

SD300

VARIABLE SPEED DRIVE



Variable Speed Drive Hardware and Installation Manual

SD300

Variable Speed Drive
Hardware and Installation Manual

Edition: February 2017
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ABOUT THIS MANUAL

PURPOSE

This manual contains important instructions for the installation and maintenance of Power Electronics SD300 variable speed drives.

INTENDED USERS

This manual is intended for qualified customers who will install, operate and maintain Power Electronics SD300 variable speed drives.

Only trained electricians approved by the installation company may install and commission the drives. The instructions assume that the installer is familiar with electrical installation rules and regulations.

REFERENCE MANUALS

The following reference guides are available for the SD300 variable speed drives:

- SD300 Programming and Software Manual.
- SD300 Hardware and Installation Manual.

POWER ELECTRONICS CONTACT INFORMATION

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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.

The following CAUTION symbols are used in this manual and they symbolise:



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.

Revisions

Date	Revision	Description
04 / 11 / 2016	A	First Edition.
10 / 01 / 2017	B	Standard ratings, Technical characteristics, Control connection.
01 / 02 / 2017	C	Standard ratings, Power connection, Power terminals

The equipment and technical documentation are periodically updated. Power Electronics reserves the right to modify all or part of the contents of this manual without previous notice. To consult the most updated information of this product, you may access through our website www.power-electronics.us where the latest version of this manual can be downloaded.

TABLE OF CONTENTS

About this manual.....	3
1. INTRODUCTION.....	12
2. CONFIGURATION TABLE & STANDARD RATINGS.....	13
2.1. Configuration Table.....	13
2.2. Standard Ratings – 230VAC single-phase.....	14
2.3. Standard Ratings – 230VAC 3-phase.....	14
2.4. Standard ratings – 400VAC.....	15
3. TECHNICAL CHARACTERISTICS	16
3.1. Enhanced Sensorless Control	17
3.1.1. Sensorless Control	17
3.1.2. Flying Start Function.....	17
4. DIMENSIONS.....	18
4.1. IP20 Drives Dimensions.....	18
4.1.1. Frame 1N Dimensions.....	18
4.1.2. Frame 2N Dimensions.....	18
4.1.3. Frame 3N Dimensions.....	19
4.1.4. Frame 4N Dimensions.....	19
4.1.5. Frame 5N Dimensions.....	20
4.1.6. Frame 1F Dimensions.....	20
4.1.7. Frame 2F Dimensions.....	21
4.1.8. Frame 3F Dimensions.....	21
4.1.9. Frame 4 Dimensions.....	22
4.1.10. Frame 5 Dimensions.....	22
4.1.11. Frame 6 Dimensions.....	23
4.2. IP66 Drives Dimensions.....	23
4.2.1. Frame 1I Dimensions.....	23
4.2.2. Frame 2I Dimensions.....	24
4.2.3. Frame 3I Dimensions.....	24
4.2.4. Frame 4I Dimensions.....	25
4.2.5. Frame 5I Dimensions.....	25
5. RECEPTION, HANDLING AND TRANSPORTATION.....	26
5.1. Reception and Storage.....	26
5.2. Handling and Transportation.....	26
6. MECHANICAL INSTALLATION	27
6.1. Environmental Ratings.....	27
6.2. Drive Mounting.....	28
6.3. Clearances.....	29
6.4. Cooling.....	30
7. POWER CONNECTION.....	31
7.1. Basic Configuration.....	31
7.2. Topology.....	32
7.3. Power Terminals.....	32
7.3.1. Power Terminals in Single-Phase Drives.....	34
7.3.2. Power Terminals in Frames 1N, 2N & 1F (3-Phase).....	34
7.3.3. Power Terminals in Frames 3N, 4N & 2F (3-Phase).....	34
7.3.4. Power Terminals in Frames 5N & 3F (3-Phase).....	35
7.3.5. Power Terminals in Frames 4, 5 & 6 (3-Phase).....	35
7.4. Power Connection and Wiring.....	35
7.4.1. Recommended Cable Section.....	37
7.5. Ground Connection.....	37
7.6. Protections.....	38
7.6.1. Safety Stop Function.....	38
7.6.2. Ground Fault Protection.....	38
7.6.3. Short Circuit.....	39
7.6.4. Motor Thermal Protection.....	39
7.6.5. Others.....	39
7.7. Dynamic Braking Resistors.....	40

8. CONTROL CONNECTION	41
8.1. Wiring Recommendations.....	41
8.2. Control Cables Access.....	42
8.3. Control Board Terminals Description.....	42
8.3.1. Pulse Output Signals Connection in IP66 Drives.....	45
8.3.2. Recommended Cable Section.....	45
8.4. Control Switches.....	45
8.5. STO - Safe Torque Off.....	46
9. COMMUNICATION	47
9.1. RJ45 Communication.....	47
9.2. Modbus Communication.....	47
9.2.1. Introduction.....	47
9.2.2. Communication Standards.....	48
9.2.3. RS485 Connections.....	49
10. COMMISSIONING	50
11. USE OF THE DISPLAY	52
12. MAINTENANCE	56
12.1. Cooling.....	56
12.2. Warnings.....	56
12.3. Routine Inspection.....	57
13. ACCESSORIES	58
13.1. Communications.....	58
13.2. Extension I/O.....	58
13.3. Conduit Kit.....	59
13.4. Flange Type.....	59
DECLARATION OF CONFORMITY CE	61

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 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.

Before opening the covers for wiring or periodic inspections, ensure DC voltage has been fully discharged. Check with a multimeter the following measures:

- **Measure between the output power busbars U, V, W and the cabinet and check that the voltage is around 0V.**
- **Measure that the DC link terminals +, - and chassis voltage are below 30VDC.**

Otherwise, you may 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.

 **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.



The inverter becomes hot during operation. Wait until it cools down before performing any actions. 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.

 **NOTICE****RECEPTION**

- The SD300 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 24hrs 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

- Packing of the equipment should be recycled. For this, it is necessary to separate the different included materials (plastic, paper, cardboard...) and deposit them in their relevant recycling areas.
- Waste products of electric and electronic devices should be selectively collected for their correct environmental management.

ELECTROMAGNETIC COMPATIBILITY (EMC)

- The drive is intended to be used in industrial environments (Second Environment). It achieves compliance with C3 category defined in IEC/EN 61800-3 standard when the installation recommendation within this manual are followed.
- Select communication and control system according to the drive EMC environment. Otherwise, systems could suffer from interferences due to a low EMS level.

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 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 SD300 drives contain static sensitive printed circuits boards. Use static safety procedures when handling these boards.
 - Avoid installing the drive in conditions that differ from those described in the Environmental Ratings section.
-

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 SD300 Series will be damaged if the incoming power is connected and applied to the output terminals (U, V, W).
 - Do not use power factor correction capacitor banks, surge suppressors, or RFI filters on the output side of the drive. Doing so may damage these components.
 - Before wiring the terminals, make sure that the inverter keypad display is turned off and the front cover is off as well. The inverter may hold a high voltage electric charge long after the power supply has been turned off.
-

TRIAL RUN

- 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.
-

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 screws 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).
-

HOW TO USE THIS MANUAL

Quick Guide

- 1- Make sure model and serial number of the drive are the same on the delivery note and unit.
- 2- Read carefully the safety instructions before installation, commissioning, operation and maintenance of the drive. **See Safety Instructions section.**
- 3- For reception, handling and transportation **see Chapter 5.**
- 4- Before the mechanical installation, check the environmental ratings, drive configuration, mounting and clearances. **See Chapter 5 and Chapter 6.**
- 5- Follow the mechanical installation instructions. **See Chapter 6.**
- 6- Before the electrical installation, check basic configuration and wiring recommendations, **see Chapter 7 and Chapter 8.**
- 7- Follow the electrical installation instructions in **Chapter 7 and Chapter 8.**
- 8- For Modbus Communication hardware, **see Chapter 9.**
- 9- Follow the commissioning instructions in **Chapter 10.**
- 10- For instructions on how to use the display, refer to **Chapter 11.**
- 11- For preventive maintenance instructions, follow the recommendations in **Chapter 12.**

1. INTRODUCTION

The SD300 is a high performance general purpose AC drive suitable for demanding heavy duty applications that require high starting torque and precise control. The dual duty rating of the SD300 (IP20) also ensures compatibility with less demanding normal duty loads. The IP66/NEMA4X option further enhances the flexibility of the product to meet the most severe environments.

The SD300 is entirely suitable for applications such as water treatment and irrigation, food and beverage, ventilation systems, material handling, lifting systems, textiles, plastic, wood processing...in fact, any application where OEMs need to control and automate apparatus and machinery.

Some of its outstanding features are:

- Easy-to-use, compact and robust product, offering users savings in time and space.
- Space saving design with side by side mounting.
- The overall motor control features and the motor/drive protection functions limit unexpected machine downtime.
- A built-in display with keypad offers programming and operation capabilities. Remote LCD display option.
- Integrated communication port and Modbus protocol allows the SD300 to exchange data for machine/process monitoring, control and preventive maintenance.
- Safe Torque Off (STO) as standard.



Figure 1.1 SD300 Series

2. CONFIGURATION TABLE & STANDARD RATINGS

2.1. Configuration Table

EXAMPLE

CODE: SD305846F

SD3		058		4		6		F	
SERIE		Drive current (Normal Duty) [1]		Drive Voltage		Degree of protection		EMC Filter	
SD3	SD300	002	2A	1	230VAC single-phase	2	IP20	F	Extended
		...		2	230VAC three-phase	6	IP66	-	Standard
		069	69A	4	400VAC three-phase				

[1] Heavy duty for IP66 models.

CODIFICATION EXAMPLES:

- **SD305842F** SD300, 58A, 400Vac three-phase, IP20 degree of protection, EMC extended.
- **SD301212** SD300, 12A, 230Vac single-phase, IP20 degree of protection.
- **SD303046** SD300, 30A, 400Vac three-phase, IP66 degree of protection.

The following figure shows an example of designation label:

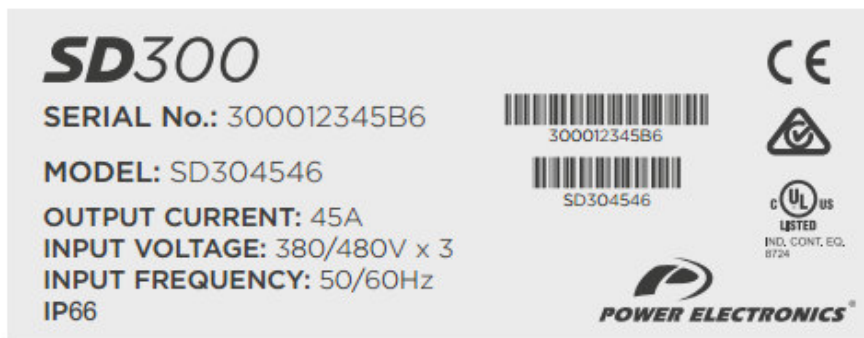


Figure 2.1 Type designation label (located on lateral panel)

2.2. Standard Ratings – 230VAC single-phase

Power ND (kW)	Power HD (kW)	Current ND (A)	Current HD (A)	EMC STANDARD		EMC EXTENDED	
				Model	Frame	Model	Frame
0.75	0.4	3.1	2.5	SD300312	2N	SD300312F [1]	1F
1.5	0.75	6.0	5.0	SD300612	3N	SD300612F [1]	2F
2.2	1.5	9.6	8.0	SD300912	4N	SD300912F [1]	
3.7	2.2	12.0	11.0	SD301212	5N	SD301212F [1]	3F

[1] EMC class 2.

2.3. Standard Ratings – 230VAC 3-phase

IP20					
Power ND (kW)	Power HD (kW)	Current ND (A)	Current HD (A)	Model	Frame
0.75	0.4	3.1	2.5	SD300322	1N
1.5	0.75	6.0	5.0	SD300622	2N
2.2	1.5	9.6	8.0	SD300922	3N
4	2.2	12	11	SD301222	4N
5.5	4	18	17	SD301822	5N
7.5	5.5	30	24	SD303022	4
11	7.5	40	32	SD304022	
15	11	56	46	SD305622	5
22	15	69	60	SD306922	6

IP66 (Only HD)			
Power HD (kW)	Current HD (A)	Model	Frame
0.4	2.5	SD300326	1I
0.75	5.0	SD300526	
1.5	8.0	SD300826	2I
2.2	11	SD301126	
4	17	SD301726	3I
5.5	24	SD302426	
7.5	32	SD303226	4I
11	46	SD304626	
15	60	SD306026	5I

2.4. Standard ratings – 400VAC

IP20							
Power ND (kW)	Power HD (kW)	Current ND (A)	Current HD (A)	EMC STANDARD		EMC EXTENDED	
				Model	Frame	Model	Frame
0.75	0.4	2.0	1.3	SD300242	1N	SD300242F ^[2]	1F
1.5	0.75	3.1	2.4	SD300342	2N	SD300342F ^[2]	
2.2	1.5	5.1	4.0	SD300542	3N	SD300542F ^[2]	2F
4	2.2	6.9	5.5	SD300742	4N	SD300742F ^[2]	
5.5	4	10	9.0	SD301042	5N	SD301042F ^[2]	3F
7.5	5.5	16	12			SD301642F ^[2]	
11	7.5	23	16			SD302342F ^[2]	4
15	11	30	24			SD303042F ^[2]	
18.5	15	38	30			SD303842F ^[2]	5
22	18.5	44	39			SD304442F ^[2]	
30	22	58	45			SD305842F ^[2]	6

[2] EMC class 3.

IP66				
Power HD (kW)	Current HD (A)	EMC STANDARD	EMC EXTENDED	Frame
		Model	Model	
0.4	1.3	SD300146	SD300146F ^[2]	1I
0.75	2.4	SD300246	SD300246F ^[2]	
1.5	4.0	SD300446	SD300446F ^[2]	
2.2	5.5	SD300646	SD300646F ^[2]	2I
4	9.0	SD300946	SD300946F ^[2]	
5.5	12	SD301246	SD301246F ^[2]	3I
7.5	16	SD301646	SD301646F ^[2]	
11	24	SD302446	SD302446F ^[2]	4I
15	30	SD303046	SD303046F ^[2]	
18.5	39	SD303946	SD303946F ^[2]	5I
22	45	SD304546	SD304546F ^[2]	

[2] EMC class 3.

- Maximum applicable capacity is indicated in the case of using a 4-pole standard motor (200 and 400V classes are based on 220 and 440V, respectively).
- For the rated capacity, 200 and 400V class input capacities are based on 220 and 440V, respectively.
- The rated output current is limited depending on the setup of carrier frequency [G4.4].
- The output voltage becomes 20~40% lower during no-load operations to protect the drive from the impact of the motor closing and opening (0.4~4.0kW models only).
- Dual rating is supported except IP66/NEMA 4X.

3. TECHNICAL CHARACTERISTICS

SD300 SERIES			
INPUT	Power ranges	0.4kW – 2.2kW 230V – Single Phase 0.4kW – 22kW 230V – 3-Phase 0.4kW – 30kW 400V – 3-Phase	
	Voltage range	230V: 200-240V Single Phase / 3-Phase (-15%/+10%) 400V: 380V-480V 3-Phase (-15%/+10%)	
	EMC Filter	C2 (First environment) C3 (Second environment)	
OUTPUT	Overload capacity	150% for 60sec. (Heavy duty) 120% for 60sec. (Normal duty) [2] 200% for 3sec. (Heavy Duty)	
	Control Method	V/f, Slip compensation, Sensorless vector, PMSM VC [1]	
	Frequency Setting Resolution	Digital command: 0.01Hz / Analog command: 0.06Hz (maximum frequency: 60Hz)	
	Frequency Accuracy	1% of the maximum output frequency	
	V/F Pattern	Linear, Quadratic, User V/F	
	Output frequency	0-400Hz (Sensorless: 0-120Hz)	
	Torque Boost	Manual/Automatic torque boost	
OPERATION	Operation Mode	Keypad / Terminal / Communication option selectable	
	Frequency Setting	Analog: -10~10[V], 0~10[V], 4~20[mA] / Digital: Keypad, Pulse train input	
	Operation Function	PID control, 3-wire operation, Frequency limit, Second function, Anti-forward and reverse direction rotation, Speed search, Power braking, Leakage reduction, Up-down operation, DC braking, Frequency jump, Slip compensation, Automatic restart, Automatic tuning, Energy buffering, Flux braking, Fire Mode	
	Input	Multi-function Terminal IP66 degree: 5 DIs IP20 degree: 7 DIs	NPN (Sink) / PNP (Source) Selectable Function: Forward run, Reverse run, Reset, External trip, Emergency stop, Jog operation, Multi-step frequency-high, middle, low, Multi-step acceleration/ deceleration-high, middle, low, DC braking at stop, 2nd motor select, Frequency up/down, 3-wire operation, Change into normal operation during PID operation, Change into main body operation during option operation, Analog command frequency fixing, Acceleration/deceleration stop etc. Selectable
		Analog Input	V1: -10~10V, selectable V2: 0~10V/I2 4~20mA
		Pulse Train	0~32kHz, Low level: 0~2.5V, High level: 3.5~12V
	Output	Open Collector Terminal	Fault output and drive operation status output
		Multi-function Relay	Less than DC 24V 50mA (N.O., N.C.) less than AC 250V 1A, less than DC 30V 1A
		Analog Output	Selectable 0~12Vdc/0~24mA Frequency, Output current, Output voltage, DC stage voltage etc. selectable
		Pulse Train	Maximum 32kHz, 10~12 [V]
PROTECTIVE FUNCTION	Trip	Over current trip, External signal trip, ARM short circuit current trip, Over heat trip, Input imaging trip, Ground trip, Motor over heat trip, I/O board link trip, No motor trip, Parameter writing trip, Emergency stop trip, Command loss trip, External memory error, CPU watchdog trip, Motor normal load trip, Over voltage trip, Temperature sensor trip, Drive over heat, Option trip, Output imaging trip, Drive overload trip, Fan trip, Pre-PID operation failure, External break trip, Low voltage trip during operation, Low voltage trip, Safety A(B) trip, Analog input error, Motor overload trip.	
	Alarm	Command loss trip alarm, overload alarm, normal load alarm, drive overload alarm, fan operation alarm, resistance braking rate alarm, number of corrections on rotor tuning error	
	Momentary Power Loss	HD below 15ms (ND below 8ms): Continuous operation (To be within rated input voltage, rated output) HD above 15ms (ND above 8ms): Automatic restart operation enable	
ENVIRONMENT	Cooling Type	Forced fan cooling structure	
	Protection Degree	IP20/UL Open (Default), UL Enclosed Type 1 (Option), IP66/NEMA 4X (Option)	
	Ambient Temperature	IP20: HD: -10~50°C (14~122°F) / ND: -10~40°C (14~104°F) [However, it is recommended to use load below 80% when using at 50°C under light load]	
		IP66: HD: -10~40°C (14~104°F)	
	Storage Temperature	-20~65°C (-4~149°F)	
	Humidity	Relative humidity below 90% RH (no dew formation)	
	Altitude, Vibration	Below 1,000m, below 9.8m/sec ² (1G)	
	Location	No corrosive gas, flammable gas, oil mist and dust etc. indoors (Pollution Degree 3 Env.)	
Pressure	70~106 kPa		
REGULATIONS	Global certification	CE, UL, cUL, RoHS	
	PCB	3C2 Conformal coating	

[1] Please consult Power Electronics before the installation with this kind of motors. [2] Only available with IP20 protection degree.

3.1. Enhanced Sensorless Control

3.1.1. Sensorless Control

Starting torque of 200% / 0.5Hz is produced and provides robust power in the low speed region. The motor auto-tuning function is optimized to maximize motor performance.

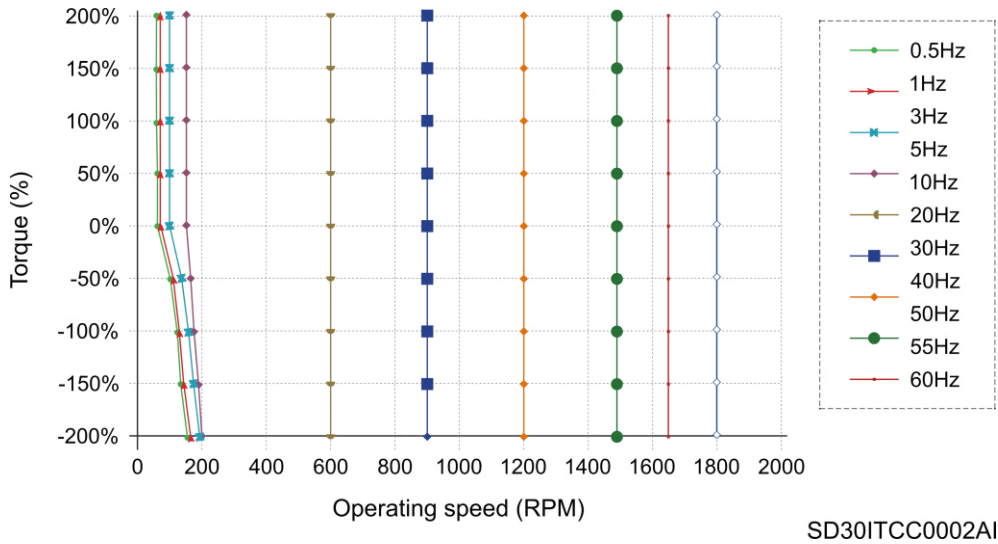


Figure 3.1 Sensorless control

3.1.2. Flying Start Function

The SD300 is capable of performing quick and reliable smooth restarts. It is equipped with standstill/rotary auto-tuning.

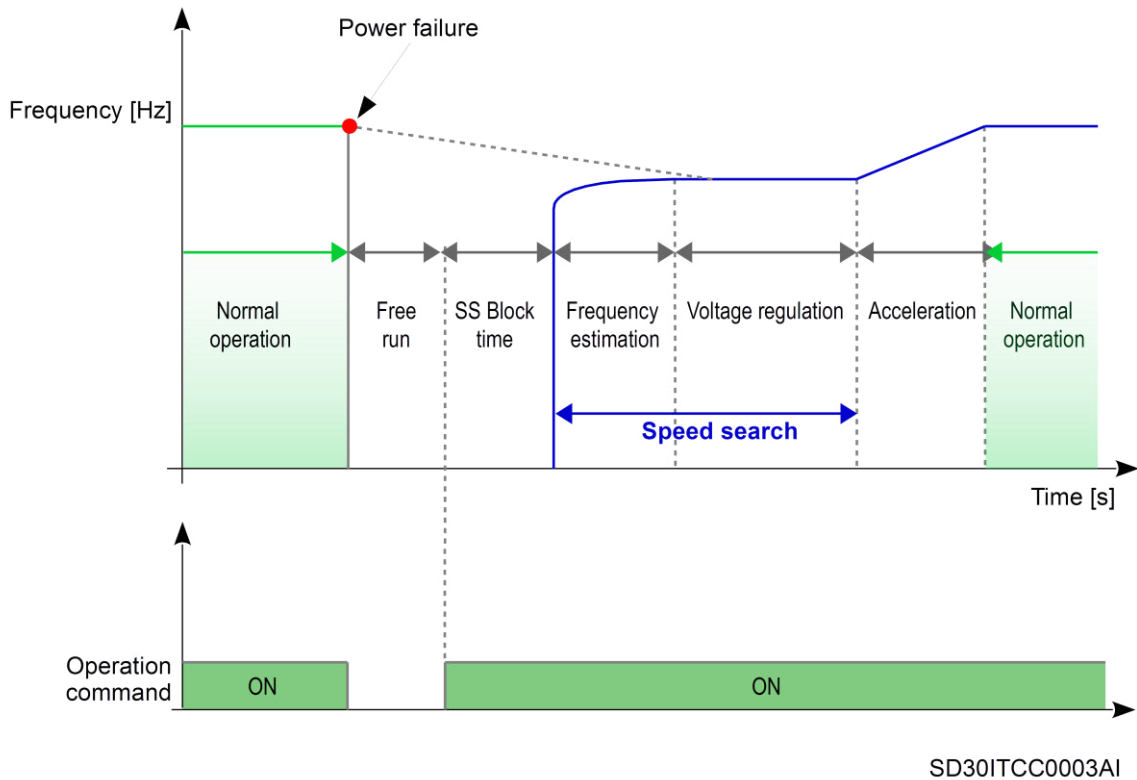


Figure 3.2 Flying start function

E
N
G
L
I
S
H

4. DIMENSIONS

4.1. IP20 Drives Dimensions

4.1.1. Frame 1N Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD300322
380~480[V]	3	SD300242

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
68 (2.7")	61.1 (2.4")	128 (5")	119 (4.7")	5 (0.2")	123 (4.8")	3.5 (1.4")	4 (0.2")	4.2 (1.65")	0.86 (1.9lb)

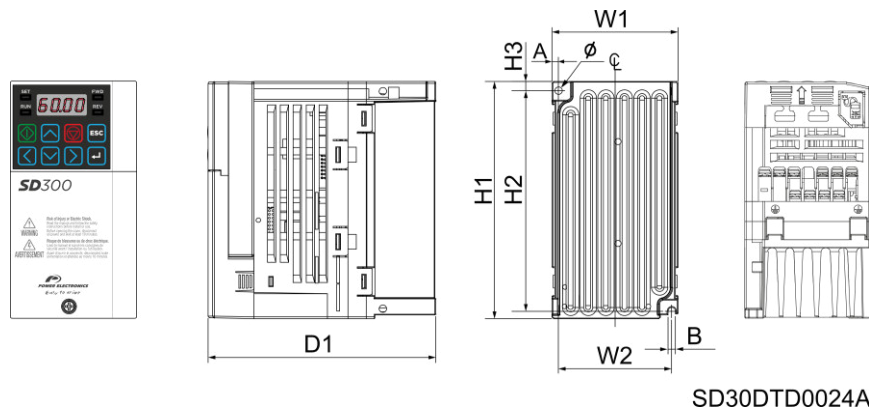


Figure 4.1 Frame 1N dimensions

4.1.2. Frame 2N Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD300312
200~240[V]	3	SD300622
380~480[V]	3	SD300342

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
68 (2.7")	61.1 (2.4")	128 (5")	119 (4.7")	5 (0.2")	128 (5")	3.5 (1.4")	4 (0.2")	4.2 (1.65")	0.86 (1.9lb)

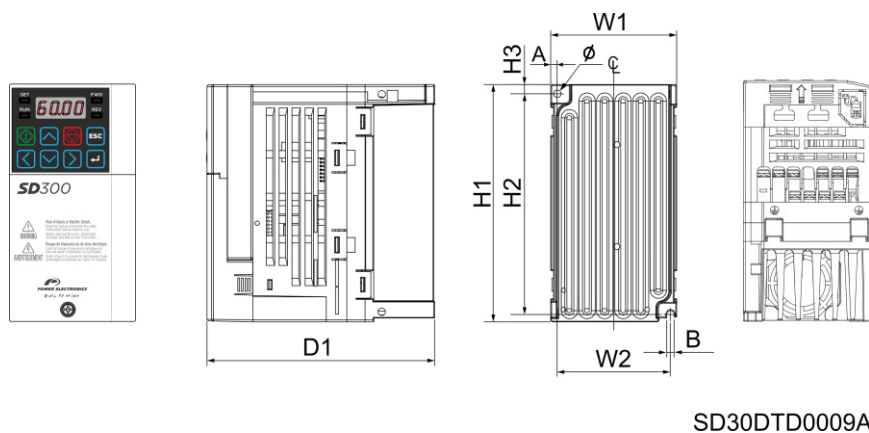


Figure 4.2 Frame 2N dimensions

4.1.3. Frame 3N Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD300612
200~240[V]	3	SD300922
380~480[V]	3	SD300542

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
100 (3.9")	91 (9.6")	128 (5")	120 (4.7")	4.5 (0.2")	130 (5.1")	4.5 (0.2")	4.5 (0.2")	4.5 (0.2")	1.5 (3.3lb)

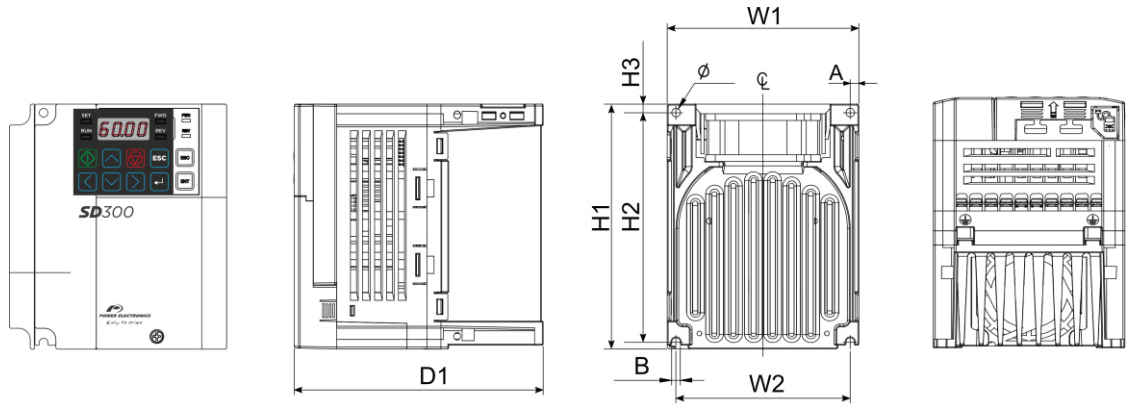


Figure 4.3 Frame 3N dimensions

4.1.4. Frame 4N Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD300912
200~240[V]	3	SD301222
380~480[V]	3	SD300742

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
100 (3.9")	91 (9.6")	128 (5")	120 (4.7")	4.5 (0.2")	145 (5.7")	4.5 (0.2")	4.5 (0.2")	4.5 (0.2")	1.5 (3.3lb)

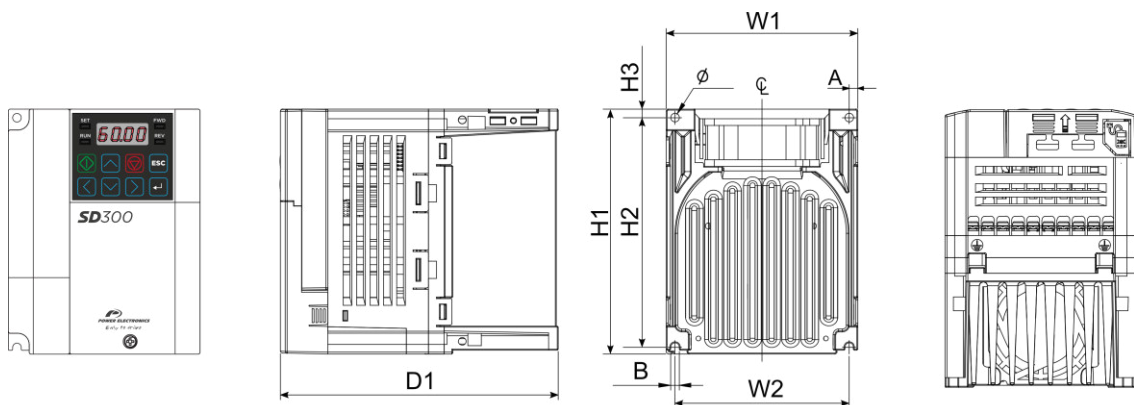


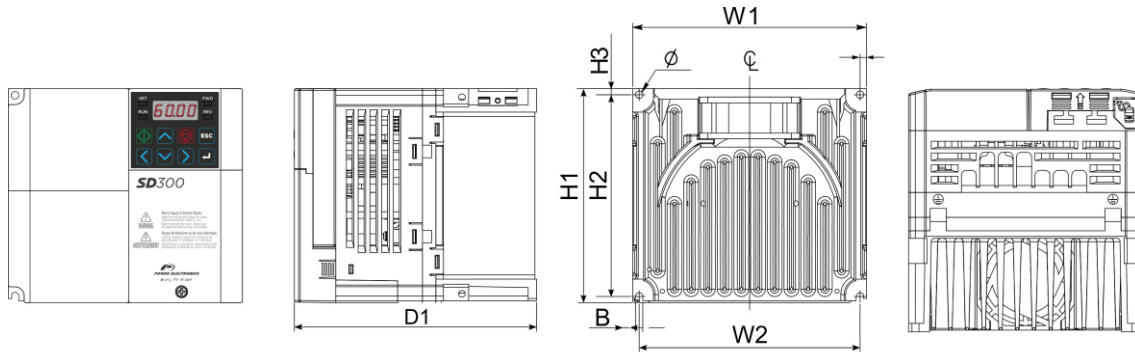
Figure 4.4 Frame 4N dimensions

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4.1.5. Frame 5N Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD301212
200~240[V]	3	SD301822
380~480[V]	3	SD301042

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
140 (5.5")	132.2 (5.2")	128 (5")	120.7 (4.8")	3.7 (0.1")	145 (5.7")	3.9 (0.2")	4.4 (0.2")	4.5 (0.2")	2.7 (6lb)



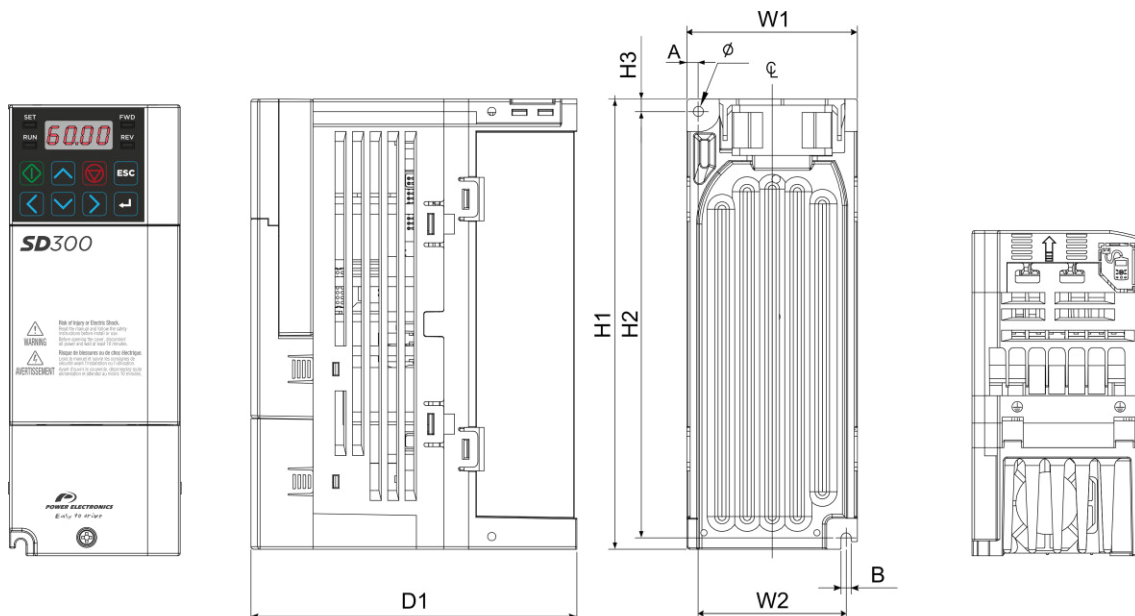
SD30DTD0012A

Figure 4.5 Frame 5N dimensions

4.1.6. Frame 1F Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD300312F
380~480[V]	3	SD300242F, SD300342F

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
68 (2.7")	59 (2.3")	180 (7.1")	170.5 (6.7")	5 (0.2")	130 (5.1")	4.5 (0.2")	4.5 (0.2")	4.2 (0.2")	1.2 (2.6lb)



SD30DTD0013A

Figure 4.6 Frame 1F dimensions

4.1.7. Frame 2F Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD300612F, SD300912F
380~480[V]	3	SD300542F, SD300742F

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
100 (3.9")	91 (3.6")	180 (7.1")	170 (6.7")	5 (0.2")	140 (5.5")	4.5 (0.2")	4.5 (0.2")	4.2 (0.2")	1.8 (4lb)

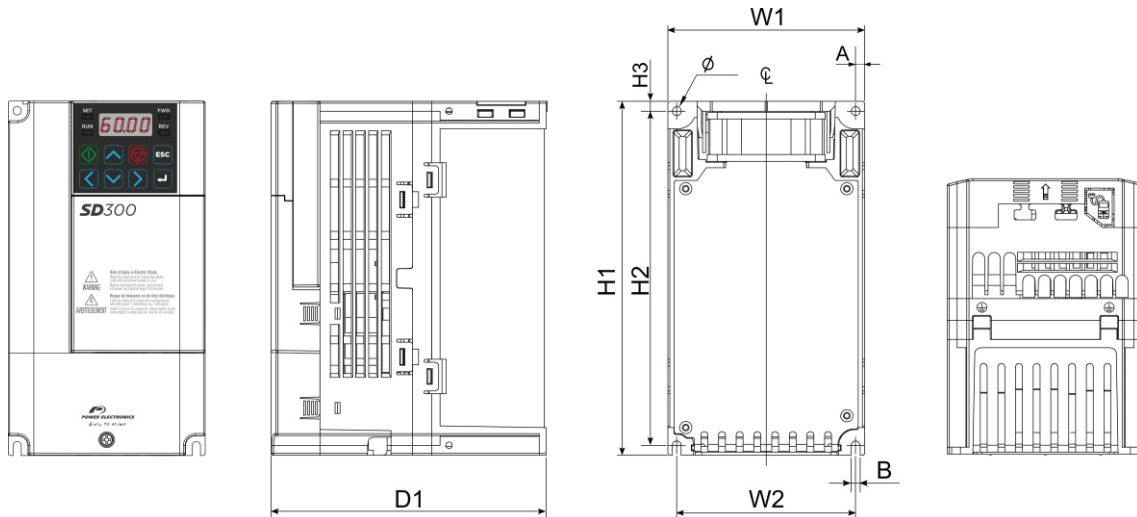


Figure 4.7 Frame 2F dimensions

SD30DTD0014A

4.1.8. Frame 3F Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	1	SD301212F
380~480[V]	3	SD301042F

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
140 (5.5")	132 (5.2")	180 (7.1")	170 (6.7")	5 (0.2")	140 (5.5")	4 (0.2")	4 (0.2")	4.2 (0.2")	2.2 (4.9lb)

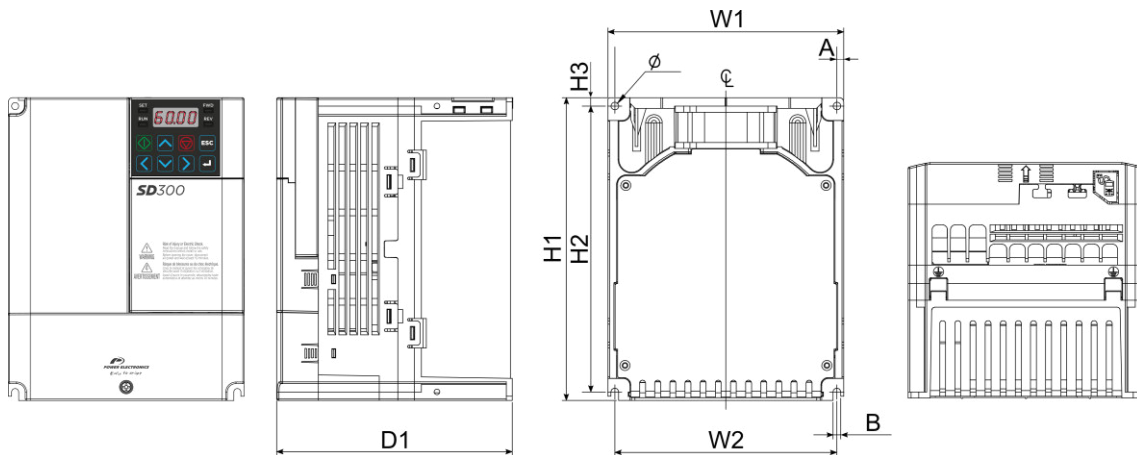


Figure 4.8 Frame 3F dimensions

SD30DTD0015A

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4.1.9. Frame 4 Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD303022, SD304022
380~480[V]	3	SD301642F, SD302342F

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
160 (6.3")	137 (5.4")	232 (9.1")	216.5 (8.5")	10.5 (0.4")	140 (5.5")	5 (0.2")	5 (0.2")	-	3.3 (7.3lb)

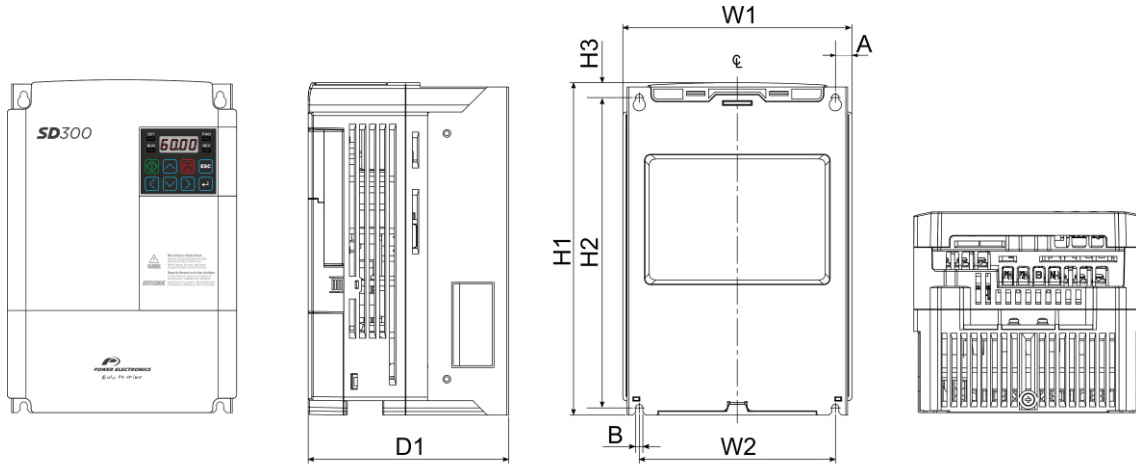


Figure 4.9 Frame 4 dimensions

SD30DTD0021A

4.1.10. Frame 5 Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD305622
380~480[V]	3	SD303042F, SD303842F

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
180 (7.1")	157 (6.2")	290 (11.4")	274 (10.8")	11.3 (0.4")	163 (6.4")	5 (0.2")	5 (0.2")	--	4.8 (10.6lb)

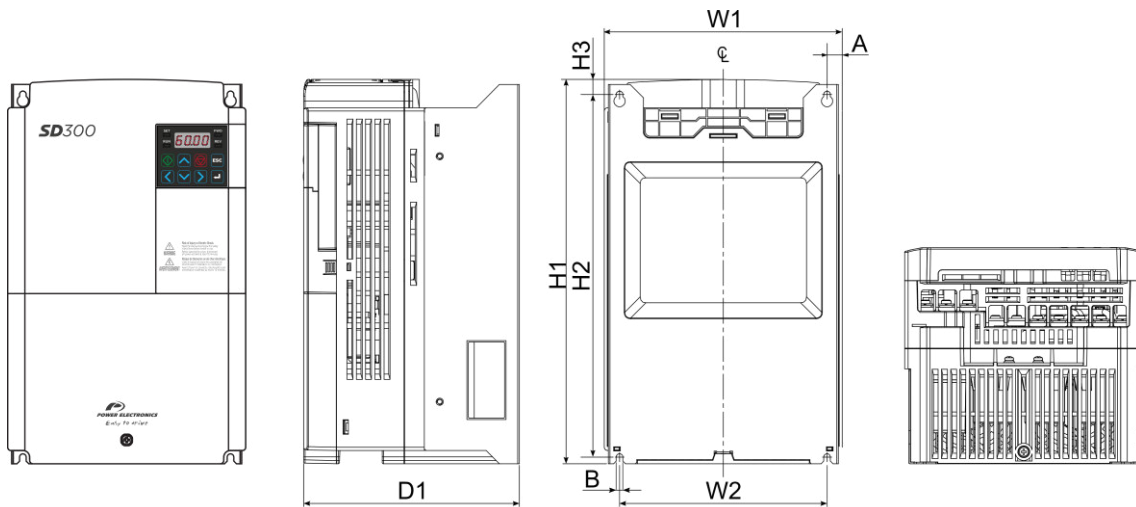


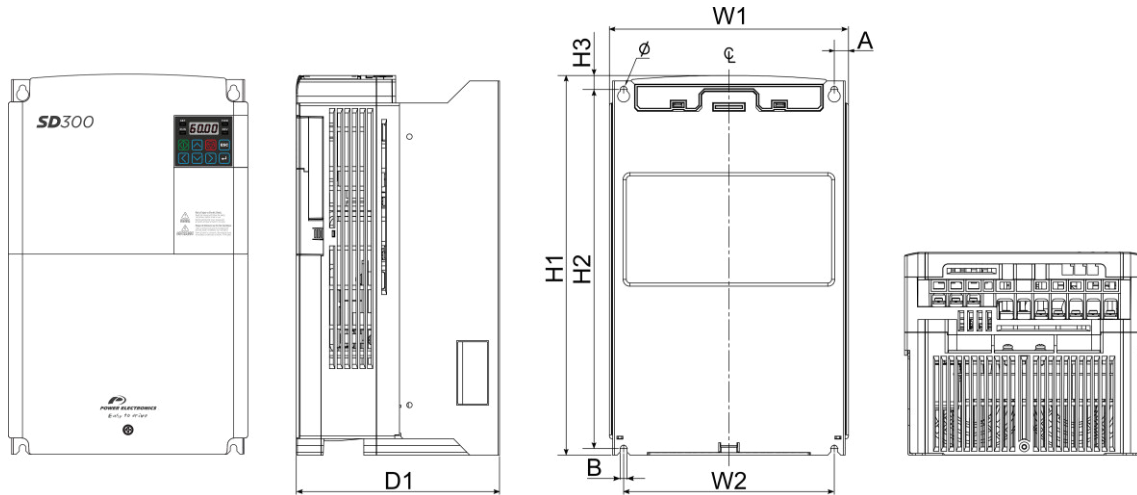
Figure 4.10 Frame 5 dimensions

SD30DTD0022A

4.1.11. Frame 6 Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	2	SD306922
380~480[V]	3	SD304442F, SD305842F

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
220 (8.7")	193.8 (7.6")	350 (13.8")	331 (13")	13 (0.5")	187 (7.4")	6 (0.2")	6 (0.2")	-	7.5 (15.4lb)



SD30DTD0023A

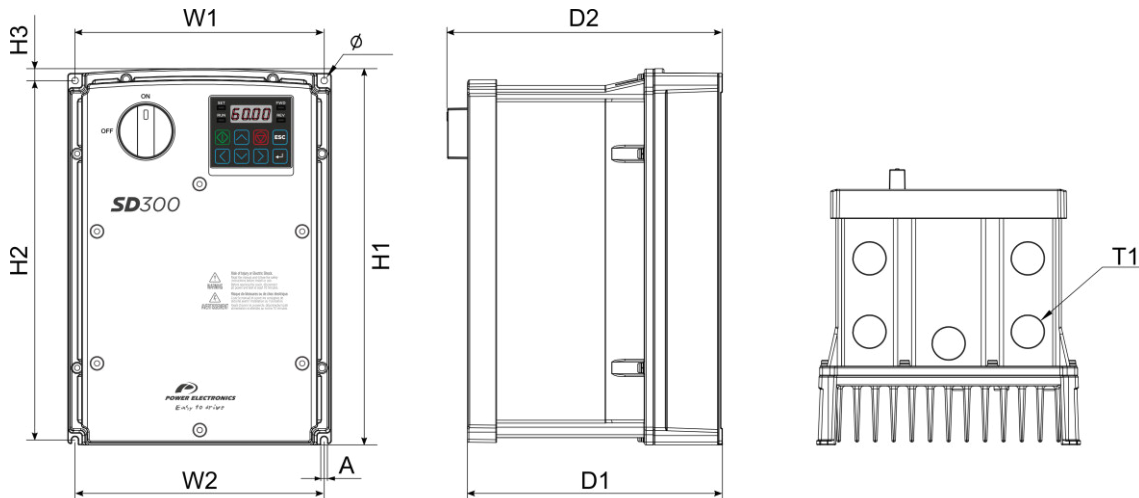
Figure 4.11 Frame 6 dimensions

4.2. IP66 Drives Dimensions

4.2.1. Frame 11 Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD300326, SD300526
380~480[V]	3	SD300146F, SD300246F

DIMENSIONS [mm/inch]											WEIGHT
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	(kg/lb)
180 (7.1")	170 (6.7")	257 (10")	245 (9.6")	8.2 (0.3")	174 (6.9")	188 (7.4")	4.5 (0.2")	4.5 (0.2")	22.3 (0.9")	-	3.7 (8.2lb)



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Figure 4.12 Frame 11 dimensions

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4.2.2. Frame 2I Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD300826, SD301126, SD301726
380~480[V]	3	SD300446F, SD300646F, SD300946F

DIMENSIONS [mm/inch]											WEIGHT
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	(kg/lb)
220 (8.7")	204 (8")	259 (10")	241 (9.5")	12 (0.5")	201 (7.9")	215 (8.5")	5.5 (0.2")	5.5 (0.2")	22.3 (0.9")	28.6 (1.1")	5.3 (12lb)

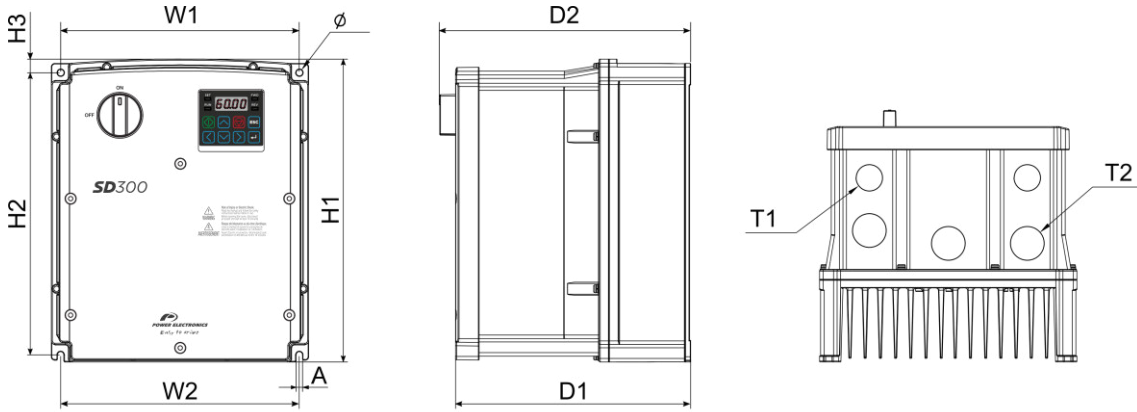


Figure 4.13 Frame 2I dimensions

SD30DTD0017A

4.2.3. Frame 3I Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD302426, SD303226
380~480[V]	3	SD301246F, SD301646F

DIMENSIONS [mm/inch]											WEIGHT
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	(kg/lb)
250 (9.8")	232 (9.1")	328 (13")	308 (12")	11 (0.4)	227 (8.9")	241 (9.5")	6 (0.2")	6 (0.2")	22.3 (0.9")	28.6 (1.1")	9 (19.8lb)

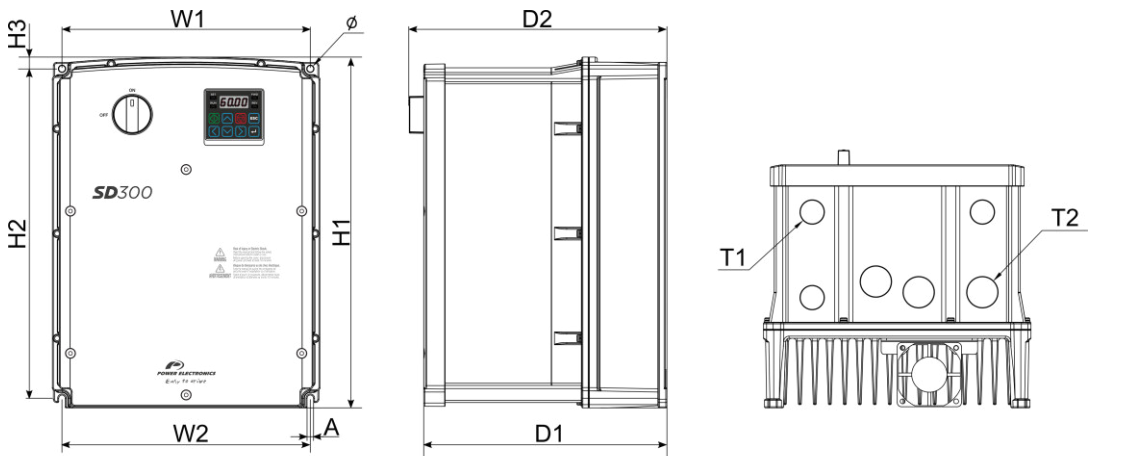


Figure 4.14 Frame 3I dimensions

SD30DTD0018A

4.2.4. Frame 4I Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD304626
380~480[V]	3	SD302446F, SD303046F

DIMENSIONS [mm/inch]											WEIGHT
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	(kg/lb)
260 (10")	229 (9")	400 (16")	377 (15")	15 (0.6")	246 (9.7")	260 (10")	6 (0.2")	-	22.3 (0.9")	34.9 (1.4")	9.6 (21lb)

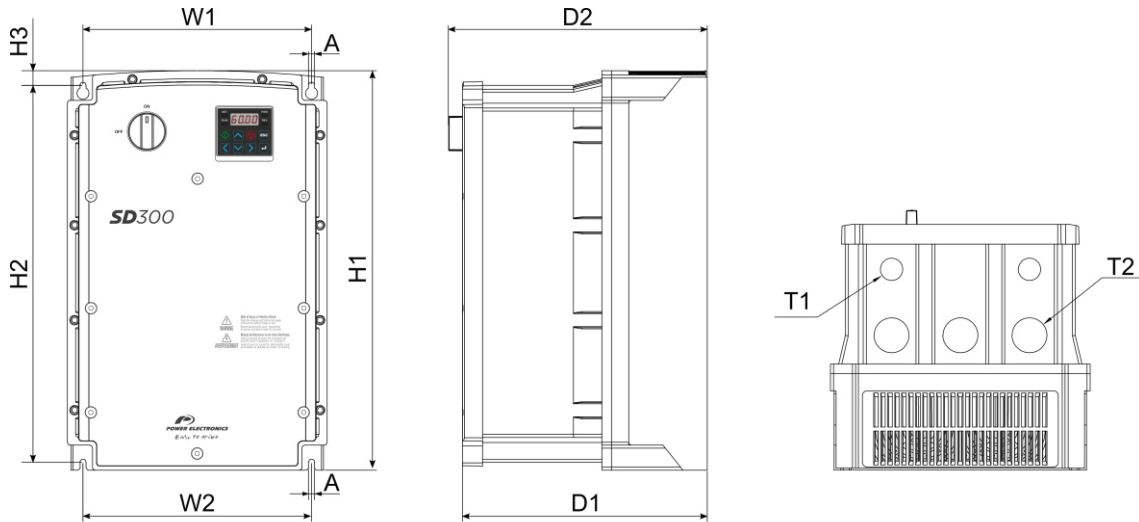


Figure 4.15 Frame 4I dimensions

SD30DTD0019A

4.2.5. Frame 5I Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
200~240[V]	3	SD306026
380~480[V]	3	SD303946F, SD304546F

DIMENSIONS [mm/inch]											WEIGHT
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	(kg/lb)
300 (12")	271 (10")	460 (18")	437 (17")	16 (0.6")	250 (9.8")	264 (10")	6 (0.2")	-	22.3 (0.9")	44.5 (1.8")	12.4 (28lb)

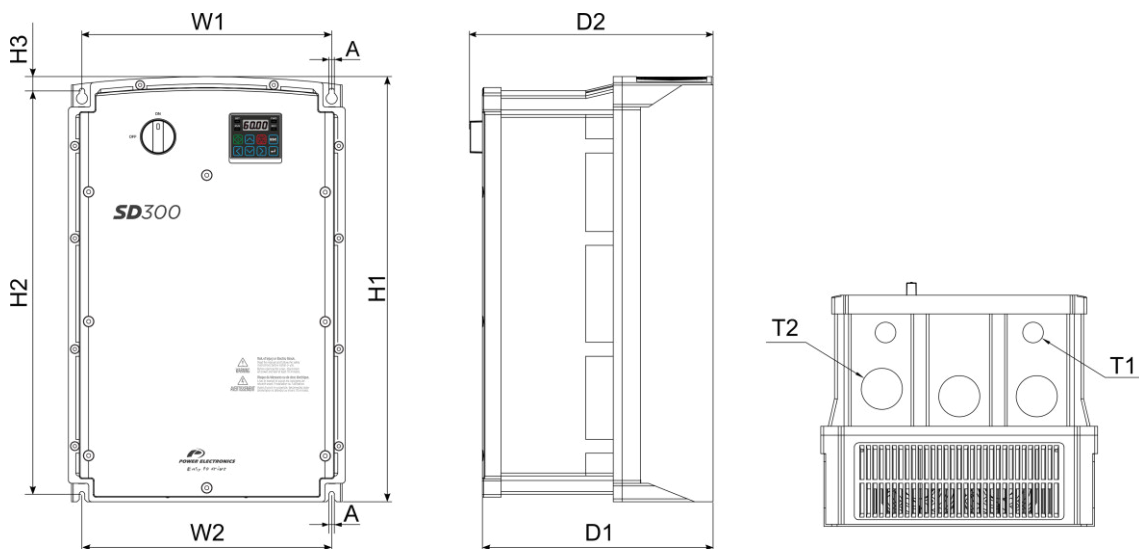


Figure 4.16 Frame 5I dimensions

SD30DTD0020A

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5. RECEPTION, HANDLING AND TRANSPORTATION



Read carefully the following instructions to ensure correct mechanical installation.
Otherwise, the equipment can be damaged and lead to personal injuries.

5.1. Reception and Storage

The SD300 is carefully tested and perfectly packed before delivery. 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 24hrs 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 -20°C and +65°C, < 95 RH without condensation. It is recommended not stacking more than two units.

5.2. Handling and Transportation



Handle the equipment carefully.
Otherwise, the equipment can gete damaged.

SD300 is delivered horizontally in a cardboard box.

Unpack the drive carefully. Do not use sharp tools as they could damage the product. After opening the package, please check the contained goods. Verify the item numbers contained within the package with the packing inventory list. Please remove and set aside any spare parts shipped with the product. There should be no evident damage caused by vibration, dropping or moisture.

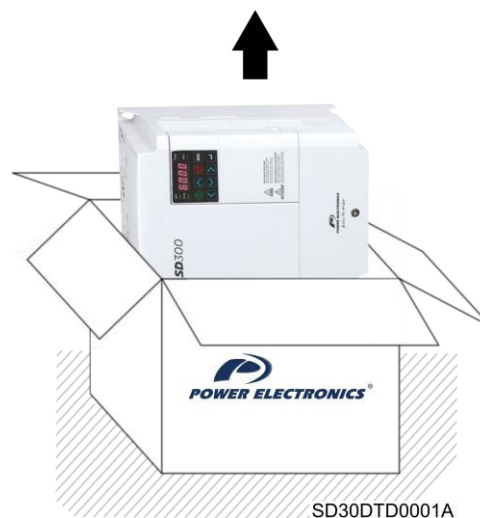


Figure 5.1 Drive unpacking.

When unpacking, carefully extract the drive from the box. The drive is packed with its frontal side facing up. Remove and place in its vertical standing position.

6. MECHANICAL INSTALLATION



CAUTION

The installation must be carried out by qualified personnel.

Otherwise, the equipment can get damaged and injuries could be sustained.

Before the installation, make sure the chosen location is suitable.

There must be enough space to fit the drive meeting the recommended clearances and ensuring that there are no obstacles impeding the cooling fans air flow.

6.1. Environmental Ratings

Power Electronics recommends following closely the instructions stated within this manual to ensure the correct operation of the drive. It is responsibility of the installer to ensure correct installation and suitable ambient conditions for the VFD. Additionally, any local regulations must be adhered to by the installer. The environmental ratings are:

- Environmental category: Indoor / Outdoor
- Pollution degree: PD3
- Cooling type: Forced fan cooling structure
Forced cooling type: 0.4~15 kW 200V/0.4~75 kW 400V
(excluding some models)
- Operation Ambient temperature: HD IP20: -10~50°C (14~122°F)
HD IP66: -10~40°C (14~104°F)
ND: -10~40°C (14~104°F) ^[1]
- Storage Ambient temperature: -20~65°C (-4~149°F)
- Humidity: Relative humidity below 90% RH (no dew formation)
- Altitude / Vibration: Below 1,000m, below 9.8m/s² (1G)
- Pressure: 70~106 kPa

[1] Power Electronics recommends to use load below 80% when using at 50°C under light load.

6.2. Drive Mounting

The SD300 variable speed drives are designed to be mounted on a wall or inside a panel.

The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate. Make sure to follow the clearance recommendations in section 6.3.

Hang the SD300 drive through the anchorages placed on the rear part of the drive on a solid wall or structure which supports the drive weight and the possible forces generated by the wiring.

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

Mount the drive using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the SD300 is placed flat on the mounting surface.

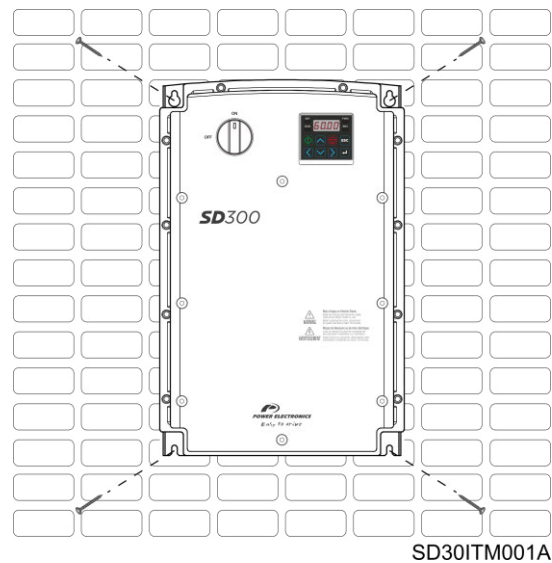


Figure 6.1 SD300 wall mounting

Note: The quantity and dimensions of the mounting brackets vary based on frame size. Please refer to section 4 to find the information that corresponds to your model.

There is an optional flange for special installations. Please consult Power Electronics and the corresponding manual for further information.

6.3. Clearances

The SD300 VFD must be installed in vertical position, and firmly fastened through the dedicated anchorages placed in the rear part of the drive that avoid any movement.

If the equipment is installed inside a cabinet, ensure that the hot air expelled from the VFD flows outside. This hot air can recirculate, and cause the drive to suffer from overheating. To guarantee a suitable ambient temperature, avoid the recirculation of air and follow the minimum clearance distances, as indicated below.

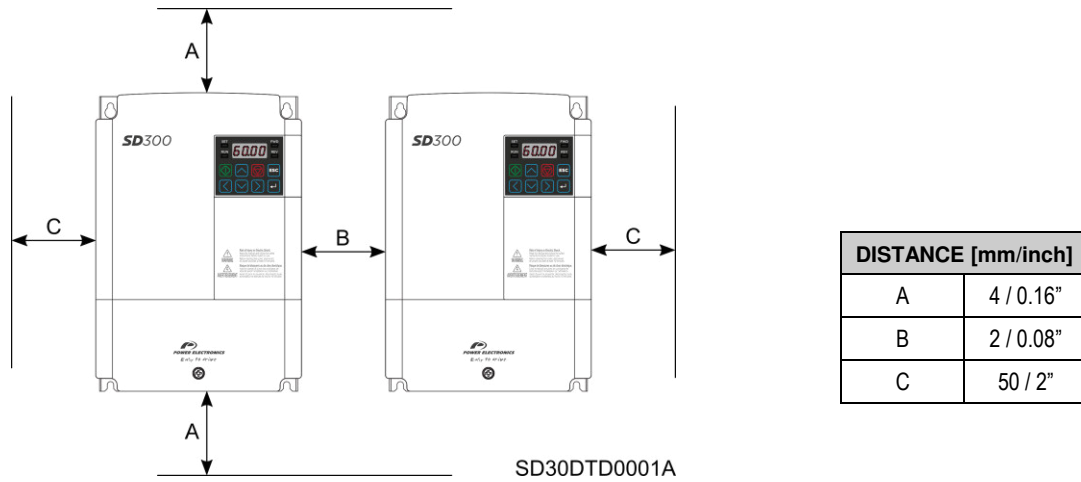


Figure 6.2 Minimum clearances

If you wish to install two or more drives in a technical room or cabinet, mount them side by side in a horizontal arrangement (do not stack one on top of the other), it is necessary to remove the top cover using a screwdriver and respect the minimum clearances in order to ensure proper cooling of the product.



Figure 6.3 Installing multiple drives



NOTICE

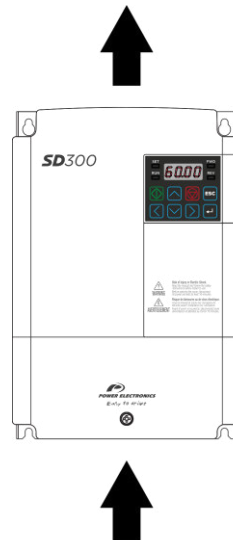
Remove the top cover of the drives when they are mounted in a horizontal arrangement. Otherwise, the equipment can get damaged and the warranty will be voided.

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6.4. Cooling

The heat sources inside the equipment correspond to the inverter bridge (IGBTs), rectifier bridge and the input filter (*).

The drive has at least one cooling fan (this varies depending on the drive size) at the bottom, the hot air is then dissipated through the gratings on the top side.



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Figure 6.4 Cooling airflow for SD300

It is possible to replace the cooling fans without dismantling the whole equipment. To do this, unscrew the screws in the fan corners and disconnect the connector.

(*) Optional elements.



NOTICE

Ensure that the technical room or cabinet has good air flow, taking into account that hot air cannot be recirculated by the drive.

7. POWER CONNECTION



CAUTION

Read carefully the following instructions to ensure correct electrical installation. Otherwise, it could cause damage to the equipment and lead to personal injuries.

7.1. Basic Configuration

Appropriate safety equipment must be used and the unit properly connected in order to guarantee correct operation. A drive which is incorrectly installed or set up can result in system malfunction, component damage or a reduced lifespan. You must read this manual thoroughly before proceeding.

	<p>AC Power Supply</p>	<p>Use a power supply with a voltage range compatible with the selected drive. SD300 drives are available for TN and TT grids, or IT grids (floating earth). Check the serial number to ensure the correct drive selection.</p>
	<p>Circuit Breaker</p>	<p>Select circuit breakers or fuses in accordance with applicable national and local codes. We recommend using specified circuit breakers or fuses to operate with the drive.</p>
	<p>Magnetic contactor (optional)</p>	<p>Install if necessary. When installed, do not use it for the purpose of starting or stopping the drive.</p>
	<p>AC reactor (optional)</p>	<p>Use an AC reactor if you wish to improve the input power factor of the power supply, reduce harmonics or suppress external surges.</p>
	<p>SD300 Installation</p>	<p>Install the drive following the recommendation within this manual in relation with the cooling requirements, position, clearances, wiring access and ground connection.</p>
	<p>DC reactor (optional)</p>	<p>DC reactors also contribute to improving the power factor and harmonics reduction, but DC reactors are usually used in facilities with higher power supply capacity.</p>
	<p>Motor cables</p>	<p>Select and install the motor cables according to the recommendation within this manual and the applicable national and local codes, otherwise you could cause EMC filtering malfunction and motor damage.</p>
	<p>Motor</p>	<p>Do not connect power factor capacitors, surge arrestors or RFI filters to the output side of the drive.</p>

7.2. Topology

SD300 drive operates according to the principle of pulse-width modulation (PWM). By 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 by means of its main components: rectifier bridge, the DC bus, inverter bridge, and power and control board.

The SD300 includes a gate drive and a control board to control the rectifier thyristor diode's bridge triggering, the inverter IGBT's bridge triggering, the soft charge, the DC bus voltage and the motor performance. In addition, the control board integrates the interface terminals such as communication ports, the digital and analogue inputs and outputs, display, etc.

7.3. Power Terminals

The available power terminals are shown in the figure below. For power connection, please refer to section 7.4.

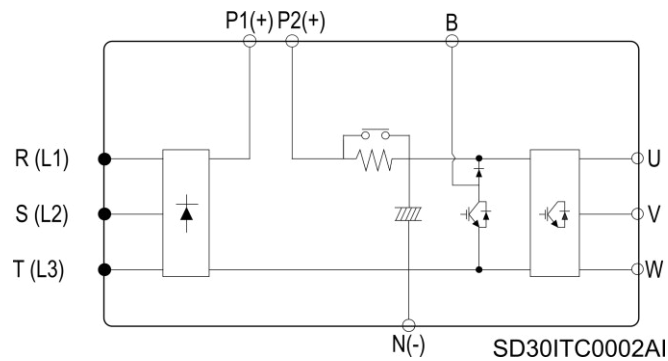


Figure 7.1 Location of terminals in the control board

	SIGNAL	DESCRIPTION
DC REACTOR	P1(+)	Connection terminal for DC reactor
	P2(+)	Harmonic mitigation
DYNAMIC BRAKE	N(-)	DC voltage negative terminal
	B	Integrated dynamic brake unit
POWER SUPPLY	R(L1)	AC Line Voltage input
	S(L2)	(3-phase, AC 200 ~ 230V)
	T(L3)	(3-phase, AC 380 ~ 480V)
MOTOR OUTPUT	U	Motor connection terminals
	V	(3-phase, AC 200 ~ 230V)
	W	(3-phase, AC 380 ~ 480V)

To access the power terminals, users have to unscrew the bottom cover as follows:

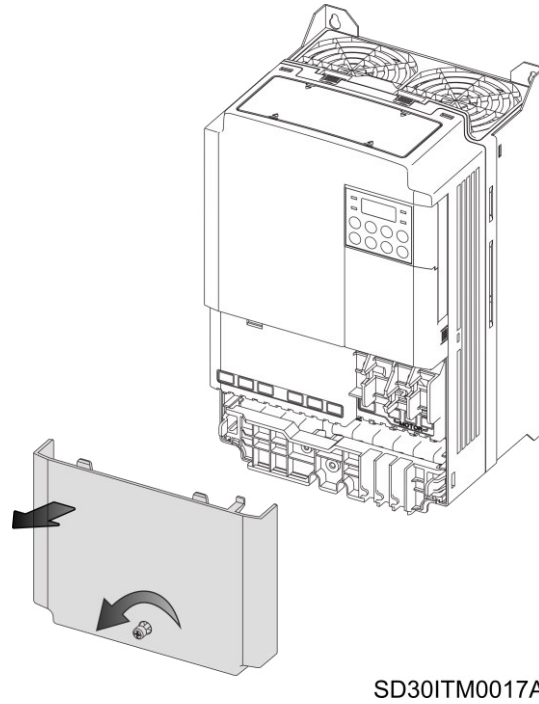


Figure 7.2 Bottom cover removal

Then remove the power terminals plastic protection pushing the sides clips as follows:

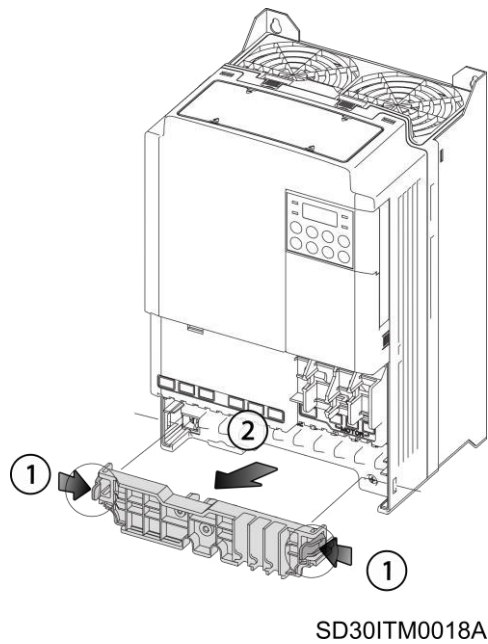


Figure 7.3 Plastic protection removal

7.3.1. Power Terminals in Single-Phase Drives

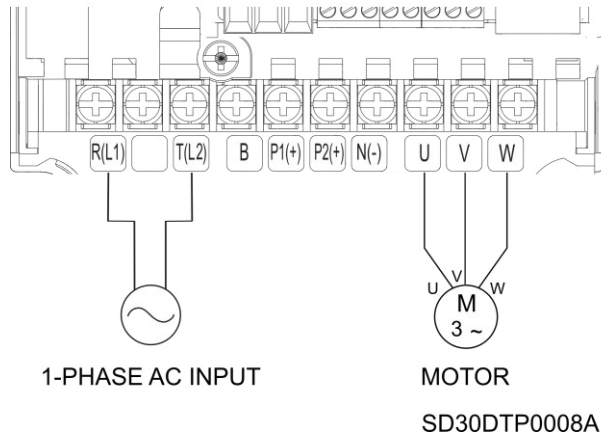


Figure 7.4 Power terminals in single-phase drives

7.3.2. Power Terminals in Frames 1N, 2N & 1F (3-Phase)

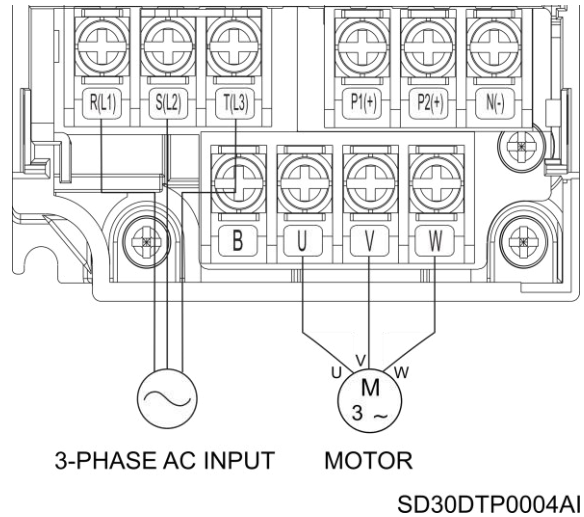


Figure 7.5 Power terminals in frames 1N, 2N & 1F

7.3.3. Power Terminals in Frames 3N, 4N & 2F (3-Phase)

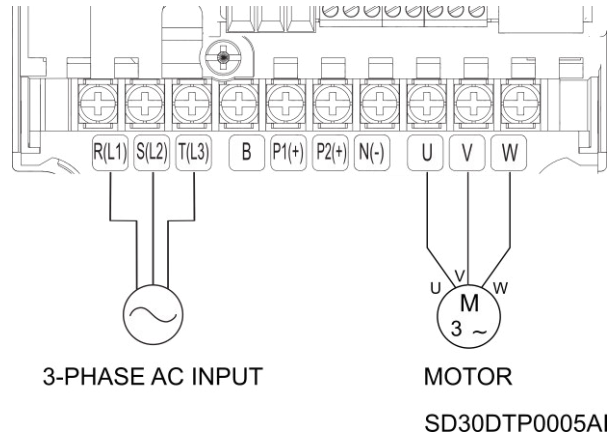


Figure 7.6 Power terminals in frames 3N, 4N & 2F

7.3.4. Power Terminals in Frames 5N & 3F (3-Phase)

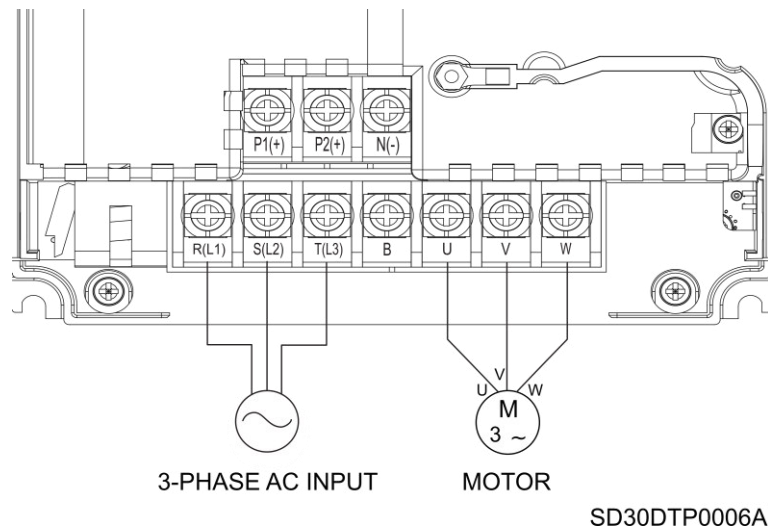


Figure 7.7 Power terminals in frames 5N & 3F

7.3.5. Power Terminals in Frames 4, 5 & 6 (3-Phase)

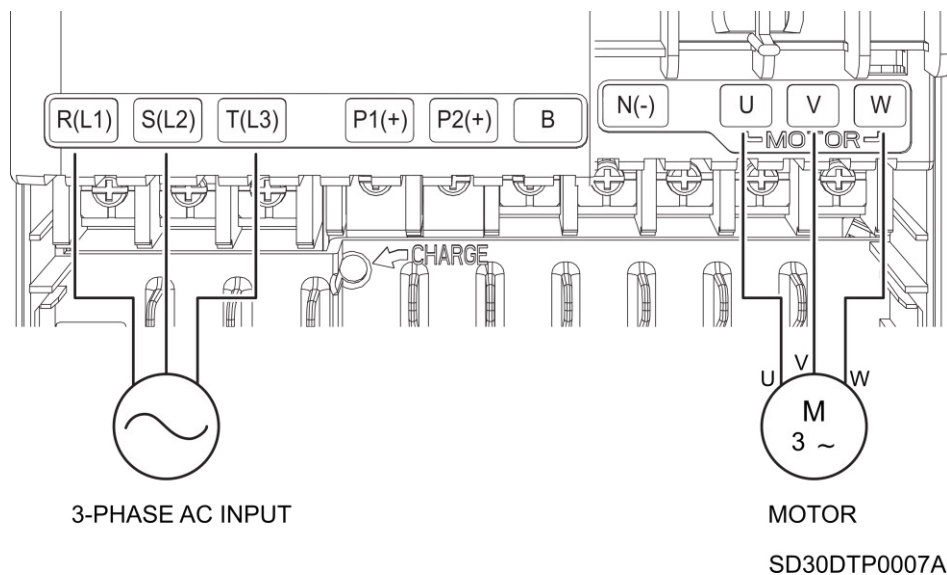


Figure 7.8 Power terminals in frames 4, 5 & 6

7.4. Power Connection and Wiring



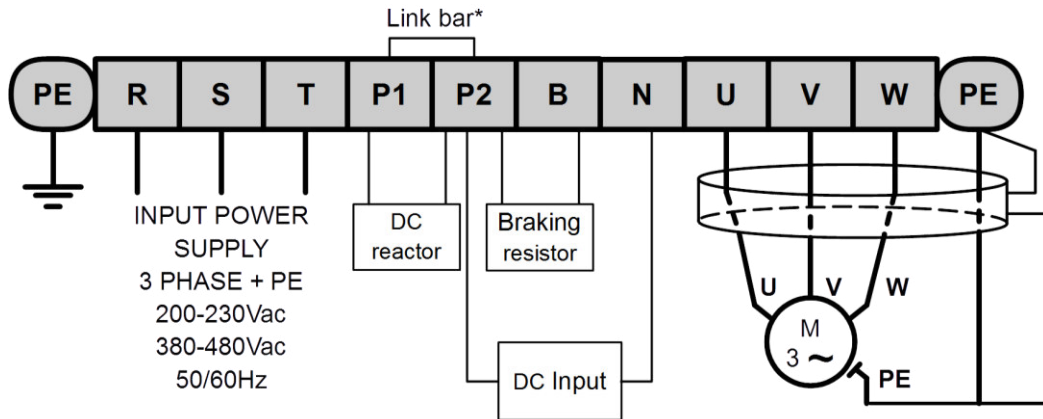
WARNING

The following installation recommendations are suitable for TN and TT grids. For IT grids, consult Power Electronics. Otherwise, the equipment could be damaged and the risk of injury heightened.

Any wiring or periodic inspections should be performed at least 10 minutes after disconnecting the input power. To remove the front cover, first check that the DC Link red LED is off, then remove the metallic cover and check with a multimeter the following:

- Measure between the output power busbars U, V, W and the cabinet and check that the voltage is around 0V.
- Measure that the DC link terminals +, - and chassis voltage are below 30VDC. Otherwise, you may get an electric shock.

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



Motor cable shield should be connected to the drive and, additionally, to the general earth of the installation.

(*) The link bar should be removed when wiring the DC reactor.

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Figure 7.9 Power wiring connection

Note: In single-phase drives, the S terminal is not available.

As standard, the input and output terminals are made of tin plated copper. If they are oxidized prior to its installation, the terminals will be poorly connected and this is a cause of overheating. To avoid this effect, clean the terminal lugs and all contact surfaces with ethanol and follow the recommended cable section.

Use insulated ring lugs when connecting the power terminals.

CAUTION

Line voltage (input supply) must never be connected to U, V and W terminals.
Incorrect connection will result in the drive being damaged.

It is necessary that the installer guarantees the correct observance of the law and the regulations that are in force in those countries or areas where this device is going to be installed.

Do not use capacitors for power factor correction, surge suppressors, or RFI filters on the output side of the drive. In doing so, the components could be damaged.

When connecting a motor, the total length should not exceed 100m for unshielded cables or 50m for shielded cables while the carrier frequency is below 2.5Hz. For drives below 4kW, this distance is reduced by half.

NOTICE

Do not exceed the motor cable distances included above.

Longer cables can cause reduced motor torque in low frequency applications due to voltage drop or increase circuit's susceptibility to stray capacitance which may trigger over-current protection devices or result in malfunction of equipment connected to the drive.

The power cables must have a sufficient power rating in order to prevent overheating and voltage drops. The installer must consider the cable cross-section, cable type, routing method and the ambient conditions to select the appropriate cable. It is only permitted the use of copper or aluminium cables.

7.4.1. Recommended Cable Section

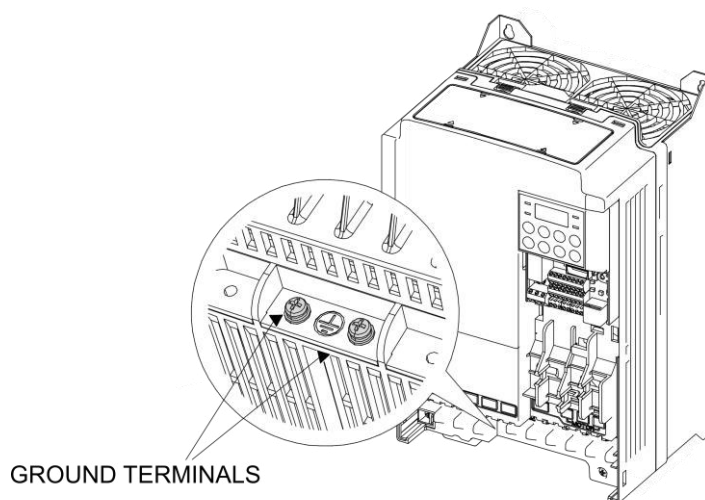
Model		Screw	Torque ^[1] [Kgf * cm / Nm]	Wire ^[2]				
				mm ²		AWG		
				R, S, T	U, V, W	R, S, T	U, V, W	
230V 1-phase	0.4 kW	M3.5 (1/8")	2.1 ~ 6.1 / 0.2 ~ 0.6	2	2	14	14	
	0.75 kW							
	1.5 kW	M4 (1/8")		3.5	3.5	12	12	
	2.2 kW							
230V 3-phase	0.4 kW	M3.5 (1/8")		2.1 ~ 6.1 / 0.2 ~ 0.6	2	2	14	14
	0.75 kW							
	1.5 kW							
	2.2 kW							
	3.7 kW	M4 (1/8")	3.5		3.5	12	12	
	4 kW							
	5.5 kW							
	7.5 kW							
	11 kW							
15 kW	M5 (3/16")	4.0 ~ 10.2 / 0.4 ~ 1.0	10	10	8	8		
			16	16	6	6		
400V 3-phase	0.4 kW	M3.5 (1/8")	2.1 ~ 6.1 / 0.2 ~ 0.6	2	2	14	14	
	0.75 kW							
	1.5 kW							
	2.2 kW							
	3.7 kW	M4 (1/8")		2.5	2.5	14	14	
	4 kW							
	5.5 kW							
	7.5 kW							
	11 kW							
	15 kW	M5 (3/16")	4.0 ~ 10.2 / 0.4 ~ 1.0	6	6	10	10	
	18.5 kW			10	10	8	8	
22 kW								

[1] Use only the specified torque on the screws, otherwise damage could occur. Loose screws can cause overheating and damage.

[2] Wires must permanently support 600V and T^a >75°C.

7.5. 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. The PE terminals are located in the bottom part of the drive and labelled with the appropriate ground connection.



SD30DTP0003AI

Figure 7.10 PE terminals location

Motor's chassis grounding must be connected to the drive. In other words, connect the motor's ground conductor to the PE output terminal of the drive and not to the installation's ground. We recommend that the cross section of the motor's ground conductor (PE) should have at least the cross section of the active conductor (U, V, W). Additionally, it should be installed following the recommendations indicated in section "7.4 Power Connection and wiring".

When connecting the earth, ensure that all connected terminal lugs are securely tightened and protected from mechanical forces. Check the recommended tightening torque in section 7.4.1.



WARNING

For safety reasons, it is essential to measure the grounding resistance of the installation. This must be established before the first start up of the plant and with the drive disconnected.

The installer is responsible of providing the adequate amount, type and cross section grounding conductor alongside the characteristics of the drive used and the plant, in order to minimize the grounding resistance, which must comply with local and national regulations.

7.6. Protections

7.6.1. Safety Stop Function

Safe Torque Off (STO) allows the drive output to be disabled so that the drive cannot provide power or generate torque in the motor.

The Safe Torque Off function meets EN ISO 13849-1 PLd and EN 61508 SIL2 (EN60204-1, stop category 0). This feature is standard and enables compliance with current safety standards. See section 8.5 for further information.

7.6.2. Ground Fault Protection

The drive is equipped with an internal software, the ground fault protective function protects the drive against input and output unbalanced currents. For further information, see the Programming and Software Manual.

This function is not intended to work as a safety or fire protection, so an external protection must be provided to ensure that a substantial ground fault current is promptly interrupted. The SD300 drives are compatible to operate with Type B RCDs, if it is required. The EMC filters and long motor cables increase the ground leakage currents, so the threshold response of the protection should be adjusted to suit the surrounding plant conditions. For additional information, contact with Power Electronics.

7.6.3. Short Circuit

The following table shows the voltage and current ratings for fuses and circuit breakers.

Model		AC Input Fuse		AC Reactor		DC Reactor	
		Current [A]	Voltage [V]	Inductance [mH]	Current [A]	Inductance [mH]	Current [A]
230V 1-phase	0.4 kW	10	600	1.2	10	4	8.67
	0.75 kW			0.88	14	3	13.05
	1.5 kW			0.56	20	1.3	18.45
	2.2 kW			1.2	10	4	8.67
230V 3-phase	0.4 kW	10		0.88	14	3	13.05
	0.75 kW			0.56	20	1.3	18.45
	1.5 kW	15		0.39	30	1.33	26.35
	2.2 kW			0.3	34		
	3.7 kW	32		0.22	45	1.25	43
	4 kW	50		0.16	64	0.95	61
	5.5 kW	50		0.13	79	0.7	75
	7.5 kW	63		4.81	4.8	16	4.27
	11 kW	80		3.23	7.5	12	6.41
	15 kW	100		2.34	10	8	8.9
400V 3-phase	0.4 kW	10		1.22	15	5.4	13.2
	0.75 kW			1.12	19	3.2	17
	1.5 kW	15	0.78	27	2.5	25	
	2.2 kW		0.59	35	1.9	32	
	3.7 kW	20	0.46	44	1.4	41	
	4 kW	32	0.4	52	1	49	
	5.5 kW		0.3	68	0.7	64	
	7.5 kW	35					
	11 kW	50					
	15 kW	63					
18.5 kW	70						
22 kW	100						

7.6.4. Motor Thermal Protection

The drive includes a motor thermal protection that, based on the motor performance parameters, mathematically calculates the thermal reservoir of the motor. When this reservoir is reduced below the limits, the drive automatically stops the motor. The thermal sensitivity is configured in the programming parameters. For further information consult Software and programming manual.

7.6.5. Others

The drive can implement additional motor and drive protections such as power-loss ride through, automatic fly restart, high and low input and output voltage, pump overload and underload... For further information, consult Software and Programming manual.

7.7. Dynamic Braking Resistors

A dynamic brake controls the regenerated energy. The dynamic brake activates an IGBT to discharge the DC bus over external resistors when the DC voltage overpasses a pre-set value.

SD300 drives include a built-in dynamic brake as standard. The user only has to connect a resistor between terminals P2 and B of the power board (see Section 7.3).

Reference	Input voltage (V)	Drive capacity (kW)	100% Braking		150% Braking		
			Ω	W*	Ω	W*	
SD300312, SD300312F, SD300322, SD300326	230	0.4	400	50	300	100	
SD300612, SD300612F, SD300622, SD300526		0.75	200	100	150	150	
SD300912, SD300912F, SD300922, SD300826		1.5	100	200	60	300	
SD301212, SD301212F, SD301222, SD301126		2.2	60	300	50	400	
SD301822, SD301726		4	40	500	33	600	
SD303022, SD302426		5.5	30	700	20	800	
SD304022, SD303226		7.5	20	1000	15	1200	
SD305622, SD304626		11	15	1400	10	2400	
SD306922, SD306026		15	11	2000	8	2400	
SD300242, SD300242F, SD300146, SD300146F		400	0.4	1800	50	1200	100
SD300342, SD300342F, SD300246, SD300246F			0.75	900	100	600	150
SD300542, SD300542F, SD300446, SD300446F			1.5	450	200	300	300
SD300742, SD300742F, SD300646, SD300646F	2.2		300	300	200	400	
SD301042, SD301042F, SD300946, SD300946F	4		200	500	130	600	
SD301642F, SD301246, SD301246F	5.5		120	700	85	1000	
SD302342F, SD301646, SD301646F	7.5		90	1000	60	1200	
SD303042F, SD302446, SD302446F	11		60	1400	40	2000	
SD303842F, SD303046, SD303046F	15		45	2000	30	2400	
SD304442F, SD303946, SD303946F	18.5		35	2400	20	3600	
SD305842F, SD304546, SD304546F	22		30	2800	10	3600	

Notes:

- The values of the braking resistors that appear in the table are the minimum recommended values. For a customized calculation, and adjusted to your application, please contact Power Electronics.
- 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 with Power Electronics.



CAUTION

Do not touch the braking resistor during the drive operation. It could be very hot (over 150°C).

8. CONTROL CONNECTION

8.1. Wiring Recommendations

Before planning the installation, follow these recommendations. The parallel cable routing should be minimized 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 separate cable racks, trays or ducts.

It is recommended to use shielded twisted cable for all the data, signal or control cables that exit the variable speed drive, with the shield correctly bonded to ground. To ensure an effective shield bonding, it is recommended to include in the SD300 front metal panel of the control board, EMC shield clamps that ensure a 360° effective shield bonding.

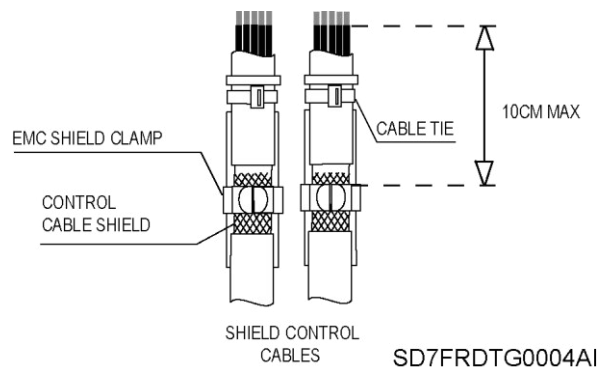


Figure 8.1 Shield bonding

Digital signal cables must be grounded at both ends of the cable (when there is not potential difference between equipments). 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 a low-interference is experienced (hum loops) using analogue signals disconnect the shield grounding from one of the ends. Please refer to section "8.3.2 Recommended cable section" for wire specifications and recommended tightening.

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

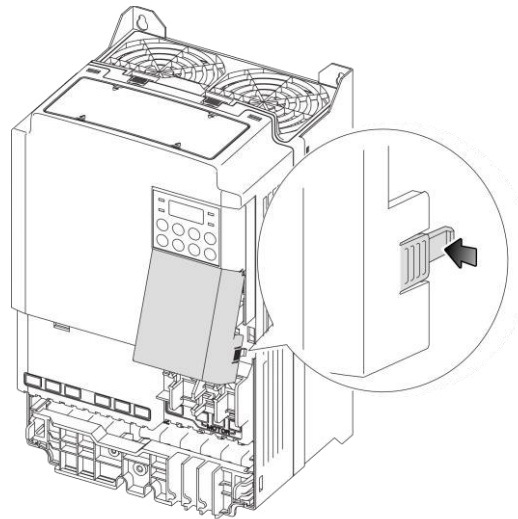


CAUTION

Changes of control wiring or bridges should be performed after disconnecting the input power and checking, with a multimeter, that the DC Link voltage is discharged (below 30VDC). Otherwise, you may get an electric shock.

8.2. Control Cables Access

The control cables must be connected to the control terminals located below the seven-segment display. Remove the terminals cover pushing on the right-side clip as follows:



SD30ITM0019A

Figure 8.2 Terminals cover removal

8.3. Control Board Terminals Description

The control board of the drive integrates some switches and connection terminals. These connection terminals vary depending on the equipment's degree of protection.

The following figures show the control board terminals schema:

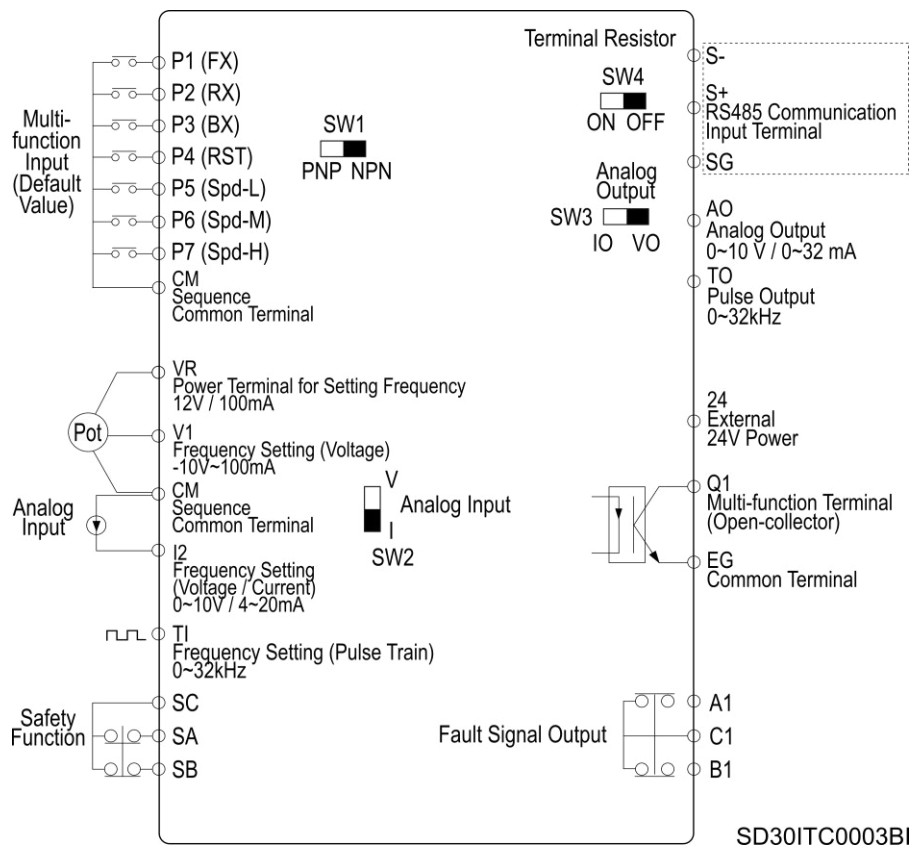


Figure 8.3 IP20 drives standard control terminals connection

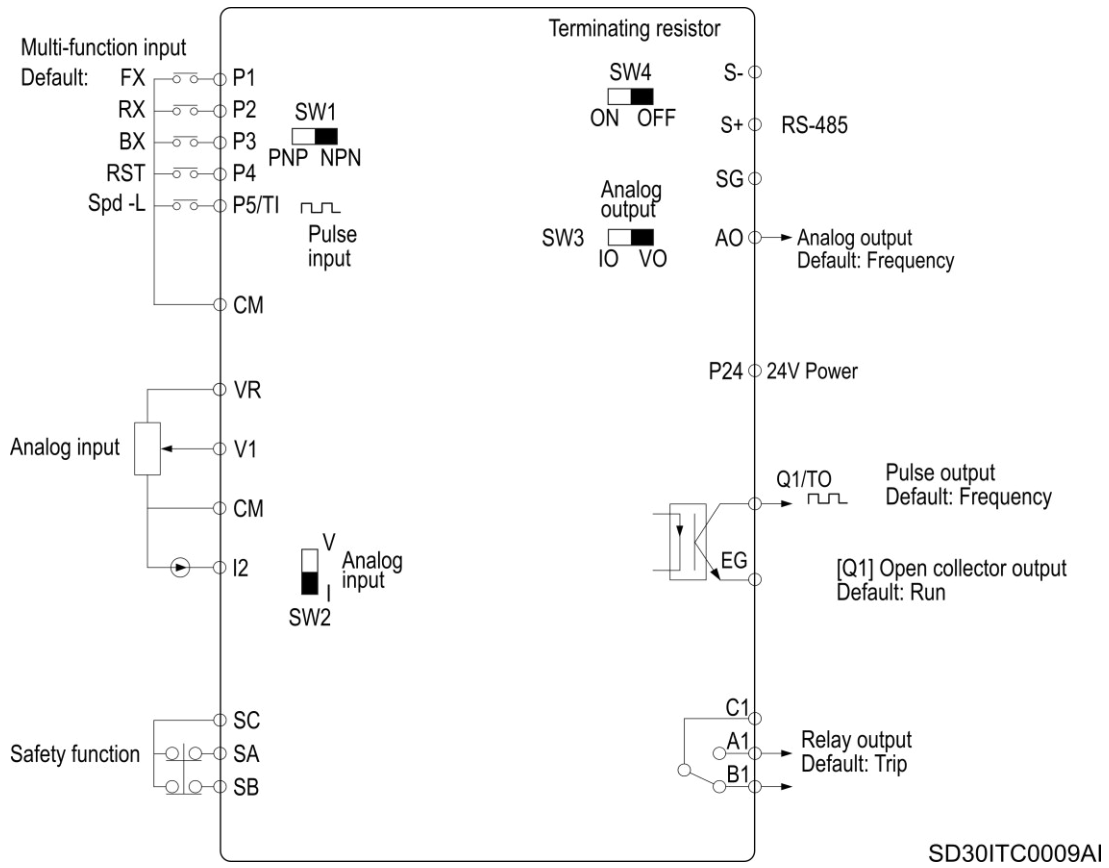


Figure 8.4 IP66 drives standard control terminals connection

Digital inputs can be configured individually or collectively. Analogue inputs can be configured as comparators. For further information, please refer to the Programming and Software Manual.

Note: The frontal cover of the control terminals can be removed to facilitate the connection.

The following figure shows the control terminals for IP20 drives:

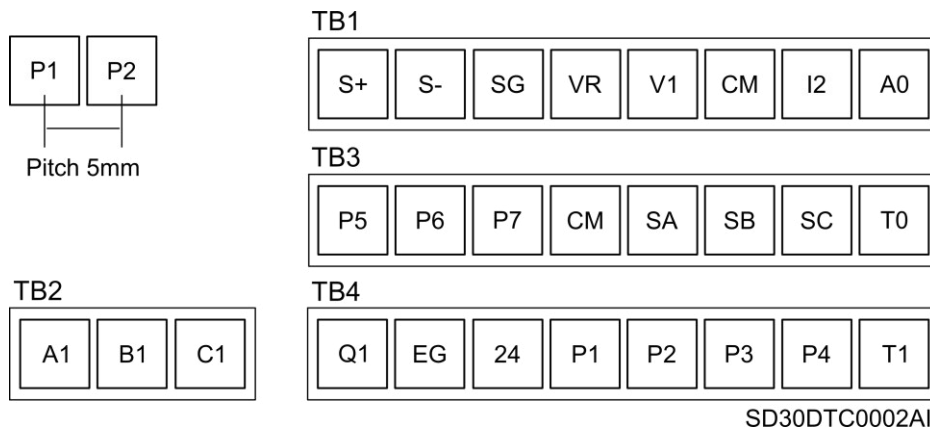
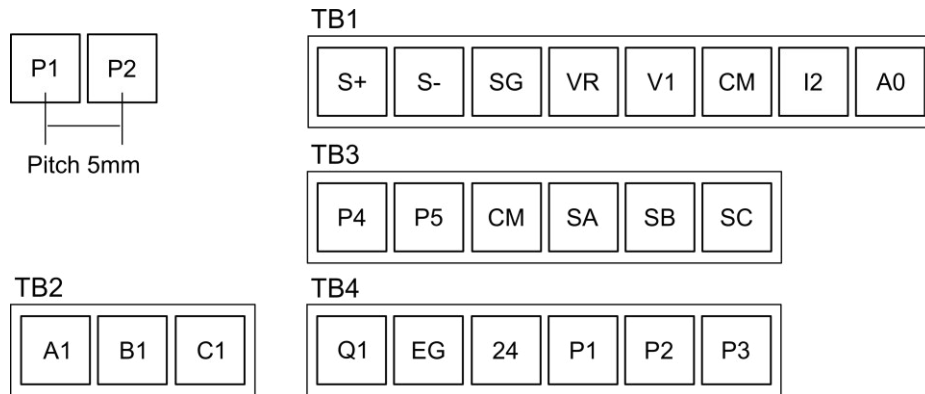


Figure 8.5 Standard control terminals for IP20 drives

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The following figure shows the control terminals for IP66 drives:



SD30DTC0001AI

Figure 8.6 Standard control terminals for IP66 drives

The following table contains the control terminals description:

SIGNAL	PIN	DESCRIPTION
DIGITAL INPUTS	P1	Configurable multi- function Input. Default value: FX.
	P2	Configurable multi- function Input. Default value: RX.
	P3	Configurable multi- function Input. Default value: BX.
	P4	Configurable multi- function Input. Default value: RST.
	P5	Configurable multi- function Input. Default value: Spd-L.
	P6 ^[1]	Configurable multi- function Input. Default value: Spd-M.
	P7 ^[1]	Configurable multi- function Input. Default value: Spd-H.
	CM	Common terminal for analog and digital terminal inputs and outputs.
DIGITAL OUTPUTS	Q1	Multi-function Terminal (Open-collector). 26VDC, ≤100mA. Default value: Run.
	EG	Common ground contact for an open collector (with external power source).
	24	External 24V power source. 150mA maximum output current.
	A1	Fault signal output. Sends out alarm signals when the inverter safety features are activated (AC 250V <1A, DC 30V <1A).
	C1	- Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection). - Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection).
ANALOGUE INPUTS	B1	
	VR	Power terminal used to setup or modify a frequency reference via analog voltage or current input. Max output V/I: 12V / 100mA, Potentiometer 1~5kΩ.
	V1	Setup or modify a frequency reference via analog voltage input terminal. - Unipolar: 0 ~ 10V (max12V) - Bipolar: -10 ~ 10V (max ±12V)
	I2	Configurable voltage/current input using the SW2 switch. Voltage / Current Analog Input (0~10V (max 12V) / 4~20mA (max24mA, input resistance: 249Ω)).
ANALOGUE INPUTS	TI ^[1]	Frequency Setting (Pulse Train) 0~32kHz. - Low level: 0-0.8V - High Level: 3.5-12V In IP66 drives, this input is shared with the P5 terminal. This terminal must be set as TI in the parameter G5.69 to use it as a train pulse input. For more information consult the Programming and Software Manual.
	ANALOG OUTPUT	AO
TO ^[1]		Pulse Output signals 0~32kHz and 0-12V. Use only a wire to connect this signal to the input of another SD300 drive. Do not install any resistor. In IP66 drives, this output is shared with the Q1 terminal.
RS485 COMMUNICATION	S-	Communication port RS485 with Modbus protocol up to 115200 kbit/s.
	SG	
	S+	
STO	SC	Safe Torque Off (STO) input available by default. Used to block the drive's output in an emergency. Built-in two NC relays SA and SB. (24VDC, <25mA.) Conditions:
	SA	- Normal Operation: Both the SA and SB terminals are connected to the SC terminal.
	SB	- Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.

[1] Only available in IP20 drives.

8.3.1. Pulse Output Signals Connection in IP66 Drives

In IP66 drives, the pulse output signal is shared with the Q1 terminal. This terminal must be set as TO in the parameter G6.33 and the next connections must be performed to use it as a train pulse output:

- Connect a 1/4W, 560Ω resistor between VR and Q1 terminals.
- Connect EG and CM terminals.

8.3.2. Recommended Cable Section

The recommended wire characteristics are summarized in the table below. The wire length of the safety input should not exceed 30m.

Terminal Type	Recommended wire size [mm ²] (AWG)		Screw	Torque [N.m]
	No crimp-style terminal	Crimp-style terminal		
P1 – P7, CM	0.75 (18)	0.5 (20)	M2 (1/32")	0.22 ~ 0.25
VR				
V1				
I2				
AO				
Q1				
EG				
24				
TI				
TO				
SA, SB, SC				
S+, S-, SG				
A1, B1, C1	1.0 (17)	1.5 (15)	M2.6 (3/32")	0.4
A2, C2				

8.4. Control Switches

There are four control switches, one for the PNP/NPN mode, one for the terminal resistor and two for analog signals. They are described in the table below:

SWITCH		OPTIONS	DESCRIPTION
SW1	PNP / NPN	PNP / NPN	NPN/PNP mode selection switch.
SW2	ANALOG INPUT	V / I	Analog voltage/current input terminal selection switch.
SW3	ANALOG OUTPUT	IO / VO	Analog voltage/current output terminal selection switch.
SW4	TERMINAL RESISTOR	ON / OFF	Terminating Resistor selection switch.

8.5. STO - Safe Torque Off

The STO function is defined as follows:

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 supplying alternating three-phase power to the stator.

This function is included as standard in SD300 drives and corresponds with an Emergency Stop Category 0 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 SD300's STO function permits to achieve two Safety Levels for the STO function. The safety integrity level SIL2 (PLe) requires the use of an external SELV/PELV 24V_{DC} source, emergency push button, and a safety relay SIL2 certified with feedback. For safety integrity, level SIL1 (PLc) it is only required an external push button.

By using this function, cleaning, emergencies or maintenance work on non-electrical parts of the machinery can be performed without switching off the input power supply to the drive.

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

The safety input function meets EN ISO 13849-1 PLd and EN 61508 SIL2 (EN60204-1, stop category 0)

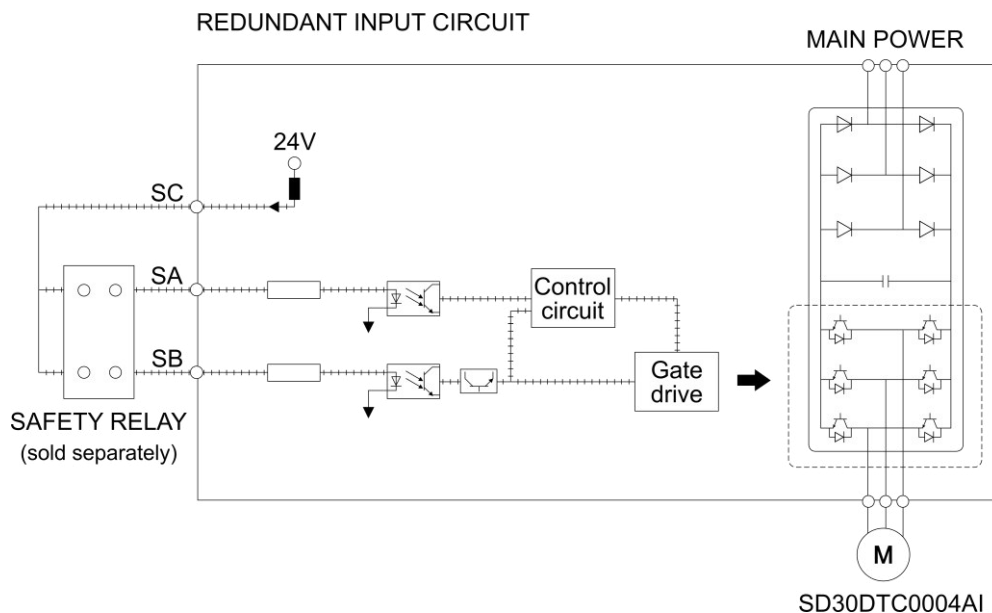


Figure 8.7 Safe input function circuit

CAUTION

The STO safety function does not disconnect the main input power and auxiliary power supply. The drive disconnects the output motor power supply. Therefore, active conductors may be present inside so do not carry out electrical maintenance tasks without isolating the drive. Otherwise, it could cause damage to the equipment and lead to injury and even death.

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

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 emergency stop.

9. COMMUNICATION

9.1. RJ45 Communication

The drive can be connected to the display using any RJ45 cable. To connect to any other equipment, such as a computer or laptop, the user will need to purchase RJ45 to RS232 and RS232 to USB adapters.

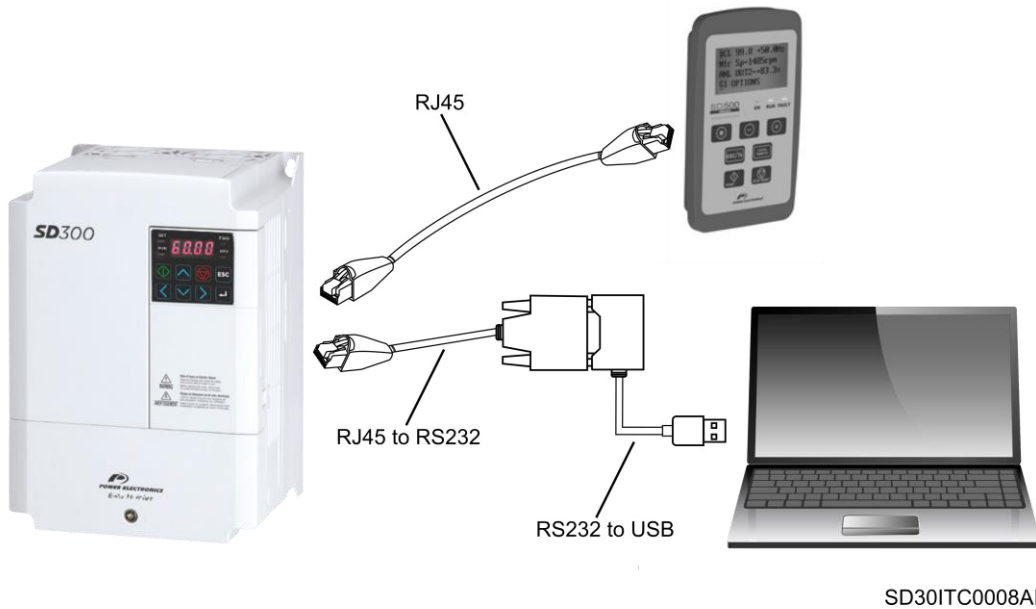


Figure 9.1 Connecting the drive to other devices

9.2. Modbus Communication

9.2.1. Introduction

The drive can be controlled and monitored by the sequence program of a PLC or another master module.

Various drives, or other slave devices, can be connected in a RS485 network to be controlled by a PLC or computer. This way, parameter setting and monitoring can be done from a computer, via a user program.

To communicate, any kind of RS485 converter can be used. Specifications depend on the manufacturer.

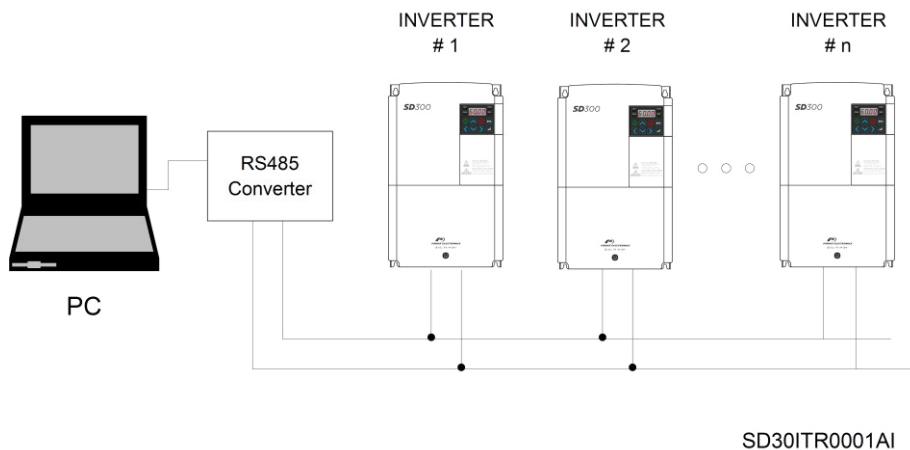


Figure 9.2 RS485 network system configuration

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The purpose of the Serial Communication Network of the SD300 is to integrate the drive into a network compatible with the Modbus communications protocol. This is possible using the RS485 physical communications port or USB port.

Modbus communication system allows SD300 drives to be controlled and/or monitored as a slave by a Modbus master from a remote location.

RS485 network allows connecting up to 16 equipments in the same network.

SD300 drives operate as a peripheral slave when connected to Modbus system. This means that the drive does not start the communication task, the master does.

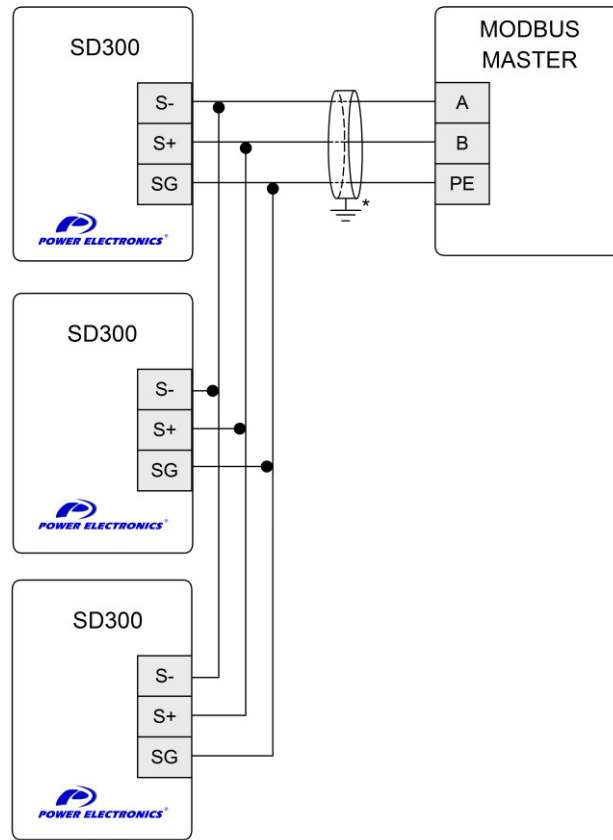
Practically all of the operating modes, parameters and drive characteristics are accessible through serial communications. For example, master can give start and stop order to the drive, control SD300 status, read the current used by the motor etc., in short, the master can access all of the features of the drive.

9.2.2. Communication Standards

Item	Standard
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Number of connected inverters/ Transmission distance	Maximum of 16 inverters / Maximum 1,200m (recommended distance: within 700m)
Recommended cable size	0.75mm ² , (18AWG), Shielded Type Twisted-Pair (STP) Wire
Installation type	Dedicated terminals (S+/S-/SG) on the control terminal block
Power supply	Supplied by the inverter - insulated power source from the inverter internal circuit
Communication speed	1,200/2,400/9,600/19,200/38,400/57,600/115,200 bps
Control procedure	Asynchronous communications system
Communication system	Half duplex system
Character system	Modbus-RTU: Binary
Stop bit length	1-bit/2-bit
Frame error check	2 bytes
Parity check	None/Even/Odd
Terminals	S- → RS485 A (negative) S+ → RS485 B (positive) SG → 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
Programmable inputs via Modbus	7 digital inputs in IP20 drives and 5 digital inputs in IP66 drives 2 programmable analogue inputs (0~10V / 4~20mA)
Programmable outputs via Modbus	3 relay outputs 2 programmable analogue outputs (0~10 V / 0~32 mA)

9.2.3. RS485 Connections

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



* The connection of the shield could be done on the gateway terminals or on the opposite extreme of the cable, depending on the installation conditions.

SD30DTR0001AI

Figure 9.3 RS485 connection

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10.COMMISSIONING



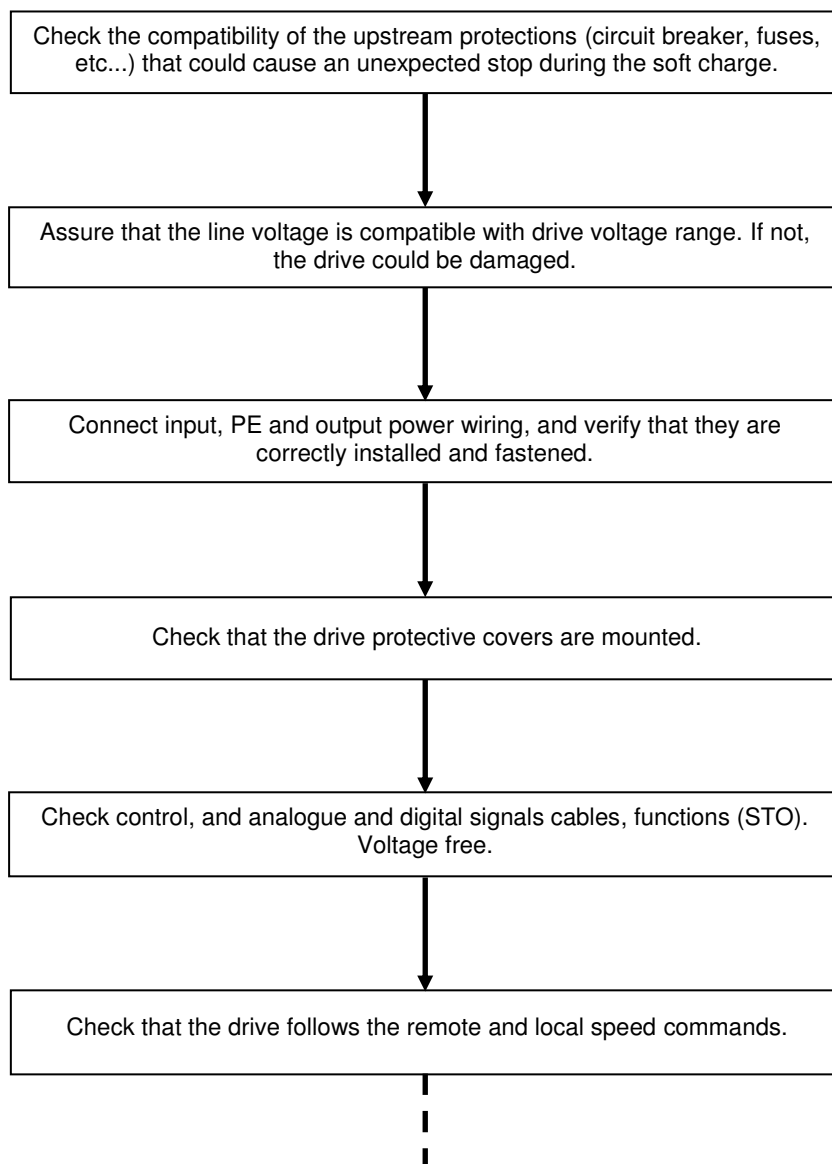
CAUTION

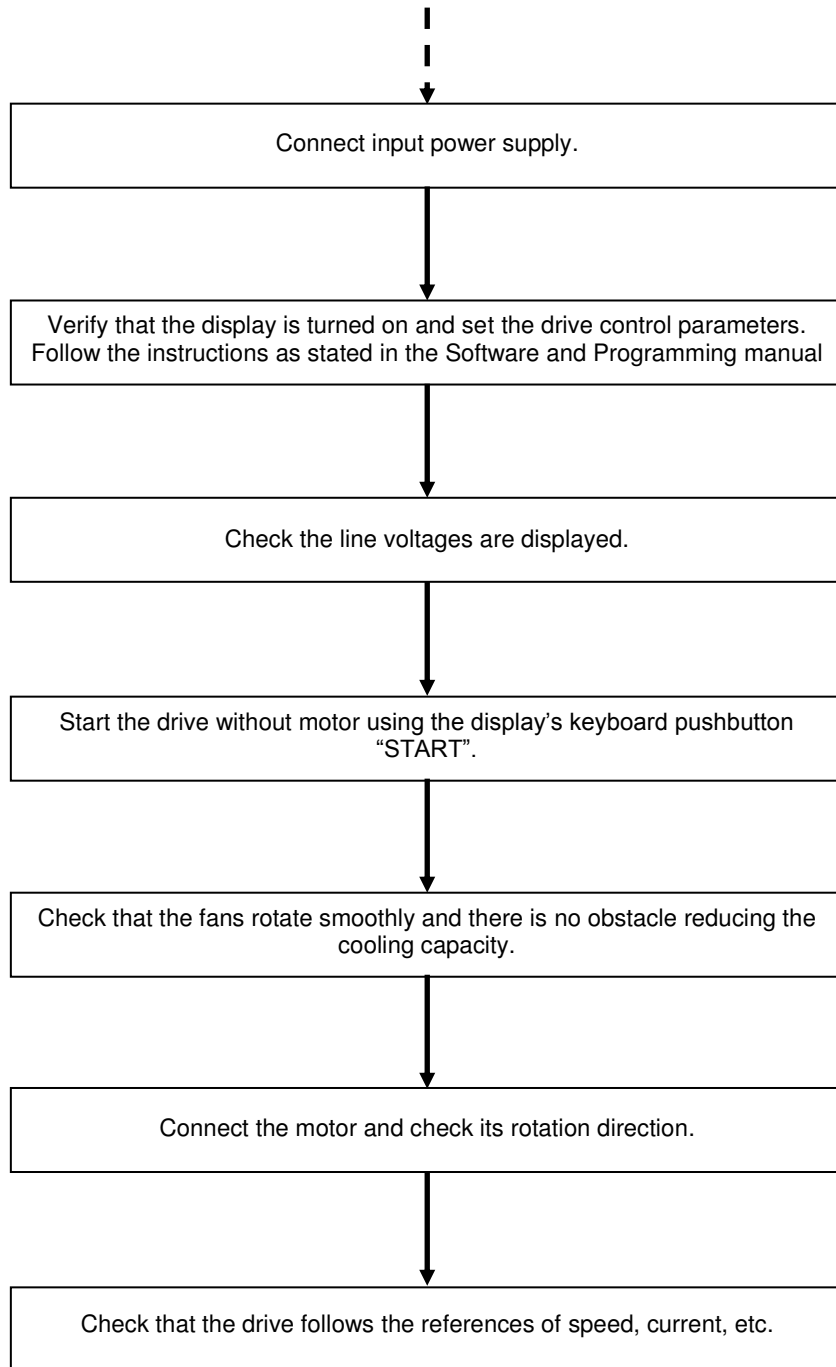
Only qualified personnel are allowed to commission the drive. Read and follow the safety instructions on the first pages of this manual. Neglecting the safety instructions can cause injury or death.

Ensure that there is no voltage present in the input power terminals and no voltage can be connected to the drive inadvertently.

This chapter does not include all the tasks to be performed during commissioning, follow local and national regulations.

In order to carry out a commissioning correctly, we recommend checking the following steps:





11. USE OF THE DISPLAY

The built-in display provides intuitive data presentation, ease of navigation through the control parameters and allows for storage thousands of user customized configurations.

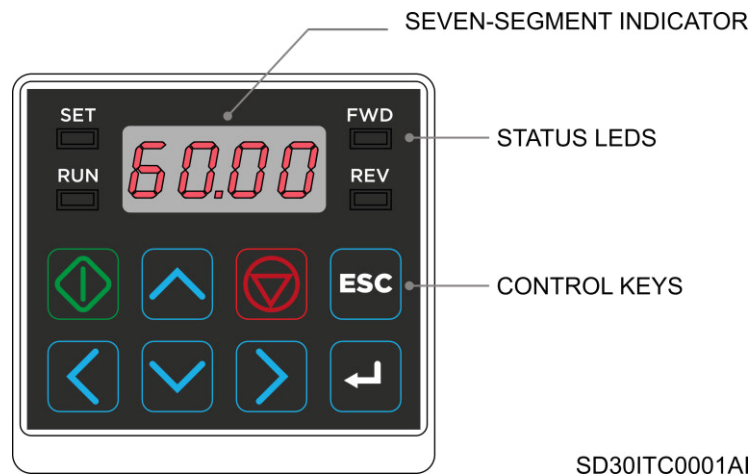
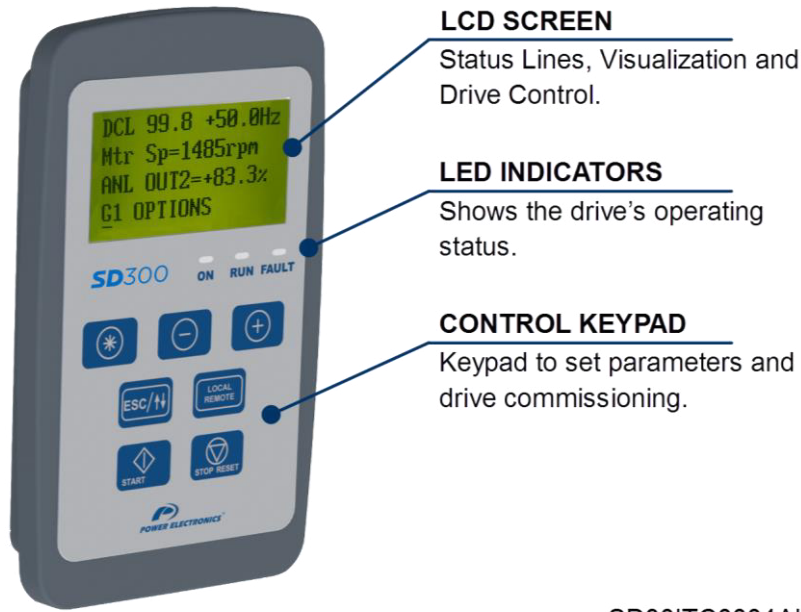


Figure 11.1 Built-in display unit

It has four indicator leds that supply information about the drive operational status, plus eight control keys. They are described in the table below:

KEY / LED	NAME	FUNCTION
	RUN key	Run command.
	STOP/RESET key	STOP: Stop command during operation. RESET: Reset command when a fault occurs.
	UP key	Used to scroll through codes or to increase a parameter value.
	DOWN key	Used to scroll through codes or to decrease a parameter value.
	Left key	Used to jump to other parameter groups or move the cursor to the left.
	Right key	Used to jump to other parameter groups or move the cursor to the right.
	Enter key	Used to set a parameter value or to save the changed parameter value.
	Escape key	Used to cancel the Jog or Remote/Local change key or when editing.
FWD LED	Forward Run	Illuminated during forward run LEDS flicker when a fault occurs
REV LED	Reverse Run	Illuminated during reverse run
RUN LED	Run	Illuminated during operation / Flickering during acceleration/deceleration.
SET LED	Setting	Illuminated during parameter setting / Flickering when the ESC key is operating as a multi-key.
Seven-segment indicator	Current value	Indicates operating conditions and parameter data.

Some SD300 models also include a second display as a removable unit for remote installation, as shown in the illustration. The display integrates three LEDs indicating the drive's operating status, an LCD display screen with 4 lines of 16 characters and control keypad for parameter setting and commissioning.



SD300ITC0004AI

Figure 11.2 Display and Keypad Unit

LED Status Indicators.

Leds show at any time, and in a comprehensive way for the user, information about output voltage or if a fault has taken place.

LED	COLOR	FUNCTION
ON	Yellow	Switched on indicates the equipment is powered.
RUN	Green	Switched on indicates the motor receives voltage from the SD300.
FAULT	Red	Flashing indicates the equipment has a fault condition.



SD300ITC0005AI

Figure 11.3 Display Status

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Alphanumeric LCD Display Screen.

The removable display integrates a four-line LCD screen with sixteen characters per line (16x4). Each line has different functions.

Status Line: Upper line.
Always present and shows the drive status (RUN, STP, etc...).
It also shows the motor output current and speed.
It is not configurable by the user.

Display Line 1: Second screen line.
Always present and allows the user to select the different variables within the display menu.
It is configurable by the user.

Display Line 2: Third screen line.
Always present and allows the user to select the different variables within the display menu.

Programming Line: Lower line
The user can view and set the different parameters

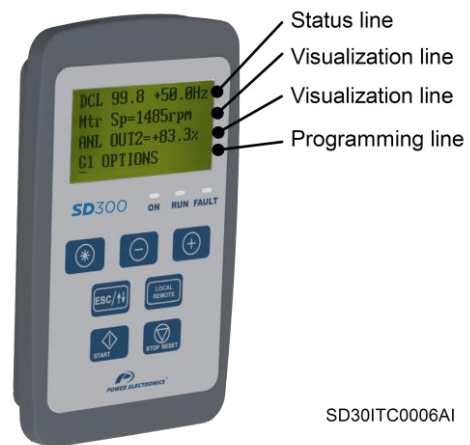


Figure 11.4 Display lines detail

Control Keypad

The keypad items have different functions depending on their individual or combined use:



Enter into a parameter group to access the subgroups. In case a group does not have subgroups, the access would be straight to the group parameters.

To modify numeric parameters:



&



Pressed simultaneously, the value increases



&



Pressed simultaneously, the value decreases

To modify enumerated parameters:



By pressing this key, the extended description is shown.



&



Press these two keys simultaneously, to switch between possible values in ascending order.



&



Press these two keys simultaneously, to switch between possible values in descending order.



Scroll through the parameter groups. Within a parameter group, it is possible to browse the different parameters in ascending order. It also allows setting (increase) the value of configurable parameters.



Same function as the previous key, but downwards. It also allows setting (decrease) the value of configurable parameters.



By pressing for a 2 second period (approximately), the cursor changes within the different lines configurable by the user. It also allows to exit from a menu location to a previous one.



By pressing this key, the drive starts if it is configured in local control mode (check equipment configuration). This button will only operate when the equipment is configured in local control mode.

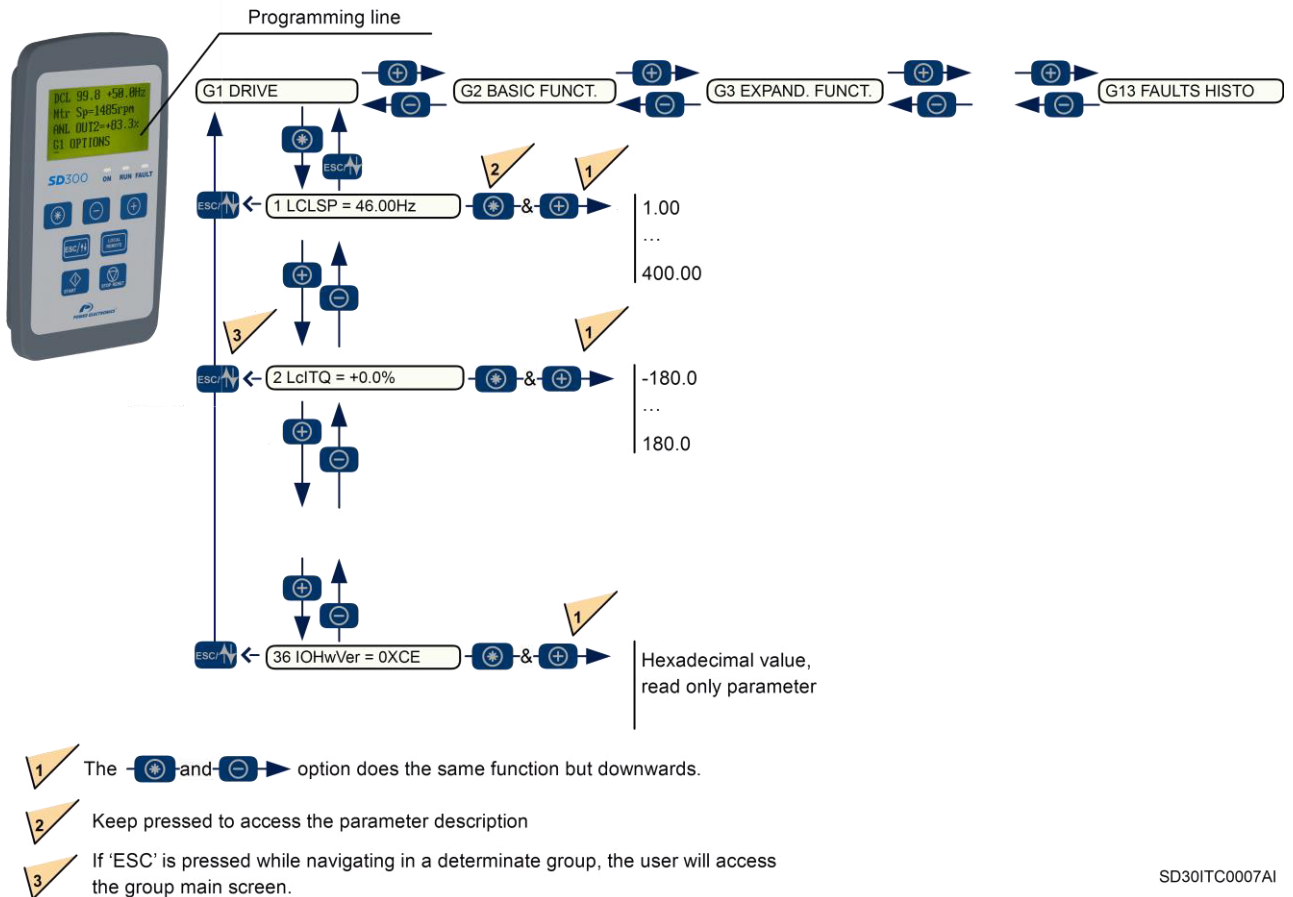


Pressing this key stops the drive if it is running. In case the equipment is at fault, pressing this button will reset the drive whenever the fault conditions have disappeared. This button will only work when the equipment is configured in local control.



Not used.

The figure below shows a programming example:



E
N
G
L
I
S
H

Figure 11.5 Parameter navigation example

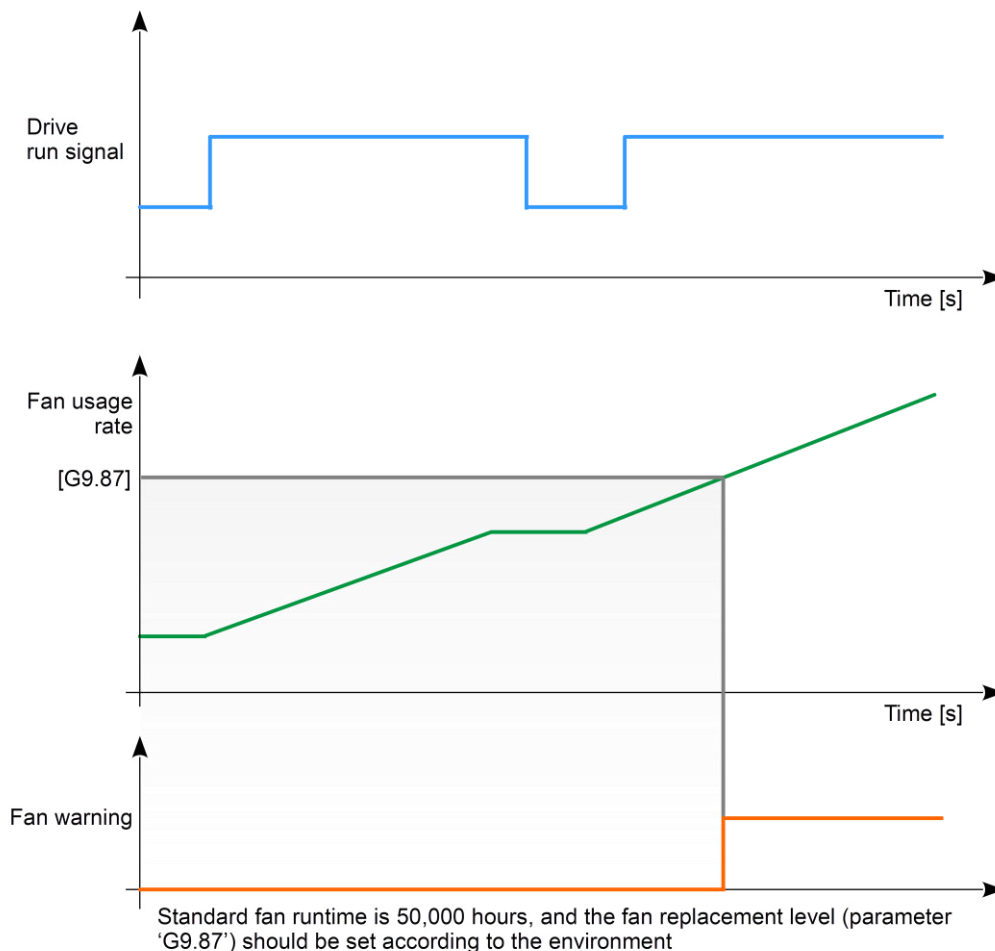
12. MAINTENANCE

SD300 drives consist of advanced semiconductor devices. Temperature, humidity, vibration and deteriorated components can reduce their efficiency. To avoid any possible irregularities, we recommend making periodic inspections.

12.1. Cooling

It is possible to replace the cooling fan without dismounting the whole equipment. To do this, unscrew the screws and disconnect the connector.

The following image shows the standard fan usage rate. Replacement level can be set in parameter 'G9.87'.



SD30ITCC0001AI

Figure 12.1 Fan usage rate

12.2. Warnings

- Make sure to disconnect the input power while performing maintenance.
- Make sure to perform maintenance after checking the DC Link capacitor has discharged. Check that the voltage between terminals +HVDC and -HVDC is below DC 30V. The bus capacitors in the drive main circuit can still be charged even after the power is turned off.
- The correct output voltage of the drive can only be measured by using an RMS voltage meter. Other voltage meters, including digital voltage meters, are likely to display incorrect values caused by the high frequency PWM output voltage of the drive.

12.3. Routine Inspection

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

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

Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Measurement instrument
			Monthly	1 year	2 years			
All	Ambient conditions	Are the ambient temperature and humidity within specification?	o			Visual check	Temperature: HD IP20: -10~50°C (14~122°F) / HD IP66: -10~40°C (14~104°F) / ND: -10~40°C (14~104°F). Humidity: below 95% non-condensing.	Thermometer, Hygrometer, Recorder.
	Module	Are there any abnormal noises or oscillations?	o			Visual and audible.	There are no anomalies.	
Main circuit	Conductor/ Cable	Is the conductor corroded? Is the cable sheath damaged?		o o		Visual check.	No anomaly.	
	Terminal	Is there any visible damage?		o		Visual check.	No anomaly.	
	Correct capacitor	Have fluid leakages been observed? Is the capacitor well fastened? Are there any signs of dilation or retraction within the capacitor?	o	o		Visual check. Measure the capacitance with a proper instrument.	No anomaly Capacitance higher than 85% of rated capacitance.	Instrument for measuring capacity.
	Contactors	Is there any contactor chatter? Is the contact damaged?		o o		Audible check. 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.	Digital multimeter / RMS voltage meter.
Cooling system	Cooling fans	Are there any abnormal noises or oscillations? Is the cooling fan disconnected?	o	o		Disconnect the power supply (OFF) and rotate the fan manually. Check the connections.	Fan should rotate effortlessly. No anomaly.	
Display	Measurement	Is the displayed value correct?	o	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? Has any unusual smell been reported?	o o			Audible, sensory and visual check. Check if damages have been produced by overheating.	No anomaly.	
	Insulation resistance	Megger check (between terminals of input and output circuits and ground terminal)			o	Disconnect the cables U, V and W and join them together. Check the resistance between this join and ground.	More than 5MΩ	Megger type 500V

Note: Long life 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.

13.ACCESSORIES

CODE*	TYPE	DESCRIPTION
See section 13.1	Communications	SD300 family is compatible with the most commonly used communication protocols (Profibus-DP, Modbus TCP, Ethernet IP, CANOpen...), thanks to its optional boards. Please refer to section 13.1 when purchasing additional communication boards:
SD3IO	Extension I/O	Expansion module I/O: 2 Relay outputs, 3 Digital inputs, 2 Analog Inputs and 1 Analog Output. Please refer to section 13.2 for further information.
SD3EBF□	Conduit Kit	UL open type and enclosed type 1 certification: <ul style="list-style-type: none"> • UL open type is offered by default. • UL enclosed type1 needs conduit kit (option) installation. Ask for the Conduit Module that corresponds to your drive frame for NEMA1 compliance. Please refer to section 13.3 for further information.
SD3FLGF□	Flange type	The heat sink can be mounted outside of the panel in case the space is limited. Ask for the flange that corresponds to your drive frame. More information about this item can be found in section 13.4.
SD3CF1	Display extender	Display extender kit 5 meters.

(* Consult availability with Power Electronics.

13.1. Communications

SD300 family is compatible with the most commonly used communication protocols (Profibus-DP, Modbus TCP, Ethernet IP, CANOpen...), thanks to its optional boards.

Please refer to the table below when purchasing additional communication boards:

Code	Frame
SD3CO	CANOpen communication module
SD3PN	Profibus-DP communication module.
SD3ETH	Ethernet I/P – Modbus TCP communication module.
SD3ETC	EtherCAT communication module.
SD3PN	Profinet communication module.

13.2. Extension I/O

The input and output expansion optional board offers the possibility to increase the number of analogue and digital inputs and outputs for the inverters of the SD300 series. This board includes:

- 3 Digital inputs and 2 digital outputs.
- 2 Analogue inputs and 1 analogue output.

For further details and installation instructions, please refer to the *I/O Expansion Board Manual*.

13.3. Conduit Kit

UL open type is offered by default. To meet UL enclosed type1, this kit must be installed.



Figure 13.1 Optional conduit kit

Ask for the conduit module that corresponds to your drive frame for NEMA1 compliance:

Code	Frame
SD3EBF1	1N & 2N
SD3EBF2	3N & 4N
SD3EBF3	5N
SD3EBF4	1F
SD3EBF5	2F
SD3EBF6	3F
SD3EBF7	4F
SD3EBF8	5F
SD3EBF9	6F

13.4. Flange Type

The flange type can be mounted outside of the panel in case the space is limited. Its main purpose is to favor the dissipation of the generated heat during operations, working as a heat sink.



Figure 13.2 Optional flange type

Ask for the flange that corresponds to your drive frame:

Code	Frame
SD3FLGF1	1N & 2N
SD3FLGF2	3N & 4N
SD3FLGF3	5N
SD3FLGF4	1F
SD3FLGF5	2F
SD3FLGF6	3F
SD3FLGF7	4F
SD3FLGF8	5F
SD3FLGF9	6F

For further information and installation instructions, refer to the *Flange Type Manual*.

DECLARATION OF CONFORMITY CE

The Company:

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

Declares under its own responsibility, that the product:

Variable Speed Drive for A.C. motors

Brand: Power Electronics
Model name: SD300 Series

Is in conformity with the following European Directives:

References	Title
2006/95/CE	Electrical Material intended to be used with certain limits of voltage
2004/108/CE	Electromagnetic Compatibility

References of the harmonized technical norms applied under the Low Voltage Directive:

References	Title
EN 61800-5-1:2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1:2007).

References of the harmonized technical norms applied under the Electromagnetic Compatibility Directive:

References	Title
IEC 61800-3:2004	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods.

Paterna, October 18th 2016



David Salvo
Executive Director

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