion rack: 40 units max. (Up to 3 expansion racks)	1.90 A	–	64	NJ501-1520
								32	NJ501-1420
								16	NJ501-1320

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	DC output (sink)	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

Symbol	Points	Type	Rated voltage	Rated current	Width	Remarks	Current consumption (A)		Connection type	Model
							5 VDC	24 VDC		
③	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*	Conversion time	Width	Remarks	Current (A)		Connection type	Model
									5 V	24 V		
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

Symbol	Points	Type	Ranges	Resolution	Accuracy*	Conversion time	Width	Remarks	Current (A)		Connection type	Model
									5 V	24 V		
③	6	Temperature control loops, thermocouple	K-type (–200 to 1,300°C) J-type (–100 to 850ºC)	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

* 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)

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 x D x 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	0.22	W4S1-03B	
		5	No		0.22	W4S1-05B	
		5	Yes	Power supply connector and connector for informing error	0.22	W4S1-05C	

Recommended EtherCAT and EtherNet/IP communication cables

Symbol	Item			Manufacturer	Cable 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
			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

*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.

NS HMI Series

Symbol	Type		Case color	Model
⑩	TFT, 15", 1024 × 768 pixels	EtherNet	Black	NS15-TX01B-V2
			Silver	NS15-TX01S-V2
	TFT, 12", 800 × 600 pixels		Black	NS12-TS01B-V2
			Ivory	NS12-TS01-V2
	TFT, 10", 640 × 480 pixels		Black	NS10-TV01B-V2
			Ivory	NS10-TV01-V2
	TFT, 8.4", 640 × 480 pixels		Black	NS8-TV01B-V2
			Ivory	NS8-TV01-V2
	TFT, 5.7", 320 × 240 pixels		Black	NS5-TQ11B-V2
			Ivory	NS5-TQ11-V2
	TFT, 5.7", 320 × 240 pixels		Black	NS5-SQ11B-V2
			Ivory	NS5-SQ11-V2
	STN, Monochrome 5.7", 320 × 240 pixels		Black	NS5-MQ11B-V2
			Ivory	NS5-MQ11-V2

Note: To connect the NJ-Series Controller, NS System version 8.5 or higher is required. CX-Designer version 3.3 or higher is also required.

NS HMI Accessories

Name	Specifications		Model
Cable	Serial programming cable		XW2Z-S002
	USB programming cable		CP1W-CN221
Video input unit	Inputs: 4 channels Signal type: NTSC/PAL		NS-CA001
	Input channels: 2 video channels and 1 RGB channel *1 Signal type: NTSC/PAL		NS-CA002
Cable to connect NS-CA00_ to video console unit	Cable length: 2 m		F150-VKP (2 m)
	Cable length: 5 m		F150-VKP (5 m)
Sheet/cover	Anti-reflection sheets (5 surface sheets)	NS15	NS15-KBA04
		NS12/10	NS12-KBA04
		NS8	NS7-KBA04
		NS5	NT30-KBA04
	Protective covers (5 pack) (anti-reflection coating)	NS12/10	NS12-KBA05
		NS8	NS7-KBA05
		NS5	NT31C-KBA05
	Protective covers (1 cover included, transparent)	NS15	NS15-KBA05N
	Protective covers (5 covers included, transparent)	NS12/10	NS12-KBA05N
		NS8	NS7-KBA05N
		NS5	NT31C-KBA05N
	Chemical-resistant cover (1 cover)	NS5	NT30-KBA01
Attachment adapter	NT625C/631/631C-Series to NS12/10-Series		NS12-ATT01
	NT625C/631/631C-Series to NS12/10-Series (Black)		NS12-ATT01B
	NT610C-Series to NS12/10-Series		NS12-ATT02
	NT620S/620C/600S-Series to NS8-Series		NS8-ATT01
	NT600M/600G/610G/612G-Series to NS8-Series		NS8-ATT02
Memory card	128 MB		HMC-EF183
	256 MB		HMC-EF283
	512 MB		HMC-EF583
Memory card adapter for PC	–		HMC-AP001
Replacement battery	Battery life: 5 years (at 25°C)		CJ1W-BAT01

*1. One screen cannot display two videos inputs simultaneously.

NJ-Series options and accessories

Specifications		Model	Appearance
SD memory card, 2 GB		HMC-SD291	
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 NJ-Series 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	

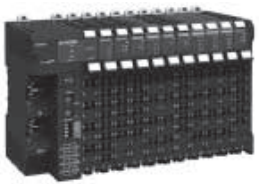
Computer software

Symbol	Specifications	Model
⑪	Sysmac Studio	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.

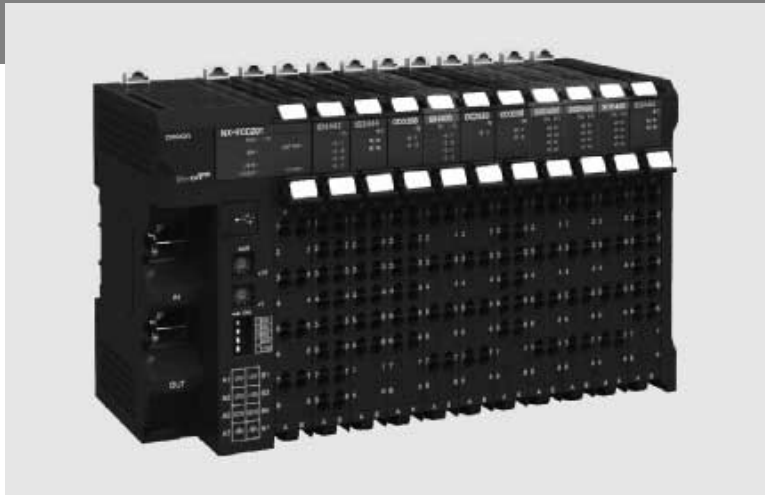
Cat. No. SysCat_I180E-EN-03A In the interest of product improvement, specifications are subject to change without notice.

Selection table – I/O

	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 • Max. 1024 bytes in + 1024 bytes out	Block I/O expandable with one digital I/O unit (16 points + 16 points)
I/O types	• Digital I/O • Analog I/O • Encoder input • Pulse output • Temperature sensor input • Safety control	• Digital I/O • Analog I/O • Encoder input • Expansion unit
I/O connection	Screwless push-in terminals	M3 screw terminals (1- or 3- wire DI)
Features	• Automatic and manual address setting • Standard and high-speed inputs • Digital input filtering • Removable push-in I/O terminals • Synchronous I/O updates using Distributed Clock • I/O units with Time Stamp function • High signal density: 16 digital or 8 analog signals in 12 mm width	• Automatic and manual address setting • High-speed input • Digital input filtering • Removable I/O terminals • Expandable digital I/O
Mounting	DIN rail	DIN rail
Page	53	81

NX-□

NX-Series I/O

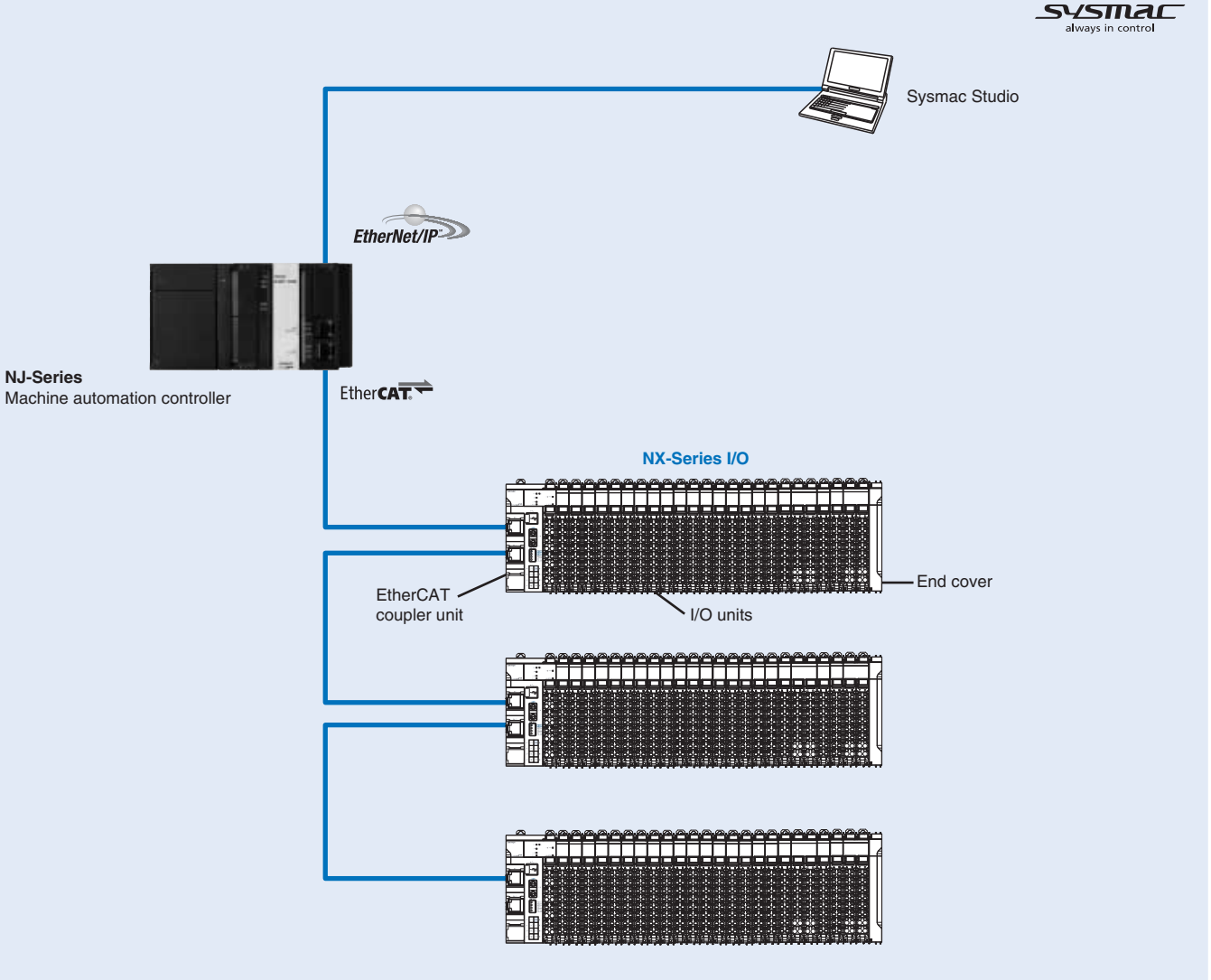


Speed and accuracy for machine performance

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 in all NX I/O units
- High signal density: Up to 16 digital or 8 analog signals in 12 mm width

System configuration



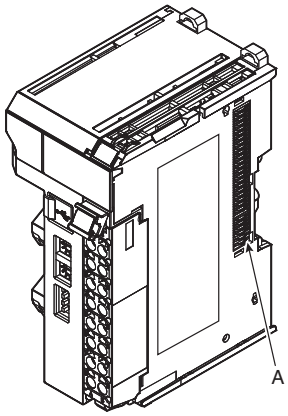
Specifications

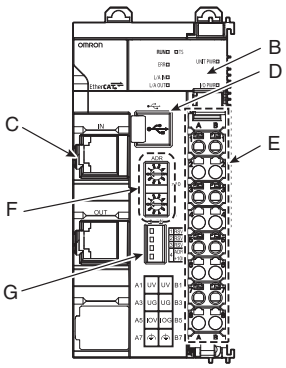
General specifications

Item		Specifications
Enclosure		Mounted in a panel
Grounding method		Ground than 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	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	Pollution degree 2 or less: conforms to JIS B3502 and IEC 61131-2
	Noise immunity	Conforms to IEC 61000-4-4. 2kV (power supply line)
	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. 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 EC: EN 61131-2 and C-Tick, KC registration

Nomenclature

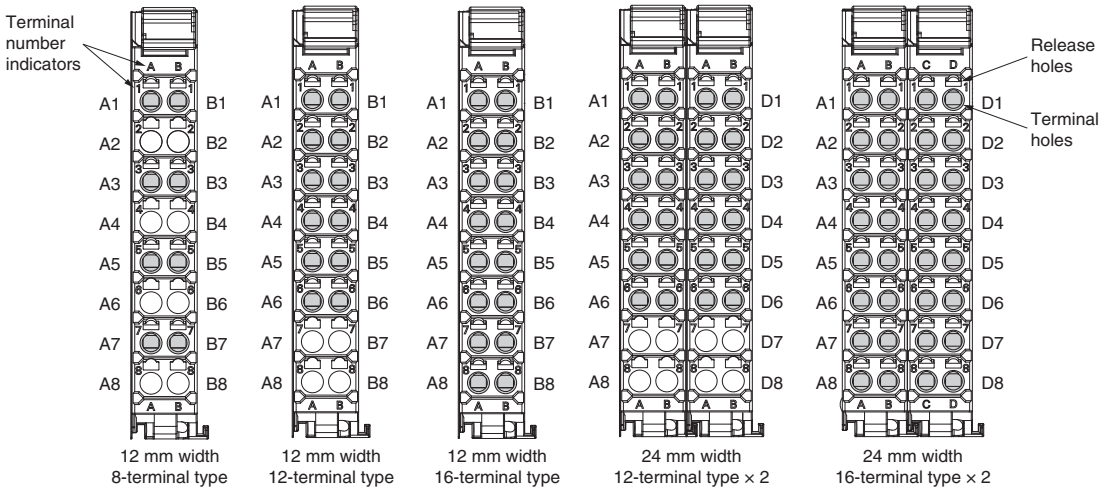
EtherCAT coupler unit





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. There are two connectors, one for the input port and one for the output port.
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 1s digit and 10s digit of the node address of the EtherCAT coupler unit as an EtherCAT slave. 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 as an EtherCAT slave.

Terminal block types



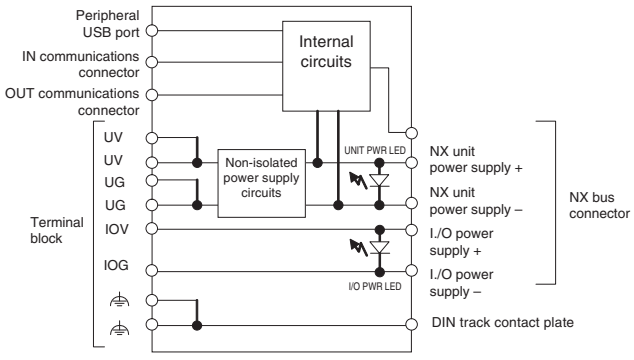
EtherCAT coupler unit

Item		Specifications
Model		**NX-ECC201**
Number of connectable NX units		63 units max.
Send/receive PDO data sizes		Input: 1024 bytes max. (including input data, status and unused areas) Output: 1024 bytes max. (including output data and unused areas)
Mailbox data size		Input: 256 bytes Output: 256 bytes
Mailbox		Emergency messages, SDO requests and SDO information
Refreshing methods		Free-run refreshing I/O-synchronized refreshing
Node address setting range		1 to 192*1
I/O jitter performance		Inputs: 1 μs max. Outputs: 1 μs max.
Communications cycle		250 to 100,000 μs*2*3
Unit power supply	**Voltage**	24 VDC (20.4 to 28.8 VDC)*4
	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)
	Maximum I/O current	4 A max.
	Terminal current capacity	4 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 MΩ min. (between isolated circuits)
External connection terminals		Connector for EtherCAT communications: • RJ45 × 2 (shielded) • IN: EtherCAT input data • OUT: EtherCAT output data
		Screwless push-in terminal (8 terminals) For power supply unit, I/O power supply and grounding. Removable.
		Peripheral USB port for Sysmac Studio connection: • Physical layer: USB 2.0-compliant, B-type connector • Transmission distance: 5 m max.
Dimensions		46(W) × 103(H) × 71(D)
Weight		150 g max.

*1. This specification applies to a connection to the built-in EtherCAT port on a NJ-series CPU unit.
*2. 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 a NJ5-series CPU unit: 500 μs, 1,000 μs, 2,000 μs and 4,000 μs. Refer to the NJ-series CPU unit built-in EtherCAT port user's manual (Cat.No. W505) for the most recent specifications.
*3. This depends on the unit configuration.
*4. Use an output voltage that is appropriate for the I/O circuits of the NX units and the connected external devices.

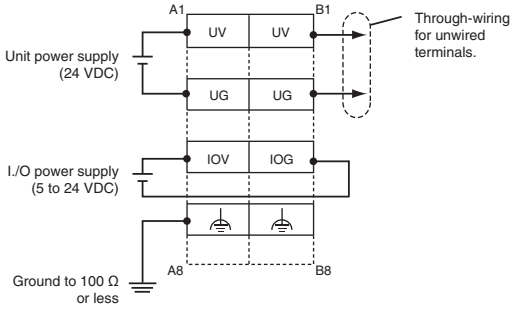
Circuit layout

NX-ECC201



Terminal wiring

NX-ECC201



Digital I/O unit

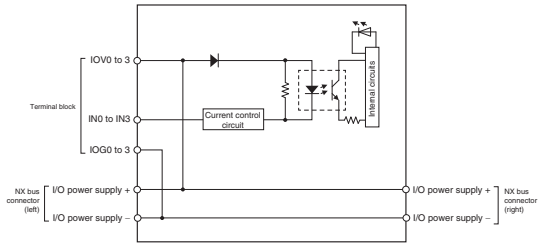
Digital input unit

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	Screwless push-in terminal							
Terminal type	12 terminals	16 terminals	16 terminals	12 terminals	12 terminals	16 terminals	16 terminals	12 terminals
Dimensions	12(W) × 100(H) × 71(D)							
Weight	65 g max.							
Disconnection/ short-circuit detection	Not supported							
Protective function	Not supported							

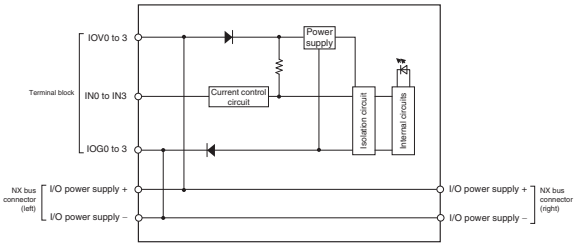
*1. Typical rated current at 24 VDC.
*2. Input filter time: No filter, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 ms.
*3. Input filter time: No filter, 1, 2, 4, 8, 16, 32, 64, 128, 256 μs.

Circuit layout

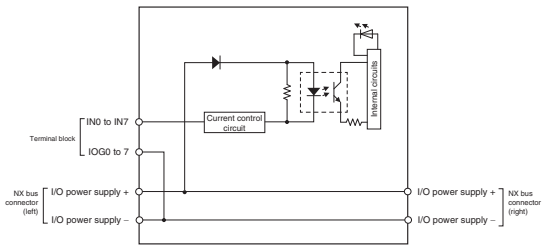
NX-ID3317



NX-ID3343

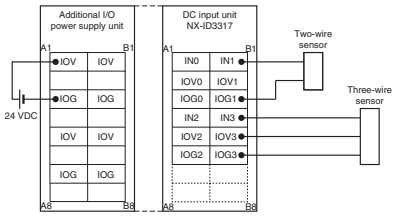


NX-ID4342



Terminal wiring

NX-ID3317



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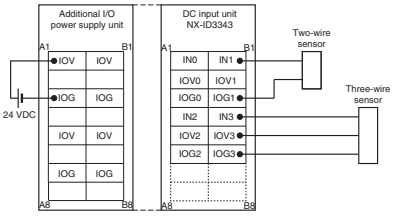

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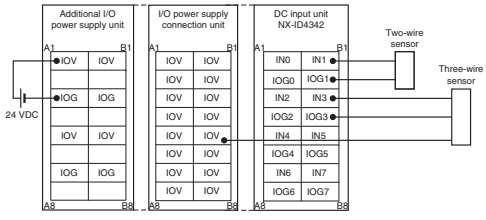
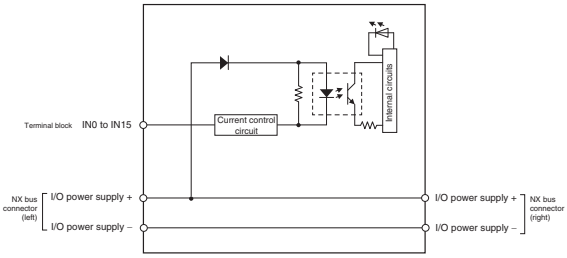


Circuit layout

NX-ID5342



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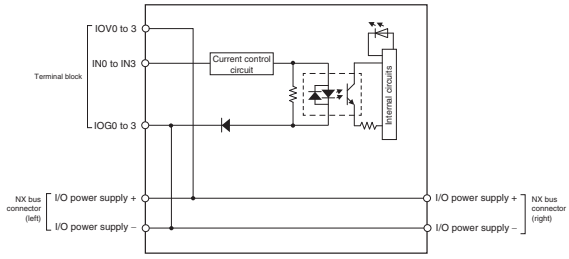

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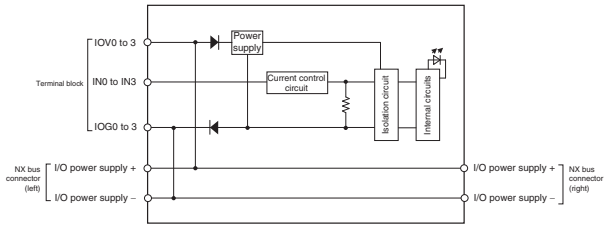
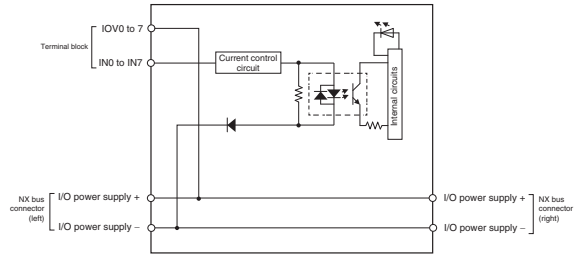


NX-ID4442



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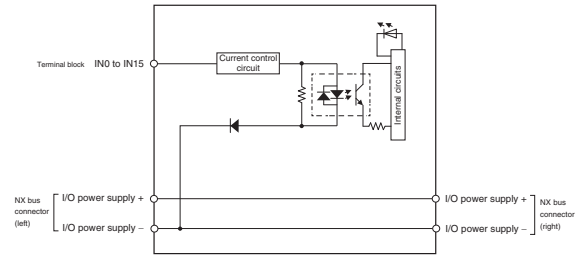
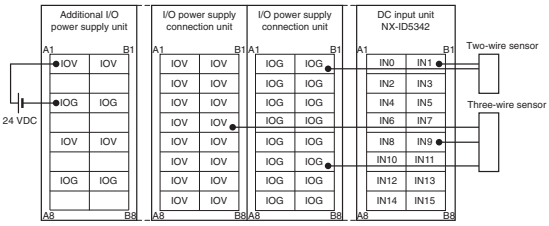


Terminal wiring

NX-ID5342



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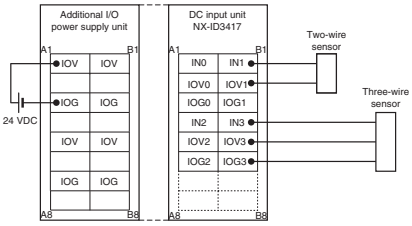

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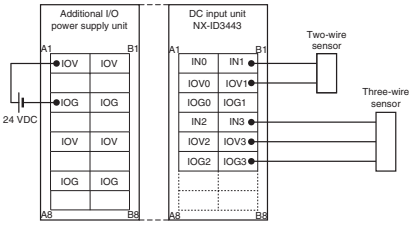

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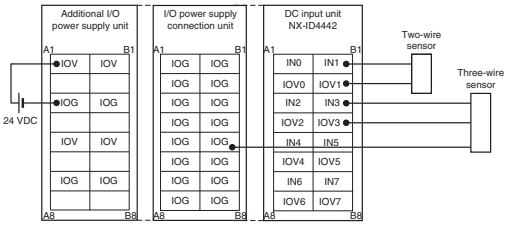

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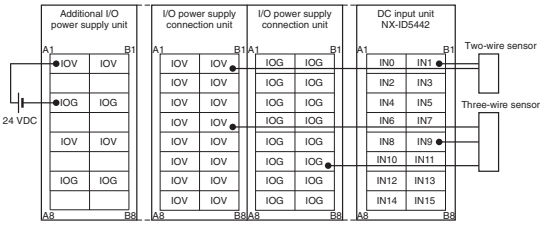


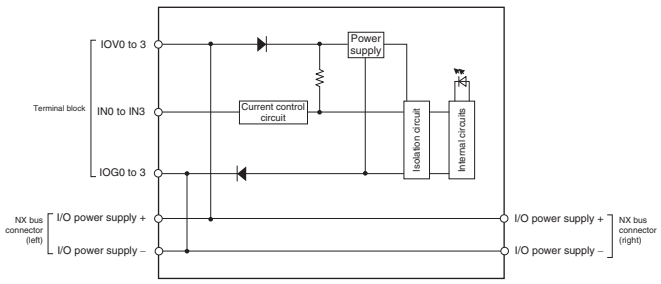
Digital input unit (with Time Stamp function)

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	Screwless push-in terminal	
Terminal type	12 terminals	
Dimensions	12(W) × 100(H) × 71(D)	
Weight	65 g max.	
Disconnection/ short-circuit detection	Not supported	
Protective function	Not supported	

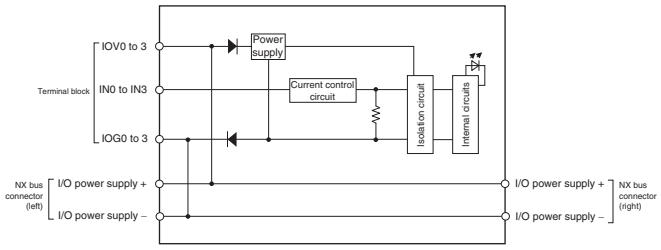
*1. Typical rated current at 24 VDC.

Circuit layout

NX-ID3344

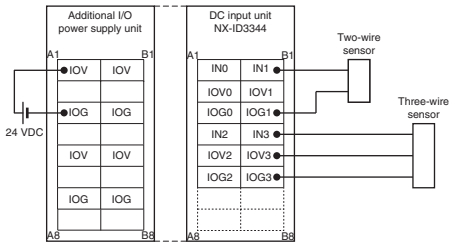


NX-ID3444

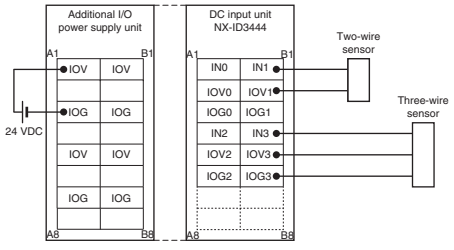


Terminal wiring

NX-ID3344



NX-ID3444

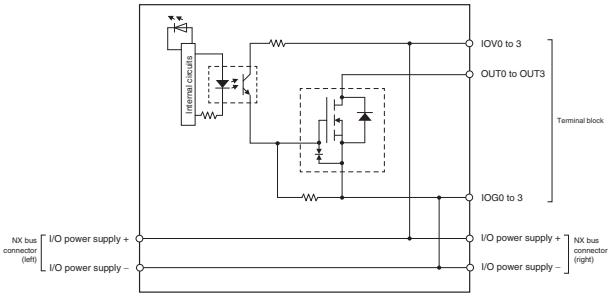


Digital output unit

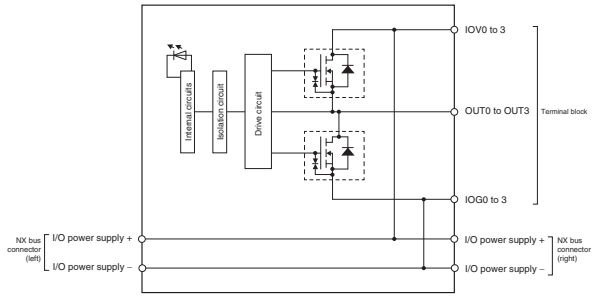
Item	Specifications							
Model	**NX-OD3121**	**NX-OD4121**	**NX-OD5121**	**NX-OD3153**	**NX-OD3256**	**NX-OD4256**	**NX-OD5256**	**NX-OD3257**
Name	Transistor output unit							
Internal I/O common	NPN				PNP			
Capacity	4 points	8 points	16 points	4 points	4 points	8 points	16 points	4 points
Rated 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	Screwless push-in terminal							
Terminal type	12 terminals	16 terminals	16 terminals	12 terminals	12 terminals	16 terminals	16 terminals	12 terminals
Dimensions	12(W) × 100(H) × 71(D)							
Weight	70 g max.							
Disconnection/ short-circuit detection	Not supported							
Protective function	Not supported				With load short-circuit protection			

Circuit layout

NX-OD3121

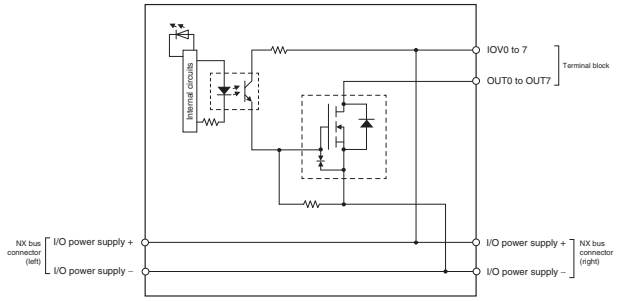


NX-OD3153



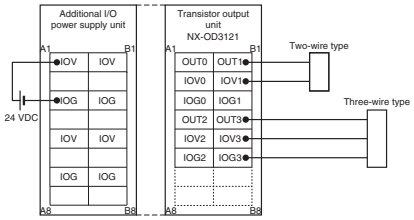
This unit uses a push-pull output circuit.

NX-OD4121

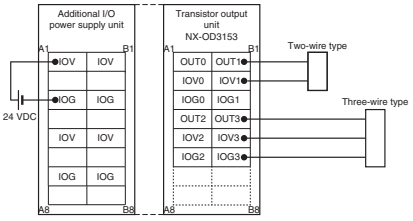


Terminal wiring

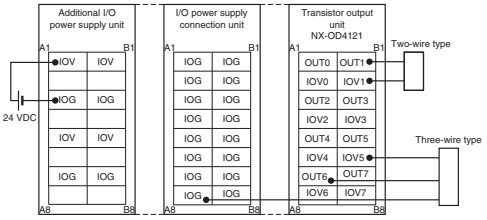
NX-OD3121



NX-OD3153

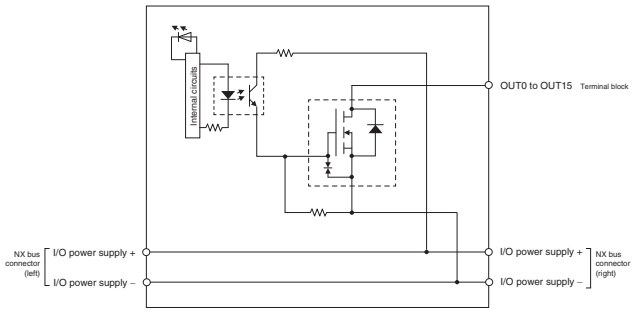


NX-OD4121

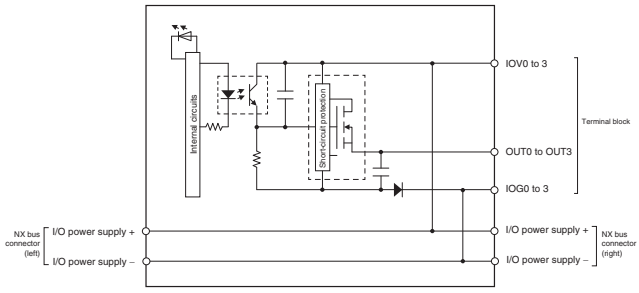


Circuit layout

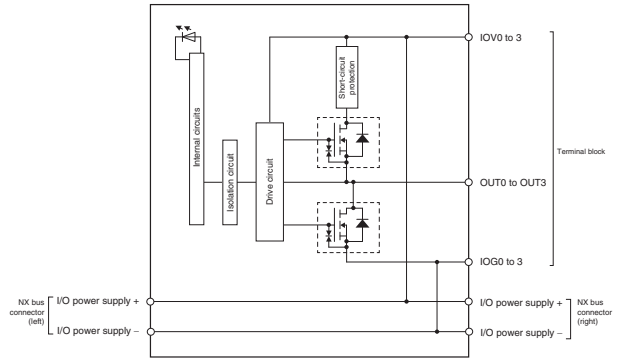
NX-OD5121



NX-OD3256

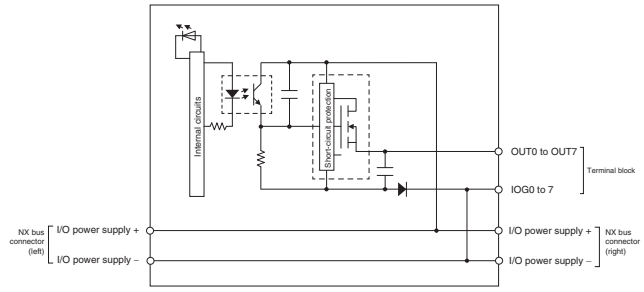


NX-OD3257

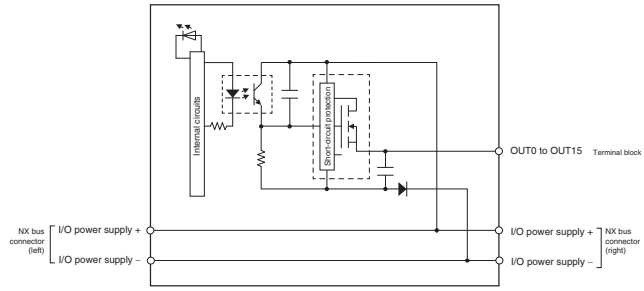


This unit uses a push-pull output circuit.

NX-OD4256

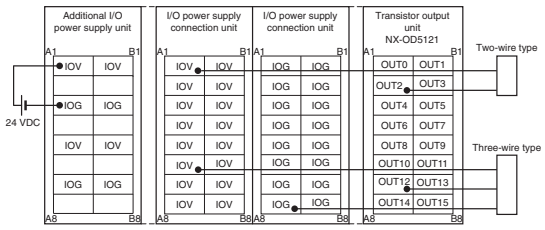


NX-OD5256



Terminal wiring

NX-OD5121



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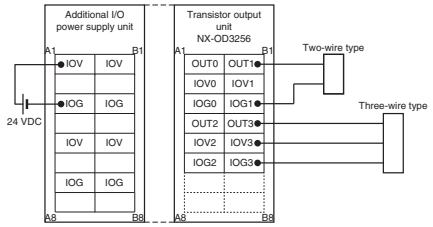

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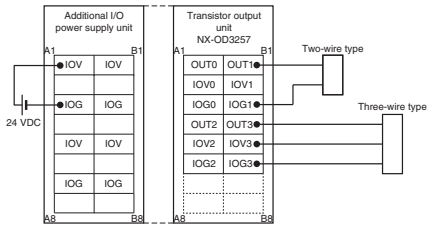

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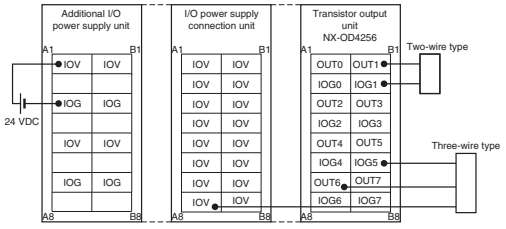
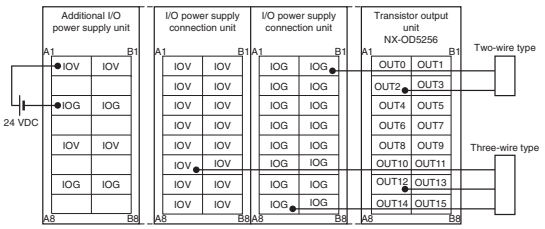


NX-OD5256

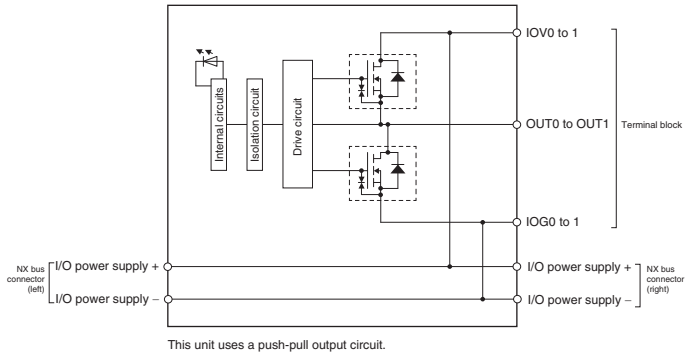


Digital output unit (with Time Stamp function)

Item	Specifications	
Model	**NX-OD2154**	**NX-OD2258**
Name	Transistor output unit	
Internal I/O common	NPN	PNP
Capacity	2 points	2 points
Rated voltage	12 to 24 VDC	
Operating load voltage	10.2 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	0.55 W max.	
I/O power supply method	Supply from the NX bus	
I/O current consumption	10 mA max.	
Current capacity of I/O power supply terminal	0.5 A/terminal max.	
I/O refreshing method	Time Stamp	
Terminal block	Screwless push-in terminal	
Terminal type	8 terminals	
Dimensions	12(W) × 100(H) × 71(D)	
Weight	70 g max.	
Disconnection/ short-circuit detection	Not supported	
Protective function	Not supported	

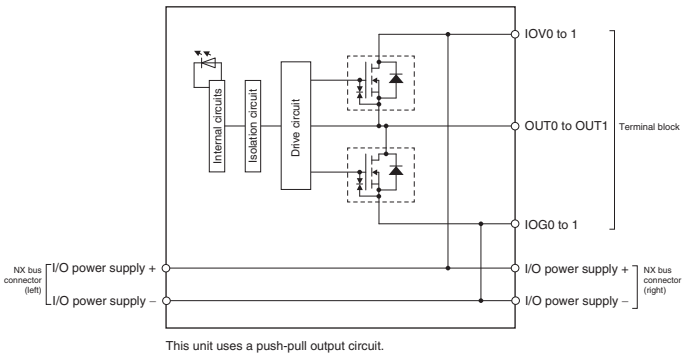
Circuit layout

NX-OD2154



This unit uses a push-pull output circuit.

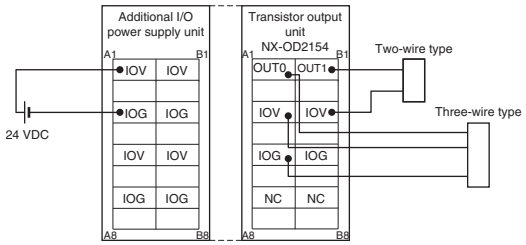
NX-OD2258



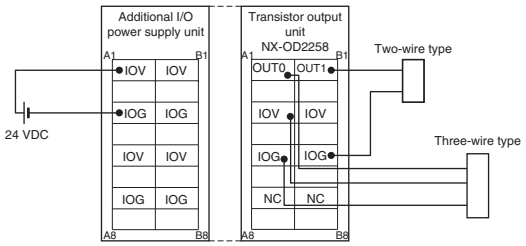
This unit uses a push-pull output circuit.

Terminal wiring

NX-OD2154



NX-OD2258



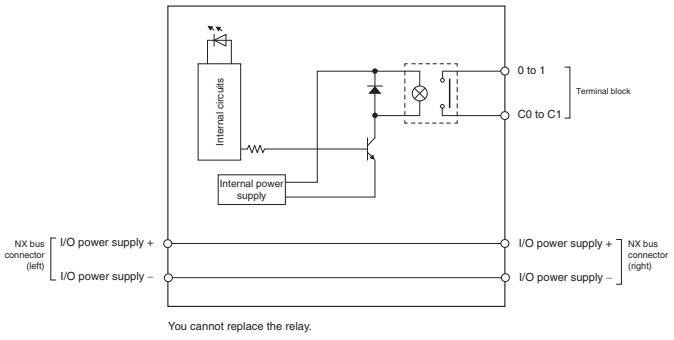
Relay output unit

Item	Specifications
Model	**NX-OC2633**
Name	Relay output unit
Relay type	N.O. contact
Capacity	2 points
Maximum switching capacity	250 VAC/2 A (cos Ø = 1), 250 VAC/2 A (cos Ø = 0.4), 24 VDC/2 A, 4 A/unit
Minimum switching capacity	5 VDC, 1 mA
ON/OFF response time	15 ms max./15 ms max.
Relay service life	Electrical: 100,000 operations *1 Mechanical: 20,000,000 operations
Dielectric strength	Between A1/B1 terminals and A3/B3 terminals: 2,300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and GR terminal: 2,300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and internal circuits: 2,300 VAC for 1 min at a leakage current of 5 mA max. Between the internal circuit and GR terminal: 510 VAC for 1 min at a leakage current of 5 mA max.
Insulation resistance	Between A1/B1 terminals and A3/B3 terminals: 20 MΩ min. (500 VDC) Between the external terminals and internal circuits: 20 MΩ min. (500 VDC) Between the internal circuit and GR terminal: 20 MΩ min. (100 VDC) Between the external terminals and GR terminal: 20 MΩ min. (500 VDC)
Vibration resistance	Conforms to IEC60068-2-6. 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.
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	Screwless push-in terminal
Terminal type	8 terminals
Dimensions	12(W) × 100(H) × 71(D)
Weight	65 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

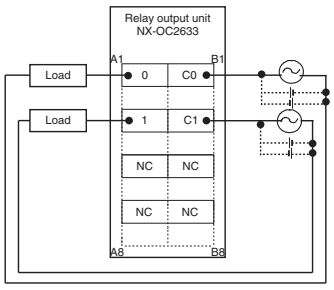
NX-OC2633



You cannot replace the relay.

Terminal wiring

NX-OC2633



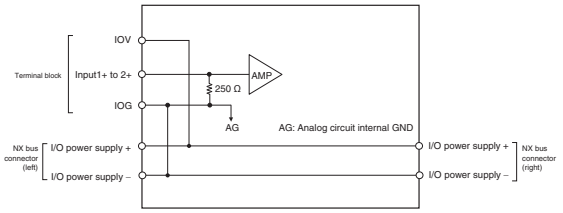
Analog I/O unit

Current input unit

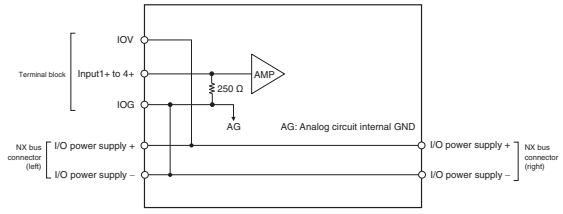
Item		Specifications								
Model		**NX-AD2203**	**NX-AD3203**	**NX-AD4203**	**NX-AD2204**	**NX-AD3204**	**NX-AD4204**	**NX-AD2208**	**NX-AD3208**	**NX-AD4208**
Name		Current input unit								
Input range		4 to 20 mA								
Input method		Single-ended input			Differential input					
Capacity		2 points	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)		
	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		Switching synchronous I/O refreshing and free-run refreshing	Free-run refreshing					Switching synchronous I/O refreshing and free-run refreshing		
Terminal block		Screwless push-in terminal								
Terminal type		8 terminals	12 terminals	16 terminals	8 terminals	12 terminals	16 terminals	8 terminals	12 terminals	16 terminals
Dimensions		12(W) × 100(H) × 71(D)								
Weight		70 g max.								
Input disconnection detection		Supported								

Circuit layout

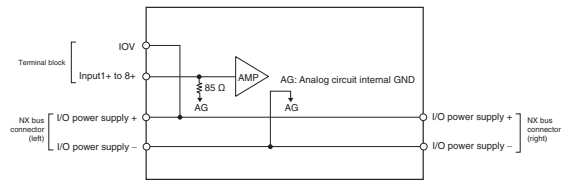
NX-AD2203



NX-AD3203

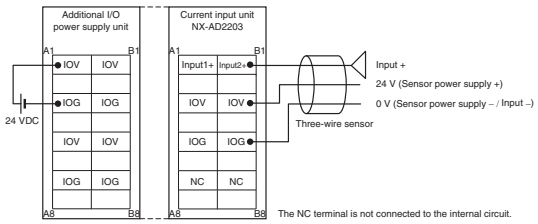


NX-AD4203

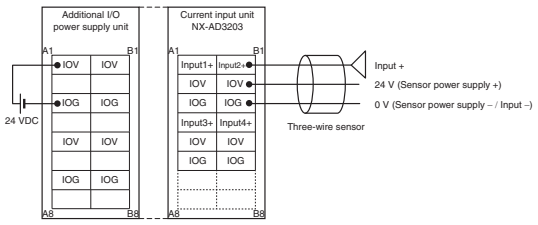


Terminal wiring

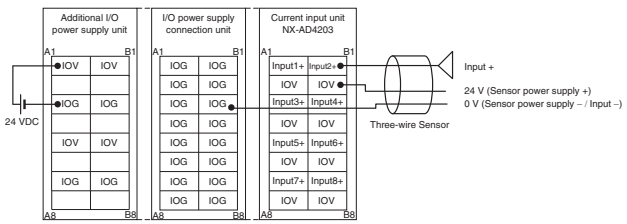
NX-AD2203



NX-AD3203

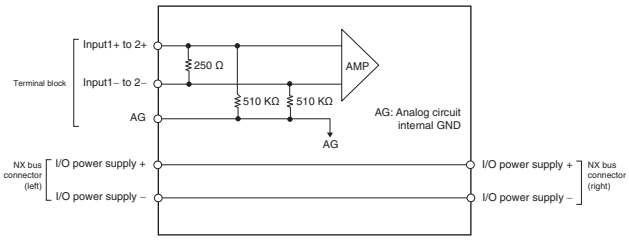


NX-AD4203

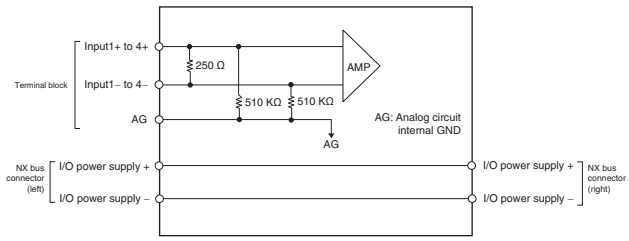


Circuit layout

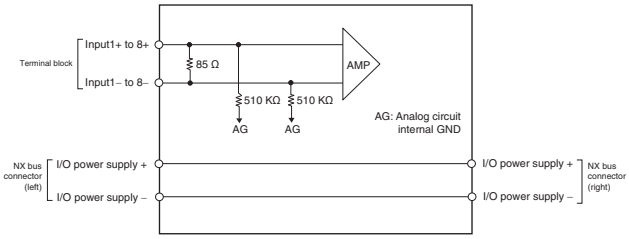
NX-AD2204/NX-AD2208



NX-AD3204/NX-AD3208

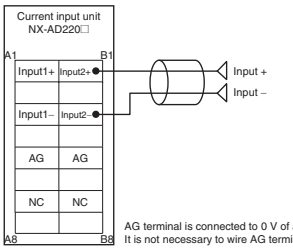


NX-AD4204/NX-AD4208



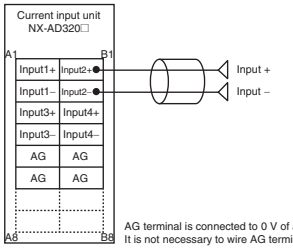
Terminal wiring

NX-AD2204/NX-AD2208



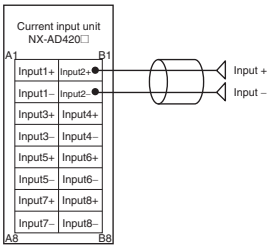
AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

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

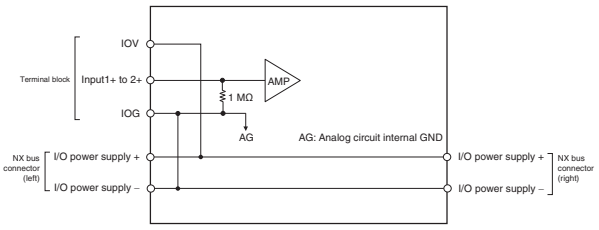


Voltage input unit

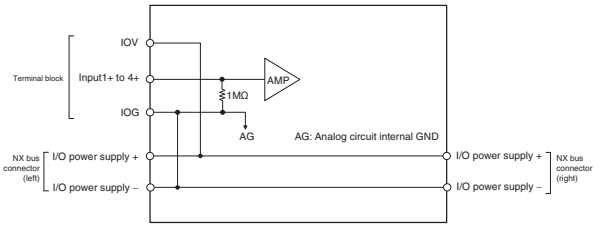
Item		Specifications								
Model		NX-AD2603	NX-AD3603	NX-AD4603	NX-AD2604	NX-AD3604	NX-AD4604	NX-AD2608	NX-AD3608	NX-AD4608
Name		Voltage input unit								
Input range		–10 to 10 V								
Input method		Single-ended input			Differential input					
Capacity		2 points	4 points	8 points	2 points	4 points	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)		
	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	Free-run refreshing	Switching synchronous I/O refreshing and free-run refreshing		
Terminal block		Screwless push-in terminal								
Terminal type		8 terminals	12 terminals	16 terminals	8 terminals	12 terminals	16 terminals	8 terminals	12 terminals	16 terminals
Dimensions		12(W) × 100(H) × 71(D)								
Weight		70 g max.								
Input disconnection detection		Not supported								

Circuit layout

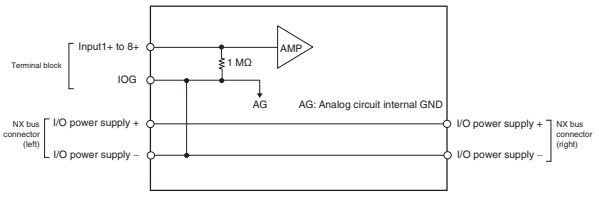
NX-AD2603



NX-AD3603

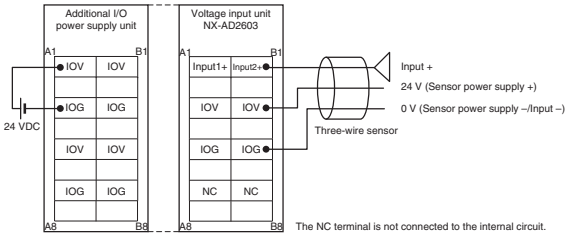


NX-AD4603

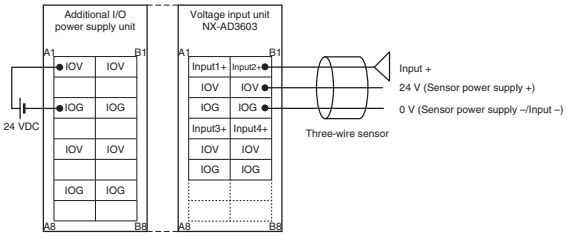


Terminal wiring

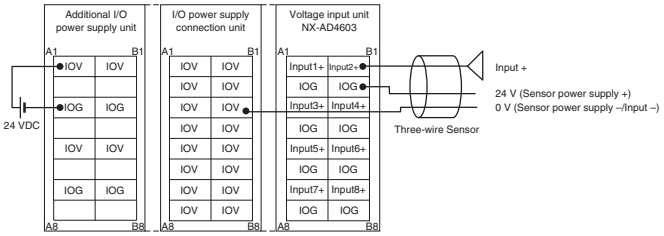
NX-AD2603



NX-AD3603

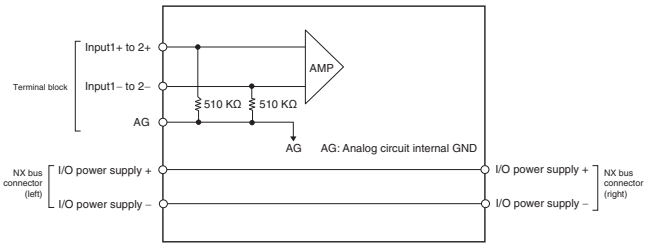


NX-AD4603

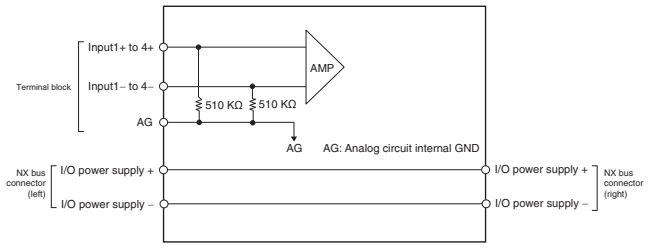


Circuit layout

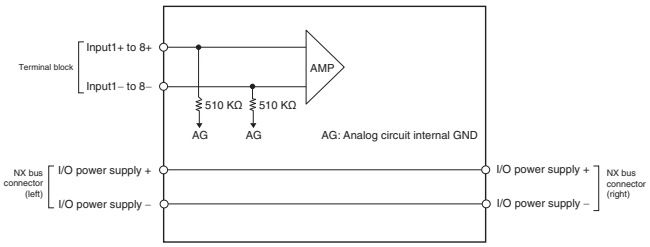
NX-AD2604/NX-AD2608



NX-AD3604/NX-AD3608

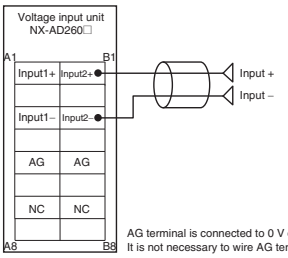


NX-AD4604/NX-AD4608



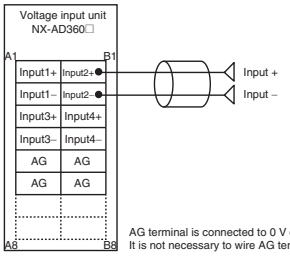
Terminal wiring

NX-AD2604/NX-AD2608



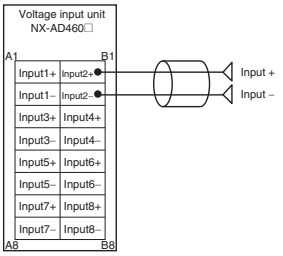
AG terminal is connected to 0 V of analog circuit inside the unit.
It is not necessary to wire AG terminal normally.

NX-AD3604/NX-AD3608



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

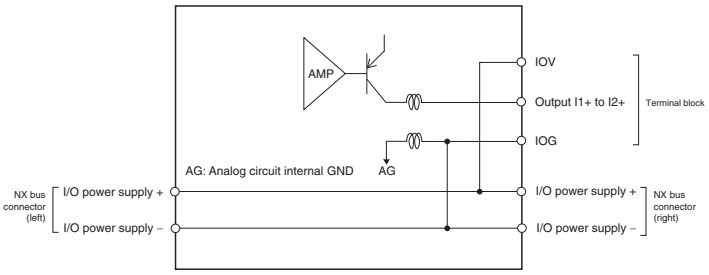


Current output unit

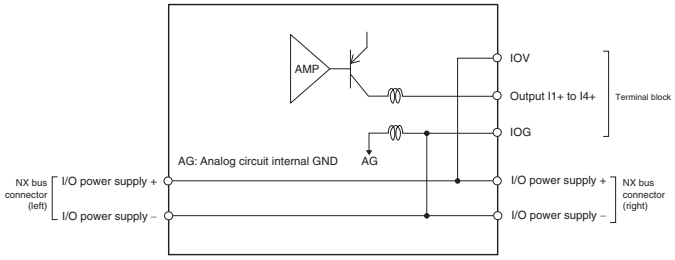
Item		Specifications			
Model		**NX-DA2203**	**NX-DA3203**	**NX-DA2205**	**NX-DA3205**
Name		Current output unit			
Output range		4 to 20 mA			
Capacity		2 points	4 points	2 points	4 points
Output conversion range		–5% to 105% (full scale)			
Allowable load resistance		600 Ω min.	350 Ω min.	600 Ω min.	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		Screwless push-in terminal			
Terminal type		8 terminals	12 terminals	8 terminals	12 terminals
Dimensions		12(W) × 100(H) × 71(D)			
Weight		70 g max.			

Circuit layout

NX-DA2203/DA2205

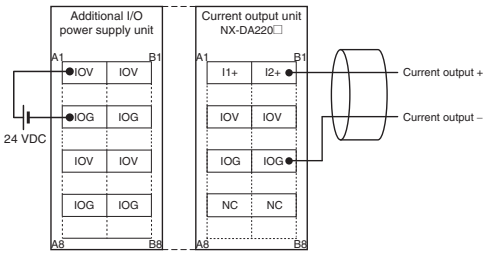


NX-DA3203/DA3205

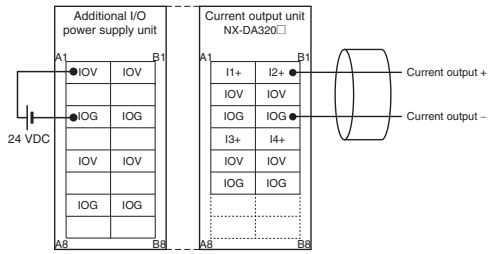


Terminal wiring

NX-DA2203/DA2205



NX-DA3203/DA3205

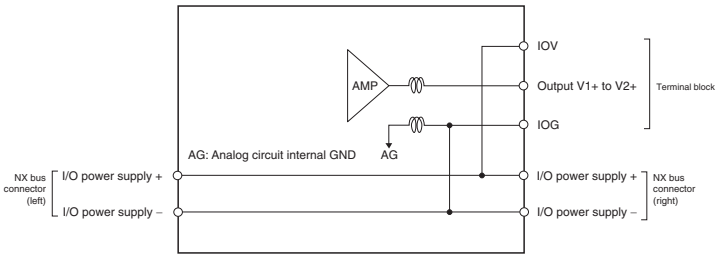


Voltage output unit

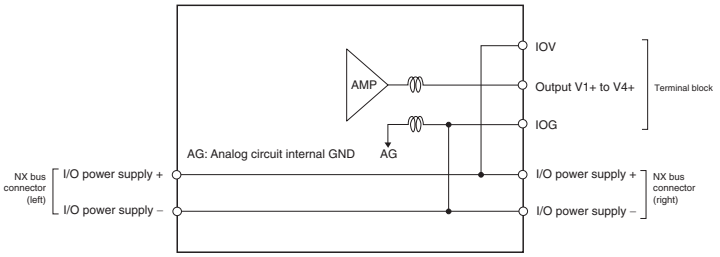
Item		Specifications			
Model		**NX-DA2603**	**NX-DA3603**	**NX-DA2605**	**NX-DA3605**
Name		Voltage output unit			
Output range		–10 to 10 V			
Capacity		2 points	4 points	2 points	4 points
Output conversion range		–5% to 105% (full scale)			
Allowable load resistance		5 kΩ min.			
Output impedance		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)	
	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		Screwless push-in terminal			
Terminal type		8 terminals	12 terminals	8 terminals	12 terminals
Dimensions		12(W) × 100(H) × 71(D)			
Weight		70 g max.			

Circuit layout

NX-DA2603/DA2605

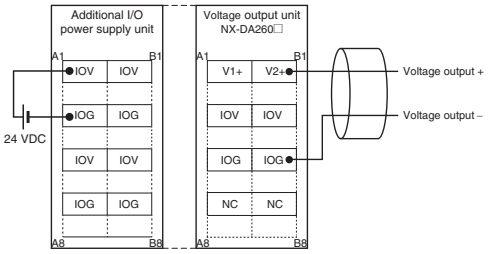


NX-DA3603/DA3605

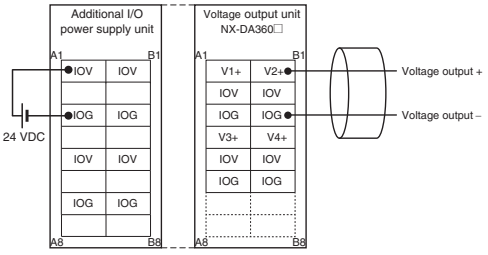


Terminal wiring

NX-DA2603/DA2605



NX-DA3603/DA3605



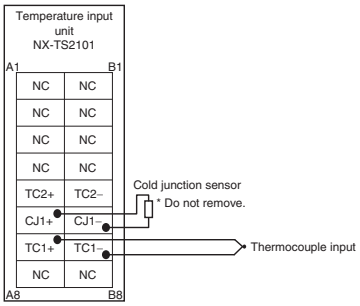
Temperature input unit

Item		Specifications			
Model		**NX-TS2101**	**NX-TS3101**	**NX-TS2201**	**NX-TS3201**
Name		Thermocouple type		RTD type	
Capacity		2 points	4 points	2 points	4 points
Temperature sensor		K, J, T, E, L, U, N, R, S, B, WRe5-26, PLII		Pt100 (three-wire)/Pt1000 (three-wire)	
Input conversion range		±20°C of the input range			
Input detection current		Approx. 0.1 μA		Approx. 0.25 mA	
Input impedance		20 KΩ min.		–	
Absolute maximum rating		±130 mV		–	
Resolution		0.1°C max.*1		0.1°C max.	
Effect of conductor resistance		–		0.06°C/Ω max. (also 20 Ω max.)	
Warm-up period		30 minutes		5 minutes	
Reference accuracy and temperature coefficient	**Conversion time**	250 ms			
	Temperature range	K, N (–200 to 1,300°C) J (–200 to 1,200°C) T (–200 to 400°C) E (–200 to 1,000°C) L (–200 to 900°C) U (–200 to 600°C) R, S (–50 to 1,700°C) B (0 to 1,800°C) WRe5-26 (0 to 2,300°C) PLII (0 to 1,300°C)		–200 to 850°C	
	Accuracy*2	K/J/E/L/N/R/S/PLII (±0.1%) T (±0.2%) U (±0.15%) WRe5-26 (±0.05%)		±0.1%	
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 = Photocoupler Between inputs: Power = Transformer, Signal = Photocoupler			
Unit power consumption		0.90 W max.	1.30 W max.	0.90 W max.	1.30 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		Screwless push-in terminal			
Terminal type		16 terminals			
Dimensions		12(W) × 100(H) × 71(D)	24(W) × 100(H) × 71(D)	12(W) × 100(H) × 71(D)	24(W) × 100(H) × 71(D)
Weight		70 g max.	140 g max.	70 g max.	140 g max.

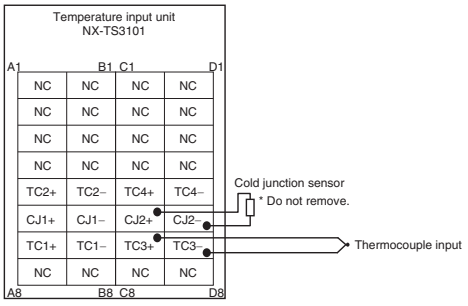
*1. The resolution is 0.2ºC max. when the input type is R, S or W.
*2. Accuracy for temperature inputs as percentatge of process value and typical value 25ºC ambient temperature (refer to the user's manual for detailed information).

Terminal wiring

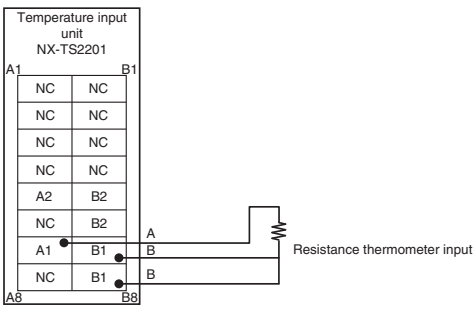
NX-TS2101



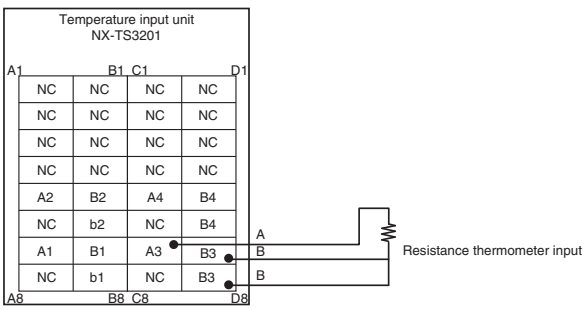
NX-TS3101



NX-TS2201



NX-TS3201



Position interface unit

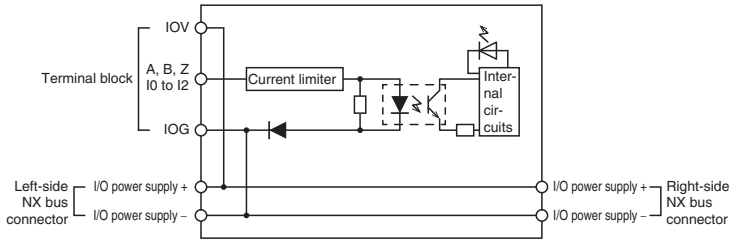
Incremental encoder input unit

Item			Specifications		
Model			**NX-EC0122**	**NX-EC0222**	**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**		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% Level input voltage: V_{IT+}: 0.1 V min. V_{IT-}: 0.1 V min. Hysteresis voltage: Vhys (V_{IT+} - V_{IT-}): 60 Mv
		Current	4.2 mA (24 VDC)		
		5 V power supply for encoder	–		Output voltage: 5 VDC 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 difference pulse input 0 × 4: 1 MHz), Phase Z: 1 MHz
Counting units			Pulses		
Pulse input method			Phase difference pulse (multiplication × 1/2/4), 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.	–	4.0 VDC max./1 mA max.
	ON/OFF response time		1 μs max./2 μs max.	–	1 μs max./2 μs max.
	Internal I/O common		PNP	–	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		
Unit power consumption			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			Screwless push-in terminal		
Terminal type			16 terminals	12 terminals	12 terminals x 2
Dimensions			12(W) × 100(H) × 71(D)	12(W) × 100(H) × 71(D)	24(W) × 100(H) × 71(D)
Weight			70 g	65 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.

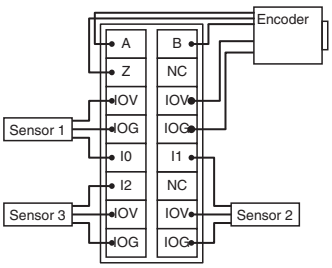
Circuit layout

NX-EC0122



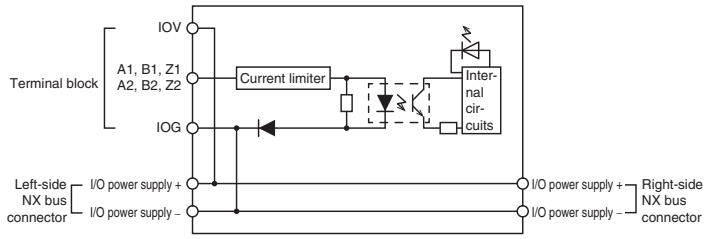
Terminal wiring

NX-EC0122



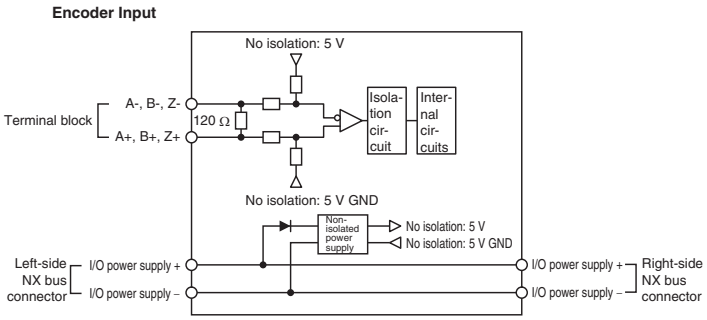
Circuit layout

NX-EC0222

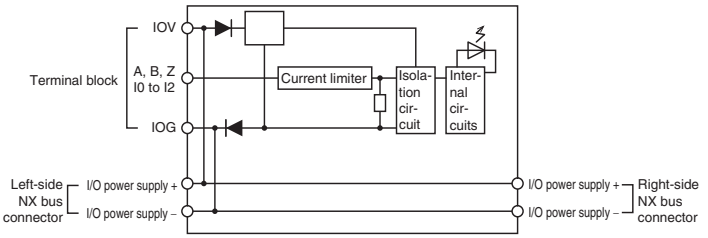


NX-EC0142

Encoder Input

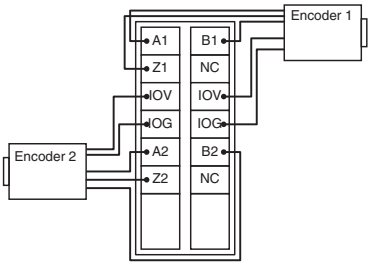


External Inputs

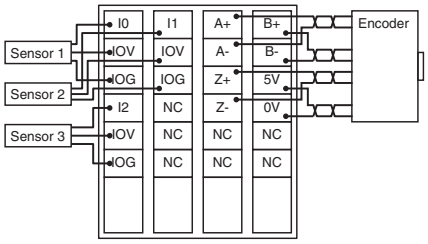


Terminal wiring

NX-EC0222



NX-EC0142



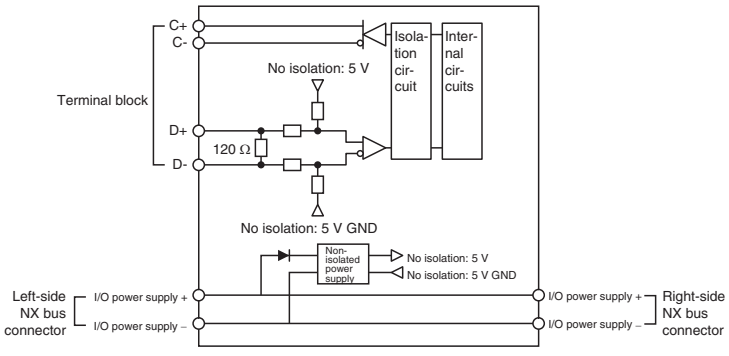
SSI input unit

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	Screwless push-in terminal	
Terminal type	12 terminals	12 terminals
Dimensions	12(W) x 100(H) x 71(D)	
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	

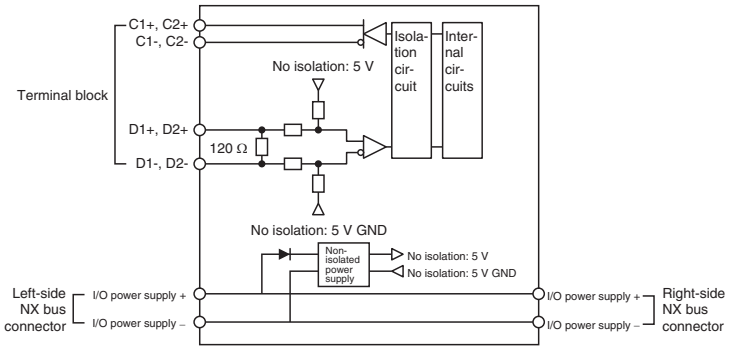
*1. The I/O refreshing method is automatically set according to the connected communication unit and CPU unit.
*2. The maximum transmission distance for an SSI input unit depends on the baud rate due to the delay that can result from the responsiveness of the connected encoder and cable impedance. The 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

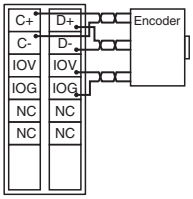


NX-ECS212

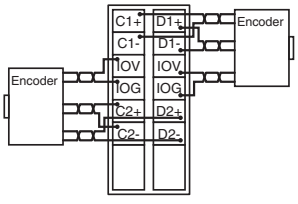


Terminal wiring

NX-ECS112



NX-ECS212



Pulse output unit

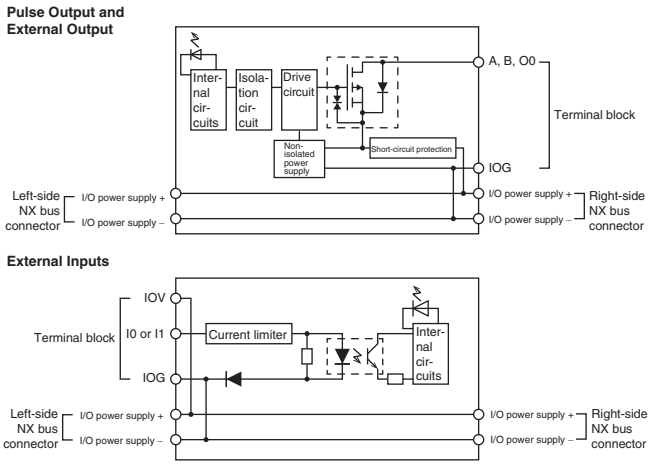
Item		Specifications
Model		**NX-PG0122**
Name		Pulse output unit
Number of axes		1 axis
I/O signals		External inputs: 2 general-purpose inputs External outputs: 3 (forward direction pulse, reverse direction pulse and a general-purpose outputs)
Control method		Open-loop control through pulse train output
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 μs max./2 μs max.
	Internal I/O common processing	PNP
External output specifications	**Rated voltage**	24 VDC (15 to 28.8 VDC)
	Maximum load current	30 mA
	ON/OFF response time	5 μs max./5 μs max.
	Internal I/O common processing	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 MΩ min. between isolated circuits (at 100 VDC)
Isolation method		External inputs: Photocoupler isolation External outputs: Digital isolator
Unit power consumption		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		Screwless push-in terminal
Terminal type		16 terminals
Dimensions		12(W) × 100(H) × 71(D)
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.

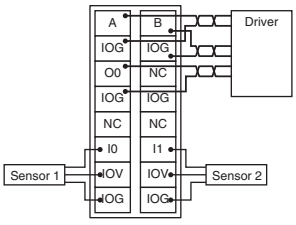
Circuit layout

NX-PG0122



Terminal wiring

NX-PG0122



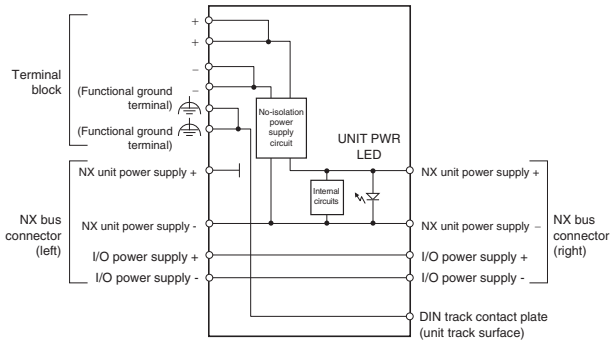
Power unit

Additional 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	Screwless push-in terminal
Terminal type	8 terminals
Dimensions	12(W) × 100(H) × 71(D)
Weight	65 g max.

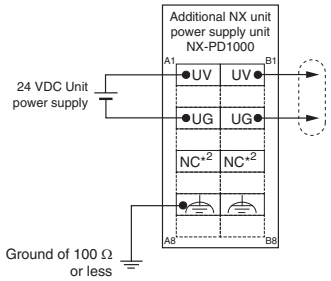
Circuit layout

NX-PD1000



Terminal wiring

NX-PD1000



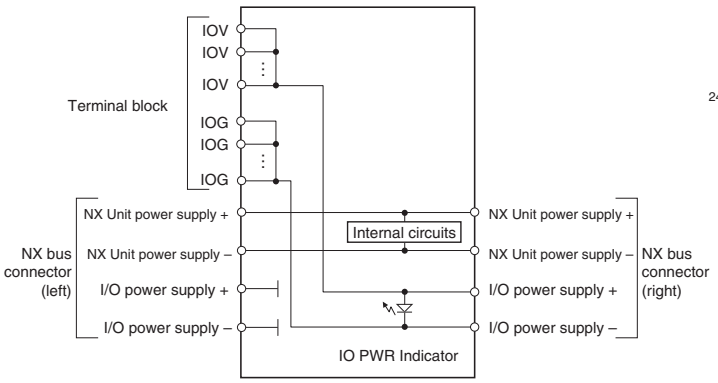
Additional I/O power supply unit

Item	Specifications
Model	**NX-PF0630**
Name	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
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.
Terminal block	Screwless push-in terminal
Terminal type	8 terminals
Dimensions	12(W) × 100(H) × 71(D)
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.

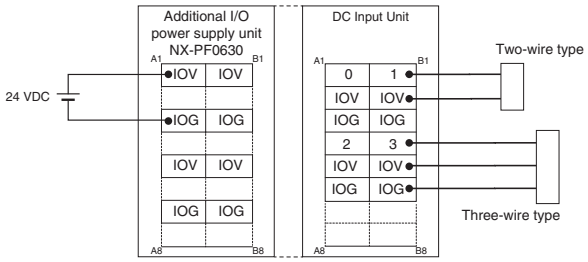
Circuit layout

NX-PF0630



Terminal wiring

NX-PF0630

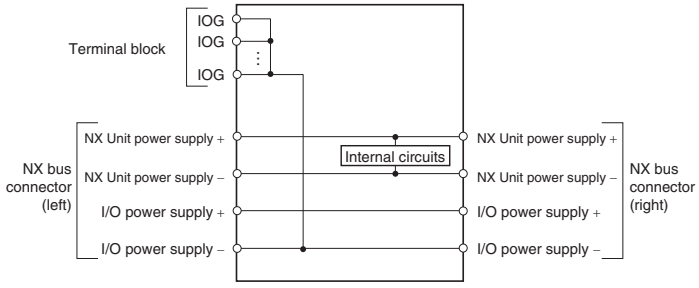


I/O power supply connection unit

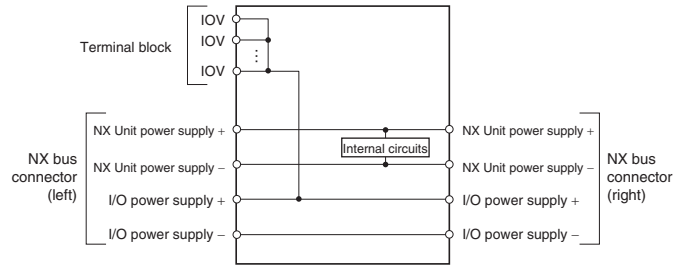
Item	Specifications		
Model	**NX-PC0010**	**NX-PC0020**	**NX-PC0030**
Name	I/O power supply connection unit		
Dielectric strength	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.		
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)		
Isolation method	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	Screwless push-in terminal		
Terminal type	16 terminals		
Number of I/O power supply terminals	IOG: 16 terminals	IOV: 16 terminals	IOG: 8 terminals IOV: 8 terminals
Dimensions	12(W) × 100(H) × 71(D)		
Weight	65 g max.		

Circuit layout

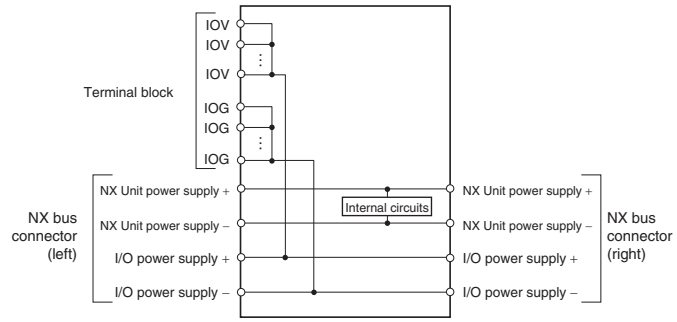
NX-PC0010



NX-PC0020

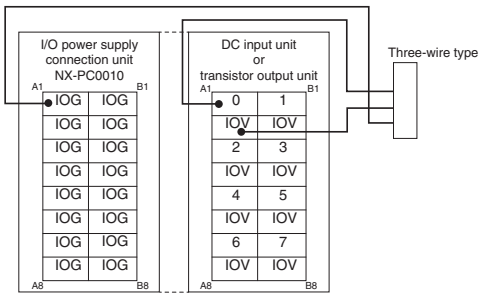


NX-PC0030

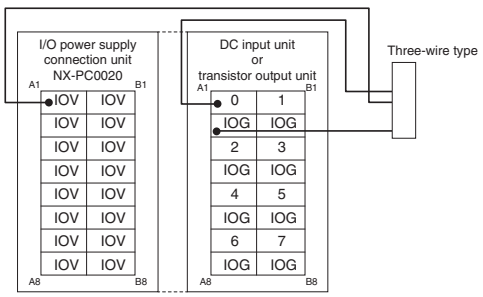


Terminal wiring

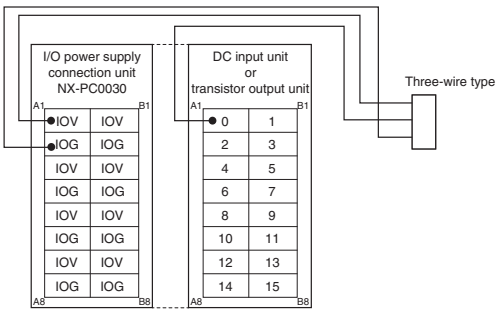
NX-PC0010



NX-PC0020



NX-PC0030



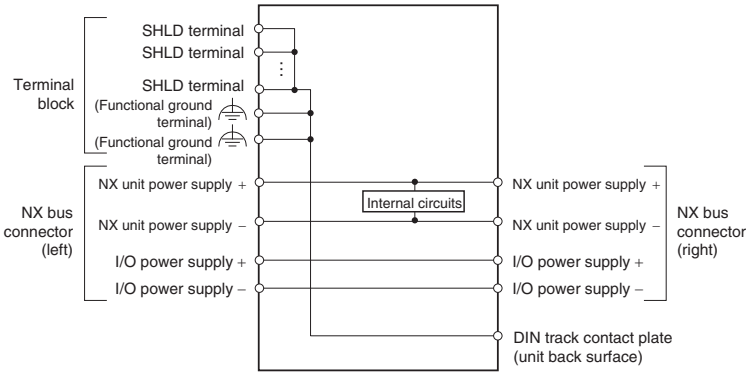
System unit

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	Screwless push-in terminal
Terminal type	16 terminals
Number of shield terminals	14 terminals (the following two terminals are functional ground terminals)
Dimensions	12(W) × 100(H) × 71(D)
Weight	65 g max.

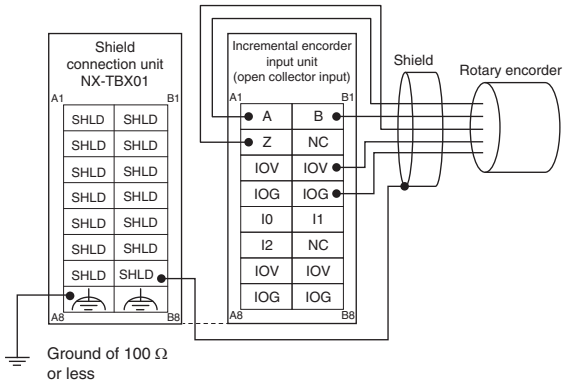
Circuit layout

NX-TBX01



Terminal wiring

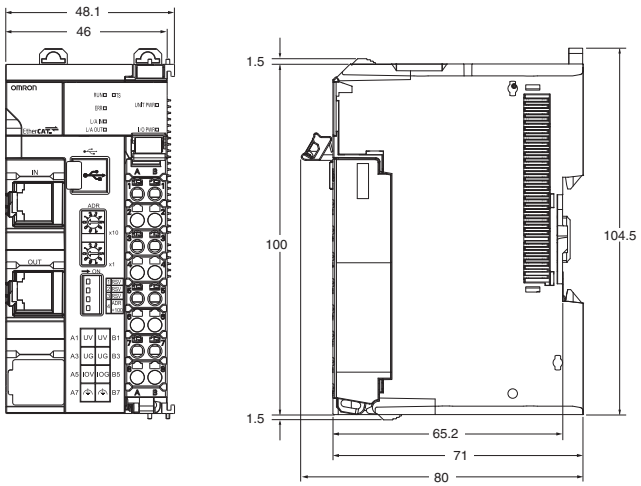
NX-TBX01



Dimensions

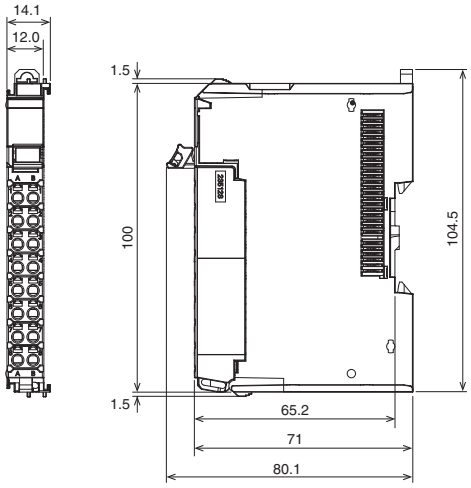
EtherCAT coupler unit

NX-ECC201

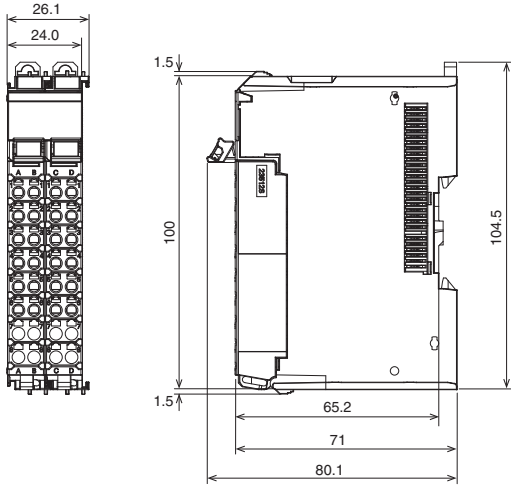


I/O unit

12 mm width

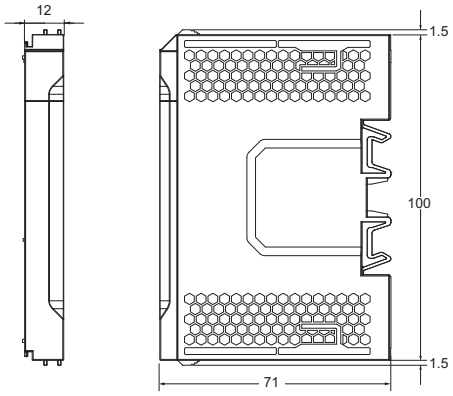


24 mm width



End cover unit (included with the EtherCAT coupler unit)

NX-END01



Ordering information

EtherCAT coupler unit

Type	Signal type	Specifications	Channels	Width	Model
EtherCAT communication coupler	EtherCAT slave	Up to 63 I/O units Max. 1024 bytes in + 1024 bytes out Supports distributed clock	2	46 mm	NX-ECC201

I/O unit

Digital I/O

Type	Signal type	Performance	Channels	Width	Model
Digital input	NPN type	Standard (< 0.4 ms On/Off delay)	4	12 mm	NX-ID3317
			8	12 mm	NX-ID4342
			16	12 mm	NX-ID5342
		High-speed (< 0.1 µs On/Off delay)	4	12 mm	NX-ID3343
		Time Stamp*1 function, High-speed (< 0.1 µs On/Off delay)	4	12 mm	NX-ID3344
	PNP type	Standard (< 0.4 ms On/Off delay)	4	12 mm	NX-ID3417
			8	12 mm	NX-ID4442
			16	12 mm	NX-ID5442
		High-speed (< 0.1 µs On/Off delay)	4	12 mm	NX-ID3443
		Time Stamp*1 function, High-speed (< 0.1 µs On/Off delay)	4	12 mm	NX-ID3444
Digital output	NPN type	Standard (< 0.8 ms On/Off delay)	4	12 mm	NX-OD3121
			8	12 mm	NX-OD4121
			16	12 mm	NX-OD5121
		High-speed (< 0.3 µs On/Off delay)	4	12 mm	NX-OD3153
		Time Stamp*1 function, High-speed (< 0.3 µs On/Off delay)	2	12 mm	NX-OD2154
	PNP type	Standard (< 1.0 ms On/Off delay)	4	12 mm	NX-OD3256
			8	12 mm	NX-OD4256
			16	12 mm	NX-OD5256
		High-speed (< 0.3 µs On/Off delay)	4	12 mm	NX-OD3257
		Time Stamp*1 function, High-speed (< 0.3 µs On/Off delay)	2	12 mm	NX-OD2258
	Relay contact	Normally Open, 250 VAC, 2 A	2	12 mm	NX-OC2633

*1. Please contact your OMRON sales representative for details on availability.

Analog I/O

Type	Signal type		Performance	Channels	Width	Model
Analog input	4 to 20 mA	Single ended	1/8,000 resolution 250 µs/channel	2	12 mm	NX-AD2203
				4	12 mm	NX-AD3203
				8	12 mm	NX-AD4203
		Differential		2	12 mm	NX-AD2204
				4	12 mm	NX-AD3204
				8	12 mm	NX-AD4204
			1/30,000 resolution 250 µs/channel	2	12 mm	NX-AD2208
				4	12 mm	NX-AD3208
				8	12 mm	NX-AD4208
	±10 V	Single ended	1/8,000 resolution 250 µs/channel	2	12 mm	NX-AD2603
				4	12 mm	NX-AD3603
				8	12 mm	NX-AD4603
		Differential		2	12 mm	NX-AD2604
				4	12 mm	NX-AD3604
				8	12 mm	NX-AD4604
			1/30,000 resolution 10 µs/channel	2	12 mm	NX-AD2608
				4	12 mm	NX-AD3608
				8	12 mm	NX-AD4608
Analog output	4 to 20 mA		1/8,000 resolution 250 µs/channel	2	12 mm	NX-DA2203
				4	12 mm	NX-DA3203
			1/30,000 resolution 10 µs/channel	2	12 mm	NX-DA2205
				4	12 mm	NX-DA3205
	±10 V		1/8,000 resolution 250 µs/channel	2	12 mm	NX-DA2603
				4	12 mm	NX-DA3603
			1/30,000 resolution 10 µs/channel	2	12 mm	NX-DA2605
				4	12 mm	NX-DA3605

Temperature input

Type		Performance	Channels	Width	Model
Temperature input	Thermocouple type B,E,J,K,L,N,R,S,T,U,WRe5-26,PLII	0.1°C resolution 250 ms/channel	2	12 mm	NX-TS2101
			4	24 mm	NX-TS3101
	RTD type Pt100 (3-wire), Pt1000, Ni508.4	0.1°C resolution 250 ms/channel	2	12 mm	NX-TS2201
			4	24 mm	NX-TS3201

Position interface

Type		Performance	Channels	Width	Model
Encoder input	Incremental encoder	PNP type, 500 kHz	1	12 mm	NX-EC0122
			2	12 mm	NX-EC0222
		Line driver, 4 MHz	1	24 mm	NX-EC0142
	SSI encoder	Synchronous serial, 2 MHz	1	12 mm	NX-ECS112
			2	12 mm	NX-ECS212
Pulse output	Pulse up/down (pulse + direction)	PNP type, 500 kHz	1	12 mm	NX-PG0122

Power unit

Type	Specifications	Width	Model
Additional NX bus power supply unit	24 VDC input, non-isolated	12 mm	NX-PD1000
Additional I/O power supply unit	For separation of groups	12 mm	NX-PF0630
I/O power supply connection unit	16 × IOG	12 mm	NX-PC0010
	16 × IOV	12 mm	NX-PC0020
	8 × IOG + 8 × IOV	12 mm	NX-PC0030

System unit

Type	Specifications	Width	Model
End cover	Included with communication coupler	12 mm	NX-END01
Shield connection unit (grounding terminal)	16 points	12 mm	NX-TBX01

Accessories

Name	Specifications	Model
DIN track insulation spacers	A spacer to insulate the control panel from the DIN track	NX-AUX01
Terminal block coding pins	For 10 units (Terminal block: 30 pins, unit: 30 pins)	NX-AUX02
End plate	End plate to secure the units on the DIN track	PFP-M

Machine controller

Name		Model
NJ-series (firmware version 1.05 or higher)	CPU unit	NJ501-□
		NJ301-□
	Power supply unit	NJ-PA3001 (220 VDC)
		NJ-PD3001 (24 VDC)

Computer software

Specifications	Model
Sysmac Studio version 1.06 or higher*1	SYSMAC-SE2□□□

*1. Please contact your OMRON representative for Sysmac Studio version supporting digital I/O units with Time Stamp function.

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-01A In the interest of product improvement, specifications are subject to change without notice.

GX-□

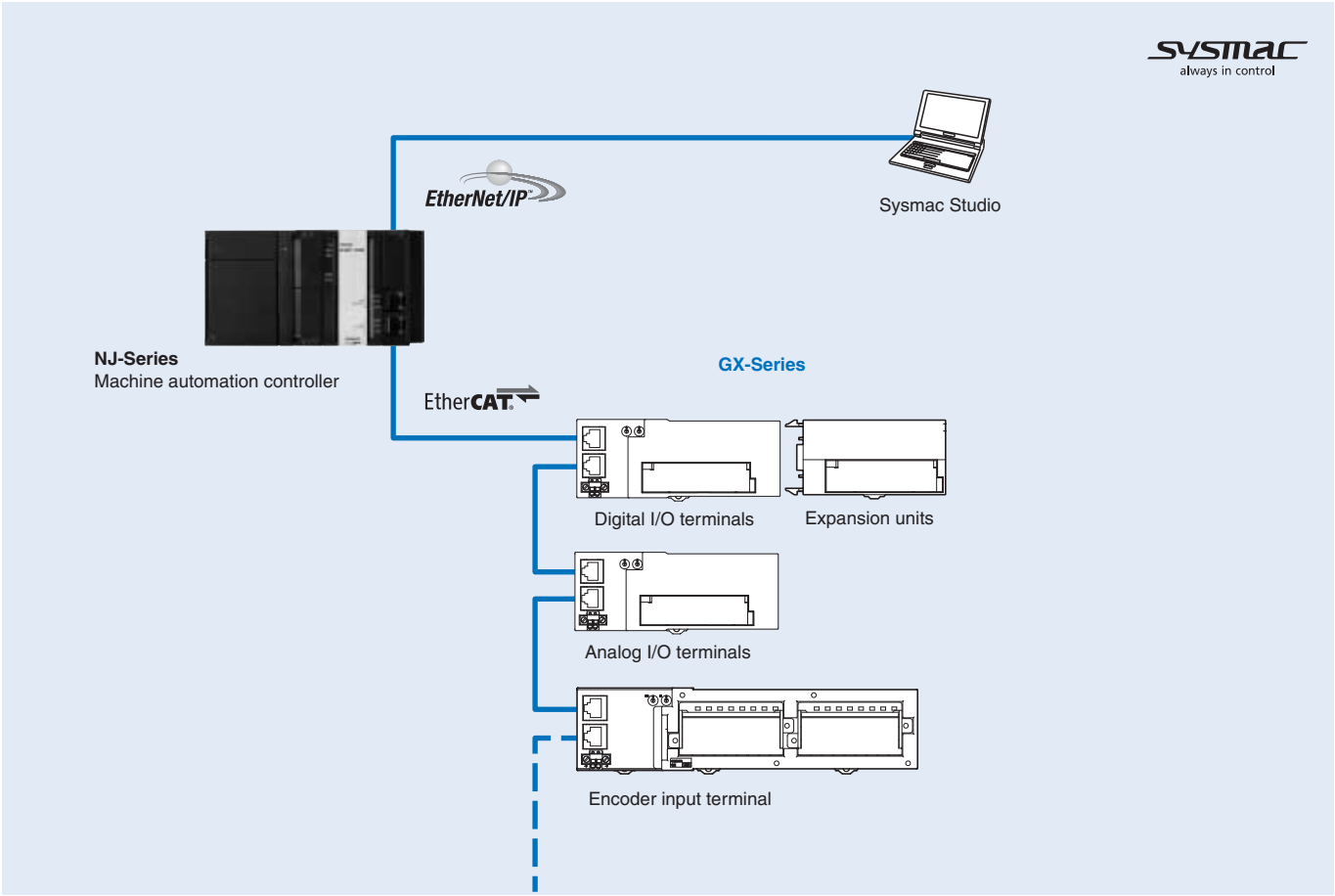
GX-Series I/O

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



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 ADC, between each output terminal and the G terminal)	1.2 V max. (0.5 ADC, 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 ADC, between each output terminal and the G terminal)	1.2 V max. (0.5 ADC, 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).

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. (0.5 ADC, between each output terminal and the G terminal)	1.2 V max. (0.5 ADC, 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. (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	
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) 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. (0.5 ADC, between each output terminal and the G terminal)	1.2 V max. (0.5 ADC, 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).

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 1 to 5 V 0 to 10 V –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 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) ±10 V: F060 to 0FA0 Hex full scale (–4000 to +4000) A/D conversion range: ±5% FS of the above data ranges.	
Isolation method		Photocoupler isolation (between input and communications lines) 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 1 to 5 V 0 to 10 V –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) ±10 V: F060 to 0FA0 Hex full scale (–4000 to +4000) D/A conversion range: ±5% FS of the above data ranges.	
Isolation method		Photocoupler isolation (between output and communications lines) 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 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	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 (24 VDC –15 to +10%)	4.5 to 5.5 VDC (5 VDC ±5%)	20.4 to 26.4 VDC (24 VDC –15 to +10%)	4.5 to 5.5 VDC (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.	

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 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. (0.5 A DC, between each output terminal and the G terminal)	1.2 V max. (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.	

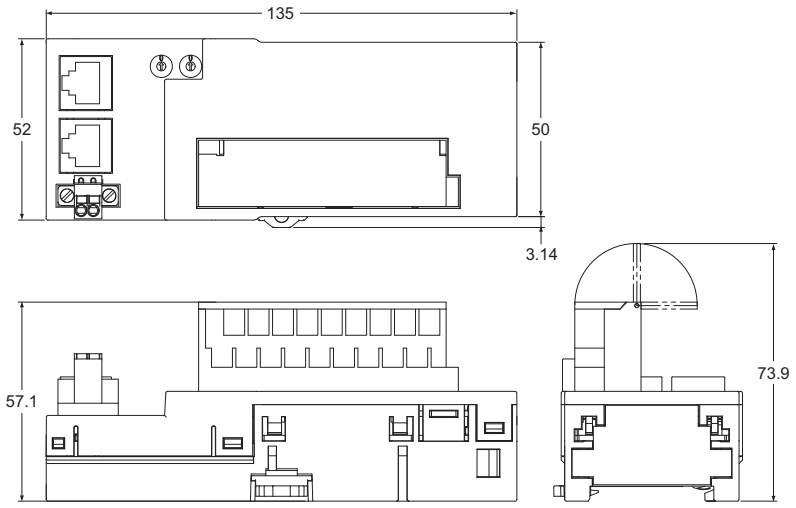
16-point output-point

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. (0.5 A DC, between each output terminal and the G terminal)	1.2 V max. (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.	

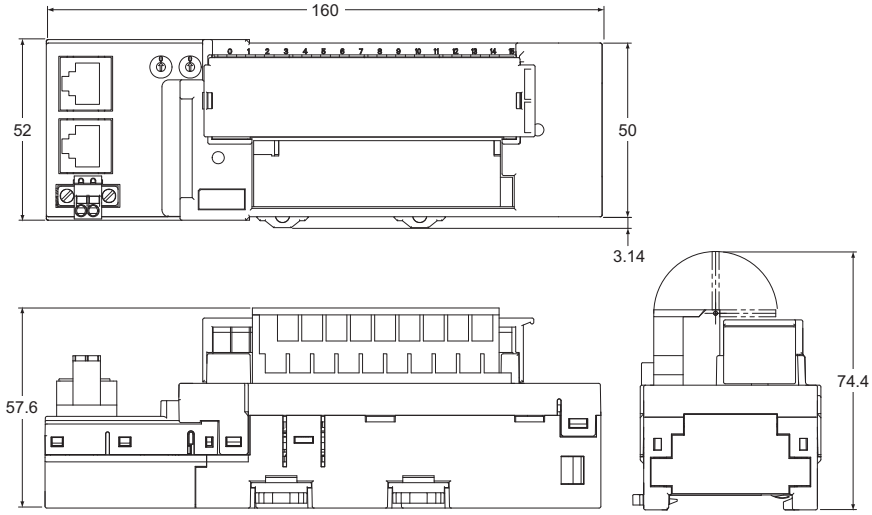
Dimensions

Digital I/O

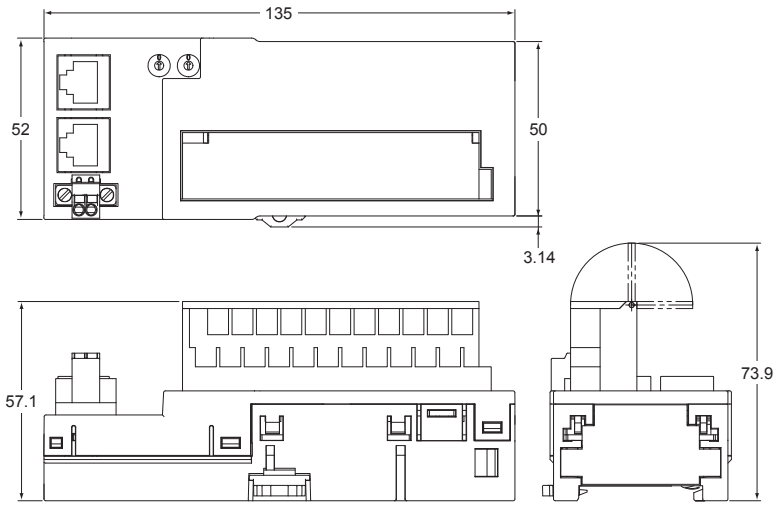
GX-ID1611/ID1621, GX-OD1611/OD1621



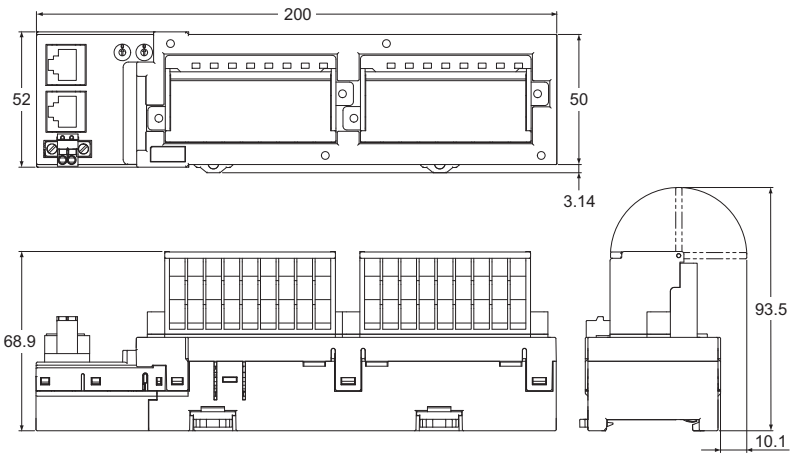
GX-OC1601



GX-MD1611/MD1621

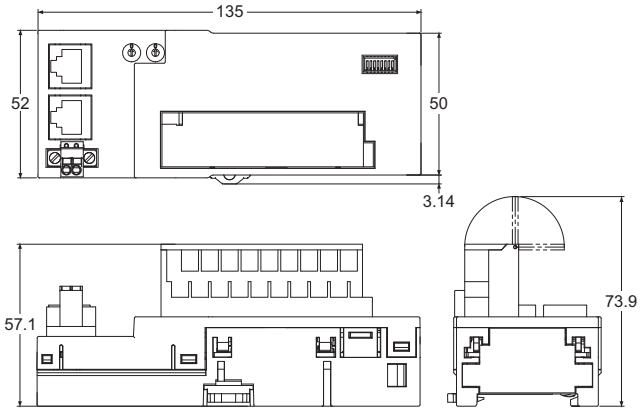


GX-ID1612/ID1622, GX-OD1612/OD1622, GX-MD1612/MD1622



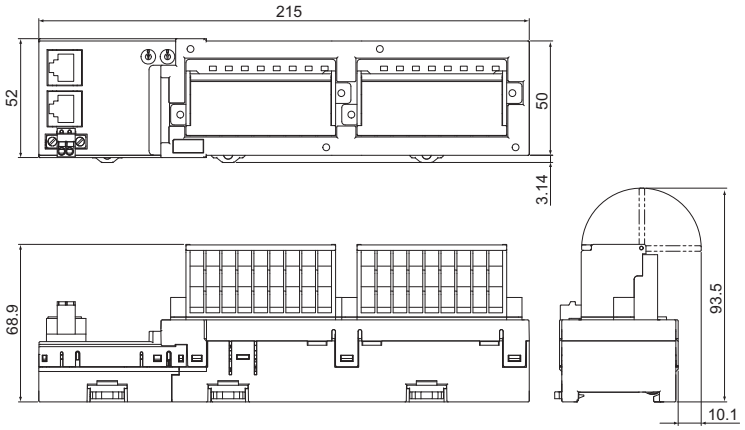
Analog I/O

GX-AD0471/DA0271



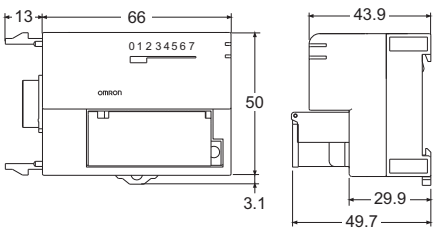
Encoder Input

GX-EC0211/EC0241

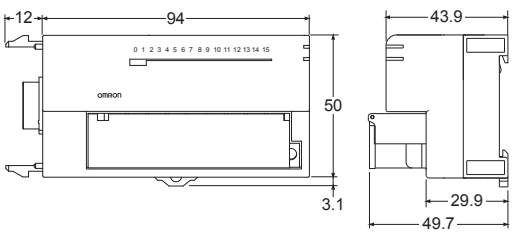


Expansion Units

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

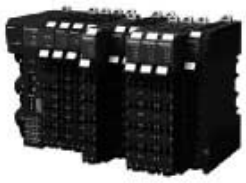
Expansion Units

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-01A In the interest of product improvement, specifications are subject to change without notice.

	Safety controller
	
Model	**NX safety controller**
Network specification	FSoE – Safety over EtherCAT
Performance level	PLe (EN ISO 13849-1)
Safety integrity level	SIL3 (IEC 61508)
PFH	4.4E-10
PFD	7.0E-06 (20 years)
TM (Mission time)	20 years
Programming	• IEC 61131-3 standard • 79 Safety FB/FUN
Safety connections	32 connections
I/O connection	Screwless push-in terminals
Features	• Freely mix with standard NX I/O • Flexibility and reusability of the programming code • Variables are part of the NJ controller project
Mounting	DIN rail
Page	95

	Safety I/O	
		
Model	**NX safety input unit**	**NX safety output unit**
Network specification	FSoE – Safety over EtherCAT	FSoE – Safety over EtherCAT
Performance level	PLe (EN ISO 13849-1)	PLe (EN ISO 13849-1)
Safety integrity level	SIL3 (IEC 61508)	SIL3 (IEC 61508)
PFH	3.80E-10	8.80E-10
PFD	6.6E-06	7.9E-06
TM (Mission time)	20 years	20 years
I /O signal	• 4 points • 8 points	• 2 points • 4 points
Number of test outputs	2	–
I/O connection	Screwless push-in terminals	Screwless push-in terminals
Maximum load current	–	• 2 A • 0.5 A
Features	• Freely mix with standard NX I/O • High connectivity for direct connection to safety input devices • I/O data monitoring in the NJ controller project	• Freely mix with standard NX I/O • High connectivity for direct connection to safety input devices • I/O data monitoring in the NJ controller project
Mounting	DIN rail	DIN rail
Page	95	95

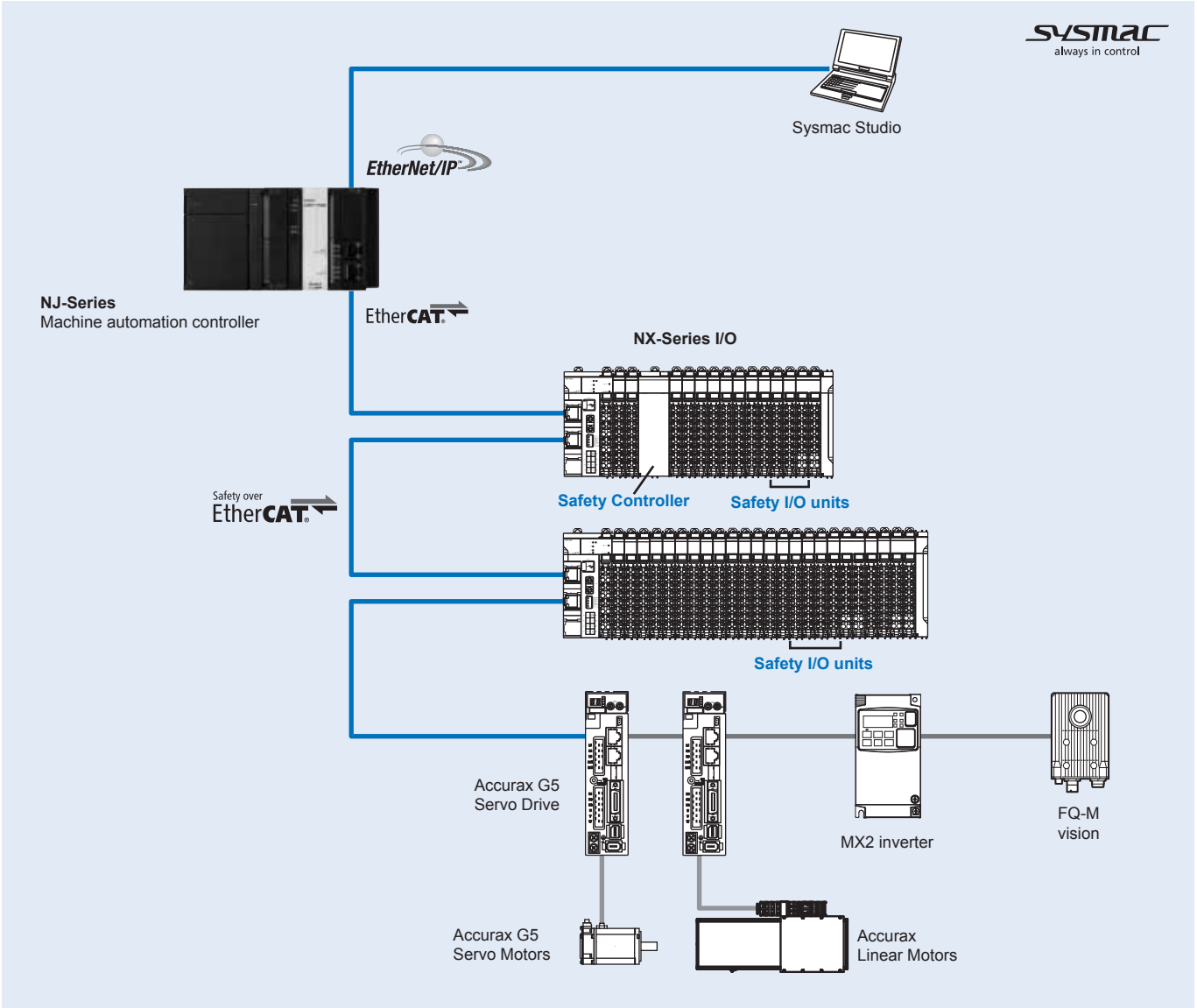
NX-S□

NX safety control

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
- 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

System configuration



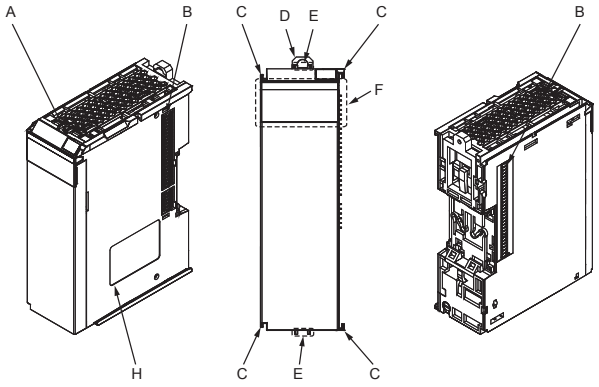
Specifications

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 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 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 60068-2-27 147 m/s^2, 3 times each in X, Y and Z directions
	Insulation resistance	20 MΩ between isolated circuits (at 100 VDC)
	Dielectric strength	500 VAC for 1 min between isolated circuits, leakage current: 10 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 IEC 61508: 2010 SIL 3, IEC/EN 62061: 2005 SIL CL3 IEC 61131-2: 2007, UL 1998 cULus: listed (UL508), ANSI/ISA 12.12.01 EC: EN 61131-2, C-Tick

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.
H	Unit specifications	The specifications of the NX unit are given here.

Safety controller unit

Item	Specifications
Model	**NX-SL3300**
Name	Safety CPU unit
Maximum number of safety I/O points	256 points
Program capacity	512 KB
Number of safety master connections	32
External connection terminals	None
Unit power consumption	0.85 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	30(W) × 100(H) × 71(D)
Weight	75 g max.

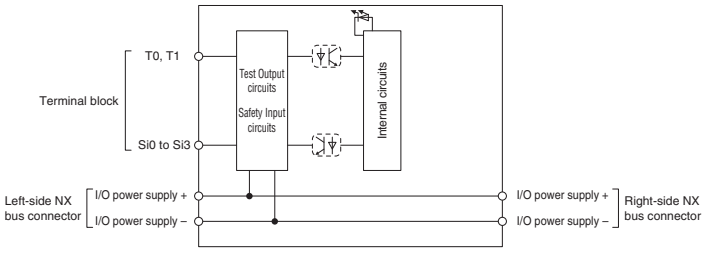
Safety I/O unit

Safety input unit

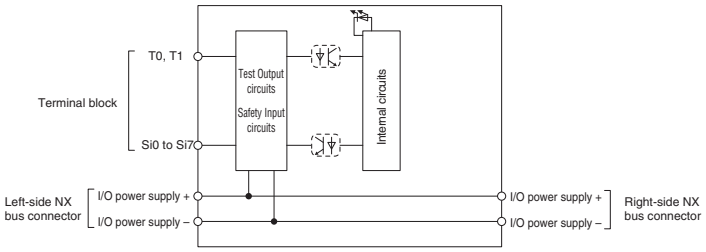
Item	Specifications	
Model	**NX-SIH400**	**NX-SID800**
Name	Advanced safety input unit	Safety input unit
Number of safety inputs	4 points	8 points
Number of test outputs	2 points	
Internal I/O common	Sinking (PNP)	
Rated input voltage	24 VDC	
OMRON special safety input devices	Can be connected	Cannot be connected
Number of safety slave connections	1	
Safety input current	4.5 mA	3.0 mA
Safety input ON voltage	11 VDC min.	
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.	
Residual ON voltage of test outputs	1.2 V max.	
Leakage current of test outputs	0.1 mA max.	
Dielectric strength	500 VAC for 1 min between isolated circuits, leakage current: 10 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	Screwless push-in terminals	
Terminal type	8 terminals	16 terminals
Dimensions	12(W) × 100(H) × 71(D)	
Weight	66 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

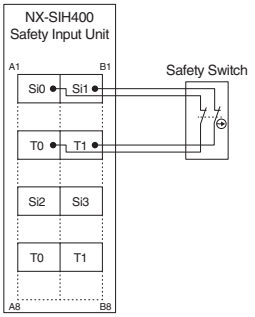


NX-SID800

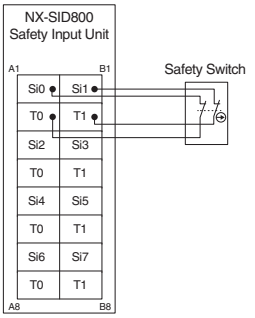


Terminal wiring

NX-SIH400



NX-SID800

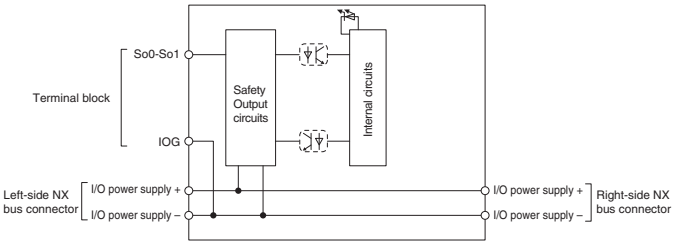


Safety output unit

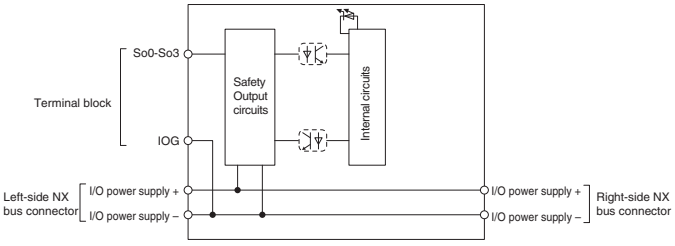
Item	Specifications	
Model	**NX-SOH200**	**NX-SOD400**
Name	High-current safety output unit	Safety output unit
Number of safety outputs	2 points	4 points
Internal I/O common	Sourcing outputs (PNP)	
Maximum load current	2.0 A/point, 4.0 A/unit at 40ºC, 2.5 A/unit at 55ºC The maximum load current depends 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	500 VAC for 1 min between isolated circuits, leakage current: 10 mA max.	
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	
Isolation method	Photocoupler isolation	
Unit power consumption	0.65 W max.	0.70 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	
I/O refreshing method	Free-run refreshing	
Terminal block	Screwless push-in terminals	
Terminal type	8 terminals	
Dimensions	12(W) × 100(H) × 71(D)	
Weight	65 g max.	
Maximum cable length	100 m	
Protective functions	Overvoltage protection circuit and ground fault detection	

Circuit layout

NX-SOH200

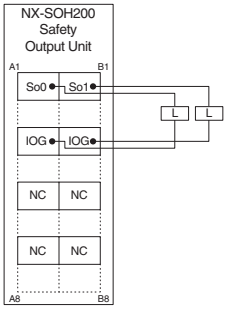


NX-SOD400

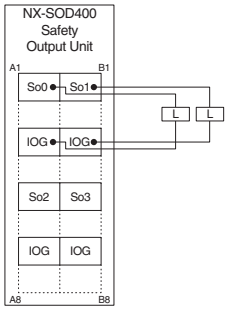


Terminal wiring

NX-SOH200



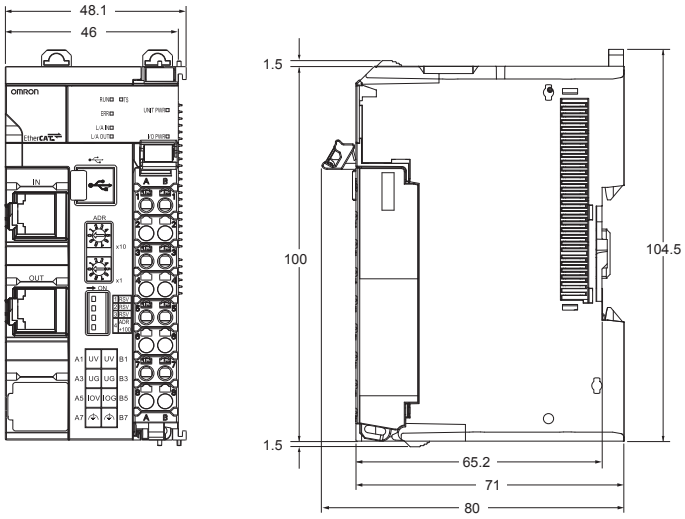
NX-SOD400



Dimensions

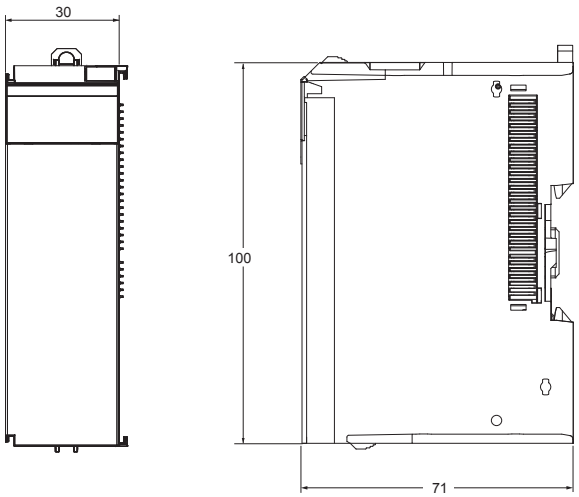
EtherCAT coupler unit

NX-ECC201



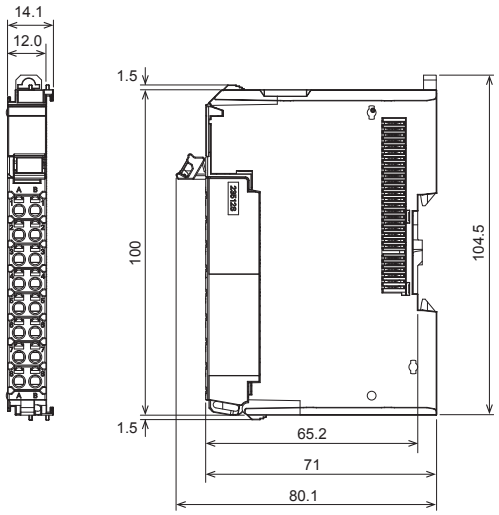
Safety controller unit

NX-SL3300



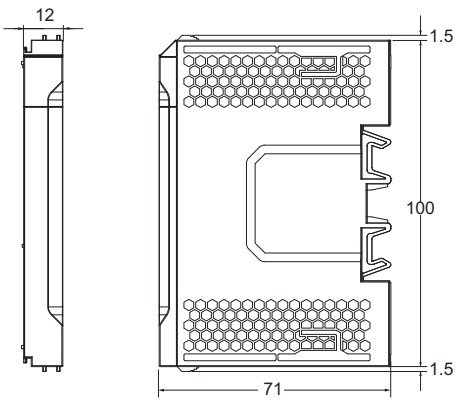
Safety I/O unit

12 mm width



End cover unit (included with the EtherCAT coupler unit)

NX-END01



Ordering information

EtherCAT coupler unit

Type	Signal type	Specifications	Channels	Width	Model
EtherCAT communication coupler*1	EtherCAT slave	Up to 63 I/O units Max. 1024 bytes in + 1024 bytes out Supports distributed clock	2	46 mm	NX-ECC201

*1. The NX safety units require an EtherCAT coupler unit version 1.1 or higher.

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

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

Computer software

Name
Sysmac Studio*1

*1. Please contact your OMRON representative for detailed specifications and ordering information.

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-01 In the interest of product improvement, specifications are subject to change without notice.

Selection table – AC servo system

	Servo drive	
		
Model	**Accurax G5**	
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	EtherCAT
Safety approvals	PLd (EN ISO 13849-1) SIL2 (IEC 61508)	PLd (EN ISO 13849-1) SIL2 (IEC 61508)
Safety function	STO	STO
Full closed loop	Built-in	N/A
Page	105	119

	Servo motor			
				
Model	**Accurax G5 rotary motor**			
Rated speed	3,000 rpm	2,000 rpm	1,500 rpm	1,000 rpm
Maximum speed	4,500 to 6,000 rpm	3,000 rpm	2,000 to 3,000 rpm	2,000 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
Sizes	50 W to 5 kW	400 W to 5 kW	7,5 kW to 15 kW	900 W to 6 kW
Applicable servo drive	Accurax G5 rotary servo drive	Accurax G5 rotary servo drive	Accurax G5 rotary servo drive	Accurax G5 rotary servo drive
Encoder resolution	20-bit incremental/ 17-bit absolute	20-bit incremental/ 17-bit absolute	17-bit absolute	20-bit incremental/ 17-bit absolute
IP rating	IP67	IP67	IP67	IP67
Page	131	131	131	131

	Servo motor	
		
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	Accurax G5 linear drive
Page	153	153

	Servo motor	
		
Model	**Accurax G5 high inertia rotary motor**	
Rated speed	2,000 rpm	1,500 rpm
Maximum speed	3,000 rpm	1,500 to 3,000 rpm
Rated torque	4.77 Nm to 23.9 Nm	47.8 Nm
Sizes	1 kW to 5 kW	7,5 kW
Applicable servo drive	Accurax G5 rotary servo drive	Accurax G5 rotary servo drive
Encoder resolution	20-bit incremental/ 17-bit absolute	17-bit absolute
IP rating	IP67	IP67
Page	131	131

R88D-KN□□□-ECT

Accurax G5 rotary drive

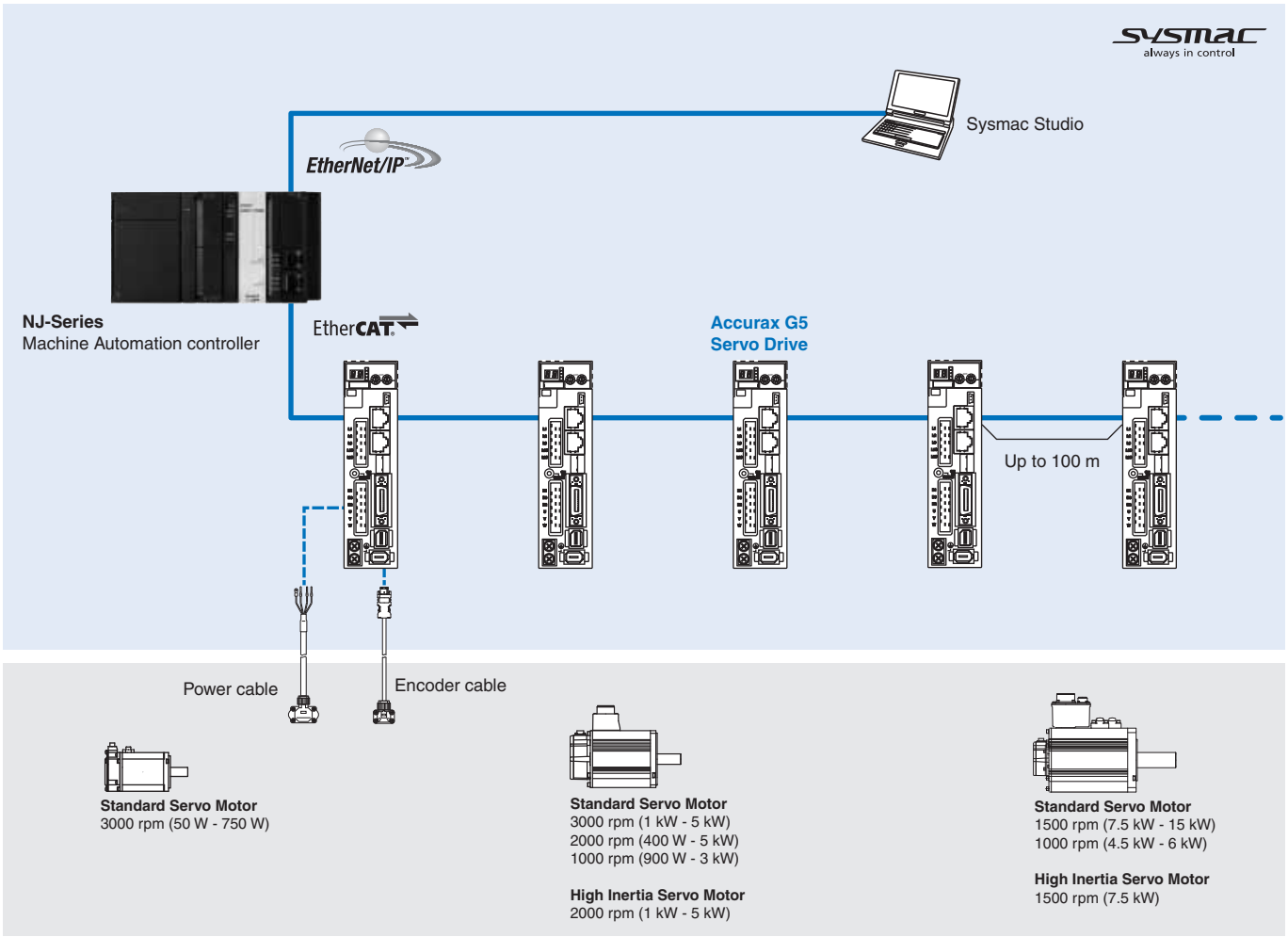
Accurate motion control in a compact size servo drive family. EtherCAT and safety built-in.

- 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)

System configuration



Servo motor supported

Standard servo motors

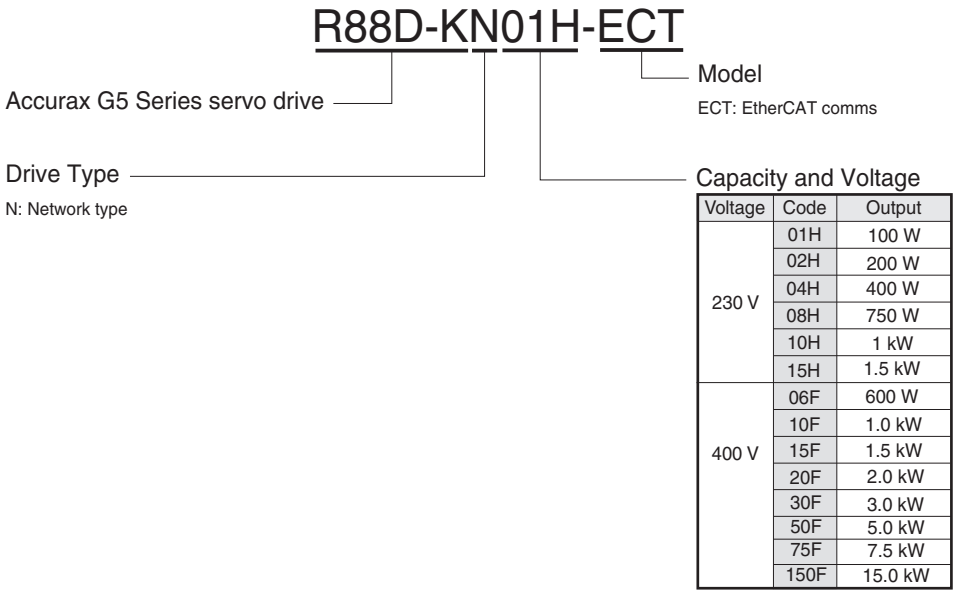
Accurax G5 rotary servo motor						Servo drive model
	Voltage	Speed	Rated torque	Capacity	Model	G5 EtherCAT
	230 V	3000 min^{-1}	0.16 Nm	50 W	R88M-K05030(H/T)-□	R88D-KN01H-ECT
			0.32 Nm	100 W	R88M-K10030(H/T)-□	R88D-KN01H-ECT
			0.64 Nm	200 W	R88M-K20030(H/T)-□	R88D-KN02H-ECT
			1.3 Nm	400 W	R88M-K40030(H/T)-□	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
	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
230 V (1 kW - 1.5 kW) 400 V (400 W - 5 kW)			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
	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
		1500 min^{-1}	47.8 Nm	7500 W	R88M-KH7K515C-□	R88D-KN75F-ECT
7.5 kW						

Type designation

Servo drive



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)-□
Basic specifications	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)					
	Conditions	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

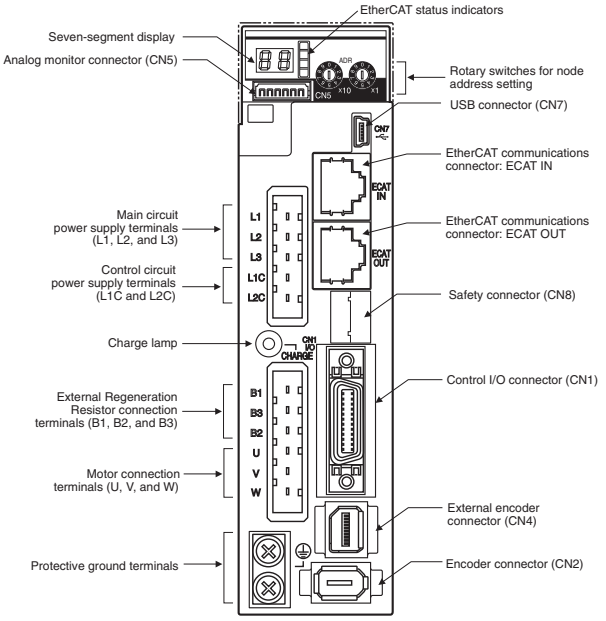
Servo drive type			R88D-KN	06F-ECT	10F-ECT	15F-ECT	20F-ECT	30F-ECT	50F-ECT	75F-ECT	150F-ECT
Applicable servo motor			R88M-K□	40020(F/C)-□	75030(F/C)-□	1K030(F/C)-□	2K030(F/C)-□	3K030(F/C)-□	4K030(F/C)-□	6K010C-□	11K015C-□
				60020(F/C)-□	1K020(F/C)-□	1K530(F/C)-□	2K020(F/C)-□	3K020(F/C)-□	5K030(F/C)-□	7K515C-□	15K015C-□
				–	–	1K520(F/C)-□	–	2K010(F/C)-□	4K020(F/C)-□	–	–
				–	–	90010(F/C)-□	–	–	5K020(F/C)-□	–	–
				–	–	–	–	–	4K510C-□	–	–
				–	–	–	–	–	3K010(F/C)-□	–	–
Basic specifications	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	
	Conditions	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) Homing mode Position profile mode Dual touch probe function (Latch function) 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 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 ECAT IN: EtherCAT input × 1 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 ERR × 1 L/A IN (Link/Activity IN) × 1 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… The monitoring signals to output and their scaling can be specified with parameters. 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	Main power supply input terminal	AC power input terminals for the main circuit **Note:** for single-phase servo drives connect the power supply input to L1 and L3.
L2		
L3		
L1C	Control power supply input terminal	AC power input terminals for the control circuit (for 200 V single/three-phase servo drives only).
L2C		
24 V		DC power input terminals for the control circuit (for 400 V three-phase servo drives only).
0 V		
B1	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. 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.
B2		
B3		
DB1	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.
DB2		
DB3		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.
DB4		
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 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	

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. 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. 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	–	

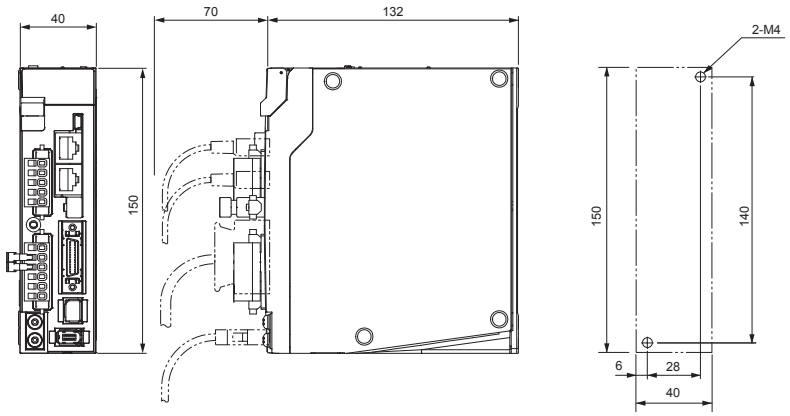
Safety connector (CN8)

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.

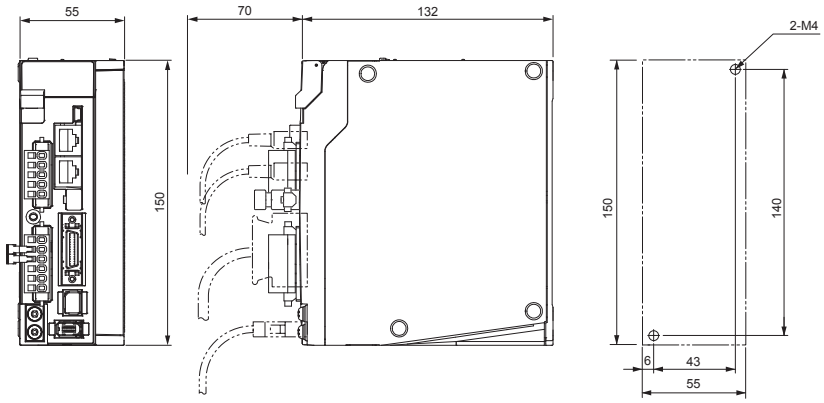
Dimensions

Servo drives

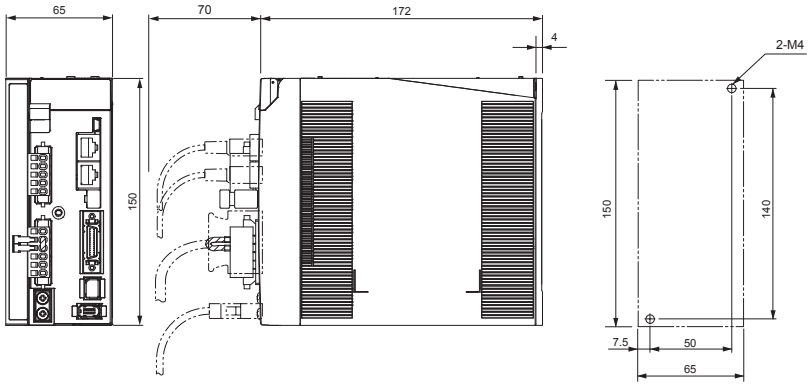
R88D-KN01H/02H-ECT (230 V, 100 to 200 W)



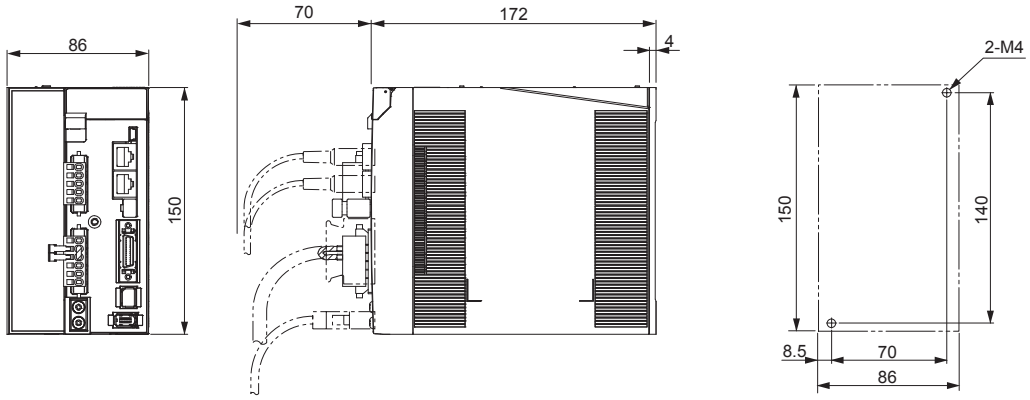
R88D-KN04H-ECT (230 V, 400 W)



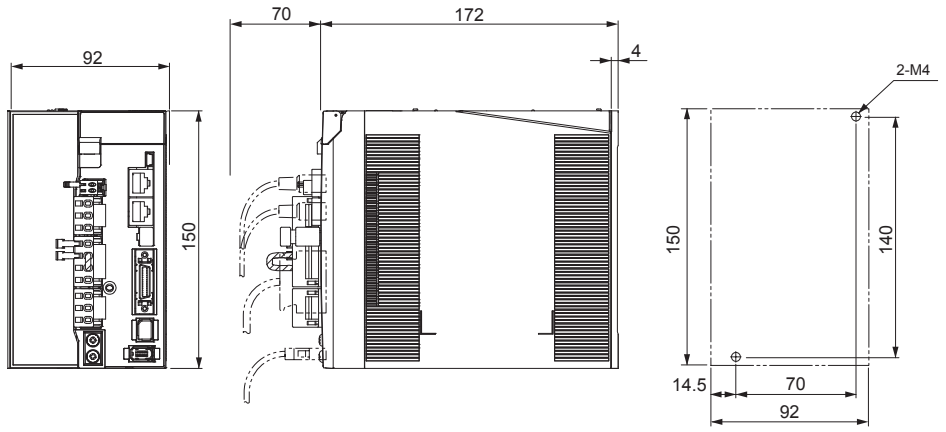
R88D-KN08H-ECT (230 V, 750 W)



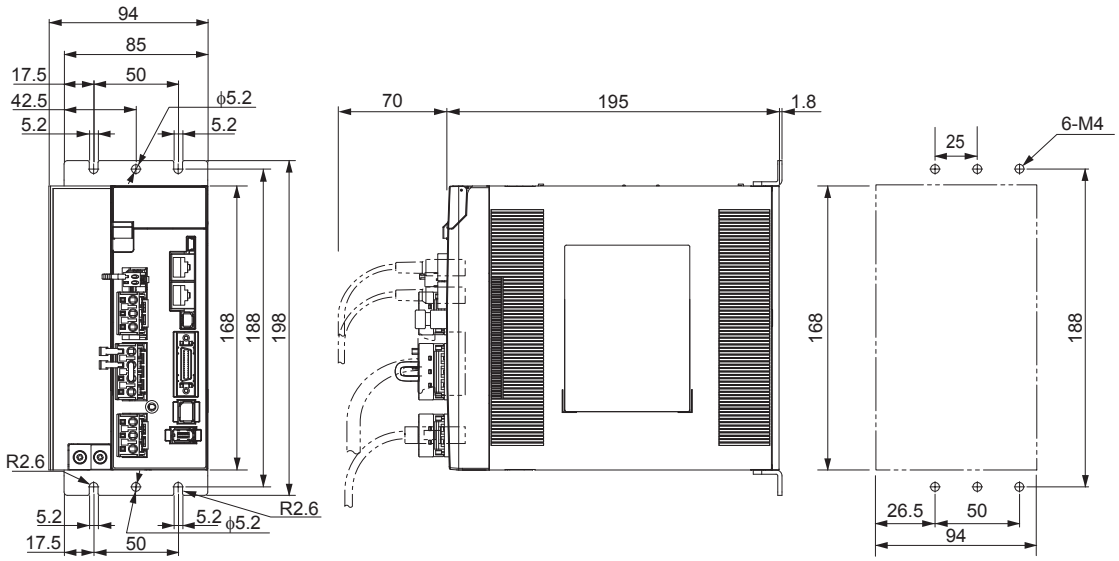
R88D-KN10H/15H-ECT (230 V, 1 to 1.5 kW)



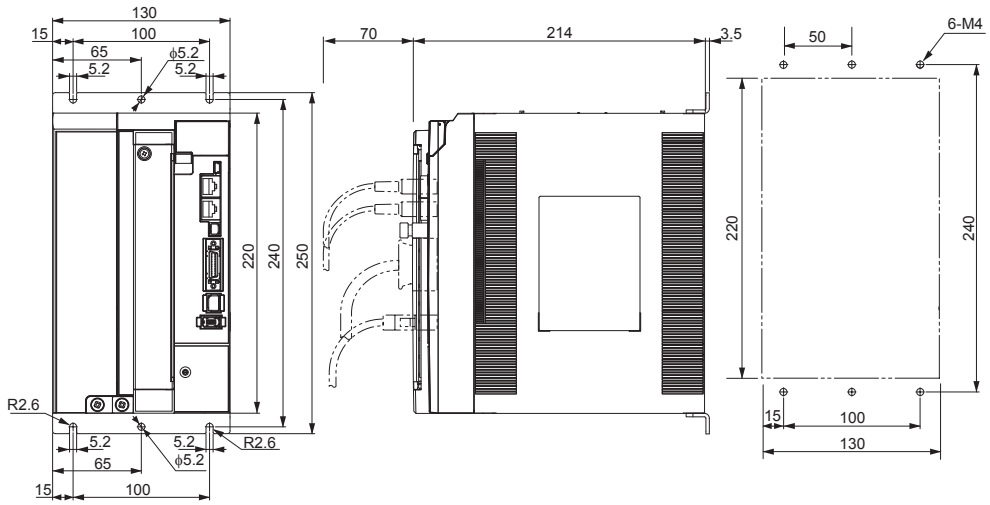
R88D-KN06F/10F/15F-ECT (400 V, 600 W to 1.5 kW)



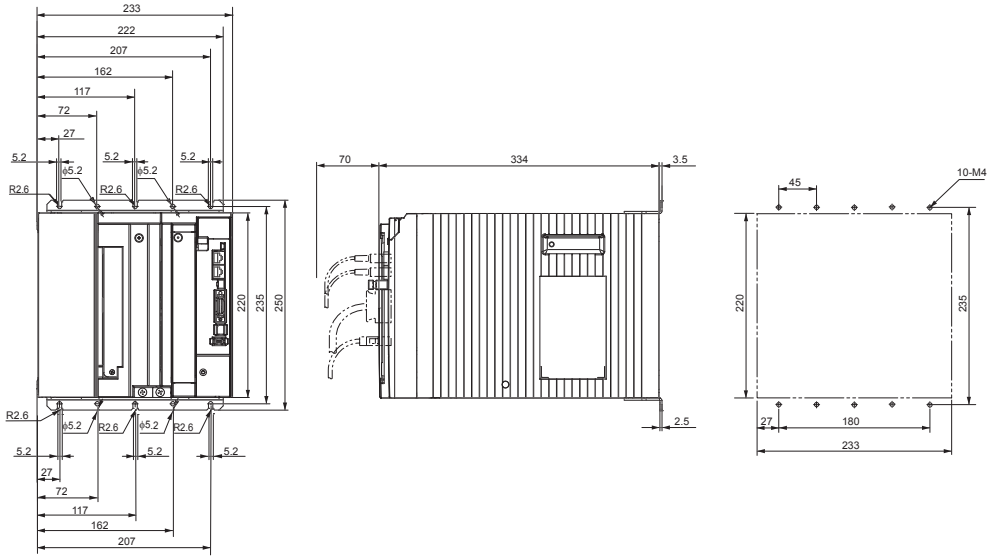
R88D-KN20F-ECT (400 V, 2 kW)



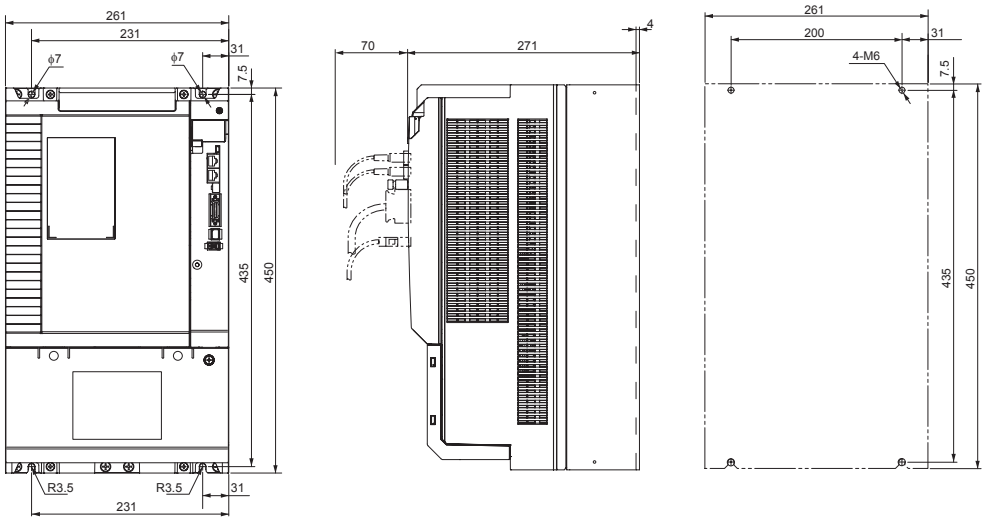
R88D-KN30F/50F-ECT (400 V, 3 to 5 kW)



R88D-KN75F-ECT (400 V, 7.5 kW)

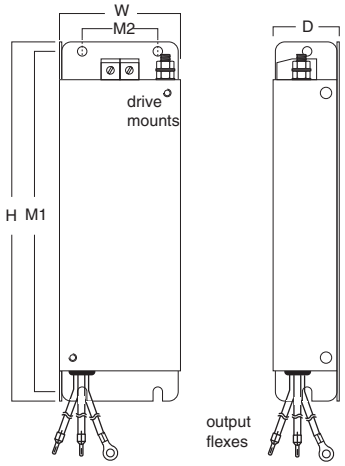


R88D-KN150F-ECT (400 V, 15 kW)



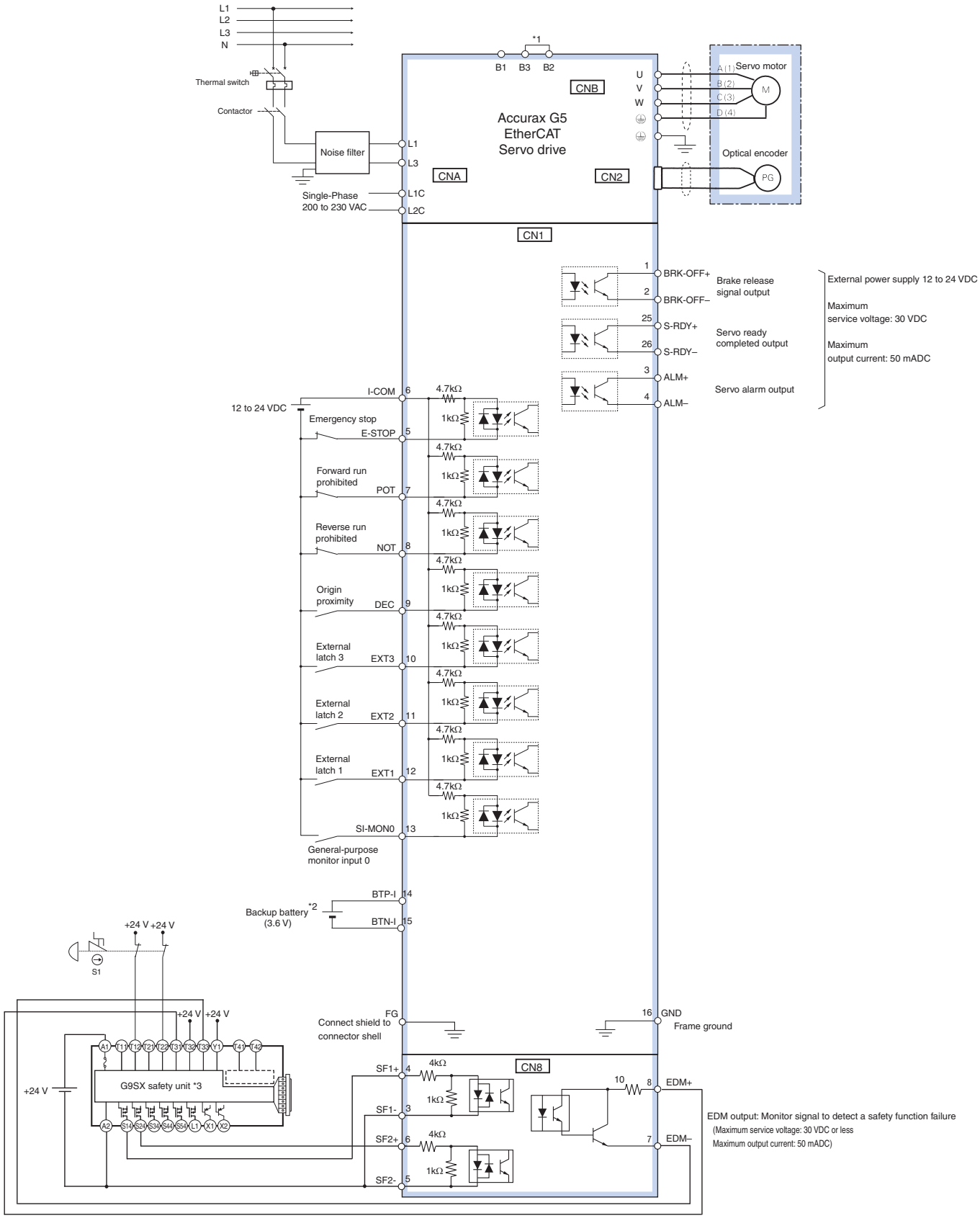
Filters

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



Installation

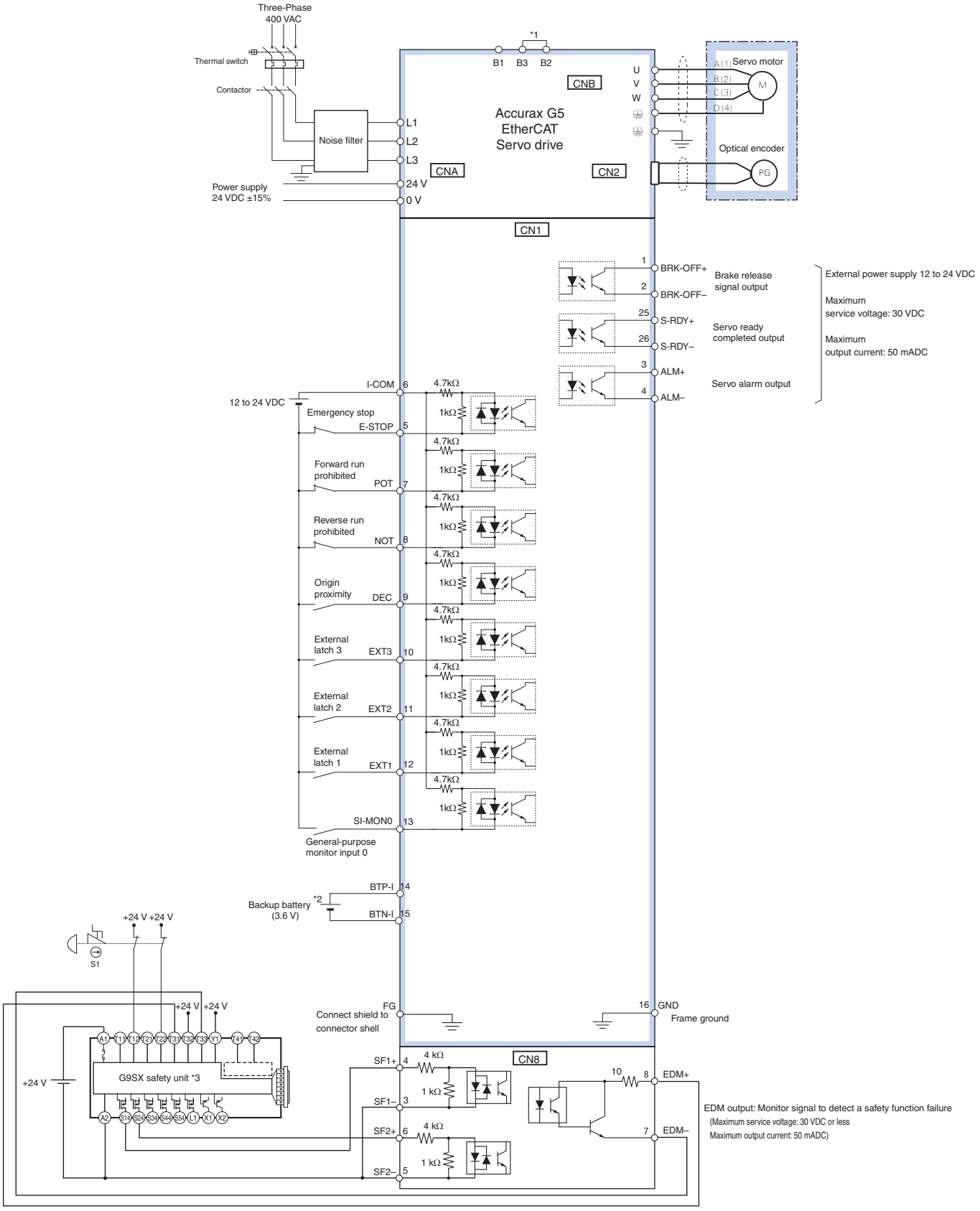
Single-phase, 230 VAC



*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

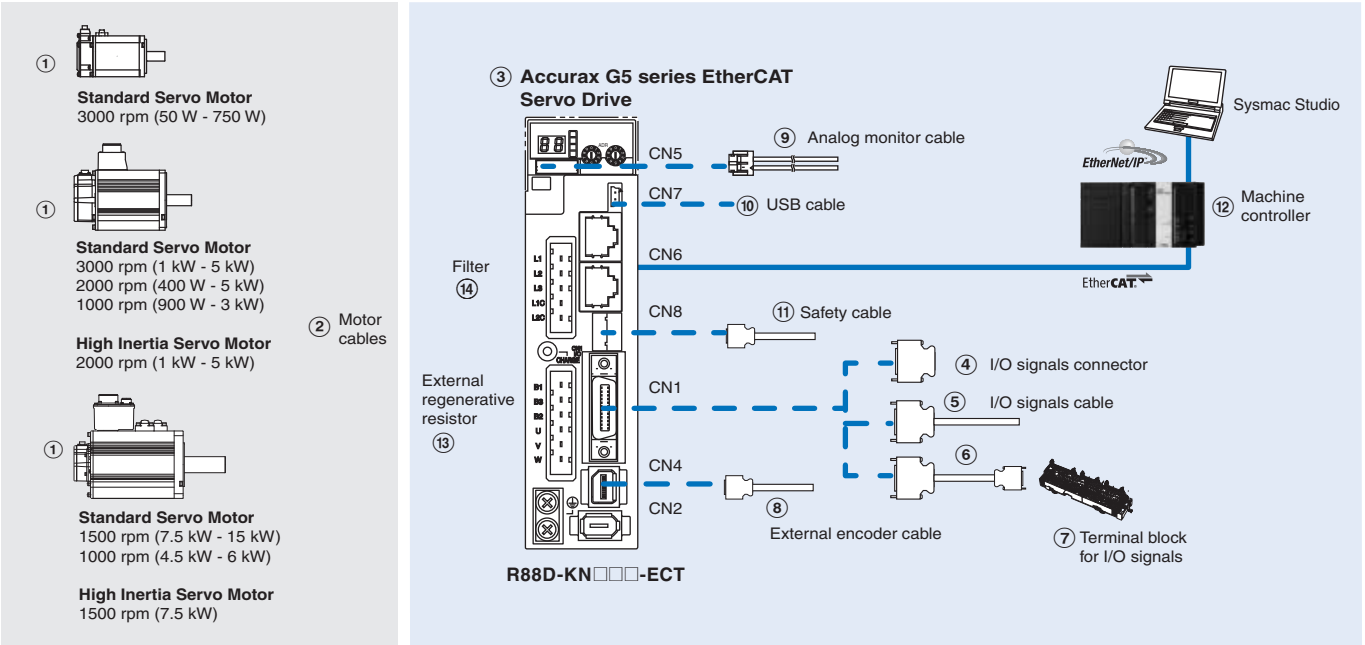


*1 For servo drives from 600 W to 5 kW, B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.
*2 For use only with an absolute encoder. If a backup battery is connected to 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)-□	–
		400 W	R88D-KN04H-ECT	R88M-K40030(H/T)-□	–
		750 W	R88D-KN08H-ECT	R88M-K75030(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.

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_I101E-EN-03A In the interest of product improvement, specifications are subject to change without notice.

R88D-KN□□□-ECT-L

Accurax G5 linear drive

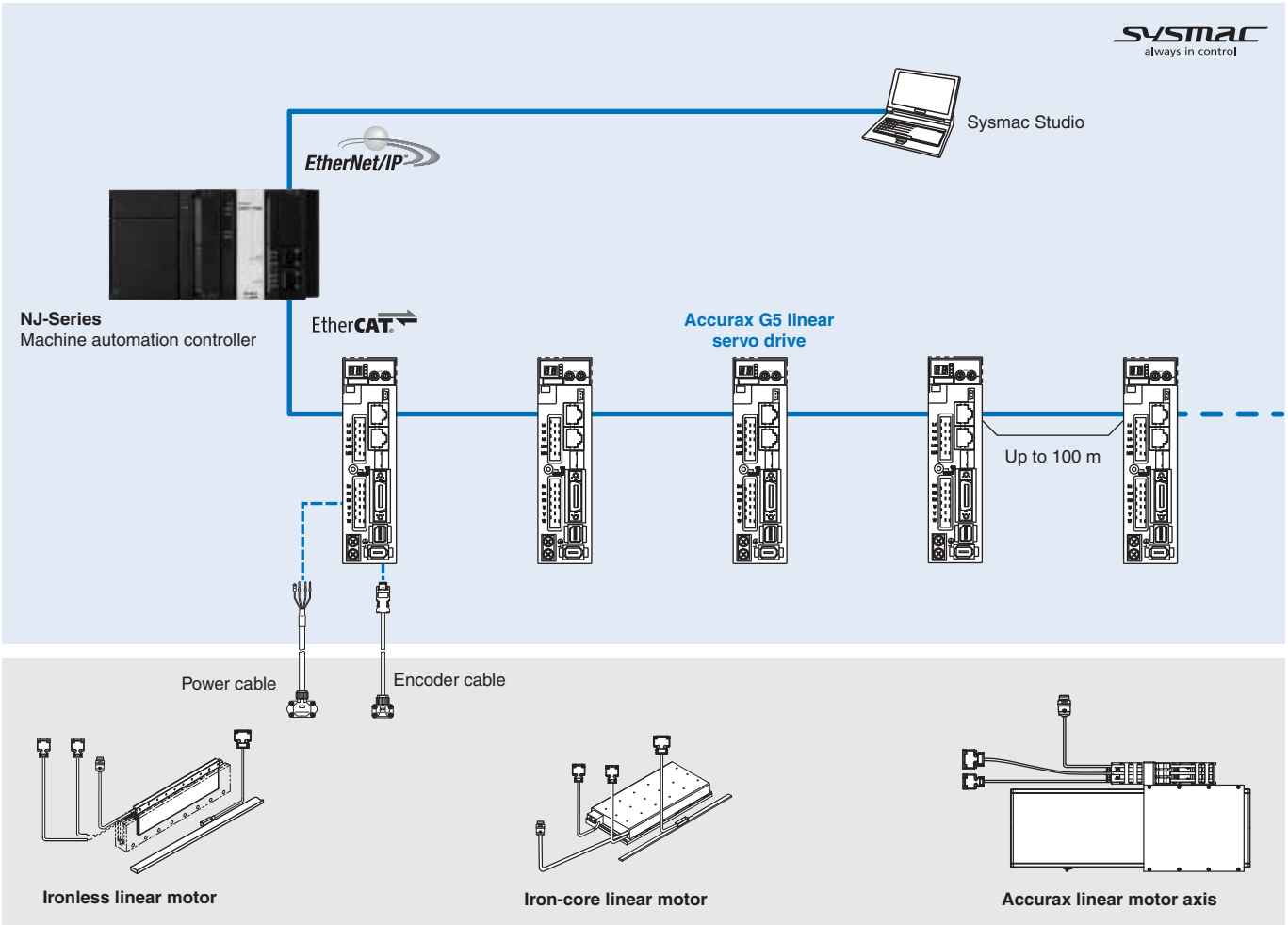
Accurate motion control in a compact size servo drive family. EtherCAT and safety built-in.

- 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)

System configuration



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  230 V/400 V	48 N	105 N	Coil without connectors	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	Coil with connectors	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	Coil without connectors	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	Coil with connectors	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

- R88D-K: Accurax G5 series servo drive
- N: Drive type — N: Network type
- 01H: Capacity and voltage
- ECT: Model — ECT: EtherCAT comms
- L: Linear drive

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	–	–
Basic specifications	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)				
	Conditions	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	

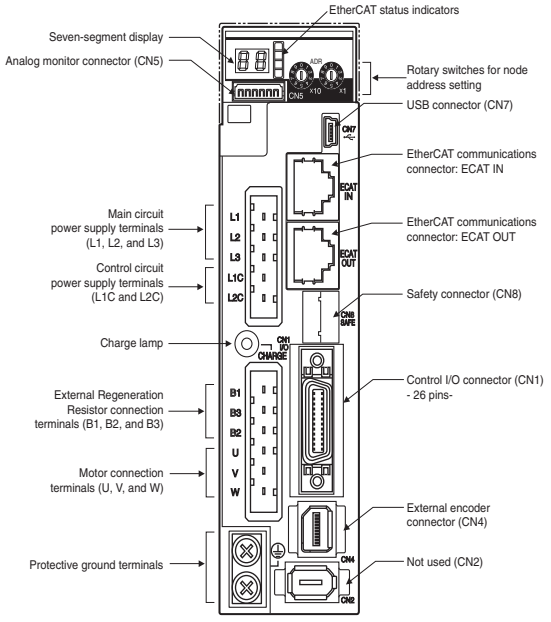
Three-phase, 400 V

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
Basic specifications	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	4.5	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				
	Conditions	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 Cyclic synchronous velocity mode Cyclic synchronous torque mode Touch probe function Torque limit function 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 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 ECAT IN: EtherCAT input × 1 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 ERR × 1 L/A IN (Link/Activity IN) × 1 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 … The monitoring signals to output and their scaling can be specified with parameters. 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 **Note:** for single-phase servo drives connect the power supply input to L1 and L3.
L2		
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. 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.
B2		
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. 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. 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	–	

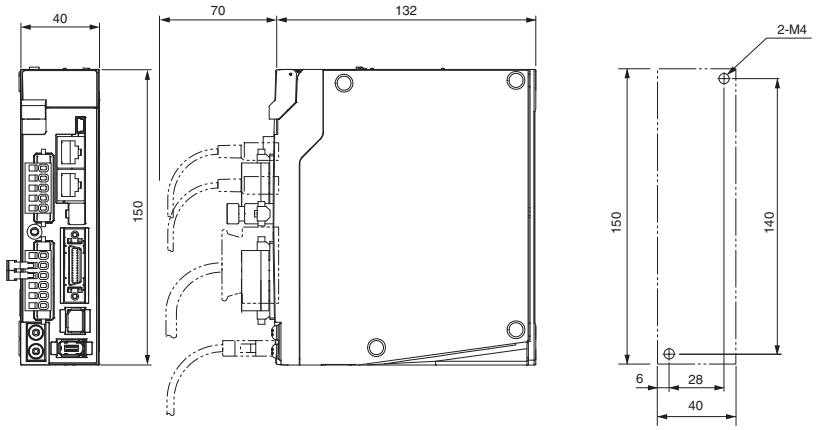
Safety connector (CN8)

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.

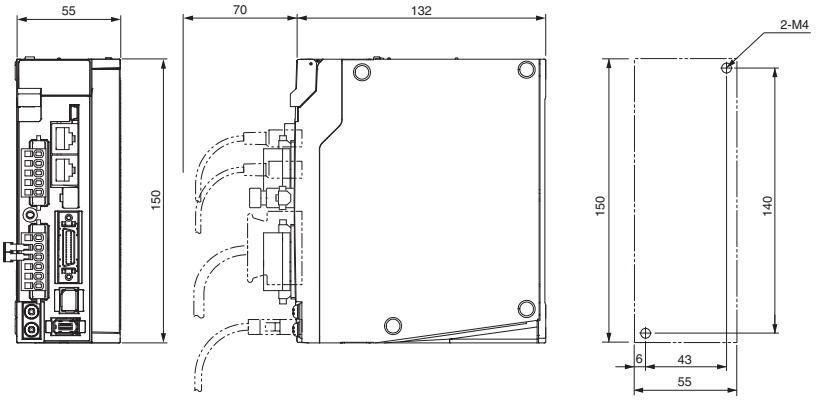
Dimensions

Servo drives

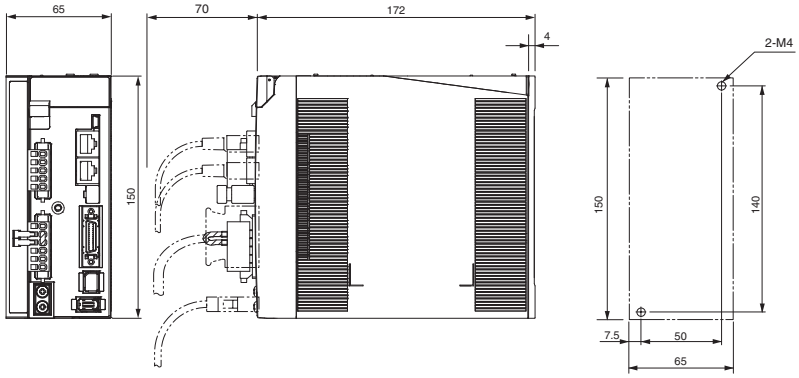
R88D-KN02H-ECT-L (230 V, 200 W)



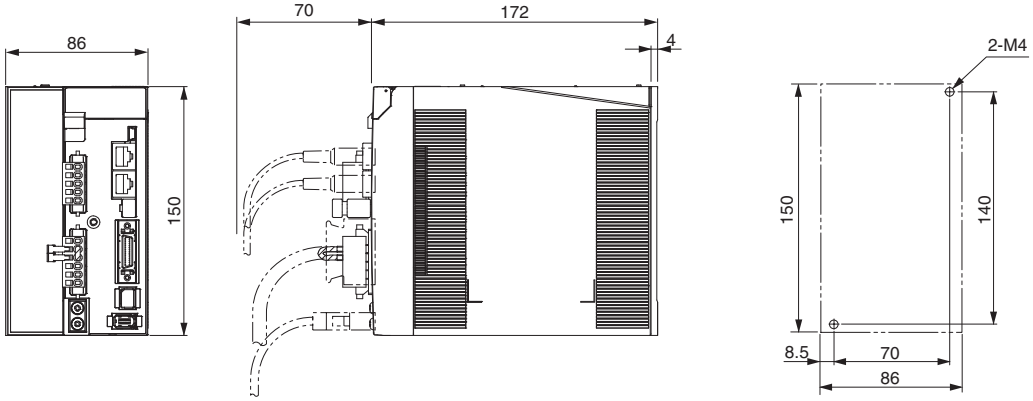
R88D-KN04H-ECT-L (230 V, 400 W)



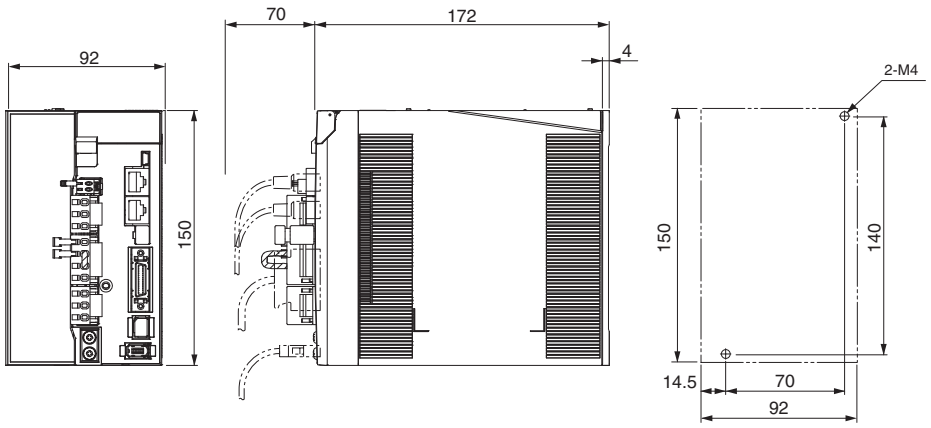
R88D-KN08H-ECT-L (230 V, 800 W)



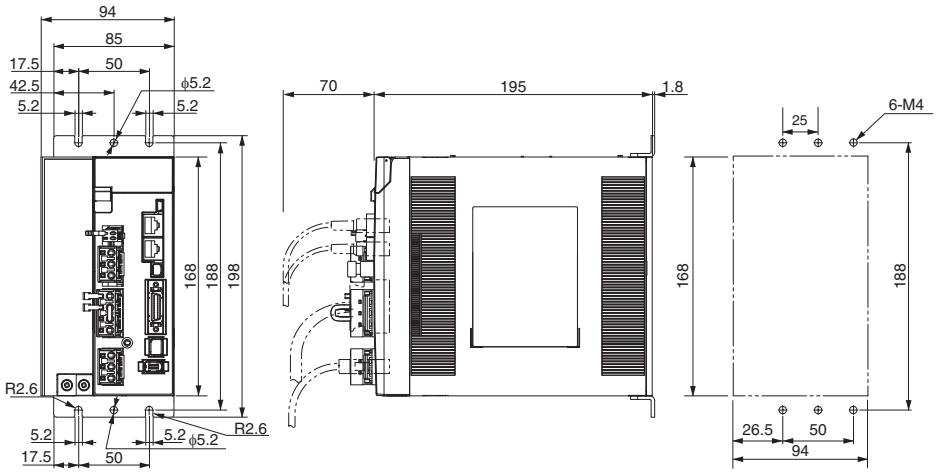
R88D-KN10H/15H-ECT-L (230 V, 1 to 1.5 kW)



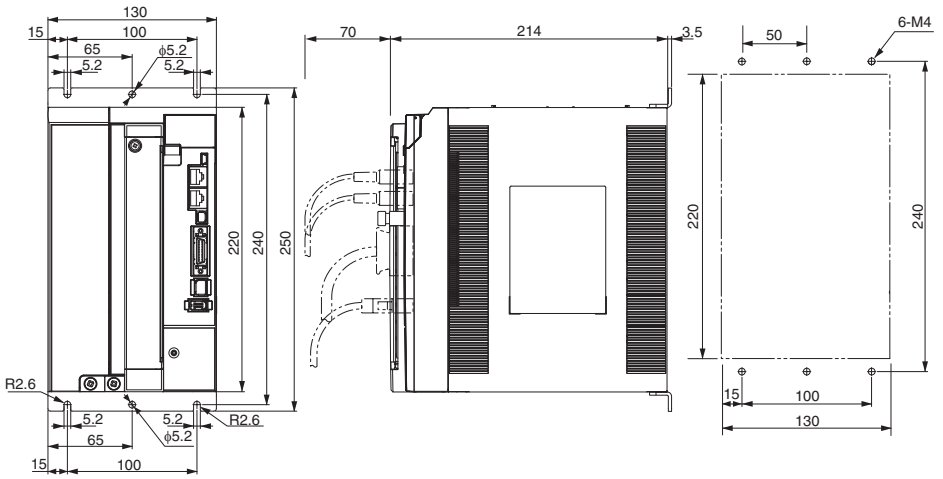
R88D-KN06F/10F/15F-ECT-L (400 V, 600 W to 1.5 kW)



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

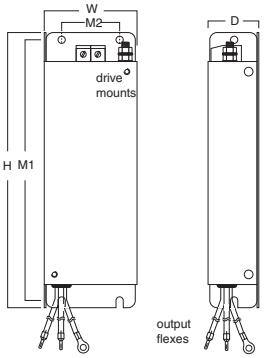


R88D-KN30F-ECT-L (400V, 3 kW)



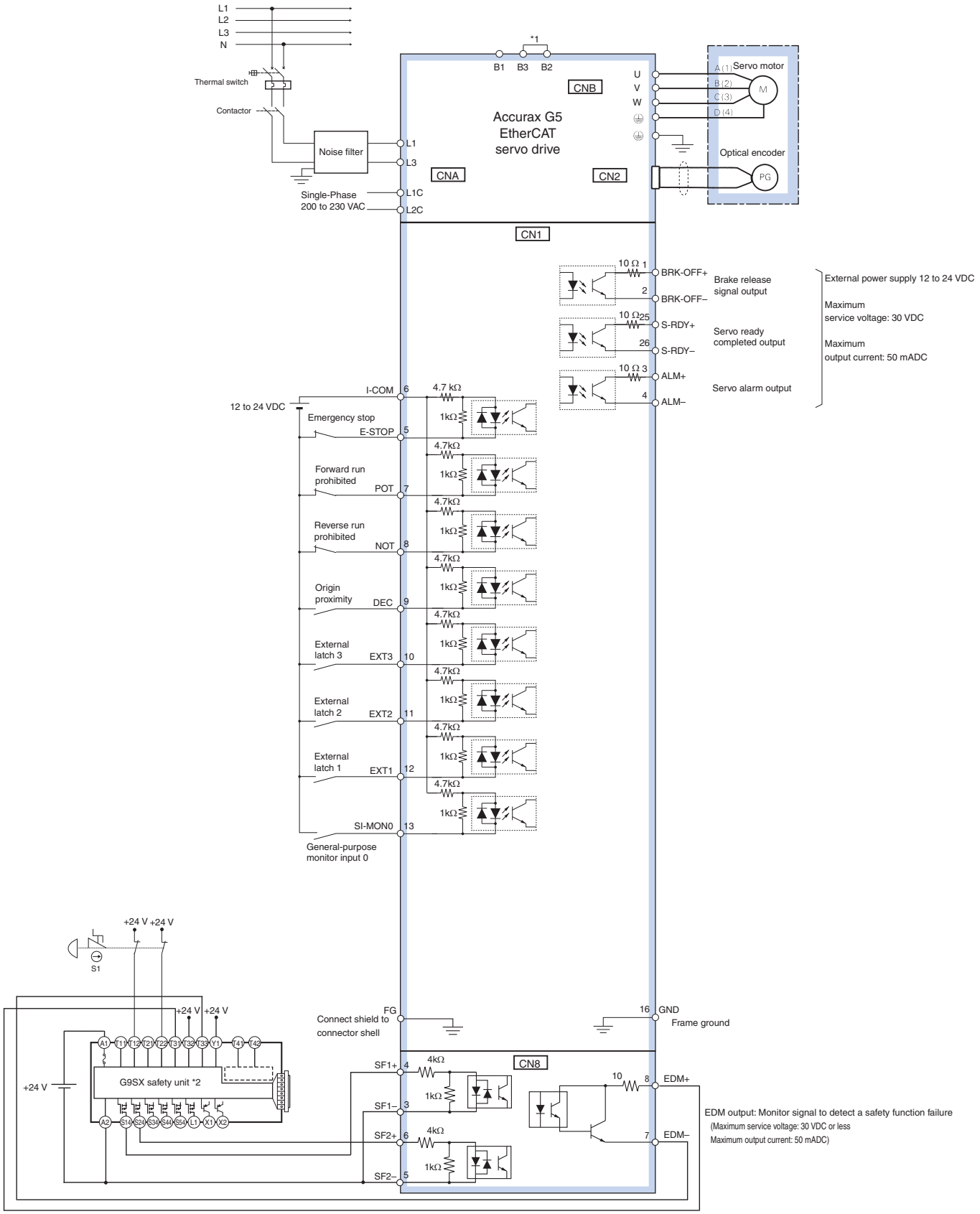
Filters

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

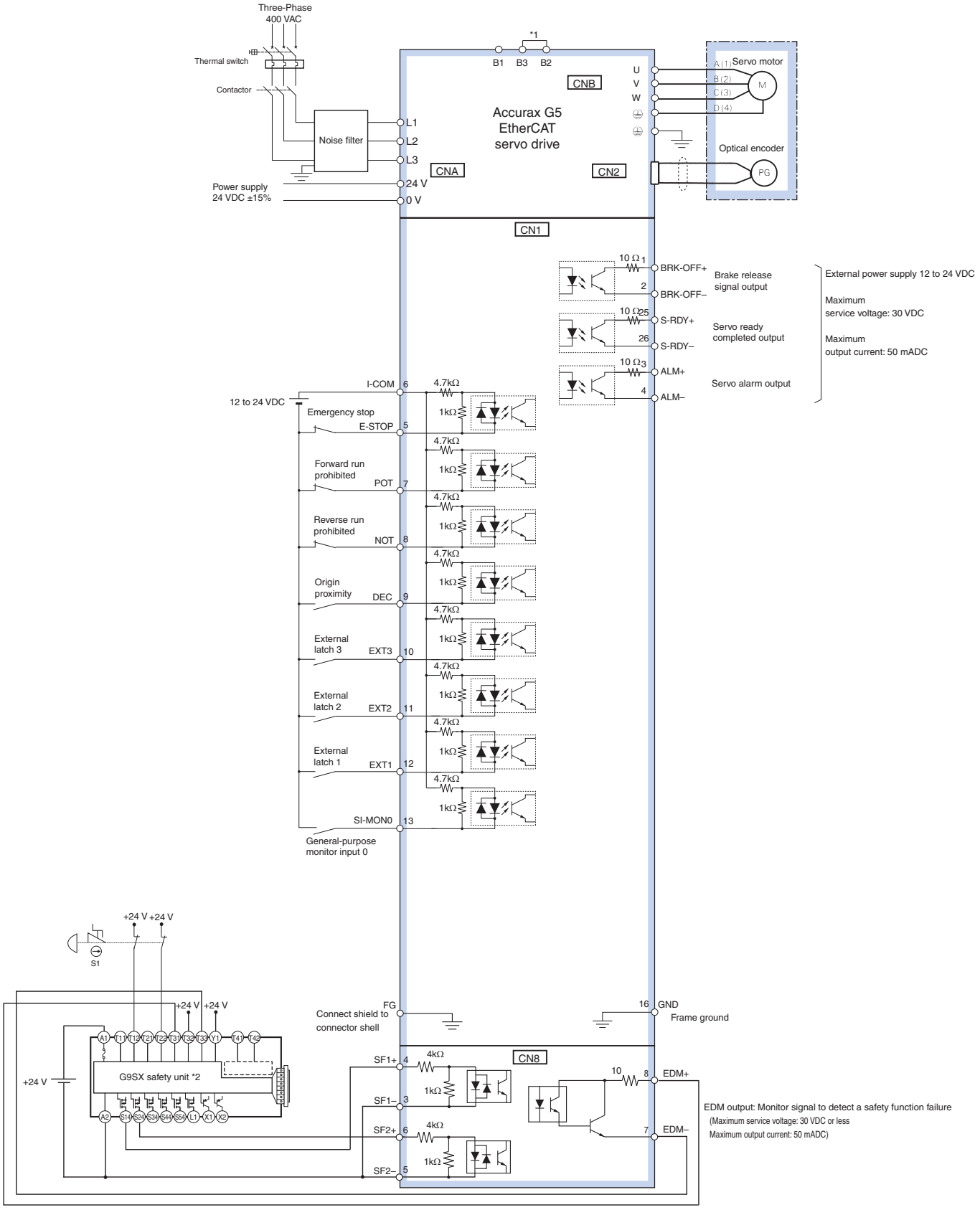
Single-phase, 230 VAC



*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



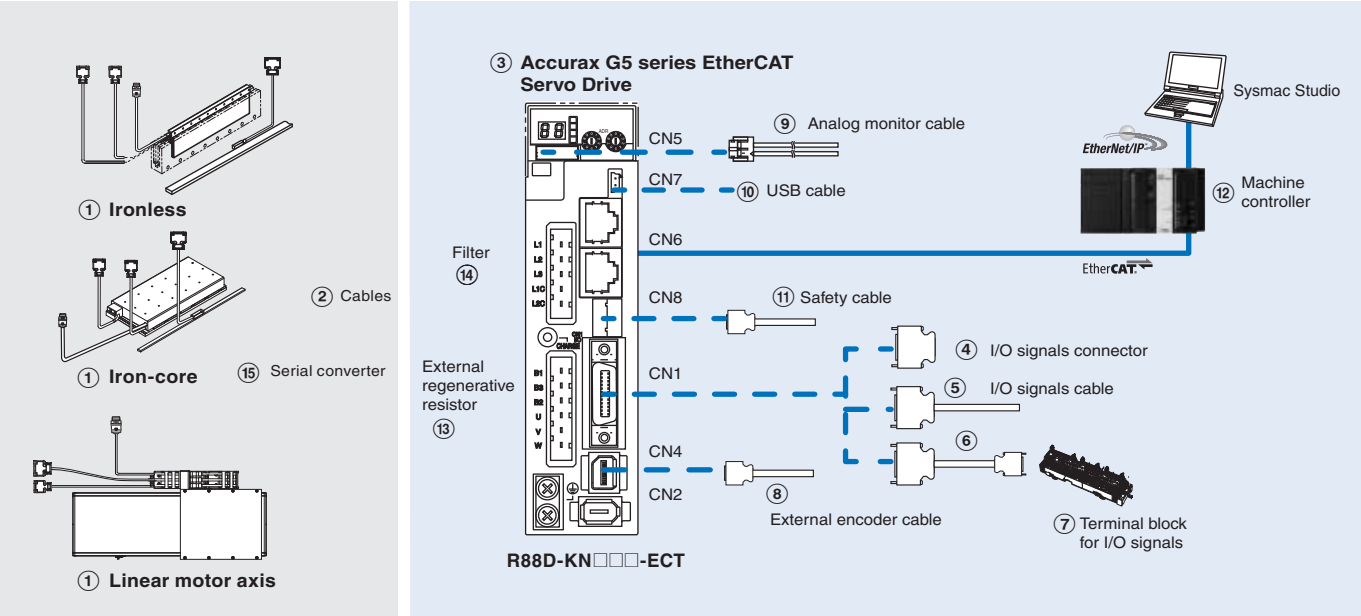
*1 Normally B2 and B3 are short-circuited. If the internal regenerative resistor is insufficient, remove the wire between B2 and B3 and connect an external regenerative resistor between B1 and B2.

*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



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-02A In the interest of product improvement, specifications are subject to change without notice.

R88M-K□, R88M-KH□

Accurax G5 rotary motor

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

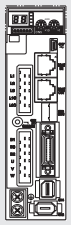
- Standard and high inertia servo motor models
- Peak torque 300% of rated torque during 3 seconds or more depending on model
- High resolution serial encoder provided by 20 bits encoder
- IP67 protection in all models
- Ultra-light and compact size motor
- Low speed ripple and low torque ripple due 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)

System configuration

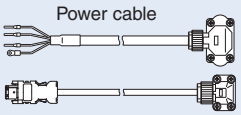
(Refer to servo drive chapter)

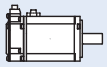


Accurax G5 servo drive
EtherCAT model

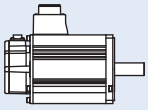
Standard servo motors

SYSMAC always in control

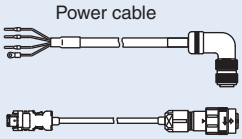


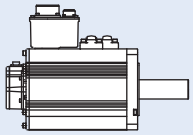


3000 rpm (50 W-750 W)



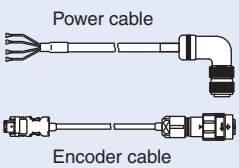
3000 rpm (750 W-5 kW)
2000 rpm (400 W-5 kW)
1000 rpm (900 W-3 kW)

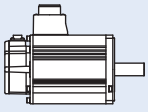




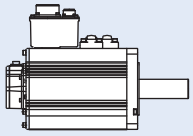
1500 rpm (7.5 kW-15 kW)
1000 rpm (4.5 kW-6 kW)

High inertia servo motors





2000 rpm (1 kW-5 kW)



1500 rpm (7.5 kW)

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
			6.37 Nm	2000 W	R88M-K2K030(F/C)-□	R88D-KN20F-ECT
230V (1 kW - 1.5 kW) 400V (400 W - 5 kW)			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
7.5 KW - 15 kW			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

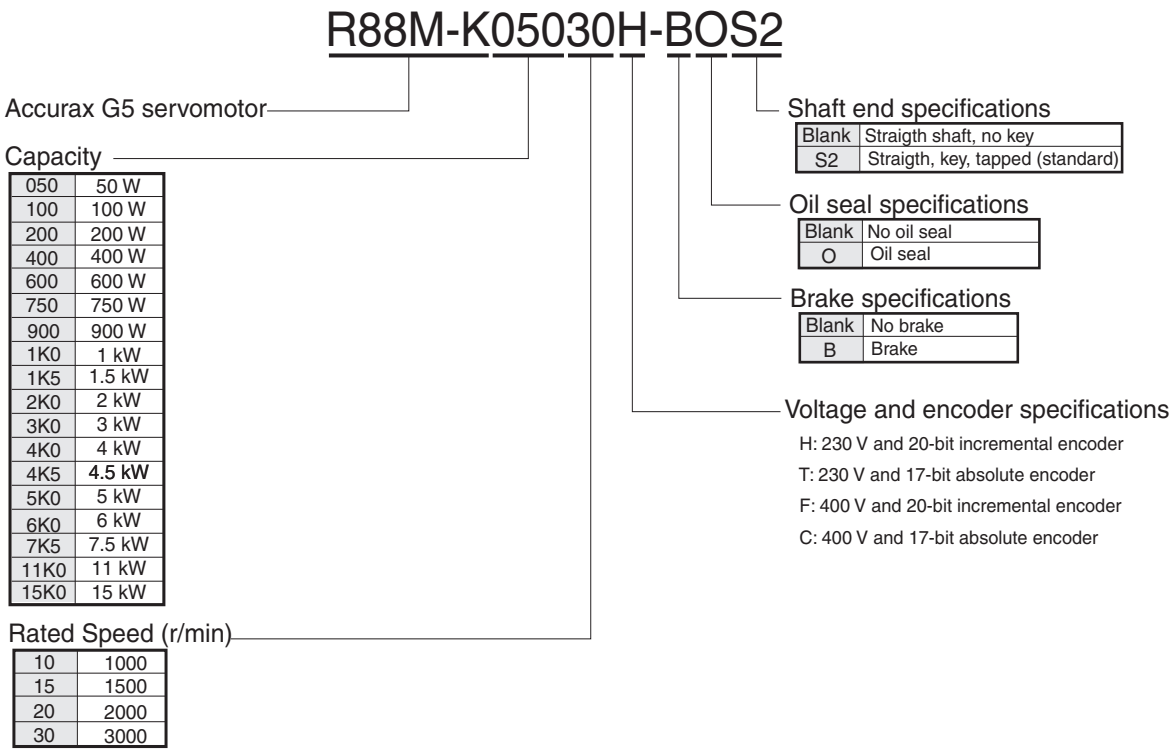
High inertia servo motors

Accurax G5 rotary servo motor						Servo drive model
	Voltage	Speed	Rated torque	Capacity	Model	G5 EtherCAT
	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
		1500 min^{-1}	47.8 Nm	7500 W	R88M-KH7K515C-□	R88D-KN75F-ECT
7.5 KW						

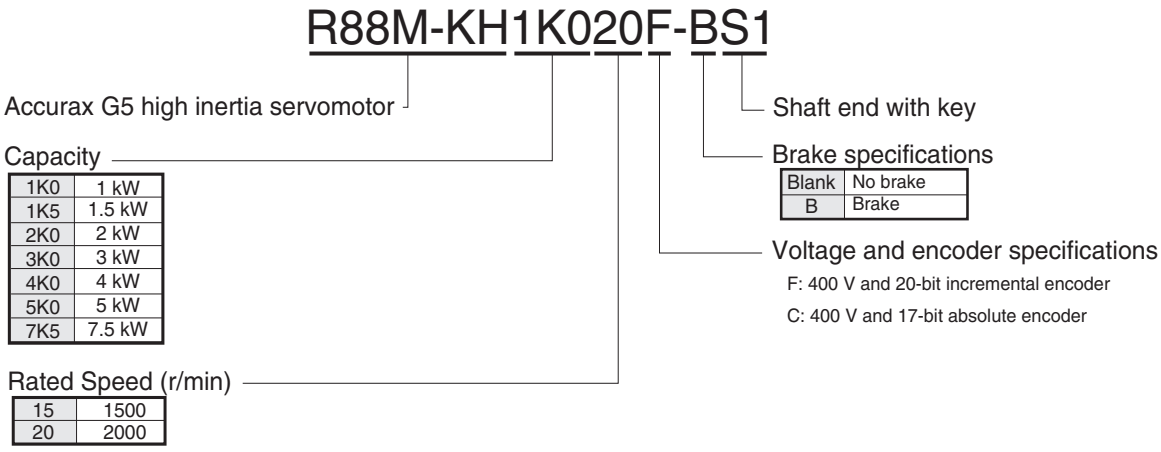
Note: 1. For servo motor and cables part numbers refer to ordering information at the end of this chapter
2. Refer to the servo drive chapter for drive options selection and detailed specifications

Servo motor type designation

Standard servo motors



High inertia servo motors



Servo motor specifications

Standard servo motors 3000 r/min, 230 V

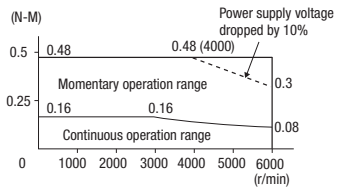
Ratings and specifications

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						

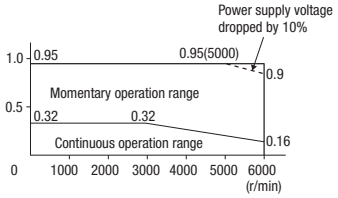
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

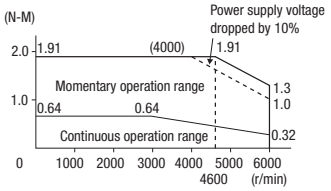
R88M-K05030H/T (50 W)



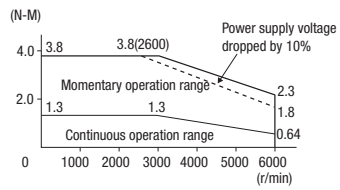
R88M-K10030H/T (100 W)



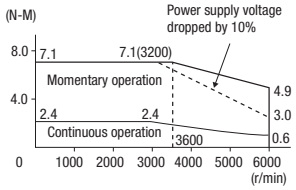
R88M-K20030H/T (200 W)



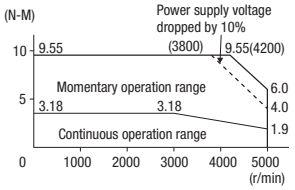
R88M-K40030H/T (400 W)



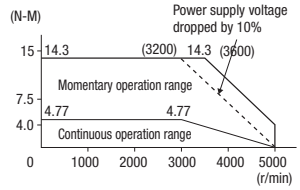
R88M-K75030H/T (750 W)



R88M-K1K030H/T (1 kW)



R88M-K1K530H/T (1.5 kW)



Standard servo motors 3000 r/min, 400 V

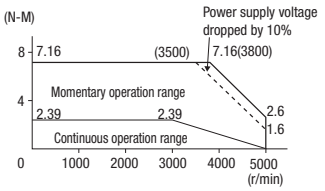
Ratings and specifications

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)		$kg·m^2×10^{-4}$ (without brake)	1.61	2.03	2.84	3.68	6.5	12.9	17.4
		$kg·m^2×10^{-4}$ (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	$kg·m^2×10^{-4}$	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						

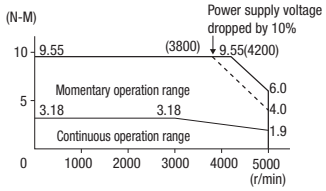
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

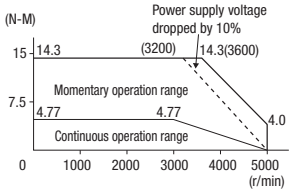
R88M-K75030F/C (750 W)



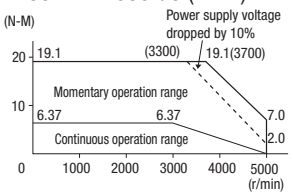
R88M-K1K030F/C (1 kW)



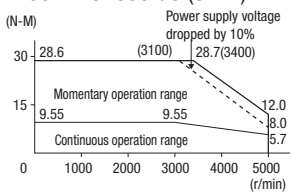
R88M-K1K530F/C (1.5 kW)



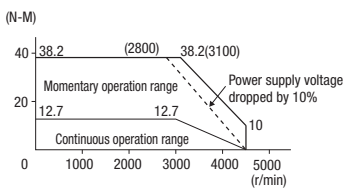
R88M-K2K030F/C (2 kW)



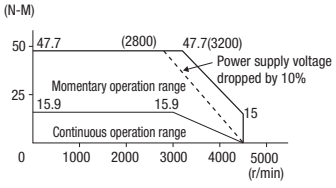
R88M-K3K030F/C (3 kW)



R88M-K4K030F/C (4 kW)



R88M-K5K030F/C (5 kW)



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

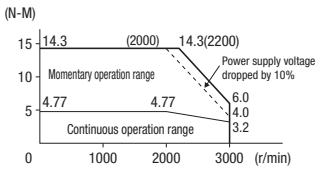
Ratings and specifications

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)		$kg·m^2×10^{-4}$ (without brake)	4.60	6.70	1.61	2.03	4.60	6.70	8.72	12.9	37.6	48
		$kg·m^2×10^{-4}$ (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) $kg·m^2×10^{-4}$	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									

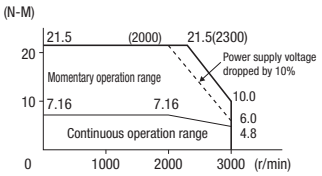
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

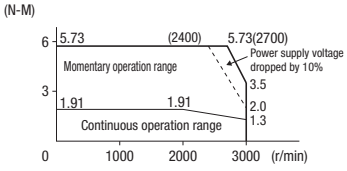
R88M-K1K020H/T (230V, 1 kW)



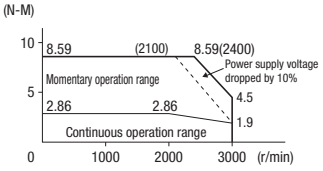
R88M-K1K520H/T (230V, 1.5 kW)



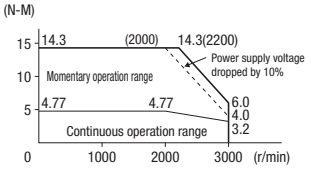
R88M-K40020F/C (400V, 400 W)



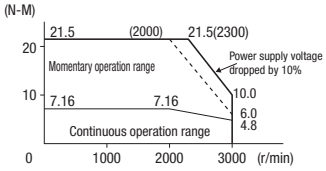
R88M-K60020F/C (400V, 600 W)



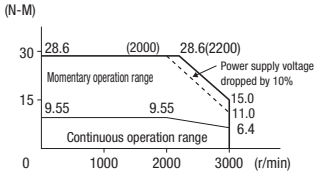
R88M-K1K020F/C (400V, 1 kW)



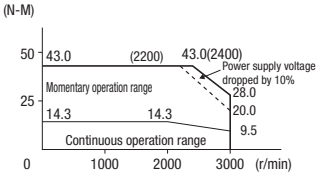
R88M-K1K520F/C (400V, 1.5 kW)



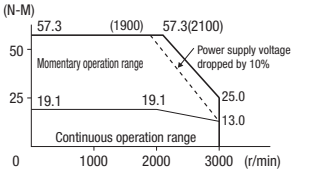
R88M-K2K020F/C (400V, 2 kW)



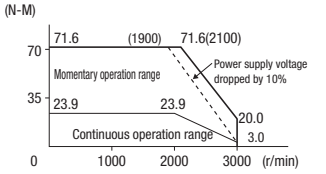
R88M-K3K020F/C (400V, 3 kW)



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



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



Standard servo motors 1500 r/min, 400 V

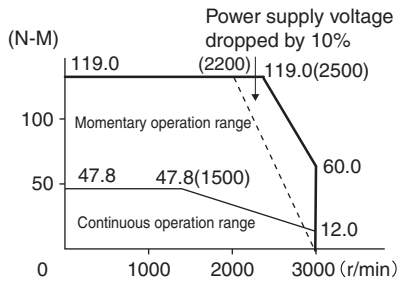
Ratings and specifications

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)		$kg·m^2×10^{-4}$ (without brake)	101	212	302
		$kg·m^2×10^{-4}$ (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	$kg·m^2×10^{-4}$	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		

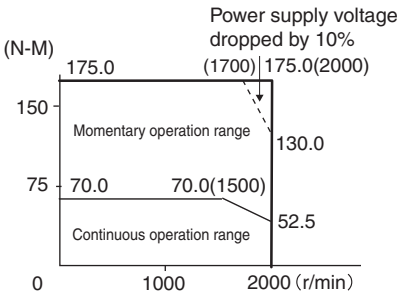
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

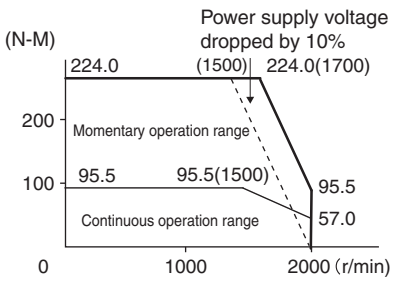
R88M-K7K515C (7.5 kW)



R88M-K11K015C (11 kW)



R88M-K15K015C (15 kW)



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

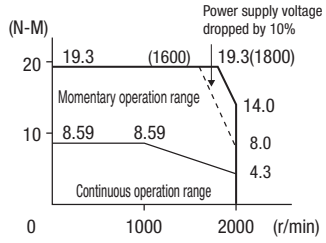
Ratings and specifications

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)	$kg·m^2×10^{-4}$ (without brake)	6.70		30.3	48.4	79.1	101
	$kg·m^2×10^{-4}$ (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	$kg·m^2×10^{-4}$	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					

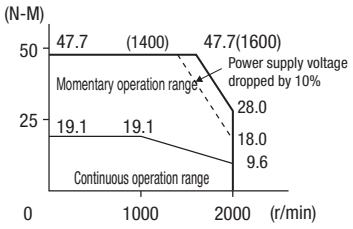
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

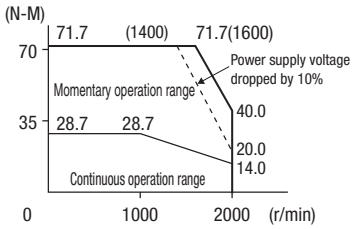
R88M-K90010H/T/F/C



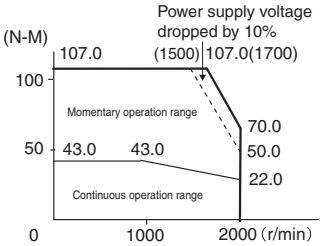
R88M-K2K010F/C



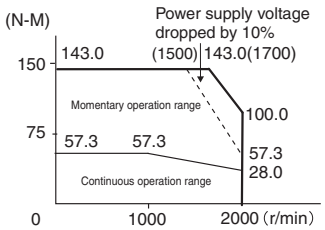
R88M-K3K010F/C



R88M-K4K510C



R88M-K6K010C



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

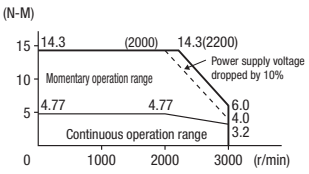
Ratings and specifications

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)	$kg·m^2×10^{-4}$ (without brake)	24.7	37.1	57.8	90.2	112	162	273
	$kg·m^2×10^{-4}$ (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%						
Brake specifications: Holding brake moment inertia	(J) $kg·m^2×10^{-4}$	1.35		4.7				
Brake specifications: Power consumption (20°C)	W	14	19	31				34
Brake specifications: Current consumption (20°C)	A	0.59±10%	0.79±10%	1.30±10%				1.40±10%
Brake specifications: Static friction torque	N.m (minimum)	4.9	13.7	24.5				58.8
Brake specifications: Rise time for holding torque	ms (max.)	80	100	80				150
Brake specifications: Release time	ms (max)	70	50	25				50
Basic specifications: Time Rating		Continuous						
Basic specifications: Insulation class		Type F						
Basic specifications: Ambient operating/ storage temperature		0 to +40°C/–20 to 65°C						
Basic specifications: Ambient operating/ storage humidity		20% to 85% RH (non-condensing)						
Basic specifications: Vibration class		V-15						
Basic specifications: Insulation resistance		20 MΩ min. at 500 VDC between the power terminals and FG terminal						
Basic specifications: Enclosure		Totally-enclosed, self-cooling, IP67 (excluding shaft opening)						
Basic specifications: Vibration resistance		Vibration acceleration 49 m/s²						
Basic specifications: Mounting		Flange-mounted						

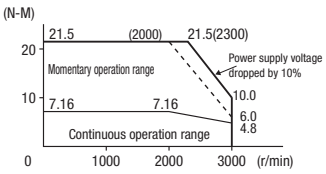
*1 Applicable load inertia: The operable load inertia ratio (load inertia/rotor inertia) depends on the mechanical configuration and its rigidity. For a machine with high rigidity, operation is possible even with high load inertia. Select an appropriate motor and confirm that operation is possible.

Torque-speed characteristics

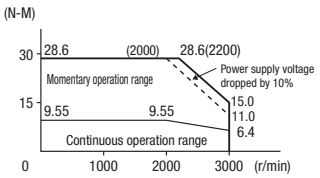
R88M-KH1K020F/C (400V, 1 kW)



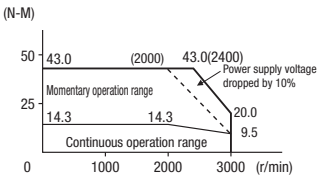
R88M-KH1K520F/C (400V, 1.5 kW)



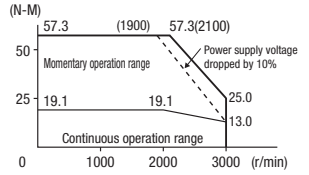
R88M-KH2K020F/C (400V, 2 kW)



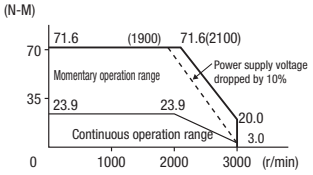
R88M-KH3K020F/C (400V, 3 kW)



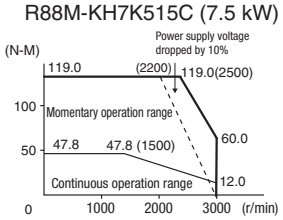
R88M-KH4K020F/C (400V, 4 kW)



R88M-KH5K020F/C (400V, 5 kW)



R88M-KH7K515C (7.5 kW)

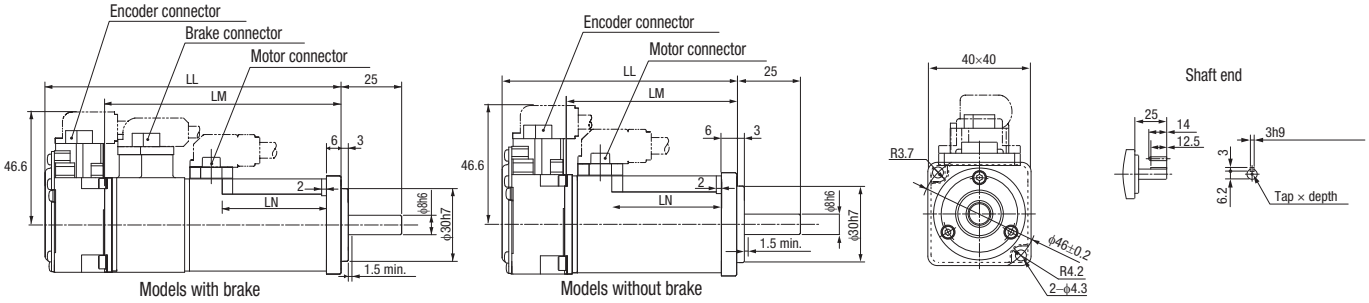


Dimensions

Standard servo motors

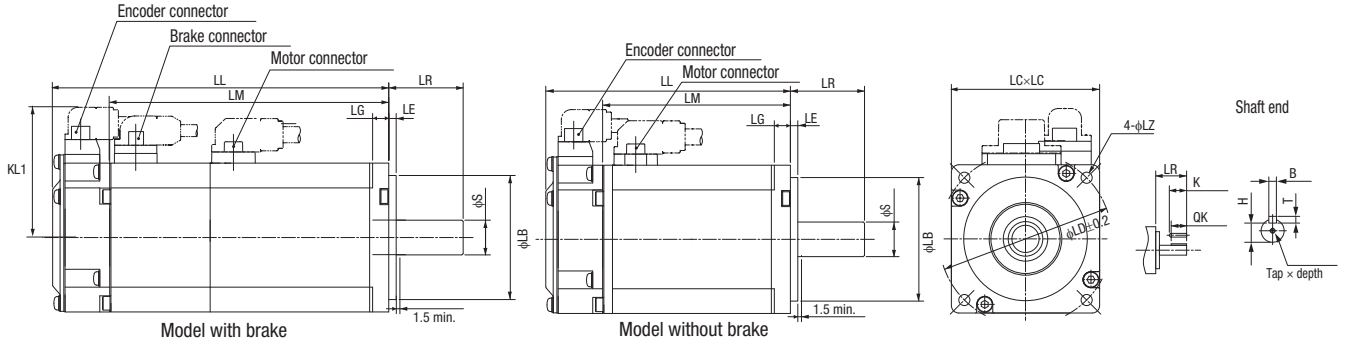
Type 3000 r/min motors (230 V, 50 to 100 W)

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	92	68	122	98	43		0.47	0.68



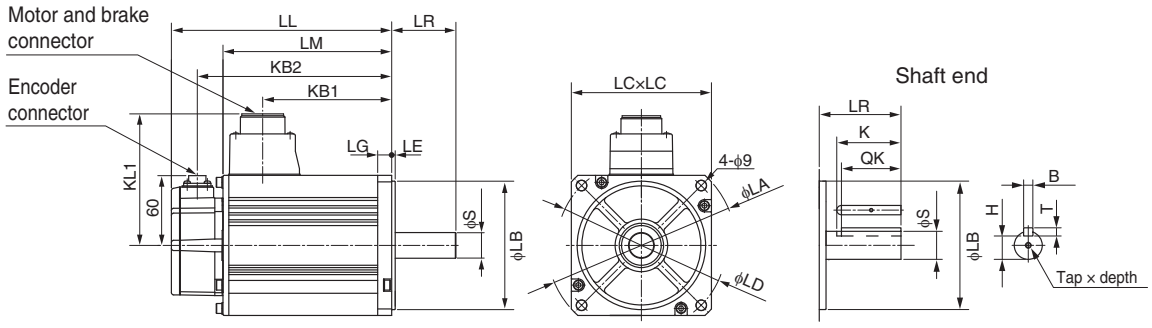
Type 3000 r/min motors (230 V, 200 to 750 W)

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	50^{h7}	60	70	3	6.5	4.5	11^{h6}	20	18	8.5	4^{h9}	4	M4×8L	0.82	1.3
R88M-K40030(H/T)-□S2	99	76	52.5	135.5	112.5	52.5								14^{h6}	25	22.5	11	5^{h9}	5	M5×10L	1.2	1.7
R88M-K75030(H/T)-□S2	112.2	86.2	60	148.2	122.2	61.6	35	70^{h7}	80	90		8	6	19^{h6}		22	15.5	6^{h9}	6		2.3	3.1



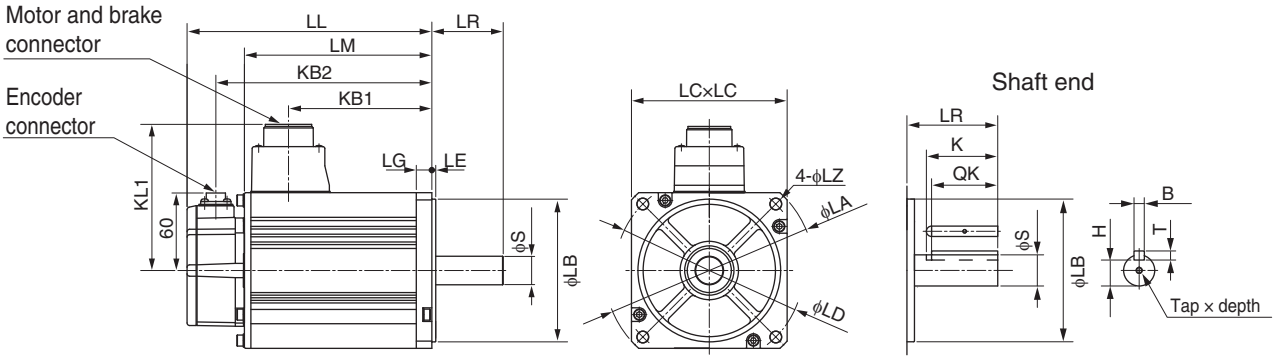
Type 3000 r/min motors (230 V, 1 to 1.5 kW/400 V, 750 W to 5 kW)

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	95^{h7}	100	115	3	10	19^{h6}	M5× 12L	45	42	15.5	6^{h9}	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	110^{h7}	120	145		12	22^{h6}			41	18	8^{h9}	7	8.3	9.4
	4K030(F/C)-□S2	208	164	127	186	118	233	189	127	211	118	65	165		130		6		24^{h6}	M8× 20L	55	51	20			11	12.6
	5K030(F/C)-□S2	243	199	162	221		268	224	162	246																14	16



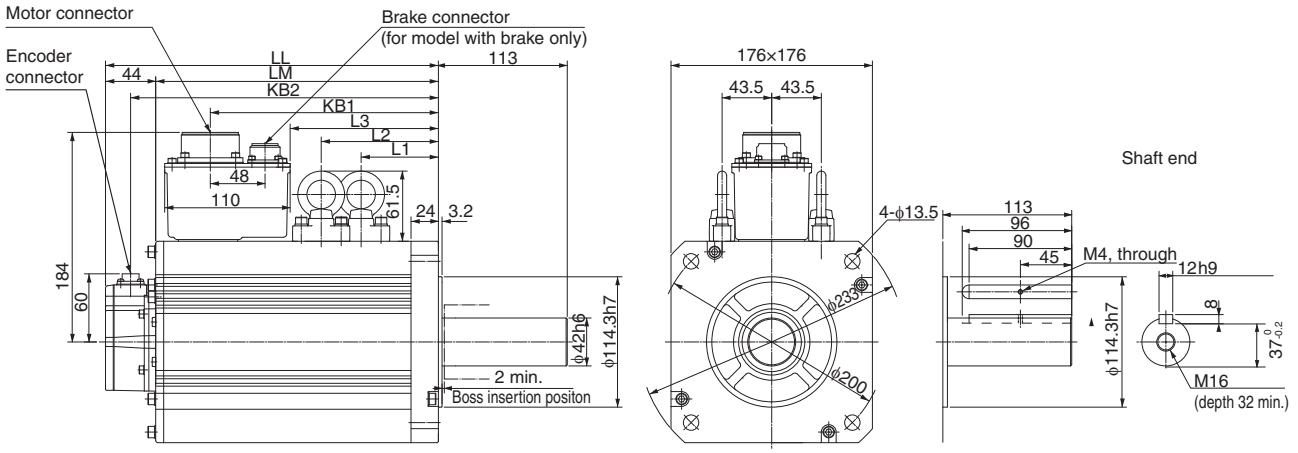
Type 2000 r/min motors (230 V, 1 to 1.5 kW/400 V, 400 W to 5 kW)

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	110^{h7}	130	145	6	12	9	22^{h6}	M5× 12L	45	41	18	8^{h9}	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	95^{h7}	100	115	3	10		19^{h6}			42	15.5	6^{h9}	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	110^{h7}	130	145	6	12		22^{h6}			41	18	8^{h9}	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								24^{h6}	M8× 20L	55	51	20			11	12.6
	4K020(F/C)-□S2	177	133	96	155	140	202	158	96	180	140	70	233	114.3^{h7}	176	200	3.2	18	13.5	35^{h6}	M12 × 25L		50	30	10^{h9}	8	15.5	18.7
	5K020(F/C)-□S2	196	152	115	174		221	177	115	199																	18.6	21.8



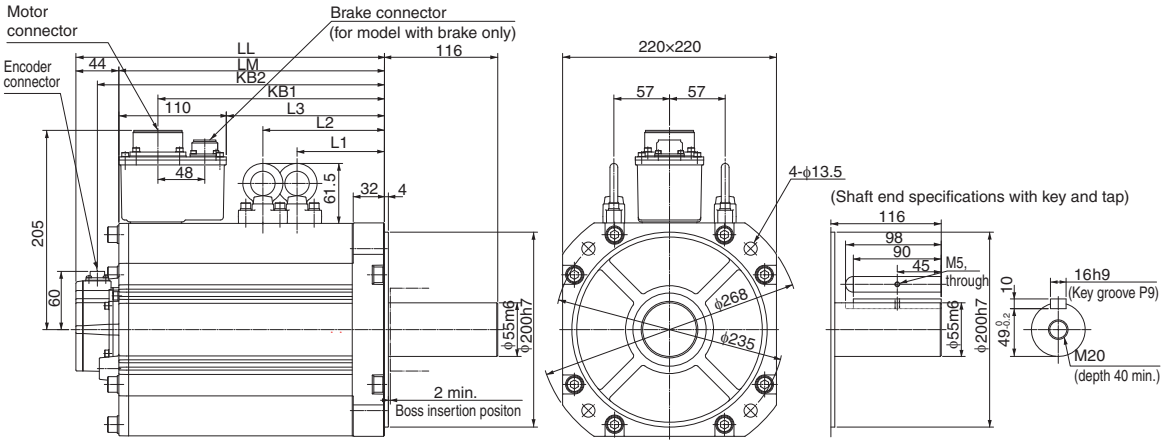
Type 1500 r/min motors (400 V, 7.5 kW)

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



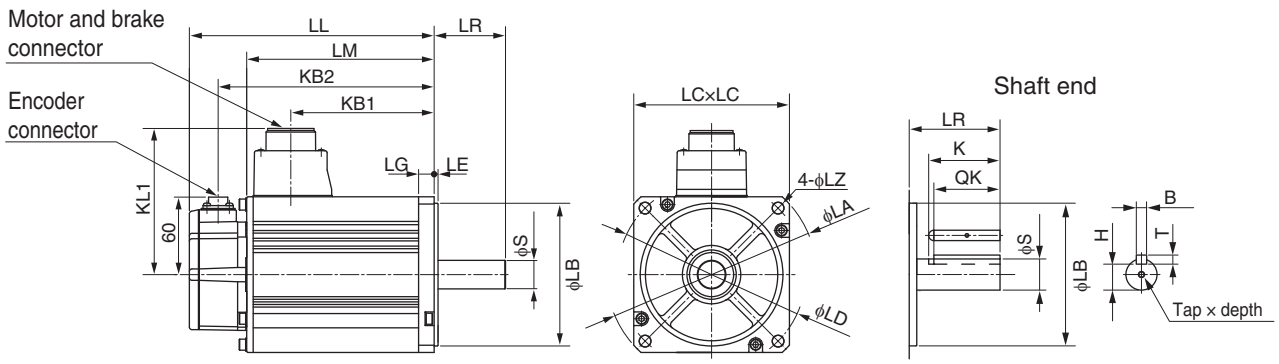
Type 1500 r/min motors (400 V, 11 to 15 kW)

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	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



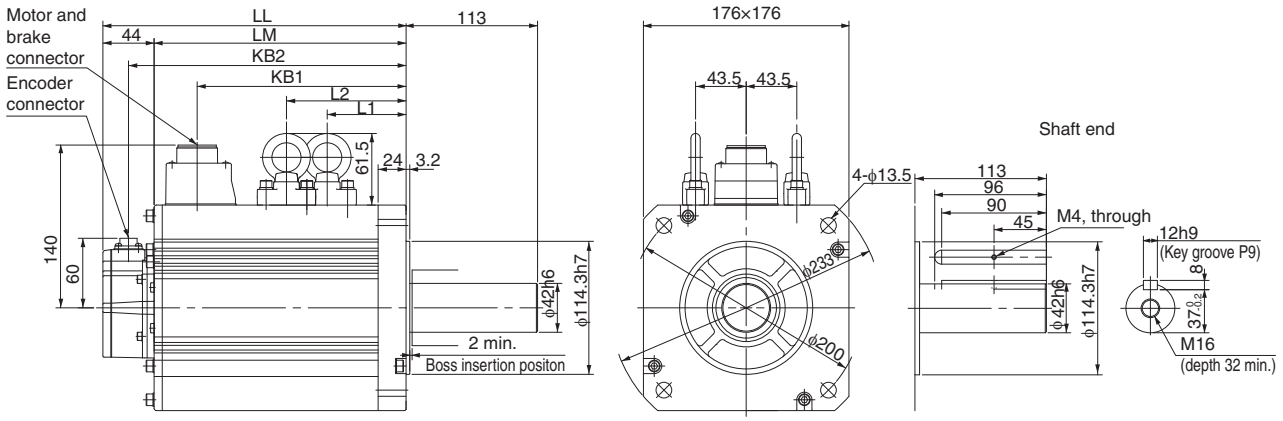
Type 1000 r/min motors (230 V, 900 W/400 V, 900 W to 3 kW)

Dimensions (mm)		Without brake					With brake					LR	Flange surface							Shaft end dimensions							Approx. mass (kg)	
Voltage	Model 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	110^{h7}	130	145	6	12	9	22^{h6}	M5× 12L	45	41	18	8^{h9}	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	114.3^{h7}	176	200	3.2	18	13.5	35^{h6}	M12× 25L	55	50	30	10^{h9}	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



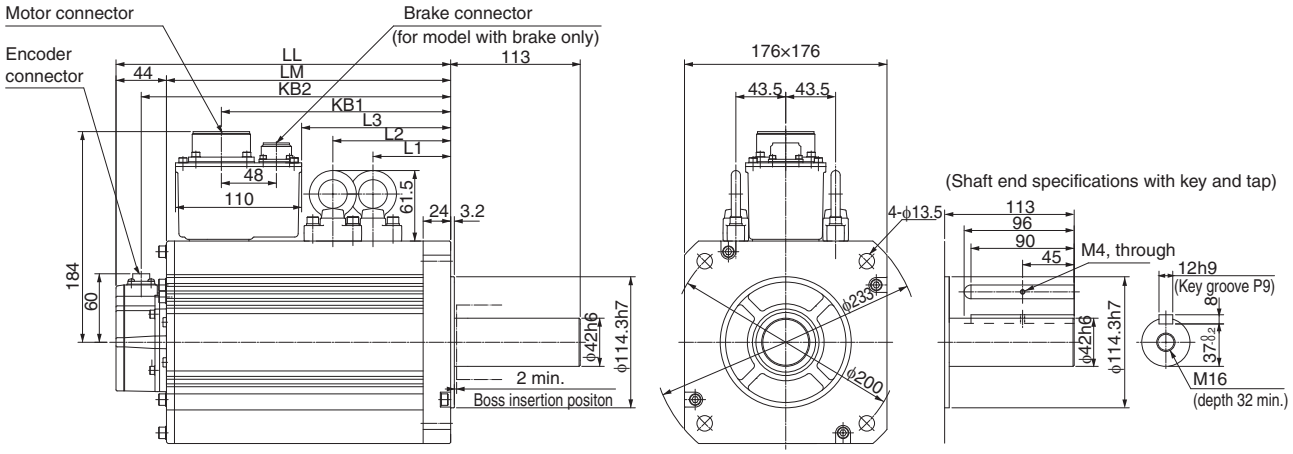
Type 1000 r/min motors (400 V, 4.5 kW)

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)

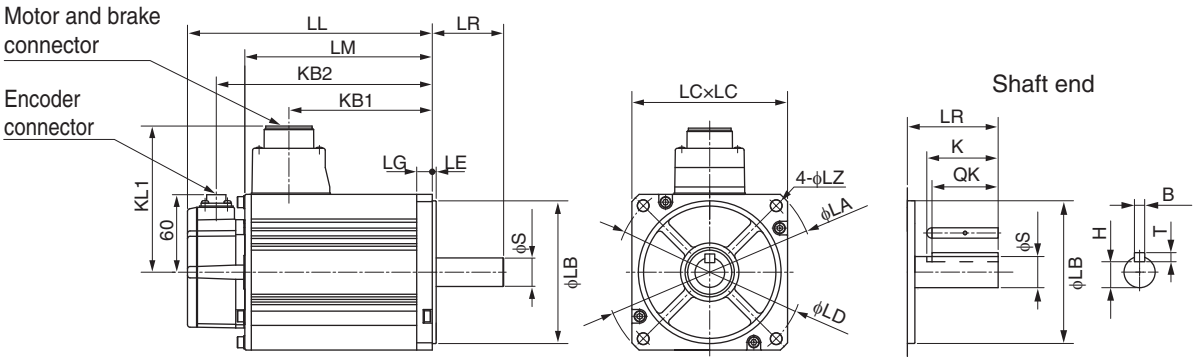
Dimensions (mm)		Without brake							With brake							Approx. mass (Kg)	
Voltage	Model R88M-K□	LL	LM	KB1	KB2	L1	L2	L3	LL	LM	KB1	KB2	L1	L2	L3	Without brake	With brake
400	6K010C-□S2	312	268	219	290	117.5	117.5	149	337	293	253	315	117.5	152.5	183	36.4	40.4



High inertia servo motors

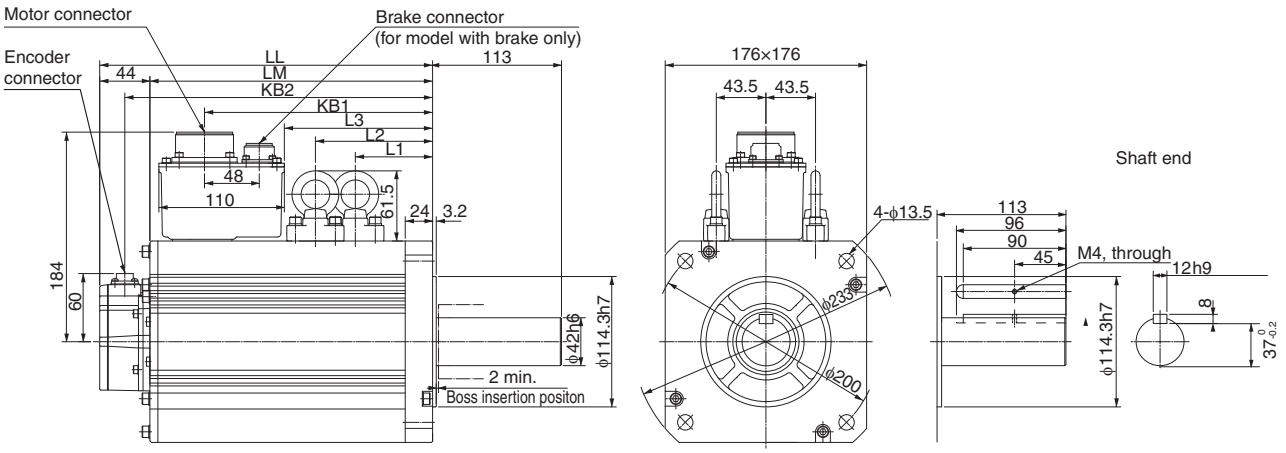
Type 2000 r/min motors (400 V, 1 kW to 5 kW)

Dimensions (mm)		Without brake					With brake					LR	Flange surface							Shaft end dimensions						Approx. mass (kg)	
Voltage	Model R88M-KH□	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	110^{h7}	130	145	6	12	9	22^{h6}	45	41	18	8^{h9}	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	114.3^{h7}	176	200	3.2	18	13.5	35^{h6}	55	50	30	10^{h9}	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



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

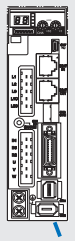
Dimensions (mm)		Without brake							With brake							Approx. mass (kg)	
Voltage	Model R88M-KH□	LL	LM	KB1	KB2	L1	L2	L3	LL	LM	KB1	KB2	L1	L2	L3	Without brake	With brake
400	7K515C-□S1	357	313	264	335	146.5	146.5	194	382	338	298	360	146.5	181.5	228	42.3	46.2



Ordering information

(Refer to servo drive chapter)

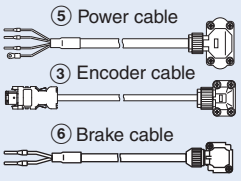
② Drive options

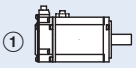


Accurax G5 servo drive
EtherCAT model

④ Extension cable for absolute encoder (with battery holder)

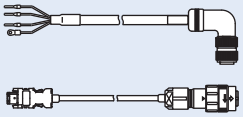
Standard servo motors



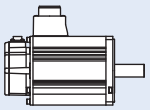


① 3000 rpm (50 W-750 W)

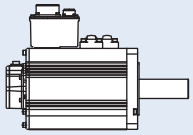
Power cable/
⑤ Power cable with brake



③ Encoder cable



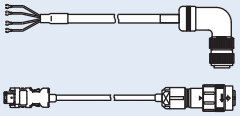
① 3000 rpm (750 W-5 kW)
2000 rpm (400 W-5 kW)
1000 rpm (900 W-3 kW)



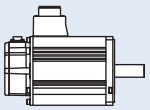
① 1500 rpm (7.5 kW-15 kW)
1000 rpm (4.5 kW-6 kW)

High inertia servo motors

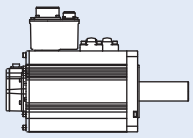
Power cable/
⑤ Power cable with brake



③ Encoder cable



① 2000 rpm (1 kW-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.

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 (50 to 750 W)  230 V (1 kW to 1.5 kW) 400 V (750 W to 5 kW)	230 V	**Incremental encoder (20 bit)** Straight 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
			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) Straight 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
				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)** Straight 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) Straight 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)** 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) 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)** 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) 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)** 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  900 W to 3 kW  4.5 kW to 6 kW	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-S2	R88D-KN30F-ECT
				28.7 Nm	3000 W	R88M-K3K010C-S2	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

High inertia servo motors

Servo motors 2000 r/min (1 - 5 kW)

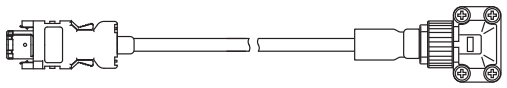
Symbol	Specifications					Servo motor model	Compatible servo drives ②
	Voltage	Encoder and design		Rated torque	Capacity		G5 EtherCAT
① 	400 V	**Incremental encoder (20 bit)** Shaft end with key	Without brake	4.77 Nm	1000 W	R88M-KH1K020F-S1	R88D-KN10F-ECT
				7.16 Nm	1500 W	R88M-KH1K520F-S1	R88D-KN15F-ECT
				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)** Shaft end with key	Without brake	47.8 Nm	7500 W	R88M-KH7K515C-S1	R88D-KN75F-ECT
			With brake	47.8 Nm	7500 W	R88M-KH7K515C-BS1	R88D-KN75F-ECT

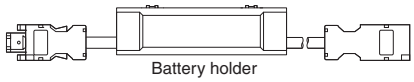
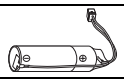
Encoder cables

For absolute and incremental encoders

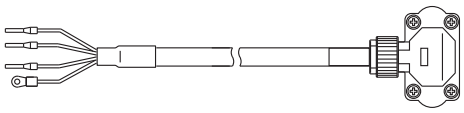
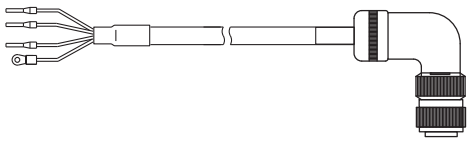
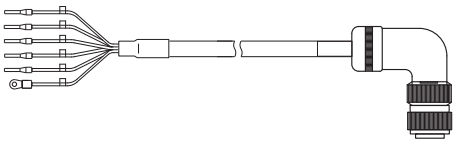
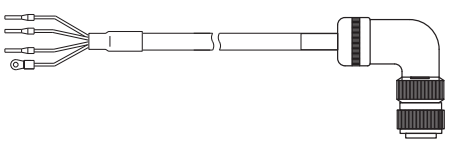
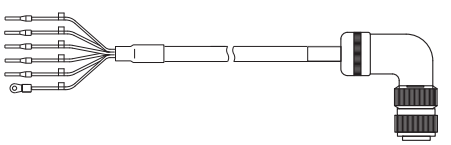
Symbol	Specifications		Model	Appearance
③	Encoder cable for servomotors R88M-K(050/100/200/400/750)30(H/T)□	1.5 m	R88A-CRKA001-5CR-E	
		3 m	R88A-CRKA003CR-E	
		5 m	R88A-CRKA005CR-E	
		10 m	R88A-CRKA010CR-E	
		15 m	R88A-CRKA015CR-E	
		20 m	R88A-CRKA020CR-E	
	Encoder cable for servomotors R88M-K(1K0/1K5)30(H/T)□ 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	

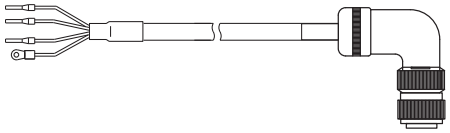
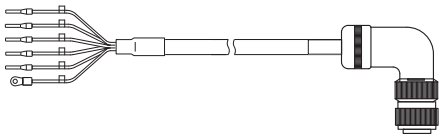
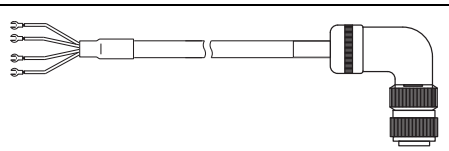
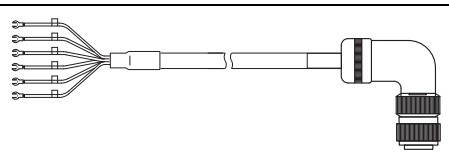
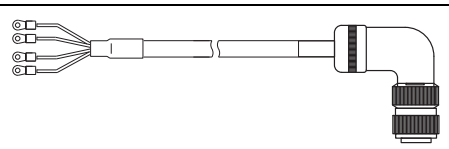
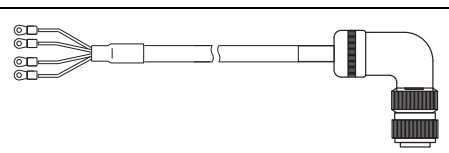
Note: For servomotors fitted with an absolute encoder you have to add the extension battery cable R88A-CRGD0R3C□ (see below) or connect a backup battery in the CN1 I/O connector.

Absolute encoder battery cable (encoder extension cable only)

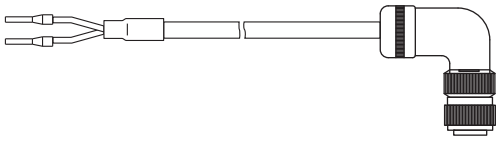
Symbol	Specifications			Model	Appearance
④	Absolute encoder battery cable	Battery not included	0.3 m	R88A-CRGD0R3C-E	
		Battery included	0.3 m	R88A-CRGD0R3C-BS-E	
	Absolute encoder backup battery	2,000 mA.h 3.6 V	–	R88A-BAT01G	

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-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	
	For 400 V servomotors R88M-K(750/1K0/1K5/2K)30(F/C)-□□S2 R88M-K(400/600/1K0/1K5/2K0)20(F/C)-□□S2 R88M-K90010(F/C)-□□S2 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	

Symbol	Specifications			Model	Appearance
⑤	For 400 V servomotors 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 R88M-K(3K0/4K0/5K0)30(F/C)-□□S2 R88M-K(3K0/4K0/5K0)20(F/C)-□□S2 R88M-K(2K0/3K0)10(F/C)-□□S2 R88M-K4K510C-□□S2 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 R88M-K6K010C-□□S2 R88M-K7K515C-□□S2 R88M-KH7K515C-□S1 **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 R88M-K(11K0/15K0)15C-□□S2 **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. For 200 V servo motors with brake 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. For 400 V servo motors with brake R88M-K6K010C-BS2 R88M-K(7K5/11K0/15K0)15C-BS2 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-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(900/2K0/3K0)10□ R88M-K(4K5/6K0)10C-□ R88M-K(7K5/11K0/15K0)15C-□ 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-K(1K0/1K5)30(H/T)-S2 R88M-K(1K0/1K5)20(H/T)-S2 R88M-K90010(H/T)-S2 R88M-K(750/1K0/1K5/2K0)30(F/C)-S2, R88M-K(400/600/1K0/1K5/2K0)20(F/C)-S2 R88M-K90010(F/C)-S2 R88M-KH(1K0/1K5)20(F/C)-S1	MS3108E20-4S
	Motor side	R88M-K(1K0/1K5)30(H/T)-BS2 R88M-K(1K0/1K5)20(H/T)-BS2 R88M-K90010(H/T)-BS2	MS3108E20-18S
	Motor side	R88M-K(750/1K0/1K5/2K0/3K0/4K0/5K0)30(F/C)-BS2 R88M-K(400/600/1K0/1K5/2K0/3K0/4K0/5K0)20(F/C)-BS2 R88M-K(900/2K0/3K0)10(F/C)-BS2 R88M-K4K510C-BS2 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 R88M-K(3K0/4K0/5K0)20(F/C)-S2 R88M-K(2K0/3K0)10(F/C)-S2 R88M-K4K510C-S2 R88M-KH(2K0/3K0/4K0/5K0)20(F/C)-S1	MS3108E22-22S
	Motor side	R88M-K6K010C-□ R88M-K(7K5/11K0/15K0)15C-□ 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 R88M-K(7K5/11K0/15K0)15C-BS2 R88M-KH7K515C-BS1	MS3108E14S-2S

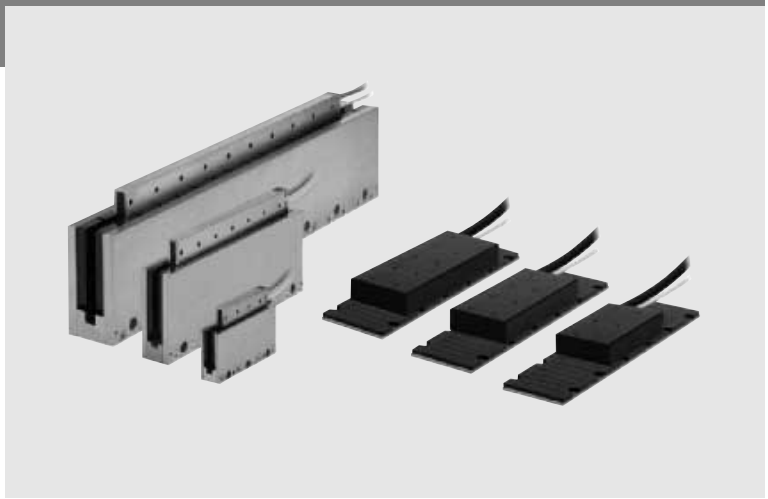
Note: 1. All cables listed are flexible and shielded (except the R88A-CAKA□□□-BR-E which is only a flexible cable).
2. All connectors and cables listed have IP67 class (except R88A-CNW01R connector and R88A-CRGD0R3C cable).

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_I100E-EN-03 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

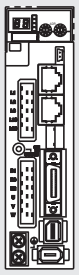
Ratings

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

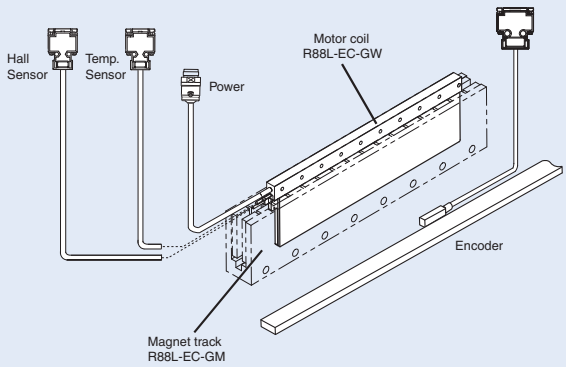
System configuration

(Refer to servo drive chapter)

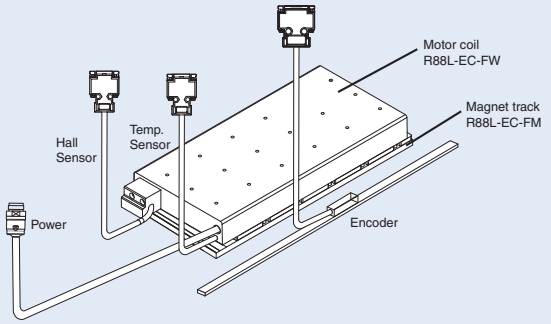
SYSMAC always in control



Accurax G5 servo drive
EtherCAT model



Ironless linear motor



Iron-core linear motor

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	Coil without connectors	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	Coil with connectors	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	Coil without connectors	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	Coil with connectors	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

Design Revision No.

Length of magnet track in mm

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

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

Design Revision No.

Placeholder

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

Linear Servomotor specifications

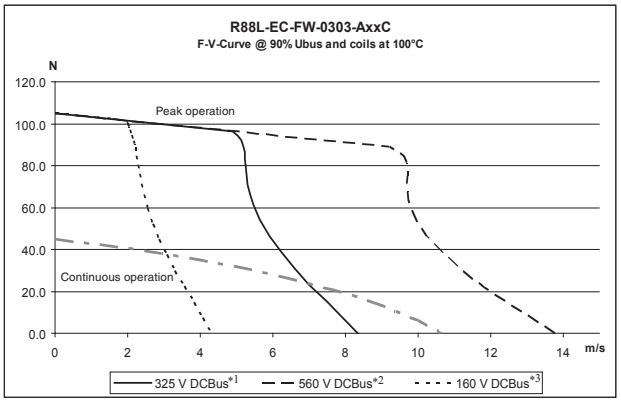
Iron-core motors R88L-EC-FW-□ (230/400 VAC)

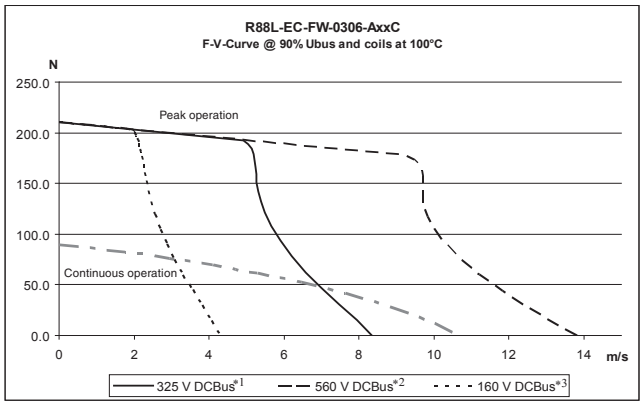
Voltage		230/400V						
Linear motor model	**R88L-EC-FW-□**	**0303-□**	**0306-□**	**0606-□**	**0609-□**	**0612-□**	**1112-□**	**1115-□**
Maximum speed (100 V)	**m/s**	2,5		2			1	
Maximum speed (200 V)	**m/s**	5		4			2	
Maximum speed (400 V)	**m/s**	10		8			4	
Peak force[*1]	**N**	105	210	400	600	800	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	**Ω**	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 MΩ						
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						

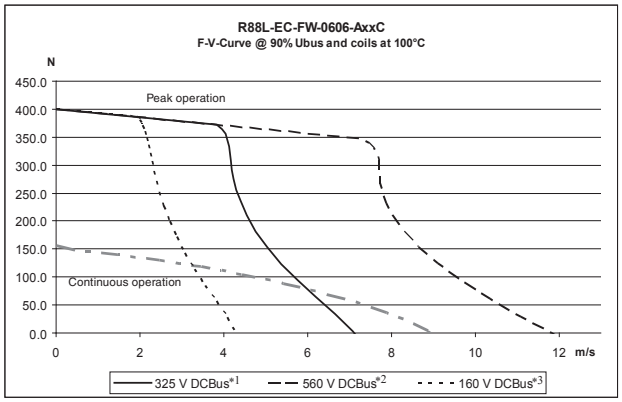
[*1] Coil temperature rising by 6K/s.
[*2] Values at 100°C coil temperature and magnets at 25°C. Coil unit must be attached to the given cooling plate sizes in the table and an airstream of 2.5 m/s (25°C) has to be applied.
[*3] Weight without connector and cable.
[*4] I^2t has to be set properly for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

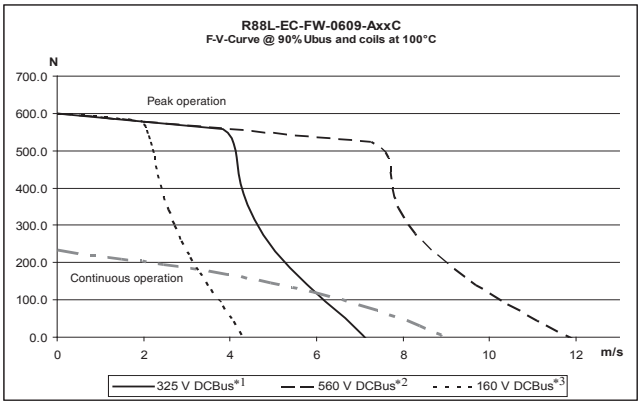
All other values at 25ºC (±10%).

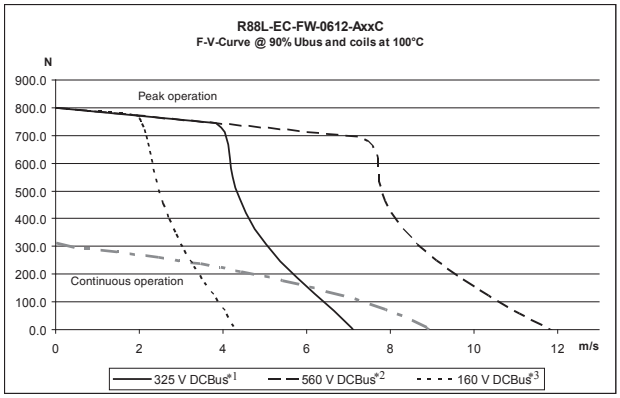
Force-speed characteristics

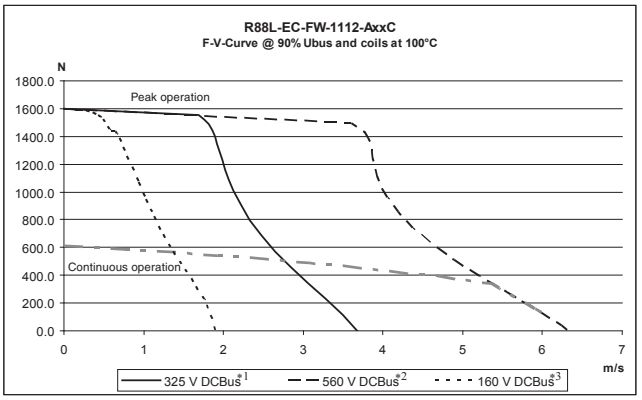


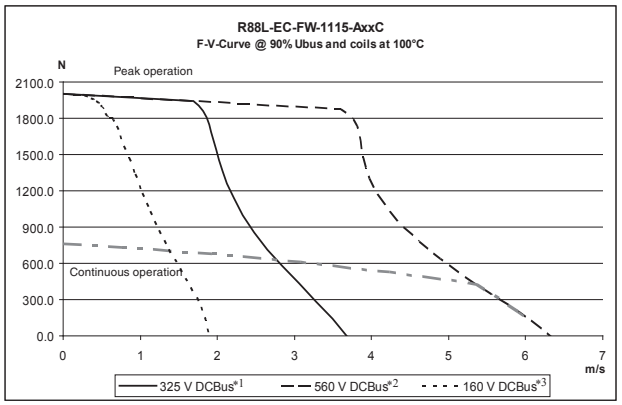












*1 The DCBus voltage corresponds to an AC voltage input (V_{ACIN}) of 235 V or more.
*2 The DCBus voltage corresponds to an AC voltage input (V_{ACIN}) of 400 V or more.
*3 The DCBus voltage corresponds to an AC voltage input (V_{ACIN}) of 115 V or more.

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

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

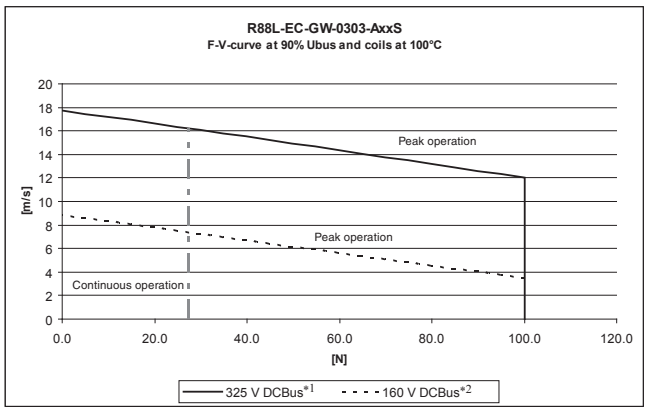
Ironless motors R88L-EC-GW-□ (230 VAC)

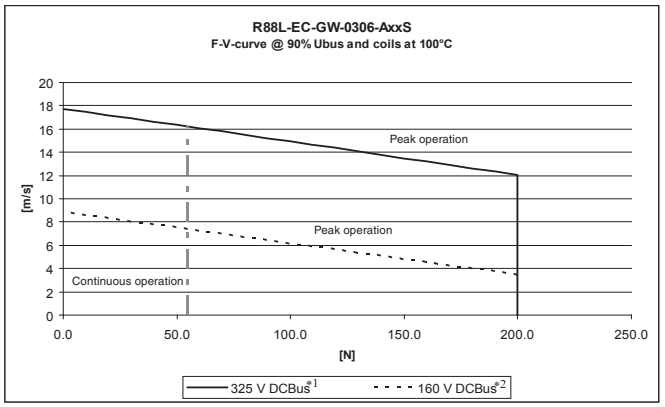
Voltage		230V								
Linear motor model	**R88L-EC-GW-□**	**0303-□**	**0306-□**	**0309-□**	**0503-□**	**0506-□**	**0509-□**	**0703-□**	**0706-□**	**0709-□**
Maximum speed (100V)	**m/s**	8			2.2			1.2		
Maximum speed (200V)	**m/s**	16			4.4			2.4		
Peak force *1	**N**	100	200	300	240	480	720	700	1400	2100
Peak current *1	**Arms**	5	10	15	3.5	7.1	10.6	5.6	11.3	16.9
Continuous force *2	**N**	29	58	87	70	140	210	141	282	423
Continuous current *2	**Arms**	1.46	2.92	4.37	1.03	2.06	3.09	1.14	2.27	3.41
Motor force constant	**N/A_{rms}**	19.9			68			124		
BEMF	**V/m/s**	16.2			55.5			101.2		
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**	39	79	111	46	95	140	82	163	247
Thermal resistance *2	**K/W**	1.81	0.90	0.65	1.26	0.63	0.42	1.04	0.52	0.34
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	0.138	0.198	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								

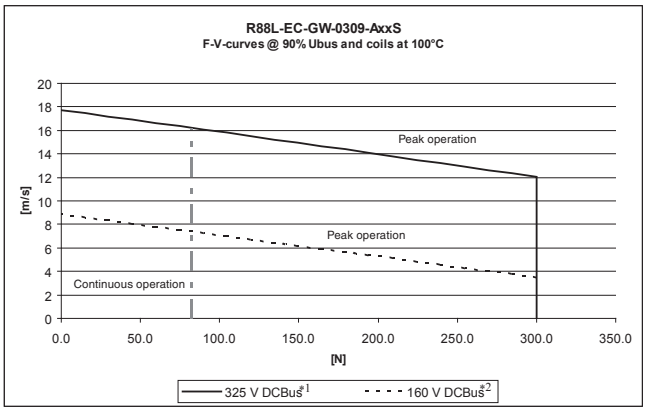
*1 Coil temperature rising 03-series by 40K/s, 05-series by 20K/s and 07-series by 20K/s.
*2 Values at 110°C coil temperature and magnets at 25°C. Coil unit installed on a water-cooled aluminium surface. Attention: All other values at 25°C. Values can have a tolerance of 10%.
*3 Weight without connector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

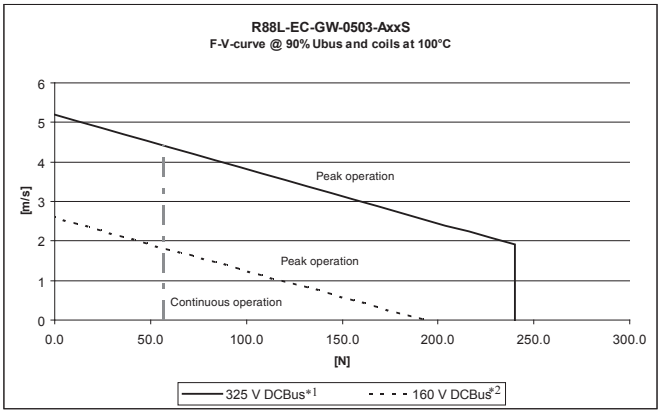
All other values at 25ºC (±10%).

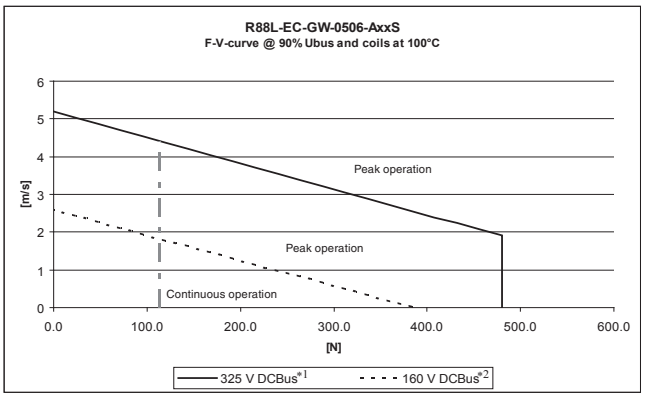
Force-speed characteristics

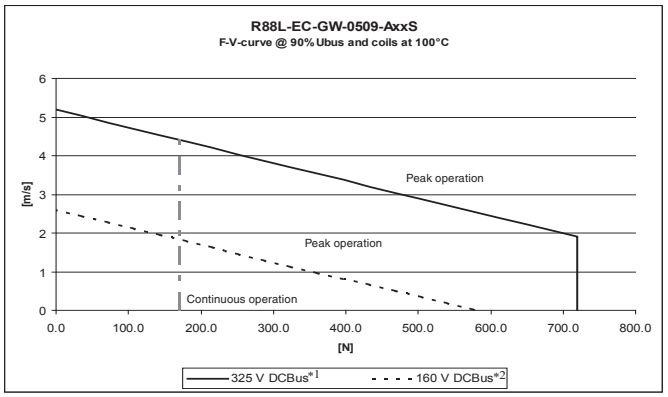


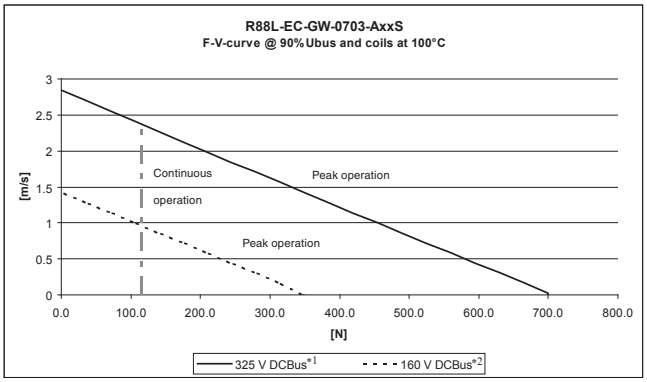


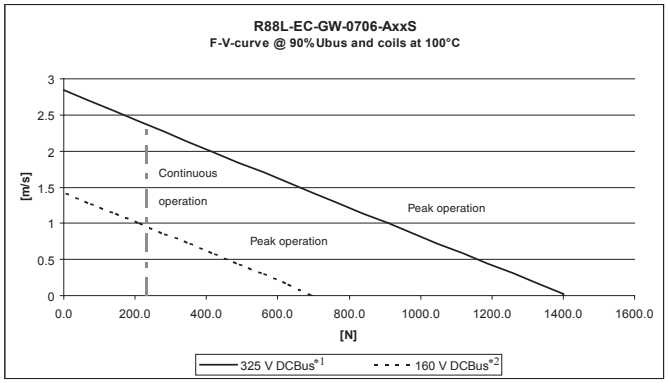


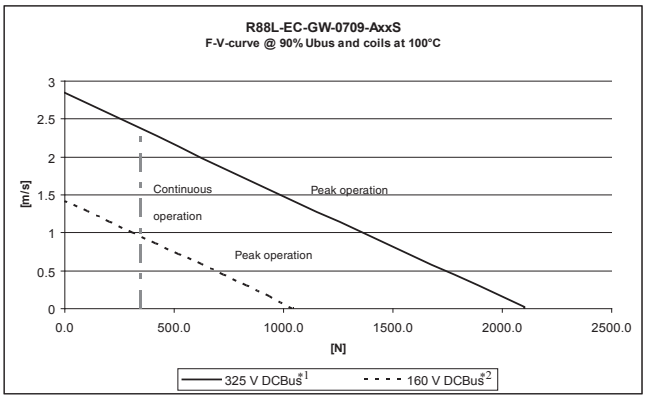












*1 The DCBus voltage corresponds to an AC voltage input (V_{ACIN}) of 235V or more.
*2 The DCBus voltage corresponds to an AC voltage input (V_{ACIN}) of 115V or more.

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

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

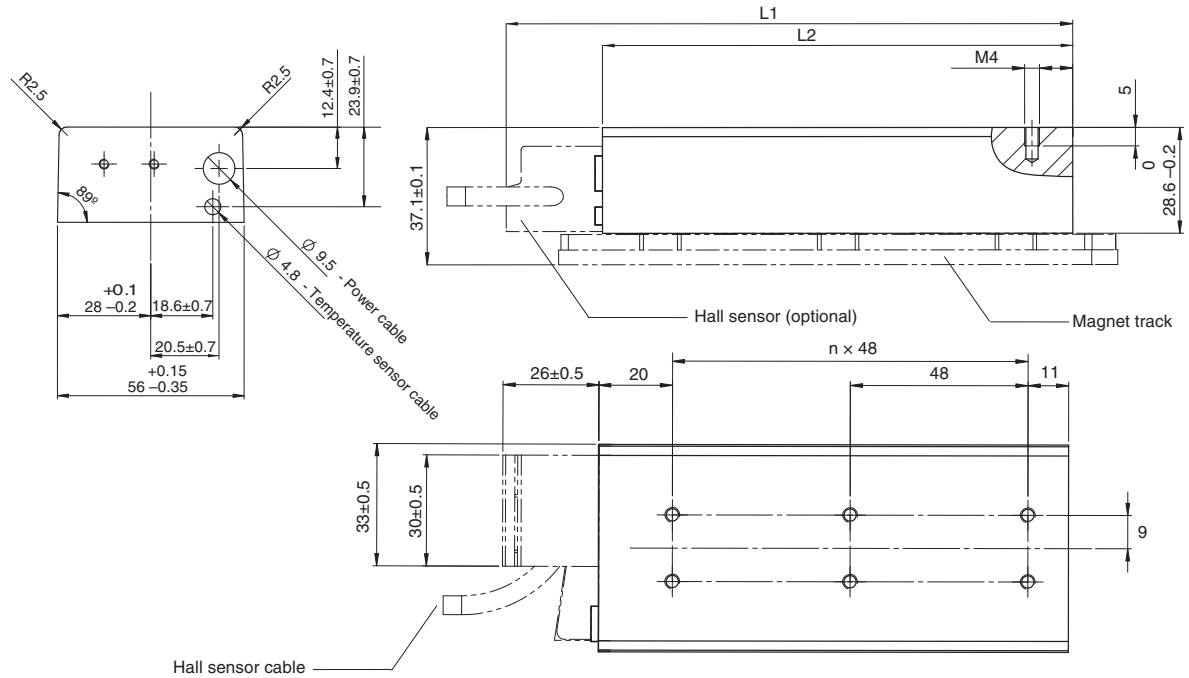
Dimensions

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)



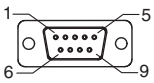
Units: mm

Wiring specifications for motor with connectors

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

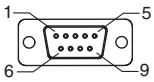
Power connector		
Pin No.	Wire	Function
1	Black-1	Phase U
2	Black-2	Phase V
3	Green/Yellow	Ground
4	Black-3	Phase W
5	Not used	–
6	Not used	–

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	–

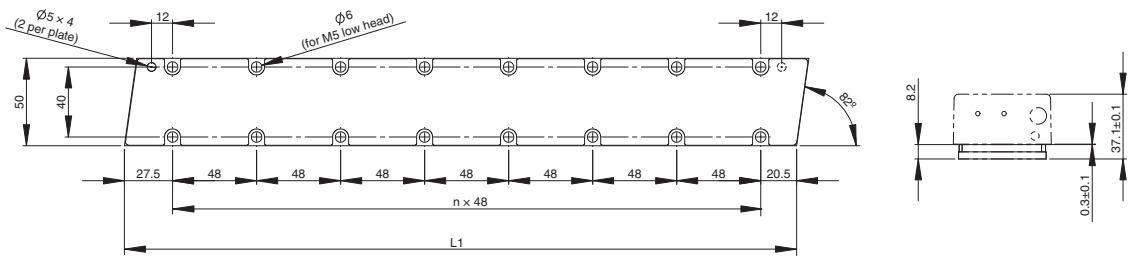


Cable length 500±30
D-Sub 9-pin (FEMALE)

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	

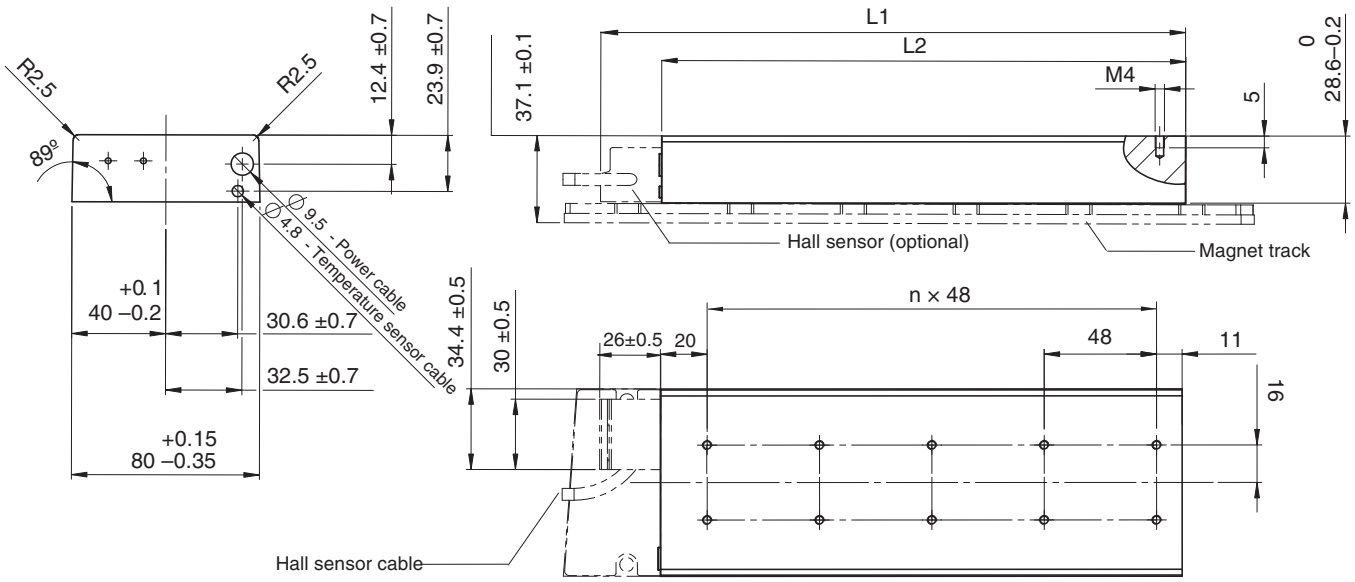


Iron-core R88L-EC-FW-06□

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)



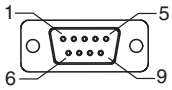
Units: mm

Wiring specifications for motor with connectors

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

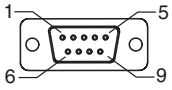
Power connector		
Pin No.	Wire	Function
1	Black-1	Phase U
2	Black-2	Phase V
3	Green/Yellow	Ground
4	Black-3	Phase W
5	Not used	–
6	Not used	–

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	–

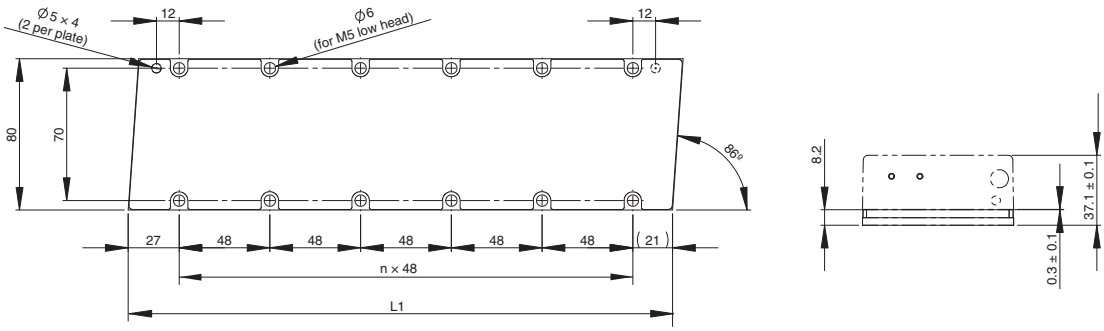


Cable length 500±30
D-Sub 9-pin (FEMALE)

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	

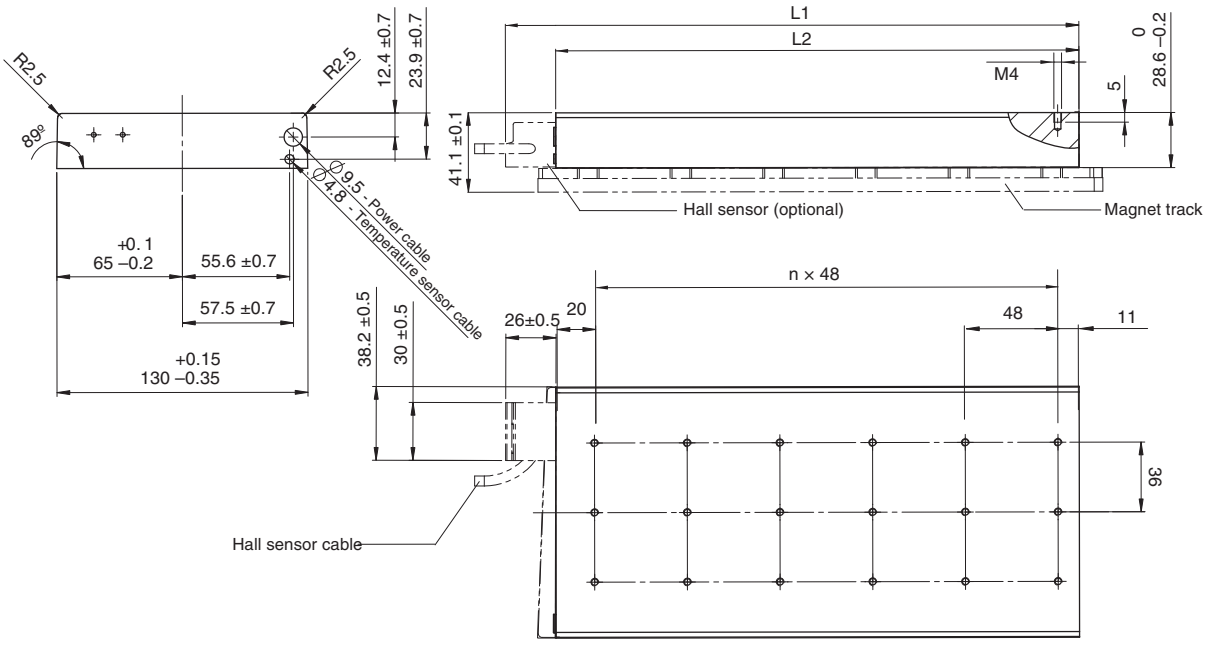


Iron-core R88L-EC-FW-11□

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)



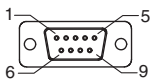
Units: mm

Wiring specifications for motor with connectors

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

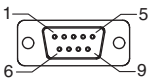
Power connector		
Pin No.	Wire	Function
1	Black-1	Phase U
2	Black-2	Phase V
3	Green/Yellow	Ground
4	Black-3	Phase W
5	Not used	–
6	Not used	–

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	–

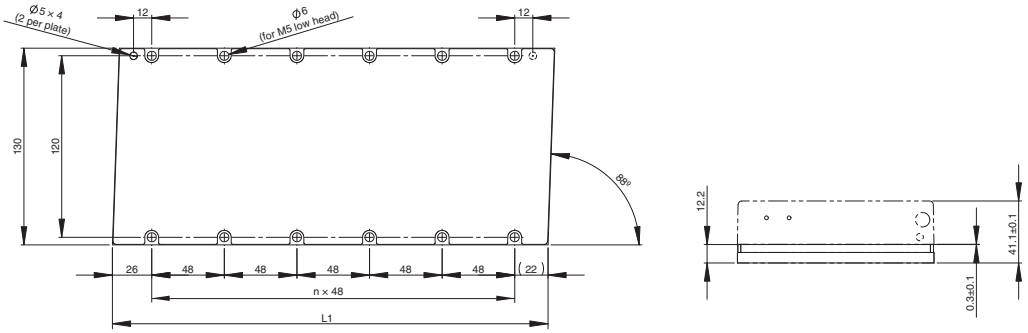


Cable length 500±30
D-Sub 9-pin (FEMALE)

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

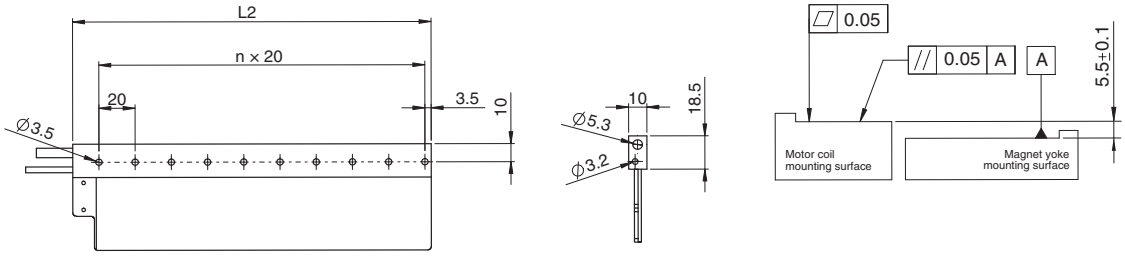
Model	L1 (mm)	n	Approx. weight (kg/m)
R88L-EC-FM-11192-A	192	3	10.5
R88L-EC-FM-11288-A	288	5	



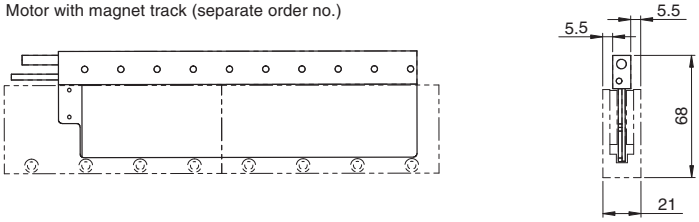
Ironless R88L-EC-GW-03□

Motor coil

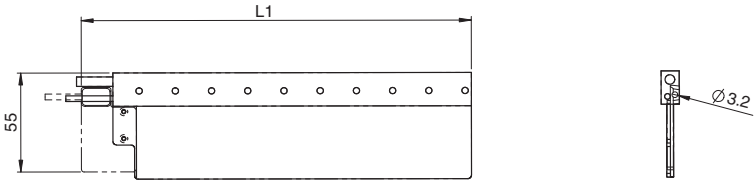
Model	L1 (mm)	L2 (mm)	n
R88L-EC-GW-0303-□	95.4	78	3
R88L-EC-GW-0306-□	155.4	138	6
R88L-EC-GW-0309-□	215.4	198	9



Motor with magnet track (separate order no.)

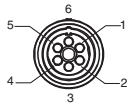


Motor with hall sensor (optional)



Units: mm

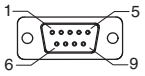
Wiring specifications for motor with connectors



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

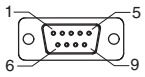
Power connector		
Pin No.	Wire	Function
1	Black	Phase U
2	Red	Phase V
3	White	Phase W
4	Not used	–
5	Not used	–
6	Green	Ground

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	–

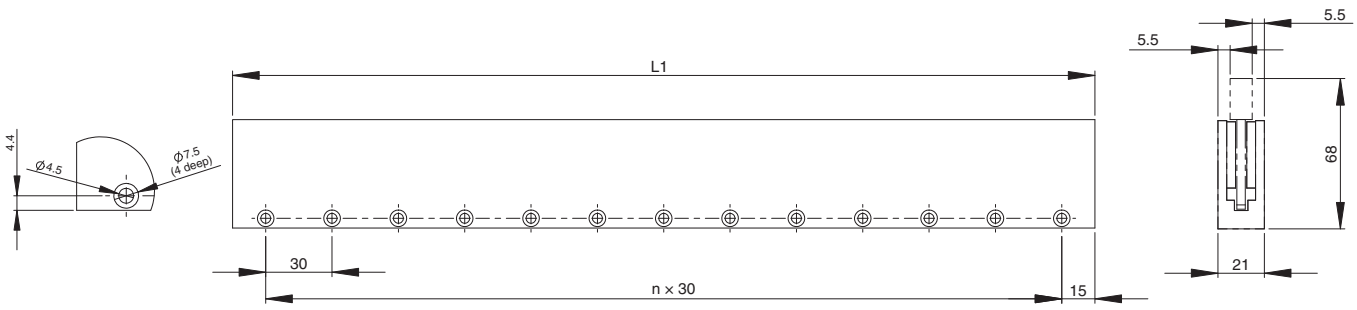


Cable length 500±30
D-Sub 9-pin (FEMALE)

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

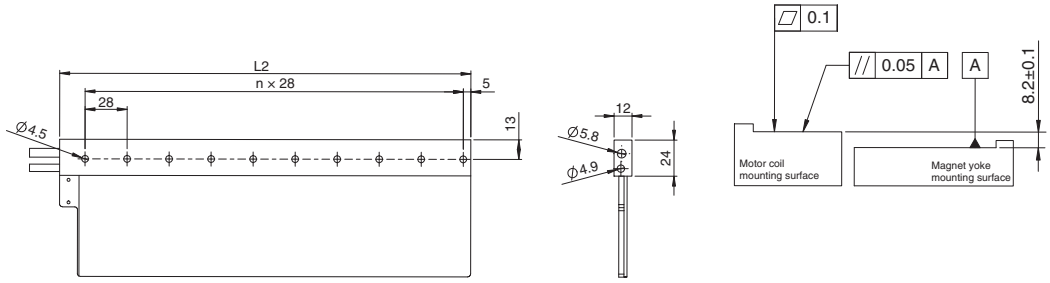
Model	L1 (mm)	n	Approx. weight (kg/m)
R88L-EC-GM-03090-A	90	2	4.8
R88L-EC-GM-03120-A	120	3	
R88L-EC-GM-03390-A	390	12	



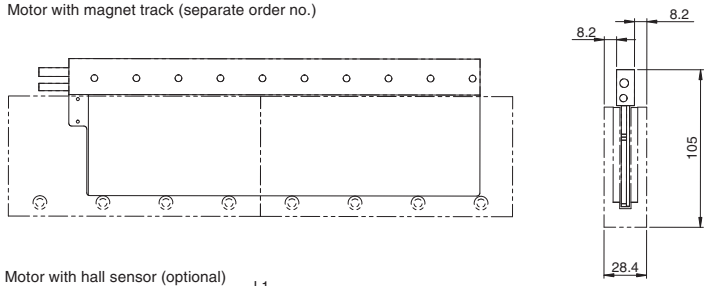
Ironless R88L-EC-GW-05□

Motor coil

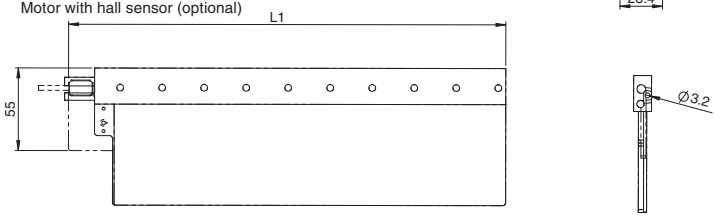
Model	L1 (mm)	L2 (mm)	n
R88L-EC-GW-0503-□	123.4	106	3
R88L-EC-GW-0506-□	207.4	190	6
R88L-EC-GW-0509-□	291.4	274	9



Motor with magnet track (separate order no.)

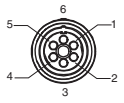


Motor with hall sensor (optional)



Units: mm

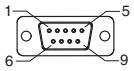
Wiring specifications for motor with connectors



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

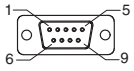
Power connector		
Pin No.	Wire	Function
1	Black	Phase U
2	Red	Phase V
3	White	Phase W
4	Not used	–
5	Not used	–
6	Green	Ground

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	–

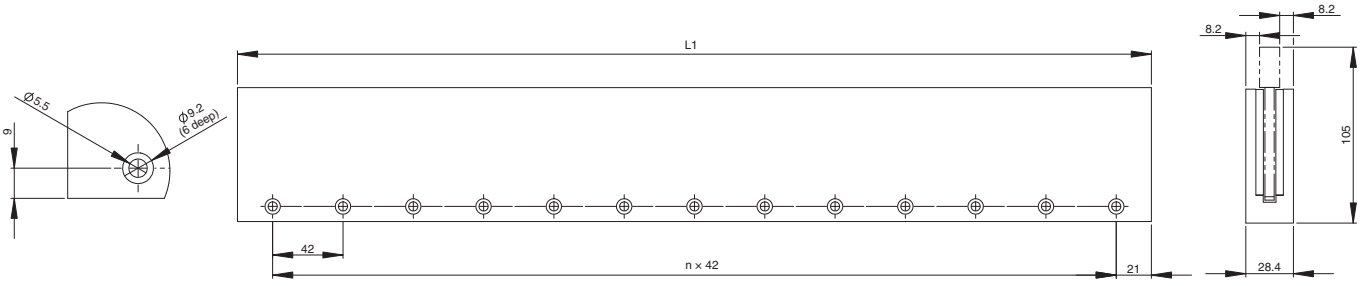


Cable length 500±30
D-Sub 9-pin (FEMALE)

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

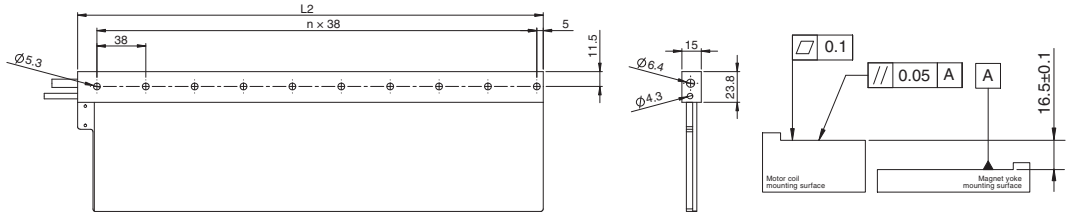
Model	L1 (mm)	n	Approx. weight (kg/m)
R88L-EC-GM-05126-A	126	2	11.2
R88L-EC-GM-05168-A	168	3	
R88L-EC-GM-05210-A	210	4	
R88L-EC-GM-05546-A	546	12	



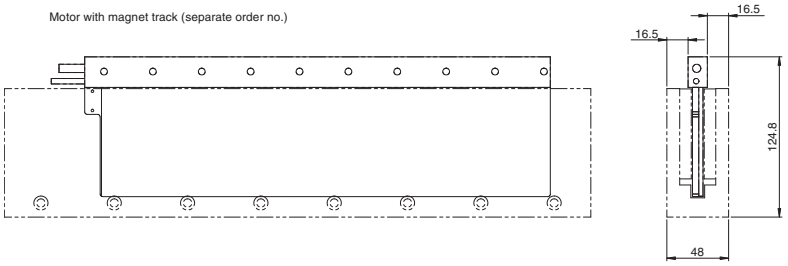
Ironless R88L-EC-GW-07□

Motor coil

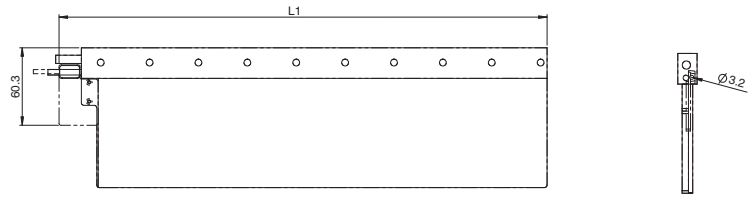
Model	L1 (mm)	L2 (mm)	n
R88L-EC-GW-0703-□	151.4	134	3
R88L-EC-GW-0706-□	265.4	248	6
R88L-EC-GW-0709-□	379.4	362	9



Motor with magnet track (separate order no.)

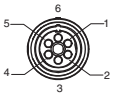


Motor with hall sensor (optional)



Units: mm

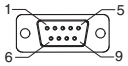
Wiring specifications for motor with connectors



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

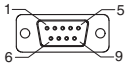
Power connector		
Pin No.	Wire	Function
1	Black	Phase U
2	Red	Phase V
3	White	Phase W
4	Not used	–
5	Not used	–
6	Green	Ground

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	–

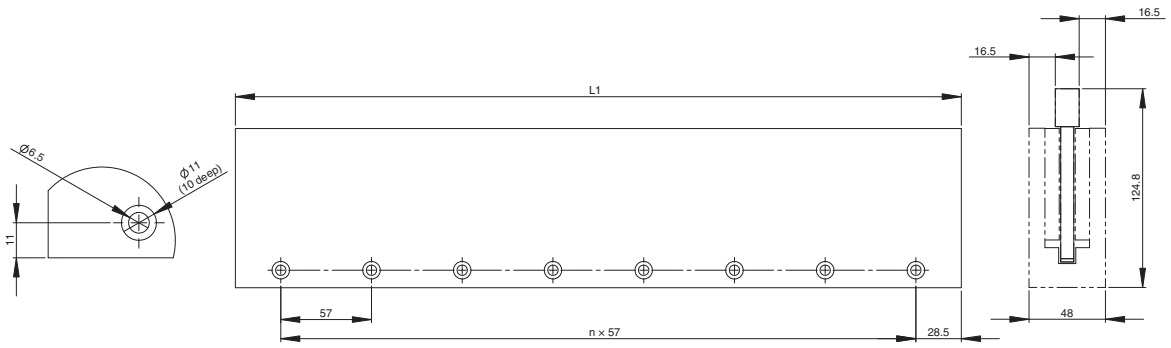


Cable length 500±30
D-Sub 9-pin (FEMALE)

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

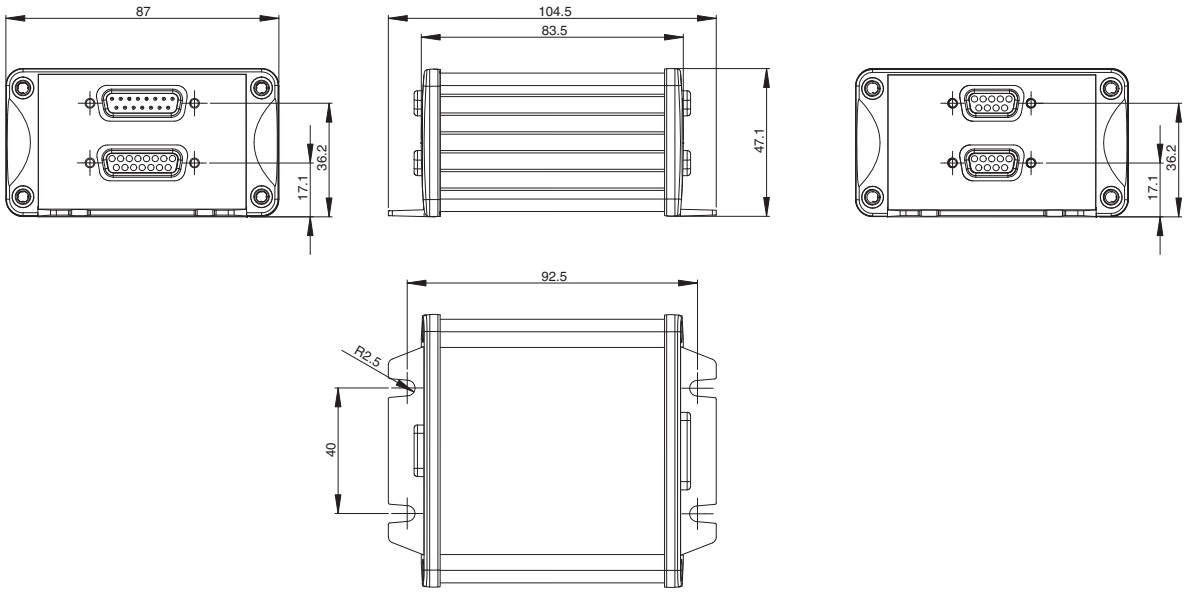
Model	L1 (mm)	n	Approx. weight (kg/m)
R88L-EC-GM-07114-A	114	1	25.5
R88L-EC-GM-07171-A	171	2	
R88L-EC-GM-07456-A	456	7	



Optional serial converter unit

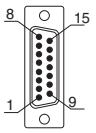
Specifications

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

Serial data output to linear servo drive

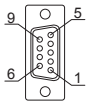


Connector D-Sub 15-pin (male)

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
Case	Shield

CN3

Temperature sensor interface without Hall sensor

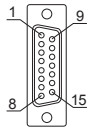


Connector D-Sub 9-pin (female)

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
Case	Shield

CN1

Encoder input 1Vpp with programmable lines NUMERIK JENA standard



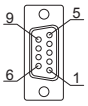
Connector D-Sub 15-pin (female)

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

CN2

Hall & temperature sensors interface

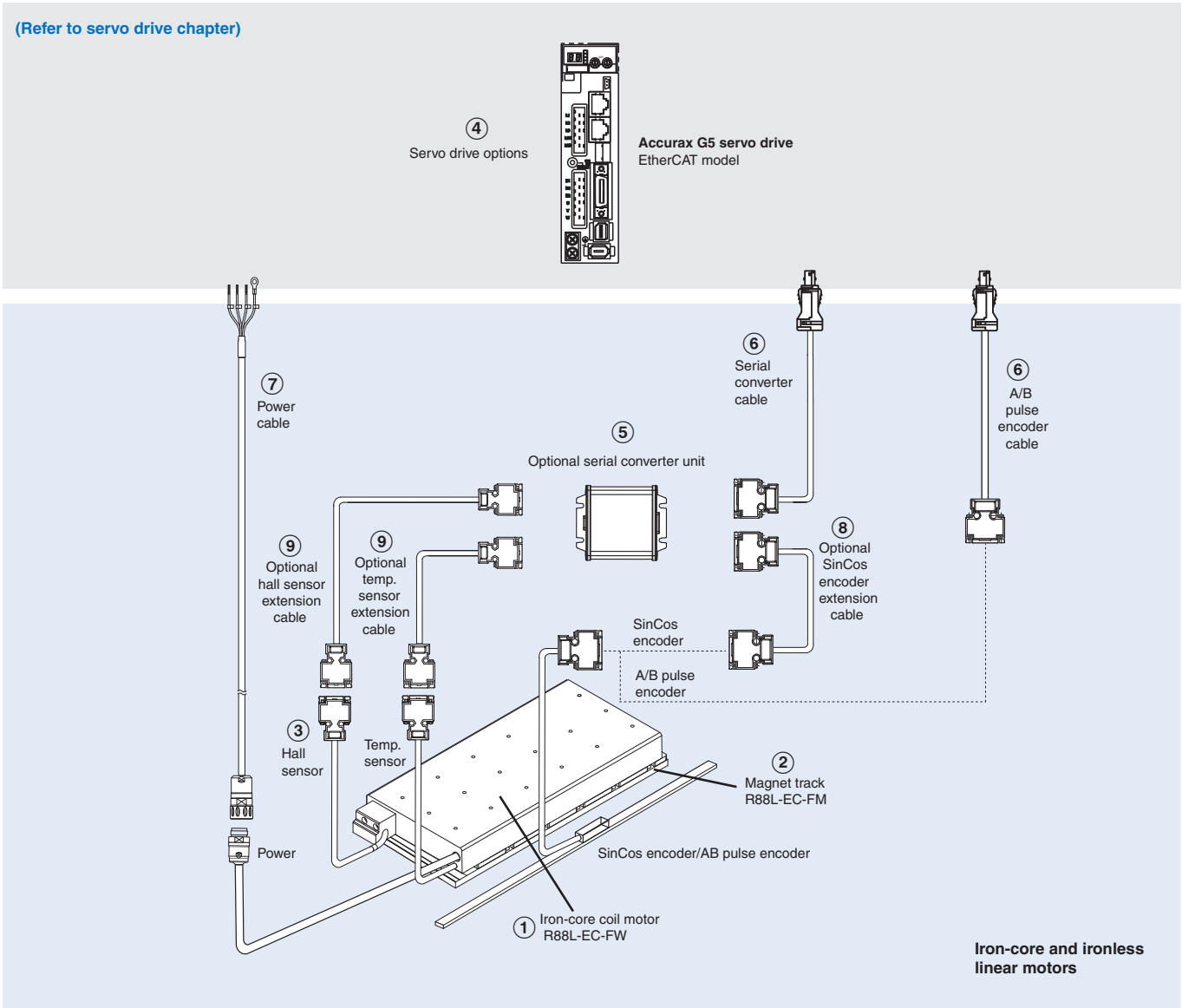


Connector D-Sub 9-pin (female)

Pin No.	Signal
1	5V
2	Hall U
3	Hall V
4	Hall W
5	GND
6	PTC
7	PTC
8	KTY/NTC
9	KTY/NTC
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



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

Linear motor parts							Linear Servo drive
							④ Accurax G5 EtherCAT
Type	Rated force	Peak force	① Ironless motor coil		② Magnet track	③ Hall Sensor	230V
①②③④ 	29 N	100 N	Coil without connectors	R88L-EC-GW-0303-ANPS	R88L-EC-GM-03090-A R88L-EC-GM-03120-A R88L-EC-GM-03390-A	R88L-EC-GH-03NN-A	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	R88L-EC-GM-05126-A R88L-EC-GM-05546-A R88L-EC-GM-05168-A R88L-EC-GM-05210-A	R88L-EC-GH-05NN-A	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	R88L-EC-GM-07114-A R88L-EC-GM-07171-A R88L-EC-GM-07456-A	R88L-EC-GH-07NN-A	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	Coil with connectors	R88L-EC-GW-0303-APLS	R88L-EC-GM-03090-A R88L-EC-GM-03120-A R88L-EC-GM-03390-A	R88L-EC-GH-03NN-A	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	R88L-EC-GM-05126-A R88L-EC-GM-05546-A R88L-EC-GM-05168-A R88L-EC-GM-05210-A	R88L-EC-GH-05NN-A	R88D-KN02H-ECT-L
	140 N	480 N		R88L-EC-GW-0506-APLS			R88D-KN04H-ECTL
	210 N	720 N		R88L-EC-GW-0509-APLS			R88D-KN08H-ECT-L
	141 N	700 N		R88L-EC-GW-0703-APLS	R88L-EC-GM-07114-A R88L-EC-GM-07171-A R88L-EC-GM-07456-A	R88L-EC-GH-07NN-A	R88D-KN04H-ECTL
	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

Servo drive

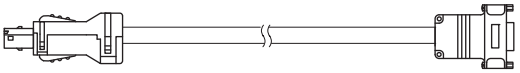
④ Refer to Accurax G5 servo drive chapter for detailed drive specifications and selection of drive accessories.

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

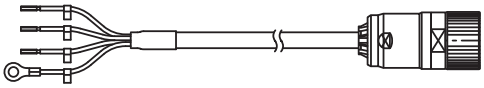
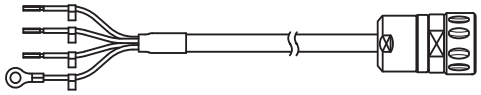
Note: If no temperature sensor is needed, then it does not matter which converter you use.

Serial converter cable to servo drive

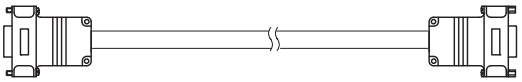
Symbol	Specifications		Model	Appearance
⑥	Accurax G5-Linear drive to serial converter cable. (Connectors R88A-CNK41L and DB-15)	1.5 m	R88A-CRKN001-5CR-E	
		3 m	R88A-CRKN003CR-E	
		5 m	R88A-CRKN005CR-E	
		10 m	R88A-CRKN010CR-E	
		15 m	R88A-CRKN015CR-E	
		20 m	R88A-CRKN020CR-E	

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

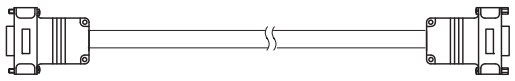
Power cable

Symbol	Specifications		Model	Appearance
⑦	For iron-core linear motors R88L-EC-FW-0303-□ 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 R88L-EC-FW-0606-□ R88L-EC-FW-0609-□ R88L-EC-FW-0612-□ R88L-EC-FW-1112-□ 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 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.

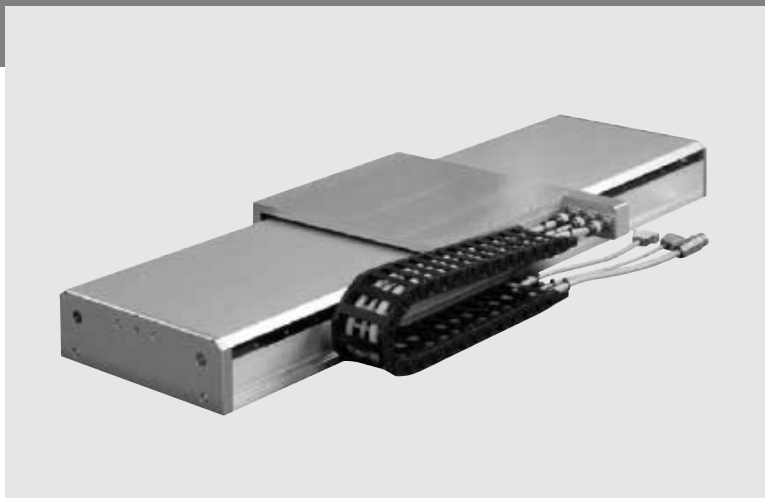
Cat. No. SysCat_I160E-EN-02 In the interest of product improvement, specifications are subject to change without notice.

	Linear axis
	
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
Page	171

	Delta robot		
			
Model	**Washdown Delta robot**	**Delta robot**	**Mini Delta robot**
Max. Payload	3 kg	2 kg	1 kg
Degrees of freedom	3+1 (rotation optional)	3+1 (rotation optional)	3+1 (rotation optional)
Rated working range	Ø 1,100 × 450 mm	Ø 1,100 × 400 mm	Ø 500 × 155 mm
Cycle time	25/305/25 mm (0.1 kg): Up to 150 cycle/ min	25/305/25 mm (0.1 kg): Up to 150 cycle/ min	25/305/25 mm (0.1 kg): Up to 200 cycle/ min
Position repeatability	±0,2mm (X, Y, Z)	±0,3 mm (X, Y, Z)	±0,2 mm (X, Y, Z)
Angular repeatability	±0,1° (θ)	±0,4° (θ)	±0,3° (θ)
Protection class	IP67	IP65	IP65
Rotational axis type	Tool Center Point mounting - Low or High inertia -	Shaft mounting	Shaft mounting
Machine controller	NJ5 Robotics	NJ5 Robotics	NJ5 Robotics
Servo drive	Accurax G5 rotary servo drive – EtherCAT	Accurax G5 rotary servo drive – EtherCAT	Accurax G5 rotary servo drive – EtherCAT
Page	185	185	185

R88L-EA-AF-□

Accurax linear motor axis



Advanced linear motor axis

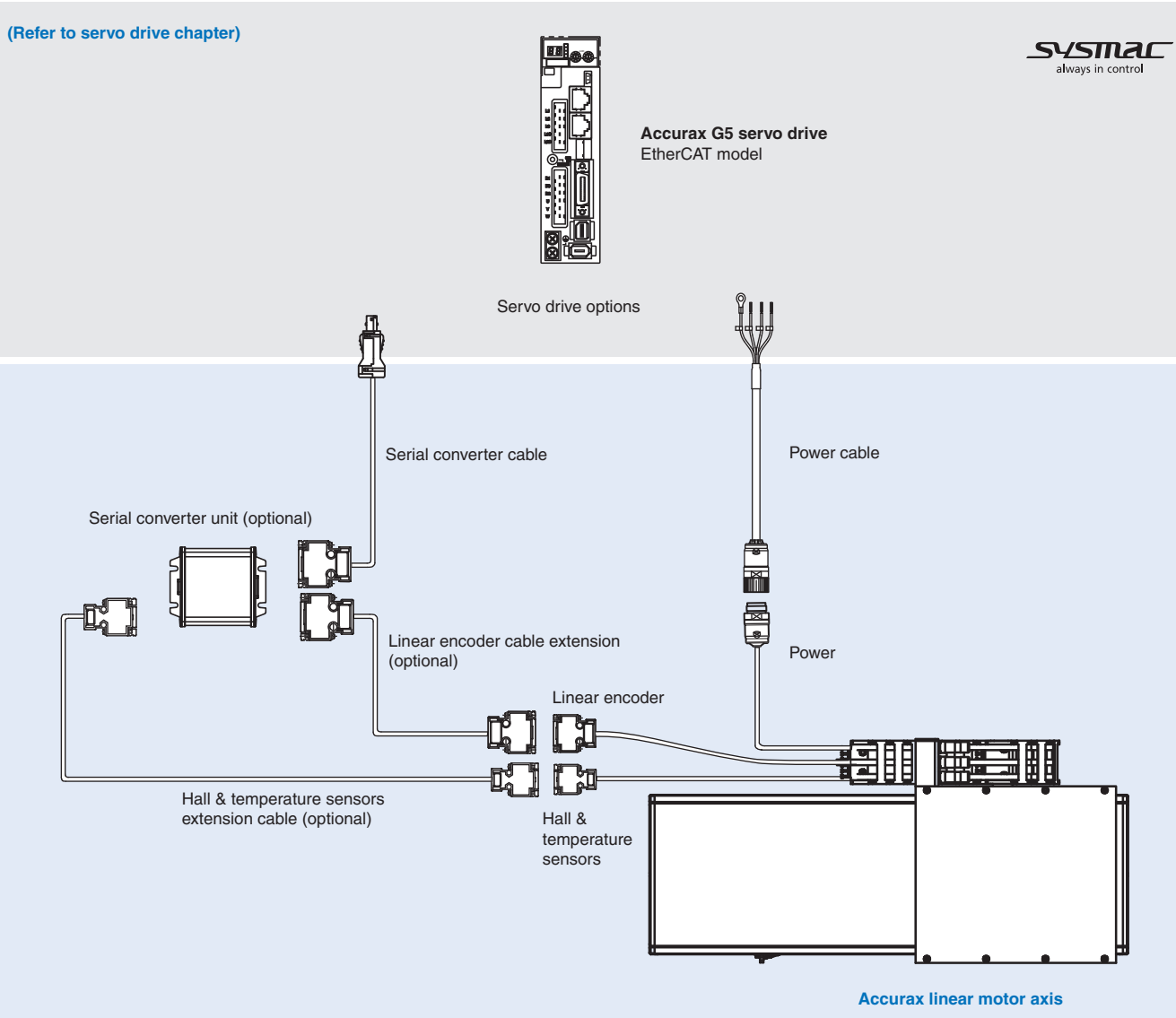
High-efficiency iron-core linear motors and magnet tracks in a wide range of over 100 standard linear motor axis.

- 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



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 - □

- R88L - EA - AF: Accurax linear motor axis
- 0303: 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

- 0110: Stroke lenght (for effective stroke distances available see dimensions section)
- □: Customised versions

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.

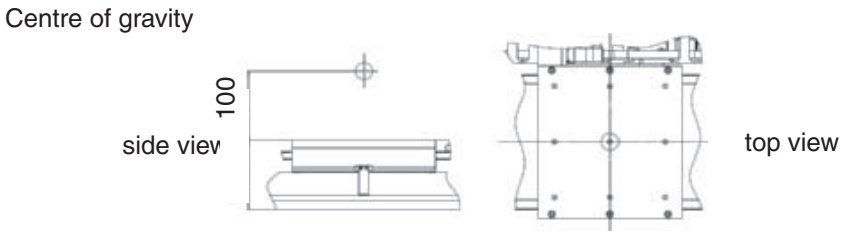
Linear servomotor specifications

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	Ω	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						

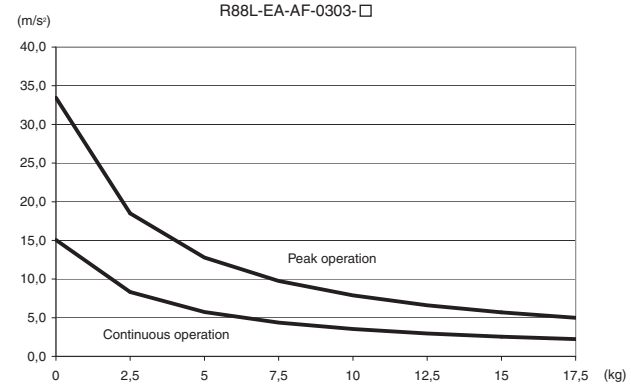
[*1] Coil temperature rising by 6K/s.
[*2] Values at 100°C coil temperature and magnets at 25°C. An airstream of 2.5 m/s (25°C) has to be applied.
[*3] Referring to the center of gravity, for higher payload or different position of payload please contact your OMRON representative.
[*4] I^2t has to be set properly for high current applications.

All other values at 25°C (±10%).

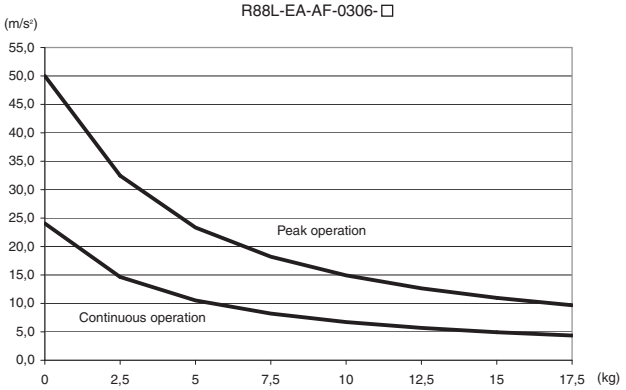


Acceleration-payload characteristics

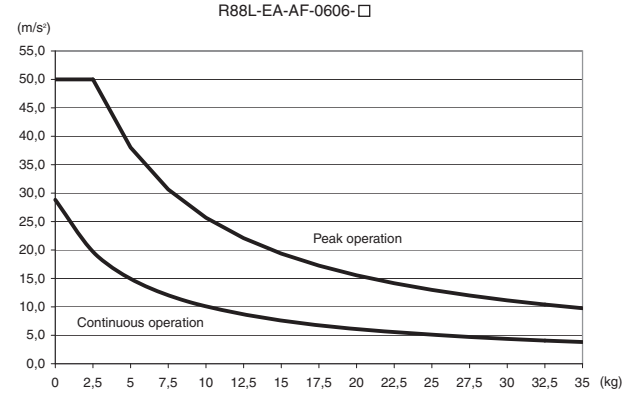
R88L-EA-AF-0303-□



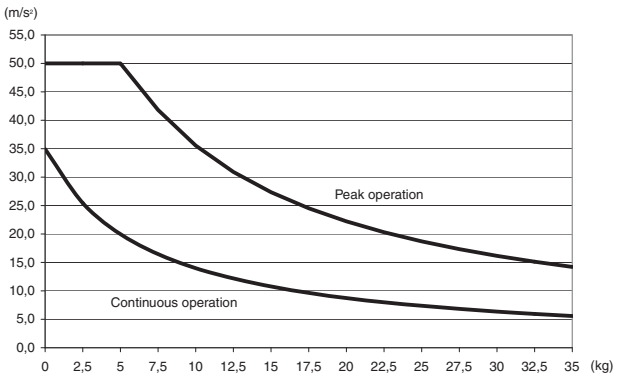
R88L-EA-AF-0306-□



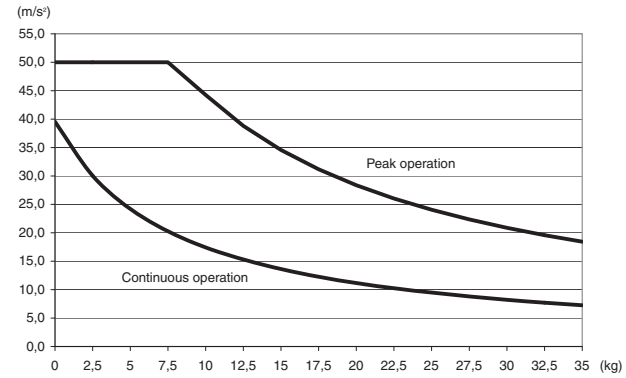
R88L-EA-AF-0606-□



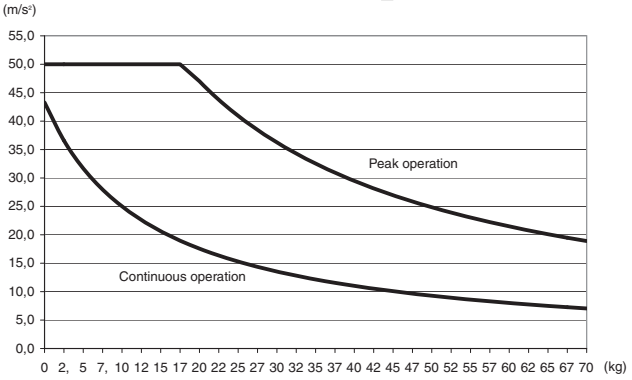
R88L-EA-AF-0609-□



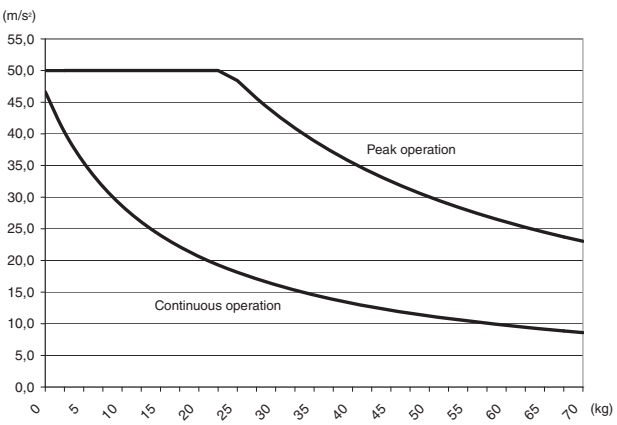
R88L-EA-AF-0612-□



R88L-EA-AF-1112-□



R88L-EA-AF-1115-□



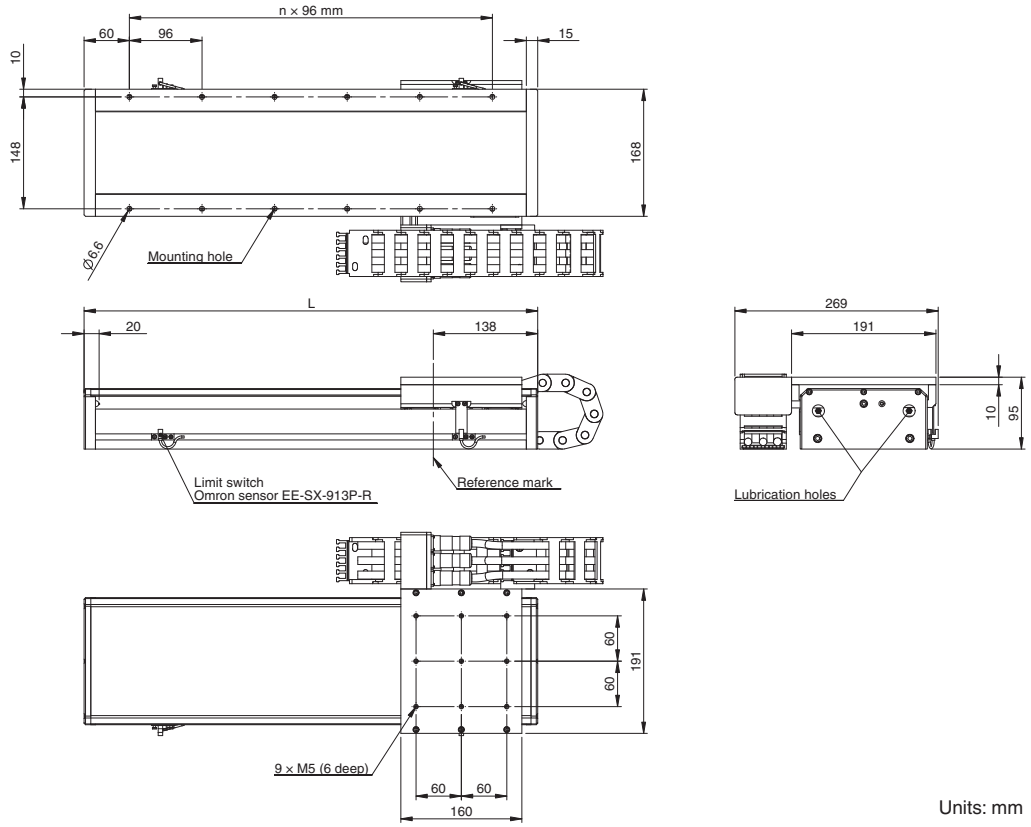
Note: The values on the above curves are calculated based on the below formula and with horizontal orientation:

$$Acceleration = (Force – Force_{Friction}) / Weigth_{Total}$$

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



Units: mm

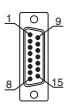
Hall sensor & temperature cable

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

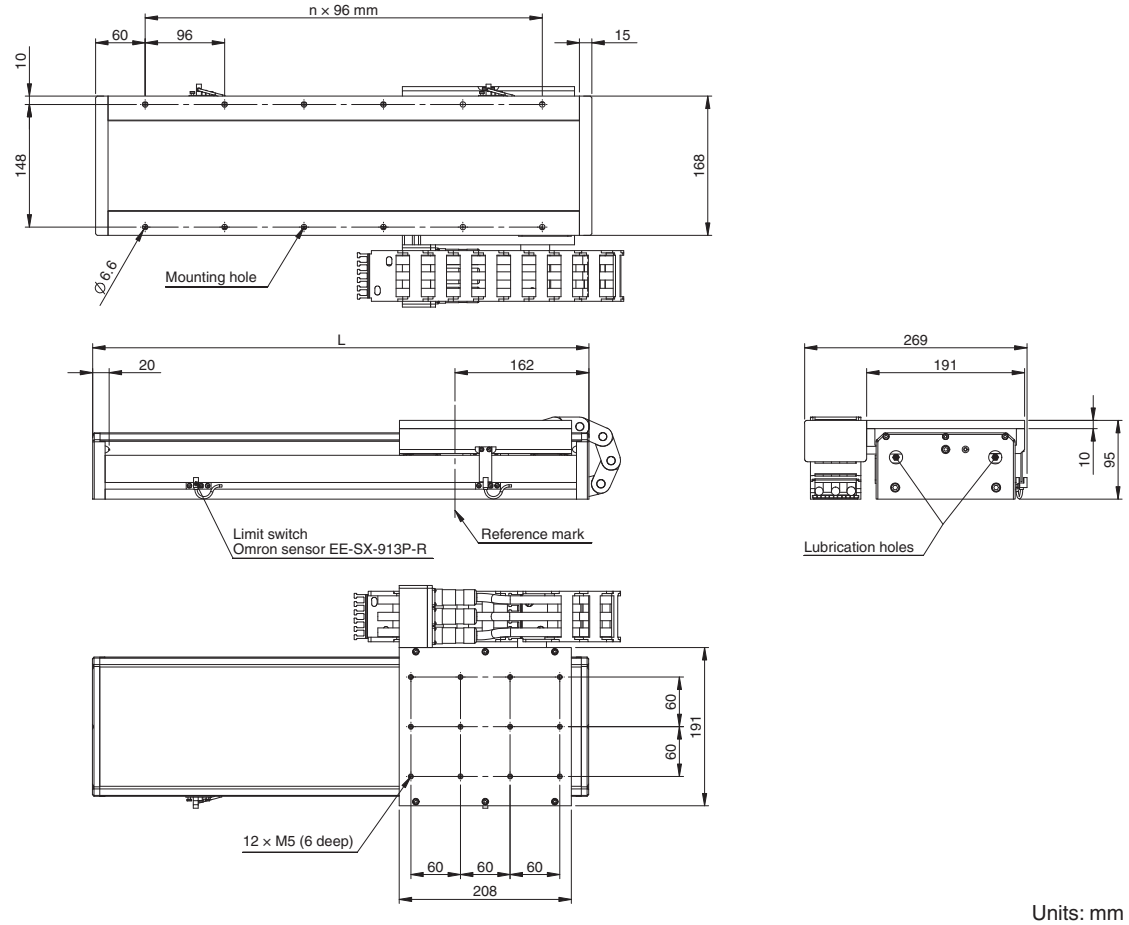
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

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

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



Units: mm

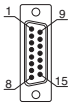
Hall sensor & temperature cable

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

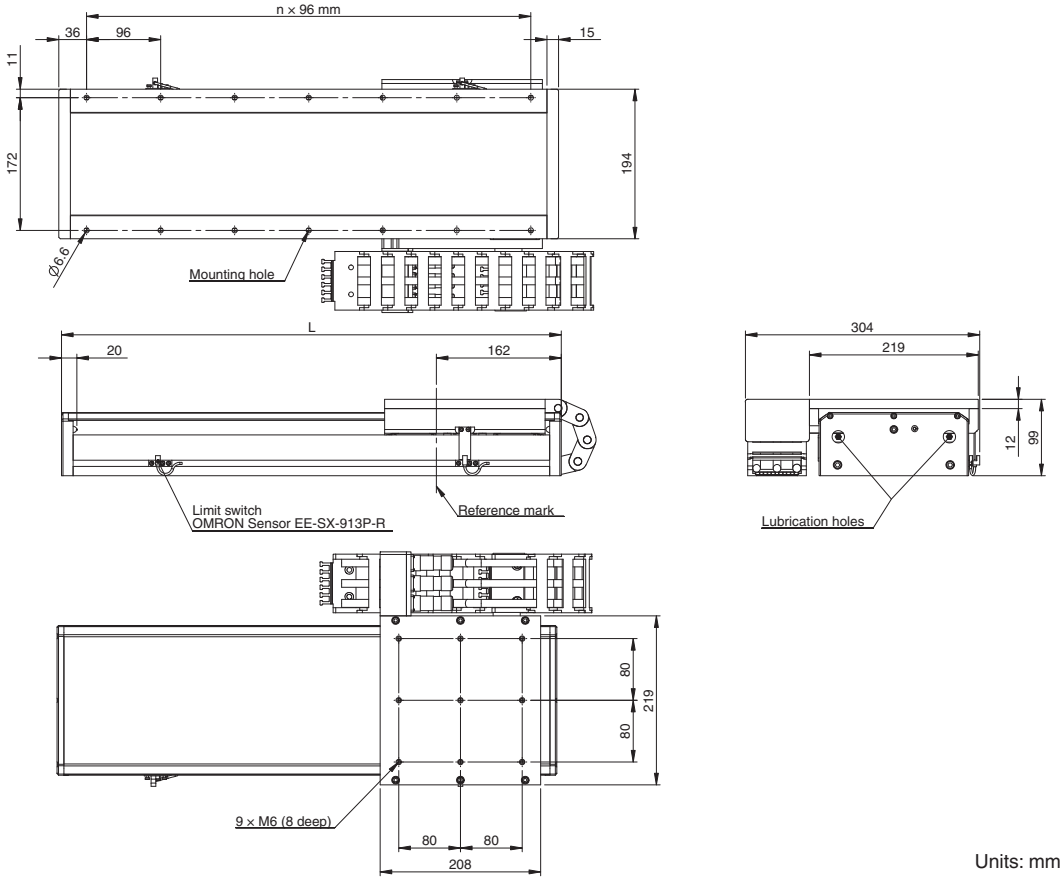
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

Mating connector:
Plug type: LPRA06BFRBN170

Pin No.	Name
1	Phase U
2	Phase V
3	Ground
4	Phase W
5	Not used
6	Not used

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



Units: mm

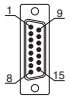
Hall sensor & temperature cable

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)



*Reserved. Please do not use

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

Power cable

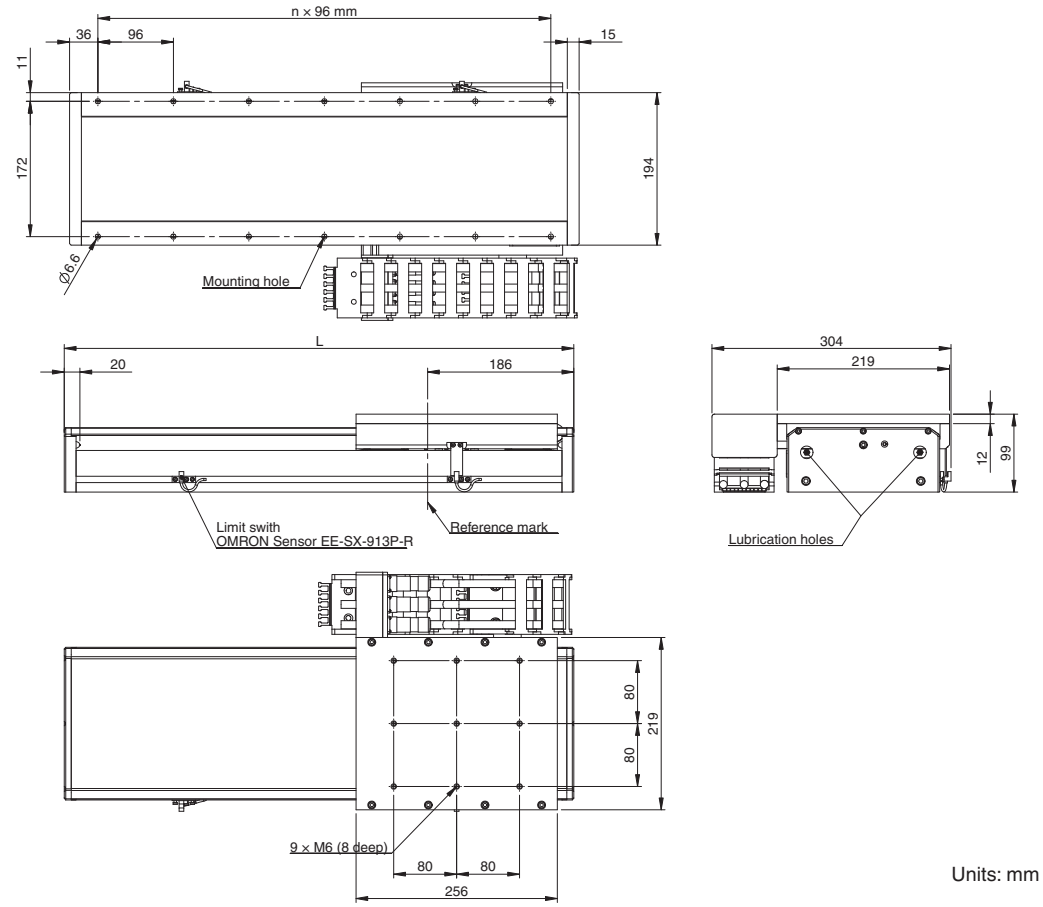
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

Mating connector:
Plug type: LPRA06BFRBN170

Pin No.	Name
1	Phase U
2	Phase V
3	Ground
4	Phase W
5	Not used
6	Not used

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



Units: mm

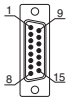
Hall sensor & temperature cable

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

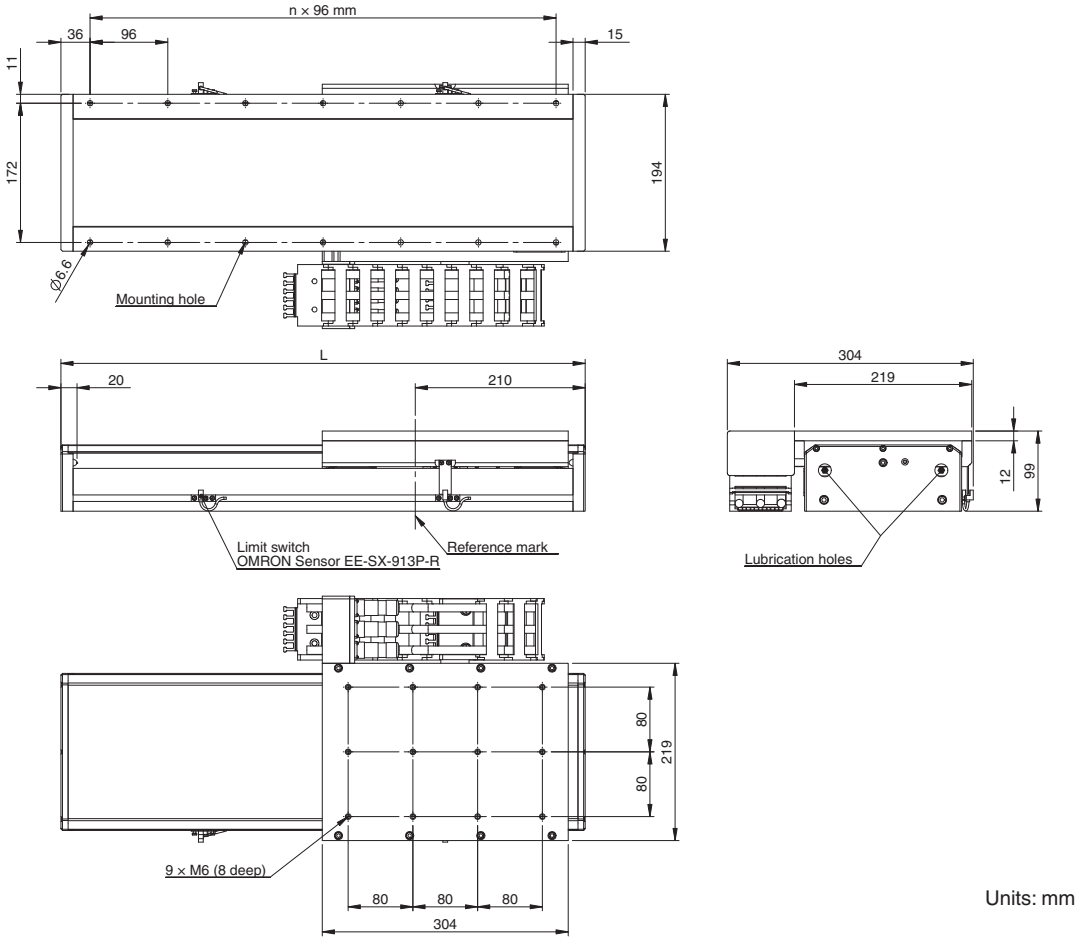
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

Mating connector:
Plug type: LPRA06BFRBN170

Pin No.	Name
1	Phase U
2	Phase V
3	Ground
4	Phase W
5	Not used
6	Not used

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



Units: mm

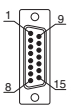
Hall sensor & temperature cable

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

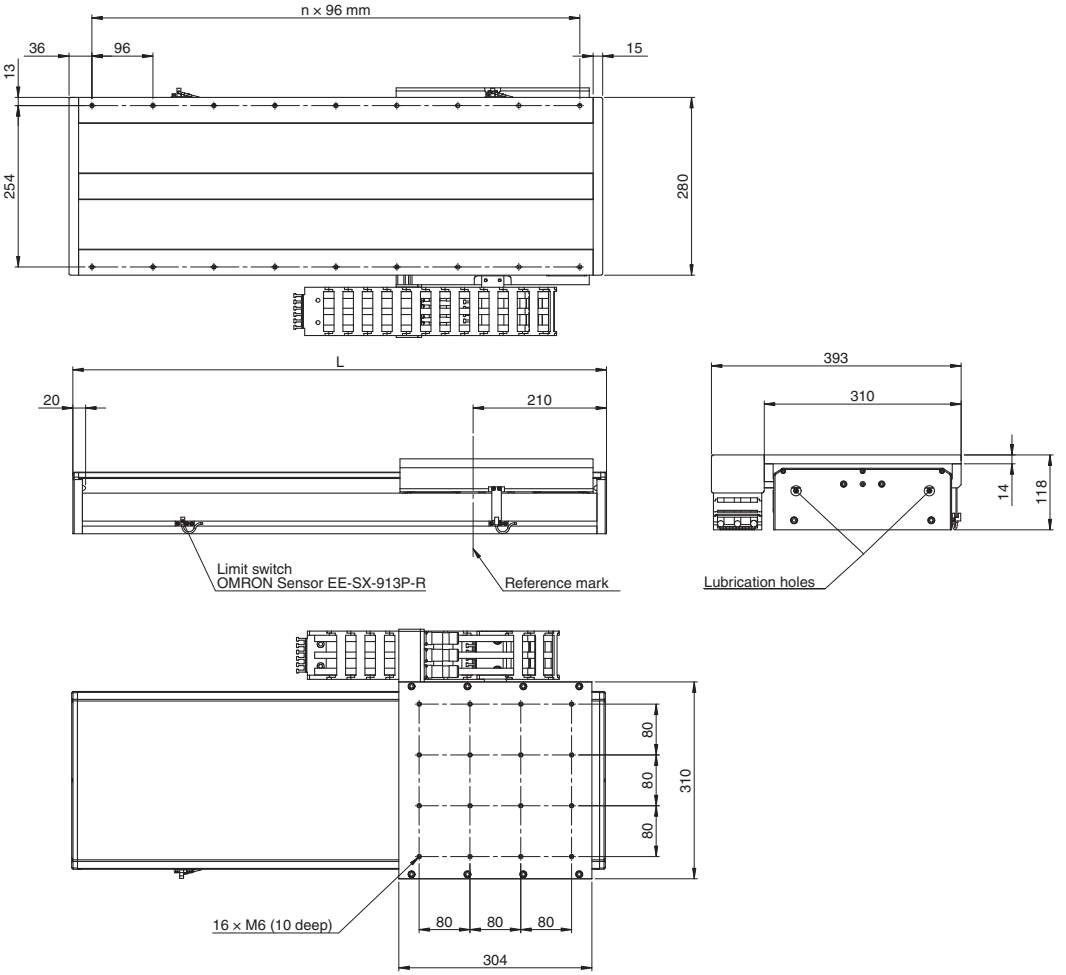
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

Mating connector:
Plug type: LPRA06BFRBN170

Pin No.	Name
1	Phase U
2	Phase V
3	Ground
4	Phase W
5	Not used
6	Not used

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



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

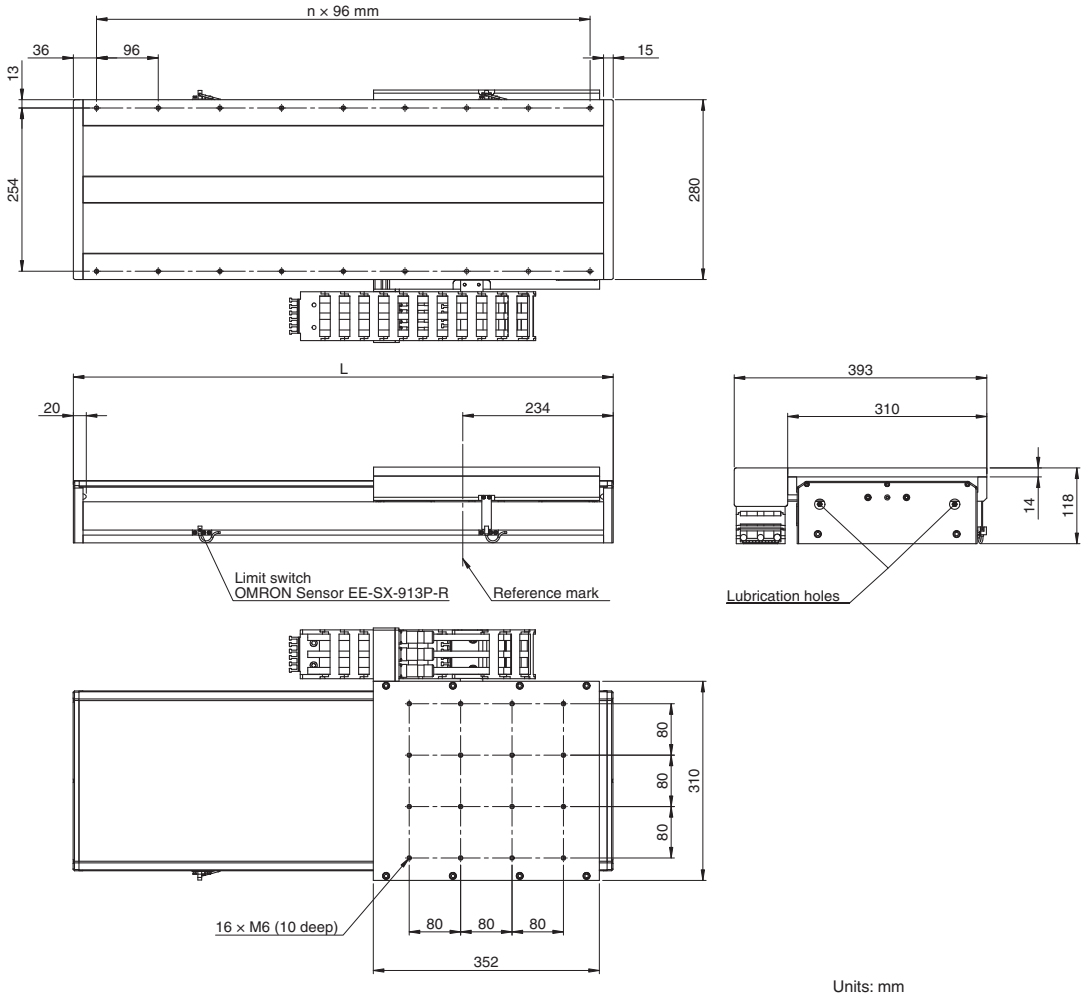
Cable length 500 mm approx.
Connector Hypertac
LRRA06AMRPN182 (male)
Pin article code: 021.279.1020

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

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



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

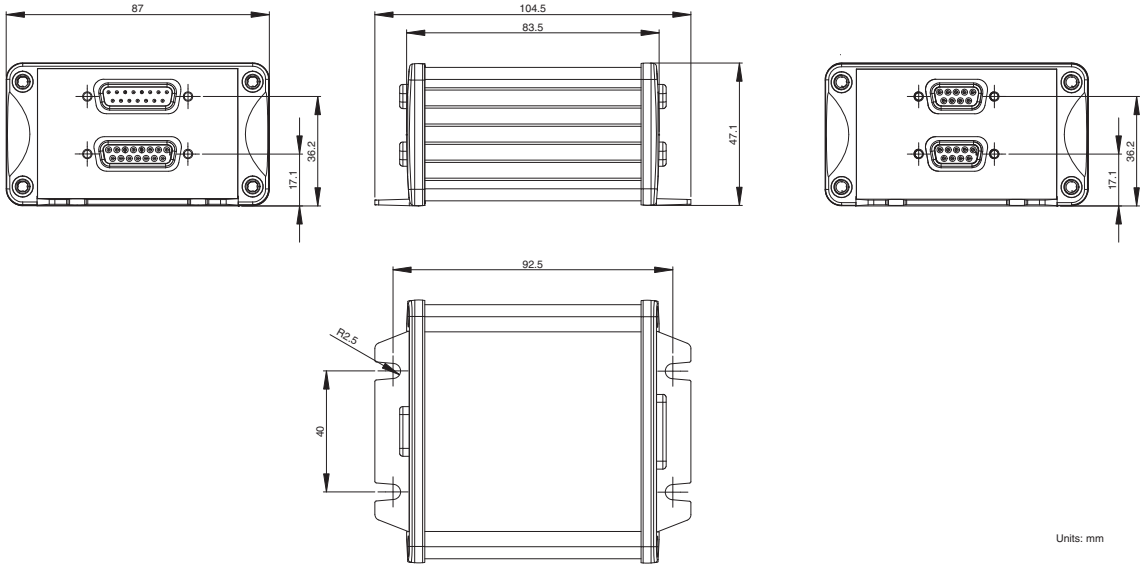
Pin No.	Name
1	Phase U
2	Phase V
3	Ground
4	Phase W
5	Not used
6	Not used

Mating connector:
Plug type: LPRA06BFRBN170

Optional serial converter unit

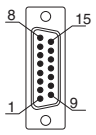
Specifications

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

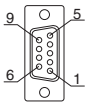
CN4
Serial data output to linear servo drive



Connector D-Sub 15-pin (male)

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
Case	Shield

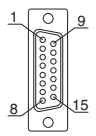
CN3
Temperature sensor interface without h all sensor



Connector D-Sub 9-pin (female)

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
Case	Shield

CN1
Encoder input 1Vpp with programmable lines NUMERIK JENA standard

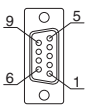


Connector D-Sub 15-pin (female)

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

CN2
Hall & temperature sensors interface

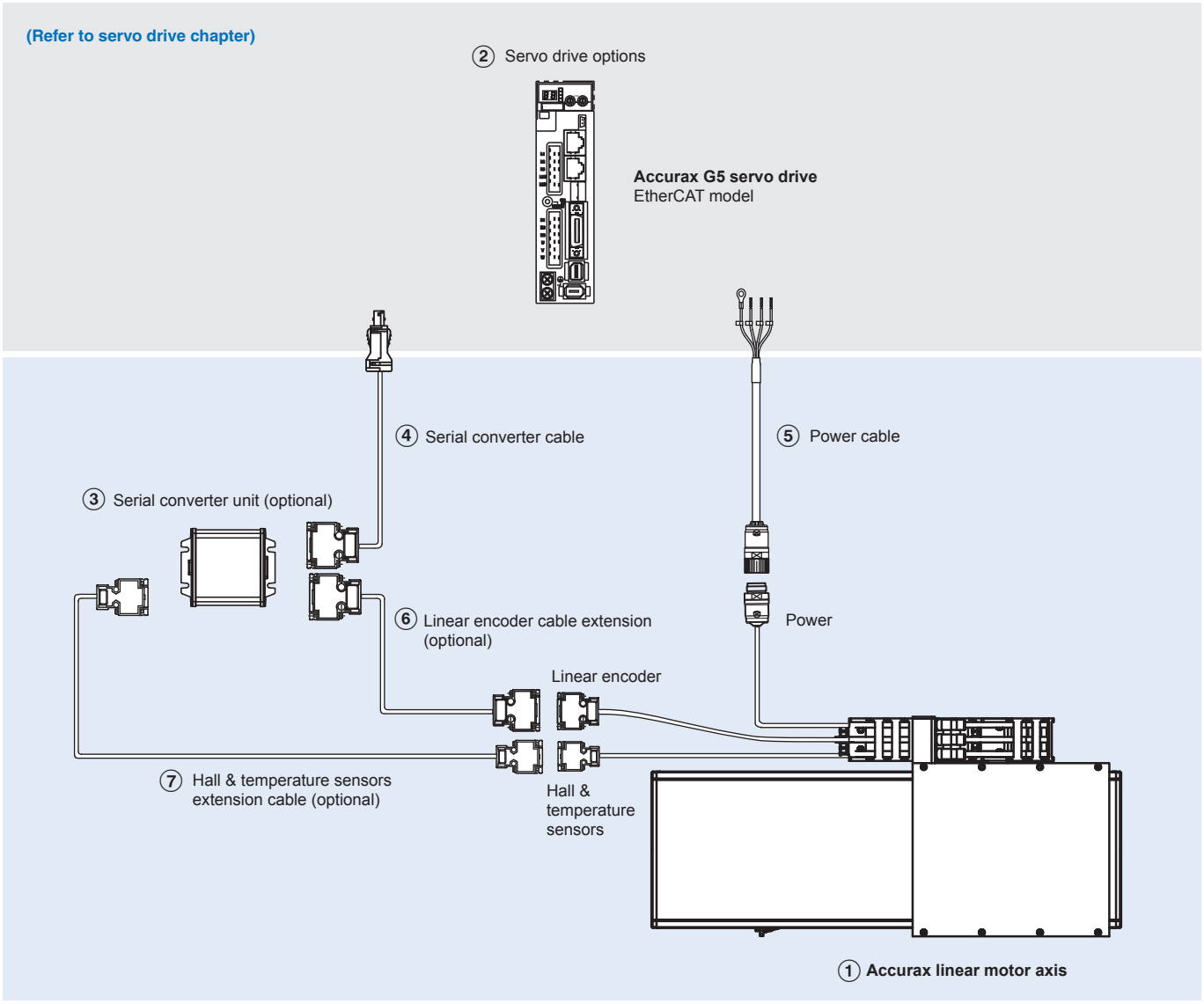


Connector D-Sub 9-pin (female)

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
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



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.

Servo drive

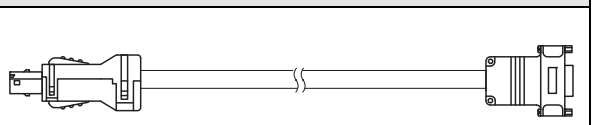
② Refer to Accurax G5 servo drive chapter for detailed drive specifications and selection of drive accessories.

Serial converter unit

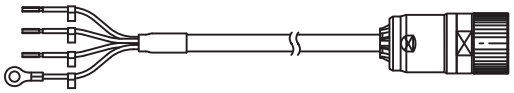
Symbol	Specifications	Model
③	Serial converter unit from 1 Vpp to G5 serial data transmission (with KTY sensor detection of iron-core motor coil)	R88A-SC01K-E
	Serial converter unit from 1 Vpp to G5 serial data transmission (with NTC sensor detection of ironless motor coil)	R88A-SC02K-E

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

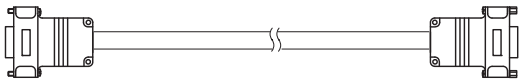
Serial converter cable to servo drive

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	

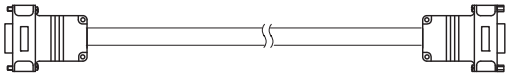
Power cable

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

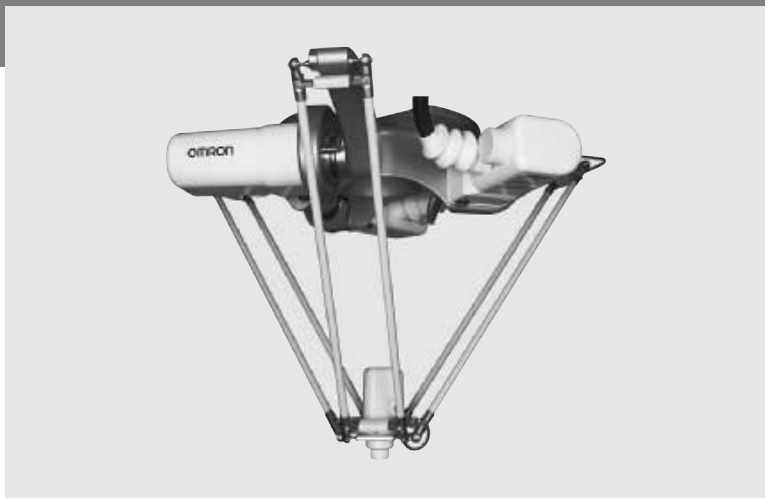
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_I161E-EN-02 In the interest of product improvement, specifications are subject to change without notice.

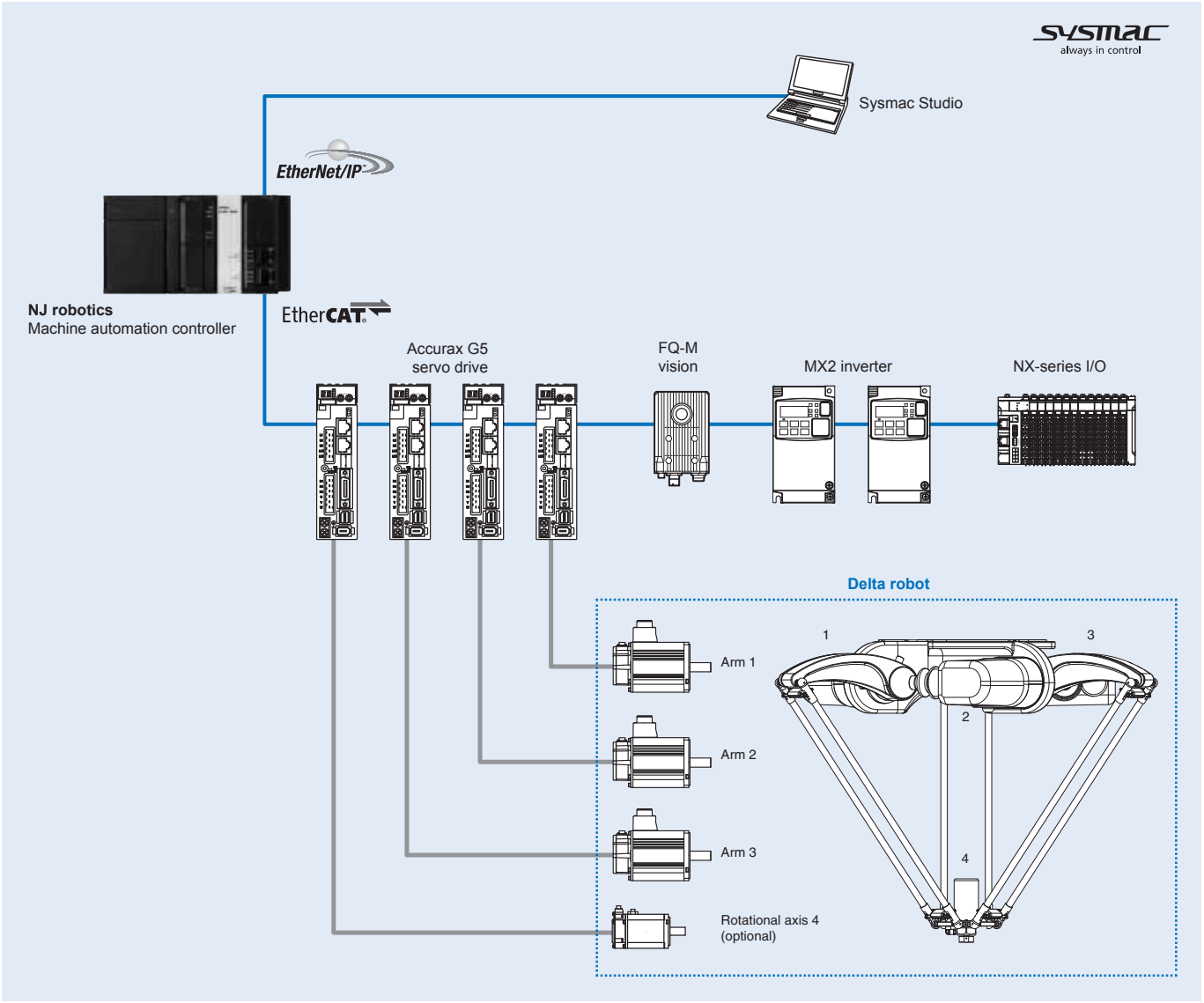
Delta robot

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 minutes
- Up to 3 kg payload
- 2 different types of robot arms: Delta and Mini Delta robot models
- IP67 and IP65 models



System configuration



Note: Servo motors included in the Delta robot.

Specifications

Washdown Delta robot specifications

Model			R6Y31110H03067	R6Y31110L03067	R6Y30110S03067
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.

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

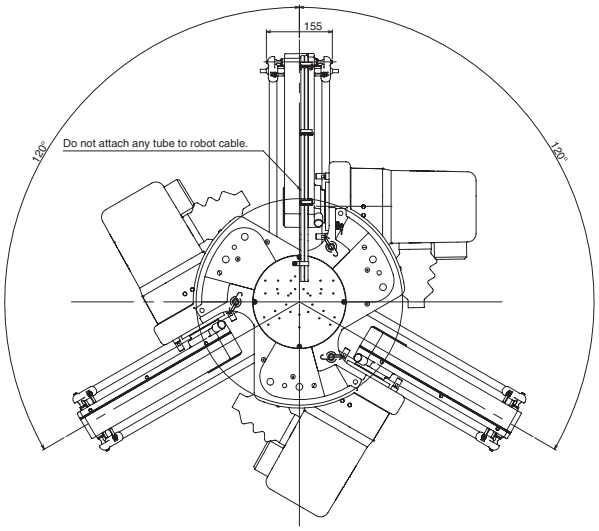
Model			CR_UGD4MINI_R	CR_UGD4MINI_NR
Working volume	X, Y axis (stroke)		Ø 500 mm	
	Z axis (stroke)[*1]		135 mm (maximum Ø 450 mm)	155 mm (maximum Ø 500 mm)
	θ axis (rotation angle)		±180 deg (default setting, it can be changed)	–
Servo motor	Arm 1, 2, 3	Model	R88M-K40030T-BS2	
		Capacity	400 W	
	Rotational 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	

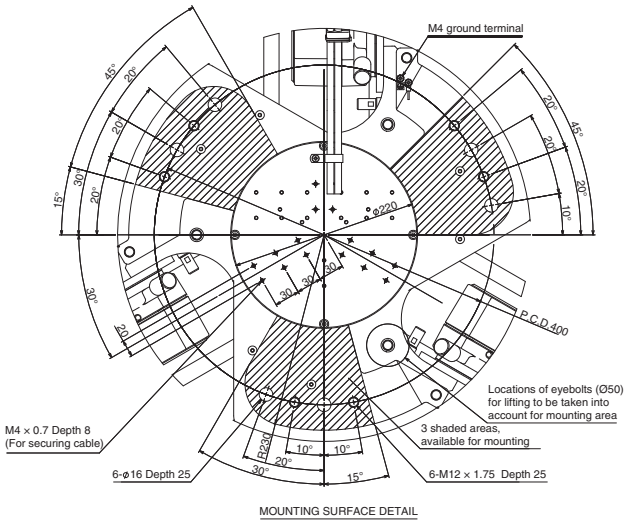
[*1] For further details please check the dimensional drawing in the next section.
[*2] This is the value at a constant ambient temperature.
[*3] With 0.1 kg payload. When reciprocating 305 mm in horizontal and 25 mm in vertical directions.
[*4] CPM: Cycle per minutes. Check the note 3 for the cycle definition.
[*5] Only for the air suctioning. The air injection is not allowed.

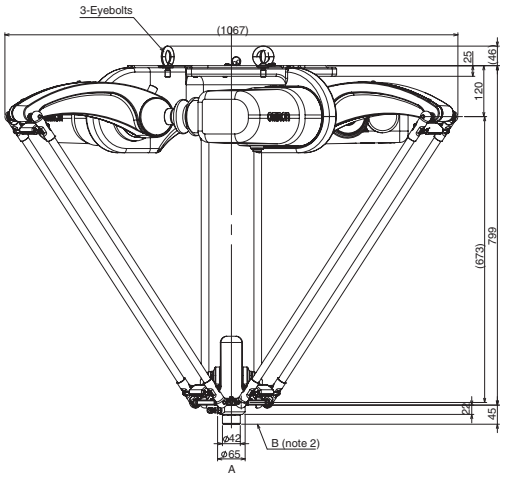
Dimensions

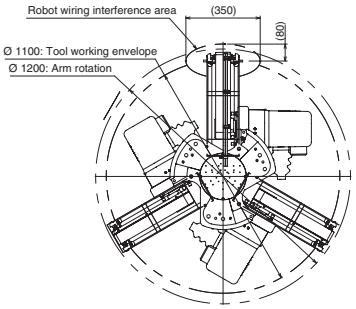
Washdown Delta robot dimensions

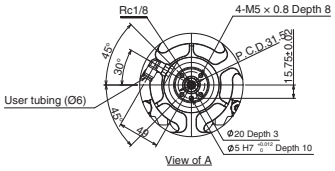
R6Y31110□03067 (3 axes + 1 rotational axis)

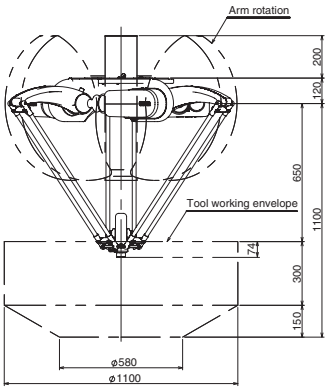






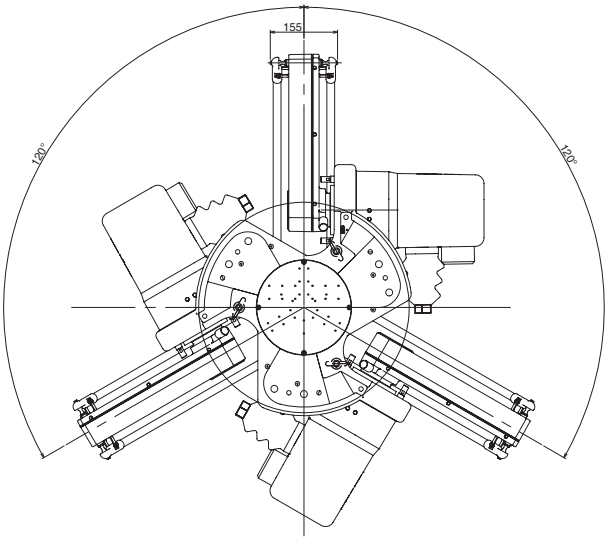


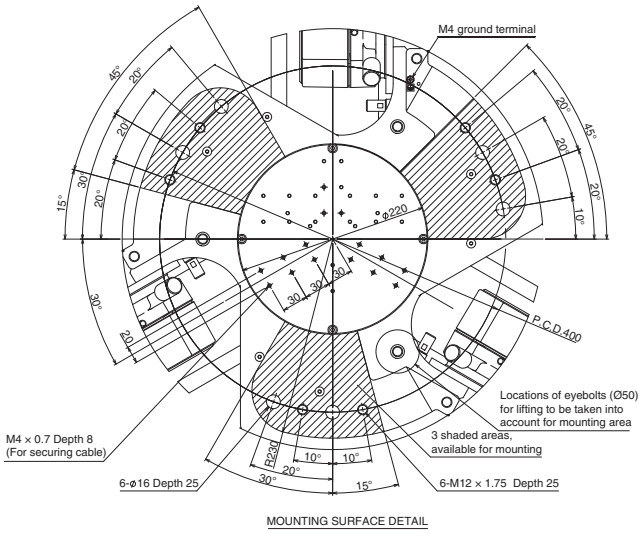


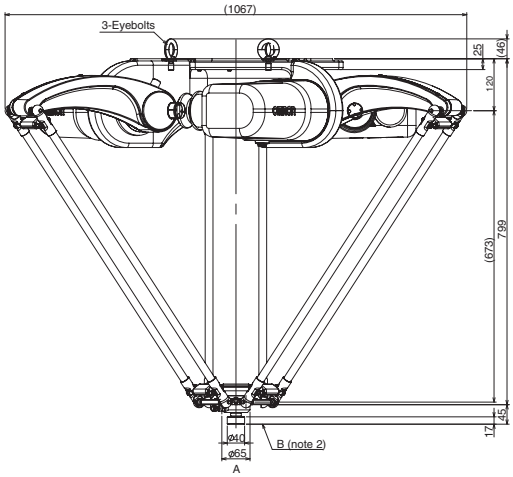


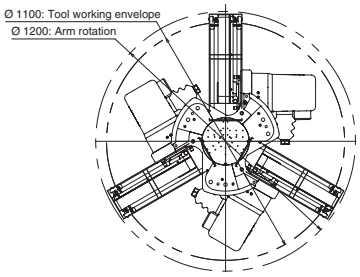
Note: The three areas of the robot base are available for mounting. Leave other area unoccupied for other needs (e.g. wiring). Also note the locations of the eyebolts when designing a mounting frame. Any part of end-effector should not stick out above the surface of B.

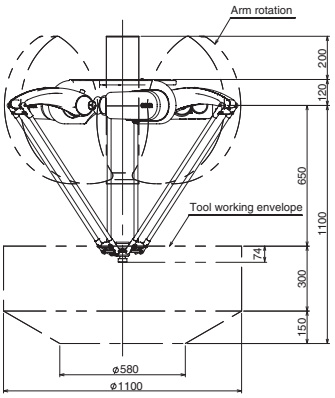
R6Y30110S03067 (3 axes)

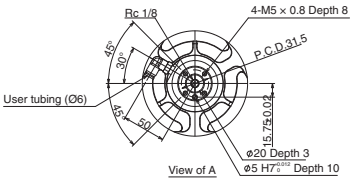








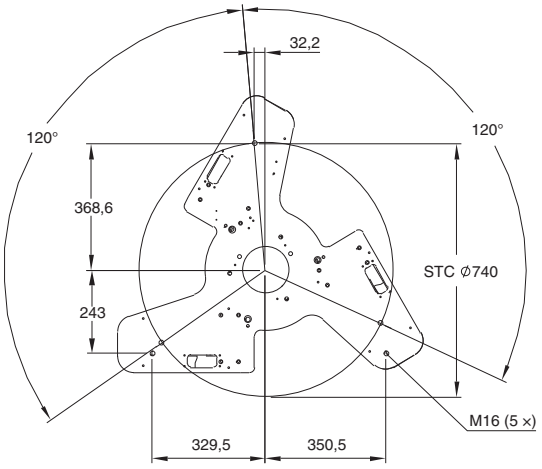


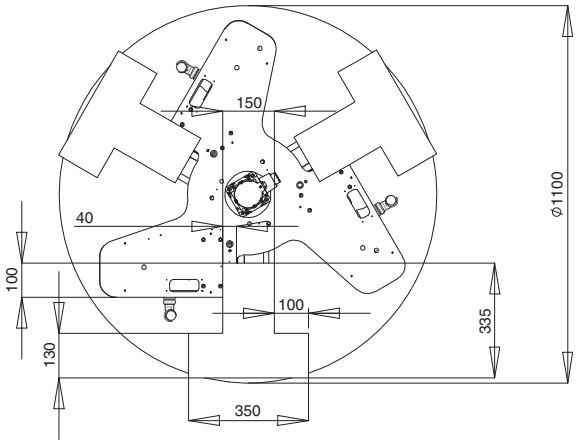


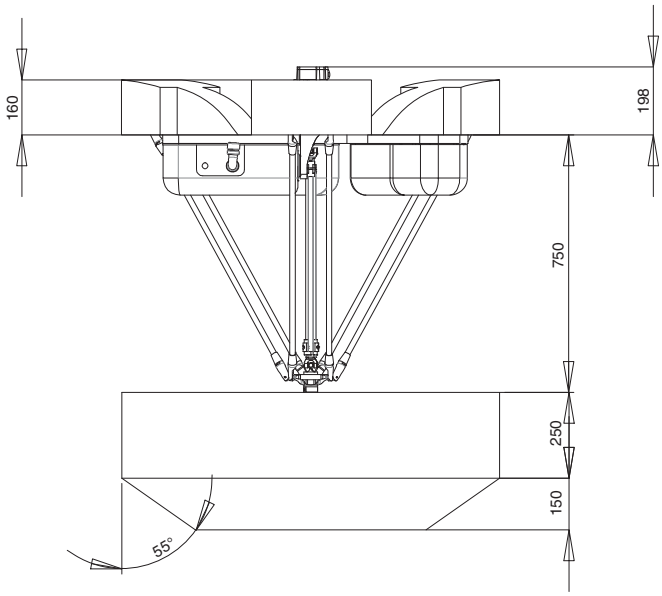
Note: The three areas of the robot base are available for mounting. Leave other area unoccupied for other needs (e.g. wiring). Also note the locations of the eyebolts when designing a mounting frame. Any part of end-effector should not stick out above the surface of B.

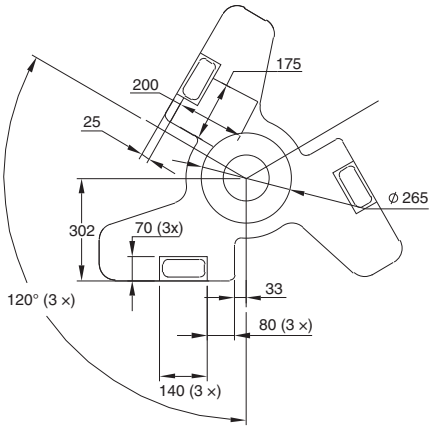
Delta robot dimensions

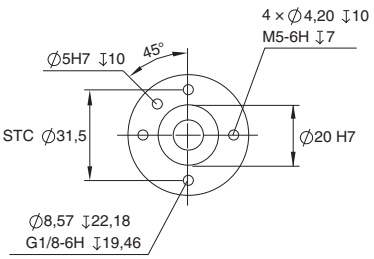
CR_UGD4_□R



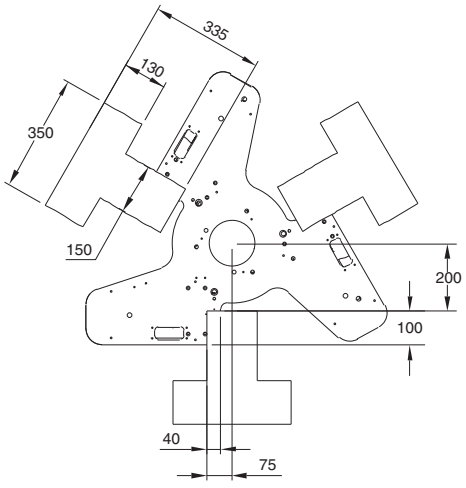






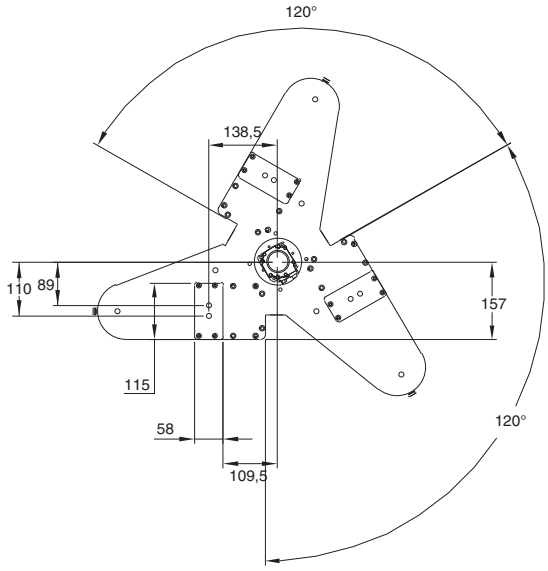


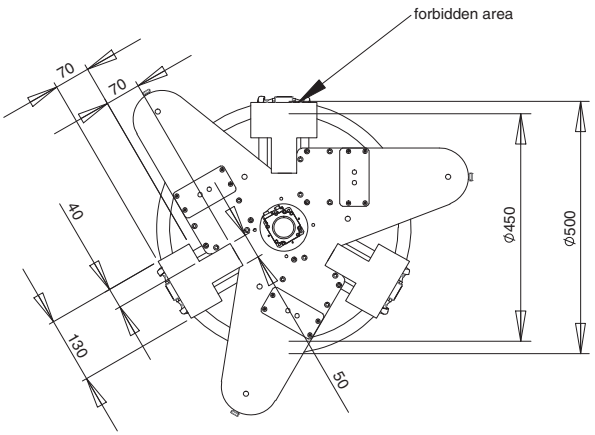
Gripper dimensions

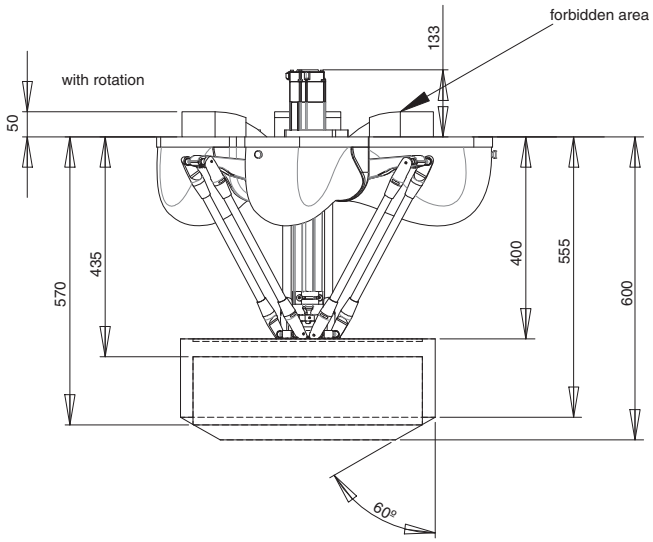


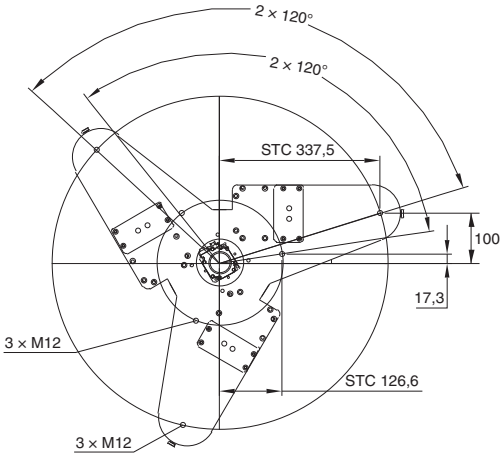
Mini Delta robot dimensions

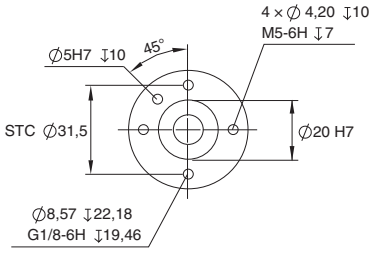
CR_UGD4MINI_□R



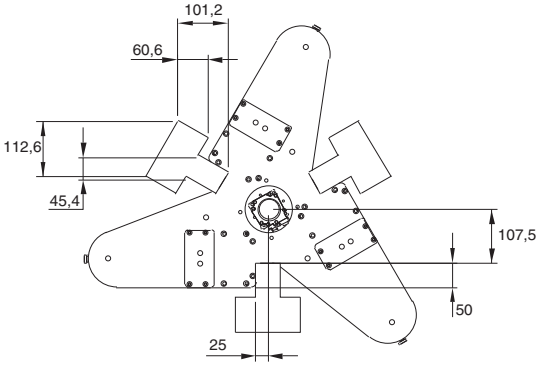




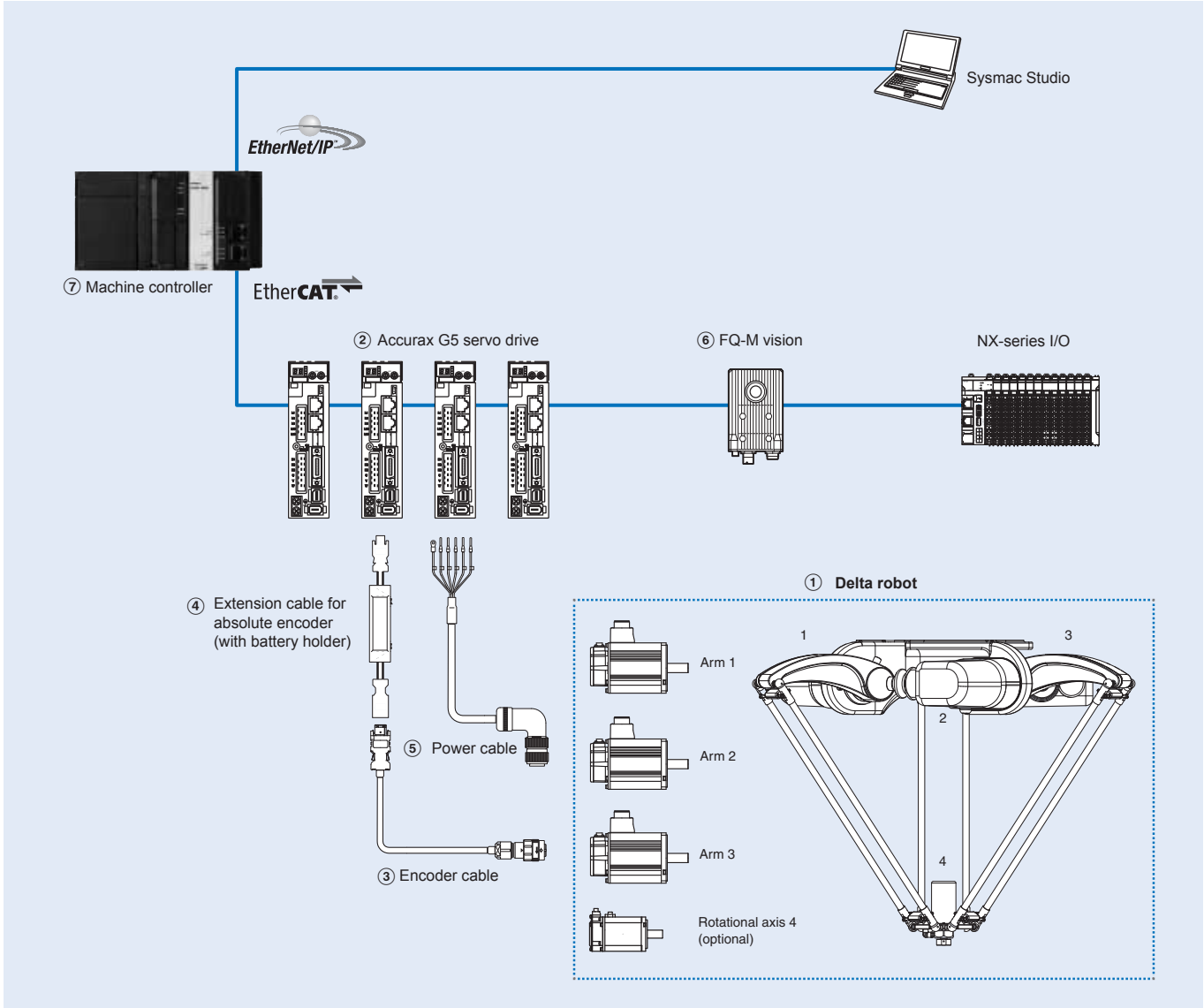




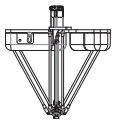
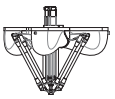
Gripper dimensions



Ordering information



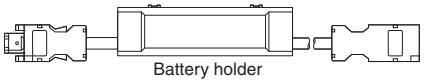
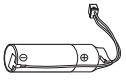
Delta robot

Symbol	Model	Max. payload	Description		Axis	② Applicable servo drive
①  Washdown Delta robot	R6Y31110H03067	3 kg	3 axes	With high inertia rotational axis	Arm 1	R88D-KN15H-ECT
					Arm 2	R88D-KN15H-ECT
					Arm 3	R88D-KN15H-ECT
					Rotational 4	R88D-KN01H-ECT
	R6Y31110L03067			With low inertia rotational axis	Arm 1	R88D-KN15H-ECT
					Arm 2	R88D-KN15H-ECT
					Arm 3	R88D-KN15H-ECT
					Rotational 4	R88D-KN01H-ECT
	R6Y30110S03067			Without rotational axis	Arm 1	R88D-KN15H-ECT
					Arm 2	R88D-KN15H-ECT
					Arm 3	R88D-KN15H-ECT
①  Delta robot	CR_UGD4_R	2 kg	3 axes	With rotational axis	Arm 1	R88D-KN15H-ECT
					Arm 2	R88D-KN15H-ECT
					Arm 3	R88D-KN15H-ECT
					Rotational 4	R88D-KN15H-ECT
	CR_UGD4_NR			Without rotational axis	Arm 1	R88D-KN15H-ECT
					Arm 2	R88D-KN15H-ECT
					Arm 3	R88D-KN15H-ECT
①  Mini Delta robot	CR_UGD4MINI_R	1 kg	3 axes	With rotational axis	Arm 1	R88D-KN04H-ECT
					Arm 2	R88D-KN04H-ECT
					Arm 3	R88D-KN04H-ECT
					Rotational 4	R88D-KN04H-ECT
	CR_UGD4MINI_NR			Without rotational axis	Arm 1	R88D-KN04H-ECT
					Arm 2	R88D-KN04H-ECT
					Arm 3	R88D-KN04H-ECT

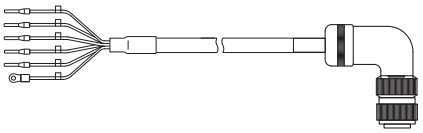
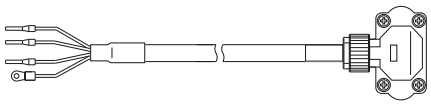
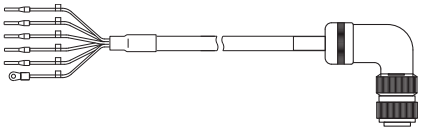
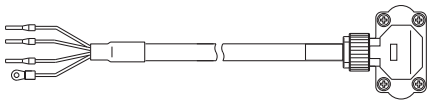
Encoder cables

Symbol	Applicable Delta robots			Model	Appearance
③	Washdown Delta robot	Arm 1, 2, 3	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	
		Rotational axis 4	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	
	Delta robot	Arm 1, 2, 3 and rotational axis 4	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	
	Mini Delta robot	Arm 1, 2, 3 and rotational axis 4	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	

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	Applicable Delta robots				Model	Appearance
⑤	Washdown Delta robot	Arm 1, 2, 3	Power cable	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 with 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	
	Delta robot	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	
	Mini Delta robot	Arm 1, 2, 3 and rotational axis 4	Power cable	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	

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		Delta robot	Axes	Model
⑦ NJ robotics	CPU unit	Control of up to 8 Delta robot depending on the number of axes supported by the CPU	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)

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-01A In the interest of product improvement, specifications are subject to change without notice.

Selection table – Frequency inverter

	Frequency inverter	
		
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 • Sensor-less vector control
Torque features	200% at 0.0 Hz (CLV) 150% at 0.3 Hz (OLV)	200% at 0.5 Hz
Connectivity	EtherCAT option board	EtherCAT option board
Logic Programming	Standard Firmware	Standard Firmware
Customisation options	–	IP54 enclosure
Page	197	215

RX frequency inverter

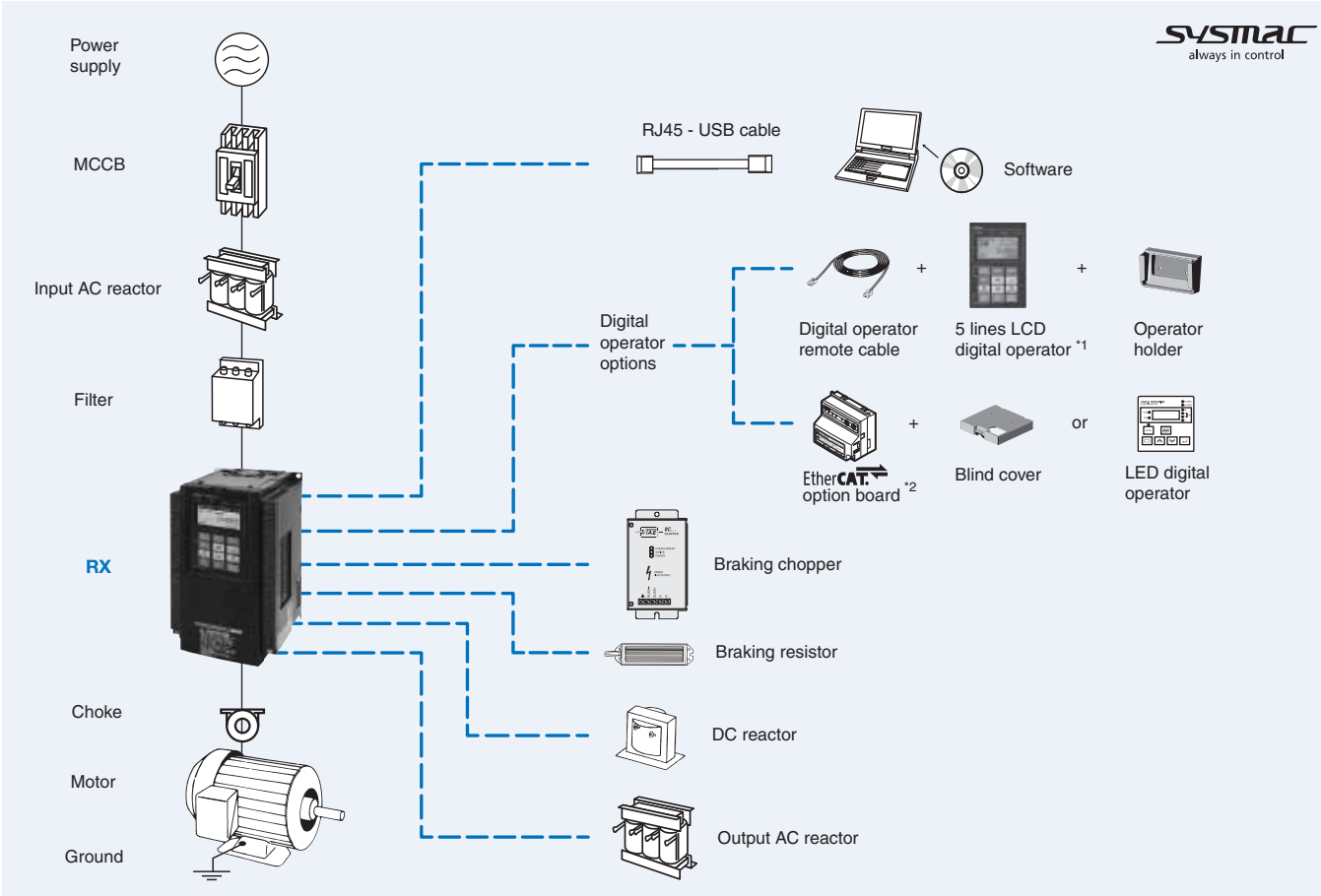
Customised to your machine

- 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

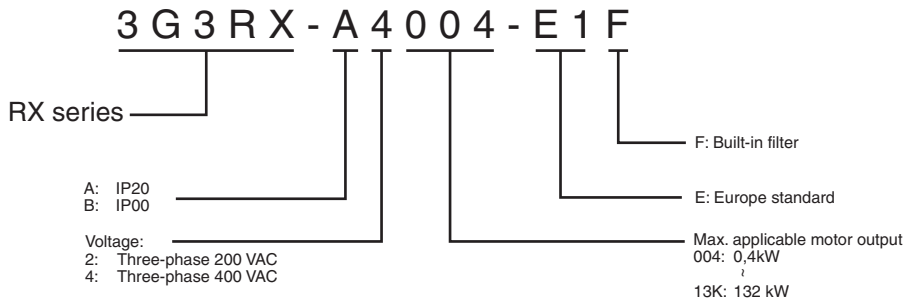
System configuration



*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.

Specifications

Type designation



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
			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
			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
			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
			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 [Terminal function] 8 functions can be selected from among 61. 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 1 relay (SPDT contact) output terminal: NO/NC switchable [Terminal function] 6 functions can be selected from among 45. 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/s^2 (0.6G), 10 to 55 Hz 3G3RX-A□300 to B□13K, 2.94 m/s^2 (0.3G), 10 to 55 Hz

Dimensions

Figure 1

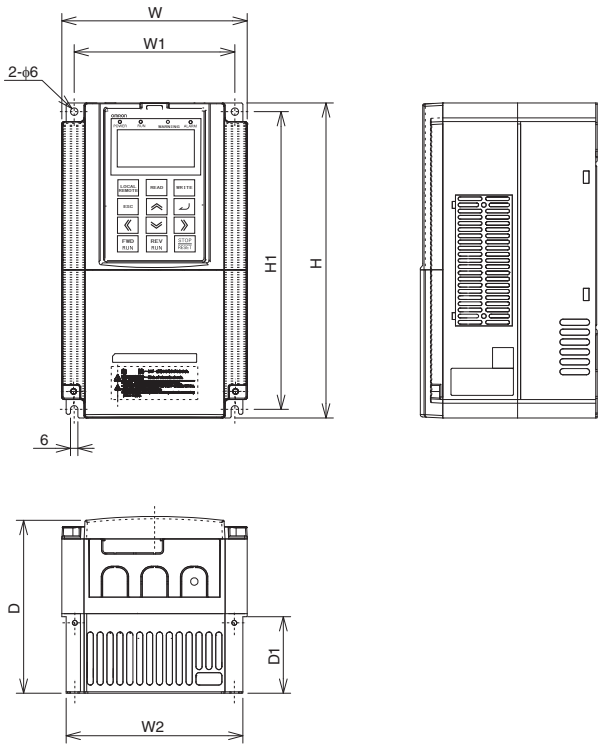


Figure 2

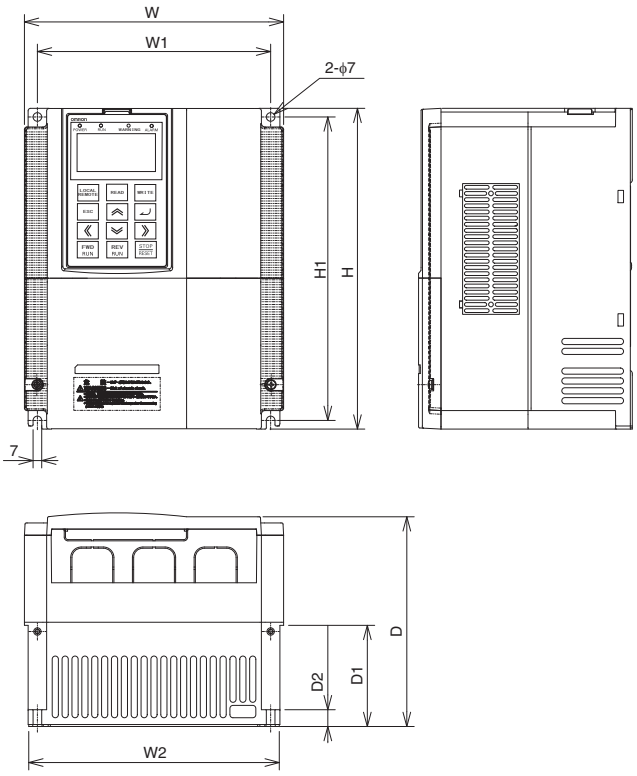


Figure 3

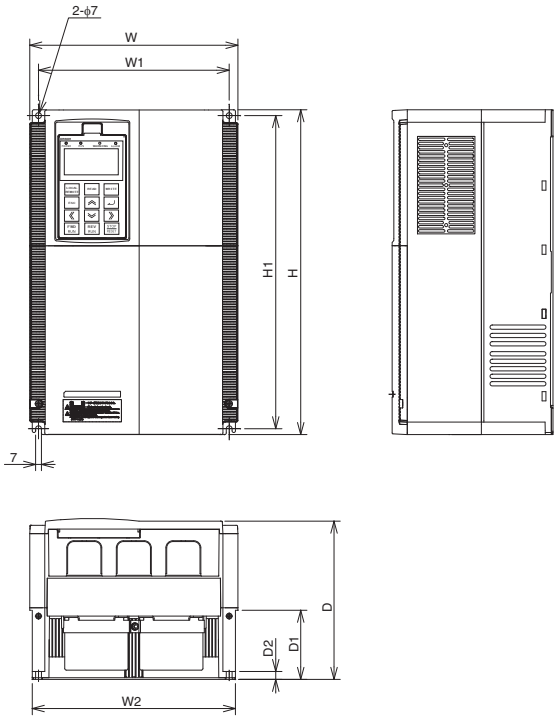


Figure 4

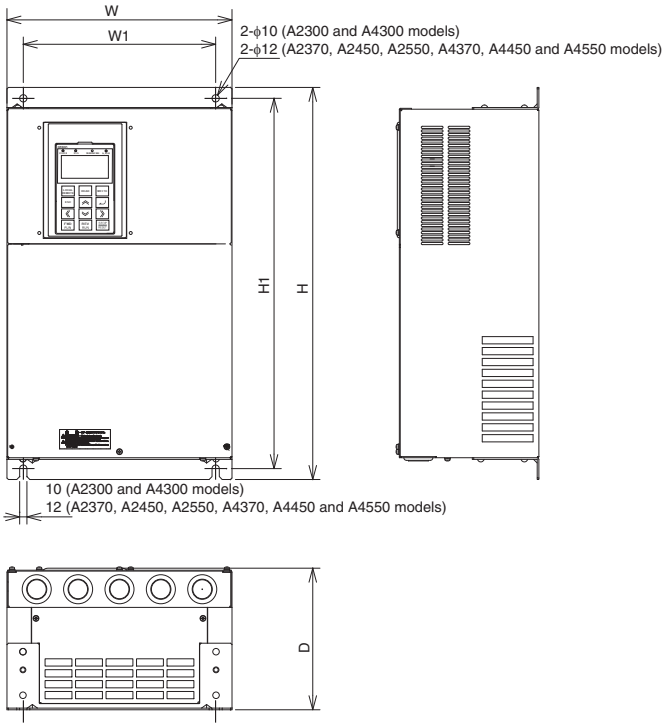
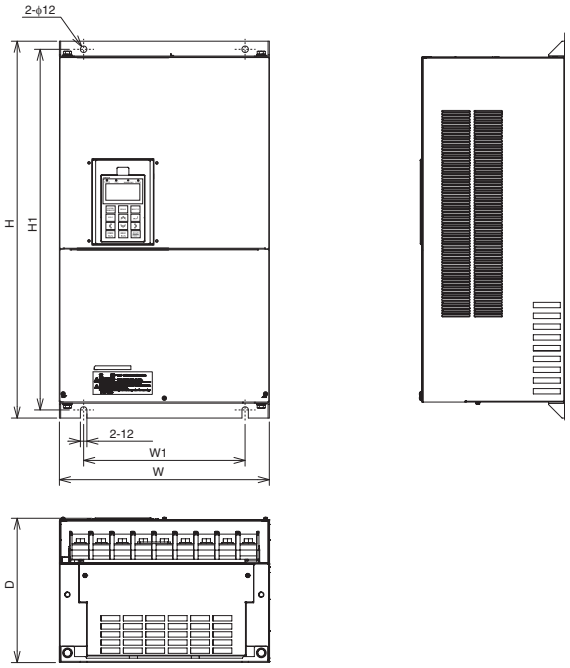


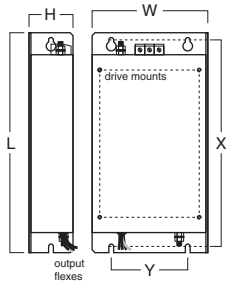
Figure 5



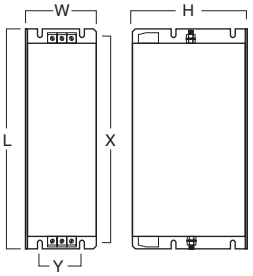
Voltage class	Inverter model 3G3RX□	Figure	Dimensions in mm								
			W	W1	W2	H	H1	D	D1	D2	Weight (kg)
Three-phase 200 V	A2004	1	150	130	143	255	241	140	62	–	3.5
	A2007										
	A2015										
	A2022										
	A2037										
	A2055	2	210	189	203	260	246	170	82	13.6	6
	A2075										
	A2110										
	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										

Rasmi filters

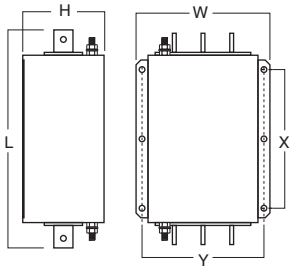
Footprint dimensions



Book type dimensions

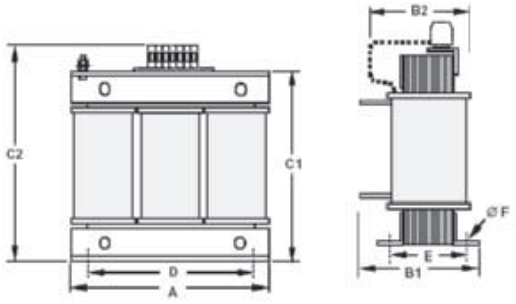


Block type dimensions



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

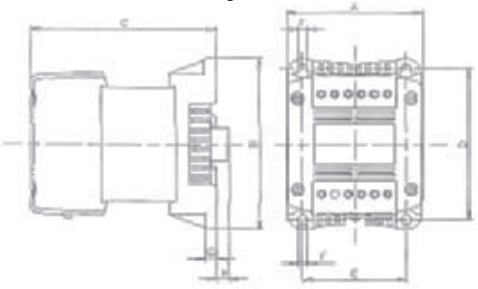
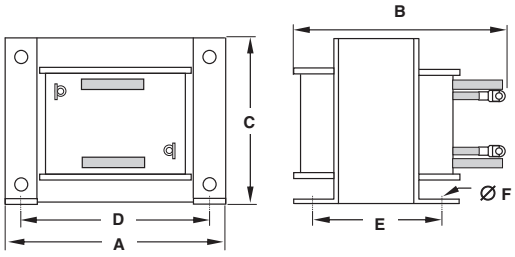
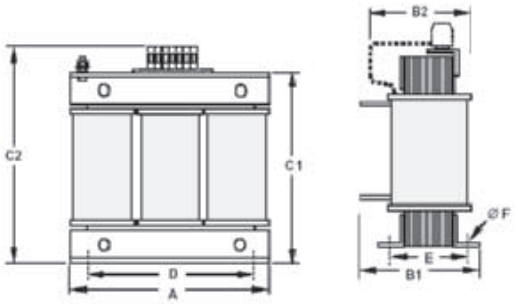


Figure 2



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	1	84	113	96	101	66	5	7.5	2	1.22	43000020-DE	1	84	113	96	101	66	5	7.5	2	1.22
06750061-DE				105						1.60	27000030-DE				105						1.60
03510093-DE											14000047-DE										
02510138-DE				116						1.95	10100069-DE				116						1.95
01600223-DE		108	135	124	120	82	6.5	9.5	9.5	3.20	06400116-DE		108	135	133	120	82	6.5	9.5	9.5	3.70
01110309-DE		120	152	136	135	94	7	9.5	–	5.20	04410167-DE		120	152	136	135	94	7	9.5	–	5.20
00840437-DE				146						6.00	03350219-DE				146						6.00
00590614-DE		150	177	160	160	115	7	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	2	195	161	162.5	185	88	10	–	–	17.0	01200644-DE	2	195	161	162.5	185	88	10	–	–	17.0
00231662-DE			196			123				25.5	00920797-DE			196			123				25.5
00192015-DE		240	188	200	228	109	12			34.0	00741042-DE		240	188	200	228	109	12			34.0
00162500-DE			198			119				38.0	00611236-DE			198			119				38.0
00133057-DE			228			149				42.0	00501529-DE			228			149				42.0
											00372094-DE										48.0
											00312446-DE		300	216	250	288	133				67.0
											00252981-DE										
											00213613-DE			236			153				79.0

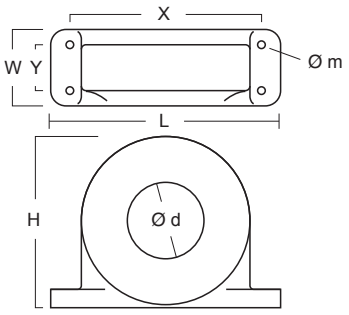
Output AC reactor



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

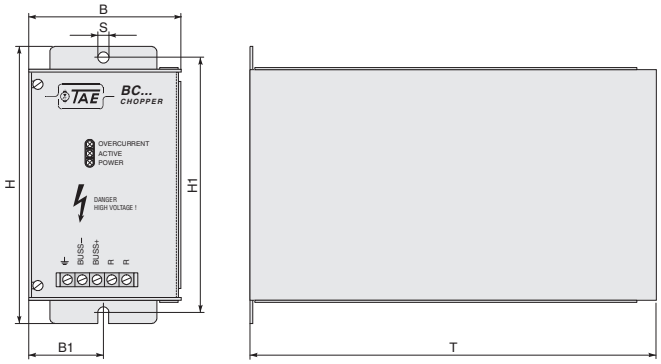
Chokes

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

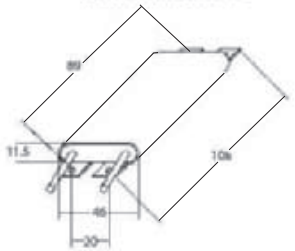


Fig 1

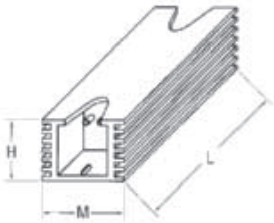


Fig 2

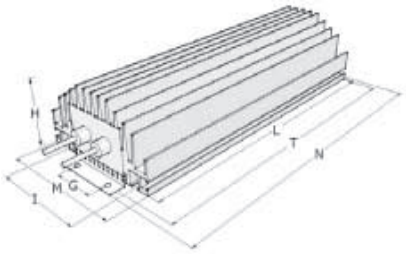


Fig 3

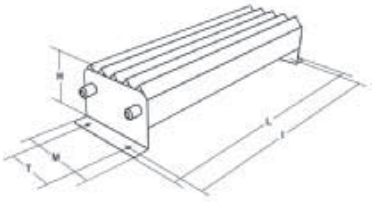


Fig 4

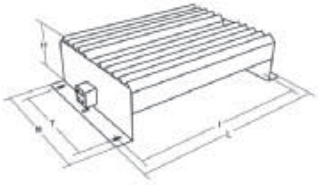
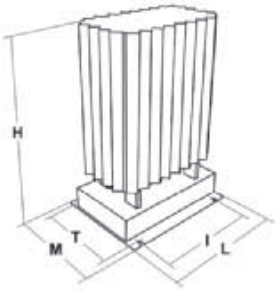
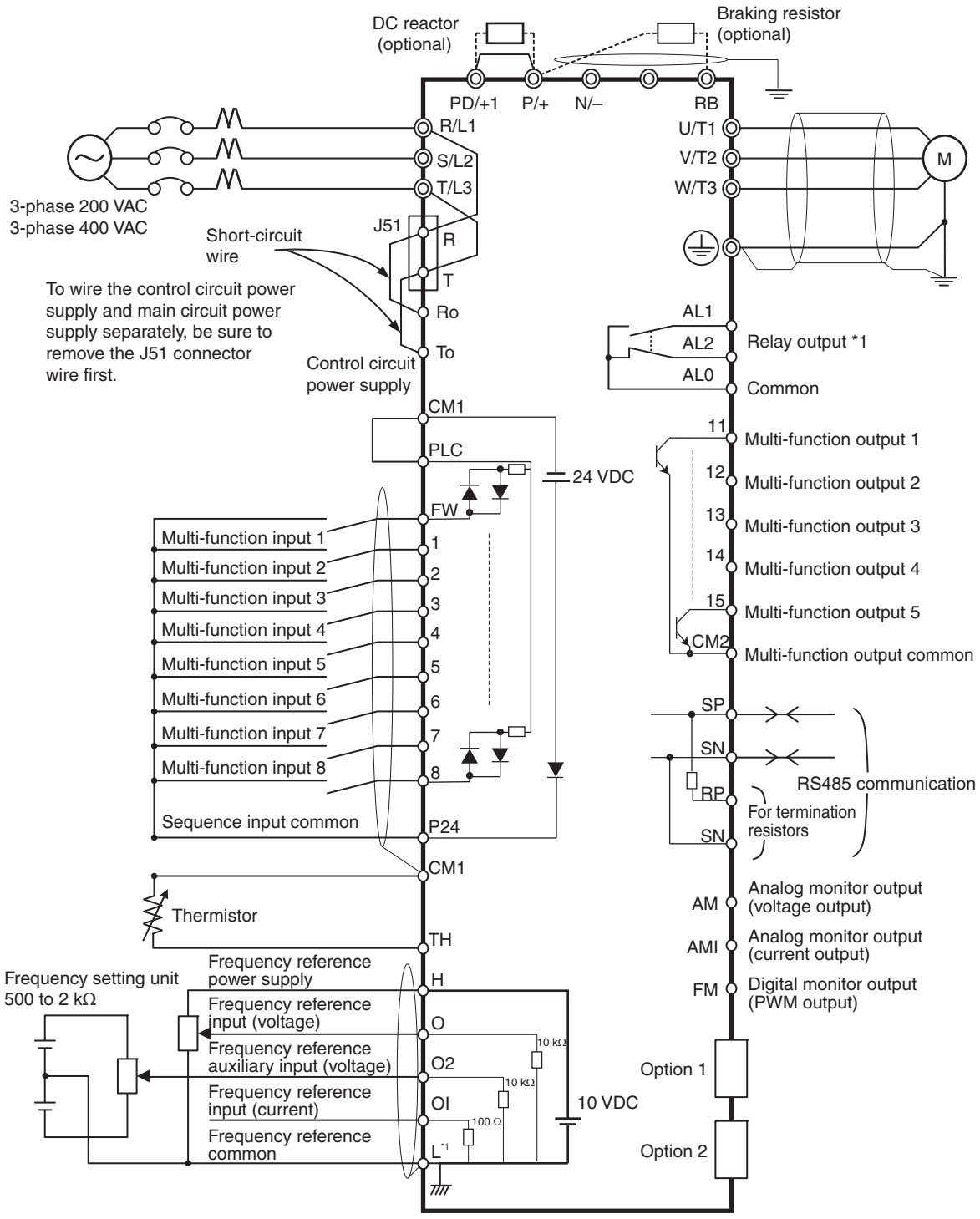


Fig 5



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

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 Source logic: Short-circuiting PLC and CM1 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) Under normal operation MA-MC open MB-MC close	R load AL1-AL0 250 VAC 2 A AL2-AL0 250 VAC 1 A I load 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 100 mW minimum Impedance at temperature error: 3 kΩ	0 to 8 VDC
Comms	SP	RS485 Modbus terminals	–	Differential input
	SN			
	RP	RS485 terminating resistor terminals	–	-
	SN			

Inverter heat loss

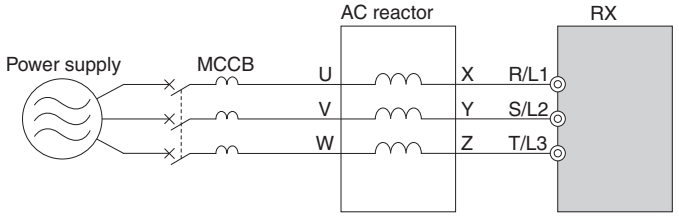
Three-phase 200 V class

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

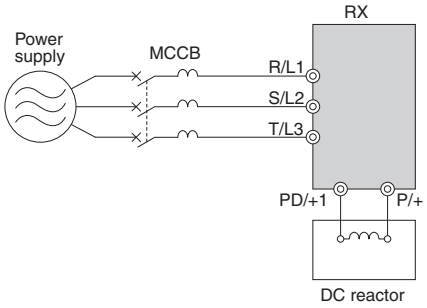
Model 3G3RX-		A4004	A4007	A4015	A4022	A4040	A4055	A4075	A4110	A4150	A4185	A4220	A4300	A4370	A4450	A4550	B4750	B4900	B411K	B413K
Inverter capacity kVA	400 V	1.0	1.7	2.5	3.6	6.2	9.7	13.1	17.3	22.1	26.3	33.2	40.1	51.9	63.0	77.6	103.2	121.9	150.3	180.1
	480 V	1.2	2.0	3.1	4.3	7.4	11.6	15.8	20.7	26.6	31.5	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

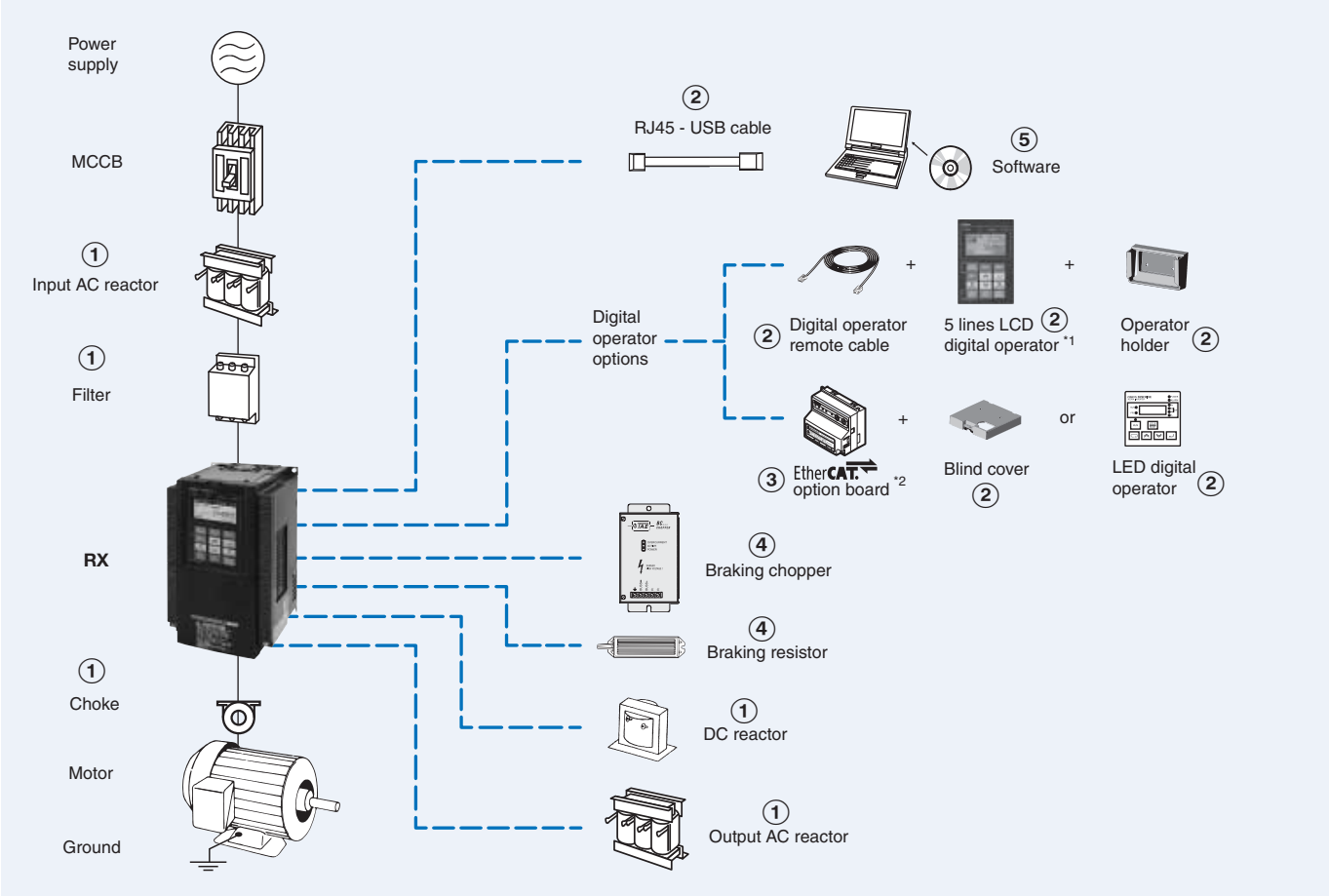
200 V class				400 V class			
Max. applicable motor output kW*	Reference	Current value A	Inductance mH	Max. applicable motor output kW*1	Reference	Current value A	Inductance mH
0.4	AX-RAO11500026-DE	2.6	11.50	0.4 to 1.5	AX-RAO16300038-DE	3.8	16.30
0.75	AX-RAO07600042-DE	4.2	7.60				
1.5	AX-RAO04100075-DE	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				
		Permanent		Peak (5 s max)		Minimum connectable resistor (Ohms)
		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

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

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) Pulse train position command input (RS-422) Pulse monitor output (RS-422) 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

Inverter					Braking resistor unit					
Voltage	Max. motor kW	Inverter 3G3RX□	Braking Unit AX-BCR□	Connectable min. resistance Ω	Inverter mounted type (3%ED, 10 sec max)		Braking torque %	External resistor 10%ED 10 sec max for built-in 5 sec max for Braking Unit		Braking torque %
		3-phase			Type AX-	Resist Ω		Type AX-	Resist Ω	
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			200
	1.5	4015			REM00K1200-IE	200	190	REM00K2200-IE	200	190
	2.2	4022			REM00K2200-IE	200	130	REM00K5120-IE	120	200
	4.0	4040		70	REM00K2120-IE	120	120	REM00K6100-IE	100	140
	5.5	4055			REM00K4075-IE	75	140	REM00K9070-IE	70	150
	7.5	4075		35			100	REM01K9070-IE	70	110
	11.0	4110			REM00K6100-IE	100	50	REM02K1070-IE	70	75
	15.0	4150		24	REM00K9070-IE	70	55	REM03K5035-IE	35	110
	18.5	4185			REM03K5035-IE	35	90	REM19K0030-IE	30	100
	22.0	4220		20			75			85
	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

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_I116E-EN-05 In the interest of product improvement, specifications are subject to change without notice.

MX2 frequency inverter

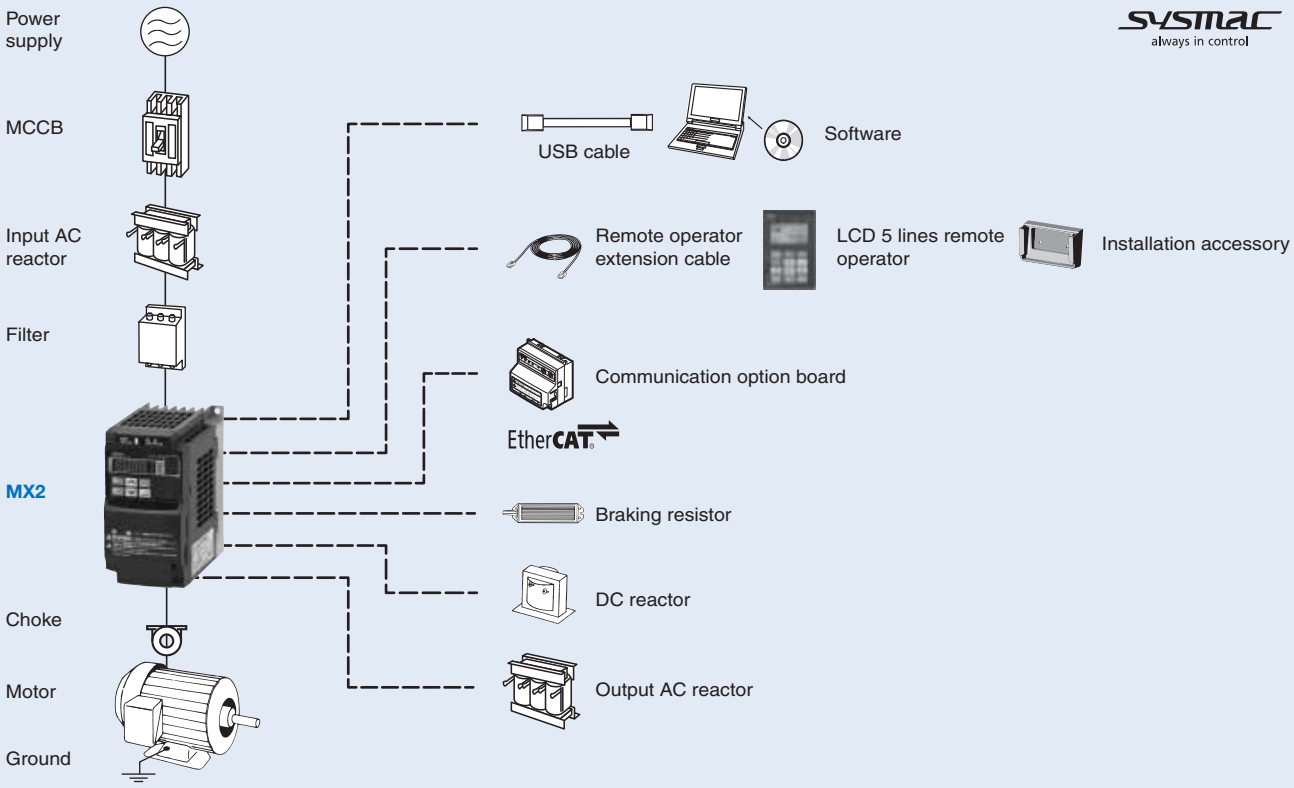
Born to drive machines

- 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

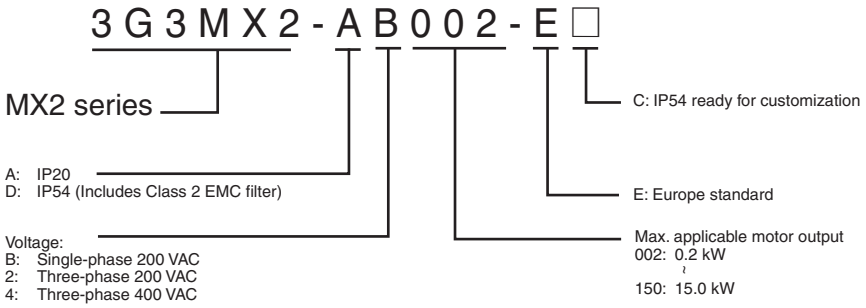
- 200 V Class single-phase 0.1 to 2.2 kW
- 200 V Class three-phase 0.1 to 15.0 kW
- 400 V Class three-phase 0.4 to 15.0 kW

System configuration



Specifications

Type designation



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	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.

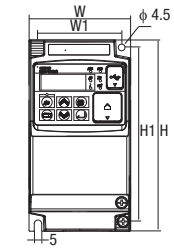
Common specifications

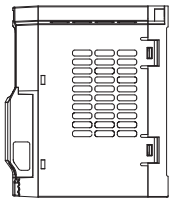
	Model number 3G3MX2	Specifications
Control functions	Control methods	Phase-to-phase sinusoidal pulse with modulation PWM (Sensorless vector control, V/F)
	Output frequency range	0.10 to 400.00 Hz
	Frequency precision	Digital set value: ±0.01% of the max. frequency
		Analogue set value: ±0.2% of the max. 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

IP20





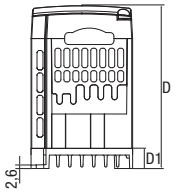
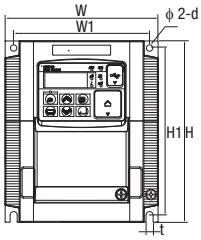
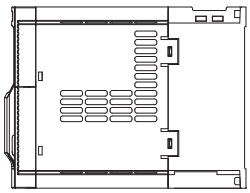


Figure 1





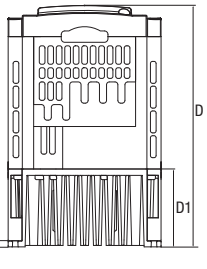
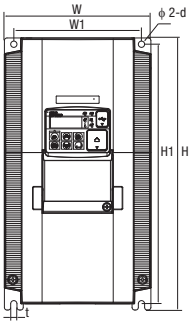
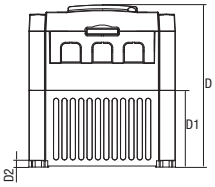


Figure 2





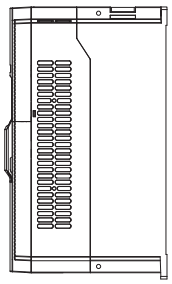
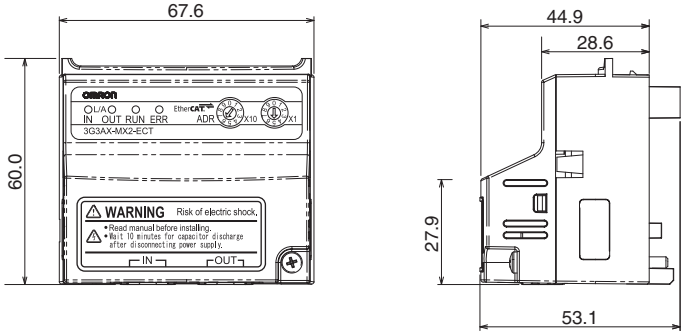


Figure 3

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	1	68	56	128	118	–	109	13.5	–	–	1.0
	B002	1										1.0
	B004	1						122.5	27			1.1
	B007	2	108	96	128	118		170.5	55	4.4	4.5	1.4
	B015	2										1.8
	B022	2										1.8
Three-phase 200 V	2001	1	68	56	128	118	–	109	13.5	–	–	1.0
	2002	1										1.0
	2004	1						122.5	27			1.1
	2007	1						145.5	50			1.2
	2015	2	108	96	128	118		170.5	55	4.4	4.5	1.6
	2022	2										1.8
	2037	3	140	128	128	118	5	170.5	55	4.4		2.0
	2055	3	140	122	260	248	6	155	73.3	6	6	3.0
	2075	3										3.4
	2110	3	180	160	296	284	7	175	97	5	7	5.1
	2150	3	220	192	350	336	7	175	84	5	7	7.4
Three-phase 400 V	4004	2	108	96	128	118	–	143.5	28	–	–	1.5
	4007	2						170.5	55			1.6
	4015	2						170.5				1.8
	4022	2										1.9
	4030	2										1.9
	4040	3	140	128	128	118	5	170.5	55	4.4	4.5	2.1
	4055	3		122	260	248	6	155	73.3	6	6	3.5
	4075	3										3.5
	4110	3	180	160	296	284	7	175	97	5	7	4.7
	4150	3										5.2

Option board



Note: Option boards could be fitted inside the IP54 model

IP54

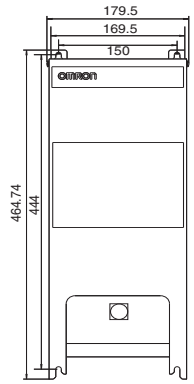
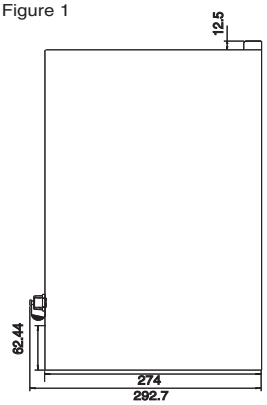


Figure 1



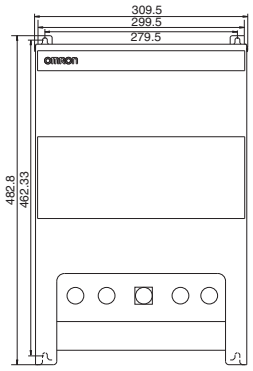
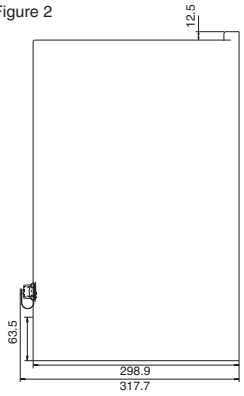


Figure 2



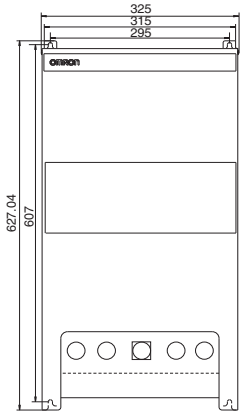
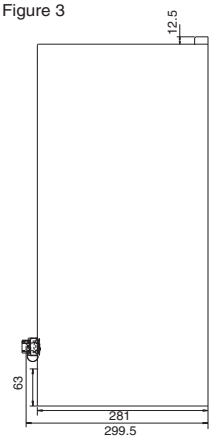


Figure 3



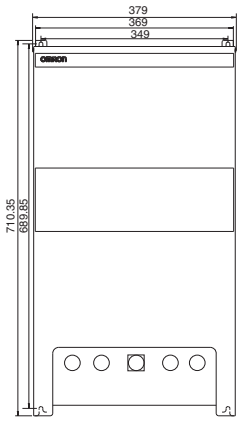


Figure 4

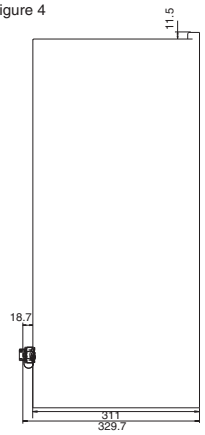
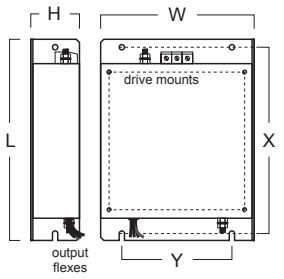


Figure 1	Figure 2	Figure 3	Figure 4
3G3MX2-DB001-E	3G3MX2-DB001-EC	3G3MX2-D2055-EC	3G3MX2-D2110-EC
3G3MX2-DB002-E	3G3MX2-DB002-EC	3G3MX2-D2075-EC	3G3MX2-D2150-EC
3G3MX2-DB004-E	3G3MX2-DB004-EC	3G3MX2-D4055-EC	3G3MX2-D4110-EC
3G3MX2-D2001-E	3G3MX2-DB007-EC	3G3MX2-D4075-EC	3G3MX2-D4150-EC
3G3MX2-D2002-E	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		

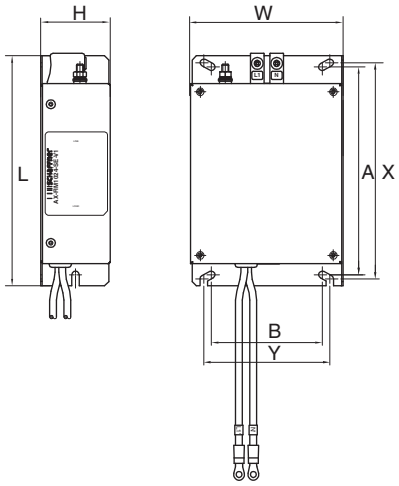
Rasmi footprint filters

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	91	M4
	AX-FIM3010-RE	114	46	169	156	91	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



Schaffner footprint filters

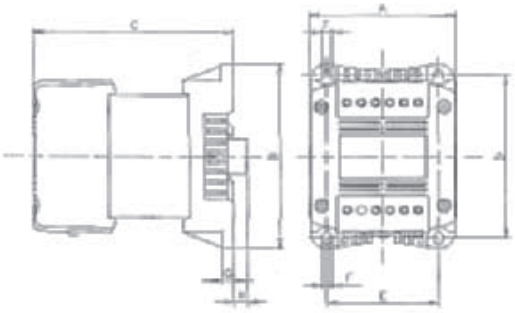
Rasmi model		Dimensions							
		W	H	L	X	Y	A	B	M
1×200 V	AX-FIM1010-SE-V1	70	40	166	156	51	150	50	M5
	AX-FIM1024-SE-V1	110	50	166	156	91	150	80	M5
3×200 V	AX-FIM2010-SE-V1	80	40	191	181	62	150	50	M5
	AX-FIM2020-SE-V1	110	50	160	156	91	150	80	M5
	AX-FIM2030-SE-V1	142	50	171	161	120	150	112	M5
	AX-FIM2060-SE-V1	140	55	304	290	122	286	112	M5
	AX-FIM2080-SE-V1	180	55	344	330	160	323	140	M5
	AX-FIM2100-SE-V1	220	65	394	380	192	376	180	M5
3×400 V	AX-FIM3005-SE-V1	110	50	166	156	91	150	80	M5
	AX-FIM3010-SE-V1	110	50	166	156	91	150	80	M5
	AX-FIM3014-SE-V1	142	50	171	161	120	150	112	M5
	AX-FIM3030-SE-V1	140	55	304	290	122	286	112	M5
	AX-FIM3050-SE-V1	180	55	344	330	160	323	140	M5



Input AC Reactor

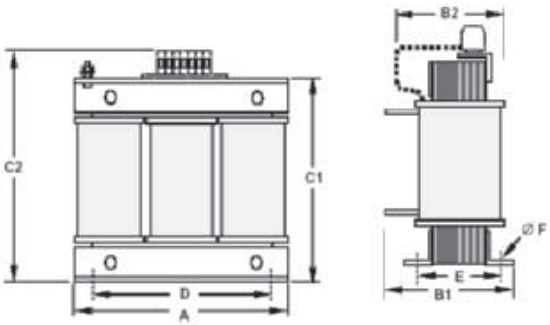
Single-phase

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



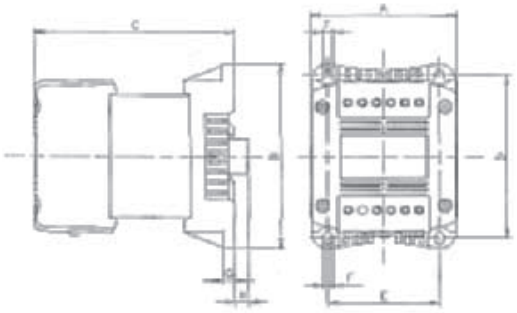
Three-phase

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



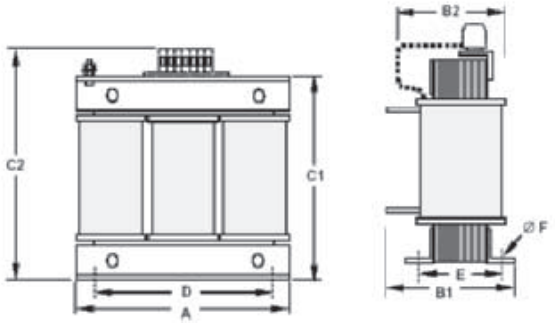
DC Reactor

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



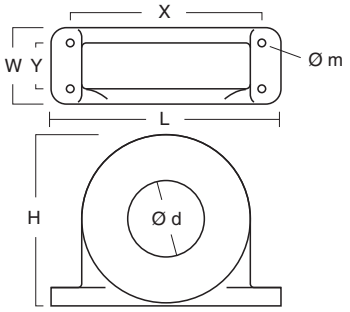
Output AC Reactor

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-REM00K1200

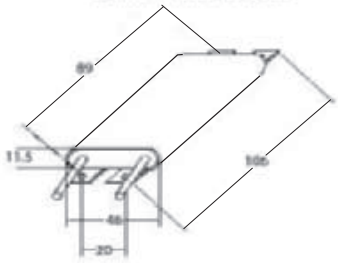


Fig 1

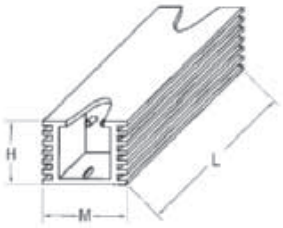


Fig 2

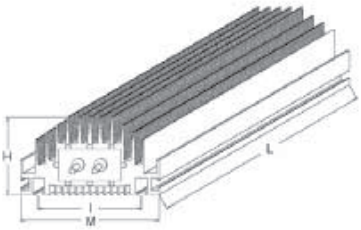


Fig 3

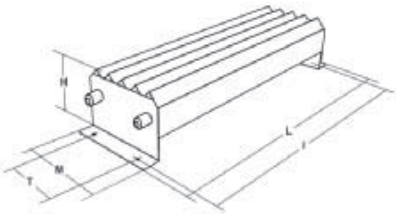
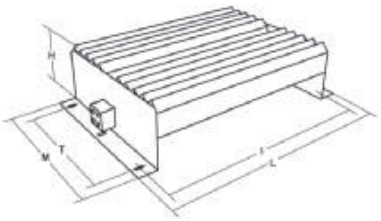
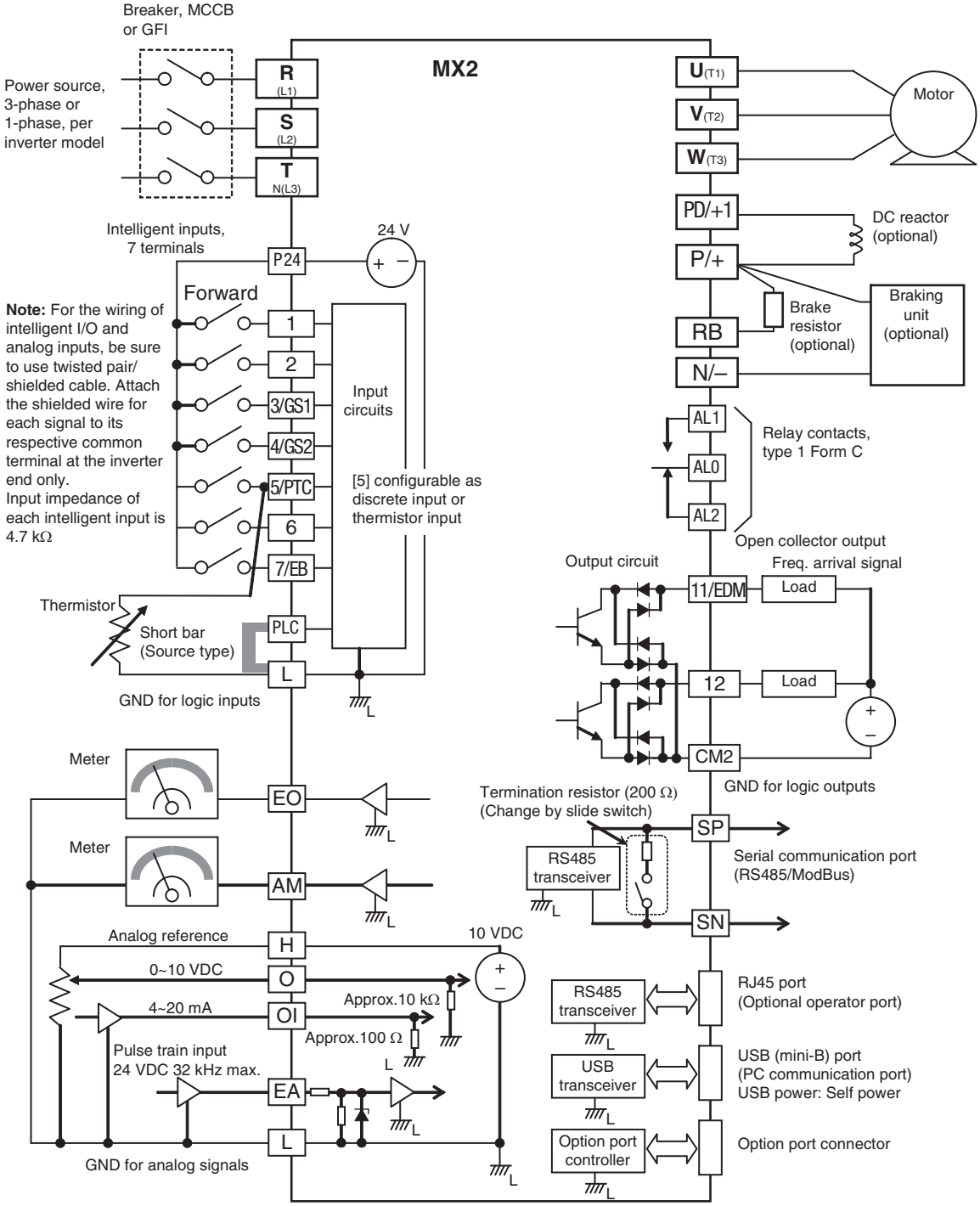


Fig 4



Type	Fig.	Dimensions					Weight
		L	H	M	I	T	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	62	100	74	–	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							

Standard connections



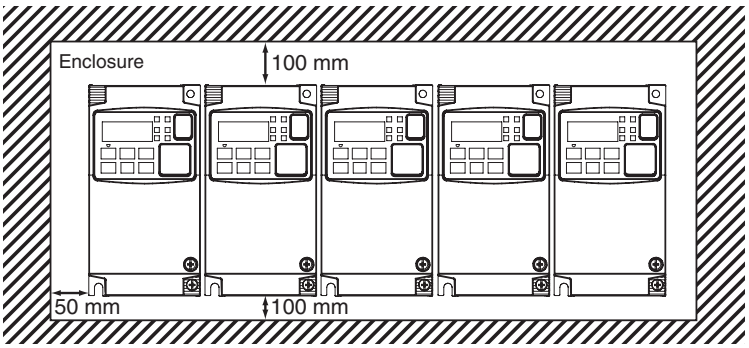
Terminal Block Specifications

Terminal	Name	Function (signal level)
R/L1, S/L2, T/L3	Main circuit power supply input	Used to connect line power to the drive. 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 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 5 to 24 VDC
	EO	Pulse train output	LAD frequency	10 VDC 2 mA 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 EDM based on 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 Under normal operation AL1 - AL0 Closed AL2 - AL0 Open	R load 250 VAC 2.5 A 30 VDC 3.0 A I load 250 VAC 0.2 A 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

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							

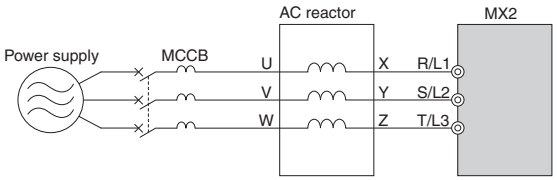
Single-phase 200 V class

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	

Three-phase 400 V class

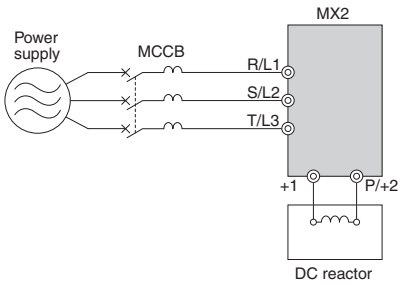
Model 3G3MX2		A4004	A4007	A4015	A4022	A4030	A4040	A4055	A4075	A4110	A4150
Inverter capacity kVA	380V VT	1.3	2.6	3.5	4.5	5.7	7.3	11.5	15.1	20.4	25.0
	380V CT	1.1	2.2	3.1	3.6	4.7	6.0	9.7	11.8	15.7	20.4
	480V VT	1.7	3.4	4.4	5.7	7.3	9.2	14.5	19.1	25.7	31.5
	480V CT	1.4	2.8	3.9	4.5	5.9	7.6	12.3	14.9	19.9	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	Inductance mH	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-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

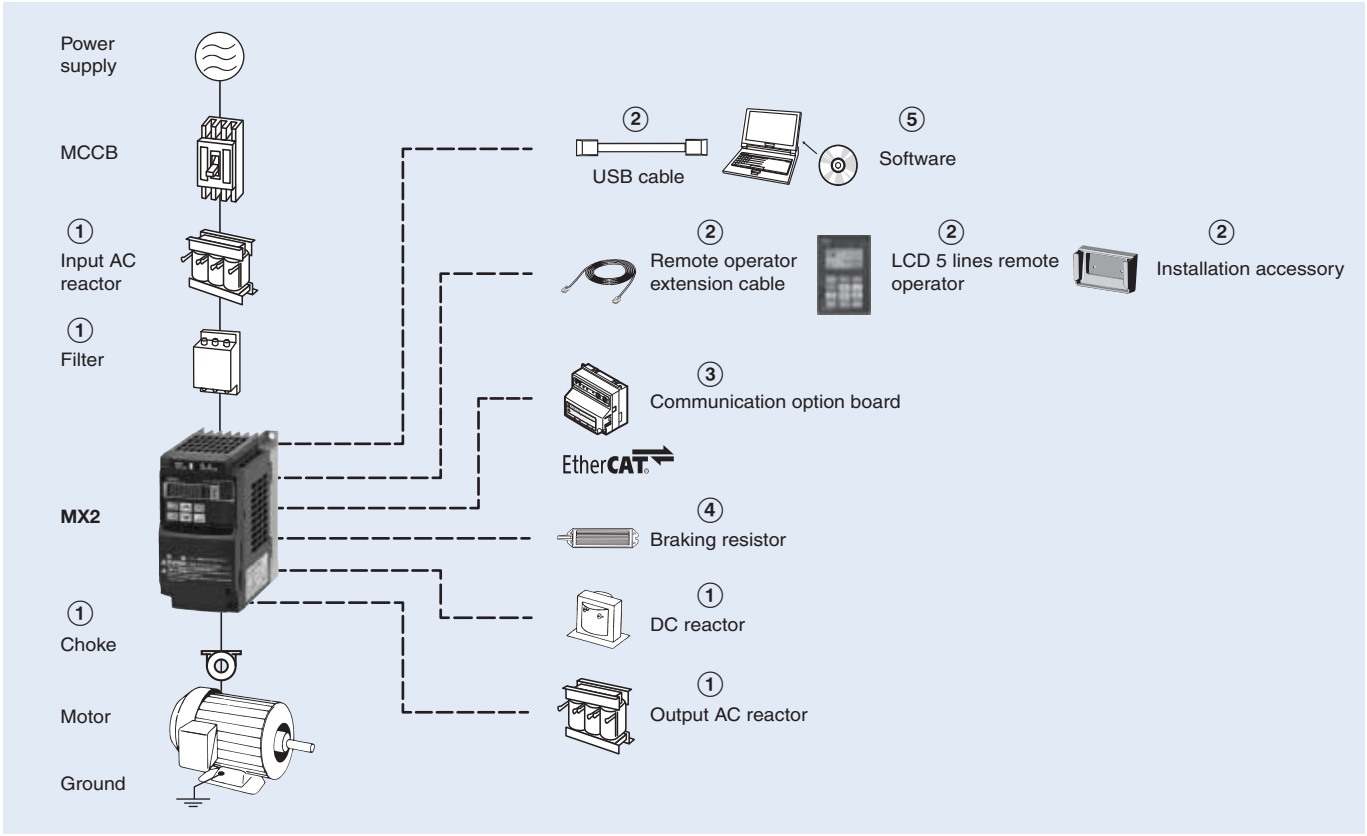


200 V class				400 V class			
Max. applicable motor output kW	Reference	Current value A	Inductance mH	Max. applicable motor output kW	Reference	Current value A	Inductance mH
0.2	AX-RC21400016-DE	1.6	21.4	0.4	AX-RC43000020-DE	2.0	43.0
0.4	AX-RC10700032-DE	3.2	10.7	0.7	AX-RC27000030-DE	3.0	27.0
0.7	AX-RC06750061-DE	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		IP20	IP54
	Max motor kW	Rated current A	Max motor kW	Rated current A		
Single-phase 200 V	0.1	1.0	0.2	1.2	3G3MX2-AB001-E	3G3MX2-DB001-E/EC
	0.2	1.6	0.4	1.9	3G3MX2-AB002-E	3G3MX2-DB002-E/EC
	0.4	3.0	0.55	3.5	3G3MX2-AB004-E	3G3MX2-DB004-E/EC
	0.75	5.0	1.1	6.0	3G3MX2-AB007-E	3G3MX2-DB007-EC
	1.5	8.0	2.2	9.6	3G3MX2-AB015-E	3G3MX2-DB015-EC
	2.2	11.0	3.0	12.0	3G3MX2-AB022-E	3G3MX2-DB022-EC
Three-phase 200 V	0.1	1.0	0.2	1.2	3G3MX2-A2001-E	3G3MX2-D2001-E/EC
	0.2	1.6	0.4	1.9	3G3MX2-A2002-E	3G3MX2-D2002-E/EC
	0.4	3.0	0.55	3.5	3G3MX2-A2004-E	3G3MX2-D2004-E/EC
	0.75	5.0	1.1	6.0	3G3MX2-A2007-E	3G3MX2-D2007-E/EC
	1.5	8.0	2.2	9.6	3G3MX2-A2015-E	3G3MX2-D2015-EC
	2.2	11.0	3.0	12.0	3G3MX2-A2022-E	3G3MX2-D2022-EC
	3.7	17.5	5.5	19.6	3G3MX2-A2037-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-D4004-EC
	0.75	3.4	1.5	4.1	3G3MX2-A4007-E	3G3MX2-D4007-EC
	1.5	4.8	2.2	5.4	3G3MX2-A4015-E	3G3MX2-D4015-EC
	2.2	5.5	3.0	6.9	3G3MX2-A4022-E	3G3MX2-D4022-EC
	3.0	7.2	4.0	8.8	3G3MX2-A4030-E	3G3MX2-D4030-EC
	4.0	9.2	5.5	11.1	3G3MX2-A4040-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

① Line filters

Inverter		Line filter Rasmi		Line filter Schaffner	
Voltage	Model 3G3MX2-□	Reference AX-FIM	Current (A)	Reference AX-FIM	Current (A)
1-phase 200 VAC	AB001 / AB002 / AB004	1010-RE	10	1010-SE-V1	8
	AB007	1014-RE	14	1024-SE-V1	27
	AB015 / AB022	1024-RE	24	1024-SE-V1	27
3-phase 200 VAC	A2001 / A2002 / A2004 / A2007	2010-RE	10	2010-SE-V1	7.8
	A2015 / A2022	2020-RE	20	2020-SE-V1	16
	A2037	2030-RE	30	2030-SE-V1	25
	A2055 / A2075	2060-RE	60	2060-SE-V1	50
	A2110	2080-RE	80	2080-SE-V1	75
	A2150	2100-RE	100	2100-SE-V1	100
3-phase 400 VAC	A4004 / A4007	3005-RE	5	3005-SE-V1	6
	A4015 / A4022 / A4030	3010-RE	10	3010-SE-V1	12
	A4040	3014-RE	14	3014-SE-V1	15
	A4055 / A4075	3030-RE	30	3030-SE-V1	29
	A4110 / A4150	3050-RE	50	3050-SE-V1	48

① Input AC reactors

Inverter		AC Reactor
Voltage	Model 3G3MX2-□	Reference
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
1-phase 200 VAC	AB002 / AB004	AX-RAI02000070-DE
	AB007	AX-RAI01700140-DE
	AB015	AX-RAI01200200-DE
	AB022	AX-RAI00630240-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 single 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	A2001 / A2002 / A2004 AB001 / AB002 / AB004	AX-RAO11500026-DE
	A2007/AB007	AX-RAO07600042-DE
	A2015 / AB015	AX-RAO04100075-DE
	A2022 / AB022	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 %
		3-phase	1-phase		Type AX-	Resist Ω		Type AX-	Resist Ω	
200 V (Single-/ Three-phase)	0.12	2001	B001	100	REM00K1400-IE	400	200	REM00K1400-IE	400	200
	0.25	2002	B002				180			180
	0.55	2004	B004		REM00K1200-IE	200	180	REM00K1200-IE	200	180
	1.1	2007	B007	50			100	REM00K2070-IE	70	200
	1.5	2015	B015		REM00K2070-IE	70	140	REM00K4075-IE	75	130
	2.2	2022	B022	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

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.

Cat. No. SysCat_I113E-EN-04 In the interest of product improvement, specifications are subject to change without notice.

	Vision
	
Model	**FQ-M**
Description	Designed for object tracking
Network specification	EtherCAT and Ethernet built-in
Inspection items	Shape search, search labelling, edge position
Simultaneous inspections	32
Registered scenes	32
Image processing method	Real color or monochrome
Resolution (usable) **Display dots**	752×480
Features	• Fast and powerful object recognition • Encoder input for object tracking and calibration • Contour based object detection • Sysmac Studio software for vision system operation and setting
Protection class	IP40
Supply voltage	24 VDC
Digital I/O	9 in/5 out
Page	231

FQ-M Series

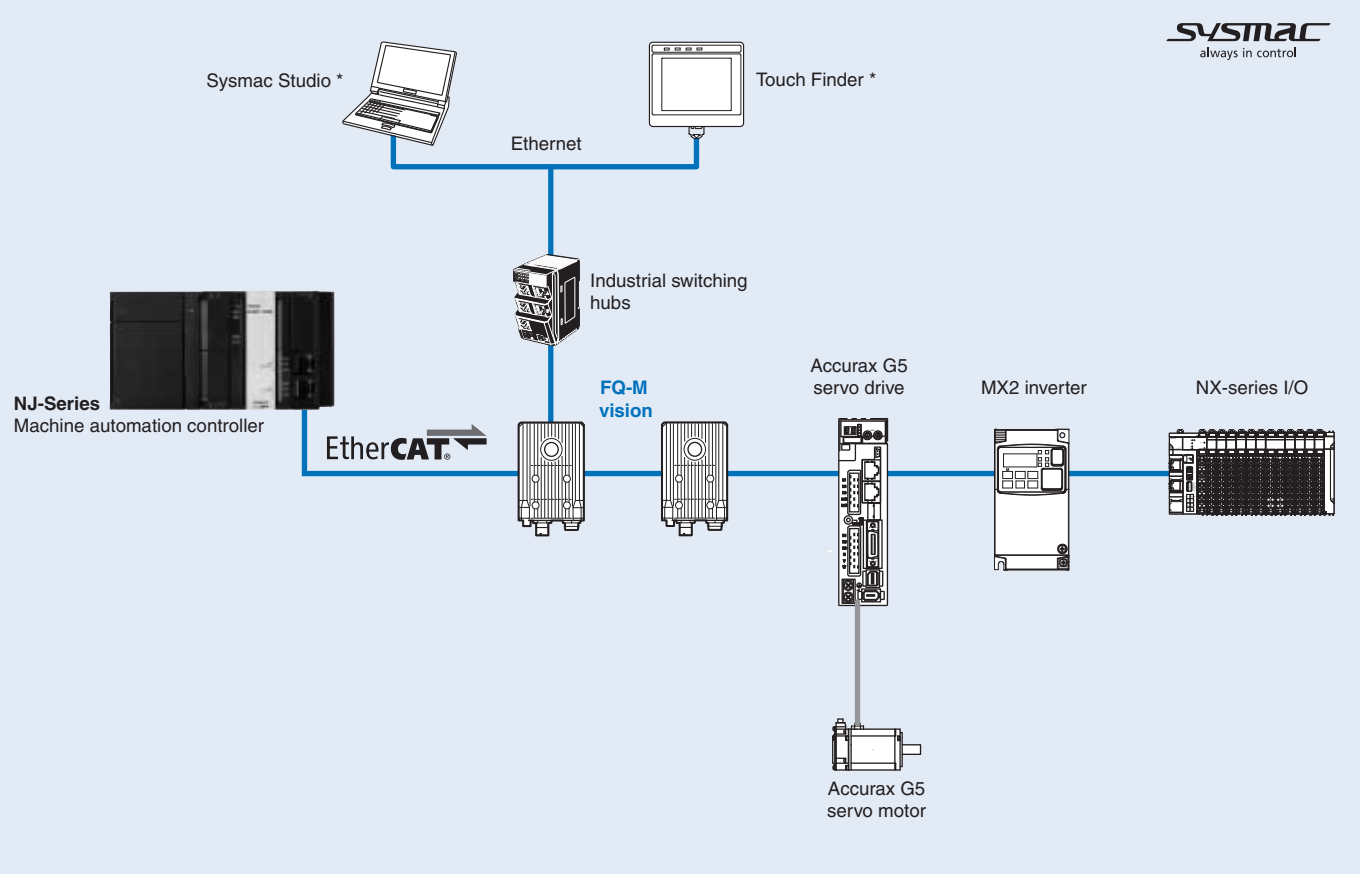
Vision sensor

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 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.

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 • Single measurement input (TRIG) • Error clear input (IN0) • Error counter reset input (IN1) • Encoder input (A±, B±, Z±)[*2]	
	Output signals	5 signals[*3] • OUT0 Overall judgement output (OR) • OUT1 Control output (BUSY) • OUT2 Error output (ERROR) • OUT3 Shutter output (SHTOUT) • OUT4 Strobe trigger output (STGOUT)	
	Ethernet specifications	100BASE-TX/10BASE-TX	
	EtherCAT specifications	Dedicated protocol for EtherCAT 100BASE-TX	
	Connection method	Special connector cables • Power supply and I/O: 1 special connector I/O cable • Touch Finder, Computer and Ethernet: 1 Ethernet cable • EtherCAT: 2 EtherCAT cable	
LED display	LED display	• OR: Judgment result indicator • ERR: Error indicator • BUSY: BUSY indicator • ETN: Ethernet communications indicator	
	EtherCAT display	• L/A IN (Link/Activity IN) × 1 • L/A OUT (Link/Activity OUT) × 1 • RUN × 1 • 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) 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/s^2 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.

Battery Specifications

Item / 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 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) 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.

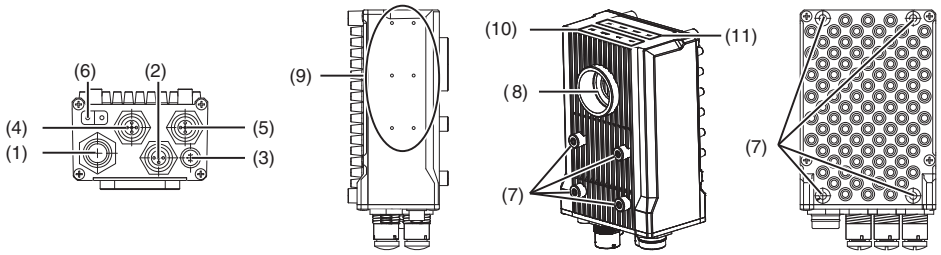
*2 This is a guideline for the time required for the capacity of the Battery to be reduced to 60% of the initial capacity. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

FQ-M Series EtherCAT communications specifications

Item	Specifications
Communication standard	IEC 61158 Type 12
Physical layer	100BASE-TX (IEEE802.3)
Connector	M12 × 2 E-CAT IN: EtherCAT (IN) 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 L/A OUT (Link/Activity OUT) × 1 RUN × 1 ERR × 1

Nomenclature

Sensor

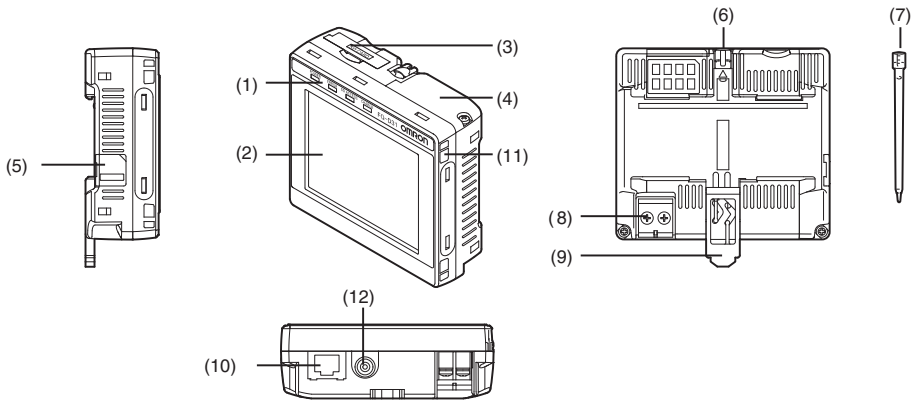


No.	Name	Description
(1)	I/O Cable connector	An I/O Cable is used to connect the sensor to the power supply and external I/O.
(2)	Ethernet connector	An Ethernet cable is used to connect the sensor to external devices such as PLCs, the Touch Finder or computers.
(3)	Lighting connector	Connect an external 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)	Measure-ment 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.

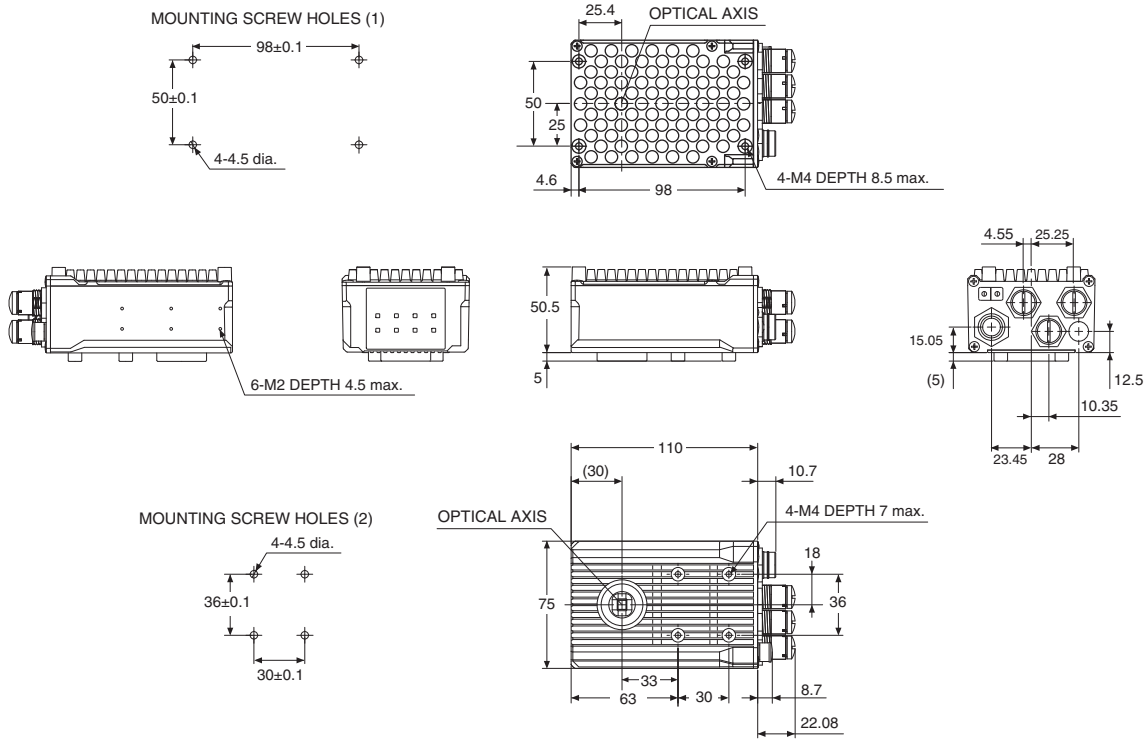
No.	Name	Description
(6)	Touch pen holder	The touch pen can be stored here when it is not being used.
(7)	Touch pen	Used to operate the touch panel.
(8)	DC power supply connector	Used to connect a DC power supply.
(9)	Slider	Used to mount the Touch Finder to a DIN Track.
(10)	Ethernet port	Used when 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.

Dimensions

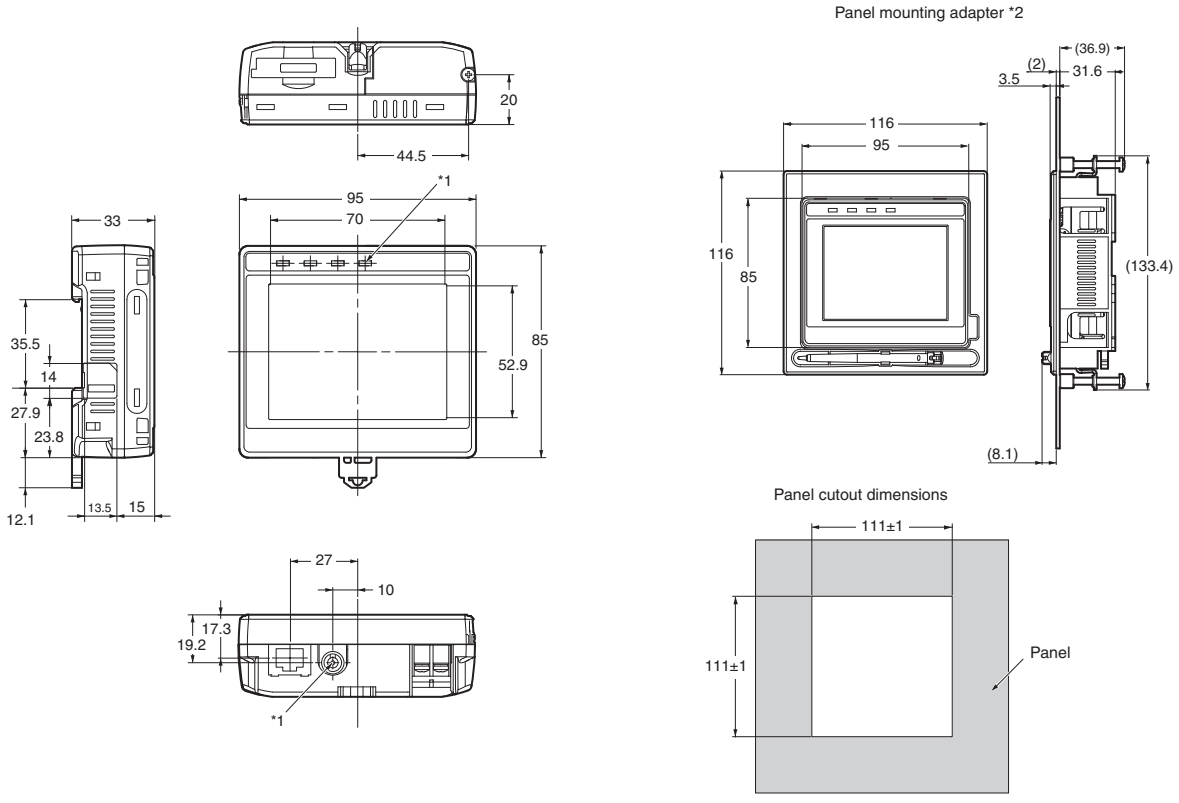
Sensor

FQ-MS12□-ECT/MS12□-M-ECT



Touch Finder

FQ-MD30/MD31



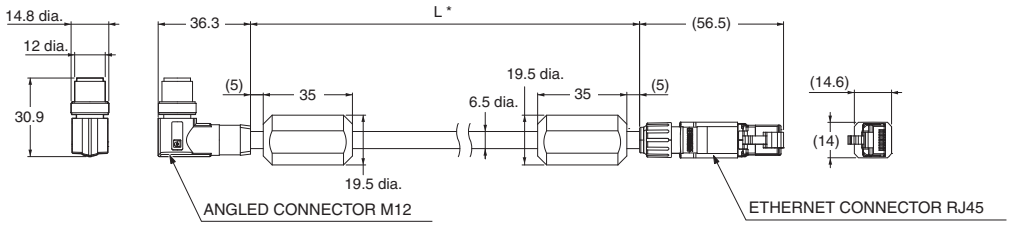
*1. Provided with FQ-MD31 only.

*2. The dimension of the panel mounting adapter does not include that of a FQ-MD□□.

Cables

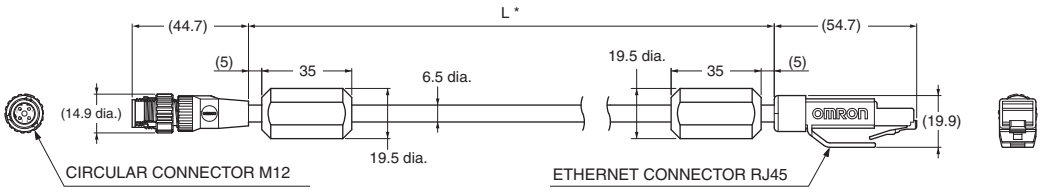
For EtherCAT and Ethernet cable

Angle: M12 / Straight: RJ45
FQ-MWNL005/010



* Cable is available in 5 m/10 m

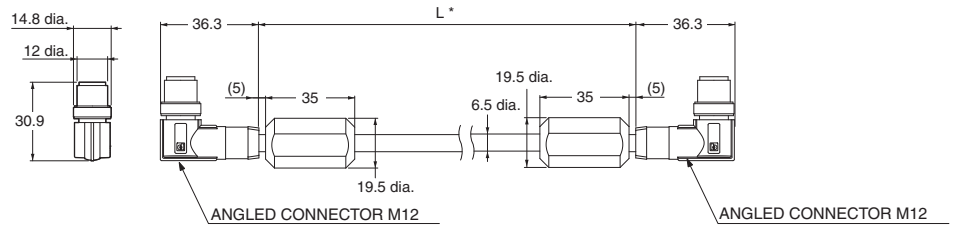
Straight type (M12/RJ45)
FQ-WN005/010



* Cable is available in 5 m/10 m

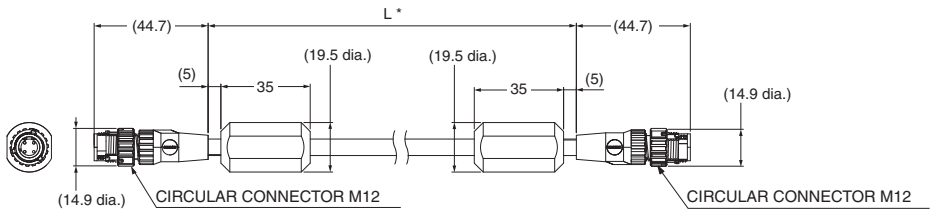
For EtherCAT cable

Angle type (M12/M12)
FQ-MWNEL005/010



* Cable is available in 5 m/10 m

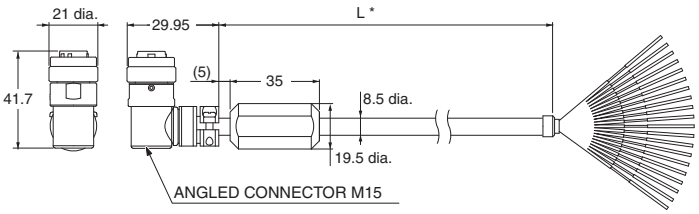
Straight type (M12/M12)
FQ-MWNE005/010



* Cable is available in 5 m/10 m

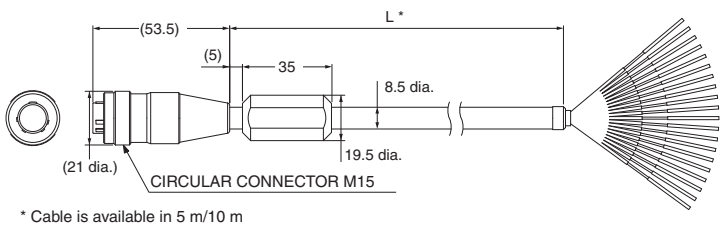
I/O cables

Angle type
FQ-MWDL005/010



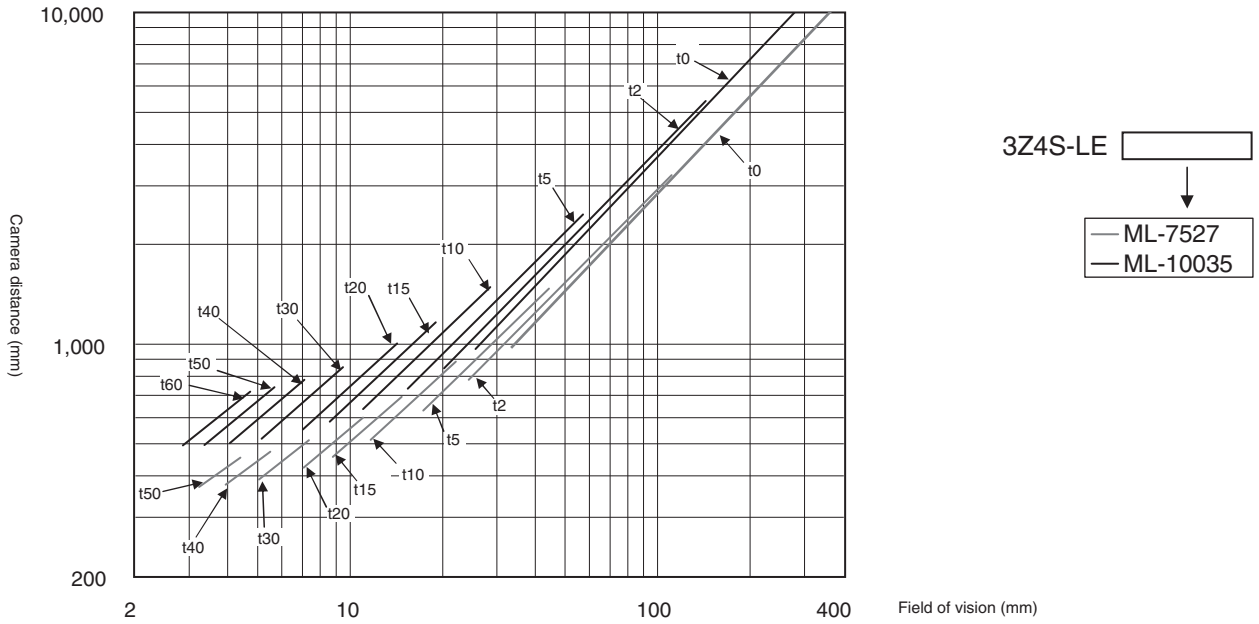
* Cable is available in 5 m/10 m

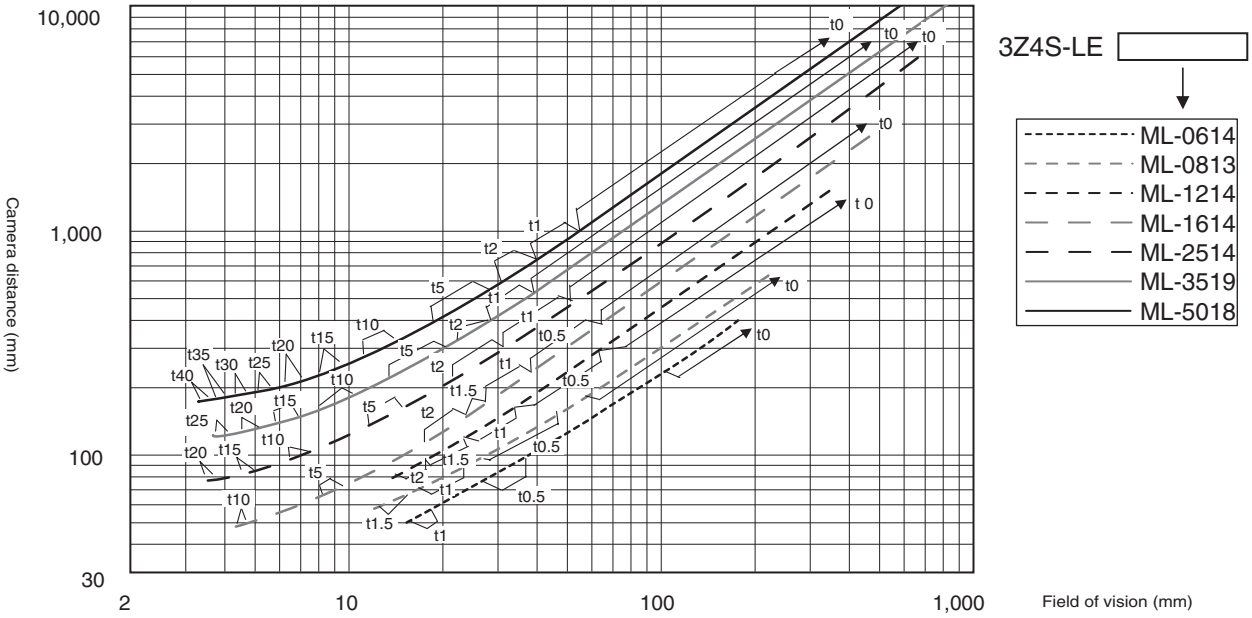
Straight type
FQ-MWD005/010



* Cable is available in 5 m/10 m

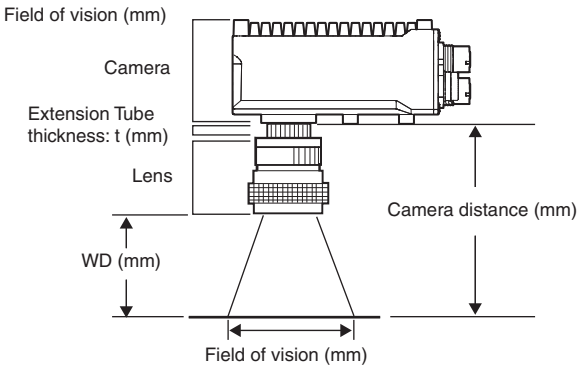
Optical Chart

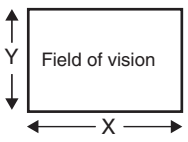




Meaning of Optical Chart

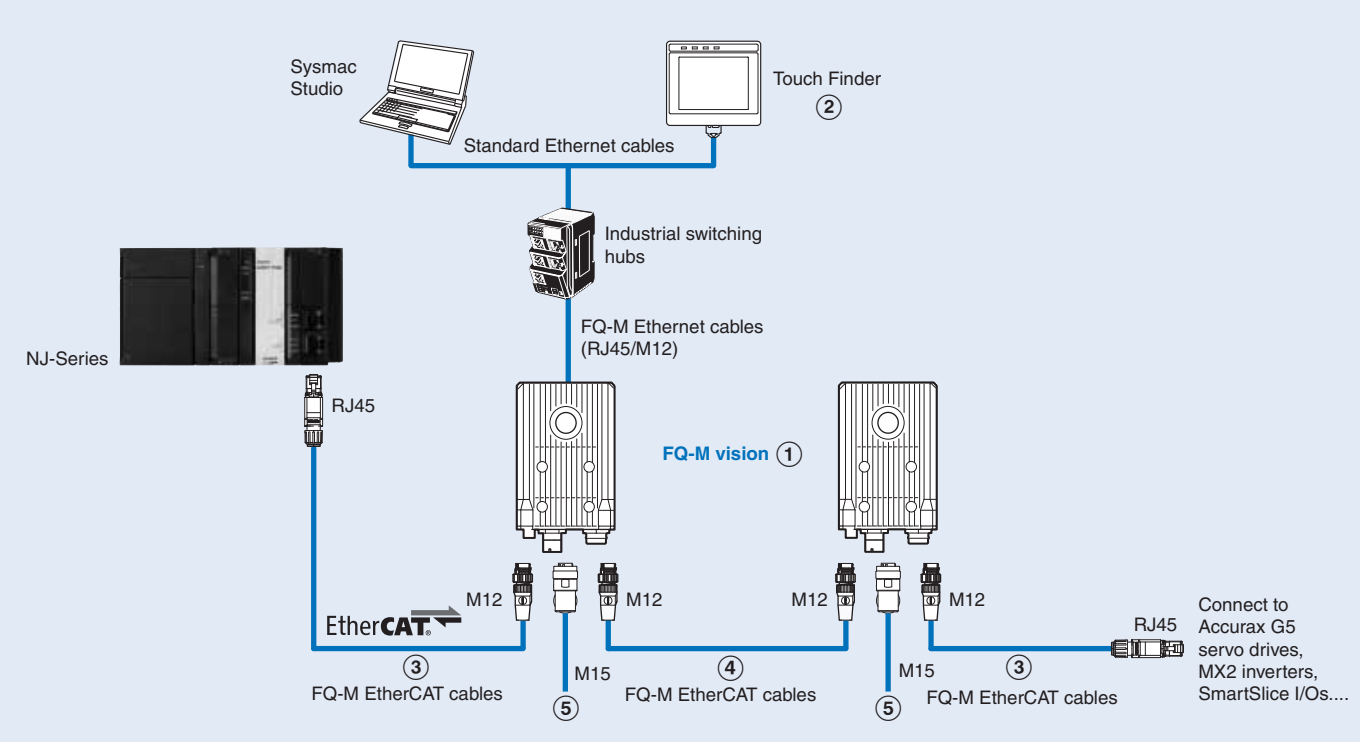
The X axis of the optical chart shows the field of vision (mm)*1, and the Y axis of the optical chart shows the camera installation distance (mm).*2





*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	

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.

Cat. No. SysCat_Q183-E2-01A-X In the interest of product improvement, specifications are subject to change without notice.

	Displacement sensor
	
Model	**ZW series**
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, • Max: 40±6 mm
Resolution	0.01 μm to 0.25 μm
Linearity	±0.8 μm to 7 μm
Special features	• Ethernet built-in • EtherCAT built-in • RS-232C • Analog VDC/mA • Sysmac Studio
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	Fiber/Laser/Proximitiy sensor	
		
Model	**N-Smart series**	**E3X/E3C/E2C series**
Network specification	EtherCAT communication unit	EtherCAT communication unit
Connectable sensors	Up to 30	Up to 30
Amplifier types	• E3NX-FA0 • E3NC-LA0 • E3NC-SA0	• E3X-HD0 • E3X-DA0-S • E3X-MDA0 • E3C-LDA0 • E2C-EDA0
Features	• High speed transmission of I/O-signals and incident values • Up to 30 amplifiers on one communication unit • Synchronized signal transmission • Slave unit for decentralized machine installation	• High speed transmission of I/O-signals • Up to 30 amplifiers on one communication unit
Mounting	DIN rail	DIN rail
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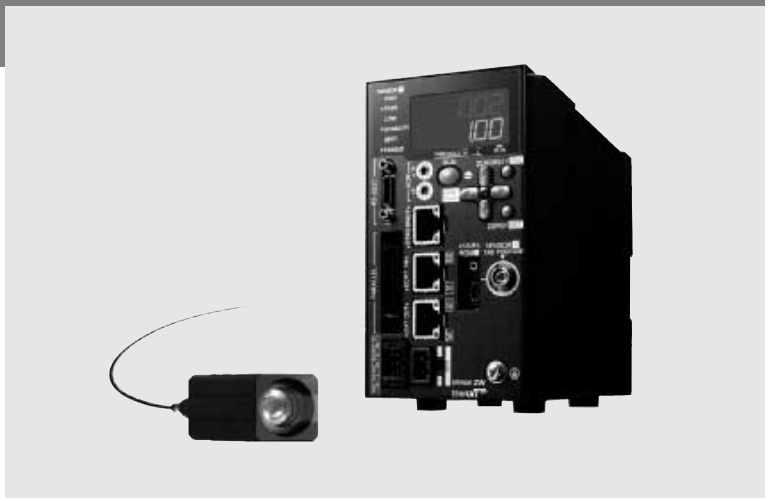
ZW-CE1□, ZW-S□□

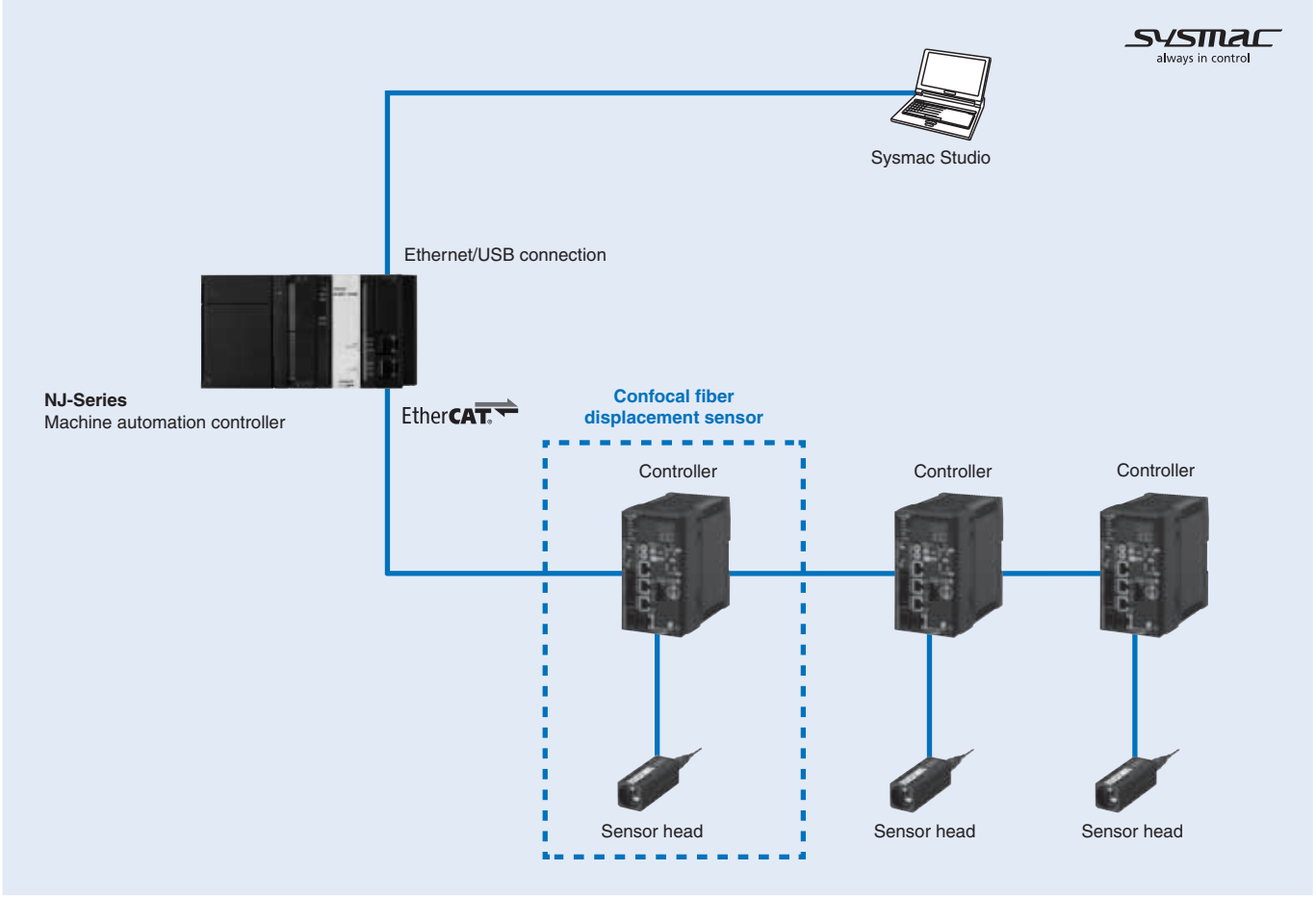
Fiber displacement sensor



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



Specifications

Sensor head specifications

Item		ZW-S07	ZW-S20	ZW-S30	ZW-S40
Measuring center distance		7 mm	20 mm	30 mm	40 mm
Measuring range		±0.3 mm	±1 mm	±3 mm	±6 mm
Static resolution*1		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
Spot diameter*3	Near	20 μm dia.	45 μm dia.	70 μm dia.	90 μm dia.
	Center	18 μm dia.	40 μm dia.	60 μm dia.	80 μm dia.
	Far	20 μm dia.	45 μm dia.	70 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	1.5 μm/ºC	2.8 μm/ºC	4.8 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		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 centre 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
Grass	±1.0 μm	±1.2 μm	±4.5 μm	±7.0 μm
SUS BA	±1.2 μm	±1.4 μm	±5.5 μm	±8.5 μm
White ceramic	±1.6 μm	±1.7 μm	±6.4 μm	±9.5 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.

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			Up to 115.200 bps	
	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 voltage 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.	
			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	
	Measurement 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	Up to 8 banks	
	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		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.

Sysmac Studio software specifications

Item	Conditions
Operating system (OS)*1*2	Windows XP (Service Pack3 or more, 32-bit version), Vista (32-bit version), 7 (32 or 64-bit version)
CPU	Windows PC with a Celeron 540 (1.8 GHz) or faster CPU Equivalent or higher recommended Core i5 M520 (2.4 GHz)
Memory	2 GB or more
Using the 3D motion trace	Video memory: 512 MB min. One of the following video card: NVIDIAR GeForceR 200 series or ATI RaedonHD5000 series
Free hard disk space	1.6 GB or more
Display	XGA 1024×768 16 million colors WXGA 1280×800 or higher recommended
Disk device	DVD-ROM drive
Communication port	USB port supports USB 2.0 or Ethernet port*3
Supported languages	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 / 7:
- 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

*3 Refer to the hardware manual for your controller for hardware connection methods and cables to connect the computer and controller.

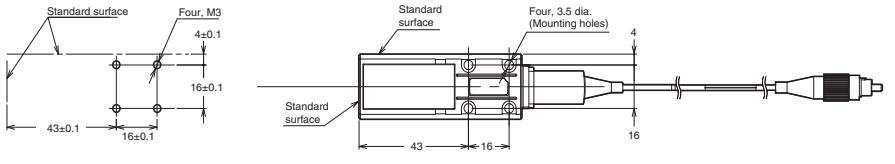
EtherCAT communication specifications

Item	Specifications
Communication standards	IEC61158 Type12
Physical layer	100BASE-TX (IEEE802.3)
Connector	RJ45 × 2, EtherCAT IN: EtherCAT input, EtherCAT OUT: EtherCAT output
Communication system	Category 5 or higher (cable with double, aluminium type and braided shielding) is recommended
Max. communication distance value	Distance between nodes: within 100 m
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, AECAT RUN × 1, AECAT ERR × 1

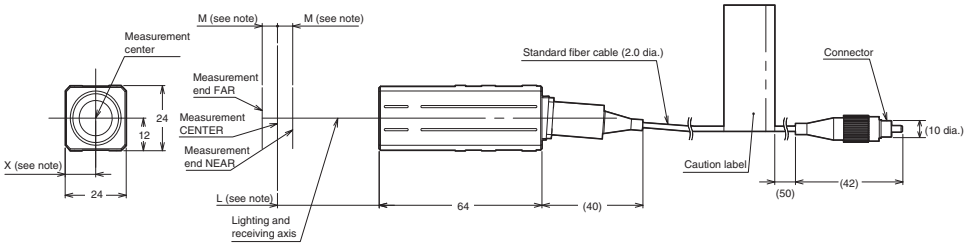
Dimensions

Sensor head

ZW-S07/S20/S30/S40



Mounting hole dimensions

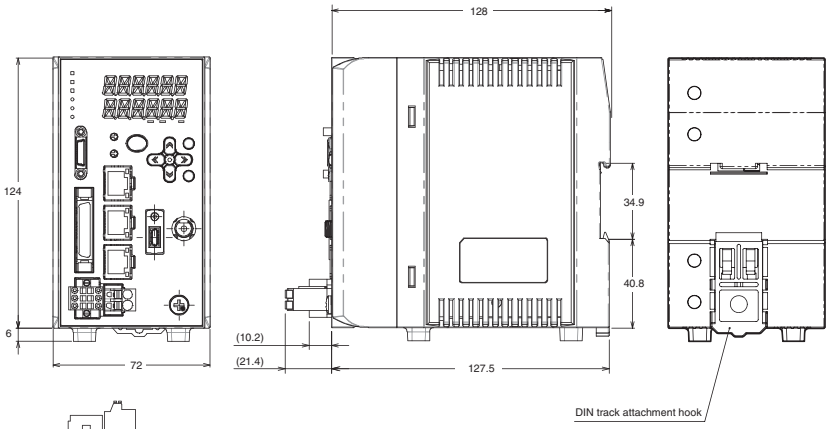


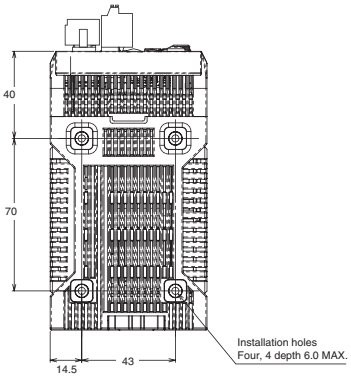
Note:

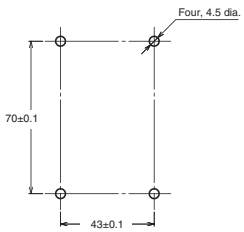
Model	L	M	X
ZW-S07	7	0.3	12
ZW-S20	20	1	11.8
ZW-S30	30	3	11.7
ZW-S40	40	6	11.7

Controller

ZW-CE10□/CE15□



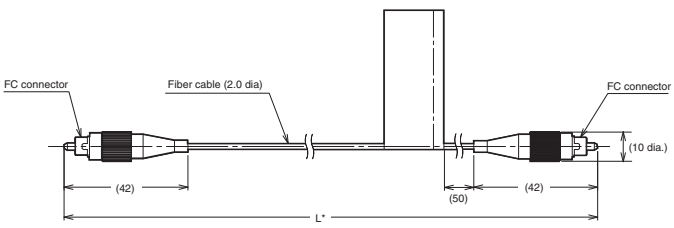




Mounting hole dimensions

Extension fiber cable

ZW-XF02R/XF05R/XF10R/XF20R/XF30R

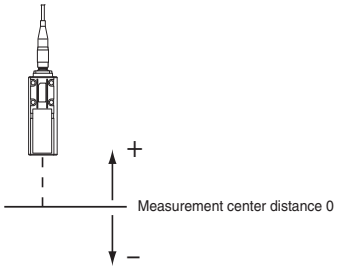


* The following table lists cable lengths per models.

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

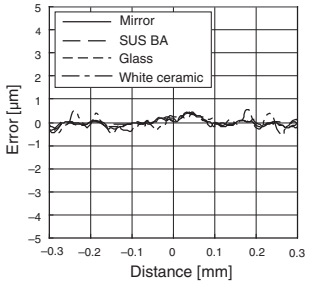
Characteristic data

Linearity characteristic by materials

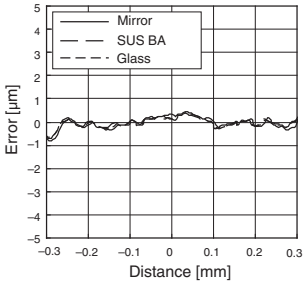


ZW-S07

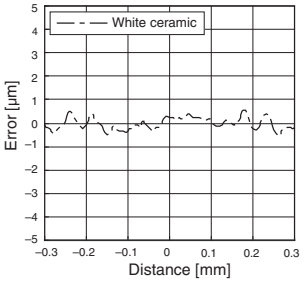
Material setting: Normal



Material setting: Mirror surface

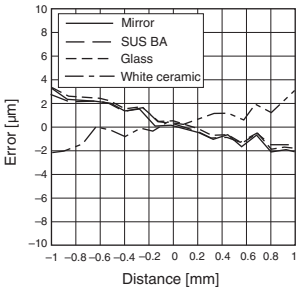


Material setting: Diffusion surface

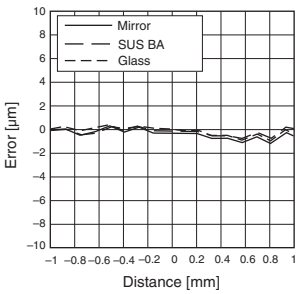


ZW-S20

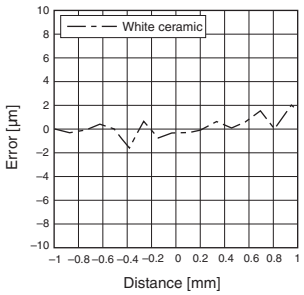
Material setting: Normal



Material setting: Mirror surface

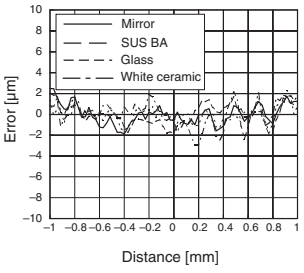


Material setting: Diffusion surface

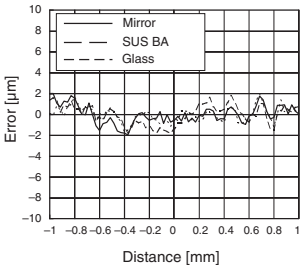


ZW-S30

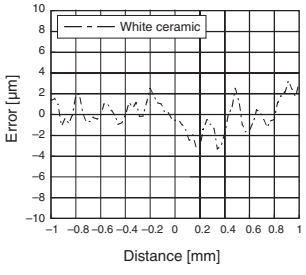
Material setting: Normal



Material setting: Mirror surface

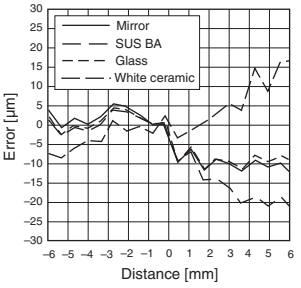


Material setting: Diffusion surface

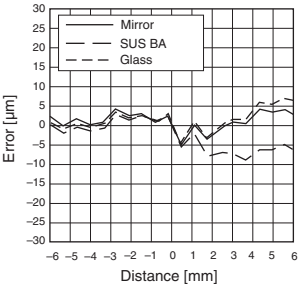


ZW-S40

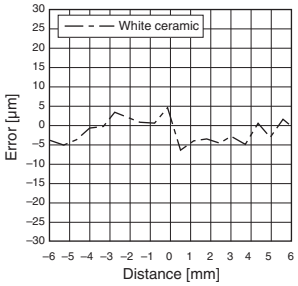
Material setting: Normal



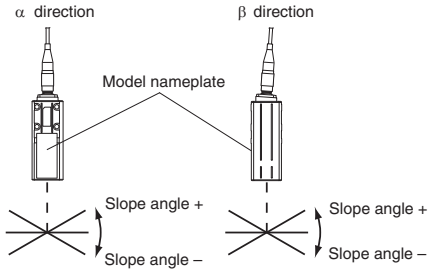
Material setting: Mirror surface



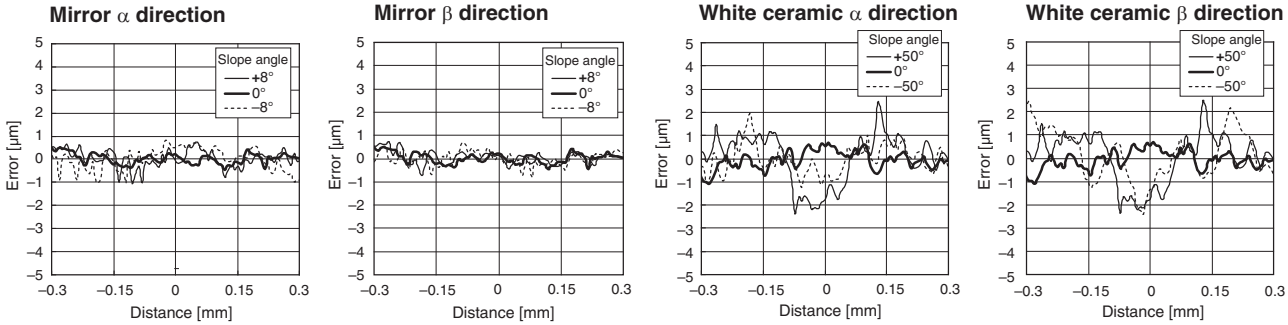
Material setting: Diffusion surface



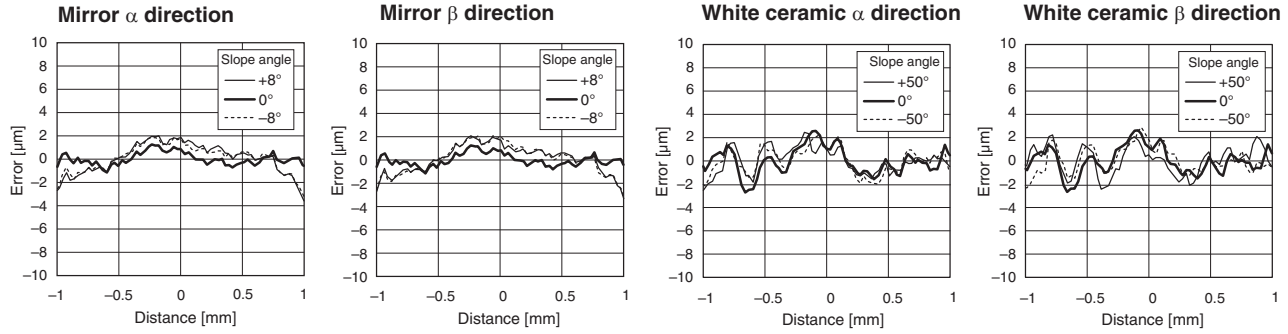
Angle characteristic*



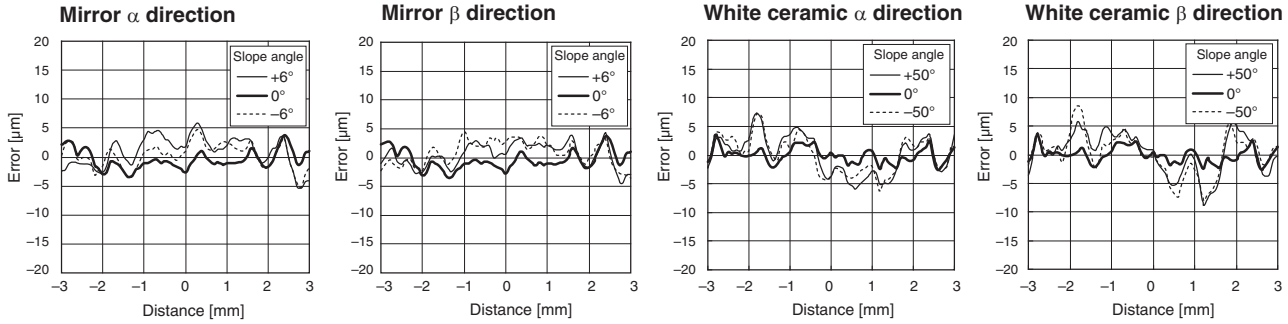
ZW-S07



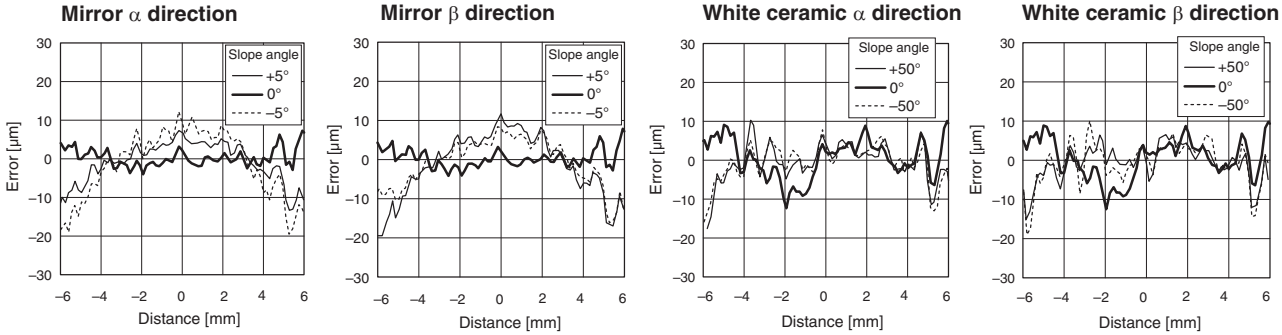
ZW-S20



ZW-S30

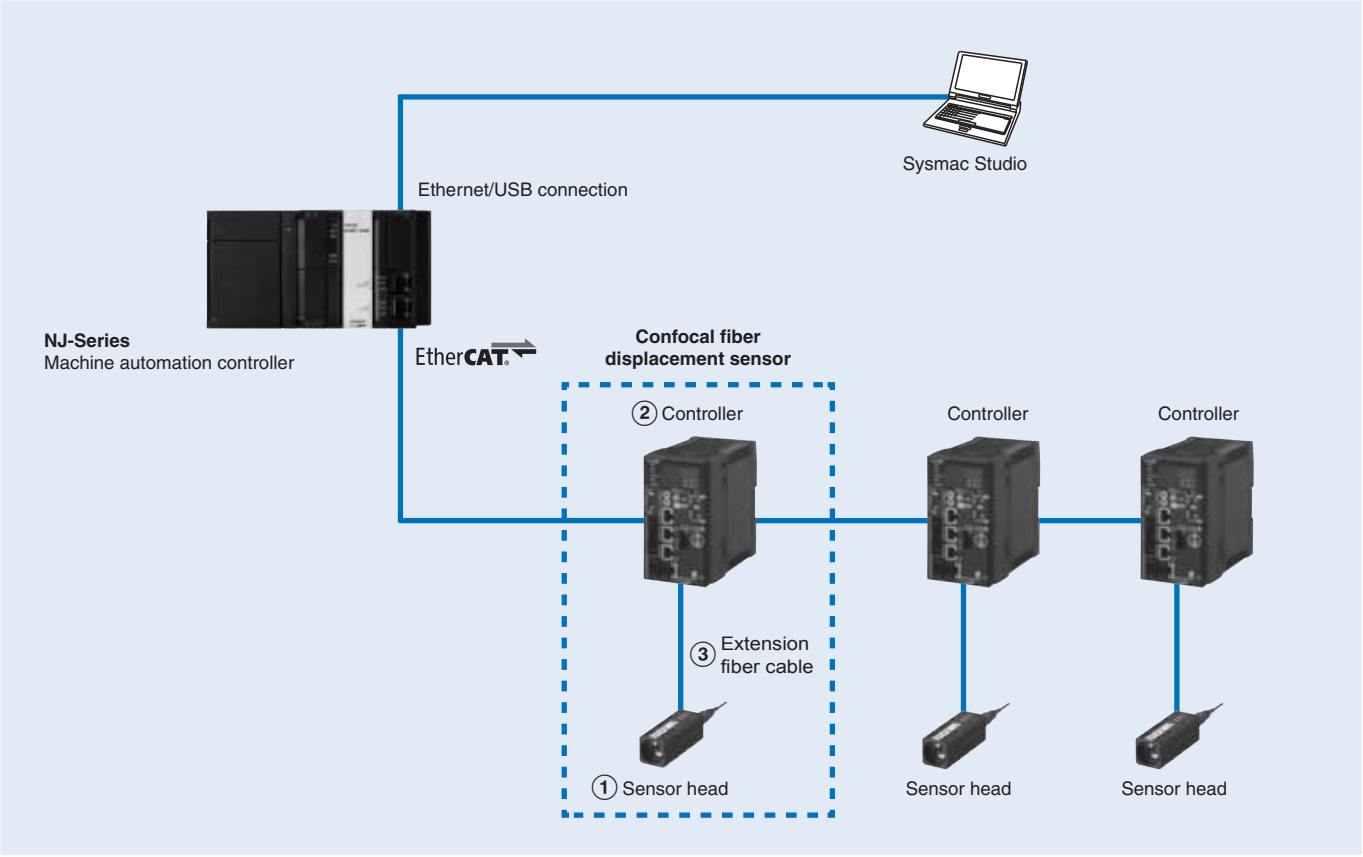


ZW-S40



* The above show the results after executing scaling.

Ordering information



Sensor head

Symbol	Measuring range	Spot diameter	Static resolution	Model
①	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

*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).

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-XCP2E). 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.

Cat.No. SysCat_E421-E2-01 In the interest of product improvement, specifications are subject to change without notice.

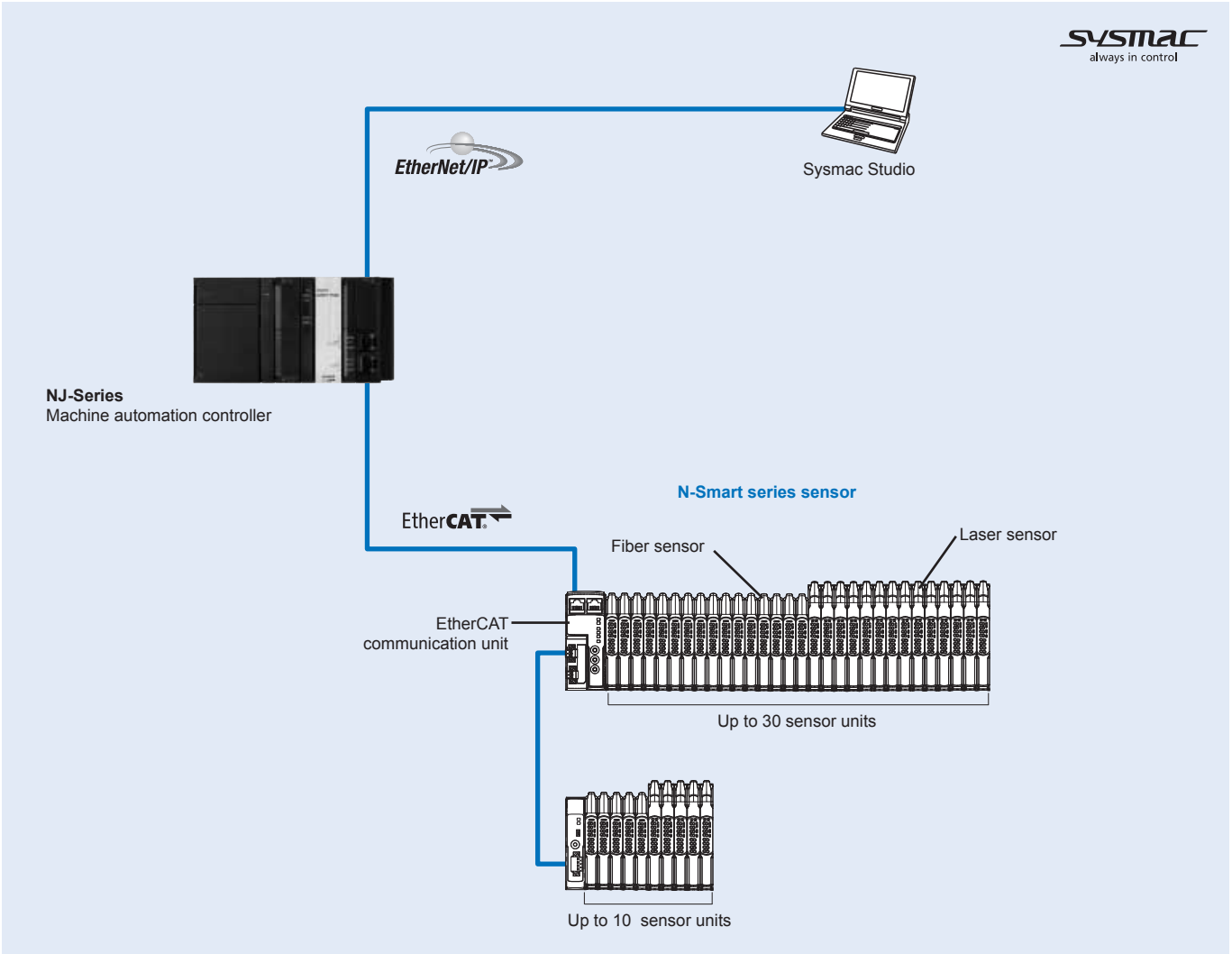
E3NW-□, E3NX-□, E3NC-□

N-Smart series sensor

Easily connect fiber sensors and laser sensors to EtherCAT

- **E3NX-FA fiber sensors:** High performance fiber amplifier with increased dynamic range, resolution and sensing distance
- **E3NC-L compact laser sensors:** 2 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

System configuration



Specifications

Sensor communication unit and distributed sensor unit specifications

Item	Specifications	
Model	**E3NW-ECT**	**E3NW-DS**
Connectable sensor amplifier units	N-Smart Smart fiber amplifier unit: E3NX-FA0 Smart laser amplifier unit: E3NC-LA0 Smart laser amplifier unit (CMOS type): E3NC-SA0	
Power supply voltage	24 VDC (20.4 to 26.4 V)	
Power and current consumption	2.4 W max./100 mA max. (not including the power supplied to sensors)	2 W max./80 mA max. (not including the power supplied to sensors)
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)	
Maximum connectable sensors	30*2	10
Maximum connectable distributed sensor units	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	
Accessories	Power supply connector, communication connectors, connector cover, DIN track end plates and instruction manuals	Power supply/communication connectors, connector cover, DIN track end plates, ferrite core and instruction manuals

*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 sensor unit specifications

Item		Specifications
Model		**E3NX-FA0**
Outputs		2 outputs
Light source (wavelength)		Red, 4-element LED (625 nm)
Power supply voltage		10 to 30 VDC, including 10% ripple (p-p)
Power consumption*1		At power supply voltage of 24 VDC Normal mode: 960 mW max. (current consumption: 40 mA max.) Power saving eco mode: 840 mW max. (current consumption: 35 mA max.)
Control output		Load power supply voltage: 30 VDC max., open-collector output Load current: groups of 1 to 3 amplifiers: 100 mA max., groups of 4 to 30 amplifiers: 20 mA max. Residual voltage: at load current of less than 10 mA: 1 V max., at load current of 10 to 100 mA: 2 V max. OFF current: 0.1 mA max.
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
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
Functions		Auto power control (APC), dynamic power control (DPC), timer, zero reset, resetting settings, eco mode, bank switching, power tuning and hysteresis width.
Maximum connectable units		30

*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). Power saving eco mode: 930 mW max. (current consumption: 31 mA max. at 30 VDC, 93 mA max. at 10 VDC).

*2 The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.

Laser sensor unit specifications

Item		Specifications	
Model		E3NC-LA0	E3NC-SA0
Outputs		2 outputs	2 outputs
Power supply voltage		10 to 30 VDC, including 10% ripple (p-p)	
Power consumption*1		At power supply voltage of 24 VDC Normal mode: 1.560 mW max. (current consumption: 65 mA max.) Power saving eco mode: 1.200 mW max. (current consumption: 50 mA max.)	At power supply voltage of 24 VDC Normal mode: 1.920 mW max. (current consumption: 80 mA max.) Power saving eco mode: 1.680 mW max. (current consumption: 70 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: 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-points tuning, full auto tuning, position tuning, maximum sensitivity tuning, power tuning or percentage tuning (–99% to +99%)), or manual adjustment.	Smart tuning (2-points 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.
No. of unit for mutual interference prevention	Super-high speed mode (SHS)*2	0	0
	High-speed mode (HS)	2	2
	Standard mode (Stnd)	2	2
	Giga-power mode (GIGA)	4	2
Functions		Dynamic power control (DPC), timer, zero reset, resetting settings, eco mode, bank switching (select from banks 1 to 4), power tuning, output 1, output 2, external input and hysteresis width.	Timer, zero reset, resetting settings, eco mode, bank switching (select from banks 1 to 4), power tuning, output 1, output 2, external input, keep function*3, background suppression*4 and hysteresis width.
Maximum connectable units		30	
Ambient temperature range		Operating: 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 Storage: –30 to 70 ºC (with no icing or condensation)	
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
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		Case: Polycarbonate (PC). Cover: Polycarbonate (PC). Cable: PVC	
Accessories		Instruction manual	

*1 At power supply voltage of 10 to 30 VDC: Normal mode: 1.650 mW max. (current consumption: 55 mA max. at 30 VDC, 115 mA max. at 10 VDC). Power saving eco mode: 1350 mW max. (current consumption: 45 mA max. at 30 VDC, 80 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 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.

*4 Only the sensing object is detected when tuning.

E3NC-LA0 sensor head

Item		Specifications	
Model		E3NC-LH02	E3NC-LH01
Light source (wavelength)*1		Visible semiconductor laser diode (660 nm), 315 μW max. (JIS class 1, IEC/EN class 1 and FDA class 1)	
Sensing distance*2	Super-high speed mode (SHS)	200 mm	70±15 mm
	High-speed mode (HS)	250 mm	
	Standard mode (Stnd)	750 mm	
	Giga-power mode (GIGA)	1200 mm	
Spot diameter*3		Approx. 0.8 mm (at distances up to 300 mm)	Approx. 0.1 mm (at distances up to 70 mm)
Differential distance*4		10% of sensing distance	
Ambient illumination		Illumination on received light surface: 10,000 lx max. of incandescent light, 20,000 lx max. of sunlight	
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)	
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 IP65	
Connecting method		Pre-wired connector (standard cable length: 2 m)	
Weight (packed state/sensor head only)		Approx. 115 g/approx. 65 g	
Materials		Case: Polybutylene terephthalate (PBT). Lens: Methacrylic resin. Cable: PVC	
Accessories		Instruction manual	

*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: 1220690).

*2 The values were measured using the OMRON standard sensing object (white paper).

*3 Defined as 1/e^2 (13.5%) of the central light intensity at the measurement distance. The spot diameter is sometimes influenced by the ambient conditions of the workpiece, such as light that leaks from the main beam, if the reflection factor of the area surrounding the workpiece is higher than that of the workpiece.

*4 Measured at the rated sensing distance.

E3NC-SA0 sensor head

Item	Specifications	
Model	**E3NC-SH250**	**E3NC-SH100**
Light source (wavelength)[*1]	Visible semiconductor laser diode (660 nm), 100 μW max. (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
Spot diameter[*3]	Approx. 1 mm (at 250 mm)	Approx. 0.5 mm (at 100 mm)
Ambient illumination	Illumination on received light surface: 2,000 lx max. of incandescent light, 4,000 lx max. of sunlight	Illumination on received light surface: 4,000 lx max. of incandescent light, 8,000 lx max. of sunlight
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)	
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	
Connecting method	Pre-wired connector (standard cable length: 2 m)	
Weight (packed state/sensor head only)	Approx. 125 g/approx. 75 g	
Accessories	Instruction manual	

[*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] Spot diameter: Defined as 1/e^2 (13.5%) of the minimum diameter (actual value) in the measurement range. False detections can occur 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, correct measurement values may not be obtained if the workpiece is smaller than the spot diameter.

Note: Incorrect detection may occur outside the measurement range if the object has a high reflection factor.

EtherCAT communication specifications

Item	Specifications
Communication protocol	Dedicated protocol for EtherCAT
Modulation	Base band
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 resistance	Conforms to IEC 61000-4-4, 1 kV or higher
Node address setting method	Set with decimal rotary switches or software[*1]
Node address range	000 to 192[*2]

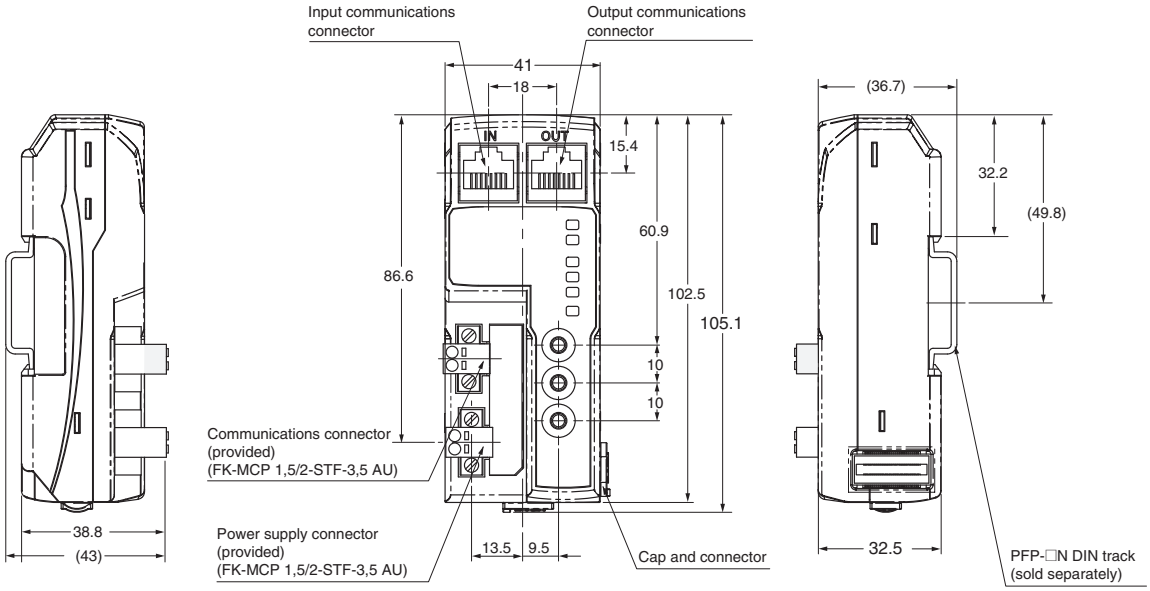
[*1] The software setting is used when the node address setting switches are set to 0.

[*2] The range depends on the EtherCAT master that is used. Refer to the "E3NW-ECT EtherCAT sensor communication unit operation manual" for details.

Dimensions

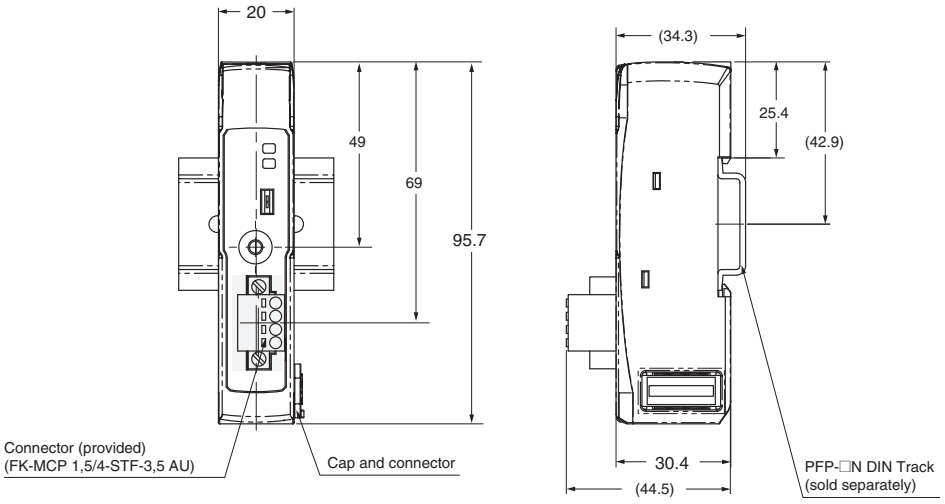
Sensor communication unit

E3NW-ECT



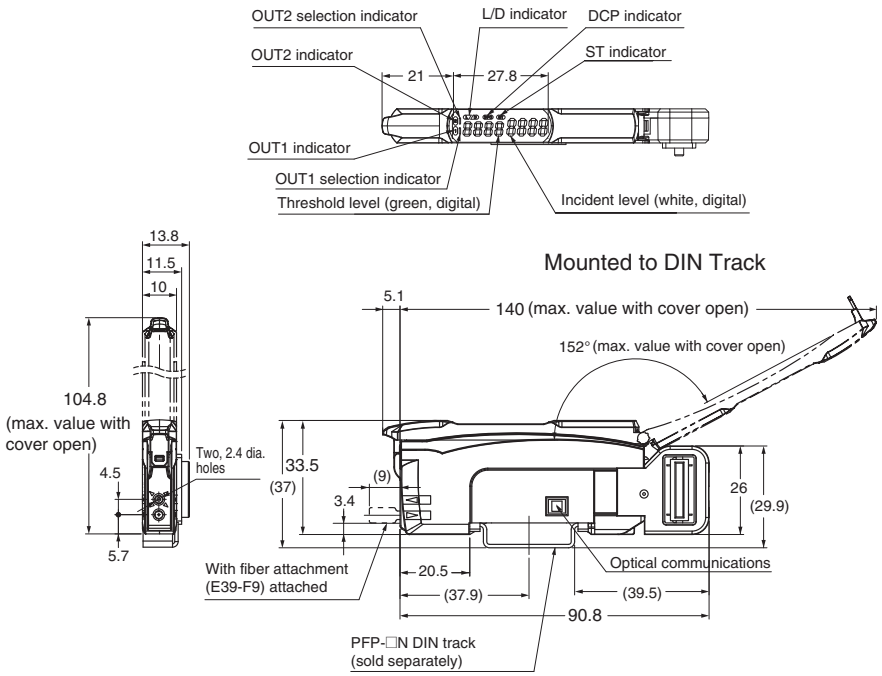
Distributed sensor unit

E3NW-DS



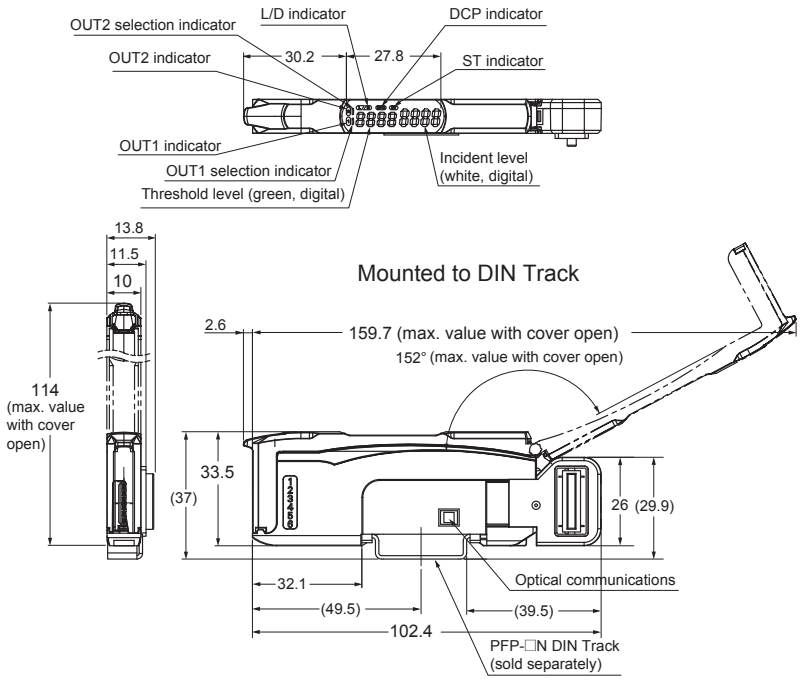
Fiber sensor unit

E3NX-FA0



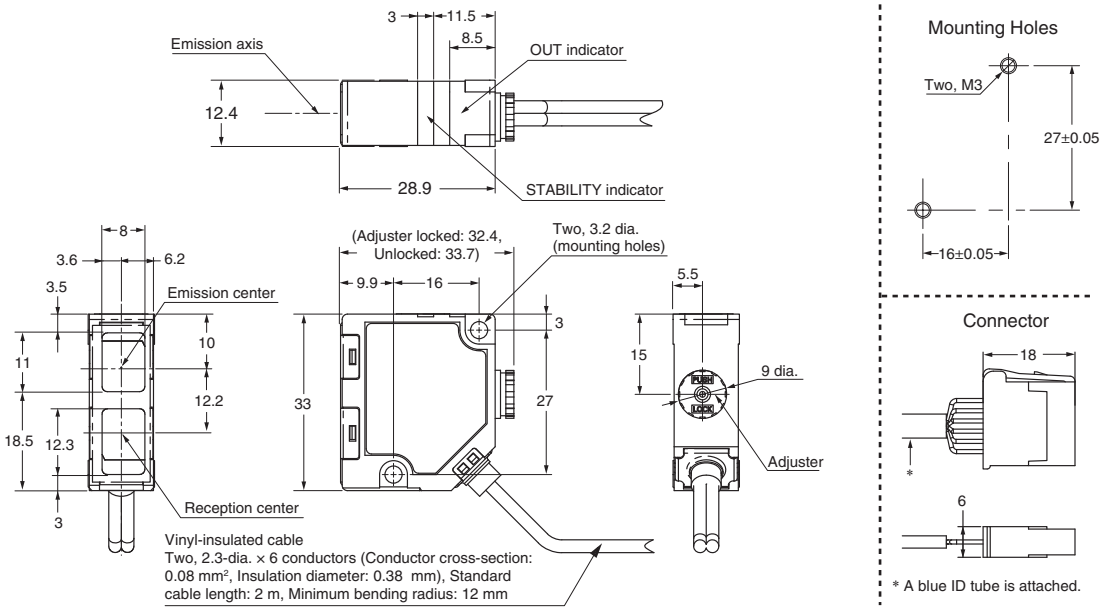
Laser sensor unit

E3NC-LA0 / E3NC-SA0

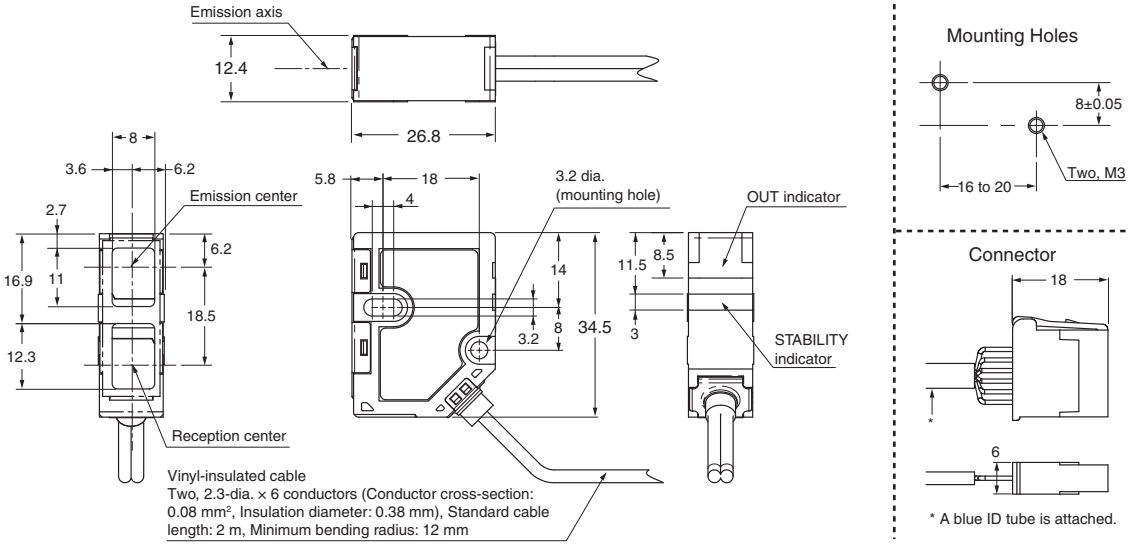


E3NC-LA0 sensor head

E3NC-LH2

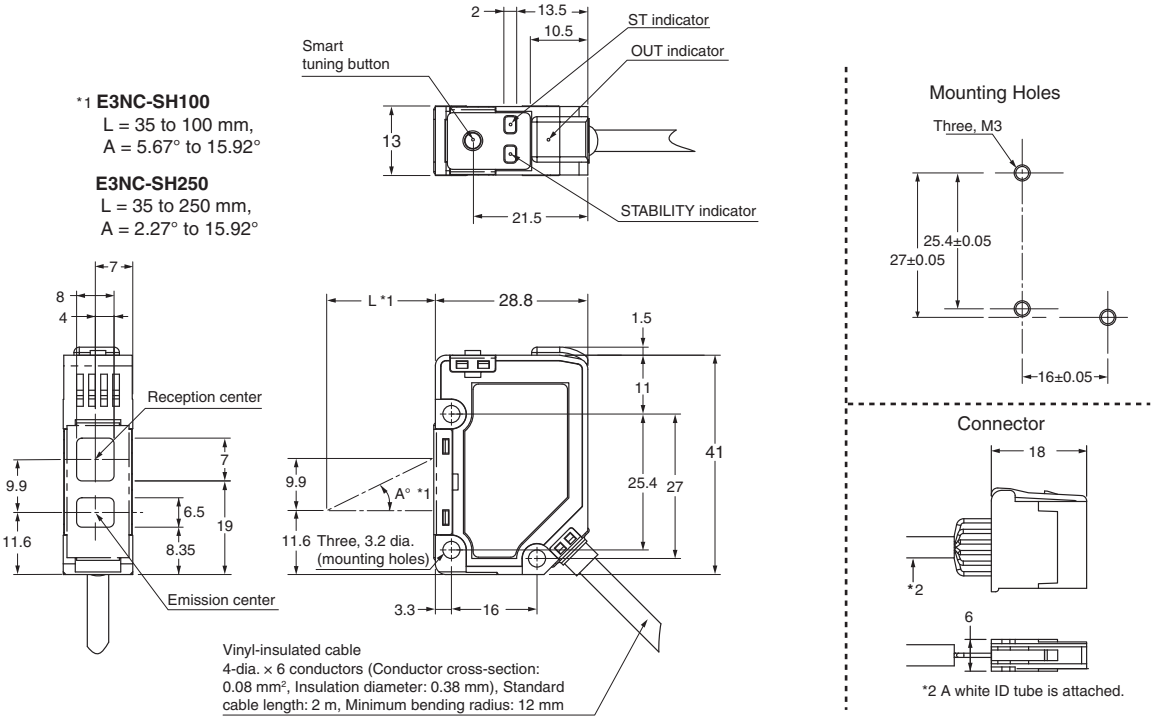


E3NC-LH1



E3NC-SA0 sensor head

E3NC-SH250/E3NC-SH100



Ordering information

Communication units

Type	Model	Appearance
Sensor communication unit for EtherCAT	E3NW-ECT	
Sensor dispersion (slave) unit	E3NW-DS	

Connectable sensor units

Type	Inputs/Outputs	Model	Appearance
Fiber amplifier unit	2 outputs	E3NX-FA0	
Smart laser amplifier unit		E3NC-LA0	
Smart laser amplifier unit (CMOS type)		E3NC-SA0	

Sensor head units

E3NC-LA0 sensor head units

Sensing method	Focus	Model	Appearance
Diffuse-reflective	Variable spot	E3NC-LH02 2M	
Limited-reflective	Spot	E3NC-LH01 2M	

E3NC-SA0 sensor head units

Sensing distance	Model	Appearance
35 to 250 mm	E3NC-SH250 2M	
35 to 100 mm	E3NC-SH100 2M	

Mounting brackets

Contents	Applicable sensor head	Model	Appearance
Mounting bracket: 1 Nut plate: 1 Philips screws (M3×18): 2	E3NC-LH02	E39-L185	
	E3NC-LH01	E39-L186	
	E3NC-SH250	E39-L187	
	E3NC-SH100	E39-L188	

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-01 In the interest of product improvement, specifications are subject to change without notice.

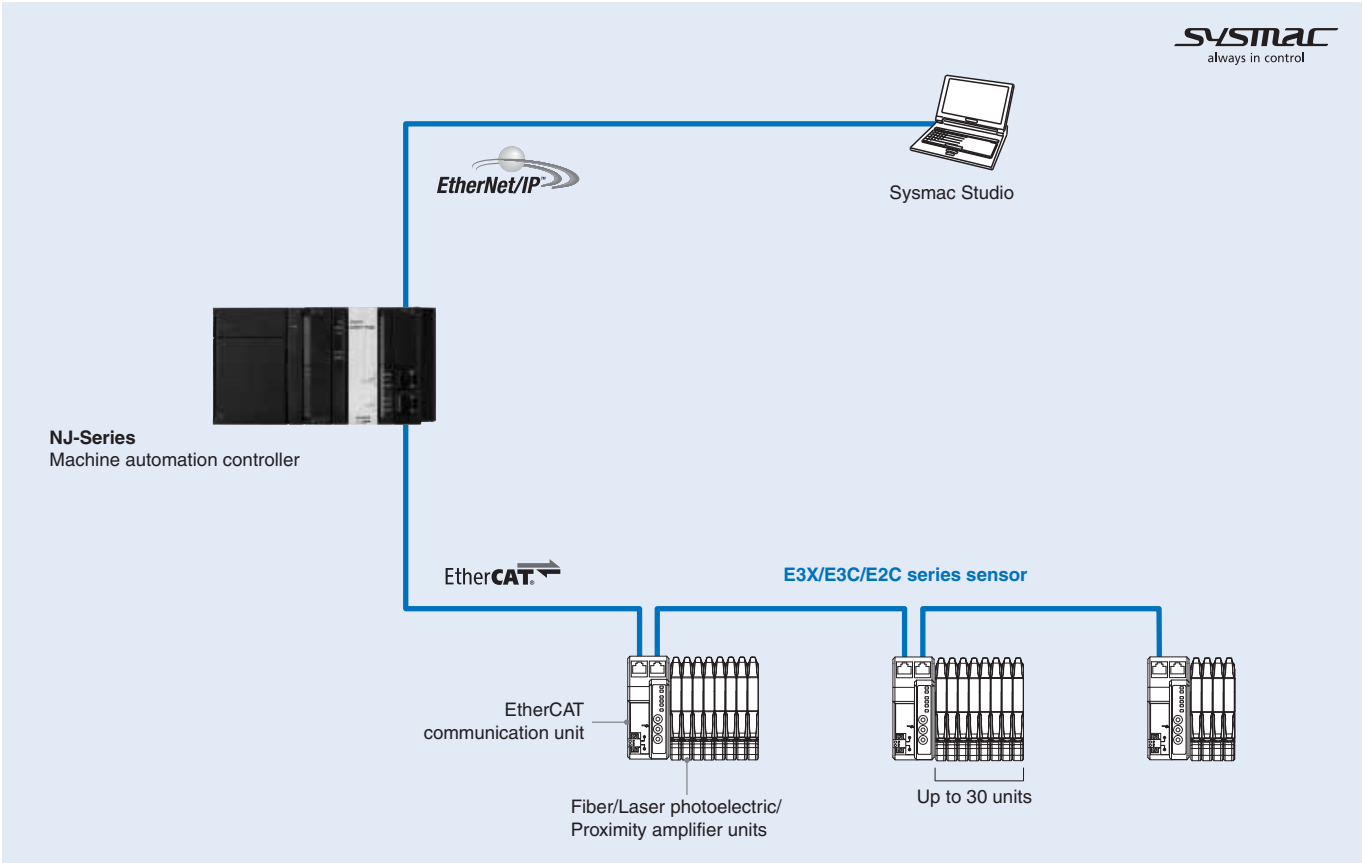
E3X-□, E3C-LDA0, E2C-EDA0

E3X/E3C/E2C series sensor

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



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) 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. (30 mA max. at 24 VDC, 60 mA max. at 12 VDC) Power saving eco: 530 mW max. (22 mA max. at 24 VDC, 44 mA max. at 12 VDC)	1,080 mW max. (45 mA max. at power supply voltage of 24 VDC)	Normal mode: 960 mW max. (40 mA max. at 24 VDC, 80 mA max. at 12 VDC) Power saving ECO1: 720 mW max. (30 mA max. at 24 VDC, 60 mA max. at 12 VDC) Power saving ECO2: 600 mW max. (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 (optical communications sync)	Possible for up to 9 units (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: Groups of 1 to 2 amplifiers: 0 to 55 ºC Groups of 3 to 10 amplifiers: 0 to 50 ºC Groups of 11 to 16 amplifiers: 0 to 45 ºC Groups of 17 to 30 amplifiers: 0 to 40 ºC 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: Groups of 1 to 2 amplifiers: 0 to 55°C Groups of 3 to 10 amplifiers: 0 to 50°C Groups of 11 to 16 amplifiers: 0 to 45°C Groups of 17 to 30 amplifiers: 0 to 40°C 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: Groups of 1 to 2 amplifiers: 0 to 55°C Groups of 3 to 5 amplifiers: 0 to 50°C Groups of 6 to 16 amplifiers: 0 to 45°C Groups of 17 to 30 amplifiers: 0 to 40°C When used in combination with an E2C-EDR6-F: Groups of 3 to 4 amplifiers: 0 to 50°C Groups of 5 to 8 amplifiers: 0 to 45°C Groups of 9 to 16 amplifiers: 0 to 40°C Groups of 17 to 30 amplifiers: 0 to 35°C 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

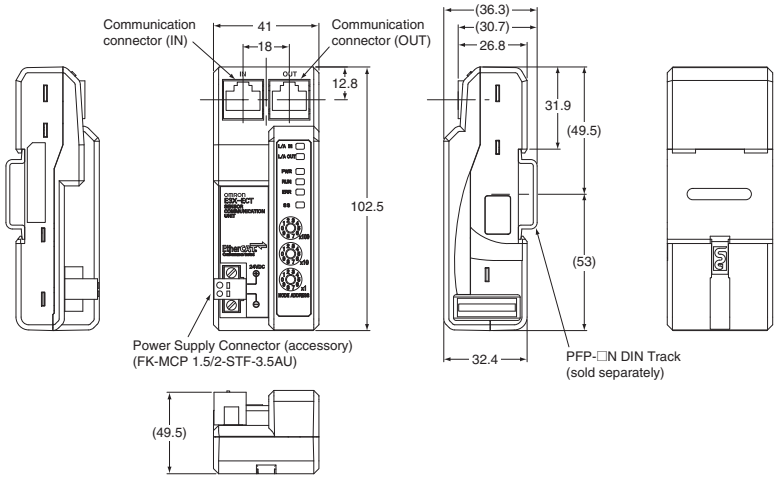
EtherCAT communication specifications

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

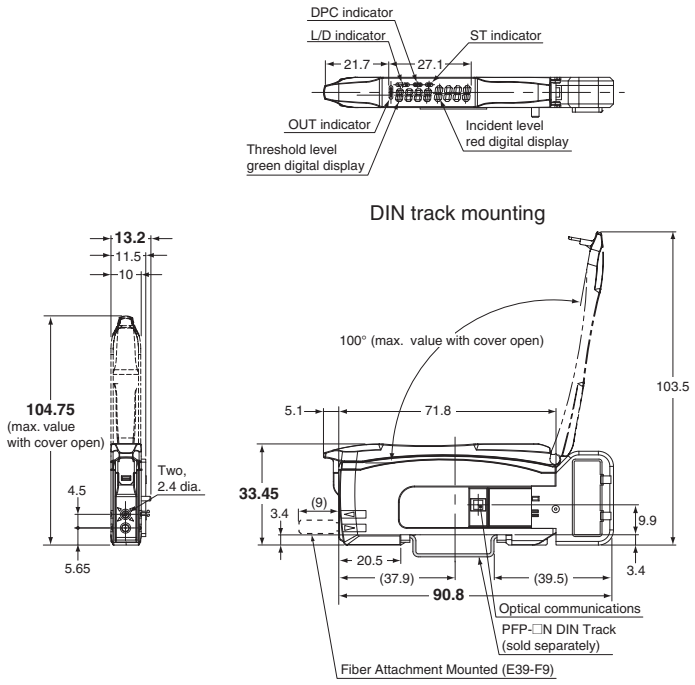
EtherCAT communication unit

E3X-ECT

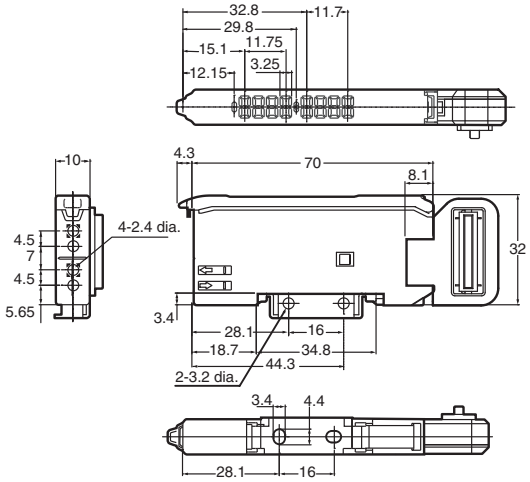


Fiber amplifier unit

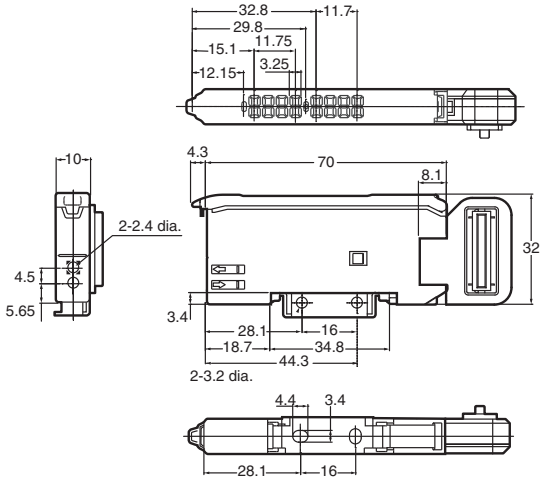
E3X-HD0



E3X-MDA0

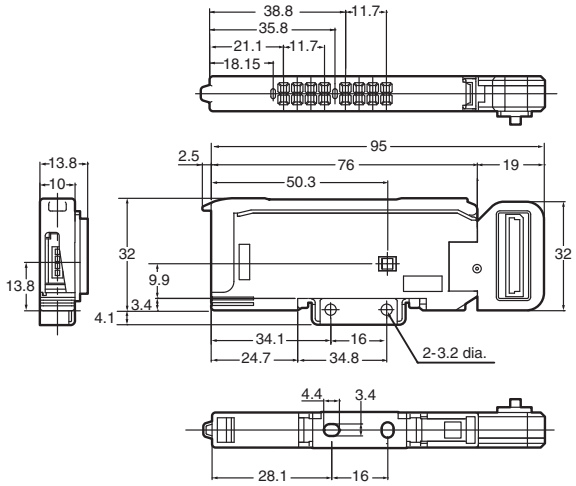


E3X-DA0-S



Laser photoelectric/Proximity amplifier unit

E3C-LDA0 / E2C-EDA0



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.

Cat. No. SysCat_E417-E2-02 In the interest of product improvement, specifications are subject to change without notice.

SYSMAC-SE2□

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 servo, inverter, vision and I/O
- 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

System requirements

Item	Requirement
Operating system (OS)[*1] [*2]	Windows XP (Service Pack 3 or higher, 32-bit version) / Vista (32-bit version) / 7 (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.
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 or Windows 7.
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 or Windows 7 font (e.g., Meiryo) is used in a project, the font size on labels may be bigger and the 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 or Windows 7 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.

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.	
		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.)	
		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 up 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.	
	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.	
		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.	
		Exporting cam tables	You can export cam table to a CSV file.	
		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.	

Item			Function	Sysmac Studio
Setting parameters	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.	All versions
		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
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 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 past 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
	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.	
	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

Item			Function	Sysmac Studio
Programming	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.	
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 .smc or .csm[*5] project file.	All versions
		Importing a project file	You can import a project from an .smc or .csm[*5] 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. Or, you can merge detailed comparison results.[*6]	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.	
	Printing		You can print various data. You can select the items to print.	
	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.	
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.	
	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[*7]		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 in 3D Motion Trace Display Mode. 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.[*8] You can consecutively read and display continuous trace results from more than one file.[*9]	
		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.	

Item			Function	Sysmac Studio
Debugging	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.	
		Changing the simulation speed	You can change the execution speed.	
		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*10	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.	
	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 trace function.	All versions
		Displaying 3D motion traces	You set the axis variables for each element of the 3D device model, and then set the 3D device 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.	
	Troubleshooting	–	You can use troubleshooting to check the errors that occurred in the controller, display corrections for the errors and clear the errors.	
		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.	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 back up or restore.*11	
		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.	

Item			Function	Sysmac Studio
Security measures	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.	All versions
		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
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 member 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 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.
*6 Merging detailed comparison results is supported by version 1.03 or higher.
*7 Changing present values in the ladder editor or ST editor is supported by version 1.03 or higher.
*8 Changing the colors of graph lines is supported by version 1.01 or higher.
*9 Consecutively reading and displaying continuous trace results from more than one file is supported by version 1.05 or higher.
*10 CX-Designer version 3.41 or higher is required.
*11 Individual selection of the retained variables to restore is supported by version 1.05 or higher.

Vision sensor functions

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 condition 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.

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. 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. 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 Sysmac Studio 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.

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. 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. DVDs 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 provides an integrated development environment to set up, program, debug and maintain NJ-series controllers and other machine automation controllers, as well EtherCAT slaves. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version) / Vista (32-bit version) / 7 (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	Sysmac Studio Vision Edition is a limited license that provides selected functions required for FQ-M 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

*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 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.

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)

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.

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_I181E-EN-03 In the interest of product improvement, specifications are subject to change without notice.

Selection table – Ethernet and EtherCAT media

	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	48	48	48	48

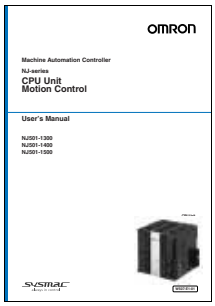
	Ethernet and EtherCAT connectors		
			
Model	**Ethernet field-mount plugs**		**Ethernet socket**
Type	Industrial RJ45 connector	Rugged RJ45 connector	Socket to terminate installation cable in the cabinet
Specifications	• Metal RJ45 • For AWG22 to AWG26	• Plastic RJ45 • For AWG22 to AWG24	• RJ45 socket • DIN-rail mount
Cable colour	Chrome	Black	Grey
Dimension	52 mm	52 mm	60 × 17.5 × 67 mm
Page	48	48	48

	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	47	47	47

	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 • Quad-core • Double shield SF/UTP	• Cat 5 • 4×2×AWG24/1 (Solid core) • Double shield SF/UTP	• Cat 5 • 4×2×AWG26/7 (Stranded core) • 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	48	48	48

	EtherCAT branching unit	
		
Model	**EtherCAT junction slave**	
Number of ports	6	3
Functions	• Power, Link/Act indicators • Auto MDI/MDIX • Reference clock	• Power, Link/Act indicators • Auto MDI/MDIX • 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	47	47

Technical documentation



	Product	Title	Cat. No.
Machine automation controller	NJ-series CPU unit hardware	User Manual	W500-E1
	NJ-series CPU unit software	User Manual	W501-E1
	NJ-series CPU unit motion montrol	User Manual	W507-E1
	NJ-series CPU unit built-in EtherCAT port	User Manual	W505-E1
	NJ-series CPU unit built-in EtherNet/IP port	User Manual	W506-E1
	NJ-series database connection CPU units	User Manual	W527-E1
	NJ-series CPU unit	Startup Guide	W513-E1
	NJ-series CPU unit motion control	Startup Guide	W514-E1
	NJ-series instructions	Reference Manual	W502-E1
	NJ-series motion control instructions	Reference Manual	W508-E1
	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 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	Operation Manual	W488-E1
Safety	NX-series safety control units	User Manual	Z930-E1
AC servo system	Accurax G5 EtherCAT rotary motor	User Manual	I576-E1
	Accurax G5 EtherCAT linear drive	User Manual	I577-E1
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	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	NS-series programmable terminals	Setup Manual	V083-E1
		Programming Manual	V073-E1

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