POWER ELECTRONICS

SD300

GETTING STARTED MANUAL

LOW VOLTAGE VARIABLE SPEED DRIVE

SD300

Variable Speed Drive

Getting Started Manual

Edition: December 2021

SD30IM01II Rev. I

ABOUT THIS MANUAL

PURPOSE

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

AUDIENCE

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

Only trained electricians may install and commission the drives.

POWER ELECTRONICS CONTACT INFORMATION

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CONTROL OF REVISIONS		
DATE	**REVISION**	**DESCRIPTION**
02 / 05 / 2017	A	First edition.
15 / 05 / 2017	B	Accessories. Subsidiaries. Misprints corrections.
30 / 05 / 2017	C	Technical characteristics. Mechanical. Installation. Maintenance.
28 / 11 / 2017	D	Safety instructions. Mechanical installation. Power connections. Warning and fault messages. Description of programming parameters. Modbus communication. Configuration register. Declaration of conformity CE. Contact information.
14 / 08 / 2018	E	Permanent magnet synchronous motor control. Commonly used configurations.
11 / 10 / 2018	F	Commonly used configurations.
28 / 02 / 2019	G	References adjustment. Power terminals for IP66
08 / 05 / 2020	H	Dynamic braking resistor. Contact information.
16 / 12 / 2021	I	Configuration table and standard ratings. Technical characteristics. Dimensions. Mechanical installation. Power connection. Control connection. Maintenance. Use of the display. Accessories. Misprints corrections.

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 our website www.power-electronics.com, where the latest version of this manual can be downloaded. The reproduction or distribution of the present manual is strictly forbidden unless express authorization from Power Electronics.

TABLE OF CONTENTS

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

Other symbols used in this manual for CAUTION 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. Timed discharge of stored energy. Wait for the indicated time to prevent 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 power supply is connected or the drive is operating. 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. 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.

The equipment contains internal capacitors in the rectification stage. Always check that the capacitors are discharged before performing any maintenance.

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

Equipment packaging 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 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 under 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.

EARTH CONNECTION

- The drive is a high frequency switching device; therefore, leakage current may flow. Ground the drive to avoid electric shock. Use caution to prevent the possibility of personal injury.
- 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).

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.

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.

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 SD300 is a high-performance general purpose AC driver. It excels in demanding heavy-duty applications that require high starting torque and precise control. The dual duty rating of the IP20 models ensures compatibility with all normal duty loads. The IP66/NEMA4X models guarantee operation even in the most severe environments. The versatile SD300 is ideal for applications in water treatment and irrigation, food and beverage, ventilation systems, materials handling, packaging systems, textiles, plastic, wood processing, in fact, any general-purpose application where apparatus and machinery needs to be automated.

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.

CONFIGURATION TABLE AND STANDARD RATINGS

2

Configuration table

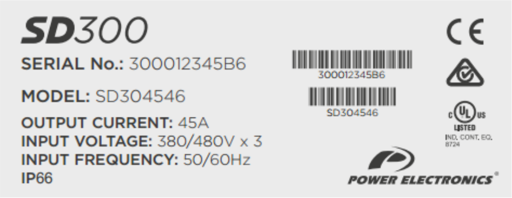
EXAMPLE. CODE: SD305846F

SD3		058		4		6		F	
SERIE		Drive current (Normal Duty) [1]		Drive Voltage		Protection Degree		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.
The following figure shows an example of designation label:



Type designation label (located on lateral panel)

Standard Ratings – 230VAC 3-phase

IP20					
Power ND (kW)	Power HD (kW)	Current ND (A)	Current HD (A)	Model	Frame
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	
5.5	24	SD302426	3I
7.5	32	SD303226	
11	46	SD304626	4I
15	60	SD306026	5I

Standard ratings – 400VAC

IP20					
Power ND (kW)	Power HD (kW)	Current ND (A)	Current HD (A)	Model	Frame
0.75	0.4	2.0	1.3	SD300242F [2]	1F
1.5	0.75	3.1	2.4	SD300342F [2]	
2.2	1.5	5.1	4.0	SD300542F [2]	2F
4	2.2	6.9	5.5	SD300742F [2]	
5.5	4	10	9.0	SD301042F [2]	3F
7.5	5.5	16	12	SD301642F [2]	4
11	7.5	23	16	SD302342F [2]	
15	11	30	24	SD303042F [2]	5
18.5	15	38	30	SD303842F [2]	
22	18.5	44	39	SD304442F [2]	6
30	22	58	45	SD305842F [2]	
37	75	30	61	SD307542F [2]	7
45	91	37	75	SD309042F [2]	8
55	107	45	91	SD310542F [2]	
75	142	55	110	SD314042F [2]	9
90	169	75	152	SD317042F [2]	

IP66			
Power HD (kW)	Current HD (A)	Model	Frame
0.4	1.3	SD300146F [2]	1I
0.75	2.4	SD300246F [2]	
1.5	4.0	SD300446F [2]	2I
2.2	5.5	SD300646F [2]	
4	9.0	SD300946F [2]	
5.5	12	SD301246F [2]	3I
7.5	16	SD301646F [2]	
11	24	SD302446F [2]	4I
15	30	SD303046F [2]	
18.5	39	SD303946F [2]	5I
22	45	SD304546F [2]	

[2] EMC clase 3.

Notes:

- 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 (Cn.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.

TECHNICAL CHARACTERISTICS

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SD300 SERIES		
INPUT	**Power ranges**	0.4kW – 2.2kW 230V – Single Phase 0.4kW – 22kW 230V – 3-Phase 0.4kW – 90kW 400V – 3-Phase
	Voltage range	230V: 200-240V Single Phase / 3-Phase (-15%/+10%) 400V: 380V-480V 3-Phase (-15%/+10%)
	EMC Filter	C2[1] (First environment) C3 (Second environment)
OUTPUT	**Overload capacity**	150% for 60sec. (Heavy duty) 120% for 60sec. (Normal duty) [2] 200% for 4sec. (Heavy Duty)
	Control Method	V/f, Slip compensation, Sensorless vector, PMSM VC [3]
	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

[1] Option external RFI filter required
[2]Only available for IP20
[3]Consult with Power Electronics before installing with this type of motors.

SD300 SERIES				
	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	Less than DC 24V 50mA
		Multi-function Relay		(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]	

SD300 SERIES		
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 Environment)
	Pressure	70~106 kPa

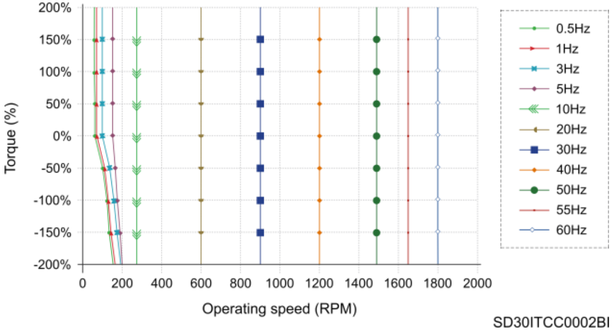
SD300 SERIES		
REGULATIONS	Global certification	CE, UL, cUL, RoHS
	PCB	3C2 Conformal coating

Enhanced sensorless control

Sensorless control

Starting torque of 200% / 0.5Hz is produced and provides robust power in the low speed region.

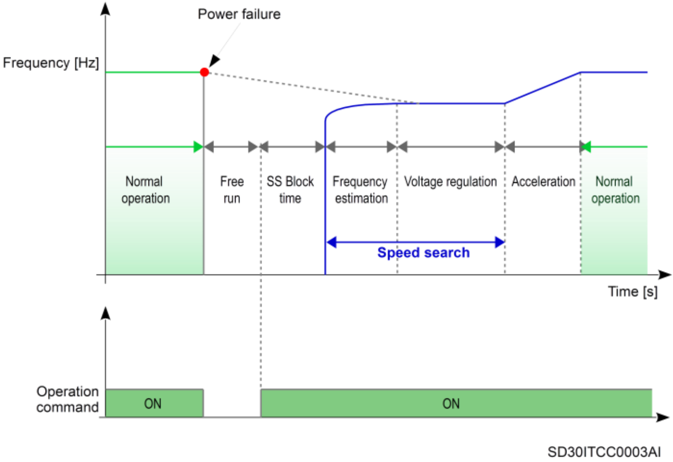
The motor auto-tuning function is optimized to maximize motor performance.



Sensorless control

Flying start function

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



Flying start function

DIMENSIONS

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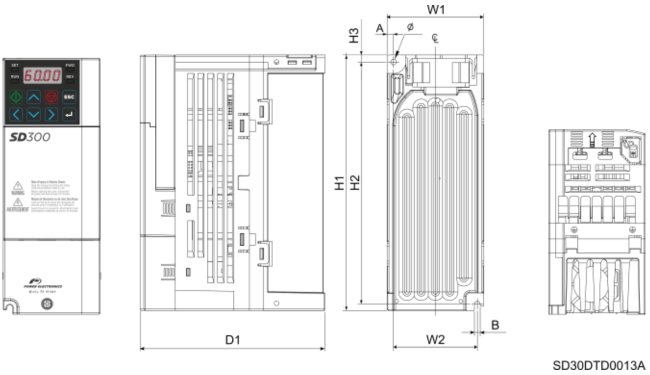
IP20 drives dimensions

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)

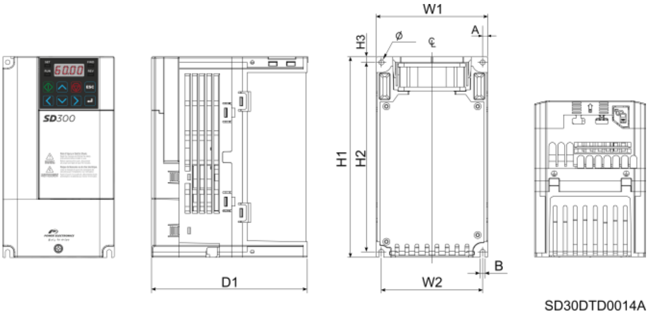


Frame 1F dimensions

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)

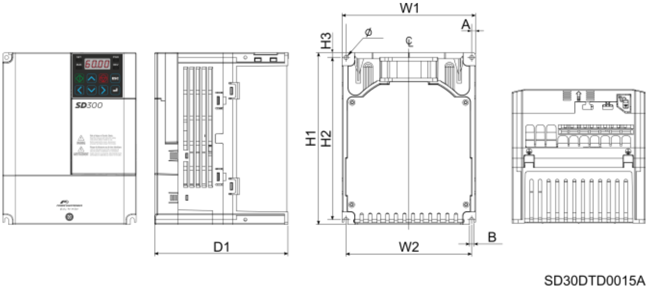


Frame 2F dimensions

Frame 3F dimensions

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

DIMENSIONS [mm/inch]									WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	A	B	Ø	
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)

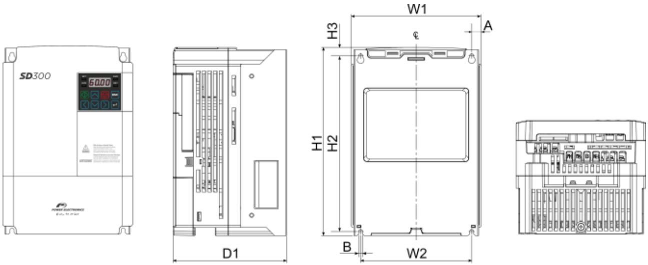


Frame 3F dimensions

Frame 4 dimensions

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

DIMENSIONS [mm/inch]									WEIGHT
W1	W2	H1	H2	H3	D1	A	B	Ø	(kg/lb)
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)



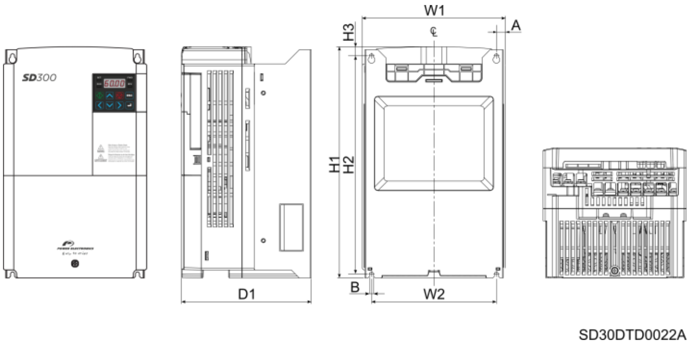
SD30DTD0021A

Frame 4 dimensions

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)

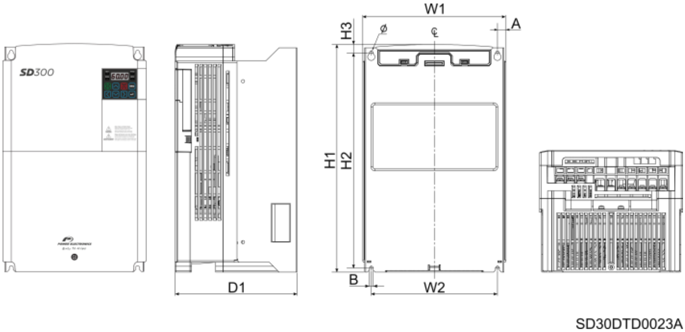


Frame 5 dimensions

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)

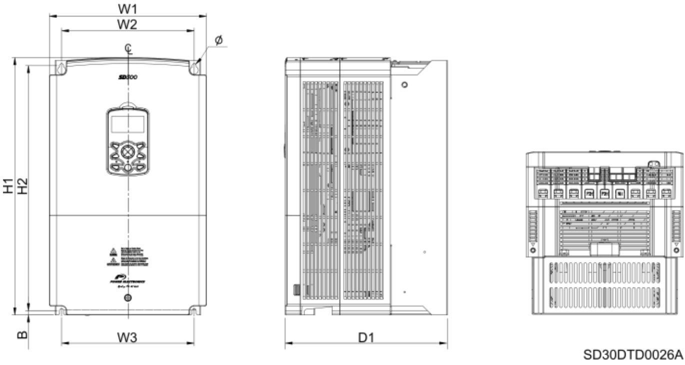


Frame 6 dimensions

Frame 7 dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
380~480[V]	3	SD307542F

DIMENSIONS [mm/inch]								WEIGHT
W1	W2	W3	H1	H2	D1	B	Ø	(kg/lb)
275 (10.8")	232 (9.1")	232 (9.1")	450 (17.7")	428.5 (19")	284 (11.2")	7.5 (0.3")	7 (0.3")	26 (57.3lb)

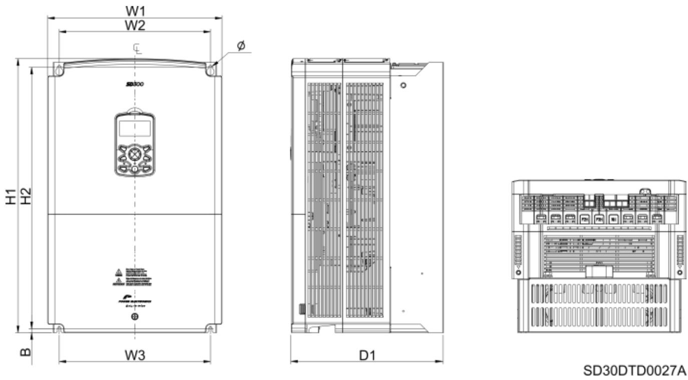


Frame 7 dimensions

Frame 8 dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
380~480[V]	3	SD309042F, SD310542F

DIMENSIONS [mm/inch]								WEIGHT
W1	W2	W3	H1	H2	D1	B	Ø	(kg/lb)
325 (12.8")	282 (11.1")	282 (11.1")	510 (20.1")	486.5 (19.1")	284 (11.2")	7.5 (0.3")	7 (0.3")	35 (77.2lb)

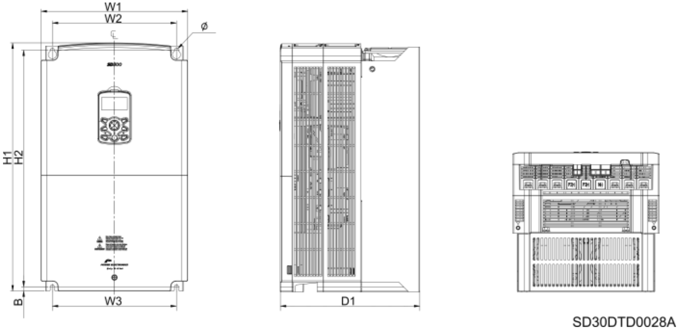


Frame 8 dimensions

Frame 9 Dimensions

INPUT VOLTAGE	PHASES	EQUIPMENT
380~480[V]	3	SD314042F, SD317042F

DIMENSIONS [mm/inch]								WEIGHT
W1	W2	W3	H1	H2	D1	B	Ø	(kg/lb)
325 (12.8”)	275 (10.8”)	275 (10.8”)	550 (21.7”)	524.5 (20.6")	309 (12.2")	9.5 (0.4”)	9 (0.4")	43 (94.8”)



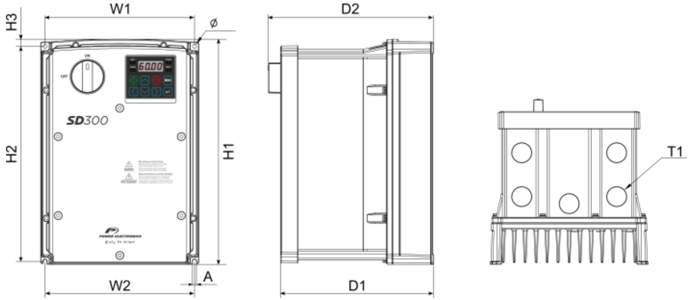
Frame 9 dimensions

IP66 drives dimensions

Frame 1I dimensions

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

DIMENSIONS [mm/inch]											WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	
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)



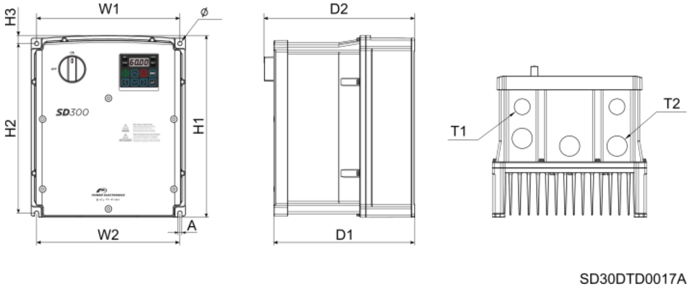
SD30DTD0016A

Frame 1I dimensions

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 (kg/lb)
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	
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)

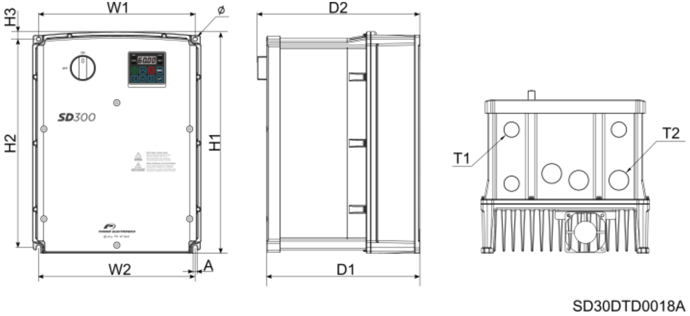


Frame 2I dimensions

Frame 3I dimensions

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

DIMENSIONS [mm/inch]											WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	
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)

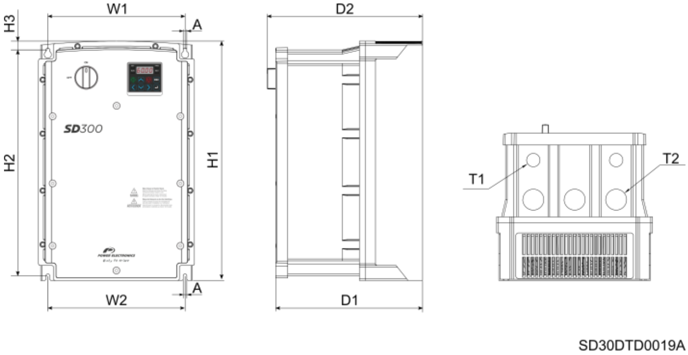


Frame 3I dimensions

Frame 4I dimensions

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

DIMENSIONS [mm/inch]											WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	
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)

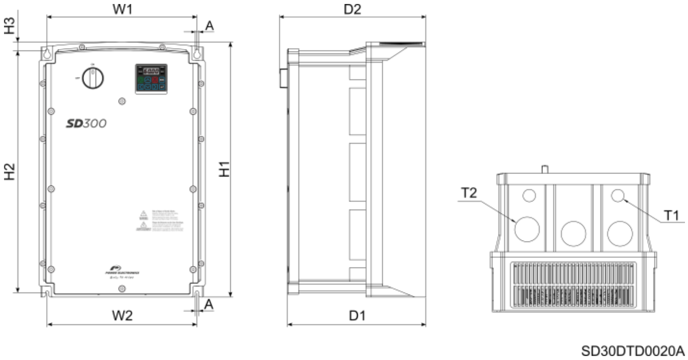


Frame 4I dimensions

Frame 5I dimensions

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

DIMENSIONS [mm/inch]											WEIGHT (kg/lb)
W1	W2	H1	H2	H3	D1	D2	A	Ø	T1	T2	
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)



Frame 5I dimensions

RECEPTION, HANDLING AND TRANSPORTATION

5

CAUTION

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

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.

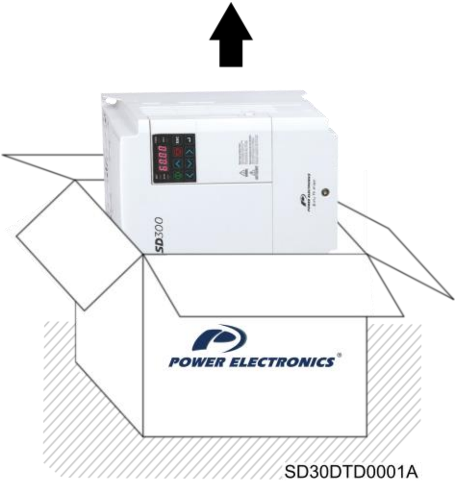
Drive should be stored in a sun and moisture protected space and with an ambient temperature between -20°C and +65°C, < 95 RH without condensation. It is recommended not stacking more than two units.

Handling and transportation

CAUTION

Handle the equipment carefully. Otherwise, the equipment can get 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.



Drive unpacking

To unpack, 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.

MECHANICAL INSTALLATION 6

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.

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]
  No cold, no frost.
- 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.

Drive mounting

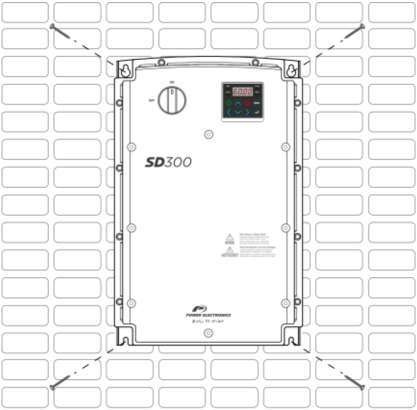
The SD300 variable speed drives are designed to be mounted on a wall or inside a panel.

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 “Clearances” section.

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.



SD300 wall mounting

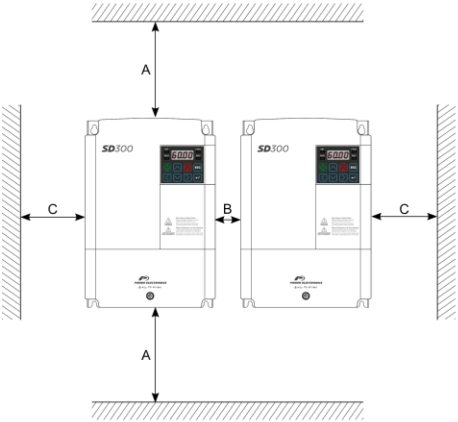
Note: The quantity and dimensions of the mounting brackets vary based on frame size. Please refer to “DIMENSIONS” section to find the information that corresponds to your model.

There is an optional flange for special installations. If you have ordered this option, please refer to “Flange type” section for installation instructions.

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.



DISTANCE [mm/inch]	
A	100 / 4”
B	2 / 0.1”
C	50 / 2”

SD30DTD0001B

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.

Installing multiple drives

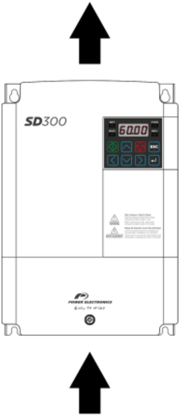
NOTICE

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.

Cooling

The heat sources inside the equipment correspond to the inverter bridge (IGBT), 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.



SD30DTD0001A

Cooling airflow for SD300

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

NOTICE

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

Fan air flow

EXAMPLES.

Air flow: 1F Frame.

1F Frame
0,4kW-1
0,4/0,8kW-2
0,4/0,8kW-4

Air flow	Maximum air flow [m3/min]	Average	0,31
		Minimum	0,28

- Air flow: 2F Frame / 3F Frame.

2F Frame	3F Frame
0,8/1,5kW-1	2,2kW-1
1,5/2,2kW-2	3,7/4,0kW-2
1,5/2,2kW-4	3,7/4,0kW-4

Air flow	Maximum air flow [m3/min]	Average	0,66
		Minimum	0,64

- Air flow: 4 Frame,

4 Frame
5,5/7,5kW-2
5,5/7,5kW-4

Air flow	Maximum air flow [m3/min]	0,98 (34,6 CFM)

- Air flow: 5 Frame.

5 Frame
11kW-2
11/15kW-4

Air flow [m3/min]	Minimum	1,45
	Rated	1,55

- Air flow: 6 Frame.

6 Frame
15kW-2
18,5/22kW-4

Air flow [m3/min]	Minimum	2,85
	Rated	3,15

- Air flow: 7 Frame.

Frame 7
30kW

Air flow [m3/min]	Minimum	2,85
	Maximun	3,15

- Air flow: 8 Frame.

Frame 8
37kW
45kW

Air flow [m3/min]	Minimum	2,85
	Maximun	3,15

- Air flow: 9 Frame.

Frame 9
55kW
75kW

Air flow [m3/min]	5,35

POWER CONNECTIONS

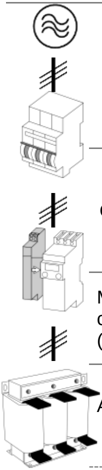
7

CAUTION

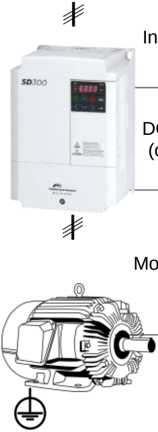
Read carefully the following instructions to ensure correct electrical installation.
Otherwise, the equipment could get damaged and lead to personal injuries.

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.



AC Power Supply	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.
Circuit Breaker	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.
Magnetic contactor (optional)	Install if necessary. When installed, do not use it for the purpose of starting or stopping the drive.
AC reactor (optional)	Use an AC reactor if you wish to improve the input power factor of the power supply, reduce harmonics or suppress external surges.



SD300 Installation	Install the drive following the recommendation within this manual in relation with the cooling requirements, position, clearances, wiring access and ground connection.
DC reactor (optional)	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.
Motor cables	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.
Motor	Do not connect power factor capacitors, surge arrestors or RFI filters to the output side of the drive.

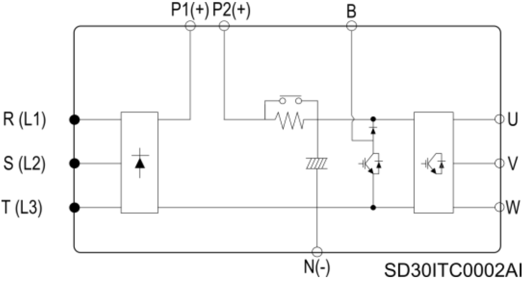
Topology

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.

Power terminals

The available power terminals are shown in the figure below. For the power connection, check section "Recommended cable".

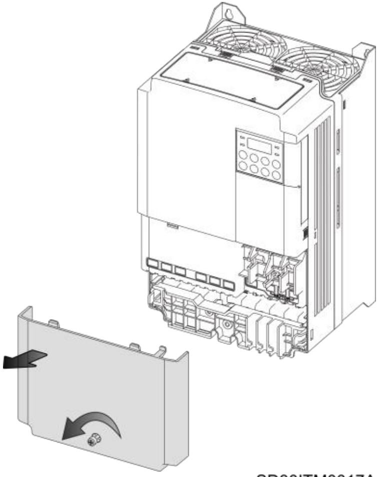


Location of terminals in the control board

	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)

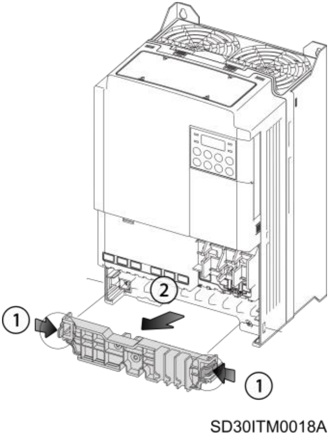
Power terminals - IP20

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



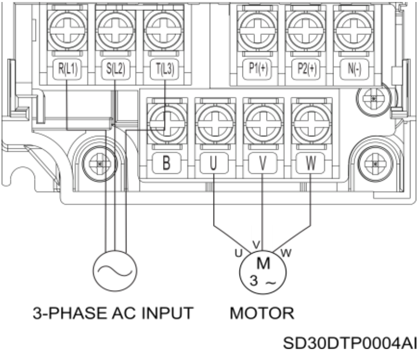
Bottom cover removal – IP20

Then, remove the power terminals plastic protection pushing sides clips as shown in the following image:

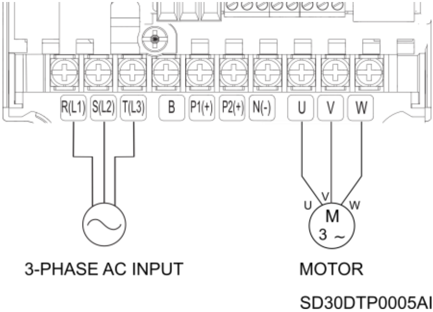


Plastic protection removal

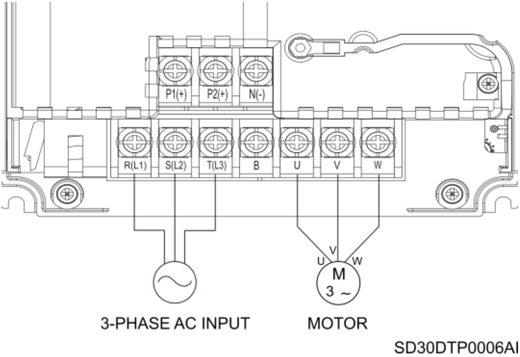
Power terminals for each frame:



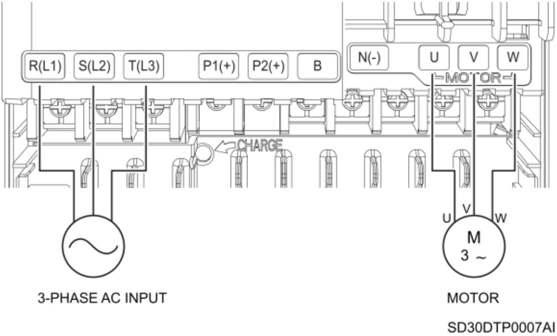
Power terminals in frame 1F



Power terminals in frame 2F



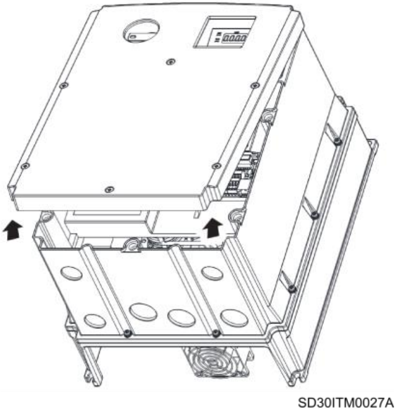
Power terminals in frame 3F



Power terminals in frames 4, 5, 6, 7, 8 and 9

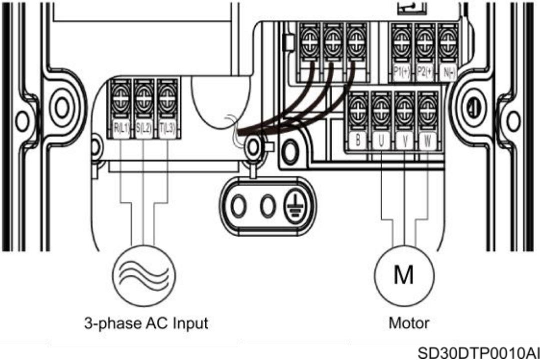
Power Terminals – IP66

To access the power terminals, users have to unscrew the front cover and take it out as follows:

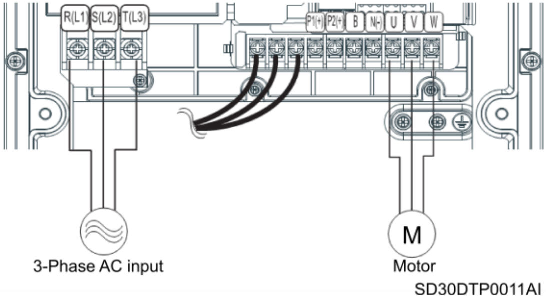


Cover removal – IP66

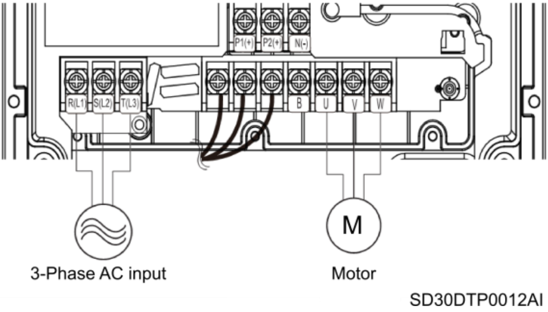
Power terminals for each frame:



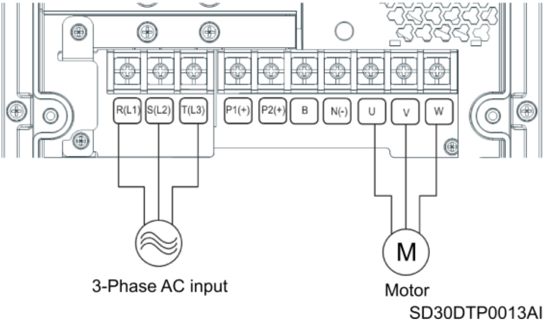
Power terminals in frame 1I



Power terminals in frame 2I – models SD300446 and SD300646



Power terminals in frame 2I – model SD300946



Power terminals in frames 3I - 4I - 5I

Power connection and wiring

CAUTION

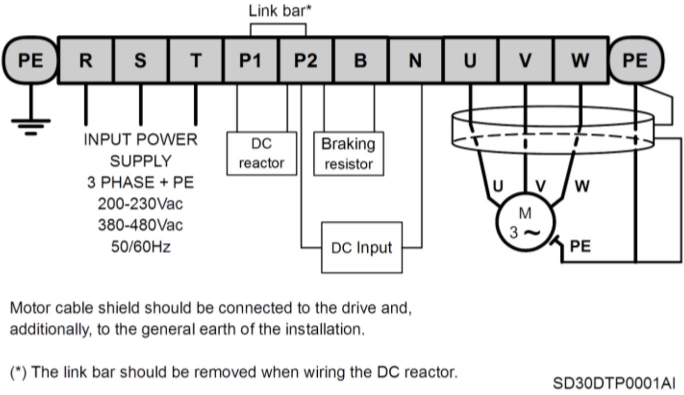
The following installation recommendations are suitable for TN and TT grids. For IT grids, consult Power Electronics. Otherwise, the equipment could be damaged and the risk of injury heightened.

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.



Power wiring connection

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 get damaged.

Use shielded and three-wire braided cable and ground. Do not use single-core wires.

If the drive settings are set by default (switching frequency 3 kHz), make sure that the total cable length does not exceed:

- 100 m (328ft) for unshielded wires.
- 50m (165ft) for shielded wires.

For other switching frequencies, lengths may vary.

Voltage drop is calculated by using the following formula:

Voltage Drop (V) = [$\sqrt{3}$ x cable resistance (mΩ/m) x cable length (m) x current(A)] / 1000

The allowed carrier frequency is:

Distance	< 50m (165ft)	< 100m (330ft)	> 100m (330ft)
Allowed carrier frequency	< 15kHz	< 5kHz	< 2.5kHz

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 cooper or aluminum cables.

NOTICE

Do not exceed the motor cable distances. Longer cables can cause reduced motor torque in low frequency applications due to the voltage drop, increase circuit susceptibility to stray capacitance which may trigger over-current protection devices or result in a malfunction of the equipment connected to the drive.

Recommended cable section

<table>
<tr><th colspan="2" rowspan="3">Model</th><th rowspan="3">Screw</th><th rowspan="3">Torque [1] [Kgf * cm / Nm]</th><th colspan="4">Wire [2]</th></tr>
<tr><th colspan="2">mm²</th><th colspan="2">AWG</th></tr>
<tr><th>R, S, T</th><th>U, V, W</th><th>R, S, T</th><th>U, V, W</th></tr>
<tr><td rowspan="4">230V 1-phase</td><td>0.4 kW</td><td rowspan="3">M3.5 (1/8“)</td><td rowspan="12">2.1 ~ 6.1 / 0.2 ~ 0.6</td><td rowspan="3">2</td><td rowspan="3">2</td><td rowspan="3">14</td><td rowspan="3">14</td></tr>
<tr><td>0.75 kW</td></tr>
<tr><td>1.5 kW</td></tr>
<tr><td>2.2 kW</td><td>M4 (1/8“)</td><td>3.5</td><td>3.5</td><td>12</td><td>12</td></tr>
<tr><td rowspan="10">230V 3-phase</td><td>0.4 kW</td><td rowspan="4">M3.5 (1/8“)</td><td rowspan="4">2</td><td rowspan="4">2</td><td rowspan="4">14</td><td rowspan="4">14</td></tr>
<tr><td>0.75 kW</td></tr>
<tr><td>1.5 kW</td></tr>
<tr><td>2.2 kW</td></tr>
<tr><td>3.7 kW</td><td rowspan="4">M4 (1/8“)</td><td rowspan="2">3.5</td><td rowspan="2">3.5</td><td rowspan="2">12</td><td rowspan="2">12</td></tr>
<tr><td>4 kW</td></tr>
<tr><td>5.5 kW</td><td rowspan="2">6</td><td rowspan="2">6</td><td rowspan="2">10</td><td rowspan="2">10</td></tr>
<tr><td>7.5 kW</td></tr>
<tr><td>11 kW</td><td rowspan="2">M5 (3/16“)</td><td rowspan="2">4.0 ~ 10.2 / 0.4 ~ 1.0</td><td>10</td><td>10</td><td>8</td><td>8</td></tr>
<tr><td>15 kW</td><td>16</td><td>16</td><td>6</td><td>6</td></tr>
<tr><td rowspan="12">400V 3-phase</td><td>0.4 kW</td><td rowspan="4">M3.5 (1/8“)</td><td rowspan="8">2.1 ~ 6.1 / 0.2 ~ 0.6</td><td rowspan="6">2</td><td rowspan="6">2</td><td rowspan="6">14</td><td rowspan="6">14</td></tr>
<tr><td>0.75 kW</td></tr>
<tr><td>1.5 kW</td></tr>
<tr><td>2.2 kW</td></tr>
<tr><td>3.7 kW</td><td rowspan="4">M4 (1/8“)</td></tr>
<tr><td>4 kW</td></tr>
<tr><td>5.5 kW</td><td>2.5</td><td>2.5</td><td>14</td><td>14</td></tr>
<tr><td>7.5 kW</td><td rowspan="2">4</td><td rowspan="2">4</td><td rowspan="2">12</td><td rowspan="2">12</td></tr>
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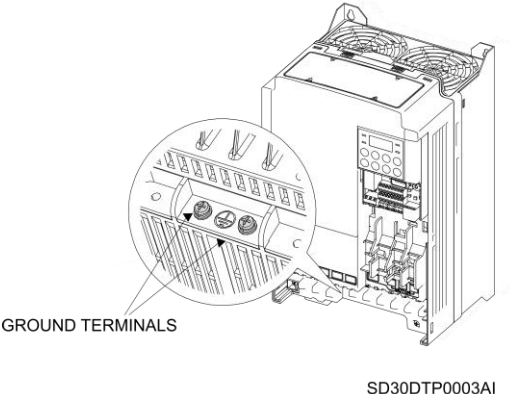
<tr><td>15 kW</td><td>6</td><td>6</td><td>10</td><td>10</td></tr>
<tr><td>18.5 kW</td><td rowspan="2">10</td><td rowspan="2">10</td><td rowspan="2">8</td><td rowspan="2">8</td></tr>
<tr><td>22 kW</td></tr>
</table>

[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 Tª >75ºC.

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.



PE terminal's location

Motor 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 previous sub-section.

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

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.

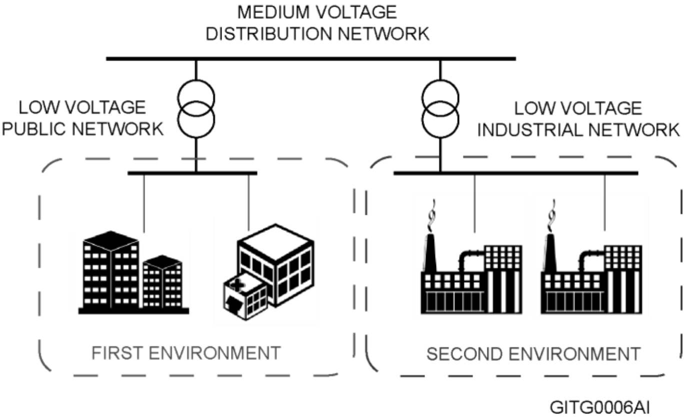
EMC Installation requirements

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.

- 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.

Environment definition

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.

SD300 compliance

SD300 variable speed drives with Extended EMC have been designed for the industrial use (Second Environment). In the case of the Standard EMC equipment, an external filter must be installed to meet C3. The correct installation following the recommendations within this manual, permit to achieve compliance with C3 category defined in IEC/EN 61800-3.

Optionally, the SD300 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 SD300 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. However, C1 category will not be required.

The SD300 with floating earth configuration can be installed in industrial (Second Environment) IT grids. Equipment with Extended EMC comply with C3 (Second Environment). In the case of the Standard EMC equipment, an external filter must be installed to meet C3.

EMC recommendations

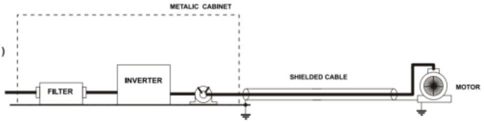
To conform the EMC directive, it is necessary that these instructions be followed as closely as possible. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, inverter and motor must be made by a qualified electrical technician.

1. Check the filter rating label to ensure that the current, voltage rating and part number are correct.
2. For best results, the filter should be fitted as closely as possible to the incoming mains supply of the wiring enclousure, usually directly after the enclousures circuit breaker or supply switch.
3. The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Be sure to remove any paint etc from the mounting holes and face area of the panel to ensure the best possible earthing of the filter.
4. Mount the filter securely.
5. Connect the mains supply to the filter terminals marked LINE, connect any earth cables to the earth stud provided. Connect the filter terminals marked LOAD to the mains input of the inverter using short lengths of appropriate gauge cable.
6. Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both drive and motor ends. The screen should be connected to the enclousure body via and earthed cable gland.
7. Connect any control cables as instructed in “Wiring recommendations” section, inside “CONTROL CONNECTION” section.

It is important that all lead lengths are kept as short as possible and that incoming mains and outgoing motor cables are kept well separated.

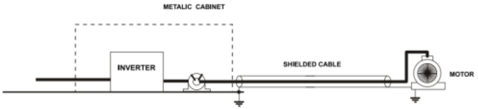
FEB/FEP SERIES (Standard)

Fig 1



INTERNAL FILTERS

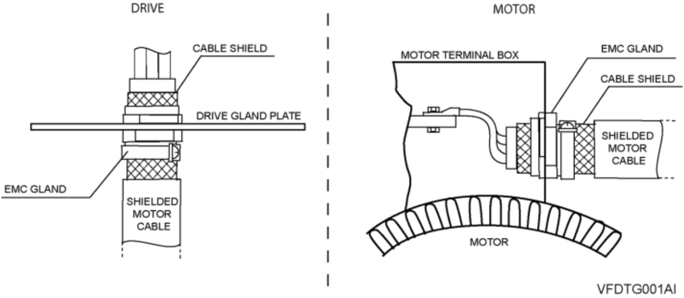
Fig 2



Connection

It is recommended the use of braided shielded motor cables to achieve compliance with C3 category. Wiring and Installation recommendations are included in previous sections: “Power Connection and Wiring”, “Ground Connection” and “EMC Installation Requirements”.

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

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

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

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 "STO" point, inside "CONTROL CONNECTION" section for further information.

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.

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						
	1.5 kW	15		0.88	14	3	13.05
	2.2 kW	20		0.56	20	1.3	18.45
230V 3-phase	0.4 kW	10		1.2	10	4	8.67
	0.75 kW						
	1.5 kW	15		0.88	14	3	13.05
	2.2 kW	20		0.56	20	1.33	18.45
	3.7 kW	32		0.39	30		26.35
	4 kW	50					
	5.5 kW	50		0.3	34	1.6	32
	7.5 kW	63		0.22	45	1.25	43
	11 kW	80		0.16	64	0.95	61
	15 kW	100		0.13	79	0.7	75
400V 3-phase	0.4 kW	10		4.81	4.8	16	4.27
	0.75 kW						
	1.5 kW			3.23	7.5	12	6.41
	2.2 kW	15		2.34	10	8	8.9
	3.7 kW	20		1.22	15	5.4	13.2
	4 kW	32					
	5.5 kW			1.12	19	3.2	17
	7.5 kW	35		0.78	27	2.5	25
	11 kW	50		0.59	35	1.9	32
	15 kW	63		0.46	44	1.4	41
	18.5 kW	70		0.4	52	1	49
	22 kW	100		0.3	68	0.7	64

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.

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, and/or pump overload and underload among others.

Dynamic braking resistors

CAUTION

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

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 “Power terminals” section).

Reference	Input voltage (V)	Drive capacity (kW)	100% Braking		150% Braking	
			Ω	W*	Ω	W*
SD300312F, SD300326	230	0.4	400	50	300	100
SD300612F, SD300526		0.75	200	100	150	150
SD300912F, SD300826		1.5	100	200	60	300
SD301212F, 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

Reference	Input voltage (V)	Drive capacity (kW)	100% Braking		150% Braking	
			Ω	W*	Ω	W*
SD306922, SD306026		15	11	2000	8	2400
SD300242F, SD300146, SD300146F	400	0.4	1800	50	1200	100
SD300342F, SD300246, SD300246F		0.75	900	100	600	150
SD300542F, SD300446, SD300446F		1.5	450	200	300	300
SD300742F, SD300646, SD300646F		2.2	300	300	200	400
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	20	3600
SD307542F		30	16.9	6400	12	5550
SD309042F		37	16.9	6400		
SD310542F		45	11.4	9600	8	8250
SD314042F		55	11.4	9600		
SD317042F		75	8.4	12800	6	11250

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

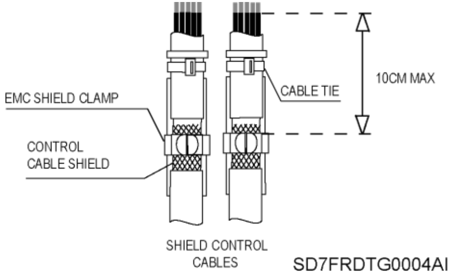
CONTROL CONNECTION

8

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 360º effective shield bonding.



Shield bonding

Digital signal cables must be grounded at both ends of the cable (when there is no potential difference between equipment). 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 "Recommended cable section" for wire specifications and recommended tightening.

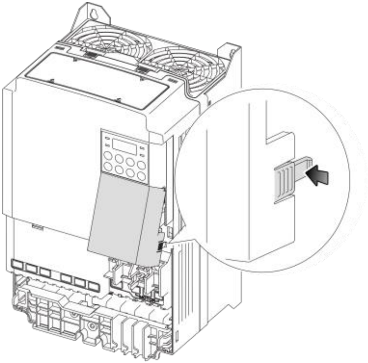
Although the control board is insulated galvanically, for safety reasons it is recommended not to modify the wiring while the equipment is connected to the input power supply.

WARNING

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

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:



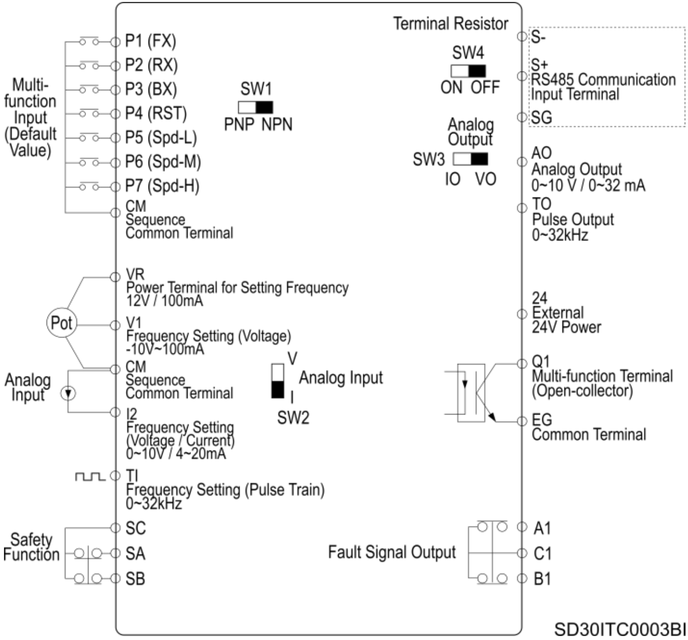
SD30ITM0019A

Terminals cover removal

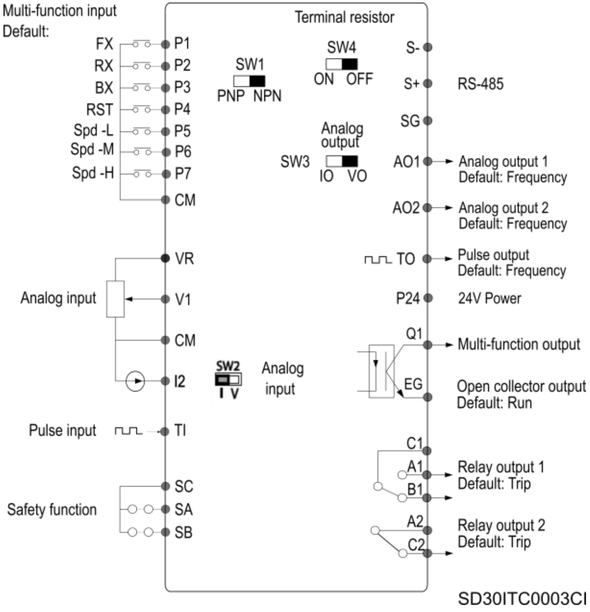
Control board terminals description

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:



IP20 drives standard control terminals connection in frames 1F, 2F, 3F, 4, 5 and 6

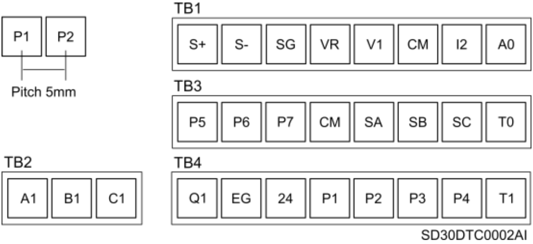


IP20 drives standard control terminals connection in frames 7, 8 and 9

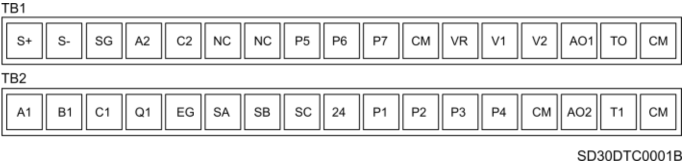
Digital inputs can be configured individually or collectively. Analogue inputs can be configured as comparators.

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

The following figures show the control terminals for IP20 drives:

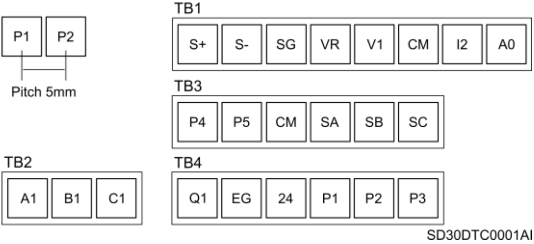


Standard control terminals for IP20 in frames 1F, 2F, 3F, 4, 5 and 6



Standard control terminals for IP20 frames 7, 8 and 9

The following figure shows the control terminals for IP66 drives:



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). - 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).
	A2 [2]	
	C1	
	B1	
	B2 [2]	

[1]Only available in IP20 drives.
[2] Only affects equipment between 30-75kW.

SIGNAL	PIN	DESCRIPTION
ANALOGUE INPUTS	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)).
	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.
ANALOGUE OUTPUTS	AO	Configurable analogue output V/I (0~10V (max 12V/10mA) / 0~20 mA (max 24mA)).
	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: - Normal Operation: Both the SA and SB terminals are connected to the SC terminal. - Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.
	SA	
	SB	

[1] Only available in IP20 drives.

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.

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				
AO1				
AO2				
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				

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.

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.

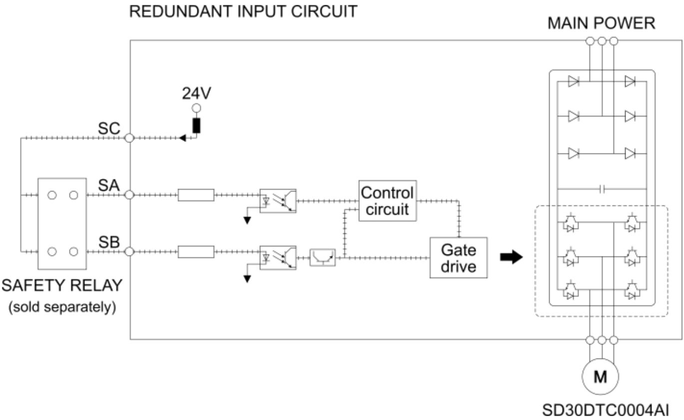
This function is included as standard in SD300 drives and corresponds with an Emergency Stop Category 0 according to IEC 60204-1. When the drive is running and the STO function is applied, the motor will freely stop by its own inertia.

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 24VDC 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)



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.

COMMISSIONING 9

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 injuries or even 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:

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

↓

Verify that the line voltage is compatible with drive voltage range. If not, the drive could get damaged.

↓

Connect input, PE and output power wiring, and verify that they are correctly installed and fastened.

Check that the drive protective covers are mounted.

↓

Check control, and analogue and digital signals cables, functions (STO).
Voltage free.

↓

Check that the drive follows the remote and local speed commands.

↓

Connect input power supply.

↓

Verify that the display is turned on and set the drive control parameters

↓

Check line voltages with the display.

Start the drive without motor using the display key “RUN”.

↓

Check that the fans rotate smoothly and there is no obstacle reducing the cooling capacity. Verify that there are no obstructing elements that could affect equipment cooling.

↓

Connect the motor and check its rotation direction.

↓

Check that the drive follows the references of speed, current, etc.

MAINTENANCE

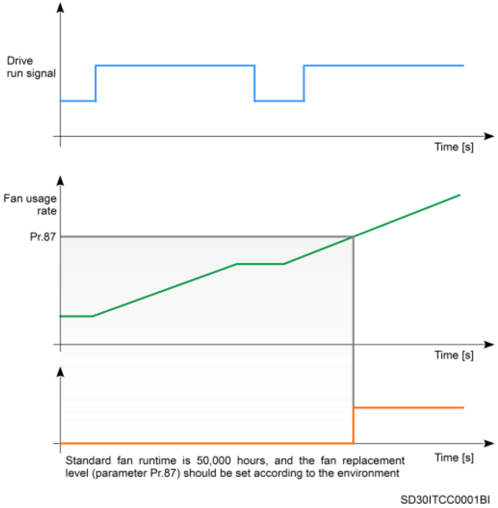
10

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.

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 Pr.87.



Fan usage rate

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 DC terminals +, - 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.

Routine Inspection

It is necessary to perform periodic inspections of the drive. The frequency of the tasks shown in the table below are recommended, the times indicated depend on the working conditions in each case.

Tasks with monthly recommendation must be performed, at least, every three months.

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.

The following table summarizes the maintenance tasks that should be carried out monthly, annually and every two years.

Inspection site	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.	
	POWER VOLTAGE						
	Are the input and output voltages normal?	o			Measure voltage between R/S/T phases in. the terminal block.	Values are within Standard Ratings (see section 2).	Digital multimeter tester
Main circuit	ALL						
	Megger test (between input / output terminals and ground terminal)		o	o	Disconnect drive and short R/S/T/ U/V/W terminals, and then measure from each terminal to the ground terminal using a Megger.	Above 5MΩ	Megger type 500V
	Is there anything loose in the device?		o	o	Tighten up all screws.	No anomaly.	
	Is there any evidence of parts overheating?		o	o	Visual inspection	No anomaly.	

Inspection site	Inspection	Period			Inspection method	Criterion	Measurement instrument
		Monthly	1 year	2 years			
Main circuit	CONDUCTOR / CABLE						
	Is the conductor corroded? Is the cable shield 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?	o o	o		Visual check. Measure the capacitance with a proper instrument.	No anomalies. Capacitance higher than 85% of rated capacitance.	Instrument for measuring capacity.
	CONTACTOR						
	Is there any contactor chatter? Is the contact damaged?		o o		Audible check. Visual check.	No anomaly.	
	OPTIONAL BRAKING RESISTOR						
	Is there any damage from resistance?		o		Visual inspection.	No anomaly.	Digital multimeter / analog tester
	Check for disconnection		o		Disconnect one side and measure with a tester.	Must be within +/- 10% of the rated value of the resistor.	Digital multimeter / analog tester
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.
	Are there any errors in the display circuit after the sequence protection test?		o		Test the drive output protection in short and open circuit conditions.	The circuit must work according to the sequence.	Digital multimeter / RMS voltage meter.

Inspection site	Inspection	Period			Inspection method	Criterion	Measurement instrument
		Monthly	1 year	2 years			
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 test (between the input, output and ground terminals)			o	Disconnect the cables for terminals U/V/W and test the wiring.	Above 5MΩ	Megger type 500V

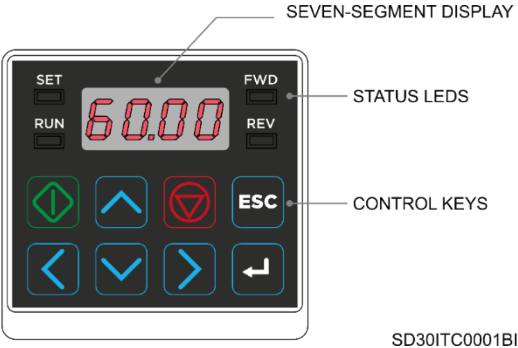
Note: Long life of the main components above indicated are based on a continuous operation for the stipulated load. These conditions can change according to the environment conditions.

USE OF THE DISPLAY

11

Integrated display

SD300 variable drives have a built-in seven segment display which provides intuitive data presentation, an easy navigation through the control parameters and allows storing thousands of user-customized configurations.



SD30ITC0001BI

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

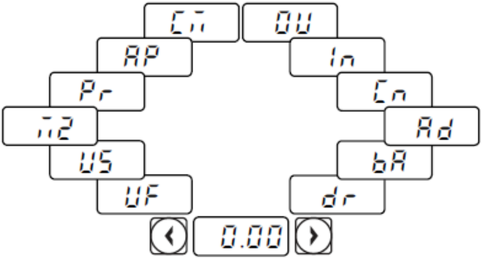
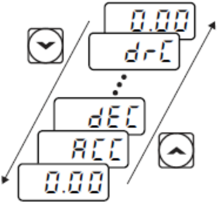
KEY / LED	NAME	FUNCTION
	RUN key	Run command.
	STOP/RESET key	STOP: Stop command during operation. RESET: Reset command when a fault occurs.

KEY / LED	NAME	FUNCTION
	UP key	Used both to scroll up through the parameters of a group and to increase a parameter value.
	DOWN key	Used both to scroll down through the parameters of a group and 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 changes or to switch from Remote/Local if this option was previously configured.
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 display	Current value	Indicates operating conditions and parameter data.

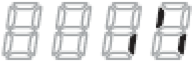
The following table shows the different characters of the seven-segment display:

0	0	A	A	K	K	U	U
1	1	b	B	L	L	u	V
2	2	C	C	M	M	W	W
3	3	d	D	n	N	X	X
4	4	E	E	O	O	Y	Y
5	5	F	F	P	P	Z	Z
6	6	G	G	q	Q	-	-
7	7	H	H	r	R	-	-
8	8	I	I	S	S	-	-
9	9	J	J	t	T	-	-

To learn how to switch between groups and parameters, follow the next examples:

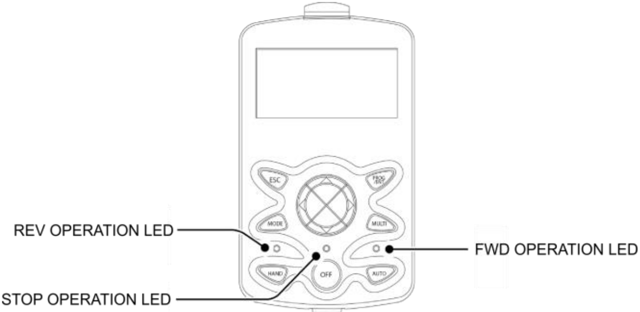
Step	Instruction	Keypad display
1	Move to the desired group using the [◄] and [►] keys.	
2	Move up and down through the parameters using the [▲] and [▼] keys.	
3	Press the [ENT] key to save the changes.	

Binary numbers are shown in the integrated display as segment lines. “1” is displayed in the top part of the display and “0” in the bottom part. For example, “010” is represented as:



External display[1]

The external display provides accurate information regarding the operation of the inverter via the monitoring screen. It allows an easy navigation through the control parameters and allows storing the storage of various user-customized configurations.



SD30ITC0015AI

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

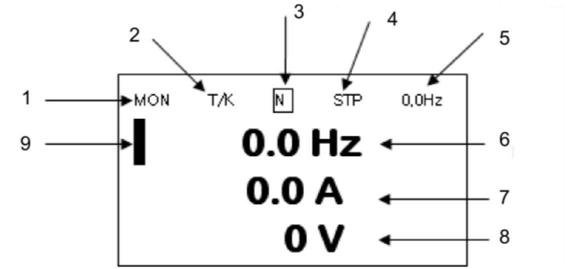
KEY / LED	NAME	FUNCTION
	MODE key	Used to switch between modes.
	PROG / Ent key	Used to select, confirm, or save a parameter value.
	UP key DOWN key	Used both to scroll up or down through the parameters of a group and to increase or decrease parameter values.
	LEFT key RIGHT key	Used both to jump to other parameter groups or move the cursor during parameter setup or modificaction to the left or to the right.

[1] This display will be supplied with the 30-75kW models.

KEY / LED	NAME	FUNCTION
	MULTI key	Used to perform special functions, such as user code registration.
	ESC key	Used to cancel an input during parameter setup. There are three functions of the ESC button: • Pressing the ESC key before pressing the PROG / ENT key reverts to the previously set value. • Pressing the ESC key while editing the codes in any function group, the first code of the function group is displayed. • Pressing the ESC key while moving through the modes makes the keypad display Monitor mode.
	FWD Key	Used to operate in forward direction.
	REV Key	Used to operate in reversed direction.
	STOP / RESET Key	STOP: Stop command during operation. RESET: Reset command when a fault occurs.
FWD LED	Forward Run	Illuminated during forward run.
REV LED	Reverse Run	Illuminated during reverse run.
STOP LED	Stop	Illuminated during stop.

The following pictures show the different parameters and display modes.

Monitor mode display

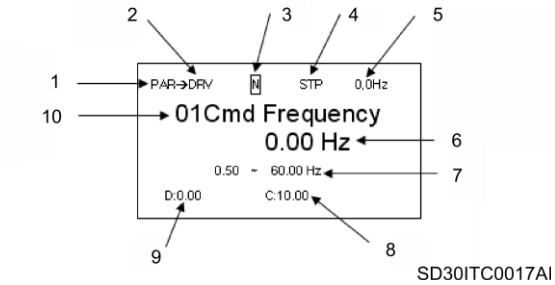


SD30ITC0016A

The following table identifies the numbering of the different display parameters:

No.	DESCRIPTION
1	Mode.
2	Operating / frequency command.
3	Multi-functional key settings.
4	Inverter operation status.
5	Items displayed in the status window.
6	Monitor mode display 1.
7	Monitor mode display 2.
8	Monitor mode display 3.
9	Monitor mode cursor.

Parameter settings display



The following table identifies the numbering of the different display parameters:

No.	DESCRIPTION
1	Mode.
2	Group.
3	Multi-functional key settings.
4	Inverter operation status.
5	Items displayed in the status window.
6	Display parameters.
7	Available settings range.
8	Existing setting values.
9	Factory default values.
10	Code numbers and names.

To learn how to switch between groups and parameters, follow the next examples:

STEP	INSTRUCTION	DISPLAY VISUALIZATION
1	When the power is turned on, **Monitor mode** is displayed. Press the [MODE] key.	MON T/K N STP 0,0Hz 0.0 Hz 0.0 A 0 V
2	In **Parameter mode**, Drive group is displayed. Press the [▸] key.	PAR →DRV N STP 0,0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Cmd Torque 0.0 %
3	In Basic group (BAS), press the [▸] key.	PAR →BAS N STP 0,0Hz 00 Jump Code 20 CODE 01 Aux Ref Src None 02 Cmd 2nd Src Fx/Rx-1
4	In Advanced group (ADV), press the [▸] key.	PAR →ADV N STP 0,0Hz 00 Jump Code 24 CODE 01 Acc Pattern Linear 02 Dec Pattern Linear
5	In Protection group (PRT), press the [▸] key.	PAR →PRT N STP 0,0Hz 00 Jump Code 40 CODE 04 Load Duty Heavy Duty 05 Phase Loss Chk

STEP	INSTRUCTION	DISPLAY VISUALIZATION
6	**Parameter mode,** Drive group (DRV) is displayed again.	PAR → DRV N STP 0,0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Cmd Torque 0.0 %

After entering **Parameter mode** from **Monitor mode**, press the [►] key to change the display as shown in the images above. Press the [◄] key to return to the previous mode.

STATUS MESSAGES

12

List of status messages

Screen	Name	Description
FLT	Fault trip	The drive is in fault state
DCB	DC Brake	The SD300 has injected DC current to stop the motor.
STP	Stopping	The drive is decreasing the output frequency due to a stop order.
DCL	Decelerating	The drive is decreasing the output frequency. The motor is decreasing its speed, it is decelerating.
ACL	Accelerating	The drive is increasing the output frequency. The motor is increasing its speed, it is accelerating.
RUN	Running	The drive is operating at reference speed. The motor will keep the introduced speed as setpoint. Operating in nominal rate.
RDY	Ready	The drive is ready for commissioning.

WARNING AND FAULT MESSAGES

13

List of warning messages

The following table summarizes the possible warning messages that may be displayed and their description.

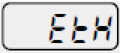
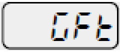
Screen	Name	Description
OLU	Over Load	Displayed when the motor is overloaded. Operates when Pr.17 is set to 1 'YES'. To operate, set the digital output terminal or relay OU.31or OU.33 to 5 'OVERLOAD' to receive overload warning output signals.
ULU	Under Load	Displayed when the motor is underloaded. Operates when Pr.25 is set to 1 'YES'. Set the digital output terminal or relay OU.31or OU.33 to 7 'UNDERLOAD' to receive underload warning output signals.
IOLU	INV Over Load	Displayed when the overload time equivalent to 60% of the drive overheat protection level is accumulated. Set the digital output terminal or relay OU.31or OU.33 to 6 'IOL' to receive drive overload warning output signals.
LCU	Lost Command	Lost command warning alarm occurs even with Pr.12 set to 0 'None'. The warning alarm occurs based on the condition set at Pr.13 to Pr.15. Set the digital output terminal or relay OU.31or OU.33 to 13 'LOSTCOMMAND' to receive lost command warning output signals. If the communication settings and status are not suitable for P2P, a Lost Command alarm occurs.
FANU	Fan Warning	Displayed when an error is detected from the cooling fan while Pr.79 is set to 1 'WARN'. Set the digital output terminal or relay OU.31or OU.33 to 8 'FAN WARNING' to receive fan warning output signals.

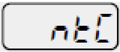
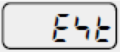
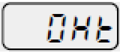
Screen	Name	Description
EFAN	Fan Exchange	An alarm occurs when the value set at Pr.86 is above the value set at Pr.87. To receive fan exchange output signals, set the digital output terminal or relay OU.31 or OU.33 to 38 'FAN EXCHANGE'.
ECAP	CAP Exchange	An alarm occurs when the value set at Pr.63 is less than the value set at Pr.62 (the value set at Pr.61 must be 2 'Pre Diag'). To receive CAP exchange signals, set the digital output terminal or relay OU.31 or OU.33 to 36 'CAP Exchange'.
DBU	DB Warn %ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at Pr.66
TRTR	Retry Tr Tune	Tr tune error warning alarm is activated when dr.9 is set to 4 'S-less1'. The warning alarm occurs when the motors rotor time constant (Tr) is either too low or too high.

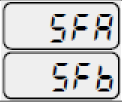
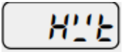
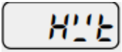
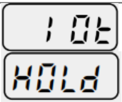
List of fault messages and troubleshooting

Section List of fault messages shows a list of all possible faults. Probable causes and troubleshooting for each fault are listed in section Fault troubleshooting.

List of fault messages

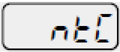
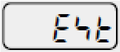
SCREEN	DESCRIPTION
-	The equipment is operative. No fault is present.
	**Overload.** The drive trips when the output current reaches the value set in parameter Pr.21, exceeding the time limit set in parameter Pr.22. The protection is operative if the parameter Pr.20 has been set with a value different to 0 ‘NONE’.
	**Underload.** The motor is working with insufficient load. The drive trips when its current is within the values set in parameter Pr.29 and Pr.30 exceeding the time limit set in parameter Pr.28. The protection will be enabled if the parameter Pr.27 has been set with a value different to 0 ‘NONE’.
	**Inverter Overload.** The drive cuts the output supply when the output current exceeds the value set in the corresponding parameters (150% for 1 minute, 200% for 3 seconds of the drive rated current). Protection is based on drive rated capacity, and may vary depending on the device capacity.
	**E-Thermal.** The internal thermo-electronic protection determines the motor overheating. If the motor is overheated, the drive stops its output. The protection is enabled setting the parameter Pr.40 to a value different than 0 ‘NONE’.
	**Ground Fault.** The drive trips when an earth leakage and its current exceed the internal value configured in the drive. The overload protection function will protect the drive from any ground fault caused by a small leakage resistance.
	**Output Ph Loss.** One of the three output phases is open. The protection will be enabled if the parameter Pr.5 is set as 1 ‘OUTPUT’ or 3 ‘ALL’.
	**Input Ph Loss** One of the three input phases is open. The protection will be enabled if the parameter Pr.5 is set as 2 ‘INPUT’ or 3 ‘ALL’.

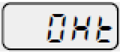
SCREEN	DESCRIPTION
	**NTC.** The drive uses a NTC thermal sensor to detect temperature increases within the supply system. When this message is displayed, the thermal sensor cable may have been cut. (The drive will continue running).
	**Overcurrent.** The drive trips when the output current exceeds the 200% of the rated current value.
	**Overvoltage.** The drive trips if the DC voltage within bus exceeds the value established. This value has been established in the internal configuration during the deceleration process or when the motor regenerative energy return to the drive is excessive for the capacitors which compose the DC bus. This fault can also be caused due to a transitory overvoltage within the supply system.
	**External Trip.** This function can be used whenever the user needs to cut the output by the use of an external trip signal. The open /closed contact use will depend on the configuration within the digital inputs (In.65-In.71) configured as 4 'EXTERNAL TRIP'. The drive cuts the motor output protecting it from the controlled situation within the terminal.
	**Short ARM.** The drive trips when a short-circuit occurs in the IGBT or in the output power.
	**Overheat.** The drive trips if overheated caused by a damaged cooling fan or by the presence of any strange substance within the cooling system.
	**Fan trip.** An anomaly detecting within the cooling fan. The protection will be enabled if parameter Pr.79 is set as 0 'TRIP'.
	**Param_Wr_Err.** A problem has been detected during the writing of a parameter by keypad.
	**Pipe Fill Flt**. An error has been detected which makes the PID feedback be always under the established value. Possible pipe breakdown.
	**External Brake.** Drive trips when the braking unit reaches a dangerous temperature.

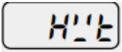
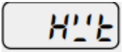
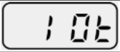
SCREEN	DESCRIPTION
	**No Motor.** The drive has not detected a connected motor at its output when the Start order has been given. The protection is enabled setting the parameter Pr.31 to a value different to 0 'NONE'.
	**Slot 1 Fail.** The optional board located in the slot1 has been extracted or there is no possible communication.
	**STO.** Automatic internal protection of several of the IGBT semiconductors has acted or the safe stop contact of the drive (connected to an external circuit by the user) has been activated (for example, emergency stop).
	**BX:** One of the digital inputs (In.65-In.71) has been enabled configured as 1 'DIS START', forcing the drive to cut the output supply and making it stop due to inertia.
	**LV.** The drive trips when the voltage within the DC bus is under the detection level. Therefore, the torque generated can be insufficient or the motor can be overheated if the input voltage decreases.
	**Lost command.** The drive trips due to a loss of speed set point established by the use of the control or communication terminals.
	**ADC Error.** Analog Input error.
	Shown upon detection of an error in the EEPROM memory or the analogue input, or when a micro-controller internal fault is detected (**Watchdog-1 Err, Watchdog-2 Err**).
	**IO board fault.** Displayed when the I/O board or external communication card is not connected to the drive or there is a bad connection.

Fault troubleshooting

Screen	Description or possible cause	Actions
OLt	Elevated motor consumption caused by an excessive load.	Increase the motor and drive capacity.
	Load defined in parameter Pr.21 is too low	Increase the defined value in parameter Pr.21.
ULt	A connection problem between the motor and the load is present.	Check the connection between motor and load is correctly set.
	The load defined in parameters Pr.29 and Pr.30 is too low.	Increase the value defined in parameters Pr.29 and Pr.30.
IOL	The load within the drive is greater than the rated value of the drive.	Increase the motor and drive capacity.
	The start torque setting is too high.	Reduce the start torque value.
EtH	Motor overheated.	Reduce load and / or operating cycle
	Load exceeds the drive capacity.	Use a more powerful drive.
	Electro-thermal protection level (ETH) too low.	Set the ETH level properly.
	Invalid selection of the drive rated power.	Select a correct drive power.
	Invalid V/f pattern setting.	Select a correct V/f pattern.
GFt	Ground leakage produced in the drive output.	Check the drive output wiring.
	The motor insulation is damaged due to heat.	Change the motor.
POt	Problem present in the drive output electric connection.	Check the output electric connections.
	Poor output electric distribution.	Check that the output electric distribution is correct.
IPO	Problem present in the drive input electric connection.	Check the input electric connections.
	Bad input electric distribution.	Check that the input electric distribution is correct.
	The drive DC capacitor must be replaced.	Replace the drive DC capacitor. Contact the Technical Service.

Screen	Description or possible cause	Actions
	The room temperature is over the allowed range.	Keep the installation location at room temperature within the specified limits.
	Problem present in the drive internal temperature sensor.	Contact the Technical Service.
	Acceleration / deceleration time too short compared to the load inertia.	Increase the acceleration /deceleration time.
	The load exceeds the drive rated power.	Increase the drive rated power.
	The drive attempts to start the motor while spinning.	Ensure the correct programming spin start conditions. Set the load inertia and the parameters which enable the speed search properly. **Note:** Adequate spin start conditions fulfilment depends on each installation.
	Ground fault or short circuit produced.	Check the output wiring.
	The mechanic brake enters too quickly.	Check the mechanic brake.
	The power circuit components overheated due to a cooling fan malfunction.	Check the cooling fan. Verify it is correctly powered and not blocked by dirt.
	⚠ **Caution: Starting the drive without correcting anomalies may damage the IGBTs.**	
	The deceleration time is too short compared to the load inertia.	Increase the deceleration time.
	Excessive energy regeneration in the drive.	Use an optional brake resistor (dynamic brake units).
	Line with High Voltage.	Check the supply line voltage.
	External fault produced.	Delete the circuit fault connected by the input fault terminal configured.

Screen	Description or possible cause	Actions
	Short circuit upper and lower IGBT.	Check IGBT.
	Short circuit at the drive output.	Check the wiring of the drive output circuit.
	Acceleration / deceleration time is too short compared with the inertia of the load (GD^2)	Increase acceleration / deceleration time.
	Cooling fan damaged or foreign matter present.	Replace the cooling fans and / or remove the foreign matter.
	Fault within the cooling system.	Check the foreign matter presence.
	Excessive room temperature.	Keep the room temperature under 50ºC or verify the drive capacity according to temperature.
	Motor overheat produced (PTC / NTC external signal) produced.	Check the motor cooling. Reduce the load and / or operating cycle.
	Cooling fan damaged or foreign matter present.	Replace the cooling fans and or remove the foreign matter.
	A problem occurred while editing a parameter with the numeric keyboard.	Check if the keyboard is properly inserted.
	Possible pipe breakdown inhibits pressure to reach the minimum level.	Check installation pipe status.
	PID feedback sensor is not showing the correct values.	Check the PID feedback pressure sensor is measuring properly. In case it is damaged, replace it.
	The braking unit has reached a dangerous temperature.	Check the braking unit.
	No motor connected to the drive output or defective wiring.	Check the motor is correctly connected to the drive output.
	The value set in parameter Pr.31 is too high.	Reduce the value of parameter Pr.31.

Screen	Description or possible cause	Actions
	The port 1 optional board is not connected properly.	Check the board is inserted in the expansion board slot.
	Defective optional board.	Replace the optional board for a new one.
	Defective optional board.	Replace the optional board.
 	The internal automatic protection of several IGBTS or the drive safe stop contact have been activated (connected by the user to an external circuit). E.g.: Emergency stop.	Check if the circuit is properly wired. Check wiring and ensure that neither of both circuits is open.
	One of the digital inputs configured as 1 'DIS START' has been enabled.	Disable the digital input configured as 1 'DIS START'.
	Low voltage in the line	Check the line voltage.
	Load exceeds the line rated power (welding machine, motor with high start current connected to the commercial line)	Increase the line rated power.
	Defective magneto thermic switch in the drive supply circuit.	Change the magneto thermic switch.
	Speed reference lost introduced through the communications or keypad inputs.	Check the drive communications or the inputs are within the defined ranges to provide the speed references.
-	Connection of the seven-segment display is not correct.	Check the connection.
	Analog input error produced.	Contact the Technical Service.
	EEP Error (memory fault).	Disconnect and reconnect the power supply. If it fails, contact Power Electronics' Technical Service.
	Watchdog Error (CPU fault).	Disconnect and reconnect the power supply. If it fails, contact Power Electronics' Technical Service.
	I/O board or external communication board fault.	Check the board is properly connected and it is not damaged.

DESCRIPTION OF PROGRAMMING PARAMETERS

14

The different parameters of the SD300 are organized in groups and are described within this section.

Use the left and right arrow keys to jump from a parameter group to another. Use the up and down keys to navigate between the parameters of the selected group.

Please refer to section "USE OF THE DISPLAY", for instructions on how to modify parameter values.

Group 0: Operation

This group is only available in the integrated display. It allows performing a basic set up of the drive with its main parameters.

Screen	Description	Default value	Modbus Address		Function
			DEC	HEX	
0.00 [1]	Target frequency	**0.00Hz**	**47936**	**0h1F00**	Set the motor speed. See group Drive(dr), parameter 0.00.
ACC [1]	Acceleration time	**20.0s**	**47937**	**0h1F01**	See group Drive (dr), parameter ACC.
dEC [1]	Deceleration time	**30.0s**	**47938**	**0h1F02**	See group Drive (dr), parameter dEC.
drv [1]	Command source	**1 = Remote**	**47939**	**0h1F03**	See group Drive (dr), parameter drv.
Frq [1]	Frequency reference source	**0 = Local**	**47940**	**0h1F04**	See group Drive (dr), parameter Frq.
St1 [1]	Multi-step speed frequency 1	**10.00Hz**	**47941**	**0h1F05**	See group Basic Functions (bA), parameter St1.

[1] Displayed when an LCD keypad is in use.

Screen	Description	Default value	Modbus Address		Function
			DEC	HEX	
St2 [1]	Multi-step speed frequency 2	**20.00Hz**	**47942**	**0h1F06**	See group Basic Functions (bA), parameter St2.
St3 [1]	Multi-step speed frequency 3	**30.00Hz**	**47943**	**0h1F07**	See group Basic Functions (bA), parameter St3.
CUr	Output current	**-**	**47944**	**0h1F08**	These values depend on drive characteristics.
rPM	Motor revolutions per minute	**-**	**47945**	**0h1F09**	
dCL	Inverter direct current voltage	**-**	**47946**	**0h1F0A**	
vOL	Inverter output voltage	**-**	**47947**	**0h1F0B**	
LuT	Out of order signal	**-**	**47948**	**0h1F0C**	
drC	Select rotation direction	**-**	**47949**	**0h1F0D**	

Group 1: Drive → dr

Screen	Description	Default value	Range	Function	Set on RUN
0.00 [1]	Local speed	0.00Hz	dr.19 to dr.20	Set the motor speed value. Minimum value is set in dr.19 and the maximum value in dr.20.	YES
dr.2	Local torque	0.0%	-180.0 to 180.0%	Set the torque value of the motor.	YES
ACC [1]	Acceleration ramp	20.0s	0.0 to 600.0s	Set the acceleration ramp 1, in seconds. This ramp will be set according to the requirements of each process.	YES
dEC [1]	Deceleration ramp	30.0s	0.0 to 600.0s	Set the deceleration ramp 1, in seconds. This ramp will be set according to the requirements of each process.	YES

[1] Displayed when an LCD keypad is in use.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>drv [1]</td><td>Control mode 1</td><td>1 = Remote</td><td>0 to 5</td><td>Set the control mode to command the drive (Start/Stop, Reset...).
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>LOCAL</td><td>Drive is controlled from the keypad.</td></tr>
<tr><td>1</td><td>REMOTE</td><td>Commands are sent from the control terminals.</td></tr>
<tr><td>2</td><td>REMOTE 2</td><td>Commands are sent from the control 2 terminals.</td></tr>
<tr><td>3</td><td>MODBUS</td><td>The drive is controlled through the communications bus, integrated in the equipment.</td></tr>
<tr><td>4</td><td>COMMS</td><td>The drive control is carried out by the use of any of the optional communication boards.</td></tr>
<tr><td>5</td><td>PLC</td><td>The common area can be linked with the user sequence output and can be used as command.</td></tr>
</table></td><td>NO</td></tr>
</table>

[1] Displayed when an LCD keypad is in use.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Frq [1]</td><td>Speed reference 1</td><td>0 = Local</td><td>0 to 12</td><td>Select the source for the speed reference.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>LOCAL</td><td>Reference will be given by keypad and will be set in dr.1.</td></tr>
<tr><td>2</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr>
<tr><td>4</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr>
<tr><td>5</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr>
<tr><td>6</td><td>MODBUS</td><td>The reference will be introduced through Modbus.</td></tr>
<tr><td>8</td><td>COMMS</td><td>The reference will be introduced through the communications.</td></tr>
<tr><td>9</td><td>PLC</td><td>The common area can be linked with user sequence output and can be used as command.</td></tr>
<tr><td>12</td><td>PULSE</td><td>Reference will be introduced through the Pulse input.</td></tr>
</table></td><td>NO</td></tr>
</table>

[1] Displayed when an LCD keypad is in use.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.8</td><td>Torque reference1</td><td>0 = LOCAL</td><td>0 to 12</td><td>Select the source for torque reference.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>LOCAL</td><td>Reference will be given by keypad and will be set in dr.1.</td></tr>
<tr><td>2</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr>
<tr><td>4</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr>
<tr><td>5</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr>
<tr><td>6</td><td>MODBUS</td><td>The reference will be introduced through Modbus.</td></tr>
<tr><td>8</td><td>COMMS</td><td>The reference will be introduced through communications.</td></tr>
<tr><td>9</td><td>PLC</td><td>The common area can be linked with user sequence output and can be used as command.</td></tr>
<tr><td>12</td><td>PULSE</td><td>Reference will be introduced through the Pulse input.</td></tr>
</table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.9</td><td>Control type</td><td>V/Hz</td><td>0 to 6</td><td>Define the drive control type.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>V/Hz</td><td>A linear V/Hz pattern configures the drive to increase or decrease the output voltage at a fixed rate for different operation frequencies. This is particularly useful when a constant torque load is applied.</td></tr>
<tr><td>2</td><td>SlipCom</td><td>Slip refers to the variation between frequency (synchronous speed) and motor rotation speed. As the load increases, there can be variations between the set frequency and motor rotation speed. Slip compensation is used for loads that require compensation of these speed variations.</td></tr>
</table>
Note: Continues on the next page.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.9</td><td>Control type</td><td>V/Hz</td><td>0 to 6</td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>4</td><td>S-less1</td><td>Sensorless vector control is an operation to carry out vector control without the rotation speed feedback from the motor but with an estimation of the motor rotation speed calculated by the drive. Sensorless vector control can generate greater torque at a lower current level than V/Hz control.</td></tr>
<tr><td>6</td><td>PM Sensor-less</td><td>It allows selecting the control for permanent magnet synchronous motors.</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>**dr.10**</td><td>Torque control</td><td>N</td><td>N
Y</td><td>Not configurable by the user.</td><td>NO</td></tr>
<tr><td>**dr.11**</td><td>Inch Frequency</td><td>10.00Hz</td><td>dr.19 to dr.20</td><td>Set the motor inch frequency.</td><td>YES</td></tr>
<tr><td>**dr.12**</td><td>INCH acceleration time</td><td>20.0s</td><td>0.0 to 600.0s</td><td>Set the time in which the drive accelerates to reach the maximum speed.</td><td>YES</td></tr>
<tr><td>**dr.13**</td><td>INCH deceleration time</td><td>30.0s</td><td>0.0 to 600.0s</td><td>Set the time in which the drive decelerates from the maximum speed until stopping.</td><td>YES</td></tr>
<tr><td>**dr.14**</td><td>Motor power</td><td>(*)</td><td>0.2 kW
0.4 kW
…
30.0 kW</td><td>Set the motor rated power according to its nameplate.</td><td>NO</td></tr>
<tr><td>**dr.15**</td><td>Torque boost</td><td>Manual</td><td>Manual
Auto1
Auto2</td><td>Proportional to the initial voltage value applied to the motor in the start moment to overcome the resistive torque in heavy starts.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Manual</td><td>Starting voltage manual setting by the use of parameters dr.16 y dr.17.</td></tr>
<tr><td>1</td><td>Auto1</td><td rowspan="2">The drive automatically calculates the voltage to apply at the start using the motor parameters.</td></tr>
<tr><td>2</td><td>Auto2</td></tr>
</table></td><td>NO</td></tr>
<tr><td>**dr.16**</td><td>Start torque in forward direction</td><td>+2.0%</td><td>0.0 to 15.0%</td><td>Set the start torque in forward direction.</td><td>NO</td></tr>
<tr><td>**dr.17**</td><td>Start torque in reverse direction</td><td>+2.0%</td><td>0.0 to 15.0%</td><td>Set the start torque in reverse direction.</td><td>NO</td></tr>
<tr><td>**dr.18**</td><td>Motor frequency</td><td>60.00Hz</td><td>30.00 to 400.00Hz</td><td>Set the base frequency (drive output frequency when running at its rated voltage) according to the motor nameplate.</td><td>NO</td></tr>
</table>

(*) This value depends on the motor setting.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.19</td><td>Start frequency</td><td>0.50Hz</td><td>0.01 to 10.00Hz</td><td>Set the start frequency. A start frequency is a frequency at which the drive starts voltage output. The drive does not produce output voltage while the frequency reference is lower than the set frequency. However, if a deceleration stop is made while operating above the start frequency, output voltage will continue until the operation frequency reaches a full-stop (0Hz).</td><td>NO</td></tr>
<tr><td>dr.20</td><td>Max speed limit</td><td>60.00Hz</td><td>40.00 to 400.00 Hz</td><td>Set upper and lower frequency limits. All frequency selections are restricted to frequencies from within the upper and lower limits.
This restriction also applies when you in input a frequency reference using the keypad.</td><td>NO</td></tr>
<tr><td>dr.21 [1]</td><td>Hz/Rpm Display</td><td>Hz</td><td>Hz
Rpm</td><td>Change the units used to display the operational speed of the drive by setting to 0 (Hz) or 1 (Rpm). This function is only available in the removable display.</td><td>YES</td></tr>
<tr><td>dr.80</td><td>Select range</td><td>Run Freq.</td><td>0 to 17</td><td>Select ranges displayed by the drive at power input.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>OPT.</th><th>DESCR.</th></tr>
<tr><td>0</td><td>Run Freq.</td><td>9</td><td>Motor RPM</td></tr>
<tr><td>1</td><td>Accel. Time</td><td>10</td><td>DC Voltage</td></tr>
<tr><td>2</td><td>Decel. Time</td><td>11</td><td>User Sel. 1</td></tr>
<tr><td>3</td><td>Cmd Source</td><td>12</td><td>Out of Order</td></tr>
<tr><td>4</td><td>Ref. Source</td><td>13</td><td>Sel. Run Dir.</td></tr>
<tr><td>5</td><td>MultiStep 1</td><td>14</td><td>Oupt. Curr. 2</td></tr>
<tr><td>6</td><td>MultiStep 2</td><td>15</td><td>Motor2 RPM</td></tr>
<tr><td>7</td><td>MultiStep 3</td><td>16</td><td>DC Voltage2</td></tr>
<tr><td>8</td><td>Oupt. Curr.</td><td>17</td><td>User Sel. 2</td></tr>
</table></td><td>YES</td></tr>
</table>

[1] Displayed when an LCD keypad is in use.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>**dr.81**</td><td>Select monitor code</td><td>Volt V</td><td>0 to 2</td><td>Select the monitor code.<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Volt V</td><td>Scalar control mode. Drive carries out the control applying a voltage / frequency ramp to the motor.</td></tr><tr><td>1</td><td>Pot kW</td><td>Control by power.</td></tr><tr><td>2</td><td>Tq kgf</td><td>Control by torque.</td></tr></table></td><td>YES</td></tr>
<tr><td>**dr.89**</td><td>Display changed parameters</td><td>All</td><td>All
Chang</td><td>Displays all parameters that are different from the factory default values. Use this feature to track changed parameters.<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>All</td><td>Display all parameters.</td></tr><tr><td>1</td><td>Chang</td><td>Display changed parameters.</td></tr></table></td><td>YES</td></tr>
<tr><td>**dr.90**</td><td>ESC key function</td><td>Mov. Pos. In</td><td>0 to 2</td><td>The [ESC] key is a multi-functional key that can be configured to carry out a number of different functions.<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Mov. Pos. In.</td><td>Move to the initial position.</td></tr><tr><td>1</td><td>JOG Key</td><td>Perform a jog operation.</td></tr><tr><td>2</td><td>Local/Rem.</td><td>Change from Local to remote control if the key has previously been configured as such.</td></tr></table></td><td>NO</td></tr>
<tr><td>**dr.91** [1]</td><td>Eloader function</td><td>None</td><td>0 to 2</td><td>Set Eloader function.<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>None</td><td>No actions are executed.</td></tr><tr><td>1</td><td>Download</td><td>Download upgrade file.</td></tr><tr><td>2</td><td>Upload</td><td>Store drive current values.</td></tr></table></td><td>NO</td></tr>
</table>

[1] Displayed when an LCD keypad is in use.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.93</td><td>Parameter initialization</td><td>No</td><td>No
All
dr
bA
Ad
Cn
In
OU
CM
AP
Pr
M2
run</td><td>Set parameters back to their factory value.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>No</td><td>All parameters keep their current value.</td></tr>
<tr><td>1</td><td>All</td><td>Initializes all parameter groups (set to factory values).</td></tr>
<tr><td>2</td><td>dr</td><td>Initialize group dr.</td></tr>
<tr><td>3</td><td>bA</td><td>Initialize group bA.</td></tr>
<tr><td>4</td><td>Ad</td><td>Initialize group Ad.</td></tr>
<tr><td>5</td><td>Cn</td><td>Initialize group Cn.</td></tr>
<tr><td>6</td><td>In</td><td>Initialize group In.</td></tr>
<tr><td>7</td><td>OU</td><td>Initialize group OU.</td></tr>
<tr><td>8</td><td>CM</td><td>Initialize group CM.</td></tr>
<tr><td>9</td><td>AP</td><td>Initialize group AP.</td></tr>
<tr><td>12</td><td>Pr</td><td>Initialize group Pr.</td></tr>
<tr><td>13</td><td>M2</td><td>Initialize group M2.</td></tr>
<tr><td>16</td><td>run</td><td>Initialize group Operation.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>dr.94</td><td>Password register</td><td>0</td><td>0 to 9999</td><td>Password for 'dr.95 ➔ Parameters lock'. It is set as Hexadecimal value.
Note: To register a password for the first time:
1. In 'dr.94', press 'Ent' key twice.
2. Register the password (except '0') and press 'Ent' key (the value will blink).
3. Press 'Ent' key again to save the value and return to 'dr.94'.
Note: To change the password, follow the next steps:
1. In 'dr.94', press 'Ent' key once.
2. Introduce the present password and press 'Ent' key again.
3. Introduce the new password and press 'Ent' key (the value will blink).
4. Press 'Ent' key again to save the value and return to 'dr.94'.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>dr.95</td><td>Parameters lock</td><td>0</td><td>0 to 9999</td><td>This parameter is able to lock or unlock parameters by typing the password previously registered in ‘dr.94 ➔ Password register’.<table><tr><td>UL (Unlock)</td><td>Parameters change enabled.</td></tr><tr><td>L (Lock)</td><td>Parameters change disabled.</td></tr></table>Note: To lock and unlock parameters setting, follow the next steps:
1. In ‘dr.95’, press ‘Ent’ key once. The present status of parameters lock will appear (UL – Unlock, L – Lock).
2. Press ‘Ent’ key again and introduce the password registered in ‘dr.94’.
3. Press ‘Ent’ key and immediately, the status of the parameters lock will be changed (UL ➔ L, or L➔ UL).
4. Press ‘Ent’ key to return to ‘dr.95’.</td><td>YES</td></tr>
<tr><td>dr.97</td><td>Software version</td><td>0</td><td>0 to 9999</td><td>Displays the software version. Ex: 0xE6 = v2.30.</td><td>YES</td></tr>
<tr><td>dr.98</td><td>IO Software version</td><td>0</td><td>0 to 65535</td><td>Displays the IO software version.</td><td>YES</td></tr>
<tr><td>dr.99</td><td>Hardware version</td><td>0</td><td>0 to 65535</td><td>Displays the hardware version.</td><td>YES</td></tr>
</table>

Group 2: Basic Functions → bA

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.1</td><td>Alt Speed Ref</td><td>None</td><td>0 to 6</td><td>Select the auxiliary speed reference source for the speed sum to the main reference, according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>The reference will be introduced by using the keypad.</td></tr>
<tr><td>1</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr>
<tr><td>3</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr>
<tr><td>4</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr>
<tr><td>6</td><td>Pulse</td><td>Reference will be introduced through the Pulse input.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>bA.2 [2]</td><td>Aux calculation type</td><td>M+(GA)</td><td>0 to 7</td><td>Adjust the equation to calculate the speed reference. In order to do this, the present reference source, the auxiliary reference (bA.1) and the gain for this reference (bA.3) are used.

Notice that options 4-7 could result in references with positive or negative sign (forward or reverse operation) even when unipolar analog inputs are used.</td><td>NO</td></tr>
</table>

[2] These parameters will only be displayed if bA.1 is not set to 0 (None).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>The following table shows the calculation for each option, where:

M: Main speed reference
G: Auxiliary reference gain (bA.3)
A: Auxiliary reference (bA.1)

<table>
<tr><th>OPT.</th><th>CALCULATION</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>M+(G*A)</td><td>$Main\ ref. + (bA.3 * bA.1 * In.1)$</td></tr>
<tr><td>1</td><td>Mx(G*A)</td><td>$Main\ ref. * (bA.3 * bA.1)$</td></tr>
<tr><td>2</td><td>M/(G*A)</td><td>$Main\ ref. / (bA.3 * bA.1)$</td></tr>
<tr><td>3</td><td>M+[M*(G*A)]</td><td>$Main\ ref. + \{Main\ ref. * (bA.3 * bA.1)\}$</td></tr>
<tr><td>4</td><td>M+G*2(A-50%)</td><td>$Main\ ref. + bA.3 * 2 * (bA.1 - 50) * In.1$</td></tr>
<tr><td>5</td><td>Mx[G*2(A-50%)</td><td>$Main\ ref. * (bA.3 * 2 * (bA.1 - 50))$</td></tr>
<tr><td>6</td><td>M/[G*2(A-50%)]</td><td>$Main\ ref. /(bA.3 * 2 * (bA.1 - 50))$</td></tr>
<tr><td>7</td><td>M+M*G*2(A-50%)</td><td>$Main\ ref. + Main\ ref. * bA.3 * 2 * (bA.1 - 50)$</td></tr>
</table>
</td><td></td></tr>
<tr><td>**bA.3** [2]</td><td>Auxiliary reference gain</td><td>1000%</td><td>-200.0 to 200.0%</td><td>Adjust a gain to the auxiliary reference configured in parameter.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>**bA.4**</td><td>Control mode 2</td><td>1</td><td>0 to 4</td><td>Set the alternative control mode to command the drive (Start/Stop, Reset...).
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>LOCAL</td><td>Drive is controlled from the keypad.</td></tr><tr><td>1</td><td>REMOTE</td><td>Commands are sent from the control terminals.</td></tr><tr><td>2</td><td>REMOTE 2</td><td>Commands are sent from the control 2 terminals.</td></tr><tr><td>3</td><td>MODBUS</td><td>The drive is controlled through the communications bus, integrated in the equipment.</td></tr><tr><td>4</td><td>COMMS</td><td>The drive control is carried out by the use of any of the optional communication boards.</td></tr></table></td><td>NO</td></tr>
<tr><td>**bA.5**</td><td>Speed reference source 2</td><td>LOCAL</td><td>0 to 12</td><td>Select the alternative source for the speed and torque reference respectively.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>LOCAL</td><td>Reference will be given by keypad and will be set in dr.1.</td></tr><tr><td>2</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr><tr><td>4</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr><tr><td>5</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr></table>
Note: Continues in the next page</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.6</td><td>Alternative torque reference</td><td>LOCAL</td><td></td><td>Note: Comes from the previous page.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>6</td><td>MODBUS</td><td>The reference will be introduced through Modbus.</td></tr><tr><td>8</td><td>COMMS</td><td>The reference will be introduced through communications.</td></tr><tr><td>9</td><td>PLC</td><td>The common area can be linked with user sequence output and can be used as command.</td></tr><tr><td>12</td><td>PULSE</td><td>Reference will be introduced through the Pulse input.</td></tr></table></td><td>YES</td></tr>
<tr><td>bA.7</td><td>V/F Pattern</td><td>Linear</td><td>0 to 3</td><td>Set the alternative acceleration ramp.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Linear</td><td>Output voltage increases and decreases at constant rate proportional to voltage/frequency (V/F) relation. Used to achieve a constant torque load regardless the frequency.</td></tr><tr><td>1</td><td>Square</td><td>Output voltage increases quadratically with a proportion of 1.5.</td></tr><tr><td>2</td><td>V/F Us</td><td>Define a customized V/F pattern.</td></tr><tr><td>3</td><td>Square2</td><td>Output voltage increases quadratically with a proportion of 2.</td></tr></table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.8</td><td>Acceleration ramp type</td><td>MaxFreq</td><td>MaxFreq
FrqDelta</td><td>Enables the acceleration ramp setting:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>MaxFreq</td><td>Allows accelerating or decelerating with the same ramp based on the maximum frequency, independently from the operating frequency.</td></tr>
<tr><td>1</td><td>FrqDelta</td><td>Allows defining the accelerating/decelerating time which will reach the next speed reference when working at constant speed.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>bA.9</td><td>Time scale</td><td>01s</td><td>0.01s
0.1s
1s</td><td>Set the time scale for all time-related values. It is particularly useful when a more accurate Acc/Dec times are required because of load characteristics, or when the maximum time range needs to be extended.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>0.01s</td><td>minimum unit: 0.01 s</td></tr>
<tr><td>1</td><td>0.1s</td><td>minimum unit: 0.1 s</td></tr>
<tr><td>2</td><td>1s</td><td>minimum unit: 1 s</td></tr>
</table></td><td>NO</td></tr>
<tr><td>bA.10</td><td>Input Frequency</td><td>60Hz</td><td>60Hz
50Hz</td><td>Set the input frequency. If the frequency changes, so do all related settings (base frequency, maximum frequency…).
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>60Hz</td><td>Set drive frequency to 60Hz.</td></tr>
<tr><td>1</td><td>50Hz</td><td>Set drive frequency to 50Hz.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>bA.11</td><td>Pole Number</td><td>(*)</td><td>2 to 48</td><td>Set the number of poles in the motor according to its nameplate.</td><td>NO</td></tr>
<tr><td>bA.12</td><td>Rated Slip</td><td>(*)</td><td>0 to 3000rpm</td><td>When a heavy load produces a big slip during the start, configure this parameter to compensate the motor slip.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.13</td><td>Motor Current</td><td>(*)</td><td>1.0 to 1000.0A</td><td>Set the motor nominal current in accordance with the nameplate.</td><td>NO</td></tr>
<tr><td>bA.14</td><td>No load Current</td><td>(*)</td><td>0.5 to 200.0A</td><td>Set the measured current at rated frequency without load. If any difficulties are found when measuring the current without load, this setting should be between 30% and 50% of the motor nameplate rated current.</td><td>NO</td></tr>
<tr><td>bA.15</td><td>Motor Voltage</td><td>0V</td><td>170 to 480V</td><td>Set the motor rated voltage according to its nameplate.</td><td>NO</td></tr>
<tr><td>bA.16</td><td>Efficiency</td><td>(*)</td><td>64 to 100%</td><td>Set the motor efficiency according to its nameplate.</td><td>NO</td></tr>
<tr><td>bA.17</td><td>Inertia Rate</td><td>0</td><td>0 to 8</td><td>Select load inertia based on motor inertia.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Less than 10 times motor inertia</td></tr><tr><td>1</td><td>10 times motor inertia</td></tr><tr><td>2-8</td><td>More than 10 times motor inertia</td></tr></table></td><td>NO</td></tr>
<tr><td>bA.18</td><td>Output power adjustment</td><td>+100</td><td>70 to 130%</td><td>Fine adjustment of the output power calculation, increasing its value if it is lower than expected or reducing it to match the real value.</td><td>YES</td></tr>
<tr><td>bA.19</td><td>Input voltage</td><td>380V</td><td>170 to 240V
320 to 480V</td><td>Set the input voltage.
Note: The default setting value and this parameter range will vary depending on the drive supply voltage:
220V ➔220
400V ➔380</td><td>YES</td></tr>
</table>

(*) This value depends on the motor setting.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.20</td><td>Auto tuning</td><td>None</td><td>0 to 7</td><td>Set auto tuning type:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>Auto-tuning is not active</td></tr>
<tr><td>1</td><td>All</td><td>The motor parameters are measured with the motor rotating. The stator resistance (Rs), leak inductance (Lσ), stator inductance (Ls), no-load current and rotor time constant are all measured. The encoder state is also measured. The encoder related functions should be rightly set. If load is connected to the motor axis, the parameter might not be correctly measured so remove the load before measurement.</td></tr>
<tr><td>2</td><td>Allst</td><td>Motor parameters are measured when the motor is stopped. Stator resistance (Rs), leak inductance (Lσ) and rotor time constant are measured at the same time.</td></tr>
<tr><td>3</td><td>Rs+Lsig</td><td>The parameter is measured with the motor stopped. The measured values are used for auto torque boost and sensorless vector control.</td></tr>
</table>
Note: Continues on the next page.</td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
bA.20	Auto tuning	None	0 to 7	**Note:** Comes from the previous page. **OPT.** / **DESCR.** / **FUNCTION** 6 / Tr / Measures the rotor time constant (Tr) with the motor in the stopped position and Control Mode dr.9 is set to 'Sensorless'. 7 / All PM / The autotuning is activated for permanent magnet synchronous motors.	
bA.21	Stator Resistor	0 (*)	(*)	Stator resistor fine setting.	NO
bA.22	Leak Inductor	0mH (*)	(*)	Leak inductor fine setting.	NO
bA.23	Stator Inductor	0mH (*)	(*)	Inductor stator fine setting.	NO
bA.24 [3]	Rotor Time Const	145ms	25 to 5000ms	Rotor time constant fine setting.	NO
bA.25 [3]	Stator inductance scale.	100%	50 to 150%	Set stator inductance scale.	NO
bA.26 [3]	Rotor time constant scale.	100%	50 to 150%	Set rotor time constant scale.	NO
bA.31 [3]	Regeneration inductance scale	80%	70 to 100%	Set regeneration inductance scale.	NO
bA.32	Q-axis inductance scale	100%	50 to 100%	Adjust the inductance scale of the reactive energy axis, Q, for the synchronous motors permanant magnet motor control. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO

[3] These parameters will only be displayed if dr.9 is set to 4 (S-less1).
(*) This value depends on the motor setting.

Screen	Description	Default value	Range	Function	Set on RUN
bA.34	Auto tuning level for Ld and Lq	33.3%	20.0 to 50.0%	Adjusts the autotuning level for Ld (active energy axis) and Lq (reactive energy axis), for the synchronous motors permanant magnet motor control. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
bA.35	Frecuencia de autoajuste para Ld y Lq	100.0%	80.0–150.0%	Adjusts the frequency of autotuning for Ld (active energy axis) and Lq (reactive energy axis), for the synchronous motors permanant magnet motor control. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
bA.41 [4]	User Frequency 1	1500Hz	0.00 to dr.20	Set user frequency 1. When the output frequency reaches this value, the drive will provide the voltage set in parameter bA.42.	NO
bA.42 [4]	User Voltage 1	25%	0 to 100%	Set user voltage 1. The drive will provide the frequency set in parameter when the frequency configured in bA.41 is reached.	NO
bA.43 [4]	User Frequency 2	3000Hz	0.00 to dr.20	Set user frequency 2. When the output frequency reaches this value, the drive will provide the voltage set in parameter bA.44.	NO
bA.44 [4]	User Voltage 2	50%	0 to 100%	Set user voltage 2. The drive will provide the frequency set in parameter when the frequency configured in bA.43 is reached.	NO
bA.45 [4]	User Frequency 3	4500Hz	0.00 to dr.20	Set user frequency 3. When the output frequency reaches this value, the drive will provide the voltage set in parameter bA.46.	NO
bA.46 [4]	User Voltage 3	75%	0 to 100%	Set user voltage 3. The drive will provide the frequency set in parameter when the frequency configured in bA.45 is reached.	NO

[4] These parameters will only be displayed if bA.7 or M2.25 are set to 2 (V/F Us).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.47 [4]</td><td>User Frequency 4</td><td>000Hz</td><td>0.00 to dr.20</td><td>Set user frequency 4. When the output frequency reaches this value, the drive will provide the voltage set in parameter bA.48.</td><td>NO</td></tr>
<tr><td>bA.48 [4]</td><td>User Voltage 4</td><td>0%</td><td>0 to 100%</td><td>Set user voltage 4. The drive will provide the frequency set in parameter when the frequency configured in bA.47 is reached.</td><td>NO</td></tr>
<tr><td>St1 [1]</td><td>Multi-Reference1</td><td>1000%</td><td rowspan="6">0.00 to dr.20</td><td rowspan="6">The user can set multiple speed references for the drive. This will be enabled by the use of the digital inputs configured as speed multi-references.

The speed applied in each situation will depend on the digital inputs that control the multi-references, which are set as SPEED-L, SPEED-M and SPEED-H.

For example, with the following options:

- In.65 ED1 = ‘Speed-H'
- In.65 ED2 = ‘Speed -M'
- In.65 ED3 = ‘Speed-L'

The adjustment is carried out by assigning a speed value for every parameter within this group, from St1-St3 and bA53-bA.56.
The following table links the digital inputs configured as SPEED to the selected multi-reference:</td><td>YES</td></tr>
<tr><td>St2 [1]</td><td>Multi-Reference2</td><td>2000 %</td><td>YES</td></tr>
<tr><td>St3 [1]</td><td>Multi-Reference3</td><td>3000%</td><td>YES</td></tr>
<tr><td>bA.53 [5]</td><td>Multi-Reference4</td><td>4000%</td><td>YES</td></tr>
<tr><td>bA.54 [5]</td><td>Multi-Reference5</td><td>5000%</td><td>YES</td></tr>
<tr><td>bA.55 [5]</td><td>Multi-Reference6</td><td>6000%</td><td>YES</td></tr>
</table>

[1] Displayed when an LCD keypad is in use.
[5] These parameters will only be displayed if one of In.65-In71 is set to SPEED-L/M/H.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.56 [5]</td><td>Multi-Reference7</td><td>6000%</td><td></td><td>
<table>
<tr><th colspan="3">DIGITAL OUTPUT: Speed</th><th rowspan="2">MULTI REFERENCE</th><th rowspan="2">PARAM.</th></tr>
<tr><th>H</th><th>M</th><th>L</th></tr>
<tr><td>0</td><td>0</td><td>X</td><td>Multi-reference 1</td><td>St1</td></tr>
<tr><td>0</td><td>X</td><td>0</td><td>Multi-reference 2</td><td>St2</td></tr>
<tr><td>0</td><td>X</td><td>X</td><td>Multi-reference 3</td><td>St3</td></tr>
<tr><td>X</td><td>0</td><td>0</td><td>Multi-reference 4</td><td>bA.53</td></tr>
<tr><td>X</td><td>0</td><td>X</td><td>Multi-reference 5</td><td>bA.54</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>Multi-reference 6</td><td>bA.55</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>Multi-reference 7</td><td>bA.56</td></tr>
</table>
Note: 0: Inactive and X: Active.</td><td>YES</td></tr>
<tr><td>bA.70</td><td>Acceleration ramp 2</td><td>20.0s</td><td rowspan="6">0.0 to 600.0s</td><td rowspan="6">The user can set different acceleration and deceleration ramps for the drive. In order to do this, parameters bA.70-82 must be configured and the acceleration and deceleration times entered (parameters ACC and dEC from group “Operation”).

The established setting within the parameter is the time required to reach the maximum frequency value, starting from 0Hz (or to reduce the frequency according to the deceleration times). These ramps will be set according to the process necessities.
Note: Continues on the next page.</td><td>YES</td></tr>
<tr><td>bA.71</td><td>Deceleration ramp 2</td><td>30.0s</td><td>YES</td></tr>
<tr><td>bA.72 [6]</td><td>Acceleration ramp 3</td><td>20.0s</td><td>YES</td></tr>
<tr><td>bA.73 [6]</td><td>Deceleration ramp 3</td><td>30.0s</td><td>YES</td></tr>
<tr><td>bA.74 [6]</td><td>Acceleration ramp 4</td><td>20.0s</td><td>YES</td></tr>
<tr><td>bA.75 [6]</td><td>Deceleration ramp 4</td><td>30.0s</td><td>YES</td></tr>
</table>

[5] These parameters will only be displayed if one of In.65-In71 is set to SPEED-L/M/H.
[6] These parameters will only be shown if one of parameters In.65-In71 is set to ACC/DEC-B/M/H.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>bA.76 [6]</td><td>Acceleration ramp 5</td><td>20.0s</td><td rowspan="8"></td><td rowspan="8">Note: Comes from the previous page

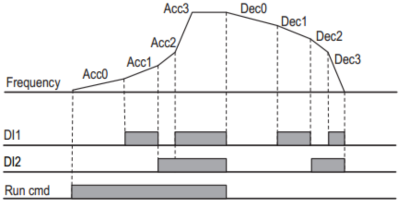
The setting is carried out by assigning a speed value for each parameter of this group:
- - bA.70 to bA.82: for acceleration times.
- - bA.71 to bA.83: for deceleration times.

Once multi-function terminals have been configured (In.65-71) as Speed-L/M/H (options 11, 12 and 49), acceleration and deceleration commands will control the drive operation based on the setting of bA.70-83.

For example, with the following options the drive will operate as shown in the following Figure Ramp operation example.

- In.65 ED1 = 'Speed-L'
- In.65 ED2 = 'Speed-M'

<table><tr><th>Accel / decel time</th><th>DI1</th><th>DI2</th></tr><tr><td>0</td><td></td><td></td></tr><tr><td>1</td><td>✓</td><td></td></tr><tr><td>2</td><td></td><td>✓</td></tr><tr><td>3</td><td>✓</td><td>✓</td></tr></table></td><td>YES</td></tr>
<tr><td>bA.77 [6]</td><td>Deceleration ramp 5</td><td>30.0s</td><td>YES</td></tr>
<tr><td>bA.78 [6]</td><td>Acceleration ramp 6</td><td>20.0s</td><td>YES</td></tr>
<tr><td>bA.79 [6]</td><td>Deceleration ramp 6</td><td>30.0s</td><td>YES</td></tr>
<tr><td>bA.80 [6]</td><td>Acceleration ramp 7</td><td>20.0s</td><td>YES</td></tr>
<tr><td>bA.81 [6]</td><td>Deceleration ramp 7</td><td>30.0s</td><td>YES</td></tr>
<tr><td>bA.82 [6]</td><td>Acceleration ramp 8</td><td>20.0s</td><td>YES</td></tr>
<tr><td>bA.83 [6]</td><td>Deceleration ramp 8</td><td>30.0s</td><td>YES</td></tr>
</table>



Ramp operation example

Group 3: Expanded Functions → Ad

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.1</td><td>Acceleration pattern</td><td rowspan="2">Linear</td><td rowspan="2">Linear
S-curve</td><td rowspan="2">Set the type of acceleration and deceleration depending on the application:
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Linear</td><td>The output frequency is constant and increases/ decreases linearly.</td></tr><tr><td>1</td><td>S-curve</td><td>Used in applications which require a soft acceleration/ deceleration, such as lifting loads. The S curve index can be set from parameters Ad.3-Ad.6.</td></tr></table></td><td rowspan="2">NO</td></tr>
<tr><td>Ad.2</td><td>Deceleration pattern</td></tr>
<tr><td>Ad.3 [7]</td><td>S curve start acceleration slope</td><td>40%</td><td>1 to 100%</td><td>Set the curve whenever the acceleration/deceleration pattern is defined as S curve. It is used to set the S curve curvilinear relation when starting the acceleration.</td><td>NO</td></tr>
<tr><td>Ad.4 [7]</td><td>S curve stop acceleration slope</td><td>40%</td><td>1 to 100%</td><td>Set the curve's ramp once the acceleration/deceleration pattern has been defined as S Curve. It is used to set the S Curve curvilinear relation when ending the acceleration.</td><td>NO</td></tr>
<tr><td>Ad.5 [8]</td><td>S curve start deceleration slope</td><td>40%</td><td>1 to 100%</td><td>Set the curve whenever the acceleration/deceleration pattern is defined as S curve. It is used to set the S curve curvilinear relation when starting the deceleration.</td><td>NO</td></tr>
<tr><td>Ad.6 [8]</td><td>S curve stop deceleration slope</td><td>40%</td><td>1 to 100%</td><td>Set the curve's ramp once the acceleration/deceleration pattern has been defined as S Curve. It is used to set the S Curve curvilinear relation when ending the deceleration.</td><td>NO</td></tr>
</table>

[7] These parameters will only be displayed if Ad.1 is set to1 (S-curve).
[8] These parameters will only be displayed if Ad.2 is set to 1 (S-curve).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.7</td><td>Motor start mode</td><td>RAMP</td><td>RAMP
DCSTART</td><td>Define the motor start mode.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>RAMP</td><td>The drive will start applying a frequency ramp to the motor</td></tr>
<tr><td>1</td><td>DC START</td><td>Allows accelerating after having stopped the motor by the use of the DC Brake. It can also be used after a normal brake whenever some torque is needed after opening the external brake.
To configure this option, see parameters Ad.12 y Ad.13.</td></tr>
</table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.8</td><td>Stop mode</td><td>RAMP</td><td>0 to 4</td><td>Select the drive main stop mode. This value should be adequate for each application.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>RAMP</td><td>The drive will stop applying a frequency ramp to stop the motor.</td></tr>
<tr><td>1</td><td>DC BRAKE</td><td>The drive will apply DC to stop the motor. To configure this option, see parameters from Ad.14 to Ad.17.</td></tr>
<tr><td>2</td><td>SPIN</td><td>The drive will cut the motor output supply, stopping due to inertia.</td></tr>
<tr><td>4</td><td>POW BRKE</td><td>The drive will stop the motor as soon as possible by controlling the regenerative energy to avoid an overvoltage fault. This option may increase or decrease the deceleration time according to the inertia of the load.
Note: Do not use this option in applications with frequent acceleration / deceleration. It could cause overheating.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Ad.9</td><td>Allow speed inversion</td><td>None</td><td>None
FWDPrev
REVPrev</td><td>Invert motor speed. This function helps to prevent the motor from rotating in inverse direction.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>The motor can spin in both directions.</td></tr>
<tr><td>1</td><td>FWDPrev</td><td>Motor cannot rotate clockwise.</td></tr>
<tr><td>2</td><td>RevPrev</td><td>Motor cannot rotate anti clockwise.</td></tr>
</table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.10</td><td>Power-on Run</td><td>N</td><td>NO
YES</td><td>This parameter allows operating the drive if once powered up the start command is already present.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>NO</td><td>The drive will NOT operate if the start command is present on power up. To operate, a stop command should previously be sent.</td></tr><tr><td>1</td><td>YES</td><td>The drive starts after powering up.</td></tr></table></td><td>YES</td></tr>
<tr><td>Ad.12 [9]</td><td>Time to DC start</td><td>0.00s</td><td>0.00 to 60.00s</td><td>Set the time during which the equipment applies DC voltage before starting to accelerate when the equipment is set in DC start mode. To enable the DC start, parameter Ad.7 must be set to ‘DCSTART’.</td><td>NO</td></tr>
<tr><td>Ad.13</td><td>Current injection DC start</td><td>50%</td><td>0 to 200%</td><td>Set the start current level when the equipment is set in DC START mode. To enable DC start option, parameter Ad.7 must be set to ‘DCSTART’.</td><td>NO</td></tr>
<tr><td>Ad.14 [10]</td><td>Pre-DC brake time</td><td>0.10s</td><td>0.00 to 60.00s</td><td>Set the time before starting the DC Brake. Once the frequency is below the value adjusted in parameter Ad.17 the drive will wait this time before starting the DC Brake operation.</td><td>NO</td></tr>
<tr><td>Ad.15 [10]</td><td>DC brake time</td><td>1.00s</td><td>0.00 to 60.00s</td><td>Set the DC Brake operation time.</td><td>NO</td></tr>
<tr><td>Ad.16 [10]</td><td>Current level DC brake</td><td>50%</td><td>0 to 200%</td><td>Set the current level which will be applied to the motor in percentage of the motor rated current during DC Brake operation.</td><td>NO</td></tr>
</table>

[9] This parameter will only be displayed if Ad.7 is set to 1 (DCSTART).
[10] These parameters will only be displayed if Ad.8 is set to 1 (DCBRAKE).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.17 [10]</td><td>Frequency start DC brake</td><td>5.00Hz</td><td>dr.19 to 60.00</td><td>Set the frequency value at which the drive will enable the DC brake. The DC Brake operation will start once the frequency is below this value and the time set in parameter Ad.14 has elapsed.</td><td>NO</td></tr>
<tr><td>Ad.20</td><td>Acceleration dwell frequency</td><td>5.00Hz</td><td>dr.19 to dr.20</td><td>During the acceleration process, the drive will pause at this frequency, keeping it constant during the time set in parameter Ad.21.</td><td>NO</td></tr>
<tr><td>Ad.21</td><td>Acceleration dwell time</td><td>0.0s</td><td>0.0 to 60.0s</td><td>During the acceleration process, this parameter allows to define during how long the drive will operate at the constant frequency set in parameter Ad.20.</td><td>NO</td></tr>
<tr><td>Ad.22</td><td>Deceleration dwell frequency</td><td>5.00Hz</td><td>dr.19 to dr.20</td><td>During the deceleration process, the drive will pause at this frequency value, remaining constant during the time period established in parameter Ad.23.</td><td>NO</td></tr>
<tr><td>Ad.23</td><td>Deceleration dwell time</td><td>0.0s</td><td>0.0 to 60.0s</td><td>During the deceleration process, this parameter allows to set how long will the drive be operating at the constant frequency set in parameter Ad.22.</td><td>NO</td></tr>
<tr><td>Ad.24</td><td>Use frequency limit</td><td>N</td><td>NO
YES</td><td>Enable or disable the frequency limit.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>NO</td><td>Frequency limit disabled.</td></tr><tr><td>1</td><td>YES</td><td>Frequency limit enabled.</td></tr></table></td><td>NO</td></tr>
<tr><td>Ad.25 [11]</td><td>Frequency lower limit</td><td>0.50Hz</td><td>0.00 to Ad.26</td><td>Set the lower frequency limit if parameter Ad. 24 is set as YES.</td><td>YES</td></tr>
<tr><td>Ad.26 [11]</td><td>Frequency higher limit</td><td>dr.20 Hz [11]</td><td>Ad.25 to dr.20</td><td>Set the upper frequency limit whenever parameter Ad. 24 is set as YES.</td><td>NO</td></tr>
</table>

[10] These parameters will only be displayed if Ad.8 is set to 1 (DCBRAKE).
[11] These parameters will only be displayed if Ad.24 is set to 1 (YES).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.27</td><td>Jump frequency activation</td><td>NO</td><td>NO
YES</td><td>The user can enable or disable a band of jump frequencies to avoid resonance frequencies or other frequency types that the motor will avoid as references. The drive will pass these frequencies during the speed changes (acceleration and/or deceleration) but will not operate within these values.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NO</td><td>Disable the frequency jump function.</td></tr>
<tr><td>1</td><td>YES</td><td>Enable the frequency jump function.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Ad.28 [12]</td><td>Lower limit jump frequency 1</td><td>10.00Hz</td><td>0.00 to Ad.29</td><td>Set the frequency jump 1 lower limit.</td><td>YES</td></tr>
<tr><td>Ad.29 [12]</td><td>Upper limit jump frequency 1</td><td>15.00Hz</td><td>Ad.28 to dr.20</td><td>Set the frequency jump 1 upper limit.</td><td>YES</td></tr>
<tr><td>Ad.30 [12]</td><td>Lower limit jump frequency 2</td><td>20.00Hz</td><td>0.00 to Ad.31</td><td>Set the frequency jump 2 lower limit.</td><td>YES</td></tr>
<tr><td>Ad.31 [12]</td><td>Upper limit jump frequency 2</td><td>25.00Hz</td><td>Ad.30 to dr.20</td><td>Set the frequency jump 2 upper limit.</td><td>YES</td></tr>
<tr><td>Ad.32 [12]</td><td>Lower limit jump frequency 3</td><td>30.00Hz</td><td>0.00 to Ad.33</td><td>Set the frequency jump 3 lower limit.</td><td>YES</td></tr>
<tr><td>Ad.33 [12]</td><td>Upper limit jump frequency 3</td><td>35.00Hz</td><td>Ad.32 to dr.20</td><td>Set the frequency jump 3 upper limit.</td><td>YES</td></tr>
<tr><td>Ad.41 [13]</td><td>Open brake current</td><td>50.0%</td><td>0.0 to 180.0%</td><td>Set the output current at which the drive will open the relay configured as ‘BRCtrl’. See parameter OU.1.</td><td>NO</td></tr>
</table>

[12] These parameters will only be displayed if Ad.27 is set to 1 (YES).
[13] These parameters will only be displayed if either ‘OU.31 u OU.33 is set to BRCtrl.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.42 [13]</td><td>Delay before brake opening</td><td>1.00s</td><td>0.00 to 10.00s</td><td>Once the motor current is greater than the one set in parameter Ad.41 and the frequency reached in the motor is the same as the one set in parameter Ad.44, the drive will open the relay configured as ‘BRCtrl’ and will keep this speed during the time established in this parameter.</td><td>NO</td></tr>
<tr><td>Ad.44 [13]</td><td>Brake opening forward frequency</td><td>1.00Hz</td><td>0.00 to dr.20</td><td>Set the brake opening frequency of the relay configured as ‘BRCtrl’ while the motor is accelerating in positive direction.</td><td>NO</td></tr>
<tr><td>Ad.45 [13]</td><td>Brake opening reverse frequency</td><td>1.00Hz</td><td>0.00 to dr.20</td><td>Set the brake opening frequency of the relay configured as ‘BRCtrl’ while the motor is accelerating in negative direction.</td><td>NO</td></tr>
<tr><td>Ad.46 [13]</td><td>Delay before brake closing</td><td>1.00s [13</td><td>0.00 to 10.00s</td><td>Once the motor has reached the frequency set in Ad.47, the drive will close the braking relay and will keep this speed during the time established in this parameter.</td><td>NO</td></tr>
<tr><td>Ad.47 [13]</td><td>Brake closing frequency</td><td>2.00Hz</td><td>0.00 to dr.20</td><td>Set the frequency value at which the braking relay will stop operating, allowing the closed brake function.</td><td>NO</td></tr>
<tr><td>Ad.50</td><td>Minimum flux mode</td><td>NONE</td><td>0 to 2</td><td>Set the minimum flux that the motor can employ to operate under low load conditions. With this optimized flux system, noises and power losses will be reduced due to the automatic flux level arrangement. The following table shows the different available configurations:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NONE</td><td>No action is executed</td></tr>
<tr><td>1</td><td>MANU</td><td>Selects the manual mode. If the output current is lower than the parameter bA.14 (no load motor current), output voltage will be reduced in the magnitude set in parameter Ad.51.</td></tr>
<tr><td>2</td><td>AUTO</td><td>Selects the automatic mode. The output voltage is set taking into account the motor rated current set in bA.13 and bA.14.</td></tr>
</table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.51 [14]</td><td>Minimum flux level in manual mode</td><td>0%</td><td>0 to 30%</td><td>Set the output voltage reducing magnitude if parameter Ad.50 is set to ‘MANU’.</td><td>YES</td></tr>
<tr><td>Ad.60</td><td>Acceleration dwell frequency</td><td>0.00Hz</td><td>0.00 to dr.20</td><td>Set the frequency at which the drive will change the acceleration ramps, from the standard to those configured in bA.70 and bA.71.

See Figure Acceleration dwell frequency</td><td>NO</td></tr>
<tr><td>Ad.64</td><td>Fan operating mode</td><td>Run</td><td>0 to 2</td><td>Choose the fan operating mode.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>During Run</td><td>The drive fans will connect with the start command and disconnect three minutes after the drive stops.</td></tr>
<tr><td>1</td><td>Always ON</td><td>The fans are permanently working whenever the drive is powered.</td></tr>
<tr><td>2</td><td>Temp Ctrl</td><td>The fan will connect when the temperature in the heat sink reaches the preset control temperature.</td></tr>
</table></td><td>YES</td></tr>
<tr><td>Ad.65</td><td>Save motorized potentiometer frequency</td><td>N</td><td>NO
YES</td><td>Automatically save the speed reference defined by the motorized potentiometer.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NO</td><td>Speed reference is not saved.</td></tr>
<tr><td>1</td><td>YES</td><td>The speed reference is saved in the memory.</td></tr>
</table></td><td>YES</td></tr>
</table>

[14] These parameters will only be displayed if Ad.50 is different than ‘NONE’.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.66</td><td>Select comparator source</td><td>None</td><td>0 to 6</td><td>The comparator source can be set according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>There is no source for the comparator</td></tr>
<tr><td>1</td><td>V1</td><td>Voltage analog input 1 will be used as source by the comparator.</td></tr>
<tr><td>3</td><td>V2</td><td>Voltage analog input 2 will be used as source by the comparator.</td></tr>
<tr><td>4</td><td>I2</td><td>Current analog input 2 will be used as source by the comparator.</td></tr>
<tr><td>6</td><td>Pulse</td><td>Pulse input will be used as source by the comparator.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Ad.67</td><td>Output activation level comparator mode</td><td>90.00%</td><td>Ad.68 to 100.00</td><td>Define the level to compare with the source selected in parameter Ad.66. In case this level is over passed, one of the digital outputs adjusted as 34 ‘COMPARAT’ will enable it. See parameters OU.31 to OU.33.</td><td>NO</td></tr>
<tr><td>Ad.68</td><td>Output deactivation level comparator mode</td><td>10.00%</td><td>-100.00 to Ad.67</td><td>Define the level to compare with the source selected in parameter Ad.66. In case this level is over passed, one of the digital outputs adjusted as 34 ‘COMPARAT’ will disable it. See parameters OU.31 a OU.33.</td><td>NO</td></tr>
<tr><td>Ad.70</td><td>Safe operation selection</td><td>Always Enable</td><td>Always Enable
DI Dependent</td><td>Configure safe operation mode. With it, the drive operates if it has permissions to do so.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Always Enable</td><td>The drive responds to any start command without requiring further permissions.</td></tr>
<tr><td>1</td><td>DI Dependent</td><td>The drive will only operate if the digital input configured as ‘13 RUNEnable’ is active.</td></tr>
</table></td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.71 [15]</td><td>Safe operation stop</td><td>Free-Run</td><td>Free-Run
Q-Stop
Q-Stop Res</td><td>Set the operation of the drive when the multi-function input terminal in safe operation mode is off.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Free-Run</td><td>Blocks the drive output when the multifunction terminal is off.</td></tr><tr><td>1</td><td>Q-Stop</td><td>If the digital input configured as ’13 RUNEnable’ is disabled when the drive is operating, the drive decelerates according to the ramp defined in parameter Ad.72. To establish again the start command, the input has to be enabled while the drive is stopped.</td></tr><tr><td>2</td><td>Q-Stop Res</td><td>If the digital input configured as ‘13 RUNEnable’ is disabled when the drive is operating, the drive decelerates according to the ramp defined in parameter Ad.72. If once the permission digital input is reset the start command is present, the drive will start normally.</td></tr></table>
Figure Safe operation stop illustrates the drive stop mode depending on the chosen option.</td><td>NO</td></tr>
<tr><td>Ad.72 [15]</td><td>Q-Stop Time</td><td>5.0s</td><td>0.0 to 600.0s</td><td>Set the deceleration time when Ad.71 is set to 1 (Q-Stop) or 2 (Q-Stop Res).</td><td>YES</td></tr>
</table>

[15] These parameters will only be displayed if Ad.70 is set to 1 (DI DEPENDENT).

Screen	Description	Default value	Range	Function	Set on RUN
Ad.74	Enable regeneration prevention	N	N S	Enable regeneration prevention. When this situation occurs, the drive will increase the output frequency to prevent a fault due to overvoltage in the DC link. With this parameter, the drive helps the dynamic brake unit to avoid regeneration situations when the drive operates at normal speed.	NO
Ad.75	Regeneration prevention level	700V	300 to 800V	Set the voltage level in the DC link voltage at which the algorithm will start increasing the speed. **Figure Regeneration prevention level** illustrates this function. **Note:** The default value and parameter range will vary depending on the drive supply voltage: 220V➔300 to 400V 380V➔600 to 800V	NO NO
Ad.76 [16]	Compare frequency limit	1.00Hz	0.00 to 10.00Hz	Set the alternative frequency width to be used by the algorithm when the voltage level set in parameter Ad.75 is overcome during regeneration prevention.	NO
Ad.77 [16]	P gain regeneration prevention	50.0%	0.0 to 100.0%	To prevent regeneration zone, set P/I gain in the DC link voltage suppress PI controller.	YES
Ad.78 [16]	I gain regeneration prevention	50.0ms	0.0 to 3000.0ms	**Note:** Press regeneration prevention does not operate during accelerations or decelerations; it only operates during constant speed motor operation. When regeneration prevention is activated, output frequency may change within the range set at Ad.76.	YES

[16] Displayed when Ad.74 is set to 1 (YES).

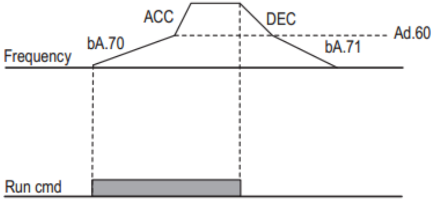
<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Ad.80
[17]</td><td>Fire mode selection</td><td>None</td><td>None
Fire Mode
Fire Mode Test</td><td>Fire mode forces the drive to ignore all minor faults and resets and restarts with major faults without considering the number of retry attempts. This action is performed until equipment destruction if necessary.

The drive runs in Fire mode when this parameter is set to ‘1 (Fire Mode)’, and the multifunction terminal (In. 65-71) configured for Fire mode is turned on.

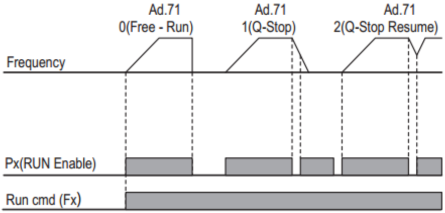
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>Fire mode is off</td></tr>
<tr><td>1</td><td>Fire Mode</td><td>Fire mode enabled. When the digital input configured as ‘Fire Mode’, the drive will start working in this mode, at the frequency configured in Ad.81 and the direction set in Ad.82.</td></tr>
<tr><td>2</td><td>Fire Mode Test</td><td>The drive simulates fire mode operation for a while. Then, it stops.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Ad.81
[17]</td><td>Fire mode frequency</td><td>60.00Hz</td><td>0.00 to 60.00Hz</td><td>Set the frequency for drive operation in Fire mode. The Fire mode frequency takes priority over the Jog frequency, Multi-step frequencies, and frequency configured from keyboard.</td><td>NO</td></tr>
<tr><td>Ad.82
[17]</td><td>Fire mode direction</td><td>Forward</td><td>Forward
Reverse</td><td>Set Fire mode direction:

<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Forward</td><td>Forward direction.</td></tr>
<tr><td>1</td><td>Reverse</td><td>Reverse direction.</td></tr>
</table></td><td>NO</td></tr>
</table>

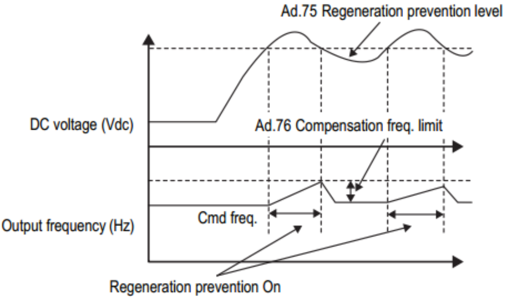
[17] Displayed when Ad.80 is set to 1 (YES).



Acceleration dwell frequency



Safe operation stop



Regeneration prevention level

Group 4: Control Functions → Cn

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.4</td><td>Modulation frequency</td><td>3.0kHz</td><td>-</td><td>Adjust motor operational noise by varying the commutation frequency in the motor output stage

If the frequency is set high, it reduces operational noise from the motor, and if it is set low, the operational noise from the motor increases.

Default value and range for this parameter depend on the load rate:

Normal load: 2kHz (Max 5kHz).
Heavy load: 3kHz (Max 15kHz).</td><td>NO</td></tr>
<tr><td>Cn.5</td><td>Modulation mode</td><td>Normal PWM</td><td>0 to 1</td><td>Change the modulation to reduce the heat loss and leakage current from the drive:

<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Normal PWM</td><td>No changes to load rate.</td></tr><tr><td>1</td><td>Low Leakage PWM</td><td>Reduces heat loss and leakage current compared to Normal PWM, but the motor noise increases.</td></tr></table></td><td>NO</td></tr>
<tr><td>Cn.9</td><td>Pre-excitation time</td><td>1.00s</td><td>0.00 to 60.00s</td><td>Set the initial excitation time. Pre-excitation is used to start the operation after performing excitation up to the motor's rated flux.</td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
Cn.10	Pre-excitation flux	100.0%	100.0 to 500.0%	Adjust the flux supplied during the pre-excitation time set in Cn.9. The motor flux increases up to the rated flux with the time constant as shown in **Figure Pre-excitation flux**. To reduce the time taken to reach the rated flux, a higher motor flux base value than the rated flux must be provided. When the magnetic flux reaches the rated flux, the provided motor flux base value is reduced.	NO
Cn.11	Power off delay	0.00s	0.00 to 60.00s	After the motor stops, this parameter sets the time during which direct current from the drive is fed into the motor This function is illustrated in **Figure Power off delay**.	NO
Cn.12	PM speed controller P gain 1	100	0–5000	Adjust the proportional gain 1 of the speed controller (low speed) for the permanent magnet synchronous motor control. If the speed deviation is greater than the torque, the output command will increase accordingly. With a high P value, the speed is regulated faster. A very high value can cause instability in speed. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.13	PM speed controller I gain 1	100	0–5000	Adjust the integral gain 1 of the speed controller (low speed) for the permanent magnet synchronous motor control. If the speed deviation is greater than the torque, the output command will increase accordingly. With a high P value, the speed is regulated faster. A very high value can cause instability in speed. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.15</td><td>PM speed controller P gain 2</td><td>100</td><td>0–5000</td><td>Adjust the proportional gain 2 of the speed controller (high speed) for permanent magnet synchronous motor control.
Note: Visible parameter if dr.9 = PM Sensor-less</td><td>NO</td></tr>
<tr><td>Cn.16</td><td>PM speed controller I gain 2</td><td>150</td><td>0–9999</td><td>Adjust the integral gain 2 of the speed controller (high speed) for permanent magnet synchronous motor control.
Note: Visible parameter if dr.9 = PM Sensor-less</td><td>NO</td></tr>
<tr><td>Cn.20</td><td>Sensorless control gain 2</td><td>NO</td><td>NO
YES</td><td>Allows configuring the sensorless control gain.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>NO</td><td>Sensorless control gain configuration parameters will not be shown.</td></tr><tr><td>1</td><td>YES</td><td>Enables sensorless control gain configuration. Parameters Cn.21-32 will be displayed.</td></tr></table></td><td>YES</td></tr>
<tr><td>Cn.21</td><td>ASR proportional gain 1</td><td>(*)</td><td>0 to 5000%</td><td>Set the proportional gain 1 of the speed controller (ASR).
The higher the proportional gain, the faster the response will be. But if the gain is too high, the speed of the motor might oscillate.</td><td>YES</td></tr>
<tr><td>Cn.22</td><td>ASR integral time 1</td><td>(*)</td><td>10 to 9999ms</td><td>Set the integral gain 1 of the speed controller (ASR).</td><td>YES</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
Cn.23 [18]	Independent controller proportional gain 2	(*)	1.0 to 1000.0%	Set the proportional gain 2 of a separate controller. The higher the proportional gain, the faster the response will be. But if the gain is too high, the speed of the motor might oscillate.	YES
Cn.24 [18]	Independent controller integral gain 2	(*)	1.0 to 1000.0%	Set the integral gain 2 of a separate controller.	YES
Cn.25 [18]	Integral time sensorless controller	(*)	10 to 999ms	Sensorless speed controller integral gain 0.	YES
Cn.26 [18]	Flux estimator proportional gain	(*)	1 to 200%	Sensorless vector control requires the rotor flux estimator. Use these parameters to adjust flux estimator gain	YES
Cn.27 [18]	Flux estimator integral gain	(*)	1 to 200%		YES
Cn.28 [18]	Speed estimator proportional gain 1	(*)	0 to 32767	Adjusts speed estimator gain for sensorless vector control: • At low speed (10Hz or lower), increase the value of Cn.29 by increments of 5. • At mid speed (30 Hz or higher), increase the value of Cn.28 by increments of 500. If the parameter setting is too extreme, over current trip may occur at low speed.	YES
Cn.29 [18]	Speed estimator integral gain 1	(*)	100 to 1000		YES
Cn.30 [18]	Speed estimator integral gain 2	(*)	100 to 10000		YES
Cn.31 [18]	Sensorless cont. proportional gain	(*)	10 to 1000	Adjusts the P and I gains of the sensorless current controller. If the value of Cn.10 is high, an overcurrent trip at start can occur. In this case, reduce the value of Cn.31 by decrements of 10.	YES
Cn.32 [18]	Sensorless cont. integral gain	(*)	10 to 1000		YES

[18] Displayed when dr.9 is set to 4 (S-less1) and Cn.20 is set to 1 (YES).
(*) This value depends on the motor setting.

Screen	Description	Default value	Range	Function	Set on RUN
Cn.33	PM D-axis back-EMF estimated gain (%)	100.0%	0–300.0%	Adjusts the gain of the velocity speed estimator on the D axis of the back EMF for the permanent magnet motor control. Set these values as a percentage of the proportional gain to have a stable polarity estimator. Higher values result in faster responses, with greater possibilities of motor vibration. Excessively low values can cause motor starting failure due to a slow response rate. For short acceleration ramps, a low value in Cn.33 is recommended (less than 100%), but the initial torque could decrease. With fast ramps, it is recommended to increase the value of Cn.33 **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.34	PM Q-axis back-EMF estimated gain (%)	100.0%	0–300.0%	Adjusts the gain of the speed estimator on the Q axis of the back EMF for the permanent magnet motor control. Set these values as a percentage of the proportional gain to have a stable polarity estimator. Higher values result in faster responses, with greater possibilities of motor vibration. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.35	Nº de reintentos estimación posición inicial del polo	2	0–10	Allows adjusting the number of retries to estimate the initial position of the pole. The initial detection of the pole position is a process that coincides with the position of the rotor calculated by the drive and the actual position of the rotor in a motor. In a permanent magnet synchronous motor (PM), the rotor flux is generated by the permanent magnet attached to the rotor. Therefore, to operate the motor in vector control mode, the exact position of the rotor (flow position) must be detected for a	NO

Screen	Description	Default value	Range	Function	Set on RUN
				precise control of the torque generated by the motor. **Note:** Visible parameter if dr.9 = PM Sensor-less	
Cn.36	Initial pole position estimation interval	20ms	1–100ms	It allows adjusting the time interval between retries to estimate the initial position of the pole in a permanent magnet synchronous motor (PM). **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.37	Initial pole position estimation pulse current (%)	15%	10–100%	It allows adjusting the value of the current pulse in the estimation of the initial position of the pole in a permanent magnet synchronous motor (PM). **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.38	Initial pole position estimation pulse voltage (%)	500%	100–4000	It allows adjusting the value of the voltage pulse in the estimation of the initial position of the pole in a permanent magnet synchronous motor (PM). **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.39	PM dead-time range (%)	100.0%	50.0–200.0%	Sets the output compensation values during the operation of a permanent magnet synchronous motor in sensorless vector control mode. If the motor does not run at low speeds, at 5%, or less, of the rated motor speed, increase the values in 10%	NO

Screen	Description	Default value	Range	Function	Set on RUN
Cn.40	PM dead-time voltage (%)	100.0%	50.0–200.0%	increments. Decrease the values by 10% decrements if a clanking noise occurs at motor startup and motor stop. **Note:** Visible parameter if dr.9 = PM Sensor-less	
Cn.41	PM speed estimator proportional gain	100	0–32000	Establish the values of the gain of the speed estimator during the operation of a permanent magnet synchronous motor in sensorless vector control mode. If there is a fault or the motor vibrates at low speed, decrease this parameter by 10% decrements until the motor runs correctly. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.42	PM speed estimator integral gain	10	0–32000	Establishes the values of the gain of the speed estimator during the operation of a permanent magnet synchronous motor in sensorless vector control mode. If oscillations occur during normal motor operation, increase this parameter. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO

Screen	Description	Default value	Range	Function	Set on RUN
Cn.43	PM speed estimator proportional gain	300	0–32000	Establishes the values of the gain of the speed estimator during the operation of a permanent magnet synchronous motor in sensorless vector control mode. They are used for low speed operations for 200V motors. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.44	PM speed estimator integral gain 2	30	0–32000	Establishes the values of the gain of the speed estimator during the operation of a permanent magnet synchronous motor in sensorless vector control mode. They are used for low speed operations for 200V motors. Note: Visible parameter if dr.9 = PM Sensor-less	NO
Cn.45	Speed estimator feedforward high speed range (%)	300%	0–1000%	Establishes the high speed portion of the feedback speed with respect to the EMF during the operation of a permanent magnet synchronous motor in the sensorless vector control mode. The forwarding of feeds improves the operation of the speed estimator. Increase the value of this parameter in increments of 10% to eliminate oscillations in the motor. If it is set too high a fault can occur. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.46	Initial pole position estimation type	1: Det. de ángulo	0–2	It allows selecting the type of initial estimation of the pole position: - 0: None. The motor operates according to the estimation of the position of the pole obtained by the algorithm of the drive. - 1: Angle detection. The motor operates according to the position of the pole obtained by changes in current. The voltage pulse input is used to detect the polar position and it produces a small amount of noise at motor startup.	NO

Screen	Description	Default value	Range	Function	Set on RUN
				- 2: Alignment. The rotor aligns the position of the rotor supplying DC current for a certain period of time. **Note:** Visible parameter if dr.9 = PM Sensor-less	
Cn.48	Controller P gain	1200	10 to 10000	Adjust current controller P gain. **Note:** Visible parameter if dr.9 = PM Sensor-less	YES
Cn.49	Controller I gain	120	10 to 10000	Adjust current controller I gain **Note:** Visible parameter if dr.9 = PM Sensor-less	YES
Cn.50	Lim. controlador de tensión	10.0%	0–1000%	Allows increasing the output voltage in certain situations. Do not modify this parameter if it is not necessary, if the motor supplies the desired torque at the maximum speed, do not modify it. Increasing this parameter can cause a higher level of THDi in the motor. **Note:** Visible parameter if dr.9 = PM Sensor-less	NO
Cn.51	Gan. integral controlador de tensión	10.0%	0–20000%		
Cn.52	Output filter vector	0ms	0 to 2000ms	Set the torque controller output filter	NO

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.53</td><td>Torque limit reference</td><td>LOCAL</td><td>0 to 12</td><td>Select the source to introduce the torque limit reference.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>LOCAL</td><td>Reference will be given by keypad and will be set in (dr.2) – Local Torque.</td></tr>
<tr><td>2</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr>
<tr><td>4</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr>
<tr><td>5</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr>
<tr><td>6</td><td>MODBUS</td><td>The reference will be introduced through Modbus.</td></tr>
<tr><td>8</td><td>COMMS</td><td>The reference will be introduced through the communications.</td></tr>
<tr><td>9</td><td>PLC</td><td>The common area can be linked with user sequence output and can be used as command.</td></tr>
<tr><td>12</td><td>PULSE</td><td>Reference will be introduced through the Pulse input.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Cn.54 [19]</td><td>Forward positive torque limit</td><td>180.0%</td><td>0.0 to 200.0%</td><td>The user can set the forward motoring operation torque limit whenever the torque limit reference has been set as LOCAL.</td><td>YES</td></tr>
<tr><td>Cn.55 [19]</td><td>Forward negative torque limit</td><td>180.0%</td><td>0.0 to 200.0%</td><td>The user can set the forward regeneration operation torque limit whenever the torque limit reference has been set as LOCAL</td><td>YES</td></tr>
<tr><td>Cn.56 [19]</td><td>Reverse positive torque limit</td><td>180.0%</td><td>0.0 to 200.0%</td><td>The user can set the reverse motoring operation torque limit whenever the torque limit reference has been set as LOCAL</td><td>YES</td></tr>
<tr><td>Cn.57 [19]</td><td>Reverse negative torque limit</td><td>180.0%</td><td>0.0 to 200.0%</td><td>The user can set the reverse regeneration operation torque limit whenever the torque limit reference has been set as LOCAL</td><td>YES</td></tr>
</table>

[19] Displayed when dr.9 is set to 4 (Sless-1). This will change the initial value of Ad.74, Torque limit, to 150%.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.62
[19]</td><td>Speed limit reference</td><td>LOCAL</td><td>0 to 8</td><td>Select the source to introduce the speed limit reference.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>LOCAL</td><td>Reference will be given by keypad and will be set in dr.1.</td></tr>
<tr><td>2</td><td>V1</td><td>Reference will be introduced through the voltage analog input 1.</td></tr>
<tr><td>4</td><td>V2</td><td>Reference will be introduced through the voltage analog input 2.</td></tr>
<tr><td>5</td><td>I2</td><td>Reference will be introduced through the current analog input 2.</td></tr>
<tr><td>6</td><td>MOD BUS</td><td>The reference will be introduced through Modbus.</td></tr>
<tr><td>7</td><td>COMM S</td><td>The reference will be introduced through the communications.</td></tr>
<tr><td>8</td><td>PLC</td><td>The common area can be linked with user sequence output and can be used as command.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Cn.63
[19]</td><td>Forward speed limit</td><td>60.00Hz</td><td>0.00 to 400.00Hz</td><td>The user can set the forward speed limit whenever the speed limit reference has been set as LOCAL.</td><td>YES</td></tr>
<tr><td>Cn.64
[19]</td><td>Reverse speed limit</td><td>60.00Hz</td><td>0.00 to 400.00Hz</td><td>The user can set the reverse speed limit whenever the speed limit reference has been set as LOCAL.</td><td>YES</td></tr>
<tr><td>Cn.65
[19]</td><td>Speed limit gain</td><td>500%</td><td>100 to 5000%</td><td>Set how much the speed reference has to decrease when motor speed exceeds the speed limit.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.70</td><td>Speed search mode selection</td><td>Flying Start1</td><td>Flying Start1
Flying Start2</td><td>Select a speed search mode.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Flying Start1</td><td>Speed search is carried out as it controls the drive output current during idling below Cn.72. If the direction of the idling motor and the direction of operation command at restart are the same, a stable speed search function can be performed at about 10 Hz or lower. However, if the direction of the idling motor and of operation command at restart are different, the speed search does not produce a satisfactory result because the direction of idling cannot be established.</td></tr></table>
Note: Continues on the next page.</td><td>NO</td></tr>
</table>

[19] Displayed when dr.9 is set to 4 (Sless-1). This will change the initial value of Ad.74, Torque limit, to 150%.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Cn.70</td><td>Speed search mode selection</td><td>Flying Start1</td><td>Flying Start1
Flying Start2</td><td>Note: Comes from the previous page
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>1</td><td>Flying Start2</td><td>The speed search is carried out as it controls the ripple current which is generated by the counter electromotive force during no-load rotation. This mode establishes the direction of the idling motor (forward/reverse), thus the speed search function is stable regardless the direction of the idling motor and of operation command. However, since ripple current is used, the idle frequency is not accurately determined and re-acceleration may start from zero speed when the speed search is performed for the idling motor at low speed (about 10 - 15 Hz, though it depends on motor characteristics).</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Cn.71</td><td>Search mode</td><td>0000</td><td>00 to 15</td><td>Set the search mode. Adjust each bit to 0 or 1 according to the table below:
<table>
<tr><th>OPT.</th><th>FUNCTION.</th></tr>
<tr><td>0001</td><td>Selection of speed search on acceleration.</td></tr>
<tr><td>0010</td><td>Speed search on start after fault.</td></tr>
<tr><td>0100</td><td>Speed search after a power supply fault.</td></tr>
<tr><td>1000</td><td>Speed search when the drive is energized, if the start command is present.</td></tr>
</table></td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
Cn.72 [20]	Speed search mode current	150%	80 to 200%	Allows controlling the current during the speed search in percentage in relation with the motor rated current.	YES
Cn.73 [21]	Speed search mode prop. gain	Depends on the value of Cn.70	0 to 9999	Allows setting the proportional gain for the speed search. **Note:** The default value of this parameter depends on Cn.70: Flying Start1➔100 Flying Start2➔600	YES
Cn.74 [21]	Speed search mode integral gain		0 to 9999	Allows setting the proportional gain for the speed search. **Note:** The default value of this parameter depends on Cn.70: Flying Start1➔200 Flying Start2➔1000	YES
Cn.75 [21]	Speed search delay	1.0s	0.0 to 60.0s	Allows locking the output during an established time before proceeding with the speed search.	NO
Cn.76 [21]	Speed estimator gain	100%	50 to 150%	Speed search estimator gain.	YES
Cn.77	KEB Select	No	0 to 2	When the input power supply is disconnected, the drive DC link voltage decreases and a low voltage trip occurs blocking the output. A kinetic energy buffering operation uses regenerative energy generated by the motor during the blackout to maintain the DC link voltage. This extends the time for a low voltage trip to occur after a sudden power interruption. This parameter allows selecting the kinetic energy buffering operation. If 1 or 2 is selected, it controls the drive output frequency and charges the DC link (drive DC part) with energy generated from the motor. **Note**: Continues on the next page.	NO

[20] Displayed when any of the bits in Cn.71 bits are set to 1 and Cn.70 is set to 0.
[21] Displayed when any of the bits in Cn.71 bits are set to 1.

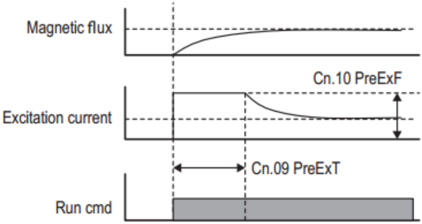
<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>No</td><td>General deceleration is carried out until a low voltage trip occurs.</td></tr>
<tr><td>1</td><td>KEB1</td><td>When the input power is lost, it charges the DC link with regenerated energy. When the input power is restored, so does normal operation from energy buffering operation to the frequency reference operation. Operation frequency acceleration is set in Cn.83.</td></tr>
<tr><td>2</td><td>KEB2</td><td>When the input power is lost, it charges the DC link with regenerated energy. When the input power is restored, it changes from the energy buffering operation to the deceleration stop operation. The operation frequency deceleration time is set in dr.4.</td></tr>
</table></td><td></td></tr>
<tr><td>Cn.78 [22]</td><td>Initial value for KEB operation</td><td>125.0%</td><td>110.0 to 200.0%</td><td rowspan="2">Sets the start and stop points of the kinetic energy buffering operation. The set values must be based on the low voltage trip level as 100% and the stop level (Cn.79) must be higher than the start level (Cn.78).</td><td>NO</td></tr>
<tr><td>Cn.79 [22]</td><td>Value to stop KEB operation</td><td>130.0%</td><td>Cn.78 to 210.0%</td><td>NO</td></tr>
</table>

[22] Displayed when Cn.77 is not set to 0 (NO).

Screen	Description	Default value	Range	Function	Set on RUN
Cn.80 [22]	KEB proportional gain	10000	1 to 20000	Maintain the voltage of the DC power section during the kinetic energy buffering operation. Change the setting value when a low voltage trip occurs right after a power failure.	YES
Cn.81 [22]	KEB integral gain	500 [22]	1 to 20000	Maintain the voltage of the DC power section during the kinetic energy buffering operation. Sets the gain value to maintain the frequency during the kinetic energy buffering operation until the drive stops.	YES
Cn.82 [22]	Energy buffering Slip gain	30.0	0 to 2000.0%	Regulation of KEB function. Slip gain KEB.	YES
Cn.83 [22]	Energy buffering acceleration time	10.0	0.0 to 600.0 s	Regulation of KEB function. Acceleration time KEB.	YES
Cn.85 [23]	Flux proportional gain 1	370	100 to 700	Flux estimator proportional gain 1.	YES
Cn.86 [23]	Flux proportional gain 2	0	0 to 100	Flux estimator proportional gain 2.	YES
Cn.87 [23]	Flux proportional gain 3	100	0 to 500	Flux estimator proportional gain 3.	YES
Cn.88 [23]	Flux integral gain 1	50 [23]	0 to 200	Flux estimator integral gain 1.	YES
Cn.89 [23]	Flux integral gain 2	50 [24]	0 to 200	Flux estimator integral gain 2.	YES
Cn.90 [23]	Flux integral gain 3	50 [24]	0 to 200	Flux estimator integral gain 3.	YES

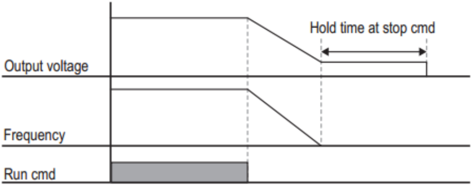
[22] Displayed when Cn.77 is not set to 0 (NO).
[23] Displayed when Cn.20 is set to 1 (YES).

Screen	Description	Default value	Range	Function	Set on RUN
Cn.91 **[23]**	SL voltage compensation 1	20 (*)	0 to 60	Adjust output voltage compensation values for sensorless vector control. • If the output frequency is higher than the base frequency during no-load operation at low speed, decrease the value of Cn.91 by decrements of 5 (10Hz or lower). • If the torque is insufficient, increase Cn.93 by increments of 5.	YES
Cn.92 **[23]**	SL voltage compensation 2	20 (*)	0 to 60		YES
Cn.93 **[23]**	SL voltage compensation 3	20 (*)	0 to 60	If the motor hunts or overcurrent trip occurs in regenerative load at low speed (10 Hz or lower), increase the value of Cn.92-93 by increments of 5 at the same time.	YES
Cn.94 **[23]**	SL fluctuation frequency	100.0% [24]	80.0 to 110.0%	If an over current trip occurs due to sudden load fluctuation at high speed (50 Hz or higher), increase/decrease the value of Cn.94 by increments/decrements of 5% (set below 100%).	YES
Cn.95 **[23]**	SL switching frequency	2.00Hz [24]	0.00 to 8.00Hz	Set sensorless gain switching frequency.	YES



Pre-excitation flux

(*) This value depends on the motor setting.



Power off delay

Group 5: Inputs → In

Screen	Description	Default value	Range	Function	Set on RUN
In.1	Analog input max. freq	dr.20	dr.19 to dr.20	Set drive operating frequency for the maximum voltage input of the analog input.	YES
In.2	Analog input max. torque	100.0%	0.0 to 200.0%	Reserved.	YES
In.5	V1 Monitor	0.00V	0.00 to 12.00	Voltage analog input 1 (V1) visualization.	NO
In.6	V1 polarity	0-10V	0-10V -/+10V	This parameter allows setting the operation directions of the drive: **DESCR.** – **FUNCTION** 0-10V – Unipolar (forward operation) ±10V – Bipolar (forward and reverse operation directions)	NO
In.7	V1 filter	10ms	0 to 10000ms	Low Pass Filter for V1. Allows setting the time response to a change produced in the speed reference, to reduce the speed fluctuation due to unstable signs or noise. Thus, the response becomes slower.	YES
In.8	V1 minimum voltage	0.00V	0.00 to 10.00V	Define the minimum voltage for the analog input 1 according to the connected sensor characteristics	YES
In.9	V1 minimum reference	0.00%	0.00 to 100.00%	Set the speed reference corresponding to the analog input 1 minimum negative range. It corresponds to the minimum voltage level set in In.12. It is configured to introduce the speed reference through the AI. The value is a percentage of the frequency set in In.1.	YES
In.10	V1 maximum voltage	10.00V	0.00 to 10.00V	Define the maximum voltage for the analog input 1, according to the connected sensor characteristics.	YES

Screen	Description	Default value	Range	Function	Set on RUN
In.11	V1 maximum reference	10.00%	0.00 to 100.00%	Set the speed reference corresponding to the analog input 1 minimum range. It corresponds to the minimum voltage level set in In.10. It is configured to introduce the speed reference through the V1 analog input. The value is a percentage of In.1.	YES
In.12 [24]	V1 minimum negative voltage	10.00V	-10.00 to 0.00V	Define the negative minimum voltage for the analog input 1, according to the connected sensor characteristics.	YES
In.13 [24]	V1 minimum negative reference	-10.00%	-100.00 to 0.00%	Set the speed reference corresponding to the analog input 1 minimum negative range. Is corresponds to the minimum voltage level set in In.12. It is configured to introduce the speed reference through the analog input. The value is a percentage of the frequency adjusted in parameter In.1.	YES
In.14 [24]	V1 maximum negative voltage	-10.00V	-10.00 to 0.00V	Define the maximum negative voltage for the analog input 1 according to the connected sensor characteristics.	YES
In.15 [24]	V1 maximum negative reference	10.00%	-100.00 to 0.00%	Set the speed reference corresponding to the analog input 1 maximum negative range. It corresponds to the maximum voltage level set in In.13. It is configured to introduce the speed reference through an analog input. The value is a percentage of In.1.	YES
In.16	V1 Inverting	N	N S	Inverts the direction of rotation. Set this parameter to 1 (NO) if you need the motor to run in the opposite direction from the current rotation.	YES

[24] Displayed if In.6 is configured as bipolar (±10V).

Screen	Description	Default value	Range	Function	Set on RUN
In.17	Adjust V1 quantification	0.04%	0.04 to 10.00%	Set the voltage analog input 1 quantification level. It is used when too much noise is present within the analog input signals. The quantification value is defined as the analog input 1 maximum percentage value. For example, if the input maximum value is 10V and the quantification level is 1%, the frequency will change in 0.05Hz (when the maximum frequency is 50Hz), in 0.1V intervals. As the input voltage increases or decreases, the output frequency will differ, removing the fluctuation effect within the analog input value.	YES
In.35 [25]	V2 Monitor	0.00V	0.00 to 12.00V	Voltage analog input 2 monitor.	YES
In.37 [25]	V2 filter	10ms	0 to 10000ms	Set the time response against a change produced in the speed reference, so that it can reduce the speed fluctuation due to unstable signs or noise. Thus, the response becomes slower.	NO
In.38 [25]	V2 minimum voltage	0.00V	0.00 to 10.00V	Define the minimum current for the analog input 2 according to the characteristics of the connected sensor.	YES
In.39 [25]	V2 minimum reference	0.00%	0.00 to 100.00%	Set the speed reference corresponding to the analog input 2 minimum range. It corresponds to the minimum voltage level set in In.38. It is configured to introduce the speed reference through the analog input. The value is a percentage of the frequency adjusted in parameter In.1.	YES
In.40 [25]	V2 maximum current	10.00V	0.00 to 10.00V	Define the maximum current for the analog input 2, according to the connected sensor characteristics.	YES

[25] Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2).

Screen	Description	Default value	Range	Function	Set on RUN
In.41 [25]	V2 maximum reference	100.00%	0.00 to 100.00%	Set the speed reference corresponding to the analog input 2 maximum range. It corresponds to the maximum current level set in In.40. It is configured to introduce the speed reference through the analog input. The value is a percentage of the frequency adjusted in parameter In.1.	YES
In.46 [25]	V2 Inverting	N	NO YES	Same as In.16, but for the voltage analog input 2.	YES
In.47 [25]	Adjust I2 visualization	0.04	0.04 to 10.00%	Same as In.17, but for the voltage analog input 2.	YES
In.50 [26]	I2 Monitor	0.00mA	0.00 to 24.00mA	Used to monitor current analog input 2.	NO
In.52 [26]	I2 filter	10ms	0 to 10000ms	Configures the time for the operation frequency to reach 63% of target	YES
In.53 [26]	I2 minimum current	4.00mA	0.00 to 20.00mA	Same as In.38, but for the current analog input 2.	YES
In.54 [26]	I2 minimum reference	0.00%	0.00 to 100.00%	Same as In.13, but for the current analog input 2.	YES
In.55 [26]	I2 maximum current	20.00mA	0.00 to 24.00mA	Same as In.40, but for the current analog input 2.	YES
In.56 [26]	I2 maximum reference	100.00%	0.00 to 100.00	Same as In.11, but for the current analog input 2.	YES
In.61 [26]	I2 Inverting	N	N Y	Same as In.16, but for the current analog input 2.	YES
In.62 [26]	Adjust I2 visualization	0.04%	0.04 to 10.00%	Same as In.17, but for the current analog input 2.	NO

[25] Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2).
[26] Displayed when I is selected on the analog current/voltage input circuit selection switch (SW2).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.65</td><td>Digital input 1</td><td>START (+)</td><td>0 to 54</td><td>Digital Inputs configuration for individual use.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>Not programmed entry.</td></tr>
<tr><td>1</td><td>START(+)</td><td>Send the start command through an open contactor (NO). The operation of the Digital Input varies when '3 WIRE' is selected.</td></tr>
<tr><td>2</td><td>START(-)</td><td>Send the reverse start command through an open contactor (NO). The operation of the Digital Input varies when '3 WIRE' is selected.</td></tr>
<tr><td>3</td><td>RESET</td><td>Send a 'Reset' command through digital inputs. (NO)</td></tr>
<tr><td>4</td><td>EXTTRIP</td><td>Trigger an external fault to stop the drive through digital inputs (NO). Is advisable to invert the digital input logic configured as Extreme Fault and set it as contact (NC). See parameter In.87.</td></tr>
<tr><td>5</td><td>DISSTART</td><td>Stop the drive by removing the motor output power supply, forcing a stop by inertia. (NO)</td></tr>
<tr><td>6</td><td>INCH1</td><td>Enable the speed reference programmed in dr.11. (NO)</td></tr>
</table>

Note: Continues on the next page</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.66</td><td>Digital input 2</td><td>START (-)</td><td>0 to 54</td><td>Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>7</td><td>SPEED-L</td><td>Bit 0 speed reference. Allows selecting the multiple preconfigured speed references. See St1-St3 and bA.53 -bA.56 (NO).</td></tr>
<tr><td>8</td><td>SPEED-M</td><td>Bit 1 speed reference. Allows selecting the multiple preconfigured speed references. See St1-St3 and bA.53 -bA.56 (NO).</td></tr>
<tr><td>9</td><td>SPEED-H</td><td>Bit 2 speed reference. Allows selecting the multiple preconfigured speed references. See St1-St3 and bA.53 -bA.56 (NO).</td></tr>
<tr><td>11</td><td>XCEL-L</td><td>Bit 0 for alternative acceleration ramps. Allows the selection of the multiple preconfigured acceleration/deceleration ramps.
See bA.70 to bA.83.</td></tr>
</table>
Note: Continues on the next page.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.67</td><td>Digital input 3</td><td>RESET</td><td>0 to 54</td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>12</td><td>XCEL-M</td><td>Bit 1 for alternative acceleration ramps. Allows the selection of the multiple preconfigured acceleration/deceleration ramps.
See bA.70 to bA.83.</td></tr>
<tr><td>13</td><td>RUN Enable</td><td>Sets the digital input to safe operation mode.</td></tr>
<tr><td>14</td><td>3 WIRE</td><td>Configure digital inputs for a behaviour with pulses. This input is configured as NC and acts as stop towards the start command.
Example:
DI1 = 1➔ START(+) (NO)
DI2 = 14➔ 3 WIRE (NC)
DI3 = 18➔ DOWN (NO)
Button DI1 orders to start and the requests from DI2 are stopped. Button DI3 slows speed down.</td></tr>
<tr><td>15</td><td>CTR/REF 2</td><td>Enables the alternative control mode programmed in bA.4 (NO).</td></tr>
</table>
Note: Continues on the next page.
</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.68</td><td>Digital input 4</td><td>RESET</td><td>0 to 54</td><td>Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>16</td><td>EXCHANGE</td><td>This option switches motor power supply from the drive with direct network supply. To do this, digital output options 17 ‘Line in’ and 18 ‘Line Co’ are used. While the digital input is open, the digital output configured as 17 ‘Line in’ remains active. Once this digital input is closed, the relay ‘Line in’ is disabled, waits for 500ms and enables ‘Line Co’. When this digital input in disabled, ‘Line Co’ is disabled, waits for 500ms, enables ‘Line In’ and performs a speed search to synchronize with the motor. See Figure Multifunction relay configuration.</td></tr>
<tr><td>17</td><td>UP</td><td>Assign the function to increase the speed reference through a button (NO) to the digital input. reference limits are those set in dr group.</td></tr>
<tr><td>18</td><td>DOWN</td><td>Set digital input to decrease the speed reference by the use of a button (NO). The reference limits will be those set on dr group</td></tr>
</table>
Note: Continues on the next page.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.69</td><td>Digital input 5</td><td>MultVel-B</td><td>0 to 54</td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>20</td><td>POT CLEAR</td><td>Reset to 0 the speed reference of the motorized potentiometer. This way, even if parameter Ad.65 is set to NO, when restarting the drive, the drive will operate at the reference set in dr.1.</td></tr>
<tr><td>21</td><td>Analog HLD</td><td>Set a speed reference from an analog input to the present activation time value. When this digital input is active, the drive will ignore any change produced in the analog input reference (NO).</td></tr>
<tr><td>22</td><td>I-Term Clear</td><td>Reset the accumulated error by the integral PID function.</td></tr>
<tr><td>23</td><td>PIDOP Loop</td><td>Allow disabling the PID function. When it is disabled, the control PID will be resumed.
Note: This option must be used when the PID reference is set by analogue input. If PID reference is set by display, use option ‘INCH1’.</td></tr>
<tr><td>24</td><td>PGain2</td><td>Set the proportional gain 2 for PID operation.</td></tr>
</table>
Note: Continues on the next page.
</td><td>NO</td></tr>
</table>

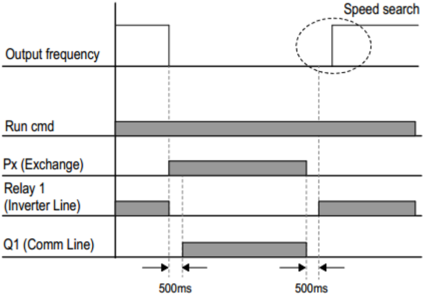
<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.70</td><td>Digital input 6</td><td>MultVel-M</td><td>0 to 54</td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>25</td><td>XCEL Stop</td><td>Sets the digital input to stop acceleration or deceleration. See Figure Inputs configuration for acceleration / deceleration</td></tr>
<tr><td>26</td><td>2ndMotor</td><td>Set the digital input as 2nd motor operation, which is used when a single drive switch operates two motors.</td></tr>
<tr><td>34</td><td>Pre-Excit</td><td>Enable the motor pre-excitation activation, before start. The user can adjust this functionality in parameters Ad.7, Ad.1 and Ad.13.</td></tr>
<tr><td>38</td><td>TimerIN</td><td>Set the function for the temporized digital output. If option 28 “Timer-Ou” is selected in OU.31 or OU.33, the digital output will be enabled once the time set in OU.56 has elapsed. Once this digital input is disabled, the digital output will be disabled once the time set in OU.57 has elapsed.</td></tr>
</table>
Note: Continues on the next page.
</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.71</td><td>Digital input 7</td><td>Mult Vel-A</td><td>0 to 54</td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>40</td><td>disAux Ref.</td><td>This digital input sets the main reference + alternative reference functionality. When drive speed is controlled by the main reference source, if this input is enabled, the speed reference will be calculated according to parameter ba.2.</td></tr>
<tr><td>46</td><td>INCH(+)</td><td rowspan="2">Enable the direct starting fix speed reference to the one set in parameter dr.11.</td></tr>
<tr><td>47</td><td>INCH(-)</td></tr>
<tr><td>49</td><td>XCEL-H</td><td>Bit 2 for alternative acceleration ramps. Allows the selection of the multiple preconfigured acceleration/deceleration ramps. See bA.70 to 83.</td></tr>
<tr><td>50</td><td>PLC</td><td>Enables the user to implement simple sequences using various function blocks.</td></tr>
<tr><td>51</td><td>FireMode</td><td>The drive runs in Fire mode when Ad.80 is set to 2 and the multifunction terminal (In 65-71) configured for Fire mode is turned on.</td></tr>
<tr><td>52</td><td>KEB1Sel</td><td>For kinetic energy buffering operation, select the multifunction terminal, set it to ‘KEB1Sel’ and enable the digital input.</td></tr>
</table>
Note: Continues on the next page.
</td><td></td></tr>
</table>

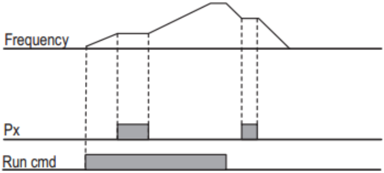
<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.71</td><td>Digital input 7</td><td>Mult Vel-A</td><td></td><td>Note: Comes from the previous page.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>54</td><td>TI</td><td>In IP66 equipment, pulse input TI and Multi-function terminal P5 share the same terminal. In this case, set parameter In.69 to 54(TI).</td></tr></table></td><td>NO</td></tr>
<tr><td>In.85</td><td>Digital input activation delay</td><td>10ms</td><td>0 to 10000ms</td><td>Set the delay time when activating the digital input. In case any variation occurs within a smaller time gap, the input will remain disabled.</td><td>YES</td></tr>
<tr><td>In.86</td><td>Digital input deactivation delay</td><td>3ms</td><td>0 to 10000ms</td><td>Set the delay time when disabling a digital input. In case any variations occur within a smaller time gap, the input will remain enabled.</td><td>YES</td></tr>
<tr><td>In.87</td><td>Digital input contact type</td><td>00000</td><td>0000000 to 1111111</td><td>Adjust each to 0 or 1 according to the following table:
<table><tr><th>BIT</th><th>DESCR.</th></tr><tr><td>0</td><td>Contact normally open (YES)</td></tr><tr><td>1</td><td>Contact normally closed (NC)</td></tr></table>The assignment order is P1, P2, …, P7 starting from the bit placed farthest to the right. The number of Digital Inputs varies depending on the equipment (IP20 drives integrate 7 Digital Inputs and IP66 drives integrate 5).</td><td>NO</td></tr>
<tr><td>In.89</td><td>DI scan time</td><td>1ms</td><td>1 to 5000ms</td><td>Set the time to wait before refreshing the digital inputs configured as multireference.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.90</td><td>Digital inputs status</td><td>00000</td><td>0000000 to 1111111</td><td>Shows the status of digital inputs:
<table><tr><th>BIT</th><th>DESCR.</th></tr><tr><td>0</td><td>Disabled</td></tr><tr><td>1</td><td>Enabled</td></tr></table>The assignment order is P1, P2, …, P7 starting from the bit placed farthest to the right. The number of Digital Inputs varies depending on the equipment (IP20 drives integrate 7 Digital Inputs and IP66 drives integrate 5).</td><td>NO</td></tr>
<tr><td>In.91</td><td>TI Monitor</td><td>0.00kHz</td><td>0.00 to 50.00 kHz</td><td>This parameter shows the pulse frequency in this input.</td><td>NO</td></tr>
<tr><td>In.92</td><td>TI Filter</td><td>10</td><td>0 to 9999</td><td>This parameter allows setting the time in which the pulse input reaches 63% of its nominal frequency. It is useful when the pulse frequency is supplied in multiple steps.</td><td>YES</td></tr>
<tr><td>In.93</td><td>TI minimum input frequency</td><td>0.00kHz</td><td>0.00 to 32.00 kHz</td><td rowspan="4"><table><tr><th>PARÁM.</th><th>FUNCTION</th></tr><tr><td>In.93</td><td>This parameter allows setting the minimum input frequency through TI.</td></tr><tr><td>In.94</td><td>This parameter allows setting the minimum input frequency percentage through TI.</td></tr><tr><td>In.95</td><td>This parameter allows setting the maximum input frequency through TI.</td></tr><tr><td>In.96</td><td>This parameter allows setting the maximum input frequency percentage through TI.</td></tr></table>See Figure TI configuration.</td><td>YES</td></tr>
<tr><td>In.94</td><td>TI minimum input frequency percentage</td><td>0.00%</td><td>0.00 to 100.00%</td><td>YES</td></tr>
<tr><td>In.95</td><td>TI maximum input frequency</td><td>32.00kHz</td><td>0.00 to 32.00 kHz</td><td>YES</td></tr>
<tr><td>In.96</td><td>TI maximum input frequency percentage</td><td>100.00%</td><td>0.00 to 100.00%</td><td>YES</td></tr>
<tr><td>In.97</td><td>TI Inverting</td><td>N</td><td>N
S</td><td>This parameter allows inverting the TI signal. Set this parameter to 1 (NO) if you need a reverse signal.</td><td>YES</td></tr>
</table>

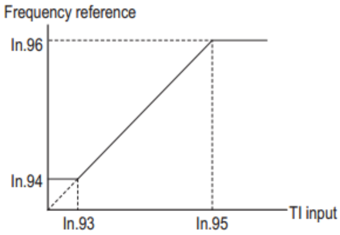
<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>In.98</td><td>TI noise reduction level</td><td>0.04%</td><td>0.04 to 10.00%</td><td>This parameter is used to reduce noise in the TI input signal. The quantification value is defined as the input maximum percentage value.</td><td>YES</td></tr>
<tr><td>In.99</td><td>Input mode setting</td><td>00</td><td>00 to 11</td><td>Software status. Set each bit to 0 or 1 according to the following table:
<table>
<tr><th>BIT</th><th>DESCR.</th></tr>
<tr><td>00</td><td>V2, NPN</td></tr>
<tr><td>01</td><td>V2, PNP</td></tr>
<tr><td>10</td><td>I2, NPN</td></tr>
<tr><td>11</td><td>I2, PNP</td></tr>
</table></td><td>NO</td></tr>
</table>



Multifunction relay configuration



Inputs configuration for acceleration / deceleration



TI configuration

Group 6: Outputs → OU

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>OU.1</td><td>Analog output 1 mode selection</td><td>Frequency</td><td>0 to 15</td><td>The analog output 1 is programmable according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Frequency</td><td>Proportional signal to the motor speed. For the maximum frequency defined in M2.20, analogue value will be 10V/20mA.</td></tr>
<tr><td>1</td><td>O/pCurr</td><td>Proportional signal to the motor current. 10V/20mA are generated when the drive rated current is at 200%.</td></tr>
<tr><td>2</td><td>O/pVolt</td><td>Proportional signal to the motor voltage. For the voltage value defined in bA.15, analogue value will be 10V/20mA.</td></tr>
<tr><td>3</td><td>DCLink V</td><td>Proportional signal to the bus DC voltage. The analogue output is 10V/20mA when the DC voltage is 410Vdc for 220Vac drives and 820Vdc for 400Vac drives.</td></tr>
<tr><td>4</td><td>Torque</td><td>Proportional signal to the generated torque.
Outputs 10V/20mA at 250% of motor rated torque.</td></tr>
<tr><td>5</td><td>O / pPower</td><td>Proportional signal to the output power. 10V/20mA are generated operating 200% of the nominal power.</td></tr>
</table>
Note: Continues on the next page.</td><td>YES</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
				Note: Comes from the previous page	

OPT.	DESCR.	FUNCTION
6	Idse	Maximum current at 200% of no load current.
7	Iqse	Maximum current at 250% of rated torque current.
8	Target Fq	Proportional signal to the target frequency set in the drive.
9	Ramp Freq	Proportional signal to the frequency which has executed the acceleration and deceleration functions and it can be different to the real output frequency.
10	SpeedF db	Real motor speed.
12	PIDRef Val	PID reference value signal. Generates 6.6V working to the 100% of the reference.
13	PIDFdb Val	Signal proportional to the feedback in PID mode. Generates 6.6V at 100% of the reference value.
14	PIDO/p	Signal proportional to the PID controller output value. Generates 5V at 100% of the reference value.
15	Constant	Value of OU.5.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>OU.2</td><td>Analog output 1 gain</td><td>100.0%</td><td>-1000.0 to 1000.0%</td><td rowspan="2">These parameters allow adjusting the gain and offset level of the analogue output 1. If a current signal is desired, the set value will be 20%.

For example, when the analogue output is configured as ‘Frequency’, the equation that governs the operation is:

$$AO1 = \frac{Frequency}{MaxFreq} \times Gain\ AO1 + Offset\ AO1$$

where Gain AO1 is set in parameter OU.2 and Offset AO1 is set in parameter OU.3.</td><td>YES</td></tr>
<tr><td>OU.3</td><td>Analog output 1 offset</td><td>0.0%</td><td>-100.0 to 100.0%</td><td>YES</td></tr>
<tr><td>OU.4</td><td>Analog output 1 filter</td><td>5ms</td><td>0 to 10000ms</td><td>Filter for the analog output 1 value.

Occasionally, the analog signal is slightly unstable. It can be improved selecting another filter value.

Note: The use of a filter can add a slight delay within the analog output.</td><td>YES</td></tr>
<tr><td>OU.5</td><td>Analog output 1 constant setting</td><td>0.0%</td><td>0.0 to 100.0%</td><td>Set a constant speed in the analog output 1, whenever it has been configured as ‘Constant’ in parameter OU.1.</td><td>YES</td></tr>
<tr><td>OU.6</td><td>Analog output 1 monitor</td><td>0.0%</td><td>0.0 to 1000.0%</td><td>Analog output 1 monitor.</td><td>YES</td></tr>
<tr><td>OU.30</td><td>Relay fault output</td><td>010</td><td>000 to 111</td><td>This parameter allows setting when the relay output is set as 29 ‘FAULT’:

<table><tr><th>OPC</th><th>FUNCTION</th></tr><tr><td>001</td><td>Fault due to low voltage.</td></tr><tr><td>010</td><td>Any faults other than low voltage.</td></tr><tr><td>100</td><td>Automatic restart final failure.
Final fault automatic restart. The relay will enable whenever all restart attempts (Pr.9) have been carried out or time set in Pr.10 has elapsed.</td></tr></table></td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>**OU.31**</td><td>Relay 1 control source</td><td>Trip</td><td>0 to 40</td><td>Configures each relay and digital output according to the following table:
<table>
<tr><th>OPT.</th><th>DESC.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>The output has no effect.</td></tr>
<tr><td>1</td><td>FDT-1</td><td>Check when the output frequency has reached the user defined frequency. The relay will be enabled if the following equation is satisfied:
F output > frequency – (Pr.2 / 2).</td></tr>
<tr><td>2</td><td>FDT-2</td><td>The relay is active whenever the reference frequency is set to Pr.1 and is Pr.2 in bandwidth</td></tr>
<tr><td>3</td><td>FDT-3</td><td>The relay will enable in the frequencies:
Pr.1 – (Pr.2/2) to Pr.1 + (Pr.2/2).</td></tr>
<tr><td>4</td><td>FDT-4</td><td>The relay will be active whenever the output frequency is greater than Pr.1 remains closed until it decreases below Pr.1 – (Pr.2/2).</td></tr>
<tr><td>5</td><td>Over Load</td><td>The relay will be active when the motor is in overload.</td></tr>
</table>
Note: Continues in the next page.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>
Note: Comes from the previous page
<table>
<tr><th>OPT.</th><th>DESC.</th><th>FUNCTION</th></tr>
<tr><td>6</td><td>IOL</td><td>The relay will be active in case a fault due to overload protection occurs.</td></tr>
<tr><td>7</td><td>Undr Load</td><td>The relay will be active in case of an underload warning.</td></tr>
<tr><td>8</td><td>VentWarn</td><td>The relay will be active in case a fan fault occurs and parameter Pr.79 is set as 1 ‘WARN’.</td></tr>
<tr><td>9</td><td>Stall</td><td>Digital output will be enable when the motor is blocked and overcharged.</td></tr>
<tr><td>10</td><td>OverVolt</td><td>The relay will enable whenever the drive DC bus voltage is higher than the protection voltage.</td></tr>
<tr><td>11</td><td>LowVolt</td><td>The relay will be active whenever the drive DC link voltage drops below the low voltage protection level.</td></tr>
<tr><td>12</td><td>Over Heat</td><td>The relay will enable when the drive temperature reaches a dangerous level.</td></tr>
<tr><td>13</td><td>Lost Command</td><td>Communications have been interrupted.</td></tr>
</table>
Note: Continues on the next page.
</td><td></td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>
Note: Comes from the previous page
<table>
<tr><th>OPT.</th><th>DESC.</th><th>FUNCTION</th></tr>
<tr><td>14</td><td>Run</td><td>The relay will enable with the start command. However, it will not enable during the DC brake.</td></tr>
<tr><td>15</td><td>Stop</td><td>The relay will always enable whenever no start command has been sent and no output voltage is present within the drive.</td></tr>
<tr><td>16</td><td>Steady</td><td>The relay will enable when the reference frequency matches the output frequency, this is, when the drive has reached the reference frequency.</td></tr>
<tr><td>17</td><td>Inv. Line</td><td>Outputs a signal while the motor is driven by the inverter line</td></tr>
<tr><td>18</td><td>Comm Line</td><td>Outputs a signal while the motor is controlled from the communications network. See option 16 “Exchange” of digital inputs configuration (parameters In.65-71).</td></tr>
<tr><td>19</td><td>Spd Srch</td><td>The relay will be active during a speed search operation.</td></tr>
<tr><td>22</td><td>Ready</td><td>The relay will enable whenever the drive is ready to start (without any warnings or trips).</td></tr>
</table>
Note: Continues on the next page.
</td><td></td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Note: Comes from the previous page

<table>
<tr><th>OPT.</th><th>DESC.</th><th>FUNCTION</th></tr>
<tr><td>28</td><td>Timer Out</td><td>The relay will be enabled after the set time has elapsed.</td></tr>
<tr><td>29</td><td>Trip</td><td>Relay is enabled when a fault trip occurs.</td></tr>
<tr><td>31</td><td>DBWarn %ED</td><td>Sets the configuration of the braking resistor (%ED: Duty cycle).</td></tr>
<tr><td>34</td><td>Compar at</td><td>Sends a signal using the value of the digital input.</td></tr>
<tr><td>35</td><td>BRCtrl</td><td>Used to control the brake opening.</td></tr>
<tr><td>36</td><td>CAP Exch.</td><td>The relay will enable CAP exchange options according to the setting of Pr.62.</td></tr>
<tr><td>37</td><td>FAN Exch.</td><td>The relay will enable FAN exchange according to the setting of Pr.87.</td></tr>
<tr><td>38</td><td>Fire Mode</td><td>Fire mode configuration.</td></tr>
<tr><td>39</td><td>TO</td><td>Sends pulse signals to external devices to provide a single output value of output frequency, output current, output voltage or DC voltage.</td></tr>
<tr><td>40</td><td>KEB Op</td><td>The relay will be active when the energy buffering operation has started because of low voltage of the drive DC power section due to a power failure on the input power.</td></tr>
</table></td><td></td></tr>
<tr><td>OU.33</td><td>Digital output 1 function</td><td>Run</td><td>0 to 35</td><td>See parameter OU.31.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>OU.41</td><td>Digital outputs status</td><td>00</td><td>00 to 11</td><td>Multi-function output monitor.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>00</td><td>No outputs enabled</td></tr><tr><td>01</td><td>Output 1 enabled</td></tr><tr><td>10</td><td>Output 1 enabled</td></tr><tr><td>11</td><td>Output 1 and 2 enabled</td></tr></table></td><td>YES</td></tr>
<tr><td>OU.50</td><td>Digital output connection delay</td><td>0.00s</td><td>0.00 to 100.00s</td><td>The user can specify a delay in the digital output 1 and relays disconnection. If during the connection delay time the activation condition disappears, the relay will not be enabled.</td><td>YES</td></tr>
<tr><td>OU.51</td><td>Digital output disconnection delay</td><td>0.00s</td><td>0.00 to 100.00s</td><td>The user can specify a delay within the digital output 1 and relays disconnection. If during the disconnection delay time, the disable condition disappears, the relay will not be disabled.</td><td>YES</td></tr>
<tr><td>OU.52</td><td>NC/NO Relays logic</td><td>00</td><td>00 to 11</td><td>Defines the type of contact following this order: Digital Output 1, Relay 2 and Relay 1, from left to right according to the bit assignment.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Contact normally open (NO)</td></tr><tr><td>1</td><td>Contact normally closed (NC)</td></tr></table></td><td>NO</td></tr>
<tr><td>OU.53</td><td>Digital output connection delay on fault</td><td>0.00s</td><td>0.00 to 100.00s</td><td rowspan="2">If a fault trip occurs, trip relay or multi-function output operates after the time delay set in OU.53. Terminal is off with the input initialized after the time delay set in OU.54.</td><td>YES</td></tr>
<tr><td>OU.54</td><td>Digital output disconnection delay on fault</td><td>0.00s</td><td>0.00 to 100.00s</td><td>YES</td></tr>
<tr><td>OU.55</td><td>Digital output connection delay</td><td>0.00s</td><td>0.00 to 100.00s</td><td rowspan="2">Input a signal (On) to the timer terminal to operate a timer output (Timer out) after the time set at OU.55 has passed. When the multi-function input terminal is off, multi-function output or relay turns off after the time set at OU.56.
See also digital inputs option 38 ‘Timer In’.</td><td>YES</td></tr>
<tr><td>OU.56</td><td>Digital output disconnection delay</td><td>0.00s</td><td>0.00 to 100.00s</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>OU.57</td><td>Relay FDT level</td><td>30.00Hz</td><td>0.00 to dr.20</td><td>Value of the output frequency for digital outputs FDT options.</td><td>YES</td></tr>
<tr><td>OU.58</td><td>Relay FDT band</td><td>10.00Hz</td><td>0.00 to dr.20</td><td>Detection frequency band for digital outputs FDT options.</td><td>YES</td></tr>
<tr><td>OU.61</td><td>Pulse output mode</td><td>Frequency</td><td>0 to 15</td><td>Pulse output setting.
<table><tr><th>OPT.</th><th>FUNCTION</th><th>OPT.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Frequency</td><td>8</td><td>TargetFq</td></tr><tr><td>1</td><td>O/pCurr</td><td>9</td><td>RampFreq</td></tr><tr><td>2</td><td>O/pVolt</td><td>10</td><td>SpeedFdb</td></tr><tr><td>3</td><td>DCLinkV</td><td>12</td><td>PIDRefVal</td></tr><tr><td>4</td><td>Torque</td><td>13</td><td>PIDFdbVal</td></tr><tr><td>5</td><td>O/pPower</td><td>14</td><td>PIDO/p</td></tr><tr><td>6</td><td>Idse</td><td>15</td><td>Constant</td></tr><tr><td>7</td><td>Iqse</td><td></td><td></td></tr></table></td><td>YES</td></tr>
<tr><td>OU.62</td><td>Pulse output gain</td><td>100.0%</td><td>-1000.0 to 1000.0%</td><td rowspan="2">Adjusts output value and offset. If frequency is selected as an output, it will operate according to the following equation:
$$T0 = \frac{Frequency}{MaxFreq} \times TO\ gain \times TO\ Bias$$</td><td>YES</td></tr>
<tr><td>OU.63</td><td>Pulse output offset</td><td>0.0%</td><td>-100.0 to 100.0%</td><td>YES</td></tr>
<tr><td>OU.64</td><td>Pulse output filter</td><td>5ms</td><td>0 to 10000ms</td><td>Sets filter time constant on analog output.</td><td>YES</td></tr>
<tr><td>OU.65</td><td>Pulse output constant setting</td><td>0.0%</td><td>0.0 to 100.0%</td><td>If analog output item is set to constant, the analog pulse output is dependent on the set parameter values.</td><td>YES</td></tr>
<tr><td>OU.66</td><td>Pulse output monitor</td><td>0.0%</td><td>0.0 to 1000.0%</td><td>Monitors analog output value. Displays the maximum output pulse (32kHz) as a percentage (%) of the standard.</td><td>YES</td></tr>
</table>

Group 7: Communication Bus → CM

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>CM.1</td><td>Slave address</td><td>1</td><td>1 to 250</td><td>Drive identifier to communicate within the network. When communicating with several equipment, each one should have a different address.</td><td>YES</td></tr>
<tr><td>CM.2 [27]</td><td>Communication protocol</td><td>Modbus</td><td>Modbus
PE BUS 485</td><td>Select the communication protocol:
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Modbus</td><td>Communication protocol compatible with Modbus-RTU</td></tr><tr><td>2</td><td>PE BUS 485</td><td>Communication protocol used to communicate drives.</td></tr></table></td><td>YES</td></tr>
<tr><td>CM.3 [27]</td><td>Baud rate</td><td>9600bps</td><td>1200 bps
2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
56 kbps
115200 bps</td><td>Sets the Modbus communications transfer rate, which must match with the bus communication master within the drive.</td><td>YES</td></tr>
</table>

[27] Will not be displayed when P2P and MultiKD is set.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>CM.4 [27]</td><td>Communication frame structure</td><td>D8/PN/S1</td><td>D8/PN/S1
D8/PN/S2
D8/PE/S1
D8/PO/S1</td><td>Select the communication frame structure and defines the data length, parity confirmation method and the number of stop bits:
<table>
<tr><th>OPT</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>D8 / PN/S1</td><td>8-bit data / no parity check / 1 stop bit</td></tr>
<tr><td>1</td><td>D8 / PN/S2</td><td>8-bit data / no parity check / 2 stop bits</td></tr>
<tr><td>2</td><td>D8/ PE/S1</td><td>8-bit data / even parity / 1 stop bit</td></tr>
<tr><td>3</td><td>D8/PO/ S1</td><td>8-bit data / odd parity / 1 stop bit</td></tr>
</table></td><td>YES</td></tr>
<tr><td>CM.5 [27]</td><td>Response delay</td><td>5ms</td><td>0 to 100 ms</td><td>The MODBUS-RTU communication plays the role of the slave device. The slave will reply after the time period set in this parameter. This allows the master device attending the communications within a system where the master cannot manage a quick slave answer.</td><td>YES</td></tr>
<tr><td>CM.6 [28]</td><td>Communication option S/W version</td><td>0.00</td><td>-</td><td>Show the software version of the optional communications card, if there is any connected.</td><td>YES</td></tr>
<tr><td>CM.7 [28]</td><td>Communication option ID</td><td>1</td><td>0 to 255</td><td>Identifier of the communications card connected to the drive.</td><td>YES</td></tr>
<tr><td>CM.8 [28]</td><td>Card baud rate</td><td>12Mbps</td><td>-</td><td>Communications card baud rate.</td><td>YES</td></tr>
<tr><td>CM.9 [28]</td><td>Communication option LED status</td><td>-</td><td>-</td><td>This parameter function depends on the communications card.</td><td>YES</td></tr>
</table>

[28] Will only be displayed when a communications optional card is installed.

Screen	Description	Default value	Range	Function	Set on RUN
CM.30	Output parameters number	3	0 to 8	Configure a group of addresses to read several output parameters at once. The user must set the number of parameters and then configure them in CM.31-38.	YES
CM.31 [29]	Output communication addresses 1 to 8	40011	0 to 65535	Define the output parameter group for data transmission, so that addresses configured in CM.31-38 ca be used to send several parameters at once in the same communications frame. The size of the group is set in CM.30	YES
CM.32 [29]		40012			YES
CM.33 [29]		40013			YES
CM.34 [29]		40001			YES
CM.35 [29]		40001			YES
CM.36 [29]		40001			YES
CM.37 [29]		40001			YES
CM.38 [29]		40001			YES

[29] Only parameters corresponding to the value set in CM.30 will be shown (E.g., if CM.30 = 3, parameters CM.31, CM.32 and CM.33 will be shown).

Screen	Description	Default value	Range	Function	Set on RUN
CM.50	Number of input parameters	2	0 to 8	Configure a group of addresses to read several input parameters at once. The user must set the number of parameters and then configure them in CM.51-58.	YES
CM.51 [30]	Input communication addresses 1 to 8	40006	0 to 65535	Define the input parameter group for data transmission, so that addresses configured in CM.51-58 ca be used to send several parameters at once in the same communications frame. The size of the group is set in CM.50	NO
CM.52 [30]		40007			NO
CM.53 [30]		40001			NO
CM.54 [30]		40001			NO
CM.55 [30]		40001			NO
CM.56 [30]		40001			NO
CM.57 [30]		40001			NO
CM.58 [30]		40001			NO
CM.68	Field bus data swap	NO	NO YES	Swap the most significant byte with the least significant byte in order to adapt to the PLC configuration.	NO
CM.70	Communication multifunction input 1 to 7	None	0 to 54	Multi-function inputs can be controlled by using the communication address 40902. Configure parameters CM.70-77 and then set the corresponding bit in address 40803 for them to operate. These inputs operate independently from those set in In.65-71.	YES
CM.71		None			YES

[30] Only parameters corresponding to the value set in CM.50 will be shown (E.g., if CM.50 = 2, parameters CM.51 and CM.52 will be shown).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>CM.72</td><td rowspan="6"></td><td>None</td><td rowspan="6"></td><td rowspan="6">
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>OPT.</th><th>DESCR.</th></tr>
<tr><td>0</td><td>None</td><td>20</td><td>POT CLEAR</td></tr>
<tr><td>1</td><td>START(+)</td><td>21</td><td>Analog HLD</td></tr>
<tr><td>2</td><td>START(-)</td><td>22</td><td>I-Term Clear</td></tr>
<tr><td>3</td><td>RESET</td><td>23</td><td>PIDOP Loop</td></tr>
<tr><td>4</td><td>EXTTRIP</td><td>24</td><td>PGain2</td></tr>
<tr><td>5</td><td>DISSTART</td><td>25</td><td>XCELStop</td></tr>
<tr><td>6</td><td>INCH1</td><td>26</td><td>2ndMotor</td></tr>
<tr><td>7</td><td>SPEED-L</td><td>34</td><td>Pre-Excit</td></tr>
<tr><td>8</td><td>SPEED-M</td><td>38</td><td>TimerIN</td></tr>
<tr><td>9</td><td>SPEED-H</td><td>40</td><td>disAuxRef.</td></tr>
<tr><td>11</td><td>XCEL-L</td><td>46</td><td>INCH(+)</td></tr>
<tr><td>12</td><td>XCEL-M</td><td>47</td><td>INCH(-)</td></tr>
<tr><td>13</td><td>RUN Enable</td><td>49</td><td>XCEL-H</td></tr>
<tr><td>14</td><td>3-WIRE</td><td>50</td><td>PLC</td></tr>
<tr><td>15</td><td>CTR/REF2</td><td>51</td><td>FireMode</td></tr>
<tr><td>16</td><td>Exchange</td><td>52</td><td>KEB1Sel</td></tr>
<tr><td>17</td><td>UP</td><td>54</td><td>TI</td></tr>
<tr><td>18</td><td>DOWN</td><td></td><td></td></tr>
</table>
Note: See parameters In.65-71, to consult detailed information about each option.
</td><td>YES</td></tr>
<tr><td>CM.73</td><td>None</td><td>YES</td></tr>
<tr><td>CM.74</td><td>None</td><td>YES</td></tr>
<tr><td>CM.75</td><td>None</td><td>YES</td></tr>
<tr><td>CM.76</td><td>None</td><td>YES</td></tr>
<tr><td>CM.77</td><td>None</td><td>YES</td></tr>
<tr><td>CM.86</td><td>Communication multifunction input monitoring</td><td>0</td><td>-</td><td>Monitor inputs configured in CM.70-77.</td><td>NO</td></tr>
<tr><td>CM.90</td><td>Data frame comm. monitor</td><td>PE BUS 485</td><td>PE BUS 485
Ext display</td><td>Monitor data frames status through the communication bus or the removable display.</td><td>YES</td></tr>
<tr><td>CM.91</td><td>Received data frames counter</td><td>0</td><td>0 to 65535</td><td>Count the number of frames correctly received.</td><td>YES</td></tr>
<tr><td>CM.92</td><td>Frames with error counter</td><td>0</td><td>0 to 65535</td><td>Count the number frames received with errors.</td><td>YES</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
CM.93	NAK frames	0	0 to 65535	Count the number frames received with timeout.	YES
CM.94 [31]	Communications update	N	NO SI	This parameter enables sending the current drive data configuration to the communications card.	NO
CM.95	P2P communication selection	Disable All	0 to 3	P2P communication allows sharing input devices between different drives. To enable it, RS485 communication must be active. This parameter allows defining which devices will be master and which slave in the P2P communication. **OPT.** – **FUNCTION** 0 – Disable All 1 – P2P Master 2 – P2P Slave 3 – M-KPD Ready	NO
CM.96 [32]	Digital output selection	NO	000 to 111	When multi-function outputs are used, a drive configured as P2P slave can choose whether to use its own output or the drive's output. **OPT.** – **FUNCTION** 001 – Analog output 010 – Multi-function relay 100 – Multi-function output	YES

[31] Only shown if an optional communications card has been connected.
[32] Displayed when AP.1 is set to 2 (Proc PID).

Group 8: PID → AP

Screen	Description	Default value	Range	Function	Set on RUN
AP.1	Application function selection	Proc PID	Nada Proc PID	Application function selection. Set this parameter to '2' (Proc PID) to select functions for the process PID.	NO
AP.2	Enable PLC mode	N	NO YES	Display the parameter groups related to a user sequence.	NO
AP.16 [32]	PID output	+0.00%	-327.68 to 327.68%	Display the existing output value of the PID controller. The unit, gain, and scale set at AP.42-44 are applied.	YES
AP.17 [32]	PID reference	+50.00%	-327.68 to 327.68%	Display the existing reference value set for the PID controller. The unit, gain, and scale set at AP.42-44 are applied.	YES
AP.18 [32]	PID feedback	+0.00%	-327.68 to 327.68%	Display the input value of the PID controller that is included in the latest feedback. The unit, gain, and scale set at AP.42-44 are applied.	YES
AP.19 [32]	PID local	+50.00%	-100.00 to 100.00%	When AP.20 is set to 0 (MREF), the reference value can be entered. If the reference source is set to any other value, the setting values for AP.19 are voided.	YES

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>AP.20 [32]</td><td>Select PID regulator source</td><td>MREF</td><td>0 to 11</td><td>Select the source to introduce the PID regulator set point:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>MREF</td><td>PID set point introduced from keypad.</td></tr>
<tr><td>1</td><td>V1</td><td>PID set point introduced by the voltage analog input 1.</td></tr>
<tr><td>3</td><td>V2</td><td>PID set point introduced by the voltage analog input 2.</td></tr>
<tr><td>4</td><td>I2</td><td>PID set point introduced by the current analog input 2.</td></tr>
<tr><td>5</td><td>MODBUS</td><td>PID set point introduced through the Modbus communication protocol.</td></tr>
<tr><td>7</td><td>COMMS</td><td>PID set point introduced through any of the optional communication boards.</td></tr>
<tr><td>8</td><td>PLC</td><td>PID set point introduced through PLC.</td></tr>
<tr><td>11</td><td>PULSE</td><td>Reference signal through the pulse input.</td></tr>
</table>
Note: In case an unavailable option is selected, the parameter will return to its previous value.</td><td>NO</td></tr>
</table>

[32] Displayed when AP.1 is set to 2 (Proc PID).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>AP.21
[32]</td><td>Select feedback signal source</td><td>V1</td><td>0 to 6</td><td>Select the source through which the feedback signal will be introduced to close the control loop.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>V1</td><td>Feedback signal by voltage analog input 1.</td></tr>
<tr><td>2</td><td>V2</td><td>Feedback signal by voltage analog input 2.</td></tr>
<tr><td>3</td><td>I2</td><td>Feedback signal by current analog input 2.</td></tr>
<tr><td>4</td><td>MODB US</td><td>Feedback signal through Modbus communications integrated in the drive.</td></tr>
<tr><td>6</td><td>COMM S</td><td>Feedback signal through any optional communication boards.</td></tr>
<tr><td>7</td><td>PLC</td><td>Feedback signal through the equipment's PLC.</td></tr>
<tr><td>10</td><td>PULSE</td><td>Feedback signal through the pulse input.</td></tr>
</table>
Note: In case an unavailable option is selected, the parameter will return to its previous value.</td><td>NO</td></tr>
<tr><td>AP.22
[32]</td><td>PID controller proportional gain</td><td>+50.00%</td><td>0.0 to 1000.0%</td><td>Set the value of the proportional gain controller. This value should be increased whenever a greater control response is needed.
Note: Increasing too much this value can cause a greater system instability.</td><td>YES</td></tr>
<tr><td>AP.23
[32]</td><td>PID controller integration time</td><td>10.0ms</td><td>0 to 200.0s</td><td>Set the regulator integration time. In case greater precision is needed, increase this value.
Note: Increasing this value may slow down the system.</td><td>YES</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
AP.24 [32]	PID controller differential time	0ms	0 to 10000ms	Set the regulator differential time. Whenever a greater response is needed, this value can be increased. **Note:** Increasing too much this value can cause a precision loss.	YES
AP.25 [32]	PID output fine adjustment	+0.0%	0.0 to 1000.0%	Apply a fine adjustment at the PID output. Use this parameter when an adjustment for the proportional constant below 0.1% is required.	YES
AP.26 [32]	Proportional gain scale	100.0%	0.0 to 100.0%	This parameter, along with AP.22 allow setting output ratio for errors between reference and feedback. If AP.22 is set to 50%, then 50% of the error is output. For ratios below 0.1% use AP.26.	NO
AP.27 [32]	PID Filter	0ms	0 to 10000ms	Used when the output of the PID controller changes too fast or the entire system is unstable, due to severe oscillation. In general, a lower value (default value=0) is used to speed up response time, but in some cases a higher value increases stability. The higher the value, the more stable the PID controller output is, but the slower the response time.	YES
AP.28 [32]	PID mode	Process	Process Normal	Set PID Mode. **OPT.** – **FUNCTION** 0 – Process 1 – Normal	NO
AP.29 [32]	Upper limit PID output	+60.00 Hz	AP.30 to 300.00 Hz	Set the PID output upper limit.	YES
AP.30 [32]	Lower limit PID output	-60.00Hz	-300.00 Hz to AP.29	Set the PID output lower limit.	YES

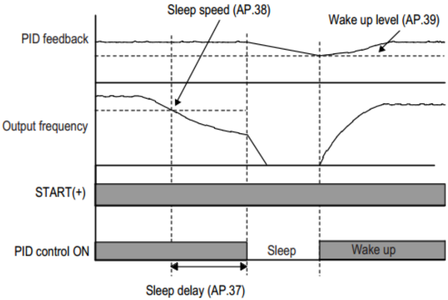
[32] Displayed when AP.1 is set to 2 (Proc PID).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>AP.31
[32]</td><td>Invert PID</td><td>N</td><td>0: NO
1: YES</td><td>Define whether to invert the PID output or not.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>NO</td><td>The PID regulator answers in normal mode. Therefore, when the feedback value exceeds the reference signal, it will decrease its speed. However, if the feedback is lower than the reference signal value, the speed will be increased.</td></tr><tr><td>SI</td><td>The PID regulator answers in inverse mode. Therefore, when the feedback exceeds the reference signal, speed will be increased. However, when the feedback value is lower than the reference signal, the speed will be decreased.</td></tr></table></td><td>NO</td></tr>
<tr><td>AP.32
[32]</td><td>PID output scale</td><td>+100.00 %</td><td>0.1 to 1000.0%</td><td>Set the PID regulator output magnitude.</td><td>NO</td></tr>
<tr><td>AP.34
[32]</td><td>PrePID reference</td><td>0.00Hz</td><td>0.00 to dr.20</td><td>Set PID controller motion frequency.
Pre-PID function allows configuring the drive to start at a fixed speed AP.34 until PID feedback is above the set level (AP.35). If at a determined moment (AP.36) the drive does not reach the feedback level set in AP.35, fault F23 ‘Pipe Fill Flt’ will be triggered</td><td>NO</td></tr>
<tr><td>AP.35</td><td>PrePID end reference</td><td>0.0%</td><td>0.0 to 100.0%</td><td>Set feedback level in PID mode.</td><td>NO</td></tr>
<tr><td>AP.36</td><td>PrePID delay</td><td>600s</td><td>0 to 9999s</td><td>Set the PrePID time before triggering a fault F23 ‘Pipe Fill Flt’.</td><td>YES</td></tr>
<tr><td>AP.37</td><td>Sleep mode activation delay</td><td>60.0s</td><td>0.0 to 999.9s</td><td>Set the delay time before enabling the sleep mode. If the drive operates at a speed value under the value of AP.38, it will stop running and enter in sleep mode.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>AP.38</td><td>Sleep mode activation speed</td><td>0.00Hz</td><td>0.00Hz to dr.20</td><td>Set the speed under which if a time period greater than the one defined in parameter AP.37, the drive will stop operating and enter in sleep mode.</td><td>YES</td></tr>
<tr><td>AP.39</td><td>Awakening level</td><td>+35%</td><td>0 to 100%</td><td>Set the resuming PID control level after a suspension period (sleep mode).</td><td>YES</td></tr>
<tr><td>AP.40</td><td>PID WakeUp mode</td><td>Below</td><td>Below
Above
Beyond</td><td>Set PID wake-up mode, according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Below</td><td>The PID operation starts when the frequency is lower than the value set in AP.39.</td></tr>
<tr><td>1</td><td>Above</td><td>The PID operation starts when the frequency is higher than the value set in AP.39.</td></tr>
<tr><td>2</td><td>Beyond</td><td>The PID operation starts when the difference between the reference value and the feedback variable is greater than the value set in (AP.39).</td></tr>
</table></td><td>YES</td></tr>
<tr><td>AP.42</td><td>PID unit</td><td>0%</td><td>0 to 12</td><td>Set PID controller unit, according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>OPT.</th><th>DESCR.</th></tr>
<tr><td>0</td><td>%</td><td>7</td><td>V</td></tr>
<tr><td>1</td><td>Bar</td><td>8</td><td>I</td></tr>
<tr><td>2</td><td>mBar</td><td>9</td><td>kW</td></tr>
<tr><td>3</td><td>Pa</td><td>10</td><td>HP</td></tr>
<tr><td>4</td><td>kPa</td><td>11</td><td>°C</td></tr>
<tr><td>5</td><td>Hz</td><td>12</td><td>ºF</td></tr>
<tr><td>6</td><td>rpm</td><td></td><td></td></tr>
</table></td><td>YES</td></tr>
<tr><td>AP.43</td><td>PID unit gain</td><td>100.00%</td><td>0.00 to 300.00%</td><td>Allows setting the PID unit gain.</td><td>YES</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
AP.44	PID scale unit	x1	0 to 4	Adjusts the size to fit the unit selected at AP.21. **OPT.** / **DESCR.** 0 / x100 1 / x10 2 / x1 3 / x0.1 4 / x0.01	YES
AP.45	Proportional gain 2	100.00%	0.0 to 100.0%	Set the value of the proportional gain controller 2. This value should be increased whenever a greater control response is needed. **Note:** Increasing too much this value can cause a greater system instability.	NO

The following figure shows the PID operation sleep mode setting details:



Group 9: Protections → Pr

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.4</td><td>Load duty type</td><td>Heavy</td><td>NRML
HEAVY</td><td>Select the load type.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NRML</td><td>Selects the normal load type (variable torque) for applications such as fans or pumps.</td></tr>
<tr><td>1</td><td>HEAVY</td><td>Selects the heavy load type (constant torque) for applications such as elevators and cranes.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>Pr.5</td><td>Phase loss type</td><td>NONE</td><td>0 to 4</td><td>Select phase loss protection type.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NONE</td><td>Phase loss protection disabled.</td></tr>
<tr><td>1</td><td>OUTPUT</td><td>Output phase loss protection enabled.</td></tr>
<tr><td>2</td><td>INPUT</td><td>Input phase loss protection enabled. For its correct operation, the user should set the parameter Pr.6.</td></tr>
<tr><td>3</td><td>ALL</td><td>Input and output phase loss protection enabled. For its correct operation, set the parameter Pr.6.</td></tr>
</table>
Caution: Users should ensure that disabling this protection does not compromise the operation of the installation and/or equipment.</td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
Pr.6	Ripple voltage	15V	1 to 100V	Set the DC Bus ripple voltage that must be exceeded to get a phase loss phase input fault when Pr.5 is set as “INPUT” or “ALL”. This value is set following customer’s requirements.	NO
Pr.7	Fault deceleration time	3.0s	0.0 to 600.0s	Deceleration time at fault trip.	YES
Pr.8	Start after restart	N	N S	Parameters Pr.9 and Pr.10 only operate when Pr.8 is set to 1(Yes).	YES
Pr.9	Retry attempts number	0	0 to 10	The number of attempts to try the auto restart is set at Pr.9.	YES
Pr.10 [33]	Retry delay	1.0s	0.0 to 60.0s	If a fault trip occurs during operation, the drive automatically restarts after the set time programmed at Pr.10. At each restart, the drive counts the number of tries and subtracts it from the number set at Pr.9 until the retry number count reaches 0. After an auto restart, if a fault trip does not occur within 60 secs, it will increase the restart count number. The maximum count number is limited by Pr.10.	YES

[33] Displayed when Pr.9 is higher than zero.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.12</td><td>Response in case of a speed reference loss</td><td>None</td><td>0 to 5</td><td>Set the action to be taken if the drive loses a speed reference:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>Protection is disabled.</td></tr>
<tr><td>1</td><td>Free-Run</td><td>The drive cuts the output voltage and allows the motor free run.</td></tr>
<tr><td>2</td><td>Dec</td><td>The motor decelerates and then stops at the time set at Pr.7.</td></tr>
<tr><td>3</td><td>Hold Input</td><td>The drive will keep operating to the input value, mean value obtained from the last 10 seconds until the moment the reference lo s has been detected.</td></tr>
<tr><td>4</td><td>Hold Output</td><td>The drive will keep operating to the input value, mean value obtained from the last 10 seconds until the moment the reference loss has been detected.</td></tr>
<tr><td>5</td><td>Lost Preset</td><td>The drive operates to the frequency defined in parameter Pr.14.</td></tr>
</table>
Caution: Users should ensure that disabling this protection does not compromise the operation of the equipment</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.13
[34]</td><td>Lost reference delay</td><td>1.0s</td><td>0.1 to 120s</td><td>Delay time setting after which the speed reference loss protection will enable.</td><td>YES</td></tr>
<tr><td>Pr.14
[34]</td><td>Reference for lost reference</td><td>0.00Hz</td><td>dr.19 to dr.20</td><td>In order to set the frequency value at which the drive will operate in case a speed reference loss occurs. Therefore, the parameter Pr.12 must be set to 'LostPreset'.</td><td>YES</td></tr>
<tr><td>Pr.15
[34]</td><td>AI Lost Level</td><td>Half</td><td>Half
Below</td><td>Analog input loss decision level.</td><td>YES</td></tr>
<tr><td>Pr.17</td><td>Overload warning select</td><td>YES</td><td>NO
YES</td><td>If the overload reaches the warning level, the terminal block multi-function output terminal and relay are used to output a warning signal. If 1 (Yes) is selected, it will operate. If 0 (No) is selected, it will not operate.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>NO</td><td>Overload warning disabled.</td></tr><tr><td>1</td><td>YES</td><td>Overload warning enabled.</td></tr></table></td><td>YES</td></tr>
<tr><td>Pr.18</td><td>Overload warning level</td><td>+150%</td><td>30 to 180%</td><td rowspan="2">The overload warning is a combination of the parameters Pr.18-20. The drive will enable some of the digital outputs configured as 'OverLoad' whenever the current flowing within the motor is greater than the value defined in parameter Pr.18 during the time established in parameter Pr.19.</td><td>YES</td></tr>
<tr><td>Pr.19</td><td>Overload warning time</td><td>10.0s</td><td>0.0 to 30.0s</td><td>YES</td></tr>
</table>

[34] Displayed when Pr.12 is not set to None.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.20</td><td>Overload trip select</td><td>Giro</td><td>0 to 2</td><td>The drive will take the following actions in case an overload fault occurs:
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>None</td><td>Protection is disabled.</td></tr><tr><td>1</td><td>FreeRun</td><td>The drive's output is cut, having as a consequence the motor free run.</td></tr><tr><td>2</td><td>Dec</td><td>A deceleration until stop is produced in the time defined in parameter Pr.7.</td></tr></table>Caution: Users should ensure that disabling this protection does not compromise the operation of the installation and/or equipment.</td><td>YES</td></tr>
<tr><td>Pr.21</td><td>Overload level</td><td>180%</td><td>30 to 200%</td><td rowspan="2">The overload warning protection is a combination of the parameters Pr.20-22. The drive will carry out the action selected in parameter Pr.20 whenever the current flow within the motor is greater than the parameter Pr.21 value during the time defined in parameter Pr.22.</td><td>YES</td></tr>
<tr><td>Pr.22</td><td>Overload trip time</td><td>60.0s</td><td>0.0 to 60.0s</td><td>YES</td></tr>
<tr><td>Pr.25</td><td>Enable underload</td><td>NO</td><td>NO
YES</td><td>Sets the underload warning options. Set to 1(Yes) and set the multi-function output terminals (OU.31 and OU.33) to 'Underload'. The warning signals are output when an underload condition arises.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>NO</td><td>Underload warning disabled.</td></tr><tr><td>1</td><td>SI</td><td>Underload warning enabled.</td></tr></table></td><td>YES</td></tr>
<tr><td>Pr.26</td><td>Underload warning delay</td><td>10.0s</td><td>0.0 to 600.0s</td><td>Set delay time when enabling the underload warning. The drive will wait this time before enabling the warning.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.27</td><td>Underload fault mode</td><td>None</td><td>0 to 2</td><td>Set the underload fault trip protection.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>None</td><td>Protection is disabled.</td></tr><tr><td>1</td><td>Free-Run</td><td>Output is blocked in an underload fault trip situation.</td></tr><tr><td>2</td><td>Dec</td><td>The motor decelerates and stops.</td></tr></table></td><td>YES</td></tr>
<tr><td>Pr.28</td><td>Underload fault delay</td><td>30.0</td><td>0.0 to 600.0s</td><td>Set the delay time before triggering the underload fault.</td><td>YES</td></tr>
<tr><td>Pr.29</td><td>Underload minimum level</td><td>+30%</td><td>10 to 30%</td><td rowspan="2">Heavy Duty: Pr.29 is not supported. At Pr.30, underload level is decided based on the motor rated current.
Normal Duty: At Pr.29 underload rate is decided based on twice the operation frequency of the motor rated slip speed (bA.12). At Pr.30, the underload rate is determined based on the frequency set at dr.18. Upper and lower limits are based on the drive rated current</td><td>YES</td></tr>
<tr><td>Pr.30</td><td>Underload maximum level</td><td>+30%</td><td>30 to 100%</td><td>YES</td></tr>
<tr><td>Pr.31</td><td>Action in case no motor is detected</td><td>Nada</td><td>None
Free-Run</td><td>The drive will carry out one of the following actions whenever a fault is present due to the fact that no motor has been connected to the drives output terminal:
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>None</td><td>Protection is disabled.</td></tr><tr><td>1</td><td>Free-Run</td><td>The drive's output is cut, having as a consequence the motor free run.</td></tr></table>Caution: Users should ensure that disabling this protection does not compromise the operation of the installation and/or equipment</td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.32</td><td>No motor fault level</td><td>+5%</td><td>1 to 100%</td><td rowspan="2">The fault protection if no motor is detected is a combination of parameters Pr.31-33. The drive will carry out the action set in parameter Pr.31 whenever the current flowing within the motor does not exceed the value defined in parameter Pr.32 during the time defined in parameter Pr.33.</td><td>YES</td></tr>
<tr><td>Pr.33</td><td>No motor fault delay</td><td>3.0s</td><td>0.1 to 10.0s</td><td>YES</td></tr>
<tr><td>Pr.40</td><td>Action in case of thermo-electronic fault</td><td>None</td><td>0 to 2</td><td>The drive will carry out one of the following actions in case of a motor thermo-electronic fault:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>The ETH function is not activated.</td></tr>
<tr><td>1</td><td>Free-Run</td><td>The drive output is blocked. The motor coasts to a halt (free-run).</td></tr>
<tr><td>2</td><td>Dec</td><td>The drive decelerates the motor until it stops.</td></tr>
</table></td><td>YES</td></tr>
<tr><td>Pr.41</td><td>Motor cooling mode at zero speed</td><td>SELF</td><td>SELF
FORCED</td><td>Select the drive mode of the cooling fan attached to the motor.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>SELF</td><td>As the cooling fan is connected to the motor axis, the cooling effect varies based on motor speed. Most universal induction motors have this design.</td></tr>
<tr><td>1</td><td>FORCED</td><td>Additional power is supplied to operate the cooling fan. This provides extended operation at low speeds. Motors designed for drives typically have this design.</td></tr>
</table></td><td>YES</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.42</td><td>Overcurrent level during 1min</td><td>150%</td><td>120 to 200%</td><td>Set the current level which flows continuously during one minute in % referenced to the motor nominal current. The motor nominal current is set in parameter bA.13. Whenever this limit is over passed, the thermo-electronic protection will be enabled, and the action defined in parameter Pr.40 will be executed.</td><td>YES</td></tr>
<tr><td>Pr.43</td><td>Continuous overcurrent level</td><td>+120%</td><td>50 to 150%</td><td>Set the overcurrent level under which the drive is able to work without enabling the thermo-electronic protection.</td><td>YES</td></tr>
<tr><td>Pr.45</td><td>Free run trip mode</td><td>FreeRun</td><td>FreeRun
Dec</td><td>Define trip mode in free run.<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>FreeRun</td><td>The drive cuts the output voltage and allows the motor free run.</td></tr><tr><td>1</td><td>Dec</td><td>The motor decelerates and then stops.</td></tr></table></td><td>NO</td></tr>
<tr><td>Pr.50</td><td>Stall prevention</td><td>00</td><td>00 to 11</td><td>Stall prevention can be configured for acceleration, deceleration, or while operating a motor at constant speed.<table><tr><th>OPC</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>00</td><td>Accelerating</td><td>Stall protection during acceleration.</td></tr><tr><td>01</td><td>At constant speed</td><td>Stall protection while operating at a constant speed.</td></tr><tr><td>10</td><td>At deceleration</td><td>Stall protection during deceleration.</td></tr><tr><td>11</td><td>FluxBraking</td><td>Flux braking during deceleration.</td></tr></table></td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
Pr.51	Speed for stall protection 1	60Hz	dr.19 to Pr.53 Hz	Additional stall protection levels can be configured for different frequencies, based on the load type. The stall level can be set above the base frequency. The lower and upper limits are set using numbers that correspond in ascending order. For example, the range for Pr.54 becomes the lower limit for Pr.52 and the upper limit for Pr.56.	YES
Pr.52	Level for stall protection 1	180%	30 to 250%		NO
Pr.53	Speed for stall protection 2	60Hz	In.55 to Pr.55 Hz		YES
Pr.54	Level for stall protection 2	180%	30 to 250%		NO
Pr.55	Speed for stall protection 3	60Hz	In.53 to Pr.57 Hz		YES
Pr.56	Level for stall protection 3	180%	30 to 250%		NO
Pr.57	Speed for stall protection 4	60Hz	In.55 to dr.20 Hz		YES
Pr.58	Level for stall protection 4	180%	30 to 250%		NO
Pr.59	Flux braking gain	0%	0 to 150%	Set flux braking gain.	YES
Pr.60	CAP diagnosis level	0%	10 to 100%	Set capacitors diagnosis percentage.	YES

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.61
[35]</td><td>Capacitor diagnosis mode</td><td>+0%</td><td>0 to 3</td><td>This parameter allows performing a capacitor diagnosis
To perform a capacitor diagnosis, the capacitance reference must be established by setting this parameter to 1 when the drive is used for the first time. The measured reference is saved in Pr. 63 and will be used as reference for the diagnosis.
<table><tr><th>OPT.</th><th>DESCR.</th></tr><tr><td>0</td><td>Nonde</td></tr><tr><td>1</td><td>RefDiag (*)</td></tr><tr><td>2</td><td>PreDiag</td></tr><tr><td>3</td><td>InitDiag</td></tr></table>(*) Note: This option is used to set a capacitance reference. It is recommended to use it when the drive is operated for the first time.</td><td>NO</td></tr>
<tr><td>Pr.62
[35]</td><td>CAP exchange warning level</td><td>0% [36]</td><td>50.0 to 95.0%</td><td>Sets the capacitor exchange warning level. The warning “ECAP” will be displayed when this value is reached.</td><td>NO</td></tr>
<tr><td>Pr.63
[35]</td><td>Capacitance reference</td><td>0.0% [36]</td><td>0.0 to 100.0%</td><td>This parameter shows the capacitance reference measured in Pr.61. This value must be equal to 100.0% when the drive is operated for the first time.</td><td>YES</td></tr>
<tr><td>Pr.66</td><td>Braking resistor configuration</td><td>+0%</td><td>0 to 30%</td><td>Set braking resistor configuration (%ED: Duty cycle). Braking resistor configuration sets the rate at which the braking resistor operates for one operation cycle.</td><td>YES</td></tr>
<tr><td>Pr.73</td><td>Speed deviation fault</td><td>N</td><td>N
Y</td><td>Fault due to speed deviation.</td><td>YES</td></tr>
<tr><td>Pr.74
[36]</td><td>Speed deviation band</td><td>50</td><td>1 to 20</td><td>Speed deviation band.</td><td>YES</td></tr>
<tr><td>Pr.75
[36]</td><td>Speed deviation time</td><td>60</td><td>1 to 120</td><td>Speed deviation time.</td><td>YES</td></tr>
</table>

[35] These parameters are displayed when Pr.60 is set to more than 0.
[36] Displayed when Pr.73 is set to YES.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.79</td><td>Action in case of fan trip</td><td>Trip</td><td>Trip
Warn</td><td>Select the action to carry out in case a fault within the cooling fan is detected:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>Trip</td><td>The drive generates a Fan-trip.</td></tr>
<tr><td>1</td><td>Warn</td><td>The drive will enable the relay configured as ‘VentWarn’.</td></tr>
</table></td><td>YES</td></tr>
<tr><td>Pr.80</td><td>Optional card trip mode</td><td>Giro</td><td>0 to 2</td><td>Enable an optional card fault (if any is used). Set the operation mode for the drive when a communication error occurs between the option card and the drive, or when the optional card is detached during operation.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>None</td><td>No operation.</td></tr>
<tr><td>1</td><td>FreeRun</td><td>The drive output is blocked and fault trip information is shown on the display.</td></tr>
<tr><td>2</td><td>Dec</td><td>Motor decelerates to the value set at Pr.7.</td></tr>
</table></td><td>YES</td></tr>
<tr><td>Pr.81</td><td>Low voltage trip delay</td><td>0.0s</td><td>0.0 to 60.0%</td><td>It allows setting a delay for low voltage fault.</td><td>NO</td></tr>
<tr><td>Pr.82</td><td>Enable low voltage trip</td><td>NO</td><td>NO
YES</td><td>When this parameter is set to NO and a low voltage situation occurs, the drive trips.</td><td>NO</td></tr>
<tr><td>Pr.86</td><td>Fan use percentage</td><td>0%</td><td>0.0 to 100.0%</td><td>This parameter allows showing the accumulated percent of fan usage.</td><td>YES</td></tr>
<tr><td>Pr.87</td><td>Fan exchange warning level</td><td>90.0%</td><td>0.0 to 100.0%</td><td>Set fan exchange warning level. When the value is reached, the EFAN warning appears.</td><td>YES</td></tr>
<tr><td>Pr.88</td><td>Fan time reset</td><td>N</td><td>N
Y</td><td>Sets the fan reset time.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>Pr.89</td><td>CAP fan status</td><td>0</td><td>00 to 11</td><td>Shows the status of capacitor fans.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>00</td><td>None</td><td>There are no warnings neither in the capacitors nor in fans.</td></tr><tr><td>01</td><td>CAP warning</td><td>There is a warning in the capacitor.</td></tr><tr><td>10</td><td>FAN warning</td><td>There is a warning in the fan.</td></tr></table></td><td>YES</td></tr>
<tr><td>Pr.90</td><td>Warning information</td><td>-</td><td>-</td><td>Warning information.</td><td>-</td></tr>
<tr><td>Pr.91</td><td>Fifth fault</td><td>nOn</td><td>-</td><td rowspan="5">It stores information on the types of faults, the frequency, the current and the acceleration/deceleration condition at the time of fault. The latest fault is automatically stored in the ‘Pr.95 ➔ First fault’.</td><td>-</td></tr>
<tr><td>Pr.92</td><td>Fourth fault</td><td>nOn</td><td>-</td><td>-</td></tr>
<tr><td>Pr.93</td><td>Third fault</td><td>nOn</td><td>-</td><td>-</td></tr>
<tr><td>Pr.94</td><td>Second fault</td><td>nOn</td><td>-</td><td>-</td></tr>
<tr><td>Pr.95</td><td>First fault</td><td>nOn</td><td>-</td><td>-</td></tr>
<tr><td>Pr.96</td><td>Reset fault history</td><td>0</td><td>0-1</td><td>It allows clearing the fault history stored from ‘Pr.91’ to ‘Pr.95’.</td><td>YES</td></tr>
</table>

Group 10: Second Motor → M2

This group appears if any of In.65-71 is set to 26 (second motor). In the following table, data shaded in grey will be displayed when a related code has been selected.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>M2.4</td><td>Motor 2 acceleration ramp</td><td>20.0s</td><td>0.0 to 600.0s</td><td>Set the acceleration ramp for second motor adjustment. The established setting within the parameter is the time required to reach the maximum frequency value, starting from 0Hz.This ramp will be set according to the process necessities.</td><td>YES</td></tr>
<tr><td>M2.5</td><td>Motor 2 deceleration ramp</td><td>30.0s</td><td>0.0 to 600.0s</td><td>Set the deceleration ramp for second motor adjustment. The established setting within the parameter is the time required to reach the maximum frequency value, starting from 0Hz.This ramp will be set according to the process necessities.</td><td>YES</td></tr>
<tr><td>M2.6</td><td>Motor 2 rated power</td><td>4.0Kw</td><td>0.2 kW
0.4 kW
…
30.0 kW</td><td>Set the second motor rated power according to its nameplate.</td><td>NO</td></tr>
<tr><td>M2.7</td><td>Motor 2 frequency</td><td>60.00Hz</td><td>30.00 to 400.00Hz</td><td>Set the second motor frequency to rated value according to its nameplate.</td><td>NO</td></tr>
<tr><td>M2.8</td><td>Control type selection</td><td>V/Hz</td><td>0 to 4</td><td>Define the drive control type.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>V/Hz</td><td>Scalar control mode. Drive carries out the control applying a voltage / frequency ramp to the motor.</td></tr>
<tr><td>2</td><td>Slip Com</td><td>Slip compensation mode. This mode reduces the effect of motor slip.</td></tr>
<tr><td>4</td><td>S-less1</td><td>Sensorless control mode.</td></tr>
</table></td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
M2.10	Poles number	(*)	2, 4, 6…48	Set the number of poles in the motor according to its nameplate.	NO
M2.11	Rated Slip	(*)	0 to 3000rpm	When facing a heavy load capable of producing a big slip during the start, configure this parameter to compensate the motor slip.	NO
M2.12	Motor nominal current	(*)	1.0 to 1000.0A	Set the motor nominal current in accordance with the nameplate.	NO
M2.13	No load current	(*)	0.5 to 1000.0A	Set the measured current at rated frequency without load. If any difficulties are found when measuring the current without load, this setting should be between 30% and 50% of the motor nameplate rated current.	NO
M2.14	Motor 2 voltage	(*)	170 to 480V	Set the motor rated voltage according to its nameplate.	NO
M2.15	Motor 2 efficiency	(*)	70 to 100%	Set the motor efficiency according to its nameplate.	NO
M2.16	Motor 2 inertia rate	(*)	0 to 8	Set the load inertia rate.	NO
M2.17	Stator resistor	(*)	(*)	Stator resistor fine setting.	NO
M2.18	Leak inductor	(*)	(*)	Leak inductor fine setting.	NO
M2.19	Stator inductor	(*)	(*)	Inductor stator fine setting.	NO
M2.20 [37]	Rotor time constant	228ms	25 to 5000ms	Rotor time constant fine setting.	NO

[37] Displayed when M2.8 is set to S-less.
(*) This value depends on the motor setting.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>M2.25</td><td>V/F pattern</td><td>Lineal</td><td>0 to 3</td><td>Set V/F pattern according to the following table.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Linear</td><td>Output voltage increases and decreases at constant rate proportional to voltage/frequency (V/F) relation</td></tr><tr><td>1</td><td>Square</td><td>Output voltage increases quadratically according to the frequency. K=1.5.</td></tr><tr><td>2</td><td>V/F User</td><td>Define a customized V/F pattern.</td></tr><tr><td>3</td><td>Square2</td><td>Output voltage increases quadratically according to the frequency. K=2.</td></tr></table></td><td>NO</td></tr>
<tr><td>M2.26</td><td>Torque in forward direction</td><td>+2.0%</td><td>0.0 to 15.0%</td><td>Set the intensified torque in forward direction.</td><td>NO</td></tr>
<tr><td>M2.27</td><td>Torque in reverse direction</td><td>+2.0%</td><td>0.0 to 15.0%</td><td>Set the intensified torque in reverse direction.</td><td>NO</td></tr>
<tr><td>M2.28</td><td>Stall prevention level motor 2</td><td>150%</td><td>30 to 150%</td><td>Set the stall prevention level.</td><td>NO</td></tr>
<tr><td>M2.29</td><td>Motor 2 overcurrent level during 1 minute</td><td>+150%</td><td>100 to 200%</td><td>Set the current level which flows continuously during one minute in % referenced to the motor nominal current. The motor nominal current is set in parameter M2.12. Whenever this limit is over passed, the thermo-electronic protection will be enabled, and the action defined in parameter Pr.40 will be executed.</td><td>NO</td></tr>
<tr><td>M2.30</td><td>Motor 2 continuous overcurrent level</td><td>+100%</td><td>50 to 150%</td><td>Set the overcurrent level under which the drive is able to work without enabling the thermo-electronic protection.</td><td>NO</td></tr>
</table>

Group 11: PLC Sequence → US

This group appears when AP.2 is set to 1 (NO) or CM.95 is set to 2 (P2P Master).

A PLC sequence creates a simple sequence from a combination of different function blocks. The sequence can comprise of a maximum of 18 steps using 29 function blocks and 30 parameters.

One loop refers to a single execution of a user configured sequence that contains a maximum of 18 steps. Users can select a Loop Time of between 10-1000ms.

The parameters for configuring PLC sequences configuration can be found in groups 11 and 12 of the removable display; which are equivalent to groups US (for user sequence settings) and UF (for function block settings).

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>US.1</td><td>PLC operation mode</td><td>Stop</td><td>0 a 2</td><td>This parameter allows setting the run and stop sequences.
<table><tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr><tr><td>0</td><td>Stop</td><td>Stop PLC sequence.</td></tr><tr><td>1</td><td>Run</td><td>The sequence will run continuously with the loop time set in US.2.</td></tr><tr><td>2</td><td>Run DI</td><td>The sequence will run continuously with the loop time set in US.2 while the digital input set as 50 “PLC” is active.</td></tr></table></td><td>NO</td></tr>
<tr><td>US.2</td><td>PLC loop time</td><td>0.02s</td><td>0.01s
0.02s
0.05s
0.1s
0.5s
1s</td><td>Set the PLC sequence loop time.</td><td>NO</td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
US.11	Output link address for PLC function 1	0	0 to 65535	Use registers US.11-28 to set the parameters to connect the 18 function blocks. If the input value is 0, an output value cannot be used. To use the output value in step 1 for the frequency reference (Cmd Frequency), enter the communication address (0x1101) of the Cmd frequency as the Link UserOut1 parameter.	NO
US.12	Output link address for PLC function 2	0			NO
…					
US.27	Output link addr. PLC function 17	0	0 to 65535	See US.11.	NO
US.28	Output link addr. PLC function 18	0			NO
US.31	PLC input value 1	0	-9999 to 9999	Use registers US.31-60 to set 30 void parameters. Use when constant (Const) parameter input is needed in the user function block.	NO
US.32	PLC input value 2	0			NO
…					
US.60	PLC input value 30	0	-9999 to 9999	See US.31.	NO
US.80	Analogue input V1 value	0.000	0 to 12.000%	Allows setting the analog input V1 voltage value.	NO
US.81	Analogue input I2 value	+0.000	-12.000 to 12.000%	Allows setting the analog input I2 voltage or current values.	NO
US.82	Digital inputs value	0	0 to 127	Allows setting the digital inputs voltage value.	NO
US.85	Analogue output value	0	0.000 to 10.000%	Allows setting the analog output AO voltage or current values.	NO
US.88	Digital output value	0	0 to 3	Allows setting the digital output Q1 voltage value.	NO

Group 12: PLC Function → UF

This group appears when AP.2 is set to 1 (Yes) or CM.95 is set to 2 (P2P Master).

Set user defined functions for the 18 function blocks. If the function block setting is invalid, the output of the User Output is -1. All outputs are read only, and can be used with the user output link of the US group.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>UF.1</td><td>PLC function 1</td><td>NOP</td><td>0 to 28</td><td>Choose the function to perform in the function block, according to the following table:
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>NOP</td><td>No operation</td></tr>
<tr><td>1</td><td>ADD</td><td>Addition, (A + B) + C</td></tr>
<tr><td>2</td><td>SUB</td><td>Subtraction, (A – B) – C</td></tr>
<tr><td>3</td><td>ADD SUB</td><td>Addition and subtraction compound, (A + B) – C</td></tr>
<tr><td>4</td><td>MIN</td><td>Smallest value of the input values, MIN(A, B, C).</td></tr>
<tr><td>5</td><td>MAX</td><td>Largest value of the input values, MAX(A, B, C).</td></tr>
<tr><td>6</td><td>ABS</td><td>Absolute value of the A parameter, | A |</td></tr>
<tr><td>7</td><td>NEGATE</td><td>Negative value of the A parameter, -(A).</td></tr>
<tr><td>8</td><td>MPYDIV</td><td>Compound multiplication and division,
(A x B)/C.</td></tr>
<tr><td>9</td><td>REMAINDE</td><td>Remainder operation of A and B, A % B</td></tr>
</table>
Note: Continues on the next page</td><td>NO</td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>
Note: Comes from the previous page.
<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>10</td><td>COMPARE - GT</td><td>Comparison operation: if (A > B) the output is C; if (A </=B) the output is 0. If C is not configured (default value 0x0000), the output when the condition is satisfied is 1.</td></tr>
<tr><td>11</td><td>COMPARE - GEQ</td><td>Comparison operation; if (A >/= B) output is C; if (A<B) the output is 0.
If C is not configured (default value 0x0000), the output when the condition is satisfied is 1.</td></tr>
<tr><td>12</td><td>COMPARE -EQUAL</td><td>Comparison operation, if (A == B) then the output is C. Otherwise, the output is 0.
If C is not configured (default value 0x0000), the output when the condition is satisfied is 1.</td></tr>
<tr><td>13</td><td>COMPARE -NEQUAL</td><td>Comparison operation, if (A!= B) then the output is C. Otherwise, the output is 0.
If C is not configured (default value 0x0000), the output when the condition is satisfied is 1.</td></tr>
</table>
Note: Continues on the next page.
</td><td></td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
				Note: Comes from the previous page.	

OPT.	DESCR.	FUNCTION
14	TIMER	Adds 1 each time a user sequence completes a loop. A sets the timer value. B enables or disables the timer. If B = 0, the timer is enabled. C defines the timer operation mode. If C = 0, the output will be 1 when timer value equals A. if C = 1, the output is the timer current value. When A equals the timer value, the counter is reset.
15	LIMIT	Sets a limit for the A parameter. If input to A is between B and C, output the input to A. If input to A is larger than B, output B. If input of A is smaller than C, output C. B must be greater than or equal to C.
16	AND	Outputs the result of the AND operation, (A and B) and C.
17	OR	Outputs the result of the OR operation, (A | B) | C.
18	XOR	Outputs the result of the XOR operation, (A ^ B) ^ C.

Note: Continues in the next page.

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>

Note: Comes from the previous page.

OPT.	DESCR.	FUNCTION
19	ANDOR	Outputs the result of the AND/OR operation, (A and B) | C.
20	SWITCH	Output a value after selecting one of two inputs, if (A) then B, otherwise C. If the input at A is 1, the output will be B. If the input at A is 0, the output parameter will be C.
21	BITTEST	Test the B bit of the A parameter, BITTEST (A, B). If the B bit of the A input is 1, the output is 1. If it is 0, then the output is 0. The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If input at B is 0, the output is always 0.
22	BITSET	Set the B bit of the A parameter, BITSET(A, B). Output the changed value after setting the B bit to input at A. The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If the input at B is 0, the output is always 0.

Note: Continues in the next page.

</td><td></td></tr>
</table>

<table>
<tr><th>Screen</th><th>Description</th><th>Default value</th><th>Range</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td></td><td></td><td></td><td></td><td>

Note: Comes from the previous page.

<table>
<tr><th>OPT.</th><th>DESCR.</th><th>FUNCTION</th></tr>
<tr><td>23</td><td>BITCLEAR</td><td>Clear the B bit of the A parameter, BITCLEAR(A, B). Output the changed value after clearing the B bit to input at A.
The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If the input at B is 0, the output is always 0.</td></tr>
<tr><td>24</td><td>LOWPASS FILTER</td><td>Output the input at A as the B filter gains time constant, B x US.2.
In the above formula, set the time when the output of A reaches 63.3% C stands for the filter operation. If it is 0, the operation is started.</td></tr>
<tr><td>25</td><td>PI_ CONTRL</td><td>P, I gain = A, B parameter input, then output as C.
Conditions for PI_PROCESS output:
C = 0: Const PI,
C = 1: PI_PROCESS-B >= PI_PROCESS-OUT >= 0,
C = 2: PI_PROCESS-B >= PI_PROCESS-OUT >= -(PI_PROCESS-B),
P gain = A/100, I gain = 1/(Bx Loop Time),
If there is an error with PI settings, output is -1.</td></tr>
</table>

Note: Continues on the next page.

</td><td></td></tr>
</table>

Screen	Description	Default value	Range	Function	Set on RUN
				Note: Comes from the previous page. **OPT.** | **DESCR.** | **FUNCTION** 26 | PI_PROCESS | A is an input error, B is an output limit, C is the value of Const PI output. Range of C is 0 to 32767. 27 | UP COUNT | Upcounts the pulses and then output the value UPCOUNT(A, B, C). After receiving a trigger input (A), outputs are upcounted by C conditions. If the B inputs is 1, do not operate and display 0. If the B inputs is 0, operate. If C is 0, upcount when A changes from 0 to 1. If C is 1, upcount when A is changed from 1 to 0. If C is 2, upcount whenever the input at A changes. Output range is: 0 to 32767. 28 | DOWN COUNT | Downcounts the pulses and then output the value- DOWNCOUNT(A, B, C). After receiving a trigger input (A), outputs are downcounted by C conditions. If the B input is 1, do not operate and display the initial value of C. If the B input is 0, operate. Downcounts when the A parameter changes from 0 to 1.	

Screen	Description	Default value	Range	Function	Set on RUN
UF.2	Input A for PLC function 1	0	0 to 65535	Communication address of the first input parameter of the PLC function.	NO
UF.3	Input B for PLC function 1	0	0 to 65535	Communication address of the second input parameter of the PLC function.	NO
UF.4	Input C for PLC function 1	0	0 to 65535	Communication address of the third input parameter of the PLC function.	NO
UF.5	Output PLC function 1	+0	-32767 to 32767	Output value (Read Only) after performing the function block.	NO
UF.6	PLC function 2	NOP	See UF.1	See UF.1.	NO
UF.7	Input A for PLC function 2	0	See UF.2	See UF.2.	NO
UF.8	Input B for PLC function 2	0	See UF.3	See UF.3.	NO
UF.9	Input C for PLC function 2	0	See UF.4	See UF.4.	NO
UF.10	Output PLC function 2	+0	See UF.5	See UF.5.	NO
…					
UF.86	PLC function 18	NOP	See UF.1	See UF.1.	NO
UF.87	Input A for PLC function 18	0	See UF.2	See UF.2.	NO
UF.88	Input B for PLC function 18	0	See UF.3	See UF.3.	NO
UF.89	Input C for PLC function 18	0	See UF.4	See UF.4.	NO
UF.90	Output PLC function 18	+0	See UF.5	See UF.5.	NO

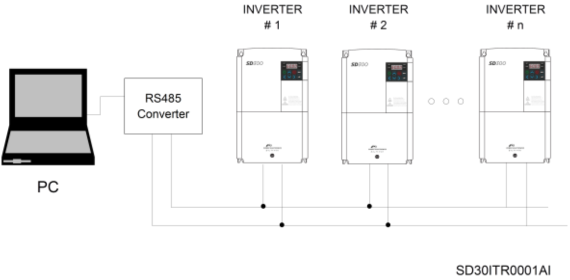
MODBUS COMMUNICATION 15

To control the variable speed drive with a PLC or a computer. the industrial standard communications protocol of Modicon, Modbus, is used. Connect the communication cables [1] and set the communication parameters on the drive according to the guidelines within this section.

Introduction

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.



RS485 network system configuration

[1] For detailed instructions on how to make the connections, please contact Power Electronics.

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 equipment 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.

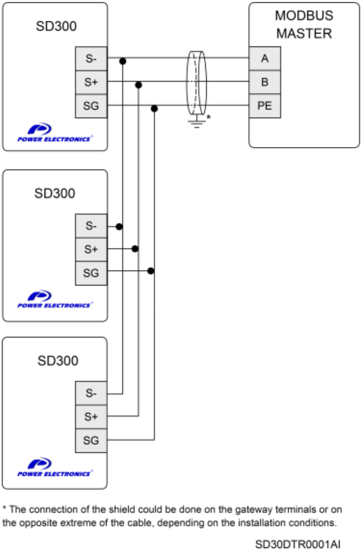
Communication standards

ITEM	STANDARD
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Number of connected inverters/ Transmission distance	Maximum of 16 inverters / Maximum1,200m (recommended distance: within 700m)
Recommended cable size	0.75mm², (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	1200/2400/9600/19200/38400/57600/115200 bps
Control procedure	Asynchronous communications system
Communication system	Half duplex system

ITEM	STANDARD
Character system	Modbus-RTU: Binary / PE Bus: ASCII
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	1 relay output; 1 pulse output (TO) in IP20 drives. 1 programmable analogue outputs (0~10 V / 0~32 mA) 1 digital output

RS485 Connections

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



RS485 connection

Supported Modbus function codes

Serial communications protocol provided by SD300 drive adhere to Modbus. The drive uses four reading and writing functions from all of the functions that exist in Modbus protocol. These are:

Function	Description
3	Registers Reading
4	Read Input Register
6	Write Single Register
16	Registers Writing

The implementation of these function codes allows reading up to 120 registers from a Parameter Group using a single frame. If you want to access to a consecutive memory registers, but belonging to different groups, you should access in as many frames as groups are involved.

Modbus function code Nº 3: Registers reading

This function code allows the Modbus controller (master) to read the content of the data registers indicated in the drive (slave). This function code only admits unicast addressing. Broadcast or groupcast addressing are not possible with this function code.

The implementation of this function code in the drive allows reading up to 120 registers with consecutive addresses of the drive in a single frame.

Next, a frame is shown where the master tries to read the content of 3 registers of a drive where the current used by each phase is. The information that should be attached in the ask frame is the following:

- Data address of the drive.
- Modbus function code (3 Registers reading).
- Starting Data address.
- Registers number for reading.
- CRC-16 code.

The answer of the drive (slave) should contain the following fields:

- Data address of the slave.
- Modbus function code (3 Registers reading).
- Bytes number for reading.
- Bytes number / 2 registers.
- CRC-16 code.

Each register consists of 2 bytes (2x8bits=16 bits). This is the default length for all registers.

Example:

Suppose that we want to read the motor current (nameplate data) via communications. This data corresponds to the parameter G2.13 'MTR CUR=0.0A'. The frame that should be transmitted is:

Modbus Address	Modbus Function Code	Starting Data Address (44622)	Registers Number	CRC-16
0x0A	0x03	0x0120D	0x0001	0x2493

Suppose that instantaneous current of the equipment is 8.2 A. (Modbus value 82 decimal = 0x52 Hexadecimal). The answer of the slave will be:

Modbus Address	Modbus Function Code	Bytes Number	Data (address 20) (=110)	CRC-16

0x0A	0x03	0x02	0x0052	0x9C78

Modbus function code Nº 16: Registers writing

This function code allows the Modbus controller (master) to write the content of the data registers indicated in the drive (slave). whenever those registers are not of Read only. Registers writing by the master does not impede the later modification of those registers by the slave.

The implementation of this function code in the drive allows writing up to 5 registers of the drive in a single frame.

Next is shown a frame where the master tries to write the content of 1 register that stores the acceleration time. The information that should be sent in the request frame is the following:

- Data address of the slave.
- Modbus function code (16 Registers writing).
- Starting Data Address.
- Registers number for writing.
- Bytes number for writing.
- Content of registers for writing.
- CRC-16 code.

The answer of the slaves includes:

- Data address of the slave.
- Modbus function code (16 Registers writing).
- Starting Data Address.
- Written registers number.
- CRC-16 code.

Addressing modes

Broadcast addressing mode

Broadcast addressing mode allows the master to access at the same time to all of the slaves connected to the Modbus network. The Modbus function code that admits this global addressing mode is:

Function	Description
16	Registers Writing

In order to access to all of the equipment connected in a Modbus network. you must use the address 0.

When this address is used. all of the slaves in the Modbus network make the required task but they do not prepare any answer.

Summary of Modbus addresses

Common area

Modbus Address		Parameter	Scale	Units	R/W	Data Values
Decimal	Hexadecimal					
40000	**0h0000**	Inverter Model	-	-	R	B: SD300
40001	**0h0001**	Drive Power Rating	-	-	R	0: 0.75kW 1: 1.5kW 2: 2.2kW 3: 3.7kW 4: 5.5kW 5: 7.5kW 6: 11kW 7: 15kW 8: 18.5kW 9: 22kW
40002	**0h0002**	Drive Input Voltage	-	-	R	0: 220VAC 1: 400VAC
40003	**0h0003**	SW Version	-	-	R	(Ex) 0x0100: Version 1.0 (Ex) 0x0101: Version 1.1
40005	**0h0005**	Reference Frequency	0.01	Hz	R/W	Starting Frequency to Max Frequency
40006	**0h0006**	Start / Stop Command	-	-	R/W	Bit 0: Stop
						Bit 1: Forward Start
						Bit 2: Reverse Start
						Bit 3: Fault Reset
						Bit 4: Emergency Stop
					-	Bit 5: Not used
					R	Bit 6 – 8: Setpoint Introduction 0: Local 1: Start/Stop-1 2: Start/Stop-2 3: RS485 integrated 4: Communications Option 5: PLC Option

Modbus Address		Parameter	Scale	Units	R/W	Data Values
Decimal	Hexadecimal					
						Bit 9 – 14: Reference Frequency 0: Local Reference 1: Not used 2: Step frequency 1 3: Step frequency 2 4: Step frequency 3 5: Step frequency 4 6: Step frequency 5 7: Step frequency 6 8: Step frequency 7 9: Step frequency 8 10: Step frequency 9 11: Step frequency 10 12: Step frequency 11 13: Step frequency 12 14: Step frequency 13 15: Step frequency 14 16: Step frequency 15 17: Up Speed 18: Down Speed 19: Constant 20 – 21: Reserved 22: Analog V1 23: Analog I1 24: Analog V2 25: Analog I2 26: Reserved 27: RS485 28: Communication Option 29: PLC Option 30: Fix Frequency 31: PID
						Bit 15: Not used
40007	**0h0007**	Acceleration Time	0.1	Sec	R/W	-
40008	**0h0008**	Deceleration Time	0.1	Sec	R/W	-
40009	**0h0009**	Output Current	0.1	A	R	-
40010	**0h000A**	Output Frequency	0.01	Hz	R	-
40011	**0h000B**	Output Voltage	1	V	R	-
40012	**0h000C**	DC Bus Voltage	1	V	R	-
40013	**0h000D**	Output Power	0.1	kW	R	-

Modbus Address		Parameter	Scale	Units	R/W	Data Values
Decimal	Hexadecimal					
40014	**0h000E**	Drive Status	-	-	R	Bit 0: Stop Bit 1: Start (+) Bit 2: Start (-) Bit 3: Fault Bit 4: Accelerating Bit 5: Decelerating Bit 6: Steady Status Bit 7: DC Brake Bit 8: Stop Bit 9: Fix Frequency Bit 10: Open Brake Bit 11: Start (+) Command Bit 12: Start (-) Command Bit 13: Start / Stop by Communication Bit 14: Freq. Reference by Communication Bit 15: 0-Remote; 1-Local
40015	**0h000F**	Fault information	-	-	R	Bit 0: Latch type fault Bit 3: Level type fault Bit 10: Hardware diagnosis
40016	**0h0010**	Digital Inputs Status	-	-	R	Bit 0: P1 Bit 1: P2 Bit 2: P3 Bit 3: P4 Bit 4: P5 Bit 5: P6 Bit 6: P7 Bit 7: P8
40017	**0h0011**	Digital Outputs Status	-	-	R	Bit 0: Relay 1 Bit 1: Multifunction output
40018	**0h0012**	V1	0.1	%	R	Voltage input V1
40019	**0h0013**	V2	0.1	%	R	Voltage Input V2 (Option I/O)
40020	**0h0014**	I2	0.1	%	R	Current Input I2
40021	**0h0015**	RPM	1	rpm	R	Speed Output
40026	**0h001A**	Display unit	-	-	R	0: Hz 1: rpm
40027	**0h001B**	Number of poles	-	-	R	Motor poles visualization

Notes:

- Start / Stop order through communications (address 40006/0h0006)

Every bit is enabled when they change their status from 0 to 1. For example, the drive stops due to a fault during start. Until the fault has been reset and the start order is given, the drive will not operate.

- Addresses 40005/0h0005 and 40006/0h0006

The values stored in these addresses will be deleted if the drive losses it power supply. These addresses will only keep their values while the equipment remains powered.

Monitoring parameters

Note: These are read-only parameters.

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
40768	**0h0300**	Drive model	-	-	SD300: 006h
40769	**0h0301**	Rated power	-	-	0.75kW: 3200h 1.5 kW: 4015h 2.2 kW: 4022h 3.7 kW: 4037h 5.5 kW: 4055h 7.5 kW: 4075h 11 kW: 40B0h 15 kW: 40F0h 18.5 kW: 4125h 22 kW: 4160h
40770	**0h0302**	Input voltage	-	-	220VAC: 0221h 400VAC: 0431h
40771	**0h0303**	SW Version	-	-	(Ex) 0x0100: Version 1.0 (Ex) 0x0101: Version 1.1
40773	**0h0305**	Drive operation state	-	-	Bit 0 – 3: 0: Stopped 1: Operating in forward direction 2: Operating in reverse direction 3: DC operating (0 speed control)
					Bit 4 – 7 1: Speed searching 2: Accelerating 3: Operating at constant rate 4: Decelerating 5: Decelerating to stop 6: H/W OCS 7: S/W OCS 8: Dwell operation
					Bit 12 – 15 0: Normal state 4: A warning has occurred 8: A fault has occurred. Drive will operate according to the setting of Pr.30.

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
40774	0h0306	Drive operation frequency command source	-	-	Bit 0 – 7: Frequency command source 0: Keypad speed 1: Keypad torque 2-4: Up/Down operation speed 5: V1, 7: V2, 8: I2, 9: Pulse 10: Built-in RS 485 11: Optional communication card 12: PLC 13: Jog 14: PID 25-39: Multi-step speed frequency
					Bit 8-15: Operation command source 0: Keypad 1: Optional communication card 2: PLC 3: Built-in RS 485 4: Terminal block
40775	0h0307	SW Version	-	-	(Ex) 0x0100: Version 1.0
40776	0h0308	SW Version	-	-	(Ex) 0x0101: Version 1.1
40784	0h0310	Output current	0.1	A	-
40785	0h0311	Output frequency	0.01	Hz	-
40786	0h0312	Output rpm	0	rpm	-
40787	0h0313	Motor speed feedback	0	rpm	-32768 rpm – 32767 rpm (directional)
40788	0h0314	Output voltage	1	V	-
40789	0h0315	DC bus voltage	1	V	-
40790	0h0316	Output power	0.1	kW	-
40791	0h0317	Output torque	0.1	%	-
40792	0h0318	PID reference	0.1	%	-
40793	0h0319	PID feedback	0.1	%	-
40794	0h031A	Motor 1 poles number	-	-	Visualization of motor 1 poles
40795	0h031B	Motor 2 poles number	-	-	Visualization of motor 2 poles
40796	0h031C	Poles number of the selected motor	-	-	Visualization of selected motor poles
40797	0h031D	Select Hz/rpm	-	-	0: Hz, 1: rpm
40800	0h0320				Bit 0: P1

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
		Digital inputs information			Bit 1: P2 Bit 2: P3 Bit 3: P4 Bit 4: P5 Bit 5: P6 Bit 6: P7
40801	**0h0321**	Digital outputs information	-	-	Bit 0: Relay 1 Bit 1: Multi-function output
40802	**0h0322**	Communication addresses information	-	-	Bit 0: Input 1 (CM.70) Bit 1: Input 2 (CM.71) Bit 2: Input 3 (CM.72) Bit 3: Input 4 (CM.73) Bit 4: Input 5 (CM.74) Bit 5: Input 6 (CM.75) Bit 6: Input 7 (CM.76) Bit 7: Input 8 (CM.77)
40803	**0h0323**	Selected motor	-	-	0: Motor 1 1: Motor 2
40804	**0h0324**	V1	0.01	%	Analog voltage input V1
40805	**0h0325**	V2	0.01	%	Analog voltage input V2
40806	**0h0326**	I2	0.01	%	Analog current input I2
40807	**0h0327**	AO1	0.01	%	Analog output 1
40808	**0h0328**	AO2	0.01	%	Analog output 2
40813	**0h032D**	Drive temperature	1	ºC	-
40814	**0h032E**	Drive power consumption	1	kWh	-
40815	**0h032F**		1	kWh	
40816	**0h0330**	Latch type trip 1 information	-	-	Bit 0: Overload Bit 1: Underload Bit 2: Inverter Overload Bit 3: E-Thermal Bit 4: Ground Fault Bit 5: Output open-phase Bit 6: Input open-phase Bit 9: NTC Bit 10: Overcurrent Bit 11: Overvoltage Bit 12: External trip Bit 13: Arm short Bit 14: Over Heat Bit 15: Open fuse

Modbus Address		Parameter	Scale	Units	Values
Decimal	**Hexadecimal**				
40817	**0h0331**	Latch type trip 2 information	-	-	Bit 0: MC Fail trip Bit 2: PTC trip Bit 3: Fan trip Bit 5: Error while writing parameter Bit 6: Pre PID trip Bit 7: External card contact fault Bit 8: External brake trip Bit 9: No motor trip Bit 10: External card fault
40818	**0h0332**	Level type trip information	-	-	Bit 0: Free run fault Bit 1: Low voltage Bit 2: Lost command Bit 3: Display lost command Bit 4: Safety A Bit 5: Safety B
40819	**0h0333**	HW diagnosis trip information	-	-	Bit 0: ADC error Bit 1: EEPROM error Bit 2: Watchdog1 Bit 3: Watchdog 2 Bit 5: Full queue
40820	**0h0334**	Warning information	-	-	Bit 0: Overload Bit 1: Underload Bit 2: Drive overload Bit 3: Lost command Bit 4: Fan running Bit 5: DB Bit 6: Wrong encoder installation Bit 7: Encoder disconnection Bit 8: Keypad lost Bit 9: Auto tuning failed
40832	**0h0340**	Days ON	0	Days	Total number of days the drive has been powered on.
40833	**0h0341**	Minutes ON	0	Minutes	Total number of minutes the drive has been powered on, excluding the total number of days.
40834	**0h0342**	Days on run	0	Days	Total number of days the drive has been driving the motor.

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
40835	**0h0343**	Minutes on run	0	Minutes	Total number of minutes the drive has been driving the motor, excluding the total number of days.
40836	**0h0344**	Fan runtime days	0	Days	Total number of days the heat sink fan has been running.
40837	**0h0345**	Fan runtime minutes	0	Minutes	Total number of minutes the heat sink fan has been running, excluding the total number of days.
40842	**0h034A**	Optional card	-	-	0: None 9: CANopen

Control parameters

Note: These parameters are read and write.

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
40896	**0h0380**	Frequency command	0.01	Hz	Frequency command setting
40897	**0h0381**	Rpm command	1	rpm	Rpm command setting
40898	**0h0382**	Operation command	-	-	Bit 0 0: Stop command 1: Run command
					Bit 1 0: Reverse command 1: Forward command
					Bit 2: 0 → 1: Trip initialization
					Bit 3: 0 → 1: Free-run stop
40899	**0h0383**	Acceleration time	0.1	s	Acceleration time setting
40900	**0h0384**	Deceleration time	0.1	s	Deceleration time setting
40901	**0h0385**	Communications addresses control (0: Off, 1: On)			Bit 0: Input 1 (CM.70)
					Bit 1: Input 2 (CM.71)
					Bit 2: Input 3 (CM.72)
					Bit 3: Input 4 (CM.73)
					Bit 4: Input 5 (CM.74)
					Bit 5: Input 6 (CM.75)
					Bit 6: Input 7 (CM.76)
					Bit 7: Input 8 (CM.77)
40902	**0h0386**	Digital outputs control (0: Off, 1: On)			Bit 0: Relay 1
					Bit 1: Multi-function output
40904	**0h0388**	PID reference	0.1	%	PID reference command
40905	**0h0389**	PID feedback	0.1	%	PID feedback value
40906	**0h038A**	Motor rated current	0.1	A	-
40907	**0h038B**	Motor rated voltage	1	V	-
40912	**0h0390**	Torque reference	0.1	%	Torque command
40913	**0h0391**	Torque limit positive forward	0.1	%	Torque limit in forward direction
40914	**0h0392**	Torque limit negative forward	0.1	%	Regenerative torque limit in forward direction
40915	**0h0393**	Torque limit positive reverse	0.1	%	Torque limit in reverse direction

Modbus Address		Parameter	Scale	Units	Values
Decimal	Hexadecimal				
40916	**0h0394**	Torque limit negative reverse	0.1	%	Regenerative torque limit in reverse direction
40917	**0h0395**	Torque bias	0.1	%	Torque bias

Memory control area

Note: These parameters are read and write.

Modbus Address		Parameter	Scale	Units	Set on run	Function
Decimal	Hexadecimal					
40992	**0h03E0**	Save parameters	-	-	YES	0: No, 1: YES
40993	**0h03E1**	Monitor mode initialization	-	-	NO	0: No, 1: YES
40994	**0h03E2**	Initialize parameters	-	-	YES	0: No, 1: All. By groups: 2: Operation, 3: bA, 4: Ad, 5: Cn, 6: In, 7: OU, 8: CM, 9: AP, 12: Pr, 13: M2. **Note**: Setting is prohibited during fault trip interruptions.
40995	**0h03E3**	Display changed parameters	-	-	NO	0: No, 1: YES
40997	**0h03E5**	Delete fault history	-		NO	0: No, 1: YES
40998	**0h03E6**	Delete user registered codes	-		NO	0: No, 1: YES
40999	**0h03E7**	Hide parameter mode	0	Hex	NO	Write: 0-9999 Read: 0: Unlock, 1: Lock
41000	**0h03E8**	Lock parameter mode	0	Hex	NO	Write: 0-9999 Read: 0: Unlock, 1: Lock
41001	**0h03E9**	Easy parameter setup	-	-	NO	0: No, 1: YES
41002	**0h03EA**	Initialize power consumption	-	-	NO	0: No, 1: YES
41003	**0h03EB**	Initialize operation accumulative time	-	-	NO	0: No, 1: YES
41004	**0h03EC**	Initialize fan operation accumulative time	-	-	NO	0: No, 1: YES

Programming parameters

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
0.00	Local speed	**44353**	**0h1101**	dr.19 to dr.20	dr.19 to dr.20
dr.2	Local torque	**44354**	**0h1102**	-180.0 to 180.0%	-1800 to 1800
ACC	Acceleration Ramp	**44355**	**0h1103**	0.0 to 600.0s	0 to 6000
dEC	Deceleration Ramp	**44356**	**0h1104**	0.0 to 600.0s	0 to 6000
drv	Control mode 1	**44358**	**0h1106**	LOCAL REMOTE REMOTE2 MODBUS COMMS PLC	0 1 3 4 5 6
Frq	Speed reference 1	**44359**	**0h1107**	LOCAL V1 V2 I2 MDBUS COMMS PLC PULSE	0 2 4 5 6 8 9 12
dr.8	Torque reference 1	**44360**	**0h1108**	LOCAL V1 V2 I2 MDBUS COMMS PLC PULSE	0 2 4 5 6 8 9 12
dr.9	Control type	**44361**	**0h1109**	V/Hz SlipCom S-less1 PM Sensor-less	0 2 4 6
dr.10	Torque control	**44362**	**0h110A**	N / Y	0 / 1
dr.11	Inch Frequency	**44363**	**0h110B**	dr.19 to dr.20	dr.19 to dr.20
dr.12	INCH acceleration time	**44364**	**0h110C**	0.0 to 600.0s	0 to 6000
dr.13	INCH deceleration time	**44365**	**0h110D**	0.0 to 600.0s	0 to 6000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
dr.14	Motor power	**44366**	**0h110E**	0.2 kW 0.4 kW 0.75 kW 1.1 kW 1.5 kW 2.2 kW 3.0 kW 3.7 kW 4.0 kW 5.5 kW 7.5 kW 11.0 kW 15.0 kW 18.5 kW 22.0 kW 30.0 kW	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
dr.15	Torque boost	**44367**	**0h110F**	Manual Auto1 Auto2	0 1 2
dr.16	Start torque in forward direction	**44368**	**0h1110**	0.0 to 15.0%	0 to 150
dr.17	Start torque in reverse direction.	**44369**	**0h1111**	0.0 to 15.0%	0 to 150
dr.18	Motor frequency	**44370**	**0h1112**	30.00 to 400.00Hz	3000 to 40000
dr.19	Start frequency	**44371**	**0h1113**	0.01 to 10.00Hz	1 to 1000
dr.20	Max speed limit	**44372**	**0h1114**	40.00 to 400.00Hz	4000 to 40000
dr.21	Hz/Rpm Display	**44373**	**0h1115**	Hz Rpm	0 1

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
dr.80	Select ranges at power input	**44432**	**0h1150**	Run Freq. Accel. Time Decel. Time Cmd Source Ref. Source MultiStep 1 MultiStep 2 MultiStep 3 Oupt. Curr. Motor RPM DC Voltage User Sel. 1 Out of Order Sel. Run Dir. Oupt. Curr. 2 Motor2 RPM DC Voltage2 User Sel. 2	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
dr.81	Select monitor code	**44433**	**0h1151**	Volt V Pow kW Tq kgf	0 1 2
dr.89	Display changed parameters	**40995**	**0h3E3**	All Chang	0 1
dr.90	ESC key function	**44442**	**0h115A**	Mov. In. Pos. JOG Key Local/Rem.	0 1 2
dr.91	Eloader function	**44443**	**0h115B**	None Download Upload	0 1 2
dr.93	Parameter initialization	**44445**	**0h115D**	No All dr bA Ad Cn In OU CM AP Pr M2 run	0 1 2 3 4 5 6 7 8 9 12 13 16

<table>
<tr><th>Screen</th><th>Description</th><th>Modbus Decimal</th><th>Address Hexadecimal</th><th>Range</th><th>Modbus Range</th></tr>
<tr><td>dr.94</td><td>Register password</td><td>44446</td><td>0h115E</td><td>0 to 9999</td><td>0 to 9999</td></tr>
<tr><td>dr.95</td><td>Lock password</td><td>44447</td><td>0h115F</td><td>0 to 9999</td><td>0 to 9999</td></tr>
<tr><td>dr.97</td><td>Software version</td><td>44449</td><td>0h1161</td><td>0 to 9999</td><td>0 to 9999</td></tr>
<tr><td>dr.98</td><td>IO Software version</td><td>44450</td><td>0h1162</td><td>0 to 65535</td><td>0 to 65535</td></tr>
<tr><td>dr.99</td><td>Hardware version</td><td>44451</td><td>0h1163</td><td>0 to 65535</td><td>0 to 65535</td></tr>
<tr><td>bA.1</td><td>Alt Speed Ref</td><td>44609</td><td>0h1201</td><td>None
V1
V2
I2
Pulse</td><td>0
1
3
4
6</td></tr>
<tr><td>bA.2</td><td>Aux Calc Type</td><td>44610</td><td>0h1202</td><td>M+(G*A)
Mx (G*A)
M/(G*A)
M+[M*(G*A)]
M+G*2(A-50%)
Mx[G*2(A-50%)
M/[G*2(A-50%)]
M+M*G*2(A-50%)</td><td>0
1
2
3
4
5
6
7</td></tr>
<tr><td>bA.3</td><td>Aux. Ref. Gain</td><td>44611</td><td>0h1203</td><td>-200.0 to 200.0</td><td>-2000 to 2000</td></tr>
<tr><td>bA.4</td><td>Alt Ctrl Mode</td><td>44612</td><td>0h1204</td><td>LOCAL
REMOTE
REMOTE2
MODBUS
COMMS
PLC</td><td>0
1
3
4
5
6</td></tr>
<tr><td>bA.5</td><td>Alt Speed Ref</td><td>44613</td><td>0h1205</td><td rowspan="2">LOCAL
V1
V2
I2
MDBUS
COMMS
PLC
PULSE</td><td rowspan="2">0
2
3
4
6
8
9
12</td></tr>
<tr><td>bA.6</td><td>Torque Ref2</td><td>44614</td><td>0h1206</td></tr>
<tr><td>bA.7</td><td>V/F Pattern</td><td>44615</td><td>0h1207</td><td>Linear
Square
V/F Us
Square2</td><td>0
1
2
3</td></tr>
<tr><td>bA.8</td><td>Ramp T Mode</td><td>44616</td><td>0h1208</td><td>MaxFreq
DeltaFreq</td><td>0
1</td></tr>
</table>

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
bA.9	Time scale	**44617**	**0h1209**	0.01s 0.1s 1s	0 1 2
bA.10	Input Frequency	**44618**	**0h120A**	60Hz 50Hz	0 1
bA.11	POLE Number	**44619**	**0h120B**	2 to 48	2 to 48
bA.12	Rated Slip	**44620**	**0h120C**	0 to 3000rpm	0 to 3000
bA.13	Motor Current	**44621**	**0h120D**	1.0 to 1000.0A	10 to 10000
bA.14	No load Current	**44622**	**0h120E**	0.5 to 200.0A	5 to 2000
bA.15	Motor Voltage	**44623**	**0h120F**	170 to 480V	170 to 480
bA.16	Efficiency	**44624**	**0h1210**	64 to 100%	64 to 100
bA.17	Inertia Rate	**44625**	**0h1211**	0 to 8	0 to 8
bA.18	Trim Power %	**44626**	**0h1212**	70 to 130%	70 to 130
bA.19	AC Input Volt	**44627**	**0h1213**	170 to 230V 320 to 480V	170 to 230 320 to 480
bA.20	Auto tuning	**44628**	**0h1214**	None All Allst Rs+Lsig Tr All PM	0 1 2 3 6 7
bA.21	Stator Resistor	**44629**	**0h1215**	Depend on motor settings	0 to 9999
bA.22	Leak Inductor	**44630**	**0h1216**		0 to 9999
bA.23	Stator Inductor	**44631**	**0h1217**		0 to 9999
bA.24	Rotor Time Const	**44632**	**0h1218**	25 to 5000ms	25 to 5000
bA.25	Stator Ind. Sca.	**44633**	**0h1219**	50 to 150%	50 to 150
bA.26	Rotor Ti Co Sca.	**44634**	**0h121A**	50 to 150%	50 to 150
bA.31	Regen. Ind. Scl.	**44639**	**0h121F**	70 to 100%	70 to 100
bA.32	Q-axis inductance scale	**44640**	**0h1220**	50 to 100%	50–100

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
bA.34	Auto tuning level for Ld and Lq	**44641**	**0h1221**	20.0–50.0%	20.0–50.0
bA.35	Auto tuning frequency for Ld and Lq	**44642**	**0h1222**	80.0–150.0%	80.0–150.0
bA.41	User Frequency 1	**44649**	**0h1229**	0.00 to dr.20	0.00 to dr.20
bA.42	User Voltage 1	**44650**	**0h122A**	0 to 100%	0 to 100
bA.43	User Frequency 2	**44651**	**0h122B**	0.00 to dr.20	0.00 to dr.20
bA.44	User Voltage 2	**44652**	**0h122C**	0 to 100%	0 to 100
bA.45	User Frequency 3	**44653**	**0h122D**	0.00 to dr.20	0.00 to dr.20
bA.46	User Voltage 3	**44654**	**0h122E**	0 to 100%	0 to 100
bA.47	User Frequency 4	**44655**	**0h122F**	0.00 to dr.20	0.00 to dr.20
bA.48	User Voltage 4	**44656**	**0h1230**	0 to 100%	0 to 100
St1	Multi-Reference1	**44658**	**0h1232**	0.00 to dr.20	0.00 to dr.20
St2	Multi-Reference2	**44659**	**0h1233**		
St3	Multi-Reference3	**44660**	**0h1234**		
bA.53	Multi-Reference4	**44661**	**0h1235**		
bA.54	Multi-Reference5	**44662**	**0h1236**		
St3	Multi-Reference6	**44663**	**0h1237**		
bA.56	Multi-Reference7	**44664**	**0h1238**		
bA.70	Acc Ramp 2	**44678**	**0h1246**	0.0 to 600.0s	0 to 6000
bA.71	Decel Ramp 2	**44679**	**0h1247**		
bA.72	Acc Ramp 3	**44680**	**0h1248**		
bA.73	Decel Ramp 3	**44681**	**0h1249**		
bA.74	Acc Ramp 4	**44682**	**0h124A**		
bA.75	Decel Ramp 4	**44683**	**0h124B**		
bA.76	Acc Ramp 5	**44684**	**0h124C**		
bA.77	Decel Ramp 5	**44685**	**0h124D**		
bA.78	Acc Ramp 6	**44686**	**0h124E**		
bA.79	Decel Ramp 6	**44687**	**0h124F**		
bA.80	Acc Ramp 7	**44688**	**0h1250**		
bA.81	Decel Ramp 7	**44689**	**0h1251**		
bA.82	Acc Ramp 8	**44690**	**0h1252**		
bA.83	Decel Ramp 8	**44691**	**0h1253**		
Ad.1	Acceleration pattern	**44865**	**0h1301**	Linear S-curve	0 1
Ad.2	Deceleration pattern	**44866**	**0h1302**		
Ad.3	S curve start acceleration slope	**44867**	**0h1303**	1 to 100%	1 to 100

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Ad.4	S curve stop acceleration slope	**44868**	**0h1304**	1 to 100%	1 to 100
Ad.5	S curve start deceleration slope	**44869**	**0h1305**	1 to 100%	1 to 100
Ad.6	S curve stop deceleration slope	**44870**	**0h1306**	1 to 100%	1 to 100
Ad.7	Motor start mode	**44871**	**0h1307**	RAMP DCSTART	0 1
Ad.8	Stop mode	**44872**	**0h1308**	RAMP DC BRAKE SPIN POW BRKE	0 1 2 4
Ad.9	Allow speed inversion	**44873**	**0h1309**	None FWDPrev REVPrev	0 1 2
Ad.10	Power-on Run	**44874**	**0h130A**	N Y	0 1
Ad.12	Time to DC Start	**44876**	**0h130C**	0.00 to 60.00s	0 to 6000
Ad.13	Current injection DC start	**44877**	**0h130D**	0 to 200%	0 to 200
Ad.14	Pre-DC Brake Time	**44878**	**0h130E**	0.00 to 60.00s	0 to 6000
Ad.15	DC brake Time	**44879**	**0h130F**	0.00 to 60.00s	0 to 6000
Ad.16	Current level DC brake	**44880**	**0h1310**	0 to 200%	0 to 200
Ad.17	Frequency start DC brake	**44881**	**0h1311**	dr.19 to 60.00	dr.19 to 6000
Ad.20	Acceleration dwell frequency	**44884**	**0h1314**	dr.19 to dr.20	dr.19 to dr.20
Ad.21	Acceleration dwell time	**44885**	**0h1315**	0.0 to 60.0	0 to 600
Ad.22	Deceleration dwell frequency	**44886**	**0h1316**	dr.19 to dr.20	dr.19 to dr.20
Ad.23	Deceleration dwell time	**44887**	**0h1317**	0.0 to 60.0S	0 to 600
Ad.24	Use frequency limit	**44888**	**0h1318**	N S	0 1
Ad.25	Frequency lower limit	**44889**	**0h1319**	0.00 to Ad.26	0 to Ad.26

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Ad.26	Frequency higher limit	**44890**	**0h131A**	Ad.25 to dr.20	Ad.25 to dr.20
Ad.27	Jump frequency activation	**44891**	**0h131B**	NO SI	0 1
Ad.28	Lower limit jump freq. 1	**44892**	**0h131C**	0.00 to dr.29	0 to dr.29
Ad.29	Upper limit jump freq. 1	**44893**	**0h131D**	Ad.28 to dr.20	Ad.28 to dr.20
Ad.30	Lower limit jump freq. 2	**44894**	**0h131E**	0.00 to dr.31	0 to dr.31
Ad.31	Upper limit jump freq. 2	**44895**	**0h131F**	Ad.30 to dr.20	Ad.30 to dr.20
Ad.32	Lower limit jump freq. 3	**44896**	**0h1320**	0.00 to dr.33	0 to dr.33
Ad.33	Upper limit jump freq. 3	**44897**	**0h1321**	Ad.32 to dr.20	Ad.32 to dr.20
Ad.41	Open brake current	**44905**	**0h1329**	0.0 to 180.0%	0 to 1800
Ad.42	Delay before brake opening	**44906**	**0h132A**	0.00 to 10.00s	0 to 1000
Ad.44	Brake opening forward freq.	**44908**	**0h132C**	0.00 to dr.20	0 to dr.20
Ad.45	Brake opening reverse freq.	**44909**	**0h132D**	0.00 to dr.20	0 to dr.20
Ad.46	Delay before brake closing	**44910**	**0h132E**	0.00 to 10.00s	0 to 1000
Ad.47	Brake closing frequency	**44911**	**0h132F**	0.00 to dr.20	0 to dr.20
Ad.50	Minimum flux mode	**44914**	**0h1332**	NONE MANU AUTO	0 1 2
Ad.51	Min. flux level in manual mode	**44915**	**0h1333**	0 to 30%	0 to 30
Ad.60	Acceleration dwell frequency	**44924**	**0h133C**	0.00 to dr.20	0 to dr.20
Ad.64	Fan operating mode	**44928**	**0h1340**	DuringRun Always ON Temp Ctrl	0 1 2

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Ad.65	Save motorized potentiometer frequency	**44929**	**0h1341**	N Y	0 1
Ad.66	Select comparator source	**44930**	**0h1342**	None V1 V2 I2 Pulse	0 1 3 4 6
Ad.67	Output activation level comparator mode	**44931**	**0h1343**	Ad.68 a 100.00	Ad.68 a 10000
Ad.68	Output deactivation level comparator mode	**44932**	**0h1344**	-100.00 a Ad.67	-10000 a Ad.67
Ad.70	Safe operation selection	**44934**	**0h1346**	Always Enable DI Dependent	0 1
Ad.71	Safe operation stop	**44935**	**0h1347**	Free-Run Q-Stop Q-Stop Res	0 1 2
Ad.72	Q-Stop Time	**44936**	**0h1348**	0.0 to 600.0s	0 to 6000
Ad.74	Enable regeneration prevention	**44938**	**0h134A**	NO YES	0 1
Ad.75	Regeneration prevention level	**44939**	**0h134B**	300 to 400V 600 to 800V	300 to 400 600 to 800
Ad.76	Compare frequency limit	**44940**	**0h134C**	0.00 to 10.00Hz	0 to 1000
Ad.77	P gain regeneration prevention	**44941**	**0h134D**	0.0 to 100.0%	0 to 1000
Ad.78	I gain regeneration prevention	**44942**	**0h134E**	0.0 to 3000.0ms	0 to 30000
Ad.80	Fire mode selection	**44944**	**0h1350**	None Fire Mode Fire Mode Test	0 1 2
Ad.81	Fire mode frequency	**44945**	**0h1351**	0.00 to 60.00Hz	0 to 6000
Ad.82	Fire mode direction	**44946**	**0h1352**	Forward Reverse	0 1
Cn.4	Modulation frequency	**45124**	**0h1404**	0.7 to 15.0	7 to 150
Cn.5	Modulation mode	**45125**	**0h1405**	Normal PWM LowLeakage PWM	0 1
Cn.9	Pre-excitation time	**45129**	**0h1409**	0.00 to 60.00s	0 to 6000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Cn.10	Pre-excitation time	**45130**	**0h140A**	100.0 to 500.0%	1000 to 5000
Cn.11	Power off delay	**45131**	**0h140B**	0.00 to 60.00s	0 to 6000
Cn.12	PM speed controller P gain 1	**45133**	**0h140D**	0–5000	0–5000
Cn.13	PM speed controller I gain 1	**45135**	**0h140F**	0–5000	0–5000
Cn.15	PM speed controller P gain 2	**45136**	**0h1410**	0–5000	0–5000
Cn.16	PM speed controller I gain 2	**45136**	**0h1410**	0–9999	0–9999
Cn.20	Sensorless control gain 2	**45140**	**0h1414**	NO YES	0 1
Cn.21	ASR proportional gain 1	**45141**	**0h1415**	0 to 5000%	0 to 5000
Cn.22	ASR integral time 1	**45142**	**0h1416**	10 to 9999ms	10 to 9999
Cn.23	Independent controller prop. gain 2	**45143**	**0h1417**	1.0 to 1000.0%	10 to 10000
Cn.24	Indep. controller integral gain 2	**45144**	**0h1418**	1.0 to 1000.0%	10 to 10000
Cn.25	Integral time sensorless contr.	**45145**	**0h1419**	10 to 999ms	10 to 9999
Cn.26	Flux estimator proportional gain	**45146**	**0h141A**	1 to 200%	1 to 200
Cn.27	Flux estimator integral gain	**45147**	**0h141B**	1 to 200%	1 to 200
Cn.28	Speed estimator prop. gain 1	**45148**	**0h141C**	0 to 32767	0 to 32767
Cn.29	Speed estimator integral gain 1	**45149**	**0h141D**	100 to 1000	100 to 1000
Cn.30	Speed estimator integral gain 2	**45150**	**0h141E**	100 to 10000	100 to 10000
Cn.31	Sensorless cont. prop. gain	**45151**	**0h141F**	10 to 1000	10 to 1000
Cn.32	Sensorless cont. integral gain	**45152**	**0h1420**	10 to 1000	10 to 1000
Cn.33	PM D-axis back-EMF estimated gain (%)	**45153**	**0h1421**	0–300.0%	0–300.0

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Cn.34	PM Q-axis back-EMF estimated gain (%)	**45154**	**0h1422**	0–300.0%	0–300.0
Cn.35	Initial pole position estimation retry	**45155**	**0h1423**	0–10	0–10
Cn.36	Initial pole position estimation interval	**45156**	**0h1424**	1–100ms	1–100
Cn.37	Initial pole position estimation pulse current (%)	**45157**	**0h1425**	10–100%	10–100
Cn.38	Initial pole position estimation pulse voltage (%)	**45158**	**0h1426**	100–4000	100–4000
Cn.39	PM dead-time range (%)	**45159**	**0h1427**	50.0–200.0%	50.0–200.0
Cn.40	PM dead-time voltage (%)	**45160**	**0h1428**	50.0–200.0%	50.0–200.0
Cn.41	PM speed estimator proportional gain	**45161**	**0h1429**	0–32000	0–32000
Cn.42	PM speed estimator integral gain	**45168**	**0h1430**	0–32000	0–32000
Cn.43	PM speed estimator proportional gain 2	**45169**	**0h1431**	0–32000	0–32000
Cn.44	PM speed estimator integral gain 2	**45170**	**0h1432**	0–32000	0–32000
Cn.45	Speed estimator feedforward high speed range (%)	**45171**	**0h1433**	0–1000%	0–1000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Cn.46	Initial pole position estimation type	**45172**	**0h1434**	0–2	0–2
Cn.48	Controller P gain	**45168**	**0h1430**	10 to 10000	10 to 10000
Cn.49	Controller I gain	**45169**	**0h1431**	10 to 10000	10 to 10000
Cn.50	Voltage controller limit	**45170**	**0h1432**	0–1000%	0–1000
Cn.51	Voltage controller I gain	**45171**	**0h1433**	0–20000%	0–20000
Cn.52	Output filter vector	**45172**	**0h1434**	0 to 2000ms	0 to 2000
Cn.53	Torque limit reference	**45173**	**0h1435**	LOCAL V1 V2 I2 MDBUS COMMS PLC Pulse	0 2 4 5 6 8 9 12
Cn.54	Forward positive torque limit	**45174**	**0h1436**	0.0 to 200.0%	0 to 2000
Cn.55	Forward negative torque limit	**45175**	**0h1437**	0.0 to 200.0%	0 to 2000
Cn.56	Reverse positive torque limit	**45176**	**0h1438**	0.0 to 200.0%	0 to 2000
Cn.57	Reverse negative torque limit	**45177**	**0h1439**	0.0 to 200.0%	0 to 2000
Cn.62	Speed limit reference	**45182**	**0h143E**	LOCAL V1 V2 I2 MDBUS COMMS PLC	0 2 4 5 6 7 8
Cn.63	Forward speed limit	**45183**	**0h143F**	0.00 to 400.00Hz	0 to 40000
Cn.64	Reverse speed limit	**45184**	**0h1440**	0.00 to 400.00Hz	0 to 40000
Cn.65	Speed limit gain	**45185**	**0h1441**	100 to 5000%	100 to 5000
Cn.70	Speed search mode selection	**45190**	**0h1446**	Flying Start1 Flying Start2	0 1
Cn.71	Search mode	**45191**	**0h1447**	00 to 15	0 to 15

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Cn.72	Speed search mode current	**45192**	**0h1448**	80 to 200%	80 to 200
Cn.73	Speed search mode prop. gain	**45193**	**0h1449**	0 to 9999	0 to 9999
Cn.74	Speed search integral gain	**45194**	**0h144A**	0 to 9999	0 to 9999
Cn.75	Speed search delay	**45195**	**0h144B**	0.0 to 60.0s	0 to 600
Cn.76	Speed estimator gain	**45196**	**0h144C**	50 to 150%	50 to 150
Cn.77	KEB Select	**45197**	**0h144D**	No KEB1 KEB2	0 1 2
Cn.78	Initial value for KEB operation	**45198**	**0h144E**	110.0 to 200.0%	1100 to 2000
Cn.79	Value to stop KEB operation	**45199**	**0h144F**	Cn.78 to 210.0%	Cn.78 to 2100
Cn.80	KEB proportional gain	**45200**	**0h1450**	1 to 20000	1 to 20000
Cn.81	KEB integral gain	**45201**	**0h1451**	1 to 20000	1 to 20000
Cn.82	Energy buffering slip gain	**45202**	**0h1452**	0 to 2000.0%	0 to 20000
Cn.83	Energy buffering acceleration time	**45203**	**0h1453**	0.0 to 600.0 s	0 to 6000
Cn.85	Flux proportional gain 1	**45205**	**0h1455**	100 to 700	100 to 700
Cn.86	Flux proportional gain 2	**45206**	**0h1456**	0 to 100	0 to 100
Cn.87	Flux proportional gain 3	**45207**	**0h1457**	0 to 500	0 to 500
Cn.88	Flux integral gain 1	**45208**	**0h1458**	0 to 200	0 to 200
Cn.89	Flux integral gain 2	**45209**	**0h1459**	0 to 200	0 to 200
Cn.90	Flux integral gain 3	**45210**	**0h145A**	0 to 200	0 to 200
Cn.91	SL voltage compensation 1	**45211**	**0h145B**	0 to 60	0 to 60

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Cn.92	SL voltage compensation 2	**45212**	**0h145C**	0 to 60	0 to 60
Cn.93	SL voltage compensation 3	**45213**	**0h145D**	0 to 60	0 to 60
Cn.94	SL fluctuation frequency	**45214**	**0h145E**	80.0 to 110.0%	800 to 1100
Cn.95	SL switching frequency	**45215**	**0h145F**	0.00 to 8.00Hz	0 to 800
In.1	Analog input max. freq	**45377**	**0h1501**	dr.19 to dr.20	dr.19 to dr.20
In.2	Analog input max. torque	**45378**	**0h1502**	0.0 to 200.0	0 to 2000
In.5	V1 Monitor	**45381**	**0h1505**	0.00 to 12.00%	0 to 1200
In.6	V1 polarity	**45382**	**0h1506**	0-10V -/+10V	0 1
In.7	V1 filter	**45383**	**0h1507**	0 to 10000ms	0 to 10000
In.8	V1 minimum voltage	**45384**	**0h1508**	0.00 to 10.00V	0 to 1000
In.9	V1 minimum reference	**45385**	**0h1509**	0.00 to 100.00%	0 to 10000
In.10	V1 maximum voltage	**45386**	**0h150A**	0.00 to 10.00V	0 to 1000
In.11	V1 maximum reference	**45387**	**0h150B**	0.00 to 100.00%	0 to 10000
In.12	V1 minimum negative voltage	**45388**	**0h150C**	-10.00 to 0.00V	-1000 to 0
In.13	V1 minimum negative reference	**45389**	**0h150D**	-100.00 to 0.00%	-10000 to 0
In.14	V1 maximum negative voltage	**45390**	**0h150E**	-10.00 to 0.00V	-1000 to 0
In.15	V1 maximum neg. reference	**45391**	**0h150F**	-100.00 to 0.00%	-10000 to 0
In.16	V1 Inverting	**45392**	**0h1510**	NO YES	0 1
In.17	Adjust V1 quantification	**45393**	**0h1511**	0.04 to 10.00%	4 to 1000
In.35	V2 Monitor	**45411**	**0h1523**	0.00 to 12.00V	0 to 1200

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
In.37	V2 filter	**45413**	**0h1525**	0 to 10000ms	0 to 10000
In.38	V2 minimum voltage	**45414**	**0h1526**	0.00 to 10.00V	0 to 1000
In.39	V2 minimum reference	**45415**	**0h1527**	0.00 to 100.00%	0 to 10000
In.40	V2 maximum voltage	**45416**	**0h1528**	0.00 to 10.00V	0 to 1000
In.41	V2 maximum reference	**45417**	**0h1529**	0.00 to 100.00%	0 to 10000
In.46	V2 Inverting	**45422**	**0h152E**	NO YES	0 1
In.47	Adjust I2 visualization	**45423**	**0h152F**	0.04 to 10.00%	4 to 1000
In.50	I2 Monitor	**45426**	**0h1532**	0.00 to 24.00mA	0 to 2500
In.52	I2 filter	**45428**	**0h1534**	0 to 10000ms	0 to 10000
In.53	I2 minimum current	**45429**	**0h1535**	0.00 to 20.00mA	0 to 2000
In.54	I2 minimum reference	**45430**	**0h1536**	0.00 to 100.00%	0 to 10000
In.55	I2 maximum current	**45431**	**0h1537**	0.00 to 24.00mA	0 to 1000
In.56	I2 maximum reference	**45432**	**0h1538**	0.00 to 100.00	0 to 10000
In.61	I2 Inverting	**45437**	**0h153D**	N Y	0 1
In.62	Adjust I2 visualization	**45438**	**0h153E**	0.04 to 10.00%	4 to 1000
In.65	Digital input 1	**45441**	**0h1541**	None START(+) START(-) RESET EXT TRIP DIS START INCH 1 SPEED-L SPEED-M SPEED-H XCEL-L XCEL-M RUN Enable 3-WIRE CTR/REF 2 Exchange UP DOWN RESERVED POT CLEAR	0 1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17 18 19 20
In.66	Digital input 2	**45442**	**0h1542**		
In.67	Digital input 3	**45443**	**0h1543**		
In.68	Digital input 4	**45444**	**0h1544**		
In.69	Digital input 5	**45445**	**0h1545**		

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
In.70	Digital input 6	**45446**	**0h1546**	AnalogHLD PIDOPLoop P Gain 2 XCEL Stop 2nd Motor Pre-Excit Timer IN disAuxRef. INCH(+) INCH(-) XCEL-H PLC Fire Mode KEB1 Sel TI	21 22 24 25 26 34 38 40 46 47 49 50 51 52 54
In.71	Digital input 7	**45447**	**0h1547**		
In.85	Digital input activation delay	**45461**	**0h1555**	0 to 10000ms	0 to 10000
In.86	Digital input deactivation delay	**45462**	**0h1556**	0 to 10000ms	0 to 10000
In.87	Digital input contact type	**45463**	**0h1557**	0: Contact normally open (NO) 1: Contact normally closed (NC)	0000 to 1111
In.89	Di Scan Time	**45465**	**0h1559**	1 to 5000ms	1 to 5000
In.90	Digital inputs status	**45466**	**0h155A**	0: Disabled 1: Enabled	0000 to 1111
In.91	TI Monitor	**45467**	**0h155B**	0.00 to 50.00kHz	0 to 5000
In.92	TI Filter	**45468**	**0h155C**	0 to 9999	0 to 9999
In.93	TI minimum input freq	**45469**	**0h155D**	0.00 to 32.00kHz	0 to 3200
In.94	TI minimum input frequency percentage	**45470**	**0h155E**	0.00 to 100.00%	0 to 10000
In.95	TI maximum input frequency	**45471**	**0h155F**	0.00 to 32.00kHz	0 to 3200
In.96	TI maximum input frequency percentage	**45472**	**0h1560**	0.00 to 100.00%	0 to 10000
In.97	TI Inverting	**45473**	**0h1561**	NO YES	0 1
In.98	TI noise reduction level	**45474**	**0h1562**	0.04 to 10.00%	4 to 1000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
In.99	Input mode setting	**45475**	**0h1563**	V2, NPN V2, PNP I2, NPN I2, PNP	00 01 10 11
OU.1	Analog output 1 mode selection	**45633**	**0h1601**	Frequency O/pCurr O/pVolt DCLinkV Torque O/pPower Idse Iqse TargetFq RampFreq Speed Fdb PIDRefVal PIDFdbVal PIDO/p Constant	0 1 2 3 4 5 6 7 8 9 10 12 13 14 15
OU.2	Analog output 1 gain	**45634**	**0h1602**	-1000.0 to 1000.0%	-10000 to 10000
OU.3	Analog output 1 offset	**45635**	**0h1603**	-100.0 to 100.0%	-1000 to 1000
OU.4	Analog output 1 filter	**45636**	**0h1604**	0 to 10000ms	0 to 10000
OU.5	Analog output 1 constant	**45637**	**0h1605**	0.0 to 100.0%	0 to 1000
OU.6	Analog output 1 monitor	**45638**	**0h1606**	0.0 to 1000.0%	0 to 10000
OU.30	Relay fault output	**45662**	**0h161E**	Low voltage Other than low voltage Automatic restart	001 010 100

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
OU.31	Relay 1 control source	**45663**	**0h161F**	None FDT-1 FDT-2 FDT-3 FDT-4 OverLoad IOL UndrLoad VentWarn Stall OverVolt LowVolt OverHeat Lost Command Run Stop Steady Inv. Line Comm Line Spd Srch Ready Timer Out Trip DBWarn%ED COMPARAT BRCtrl CAP Exch. FAN Exch. Fire Mode TO KEB Op.	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 22 28 29 31 34 35 36 37 38 39 40
OU.33	Digital output 1 function	**45665**	**0h1621**		
OU.41	Digital outputs status	**45673**	**0h1629**	00 to 11	0 to 3
OU.50	Digital output connection delay	**45682**	**0h1632**	0.00 to 100.00s	0 to 10000
OU.51	Digital output disconnection delay	**45683**	**0h1633**	0.00 to 100.00s	0 to 10000
OU.52	NC/NO Relays logic	**45684**	**0h1634**	0: Contact normally open(NO) 1: Contact normally closed (NC)	00 a 11

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
OU.53	Digital output connection delay on fault	**45685**	**0h1635**	0.00 to 100.00s	0 to 10000
OU.54	Digital output disconnection delay on fault	**45686**	**0h1636**	0.00 to 100.00s	0 to 10000
OU.55	Digital output connection delay	**45687**	**0h1637**	0.00 to 100.00s	0 to 10000
OU.56	Digital output disconnection delay	**45688**	**0h1638**	0.00 to 100.00s	0 to 10000
OU.57	Relay FDT level	**45689**	**0h1639**	0.00 to dr.20	0 to dr.20
OU.58	Relay FDT band	**45690**	**0h163A**	0.00 to dr.20	0 to dr.20
OU.61	Pulse output mode	**45693**	**0h163D**	Frequency O/pCurr O/pVolt DCLinkV Torque O/pPower Idse Iqse TargetFq RampFreq Speed Fdb PIDRefVal PIDFdbVal PIDO/p Constant	0 1 2 3 4 5 6 7 8 9 10 12 13 14 15
OU.62	Pulse output gain	**45694**	**0h163E**	-1000.0 to 1000.0%	-10000 to 10000
OU.63	Pulse output offset	**45695**	**0h163F**	-100.0 to 100.0%	-1000 to 1000
OU.64	Pulse output filter	**45696**	**0h1640**	0 to 10000ms	0 to 10000
OU.65	Pulse output constant setting	**45697**	**0h1641**	0.0 to 100.0%	0 to 1000
OU.66	Pulse output monitor	**45698**	**0h1642**	0.0 to 1000.0%	0 to 10000
CM.1	Slave address	**45889**	**0h1701**	1 to 250	1 to 250
CM.2	RS-485 communication protocol	**45890**	**0h1702**	Modbus PE BUS 485	0 1

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
CM.3	Baud Rate	**45891**	**0h1703**	1200 bps 2400 bps 4800 bps 9600 bps 19200 bps 38400 bps 56 Kbps 115 Kbps	0 1 2 3 4 5 6 7
CM.4	Communication frame structure	**45892**	**0h1704**	D8/PN/S1 D8/PN/S2 D8/PE/S1 D8/PO/S1	0 1 2 3
CM.5	Response delay	**45893**	**0h1705**	0 to 100.0 ms	0 to 1000
CM.6	Communication option S/W version	**-**	**0h1706**	-	-
CM.7	Communication option ID	**-**	**0h1707**	0 to 255	0 to 255
CM.8	Card baud rate	**-**	**0h1708**	-	-
CM.9	Comm. option LED status	**-**	**0h1709**	-	-
CM.30	Output parameters number	**-**	**0h171E**	0 to 8	0 to 8
CM.31	Output communication addresses 1 to 8	**-**	**0h171F**	0000 to FFFF	0000 to FFFF
CM.32		**-**	**0h1720**		
CM.33		**-**	**0h1721**		
CM.34		**-**	**0h1722**		
CM.35		**-**	**0h1723**		
CM.36		**-**	**0h1724**		
CM.37		**-**	**0h1725**		
CM.38		**-**	**0h1726**		
CM.50	Number of input parameters	**-**	**0h1732**	0 to 8	0 to 8
CM.51	Input communication addresses 1 to 8	**-**	**0h1733**	0000 to FFFF	0000 to FFFF
CM.52		**-**	**0h1734**		
CM.53		**-**	**0h1735**		
CM.54		**-**	**0h1736**		
CM.55		**-**	**0h1737**		
CM.56		**-**	**0h1738**		
CM.57		**-**	**0h1739**		

<table>
<tr><th>Screen</th><th>Description</th><th>Modbus Decimal</th><th>Address Hexadecimal</th><th>Range</th><th>Modbus Range</th></tr>
<tr><td>CM.58</td><td></td><td>-</td><td>0h173A</td><td></td><td></td></tr>
<tr><td>CM.68</td><td>Field bus data swap</td><td>-</td><td>0h1744</td><td>NO
YES</td><td>0
1</td></tr>
<tr><td>CM.70</td><td rowspan="8">Communication multifunction input 1 to 7</td><td>-</td><td>0h1746</td><td rowspan="8">None
START(+)
START(-)
RESET
EXTTRIP
DISSTART
INCH1
SPEED-L
SPEED-M
SPEED-H
XCEL-L
XCEL-M
RUNEnable
3-WIRE
CTR/REF2
Exchange
UP
DOWN
POTCLEAR
AnalogHLD
I-Term Clear
PIDOPLoop
PGain2
XCELStop
2ndMotor
Pre-Excit
TimerIN
disAuxRef.
INCH(+)
INCH(-)
XCEL-H
PLC
FireMode
KEB1Sel
TI</td><td rowspan="8">0
1
2
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4
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7
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9
11
12
13
14
15
16
17
18
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21
22
23
24
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46
47
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51
52
54</td></tr>
<tr><td>CM.71</td><td>-</td><td>0h1747</td></tr>
<tr><td>CM.72</td><td>-</td><td>0h1748</td></tr>
<tr><td>CM.73</td><td>-</td><td>0h1749</td></tr>
<tr><td>CM.74</td><td>-</td><td>0h174A</td></tr>
<tr><td>CM.75</td><td>-</td><td>0h174B</td></tr>
<tr><td>CM.76</td><td>-</td><td>0h174C</td></tr>
<tr><td>CM.77</td><td>-</td><td>0h174D</td></tr>
<tr><td>CM.86</td><td>Communication multifunction input monitor</td><td>-</td><td>0h1756</td><td>-</td><td>-</td></tr>
</table>

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
CM.90	Data frame comm. monitor	-	**0h175A**	PE BUS 485 Rem. display	0 1
CM.91	Received data frames counter	-	**0h175B**	0 to 65535	0 to 65535
CM.92	Frames with error counter	-	**0h175C**	0 to 65535	0 to 65535
CM.93	NAK frames counter	-	**0h175D**	0 to 65535	0 to 65535
CM.94	Communications update	-	-	NO YES	0 1
CM.95	P2P communication selection	-	**0h1760**	Disable All P2P Master P2P Slave M-KPD Ready	0 1 2 3
CM.96	Digital output selection	-	-	Analog output Multi-function relay Multi-function output	001 010 100
AP.1	Application function selection	**46145**	**0h1801**	None Proc PID	0 2
AP.2	Enable PLC mode	-	-	N Y	0 1
AP.16	PID output	**46160**	**0h1810**	-327.68 to 327.68%	32768 to 32768
AP.17	PID reference	**46161**	**0h1811**	-327.68 to 327.68%	32768 to 32768
AP.18	PID feedback	**46162**	**0h1812**	-327.68 to 327.68%	32768 to 32768
AP.19	PID local	**46163**	**0h1813**	-100.00 to 100.00%	10000 to 10000
AP.20	Select PID regulator source	**46164**	**0h1814**	MREF V1 V2 I2 MODBUS COMMS PLC PULSE	0 1 3 4 5 7 8 11

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
AP.21	Select feedback signal source	**46165**	**0h1815**	V1 V2 I2 MODBUS COMMS PLC PULSE	0 2 3 4 6 7 10
AP.22	PID controller proportional gain	**46166**	**0h1816**	0.0 to 1000.0%	0 to 10000
AP.23	PID controller integration time	**46167**	**0h1817**	0 to 200.0s	0 to 2000
AP.24	PID controller differential time	**46168**	**0h1818**	0.0 to 10000ms	0 to 10000
AP.25	PID output fine adjustment	**46169**	**0h1819**	0.0 to 1000.0%	0 to 10000
AP.26	Proportional gain scale	**46170**	**0h181A**	0.0 to 100.0%	0 to 1000
AP.27	PID Filter	**46171**	**0h181B**	0 to 10000ms	0 to 10000
AP.28	PID Mode	**46172**	**0h181C**	Process Normal	0 1
AP.29	Upper limit PID output	**46173**	**0h181D**	AP.30 to 300.00Hz	AP.30 to 30000
AP.30	Lower limit PID output	**46174**	**0h181E**	-300.00Hz to AP.29	30000 to AP.29
AP.31	Invert PID	**46175**	**0h181F**	NO YES	0 1
AP.32	PID output scale	**46176**	**0h1820**	0.1 to 1000.0%	1 to 10000
AP.34	PrePID reference	**46178**	**0h1822**	0.00 to dr.20	0 to dr.20
AP.35	PrePID end reference	**46179**	**0h1823**	0.0 to 100.0%	0 to 1000
AP.36	PrePID delay	**46180**	**0h1824**	0 to 9999s	0 to 9999
AP.37	Sleep mode activation delay	**46181**	**0h1825**	0.0 to 999.9s	0 to 9999
AP.38	Sleep mode activation speed	**46182**	**0h1826**	0.00Hz to dr.20	0 to dr.20
AP.39	Awakening level	**46183**	**0h1827**	0 to 100%	0 to 100
AP.40	PID WakeUp Mode	**46184**	**0h1828**	Below Above Beyond	0 1 2

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
AP.42	PID unit	**46186**	**0h182A**	% Bar mBar Pa kPa Hz rpm V I kW HP °C ºF	0 1 2 3 4 5 6 7 8 9 10 11 12
AP.43	PID unit gain	**46187**	**0h182B**	0.00 to 300.00%	0 to 30000
AP.44	PID scale unit	**46188**	**0h182C**	x100 x10 x 1 x 0.1 x 0.01	0 1 2 3 4
AP.45	Proportional gain	**46189**	**0h182D**	0.0 to 1000.0%	0 to 10000
Pr.4	Load duty type	**46916**	**0h1B04**	NRML HEVY	0 1
Pr.5	Phase loss type	**46917**	**0h1B05**	NONE OUTPUT INPUT ALL	0 1 2 3
Pr.6	Ripple voltage	**46918**	**0h1B06**	1 to 100V	1 to 100
Pr.7	Fault deceleration time	**46919**	**0h1B07**	0.0 to 600.0s	0 to 6000
Pr.8	Start after restart	**46920**	**0h1B08**	N Y	0 1
Pr.9	Retry attempts number	**46921**	**0h1B09**	0 to 10	0 to 10
Pr.10	Retry delay	**46922**	**0h1B0A**	0.0 to 60.0s	0 to 600

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Pr.12	Response in case of a speed reference loss	**46924**	**0h1B0C**	None Free-Run Dec Hold Input Hold Output Lost Preset	0 1 2 3 4 5
Pr.13	Lost reference delay	**46925**	**0h1B0D**	0.1 to 120.0s	0 to 1200
Pr.14	Reference for lost reference	**46926**	**0h1B0E**	(dr.19 to dr.20)	(dr.19 to dr.20)
Pr.15	AI Lost Level	**46928**	**0h1B10**	Half Below	0 1
Pr.17	Overload warning select	**46929**	**0h1B11**	NO YES	0 1
Pr.18	Overload warning level	**46930**	**0h1B12**	30 to 180%	30 to 180
Pr.19	Overload warning time	**46931**	**0h1B13**	0.0 to 30.0s	0 to 300
Pr.20	Overload trip select	**46932**	**0h1B14**	None Free-Run Dec	0 1 2
Pr.21	Overload level	**46933**	**0h1B15**	30 to 200%	30 to 200
Pr.22	Overload trip time	**46934**	**0h1B16**	0.0 to 60.0s	0 to 600
Pr.25	Enable underload	**46937**	**0h1B19**	NO YES	0 1
Pr.26	Underload warning delay	**46938**	**0h1B1A**	0.0 to 600.0s	0 to 6000
Pr.27	Underload fault mode	**46939**	**0h1B1B**	None Free-Run Dec	0 1 2
Pr.28	Underload fault delay	**46940**	**0h1B1C**	0.0 to 600.0s	0 to 6000
Pr.29	Underload minimum level	**46941**	**0h1B1D**	10 to 100%	10 to 100
Pr.30	Underload maximum level	**46942**	**0h1B1E**	10 to 100%	10 to 100
Pr.31	Action in case no motor is detected	**46943**	**0h1B1F**	None Free-Run Dec	0 1 2
Pr.32	No motor fault level	**46944**	**0h1B20**	1 to 100%	1 to 100

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Pr.33	No motor fault delay	**46945**	**0h1B21**	0.1 to 10.0s	1 to 100
Pr.40	Action in case of thermo-electronic fault	**46952**	**0h1B28**	None Free-Run Dec	0 1 2
Pr.41	Motor cooling mode at zero speed	**46953**	**0h1B29**	SELF FORCED	0 1
Pr.42	Overcurrent level during 1min	**46954**	**0h1B2A**	120 to 200%	120 to 200
Pr.43	Continuous overcurrent level	**46955**	**0h1B2B**	50 to 150%	50 to 150
Pr.45	Free run trip mode	**46957**	**0h1B2D**	FreeRun Dec	0 1
Pr.50	Stall prevention	**46962**	**0h1B32**	Accelerating At constant speed At deceleration FluxBraking	00 01 10 11
Pr.51	Speed for stall protection 1	**46963**	**0h1B33**	dr.19 to Pr.53 Hz	dr.19 to Pr.53
Pr.52	Level for stall protection 1	**46964**	**0h1B34**	30 to 250%	30 to 250
Pr.53	Speed for stall protection 2	**46965**	**0h1B35**	In.55 to Pr.55 Hz	In.55 to Pr.55
Pr.54	Level for stall protection 2	**46966**	**0h1B36**	30 to 250%	30 to 250
Pr.55	Speed for stall protection 3	**46967**	**0h1B37**	In.53 to Pr.57 Hz	In.53 to Pr.57
Pr.56	Level for stall protection 3	**46968**	**0h1B38**	30 to 250%	30 to 250
Pr.57	Speed for stall protection 4	**46969**	**0h1B39**	In.55 to dr.20 Hz	In.55 to dr.20
Pr.58	Level for stall protection 4	**46970**	**0h1B3A**	30 to 250%	30 to 250
Pr.59	Flux braking gain	**46971**	**0h1B3B**	0 to 150%	0 to 150
Pr.60	CAP diagnosis level	**46972**	**0h1B3C**	0 to 100%	0 to 100
Pr.61	Capacitor diagnosis mode	**46973**	**0h1B3D**	Nonde RefDiag PreDiag InitDiag	0 1 2 3

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
Pr.62	CAP exchange warning level	**46974**	**0h1B3E**	0.0 to 95.0%	0 to 950
Pr.63	Capacitance reference	**46975**	**0h1B3F**	0.0 to 100.0%	0 to 1000
Pr.66	Braking resistor configuration	**46978**	**0h1B42**	0 to 30%	0 to 30
Pr.73	Speed deviation fault	**46946**	**0h1B22**	N Y	0 1
Pr.74	Speed deviation band	**46947**	**0h1B23**	1 to 20	1 to 20
Pr.75	Speed deviation time	**46948**	**0h1B24**	1 to 120	1 to 120
Pr.79	Action in case of fan trip	**46991**	**0h1B4F**	Trip Warn	0 1
Pr.80	Optional card trip mode	**46992**	**0h1B50**	None Free-Run Dec	0 1 2
Pr.81	Low voltage trip delay	**46993**	**0h1B51**	0.0 to 60.0s	0 to 600
Pr.82	Enable low voltage trip	**46994**	**0h1B52**	NO YES	0 1
Pr.86	Fan use percentage	**46998**	**0h1B56**	0.0 to 100.0%	0 to 1000
Pr.87	Fan exchange warning level	**46999**	**0h1B57**	0.0 to 100.0%	0 to 1000
Pr.88	Fan time reset	**47000**	**0h1B58**	N Y	0 1
Pr.89	CAP fan status	**47001**	**0h1B59**	None CAP warning FAN warning	00 01 10
Pr.90	Warning information	**47003**	**0h1B5A**	-	-
Pr.91	Fifth fault	**47004**	**0h1B5B**	-	-
Pr.92	Fourth fault	**47005**	**0h1B5C**	-	-
Pr.93	Third fault	**46917**	**0h1B04**	-	-
Pr.94	Second fault	**46918**	**0h1B05**	-	-
Pr.95	First fault	**46919**	**0h1B06**	-	-
Pr.96	Reset fault history	**46920**	**0h1B07**	0 to 1	0 to 1
M2.4	Motor 2 acceleration ramp	**47172**	**0h1C04**	0.0 to 600.0s	0 to 6000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
M2.5	Motor 2 deceleration ramp	**47173**	**0h1C05**	0.0 to 600.0s	0 to 6000
M2.6	Motor 2 rated power	**47174**	**0h1C06**	0.2kW 0.4kW 0.75kW 1.1kW 1.5kW 2.2kW 3.0kW 3.7kW 4.0kW 5.5kW 7.5kW 11.0kW 15.0kW 18.5kW 22.0kW 30.0kW	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
M2.7	Motor 2 frequency	**47175**	**0h1C07**	30.00 to 400.00Hz	3000 to 40000
M2.8	Control type selection	**47176**	**0h1C08**	V/Hz SlipCom S-less1	0 2 4
M2.10	Poles number	**47178**	**0h1C0A**	2 4 … 48	2 4 … 48
M2.11	Rated slip	**47179**	**0h1C0B**	0 to 3000rpm	0 to 3000
M2.12	Motor nominal current	**47180**	**0h1C0C**	1.0 to 200.0A	10 to 2000
M2.13	No load current	**47181**	**0h1C0D**	0.5 to 200.0A	5 to 2000
M2.14	Motor 2 voltage	**47182**	**0h1C0E**	180 to 480V	180 to 480
M2.15	Motor 2 efficiency	**47183**	**0h1C0F**	70 to 100%	70 to 100
M2.16	Motor 2 inertia rate	**47184**	**0h1C10**	0 to 8	0 to 8
M2.17	Stator resistor	**47185**	**0h1C11**	Depend on motor setting	0 to 9999
M2.18	Leak inductor	**47186**	**0h1C12**		0 to 9999
M2.19	Stator inductor	**47187**	**0h1C13**		0 to 9999
M2.20	Rotor time constant	**47188**	**0h1C14**	25 to 5000ms	5000

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
M2.25	V/F pattern	**47193**	**0h1C19**	Linear Square V/F User Square2	0 1 2 3
M2.26	Torque in forward direction	**47194**	**0h1C1A**	0.0 to 15.0%	0 to 150
M2.27	Torque in reverse direction	**47195**	**0h1C1B**	0.0 to 15.0%	0 to 150
M2.28	Stall prevention level motor 2	**47196**	**0h1C1C**	30 to 150%	30 to 150
M2.29	Motor 2 overcurrent level 1 min	**47197**	**0h1C1D**	100 to 200%	100 to 200
M2.30	Motor 2 continuous overcurrent	**47198**	**0h1C1E**	50 to 150%	50 to 150
US.1	PLC operation mode	**47425**	**0h1D01**	Stop Run Run DI	0 1 2
US.2	PLC loop time	**47426**	**0h1D02**	0.01s 0.02s 0.05s 0.1s 0.5s 1s	0 1 2 3 4 5
US.11	Output link address PLC func. 1	**47435**	**0h1D0B**	0 to 65535	0 to 65535
US.12	Output link address PLC func. 2	**47436**	**0h1D0C**	0 to 65535	0 to 65535
US.13	Output link address PLC func. 3	**47437**	**0h1D0D**	0 to 65535	0 to 65535
US.14	Output link address PLC func. 4	**47438**	**0h1D0E**	0 to 65535	0 to 65535
US.15	Output link address PLC func. 5	**47439**	**0h1D0F**	0 to 65535	0 to 65535
US.16	Output link address PLC func. 6	**47440**	**0h1D10**	0 to 65535	0 to 65535
US.17	Output link address PLC func. 7	**47441**	**0h1D11**	0 to 65535	0 to 65535
US.18	Output link address PLC func. 8	**47442**	**0h1D12**	0 to 65535	0 to 65535

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
US.19	Output link address PLC func. 9	**47443**	**0h1D13**	0 to 65535	0 to 65535
US.20	Output link addr. PLC func. 10	**47444**	**0h1D14**	0 to 65535	0 to 65535
US.21	Output link addr. PLC func. 11	**47445**	**0h1D15**	0 to 65535	0 to 65535
US.22	Output link addr. PLC func. 12	**47446**	**0h1D16**	0 to 65535	0 to 65535
US.23	Output link addr. PLC func. 13	**47447**	**0h1D17**	0 to 65535	0 to 65535
US.24	Output link addr. PLC func. 14	**47448**	**0h1D18**	0 to 65535	0 to 65535
US.25	Output link addr. PLC func. 15	**47449**	**0h1D19**	0 to 65535	0 to 65535
US.26	Output link addr. PLC func. 16	**47450**	**0h1D1A**	0 to 65535	0 to 65535
US.27	Output link addr. PLC func. 17	**47451**	**0h1D1B**	0 to 65535	0 to 65535
US.28	Output link addr. PLC func. 18	**47452**	**0h1D1C**	0 to 65535	0 to 65535
US.31	PLC input value 1	**47455**	**0h1D1F**	-9999 to 9999	-9999 to 9999
US.32	PLC input value 2	**47456**	**0h1D20**	-9999 to 9999	-9999 to 9999
US.33	PLC input value 3	**47457**	**0h1D21**	-9999 to 9999	-9999 to 9999
US.34	PLC input value 4	**47458**	**0h1D22**	-9999 to 9999	-9999 to 9999
US.35	PLC input value 5	**47459**	**0h1D23**	-9999 to 9999	-9999 to 9999
US.36	PLC input value 6	**47460**	**0h1D24**	-9999 to 9999	-9999 to 9999
US.37	PLC input value 7	**47461**	**0h1D25**	-9999 to 9999	-9999 to 9999
US.38	PLC input value 8	**47462**	**0h1D26**	-9999 to 9999	-9999 to 9999
US.39	PLC input value 9	**47463**	**0h1D27**	-9999 to 9999	-9999 to 9999
US.40	PLC input value 10	**47464**	**0h1D28**	-9999 to 9999	-9999 to 9999
US.41	PLC input value 11	**47465**	**0h1D29**	-9999 to 9999	-9999 to 9999
US.42	PLC input value 12	**47466**	**0h1D2A**	-9999 to 9999	-9999 to 9999
US.43	PLC input value 13	**47467**	**0h1D2B**	-9999 to 9999	-9999 to 9999
US.44	PLC input value 14	**47468**	**0h1D2C**	-9999 to 9999	-9999 to 9999
US.45	PLC input value 15	**47469**	**0h1D2D**	-9999 to 9999	-9999 to 9999
US.46	PLC input value 16	**47470**	**0h1D2E**	-9999 to 9999	-9999 to 9999
US.47	PLC input value 17	**47471**	**0h1D2F**	-9999 to 9999	-9999 to 9999
US.48	PLC input value 18	**47472**	**0h1D30**	-9999 to 9999	-9999 to 9999
US.49	PLC input value 19	**47473**	**0h1D31**	-9999 to 9999	-9999 to 9999

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
US.50	PLC input value 20	**47475**	**0h1D32**	-9999 to 9999	-9999 to 9999
US.51	PLC input value 21	**47475**	**0h1D33**	-9999 to 9999	-9999 to 9999
US.52	PLC input value 22	**47476**	**0h1D34**	-9999 to 9999	-9999 to 9999
US.53	PLC input value 23	**47477**	**0h1D35**	-9999 to 9999	-9999 to 9999
US.54	PLC input value 24	**47478**	**0h1D36**	-9999 to 9999	-9999 to 9999
US.55	PLC input value 25	**47479**	**0h1D37**	-9999 to 9999	-9999 to 9999
US.56	PLC input value 26	**47480**	**0h1D38**	-9999 to 9999	-9999 to 9999
US.57	PLC input value 27	**47481**	**0h1D39**	-9999 to 9999	-9999 to 9999
US.58	PLC input value 28	**47482**	**0h1D3A**	-9999 to 9999	-9999 to 9999
US.59	PLC input value 29	**47483**	**0h1D3B**	-9999 to 9999	-9999 to 9999
US.60	PLC input value 30	**47484**	**0h1D3C**	-9999 to 9999	-9999 to 9999
US.80	Analogue input V1 value	**47504**	**0h1D50**	0 to 12.000%	0 to 12000
US.81	Analogue input I2 value	**47505**	**0h1D51**	-12.000 to 12.000%	-12000 to 12000
US.82	Digital inputs value	**47506**	**0h1D52**	0 to 127	0 to 127
US.85	Analogue output value	**47509**	**0h1D55**	0.000 to 10.000%	0 to 10000
US.88	Digital output value	**47512**	**0h1D58**	0 to 3	0 to 3

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
UF.1	PLC function 1	**47681**	**0h1E01**	NOP ADD SUB ADDSUB MIN MAX ABS NEGATE MPYDIV REMAINDER COMPARE-GT COMPARE-GEQ COMPARE- EQUAL COMPARE- NEQUAL TIMER LIMIT AND OR XOR ANDOR SWITCH BITTEST BITSET BITCLEAR LOWPASSFILTER PI_CONTORL PI_PROCESS UPCOUNT DOWNCOUNT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
UF.2	Input A for PLC function 1	**47682**	**0h1E02**	0 to 65535	0 to 65535
UF.3	Input B for PLC function 1	**47683**	**0h1E03**	0 to 65535	0 to 65535
UF.4	Input C for PLC function 1	**47684**	**0h1E04**	0 to 65535	0 to 65535
UF.5	Output PLC function 1	**47685**	**0h1E05**	-32767 to 32767	-32767 to 32767
UF.6	PLC function 2	**47686**	**0h1E06**	See UF.1	See UF.1

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
UF.7	Input A for PLC function 2	**47687**	**0h1E07**	See UF.2	See UF.2
UF.8	Input B for PLC function 2	**47688**	**0h1E08**	See UF.3	See UF.3
UF.9	Input C for PLC function 2	**47689**	**0h1E09**	See UF.4	See UF.4
UF.10	Output PLC function 2	**47690**	**0h1E0A**	See UF.5	See UF.5
UF.11	PLC function 3	**47691**	**0h1E0B**	See UF.1	See UF.1
UF.12	Input A for PLC function 3	**47692**	**0h1E0C**	See UF.2	See UF.2
UF.13	Input B for PLC function 3	**47693**	**0h1E0D**	See UF.3	See UF.3
UF.14	Input C for PLC function 3	**47694**	**0h1E0E**	See UF.4	See UF.4
UF.15	Output PLC function 3	**47695**	**0h1E0F**	See UF.5	See UF.5
UF.16	PLC function 4	**47696**	**0h1E10**	See UF.1	See UF.1
UF.17	Input A for PLC function 4	**47697**	**0h1E11**	See UF.2	See UF.2
UF.18	Input B for PLC function 4	**47698**	**0h1E12**	See UF.3	See UF.3
UF.19	Input C for PLC function 4	**47699**	**0h1E13**	See UF.4	See UF.4
UF.20	Output PLC function 4	**47700**	**0h1E14**	See UF.5	See UF.5
UF.21	PLC function 5	**47701**	**0h1E15**	See UF.1	See UF.1
UF.22	Input A for PLC function 5	**47702**	**0h1E16**	See UF.2	See UF.2
UF.23	Input B for PLC function 5	**47703**	**0h1E17**	See UF.3	See UF.3
UF.24	Input C for PLC function 5	**47704**	**0h1E18**	See UF.4	See UF.4
UF.25	Output PLC function 5	**47705**	**0h1E19**	See UF.5	See UF.5
UF.26	PLC function 6	**47706**	**0h1E1A**	See UF.1	See UF.1
UF.27	Input A for PLC function 6	**47707**	**0h1E1B**	See UF.2	See UF.2

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
UF.28	Input B for PLC function 6	**47708**	**0h1E1C**	See UF.3	See UF.3
UF.29	Input C for PLC function 6	**47709**	**0h1E1D**	See UF.4	See UF.4
UF.30	Output PLC function 6	**47710**	**0h1E1E**	See UF.5	See UF.5
UF.31	PLC function 7	**47711**	**0h1E1F**	See UF.1	See UF.1
UF.32	Input A for PLC function 7	**47712**	**0h1E20**	See UF.2	See UF.2
UF.33	Input B for PLC function 7	**47713**	**0h1E21**	See UF.3	See UF.3
UF.34	Input C for PLC function 7	**47714**	**0h1E22**	See UF.4	See UF.4
UF.35	Output PLC function 7	**47715**	**0h1E23**	See UF.5	See UF.5
UF.36	PLC function 8	**47716**	**0h1E24**	See UF.1	See UF.1
UF.37	Input A for PLC function 8	**47717**	**0h1E25**	See UF.2	See UF.2
UF.38	Input B for PLC function 8	**47718**	**0h1E26**	See UF.3	See UF.3
UF.39	Input C for PLC function 8	**47719**	**0h1E27**	See UF.4	See UF.4
UF.40	Output PLC function 8	**47720**	**0h1E28**	See UF.5	See UF.5
UF.41	PLC function 9	**47721**	**0h1E29**	See UF.1	See UF.1
UF.42	Input A for PLC function 9	**47722**	**0h1E2A**	See UF.2	See UF.2
UF.43	Input B for PLC function 9	**47723**	**0h1E2B**	See UF.3	See UF.3
UF.44	Input C for PLC function 9	**47724**	**0h1E2C**	See UF.4	See UF.4
UF.45	Output PLC function 9	**47725**	**0h1E2D**	See UF.5	See UF.5
UF.46	PLC function 10	**47726**	**0h1E2E**	See UF.1	See UF.1
UF.47	Input A PLC function 10	**47727**	**0h1E2F**	See UF.2	See UF.2
UF.48	Input B PLC function 10	**47728**	**0h1E30**	See UF.3	See UF.3

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
UF.49	Input C PLC function 10	**47729**	**0h1E31**	See UF.4	See UF.4
UF.50	Output PLC function 10	**47730**	**0h1E32**	See UF.5	See UF.5
UF.51	PLC function 11	**47731**	**0h1E33**	See UF.1	See UF.1
UF.52	Input A PLC function 11	**47732**	**0h1E34**	See UF.2	See UF.2
UF.53	Input B PLC function 11	**47733**	**0h1E35**	See UF.3	See UF.3
UF.54	Input C PLC function 11	**47734**	**0h1E36**	See UF.4	See UF.4
UF.55	Output PLC function 11	**47735**	**0h1E37**	See UF.5	See UF.5
UF.56	PLC function 12	**47736**	**0h1E38**	See UF.1	See UF.1
UF.57	Input A PLC function 12	**47737**	**0h1E39**	See UF.2	See UF.2
UF.58	Input B PLC function 12	**47738**	**0h1E3A**	See UF.3	See UF.3
UF.59	Input C PLC function 12	**47739**	**0h1E3B**	See UF.4	See UF.4
UF.60	Output PLC function 12	**47740**	**0h1E3C**	See UF.5	See UF.5
UF.61	PLC function 13	**47741**	**0h1E3D**	See UF.1	See UF.1
UF.62	Input A PLC function 13	**47742**	**0h1E3E**	See UF.2	See UF.2
UF.63	Input B PLC function 13	**47743**	**0h1E3F**	See UF.3	See UF.3
UF.64	Input C PLC function 13	**47744**	**0h1E40**	See UF.4	See UF.4
UF.65	Output PLC function 13	**47745**	**0h1E41**	See UF.5	See UF.5
UF.66	PLC function 14	**47746**	**0h1E42**	See UF.1	See UF.1
UF.67	Input A PLC function 14	**47747**	**0h1E43**	See UF.2	See UF.2
UF.68	Input B PLC function 14	**47748**	**0h1E44**	See UF.3	See UF.3
UF.69	Input C PLC function 14	**47749**	**0h1E45**	See UF.4	See UF.4

Screen	Description	Modbus Decimal	Address Hexadecimal	Range	Modbus Range
UF.70	Output PLC function 14	**47750**	**0h1E46**	See UF.5	See UF.5
UF.71	PLC function 15	**47751**	**0h1E47**	See UF.1	See UF.1
UF.72	Input A PLC function 15	**47752**	**0h1E48**	See UF.2	See UF.2
UF.73	Input B PLC function 15	**47753**	**0h1E49**	See UF.3	See UF.3
UF.74	Input C PLC function 15	**47754**	**0h1E4A**	See UF.4	See UF.4
UF.75	Output PLC function 15	**47755**	**0h1E4B**	See UF.5	See UF.5
UF.76	PLC function 16	**47756**	**0h1E4C**	See UF.1	See UF.1
UF.77	Input A PLC function 16	**47757**	**0h1E4D**	See UF.2	See UF.2
UF.78	Input B PLC function 16	**47758**	**0h1E4E**	See UF.3	See UF.3
UF.79	Input C PLC function 16	**47759**	**0h1E4F**	See UF.4	See UF.4
UF.80	Output PLC function 16	**47760**	**0h1E50**	See UF.5	See UF.5
UF.81	PLC function 17	**47761**	**0h1E51**	See UF.1	See UF.1
UF.82	Input A PLC function 17	**47762**	**0h1E52**	See UF.2	See UF.2
UF.83	Input B PLC function 17	**47763**	**0h1E53**	See UF.3	See UF.3
UF.84	Input C PLC function 17	**47764**	**0h1E54**	See UF.4	See UF.4
UF.85	Output PLC function 17	**47765**	**0h1E55**	See UF.5	See UF.5
UF.86	PLC function 18	**47766**	**0h1E56**	See UF.1	See UF.1
UF.87	Input A PLC function 18	**47767**	**0h1E57**	See UF.2	See UF.2
UF.88	Input B PLC function 18	**47768**	**0h1E58**	See UF.3	See UF.3
UF.89	Input C PLC function 18	**47769**	**0h1E59**	See UF.4	See UF.4
UF.90	Output PLC function 18	**47770**	**0h1E5A**	See UF.5	See UF.5

ACCESSORIES

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CODE(*)	TYPE	DESCRIPTION
See section “Communications”	**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 “Communications” when purchasing additional communication boards.
SD3IO	**Extension I/O**	Expansion module I/O: 3 Digital Inputs, 2 Digital Outputs, 2 Analog Inputs and 1 Analog Output. Please refer to section “Extension I/O ” for further information.
SD3EBF□	**Conduit Kit**	UL open type and enclosed type 1 certification: • 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 “Conduit kit” 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 “Flange type”.
SD3CF1	**Display extender**	Display extender kit 3 meters.

CODE(∗)	TYPE	DESCRIPTION
SD3DSP	Optional display	Removable LCD display unit for remote installation. It integrates three LEDs that show the drive status, a LCD screen with 4 lines of 16 characters and a control keyboard for parameters setting and commissioning. For further information, contact Power Electronics.

(∗) Consult availability with Power Electronics.

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
SD3PB	Profibus-DP communication module.
SD3ETH	Ethernet I/P – Modbus TCP communication module.
SD3ETC	EtherCAT communication module.
SD3PN	Profinet communication module.

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.

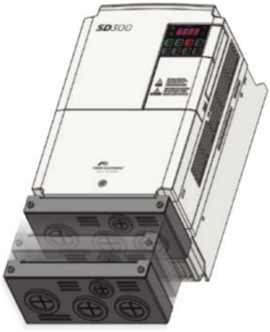
This board includes:

- 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.*

Conduit kit

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



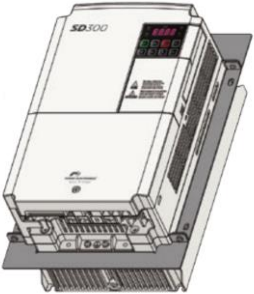
Optional conduit kit

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

Code	Frame
SD3EBIP6F1	1F
SD3EBIP6F2	2F
SD3EBIP6F3	3F
SD3EBF4	4
SD3EBF5	5
SD3EBF6	6
SD3EBF7	7
SD3EBF8	8
SD3EBF9	9

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.



Optional flange type

Ask for the flange that corresponds to your drive frame:

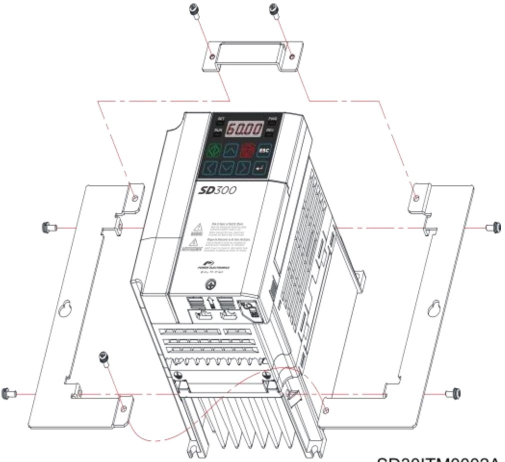
Code	Frame
SD3FLGIP6F1	1F
SD3FLGIP6F2	2F
SD3FLGIP6F3	3F
SD3FLGF4	4
SD3FLGF5	5
SD3FLGF6	6
SD3FLGF7	7
SD3FLGF8	8
SD3FLGF9	9

Mechanical installation

Frames 1F, 2F and 3F:

In order to install the Flange Option:

- Fasten both sides of the flange to the base of the drive using the included M3 bolts with a tightening torque between 2.1 and 6.1 (kgf*cm).
- Use the remaining bolts to fix the flange as shown below.

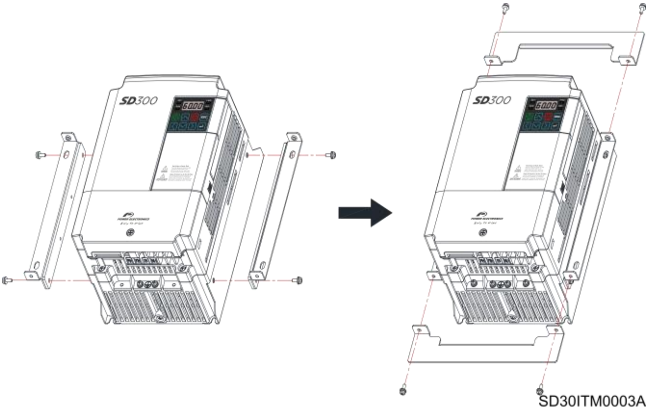


Frame F flange option kit mounting

Frames 4, 5, 6, 7, 8 and 9:

In order to install the Flange Option:

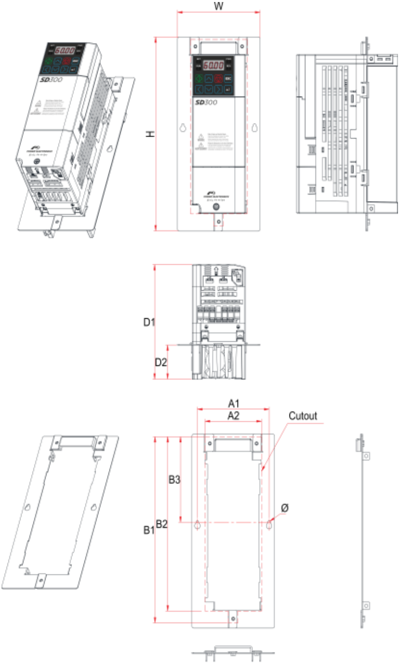
- Fasten both sides of the flange to the base of the drive using the included M4 bolts with a tightening torque between 0.2 and 0.6 (Nm) and M5 bolts with a tightening torque between 0.4 and 1 (Nm).
- Use the remaining bolts to fix the flange as shown below.



Frames 4, 5, 6, 7, 8 and 9 flange option kit mounting

Dimensions

Frame 1F:



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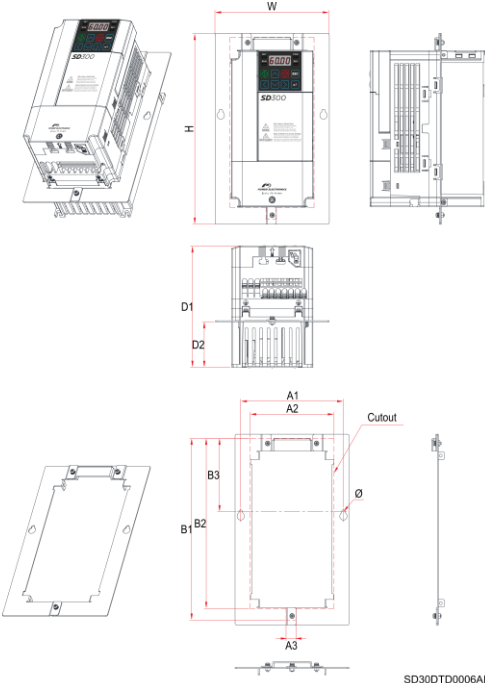
Frame 1F flange option kit dimensions

Model	W	H	D1	D2	A1	A2	B1	B2	B3	Ø	Weight*
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg (lb)
SD300242F SD300312F SD300342F	106 (4.17)	220 (8.66)	130 (5.12)	38.8 (1.53)	92 (3.62)	72.5 (2.85)	211.4 (8.32)	197.8 (7,79)	97.1 (3.82)	3.5 (0.14)	1.5 (3.3)

*Total weight of the drive with the flange installed

Frame 2F:

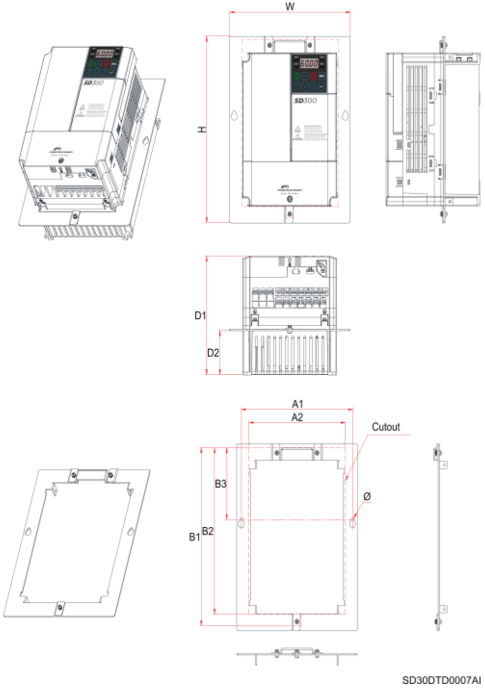


Frame 2F flange option kit dimensions

Model	W	H	D1	D2	A1	A2	B1	B2	B3	Ø	Weight*
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg (lb)
SD300612F SD300912F SD300542F SD300742F	140 (5.51)	220 (8.66)	140 (5.51)	52.6 (2.07)	126 (4.96)	103.1 (4.06)	209.6 (8.25)	196.2 (7.72)	84.9 (3.34)	4.5 (0.18)	2.2 (4.85)

*Total weight of the drive with the flange installed

Frame 3F:

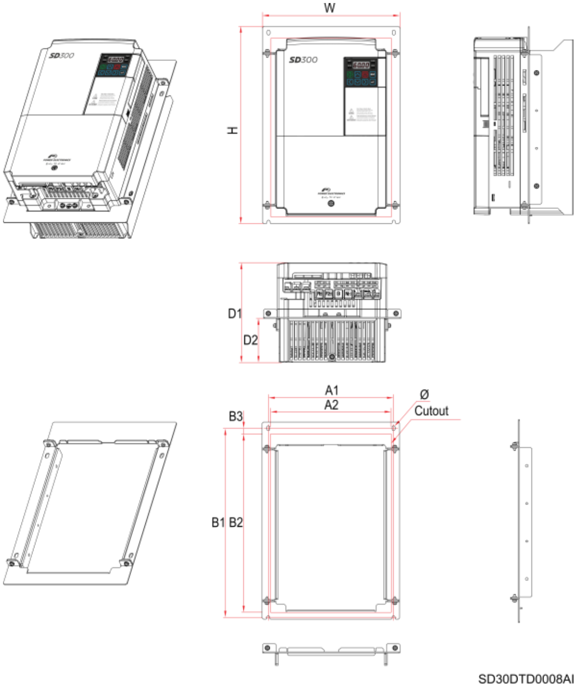


Frame 3F flange option kit dimensions

Model	W	H	D1	D2	A1	A2	B1	B2	B3	Ø	Weight*
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg (lb)
SD301042F SD301212F	180 (7.09)	220 (8.66)	140 (5.51)	52.2 (2.06)	166 (6.54)	143.3 (5.64)	210.1 (8.27)	196.7 (7.74)	85.1 (3.35)	4.5 (0.18)	2.3 (5.07)

*Total weight of the drive with the flange installed

Frames 4, 5 and 6:



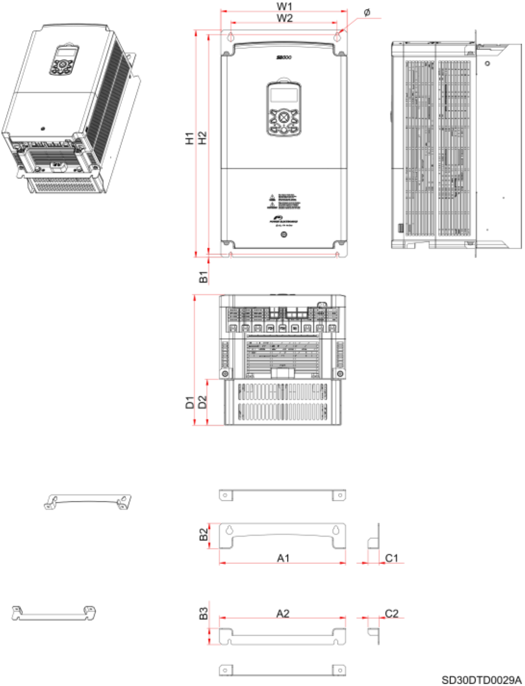
Frames 4, 5 and 6 flange option kit dimensions

Model	W	H	D1	D2	A1	A2	B1	B2	B3	Ø	Weight*
	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg (lb)
SD303022, SD304022 SD301642F, SD302342F	206 (8.11)	264.5 (10.41)	140 (5.51)	55.1 (2.17)	186 (7.32)	178 (7.01)	251.5 (9.90)	235 (9.25)	8.4 (0.33)	5 (0.20)	3.7 (8.16)

Model	W mm (in)	H mm (in)	D1 mm (in)	D2 mm (in)	A1 mm (in)	A2 mm (in)	B1 mm (in)	B2 mm (in)	B3 mm (in)	Ø mm (in)	Weight* kg (lb)
SD305622, SD303042F SD303842F	225.2 (8.87)	322.7 (12.71)	163 (6.42)	72.1 (2.84)	205.2 (8.09	197.5 (7.78)	309.7 (12.19)	292.5 (11.52)	9.3 (0.37)	5 (0.20)	5.15 (11.35)
SD306922, SD304442F SD305842F	267 (10.51)	384.5 (15.14)	187 (7.36)	93.6 (3.69)	247 (9.72)	239 (9.41)	371.5 (14.63)	352 (13.86)	9.5 (0.37)	6 (0.24)	5.4 (11.91)

*Total weight of the drive with the flange installed

Frames 7, 8 and 9:



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Frames 7, 8 and 9 flange option kit dimensions

Model	W1 mm (in)	W2 mm (in)	H1 mm (in)	H2 mm (in)	D1 mm (in)	D2 mm (in)	A1 mm (in)	A2 mm (in)	B1 mm (in)	B2 mm (in)	B3 mm (in)	C1 mm (in)	C2 mm (in)	Ø mm (in)	Weight* kg (lb)
SD307542F	275 (10.83)	232 (9.13)	495 (19.49)	478.5 (18.84)	284 (11.18)	100 (3.94)	275 (10.83)	275 (10.83)	7.5 (0.30)	55 (2.17)	35.5 (1.40)	24 (0.95)	24 (0.94)	7 (0.28)	26.4 (58.20)
SD309042F SD310542F	325 (12.80)	282 (11.10)	555.5 (21.87)	539 (21.22)	284 (11.18)	100 (3.94)	325 (12.80)	325 (12.80)	7.5 (0.30)	57.3 (2.26)	35.5 (1.40)	24 (0.95)	24 (0.94)	7 (0.28)	35.4 (78.04)
SD314042F SD317042F	325 (12.80)	275 (10.83)	605.5 (23.84)	587 (23.11)	309 (12.17)	131.6 (5.18)	325 (12.80)	325 (12.80)	9.5 (0.37)	68.5 (2.69)	46.5 (1.83)	24 (0.95)	24 (0.94)	9 (0.35)	43.5 (95.90)

*Total weight of the drive with the flange installed.

Drive + flange mounting

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

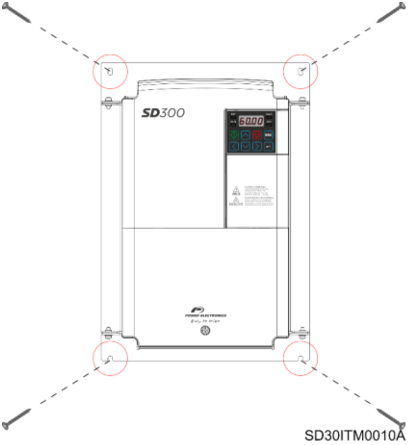
The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate.

Make sure to follow the mounting and clearance recommendations in sections Drive Mounting and Clearances respectively.

The number of required screws for fixing the drive + flange varies depending the frame and is shown in the table below. Please refer to section “DIMENSIONS” to verify the frame and exact measures of your SD300 drive.

Frame	Fixing screws (number * metric)
4, 5	4*M4
6	4*M5
7	4*M5
8	4*M5
9	4*M5

Example: Frame 5 drive + flange mounting: Use four M4 screws to fix the drive to the wall/cabinet.



Drive + flange mounting. Frame 5

COMMONLY USED CONFIGURATIONS

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NOTICE

The following instructions are based on the assumption that all parameters are set to the factory default values. Results may be different if parameter values have been modified. In this case, set all parameters back to their default value and follow the instructions.

Start/Stop command and speed setting from keyboard

Parameter configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Frequency reference	x.xxHz (Set the frequency reference).
ACC	20.0 seg	Acceleration time	10.0 sec
dEC	30.0 seg	Deceleration time	10.0 sec
drv	1	Start/Stop control	**0:** Start/Stop from keyboard.
frq	0	Frequency setting mode	**0:** Reference will be introduced from keyboard.
Ad.8	0	Stop mode	**0:** Stop with deceleration ramp. **1:** DC brake to stop. **2:** Free run to stop. **4:** Regenerative brake to stop.
Ad.10	0	Start after low voltage.	**0:** NO (Drive does not start after power loss). **1:** YES (Drive starts after power loss).
Ad.24	0	Use frequency limit	**0:** NO (Limits are set by maximum frequency and start frequency). **1:** YES (Limits are set by the higher and lower frequency limits).
Ad.25	0.50Hz	Frequency lower limit	0.00Hz

<table>
<tr><th>Parameter</th><th>Default value</th><th>Description</th><th>Set value</th></tr>
<tr><td>Ad.26</td><td>50.00Hz</td><td>Frequency higher limit</td><td>50.00Hz</td></tr>
<tr><td>bA.13</td><td>(*)</td><td>Motor Current</td><td>?A (See motor plate).</td></tr>
<tr><td>dr.14</td><td>(*)</td><td>Motor rated power</td><td><table><tr><td>0.2</td><td>0.2kW</td></tr><tr><td>…</td><td>…</td></tr><tr><td>5.5</td><td>5.5kW</td></tr><tr><td>7.5</td><td>7.5kW</td></tr></table></td></tr>
<tr><td>dr.15</td><td>0</td><td>Torque boost</td><td>0: Manual torque (Both directions can be configured separately, in dr.16 ➔ ‘Start torque in forward direction’ and in dr.17 ➔ ‘Start torque in reverse direction’).
1 and 2: The drive automatically calculates the voltage to apply at the start using the motor parameters.</td></tr>
<tr><td>dr.18</td><td>60.00Hz</td><td>Motor frequency</td><td>50.00Hz</td></tr>
<tr><td>dr.19</td><td>0.50Hz</td><td>Start frequency</td><td>0.10Hz</td></tr>
<tr><td>dr.20</td><td>60.00Hz</td><td>Max speed limit</td><td>50.00Hz</td></tr>
<tr><td>dr.93</td><td>0</td><td>Parameter initialization</td><td>1: Set parameters back to their factory value (only if required)</td></tr>
<tr><td>dr.97</td><td>2.x</td><td>Software version</td><td>-</td></tr>
<tr><td>Cn.4</td><td>3kHz</td><td>Modulation frequency</td><td>5kHz</td></tr>
</table>

(*) This value depends on the motor setting.

Start/Stop command by keyboard and speed setting by analogue input

Parameter configuration

<table>
<tr><th>Parameter</th><th>Default value</th><th>Description</th><th>Set value</th></tr>
<tr><td>0.00</td><td>0.00Hz</td><td>Frequency reference</td><td>x.xxHz (Reference visualization).</td></tr>
<tr><td>ACC</td><td>20.0 seg</td><td>Acceleration time</td><td>10.0 sec</td></tr>
<tr><td>dEC</td><td>30.0 seg</td><td>Deceleration time</td><td>10.0 sec</td></tr>
<tr><td>drv</td><td>1</td><td>Start/Stop control</td><td>0: Start/Stop from keyboard.</td></tr>
<tr><td>frq</td><td>0</td><td>Frequency setting mode</td><td>2: Reference will be introduced through analogue V1.
5: Reference will be introduced through analogue I2.</td></tr>
<tr><td>Ad.8</td><td>0</td><td>Stop mode</td><td>0: Stop with deceleration ramp.
1: DC brake to stop.
2: Free run to stop.
4: Regenerative brake to stop.</td></tr>
<tr><td>Ad.10</td><td>0</td><td>Start after low voltage.</td><td>0: NO (Drive does not start after power loss).
1: YES (Drive starts after power loss).</td></tr>
<tr><td>Ad.24</td><td>0</td><td>Use frequency limit</td><td>0: NO (Limits are set by maximum frequency and start frequency).
1: YES (Limits are set by the higher and lower frequency limits).</td></tr>
<tr><td>Ad.25</td><td>0.50Hz</td><td>Frequency lower limit</td><td>0.00Hz</td></tr>
<tr><td>Ad.26</td><td>50.00Hz</td><td>Frequency higher limit</td><td>50.00Hz</td></tr>
<tr><td>bA.13</td><td>(*)</td><td>Motor Current</td><td>?A (See motor plate).</td></tr>
<tr><td>dr.14</td><td>(*)</td><td>Motor rated power</td><td><table><tr><td>0.2</td><td>0.2kW</td></tr><tr><td>…</td><td>…</td></tr><tr><td>5.5</td><td>5.5kW</td></tr><tr><td>7.5</td><td>7.5kW</td></tr></table></td></tr>
</table>

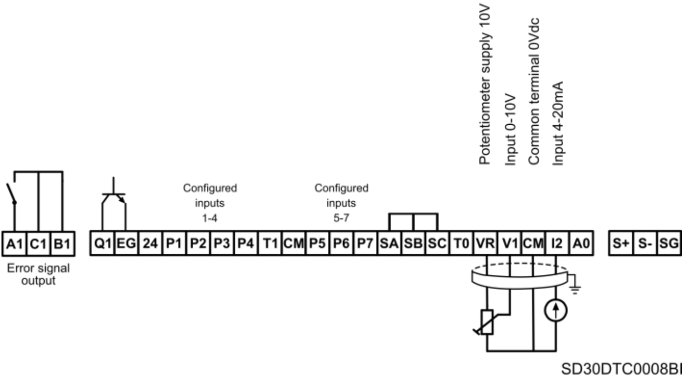
(*) This value depends on the motor setting.

Parameter	Default value	Description	Set value
dr.15	0	Torque boost	**0:** Manual torque (Both directions can be configured separately, in dr.16 ➔ 'Start torque in forward direction' and in dr.17 ➔ 'Start torque in reverse direction'). **1 and 2:** The drive automatically calculates the voltage to apply at the start using the motor parameters.
dr.18	60.00Hz	Motor frequency	50.00Hz
dr.19	0.50Hz	Start frequency	0.10Hz
dr.20	60.00Hz	Max speed limit	50.00Hz
dr.93	0	Parameter initialization	**1:** Set parameters back to their factory value (only if required).
dr.97	2.x	Software version	-
Cn.4	3kHz	Modulation frequency	5kHz
In.1	50.00Hz	Analog input max. freq	50.00Hz
In.7	10	V1 filter	10ms (Low Pass Filter for V1).
In.8	0V	V1 minimum voltage	0.00V (V1 minimum voltage adjustment).
In.9	0.00	V1 minimum reference	0.00 (% of the value set in In.1)
In.10	10V	V1 maximum voltage	10.0V (V1 maximum voltage adjustment).
In.11	100.00	V1 maximum reference	100.00 (% of the value set in In.1)
In.52	10ms	I2 filter	10ms (Analogue input current filter).
In.53	4.00mA	I2 minimum current	4.00mA (I2 minimum current adjustment).
In.54	0.00	I2 minimum reference	0.00 (% of the value set In.1)
In.55	20.00mA	I2 maximum current	20.00mA (I2 maximum current adjustment)
In.56	100.00	I2 maximum reference	100.00 (% of the value set In.1)

Connection scheme

Terminals I2/CM: Analogue input 4 – 20mA.

Terminals VR/V1/CM: Analogue input 0 – 10V.



Start/Stop command by keyboard and speed setting by analogue input

Start/Stop command by terminals and speed setting by analogue input

Parameter configuration

<table>
<tr><th>Parameter</th><th>Default value</th><th>Description</th><th>Set value</th></tr>
<tr><td>0.00</td><td>0.00Hz</td><td>Frequency reference</td><td>x.xxHz (Reference visualization).</td></tr>
<tr><td>ACC</td><td>20.0 seg</td><td>Acceleration time</td><td>10.0 sec</td></tr>
<tr><td>dEC</td><td>30.0 seg</td><td>Deceleration time</td><td>10.0 sec</td></tr>
<tr><td>drv</td><td>1</td><td>Start/Stop control</td><td>1: Start/Stop from terminals FX – Forward o Rx – Reverse.</td></tr>
<tr><td>frq</td><td>0</td><td>Frequency setting mode</td><td>2: Reference will be introduced through analogue V1.
5: Reference will be introduced through analogue I2.</td></tr>
<tr><td>Ad.8</td><td>0</td><td>Stop mode</td><td>0: Stop with deceleration ramp.
1: DC brake to stop.
2: Free run to stop.
4: Regenerative brake to stop.</td></tr>
<tr><td>Ad.10</td><td>0</td><td>Start after low voltage.</td><td>0: NO (Drive does not start after power loss).
1: YES (Drive starts after power loss).</td></tr>
<tr><td>Ad.24</td><td>0</td><td>Use frequency limit</td><td>0: NO (Limits are set by maximum frequency and start frequency).
1: YES (Limits are set by the higher and lower frequency limits).</td></tr>
<tr><td>Ad.25</td><td>0.50Hz</td><td>Frequency lower limit</td><td>0.00Hz</td></tr>
<tr><td>Ad.26</td><td>50.00Hz</td><td>Frequency higher limit</td><td>50.00Hz</td></tr>
<tr><td>bA.13</td><td>(*)</td><td>Motor Current</td><td>?A (See motor plate).</td></tr>
<tr><td>dr.14</td><td>(*)</td><td>Motor rated power</td><td><table><tr><td>0.2</td><td>0.2kW</td></tr><tr><td>…</td><td>…</td></tr><tr><td>5.5</td><td>5.5kW</td></tr><tr><td>7.5</td><td>7.5kW</td></tr></table></td></tr>
</table>

(*) This value depends on the motor setting.

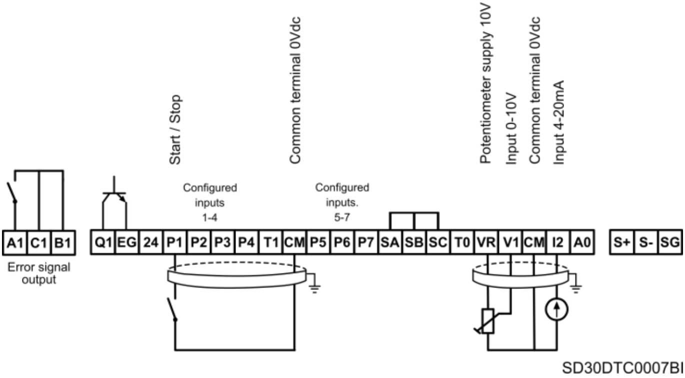
Parameter	Default value	Description	Set value
dr.15	0	Torque boost	**0:** Manual torque (Both directions can be configured separately, in dr.16 ➔ 'Start torque in forward direction' and in dr.17 ➔ 'Start torque in reverse direction'). **1 and 2:** The drive automatically calculates the voltage to apply at the start using the motor parameters.
dr.18	60.00Hz	Motor frequency	50.00Hz
dr.19	0.50Hz	Start frequency	0.10Hz
dr.20	60.00Hz	Max speed limit	50.00Hz
dr.93	0	Parameter initialization	**1:** Set parameters back to their factory value (only if required).
dr.97	2.x	Software version	-
Cn.4	3kHz	Modulation frequency	5kHz
In.1	50.00Hz	Analog input max. freq	50.00Hz
In.7	10	V1 filter	10ms (Low Pass Filter for V1).
In.8	0V	V1 minimum voltage	0.00V (V1 minimum voltage adjustment).
In.9	0.00	V1 minimum reference	0.00 (% of the value set in In.1)
In.10	10V	V1 maximum voltage	10.0V (V1 maximum voltage adjustment).
In.11	100.00	V1 maximum reference	100.00 (% of the value set in In.1)
In.52	10ms	I2 filter	10ms (Analogue input current filter).
In.53	4.00mA	I2 minimum current	4.00mA (I2 minimum current adjustment).
In.54	0.00	I2 minimum reference	0.00 (% of the value set In.1)
In.55	20.00mA	I2 maximum current	20.00mA (I2 maximum current adjustment)
In.56	100.00	I2 maximum reference	100.00 (% of the value set In.1)
In.65	1	Digital input 1	**1:** Forward start command

Connection scheme

Terminals CM/P1: Start commando (NO state).

Terminals I2/CM: Analogue input 4 – 20mA.

Terminals VR/V1/CM: Analogue input 0 – 10V.



Start/Stop command by terminals and speed setting by analogue input

Multi-speed commands (multi-step frequencies) using P5, P6 and P7

Parameter configuration

<table>
<tr><th>Parameter</th><th>Default value</th><th>Description</th><th>Set value</th></tr>
<tr><td>0.00</td><td>0.00Hz</td><td>Frequency reference</td><td>x.xxHz (Reference visualization).</td></tr>
<tr><td>ACC</td><td>20.0 seg</td><td>Acceleration time</td><td>10.0 sec</td></tr>
<tr><td>dEC</td><td>30.0 seg</td><td>Deceleration time</td><td>10.0 sec</td></tr>
<tr><td>drv</td><td>1</td><td>Start/Stop control</td><td>1: Start/Stop from terminals FX – Forward o Rx – Reverse.</td></tr>
<tr><td>frq</td><td>0</td><td>Frequency setting mode</td><td>0: Reference will be introduced from keyboard.</td></tr>
<tr><td>St1</td><td>10.00Hz</td><td>Multi-reference speed 1</td><td>30.00Hz (Multi-speed 1)</td></tr>
<tr><td>St2</td><td>20.00Hz</td><td>Multi-reference speed 2</td><td>35.00Hz (Multi-speed 2)</td></tr>
<tr><td>St3</td><td>30.00Hz</td><td>Multi-reference speed 3</td><td>40.00Hz (Multi-speed 3)</td></tr>
<tr><td>Ad.8</td><td>0</td><td>Stop mode</td><td>0: Stop with deceleration ramp.
1: DC brake to stop.
2: Free run to stop.
4: Regenerative brake to stop.</td></tr>
<tr><td>Ad.10</td><td>0</td><td>Start after low voltage.</td><td>0: NO (Drive does not start after power loss).
1: YES (Drive starts after power loss).</td></tr>
<tr><td>Ad.24</td><td>0</td><td>Use frequency limit</td><td>0: NO (Limits are set by maximum frequency and start frequency).
1: YES (Limits are set by the higher and lower frequency limits).</td></tr>
<tr><td>Ad.25</td><td>0.50Hz</td><td>Frequency lower limit</td><td>0.00Hz</td></tr>
<tr><td>Ad.26</td><td>50.00Hz</td><td>Frequency higher limit</td><td>50.00Hz</td></tr>
<tr><td>bA.13</td><td>(*)</td><td>Motor Current</td><td>?A (See motor plate).</td></tr>
<tr><td>dr.14</td><td>(*)</td><td>Motor rated power</td><td><table><tr><td>0.2</td><td>0.2kW</td></tr><tr><td>…</td><td>…</td></tr><tr><td>5.5</td><td>5.5kW</td></tr><tr><td>7.5</td><td>7.5kW</td></tr></table></td></tr>
</table>

(*) This value depends on the motor setting.

Parameter	Default value	Description	Set value
dr.15	0	Torque boost	**0:** Manual torque (Both directions can be configured separately, in dr.16 ➔ 'Start torque in forward direction' and in dr.17 ➔ 'Start torque in reverse direction'). **1 and 2:** The drive automatically calculates the voltage to apply at the start using the motor parameters.
dr.18	60.00Hz	Motor frequency	50.00Hz
dr.19	0.50Hz	Start frequency	0.10Hz
dr.20	60.00Hz	Max speed limit	50.00Hz
dr.93	0	Parameter initialization	**1:** Set parameters back to their factory value (only if required)
dr.97	2.x	Software version	-
Cn.4	3kHz	Modulation frequency	5kHz
In.65	1	Digital input 1	**1:** Forward start command
In.69	7	Digital input 5	**7:** Low Speed (Low bit).
In.70	8	Digital input 6	**8:** Medium Speed (Medium bit).
In.71	9	Digital input 7	**9:** High Speed (High bit).
bA.53	40.00Hz	Multi-Reference4	45.00Hz (multiple speed 4).
bA.54	50.00Hz	Multi-Reference5	50.00Hz (multiple speed 5).
bA.55	60.00Hz	Multi-Reference6	47.00Hz (multiple speed 6).
bA.56	60.00Hz	Multi-Reference7	42.00Hz (multiple speed 7).

Depending on the state of inputs P5, P6 y P7, the different configured frequencies can be selected:

Programmed frequency	Parameter	High speed (P7)	Medium speed (P6)	Low speed (P5)
50.00Hz	0.00	0	0	0
30.00Hz	St1	0	0	1
35.00Hz	St2	0	1	0
40.00Hz	St3	0	1	1
45.00Hz	bA.53	1	0	0
50.00Hz	bA.54	1	0	1
47.00Hz	bA.55	1	1	0
42.00Hz	bA.56	1	1	1

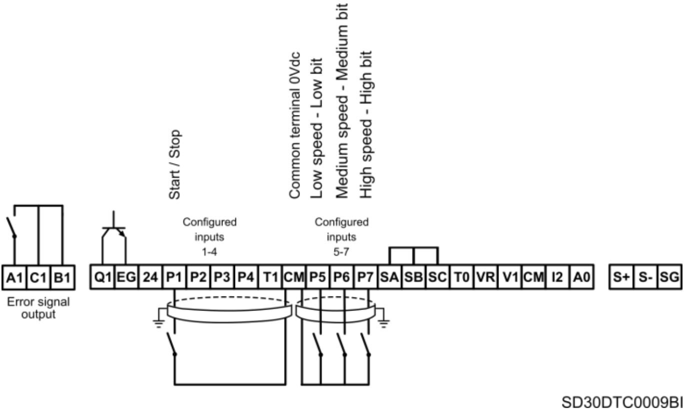
Connection scheme

Terminals CM/P1: Start command (NO state).

Terminals CM/P5: Low speed (Low bit) (NO state).

Terminals CM/P6: Medium speed (Medium bit) (NO state).

Terminals CM/P7: High speed (High bit) (NO state).



Multi-speed commands (multi-step frequencies) using P5, P6 and P7

Constant pressure control and automatic stop at zero level flow.

Pressure command is set by keypad.

Parameter configuration

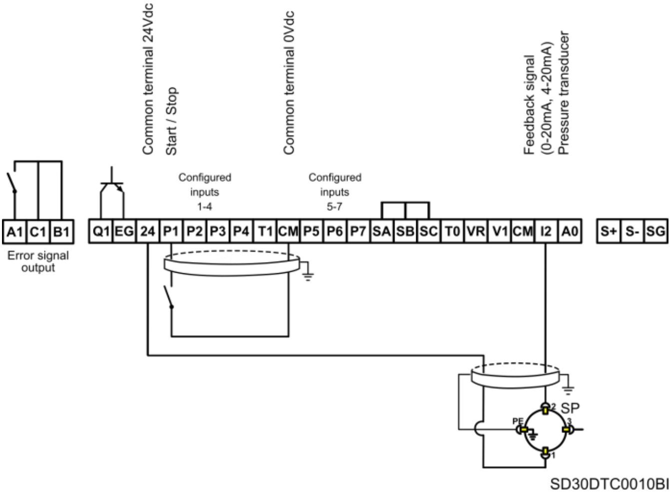
<table>
<tr><th>Parameter</th><th>Default value</th><th>Description</th><th>Set value</th></tr>
<tr><td>ACC</td><td>20.0 seg</td><td>Acceleration time</td><td>10.0 sec</td></tr>
<tr><td>dEC</td><td>30.0 seg</td><td>Deceleration time</td><td>10.0 sec</td></tr>
<tr><td>drv</td><td>1</td><td>Start/Stop control</td><td>1: Start/Stop from terminals FX – Forward o Rx – Reverse.</td></tr>
<tr><td>frq</td><td>0</td><td>Frequency setting mode</td><td>0: Reference will be set by keyboard</td></tr>
<tr><td>Ad.8</td><td>0</td><td>Stop mode</td><td>0: Stop with deceleration ramp.
1: DC brake to stop.
2: Free run to stop.
4: Regenerative brake to stop.</td></tr>
<tr><td>Ad.10</td><td>0</td><td>Start after low voltage.</td><td>0: NO (Drive does not start after power loss).
1: YES (Drive starts after power loss).</td></tr>
<tr><td>Ad.24</td><td>0</td><td>Use frequency limit</td><td>0: NO (Limits are set by maximum frequency and start frequency).
1: YES (Limits are set by the higher and lower frequency limits).</td></tr>
<tr><td>Ad.25</td><td>0.50Hz</td><td>Frequency lower limit</td><td>0.00Hz</td></tr>
<tr><td>Ad.26</td><td>50.00Hz</td><td>Frequency higher limit</td><td>50.00Hz</td></tr>
<tr><td>bA.13</td><td>(*)</td><td>Motor Current</td><td>?A (See motor plate).</td></tr>
<tr><td>dr.14</td><td>(*)</td><td>Motor rated power</td><td><table><tr><td>0.2</td><td>0.2kW</td></tr><tr><td>…</td><td>…</td></tr><tr><td>5.5</td><td>5.5kW</td></tr><tr><td>7.5</td><td>7.5kW</td></tr></table></td></tr>
<tr><td>dr.18</td><td>60.00Hz</td><td>Motor frequency</td><td>50.00Hz</td></tr>
<tr><td>dr.19</td><td>0.50Hz</td><td>Start frequency</td><td>0.10Hz</td></tr>
<tr><td>dr.20</td><td>60.00Hz</td><td>Max speed limit</td><td>50.00Hz</td></tr>
<tr><td>dr.93</td><td>0</td><td>Parameter initialization</td><td>1: Set parameters back to their factory value (only if required).</td></tr>
</table>

(*) This value depends on the motor setting.

Parameter	Default value	Description	Set value
dr.97	2.x	Software version	-
Cn.4	3kHz	Modulation frequency	5kHz
AP.1	0	Application function selection	**2:** PID control enabled.
AP.19	50.0	PID local	40.0 (adjust desired PID in %)
AP.20	0	Select PID regulator source	**0:** PID set point introduced from keypad
AP.21	0	Select feedback signal source	**3:** I2 input (Feedback from a signal of 0 – 20mA).
AP.22	50.0	PID controller proportional gain	50.0
AP.23	10.0	PID controller integration time	10.0
AP.24	0.0	PID controller differential time	0.0
AP.28	0	PID mode	**0:** Process **1:** Normal.
AP.29	60.00	Upper limit PID output	50.00Hz
AP.30	-60.00	Lower limit PID output	00.00Hz
AP.37	60 seg	Sleep mode activation delay	40 seg (Delay time before the drive stops).
AP.38	0.00Hz	Sleep mode activation speed	10.00Hz (Frequency to stop operating and enter in sleep mode).
AP.39	35%	Awakening level	10% (% of the feedback to start again).
In.1	50.00Hz	Analog input max. freq	50.00Hz
In.52	10ms	I2 filter	10ms (Analogue input current filter).
In.53	4.00mA	I2 minimum current	4.00mA (I2 minimum current adjustment).
In.54	0.00	I2 minimum reference	0.00 (% of the value set In.1)
In.55	20.00mA	I2 maximum current	20.00mA (I2 maximum current adjustment)
In.56	100.00	I2 maximum reference	100.00 (% of the value set In.1)
In.65	1	Digital input 1	**1:** Forward start command

Connection scheme

Terminals CM/P1: Start command (NO state).



Constant pressure control and automatic stop at zero level flow. Pressure command is set by keypad

Note: For two-wire pressure transducers, connect 1 to pin 24 and 2 to pin I2

Speed control (up/down potentiometer) and Start/Stop commands by terminals

Parameter configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Frequency reference	x.xxHz (Reference visualization).
ACC	20.0 seg	Acceleration time	10.0 sec
dEC	30.0 seg	Deceleration time	10.0 sec
drv	1	Start/Stop control	**1:** Start/Stop from terminals FX – Forward o Rx – Reverse.
Frq	0	Frequency setting mode	**0:** Local
Ad.8	0	Stop mode	**0:** Stop with deceleration ramp. **1:** DC brake to stop. **2:** Free run to stop. **4:** Regenerative brake to stop.
Ad.10	0	Start after low voltage.	**0:** NO (Drive does not start after power loss). **1:** YES (Drive starts after power loss).
Ad.24	0	Use frequency limit	**0:** NO (Limits are set by maximum frequency and start frequency). **1:** YES (Limits are set by the higher and lower frequency limits).
Ad.25	0.50Hz	Frequency lower limit	0.00Hz
Ad.26	50.00Hz	Frequency higher limit	50.00Hz
bA.13	(*)	Motor Current	?A (See motor plate).
dr.14	(*)	Motor rated power	0.2 — 0.2kW … — … 5.5 — 5.5kW 7.5 — 7.5kW
dr.15	0	Torque boost	**0:** Manual torque (Both directions can be configured separately, in dr.16 ➔ 'Start torque in forward direction' and in dr.17 ➔ 'Start torque in reverse direction'). **1 and 2:** The drive automatically calculates the voltage to apply at the start using the motor parameters.

Parameter	Default value	Description	Set value
dr.18	60.00Hz	Motor frequency	50.00Hz
dr.19	0.50Hz	Start frequency	0.10Hz
dr.20	60.00Hz	Max speed limit	50.00Hz
dr.93	0	Parameter initialization	**1:** Set parameters back to their factory value (only if required).
dr.97	2.x	Software version	-
Cn.4	3kHz	Modulation frequency	5kHz
In.65	1	Digital input 1	**1:** Forward start command
In.70	8	Digital input 6	**17:** UP
In.71	9	Digital input 7	**18:** DOWN

(*) This value depends on the motor setting.

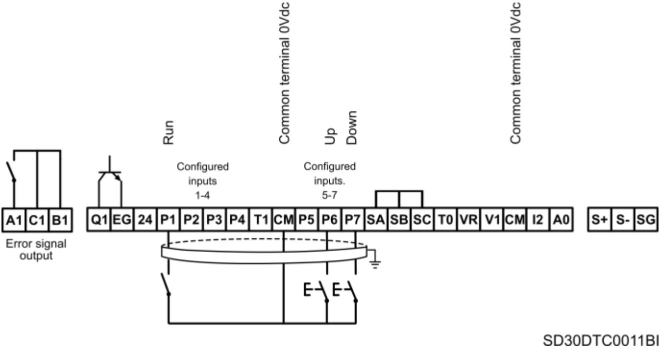
When the forward start command is sent (common CM), the drive will start and maintain speed at 0Hz. When P6 pushbutton is pressed, the speed will increase up to the minimum speed Ad.25, or to the speed stored in memory if Ad.65=Y

Connection scheme

Terminals CM/P1: Run command (NO state).

Terminals CM/P6: Up push button (NO state).

Terminals CM/P7: Down push button (NO state).



Speed control (up/down potentiometer) and Start/Stop commands by terminals

Permanent Magnet Synchronous Motor control

Parameter configuration by funcionalities

1. Basic Parameters drive/motor

These parameters are the necessary ones to correctly set the nameplate of the motor and the configuration of the drive. It is mandatory all parameters to be introduced since the thermal model and internal calculation depend on these parameters for the proper operation of the vector sensorless control.

Parameter	Default value	Description	Set value
dr.9	V/Hz	Control mode	6 PM Sensor-less
dr.14	-	Motor capacity	Depends on the motor capacity
dr.18	60.00Hz	Base frequency	Depends on the PM motor capacity
dr.20	60.00Hz	Maximum frequency	Depends on the PM motor capacity
bA.11	-	Motor pole number	4
bA.13	-	Rated motor current	Depends on the motor capacity
bA.15	0V	Motor-rated voltage	220/380/440/480
bA.16	-	Motor efficiency	Depends on the motor capacity
bA.19	380V	Motor input voltage	220/380

2. Internal motor parameters

These parameters are meassured by the function “Auto-tuning”. To perform the autotuning, it is necessary the parameter bA.20 to be set at 7. The drive will perform diverse tests to extract the value of the parameters.

Parameter	Default value	Description	Set value
bA.20	0	Auto tuning	7 All PM
bA.32	100%	Q-axis inductance scale	100%
bA.34	33.3%	Auto tuning level for Ld and Lq	33.3%
bA.35	100.0%	Auto tuning frequency for Ld and Lq	100.0%

3. Speed loop controller Sensorless

For a PI speed controller, P gain is a proportional gain for the speed deviation. If the speed deviation becomes greater than the torque, the output command will increase accordingly. With a high value in P, the speed is regulated in faster way. Too high values can produce instability in the speed.

The speed controller I gain is the integral gain for speed deviation. It is the time taken for the gain to reach the rated torque output command while constant speed deviation continues. The lower the value becomes, the faster the speed deviation will decrease.

As the motor inertia varies by motor, the gain values should be changed according to the motor speeds. Cn.12 and Cn. 13 set the low speed P/I controller gain values, while Cn.15 and Cn.16 set the high speed P/I controller gain values, so that an appropriate gain value can be used for different motor speeds.

If the values of the speed regulator are too low, the speed could get overshoots when it tries to find the speed. If the values of this regulator is too high, the motor could get instabilities trying to find the speed.

Parameter	Default value	Description	Set value
Cn.12	100	PM speed controller P gain 1	100
Cn.13	150	PM speed controller I gain 1	150
Cn.15	100	PM speed controller P gain 2	100
Cn.16	150	PM speed controller I gain 2	150

4. Back EMF control loop

To ensure that the back-EMF with rotor position information can be properly estimated during a PM synchronous motor operation in sensorless vector control mode, set the following parameters values as a percentage of the proportional gain, which is designed to have a stable estimator polarity.

Higher values produce faster responses, with higher chances of increasing motor vibration.

Excessively low values may result in motor startup failure due to slow response rate.

For a short ramps of acceleration, it is recommended a low value set in Cn.33 (less than 100%), but initial torque could decrease. For fast ramps, it is recommended the value of Cn.33 to be increased.

Parameter	Default value	Description	Set value
Cn.33	100.0%	PM D-axis back-EMF estimated gain (%)	100.0%
Cn.34	100.0%	PM Q-axis back-EMF estimated gain (%)	100.0%

5. Initial pole searching

Initial pole position detection is a process to match the rotor position calculated by the variable speed drive and the current rotor position in a motor. In a permanent-magnet (PM) synchronous motor, rotor flux is generated by the permanent magnet attached to the rotor. Therefore, to run the motor in vector control mode, the exact rotor position (flux position) must be detected for an accurate control of the torque generated by the motor.

At Cn. 46 (InitAngle Sel), select the type of initial pole position detection.

When Cn. 46 is set to 0 (None), the motor is operated according to the pole position estimated by the drive’s sensorless control algorithm, instead of detecting the physical position of the rotor pole.

When Cn.46 is set to 1 (Angle Detect), the motor is operated according to the pole position detected by changes in the current. The voltage pulse input is used to detect the pole position and it results in a small amount of noise at motor startup.

When Cn. 46 is set to 2 (Alignment), the drive forcefully align the rotor position by supplying DC current for a certain period of time.

Parameter	Default value	Description	Set value
Cn.35	2	Initial pole position estimation retry	2
Cn.36	20ms	Initial pole position estimation interval	20ms
Cn.37	15%	Initial pole position estimation pulse current (%)	15%
Cn.38	500%	Initial pole position estimation pulse voltage (%)	500%
Cn.46	1: Det. de ángulo	Initial pole position estimation type	1: Det. de ángulo

6. Voltage compensation

These parameters set the output compensation values during a PM synchronous motor operation in sensorless vector control mode.

If the motor fails operating at low speeds, at or below 5% of the rated motor speed, increase the parameter values set at Cn.39 and Cn.40 by 10% increments. Decrease the values in 10% decrements if a clanking noise occurs at motor startup and motor stop.

Parameter	Default value	Description	Set value
Cn.39	100.0%	PM dead-time range (%)	100.0%
Cn.40	100.0%	PM dead-time voltage (%)	100.0%

7. Speed and flux estimator loops

Set these parameters to change the speed estimator gain during a PM synchronous motor operation in sensorless vector control mode.

If fault trips occur or excessive oscillation is observed at low speed, decrease the Cn.41 value in 10% decrements until the motor operates stably.

If ripples occurs during normal operation, increase the value at Cn. 42.

The values at Cn.43 and Cn.44 are used for low speed operations in 200 V motors.

Set the high speed portion of the forward speed versus the counter the back-EMF during a PM synchronous motor operation in sensorless vector control mode. Feed forwarding enhances operation of the speed estimator.

Increase the value at Cn.45 in 10% increments to suppress motor oscillation under load. A fault trip may occur if this value is set too high

It is not recommended modifing these parameters, the default values are valid for the 90% of the applications.

Parameter	Default value	Description	Set value
Cn.41	100	PM speed estimator proportional gain	100
Cn.42	10	PM speed estimator integral gain	10
Cn.43	300	PM speed estimator proportional gain 2	300
Cn.44	30	PM speed estimator integral gain 2	30
Cn.45	300%	Speed estimator feedforward high speed range (%)	300%

8. Current loop controller

Set these parameters for setting the gain values for the PI current controller in a synchronous motor.

The P gain is the proportional gain for the current deviation. The current deviation decreases faster with higher values, as the deviation in voltage output command increases with increased deviation.

The I gain is the integral gain for the current deviation. Deviation in normal operation decreases with higher values.

However, the gain values are limited by the carrier frequency. A fault trip may occur due to interference if the gain values are set too high.

Parameter	Default value	Description	Set value
Cn.48	1200	Current controller P gain	1200
Cn.49	120	Current controller I gain	120

9. Voltage loop limiter controller

The PMSM motors have a handicap: to gets the maximum torque at the maximum speed, it is necessary the nominal voltage of the motor. Due to the voltage drop in the drive, sometimes the drive is not able to supply the maximum voltage to the motor.

By overmodulation space vector algorithm, the drive is able to increase the output voltage using the parameters Cn.50 and Cn.51.

If it is not necessary, do not modify these parameters, if the motor supplies the torque desired at maximum speed. Increase these parameters can cause a higher THDi level in the motor, getting torque pulses.

Parameter	Default value	Description	Set value
Cn.50	10.0%	Voltage controller limit	10.0%
Cn.51	10.0%	Voltage controller I gain	10.0%

10. Limitador de par

It allows establishing torque limitations for the four quadrants in the operation of synchronous motors permanant magnets.

Parameter	Default value	Description	Set value
Cn.52	0ms	Torque controller output filter	0ms
Cn.53	LOCAL	Torque limit source	LOCAL
Cn.54	180.0%	FWD reverse torque limit	180.0%
Cn.55	180.0%	FWD regenerative torque limit	180.0%
Cn.56	180.0%	REV regenerative torque limit	180.0%
Cn.57	180.0%	REV reverse torque limit	180.0%

Commissioning

A few parameters must be modified for PM synchronous motor operation in sensorless vector control mode commissioning. The default parameters have been set for the 80-90% of the applications.

It is mandatory all parameters related with the nameplate of the motor and characteristics of the drive to be set:

Parameter	Default value	Description	Set value
dr.9	V/Hz	Control mode	6 PM Sensor-less
dr.14	-	Motor capacity	Depends on the motor capacity
dr.18	60.00Hz	Base frequency	Depends on the PM motor capacity
dr.20	60.00Hz	Maximum frequency	Depends on the PM motor capacity
bA.11	-	Motor pole number	4
bA.13	-	Rated motor current	Depends on the motor capacity

Parameter	Default value	Description	Set value
bA.15	0V	Motor-rated voltage	220 / 380 / 440 / 480
bA.16	-	Motor efficiency	Depends on the motor capacity
bA.19	380V	Motor input voltage	220 / 380

After introducing the basic parameters motor/drive, it is necessary to perform an autotuning to calculate the internal parameters of the motor:

Parameter	Default value	Description	Set value
bA.20	0	Autoajuste	7 Todo PM

After that, check if the motor turns correctly. If the motor turns in the lower speed irregularly, try to increase the parameter of Back EMF:

Parameter	Default value	Description	Set value
Cn.33	100.0%	PM D-axis back-EMF estimated gain (%)	100.0%

The following parameters are used for the starting as well. If the acceleration ramp is too slow and the motor works irregularly these parameter must be decreased. If the ramp is very fast, increase the parameters to provide stability.

If for high speed operation the speed is unstable, the speed loops regulators could be modified:

Parameter	Default value	Description	Set value
Cn.12	100	PM speed controller P gain 1	100
Cn.13	150	PM speed controller I gain 1	150
Cn.15	100	PM speed controller P gain 2	100
Cn.16	150	PM speed controller I gain 2	150

If the motor gets overshoot of the speed, increase the value of P, and for the fine tune, increase the value of I. If the motor is not able to keep the speed on, because the speed is very “nervous”, decrease the value of P and for the fine tune decrease the I.

For high dynamic applications, the current loop regulator might be modified:

Parameter	Default value	Description	Set value
Cn.48	1200	Current controller P gain	1200
Cn.49	120	Current controller I gain	120

For high dynamic applications, the regulator values could be increased in order to give stability to the system. For very slow dynamins the regulator values could be decreased in order to give a better operation in the motor (e.g. geting a constant torque in applications such as positive displacement pumps)

Finally, if you have not been able to make the motor work properly, you should initialize all parameters and retry the process from the beginning again. Maybe the result of the autotuning was not very good and the drive was not able to calculate properly the vector position.

Parameter	Default value	Description	Set value
dr.93	0 No	Initialization parameters	1 All parameters

CONFIGURATION REGISTER

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VARIABLE SPEED DRIVE: SD300.

SERIAL Nº: MODEL:

APPLICATION:

DATE:

CUSTOMER:

NOTES:

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
	dr: Drive		
0.00 Local speed	0.00Hz	________________	________________
dr.2 Local torque	0.0%	________________	________________
ACC Acceleration ramp	20.0s	________________	________________
dEC Deceleration ramp	30.0s	________________	________________
drv Control mode 1	REMOTE	________________	________________
Frq Speed reference 1	LOCAL	________________	________________
dr.08 Torque reference 1	LOCAL	________________	________________
dr.9 Control type	V/Hz	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
dr.10 Torque control	N	______________	______________
dr.11 Inch Frequency	10.00Hz	______________	______________
dr.12 INCH accel. time	20.0s	______________	______________
dr.13 INCH decel. time	30.0s	______________	______________
dr.14 Motor power	_._kW	______________	______________
dr.15 Torque boost	Manual	______________	______________
dr.16 Start torque FW. direction	2.0%	______________	______________
dr.17 Start torque in reverse direction	2.0%	______________	______________
dr.18 Motor frequency	60.00Hz	______________	______________
dr.19 Start frequency	0.5Hz	______________	______________
dr.20 Max speed limit	60.00Hz	______________	______________
dr.21 Hz/Rpm Display	Hz	______________	______________
dr.80 Select range	Run Freq.	______________	______________
dr.81 Select monitor code	Volt V	______________	______________
dr.89 Display changed parameters	All	______________	______________
dr.90 ESC key function	Mov. In. Pos.	______________	______________
dr.91 Eloader function	None	______________	______________
dr.93 Parameter initialization	No	______________	______________
dr.94 Register password	0	______________	______________
dr.95 Lock password	0	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
dr.97 Software version	0	______________	______________
dr.98 IO Software version	0	______________	______________
dr.99 Hardware version	0	______________	______________
	bA: Basic Functions		
bA.1 Alt Speed Ref	None	______________	______________
bA.2 Aux calculation type	M+(G*A)	______________	______________
bA.3 Auxiliary reference gain	100.0%	______________	______________
bA.4 Control mode 2	REMOTE	______________	______________
bA.5 Speed reference source 2	LOCAL	______________	______________
bA.6 Alternative torque reference	LOCAL	______________	______________
bA.7 V/F Pattern	Linear	______________	______________
bA.8 Acceleration ramp type	MaxFreq	______________	______________
bA.9 Time scale	0.1s	______________	______________
bA.10 Input Frequency	60Hz	______________	______________
bA.11 Pole Number	4	______________	______________
bA.12 Rated Slip	40rpm	______________	______________
bA.13 Motor Current	3.6A	______________	______________
bA.14 No load Current	1.6A	______________	______________
bA.15 Motor Voltage	0V	______________	______________
bA.16 Efficiency	72%	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
bA.17 Inertia Rate	0	___________	___________
bA.18 Output power adjustment	100%	___________	___________
bA.19 Input voltage	220V→220 440V→380	___________	___________
bA.20 Auto tuning	None	___________	___________
bA.21 Stator Resistor	0	___________	___________
bA.22 Leak Inductor	__mH	___________	___________
bA.23 Stator Inductor	__mH	___________	___________
bA.24 Rotor Time Const	145ms	___________	___________
bA.25 Stator inductance scale.	100%	___________	___________
bA.26 Rotor time constant scale.	100%	___________	___________
bA.31 Regeneration inductance scale	80%	___________	___________
bA.32 Q-axis inductance scale	100%	___________	___________
bA.34 Auto tuning level for Ld and Lq	33.3%	___________	___________
bA.35 Auto tuning frequency for Ld and Lq	100.0%	___________	___________
bA.41 User Frequency 1	15.00Hz	___________	___________
bA.42 User Voltage 1	25%	___________	___________
bA.43 User Frequency 2	30.00Hz	___________	___________
bA.44 User Voltage 2	50%	___________	___________
bA.45 User Frequency 3	45.00Hz	___________	___________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
bA.46 User Voltage 4	75%	____________	____________
bA.47 User Frequency 4	0.00Hz	____________	____________
bA.48 User Voltage 5	0%	____________	____________
St1 Multi-Reference 1	10.00%	____________	____________
St2 Multi-Reference 2	20.00%	____________	____________
St**3** Multi-Reference 3	30.00%	____________	____________
bA.53 Multi-Reference 4	40.00%	____________	____________
bA.54 Multi-Reference 5	50.00%	____________	____________
bA.55 Multi-Reference 6	60.00%	____________	____________
bA.56 Multi-Reference 7	60.00%	____________	____________
bA.70 Acceleration ramp 2	20.0s	____________	____________
bA.71 Deceleration ramp 2	30.0s	____________	____________
bA.72 Acceleration ramp 3	20.0s	____________	____________
bA.73 Deceleration ramp 3	30.0s	____________	____________
bA.74 Acceleration ramp 4	20.0s	____________	____________
bA.75 Deceleration ramp 4	30.0s	____________	____________
bA.76 Acceleration ramp 5	20.0s	____________	____________
bA.77 Deceleration ramp 5	30.0s	____________	____________
bA.78 Acceleration ramp 6	20.0s	____________	____________
bA.79 Deceleration ramp 6	30.0s	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
bA.80 Acceleration ramp 7	20.0s	____________________	____________________
bA.81 Deceleration ramp 7	30.0s	____________________	____________________
bA.82 Acceleration ramp 8	20.0s	____________________	____________________
bA.83 Deceleration ramp 8	30.0s	____________________	____________________
	Ad: Expanded Functions		
Ad.1 Acceleration pattern	Linear	____________________	____________________
Ad.2 Deceleration pattern	Linear	____________________	____________________
Ad.3 S curve start acceleration slope	40%	____________________	____________________
Ad.4 S curve stop acceleration slope	40%	____________________	____________________
Ad.5 S curve start decal. slope	40%	____________________	____________________
Ad.6 S curve stop decal. slope	40%	____________________	____________________
Ad.7 Motor start mode	RAMP	____________________	____________________
Ad.8 Stop mode	RAMP	____________________	____________________
Ad.9 Allow speed inversion	None	____________________	____________________
Ad.10 Power-on Run	N	____________________	____________________
Ad.12 Time to DC start	0.00s	____________________	____________________
Ad.13 Current injection DC start	50%	____________________	____________________
Ad.14 Pre-DC brake time	0.10s	____________________	____________________
Ad.15 DC brake time	1.00s	____________________	____________________
Ad.16 Current level DC brake	50%	____________________	____________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Ad.17 Frequency start DC brake	5.00Hz	______________	______________
Ad.20 Acceleration dwell frequency	5.00Hz	______________	______________
Ad.21 Acceleration dwell time	0.0s	______________	______________
Ad.22 Deceleration dwell frequency	5.00Hz	______________	______________
Ad.23 Deceleration dwell time	0.0s	______________	______________
Ad.24 Use frequency limit	N	______________	______________
Ad.25 Frequency lower limit	0.50Hz	______________	______________
Ad.26 Frequency higher limit	[]/dr.20Hz	______________	______________
Ad.27 Jump frequency activation	N	______________	______________
Ad.28 Lower limit jump frequency 1	10.00Hz	______________	______________
Ad.29 Upper limit jump frequency 1	15.00Hz	______________	______________
Ad.30 Lower limit jump frequency 2	20.00Hz	______________	______________
Ad.31 Upper limit jump frequency 2	25.00Hz	______________	______________
Ad.32 Lower limit jump frequency 3	30.00Hz	______________	______________
Ad.33 Upper limit jump frequency 3	35.00Hz	______________	______________
Ad.41 Open brake current	50.0%	______________	______________
Ad.42 Delay before brake opening	1.00s	______________	______________
Ad.44 Brake opening forward freq.	1.00Hz	______________	______________
Ad.45 Brake opening reverse freq.	1.00Hz	______________	______________
Ad.46 Delay before brake closing	1.00s	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Ad.47 Brake closing frequency	2.00Hz	________________	________________
Ad.50 Minimum flux mode	NONE	________________	________________
Ad.51 Minimum flux level in manual mode	0%	________________	________________
Ad.60 Acceleration dwell frequency	0.00Hz	________________	________________
Ad.64 Fan operating mode	During Run	________________	________________
Ad.65 Save motorized potentiometer frequency	N	________________	________________
Ad.66 Select comparator source	None	________________	________________
Ad.67 Output activation level comparator mode	90.00%	________________	________________
Ad.68 Output deactivation level comparator mode	10.00%	________________	________________
Ad.70 Safe operation selection	Always Enable	________________	________________
Ad.71 Safe operation stop	Free Run	________________	________________
Ad.72 Q-Stop Time	5.0s	________________	________________
Ad.74 Enable regeneration prevention	N	________________	________________
Ad.75 Regeneration prevention level	700V	________________	________________
Ad.76 Compare frequency limit	1.00Hz	________________	________________
Ad.77 P gain regeneration prevention	50.0%	________________	________________
Ad.78 I gain regeneration prevention	50.0ms	________________	________________
Ad.80 Fire mode selection	None	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Ad.81 Fire mode frequency	60.00Hz	________________	________________
Ad.82 Fire mode direction	Forward	________________	________________
Cn: Control Functions			
Cn.4 Modulation frequency	2.0 / 3.0kHz	________________	________________
Cn.5 Modulation mode	Normal PWM	________________	________________
Cn.9 Pre-excitation time	1.00s	________________	________________
Cn.10 Pre-excitation flux	100.0%	________________	________________
Cn.11 Power off delay	0.00s	________________	________________
Cn.12 PM speed controller P gain 1	100	________________	________________
Cn.13 PM speed controller I gain 1	150	________________	________________
Cn.15 PM speed controller P gain 2	100	________________	________________
Cn.16 PM speed controller I gain 2	150	________________	________________
Cn.20 Sensorless control gain 2	N	________________	________________
Cn.21 ASR proportional gain 1	___%	________________	________________
Cn.22 ASR integral time 1	___ms	________________	________________
Cn.23 Independent controller proportional gain 2	___._%	________________	________________
Cn.24 Independent controller integral gain 2	___._%	________________	________________
Cn.25 Integral time sensorless controller	___ms	________________	________________
Cn.26 Flux estimator proportional gain	__%	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Cn.27 Flux estimator integral gain	__%	________________	________________
Cn.28 Speed estimator proportional gain 1	___	________________	________________
Cn.29 Speed estimator integral gain 1	___	________________	________________
Cn.30 Speed estimator integral gain 2	___	________________	________________
Cn.31 Sensorless cont. proportional gain	___	________________	________________
Cn.32 Sensorless controller integral gain	___	________________	________________
Cn.33 PM D-axis back-EMF estimated gain (%)	100.0%	________________	________________
Cn.34 PM Q-axis back-EMF estimated gain (%)	2	________________	________________
Cn.35 Initial pole position estimation retry	20ms	________________	________________
Cn.36 Initial pole position estimation interval	15%	________________	________________
Cn.37 Initial pole position estimation pulse current (%)	500%	________________	________________
Cn.38 Initial pole position estimation pulse voltage (%)	100.0%	________________	________________
Cn.39 PM dead-time range (%)	20ms	________________	________________
Cn.40 PM dead-time voltage (%)	100.0%	________________	________________
Cn.41 PM speed estimator proportional gain	100	________________	________________
Cn.42 PM speed estimator integral gain	10	________________	________________
Cn.43 PM speed estimator proportional gain 2	300	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Cn.44 PM speed estimator integral gain 2	30	______________	______________
Cn.45 Speed estimator feedforward high speed range (%)	300%	______________	______________
Cn.46 Initial pole position estimation type	1: Angle Detect	______________	______________
Cn.48 Controller P gain	1200	______________	______________
Cn.49 Controller I gain	120	______________	______________
Cn.50 Voltage controller limit	10.0%	______________	______________
Cn.51 Voltage controller I gain	10.0%	______________	______________
Cn.52 Output filter vector	0ms	______________	______________
Cn.53 Torque limit reference	LOCAL	______________	______________
Cn.54 Forward positive torque limit	180.0%	______________	______________
Cn.55 Forward negative torque limit	180.0%	______________	______________
Cn.56 Reverse positive torque limit	180.0%	______________	______________
Cn.57 Reverse negative torque limit	180.0%	______________	______________
Cn.62 Speed limit reference	LOCAL	______________	______________
Cn.63 Forward speed limit	50.00Hz	______________	______________
Cn.64 Reverse speed limit	50.00Hz	______________	______________
Cn.65 Speed limit gain	500%	______________	______________
Cn.70 Speed search mode selection	Flying Start1	______________	______________
Cn.71 Search mode	0000	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Cn.72 Speed search mode current	150%	____________	____________
Cn.73 Speed search mode proportional gain	100/600	____________	____________
Cn.74 Speed search mode integral gain	100/600	____________	____________
Cn.75 Speed search delay	1.0s	____________	____________
Cn.76 Speed estimator gain	100%	____________	____________
Cn.77 KEB Select	No	____________	____________
Cn.78 Initial value for KEB operation	125.0%	____________	____________
Cn.79 Value to stop KEB operation	130.0%	____________	____________
Cn.80 KEB proportional gain	10000	____________	____________
Cn.81 KEB integral gain	500	____________	____________
Cn.82 Energy buffering Slip gain	30.0	____________	____________
Cn.83 Energy buffering acceleration time	10.0	____________	____________
Cn.85 Flux proportional gain 1	370	____________	____________
Cn.86 Flux proportional gain 2	0	____________	____________
Cn.87 Flux proportional gain 3	100	____________	____________
Cn.88 Flux integral gain 1	50	____________	____________
Cn.89 Flux integral gain 2	50	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Cn.90 Flux integral gain 2	___	____________	____________
Cn.91 Sensorless voltage compensation 1	___	____________	____________
Cn.92 Sensorless voltage compensation 2	___	____________	____________
Cn.93 Sensorless voltage compensation 3	20	____________	____________
Cn.94 Sensorless fluctuation frequency	100.0%	____________	____________
Cn.95 Sensorless switching frequency	2.00Hz	____________	____________
In: Inputs			
In.1 Analog input max. freq	dr.20	____________	____________
In.2 Analog input max. torque	100.0%	____________	____________
In.5 V1 Monitor	0.00V	____________	____________
In.6 V1 polarity	0-10V	____________	____________
In.7 V1 filter	10ms	____________	____________
In.8 V1 minimum voltage	0.00V	____________	____________
In.9 V1 minimum reference	0.00%	____________	____________
In.10 V1 maximum voltage	10.00V	____________	____________
In.11 V1 maximum reference	10.00%	____________	____________
In.12 V1 minimum negative voltage	-10.00V	____________	____________
In.13 V1 minimum negative reference	-10.00%	____________	____________
In.14 V1 maximum negative voltage	-10.00V	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
In.15 V1 maximum negative reference	-10.00%	________________	________________
In.16 V2 Inverting	N	________________	________________
In.17 Adjust V1 quantification	0.04%	________________	________________
In.35 V2 Monitor	0.00V	________________	________________
In.37 V2 filter	10ms	________________	________________
In.38 V2 minimum voltage	0.00V	________________	________________
In.39 V2 minimum reference	0.00%	________________	________________
In.40 V2 maximum current	10.00V	________________	________________
In.41 V2 maximum reference	100.00%	________________	________________
In.46 V2 Inverting	N	________________	________________
In.47 Adjust I2 visualization	0.04%	________________	________________
In.50 I2 Monitor	0.00mA	________________	________________
In.52 I2 filter	10ms	________________	________________
In.53 I2 minimum current	4.00mA	________________	________________
In.54 I2 minimum reference	0.00%	________________	________________
In.55 I2 maximum current	10.00mA	________________	________________
In.56 I2 maximum reference	100.00%	________________	________________
In.61 I2 Inverting	N	________________	________________
In.62 Adjust I2 visualization	0.04%	________________	________________
In.65 Digital input 1	1	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
In.66 Digital input 2	2	___________	___________
In.67 Digital input 3	3	___________	___________
In.68 Digital input 4	3	___________	___________
In.69 Digital input 5	7	___________	___________
In.70 Digital input 6	8	___________	___________
In.71 Digital input 7	9	___________	___________
In.85 Digital input activation delay	10ms	___________	___________
In.86 DI deactivation delay	3ms	___________	___________
In.87 Digital input contact type	0000	___________	___________
In.89 DI scan time	1ms	___________	___________
In.90 Digital inputs status	0000	___________	___________
In.91 TI Monitor	0.00kHz	___________	___________
In.92 TI Filter	400ms	___________	___________
In.93 TI minimum input frequency	0.00kHz	___________	___________
In.94 TI minimum input frequency percentage	0.00%	___________	___________
In.95 TI maximum input frequency	32.00kHz	___________	___________
In.96 TI max. input freq. %	100.00%	___________	___________
In.97 TI Inverting	N	___________	___________
In.98 TI noise reduction level	0.04%	___________	___________
In.99 Input mode setting	00	___________	___________
OU: Outputs			
OU.1 Analog output 1 mode selection	Frequency	___________	___________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
OU.2 Analog output 1 gain	100.0%	________________	________________
OU.3 Analog output 1 offset	0.0%	________________	________________
OU.4 Analog output 1 filter	5ms	________________	________________
OU.5 Analog output 1 constant setting	0.0%	________________	________________
OU.6 Analog output 1 monitor	0.0%	________________	________________
OU.30 Relay fault output	010	________________	________________
OU.31 Relay **1** control source	Trip	________________	________________
OU.33 Digital output 1 function	Run	________________	________________
OU.41 Digital outputs status	00	________________	________________
OU.50 Digital output connection delay	0.00s	________________	________________
OU.51 Digital output disconnection delay	0.00s	________________	________________
OU.52 NC/NO Relays logic	00	________________	________________
OU.53 Digital output connection delay on fault	0.00s	________________	________________
OU.54 Digital output disconnection delay on fault	0.00s	________________	________________
OU.55 Digital output connection delay	0.00s	________________	________________
OU.56 Digital output disconnection delay	0.00s	________________	________________
OU.57 Relay FDT level	30.00Hz	________________	________________
OU.58 Relay FDT band	10.00Hz	________________	________________
OU.61 Pulse output mode	Frequency	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
OU.62 Pulse output gain	100.0%	____________	____________
OU.63 Pulse output offset	0.0%	____________	____________
OU.64 Pulse output filter	5ms	____________	____________
OU.65 Pulse output constant setting	0.0%	____________	____________
OU.66 Pulse output monitor	0.0%	____________	____________
CM: Communications			
CM.1 Slave address	1	____________	____________
CM.2 Communication protocol	Modbus	____________	____________
CM.3 Baud rate	9600bps	____________	____________
CM.4 Communication frame structure	D8/PN/S1	____________	____________
CM.5 Response delay	5ms	____________	____________
CM.6 Communication option S/W version	0.00	____________	____________
CM.7 Communication option ID	1	____________	____________
CM.8 Card baud rate	12Mbps	____________	____________
CM.9 Communication option LED status	-	____________	____________
CM.30 Output parameters number	3	____________	____________
CM.31 Output comm. address 1	000A	____________	____________
CM.32 Output comm. address 2	000E	____________	____________
CM.33 Output comm. address 3	000F	____________	____________
CM.34 Output comm. address 4	0000	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
CM.35 Output comm. address 5	0000	____________	____________
CM.36 Output comm. address 6	0000	____________	____________
CM.37 Output comm. address 7	0000	____________	____________
CM.38 Output comm. address 8	0000	____________	____________
CM.50 Number of input parameters	2	____________	____________
CM.51 Input comm. address 1	0005	____________	____________
CM.52 Input comm. address 2	0006	____________	____________
CM.53 Input comm. address 3	0000	____________	____________
CM.54 Input comm. address 4	0000	____________	____________
CM.55 Input comm. address 5	0000	____________	____________
CM.56 Input comm. address 6	0000	____________	____________
CM.57 Input comm. address 7	0000	____________	____________
CM.58 Input comm. address 8	0000	____________	____________
CM.68 Field bus data swap	0	____________	____________
CM.70 Communication multifunction input 1	None	____________	____________
CM.71 Communication multifunction input 2	None	____________	____________
CM.72 Communication multifunction input 3	None	____________	____________
CM.73 Communication multifunction input 4	None	____________	____________
CM.74 Communication multifunction input 5	None	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
CM.75 Communication multifunction input 6	None	____________	____________
CM.76 Communication multifunction input 7	None	____________	____________
CM.77 Communication multifunction input 8	None	____________	____________
CM.86 Comm. multifunction input monitoring	0	____________	____________
CM.90 Data frame comm. monitor	0	____________	____________
CM.91 Received data frames counter	0	____________	____________
CM.92 Frames with error counter	0	____________	____________
CM.93 NAK frames	0	____________	____________
CM.94 Communications update	NO	____________	____________
CM.95 P2P communication selection	Disable all	____________	____________
CM.96 Digital output selection	0	____________	____________
AP: PID			
AP.1 Application function selection	Proc PID	____________	____________
AP.2 Enable PLC mode	N	____________	____________
AP.16 PID output	+0.0%	____________	____________
AP.17 PID reference	+50.00%	____________	____________
AP.18 PID feedback	+0.00%	____________	____________
AP.19 PID local	+50.00%	____________	____________
AP.20 Select PID regulator source	MREF	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
AP.21 Select feedback signal source	V1	______________	______________
AP.22 PID controller proportional gain	+50.00%	______________	______________
AP.23 PID controller integration time	10.0ms	______________	______________
AP.24 PID controller differential time	0ms	______________	______________
AP.25 PID output fine adjustment	+0.0%	______________	______________
AP.26 Proportional gain scale	100.0%	______________	______________
AP.27 PID Filter	0ms	______________	______________
AP.28 PID mode	Process	______________	______________
AP.29 Upper limit PID output	+60.00Hz	______________	______________
AP.30 Lower limit PID output	-60.00Hz	______________	______________
AP.31 Invert PID	N	______________	______________
AP.32 PID output scale	+100.00%	______________	______________
AP.34 PrePID reference	0.00Hz	______________	______________
AP.35 PrePID end reference	0.0%	______________	______________
AP.36 PrePID delay	600s	______________	______________
AP.37 Sleep mode activation delay	60.0s	______________	______________
AP.38 Sleep mode activation speed	0.00Hz	______________	______________
AP.39 Awakening level	+35%	______________	______________
AP.40 PID WakeUp mode	Below	______________	______________
AP.42 PID unit	%	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
AP.43 PID unit gain	100.00%	________________	________________
AP.44 PID scale unit	x1	________________	________________
AP.45 Proportional gain 2	100.0%	________________	________________
	Pr: Protections		
Pr.4 Load duty type	Heavy	________________	________________
Pr.5 Phase loss type	NONE	________________	________________
Pr.6 Ripple voltage	15V	________________	________________
Pr.7 Fault deceleration time	3.0s	________________	________________
Pr.8 Start after restart	N	________________	________________
Pr.9 Retry attempts number	0	________________	________________
Pr.10 Retry delay	1.0s	________________	________________
Pr.12 Response in case of a speed reference loss	None	________________	________________
Pr.13 Lost reference delay	1.0s	________________	________________
Pr.14 Reference for lost reference	0.00Hz	________________	________________
Pr.15 AI Lost Level	Half	________________	________________
Pr.17 Overload warning select	YES	________________	________________
Pr.18 Overload warning level	+150%	________________	________________
Pr.19 Overload warning time	10.0s	________________	________________
Pr.20 Overload trip select	FreeRun	________________	________________
Pr.21 Overload level	180%	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Pr.22 Overload trip time	60.0s	________________	________________
Pr.25 Enable underload	YES	________________	________________
Pr.26 Underload warning delay	10.0s	________________	________________
Pr.27 Underload fault mode	None	________________	________________
Pr.28 Underload fault delay	30.0	________________	________________
Pr.29 Underload minimum level	+30%	________________	________________
Pr.30 Underload maximum level	+30%	________________	________________
Pr.31 Action in case no motor is detected	None	________________	________________
Pr.32 No motor fault level	+5%	________________	________________
Pr.33 No motor fault delay	3.0s	________________	________________
Pr.40 Action in case of thermo-electronic fault	None	________________	________________
Pr.41 Motor cooling mode at zero speed	SELF	________________	________________
Pr.42 Overcurrent level during 1 min	150%	________________	________________
Pr.43 Continuous overcurrent level	+120%	________________	________________
Pr.45 Free run trip mode	FreeRun	________________	________________
Pr.50 Stall prevention	00	________________	________________
Pr.51 Speed for stall protection 1	60Hz	________________	________________
Pr.52 Level for stall protection 1	180%	________________	________________
Pr.53 Speed for stall protection 2	60Hz	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Pr.54 Level for stall protection 2	180%	________________	________________
Pr.55 Speed for stall protection 3	60Hz	________________	________________
Pr.56 Level for stall protection 3	180%	________________	________________
Pr.57 Speed for stall protection 4	60Hz	________________	________________
Pr.58 Level for stall protection 4	180%	________________	________________
Pr.59 Flux braking gain	0%	________________	________________
Pr.60 CAP diagnosis level	0%	________________	________________
Pr.61 Capacitor diagnosis mode	+0%	________________	________________
Pr.62 CAP exchange warning level	0%	________________	________________
Pr.63 Capacitance reference	0.0%	________________	________________
Pr.66 Braking resistor configuration	+0%	________________	________________
Pr.73 Speed deviation fault	N	________________	________________
Pr.74 Speed deviation band	50	________________	________________
Pr.75 Speed deviation time	60	________________	________________
Pr.79 Action in case of fan trip	Warn	________________	________________
Pr.80 Optional card trip mode	FreeRun	________________	________________
Pr.81 Low voltage trip delay	0.0s	________________	________________
Pr.82 Enable low voltage trip	YES	________________	________________
Pr.86 Fan use percentage	0%	________________	________________
Pr.87 Fan exchange warning level	90.0%	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
Pr.88 Fan time reset	N	____________	____________
Pr.89 CAP fan status	0	____________	____________
Pr.90 Warning information	-	____________	____________
Pr.91 Fifth fault	nOn	____________	____________
Pr.92 Fourth fault	nOn	____________	____________
Pr.93 Third fault	nOn	____________	____________
Pr.94 Second fault	nOn	____________	____________
Pr.95 First fault	nOn	____________	____________
Pr.96 Reset fault history	0	____________	____________
M2: Second Motor			
M2.4 Motor 2 acceleration ramp	20.0s	____________	____________
M2.5 Motor 2 deceleration ramp	30.0s	____________	____________
M2.6 Motor 2 rated power	4.0kW	____________	____________
M2.7 Motor 2 frequency	60.00Hz	____________	____________
M2.8 Control type selection	V/Hz	____________	____________
M2.10 Poles number	__	____________	____________
M2.11 Rated Slip	__rpm	____________	____________
M2.12 Motor nominal current	_._A	____________	____________
M2.13 No load current	_._A	____________	____________
M2.14 Motor **2** voltage	__V	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
M2.15 Motor **2** efficiency	___%	________________	________________
M2.16 Motor **2** inertia rate	__	________________	________________
M2.17 Stator resistor	___mΩ	________________	________________
M2.18 Leak inductor	_.___m	________________	________________
M2.19 Stator inductor	__.__mH	________________	________________
M2.20 Rotor time constant	___ms	________________	________________
M2.25 V/F pattern	Linear	________________	________________
M2.26 Torque in forward direction	+2.0%	________________	________________
M2.27 Torque in reverse direction	+2.0%	________________	________________
M2.28 Stall prevention level motor 2	150%	________________	________________
M2.29 Motor 2 overcurrent level during 1 minute	+150%	________________	________________
M2.30 Motor 2 continuous overcurrent level	+100%	________________	________________
US: PLC Sequence			
US.1 PLC operation mode	Stop	________________	________________
US.2 PLC loop time	0.02s	________________	________________
US.11 Output link address for PLC function 1	0	________________	________________
US.12 Output link address for PLC function 2	0	________________	________________
US.13 Output link address for PLC function 3	0	________________	________________
US.14 Output link address for PLC function 4	0	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
US.15 Output link address for PLC function 5	0	________________	________________
US.16 Output link address for PLC function 6	0	________________	________________
US.17 Output link address for PLC function 7	0	________________	________________
US.18 Output link address for PLC function 8	0	________________	________________
US.19 Output link address for PLC function 9	0	________________	________________
US.20 Output link address for PLC function 10	0	________________	________________
US.21 Output link address for PLC function 11	0	________________	________________
US.22 Output link address for PLC function 12	0	________________	________________
US.23 Output link address for PLC function 13	0	________________	________________
US.24 Output link address for PLC function 14	0	________________	________________
US.25 Output link address for PLC function 15	0	________________	________________
US.26 Output link address for PLC function 16	0	________________	________________
US.27 Output link address for PLC function 17	0	________________	________________
US.28 Output link address for PLC function 18	0	________________	________________
US.31 PLC input value 1	0	________________	________________
US.32 PLC input value 2	0	________________	________________
US.33 PLC input value 3	0	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
US.34 PLC input value 4	0	________	________
US.35 PLC input value 5	0	________	________
US.36 PLC input value 6	0	________	________
US.37 PLC input value 7	0	________	________
US.38 PLC input value 8	0	________	________
US.39 PLC input value 9	0	________	________
US.40 PLC input value 10	0	________	________
US.41 PLC input value 11	0	________	________
US.42 PLC input value 12	0	________	________
US.43 PLC input value 13	0	________	________
US.44 PLC input value 14	0	________	________
US.45 PLC input value 15	0	________	________
US.46 PLC input value 16	0	________	________
US.47 PLC input value 17	0	________	________
US.48 PLC input value 18	0	________	________
US.49 PLC input value 19	0	________	________
US.50 PLC input value 20	0	________	________
US.51 PLC input value 21	0	________	________
US.52 PLC input value 22	0	________	________
US.53 PLC input value 23	0	________	________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
US.54 PLC input value 24	0	______________	______________
US.55 PLC input value 25	0	______________	______________
US.56 PLC input value 26	0	______________	______________
US.57 PLC input value 27	0	______________	______________
US.58 PLC input value 28	0	______________	______________
US.59 PLC input value 29	0	______________	______________
US.60 PLC input value 30	0	______________	______________
US.80 Analogue input V1 value	0.000	______________	______________
US.81 Analogue input I2 value	+0.000	______________	______________
US.82 Digital inputs value	0	______________	______________
US.85 Analogue output value	-	______________	______________
US.88 Digital output value	0	______________	______________
UF: PLC Function			
UF.1 PLC function 1	NOP	______________	______________
UF.2 Input A PLC function 1	0	______________	______________
UF.3 Input B PLC function1	0	______________	______________
UF.4 Input C PLC function1	0	______________	______________
UF.5 Output PLC function 1 PLC	+0	______________	______________
UF.6 PLC function 2	NOP	______________	______________
UF.7 Input A PLC function 2	0	______________	______________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
UF.8 Input B PLC function 2	0	________________	________________
UF.9 Input C PLC function 2	0	________________	________________
UF.10 Output PLC function 2	+0	________________	________________
UF.11 PLC function 3	NOP	________________	________________
UF.12 Input A PLC function 3	0	________________	________________
UF.13 Input B PLC function 3	0	________________	________________
UF.14 Input C PLC function 3	0	________________	________________
UF.15 Output PLC function 3	+0	________________	________________
UF.16 PLC function 4	NOP	________________	________________
UF.17 Input A PLC function 4	0	________________	________________
UF.18 Input B PLC function 4	0	________________	________________
UF.19 Input C PLC function 4	0	________________	________________
UF.20 Output PLC function 4	+0	________________	________________
UF.21 PLC function 5	NOP	________________	________________
UF.22 Input A PLC function 5	0	________________	________________
UF.23 Input B PLC function 5	0	________________	________________
UF.24 Input C PLC function 5	0	________________	________________
UF.25 Output PLC function 5	+0	________________	________________
UF.26 PLC function 6	NOP	________________	________________
UF.27 Input A PLC function 6	0	________________	________________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
UF.28 Input B PLC function 6	0	__________	__________
UF.29 Input C PLC function 6	0	__________	__________
UF.30 Output PLC function 6	+0	__________	__________
UF.31 PLC function 7	NOP	__________	__________
UF.32 Input A PLC function 7	0	__________	__________
UF.33 Input B PLC function 7	0	__________	__________
UF.34 Input C PLC function 7	0	__________	__________
UF.35 Output PLC function 7	+0	__________	__________
UF.36 PLC function 8	NOP	__________	__________
UF.37 Input A PLC function 8	0	__________	__________
UF.38 Input B PLC function 8	0	__________	__________
UF.39 Input C PLC function 8	0	__________	__________
UF.40 Output PLC function 1	+0	__________	__________
UF.41 PLC function 9	NOP	__________	__________
UF.42 Input A PLC function 9	0	__________	__________
UF.43 Input B PLC function 9	0	__________	__________
UF.44 Input C PLC function 9	0	__________	__________
UF.45 Output PLC function 9	+0	__________	__________
UF.46 PLC function 10	NOP	__________	__________
UF.47 Input A PLC function 10	0	__________	__________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
UF.48 Input B PLC function 10	0	________	________
UF.49 Input C PLC function 10	0	________	________
UF.50 Output PLC function 10	+0	________	________
UF.51 PLC function 11	NOP	________	________
UF.52 Input A PLC function 11	0	________	________
UF.53 Input B PLC function 11	0	________	________
UF.54 Input C PLC function 11	0	________	________
UF.55 Output PLC function 11	+0	________	________
UF.56 PLC function 12	NOP	________	________
UF.57 Input A PLC function 12	0	________	________
UF.58 Input B PLC function 12	0	________	________
UF.59 Input C PLC function 12	0	________	________
UF.60 Output PLC function 12	+0	________	________
UF.61 PLC function 13	NOP	________	________
UF.62 Input A PLC function 13	0	________	________
UF.63 Input B PLC function 13	0	________	________
UF.64 Input C PLC function 13	0	________	________
UF.65 Output PLC function 13	+0	________	________
UF.66 PLC function 14	NOP	________	________
UF.67 Input A PLC function 14	0	________	________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
UF.68 Input B PLC function 14	0	____________	____________
UF.69 Input C PLC function 14	0	____________	____________
UF.70 Output PLC function 14	+0	____________	____________
UF.71 PLC function 15	NOP	____________	____________
UF.72 Input A PLC function 15	0	____________	____________
UF.73 Input B PLC function 15	0	____________	____________
UF.74 Input C PLC function 15	0	____________	____________
UF.75 Output PLC function 15	+0	____________	____________
UF.76 PLC function 16	NOP	____________	____________
UF.77 Input A PLC function 16	0	____________	____________
UF.78 Input B PLC function 16	0	____________	____________
UF.79 Input C PLC function 16	0	____________	____________
UF.80 Output PLC function 16	+0	____________	____________
UF.81 PLC function 17	NOP	____________	____________
UF.82 Input A PLC function 17	0	____________	____________
UF.83 Input B PLC function 17	0	____________	____________
UF.84 Input C PLC function 17	0	____________	____________
UF.85 Output PLC function 17	+0	____________	____________
UF.86 PLC function 18	NOP	____________	____________
UF.87 Input A PLC function 18	0	____________	____________

PARAMETER	DEFAULT VALUE	SETTING 1	SETTING 2
UF.88 Input B PLC function 18	0	____________	____________
UF.89 Input C PLC function 18	0	____________	____________
UF.90 Output PLC function 18 PLC	+0	____________	____________

DECLARATION OF CONFORMITY CE
DECLARACIÓN DE CONFORMIDAD CE

The Company ***La empresa:***

Name *Nombre:*	**POWER ELECTRONICS ESPAÑA, S.L.**
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Declares under its own responsibility, that the product:
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Reference ***Referencia***	**Títle** ***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)*

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	**Títle Título**
IEC 61800-3:2004	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***	***Títle*** ***Título***
IEC 61800-5-1:2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1:2007); *Accionamientos eléctricos de potencia de velocidad variable. Parte 5-1: Requisitos de seguridad. Eléctricos, térmicos y energéticos.*

Paterna, 10th of March, 2017

David Salvo
CEO

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