SX (690 V)

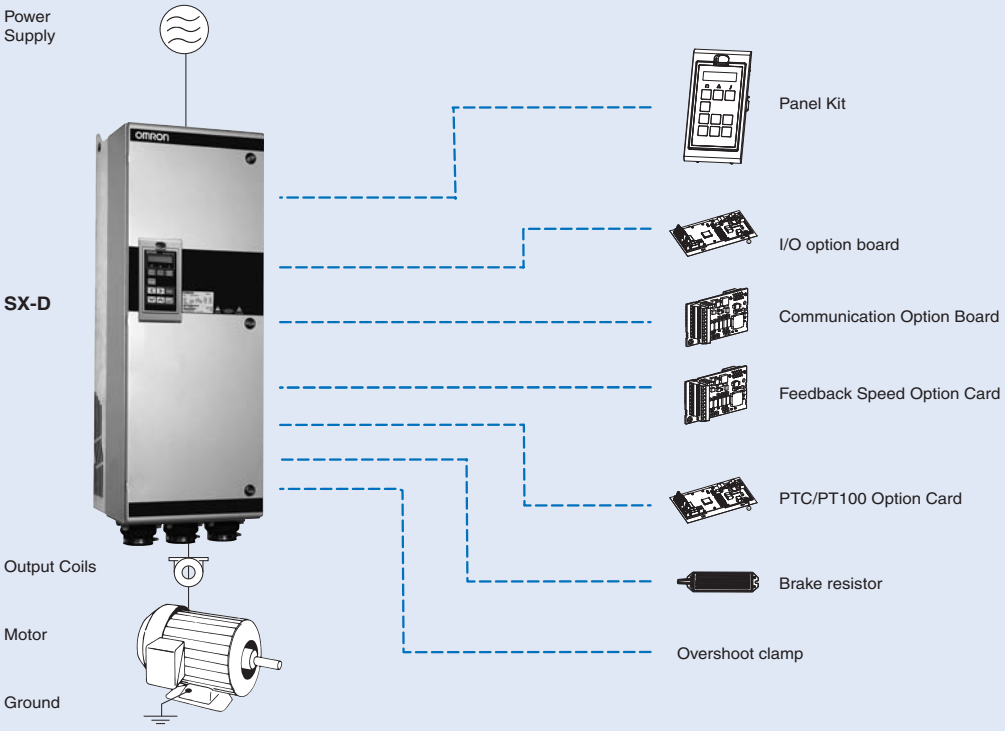
High performance Vector Control

- IP54 full range.
- Compact design & Robustness
- Built-in Filter according to C3 Class
- Built-in Fuses (From 200kW)
- Safety according EN13849-1 and EN62061 standards
- Load curve control
- HCB technology (Half controlling Bridge)
- Logic programmability
- Pre-maintenance alarms
- Options flexibitity (I/O's, Fieldbus, PTC/PT100, Multiple Pump control, Encoder, Crane control)
- Communications options (EtherCAT, PROFINET, Modbus, DeviceNet, PROFIBUS, Modbus TCP)
- 24Vdc control board supply
- Liquid cooling drive version
- 12-pulse rectifier option.
- Flexible cable connections & User Friendly wiring connection
- CE, UL, RoHS, DNV

Ratings

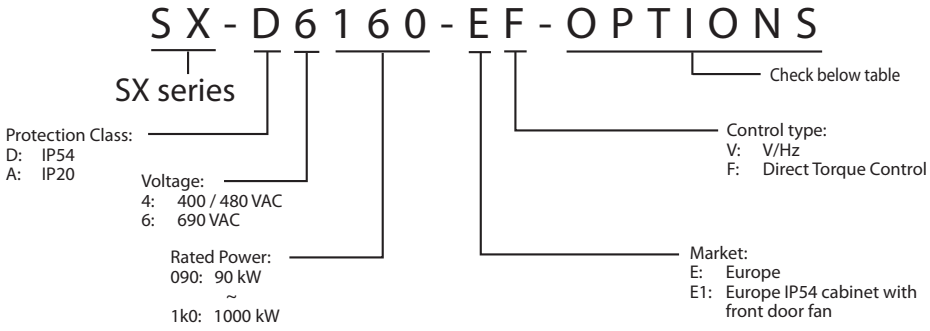
- 690 V Class three-phase 90 to 1000 kW

System configuration



Specifications

Type designation



Options available

Options	Letter ("?" means no character)	Options	Letter ("?" means no character)
Control panel	"?" = Standard control panel (Std.PPU) "A"= Blank control panel (Blank PPU)	Option board position 3	"?" = No option "I" = Encoder "J" = PTC/PT100 "K" = Extended I/O"
Built-in EMC filter	"?" = Standard EMC inside (Category C3) "B" = IT-Net (filter disconnected from ground)	Option board Fieldbus position 4	"?" = No option "L" = DeviceNet "M" = PROFIBUS-DP "M1" = PROFINET "N" = RS232/485 "O" = Ethernet Modbus TCP "O1" = EtherCAT
Built-in brake chopper	"?" = No brake chopper or DC-connection included "C" = Brake chopper & DC-connection included "D" = Only DC-connection included	Liquid Cooling	"?" = No Liquid Cooling "P" = Liquid Cooling
Standby power supply	"?" = Not included "E" = Standby power supply included	Standard	"?" = IEC "Q" = UL
Safe stop	"?" = Not included "F" = Safe stop included	Marine	"?" = No marine option "R" = Marine option included
Coated boards	"?" = No coating "G" = Coated boards	Cabinet input options	"?" = No cabinet input options "S" = Main switch included "T" = Main contactor included "U" = Main switch + contactor included
Option board position 1	"?" = No option "H" = Crane I/O "I" = Encoder "J" = PTC/PT100 "K" = Extended I/O"	Cabinet output options	"?" = No cabinet output options included "V" = dV/dt filter included "W" = dV/dt filter + Overshoot clamp included "X" = Sinusfilter included "X1" = All-pole sinus filter included
Option board position 2	"?" = No option "I" = Encoder "J" = PTC/PT100 "K" = Extended I/O"		

690 V class

Three-phase: SX-D6□□-EF		90	110	132	160	200	250	315	355	450	500	600	630	710	800	900	1K0
Motor kW[1]	For HD setting	75	90	110	132	160	200	250	315	315	355	450	500	600	650	710	800
	For ND setting	90	110	132	160	200	250	315	355	450	500	600	630	710	800	900	1000
Output characteristics	Max output current (A)	108	131	175	210	252	300	360	450	516	600	720	780	900	1032	1080	1200
	Rated output current (A) at HD	72	87	117	140	168	200	240	300	344	400	480	520	600	688	720	800
	Rated output current (A) at ND[3]	90	109	146	175	210	250	300	375	430	500	600	650	750	860	900	1000
	Output voltage	0 to Mains supply voltage															
	Max. output frequency	400 Hz															
Power supply	Rated input voltage and frequency	3-phase 500..690V, 50/60 Hz															
	Allowable voltage fluctuation	+10%..-15%															
	Allowable frequency fluctuation	45 to 65 Hz															

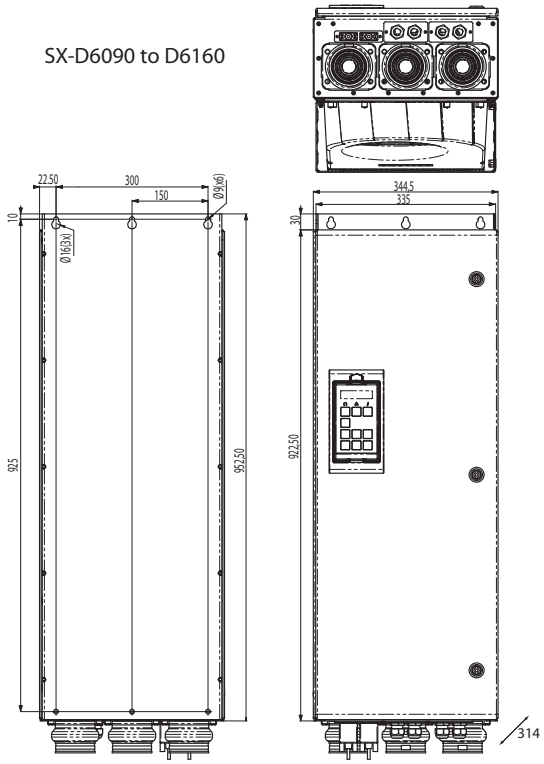
1. Based on a standard 4-pole motor for maximum applicable motor output

Common specifications

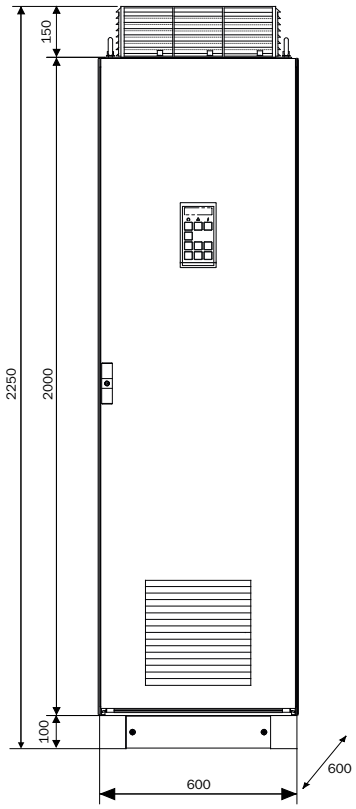
Model number SX-		Specifications
Control functions	Control methods	V/f control for “V” type V/f control, Vector control with or without feedback for the “F” type
	Output frequency range	0.0..400 Hz
	Frequency tolerance	Analogue set value: 1% + 1.5 LSB fsd
	Resolution of frequency set value	Digital set value: 0.1 Hz
		Analogue set value: 0.03 Hz / 60 Hz (11 bit + sign)
	Resolution of output frequency	0.1 Hz
	Frequency set value	-10..+10 V (20 kΩ), 0..20 mA (250 Ω), frequency setting value (selectable)
	Starting Torque	150% for Heavy duty, 120% for Normal duty
	Torque static accuracy	<3% in Vector control with feedback <3% in vector control without feedback if speed between 10 and 100%, <10% at 0 Hz
	Torque response	1ms for 0 - 90% speed 5ms for 90 - 100% speed (Close and open loop)
	Speed Control Accuracy	V/f control 1% Vector control without feedback 0.1% Vector control with feedback 0.01%
	Speed Response	0.4% without encoder feedback 0.2% with encoder feedback
	Torque Limit	From Analog input
	Accel/Decel Time	0.0 to 3600.0 s
	Braking torque	5 - 10% (100% with external braking resistor)
Functionality	Main Control Functions	PID, sleep function, brake control, torque control (Direct torque control model), Pump/Fan control, Logic functions, virtual connections, overvoltage control, undervoltage override, autoreset, two motor support, Lim Switch, External trip, Preset Speeds, MotPot Up Down, Pump Feedb, Timer, Mot PreMag , Jog, Ext Mot Temp, Loc/Rem, AnIn select, Brk Ackn.
Protection functions	Motor protection	Motor overheat protection based on output current or PTC by option board
	Momentary overcurrent Protection	Drive stops when ouput current exceeds 200% of peak current
	Overload Protection	Drive stops after 1 min at 150% of rated output current (Heavy Duty Rating) Drive stops after 1 min at 120% of rated output current (Normal Duty Rating) (1min every 10min)
	Overvoltage Protection	Line Overvoltage: 1120 VDC during more than 10s for 690V class Fast Overvoltage: 1220 for 690 VDC
	Undervoltage Protection	500 for 690V class (Adjustable by input power supply parameter)
	Momentary power loss Ride-Thru	Low voltage override function
	Heatsink Overheat Protection	Protected by thermister
	Braking Resistance Overheat Protection	Hardware short circuit protection
	Stall prevention	Current limit function
	Power charge indication	Power LED remains lit while capacitors are charged
Ambient conditions	Ambient Temperature	0ºC..+40 ºC, up to 45 ºC with derating
	Ambient humidity	90% RH or less (without condensation)
	Storage temperature	-20 ºC..+60 ºC (short-term temperature during transportation)
	Altitude	Up to 1000 meters (output derating of 1% per 100 m above 1000 m, max. 2000 m)
	Vibration / Shock	According to IEC 600068-2-6, Sinusodial vibrations: 10<f<57 Hz, 0.075 mm, 57<f<150 Hz, 1g
	Contamination, according to IEC 60721-3-3	No electrically conductive dust allowed. Cooling air must be clean and free from corrosive materials. Chemical gases, class 3C2. Solid particles, class 3S2
	Protection Design	IP54 enclosure according to the EN 60529, IP20

Standard dimensions IP54

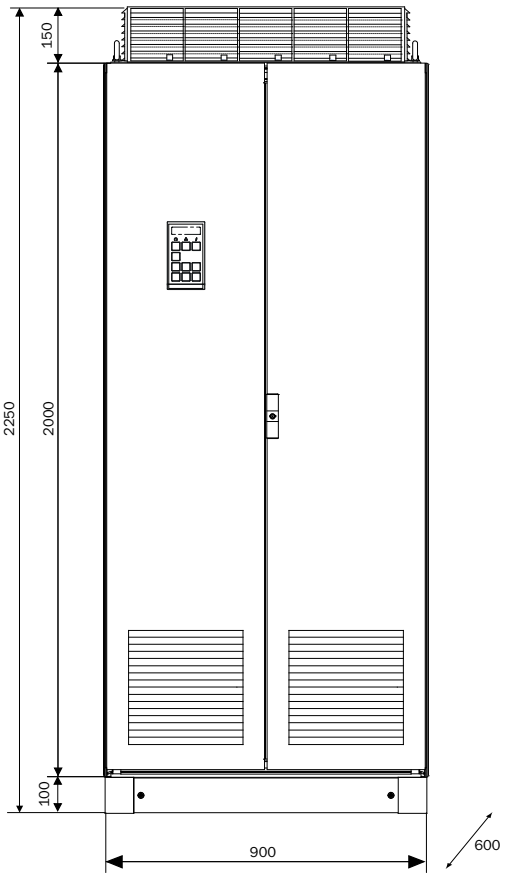
SX-D6090 to D6160



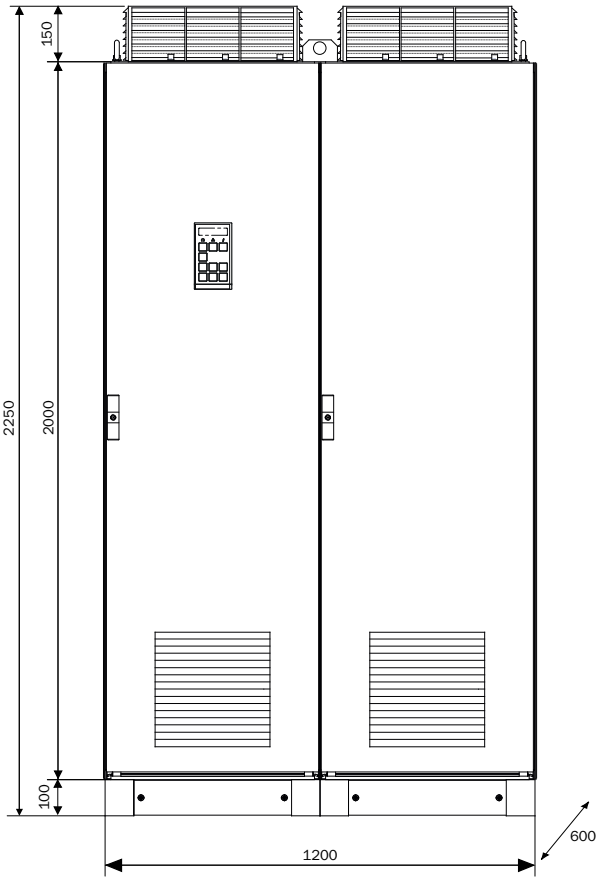
SX-D6200 to D6355-E1F/V



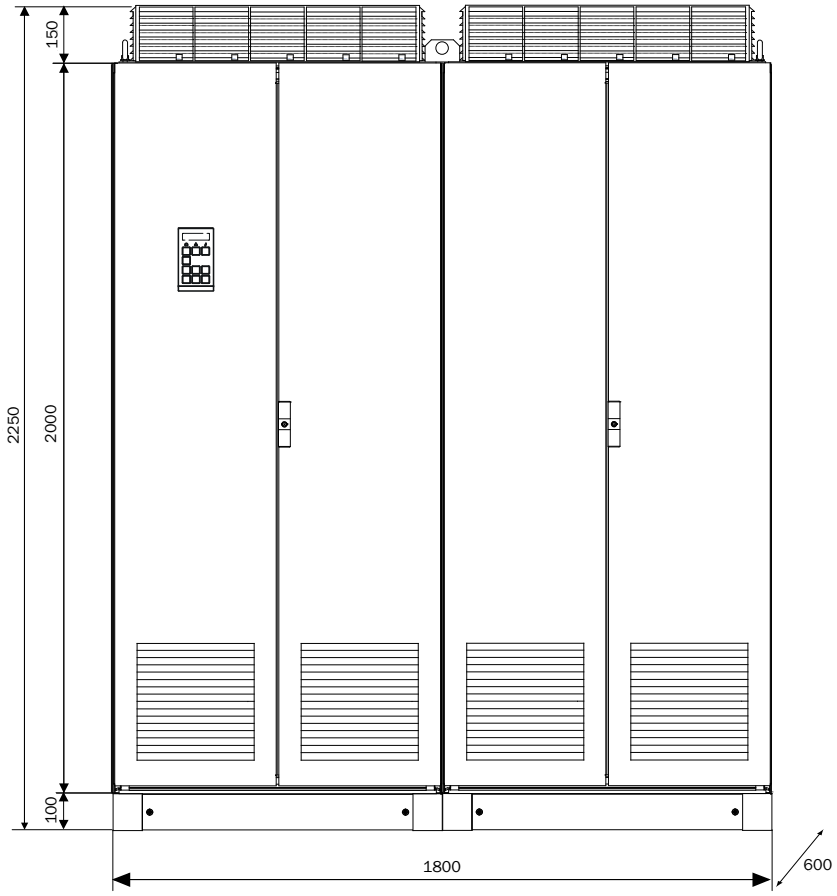
SX-D6450 to D6500-E1F/V



SX-D6600 to D6630-E1F/V

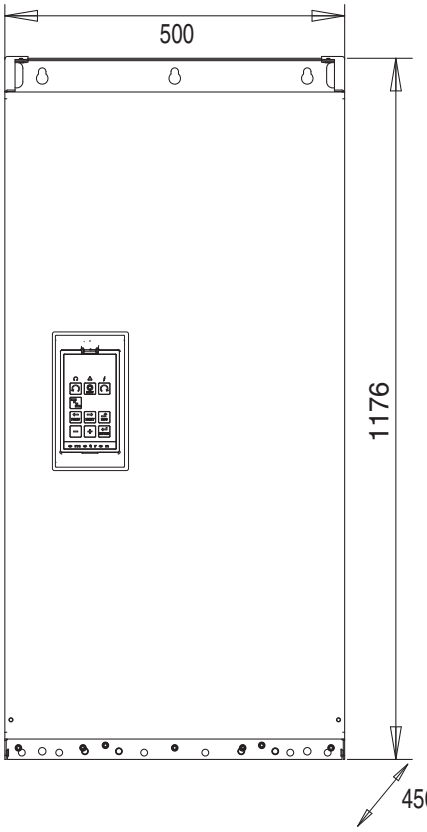


SX-D6710 to D61K0-E1F/V

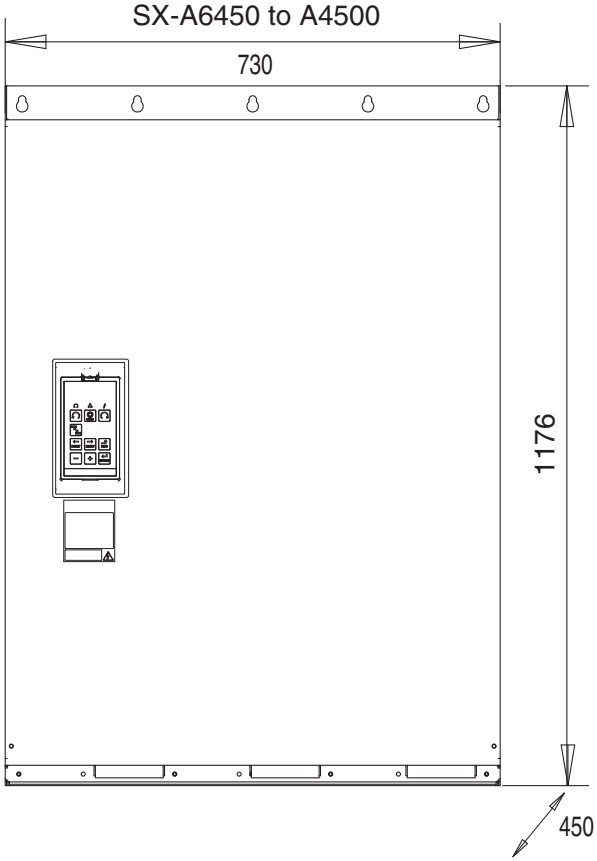


Standard dimensions IP20

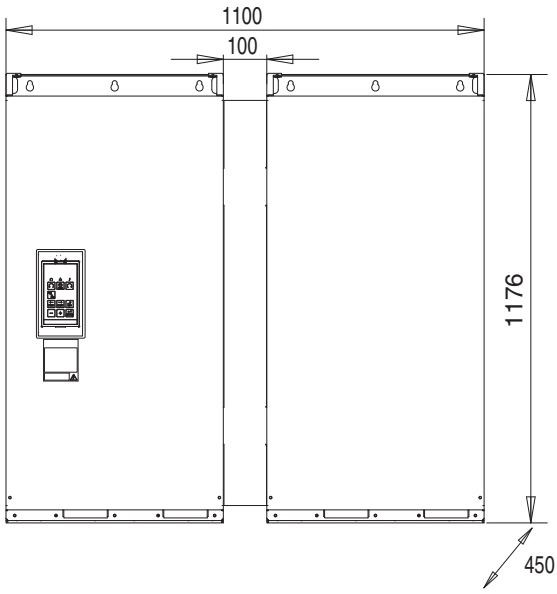
SX-A6200 to A6375



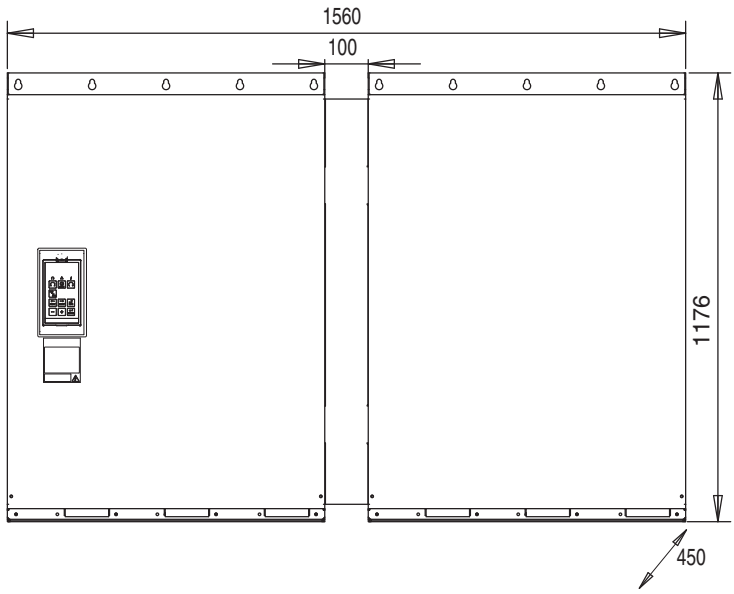
SX-A6450 to A4500



SX-A6600 to A6630



SX-A6710 to A61K0



Weight and Air flow

Model SX-	Weight (Kg)		Air flow (m^3 /hour)
	SX-D (IP54)	SX-A (IP20)	
090 to 160	77	-	800
200 to 355	399	176	1600
450 to 500	563	257	2400
600 to 630	773	352	3200
710 to 1K0	1100	514	4800

LCD operator

Output coils

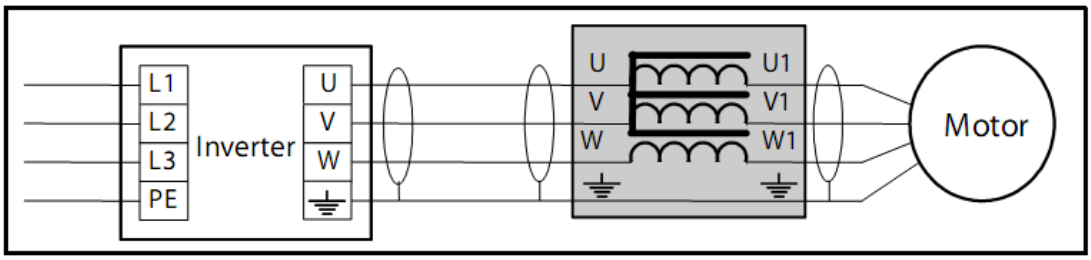
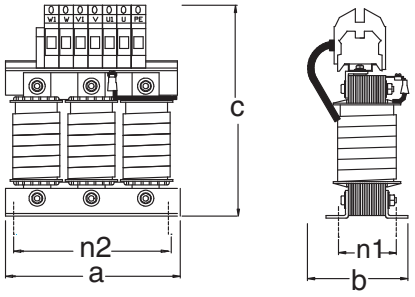
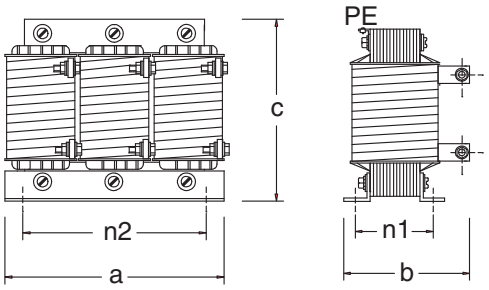


Figure 1

Figure 2





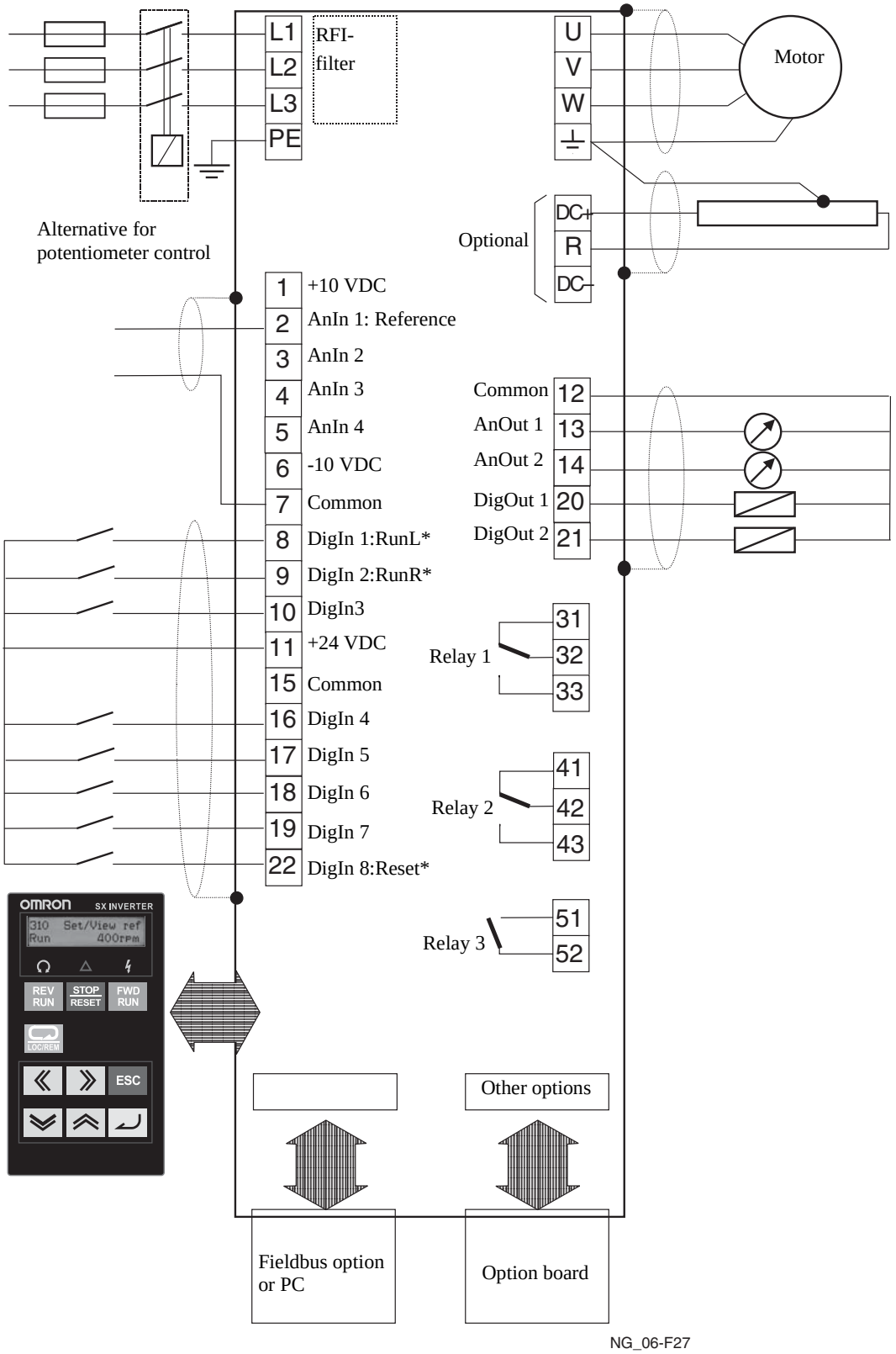
Type	Fig	a	b	c	n2	n1	Fix	Weight	Connection
473169 00	1	190	120	235	170	66	M6	8.4 kg	35 mm^2
473170 00		190	140	260	170	77	M6	10.2 kg	35 mm^2
473171 00	2	210	160	180	175	97	M6	13.4 kg	M10
473172 00		230	170	200	175	95	M6	18.4 kg	M10

Specifications

Model	Rated current	Inductance	Rated voltage	Max carrier	Max output frequency	Max temp	Protection Class
473169 00	90A	0.1 mH	800V	6 kHz	200Hz	40ºC	IP00
473170 00	146A	0.05 mH					
473171 00	175A	0.05 mH					
473172 00	275A	0.032 mH		1.5 kHz	100Hz		

Installation

Standard connections



NG_06-F27

* Default settings

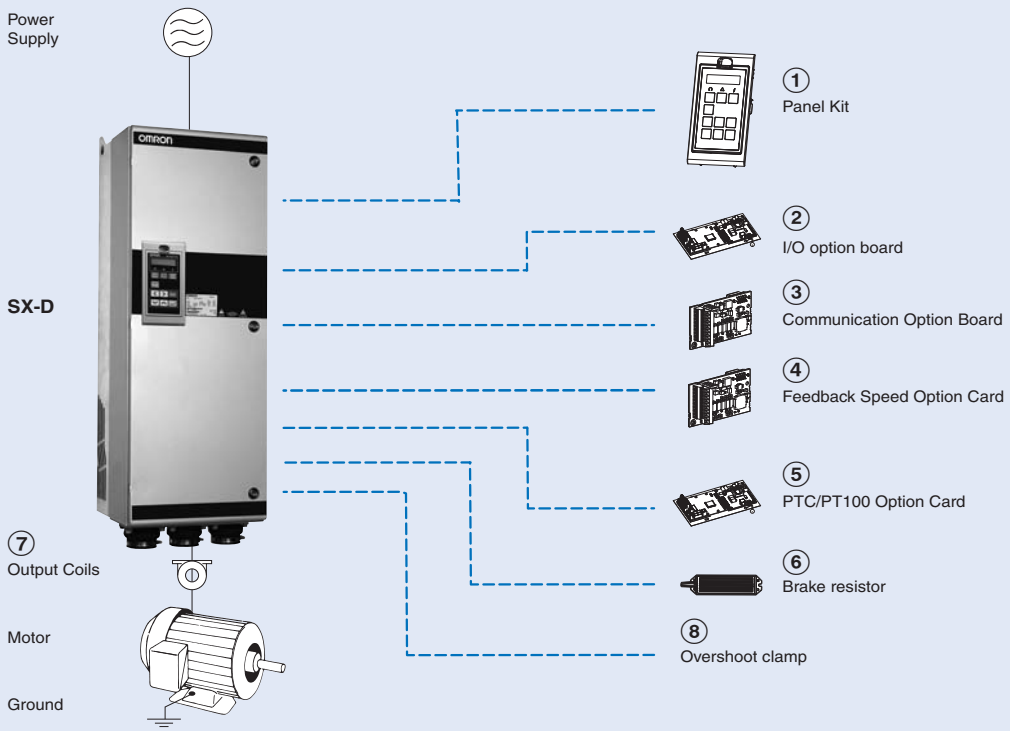
Main circuit

Terminal	Name	Function (signal level)
L1, L2, L3	Main circuit power supply input	Used to connect line power to the drive.
U, V, W	Inverter output	Used to connect the motor
DC-, DC+ , R	DC link connections, Brake resistor	The brake resistor must be connected terminals DC+ and R (Terminals are only fitted if the Brake Chopper Option is built-in)
PE	Safety earth	Protected earth
⏚	Grounding	Motor earth

Control Circuit

Type	No.	Signal name	Function	Signal level
Digital input signals	8	DigIn 1	RunL (reverse)	High > 9 VDC Low < 4 VDC Max 30 VDC Impedance 4.7 kW for < 3.3 VDC 3.6 kW for > 3.3 VDC
	9	DigIn 2	RunR (forward)	
	10	DigIn 3	Off	
	16	DigIn 4	Off	
	17	DigIn 5	Off	
	18	DigIn 6	Off	
	19	DigIn 7	Off	
	22	DigIn 8	RESET	
	11	+24 V	+24 VDC supply voltage	Max 100mA
	15	Common	Signal ground	
Analog input signals	1	+10 V	+10 VDC supply voltage	-10 to 10 VDC 0 to 20mA Max 30V/30mA Impedance 20 kW Voltage 250 W Current
	2	AnIn 1	Process Ref	
	3	AnIn 2	Off	
	4	AnIn 3	Off	
	5	AnIn 4	Off	
	6	-10 V	-10 VDC supply voltage	
	7	Common	Signal ground	
Digital output signals	20	DigOut 1	Ready	High > 20VDC @50mA > 23VDC open Low <1 VDC @ 50mA 100 mA max togheter with +24VDC
	21	DigOut 2	Brake	
	12	Common	Signal ground	
	31	N/C 1	Relay 1 output Trip, active when the VSD is in a TRIP condition.	0.1 to 2A 250 VAC or 42 VDC
	32	COM 1		
	33	N/O 1		
	41	N/C 2	Relay 2 output Run, active when the VSD is started.	
	42	COM 2		
	43	N/O 2		
	51	COM 3	Relay 3 output Off	
	52	N/O 3		
Analog output signals	12	Common	Signal ground	0 - 10V / 0 - 20mA Max -15V @ 5mA Impedance: 10 W (Voltage)
	13	AnOut1	Min speed to max speed	
	14	AnOut2	0 to max torque	

Ordering information



SX

Specifications					IP54 Model		IP20 Model	
Voltage	Heavy Duty		Normal Duty		Direct torque control	V/F	Direct torque control	V/F
690 V	75 kW	72 A	90 kW	90 A	SX-D6090-EF	SX-D6090-EV	-	-
	90 kW	87 A	110 kW	109 A	SX-D6110-EF	SX-D6110-EV		
	110 kW	117 A	132 kW	146 A	SX-D6132-EF	SX-D6132-EV		
	132 kW	140 A	160 kW	175 A	SX-D6160-EF	SX-D6160-EV		
	160 kW	168 A	200 kW	210 A	SX-D6200-E1F	SX-D6200-E1V		
	200 kW	200 A	250 kW	250 A	SX-D6250-E1F	SX-D6250-E1V	SX-A6250-EF	SX-A6250-EV
	250 kW	240 A	315 kW	300 A	SX-D6315-E1F	SX-D6315-E1V	SX-A6315-EF	SX-A6315-EV
	315 kW	300 A	355 kW	375 A	SX-D6355-E1F	SX-D6355-E1V	SX-A6355-EF	SX-A6355-EV
	315 kW	344 A	450 kW	430 A	SX-D6450-E1F	SX-D6450-E1V	SX-A6450-EF	SX-A6450-EV
	355 kW	400 A	500 kW	500 A	SX-D6500-E1F	SX-D6500-E1V	SX-A6500-EF	SX-A6500-EV
	450 kW	480 A	600 kW	600 A	SX-D6600-E1F	SX-D6600-E1V	SX-A6600-EF	SX-A6600-EV
	500 kW	520 A	630 kW	650 A	SX-D6630-E1F	SX-D6630-E1V	SX-A6630-EF	SX-A6630-EV
	600 kW	600 A	710 kW	750 A	SX-D6710-E1F	SX-D6710-E1V	SX-A6710-EF	SX-A6710-EV
	650 kW	688 A	800 kW	860 A	SX-D6800-E1F	SX-D6800-E1V	SX-A6800-EF	SX-A6800-EV
	710 kW	720 A	900 kW	900 A	SX-D6900-E1F	SX-D6900-E1V	SX-A6900-EF	SX-A6900-EV
	800 kW	800 A	1000 kW	1000 A	SX-D61K0-E1F	SX-D61K0-E1V	SX-A61K0-EF	SX-A61K0-EV

① Panel Kit

Model	Description	Function
01-3957-00	Panel kit	Panel kit complete including panel
01-3957-01	Blank panel kit	Panel kit complete including blank panel

② I/O option board

Model	Description	Function
01-3876-01	Additional I/O option	Provides 3 extra relay outputs and 3 additional digital inputs
01-3876-07	Crane option	Dedicated option board for crane application, including additional I/O and functions

③ Communication option board

Type	Model	Description	Function
Communication option board	01-3876-04	RS232/485	• MODBUS RTU serial communication by RS232 or RS485 interface with galvanic isolation
	01-3876-05	PROFIBUS-DP option card	• Used for operating the inverter through PROFIBUS-DP communication with the host controller.
	01-3876-06	DeviceNet option card	• Used for operating the inverter through DeviceNet communication with the host controller.
	01-3876-09	Modbus/TCP, Ethernet	• Used for operating the inverter through Modubs/TCP communication with the host controller.
	01-3876-10	EtherCAT	• Used for operating the inverter through EtherCAT communication with the host controller.
	Under development	PROFINET	• Used for operating the inverter through PROFINET communication with the host controller.

④ Encoder feedback option card

Model	Description	Function
01-3876-03	Encoder option	Used for connection of the actual motor speed via encoder. Up to 100kHz with TTL and HTL incremental encoders with 5/24 V power supply

⑤ PTC/PT100 option card

Model	Description	Function
01-3876-08	Thermal protection	Allows to conect a motor thermistor to the inverter

⑥ Braking chooper and braking resistor

All inverter sizes could be fitted with an optional built-in brake chopper from factory but is not possible to install it later. The choice of the resistor depends on the application switch-on duration and duty-cycle Following tables describes the activation level of the built-in braking chopper and the minimum resistor that could be used depending on the input voltage.

600V			
Type	Rmin for different input votlage (Ω)		
	500-525 VAC	550-600 VAC	660-690 VAC
SX-D6090-EF	4.9	5.7	6.5
SX-D6110-EF	4.9	5.7	6.5
SX-D6132-EF	4.9	5.7	6.5
SX-D6160-EF	4.9	5.7	6.5
SX-D6200-EF	2 x 4.9	2 x 5.7	2 x 6.5
SX-D6250-EF	2 x 4.9	2 x 5.7	2 x 6.5
SX-D6315-EF	2 x 4.9	2 x 5.7	2 x 6.5
SX-D6355-EF	2 x 4.9	2 x 5.7	2 x 6.5
SX-D6450-EF	3 x 4.9	3 x 5.7	3 x 5.7
SX-D6500-EF	3 x 4.9	3 x 5.7	3 x 5.7
SX-D6600-EF	4 x 4.9	4 x 5.7	4 x 5.7
SX-D6630-EF	4 x 4.9	4 x 5.7	4 x 5.7
SX-D6710-EF	6 x 4.9	6 x 5.7	6 x 5.7
SX-D6800-EF	6 x 4.9	6 x 5.7	6 x 5.7
SX-D6900-EF	6 x 4.9	6 x 5.7	6 x 5.7
SX-D61K0-EF	6 x 4.9	6 x 5.7	6 x 5.7

Supply voltage (VAC)l	Built-in brake chopper trigger level (VDC)
500-525	860
550-600	1000
660-690	1150

⑦ Output coils

Output coils above SX-D6160-E should be order from factory as they should be installed inside of the cabinet

Voltage	Inverter model	Model	Rated current	Inductance	Rated Voltage	Max carrier	Max output frequency	Max temp
690V	SX-D6090-EF	473169 00	90A	0.1 mH	800V	6 kHz	200 Hz	40ºC
	SX-D6110-EF	473170 00	146A	0.05 mH		6 kHz	200 Hz	
	SX-D6132-EF							
	SX-D6160-EF	473171 00	175A	0.05 mH		6 kHz	200 Hz	

⑧ Overshoot clamp

Only two types of overshoot clamps could be order for after mounting

Model	Inverter	Function
52163	SX-6090 to SX-6160	Together with the output coils, the overshoot clamp restricts the voltage and the dV/dt on the motor winding. Inverters must be ordered including the option DC+/DC- connectors.
52220	SX-6200 to SX-61K0	Together with the output coils, the overshoot clamp restricts the voltage and the dV/dt on the motor winding. Doesn´t require the “DC+/DC-“ option.

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. I125E-EN-03