POWER ELECTRONICS

SD750

HARDWARE AND INSTALLATION MANUAL

LOW VOLTAGE VARIABLE SPEED DRIVE

SD750

Variable Speed Drive

Hardware and Installation Manual

Edition: February 2019

SD75MTHW01FI Rev. F

ABOUT THIS MANUAL

PURPOSE

This manual contains important instructions for the installation and maintenance of Power Electronics SD750 variable speed drives.

TARGET AUDIENCE

This manual is intended for qualified customers who will install, operate and maintain Power Electronics SD750 variable speed drives.

Only trained electricians may install and commission the drives.

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REFERENCE MANUALS

The following reference documents are available for SD750 variable speed drives:

- SD750 Hardware and Installation Manual.
- SD750 Programming and Software Manual.
- Pumps Application Manual.

POWER ELECTRONICS CONTACT INFORMATION

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REVISIONS CONTROL		
DATE	**REVISION**	**DESCRIPTION**
24 / 10 / 2017	A	First Edition.
18 / 01 / 2018	B	Introduction, Configuration table and stantard ratings, Technical Characteristics, Dimensions, Power connection, Control connection Maintenance.
28 / 03 / 2018	C	Standard ratings, Accessories.
11 / 04 / 2018	D	Safety instructions. Misprints update.
24 / 10 / 2018	E	Dimensions. Control connections
28 / 02 / 2019	F	RS485 connection. Functional safety. CE conformity.

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SAFETY SYMBOLS

Always follow safety instructions to prevent accidents and potential hazards from occurring.

In this manual, safety messages are classified as follows:

 **WARNING**	Identifies potentially hazardous situations where dangerous voltage may be present, which if not avoided, could result in minor personal injury, serious injury or death. Be extremely careful and follow the instructions to avoid the risk of electrical shocks.
 **CAUTION**	Identifies potentially hazardous situations, which if not avoided, could result in product damage, or minor or moderate personal injury. Read the message and follow the instructions carefully.
 **NOTICE**	Identifies important measures to take in order to prevent damage equipment and warranty lost, as well as encouraging good use and environmental practices.

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Other symbols used in this manual for safety messages are the following:

	Hot surface. Be careful and follow the instructions to avoid burns and personal injuries.
	Risk of fire. Be careful and follow the instructions to prevent causing an unintentional fire.
	Caution, risk of electric shock. Energy storage timed discharge. Wait for the indicated time to avoid electrical hazards.
	Caution, risk of hearing damage. Wear hearing protection.

SAFETY INSTRUCTIONS

IMPORTANT!

Read carefully this manual to maximize the performance of the product and to ensure its safe use.

In order to appropriately use the drive, please, follow all instructions described in the installation manual which refer to transportation, installation, electrical connection and commissioning of the equipment.

Power Electronics accepts no responsibility or liability for partial or total damages resulting from incorrect use of equipment.

Please, pay careful attention to the following recommendations:

WARNING

Do not remove the cover while the drive is powered or running.
Otherwise, you may get an electric shock.

Do not run the drive with the front cover removed.
Otherwise, you may get an electric shock.

The drive does not remove the voltage from the input terminals of the drive. Before working on the drive, isolate the whole drive from the supply.
If you do not remove the power supply, you may get an electric shock.

Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied.
Otherwise, you get an electric shock.

Operate the drive with dry hands.
Otherwise, you may get an electric shock.

Do not use cables with damaged insulation.
Otherwise, you may get an electric shock.

Do not subject the cables to abrasions, excessive stress, heavy loads or pinching.
Otherwise, you may get an electric shock.

Do not make any insulation or voltage withstand tests on the motor while the drive is connected.

WARNING

Both wiring and periodic inspections must be carried out at least 10 minutes after disconnecting the input power. To remove the front cover, make sure that the red "DC Link" LED is off. Then remove the metal cover from the terminals and check the following with a multimeter:

- **Voltage between the output busbares U, V, W and the cabinet is around 0V.**
- **Voltage between the terminals + HVDC, -HVDC and the cabinet is below 30VDC.**

If you omit this recommendation, you may get an electric shock.

Even though multimeters have their own revisions Schedule, it is convenient to verify it works properly, specially to check voltage absence. It could be damaged and show incorrect values. Use a 1.5V battery to verify proper functioning.

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CAUTION

Install the drive on a non-flammable surface. Do not place flammable material nearby. Otherwise, a fire could occur.

Disconnect the input power if the drive is damaged.
Otherwise, it could result in a secondary accident or fire.

Do not allow lint, paper, wood chips, dust, metallic chips or other foreign matter into the drive. Otherwise, a fire or accident could occur.

After stopping the drive, some of its parts will stay warm for a while. Wait for the drive to cool down for handling.
Touching hot parts may result in skin burns.

Do not apply power to a damaged drive or to a drive with parts missing, even if the installation is complete.
Otherwise, you may get an electric shock.

It is not allowed to weld the cabinet or structure, this could damage the sensitive electronic components inside the cabinet or structure.

NOTICE

RECEPTION

- The SD750 are carefully tested and perfectly packed before delivering.
- In the event of transport damage, please ensure to notify the transport agency and POWER ELECTRONICS: 902 40 20 70 (International +34 96 136 65 57) or your nearest agent, within 24h from receiving the goods.

UNPACKING

- Make sure model and serial number of the variable speed drive are the same on the box, delivery note and unit.
- Each variable speed drive is delivered with Hardware and Software technical manuals.

RECYCLING

Packaging equipment must be recycled. Separate all different materials (plastic, paper, cardboard, wood…) and place them in the corresponding containers. Ensure waste collection is properly managed with a Non-Hazardous Waste Agent.

To guarantee health and natural environmental sources protection, the European Union has adopted the WEEE directive concerning discarded electric and electronic equipment (SEEA).

Waste of electrical and electronic equipment (WEEE) must be collected selectively for proper environmental management.

Our products contain electronic cards, capacitors and other electronic devices that should be separated when they are no longer functional. These WEEEs should be managed accordingly with a Hazardous Waste Agent.

Power Electronics promotes good environmental practices and recommends that all its products sold outside of the European Union, once they reach the end of their life, are separated and the WEEE managed according to the particular country applicable legislation (especially: electronic cards, capacitors and other electronic devices).

If you have any questions about the electric and electronic equipment waste, please contact Power Electronics.

ELECTROMAGNETIC COMPATIBILITY (EMC)

The drive is intended to be used in industrial environment (Second Environment). It achieves compliance with category C3 defined in IEC/EN 61800-3 standard when the installation recommendations within this manual are followed. The driver can optionally operate in domestic environments (First Environment), complying with category C2 defined in IEC / EN 61800-3 standard. For category C1 consult Power Electronics. Optional IT filter.

Select communication and control system according to the drive EMC environment. Otherwise, systems could suffer from interferences due to a low EMS level.

CAPACITORS DEPLETION

If the drive has not been operated for a long time, capacitors lose their charging characteristics and are depleted. To prevent depletion, once a year run the device under no-load conditions during 30-60 minutes.

SAFETY

- Before operating the drive, read this manual thoroughly to gain an understanding of the unit. If any doubt exists, please contact POWER ELECTRONICS, (902 40 20 70 / +34 96 136 65 57) or your nearest agent.
- Wear safety glasses when operating the drive with power applied or for when the front cover is removed.
- Handle and transport the drive following the recommendations within this manual.
- Install the drive according to the instructions within this manual and the local regulations.
- Do not place heavy objects on the drive.
- Ensure that the drive is mounted vertically and keeping the minimum clearance distances.
- Do not drop the drive or subject it to impact.
- The SD750 drives contain static sensitive printed circuits boards. Use anti-static safety procedures when handling these boards.
- Avoid installing the drive in conditions that differ from those described in the Environmental Ratings section.

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CONNECTION PRECAUTIONS

- To ensure a correct operation of the drive, it is recommended to use a SCREENED CABLE for the control wiring.
- The motor cable should comply with the requirements within this manual. Due to increased leakage capacitance between conductors, the external ground fault protection threshold value should be adjusted ad hoc.
- Do not disconnect motor cables if the input power supply remains connected.
- The internal circuits of the SD750 Series will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
- Do not use power factor correction capacitors banks, surge suppressors, or RFI filters on the output side of the drive. Doing so may damage these components.
- Always check whether the DC Link red LED is OFF before wiring terminals. The capacitors may hold high-voltage even after the input power is disconnected.

COMMISSIONING

- Verify all parameters before operating the drive. Alteration of parameters may be required depending on application and load.
- Always apply voltage and current signals to each terminal that are within the levels indicated in this manual. Otherwise, damage to the drive may occur.
- For correct starting, refer to the start-up section.

HANDLING PRECAUTIONS

- When the "Automatic Restart" function is selected, observe the appropriate safety measures to avoid any damage in case of sudden restart of the motor after an emergency and subsequent reset.
- The "STOP / RESET" key on the driver's own keypad will be operative as long as this option has been selected. By pressing this button, the drive will not perform an emergency stop. The driver has a STO function which, installed with an external EMERGENCY pushbutton, will disconnect the motor power supply and prevent the ability to generate torque in the motor.
- If an alarm is reset without having lost the reference signal (setpoint), an automatic start may occur. Check that the system has not been configured as such. Failure to do so could result in personal injury.
- Do not modify anything inside the driver without the supervision of Power Electronics.

- Before starting the parameter setting, reset all parameters.

EARTH CONNECTION

- Ground the drive and adjoining cabinets to ensure a safe operation and to reduce electromagnetic emission.
- Connect the input PE terminal only to the dedicated PE terminal of the drive. Do not use the case, nor chassis screw for grounding.
- Ground the drive chassis through the labelled terminals. Use appropriate conductors to comply with local regulations. The ground conductor should be connected first and removed last.
- Motor ground cable must be connected to the PE output terminal of the drive and not to the installation's ground. We recommend that the section of the ground conductor (PE) is equal or greater than the active conductor (U, V, W).
- If the user decides to use screened motor cable, ensure a good 360° connection of the cable screen in both the drive cabinet and the motor terminal box.

CYBER SECURITY DISCLAIMER

This product is designed to be connected to and to communicate information and data via a network interface. The customer is the sole responsible for providing and continuously ensuring a secure connection between the product and customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of antivirus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Power Electronics and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

INTRODUCTION

1

The SD750 low voltage drive designed by Power Electronics are an extended family of products with a power range from 1.5kW to 1750kW. The drive has been designed to provide maximum care to the engine, with durable components and easy maintenance.

The SD750 series is the family reference and the evolution of SD700. Available from 1.5kW to 1750kW, with a voltage range from 380 VAC to 480 VAC. Its IP20 and IP54 mechanical designs cover all general industry applications, making it the most flexible and extensive series.

The whole family integrates unique features such as low dV/dt, smart mechanical design and accurate control. It is divided in 11 frames to cover the whole power range.

SD750 products provide high efficiency, maximum control, functional safety, durability, easy commissioning and easy maintenance for the whole range. Power Electronics delivers flexible integrated solutions, fully tested under the most demanding environmental and electrical conditions.

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CONFIGURATION TABLE & STANDARD RATINGS

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Configuration table

To consult the configuration table of SD750 drives manufactured by Power Electronics, please refer to the latest brochure (visit http://www.power-electronics.com).

Standard ratings

Voltages in the standard ratings shown in the following tables are the three-phase input voltages for the drive.

The number of pulses depend on the number of transformer secondaries at drive input.

- 6 pulses: Transformer with a single secondary.

400Vac

6 PULSES								
FRAME	CODE	NORMAL DUTY (Operation Temperature 40 ºC)			HEAVY DUTY (Operation Temperature 50 ºC)			OVERLOAD (A)
		Motor Power (kW)	Motor Power (hp)	I(A) Rated	Motor Power (kW)	Motor Power (hp)	I(A) Rated	
1	SD750006 5B06DEF	2.2	3	6	1.5	2	3	6
	SD750008 5B06DEF	4	5	8	2.2	3	6	9
	SD750011 5B06DEF	5.5	7,5	11	4	5	9	14
	SD750015 5B06DEF	7.5	10	15	5.5	7,5	12	18
	SD750024 5B06DEF	11	15	24	7.5	10	18	27
	SD750030 5B06DEF	15	20	30	11	15	24	36
	SD750040 5B06DEF	18.5	25	40	15	20	32	48
2	SD750048 5B06DEF	22	30	48	18.5	25	38	57
	SD750060 5B06DEF	30	40	60	22	30	48	72
	SD750075 5B06DEF	37	50	75	30	40	60	90
3	SD750095 5B06DEF	45	60	95	37	50	75	113
	SD750110 5B06DEF	55	75	110	45	60	90	135
	SD750145 5B06DEF	75	100	145	55	75	115	173
	SD750180 5B06DEF	90	125	180	75	100	150	225
4	SD750200 5B06DEF	110	150	200	90	125	170	255
	SD750260 5B06DEF	132	200	260	110	150	210	315
5	SD750320 5B06DEF	160	250	320	132	200	250	375
	SD750400 5B06DEF	220	300	400	160	250	330	495
6	SD750450 5B06DEF	250	350	450	220	300	370	555
	SD750570 5B06DEF	315	400	570	250	350	460	690
	SD750700 5B06DEF	400	550	700	315	450	580	870
7	SD750800 5B06DEF	450	650	800	355	500	650	975
	SD750900 5B06DEF	500	700	900	400	550	720	1080
	SD751050 5B06DEF	560	800	1050	450	700	840	1260
8	SD751140 5B06DEF	630	900	1140	500	750	925	1388
	SD751400 5B06DEF	800	1000	1400	630	900	1150	1725
9	SD751550 5B06DEF	900	1250	1550	710	1000	1260	1890
	SD751800 5B06DEF	1000	1400	1800	800	1150	1440	2160
	SD751950 5B06DEF	1100	1500	1950	900	1250	1580	2370
10	SD752250 5B06DEF	1200	1750	2250	1000	1450	1800	2700
	SD752750 5B06DEF	1500	2200	2750	1200	1750	2200	3300
11	SD753100 5B06DEF	1750	2450	3100	1400	2000	2500	3750

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440Vac

6 PULSES								
FRAME	CODE	NORMAL DUTY (Operation Temperature 40 ºC)			HEAVY DUTY (Operation Temperature 50 ºC)			OVERLOAD (A)
		Motor Power (kW)	Motor Power (hp)	I(A) Rated	Motor Power (kW)	Motor Power (hp)	I(A) Rated	
1	SD750006 5B06DEF	2.2	3	5	1.5	2	3	6
	SD750008 5B06DEF	4	5	7	2.2	3	5	8
	SD750011 5B06DEF	5.5	7,5	10	4	5	8	13
	SD750015 5B06DEF	7.5	10	14	5.5	7,5	11	16
	SD750024 5B06DEF	11	15	22	7.5	10	16	25
	SD750030 5B06DEF	15	20	27	11	15	22	33
	SD750040 5B06DEF	18.5	25	36	15	20	29	44
2	SD750048 5B06DEF	22	30	44	18.5	25	35	52
	SD750060 5B06DEF	30	40	55	22	30	44	65
	SD750075 5B06DEF	37	50	68	30	40	55	82
3	SD750095 5B06DEF	45	60	86	37	50	68	103
	SD750110 5B06DEF	55	75	100	45	60	82	123
	SD750145 5B06DEF	75	100	132	55	75	105	157
	SD750180 5B06DEF	90	125	164	75	100	136	205
4	SD750200 5B06DEF	110	150	182	90	125	155	232
	SD750260 5B06DEF	132	200	236	110	150	191	286
5	SD750320 5B06DEF	160	250	291	132	200	227	341
	SD750400 5B06DEF	220	300	364	160	250	300	450
6	SD750450 5B06DEF	250	350	409	220	300	336	505
	SD750570 5B06DEF	315	400	518	250	350	418	627
	SD750700 5B06DEF	400	550	636	315	450	527	791
7	SD750800 5B06DEF	450	650	727	355	500	591	886
	SD750900 5B06DEF	500	700	818	400	550	655	982
	SD751050 5B06DEF	560	800	955	450	700	764	1145
8	SD751140 5B06DEF	630	900	1036	500	750	841	1262
	SD751400 5B06DEF	800	1000	1273	630	900	1045	1568
9	SD751550 5B06DEF	900	1250	1409	710	1000	1145	1718
	SD751800 5B06DEF	1000	1400	1636	800	1150	1309	1964
	SD751950 5B06DEF	1100	1500	1773	900	1250	1436	2155
10	SD752250 5B06DEF	1200	1750	2045	1000	1450	1636	2455
	SD752750 5B06DEF	1500	2200	2500	1200	1750	2000	3000
11	SD753100 5B06DEF	1750	2450	2818	1400	2000	2273	3409

480Vac

6 PULSES								
FRAME	CODE	NORMAL DUTY (Operation Temperature 40 ºC)			HEAVY DUTY (Operation Temperature 50 ºC)			OVERLOAD (A)
		Motor Power (kW)	Motor Power (hp)	I(A) Rated	Motor Power (kW)	Motor Power (hp)	I(A) Rated	
1	SD750006 5B06DEF	2.2	3	5	1.5	2	3	6
	SD750008 5B06DEF	4	5	7	2.2	3	5	8
	SD750011 5B06DEF	5.5	7,5	9	4	5	8	12
	SD750015 5B06DEF	7.5	10	13	5.5	7,5	10	15
	SD750024 5B06DEF	11	15	20	7.5	10	15	23
	SD750030 5B06DEF	15	20	25	11	15	20	30
	SD750040 5B06DEF	18.5	25	33	15	20	27	40
2	SD750048 5B06DEF	22	30	40	18.5	25	32	48
	SD750060 5B06DEF	30	40	50	22	30	40	60
	SD750075 5B06DEF	37	50	63	30	40	50	75
3	SD750095 5B06DEF	45	60	79	37	50	63	94
	SD750110 5B06DEF	55	75	92	45	60	75	113
	SD750145 5B06DEF	75	100	121	55	75	96	144
	SD750180 5B06DEF	90	125	150	75	100	125	188
4	SD750200 5B06DEF	110	150	167	90	125	142	213
	SD750260 5B06DEF	132	200	217	110	150	175	263
5	SD750320 5B06DEF	160	250	267	132	200	208	313
	SD750400 5B06DEF	220	300	333	160	250	275	413
6	SD750450 5B06DEF	250	350	375	220	300	308	463
	SD750570 5B06DEF	315	400	475	250	350	383	575
	SD750700 5B06DEF	400	550	583	315	450	483	725
7	SD750800 5B06DEF	450	650	667	355	500	542	813
	SD750900 5B06DEF	500	700	750	400	550	600	900
	SD751050 5B06DEF	560	800	875	450	700	700	1050
8	SD751140 5B06DEF	630	900	950	500	750	771	1157
	SD751400 5B06DEF	800	1000	1167	630	900	958	1438
9	SD751550 5B06DEF	900	1250	1292	710	1000	1050	1575
	SD751800 5B06DEF	1000	1400	1500	800	1150	1200	1800
	SD751950 5B06DEF	1100	1500	1625	900	1250	1317	1975
10	SD752250 5B06DEF	1200	1750	1875	1000	1450	1500	2250
	SD752750 5B06DEF	1500	2200	2292	1200	1750	1833	2750
11	SD753100 5B06DEF	1750	2450	2583	1400	2000	2083	3125

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TECHNICAL CHARACTERISTICS

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SD750 SERIES		
INPUT	POWER RANGE [1]	1.5kW – 2200kW
	VOLTAGE RANGE	380 - 480Vac, 500 - 690Vac and 690Vac, 3 phases (±10%)
	INPUT FREQUENCY	50Hz/60Hz (±6%)
	INPUT RECTIFIER TECHNOLOGY	Diode-Diode Frames 1 and 2 / Thyristor-Diode Frames 3 to 11
	DISPLACEMENT POWER FACTOR (DPF = cos Φ)	≥ 0.98
	POWER FACTOR (PF= I_1/I_{rms}· cos Φ)	≥ 0.91
	MOMENTARY POWER LOSS	> 2s (depending on the load inertia)
	EMC INPUT FILTER	Second environment (Industrial): (C3 Standard) First environment (Domestic): C2 (Optional). C1 consult Power Electronics Optional IT filter
	HARMONICS FILTER	Choke coils 3% impedance
	CURRENT THD (%)	< 40%
	REGENERATIVE	NO
OUTPUT	OUTPUT FREQUENCY [2]	0...599Hz
	OVERLOAD CAPACITY	Constant torque: 150% during 60s at 50ºC Variable torque: 120% during 60s at 40ºC
	EFFICIENCY (At full load)	≥98%
	CONTROL METHOD	V/Hz VECTOR CONTROL Open Loop. PWM speed control (OLSP) / torque (OLTQ), AVC: speed control (OLSP) / torque (OLTQ) Close Loop (Encoder): PWM speed control (CLSP)/torque (CLTQ), AVC: speed control (CLSP)/torque (CLTQ) PMSM Without sensor
	CARRIER FREQUENCY	4 to 8kHz – PEWave
	OUTPUT DV/DT FILTER	500 to 800V/µs [3]
	OUTPUT CABLE LENGTH [4]	USC 300m, SC 150m
	DYNAMIC BRAKE	External B150 Dynamic Brake (Integrated in Frames 1 and 2)
ENVIRONMENTAL RATINGS	OPERATION AMBIENT TEMPERATURE	Minimum: -20°C Maximum: +50°C (Constant torque) Minimum: -20°C Maximum: +40°C (Variable torque)
	STORAGE TEMPERATURE	Minimum: -40°C Maximum: +70°C
	ALTITUDE	1000m
	POWER ALTITUDE DERATING	> 1000m, 1% P_N(kW) per 100m; 4000m maximum
	AMBIENT HUMIDITY	<95%, non-condensing
	DEGREE OF PROTECTION	IP20, IP54, GL Marine Series (IP44/IP54)
	VIBRATION	Amplitude: ± 1mm (2Hz-13.2Hz), ± 0.075mm (13.2Hz-57Hz) Acceleration: 6.86m/s² (13.2Hz-57Hz), 9.8m/s² (57Hz-150Hz)
	HEATING RESISTORS	Optional
PROTECTIONS	MOTOR PROTECTIONS	Rotor Locked, Overload (thermal model), Output Current Limit, Phase Current Imbalance, Phase Voltage Imbalance, Motor Overtemperature (PT100 signal), Speed Limit, Torque Limit
	DRIVE PROTECTIONS	IGBT Overload, Input Loss, Low Input Voltage, High Input Voltage, Bus Voltage Limit, Bus Low Voltage, High Supply Frequency, Low Supply Frequency, IGBT Temperature, High Temperature in the Radiator, Power Supply Fault, Temperature Sensors for Drive Thermal Control, Ground Fault, Software and Hardware Fault, Loss of Analog Input Signals (Loss of Speed Reference), Safe Stop / Stop Emergency

[1]: Other configuration, consult Power Electronics.
[2]: For operation frequencies higher than 100Hz consult Power Electronics.
[3]: Depending on the nominal power, input voltage and according to the recommendations of installation of Power Electronics.. In case of configuring the AI3 en PT100 mode, any of the two analogic outputs must be configured in 10 mA mode.
[4]: SC: Shielded cable, USC: Unshielded Cable. For other distances consult Power Electronics.

SD750 SERIES		
HARDWARE	DIGITAL INPUTS	6 programmable to be active high (PNP) or low (NPN), Isolated power supply
		1 PTC input
	DIGITAL OUTPUTS	3 programmable changeover relays (250Vac, 8A or 30Vdc, 8A)
	ANALOGUE INPUT	3 programmable inputs: 0 – 20mA, 4 – 20mA, 0 – 10Vdc (optically isolated)
	ANALOGUE OUTPUTS	2 isolated programmable outputs: 0 – 20mA, 4 – 20mA, 0 – 10Vdc
	ENCODER INPUTS (Optional)	Two differential encoder inputs. Voltages inputs from 5 to 24Vdc
	USER POWER SUPPLY	+24Vdc user power supply, (Max. 180 mA) regulated and short-circuit protected +10Vdc user power supply, (Max. 2 potentiometers R= 1 kΩ) regulated and short-circuit protected
	I/O EXTENSION BOARD (Optional)	5 Digital Inputs: Programmable inputs to be active high (PNP) or low (NPN). Optically isolated. 2 Analogue Inputs: Programmable and differential input. 5 Digital Outputs: programmable multi-function relays. 2 Analogue Outputs: Programmable outputs in voltage / current.
	EXTERNAL POWER SUPPLY	24Vdc External Power Supply
COMMUNICATION	STANDARD HARDWARE	USB port
		RS485 port
		Ethernet
	OPTIONAL HARDWARE	Optical fiber
		Communication Cards
	STANDARD PROTOCOL	Modbus-RTU
		Ethernet (Modbus TCP)
	OPTIONAL PROTOCOL	Profibus-DP
		Field Bus
		Ethernet IP
		CAN Open
		ProfiNet
CONTROL PANEL	TYPE	Removable
	LENGTH	3 meters and 5 meters (optional)
	CONNECTION	USB
	VISUALIZATION (POWER ELECTRONICS LOGO)	GREEN: Running
		ORANGE: Warning
		GREY: Stopped
		RED: Fault
	MONOCHROME GRAPHIC DISPLAY	LCD screen
		Keypad with 68 keys to control and configure the drive, start and stop / reset
		Independent memory
		Wi-Fi communication module (optional)
	TOUCH AND COLOUR GRAPHIC DISPLAY (Optional)	Optional Colour touch-screen display 4.3”
		4Gbytes for recording historical files
		Panel or USB cable connection
		Wi-Fi remote connection, micro-USB connection to control card
	DISPLAY INFORMATION	Average current and 3-phase motor current
		Average voltage and 3-phase motor voltage
		Average input voltage and 3-phase input voltage
		3-phase motor input and output frequency
		DC Bus Voltage
		Drive Status
		Speed, Torque, Power, Power Factor of the motor
		Register of total and partial drive running time with reset function (hours)
		Register of total and partial drive energy consumption with reset function (kWh)
		Relay status
		Digital inputs / PTC status
		Output comparator status
		Analogue inputs and sensor values
		Analogue outputs value
		Motor and equipment overload status
		IGBT and rectifier temperature
		Fault history (last 6 faults)
	OTHERS	Real time clock
		Perpetual calendar

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SD750 SERIES		
REGULATIONS	CERTIFICATIONS	CE, RCM, IEC
	ELECTROMAGNETIC COMPATIBILITY	EMC Directive (2004/108/CE)
		IEC/EN 61800-3
	DESIGN AND CONSTRUCTION	LVD Directive (2006/95/CE)
		IEC/EN 61800-2 General requirements
		IEC/EN 61800-5-1 Safety
		IEC/EN 60146-1-1 Semiconductors
		IEC 60068-2-6 – Vibration
	FUNCTIONAL SAFETY	IEC/EN 61800-5-2, IEC 61511-1, and UL 61500-5-2 Safety Stop (STO)

DIMENSIONS

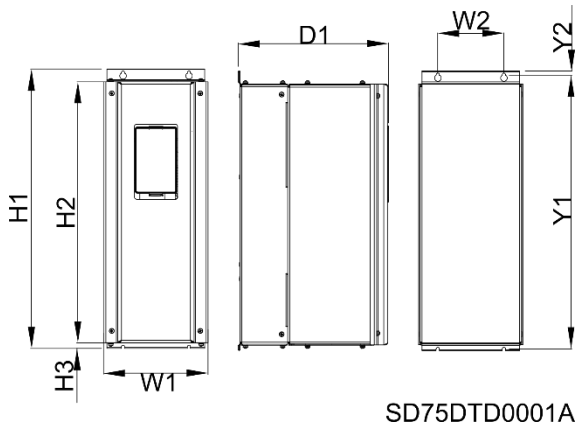
4

Dimensions of Frames 1 and 2

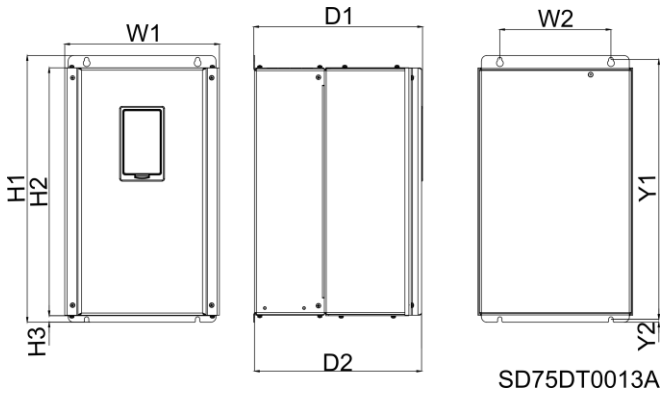
TALLA	TENSIÓN DE ENTRADA	EQUIPOS
1	380VAC – 480VAC (-10% a +10%)	SD750006 5B06DEF, SD750008 5B06DEF, SD750011 5B06DEF, SD750015 5B06DEF, SD750024 5B06DEF, SD750030 5B06DEF, SD750040 5B06DEF
2	380 – 480VAC (-10% a +10%)	SD750048 5B06DEF, SD750060 5B06DEF, SD750075 5B06DEF

TALLA	DIMENSIONES (mm)									PESO (kg)
	H1	H2	H3	W1	W2	D1	D2	Y1	Y2	
1	507	474	10	190	120	273	-	498	7	15
2	510	474	13	296	212	323	320	497	6	26

EN



Dimensions of Frame 1

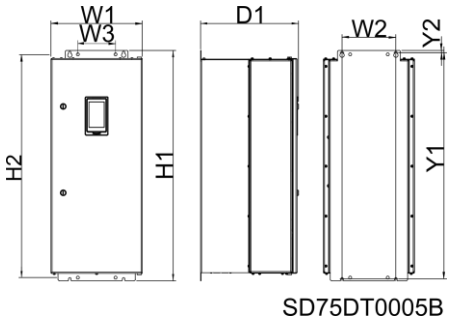


Dimensions of Frame 2

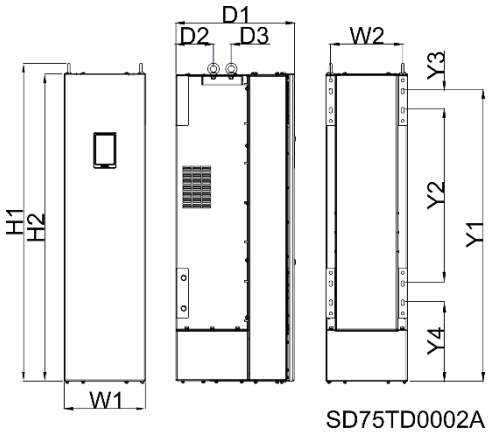
Dimensions of Frames 3, 4 and 5

TALLA	TENSIÓN DE ENTRADA	EQUIPOS
3	380 – 480VAC (-10% a +10%)	SD750095 5B06DEF, SD750110 5B06DEF, SD750145 5B06DEF, SD750180 5B06DEF
4	380VAC – 480VAC (-10% a +10%)	SD750200 5B06DEF, SD750260 5B06DEF
5	380VAC – 480VAC (-10% a +10%)	SD750320 5B06DEF, SD750400 5B06DEF

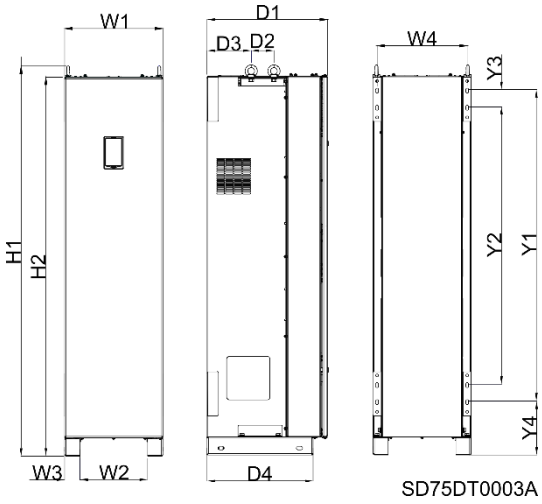
TALLA	DIMENSIONES (mm)														PESO
	H1	H2	W1	W2	W3	W4	D1	D2	D3	D4	Y1	Y2	Y3	Y4	(kg)
3	854	839	301	200	140	-	358	-	-	-	839	8	-	-	67,5
4	1249	1208	320	284	-	-	466	148	70		1145	682	75	313	94
5	1716	1667	431	298	67	396	529	100	194	467	1370	1220	75	237	200



Dimensions of Frame 3



Dimensions of Frame 4

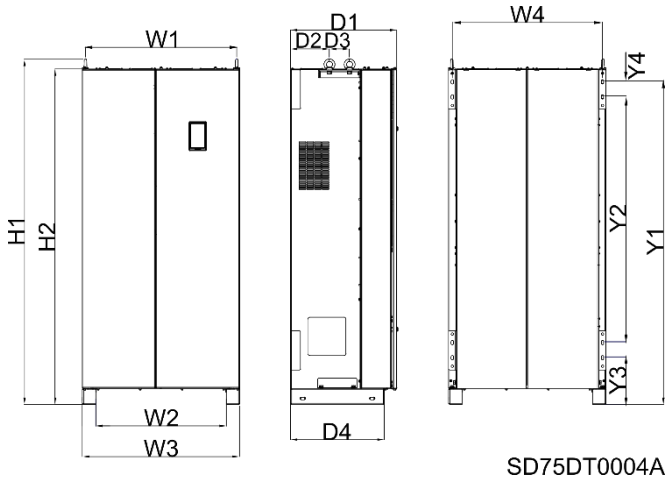


Dimensions of Frame 5

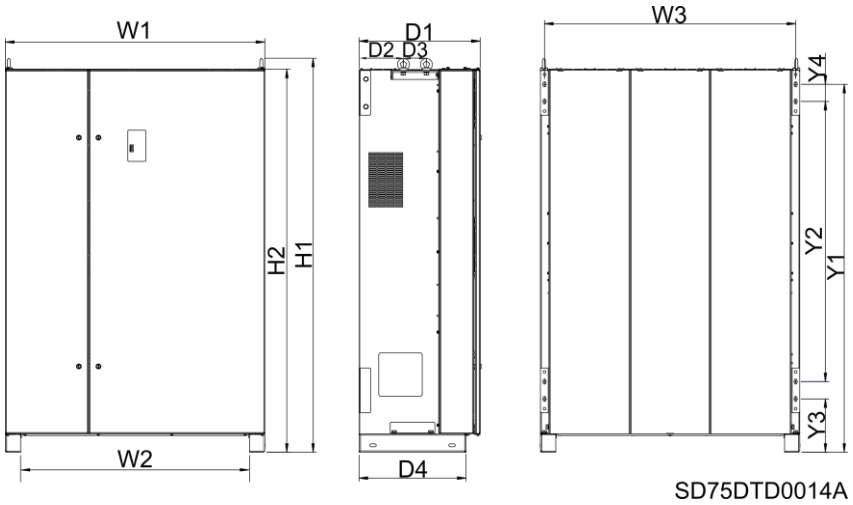
Dimensions of Frames 6 and 7

TALLA	TENSIÓN DE ENTRADA	EQUIPOS
6	380VAC – 480VAC (-10% a +10%)	SD750450 5B06DEF, SD750570 5B06DEF, SD750700 5B06DEF, SD750450 5B12DEF, SD750570 5B12DEF, SD750700 5B12DEF, SD750450 5B12DEF, SD750570 5B12DEF, SD750700 5B12DEF
7	380 – 480VAC (-10% a +10%)	SD750800 5B06DEF, SD750900 5B06DEF, SD751050 5B06DEF

TALLA	DIMENSIONES (mm)													PESO (kg)
	H1	H2	W1	W2	W3	D1	D2	D3	D4	Y1	Y2	Y3	Y4	
6	1715	1667	780	649	780	529	194	100	467	1607	1220	237	75	335
7	1715	1667	1132	990	1096	529	194	100	467	1602	1220	232	75	479



Dimensions of Frame 6

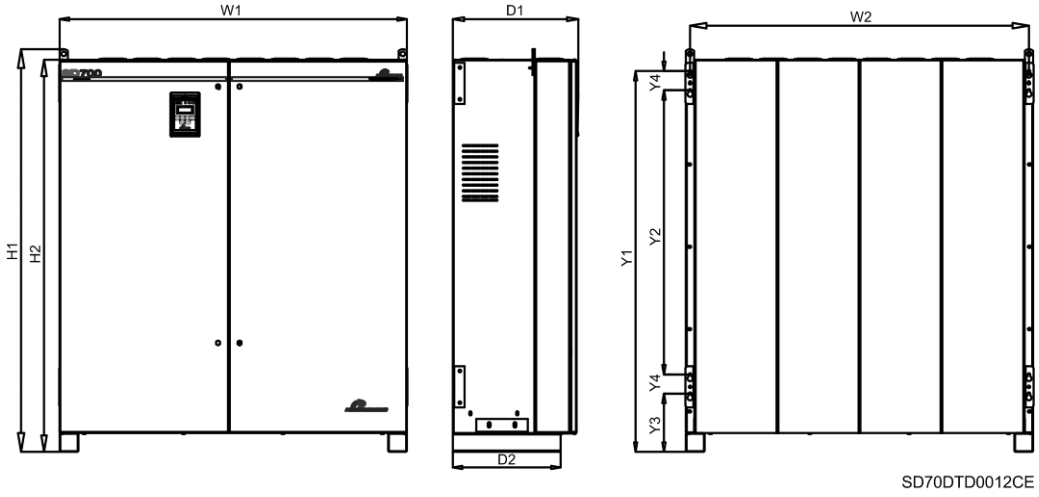


Dimensions of Frame 7

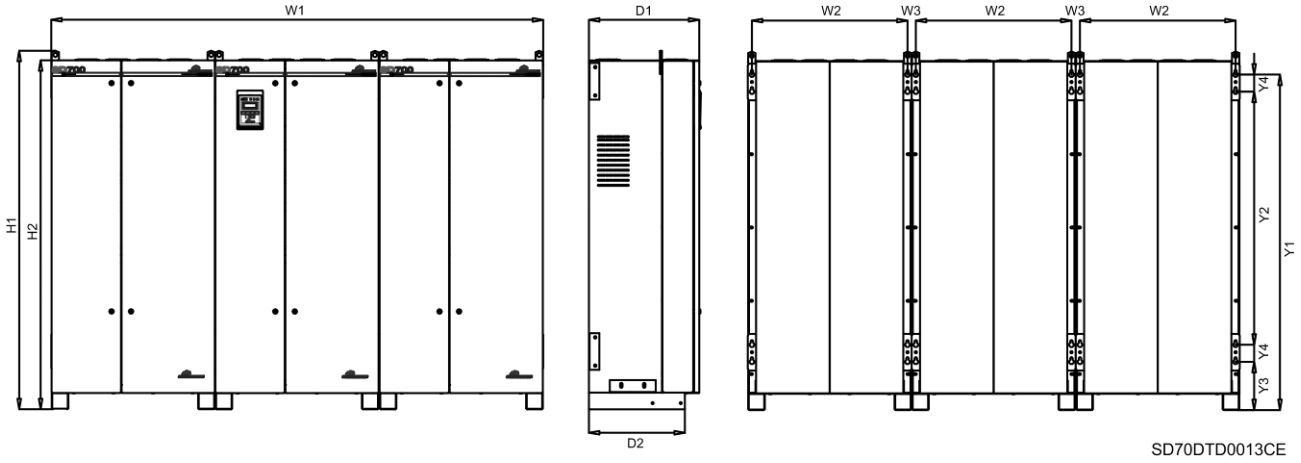
Dimensions of Frames 8 and 9

TALLA	TENSIÓN DE ENTRADA	EQUIPOS
8	380VAC – 480VAC (-10% a +10%)	SD751140 5B06DEF, SD751400 5B06DEF, SD751140 5B12DEF, SD751400 5B12DEF, SD751140 5B24DEF, SD751400 5B24DEF, SD751140 5B06DEF, SD751400 5B06DEF, SD751140 5B12DEF, SD751400 5B12DEF, SD751140 5B24DEF, SD751400 5B24DEF
9	380 – 480VAC (-10% a +10%)	SD751550 5B06DEF, SD751800 5B06DEF, SD751950 5B06DEF, SD751550 5B12DEF, SD751800 5B12DEF, SD751950 5B12DEF, SD751550 5B18DEF, SD751800 5B18DEF, SD751950 5B18DEF

TALLA	DIMENSIONES (mm)											PESO (kg)
	H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
8	1715	1667	1482	1452	-	529	467	1602	1220	232	75	585
9	1712	1667	2352	747	38	529	460	1619	1209	247.5	81.5	1005



Dimensions of Frame 8

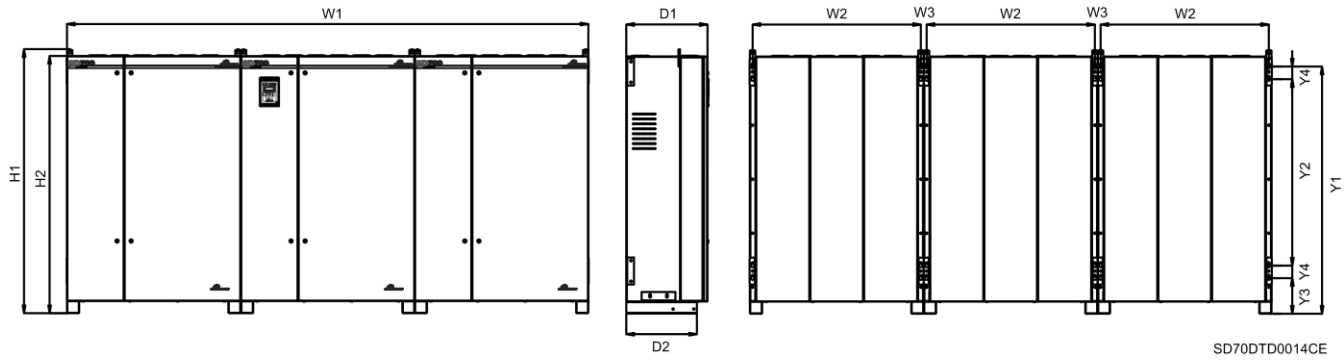


Dimensions of Frame 9

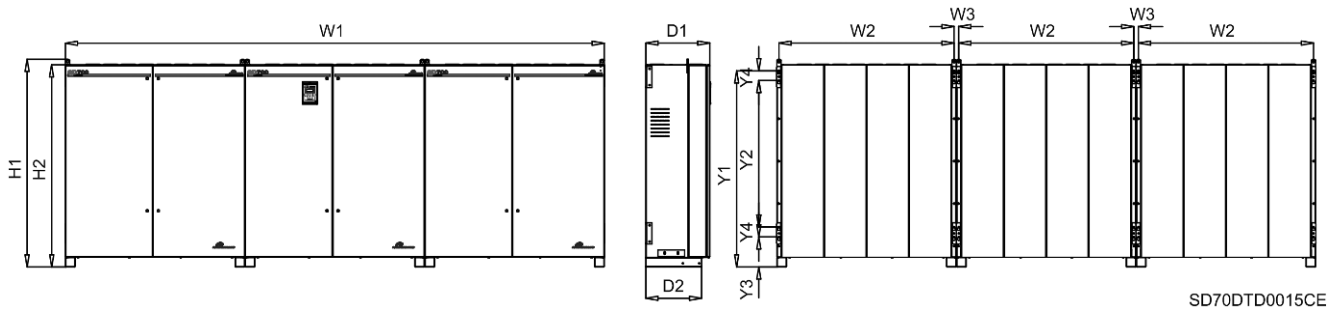
Dimensions of Frames 10 and 11

TALLA	TENSIÓN DE ENTRADA	EQUIPOS
10	380 – 480VAC (-10% a +10%)	SD752250 5B06DEF, SD752750 5B06DEF, SD752250 5B18DEF, SD752750 5B18DEF
11	380 – 480VAC (-10% a +10%)	SD753100 5B06DEF, SD753100 5B12DEF, SD753100 5B18DEF, SD753100 5B24DEF

TALLA	DIMENSIONES (mm)											PESO (kg)
	H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
10	1712	1667	3402	1097	38	529	460	1619	1209	247.5	81.5	1437
11	1712	1667	4452	1447	38	529	460	1619	1209	247.5	81.5	1755



Dimensions of Frame 10



Dimensions of Frame 11

RECEPTION, HANDLING AND TRANSPORTATION

5

CAUTION

Read carefully the following installation instructions for a correct mechanical installation.
Otherwise, the equipment can be damaged and lead to personal injury**.**

Reception and Storage

The SD750 is carefully tested and perfectly packed before delivering. In the event of transport damage, please ensure that you notify the transport agency and Power Electronics: 902 40 20 70 (International +34 96 136 65 57) or your nearest agent, within 24h from receipt of the goods.

Make sure model and serial number of the drive are the same on the delivery note and unit.

Drive should be stored in a sun and moisture protected space and with an ambient temperature between -40°C and +70°C, < 95 RH without condensation. It is recommended not to stack more than two units.

Handling and Transportation

Only the transport methods described in this document or in the delivery notes are permissible. Any other transport method or system could damage the unit.

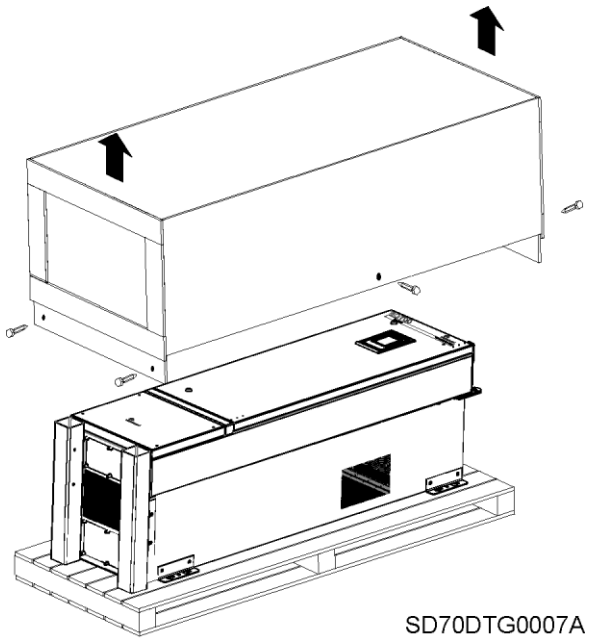
SD750 is delivered vertically. Frames 1 and 2 are delivered in a cardboard box. From frame 3 they are delivered fastened to a wooden pallet. Frames 3 and 4 are covered with a cardboard box and from frames 5 with a wooden box. Depending on the method of transportation, the drive is supllied wrapped to be protected against dust. Place the entire pallet as close as possible to the installation site before removing the wooden box to prevent damage to the drive during transportation.

It is mandatory to carry the drive with a pallet truck, a forklift track or a crane, taking into account the load distribution and its center of gravity. Check the size and weight of the VFD to choose a proper equipment that can lift a higher weight.

Remove the drive packaging carefully (do not use sharp tools). After removing the packaging, please check the material inside. Verify that the number of items included in the package is in accordance with the inventory. In case of receiving spare parts with the product, please separate it and store it in a safe place. It should not be exposed to vibrations, falls or moisture.

CAUTION

If the weight of the load to be handled is greater than the maximum permissible weight of the crane, it could damage the equipment and personnel.

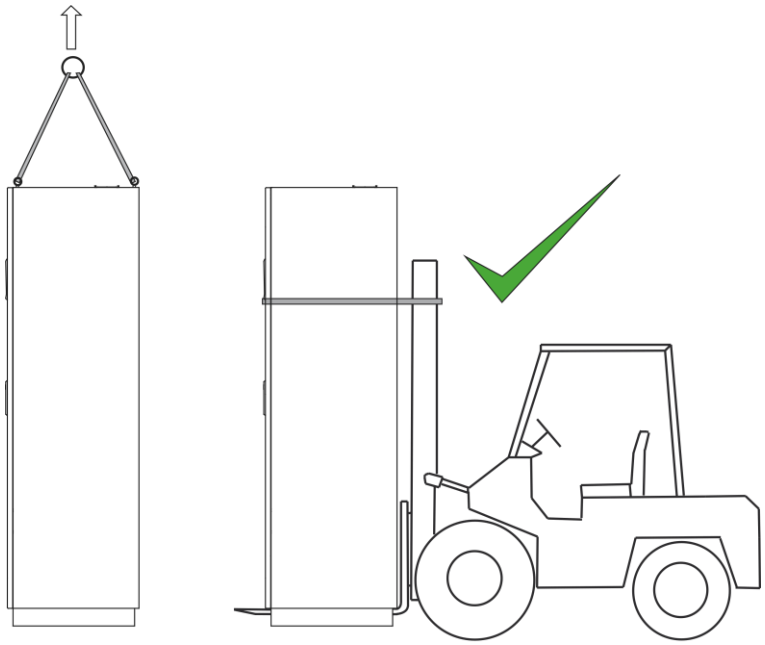


Frame 5 unpacking

To unpack, if necessary, unscrew the screws that fix the wooden box to the pallet. Then, unscrew the fixing screws on the angle brackets. To lift the inverter and place it in a vertical position, use only a crane or a forklift equipped with straps or slings. Lift gently by pulling the top bolts.

To rise to an upright position use only a crane or forklift equipped with belts or slings. Lift it carefully pulling from the top eyebolts.

Once the drive is upright, reinsert the straps / slings. The crane or forklift must always lift the inverter from its bottom. Avoid sudden movements and blows during transportation. When placing the equipment on the ground, stop the lowering movement just before contacting the ground, and after this, lower it very slowly to avoid blows.



SD75DTG0002A

Lifting the equipment

MECHANICAL INSTALLATION

6

CAUTION

The installation must be done by qualified personal.
Otherwise, the equipment can be damaged and lead to personal injury.

Before installation, make sure the location chosen is appropriate.
There should be sufficient space to adapt the unit to the recommended distances and to ensure that there are no obstacles preventing the airflow from the fans.

EN

Environmental ratings

Power Electronics recommends to follow the instructions in this manual carefully to ensure a correct operation of the drive. The installer is responsible for performing a proper installation in order to comply with the ambient conditions of the VFD. In addition, the installer is solely responsible for complying with the local regulations. The environmental conditions are:

- Environmental category: Indoor
- Outdoor: No
- Pollution degree: Clean area: PD2
Dirty area: PD3
- Ingress protection rating: Clean zone: Electronics IP54 or IP20
Power connection and Input filters: IP20
- Operation Ambient temperature: -20ºC to 50ºC Constant torque
-20ºC to 40ºC Variable torque
- Storage Ambient temperature: -40ºC to 70ºC
- Humidity: Relative humidity less than 95% (non-condensing)
- Heating resistors: Optionals
- Maximum altitude and power derating: 1000m 1% PN(kW) every 100m; 4000m maximum
- Vibration (IEC60068-2-6): Amplitude ± 1mm (2Hz – 13.2Hz), ±0.075 (13.2Hz – 57Hz)
Acceleration 6.86m/s^2 (13.2Hz-57Hz), 9.8m/s^2 (57Hz-150Hz)
- Audible Noise: Maximum 68-70 dB Frames 1 and 2
Maximum 80 dB Frame 3 and above
- Overvoltage category: III
- Protection class: Class 1
- Painting: Standard colour RAL 9016. Any other, on request

Drive mounting

This section contains assembly instructions for optimum operation of the inverter and precautions to avoid personal injury and property damage.

SD750 drives are designed for wall or panel mounting.

The drive may become hot during operation. Install it on a surface that is fire resistant or flame retardant and with sufficient space around the drive to allow air to circulate. Make sure to follow the space recommendations given in section 6.3.

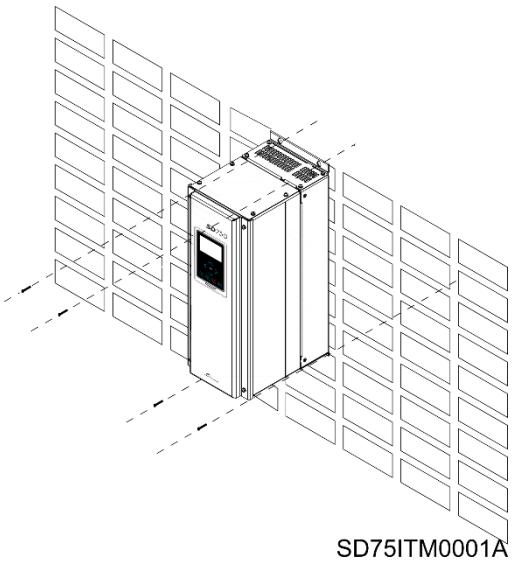
Wall mounting drives

The drives SD750 from frame 1 to 4 are are designed for wall mounting. In addition, the frame 4 has optionally available a plinth that that allows its mounting on the ground..

The installation method and its location must be in accordance with the weight and dimensions of the drive. Power Electronics recommends hanging the SD750 in a wall or solid structure using the anchors arranged in the back, which supports the weight and possible forces generated by the wiring..

Use a level to draw a horizontal line on the mounting surface and mark the attachment points. Then, drill the two holes of the top mounting bolts, and then install the mounting bolts. Do not fully tighten bolts yet.

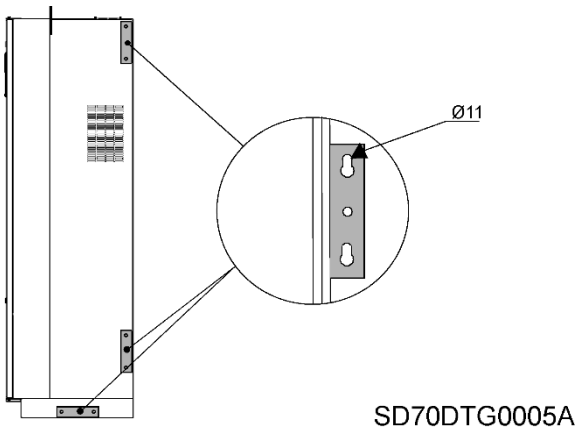
Mount the unit with the top two bolts and then fully tighten the mounting bolts. Make sure the SD750 is flat on the mounting surface.



SD750 wall mounting

Stand alone drives

Frames 5 to 11 are designed to be placed over a technical floor. If necessary, there are optional plinths that increase the height of the drive from 1710 mm to 2000 mm or 2200 mm. The floor must guarantee a non-flammable, solid, plain and level surface to the drive, a minimum safety distance around it and esay cable access. The maximum allowed slope is 1cm per 6 meters. The installation site should be level since the cabinet is not equipped with a height-adjustable base. The walls adjoining the drive must be of a non-flammable material. Attach the SD750 to the wall or floor using the L brackets on both sides of the drive. The brackets have Ø11 hole diameters and are located on the legs and rear.

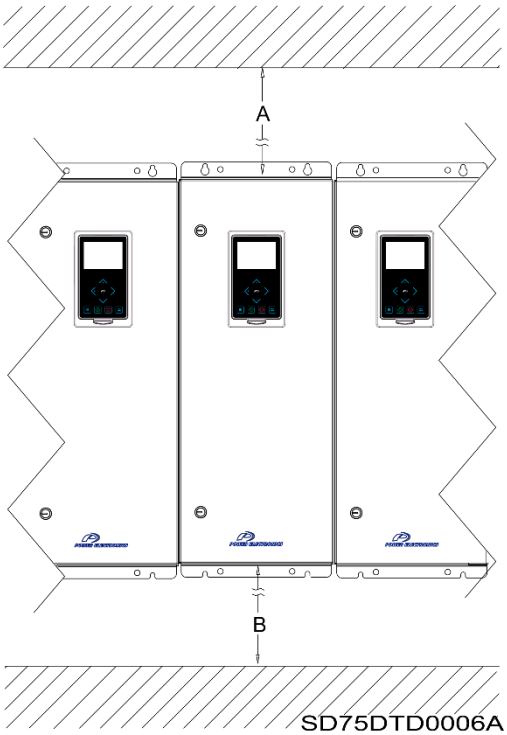


Wall or floor fixation

It is recommended to construct a cable duct to get the cables to the input / output connections. The duct width must not exceed 300 mm and the ground contact surface must withstand the weight of the cabinet that falls on its legs.

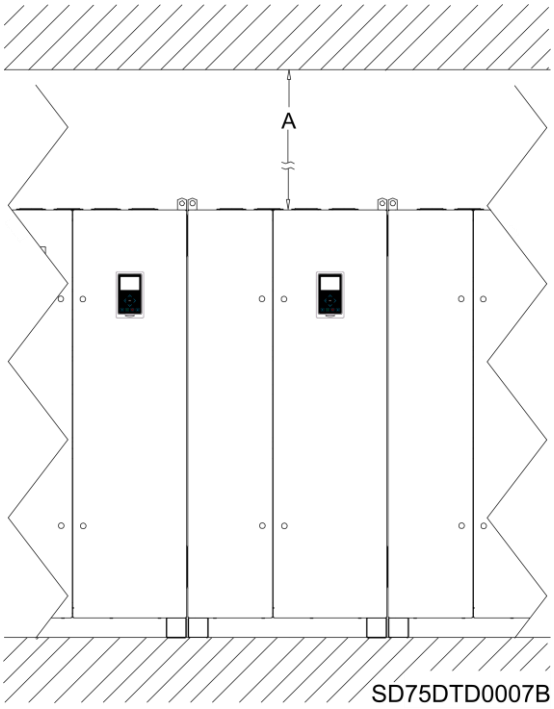
Clearances

If the equipment is installed inside a cabinet, ensure that the hot air expelled from the VFD is evacuated outside. This hot air could be sucked back and cause the drive to overheat. To ensure proper ventilation avoid air recirculation and maintain the minimum clearances indicated below.



Minimum clearances for frames 1 to 4

FRAME	DISTANCE (mm)		FRONT CLEARANCE
	A	B	
1	200	200	700
2	200	200	800
3	200	200	800
4	300	300	820



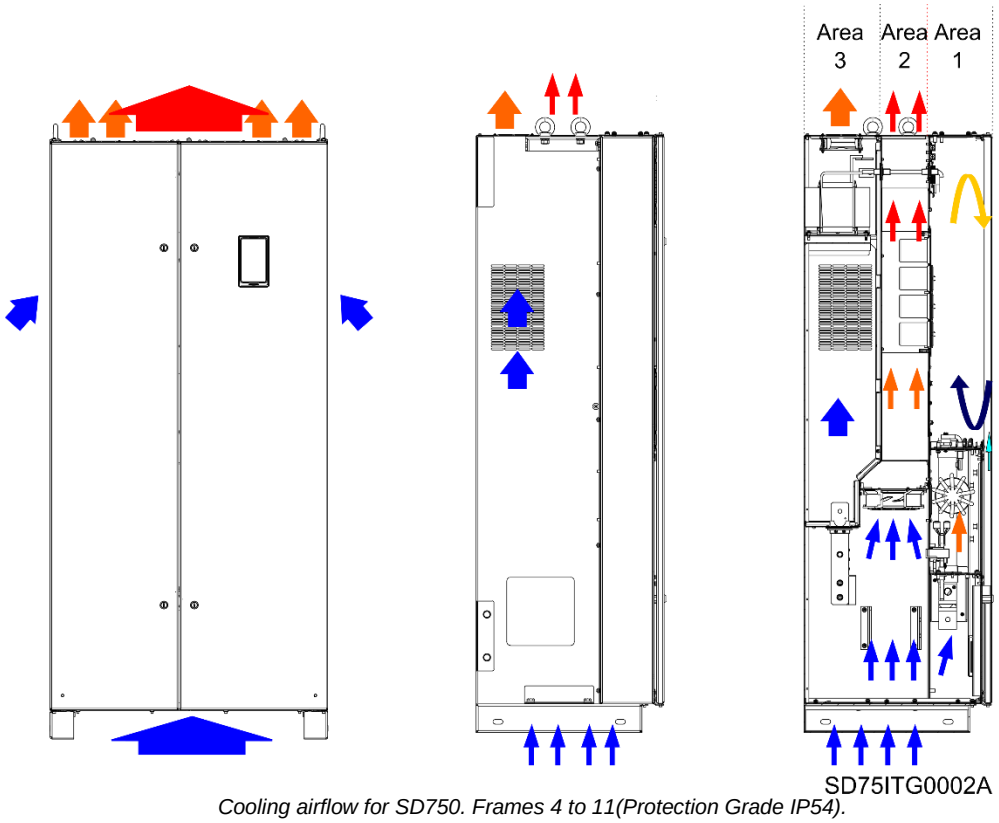
Minimum clearances for frames 5 to 11

FRAME	DISTANCE (mm)	FRONT CLEARANCE
	A	
5	400	930
6	400	940
7	400	1260
8	400	1260
9	400	940
10	400	1260
11	400	1260

Cooling

The main heat sources inside the equipment correspond to: losses in the bridge rectifier (IGBTs), the input filter and the output dV/dt filter. The SD750 series has an overall efficiency higher than 98%, so losses due to heat dissipation correspond to 2% of the power supplied by the equipment.

The cooling system of the drive depends on its degree of protection and its frame. In general terms, the drive has been designed with three independent cooling areas.



Cooling airflow for SD750. Frames 4 to 11(Protection Grade IP54).

1st Area - Electronics:

IP20 cabinets incorporate extractors in its upper part that evacuate the internal heat generated in the area.

IP54 cabinets keep electronic components fully sealed. The internal heat generated is evacuated through the metal doors thanks to an internal forced convection system.

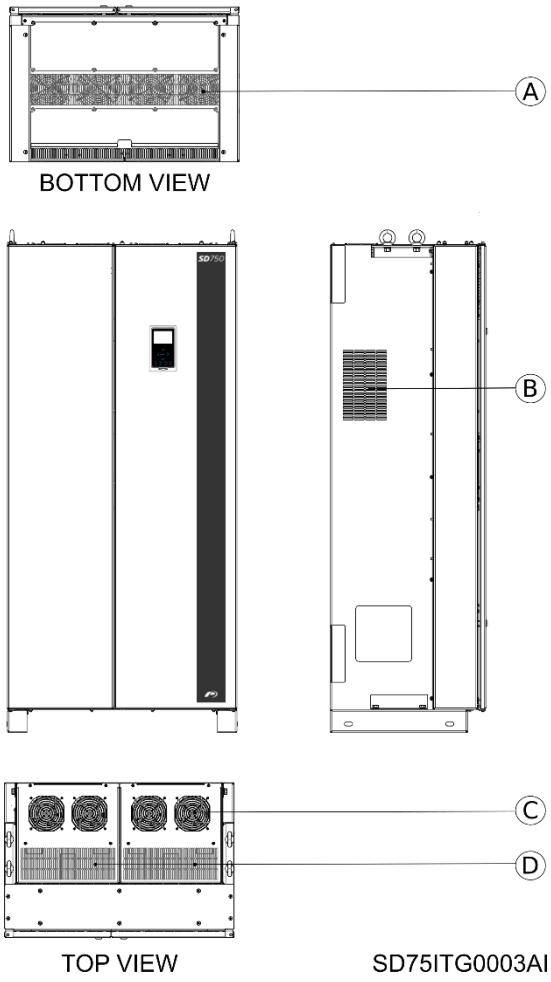
2nd Area – Rectifier bridge, Inverter bridge and DC bus cooling area:

The drive has fans that collect the air from the bottom and evacuate it through the central grid at the top. The fans propel the air through the radiator thus evacuating the heat generated by the main components.

3rd Area – Filters:

Intake grills are placed on the sides of the equipment. In addition, the rear upper part incorporates extractors.

The following figure identifies the gratings and extraction fans of the different levels.



SD750 gratings and fans

		FRAMES											
		ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AREA 2	**OPERATION FLOW (m^3/h) (*)**	D	64-77	239-287	306-367	342-410	396-475	486-583	720-864	972-1166	1458-1750	2178-2614	2898-3478
	INLET GRATING NET SECTION (m^2)	A	0.081	0.016	0.025	0.031	0.034	0.064	0.101	0.123	0.192	0.303	0.369
	OUTLET GRATING NET SECTION (m^2)	D	0.003	0.013	0.017	0.019	0.022	0.027	0.040	0.054	0.081	0.121	0.161
AREA 3	**OPERATION FLOW (m^3/h)**	C	-	-	-	180	360	720	1080	1440	2160	3240	4320
	INLET GRATING NET SECTION (m^2)	B	0.081	0.016	0.025	0.031	0.034	0.041	0.041	0.041	0.122	0.122	0.122

Heat dissipation

The heat generated by the SD750 depends on the carrier frequency (Hz), the grid frequency and the load. It can be estimated by the following equation, considering the worst case at rated power condition.

$$P_{loss}\,[W] = 0{,}02 \cdot P_{motor}\,[W]$$

(*) The air velocity, which passes through the gratings, varies between 5 and 6 m/s depending on the blocking of the gratings.

POWER CONNECTION

7

CAUTION

Please read the following instructions for proper electrical installation.
Otherwise, it could result in damage to equipment and personnel.

EN

General recommendations for connections

The following table summarizes the recommended torque for both mechanical and electrical connections:

SCREW SIZE		RECOMMENDED TORQUE			
Metric (mm)	English (inches)	DIN (Nm)		ASTM (ft*lb)	
		6,9 Quality [a]	8,8 Quality [a]	A449 Type 1 [a]	A325 Type 1 [a]
M3	1/8	1	1,3	-	-
M4	5/32	2,5	3		
M5	3/16	4	6		
M6	1/4	5	10	4	
M8	5/16	20	25	9	
M10	7/16	40	50	25	
M12	1/2	60	70	38	50 – 58
M14	9/16	100	120	54	-
M16	5/8	150	210	75	99 – 120

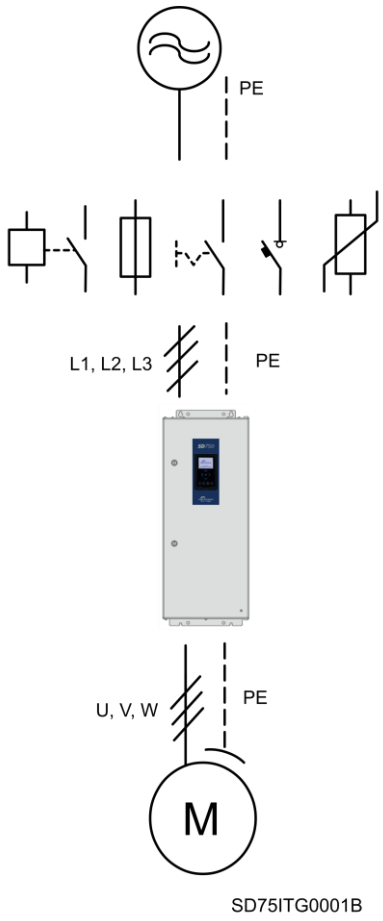
[a] For other qualities, follow the screw's manufacturer guidelines.

NOTES:

- Power Electronics recommends the **use of zinc coated quality 8.8 steel bolts for internal-indoor connections in general**, including ground and DC power connections.
- Power Electronics recommends the **use of A2-70 stainless steel bolts for external-outdoor connections in general**, including AC power connections.

Basic configuration

Select the appropriate safety equipment and perform the wiring properly to ensure proper operation of the equipment. Incorrect application or installation can lead to malfunction of the drive and consequently reduce its life or damage its components. Read and understand this manual thoroughly before performing any operations.

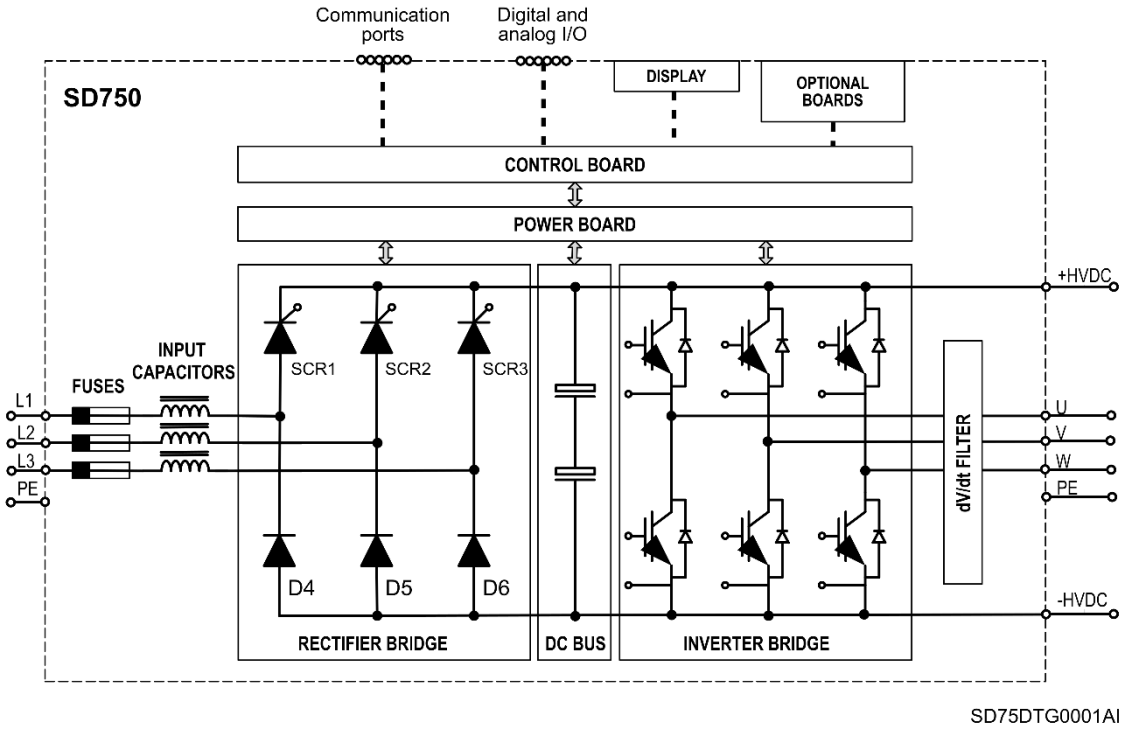


Basic configuration

AC Power Supply	Use a power supply according to the selected drive. The SD750 drives are available for TN, TT or IT grids (floating earth). Check the serial number to ensure the correct drive selection.
External line-side protection	Select fuses and switches in accordance with the recommendation within this manual and the applicable national and local regulations. Do not use them for the purpose of starting or stopping the drive. IT grids should be externally protected against insulation breakdowns and overvoltages.
SD750 Installation	Install the drive following the recommendation within this manual in relation with the cooling requirements, position, clearances, wiring access and ground connection.
Motor cables	Select and install the motor cables according to the recommendation within this manual and the applicable national and local codes. An incorrect motor cable selection and installation could cause EMC filtering malfunction and motor damaged.
Motor	Do not connect capacitors for power factor protection, surge protectors or RFI filters at the drive output.

Topology

The operating principle of the SD750 is the pulse width modulation (PWM). Varying the power supply voltage and the grid frequency, it is possible to control the speed and torque of the connected induction three-phase motors thanks to its main components: rectifier bridge, the DC bus, inverter bridge, and power and control card.



General Block Scheme for frames 5 to 11

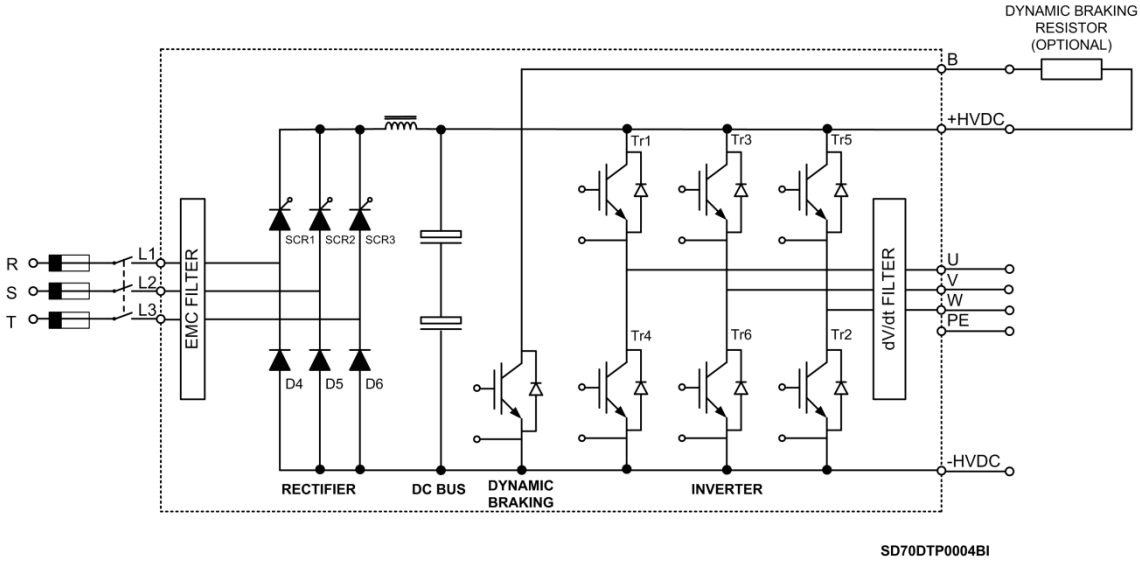
The SD750 drive is equipped with an input filter. This input filter significantly reduces the THDi values and increases line impedance, thus protecting the drive from electrical system distortions. Depending on the frame, the input filter is connected to the input or to the DC bus. From frames 3 to 11 the filter is installed in the input side. In frames 1 and 2 the filter is installed on the DC bus (see figure "*Power electronics for Frames 1 and 2 equipment*").

Frames 5 to 11 integrate as standard ultra fast fuses that protect the drive against downstream overcurrents. Additionally, the drive integrates multiple electrical protections that protect the drive and the motor, similar to those provided by a motor protection relay.

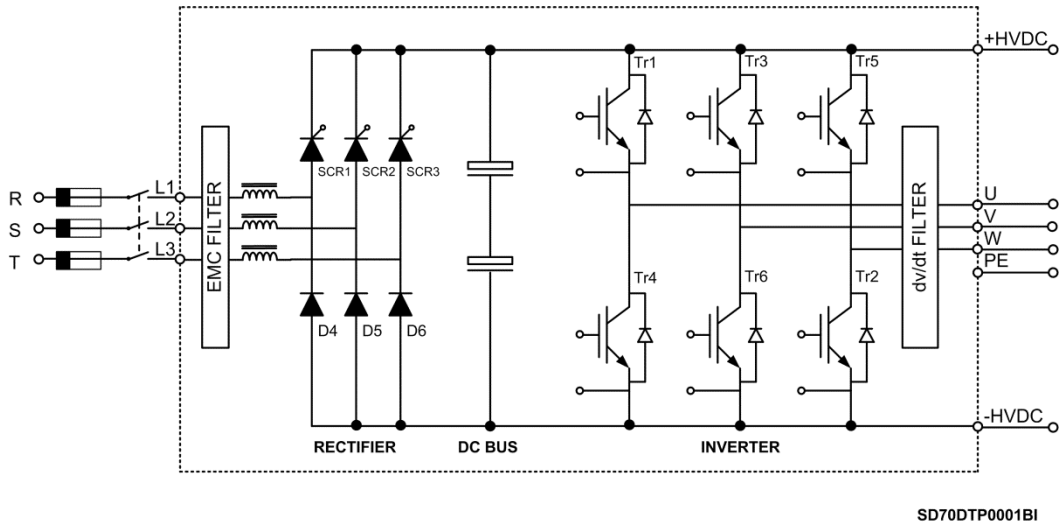
The SD750 drive includes a power and a control board that are responsible for the rectifier bridge trip, inverter bridge trip, soft load management, DC bus voltage control and motor operation. In addition, the control card integrates terminals such as communication ports, digital and analogue inputs and outputs, colour touch-screen display, alphanumeric display, etc.

The inverter bridge generates the PWM wave that controls the motor response (voltage, current, torque, etc.). The Power Electronics SD750 series integrates as standard dV/dt filters and a CLAMP system that reduces significantly the rise time (dV/dt) below 500V/µs - 800V/µs, therefore, it reduces the voltage peaks in the motor windings, the common mode currents and the EMC emissions.

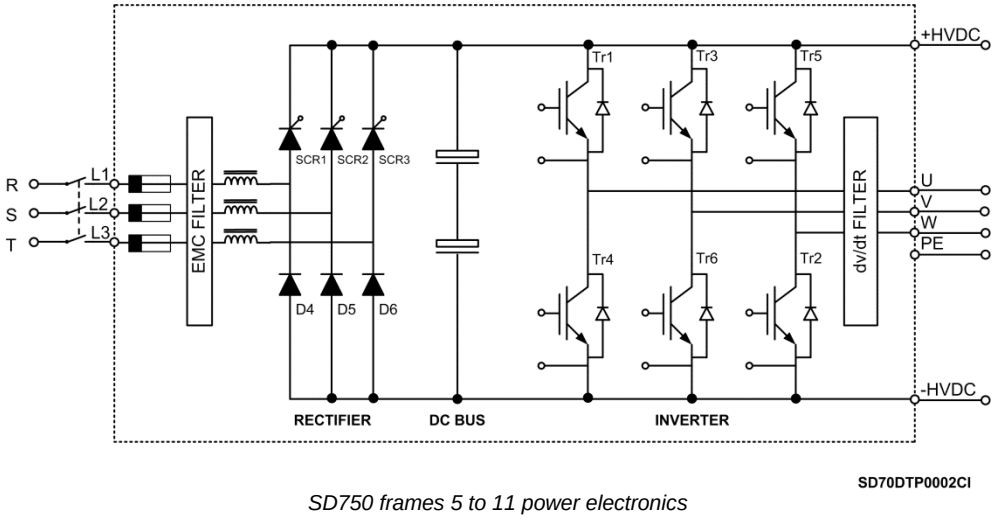
The following schemes illustrate the SD750 internal power structure.



SD750 frames 1 and 2 power electronics.



SD750 frames 3 and 4 power electronics



SD750 frames 5 to 11 power electronics

Power Connection and Wiring

CAUTION

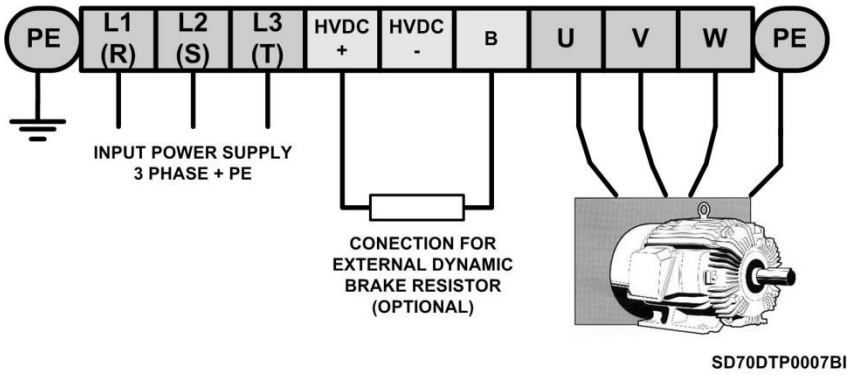
The following installation recommendations are suitable for TN and TT grids. For IT grids refer the dedicated section. Otherwise, you could cause damage to equipment and personnel.

Wiring and periodic inspections should be performed at least 10 minutes after disconnecting the input power. When removing the front cover, check that the red DC Link LED is off. Afterwards you can remove the metal cover and check with a multimeter the following measures:

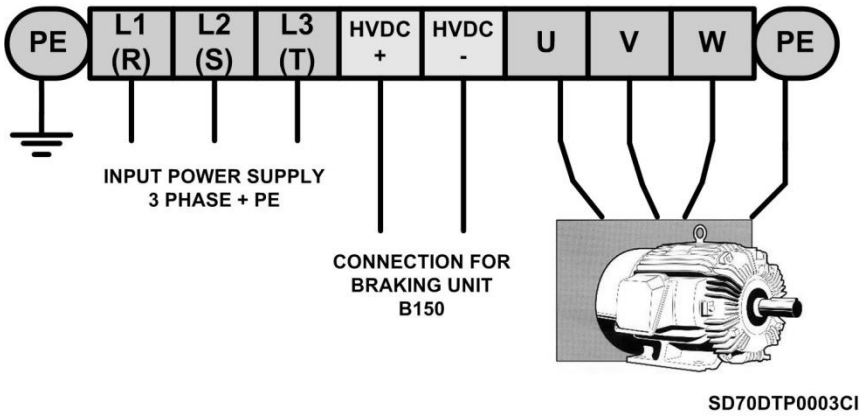
- The voltage between the output plates U, V, W and the cabinet must be around 0V.
- The voltage between the DC link +, - terminals and the chassis must be below 30Vdc.

Otherwise, you may get an electric shock.

The input and output busbars are labelled according to the following diagram.



Power wiring connection for frames 1 and 2



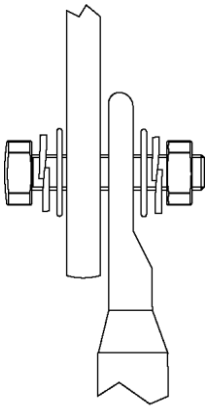
Power wiring connection for frames 3 to 11

The input terminals L1, L2, L3 and PE (drive power supply), output terminals U, V, W and PE (motor power supply) must be introduced through the metal plates situated in the bottom part of the cabinet. Do not drill or mechanize the vents. Otherwise, the drive could reduce its cooling capacity.

The front metal panel corresponds to the motor cables and the rear metal panel to the input cables; these panels are not delivered neither drilled nor pre-marked to enable any configuration. Each cable must be equipped with its own cable gland or grommet that prevent dust or moisture from entering the equipment.

To perform a correct terminals connection, follow the next steps.

- Refer to section “Power Terminals” for recommended screws and washers metrics, as well as recommended torque.
- The number of busbars depends on the frame size. Check the “Power terminals” section.
- Before connecting the cables, clean the contact surface with a clean cloth and ethanol cleaner.
- Use a pressure washer and a flat washer between the nut or bolt head and the terminal lug.
- Use copper or aluminium conductors that whithstand a voltage of 600Vac for equipment with rated voltage up to 500Vac..



FSITG0038A

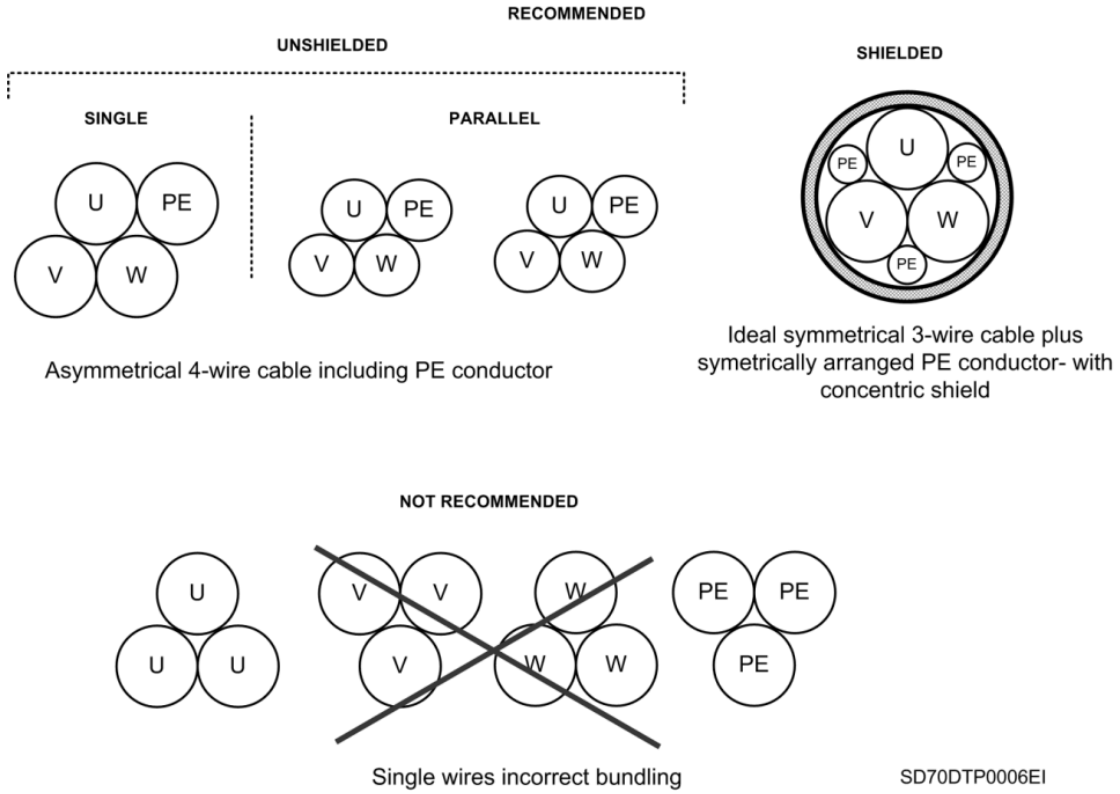
The recommended cable types and lengths between the drive (with factory settings) and the motor are:

- **Unshielded cable**: 300m. Asymmetrical 4-wire cable including PE conductor. It is recommended to use a motor ground cable (PE) with a cross section equal or higher than the supply motor wires cross section (U, V, W). When single-wire cables are used in three-phase systems, the three phase conductors must be bundled symmetrically.
- **Shielded cable**: 150m. Symmetrical 3-wire cable with PE conductor- with concentric shield. To implement an effective shield bonding, an EMC cable gland should be used in both the motor junction box and the drive cabinet to ensure effective 360º ground connection and a low impedance path for high frequency current. Refer to “EMC Installation Requeriments” section.

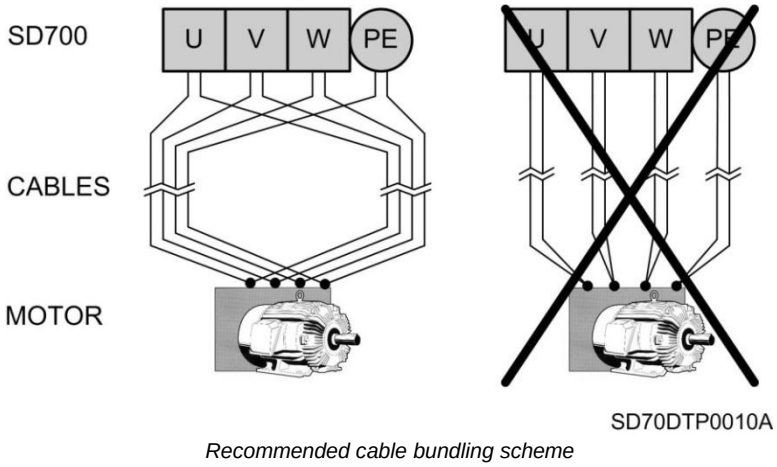
NOTICE

The number of three phase plus neutral cable hose (U, V, W, PE) to the motor should be equal to the number of IGBTs in the drive, having one 4-wire cable hose by each IGBTs block.

The following figures show the recommended cable type and bundling.



Recommended cable type and bundling



Recommended cable bundling scheme

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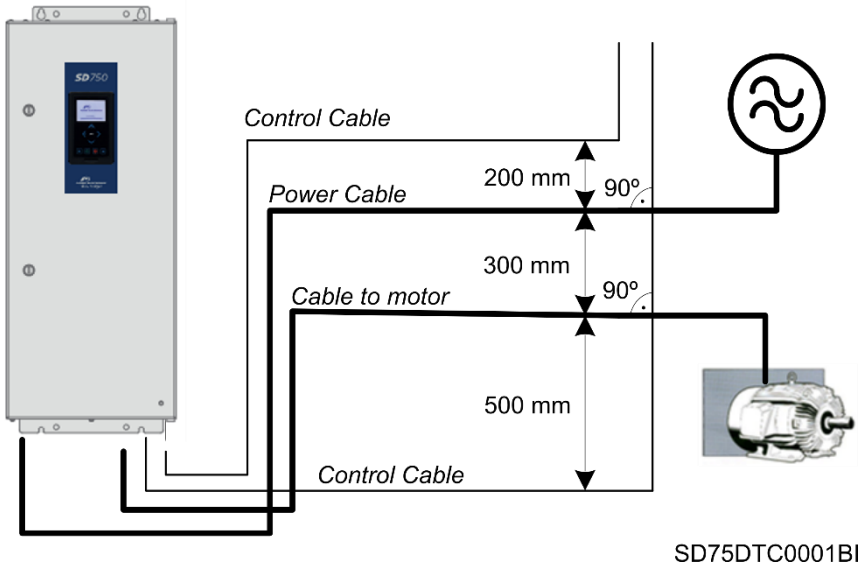
CAUTION

Line voltage (input supply) must never be connected to U, V and W terminals.
Otherwise, the drive will be damaged.

It is absolutely necessary that the installer ensures correct compliance with the laws and regulations in force in the countries or areas where the drive is to be installed.

Do not use capacitors for power factor correction, surge suppressors or RFI filters on the output side of the drive. Doing so may damage these components or the drive itself.

All power conductors such as power input cables, output cables to the motor or DC link cables must be separated from the control, signal, PTC, encoder or data cables. The recommended distances between the cables are shown in the next figure:



Cable routing distances

Power Electronics recommends that the following cable types are installed in cable racks, trays or in different wire ducts:

- Single-wire signal or data cables with V< 60V
- Single-wire cables with 60V<V< 230V
- Input power cables with a low level of interferences 230V<V<1000V
- Output power cables to the motor and dynamic DC brake with a high level of interference 230V<V<1000V.
- Medium voltage cables with V<1000V

Power cables must have a sufficient nominal current to prevent important wiring overheating and voltage drops. The installer must consider the cable cross-section, cable type, wiring method and ambient conditions to select the appropriate cable. It is only permitted the use of cooper or aluminium cables. Please check the maximum cable section and the available holes per phase in section “Power terminals”.

Recommended Cable Section for 400VAC

FRAME	CODE	I(A) Rated	Power (kW) at 400VAC	Power (hp) at 400VAC	Recommended Cable Section per Phase		Recommended Cable Section for Earth Wire	
					AWG / kcmil	mm²	AWG / kcmil	mm²
1	SD750006 5B06DEF	6	2.2	3	12 – 10	2,5 – 4	12 – 10	2,5 – 4
	SD750008 5B06DEF	8	4	5	12 – 10	2,5 – 4	12 – 10	2,5 – 4
	SD750011 5B06DEF	11	5.5	7,5	10 – 8	4 – 6	10 – 8	4 – 6
	SD750015 5B06DEF	15	7.5	10	10 – 8	4 – 6	10 – 8	4 – 6
	SD750024 5B06DEF	24	11	15	10 – 8	4 – 6	10 – 8	4 – 6
	SD750030 5B06DEF	30	15	20	6 – 4	6 – 10	6 – 4	6 – 10
	SD750040 5B06DEF	40	18.5	25	6 – 4	10 – 16	6 – 4	10 – 16
2	SD750048 5B06DEF	48	22	30	3 – 1	16 – 25	3 – 1	16 – 25
	SD750060 5B06DEF	60	30	40	3 – 1	16 – 35	3 – 1	16 – 35
	SD750075 5B06DEF	75	37	50	1 – 1/0	25 – 50	1 – 1/0	25 – 50
3	SD750095 5B06DEF	95	45	60	1/0 – 3/0	25 – 50	1/0 – 3/0	25 – 50
	SD750110 5B06DEF	110	55	75	2/0 – 4/0	50 – 95	2/0 – 4/0	50 – 95
	SD750145 5B06DEF	145	75	100	3/0 – 300	70 – 120	3/0 – 300	70 – 120
	SD750180 5B06DEF	180	90	125	3/0 – 300	95 – 150	3/0 – 300	95 – 150
4	SD750200 5B06DEF	200	110	150	300 – 500	120 – 240	300 – 500	120 – 240
	SD750260 5B06DEF	260	132	200	350 – 500	185 – 240	350 – 500	185 – 240
5	SD750320 5B06DEF	320	160	250	2 x 300	2 x 150	2 x 300	2 x 150
	SD750400 5B06DEF	400	220	300	2 x 350	2 x 185	2 x 350	2 x 185
6	SD750450 5B06DEF	450	250	350	2 x 500	2 x 240	2 x 500	2 x 240
	SD750570 5B06DEF	570	315	400	2 x 500	2 x 240	2 x 500	2 x 240
	SD750700 5B06DEF	700	355	450	3 x 500	2 x 240	3 x 500	2 x 240
7	SD750800 5B06DEF	800	400	500	3 x 500	3 x 240	3 x 500	3 x 240
	SD750900 5B06DEF	900	450	600	4 x 500	3 x 240	4 x 500	3 x 240
	SD751050 5B06DEF	1050	500	700	4 x 500	4 x 240	4 x 500	4 x 240
8	SD751140 5B06DEF	1140	630	800	4 x 500	4 x 240	4 x 500	4 x 240
	SD751400 5B06DEF	1400	710	900	6 x 500	6 x 240	6 x 500	6 x 240
9	SD751550 5B06DEF	1550	800	1000	6 x 500	6 x 240	6 x 500	6 x 240
	SD751800 5B06DEF	1800	900	1250	6 x 500	6 x 240	6 x 500	6 x 240
	SD751950 5B06DEF	1950	1000	1350	7 x 500	7 x 240	7 x 500	7 x 240
10	SD752250 5B06DEF	2250	1200	1500	8 x 500	8 x 240	8 x 500	8 x 240
	SD752750 5B06DEF	2750	1400	1750	8 x 500	8 x 240	8 x 500	8 x 240
11	SD753100 5B06DEF	3100	1600	2000	9 x 500	9 x 240	9 x 500	9 x 240

Note: The cable must permanently support a Tª> 75ºC. **Make sure to comply with local regulations.**

EN

Ground Connection

Before connecting the power conductors, make sure that the chassis of the drive and the adjoining cabinets are connected to ground through the dedicated (PE) terminals. These are situated at both sides of the bottom metal walls of the drive and they are labeled with the earth symbol. Check section “Power Terminals”.

The motor chassis ground must be connected to the drive. In other words, connect the motor’s ground conductor to the PE protection terminal of the drive and not to the installation’s ground. It is recommended that the section of the motor ground conductor (PE) has at least the same cross section as the motor power cables sections (U, V, W). Additionally, it must be installed following the recommendations indicated in section “Power connection and wiring”.

When connecting the earth, ensure that all connected cable terminals are properely tight and protected from mechanical forces.

CAUTION

For safety reasons, the earth resistance of the installation must be measured. This must be established before the first start up of the plant and with the drive disconnected.

It is the responsibility of the installer to provide the appropriate number, type and section of cables for the ground conductor in accordance with the characteristics of the equipment used and the plant to minimize ground resistance, which must comply with local and national regulations.

EMC Installation Requirements

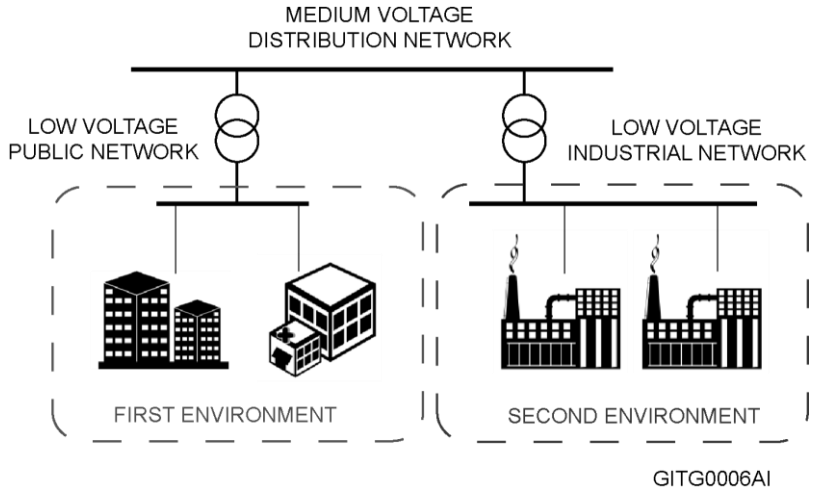
Introduction

The EMC European Directive defines electromagnetic compatibility as the capability of an apparatus, an industrial plant, or a system to work satisfactorily in the electromagnetic environment without at the same time causing electromagnetic disturbances in the apparatus, industrial plant or systems present in the same environment.

The Electromagnetic Compatibility (EMC) depends on two main characteristics of the equipment: Electromagnetic Interference (EMI) and Electromagnetic Susceptibility (EMS). The EMC standards aims to ensure that all the electrical equipment that could operate simultaneously in the same environment are compatible. This means that the interference immunity of all the devices is greater than the interference emission of all the devices within the same environment.

The EMC requirements for Power Drive System (PDS) are defined in IEC/EN 61800-3 standard that is included in the Declaration of conformity CE enclosed. In the European Union, EN61800-3 standard takes priority over all generic standards. The PDS in the context of this standard comprises the drive converter, the motor cables and the motor. Therefore, the installer as the ultimate responsible must follow the installation instructions given within this manual.

Depending on the location of the drive, the standards define four categories distributed in two environments.



Environments definition

- *First Environment:* Domestic installations. It also includes premises directly connected to a low-voltage power supply network without an intermediate transformer which supplies buildings used for domestic purposes such as shopping malls, cinemas, hospitals…
- *Second environment*: Industrial installations. Second Environment includes all plants other than those directly connected to the public low-voltage network which supplies buildings used for domestic purposes, e.g. factories and those other premises supplied by their own dedicated transformer.

The two environments are divided in four categories C1 to C4 that are summarized in the following table.

	FIRST ENVIRONMENT		SECOND ENVIRONMENT	
	C1	C2	C3	C4
Restricted Installation [1]	NO	YES	YES	YES [2]

Notes

[1] “Restricted Installation” means that the installation and commissioning must be carried out by specialist personnel.

[2] C4 Category applies only for complex systems or when ratings are equal or above to 1000 V or 400 A wich are unable to comply with the limits of C3 Category. In these cases, C4 Category can be achieved by adjusting the equipment in situ and applying the EMC recommendations.

SD750 compliance

SD750 variable speed drives have been designed for the industrial use (Second Environment). The implementation of radio frequency interference filters (RFI filters) and dV/dt filters as standard, and the correct installation following the recommendations within this manual, permit to achieve compliance with C3 category defined in IEC/EN 61800-3.

Optionally, the SD750 drive with non-floating earth can be installed in residential areas (First Environment) by employing optional RFI filters that permit to achieve the C2 category.

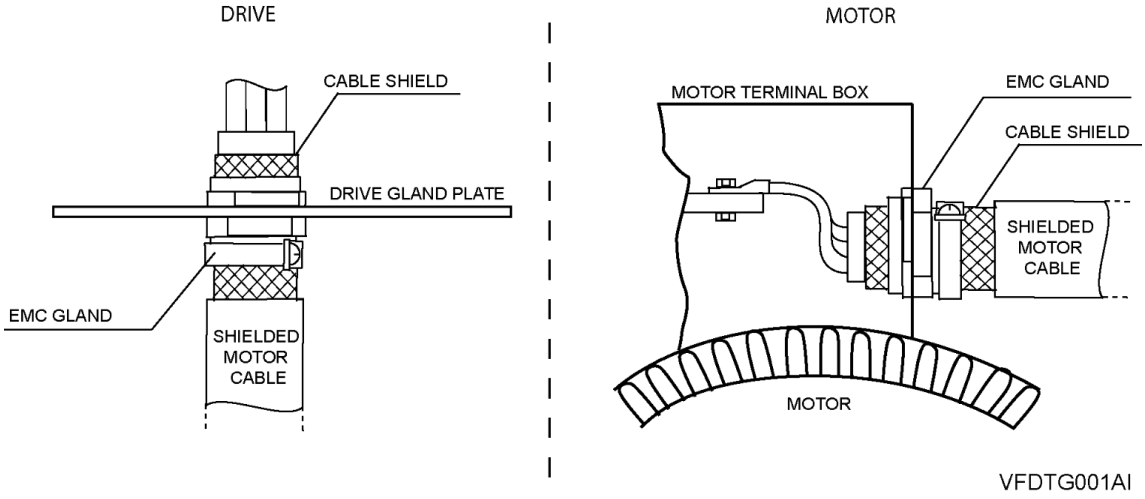
The SD750 is not a retail unit. It is neither a plug in device nor a movable device and it is intended to be installed and commissioned by qualified personnel. Therefore, C1 category will not be required.

The SD750 with floating earth configuration can be installed in industrial (Second Environment) IT grids. Although it does not integrate RFI filters, following the installation recommendations within this manual and with its integrated dV/dt filter, it achieves the C3 category defined in IEC/EN61800-3.

Connection

The SD750 do not require the use of shielded motor cable to achieve compliance with C3 category, when a correct installation is made. Wiring and Installation recommendations are included in sections “Power Connection and Wiring” and “Ground Connection”.

In shielded cables it is recommended to connect the shield by making 360° contact in both the drive cabinet and the motor terminal box. As an example, EMC cable glands can be installed as shown in the next figure.



Correct output motor cables shield bonding

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It is recommended to use shielded cable for control signals and to follow recommendations included in section ”Wiring Recommendations”.

CAUTION

Select communication and control system according to the drive EMC environment. Otherwise, systems could suffer from interferences due to a low EMS level.

Protections

Short circuit

The SD750 includes from frame 5 to 11 ultra fast input protection fuses as standard. Frame 5 includes one fuse per phase with a rated current that depends on the drive’s nominal current. From frame 6 upwards, the fuses per phase depend on the number of modules (frame 5) interconnected. The main characteristics of these fuses are shown in the following table.

FUSE CHARACTERISTICS						
In (A)	Ic @ Un (A)	I^2t @ 1ms I^2t_p (A^2s)	I^2t @ Un (A^2s)	Un (V)	Manufacturer	Model
350A	200kA	10500	55000	690VAC	FERRAZ-SHAWMUT	PC31UD69V350TF
450A	200kA	26500	140000	690VAC	FERRAZ-SHAWMUT	PC31UD69V450TF

However, it is not recommended to install the drive at points where the short-circuit current available is higher than 200kA. If necessary, install general fuses with a greater breaking capacity and with fastest overcurrent capacity.

380-500Vac		
FRAME	**CODE**	**FUSES PER PHASE (In)**
5	SD750320 5B06DEF	1x350A
	SD750400 5B06DEF	1x450A
6	SD750450 5B06DEF	2x350A
	SD750570 5B06DEF	2x350A
	SD750700 5B06DEF	2x450A
7	SD750800 5B06DEF	3x350A
	SD750900 5B06DEF	3x350A
	SD751050 5B06DEF	3x450A
8	SD751040 5B06DEF	4x350A
	SD751400 5B06DEF	4x450A
9	SD751550 5B06DEF	6x350A
	SD751800 5B06DEF	6x350A
	SD751950 5B06DEF	6x450A
10	SD752250 5B06DEF	9x350A
	SD752750 5B06DEF	9x450A
11	SD753100 5B06DEF	12x350A

Recommended protections for drives Frame 1 to Frame 4 are shown up next; they do not integrate fuses. However, it should be noticed that the equipment installer must calculate the appropriate protection for the application considering that the fuse complies with the following requirements:

- Ultra-fast operation
- Class aR according to VDE 636-23 and IEC 60269-4.
- Recommended for drive protection use.

400-500 Vac. 6 PULSOS		
FRAME	**CODE**	**FUSE CALIBER In**
1	SD750006 5B06DEF	16
	SD750008 5B06DEF	16
	SD750011 5B06DEF	16
	SD750015 5B06DEF	20
	SD750024 5B06DEF	25
	SD750030 5B06DEF	40
	SD750040 5B06DEF	50
2	SD750048 5B06DEF	63
	SD750060 5B06DEF	80
	SD750075 5B06DEF	100
3	SD750095 5B06DEF	125
	SD750110 5B06DEF	160
	SD750145 5B06DEF	200
	SD750180 5B06DEF	250
4	SD750200 5B06DEF	250
	SD750260 5B06DEF	315

Ground fault protection

The drive is equipped with an internal software that protect the motor and the drive against input and output unbalanced currents. For further information, see Programming and Software Manual.

This function is not intended to protect people against direct or indirect contacts or against fire, so an external protection must be provided to ensure that a substantial ground fault current is promptly interrupted. The SD750 drives are suitable to operate with RCD components Type B, if it is required. The EMC / EMC filters and motor cable lengths increase the earth leakage currents, so the protection range is set according to the installation conditions. For additional information, contact Power Electronics.

Motor thermal protection

The drive includes a motor thermal protection based on the motor performance parameters which mathematically calculates the remaining heating capacity in the motor. When this reservoir is reduced below the limits, this is, the motor temperature approaches the maximum, the drive automatically stops the motor. For further information consult the Software and Programming Manual.

The drive includes as standard a PTC connection that permits monitor the motor temperature. Once connected and configured, the drive could either stop the motor or generate a warning signal.

Other Protections

Apart from the protections mentioned above, the drive implements additional protections such as Temporary loss of power, automatic re-start, high and low input and output voltage, overload or underload of the pump, etc. For further information, consult the Software and Programming Manual.

Safety Stop Function – STO (Safe Torque Off)

The Safety Stop Function allows the drive's output to be disabled so that the drive cannot provide power or generate torque in the motor.

The Safe Torque Off function complies with EN ISO 13849-1 PLd and EN 61508 SIL3 (EN60204-1, stop category 0). This feature is standard and allows you to comply with current safety standards. For more information see section "STO - Safe Torque Off".

IT Grids – Floating Earth drives

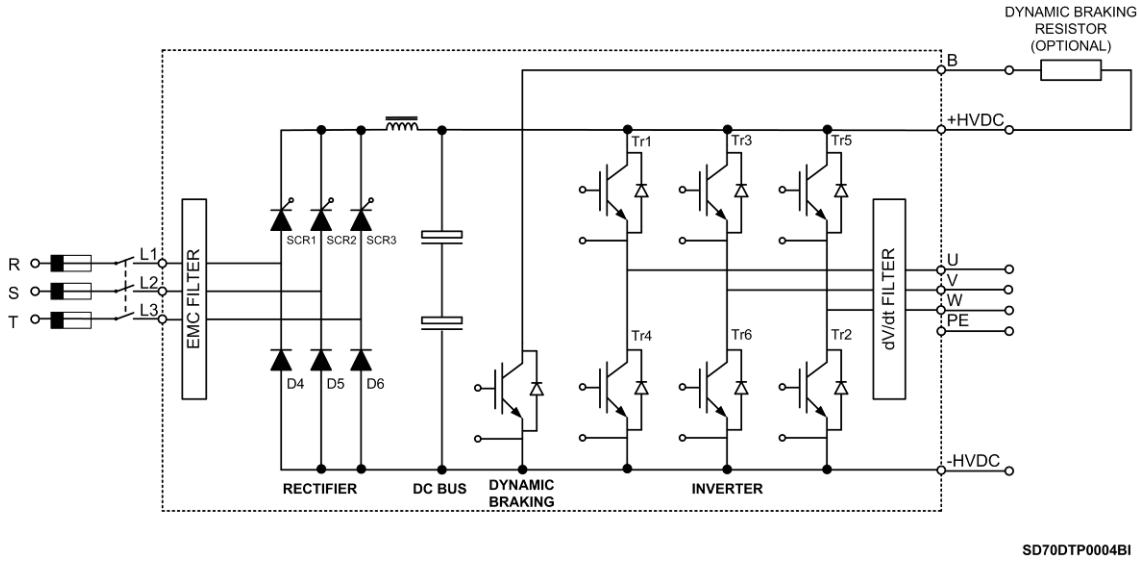
When planning an IT grid electrical installation select the drive for floating earth operation. Check the drive reference and make sure that the drive is suitable for this type of installations.

IT grids must be equipped with an insulation monitoring system. To adjust the parameters consider that the drive has a very high impedance even if there is a large number of equipment working in parallel in the same IT network.

It is recommended the installation of lightning rods to ground in order to protect against transient overvoltages. The lightning rod must have a rated voltage greater than the drive rated voltage for the purpose of preventing its operation during normal conditions.

Dynamic Braking Resistors for Equipment of Frames 1 and 2

Frames 1 and 2 equipment include the built-in dynamic brake as standard. The user should only connect a resistor between terminals +HVDC and B as the following drawing shows.



Power electronics for Frames 1 and 2 equipment

Resistor Values for Dynamic Brake (Optional)

FRAME	CODE	I(A) Rated	Motor Power (kW) at 400VAC	Dynamic Braking Resistor (Ω)	Power of Braking Resistor (kW)
1	SD750006 5B06DEF	3	1,5	375	1,5
	SD750008 5B06DEF	6	2,2	250	2,2
	SD750011 5B06DEF	9	4	140	4
	SD750015 5B06DEF	12	5,5	100	5,5
	SD750024 5B06DEF	18	7,5	75	7,5
	SD750030 5B06DEF	24	11	50	11
	SD750040 5B06DEF	32	15	40	15
2	SD750048 5B06DEF	38	18,5	30	18,5
	SD750060 5B06DEF	48	22	25	22
	SD750075 5B06DEF	60	30	18	30

Note: This table is based on a 100% enable duty (ED). For other ED's different from 100%, braking resistors with the same ohmic value shall be used and their power shall be calculated by multiplying the power of said resistance to 100% (value of the table) by the new ED. Enable Duty means the time the resistor is working (regeneration). Resistors for 100% of ED = continuous operation. For example, in case of ED of 30%, it will be multiplied by 0.3.

Terminals of the Resistor for Dynamic Brake

The terminals of the dynamic braking resistors are:

TERMINAL	DESCRIPTION
B1, B2	Connection terminals for connecting the resistor with the integrated dynamic brake terminals in the drive.
TH1, TH2 [1]	Thermal sensor of the resistor. The status will change according to the temperature. - For normal temperature (ambient): Normally closed (NC) (TH1 – TH2 closed contact). - In case of resistor over temperature: Normally open (NO) (TH1 – TH2 open contact). Connect this signal to a terminal of one digital input of the drive configured as 'external fault'.

[1] Terminals TH1 and TH2 will be available when the used braking resistor is equipped with thermal sensor.

Note: It is recommended to use braking resistors equipped with thermal sensors. Connect the thermal sensor to one digital input of the drive and configure this input as 'external fault'.

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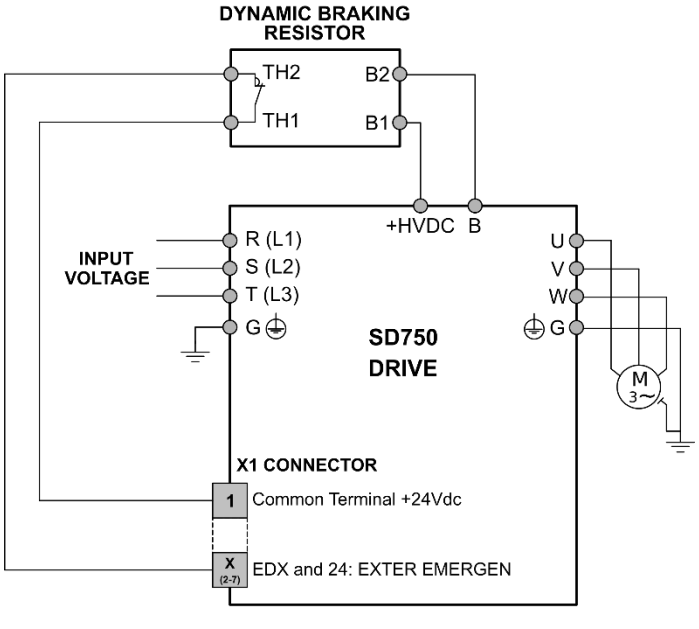
Connection Drawing

The following figure shows the connection between the optional external resistor for the built-in dynamic brake and the drive.



Connection drawing of the resistor for the dynamic brake in equipment of Frames 1 and 2

Notes:

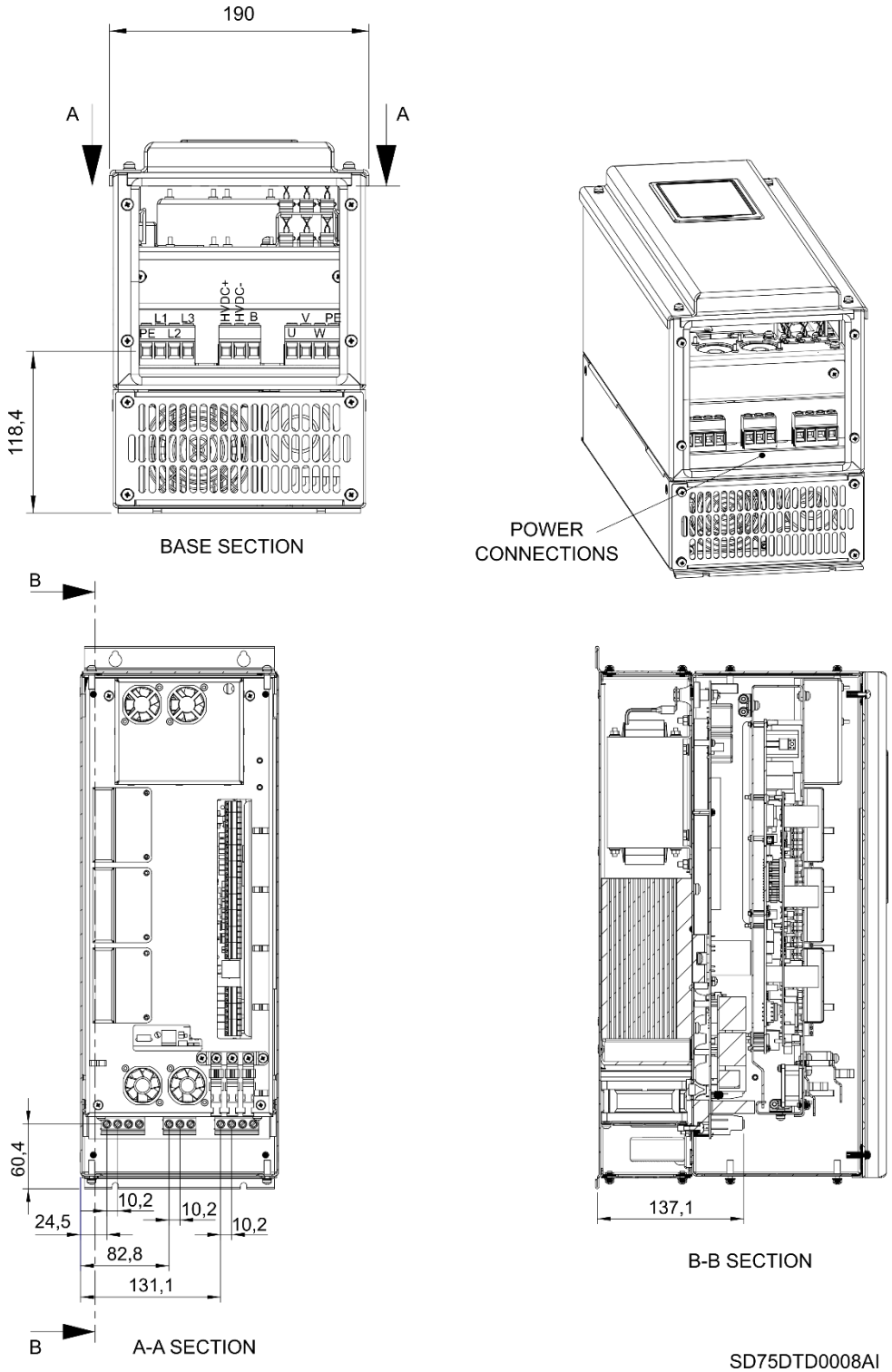
- The braking resistor should be non-inductive.
- To connect the sensor to the drive it is recommended to use shielded cable.
- The maximum cable length between the drive and the external braking resistor is 20m. For other configurations, contact Power Electronics.

CAUTION

Do not touch the braking resistor during drive operation. It can reach T > 150ºC. If you omit this precaution there is a high risk of burns and / or abrasion.

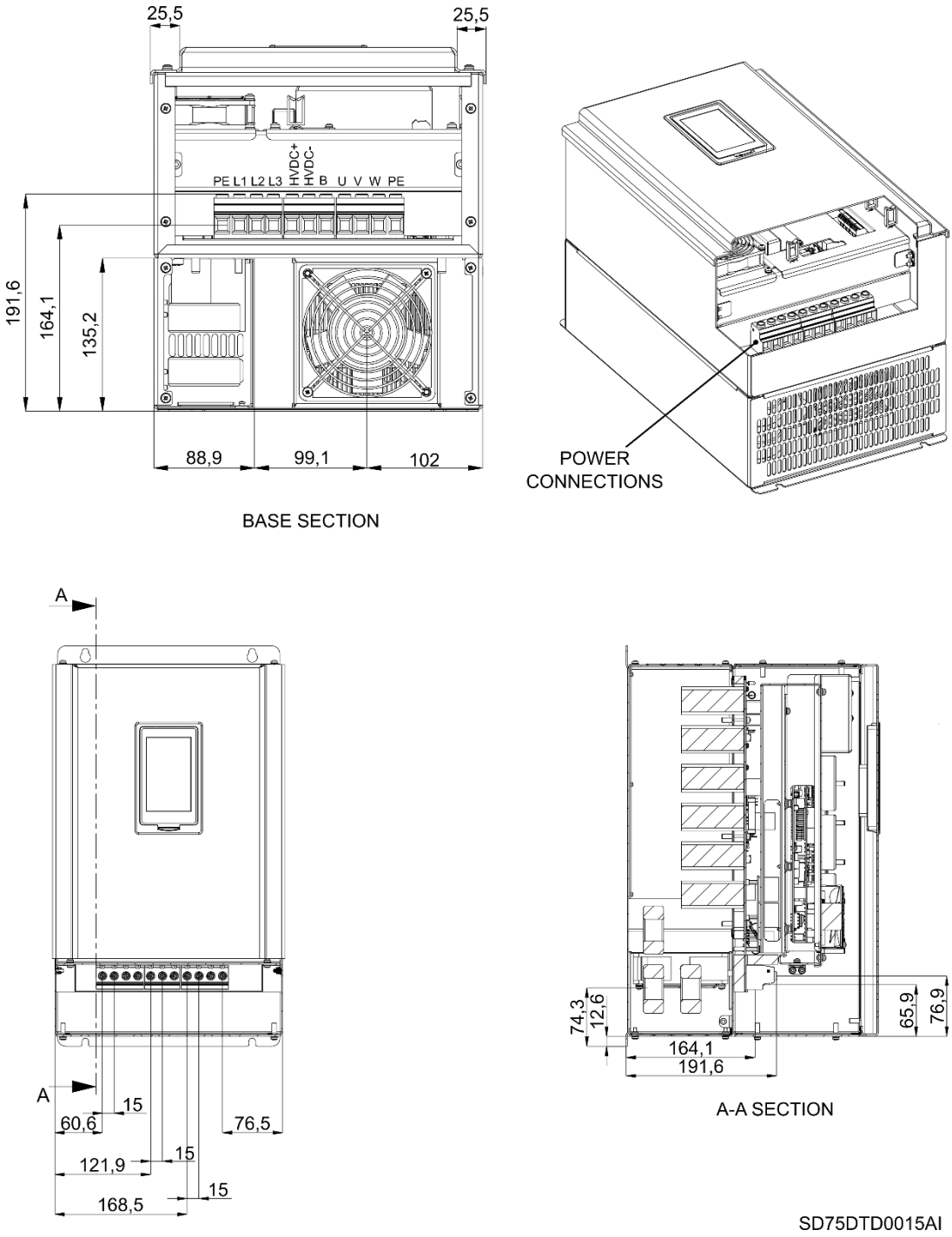
Power Terminals

Connections for Frame 1



Power connections location in Frame 1 equipment [mm]

Connections for Frame 2



Power connections location in Frame 2 equipment [mm]

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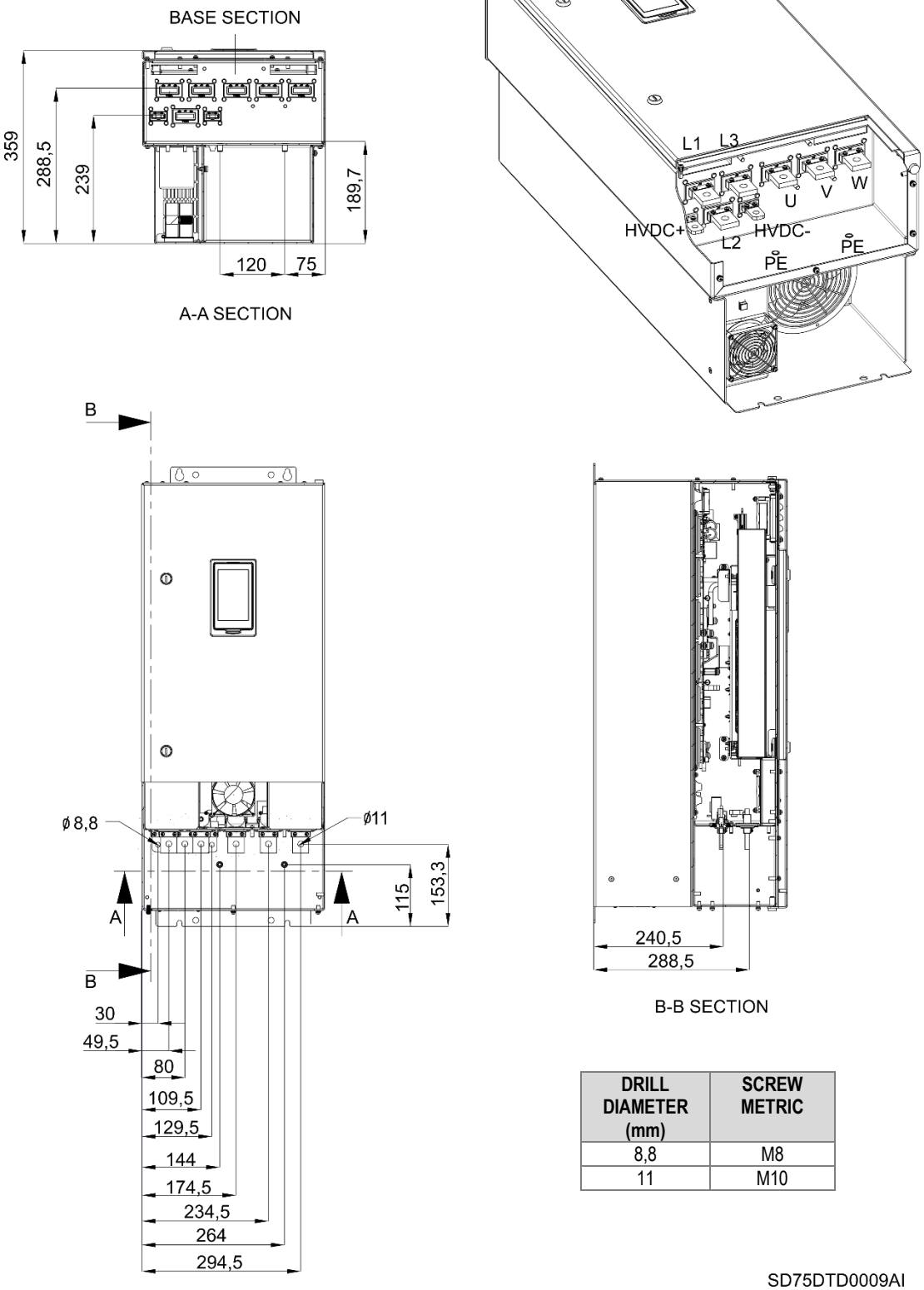
Connections for Frame 3

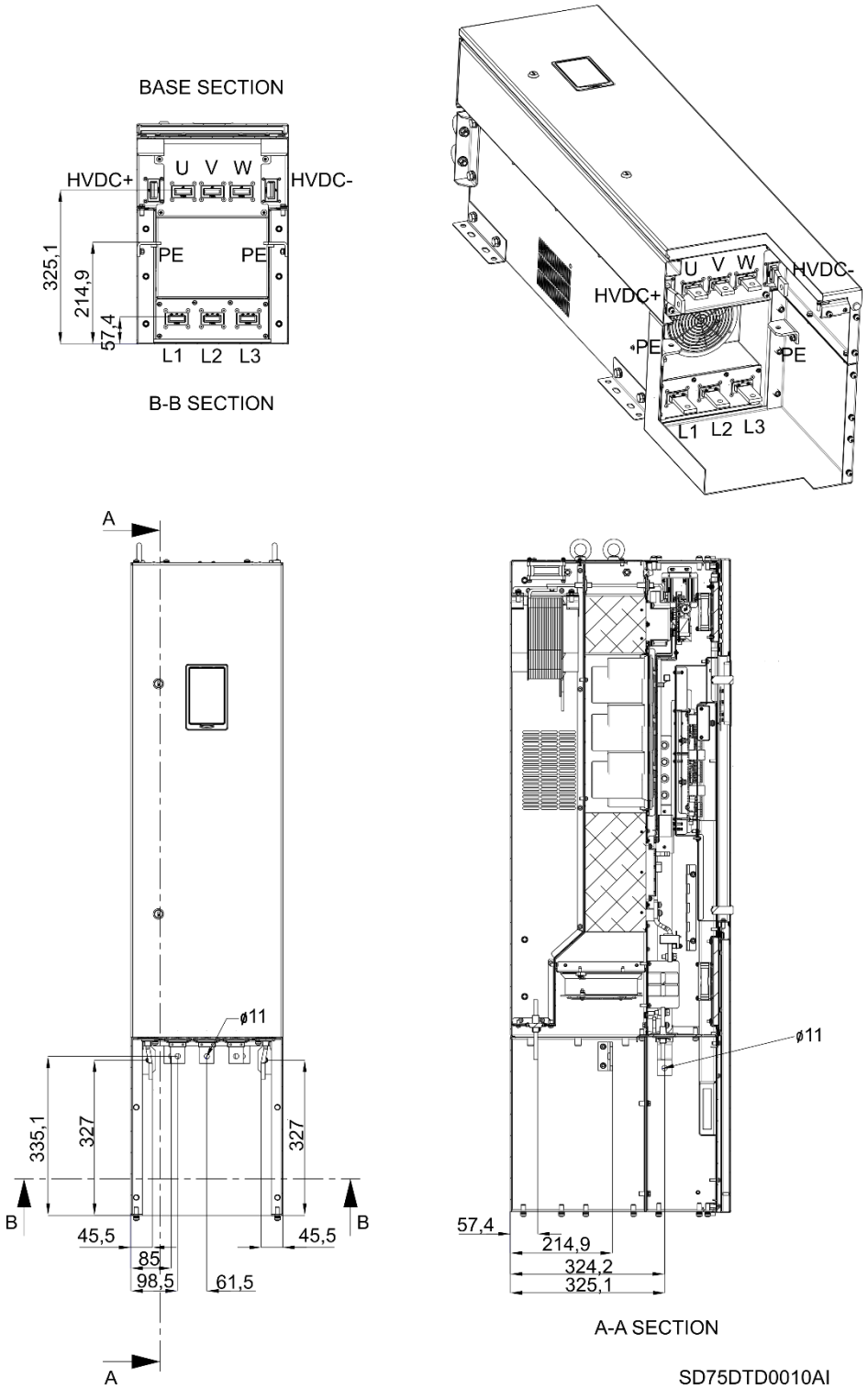


DRILL DIAMETER (mm)	SCREW METRIC
8,8	M8
11	M10

SD75DTD0009AI

Power connections location in Frame 3 equipment [mm]

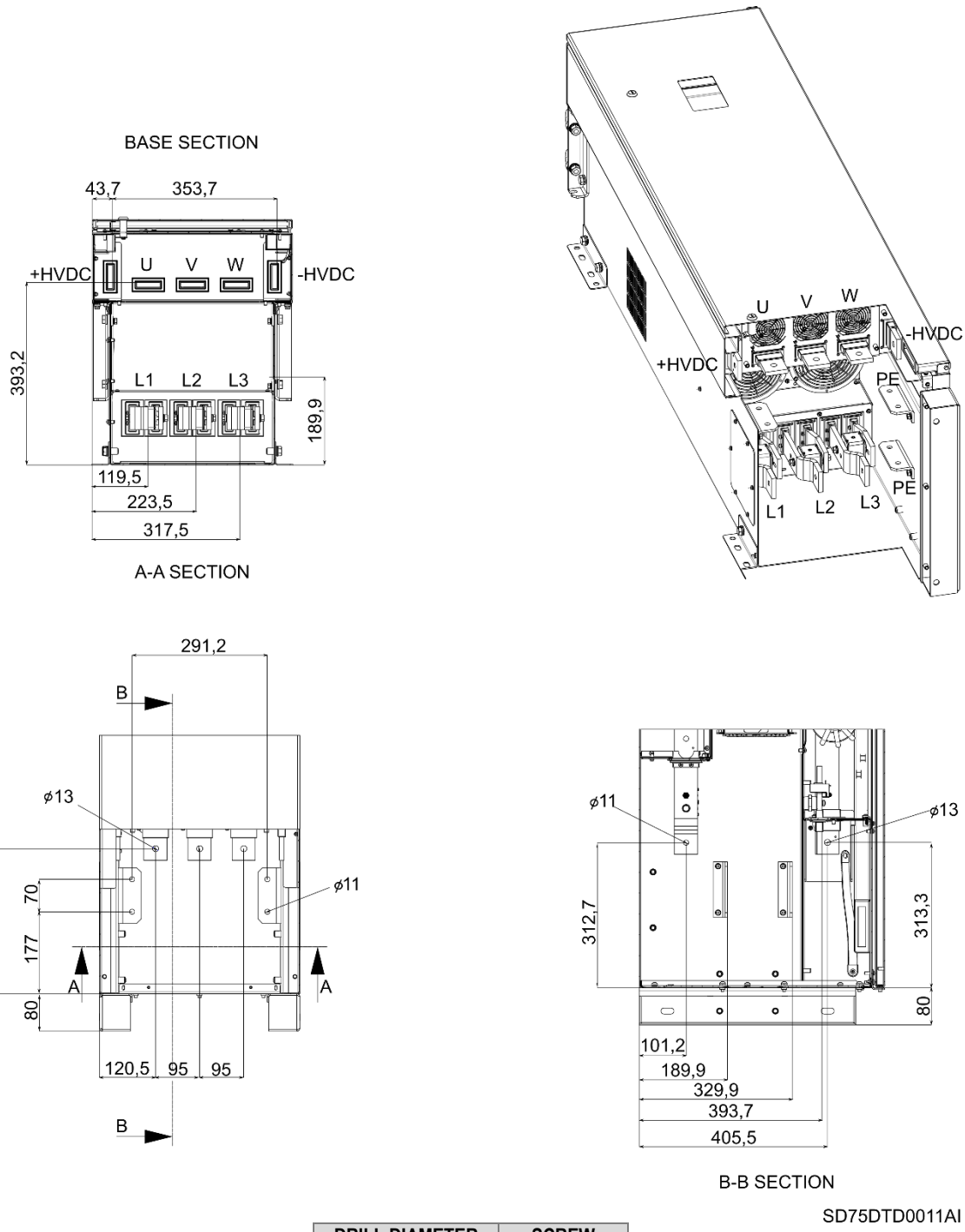
Connections for Frame 4



DRILL DIAMETER (mm)	SCREW METRIC
11	M10

Power connections location in Frame 4 equipment [mm]

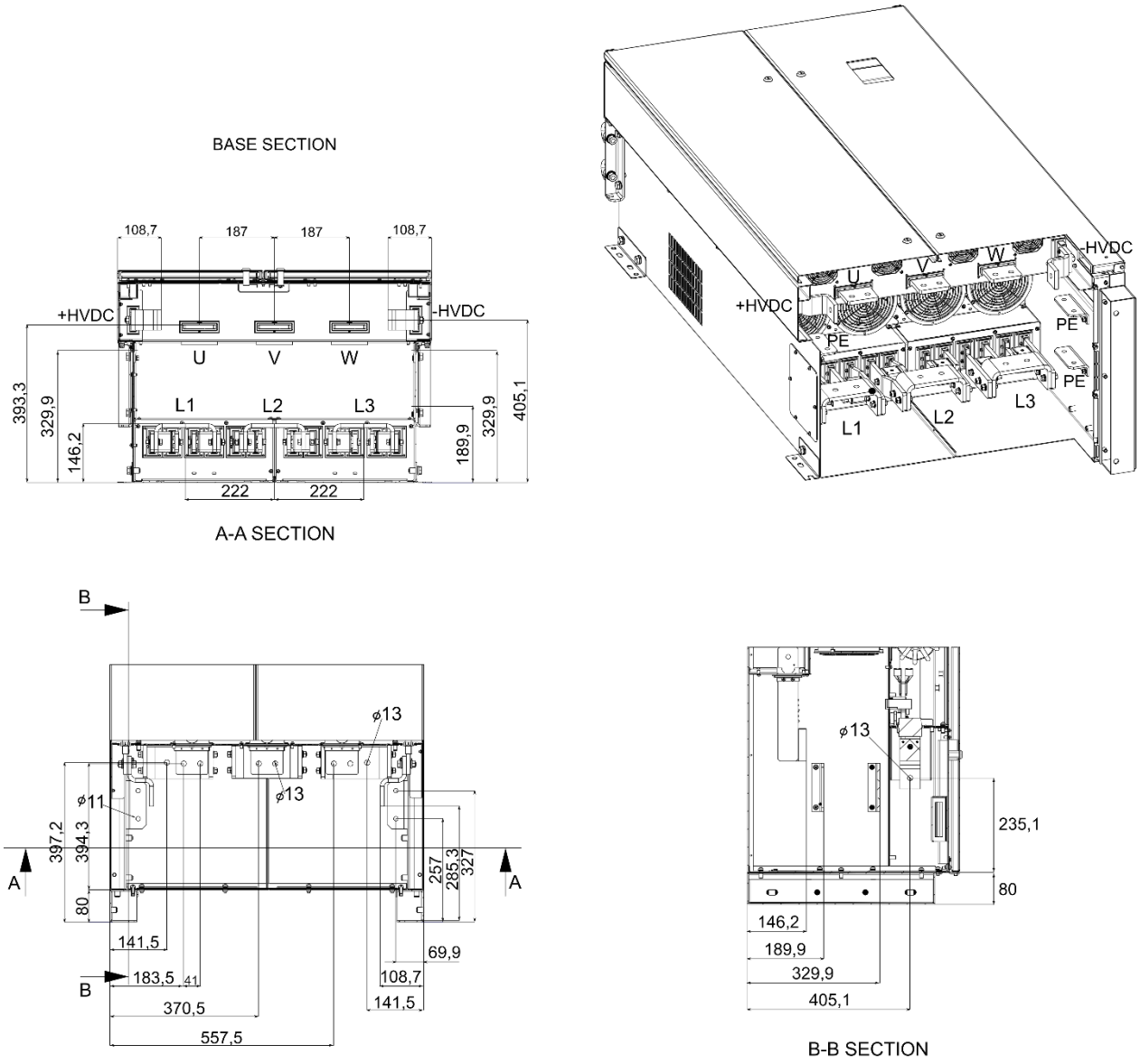
Connections for Frame 5



DRILL DIAMETER (mm)	SCREW METRIC
11	M10
13	M12

Power connections location in Frame 5 equipment [mm]

Connections for Frame 6



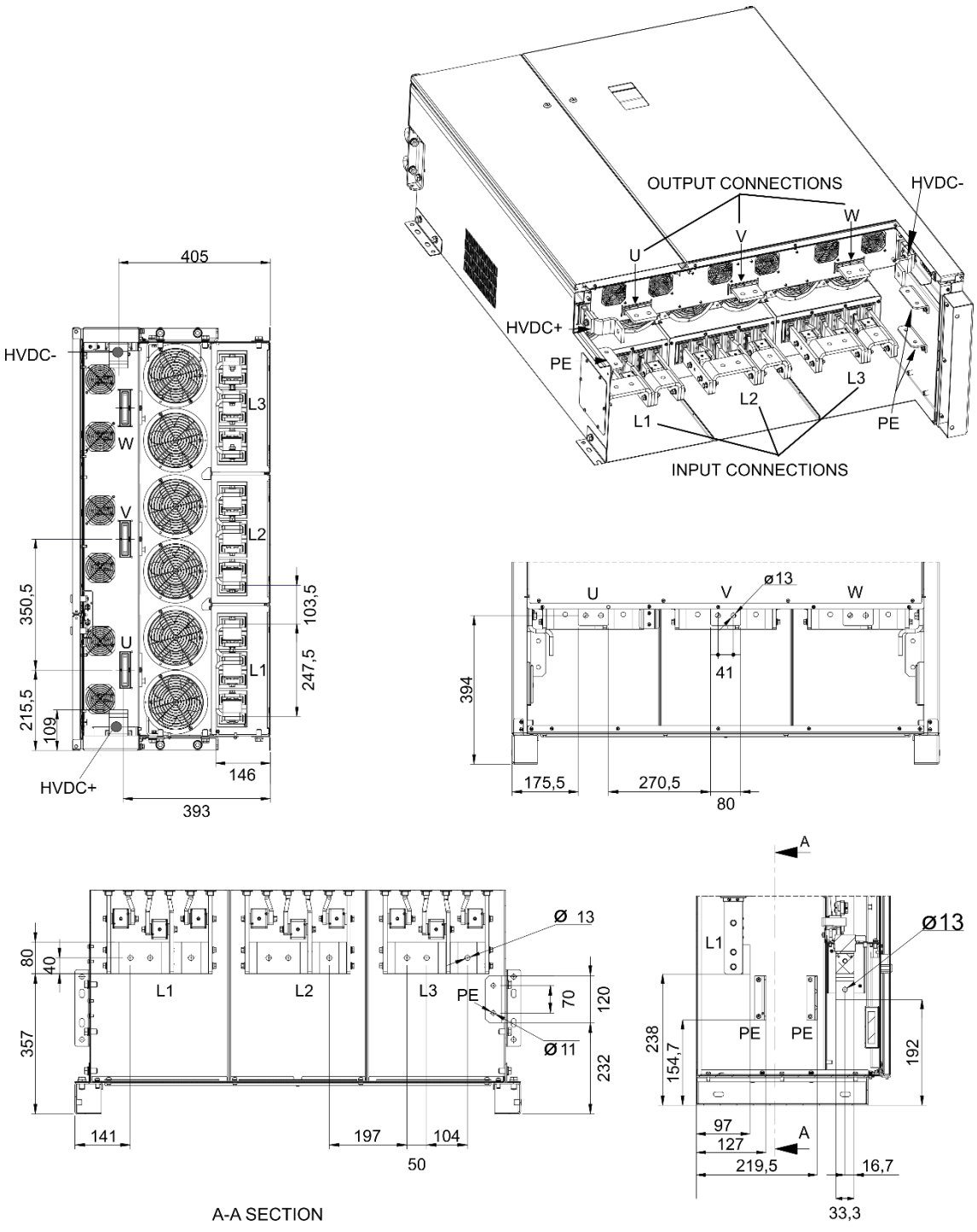
SD75DTD0012AI

DRILL DIAMETER (mm)	SCREW METRIC
11	M10
13	M12

Power connections location in Frame 6 equipment [mm]

EN

Connections for Frame 7

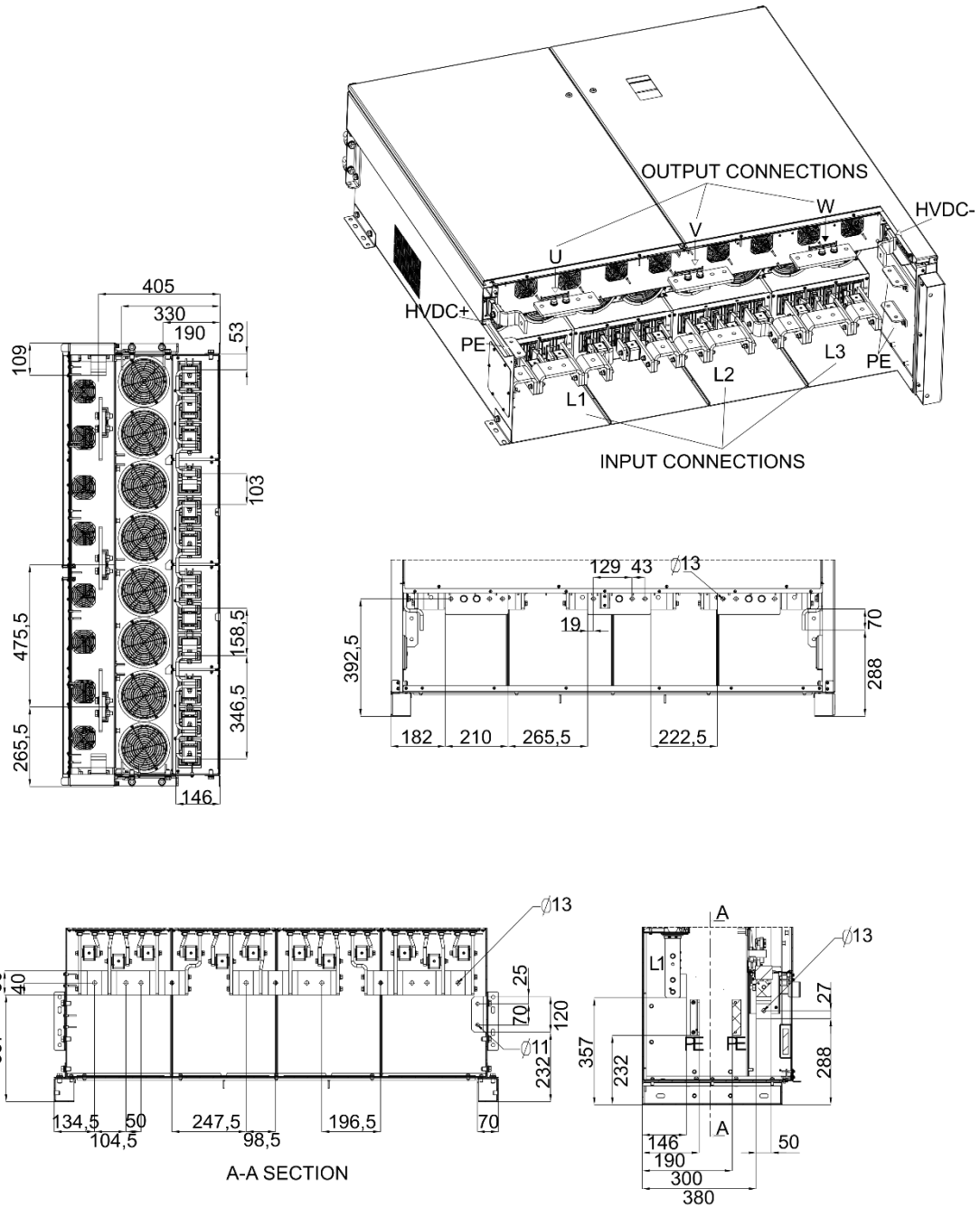


SD75DTD0016AI

DRILL DIAMETER (mm)	SCREW METRIC
11	M10
13	M12

Power connections location in Frame 7 equipment [mm]

Connections for Frame 8

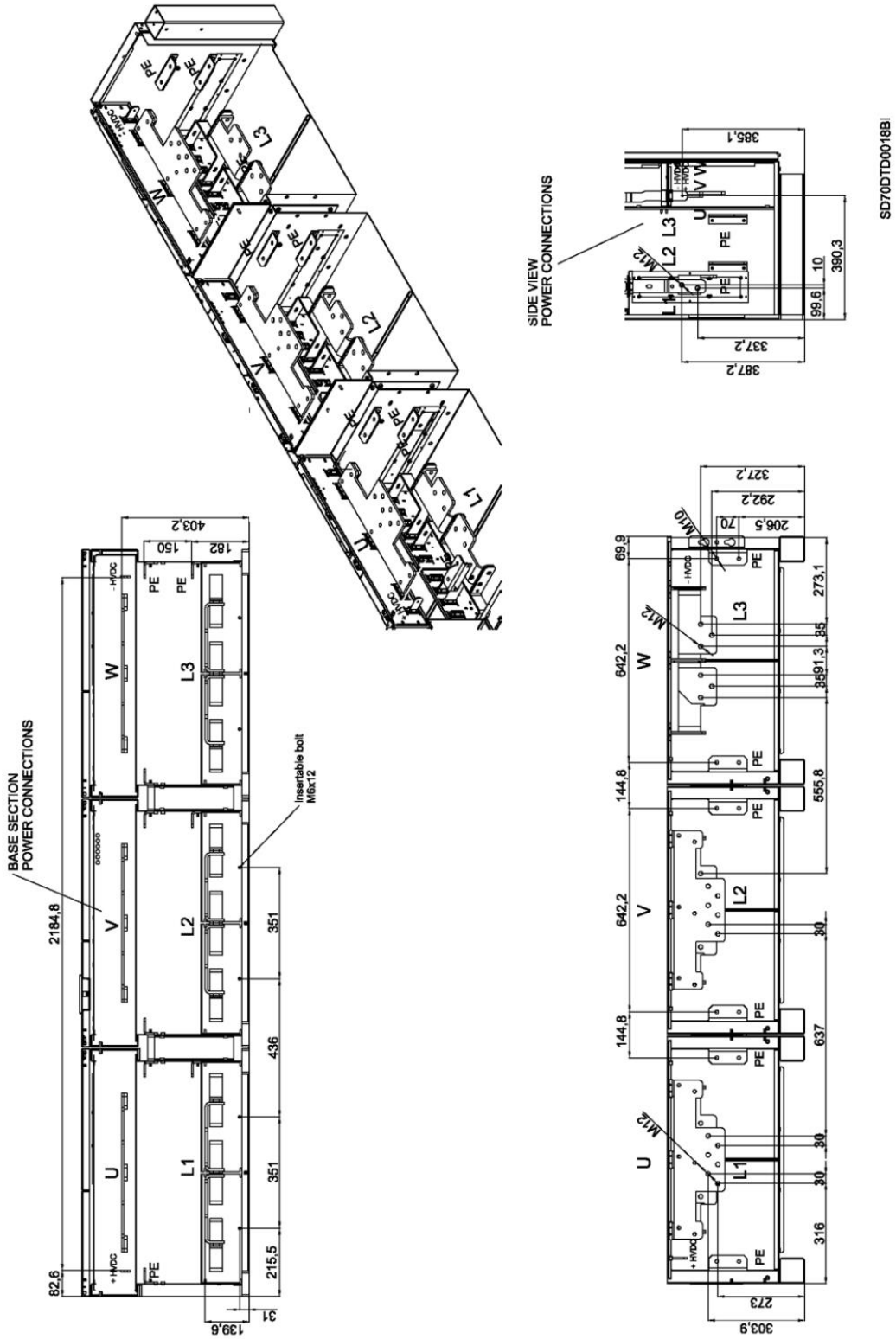


DRILL DIAMETER (mm)	SCREW METRIC
11	M10
13	M12

Power connections location in Frame 8 equipment [mm]

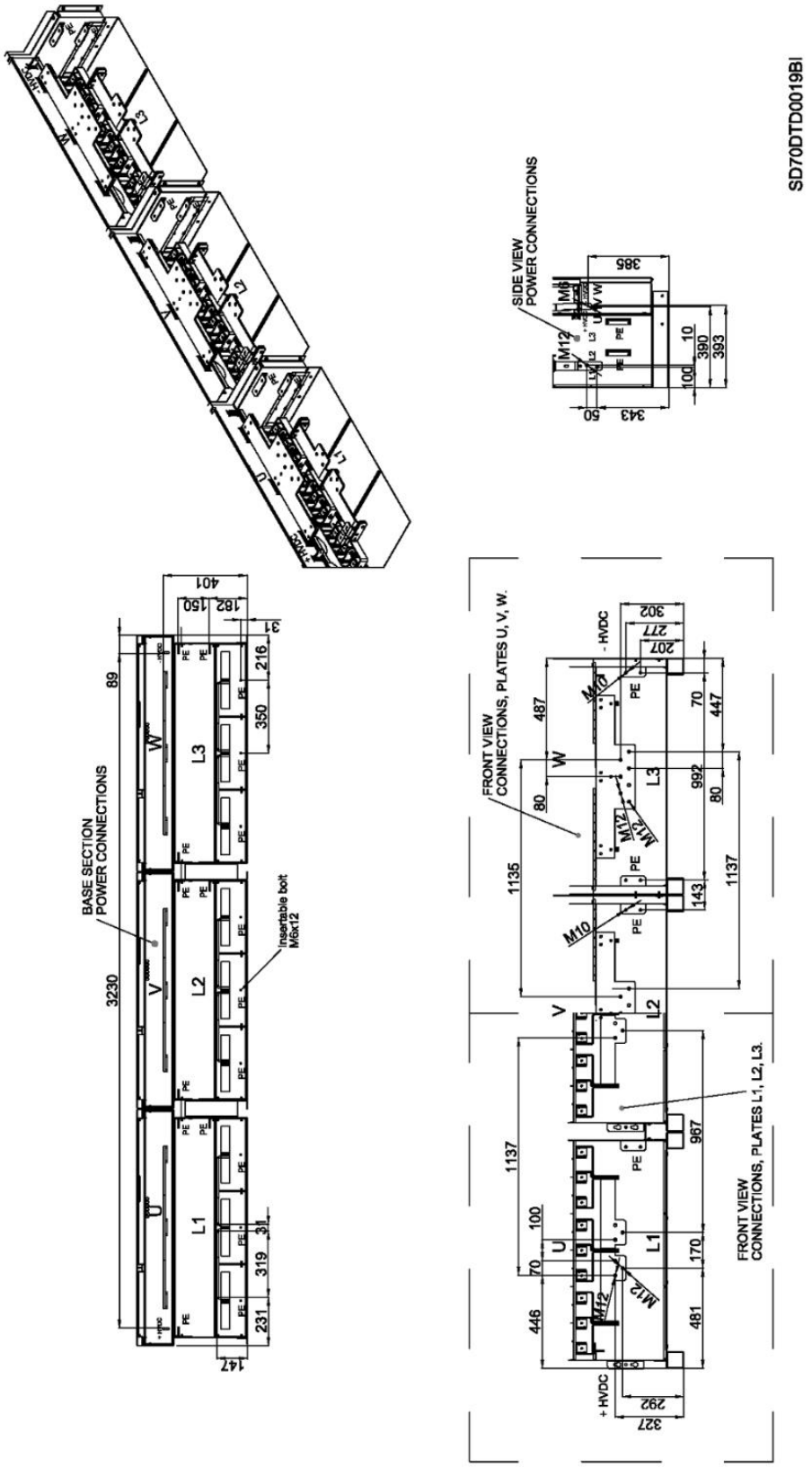
EN

Connections for Frame 9



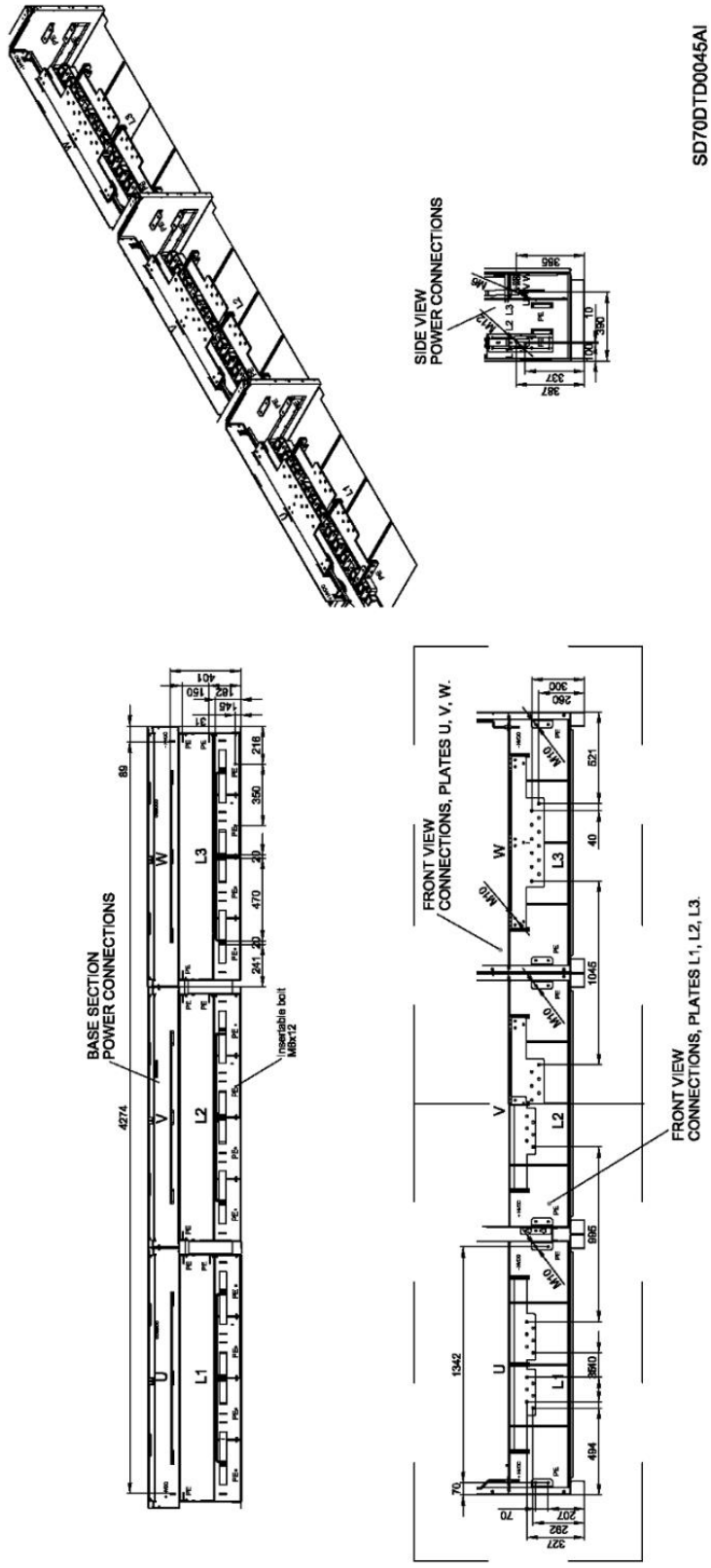
Power connections location in Frame 9 equipment [mm]

Connections for Frame 10



Power connections location in Frame 10 equipment [mm]

Connections for Frame 11



Power connections location in Frame 11 equipment [mm]

CONTROL CONNECTION

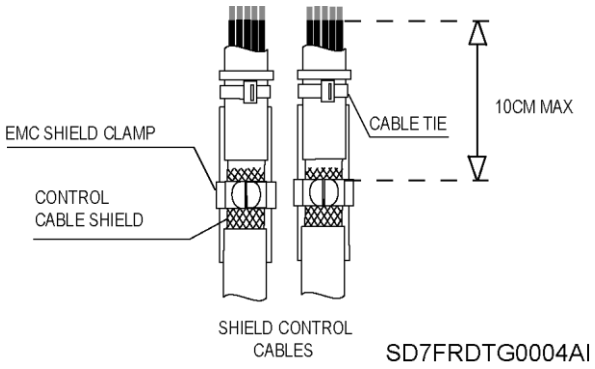
8

EN

Wiring Recommendations

Before planning the installation, follow and understand the next recommendations. The parallel cable routing should be avoided and the distance between the control wiring and the power wiring should be maximized. It is recommended to route control cables with different voltages in separately cable racks, trays or ducts.

It is recommended to use shielded cable for all the data, signal or control cables coming from the variable speed drive. Each cable must have an EMC clip that secures an effective ground shield, making a contact of the 360º shield.



Shield bonding

Cable shields for digital signal must be grounded at both ends of the cable. It is recommended to use independent shielded cables for digital and analogue signals. When using multiple analogue signals, do not use common return for them. If using analogue signals, a low-interference is experienced (hum loops), disconnect the shield grounding from one of the ends. The maximum section for the control cables is 2.5mm² and the recommended tightening torque is 0.4Nm.

Although the control boards are insulated galvanically, for safety reasons it is recommended not to modify the wiring while the equipment is connected to the input power supply.

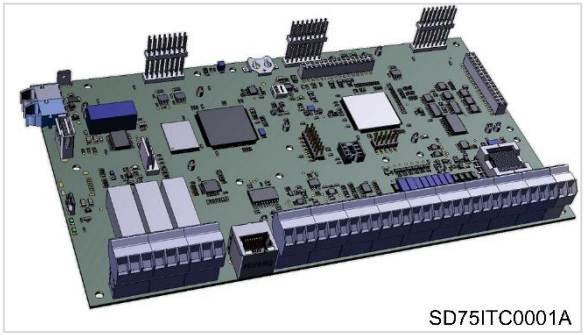
CAUTION

Any change to the control board wiring or bridges must be performed following the safety instructions indicated before. Otherwise, it could cause damage to the equipment and cause damage to people.

Control board terminals description

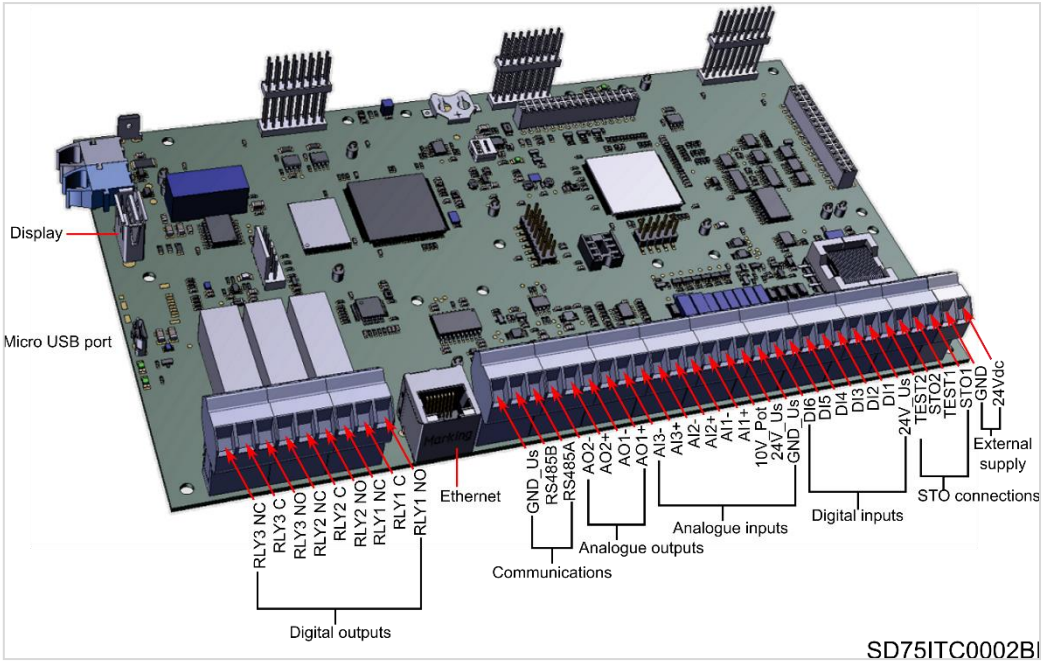
CAUTION

Any changes to the control board wiring or bridges must be performed at least 10 minutes after disconnecting the input power and after checking the bus voltage (DC Link) is discharged below 30VDC. Otherwise, you may get an electric shock.



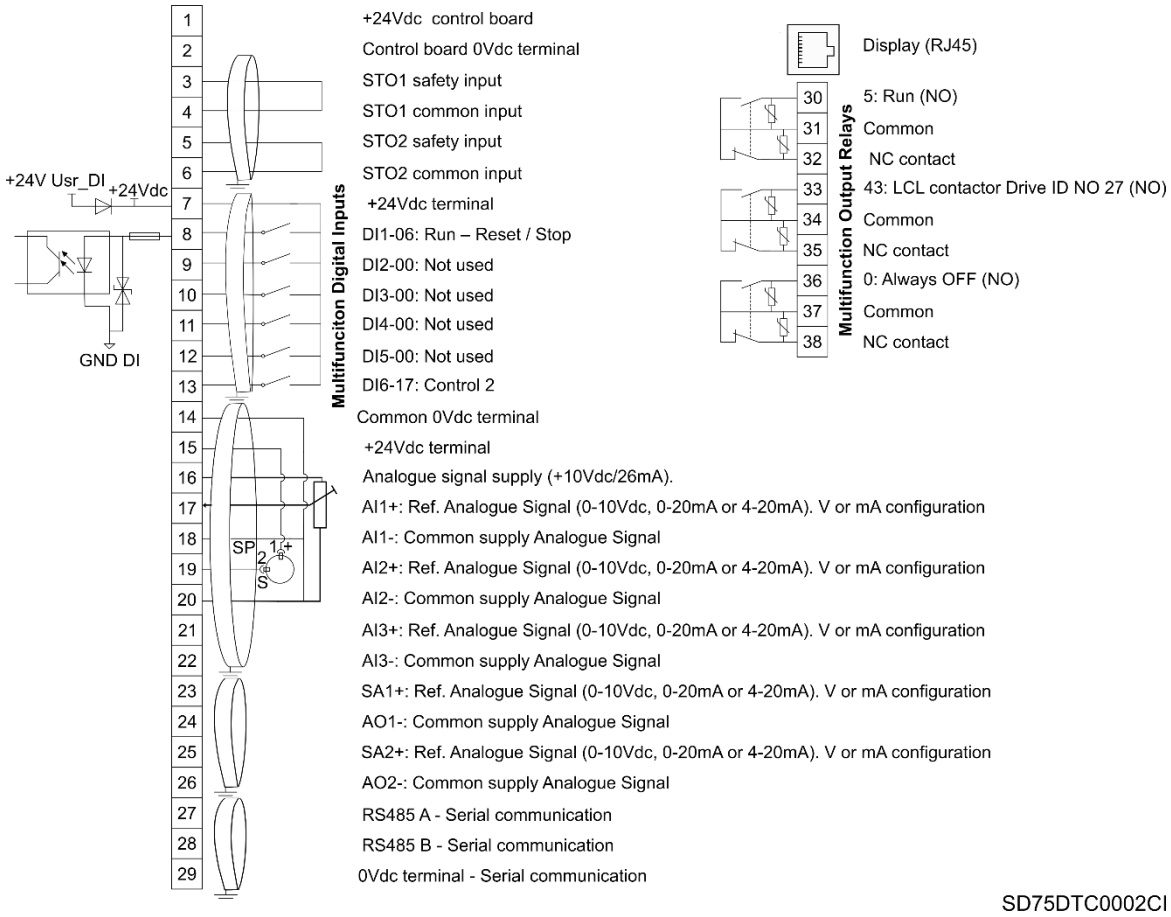
SD750 Control board

User will have access to the drive control board equipped with user interface ports and connectors. It integrates PTC connection, analogue inputs and outputs, digital inputs and outputs, DC external input power supply, RS485 communication ports, Ethernet, USB port and display connection. In addition, the board is ready for the connection of optional boards such as I/O expansion board, encoder board, communication boards, fiber optic board, etc.



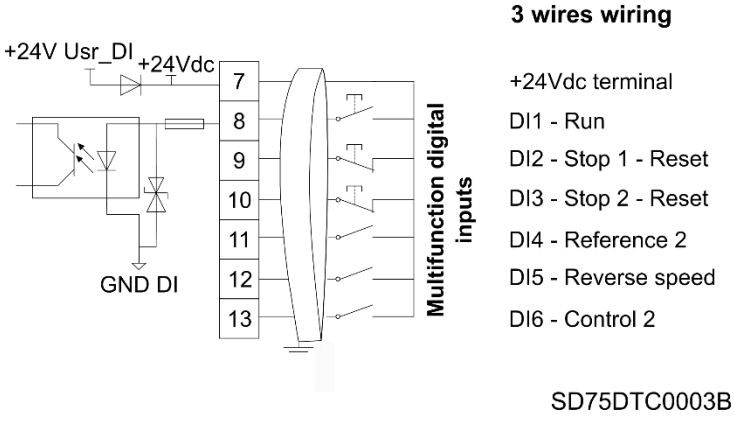
Location and description of user connectors

The following figure provides an standard wiring overview of the control terminals.



Example of control terminals standard wiring

Digital inputs can be configured individually or collectively. Analogue inputs can be configured as comparators. For further information on configurations, please refer to the Software and Programming Manual. The following figure shows the wiring detail of the X1 connector with the wiring of the three-wire start / stop buttons.



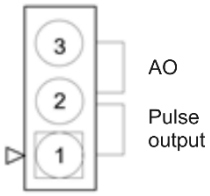
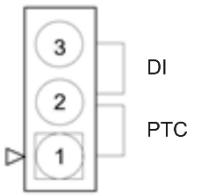
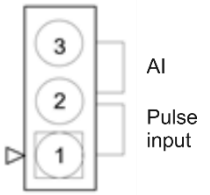
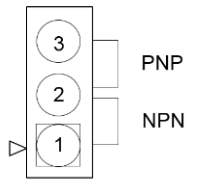
Wire control terminals wiring

	PIN	SEÑAL	DESCRIPCIÓN
EXT. SUPPLY	1	+24Vdc	Power supply 24Vdc control card.
	2	GND	GND control board.
STO FUNCITON	3	STO 1[1]	Safety input STO 1.
	4	TEST 1	Safety common input STO 1.
	5	STO 2[1]	Safety input STO 2.
	6	TEST 2	Safety common input STO 2.
DIGITAL INPUTS	7	+24V_USER	Power supply for digital intputs. Protect against short circuit and overload. (Maximum +24Vdc, 180mA).
	8	DI1	Programmable Digital Input 1 (Digital Input 1). Digital inputs are configured in the Input group. Their status can be displayed in the visualisation group. It is powered from terminal 7 or form an external power 24Vdc supply. If an external power supply is used, the common must be connected to terminal 29 (GND_USER). Programmable input as PNP and NPN [2].
	9	DI2	Programmable Digital Input 2. Same features as DI1.
	10	DI3	Programmable Digital Input 3. Same features as DI1.
	11	DI4	Programmable Digital Input 4. Same features as DI1.
	12	DI5	Programmable Digital Input 5. Same features as DI1.
	13	DI6	Programmable Digital Input 6. Same features as DI1. Besides, input configurable as digital PTC.
ANALOGUE INPUTS	14	GND_USUARIO	GND connection (0 V) for inputs
	15	+24V_USUARIO	Supply voltage for analog inputs
	16	10V_POT	10V power supply for potentiometer. Ready to supply a maximum of 2 potentiometers (R ≥ 1kΩ).
	17	AI1+	Voltage or current Programmable Analogue Input 1 (V o mA). Configurable to 0-10Vdc, 0-20mA or 4-20mA [3]. The value of the input resistance in voltage mode is Ri=20kΩ. The value of the input resistance in current mode is Ri=250Ω.
	18	AI1-	Common Analog Input 1.
	19	AI2+-	Voltage or current Programmable Analogue Input 2 (V o mA). Configurable to 0-10Vdc, 0-20mA or 4-20mA. The value of the input resistance in voltage mode is Ri=20kΩ. The value of the input resistance in current mode is Ri=250Ω.
	20	AI2-	Common Analog Input 2.
	21	AI3+-	Voltage or current Programmable Analogue Input 2 (V o mA). Configurable to 0-10Vdc, 0-20mA or 4-20mA. The value of the input resistance in voltage mode is Ri=20kΩ. The value of the input resistance in current mode is Ri=250Ω.
	22	AI3-	Common Analog Input 3.
ANALOGUE OUTPUTS	23	AO1+	Voltage or current Programmable Analogue Output 1 (V o mA). Configurable to 0-10Vdc, 0-20mA or 4-20mA.
	24	AO1-	Common Analog Ouput 1.
	25	AO2+	Voltage or current Programmable Analogue Output 2 (V o mA). Configurable to 0-10Vdc, 0-20mA or 4-20mA.
	26	AO2-	Common Analog Ouput 2.
COMMUNICATIONS	27	RS485 A	RS485 Modbus serial communication interface.
	28	RS485 B	RS485 Modbus serial communication interface.
	29	GND_USER	GND Connection.
DIGITAL OUTPUTS	30	RLY1 NO	Digital Output 1. Programmable change over relay (NO / NC). Potential free (Maximum: 250VAC, 8A; 30VDC, 8A).
	31	RLY1 C	
	32	RLY1 NC	
	33	RLY2 NO	Digital Output 2. Programmable change over relay (NO / NC). Potential free (Maximum: 250VAC, 8A; 30VDC, 8A).
	34	RLY2 C	
	35	RLY2 NC	
	36	RLY3 NO	Digital Output 3. Programmable change over relay (NO / NC). Potential free (Maximum: 250VAC, 8A; 30VDC, 8A).
	37	RLY3 C	
	38	RLY3 NC	

[1] It is recommended to use double shielded twisted-pair cable for 24Vdc power supply and safety channels. The shield must be grounded as shown in the examples.

[2] When a PNP or NPN input is configured, the rest of digital inputs will have to be the same. This means, PNP and NPN inputs cannot coexist.

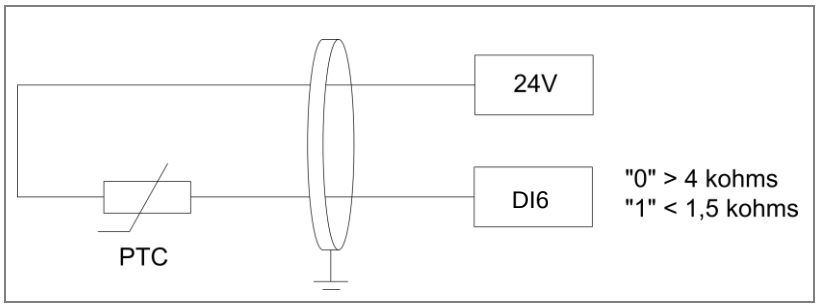
[3] Analogue inputs and outputs are configured individually and through the use of Software. In case of configuring the AI3 in mode PT100, the analogue output (any of the two) must be configured in mode 10mA.

Bridge (Signal)	Description	Positions
J18 (AO2+)	Configures AO2+ as Analogue Output or Pulse Output.	
J20 (DI6)	Configures the AI6 as Digital Input or PTC.	
J21 (AI2+)	Configures the AI2+ as Analogue Input or Pulse Input.	
J25 (DI1 a DI6)	Configures each DIx as NPN or PNP.	

DI6 (PIN13) PTC sensor input mode.

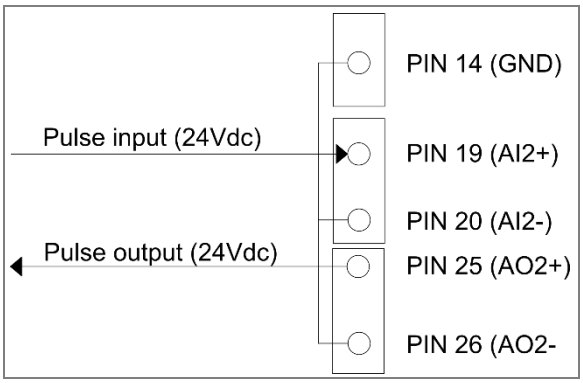
It is possible to connect a PTC sensor in the digital input 6 (DI6) so that the equipment acts from a temperatura (resistance) value associated to motor's temperature and to allow enabling cooling or stop motor running. It must be considered that sensor resistance does not exceed trigger point (pass from 1 to 0) of the DI6 when motor is under normal conditions of operation temperature. Cable ground screening must be connected only in one end.

EN



AI2/AO2 (PIN19/25) pulse input/output mode.

Both analogue input and output 2 can be configured as pulse input/output. To do so, bridge J21 must be connected in the position indicated in the table above and, besides, they must be connected to GND (PIN 14).

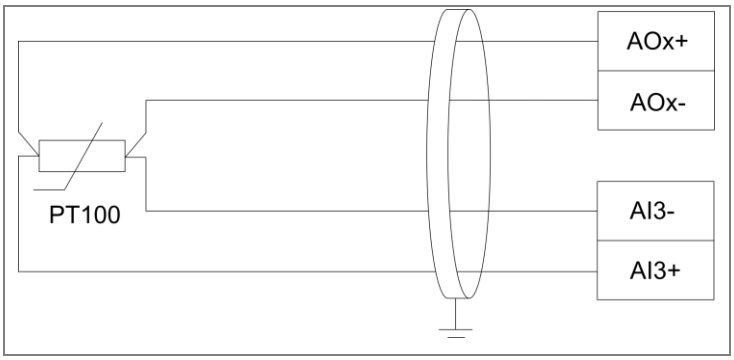


AI3 (PIN 21/22) PT100 mode.

The AI3 allows configuring a PT100 sensor. With this sensor, motor temperature can be measured continuously. Ground cable screening must be connected only in one end. For further information about parameter configuration, consult the *Software and Programming Manual.*

Measurement process:

a. Analogue output is configured in current mode.
b. Analogue input is configured in voltage mode and any of the two analogue outputs in mode 10 mA.
c. A current of 1mA (generated by the analogue output) through the PT100.
d. Voltage in the analogue input is measured.
e. With injected current and voltage, the PT100 resistance is calculated.
f. With the PT100 table, and knowing the resistance, temperature is obtained.



NOTICE

Terminals PIN14 and PIN15 can be used for other functions depending on the invertir bridge characteristics (frequency regulation by external potentiometer, analogue feedback, etc.). to avoid multiple connections in one terminal (PIN 14, PIN 15), it is advisable to add external terminals for supply distribution.

EN

STO – Safe Torque Off

The STO function is defined as: *Power, that can cause rotation, is not applied to the motor. The frequency converter will not provide energy to the motor, which can generate torque.*

For three-phase asynchronous motor, that means to stop three-phase power supply to the stator.

This function corresponds to a Category 0 Emergency Stop according to IEC 60204-1. When the drive is running and the STO function is applied, the motor will freely stop by its own inertia.

The STO function integrated as standard in the SD750 permits to achieve safety level SIL3 (PLe) for the safe stop function. SIL3 requires the use of an emergency pushbutton The maximum reaction time of STO function is less than 50ms. See section “Safety Integrity Level SIL3-PLe” for additional information.

By using this function you can safely carry out cleaning, maintenance or emergency work on non-electric parts of the equipment, without having to disconnect the power supply. In case STO safety function is not used, user must connect the corresponding terminals.

Based on a study of each application and risk assessment, the designer should define the required safety function and safety level.

CAUTION

The STO safety function does not disconnect nor the main neither the auxiliary power supply. With STO function the drive disconnects the motor power supply. To carry out electrical maintenance tasks, isolate the inverter. Particular care must be taken with the active conductors inside the inverter. Failure to do so could result in damage to equipment and personnel.

Do not use the STO function as a normal drive stop.

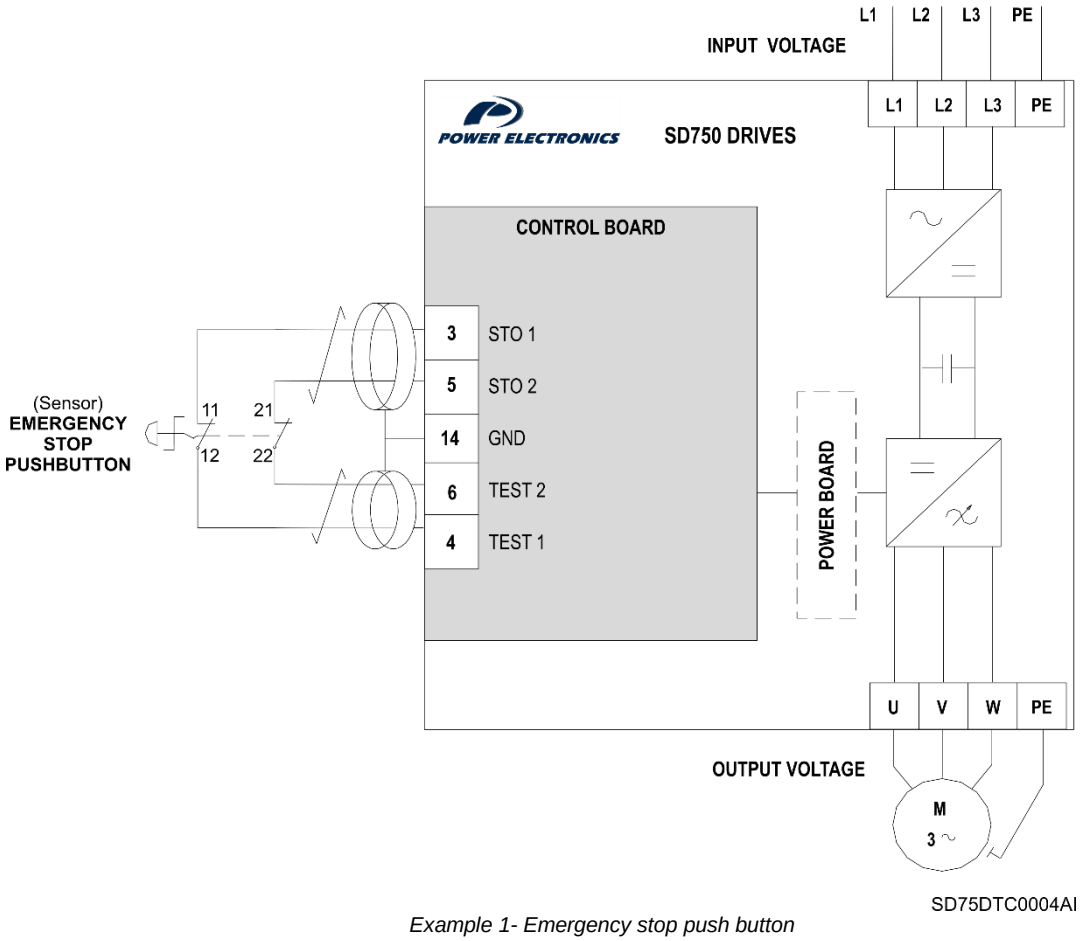
Safety Integrity Level SIL3- PLe

This configuration provides a highly reliable safety level. When the sensor is activated due to an emergency situation, the STO function interrupts the power supply to the motor. The motor will stop for its own inertia or will prevent an accidentally start.

The sensors (emergency push buttons, limit switches, etc.) must be certified as safety elements.

The value of the average probability of a dangerous failure per hour (PFH) of all elements applicable to the safety function, must not exceed the limit of the corresponding SIL level. The installation must be performed by trained personal with experience in functional safety.

Example 1: Safety function with automatic restart by emergency stop buttons (SIL3, PLe). It is mandatory that the stop button has 2 closed contacts (NC) that will be connected to the safety inputs of the relay.

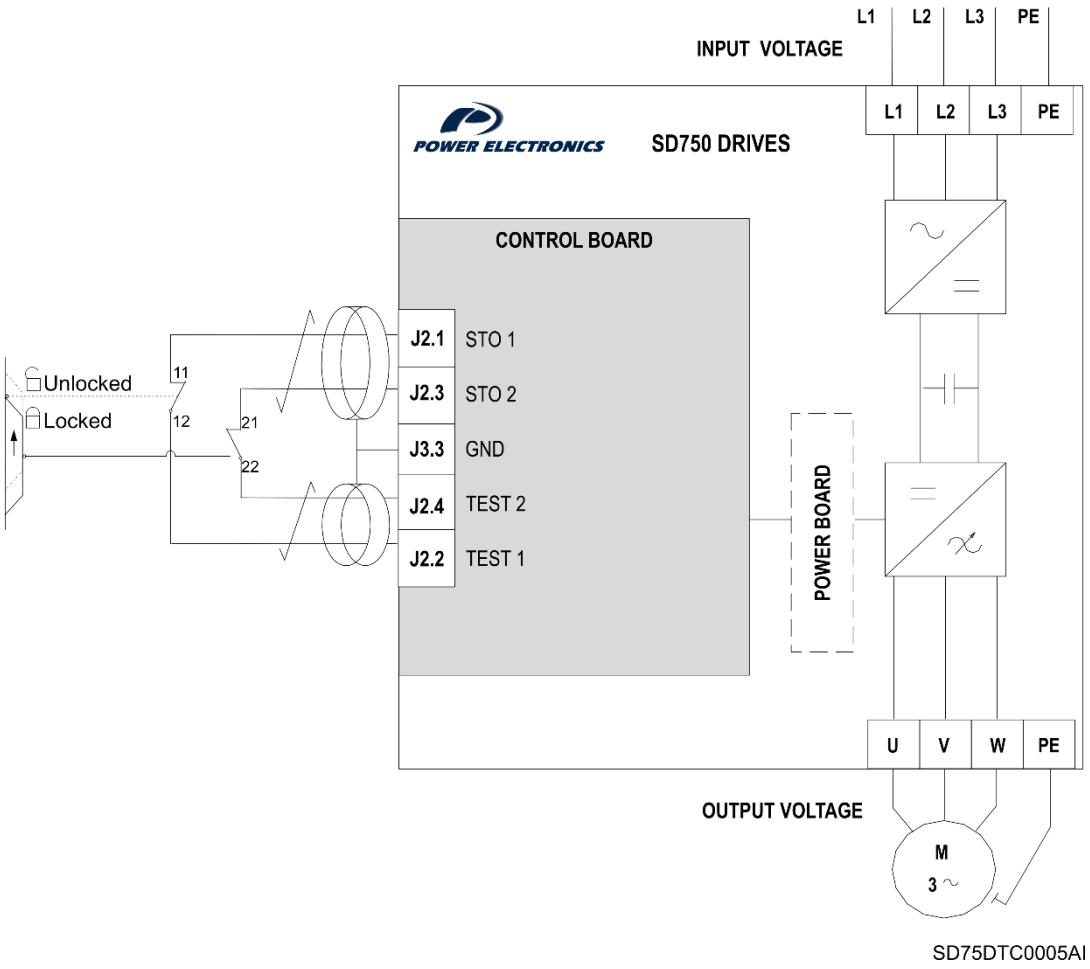


Example 1- Emergency stop push button

CAUTION

According to EN 60204-1 automatic restart is not allowed after an emergency stop. For this reason the machine control must prevent an automatic start after an emergency stop.
For SIL 3 applications the safety function has to be tested regularly (approximately once per month) in order to detect certain failures.

Example 2: SIL3 (PLe) Safety door opening for maintenance tasks with manual restart. This function is used to prevent an unexpected restart when a maintenance task is being carried out in a risk area. In this case, the relay's safety inputs will be connected to a safety interlock switch placed in the door. Additionally, a pushbutton will be installed to force a relay manual restart and a lamp connected to the NC close contact to indicate it.



Example 2- Safety door opening

CAUTION

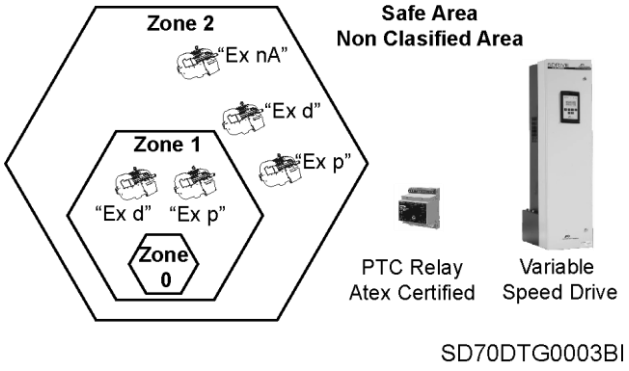
For SIL 3 applications the safety function has to be tested regularly (approximately once per month) in order to detect anomalies or possible failures.

According to EN 60204-1 automatic restart is not allowed after an emergency stop. For this reason the machine control must prevent an automatic start after an emergency stop.
For SIL 3 applications the safety function has to be tested regularly (approximately once per month) in order to detect certain failures.

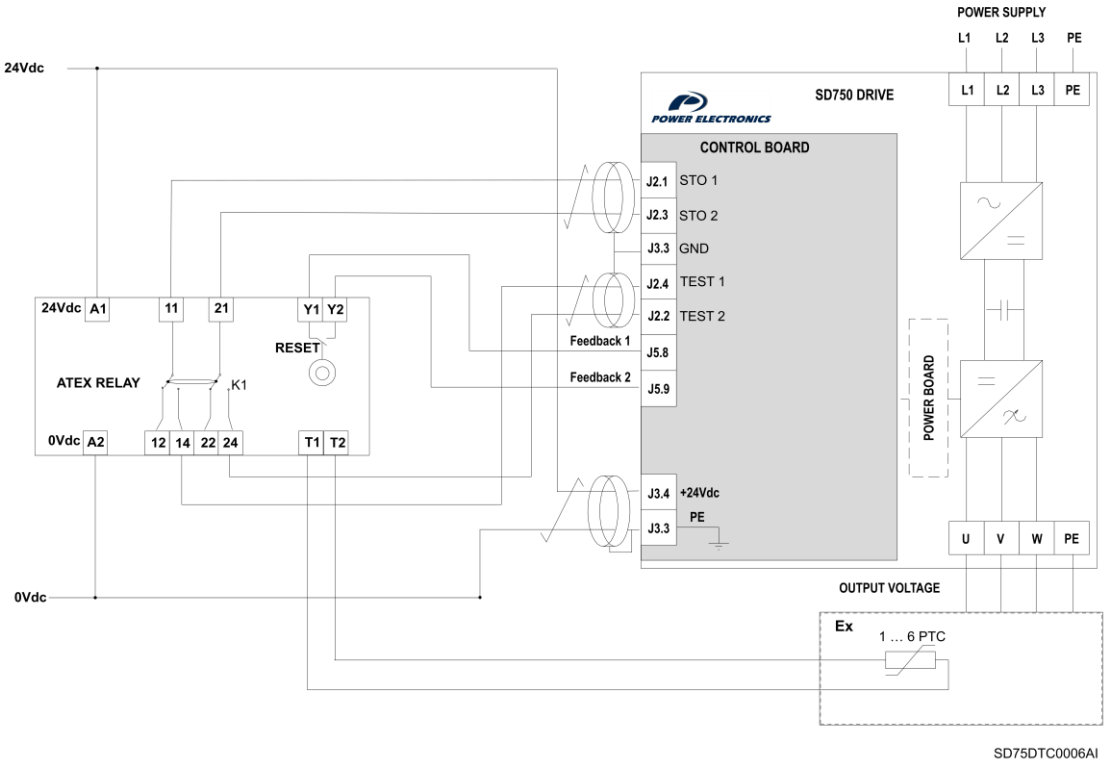
Connection with ATEX motors

The ATEX standard is related to the use of machinery, installations and equipment in areas with a potentially explosive atmosphere. In the European Union, the use of equipment in these areas Is regulated by two complementary directives: Directive 1999/92/EC for the installation environment and worker's protection, and Directive 94/9/EC for the ATEX equipment. These guidelines and directives are based on two basic concepts: the classification of potentially explosive areas or zones and the limitation of equipment that can be installed in each of them.

Power Electronics provides a solution for driving ATEX motors such as "Ex nA", "Ex d" and "Ex p" under the ATEX zone areas illustrated below. For different motor and ATEX zone combinations, consult Power Electronics.



Atex motors and Zones combination



Connection scheme (Example with ZIEHL - PTC Thermistor Relay Type MSR 220 Vi)

As shown in the figure above, the SD750 drive and the ATEX relay must be installed in a safe zone, outside the ATEX zone. This solution is valid for motors with "Ex d" or "Ex p" protection installed in zones 1 and 2, or motors with "EX nA" protection installed in zone 2. The external relay must be certified for ATEX zones and Must be compatible with the following features: 24 Vdc power supply voltage, 2 safety inputs, at least 2 open contacts and reset function. (Exemple: ZIEHL - PTC MSR 220Vi).

The SD750 series features a dV/dt filter and a unique CLAMP system that reduces dV/dt and voltage peaks in the motor windings. This reduces the risk of sparks in the windings, motor overheating and leakage currents through the bearings. In addition, it is possible to regulate the thermal protection of the motor, thus increasing the protection against overheating in the motor. In self-ventilated motors, the inverter may require an oversizing according to the derating curves provided by the motor manufacturer.

MODBUS COMMUNICATION

9

Introduction

To guarantee a correct operation of the drive, peripheral elements must be correctly selected and properly connected. A wrong installation and/or application could cause a wrong operation of the system or a reduction of the long life of the equipment, as well as damage to the components. This manual should be read and understood carefully before proceeding.

The purpose of the Serial Communication Bus of the SD750 drive is to integrate the drive itself into a network compatible with the Modbus communications protocol. This is possible using the physical communications ports RS485, Ethernet or USB port.

The Modbus communications system allows the SD750 drive to be controlled and / or monitored as a slave by a Modbus master from a remote location.

The RS485 network allows to connect up to 240 computers on the same network.

The SD750 drive operates as a peripheral slave when connected to a Modbus system. This means that the drive does not initiate the communication task, the master will start the task instead.

Virtually all of the drive operating modes, parameters and drive characteristics are accessible through serial communications. As an example, the master can give command to start and stop the drive, check the status of the SD750, read the current consumed by the motor, etc. The master mode can access all the possibilities of the drive.

Hardware Technical Specifications

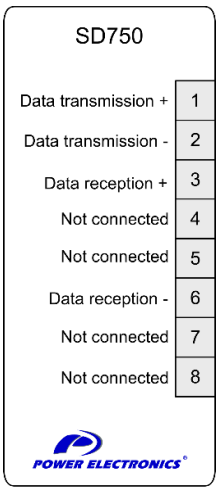
Ethernet	Physical level	8 cables, half and full duplex, RJ45 ending
	Terminals	1 ➔ Transmission data +
		2 ➔ Transmission data -
		3 ➔ Reception data +
		4 ➔ Not connected
		5 ➔ Not connected
		6 ➔ Reception data -
		7 ➔ Not connected
		8 ➔ Not connected
	Type of wiring	Ethernet 10Base-T, Ethernet 100Base-TX
	Data Interconnection Protocol	Modbus TCP/IP, Ethernet/IP Supports DHCP auto-addressing
	Data Transfer Rate	10Mbps, 100Mbps, auto-negociation 10 / 100
	Compliance Standards	IEEE 802.3, IEEE 802.3u (only for 100Base-TX)
	Maximum cable length	100m per network segment
RS485	Physical level	2 cables, optically insulated, half duplex, RS485 differential mode
	Terminals	27 ➔ RS485 A (negative)
		28 ➔ RS485 B (positive)
		29 ➔ RS Common (0VDC)
	Output signal level	'1' logical = +5V differential
		'0' logical = -5V differential
	Input signal level	'1' logical = +5V differential
		'0' logical = -5V differential
	Insulation	± 50VDC regarding to the earth
	Programmable inputs via Modbus	7 digital inputs
		2 programmable analogue inputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Programmable outputs via Modbus	3 relay outputs
		2 programmable analogue outputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Max. number of SD750 in network	240
	Maximum cable length	1000m
USB	Connector: USB 1.1 and 2.0 type B. Controller FTDI chip Model FT232BM	For the correct operation of the USB connection, it is necessary to install the proper drivers. To this, simply access to the information of the appropiate model in: http://www.ftdichip.com/Drivers/VCP.htm From this site you can download the required files and complete their correct installation.

Note: For the installation of the driver in the Host of the SD750 USB, it is only necessary to indicate the driver at the time of the installation. The USB device will be detected by the operating systems XP or later versions. In case of operating systems before W98 / Me, execute a search of new Hardware in the device administrator and complete the installation by indicating the drivers when the computer requires them.

EN

Ethernet Connection

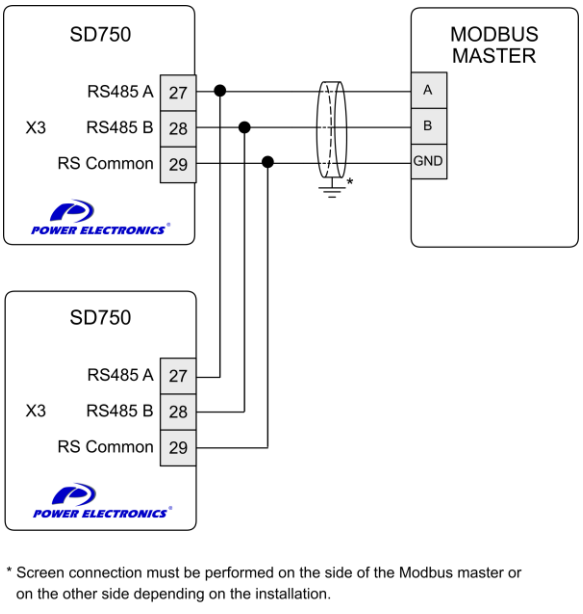
The following diagram shows the common wiring for an Ethernet connection:



Ethernet Connection

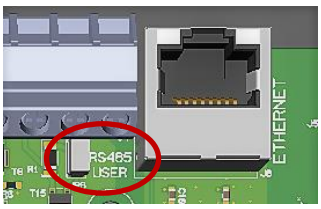
RS485 Connection

The following diagram shows a common wiring for a RS485 connection:



RS485 connection

It is recommended to connect the jumper “RS485 USER” at the first and the last device of the RS485 communication network, to connect the end of line resistor.



COMMISSIONING

10

CAUTION

Only qualified personnel are allowed to commission the drive. Read carefully and follow the safety instructions of this manual.
Failure to do so may result in damage to the equipment and you may suffer an electric shock.

Make sure that there is no voltage at the power terminals. Make sure that voltage is not connected to the computer unexpectedly.

This section does not include all the tasks to be performed during the commissioning of the equipment. Follow local and national regulations.

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For a proper commissioning, follow the next steps:

Check the compatibility of the upstream protections (circuit breakers, fuses, etc...) that could cause an unexpected stop during the soft charge.

↓

Assure that the line voltage is compatible with the drive voltage range. Otherwise the drive could get damaged.

↓

Connect input, PE and output wiring and check that the connections and tightening torque are correct.

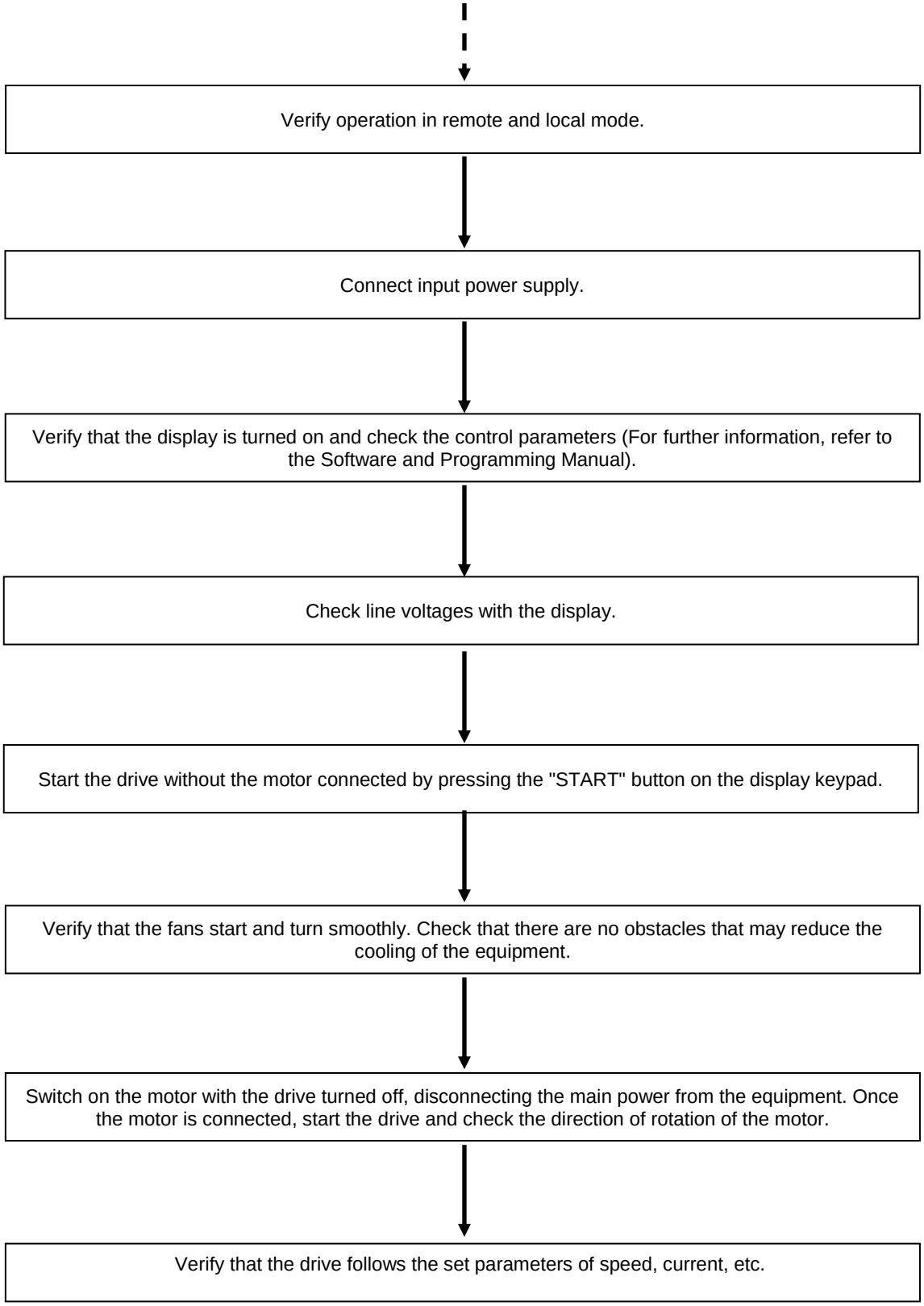
↓

Check that the protective covers are mounted and doors are properly closed.

↓

Check control cables (analogue and digital signals) and functions (STO). Make sure that the cables are free of voltage.

⋮


Verify operation in remote and local mode.
Connect input power supply.
Verify that the display is turned on and check the control parameters (For further information, refer to the Software and Programming Manual).
Check line voltages with the display.
Start the drive without the motor connected by pressing the "START" button on the display keypad.
Verify that the fans start and turn smoothly. Check that there are no obstacles that may reduce the cooling of the equipment.
Switch on the motor with the drive turned off, disconnecting the main power from the equipment. Once the motor is connected, start the drive and check the direction of rotation of the motor.
Verify that the drive follows the set parameters of speed, current, etc.

USE OF THE DISPLAY

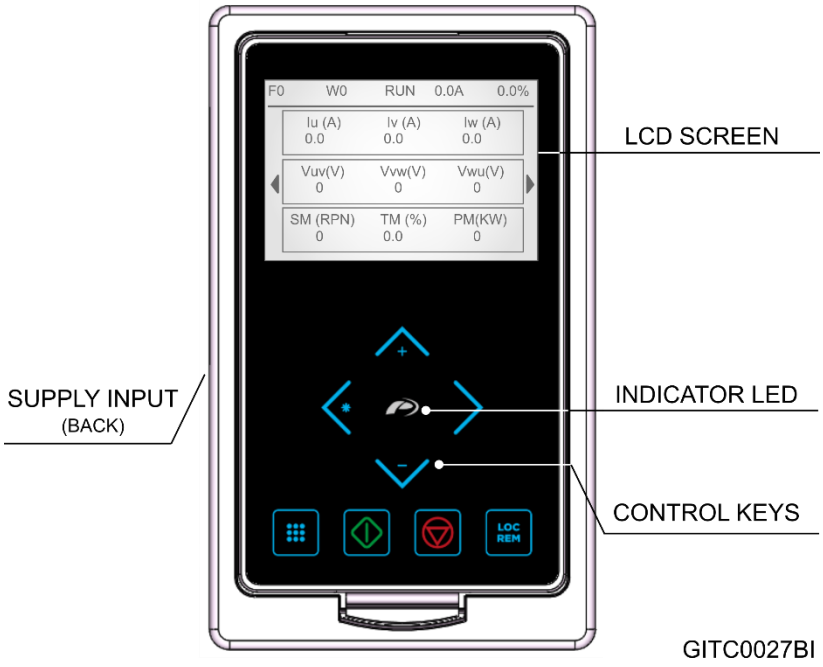
11

The SD750 drive has two types of screens, a monochrome graphics and an optional, tactile and color. Both screens provide intuitive data presentation, easy navigation through the control parameters and allow thousands of customized configurations to be stored by the user.

Below are the two types of displays.

Graphic Display

The graphic display is a removable display unit for remote installation. It is shown in the following figure. There is a built-in LED indicator on the display that provides information on the operating status of the device. In addition, there is a 2.8" LCD screen and eight control keys.



Screen and keyboard

For more information, refer to the Graphic Display Input Manual.

The LED indicator generates three different colors depending on the status of the drive, which indicates the following information:

- Yellow: Warning
- Red: Fault
- Green: Running

MAINTENANCE

12

The SD750 Series drives are industrial electronic products that contain advanced semiconductor elements. For this reason, temperature, humidity, vibrations and worn components can affect performance. To avoid any possible irregularities, it is recommended to carry out periodic inspections.

Warnings

Make sure to disconnect the drive from the power supply while performing maintenance.

Make sure to check that the DC bus voltage has been fully discharged before servicing. The voltage between the bus terminals (+ HVDC and -HVDC) must be less than 30Vdc. Note that the DC bus capacitors of the electronic circuit may remain charged even if the mains supply is disconnected.

The correct output voltage of the drive can only be measured by using an RMS voltage meter. Others voltage meters, including digital voltage meters, would give incorrect readings due to the high switching of the frequency PWM.

Routine Inspection

Make sure to check the following points before handling the drive:

- Installation site conditions.
- Drive cooling system conditions.
- Excessive vibrations in the motor.
- Excessive overheating.
- Normal output current value on the monitor.

Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Instrument of Measurement
			Monthly	1 year	2 years			
All	Ambient conditions	Are there dust particles? Are the ambient temperature and the humidity within specification?	o			Visual check	Temperature: -20 to +50 Humidity: below 95% non-condensing.	Thermometer, Hygrometer, Recorder.
	Module	Are there any abnormal noises or oscillations?	o			Visual and audible.	There are no anomalies.	
	Input power	Is the input power to the main circuit correct?	o			Measure the voltage between terminals L1, L2, L3 and PE.		Digital multimeter. Tester.
	Power connections	Are the power terminals correctly fastened?		o		Measure the temperature and the torque of the connections	Fasten the set screws one week after the start-up. Check that the temperature is homogeneous and below 70ºC.	Infrared thermometer, torque wrench.
Main circuit	Conductor/ Cable	Is the conductor corroded?		o		Visual check.	No anomaly.	
		Is the sheathing of the cable damaged?		o		Visual check.	No anomaly.	
	Terminal	Is any damage visible?		o		Visual check.	No anomaly.	
	IGBTs module Diodes module and Rectifier	Check the resistance value between each one of the terminals			o	Disconnect the drive connection and measure the resistance value between: R, S, T ⇔ VDC+, VDC- and U, V, W ⇔ VDC+, VDC- with a tester > 10kΩ		Digital multimeter. Analogue tester.
	Correct capacitor	Have fluid leakages been observed?	o			Visual check.	No anomaly.	
		Are the pins well fastened?		o		Visual check.	No anomaly.	
		Is any dilation or retraction sign observed? Measure the capacitance	o			Measure the capacitance with a proper instrument.	Capacitance higher than 85% of rated capacitance	Instrument for measuring capacity.
	Input Inductances	Is there any liquid leakage?		o		Visual check.	No anomaly.	
		Is there any overheated point?		o		Measure the surface and connectors' temperature.	Check temperature is homogeneous and below 70ºC	Infrared thermometer.
	Contactor	Is there any contactor chatter?		o		Audible check.	No anomaly.	
		Is the contact damaged?		o		Visual check.	No anomaly.	
Control circuit and Protections	Operating check	Is there any imbalance between output voltage phases?		o		Measure voltage between output terminals U, V and W.	Balanced voltage between phases i.e. lower than 8V difference for 400V models.	Digital multimeter / RMS voltage meter.
Cooling system	Cooling fans	Are there any abnormal noises or oscillations?	o			Disconnect the power supply (OFF) and rotate the fan manually.	Fan should rotate effortlessly.	
		Is the cooling fan disconnected?		o		Check the connections.	No anomaly.	
		Check that fans rotate smoothly.	o			Visual check.	No anomaly.	

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Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Instrument of Measurement
			Monthly	1 year	2 years			
Cooling system	Cooling fans	Clean the fans.			o	Uninstall fans and blow the radiator with compressed air free of humidity. This task should be performed more frequently depending on the dirt observed.		Compressed air.
	Filters	Is the filter saturated?	o			Visual check.	No anomaly. In case filter is saturated, replace it.	
Display	Measurement	Is the displayed value correct?	o			Check the reading instrument with an external measurement.	Check the specified values and the control values.	Voltage meter / Current meter etc.
Motor	All	Is there any noise or abnormal vibrations?	o			Audible, sensory and visual check.		
		Has any unusual smell been perceived?	o			Check if damages have been produced by overheating.	No anomaly.	

Note: The life cycle of the main components above indicated are based on a continuous operation for the stipulated load. These conditions can change according to the environment conditions.

OPTIONAL EQUIPMENT

13

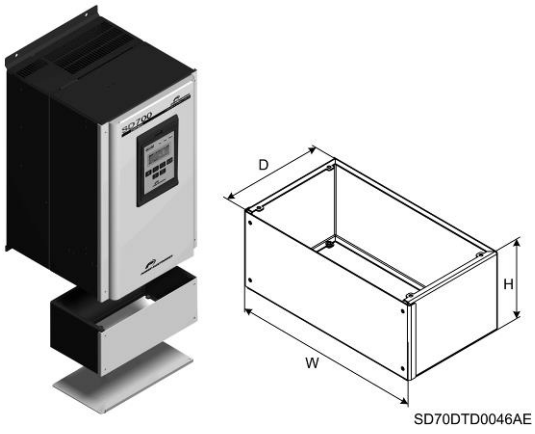
EN

Accessories

CODE	DESCRIPTION
SD75ET	**Profinet Communication Board.**
SD75PB	**Profibus Communication Board.**
SD75CO	**CAN Open Communication Board.**
SD75EC	**Encoder Board.** It allows connecting up to 2 differential Encoders (one of them for the user and the other one for the vector control) working from 5 to 24VDC, according to the requirements.
SD75DIO	**Digital Inputs / Outputs Expansion Board.** It allows increasing the number of inputs and outputs of the drive. It includes: • 5 Programmable Digital Inputs optically isolated • 5 Digital Outputs (Relays)
SD75AIO	**Analogue Inputs / Outputs Expansion Board.** It allows increasing the number of inputs and outputs of the drive. It includes: • 2 Programmable Analogue Input • 2 Programmable Analogue Output
SD75FO	**Fiber Optic Board.** It allows communication between multiple drives in a master slave configuration.
SD75PT	**PT100 Thermal Probe Board.**
B150	**Dynamic Braking Unit.** (For further information, see section “Dynamic Braking Unit B150”).
SD75DE3	**Kit 3 meters Extender for Display.**
SD75TD	**Tactile display 4.3”.**

Extension Box

FRAME	CODE	Dimensions (mm)		
		W	H	D
1	SD75EB1	189	122	161
2	SD75EB2	295	122	161
3	SD75EB3	300	151	168



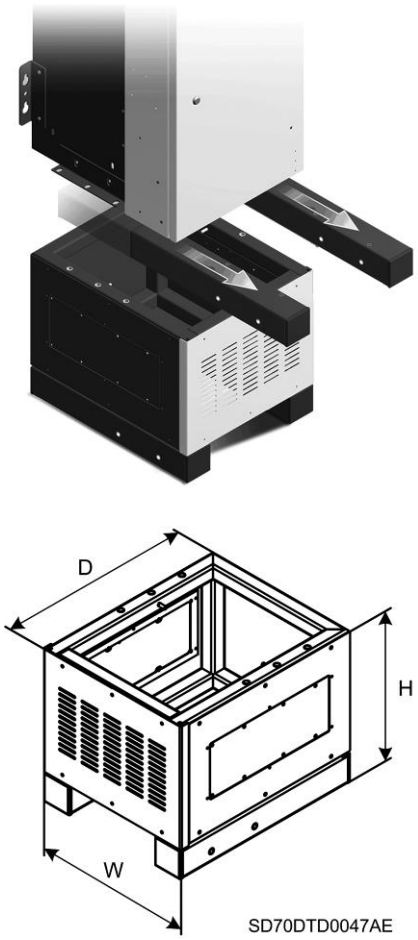
Dimensions for Extension Box

Plinths

FRAME	CODE	Dimensions (mm)			Total Drive Height (mm)
		W	H	D	
4	**SD75PL0417**	320	464	438.5	1712
5	**SD75PL0520**	431	413.5	529	2000
	SD75PL0522	431	613.5	529	2200
6	**SD75PL0620**	786	413.5	529	2000
	SD75PL0622	786	613.5	529	2200
7	**SD75PL0720**	1132	413.5	529	2000
	SD75PL0722	1132	613.5	529	2200
8	**SD75PL0820**	1482	413.5	529	2000
	SD75PL0822	1482	613.5	529	2200
9	**SD75PL0920**	3 x SD75PL0620			2000
	SD75PL0922	3 x SD75PL0622			2200
10	**SD75PL1020**	3 x SD75PL0720			2000
	SD75PL1022	3 x SD75PL0722			2200
11	**SD75PL1120**	3 x SD75PL0820			2000
	SD75PL1122	3 x SD75PL0822			2200

Code Explanation: SD75PL0520

SD75	PL05	20
SD750 Series	Plinth for Frame 5	Total Height 2000mm

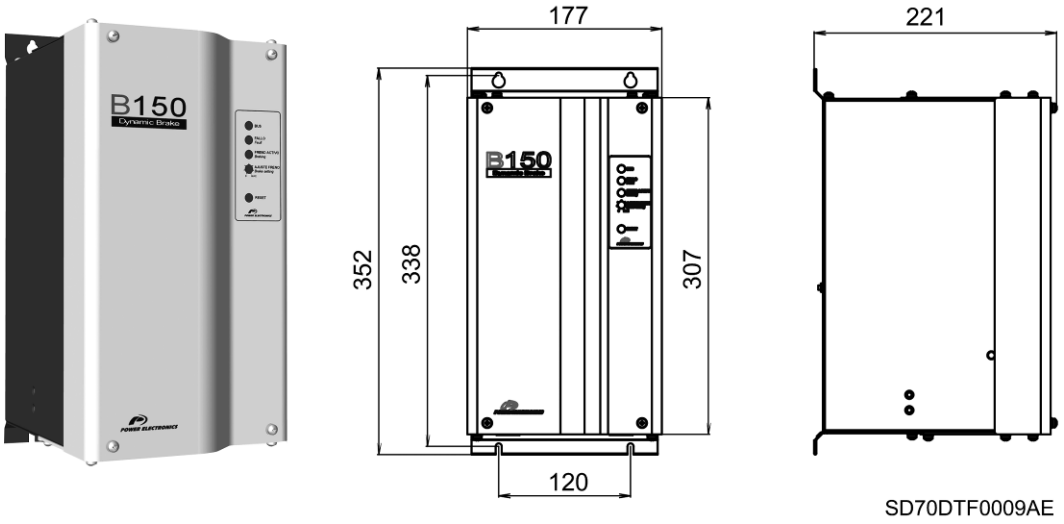


Dimensions for Plinths

Dynamic Braking Unit B150

The Dynamic brake permits to control the regenerated energy for series SD750 (integrated in frames 1 and 2). B150 dynamic brake activates an IGBT to discharge the DC bus with external resistors when the DC voltage overpasses a pre-set value. This activation signal can also be sent by the drive in slave mode from the common fiber optic port included in the control board.

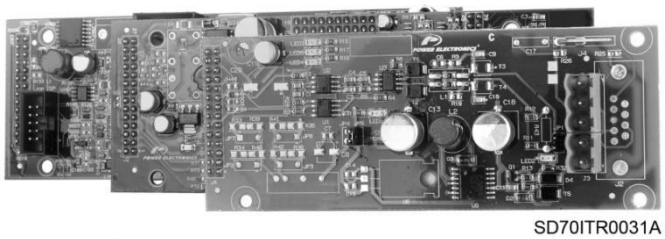
The B150, with reduced dimensions and high reliability, is the main power-switching device of such dynamic braking systems.



REFERENCE	VOLTAGE	CURRENT (A)		MINIMUM RESISTANCE RATING (Ω)	DIMENSIONS (MM)			WEIGHT
		MAXIMUM	CONTINUOUS		W	D	H	
B150	400Vac - 500Vac	300A	150A	2.4Ω	177	221	352	7 kg

Communication boards

SD750 family is compatible with the most commonly used communication protocols (Profibus-DP, Profinet, Modbus TCP, Ethernet IP, CAN Open, Field Bus, etc.), thanks to its optional boards.



DECLARATION OF CONFORMITY CE

DECLARACIÓN DE CONFORMIDAD CE

The Company *La empresa:*

Name *Nombre:*	POWER ELECTRONICS ESPAÑA, S.L.
Address *Dirección:*	C/ Leonardo Da Vinci, 24-26, 46980 Paterna, Valencia, Spain
Telephone *Teléfono:*	+34 96 136 65 57
Fax:	+34 96 131 82 01

Declares under its own responsibility, that the product:
Declara bajo su propia responsabilidad, que el producto:

Variable Speed Drive for AC motors
Variadores de velocidad para motores AC

Brand *Marca* : Power Electronics

Model *Modelo*: SD750

Is in conformity with the following European Directives:
Se halla en conformidad con las siguientes Directivas Europeas:

Reference *Referencia*	Título *Título*
2014/30/UE	Electromagnetic Compatibility *Compatibilidad Electromagnética*
2014/35/UE	Electrical Material intended to be used with certain limits of voltage *Material Eléctrico para su utilización con determinados límites de tensión (Baja tensión)*
2006/42/CE	Machinery directive Directiva de Máquinas

References of the harmonized technical norms applied under the Electromagnetic Compatibility Directive:
Referencias de las normas técnicas armonizadas aplicadas bajo la Directiva de Compatibilidad Electromagnética:

Reference *Referencia*	*Título Título*
EN 61800-3:2004 + A1 2012	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods. *Accionamientos eléctricos de potencia de velocidad variable. Parte 3: Requisitos CEM y métodos de ensayo específicos.*

References of the harmonized technical norms applied under the Low Voltage Directive:
Referencias de las normas técnicas armonizadas aplicadas bajo la Directiva de Baja Tensión:

Reference *Referencia*	*Título Título*
EN 61800-5-1:2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy *Accionamientos eléctricos de potencia de velocidad variable. Parte 5-1: Requisitos de seguridad. Eléctricos, térmicos y energéticos.*

References of the harmonized technical norms applied under the Machinery Directive:
Referencias de las normas técnicas armonizadas aplicadas bajo la Directiva de Máquinas

Reference *Referencia*	*Título Título*
EN 61800-5-2:2007	Adjustable speed electrical power drive systems. Part 5-2: Safety requirements - Functional *Accionamientos eléctricos de potencia de velocidad variable. Parte 5-2: Requisitos de Seguridad Funcional.*

Paterna, 28th of February, 2019

David Salvo
CEO

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