SDRIVE
450 Series

VARIABLE SPEED DRIVE

variable speed drive

Getting Started Manual

POWER ELECTRONICS

SDRIVE
450 Series
VARIABLE SPEED DRIVE

frequency converter

Getting Started Manual

Edition: october 2006

SD45IM01BI Rev. B

SAFETY SYMBOLS

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

	**WARNING**	This symbol means improper operation may results in serious personal injury or death.
	**CAUTION**	Identifies shock hazards under certain conditions. Particular attention should be given because dangerous voltage may be present. Maintenance operation should be done by qualified personnel.
		Identifies potential hazards under certain conditions. Read the message and follow the instructions carefully.
		Identifies shock hazards under certain conditions. Particular attention should be given because dangerous voltage may be present.

Edition of october 2006

This publication could present technical imprecision or misprints. The information here included will be periodically modified and updated, and all those modifications will be incorporated in later editions.
To consult the most updated information of this product you might access through our website www.power-electronics.com where the latest version of this manual can be downloaded.

Revisions

Date	Revision	Description
06 / 03 / 2006	A	Updated software version SW PE 1.1 Ver 0.3
17 / 10 / 2006	B	Updated MODBUS communication Updated software version SW PE 1.2 Ver 0.3

INDEX

SAFETY INSTRUCTIONS **7**

1. INTRODUCTION **11**
1.1. Designation Code 11
1.2. Power Range 11
1.3. Drive Description 12

2. INSTALLATION AND CONNECTION **13**
2.1. Basic Configuration 13
2.2. Environmental Conditions 14
2.3. Power Terminals Wiring 15
2.4. Main Power Supply and Motor Connection 19
2.5. Controls Terminals Wiring 20

3. TECHNICAL CHARACTERISTICS **27**

4. DIMENSIONS **28**
4.1. Dimensions of Frames 1 and 2 28
4.2. Dimensions of Frames 3 and 4 29
4.3. Dimensions of Frames 5, 6 and 7 30

5. POWER RANGE AND ACCESORIES **31**
5.1. Power Range 31
5.2. Sinoidal Output Filters 31
5.3. Harmonics Filters 31

6. CONFORMITY DECLARATION **32**

7. PROGRAMMING KEYPAD **33**
7.1. Parameters Groups 33
7.2. Display Unit 33

8. PROGRAMMING PARAMETERS LIST **37**
8.1. Basic Functions and Display Parameters Group (DRV) 37
8.2. Functions Menu (FU1) 40
8.3. Functions Menu (FU2) 45
8.4. Inputs and Outputs Menu (I/O) 50
8.5. Applications Menu (APP) 57

9. FAULT MESSAGES **63**
9.1. Displayed Faults 63
9.2. Solution of Displayed Faults 64
9.3. Problems Solution 65
9.4. Checking of Power Circuit Components 66
9.5. Maintenance 68
9.6. Daily and Periodic Check Points 69

10. RS485 COMMUNICATION **71**
10.1. Introduction 71
10.2. Specifications 71
10.3. Installation 72
10.4. Communication protocol MODBUS-RTU 74
10.5. Address list 74
10.6. Faults solution 92

11. OPTIONS **93**
11.1. Dynamic Braking Unit 93
11.2. Dynamic Braking Resistor 96

12. COMMONLY USED CONFIGURATIONS 97
12.1. Start / Stop Command and Speed Reference by Keypad or Analogue Input 97
12.2. Multi-speed References via M1, M2 and M3 Terminals 99
12.3. Control of one Pump, Eight Speed References and Manual Speed (Under-load) Without Pressure Group Functionality 101
12.4. Control of 2 Pumps, Four Speed References and Speed Reference by Keypad (Under-load) as Pressure Group. Without MMC Optional Board 104
12.5. Control of Four Pumps, Four Speed References and Speed Reference by Keypad (Under-load) as Pressure Group 107
12.6. Control of Speed by Pushbuttons 110
12.7. Control of Four Pumps in Alternation mode and Four Speed References 112

13. CONFIGURATION REGISTER 115

SAFETY INSTRUCTIONS

IMPORTANT!

- Read this manual carefully to maximise the performance of this product and to ensure its safe use.
- In this manual, safety messages are classified as follows:

⚠ WARNING

Do not remove the cover while the power is applied or the unit is in operation.
Otherwise, electric shock could occur.

Do not run the inverter with the front cover removed.
Otherwise, you may get an electric shock due to the high voltage terminals or exposure of charged capacitors.

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

Wiring and periodic inspections should be performed at least 10 minutes after disconnecting the input power and after checking the DC Link voltage is discharged with a meter (below 30VDC).
Otherwise, you may get an electric shock.

Operate the switches 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.

CAUTION

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

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

After the input power is applied or removed, the inverter will remain hot for a couple of minutes.
Touching hot parts may result in skin burns.

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

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

WARNINGS

RECEPTION

- The SDRIVE 450 is carefully tested and perfectly packed before leaving the factory.
- In the even 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.

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 supplied with a SDRIVE 450 technical manual.

SAFETY

- Before operating the inverter, read this manual thoroughly to gain and understanding of the unit. If any doubt exists then please contact POWER ELECTRONICS, (902 40 20 70 / +34 96 136 65 57) or your nearest agent.
- Wear safety glasses when operating the inverter with power applied and the front cover is removed.
- Handle the inverter with care according to its weight.
- Install the inverter according to the instructions within this manual.
- Do not place heavy objects on the inverter.
- Ensure that the mounting orientation is correct.

SEGURIDAD

- Do not drop the inverter or subject it to impact.
- The SDRIVE 450 inverters contain static sensitive printed circuits boards. Use static safety procedures when handling these boards.
- Avoid installing the inverter in conditions that differ from those described in the *Technical Characteristics* section.

CONNECTION PRECAUTIONS

- To ensure correct operation of the inverter it is recommended to use a SCREENED CABLE for the control wiring.
- For EMERGENCY STOP, make sure supply circuitry is open.
- Do not disconnect motor cables if input power supply remains connected. The internal circuits of the SDRIVE 700 series will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
- It is not recommended to use a 3-wire cable for long distances. Due to increased leakage capacitance between conductors, over-current protective feature may operate malfunction.
- Do not use power factor correction capacitors, surge suppressors, or RFI filters on the output side of the inverter. Doing so may damage these components.
- Always check whether the DC Link LED is OFF before wiring terminals. The charge capacitors may hold high-voltage even after the input power is disconnected. Use caution to prevent the possibility of personal injury.
- The maximum recommended cable length between the inverter and motor is:
    - For models 3.7kW to 22kW, do not exceed 50m when operating at factory default carrier frequency.
    - For models 30kW to 75kW, do not exceed 150m when operating at default carrier frequency.
- For greater output cable lengths please consult the Technical Department at POWER ELECTRONICS.

TRIAL RUN

- Verify all parameters before operating the inverter. Alteration of parameters may be required depending on application and load.
- Always apply voltage and current signals to each terminal that are within levels indicated within this manual. Otherwise, damage to the inverter may result.

OPERATION PRECAUTIONS

- When the Auto Restart function is enabled, keep clear of driven equipment, as the motor will restart suddenly after a fault is reset.
- The “STOP / RESET” key on the keypad is active only if the appropriate function setting has been made. For this reason, install a separate EMERGENCY STOP push button that can be operated at the equipment.
- If a fault reset is made with the reference signal still present then a restart will occur. Verify that it is permissible for this to happen, otherwise an accident may occur.
- Do not modify or alter anything within the inverter.
- Before programming or operating the SDRIVE 450 series, initialise all parameters back to factory default values.

EARTH CONNECTION

- The inverter is a high frequency switching device, and leakage current may flow. Ground the inverter to avoid electrical shock. Use caution to prevent the possibility of personal injury.
- Connect only to the dedicated ground terminal of the inverter. Do not use the case or the chassis screw for grounding.
- When installing, grounding wire should be connected first and removed last.
- The earth cable must have a minimal cross sectional area that meets local country electrical regulations.
- Motor ground must be connected to the drive ground terminal and not to the installation’s ground. We recommend that the section of the ground connection cable should be equal or higher than the active conductor.
- Installation ground must be connected to the inverter ground terminal.

1. INTRODUCTION

1.1. Designation Code

SDRIVE450 SD 45 008

- 008: Ampers
- 45: Series
- SD: Model

1.2. Power Range

REFERENCE	FRAME	kW	I
SD45008	1	3,7	8
SD45012	2	5,5	12
SD45016		7,5	16
SD45024	3	11	24
SD45030		15	30
SD45039	4	18,5	39
SD45045		22	45
SD45060	5	30	60
SD45075		37	75
SD45090	6	45	90
SD45110	7	55	110
SD45150		75	150

STANDARD MOTORS: **4 POLES.**
SOFTWARE VERSION: **S/W PE 1.2 Ver 0.3**

1.3. Drive Description

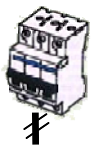
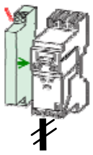
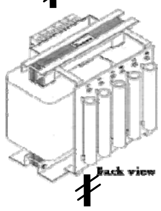
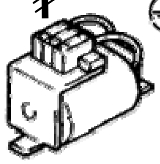
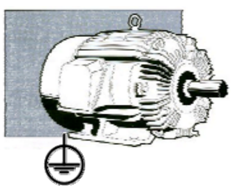
The SD450 is the ideal frequency inverter for ac motor operation from 3,7kW to 90kW, in all kinds of industry and most applications: HVAC (heating ventilation, air conditioning), MMC (multiple motors control), transport, handling…

1. Removable display with independent memory
2. Cables input

2. INSTALLATION AND CONNECTION

2.1. Basic Configuration

The following devices are required to operate the inverter. Proper peripheral devices must be selected and correct connections must be done to ensure proper operation. An incorrectly applied or installed inverter can result in system malfunction or reduction in product life as well as component damage. You must read and understand this manual thoroughly before proceeding.

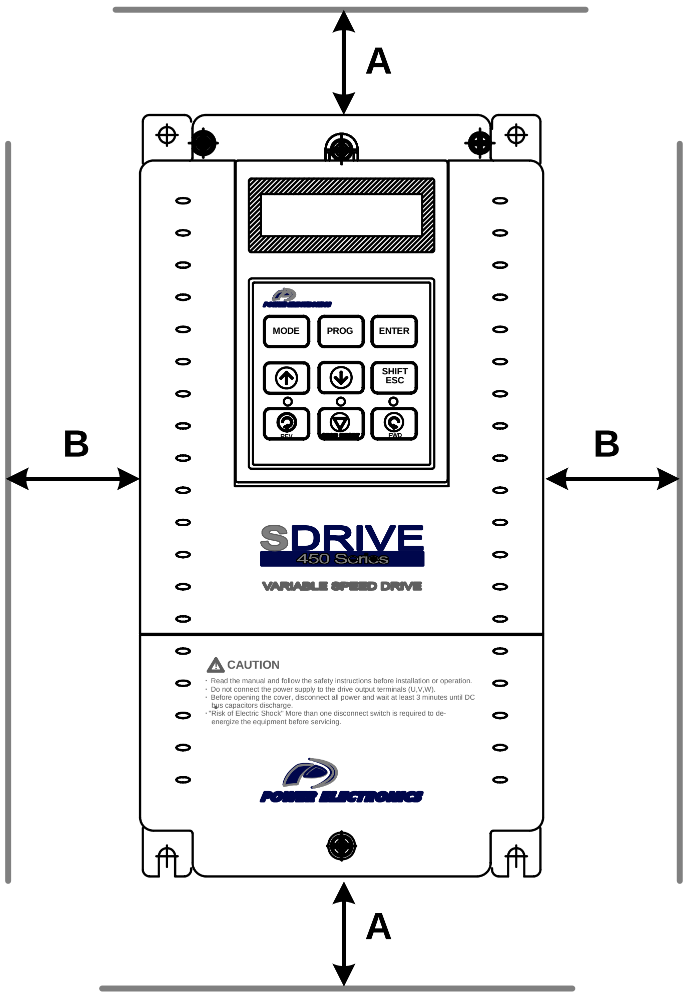
	AC Power Supply	Use a power source with a voltage within the permissible range of inverter input power rating.
	Earth leakage circuit breaker (ELB)	Select circuit breakers or fuses in accordance with applicable national and local codes.
	Inline Magnetic Contactor	Install if necessary. When installed, do not use it for the purpose of starting or stopping the drive.
	AC Reactor	The reactors must be used when the power factor is to be improved and harmonic level has been reduced.
	Installation and wiring	To getting a reliable operation of the inverter, install the inverter in the proper orientation and with proper clearances. Incorrect terminal wiring can damage the equipment.
	DC Reactor	DC reactor can be used to reduce harmonic level or improve power factor instead of AC reactor.
	Motor	Do not connect a power factor capacitor, surge suppressor or radio noise filter to the output side of the drive.

2.2. Environmental Conditions

Verify ambient conditions of mounting location.
Ambient temperature should not be below -10ºC (14ºF) or above 50ºC (122ºF).
Relativity humidity should be less than 90% (non-condensing).
Altitude should be below 1.000m (3.300ft).

The inverter must be mounted vertically with sufficient horizontal and vertical space between adjacent equipment.

- A = Higher to 100mm (500mm in case of drives up to 30kW and greater).
- B = Higher to 50mm (200mm in case of drives up to 30kW and greater).



SD45ITM0001AE

Figure 2.1 SDRIVE 450 mounting

2.3. Power Terminals Wiring

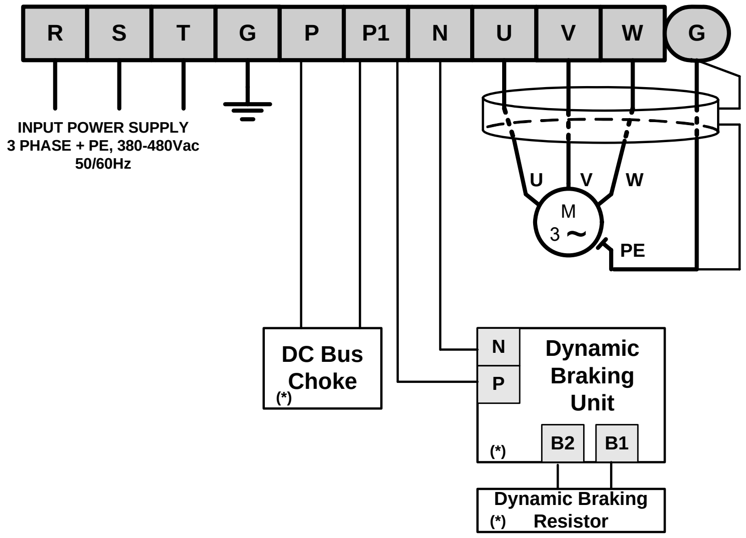
SYMBOL	DESCRIPTION
R (L1) S (L2) T (L3)	AC Line Voltage Input (3-Phase, 380 ~ 480 VAC)
G	Earth or Ground
P (+)	**Positive Terminal of DC Bus** Connection terminal for Dynamic Braking Units [P(+)*]. See attached drawings according to the drive capacity.
N (-)	**Negative Terminal of DC Bus** Connection terminal for Dynamic Braking Units [N(-)**]
U V W	Output terminal to Motor (3-Phase, 380 ~ 480 VAC)

POWER TERMINALS (details)	
	
Figure 2.2 Detail 1	*Figure 2.3 Detail 2*

* P terminal is for optional Dynamic Braking Unit.
** N terminal is for optional Dynamic Braking Unit.

2.3.1. Configuration of Frames 1 and 2

- This configuration is correct for models from SD45008 to SD45016.
- These drives does not built-in the DC Bus inductance, this connection is optional.
- Regarding to the braking capacity, an external Dynamic Braking Unit should be connected depending on the ED needed.



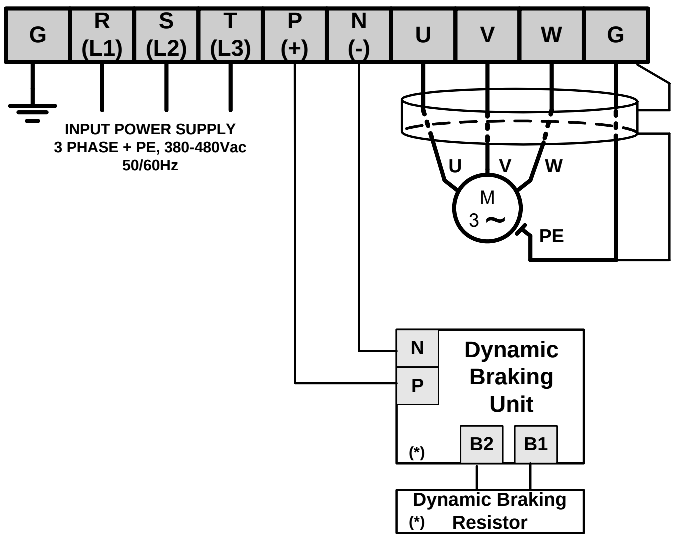
Motor cable shield should be connected to the drive and additionally to the general earth of the installation.
(*) Options

SD45DTP0001DI

Figure 2.4 Power circuit frames for Frames 1 and 2

2.3.2. Configuration of Frame 3

Dynamic braking resistor or dynamic braking unit can be added to the SD45024 and SD45030 drives.

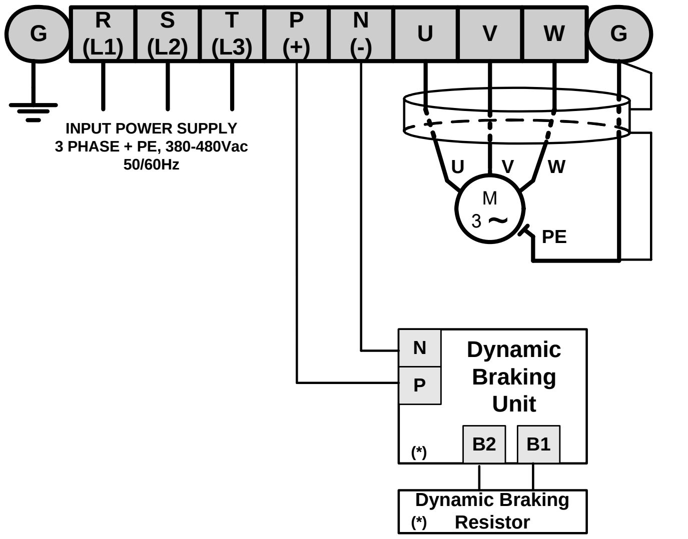


Motor cable shield should be connected to the drive and additionally to the general earth of the installation.
(*) Options

SD45DTP0002DI

Figure 2.5 Power circuit wiring for Frame 3

2.3.3. Configuration of Frame 4



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

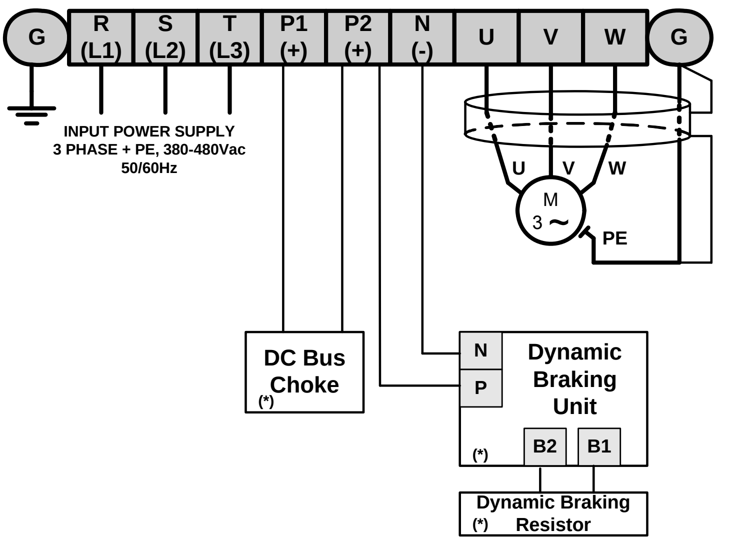
(*) Options

SD45DTP0003DI

Figure 2.6. Power circuit wiring for Frame 4

2.3.4. Configuration of Frames 5, 6 and 7

The wiring for inverters from SD45060 to SD45150 could be done in a similar way of above mentioned. The main difference is the physical distribution of the terminals.



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

(*) Options

SD45DTP0004DI

Figure 2.7 Power circuit wiring for Frames 5 to 7

2.3.5. Wiring and Cross Section of Terminals

Pay attention to the following table when information for wiring, cross section of terminals and screws is required to connect correctly the main power supply (R, S, T) and the output to the motor (U, V, W).

Inverter rated power		Terminal screw size	Screw torque* (Kg·cm)	Ring terminals		Cable**			
						mm²		AWG	
				R,S,T	U,V,W	R,S,T	U,V,W	R,S,T	U,V,W
400V Model	3.7kW	M4	15	2-4	2-4	4	2.5	12	14
	5.5kW	M5	15	5.5-5	5.5-5	4	4	12	12
	7.5kW	M5	26	14-5	8-5	6	6	10	10
	11kW	M6	26	14-5	14-5	16	10	6	8
	15kW	M6	45	22-6	22-6	16	10	6	8
	18.5kW	M8	45	38-8	38-8	16	16	4	6
	22kW	M8	100	38-8	38-8	16	16	4	4
	30kW	M8	100	38-8	38-8	25	25	4	4
	37kW	M8	100	38-8	38-8	35	35	2	2
	45kW	M8	100	38-8	38-8	35	35	2	2
	55kW	M8	100	38-8	38-8	70	70	1/0	1/0
	75kW	M10	300	-	-	70	70	1/0	1/0

* Apply the rated torque to terminal screws. Loosen screws can cause of short circuit and malfunction. Tightening the screw too much can damage the terminals and cause short circuit and malfunction.

** Use cooper wire with 600V, 75 ºC ratings for wiring.
Recommended cable section. It is absolutely necessary that the installer guaranties 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.

2.4. Main Power Supply and Motor Connection

Power supply must be connected to the R(L1), S(L2), and T(L3) terminals. Connecting it to the U, V, and W terminals causes internal damages to the inverter. Arranging the phase sequence is not necessary.

Motor should be connected to the U, V, and W terminals. If the forward command (FX) is on, the motor should rotate counter clockwise when viewed from the load side of the motor. If the motor rotates in the reverse, switch the U and V terminals.

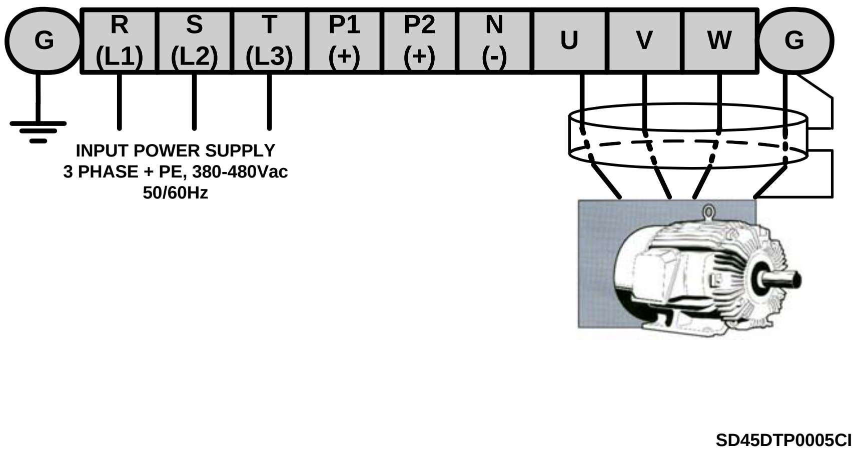
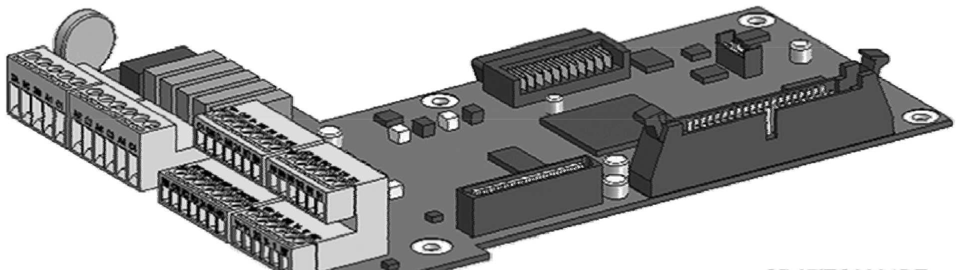


Figure 2.8 Inverter and motor connection

2.5. Control Terminals Wiring

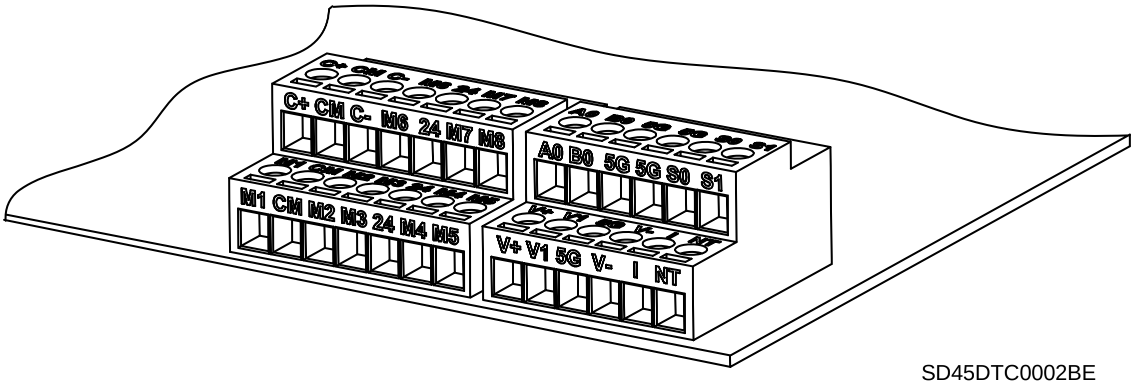
2.5.1. Control Terminals Detail



SD45ITC0001BE

Figure 2.9 Connectors on control board

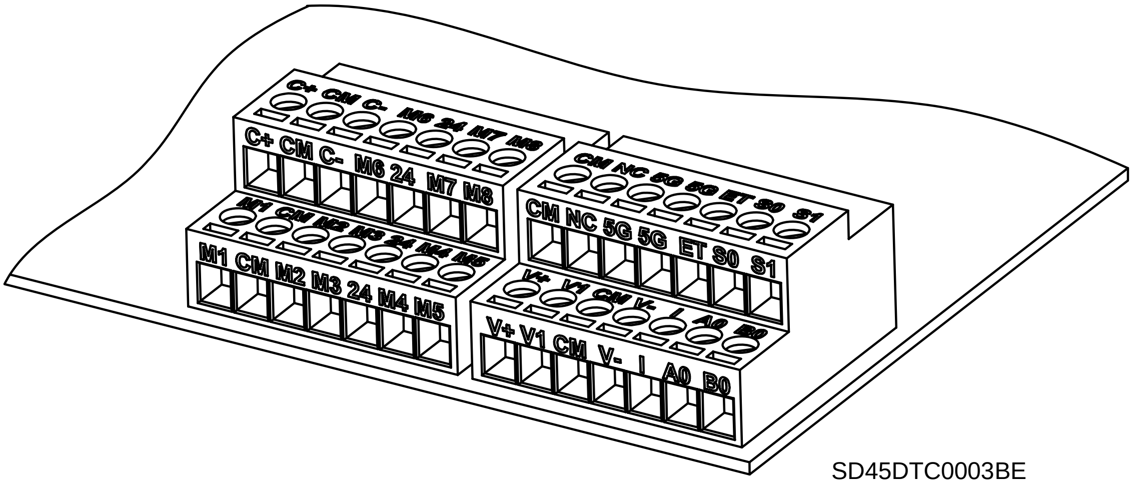
Control connectors for inverters from SD45008 to SD45045 (3.7kW a 22kW)



SD45DTC0002BE

Figure 2.10 Detail of control terminals for Frame 1 to Frame 4

Control connectors for inverters from SD45060 to SD45150 (30kW a 75kW)



SD45DTC0003BE

Figure 2.11 Detail of control terminals for Frame 5 to Frame 7

Connection precautions

- CM and 5G terminals are insulated each other. Do not connect these terminals together or to the power ground.
- Use shielded wires or twisted wires for control circuit wiring, and separate these wires from the main power circuits and other high voltage circuits (200V relay sequence circuit).
- It is recommended to use the cables of 0.0804mm² (28 AWG) ~ 1.25mm² (16 AWG) for TER1, TER2 control terminals and the cables of 0.33mm² (22 AWG) ~ 2.0mm² (14 AWG) for TER3, TER4 control terminals.

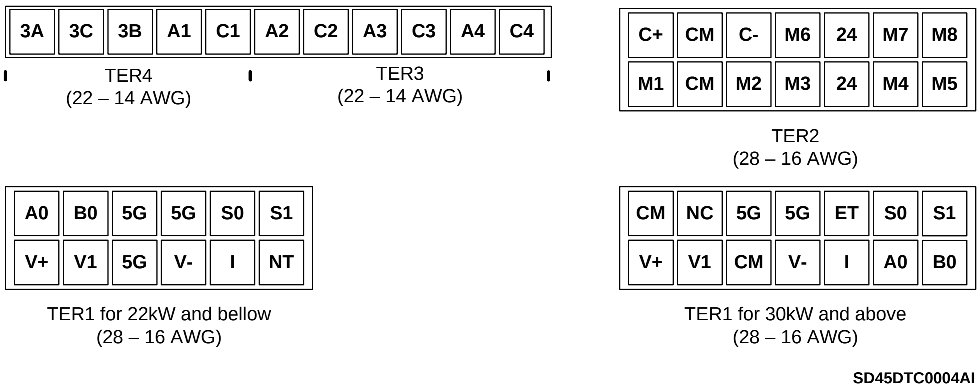


Figure 2.12 Detail of control terminals for SD450 Series

Description of control terminals

TYPE		SYMBOL	NAME	DESCRIPTION
Input Signals	Digital Inputs	M1, M2, M3	Programmable digital inputs 1, 2 and 3.	Programmable input terminals to define the digital inputs functions. **Factory setting: Speed-L, Speed-M and Speed-H, for multiple speeds.** It can be programmable also like M1 – M8.
		M7	Programmable digital input, 7.	Activating a contact on this terminal, the drive starts to run in forward direction, by deactivating the contact on the terminal, the drive stops. **Factory setting: Forward command (FX).** It can be programmable also like M1 – M8.
		M8	Programmable digital input, 8.	Activating a contact on this terminal, the drive starts to run in reverse direction, by deactivating the contact on the terminal, the drive stops. **Factory setting: Reverse command (RX).** It can be programmable also like M1 – M8.
		M6	Programmable digital input, 6.	Activating a contact on this terminal, the drive start to run at preset frequency, programmed as JOG frequency, by deactivating the contact the drive stops. **Factory setting: JOG Frequency.** It can be programmable also like M1 – M8.
		M4	Programmable digital input, 4.	By activating a contact on this terminal, the drive is reset after a fault. **Factory setting: Faults Reset (RST).** It can be programmable also like M1 – M8.
		M5	Programmable digital input, 5.	Activating a contact on this terminal, the drive cut its output due to an emergency situation. If emergency conditions disappear, the drive does not need to receive a reset signal and can automatically start to run again. Be careful using this signal. **Factory setting: Emergency.** It can be programmable also like M1 – M8.
		CM	(NPN) Common / 24V Common	Common terminal 0Vdc for input contacts at NPN mode and common terminal for 24Vdc external supply.
		24	(PNP) Common / +24Vdc Supply	Common terminal 24Vdc for input contacts at PNP mode. It can also be used like user power supply (maximum: +24V, 50mA).

TYPE		SYMBOL	NAME	DESCRIPTION
Input Signals	Analogue Inputs	V+, V-	Analogue power supply (+12V, -12V)	Power supply for analogue reference signal. Maximum output:+12Vdc, 100mA; -12Vdc, 100mA.
		V1	Frequency Reference Signal (Voltage)	Terminal used to introduce the frequency reference or target, using a voltage signal of 0-12Vdc or ±12Vdc. (Input impedance 20kΩ).
		I	Frequency Reference Signal (Current)	Terminal used to introduce the frequency reference or target, using a current signal of 0-20mA. (Input impedance 249Ω).
		A0, B0	Frequency Reference Signal (Pulses)	Terminal used to introduce the frequency reference or target, using a pulse signal.
		5G (≤22kW) CM (≥30kW)	Common terminals for analogue signals	Common terminal for all analogue reference signals.
	Motor thermal detection	NT (≤22kW) ET (≥30kW)	Motor temperature input	Motor thermal sensor input. Used to prevent motor from overheating using a NTC or PTC sensor.
Output signals	Digital Outputs	3A, 3C, 3B	Fault Relays Contacts	It is a commutate contact. It will be active when a fault is present (250Vac, 1A; 30Vdc, 1A). At fault conditions: 3A-3C Closed (3B-3C Open). At normal conditions: 3B-3C Closed (3A-3C Open)
		A1 – A4 C1 – C4	Programmable digital outputs	Free potential relays contacts. To be used as programmable digital outputs (250Vac, 1A; 30Vdc, 1A).
		S0, S1, 5G	Programmable analogue outputs	Analogue output voltage settable as one of the following parameters: Output Frequency, Output Current, Output Voltage, DC Link Voltage.
RS485	Communications	C+, C-	High and Low RS485 Signal	Communication RS485 Signal.
		CM	RS485 common	Common terminal for RS485 signal.

The SD450 series provides two different way of functioning regarding to the input signals: NPN or PNP modes. The corresponding connections methods are shown below:

NPN mode

It is necessary to set J1 at NPN (lower position). In that case, the input terminals will be energized using the internal power supply of the drive. CM terminal (GND for 24Vdc) will be the common terminal for contact input signals.

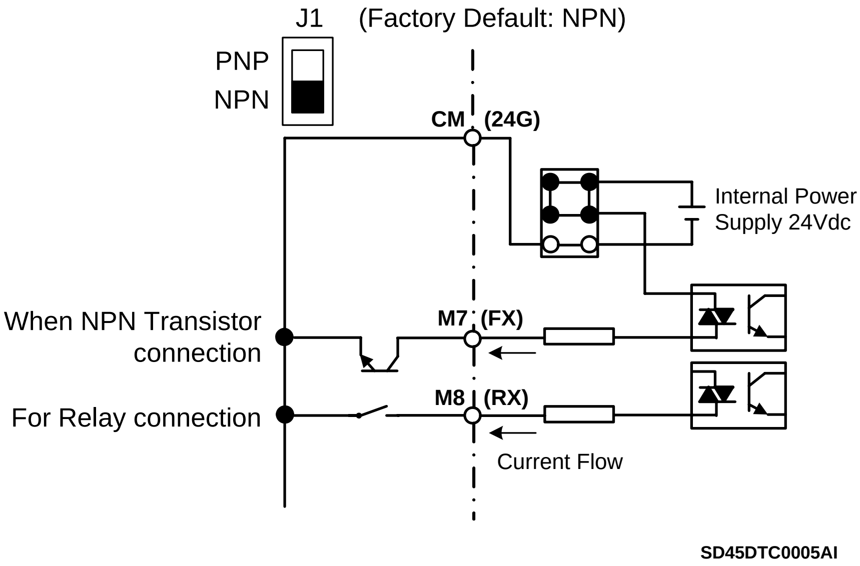


Figure 2.13 Control terminals at NPN mode

PNP mode

It is necessary to set J1 at PNP (upper position). In that case, the input terminals will be energized using the internal power supply of the drive. 24 terminal (24Vdc) will be the common terminal for contact input signals.

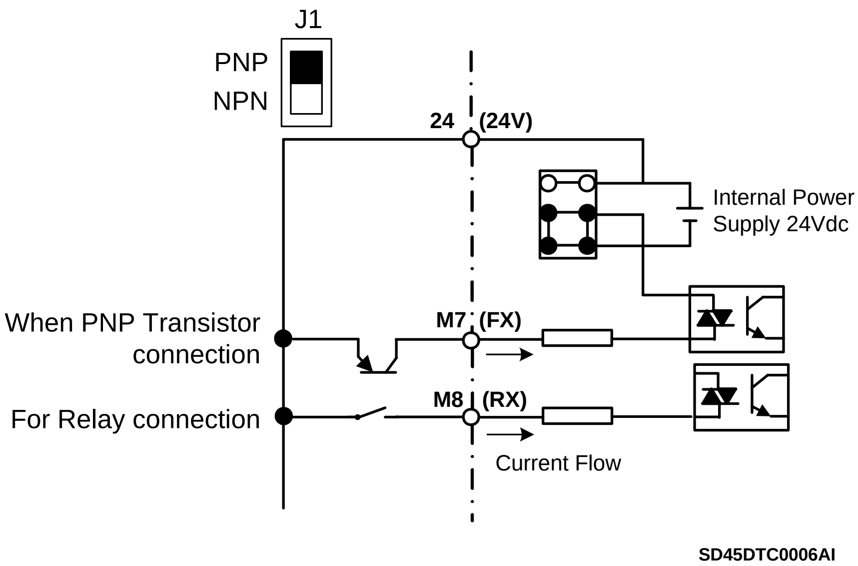


Figure 2.14 Control terminals at PNP mode and internal power supply

PNP mode (external supply)

It is necessary to set J1 at PNP (upper position). In this case, the input terminals will be energized using and external power supply of 24Vdc, but its GND terminal must be connected to CM terminal of the drive. 24 terminal of the external power supply will be the common for the contact input signals.

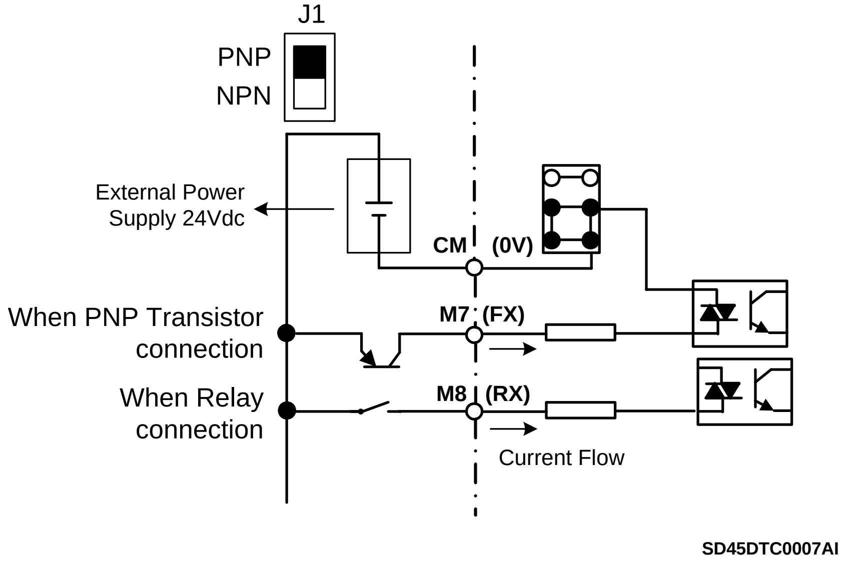


Figure 2.15 Control terminals at PNP mode and external power supply

2.5.2. Standard Connection for Control Terminals

Digital inputs and outputs connection is standard for all drives capacities, as it is shown in the following figure:

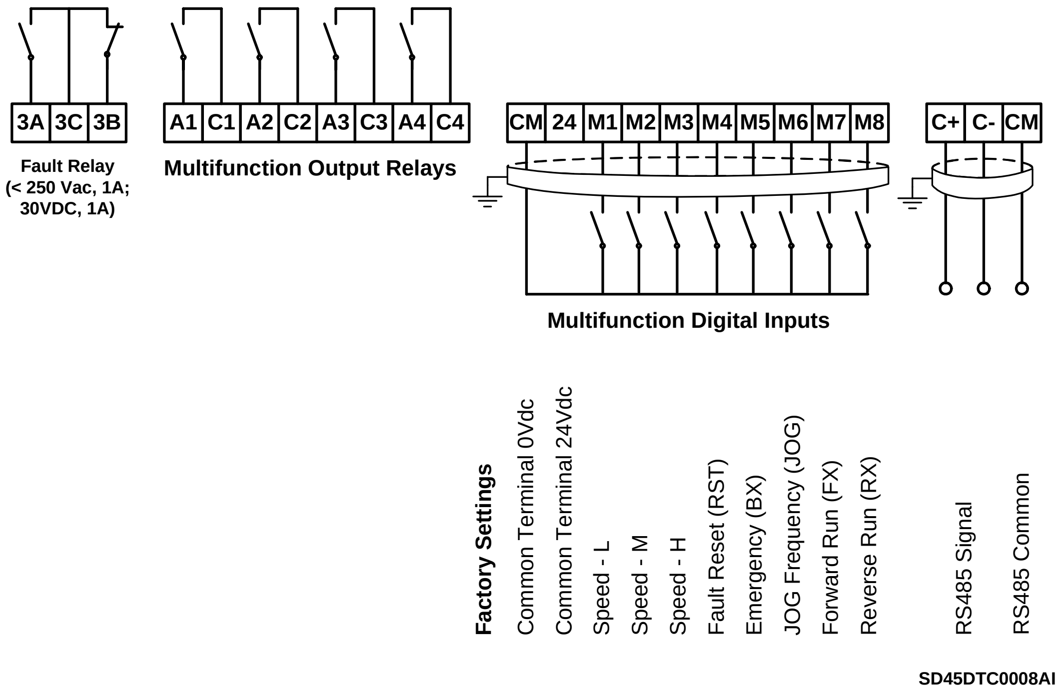


Figure 2.16 General wiring for SD450 Series

Analogue inputs and outputs are not standard for the complete SD450 series. The following differences must be taken into consideration:

a) Control signal wiring from 3.7kW to 22kW.

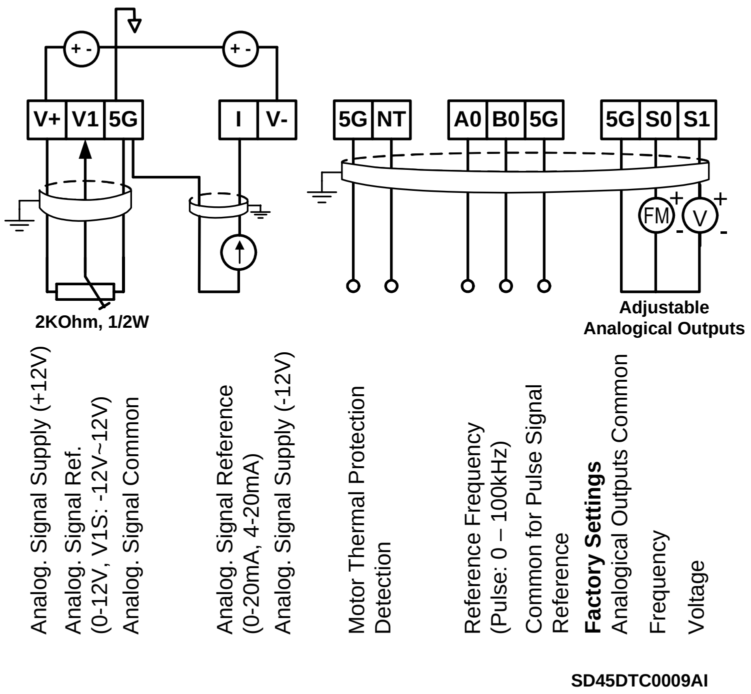


Figure 2.17 General wiring for analogue signals for Frames 1 to 4

b) Control signal wiring from 30kW to 75kW.

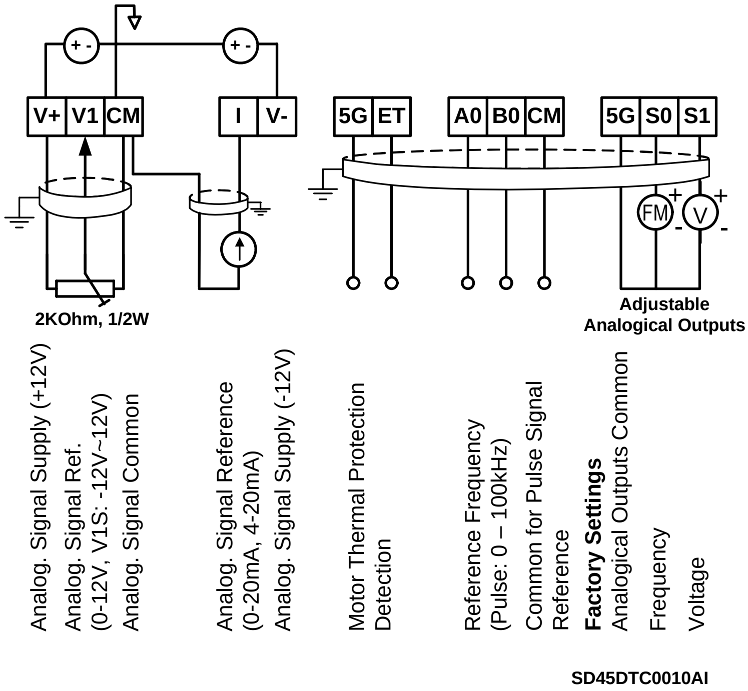


Figure 2.18 General wiring for analogue signals for Frames 5 to 7

Note: Do not apply voltage directly to M7(FX) and M8 (RX) terminals.

3. TECHNICAL CHARACTERISTICS

INPUT	Power supply	380 to 480Vac (-15% to +10%) 3-Phase
	Input frequency	50÷60 Hz ± 5%
	Input power factor	> 0.98 (of fundamental)
	Momentary power loss	> 15ms
OUTPUT	Motor output voltage	0Vac to V. Input (–3V at 100% load)
	Overload capacity	150% during 60 sec; 200% during 0,5 sec
	Frequency ratings	0.01Hz to ± 120Hz
	Efficiency (at full load)	>98%
	Control method	Space vector technology
	Carrier frequency	Maximum 15kHz
ENVIRONMENTAL CONDITIONS	Degree Protection	IP20
	Ambient temperature	-10ºC to 50ºC
	Storage temperature	-20ºC to +65ºC
	Ambient humidity	<90%, non-condensing
	Altitude	1000m
	Altitude de-rating (> 1000)	-1% per 100m; maximum 3000m
	Display degree protection	IP21
	Vibration	5,9m/sec² (=0,6g)
	Installation site	Environment with no corrosive gas, combustible gas, oil mist or dust
CONTROL	Control method	V / Hz control, Vector control (Sensorless)
	Analogue inputs	1 input 0-12Vdc, ±12Vdc, 1 input 4-20mA/0-20mA 1 input pulse (0-100kHz)
	Digital inputs	8 programmable inputs
	PTC input	1 input
	Analogue outputs	2 outputs 0-10V
	Relay outputs	1 switch over fault relay (AC250V, 1A; DC30V, 1A) 4 normally open programmable relays (AC250V, 1A; DC30V, 1A)
	Display unit	Removable keypad, digitally programmable (independent memory)
	Communications port	RS232/485 ModBus RTU protocol, Device Net, Profibus (opt.)
	Dynamic braking unit	Optional
	Normative	CE, UL, cUL, cTick
MOTOR PROTECTIONS	Motor thermal model Ground fault Overload warning Dynamic brake resistor thermal model Torque limit and torque limit time (settable) Low voltage 10% dynamic brake duty cycle Input / output phase loss Phases current imbalance Motor stall protection Short circuit Speed limit and speed limit time (programmable) Over voltage Mean torque 100% of braking during 5sec	
SDRIVE 450 SETTINGS	Thermal model (software) IGBTs overload Over voltage fault Hardware fault Sink over temperature Output current limit Regeneration limit	

4. DIMENSIONS

4.1. Dimensions of Frames 1 and 2

REFERENCE	DIMENSIONS (mm.)								RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D	C1	C2	C3	L	Y	W	X	H	
SD45008/F	284	269	150	130	157	18,5	18,5	18,5	329	315	151	120	50	4,9
SD45012/F	284	269	200	180	187,5	28	18,5	28	329	315	201	160	60	6
SD45016/F	284	269	200	180	187,5	28	18,5	28	329	315	201	160	60	6

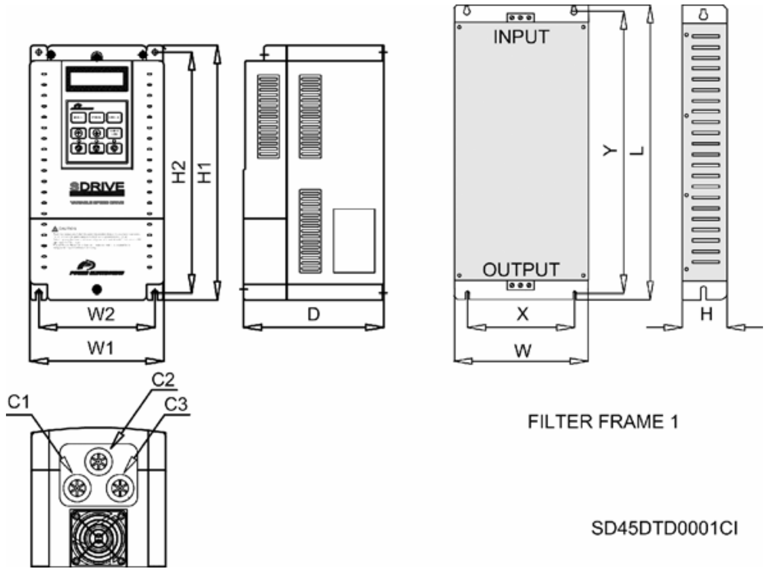


Figure 4.1 Dimensions of Frame 1

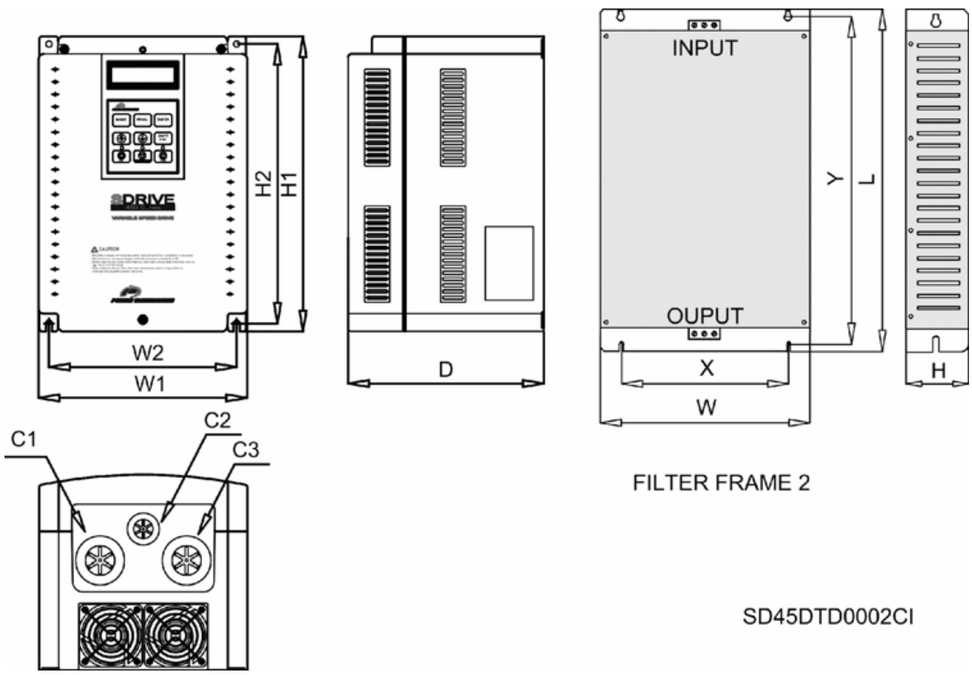


Figure 4.2 Dimensions of Frame 2

4.2. Dimensions of Frames 3 and 4

REFERENCE	DIMENSIONS (mm.)						RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D1	D2	L	Y	W	X	H	
SD45024/F	475,5	392	250	186	261,2	188,4	475	450	251	181	65	21,2
SD45030/F	475,5	392	250	186	261,2	188,4	475	450	251	181	65	21,2
SD45039/F	554,6	468,5	260	220	268,6	211,0	580	525	281	220	65	29,5
SD45045/F	554,6	468,5	260	220	268,6	211,0	580	525	281	220	65	29,5

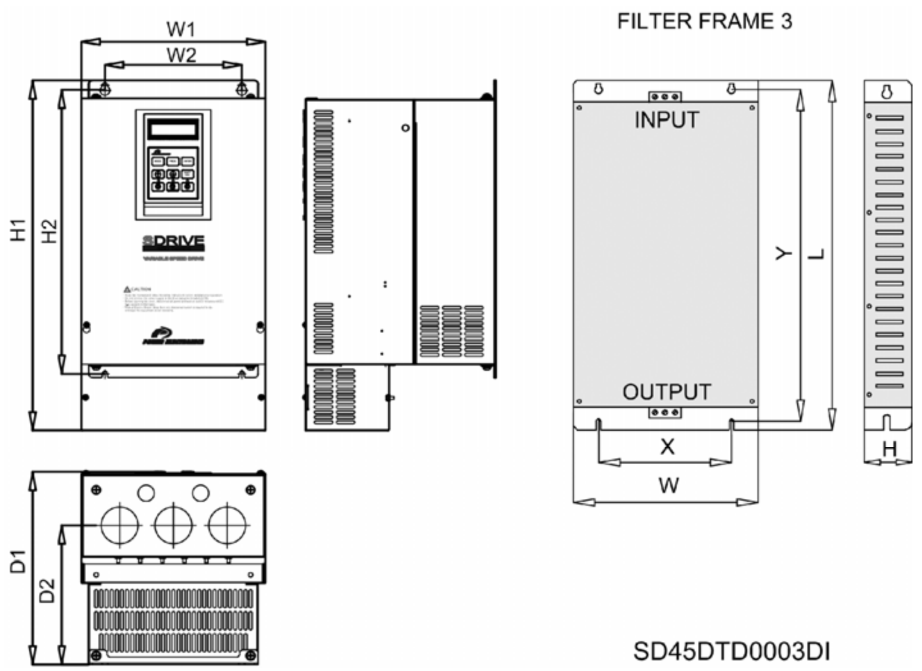


Figure 4.3 Dimensions of Frame 3

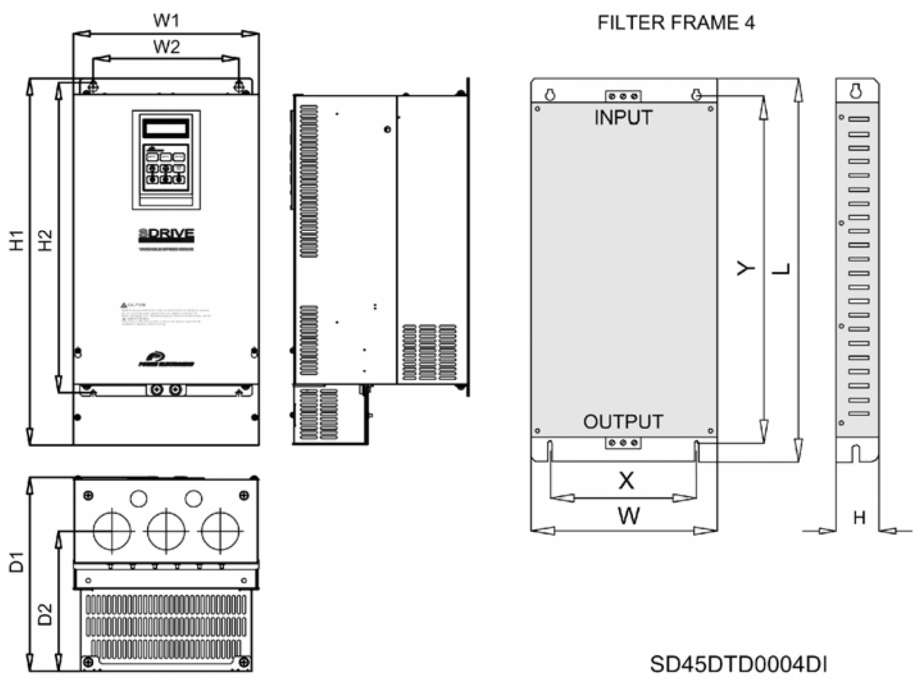


Figure 4.4 Dimensions of Frame 4

4.3. Dimensions of Frames 5, 6 and 7

REFERENCE	DIMENSIONS (mm.)						RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D1	D2	L	Y	W	X	H	
SD45060/F	792	665	300	190	265,6	163,4	270	255	90	65	150	41
SD45075/F	792	665	300	190	265,6	163,4	270	255	90	65	150	42
SD45090/F	792	665	300	190	292,6	190,4	270	255	90	65	150	49
SD45110/F	917,5	737	370	220	337,6	223,4	351	320	180	122	95	70,5
SD45150/F	917,5	737	370	220	337,6	223,4	351	320	180	122	95	72,5

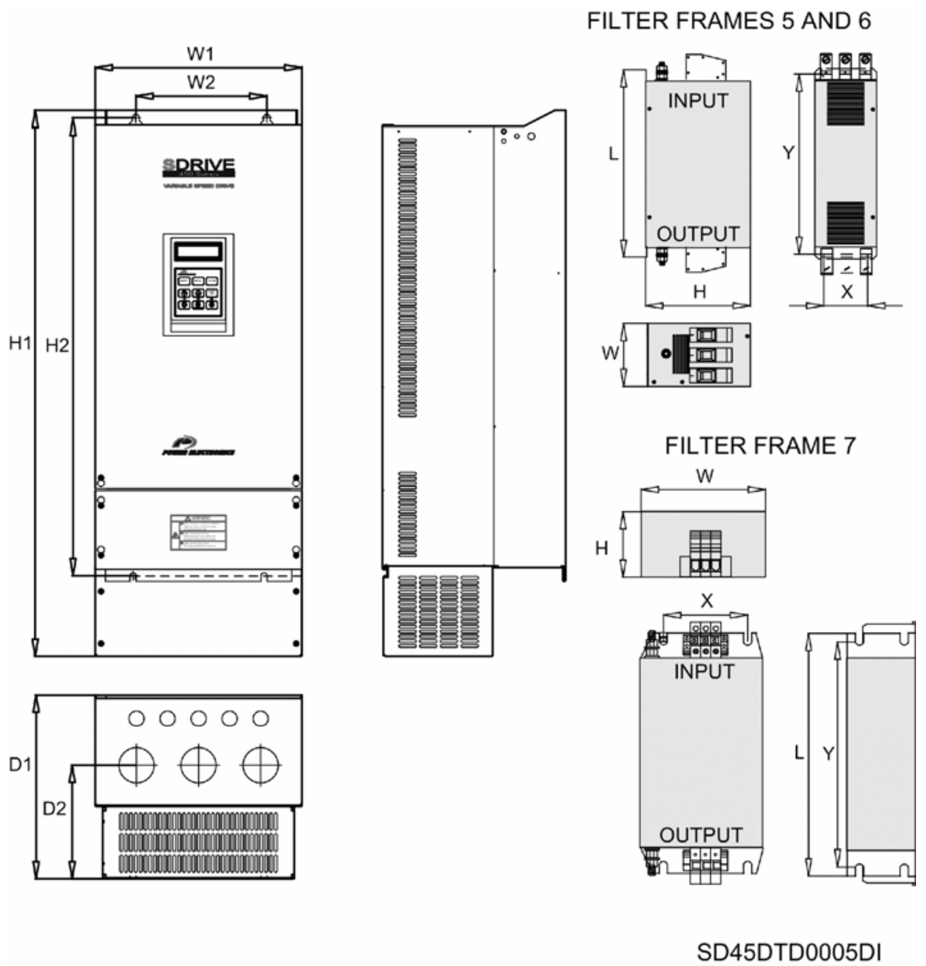


Figure 4.5 Dimensions of Frames 5, 6 and 7

Note: The net weights do not include the filters at any reference.

5. POWER RANGE AND ACCESORIES

5.1. Power Range

FRAME	CODE	Operation Temperature 50ºC HEAVY DUTY			Operation Temperature 40ºC NORMAL DUTY		
		I(A) Rated	Power (kW) at 400Vac	50ºC I(A) Overload	I(A) Rated	Power (kW) at 400Vac	40ºC I(A) Overload
1	SD45008	8	3,7	13	12	5,5	13
2	SD45012	12	5,5	17	16	7,5	17
	SD45016	16	7,5	26	24	11	26
3	SD45024	24	11	33	30	15	33
	SD45030	30	15	42	39	18,5	42
4	SD45039	39	18,5	49	45	22	49
	SD45045	45	22	66	60	30	66
5	SD45060	60	30	82	75	37	82
	SD45075	75	37	99	90	45	99
6	SD45090	90	45	121	110	55	121
7	SD45110	110	55	165	150	75	165
	SD45150	150	75	201	183	90	201

5.2. Sinoidal Output Filters

REFERENCE	I (A)	V	IP	DIMENSIONS (mm)		
				H	W	D
FN0008-42	8	400	20	280	175	285
FN0012-42	12	400	20	280	175	285
FN0016-42	16	400	20	280	175	285
FN0024-42	24	400	20	460	302	475
FN0030-42	30	400	20	460	302	475
FN0039-42	39	400	20	460	302	475
FN0045-42	45	400	20	696	447	740
FN0060-42	60	400	20	696	447	740
FN0075-42	75	400	20	696	447	740
FN0090-42	90	400	20	696	447	740
FN0110-42	110	400	20	696	447	740
FN0150-42	150	400	20	795	555	845

5.3. Harmonics Filters

REFERENCE	I (A)	V	FILTER TYPE	DIMENSIONS (mm)		
				H	W	D
FHSD4008	8	400	INPUT	230	170	120
FHSD4016	16	400	INPUT	230	170	120

6. CONFORMITY DECLARATION

Directives to be conformed are:

CD 73/23/EEC and CD 89/336/EEC

Producto: **Product:**	**VARIADOR (Equipo de Conversión de Potencia)** **Variable Speed Drive**
Marca comercial: **Trade Mark**	**POWER ELECTRONICS**
Modelo /Tipo Ref.: **Model / Type Ref.**	**SDRIVE 450 SERIES**
Fabricante: **Manufacturer**	**PE Industrial Systems Co., Ltd.** **181, Samsung-Ri, Mokchon, Chonan-Si,** **330-845, Chungnam** **Corea**
Peticionario: **Tested on request of**	**POWER ELECTRONICS ESPAÑA, S.L.** **C/. Leonardo da Vinci, 24-26** **Parque Tecnológico** **46980 · PATERNA · VALENCIA** **ESPAÑA**
Technical standard:	**The standards applied in order to comply with the essential requirements of the Directives 73/23/CEE "Electrical material intended to be used with certain limits of voltage" and 89/336/CEE "Electromagnetic Compatibility" are the following ones:**

EN 50178 (1997): Electronic equipment for use in power installations.

EN 50081-2 (1993): Electronic Compatibility. Generic emission standards. Part 2: Industrial environment.

EN 55011 (1994): Industrial, scientific and medical (ISM) radio-frequency equipment radio disturbances characteristics. Limits and methods of measurement.

EN 50082-2 (1995): Electromagnetic Compatibility. Generic immunity standard. Part 2: Industrial environment.

EN 61000-4-2 (1995): Electromagnetic Compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test. Basic EMC publication (IEC 1000-4-2: 1995).

ENV 50140 (1993): Electromagnetic Compatibility. Basic immunity. Radiated radio-frequency electromagnetic field. Immunity test.

ENV 50204 (1995): Radiated electromagnetic field from digital radio telephones.

EN 61000-4-4 (1995): Electromagnetic Compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test. Basic EMC publication (IEC 1000-4-4: 1995).

ENV 50141 (1993): Electromagnetic Compatibility. Basic immunity standard. Conducts disturbances induced by radio-frequency fields. Immunity test.

EN 61000-4-8 (1993): Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. Basic EMC publication (IEC 1000-4-8: 1993).

7. PROGRAMMING KEYPAD

7.1. Parameters Groups

SDRIVE 450 series has six parameters groups classified according its function as it shown below.

Parameters groups	Display	Description
Main menu	DRV	Frequency reference, accel./decel. time, etc. Basic parameters.
Function group 1 menu	FU1	Start / stop, frequency limits, torque boost, thermal protections, overload and underload protections, etc.
Function group 2 menu	FU2	Fault history, motor data, second acceleration / deceleration, second motor, save parameters display/drive.
Input / Output menu	I/O	Setting of analogue and digital inputs and outputs, frequency steps, several accelerations setting.
Applications menu	APP	Pumps control (Pressure group).
Communications menu	COM	Configuration of serial communication.

7.2. Display Unit

The Liquid Crystal Display (LCD) can show up to 32 alphanumeric characters maximum. That makes possible to check some settings directly on the screen. A description of the keypad unit and display is shown below.

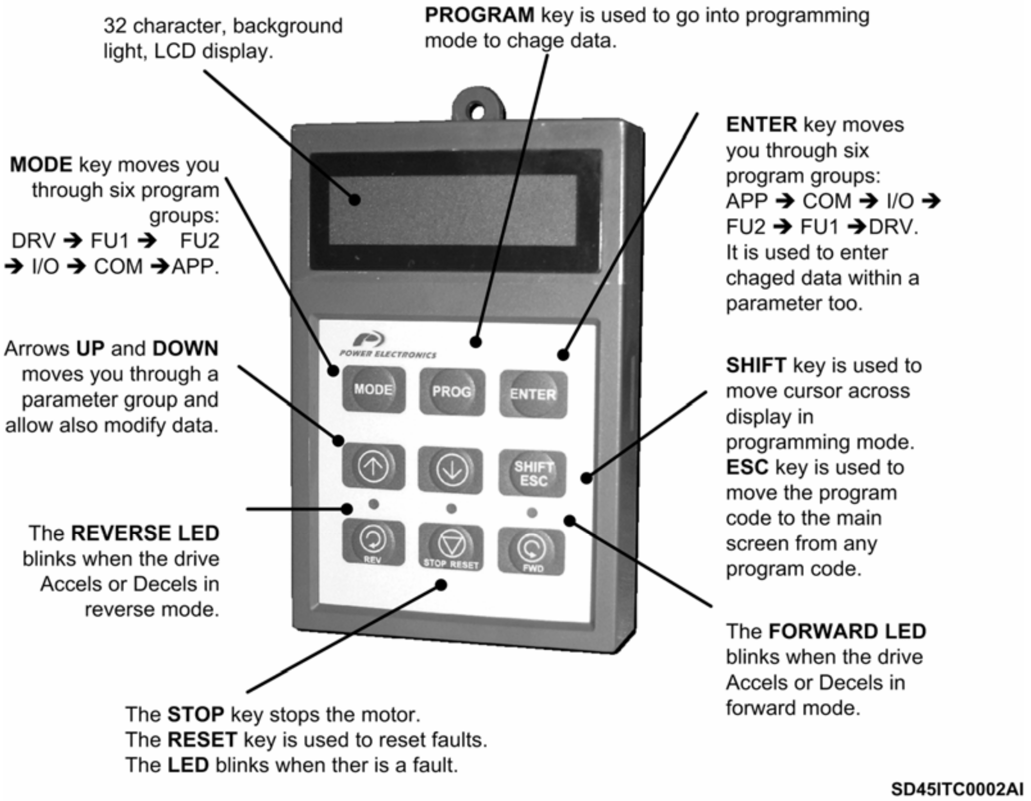


Figure 7.1 Programming keypad and display

7.2.1. Liquid Crystal Display

Different fields on display and their meaning can be seen at the following figure.

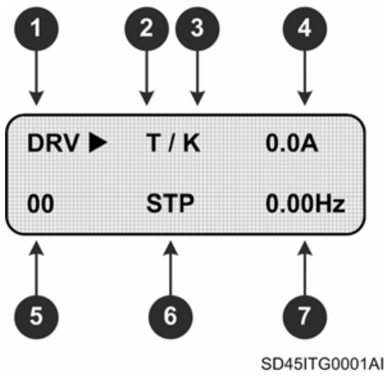


Figure 7.2 LCD display

Screen	Description	
1. Parameter group	It shows the parameter group: DRV, FU1, FU2, I/O, COM, APP.	
2. Start / stop mode	It shows the drive start / stop mode of the inverter.	
	K	Start / stop using FWD, REV keys of programming **K**eypad.
	T	Start / stop using control **T**erminals signals at M7 (FX), M8 (RX).
	R	Start / stop using **R**S485 series communication port.
	O	Start / stop using **O**ptional communication boards.
3. Frequency setting mode	It shows the frequency setting mode.	
	K	Frequency setting by **K**eypad.
	V	Frequency setting using terminals **V**1 (0-12V or -12V R +12V) or **V**1 + I
	I	Frequency setting using terminal **I** (0-20mA or 4-20mA).
	P	Frequency setting using **P**ulse input.
	R	Frequency setting using **R**S485 communication option.
	U	When **U**p/Down function has been selected and the programmed terminal like **U**p function is on. Then the frequency reference is going **U**p.
	D	When Up/**D**own function has been selected and the programmed terminal like **D**own function is on. Then the frequency reference is going **D**own.
	S	**S**top status when Up/Down function has been selected and the drive is stopped.
	O	Frequency setting using the **O**ptional communications boards.
	J	Frequency setting using **J**og input terminal.
	1~ 15	Frequency setting using digital inputs set as 'Frequency Steps'.
4. Output current	It shows the output current during running.	
5. Parameter code	Displays parameter code into a parameter group. Using keys ↑ (Up) and ↓ (Down) it is possible to move through parameters of a group (0~99).	
6. Operation status	It shows the information about the operation status.	
	STP	While it is stopped (**ST**O**P**).
	FWD	While it is running forward (**F**OR**W**AR**D**).
	REV	While it is running reverse (**REV**ERSE).
	DCB	While **D**ynamic **B**raking **C**urrent.
	LOP	Reference from control board is lost (DPRAM fault).
	LOR	Reference from network board is lost.
	LOV	Analogue reference signal is lost (V1: 0-10V).
	LOI	Analogue reference signal is lost (I: 4-20mA).
7. Inverter output frequency. Frequency reference.	Displays the output frequency during running. Displays the command Frequency during stop.	

7.2.2. Procedure for Parameter Setting

- Pressing **MODE** key successively, you will access to different parameters groups (increasing order, from DRV to APP). Pressing **ENTER** key the access is in a decreasing way (from APP to DRV).
- Pressing keys ↑ or ↓ you will access to desired parameter inside the parameter group previously selected. First parameter in each group, coded as 00, is always a **"Parameter jump"**. If you already know the parameter code to which you will access, you could directly introduce it here, and then the change will be direct, without passing through all parameters. In DRV group, parameter DRV-00 is not a "parameter jump", in this case this is reference frequency input.
- Pressing **PROG** key all modifiable parameters are edited, to modify parameter value. Cursor starts to blink.
- Key **SHIFT/ESC** is used to move cursor onto the desired digit to be modified. As far as cursor is placed on such a digit, press keys ↑ or ↓ to modify it.
- Pressing **ENT** key all setting data is saved. Cursor stops from blinking.
- When a parameter is being set and the change is not wanted to be saved, because we want to cancel this action, key **MODE,** should be pressed escaping from "Programming" mode.
- If you are at any parameter group and you want to come back to main parameter, key **SHIFT/ESC** should be pressed.

Note: Data cannot be modified when:
Parameter is not adjustable during operating mode.
Parameter lock function is activated in FU2-94 (Parameter lock).

7.2.3. Parameter Navigation

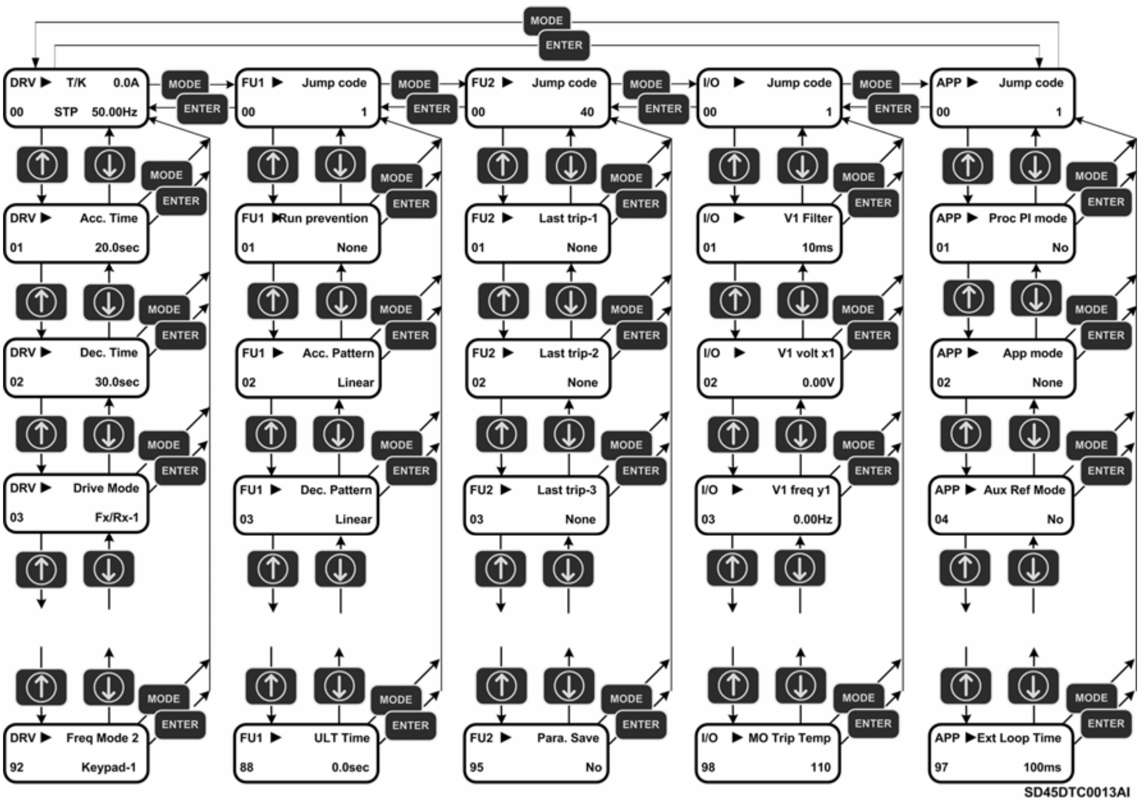


Figure 7.3 Parameter navigation

7.2.4. Operation Modes

SD450 has several operation modes as it is shown bellow.

Operation modes	Function	Functions configuration
Operation using **keypad**	Reference frequency and start/stop command can be programmed only by the keypad.	DRV-03: Keypad DRV-04: Keypad-1 or -2
Operation via **control terminals**	Closing or opening a contact over terminals M7(FX) or M8(RX) Start/Stop command is given. Frequency reference is set via terminal V1 or I or V1+I.	DRV-03: Fx/Rx-1 or -2 DRV-04: V1 or I or V1+I
Operation using **keypad and control terminals**	Start/Stop command is given by the keypad. Frequency reference is controlled by terminal V1 or I or V1+I.	DRV-03: Keypad-1 or -2 DRV-04: V1 or I or V1+I
	Closing a contact over terminals M7(FX) or M8(RX) Start/Stop command is given. Frequency reference is controlled by keypad.	DRV-03: Fx/Rx-1 or -2 DRV-04: Teclado-1 or -2
Operation using **optional boards**	Operation through optional boards. The SD450 has three communication boards. **Optional boards:** Device-Net, ProfiBus.	

8. PROGRAMMING PARAMETERS LIST

8.1. Basic Functions and Display Parameters Group (DRV)

Display	Description	Range	Default value	Memory address	Function	Set during RUN
DRV[1] ► Cmd. Freq 00 0.00 Hz	Reference frequency, output current (LCD)	0 A FU1-30 (Max. freq.)	0.00Hz	9100	It supplies information about start/stop motor status, frequency setting mode, output current, drive status, output frequency or reference frequency.	YES
DRV[1] ► T/K 0.00Hz 00 R 0.0%F 0.0%	Reference and feedback value	0 – 100%	0	9100	Setting of reference number 1 in PID mode and displays feedback PID value or sensor value. **Note:** This parameter only appears if option APP-02 is set to "Yes".	YES
DRV[2] ► Acc. Time 01 20.0 sec	Acceleration time	0 to 600.0 sec	20.0sec	9101	This parameter sets acceleration and deceleration time from 0Hz to FU2-70.	YES
DRV[2] ► Dec. Time 02 30.0 sec	Deceleration time	0 to 600.0 sec	30.0sec	9102		YES
DRV ► Drive mode 03 Fx/Rx-1	Start / Stop control mode	Keypad	Fx/Rx-1	9103	Start / stop are controlled by keypad.	NO
		Fx/Rx-1			Control terminals of optional board FX, RX and CM will control start / stop orders. **FX = 1 and RX = 0 ⇒ Forward command. FX = 0 ⇒ Stop. FX = 0 and RX = 1 ⇒ Reverse command. RX = 0 ⇒ Stop.**	
		Fx/Rx-2			Control terminals of optional sub-board FX, RX and CM will control start / stop commands. **FX = 1 and RX = 0 ⇒ Forward command. FX = 0 and RX = 0 ⇒ Stop. FX = 1 and RX = 1 ⇒ Reverse command. FX = 0 and RX = 0 ⇒ Stop.**	
		Int.485			Start / stop are controlled by RS485 communication net.	
DRV[3] ► Freq mode 04 Keypad-1	Frequency control mode (Method to introduce reference frequency)	Keypad-1	Keypad-1	9104	Frequency is set in DRV-00. New reference will not be effective until **ENT** key is pressed.	NO
		Keypad-2			As previous option but in this case the reference is modified at time.	
		V1			Reference frequency (0-12V) is introduced using control terminal V1.	
		V1S			Reference frequency (-12 to +12V) is introduced using control terminal V1.	
		I			Reference frequency (4-20mA/0-20mA) is introduced using control terminal I.	
		V1 + I			Reference frequency (0 ~ 10V, 4 ~ 20mA) is introduced using control terminals V1, I. Signal V1 is added to signal I.	
		Pulse			Reference frequency (0 ~ 100kHz) is introduced using control terminals A0 and B0.	
		Int. 485			Reference frequency is introduced by RS485 communication net using terminals C+, C-.	
		Ext. PID			It will be available when APP-80 'Ext PID Mode' is set to 'Yes'. In this case, 4-20mA signal applied in I will become the reference signal of the inverter for this External PID operation mode. Consult linked parameters (I/O-20 – I/O-27 and APP-80 to APP-97)	

[1] Alternatives options to introduce the frequency are "Multi-function terminals M1.. M3" (I/O-20 to 22), "JOG frequency" (I/O-25).
[2] Function linked with set values in "Maximum frequency" FU1-30, "Selection between Maximum frequency or Delta" FU1-73 and "Time scale" FU1-74.
[3] When other options to introduce reference frequency are selected in "Multi-function terminals M1.. M3" (I/O-20 to 22), "JOG frequency" (I/O-25), option set in DRV-03 is disabled.

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>DRV[4] ► Step Freq-1
05 10.00 Hz</td><td>Speed at step frequency 1</td><td rowspan="3">FU1-32 to FU1-30 (Start freq. at maximum freq.)</td><td>10.0Hz</td><td>9105</td><td rowspan="3"><table><tr><th colspan="3">Binary combination of M1, M2, M3</th><th rowspan="2">Output freq.</th><th rowspan="2">Preset speed. Step No.</th></tr><tr><th>Speed-L</th><th>Speed-M</th><th>Speed-H</th></tr><tr><td>0</td><td>0</td><td>0</td><td>DRV-00</td><td>Speed 0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>DRV-05</td><td>Speed 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>DRV-06</td><td>Speed 2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>DRV-07</td><td>Speed 3</td></tr></table></td><td rowspan="3">YES</td></tr>
<tr><td>DRV[4] ► Step Freq-2
06 20.00 Hz</td><td>Speed at step frequency 2</td><td>20.0Hz</td><td>9106</td></tr>
<tr><td>DRV[4] ► Step Freq-3
07 30.00 Hz</td><td>Speed at step frequency 3</td><td>30.0Hz</td><td>9107</td></tr>
<tr><td>DRV ► Current
08 0.0 A</td><td>Output current</td><td>-</td><td>A</td><td>9108</td><td>It shows inverter output current in RMS.</td><td>-</td></tr>
<tr><td>DRV ► Speed
09 0rpm</td><td>Motor speed</td><td>Speed motor in RPM</td><td>Rpm</td><td>9109</td><td>It shows motor speed in rpm.</td><td>-</td></tr>
<tr><td>DRV ► DC link Vtg
10 ----- V</td><td>DC voltage</td><td>-</td><td>V</td><td>910A</td><td>It shows DC Link voltage.</td><td>-</td></tr>
<tr><td>DRV ► User disp
11 Out 0.0 V</td><td>User display selection</td><td>Selection in FU2-81 (User display)</td><td>-</td><td>910B</td><td>It shows parameter selected in FU2-81 'User display'. It exist several types of parameters here: Volts and Watts.</td><td>-</td></tr>
<tr><td>DRV ► Fault
12 None</td><td>Displayed fault in display</td><td>-</td><td>None</td><td>910C</td><td>It shows the present fault of the inverter. Use **PROG**, ↑ and ↓ keys before pressing the **RESET** key.<table><tr><th>Fault</th><th>Display</th></tr><tr><td>Over current 1</td><td>Over Current 1</td></tr><tr><td>Over voltage</td><td>Over Voltage</td></tr><tr><td>External fault</td><td>Ext. Trip</td></tr><tr><td>Emergency stop
(No reset)</td><td>BX</td></tr><tr><td>Low voltage</td><td>Low Voltage</td></tr><tr><td>Ground fault</td><td>Ground Fault</td></tr><tr><td>Inverter over temperature</td><td>Over Heat</td></tr><tr><td>Electro thermal protection</td><td>E-Thermal</td></tr><tr><td>Over load trip</td><td>Over Load</td></tr><tr><td>H/W inverter fault
- Error EEP
- ADC Offset
- Error WDOG
- Output phase open
- Open fuse (>30kW)</td><td>HW-Diag</td></tr><tr><td>Over current 2</td><td>Arm Short</td></tr><tr><td>Output phase loss</td><td>Phase open</td></tr><tr><td>Inverter over load</td><td>Inv. OLT</td></tr></table>**Note:** When an inverter hardware fault occurs, WDOG, EEP and ADC errors are displayed. In this case, inverter will not be reset.</td><td>-</td></tr>
<tr><td>DRV ► TAR 0.00Hz
14 OUT 0.00Hz</td><td>Target / Output frequency displaying</td><td>-</td><td>0.00Hz</td><td>910E</td><td>It shows frequency command set in DRV-00 and the inverter output frequency.</td><td>-</td></tr>
<tr><td>DRV ► REF 0.00%
15 FBK 0.00%</td><td>Motor speed displaying</td><td>-</td><td>-</td><td>910F</td><td>It shows the reference speed set in percentage and its comparison with the inverter output.</td><td>-</td></tr>
<tr><td>DRV ► Hz/Rpm Disp
16 Hz</td><td>Motor speed displaying</td><td>Hz
Rpm</td><td>Hz</td><td>9110</td><td>Selection of displaying mode of motor speed that will be shown in DRV-00 at Hz or rpm.</td><td>YES</td></tr>
<tr><td>R 0.0Hz T 0.0Hz
F 0.0Hz O 0.0Hz
DRV-18</td><td>PID parameters displaying</td><td>-</td><td>-</td><td>9112</td><td>Parameters display in PID mode together with motor speed at Hz.</td><td>-</td></tr>
<tr><td>V1 0 V2 0
V1S 0 I 0
DRV-19</td><td>AD parameters</td><td>-</td><td>-</td><td>9113</td><td>Displaying of conversion from analogue signals to digital signals.</td><td>-</td></tr>
<tr><td>R 0.00% O 0.0%
F 0.00% DRV-20</td><td>Displaying of External PID parameters</td><td>-</td><td>-</td><td>9114</td><td>Displaying of the parameters in External PID mode together with the motor speed in Hz</td><td>-</td></tr>
</table>

[4] These parameters are selected by configuring “Multi-function terminals M1.. M3” (I/O-20 to 22), as table indicates. Display will change according to the selected units (%, Bar, kPa, etc) in PID operation when units of V1 or I or Pulse are selected. See I/O-86 to I/O-88 parameters. (Ex. When % ➔ DRV-05 = Step freq.-1 is selected, 10.00Hz becomes to 20.00%).

Display	Description	Range	Default value	Memory address	Function	Set during RUN
DRV[5] ► Drive mode2 **91 Fx/Rx-1**	Optional Start / Stop control mode	Keypad Fx/Rx-1 Fx/Rx-2	Fx/Rx-1	915B	The value set here will be applied when inverter control will be given by communication net.	-
DRV[5] ► Freq mode2 **92 Keypad-1**	Optional frequency control mode (Method to introduce reference frequency)	Keypad-1 Keypad-2 V1 V1S I V1 + I Pulse	Keypad-1	915C	The value set here will be applied when inverter control will be given by communication net.	-

[5] It is only available if any of digital inputs is set as 'Main-drive' in I/O-20 to I/O-27 and DRV-03 and DRV-04 are set to 'Int 485' at the same time.

8.2. Functions Menu (FU1)

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU1 ▶ 00 Jump code 1	Jump to desired parameter	1 to 99	1	9200	Any parameter of FU1 group can be directly selected from here without scrolling up/down to others parameters. You only need to introduce the number of desired parameter and press PROG key.	YES
FU1 ▶ 01 Run Prev. None	Prevention of direction rotation motor	None Forward Prev Reverse Prev	None	9201	**None:** Prevention is not active. **Forward Prev:** Forward direction forbidden. **Reverse Prev:** Reverse direction forbidden.	NO
FU1 ▶ 02 Acc. pattern Linear	Acceleration pattern	Linear S-curve U-curve	Linear	9202	**Linear:** Recommended for constant torque applications. **S-Curve:** This pattern allows the motor to accelerate and decelerate smoothly. **U-Curve:** This pattern provides more efficient control of acceleration and deceleration doing it faster. **Note:** The values set in DRV-01 and DRV-02 are ignored.	NO
FU1 ▶ 03 Dec. pattern Linear	Deceleration pattern			9203		NO
FU1[6] ▶ 04 Start Curve 50%	S-Curve start	0 – 100%	50%	9204	It allows setting the S-curve start selected in acceleration pattern.	NO
FU1[6] ▶ 05 End Curve 50%	S-Curve end	0 – 100%	50%	9205	It allows setting the S-curve end selected in deceleration pattern.	NO
FU1 ▶ 10 Pre-HeatMode No	Motor pre-heat	No Yes	No	920A	It avoids producing produce a motor condensation when motor is stopped and is installed in areas with humidity. This is possible by a continuous DC current injection. **Note:** This function is only active when the inverter is stopped.	NO
FU1[7] ▶ 11 PreHeat Level 30%	Percentage of motor rated current	1 – 50%	30%	920B	This parameter sets the level of pre-heat current to heat the motor, calculated as percentage of the value introduced in motor rated current FU2-43. ⚠**Caution:** Parameters modifications are disabled during pre-heat process. ⚠**Caution:** Decrease the value introduced here if the motor is over heated.	NO
FU1[7] ▶ 12 PreHeatPerc 100%	Time of DC current application to the motor	1 – 100%	100%	920C	It allows setting the percentage of time that motor pre-heat current will be applied over a total cycle of 10 seconds. If it is set to 100%, the current is applied continuously. ⚠**Caution:** Parameter modifications are disabled during pre-heat process. ⚠**Caution:** Decrease the value introduced here if the motor is over heated.	NO
FU1 ▶ 20 Start mode Accel	Inverter start mode	Accel DC – start Flying – start	Accel	9214	**Accel start:** Inverter applies the acceleration ramp set until reaching the steady status. **DC start:** Inverter starts to accelerate after applying a magnetizing DC current. **Flying start:** Inverter starts while motor is still running until taking its speed and it makes it operate at steady status again. **Note:** The real direction rotation of the motor and run command should be the same for an optimal use of this function. However, if they are opposite, this function is also effective whenever the speed is below 50% of the rated speed when the inverter starts again.	NO

[6] It is only available if 'S-Curve' is set in acceleration and deceleration patterns.
[7] It is only available if pre-heat mode is set in FU1-10.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU1[8] ▶ DCSt time **21 0.0sec**	Time of DC current application	0.0 – 60.0sec	0.0sec	9215	It is the time that DC current is applied before starting motor acceleration.	NO
FU1[8] ▶ DCSt value **22 50%**	DC current level before starting	0 – 150%	50%	9216	This parameter sets the DC current level applied to the motor as a percentage of rated current introduced in FU2-43. **Caution:** If this value is set above the value introduced in FU2-43 'Rated-Curr', motor can be overheated and ‘Over load’ fault can occur.	NO
FU1 ▶ Stop mode **23 Decel**	Inverter stop mode	Decel DC – brake Free – run Fluxe – brake	Decel	9217	**Decel:** Inverter will stop with a deceleration ramp. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Inverter turns off the ouput power supply to the motor immediately after receiving the stop command. The inverter will stop by inertia. **Fluxe brake:** Fast stop is get turning the regenerated energy to heat into the motor. **Caution:** Motor can be overheated due to an excessive use of this function.	NO
FU1[9] ▶ DCBlk time **24 0.10sec**	DC current application delay time	0.10 – 60.00sec	0.10sec	9218	It is the locking time while inverter makes a free run stop before applying DC brake.	NO
FU1[9] ▶ DCBr Frq **25 5.00Hz**	DC brake starting frequency	0.10 – 60.00Hz	5.00Hz	9219	This parameter sets the frequency from which the inverter will start to apply DC current injection during deceleration. Note: If this value is very high, there is a possibility of over current trip occurs.	NO
FU1[9] ▶ DCBr time **26 1.0sec**	Time of DC current application	0.0 – 60.0sec	1.0sec	921A	It allows setting the time that the inverter will apply the DC current injection during ‘DC brake’ operation.	NO
FU1[9] ▶ DCBr value **27 50%**	DC current level applied for DC brake	0 – 200%	50%	921B	It allows setting the DC current level applied to the motor during ‘DC brake’ mode calculated as a percentage of motor rated current introduced in FU2-43. **Caution:** Motor can be overheated if a higher DC current level than motor rated current is set.	NO
FU1 ▶ Safety Stop **28 No**	Motor stopped at safety conditions from power supply loss	No Yes	No	921C	It allows avoiding potential hazards when the complete system is stopped but the load follows running due to high inertia. The inverter will stop the motor by deceleration. Deceleration time will depend on the load inertia. **Note:** The inertia value should be set in FU1-90 'STOP Inertia’ carefully until finding the appropriate value. **Caution:** This function is effective for loads with high inertias.	NO
FU1 ▶ Line Freq **29 50.00Hz**	Line frequency value	40.00 – 120.00Hz	50.00Hz	921D	It allows setting the line frequency value according to the zone, region or country where the installation is done. **Caution:** If the line frequency is changed, then the linked frequencies such as Maximum frequency or Base frequency are changed automatically. To set different values of line the line frequency, user should set the parameters manually.	NO
FU1 ▶ Max Freq **30 50.00Hz**	Maximum output frequency of the inverter	40.00 – 120.00Hz	50.00Hz	921E	It allows setting the maximum output frequency of the inverter. **Note:** Make sure the value set here is not higher than the motor rated speed.	NO
FU1 ▶ Base Freq **31 50.00Hz**	Output frequency for motor rated voltage	30.00 – 120.00Hz	50.00Hz	921F	At this frequency, the inverter supplies the rated voltage. If a 50Hz motor is used, then it should be set to 50Hz.	NO
FU1 ▶ Start Freq **32 0.50Hz**	Start frequency	0.01 – 10.00Hz	0.50Hz	9220	Minimum start frequency that inverter start to apply output voltage. Motor will start to operate at frequency set here.	NO

[8] It is only available if DC-start as Inverter start mode is selected in FU1-20.
[9] It is only available if DC-brake as Inverter stop mode is selected in FU1-23.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU1 ▶ Freq limit 33 No	Frequency limits selection	No Yes	No	9221	It allows selecting the limits for inverter operation frequency. If this parameter is set to 'Yes', then inverter will operate within the upper and lower limit setting. The inverter will operate at the upper limit when the frequency reference is above the high frequency limit. The inverter will operate at the lower limit when the frequency reference is below the low frequency limit.	NO
FU1[10] ▶ F-limit Lo 34 0.50Hz	Low frequency limit	0.00 – FU1-35 Hz	0.50Hz	9222	It sets the low frequency limit if FU1-33 is set to 'Yes'.	NO
FU1[10] ▶ F-limit Hi 35 50.00Hz	High frequency limit	FU1-34 – FU1-30 Hz	50.00Hz	9223	It sets the high frequency limit if FU1-33 is set to 'Yes'.	NO
FU1 ▶ V/F pattern 40 Linear	Relation factor between voltage and frequency applied to the motor	Linear Square User V/F	Linear	9228	Motor torque boost depends on this relation factor. **Linear:** Recommended when the application requires constant torque. This model preserves a linear relation factor between voltage and frequency from zero up to Base frequency. **Square:** Recommended when the application requires variable torque at any speed. **User V/F:** Recommended for special applications. User can set the relation between voltage and frequency in four stretches that will provide the curve that will be applied to the motor.	NO
FU1[11] ▶ User Freq 1 41 15.00Hz	Frequency 1 (User V/F pattern)	0 – FU1-30Hz	15.00Hz	9229	User can customize the voltage/frequency pattern by the setting of these four parameters included between FU1-31 start frequency and FU1-32 Base frequency. **Note:** See the relation factor between maximum frequency and base frequency. **Note:** When 'User V/F' pattern is selected, then torque boost set in FU2-67 to FU2-69 is ignored.	NO
FU1[11] ▶ User volt 1 42 25%	Voltage 1 (User V/F pattern)	0 – 100%	25%	922A		NO
FU1[11] ▶ User Freq 2 43 30.00Hz	Frequency 2 (User V/F pattern)	0 – FU1-30Hz	30.00Hz	922B		NO
FU1[11] ▶ User volt 2 44 50%	Voltage 2 (User V/F pattern)	0 – 100%	50%	929C		NO
FU1[11] ▶ User Freq 3 45 45.00Hz	Frequency 3 (User V/F pattern)	0 – FU1-30Hz	45.00Hz	922D		NO
FU1[11] ▶ User volt 3 46 75%	Voltage 3 (User V/F pattern)	0 – 100%	75%	922E		NO
FU1[11] ▶ User Freq 4 47 50.00Hz	Frequency 4 (User V/F pattern)	0 – FU1-30Hz	50.00Hz	922F		NO
FU1[11] ▶ User volt 4 48 100%	Voltage 4 (User V/F pattern)	0 – 100%	100%	9230		NO
FU1 ▶ VAC 400.4V 49 91.0%	Input voltage setting	73.0 – 115.0%	91.0%	9231	It should be correctly set when the inverter input voltage and the standard input voltage are very different. Otherwise, inverter could get damaged. This setting affects to the inverter over voltage trip.	NO
FU1 ▶ Motor Volt 50 400 V	Motor rated voltage	0 – 600V	400V	9232	It allows holding the output voltage constant independently of input voltage could suffer fluctuations. **Caution:** When the input voltage is lower than the value set here, the maximum output voltage cannot exceed the input voltage.	NO
FU1 ▶ Energy save 51 None	Energy save level enabled/disabled	None Manual Auto	None	9233	This function is used to decrease the output voltage for applications that don´t require a high torque at steady status. **Note:** When energy saving is active, inverter takes more time to decelerate until stopping.	NO
FU1[12] ▶ Manual save% 52 0%	Energy save level	0 – 30%	0%	9234	Inverter decreases the output voltage the percentage set here after accelerates up to reference frequency. **Note:** This function can cause over current trip due to the load fluctuations.	NO

[10] It is only available if the application of frequency limits is set in FU1-33.
[11] It is only available if FU1-40 is set to 'User V/F'.
[12] It is only available if FU1-51 is set to 'Manual'.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU1 ► KiloWattHour 54 0M 0.0kW	Displaying of Mega and Kilo watts	-	-	9236	Maximum cumulative value is 9999M999.9kW Note: The value cumulative here is reset by pressing the **PROG** key during 5 seconds.	YES
FU1 ► Inv. Temp. 55 25	Inverter temperature	0 – 160ºC	25ºC	9237	IGBT surface temperature is displayed in this parameter.	-
FU1 ► Motor Temp. 56 0	Motor temperature	0 – 160ºC	25ºC	9238	Motor temperature detected by a thermal sensor is displayed here.	-
FU1 ► ETH select 60 Yes	Electronic thermal protection	No Yes	Yes	923C	This function protects the motor from overheating without using additional thermal overload relay. The inverter turns off its output and will display a fault message when thermal function is activated. **Note:** If it is set to 'No', protection will be deactivated.	YES
FU1[13] ► ETH 1min 61 150%	Electronic thermal protection level for 1 minute	FU1-62 – 200%	150%	923D	It allows setting the value that determines that the inverter is overheated. **Note:** This value is calculated as a percentage of inverter rated current introduced in FU2-43.	NO
FU1[13] ► ETH cont 62 105%	Electronic thermal protection level for continuous	50% - FU1-61 (max. 150%)	105%	923E	It allows setting the current level that inverter can operate in continuous form. Usually, this parameter is set to 100%, this means that the inverter will operate at value set in FU2-43. **Note:** This value never cannot be higher than the value set in FU1-61.	NO
FU1 ► Motor type 63 Self-cool	Motor cooling mode	Self-cool Forced-cool	Self-cool	923F	It allows that electronic thermal protection function is optimum. **Auto-cooling:** Cooling fan (of the motor) is coupled to the motor axis. For this, cooling is worse at low speeds and motor will be overheated quickly. **Forced-cooling**: Cooling fan is independent. For this, its cooling capacity does not depend on the speed.	NO
FU1 ► OL level 64 110%	Overload warning level	30 – 110%	110%	9240	It sets the percentage of current to generate a warning because of inverter overload. **Note:** The percentage of current is calculated based on inverter rated current introduced in FU2-43.	NO
FU1 ► OL time 65 10.0sec	Overload warning time	0.0 – 30.0sec	10.0sec	9241	It sets the time has to elapse being the inverter current the value of current set as overload warning level to generate an alarm. This alarm signal can be configured at output relays. See I/O-76 to I/O-79.	NO
FU1 ► OLT select 66 Yes	Overload trip selection	No Yes	Yes	9242	It sets the overload trip. Inverter turns off the output to the motor to protect it from unusual operation conditions. Trip is produced when the current is remained above the level set in FU1-67 for a time longer than the time set in FU1-68.	NO
FU1[14] ► OLT level 67 120%	Overload trip level	30 – 150%	120%	9243	It sets the current level to produce overload trip, protecting inverter and motor.	NO
FU1[14] ► OLT time 68 60.0sec	Overload trip time	0.0 – 60.0sec	60.0sec	9244	It sets the time that will have to elapse with the current level above the value set in FU1-67, to produce overload trip.	NO
FU1 ► Trip select 69 100	Input / output phase loss protection	000 – 111 (Bit setting)	100	9245	Setting for inverter trip from input or output phase loss. **First bit:** To enable output phase loss trip. **Second bit:** To enable input phase loss trip. **Third bit[15]:** To enable 'Exchange' function.	NO

[13] It is only available if FU1-60 is set to 'Yes'.
[14] It is only available if FU1-66 is set to 'Yes'.
[15] In this case (100), you need to configure auxiliary inputs and outputs for example (I/O-20 = 'Exchange' and I/O-76 = COMM line'). When I/O-20 is active, the inverter will turn off the output voltage and will activate the corresponding relay to I/O-76 (Aux1).

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>FU1 ▶ 70 Stall prev. 000</td><td>Stall prevention mode</td><td>000 – 111 (Bit setting)</td><td>000</td><td>9246</td><td rowspan="2">It allows setting the dynamic limitation of current during acceleration and deceleration status, and during steady status. Also, it allows setting the level of this limitation.
<table>
<tr><th colspan="3">Setting Range</th><th rowspan="2">FU1-70</th><th rowspan="2">Description</th></tr>
<tr><th>3rd Bit</th><th>2nd Bit</th><th>1st Bit</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>000</td><td>Current limitation deactivated.</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>001</td><td>Limitation activated during acceleration.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>000</td><td>Limitation at steady status. NO OPERATIVE.</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>100</td><td>Limitation activated during deceleration.</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>111</td><td>Limitation activated at three statuses.</td></tr>
</table>
Note: Do not set the value of FU1-71 above the value of inverter rated current.
Note: FU1-71 is a percentage of motor rated current introduced in FU2-43.
Note: Acceleration and deceleration times can be increased due to current limitation.
Note: Output frequency can oscillate if limitation persists at steady status.
Note: Limitation level can be automatically reduced if the inverter operates at higher frequencies than base frequency.</td><td>YES</td></tr>
<tr><td>FU1 ▶ 71 Stall level 100%</td><td>Limitation current level</td><td>30 – 150%</td><td>100%</td><td>9247</td><td>YES</td></tr>
<tr><td>FU1 ▶ 72 Acc/Dec ch F 0.00Hz</td><td>Frequency of acceleration and deceleration change</td><td>0 – FU1-30</td><td>0.00Hz</td><td>9248</td><td>It allows setting the frequency level that acceleration and deceleration ramps applied to the inverter will be changed.
Acceleration: First, the ramp set in I/O-50 will be applied and then, the ramp set in DRV-01.
Deceleration: First, the ramp set in DRV-02 will be applied and then, the ramp set in I/O-51</td><td>YES</td></tr>
<tr><td>FU1 ▶ 73 Acc/Dec Freq Max</td><td>Frequency for acceleration and deceleration</td><td>Max
Delta</td><td>Max</td><td>9249</td><td>This is the frequency used to define acceleration and deceleration ramps.</td><td>YES</td></tr>
<tr><td>FU1 ▶ 74 Time scale 0.1sec</td><td>Time scale</td><td>0.01sec
0.1sec
1sec</td><td>0.1seg</td><td>924A</td><td>It allows changing the time scale.
0.01sec: Maximum time range is 60s.
0.1sec: Maximum time range is 600s.
1sec: Maximum time range is 6000s.</td><td>NO</td></tr>
<tr><td>FU1 ▶ 80 Up/Dn Save No</td><td>To memorize the reference of motorized potentiometer</td><td>No
Yes</td><td>No</td><td>9250</td><td>It allows deciding if the inverter should memorize the reference frequency introduced by motorized potentiometer.
Note: This function is linked with the reference introduction through digital inputs. See I/O-20 to I/O-27.

Caution: This function cannot be used in PID mode.</td><td>NO</td></tr>
<tr><td>FU1 ▶ 81 Run Delay T 0.0sec</td><td>Delay time at the starting</td><td>0.0 – 600.0sec</td><td>0.0sec</td><td>9251</td><td>Delay time for run command. This option is only valid when the signal is introduced by terminals.</td><td>NO</td></tr>
<tr><td>FU1 ▶ 85 ULT select No</td><td>Underload trip selection</td><td>No
Yes</td><td>No</td><td>9255</td><td>It allows activating underload trip. Inverter will turn off its output if detects that it is operating below established levels.</td><td>NO</td></tr>
<tr><td>FU1[16] ▶ 86 ULT level 30%</td><td>Underload level</td><td>0 – 100%</td><td>30%</td><td>9256</td><td>It allows setting underload trip level calculated as a percentage of motor rated current set in FU2-43.</td><td>NO</td></tr>
<tr><td>FU1[16] ▶ 87 ULT Freq 15.00Hz</td><td>Underload frequency</td><td>FU1-31 – FU1-30</td><td>15.00Hz</td><td>9257</td><td>To produce underload trip, output frequency has to be higher than the frequency set here since, there are applications (like fans) that need a small torque at low speed.</td><td>NO</td></tr>
<tr><td>FU1[16] ▶ 88 ULT time 0.0sec</td><td>Underload trip time</td><td>0.0 – 200.0sec</td><td>0.0sec</td><td>9258</td><td>During the time set here, previous specifications have to be given to produce underload trip.</td><td>YES</td></tr>
<tr><td>FU1[17] ▶ 90 STOP Inertia 8</td><td>Setting of load inertia</td><td>8 – 5000</td><td>8</td><td>925A</td><td>It allows setting the approx inertia associated to the application. This parameter is directly linked with 'Safety Stop' function.
Note: We recommend to begin with values about 1000 as starting point and from now on, begin to prove with load.</td><td>NO</td></tr>
</table>

[16] It is only available if FU1-85 'ULT select' is set to 'Yes'.
[17] It is only available if FU1-28 'Safety Stop' is set to 'Yes'.

8.3. Functions Menu (FU2)

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU2 ▶ 00 Jump code 40	Jump to desired parameter	1 to 99	40	9300	Any parameter of FU2 group can be directly selected from here without scrolling up/down to others parameters. You only need to introduce the number of desired parameter and press **PROG** key.	YES
FU2 ▶ 01 Last trip-1 None	Last trip of fault history	-	None	9301	Before pressing the **RESET** key, if you press the **PROG** key, and using ↑ and ↓ keys is possible to display the frequency, the current and the operation mode at the moment of the fault.	-
FU2 ▶ 02 Last trip-2 None	Last trip-1 of fault history	-	None	9302		-
FU2 ▶ 03 Last trip-3 None	Last trip-2 of fault history	-	None	9303		-
FU2 ▶ 04 Last trip-4 None	Last trip-3 of fault history	-	None	9304		-
FU2 ▶ 05 Last trip-5 None	Last trip-4 of fault history	-	None	9305		-
FU2 ▶ 06 Erase trips No	Erase fault history	No Yes	No	9306	It allows erasing fault history. **Note:** Parameters initialize does not erase faults.	-
FU2 ▶ 07 Dwell time 0.0sec	Dwell time	0.0 – 10.0sec	0.0sec	9307	It allows setting a time to inverter operates at stipulated speed before applying the acceleration ramp. Dwell function.	NO
FU2[18] ▶ 08 Dwell Freq 5.00Hz	Dwell frequency	FU1-32 – FU1-30	5.00Hz	9308	It allows setting the previous speed of inverter operation before applying the acceleration ramp, once run command is received. Dwell function.	YES
FU2 ▶ 10 Jump Freq No	Skip frequencies selection	No Yes	No	930A	It allows setting up to three frequency ranges that will be avoided when the inverter operates at steady status. These skips are not considering during acceleration and deceleration. In case of the speed reference is within these ranges, inverter starts to operate at minimum speed of this interval. It allows preventing resonances and vibrations on the structure of the machine.	NO
FU2[19] ▶ 11 jump Lo 1 10.00Hz	Setting of low frequency skip 1	0 – FU2-12	10.00Hz	930B	It sets the low frequency of the first skip of frequencies.	NO
FU2[19] ▶ 12 jump Hi 1 15.00Hz	Setting of high frequency skip 1	FU2-11 – FU1-30	15.00Hz	930C	It sets the high frequency of the first skip of the frequencies.	NO
FU2[19] ▶ 13 jump Lo 2 20.00Hz	Setting of low frequency skip 2	0 – FU2-14	20.00Hz	930D	It sets the low frequency of the second skip of frequencies.	NO
FU2[19] ▶ 14 jump Hi 2 25.00Hz	Setting of high frequency skip 2	FU2-13 – FU1-30	25.00Hz	930E	It sets the high frequency of the second skip of frequencies.	NO
FU2[19] ▶ 15 jump Lo 3 30.00Hz	Setting of low frequency skip 3	0 – FU2-16	30.00Hz	930F	It sets the low frequency of the third skip of frequencies.	NO
FU2[19] ▶ 16 jump Hi 3 35.00Hz	Setting of high frequency skip 3	FU2-15 – FU1-30	35.00Hz	9310	It sets the high frequency of the third skip o frequencies.	NO
FU2 ▶ 20 Power-on run No	Restart after power supply fault	No Yes	No	9314	It allows inverter restart automatically after power supply is lost and recovered again. **Note:** If the motor is still running when the power supply is recovered, a trip can be produced in the inverter. To avoid this, use the function of 'Speed search' combined. ⚠ **Caution:** You should pay special attention to application since the motor restart automatically when power supply is recovered again, to avoid possible damages.	NO
FU2 ▶ 21 RST restart No	Restart after fault reset	No Yes	No	9315	It allows inverter to start automatically after receiving the signal of fault reset. **Note:** If the motor is still running when the power supply is recovered, a trip can be produced in the inverter. To avoid this, use the function of 'Speed search' combined. ⚠ **Caution:** You should pay special attention to application since the motor restart automatically when power supply is recovered again, to avoid possible damages.	NO

[18] It is only available if dwell time is set to a value higher than zero in FU2-07.
[19] It is only available if FU2-10 is set to 'Yes'.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU2 ▶ 22 Speed Search 0000	Speed search function	0000 – 1111 (Bit setting)	0000	9316	This function allows an automatic start after a fault occurs or after power supply is lost without waiting for that the motor is stopped. **Bit setting range (4th 3rd 2nd 1st) – Description** 0 0 0 0 – Speed search deactivated 0 0 0 1 – Speed search activated during acceleration 0 0 1 0 – Speed search activated after a fault reset (FU2-21) 0 1 0 0 – Speed search activated after an instant power supply fault (instant cut off) 1 0 0 0 – Speed search activated after power supply loss (FU2-20) 1 1 1 1 – Always Speed search activated **Note:** Load inertia should be correctly set. See FU2-46 'Inertia rate'.	NO
FU2[20] ▶ 23 SS P-Gain 200	Proportional gain for speed search	0 – 9999	200	9317	It is the proportional gain that should be set considering the load inertia (GD²) and the load torque. See FU2-46 'Inertia rate'.	YES
FU2[20] ▶ 24 SS I-Gain 500	Integral gain for speed search	0 – 9999	500	9318	It is the integral gain that should be set considering the load inertia (GD²) and the load torque. See FU2-46 'Inertia rate'. **Caution:** If this value is too high, an over voltage trip can occurs.	YES
FU2 ▶ 25 Retry number 0	Tries of automatic fault resets	0 – 10	0	9319	This function is used to inverter does an autoreset after a fault occurs. The number of tries of autoreset is set here. If the number of tries of fault resets has passed and the fault persists, then inverter does not try to reset again. It is necessary to reset fault conditions. **Caution:** You should pay special attention to application since the motor restart automatically when power supply is recovered again, to avoid possible damages.	YES
FU2[21] ▶ 26 Retry delay 1.0sec	Time between tries of automatic fault resets	0.0 – 60.0sec	1.0sec	931A	It allows setting the wait time between an automatic fault reset and the next one. If the fault persists for more time than the time set here, and after reset is done, Autoreset function is not carried out. **Caution:** You should pay special attention to application since the motor restart automatically when power supply is recovered again, to avoid possible damages.	YES
FU2 ▶ 40 Motor select __._kW	Motor power setting	3.7kW – 75kW	*	9328	It allows setting the capacity of the motor that will be used. Values of motor slip frequency, rated current, no load current, stator resistance and leakage inductance will be automatically changed when this value is modified.	NO
FU2 ▶ 41 Pole number 4	Number of motor poles	2 – 12	4	9329	It allows setting the poles number of motor that will be used.	NO
FU2 ▶ 42 Rated-Slip _.__Hz	Rated slip frequency of the motor	0 – 10Hz	*	932A	It allows setting the rated slip frequency of the motor that will be controlled.	NO
FU2 ▶ 43 Rated-Curr __._A	Motor rated current	1 – 200.0A	*	932B	It allows setting the rated current of the motor that will be controlled. This value will be used to calculate other settings (protections, limitations, ...).	NO

[20] It is only available if active speed search is set at any moment in FU2-22.
[21] It is only available if autoreset function is set in FU2-25.
* Depending on the inverter capacity.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
FU2 ► 44 Noload-Curr __._A	No load current of the motor	0.5 – 200.0A	*	932C	It allows setting no load current of the motor that will be controlled. This value should be correctly for 'Sensorless' option.	NO
FU2 ► 45 Efficiency __%	Motor efficiency	70 – 100%	*	932D	It allows setting the efficiency of the motor that will be controlled.	NO
FU2 ► 46 Inertia rate 0	Load inertia rate	0 – 8	0	932E	It allows setting the approx inertia associated to the application. This parameter is directly linked with Speed search.	NO
FU2 ► 47 RPM factor 100%	Setting of gain for speed motor	1 – 1000%	100%	932F	It allows setting the gain for speed displaying of the motor that will be controlled.	YES
FU2 ► 48 Carrier freq _._kHz	Setting of carrier frequency	0.7 – 15.0kHz	*	9330	It allows setting the carrier frequency (commutation frequency) according to inverter frame. This value affects the audible sound of the motor, noise emission from the inverter, inverter temp, and leakage current.	YES
FU2 ► 49 PWM Select Normal 1	Selection of modulation mode	Normal 1 Normal 2 Low Leakage	Normal 1	9331	It allows modifying the leakage current and the noise without modifying the commutation frequency. **Modulation mode** – **Description** Normal 1 – Standard modulation mode PWM. Normal 2 – Operation with pre-defined commutation frequency. Low Leakage – Inverter reduces commutation cycle to reduce leakage current. **Caution:** A decrease of commutation frequency can increase noise. If 'Low Leakage' is set and commutation frequency is lower than 2kHz, then the value of FU2-48 will be automatically set to 2kHz.	NO
FU2 ► 60 Control mode V/F	Selection of inverter control mode	V/F Slip compen Sensorless	V/F	933C	**V/F:** This mode constantly controls the relation factor voltage/frequency. **Slip compen:** It allows holding constant motor speed. Inverter output frequency changes within the limits of slip frequency set in FU2-42 depending on the load current. **Sensorless:** It allows controlling the motor when a high torque is required at low speed, fluctuation of the load is high and a fast response is needed. We recommend carry out an 'Auto Tuning' of the motor before using this function. **Caution:** If no load current is incorrectly set in FU2-44, this function can lose this functionality.	NO
FU2[22] ► 61 Auto Tuning No	Auto tuning of motor parameters	No Yes	No	933D	This function allows the inverter measuring automatically all of parameters required for the control mode selected in FU2-60, such as stator resistance, rotor resistance, leakage inductance and no load current.	NO
FU2[22] ► 62 Rs _.___ohm	Stator resistance	*	*	933E	Calculation of the stator resistance depending on the motor capacity.	NO
FU2[22] ► 63 Lsigma _.__mH	Leakage inductance	*	*	933F	Calculation of the leakage inductance depending of the motor capacity.	NO
FU2[22] ► 64 PreExTime 1.0sec	Pre-exciting time of the motor	0.0 – 60.0sec	1.0sec	9340	IT allows setting the time that the inverter will apply a DC current to the output before starting to apply the acceleration ramp, once run command is received. **Note:** DCB is displayed.	NO
FU2[22] ► 65 SL P-Gain 1000	Proportional gain in Sensorless	0 – 9999	1000	9341	It allows setting the value of proportional gain that will be used in Sensorless control mode. A very high value supplies a faster response, but the system can become unstable. Set an appropriate value for your application	YES
FU2[22] ► 66 SL I-Gain 100	Integral gain in Sensorless	0 – 9999	100	9342	It allows setting the value of integral gain that will be used in Sensorless control mode. A low value supplies more stable and slower response of the system, but a trip during speed control can be generated by the inverter. Set an appropriate value for your application.	YES

* Depending on the inverter capacity.
[22] It is only available if control mode is set to 'Sensorless' in FU2-60.

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>FU2 ► 67 Torque boost Manual</td><td>Torque boost setting</td><td>Manual
Automatic</td><td>Manual</td><td>9343</td><td rowspan="3">This function is used to increase the torque boost at low speed, increasing the output voltage applied to the motor.
If the value is higher than the required value, motor can be saturated generating an overcurrent fault.
Torque boost is calculated as a percentage of inverter rated voltage.
Manual: Values set in FU2-67 and FU2-68 are applied. If control mode set in FU2-60 is 'V/F', then settings done from FU2-67 to FU2-69 will be ignored.
Note: A very high value of torque boost could saturate the motor and could generate an overcurrent trip.
Note: We recommend use this function when the distance from motor to inverter is very big.
Automatic: Values automatically calculated by the inverter according to the load are applied. If control mode set in FU2-60 is ‘Sensorless’, then this function is not available.
Note: We recommend carry out an ‘Auto tuning’ of the motor so that this function is effective.
Note: This function is only available for the first motor. It is not available for settings of the second motor.</td><td>NO</td></tr>
<tr><td>FU2[23] ► 68 Fwd boost 2.0%</td><td>Manual torque boost in forward direction</td><td>0.0 – 15.0%</td><td>2.0%</td><td>9344</td><td>NO</td></tr>
<tr><td>FU2[23] ► 69 Rev boost 2.0%</td><td>Manual torque boost in reverse direction</td><td>0.0 – 15.0%</td><td>2.0%</td><td>9345</td><td>NO</td></tr>
<tr><td>FU2 ► 80 PowerOn disp 0</td><td>Power on display</td><td>0 – 12</td><td>0</td><td>9350</td><td>Depending on the code introduced here, a different parameter will be displayed when power supply loss occurs and it is recovered again.
<table>
<tr><th>Set value</th><th>Displaying at the moment of re-connection</th></tr>
<tr><td>0</td><td>DRV-00 'Cmd. Freq.'</td></tr>
<tr><td>1</td><td>DRV-01 'Acc. Time'</td></tr>
<tr><td>2</td><td>DRV-02 'Dec. Time'</td></tr>
<tr><td>3</td><td>DRV-03 'Drive mode'</td></tr>
<tr><td>4</td><td>DRV-04 'Freq mode'</td></tr>
<tr><td>5</td><td>DRV-05 'Step Freq-1'</td></tr>
<tr><td>6</td><td>DRV-06 'Step Freq-2'</td></tr>
<tr><td>7</td><td>DRV-07 'Step Freq-3'</td></tr>
<tr><td>8</td><td>DRV-08 'Current'</td></tr>
<tr><td>9</td><td>DRV-09 'Speed'</td></tr>
<tr><td>10</td><td>DRV-10 'DC link Vtg'</td></tr>
<tr><td>11</td><td>DRV-11 'User disp'</td></tr>
<tr><td>12</td><td>DRV-12 'Fault None'</td></tr>
</table>
Note: It operates in the same way in PID mode.</td><td>YES</td></tr>
<tr><td>FU2 ► 81 User disp Voltage</td><td>Displaying for value displayed in DRV-11</td><td>Volts
Watts</td><td>Volts</td><td>9351</td><td>It allows selecting the units for output voltage or power displaying showed in DRV-11.</td><td>YES</td></tr>
<tr><td>FU2 ► 82 S/W PE x.x Ver y.y</td><td>Software version</td><td>-</td><td>-</td><td>9352</td><td>Displaying of software version installed in the equipment.</td><td>-</td></tr>
<tr><td>FU2 ► 83 LastTripTime 0:00:00:00:00</td><td>Time from the last fault</td><td>-</td><td>-</td><td>9353</td><td>Displaying of the elapsed time from the last fault.
Note: this time is automatically reset after each fault.</td><td>-</td></tr>
<tr><td>FU2 ► 84 On-Time 0:00:00:00:00</td><td>Time from the equipment was connected</td><td>-</td><td>-</td><td>9354</td><td>Displaying of the elapsed time from the inverter was connected.
Note: this time is not automatically reset.</td><td>-</td></tr>
<tr><td>FU2 ► 85 Run-time 0:00:00:00:00</td><td>Operation time</td><td>-</td><td>-</td><td>9355</td><td>Displaying of the elapse time while inverter is running.
Note: this time is not automatically reset.</td><td>-</td></tr>
<tr><td>FU2 ► 87 Power Set 100.0%</td><td>Power setting</td><td>0.1 – 400.0%</td><td>100.0%</td><td>9357</td><td>Setting of the scale of the inverter output power.</td><td>YES</td></tr>
<tr><td>FU2 ► 90 Para. disp Default</td><td>Selection of parameters displaying</td><td>Default
All Para
Diff Para</td><td>Default</td><td>935A</td><td>Default: Default parameters of the inverter are only displayed.
All Para: All of parameters of the inverter are displayed.
Diff Para: Parameters that have been modified are only displayed.</td><td>NO</td></tr>
</table>

[23] It is only available if torque boost is set to ‘Manual’ in FU2-67.

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>FU2 ► Para. read
91 No</td><td>Parameters read</td><td>No
Yes</td><td>No</td><td>935B</td><td rowspan="2">Functions used for programs of multiple inverters with the same settings. LCD display ‘reads’ parameters of the inverter memory (load) and can ‘write’ them into the memory of other inverters (download) when display is connected to these inverters.
Note: When FU2-91 is used, parameters referred to the motor such as FU2-40 – 46, FU2-62 – 63 will be restarted. Carry out ‘Auto tuning’ function before using ‘Sensorless’ control mode.
Note: Carry out FU2-95 'Para. save' before using FU2-91.</td><td>NO</td></tr>
<tr><td>FU2 ► Para. write
92 No</td><td>Parameters write</td><td>No
Yes</td><td>No</td><td>935C</td><td>NO</td></tr>
<tr><td>FU2 ► Para. init
93 No</td><td>Parameters initialize</td><td>No
All groups
DRV
FU1
FU2
I/O
EXT
COM
APP</td><td>No</td><td>935D</td><td>It allows initialize selected parameters back to the factory default value together or in a separate way.
<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>No</td><td>It is displayed after initializing command.</td></tr>
<tr><td>All groups</td><td>All of parameters are initialized.</td></tr>
<tr><td>DRV</td><td>Parameters of DRV group are initialized</td></tr>
<tr><td>FU1</td><td>Parameters of FU1 group are initialized</td></tr>
<tr><td>FU2</td><td>Parameters of FU2 group are initialized</td></tr>
<tr><td>I/O</td><td>Parameters of I/O group are initialized</td></tr>
<tr><td>EXT</td><td>Parameters of EXT group are initialized</td></tr>
<tr><td>COM</td><td>Parameters of COM group are initialized</td></tr>
<tr><td>APP</td><td>Parameters of APP group are initialized</td></tr>
</table>
Note: Set motor nameplate data in FU2 again.
Note: Fault history is not erased if FU2-06 'Erase trips' is not executed.</td><td>NO</td></tr>
<tr><td>FU2 ► Para. lock
94 0</td><td>Parameters lock</td><td>0 – 9999</td><td>0</td><td>935E</td><td>It allows user to lock parameters so that they cannot be modified. Under these circumstances, arrows of display do not appear full, but empty.
Lock and unlock code is 12.</td><td>YES</td></tr>
<tr><td>FU2 ► Para. save
95 No</td><td>Parameters save</td><td>No
Yes</td><td>No</td><td>935F</td><td>It allows memorizing parameters value that has been modified. If a parameters read is done before executing FU2-91, modified values will be read.</td><td>NO</td></tr>
</table>

8.4. Inputs and Outputs Menu (I/O)

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O ▶ Jump code 00 1	Jump to desired parameter	1 to 99	1	9400	Any parameter of **I/O** group can be directly selected from here without scrolling up/down to others parameters. You only need to introduce the number of desired parameter and press **PROG** key.	YES
I/O[24] ▶ V1 Filter 01 250ms	Filter of analogue voltage input	0 – 9999ms	250ms	9401	Filter for analogue input signal V1. An increase of this value will improve stability in case of the signal is being affected by noise. **Note:** If you increase this value, response time become slower.	YES
I/O[24] ▶ V1 volt x1 02 0.00V	Minimum voltage of V1 input	0.00 – I/O-04 (12.00V max.)	0.00V	9402	Setting the minimum voltage value of input signal V1 that inverter supplies the minimum output frequency set in I/O-03.	YES
I/O[24] ▶ V1 Freq y1 03 0.00Hz	Minimum frequency for minimum voltage of V1 input	0.00 – FU1-30 Hz	0.00Hz	9403	Setting of minimum frequency for analogue reference signal V1 corresponding to the minimum voltage set in I/O-02.	YES
I/O[24] ▶ V1 volt x2 04 10.00V	Maximum voltage of V1 input	I/O-02 (0.00V min.) – 12.00V	10.00V	9404	Setting of maximum voltage value of input signal V1 that inverter supplies the maximum output frequency set in I/O-05.	YES
I/O[24] ▶ V1 Freq y2 05 50.00Hz	Maximum frequency for maximum voltage of V1 input	0.00 – I/O-03 Hz	50.00Hz	9405	Setting of maximum frequency for analogue reference signal V1 corresponding to the maximum voltage set in I/O-04.	YES
I/O[25] ▶ I Filter 06 250ms	Filter of analogue current input	0 – 9999ms	250ms	9406	Filter for analogue input signal I. An increase of this value will improve the stability in case of the signal is being affected by noise. **Note:** If you increase this value, response time become slower.	YES
I/O[25] ▶ I curr x1 07 4.00mA	Minimum current of I input	0.00 – I/O-09 (20.00mA max.)	4.00mA	9407	Setting of minimum current value of input signal I that inverter supplies the minimum output frequency set in I/O-08.	YES
I/O[25] ▶ I Freq y1 08 0.00Hz	Minimum frequency for minimum current of I input	0.00 – FU1-30 Hz	0.00Hz	9408	Setting of minimum frequency for analogue reference signal I corresponding to the minimum current set in I/O-07.	YES
I/O[25] ▶ I curr x2 09 20.00mA	Maximum current of I input	I/O-07 (0.00mA min.) – 20.00mA	20.00mA	9409	Setting of maximum current value of input signal I that inverter supplies the maximum output frequency set in I/O-10.	YES
I/O[25] ▶ I Freq y2 10 50.00Hz	Maximum frequency for maximum current of I input	0.00 – I/O-08 Hz	50.00Hz	940A	Setting of maximum frequency for analogue reference signal I corresponding to the maximum current set in I/O-09.	YES
I/O[26] ▶ P pulse set 11 (A)	Selection of pulse input mode	(A+B) (A)	(A)	940B	Setting of pulse input mode: A or A+B. Do not apply pulse input in both terminals in case of A+B is set.	YES
I/O[26] ▶ P Filter 12 10ms	Filter of pulse input	0 – 9999ms	10ms	940C	Filter of analogue pulse input signal. An increase of this value will improve operation stability in case of the input is being affected by noise. **Note:** If you increase this value, response time become slower.	YES
I/O[26] ▶ P pulse x1 13 0.0kHz	Minimum pulse frequency of A0, B0 input	0.0 – I/O-15 (10.0kHz max.)	0.0kHz	940D	Setting of minimum frequency value of pulse input signal that inverter supplies the minimum output frequency set in I/O-14.	YES
I/O[26] ▶ P Freq y1 14 0.00Hz	Minimum frequency for minimum pulse frequency of A0, B0 input	0.00 – FU1-30 Hz	0.00Hz	940E	Setting of minimum frequency for pulse reference signal corresponding to the minimum pulse frequency set in I/O-13.	YES
I/O[26] ▶ P pulse x2 15 10.0kHz	Maximum pulse frequency of A0, B0 input	I/O-13 (0.0mA min.) – 10.0kHz	10.0kHz	940F	Setting of maximum frequency value of pulse input signal that inverter supplies the maximum output frequency set in I/O-16.	YES
I/O[26] ▶ P Freq y2 16 50.00Hz	Maximum frequency for maximum pulse frequency of A0, B0 input	0 – I/O-14 Hz	50.00Hz	9410	Setting of maximum frequency for pulse reference signal corresponding to the maximum pulse frequency set in I/O-15.	YES

[24] It is only available if reference signal is set to V1, V1S or V1+I in DRV-04 'Frequency mode'.
[25] It is only available if reference signal is set to I or V1+I in DRV-04 'Frequency mode'.
[26] It is only available if reference signal is set to Pulse in DRV-04 'Frequency mode'.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O[27] ▶ Wire broken 17 None	Criterion for signal loss of reference analogue input	None Half of x1 Less than x1	None	9411	It defines criterion for defining if reference signal has been lost. **None:** Disabled function. **Half of x1:** Inverter determines the reference signal loss when its value is below half of minimum value set in I/O-02, I/O-07 or I/O-13. **Less than x1:** Inverter determines the reference signal loss when its value is below minimum value set in I/O-02, I/O-07 or I/O-13.	YES
I/O[27] ▶ Lostcommand 18 None	Stop mode after analogue input signal loss	None FreeRun Stop	None	9412	It defines the stop mode after analogue input signal loss. **None:** It continues operating even if the signal has been lost. **Free Run:** Inverter turns off the output voltage and the system stops by inertia. **Stop**: Inverter stops the system applying a deceleration ramp. **LOP** – Reference loss from Optional Card (DPRAM fault) **LOR** – Reference loss from Optional Card (Net communication fault). **LOV** – Loss of analogue frequency reference (V1: 0-10V) **LOI** – Loss of analogue frequency reference (I: 4-20mA)	YES
I/O[27] ▶ Time out 19 1.0sec	Delay time after reference signal loss	0.1 – 120.0sec	1.0sec	9413	Delay time after losing the reference signal, before inverter performing according to the previous explained criteria.	YES

[27] It is only available if reference signal is set to V1, V1S, I, V1+I or Pulse in DRV-04 'Frequency mode'. Function will be only executed if the values set in I/O-02, I/O-07 or I/O-13 are different from 0.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O ► 20 **M1 define Speed-L**	Multi-function digital input. M1 terminal	Speed-L Speed-M Speed-H XCEL-L XCEL-M XCEL-H DC-brake 2nd Func Exchange Reserved Up Down 3-Wire Ext Trip Pre-Heat iTerm Clear Open-loop Main-drive Analog hold XCEL stop P Gain2 Reserved Interlock1 Interlock2 Interlock3 Interlock4 Speed-X RST BX JOG FX RX ANA_CHG Pre-Excite Ext PID Run Up/Dn Clr	Speed-L	9414	Setting of multi-function inputs. **Speed-L, Speed-M, Speed-H:** Multiple step-speeds activating these inputs. **XCEL-L, XCEL-M, XCEL-H:** Multiple acceleration ramps activating these inputs. **DC-brake**: Activation of braking current injection during the stop. **2nd Func:** Parameters activation for second motor. **Exchange:** Exchange to commercial power line. **Reserved:** No function. **Up:** To increase reference frequency by motorized potentiometer. **Down:** To decrease reference frequency by motorized potentiometer. **3-Wire:** Wiring of start/stop signals by pulse. **Ext trip:** Generation of an external trip in the inverter. **Pre-Heat:** Activation of pre-heat function. **iTerm Clear:** It sets to 0 the value of I gain in PID mode. **Open-loop:** It commutes from PID operation (close loop) to V/F (open loop). **Main-drive:** Its activation allows that inverter will be controlled through communication net without additional changes. **Analog hold:** It allows holding fixed the output frequency while this terminal is active and the reference signal is analogue. **XCEL stop:** Inverter stops the acceleration and deceleration when this signal is activated. **P Gain2:** Its activation allows that the P2 set value in PID mode is applied. **Reserved:** No function. **Interlock1:** It allows determining if the auxiliary motor 1 is out of service. Use of NC contact. **Interlock2:** It allows determining if the auxiliary motor 2 is out of service. Use of NC contact. **Interlock3:** It allows determining if the auxiliary motor 3 is out of service. Use of NC contact. **Interlock4:** It allows determining if the auxiliary motor 4 is out of service. Use of NC contact. **Speed-X:** Multiple step-speeds through activation of these inputs. **RST:** Fault reset. **BX:** Emergency stop trip. No reset. **JOG:** Activation of this signal allows that the inverter ignores any speed reference and starts to operate at jog frequency programmed in I/O-30. **FX:** Forward run command. **RX:** Reverse run command. **ANA_CHG:** If reference signal is set to V1+I, it allows change from V1 to I. **Pre-Excite:** It allows applying a pre-exciting current until start signal is activated. **Ext PID Run:** Its activation allows starting dual PID. **Up/Dn Clr:** It allows clearing memorized frequency introduced by motorized potentiometer.	YES
I/O ► 21 **M2 define Speed-M**	Multi-function digital input. M2 terminal		Speed-M	9415		YES
I/O ► 22 **M3 define Speed-H**	Multi-function digital input. M3 terminal		Speed-H	9416		YES
I/O ► 23 **M4 define RST**	Multi-function digital input. M4 terminal		RST	9417		YES
I/O ► 24 **M5 define BX**	Multi-function digital input. M5 terminal		BX	9418		YES
I/O ► 25 **M6 define JOG**	Multi-function digital input. M6 terminal		JOG	9419		YES
I/O ► 26 **M7 define FX**	Multi-function digital input. M7 terminal		FX	941A		YES
I/O ► 27 **M8 define RX**	Multi-function digital input. M8 terminal		RX	941B		YES
I/O ► 28 **In status 00000000000**	Digital inputs status	00000000000 – 11111111111	00000000000	941C	It displays the activation or not activation of all of digital inputs.	-
I/O ► 29 **Ti Filt Num 15ms**	Filter of digital inputs	2 – 1000ms	15ms	941D	Filter for digital inputs. This filter is effective in case of inputs are being affected by noise. **Note:** If you increase this value, response time become slower.	YES
I/O ► 30 **Jog Freq 10.00Hz**	Setting of jog frequency	0 – FU1-30 Hz	10.00Hz	941E	Setting of frequency value that the inverter will start to operate independently of any other reference signal whenever some of the digital inputs is configured as 'JOG' and it is activated.	YES

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O[28] ▶ 31 **Step Freq-4 40.00Hz**	Speed at step frequency 4	0 – FU1-30 Hz	40.00Hz	941F	Setting of frequency values that will be applied as multiple speeds by activating input signals according to the attached table: (see table below). Frequency values set from Step 0=DRV-00, Step 1 to Step 3 in DRV-05 to DRV-07, and the others indicated here.	YES
I/O[28] ▶ 32 **Step Freq-5 50.00Hz**	Speed at step frequency 5		50.00Hz	9420		YES
I/O[28] ▶ 33 **Step Freq-6 40.00Hz**	Speed at step frequency 6		40.00Hz	9421		YES
I/O[28] ▶ 34 **Step Freq-7 30.00Hz**	Speed at step frequency 7		30.00Hz	9422		YES
I/O[29] ▶ 35 **Step Freq-8 20.00Hz**	Speed at step frequency 8		20.00Hz	9423		YES
I/O[29] ▶ 36 **Step Freq-9 10.00Hz**	Speed at step frequency 9		10.00Hz	9424		YES
I/O[29] ▶ 37 **Step Freq-10 20.00Hz**	Speed at step frequency 10		20.00Hz	9425		YES
I/O[29] ▶ 38 **Step Freq-11 30.00Hz**	Speed at step frequency 11		30.00Hz	9426		YES
I/O[29] ▶ 39 **Step Freq-12 40.00Hz**	Speed at step frequency 12		40.00Hz	9427		YES
I/O[29] ▶ 40 **Step Freq-13 50.00Hz**	Speed at step frequency 13		50.00Hz	9428		YES
I/O[29] ▶ 41 **Step Freq-14 40.00Hz**	Speed at step frequency 14		40.00Hz	9429		YES
I/O[29] ▶ 42 **Step Freq-15 30.00Hz**	Speed at step frequency 15		30.00Hz	942A		YES

Step	M1 Speed-L	M2 Speed-M	M3 Speed-H	M4 Speed-X
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O ▶ 50 **Acc time-1 20.0sec**	Acceleration time 1	0 – 600.0sec	20.0sec	9432	Values set here will be applied based on the explanation done in FU1-72 'Acc/Dec ch F'. Additionally, these values are used according to the settings done for digital inputs. See I/O-52 to I/O-63.	YES
I/O ▶ 51 **Dec time-1 20.0sec**	Deceleration time 1		20.0sec	9433		YES
I/O[30] ▶ 52 **Acc time-2 30.0sec**	Acceleration time 2	0 – 600.0sec	30.0sec	9434	Setting of time values that will be applied as multiple acceleration and deceleration ramps by activating input signals according to the attached table: (see table below)	YES
I/O[30] ▶ 53 **Dec time-2 30.0sec**	Deceleration time 2		30.0sec	9435		YES
I/O[30] ▶ 54 **Acc time-3 40.0sec**	Acceleration time 3		40.0sec	9436		YES
I/O[30] ▶ 55 **Dec time-3 40.0sec**	Deceleration time 3		40.0sec	9437		YES
I/O[31] ▶ 56 **Acc time-4 50.0sec**	Acceleration time 4		50.0sec	9438		YES
I/O[31] ▶ 57 **Dec time-4 50.0sec**	Deceleration time 4		50.0sec	9439		YES
I/O[31] ▶ 58 **Acc time-5 40.0sec**	Acceleration time 5		40.0sec	943A		YES
I/O[31] ▶ 59 **Dec time-5 40.0sec**	Deceleration time 5		40.0sec	943B		YES
I/O[31] ▶ 60 **Acc time-6 30.0sec**	Acceleration time 6		30.0sec	943C		YES
I/O[31] ▶ 61 **Dec time-6 30.0sec**	Deceleration time 6		30.0sec	943D		YES
I/O[31] ▶ 62 **Acc time-7 20.0sec**	Acceleration time 7		20.0sec	943E		YES
I/O[31] ▶ 63 **Dec time-7 20.0sec**	Deceleration time 7		20.0sec	943F		YES

Step	M1 XCEL-L	M2 XCEL-M	M3 XCEL-H
DRV-01: Acc-0 DRV-02: Dec-0	0	0	0
I/O-50: Acc-1 I/O-51: Dec-1	1	0	0
I/O-52: Acc-2 I/O-53: Dec-2	0	1	0
I/O-54: Acc-3 I/O-55: Dec-3	1	1	0
I/O-55: Acc-4 I/O-57: Dec-4	0	0	1
I/O-58: Acc-5 I/O-59: Dec-5	1	0	1
I/O-60: Acc-6 I/O-61: Dec-6	0	1	1
I/O-62: Acc-7 I/O-63: Dec-7	1	1	1

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O ▶ 68 **S0 Level 0.0%**	Offset for S0 analogue output	0.0 – 100.0%	0.0%	9444	Setting of the beginning of S0 analogue output. It allows moving level of 0V up to 100.0% of output frequency.	YES
I/O ▶ 69 **S1 Level 0.0%**	Offset for S1 analogue output	0.0 – 100.0%	0.0%	9445	Setting of the beginning of S0 analogue output. It allows moving level of 0V up to 100.0% of output frequency.	YES

[28] It is only available if three of digital inputs are set to 'Speed-L', 'Speed-M' and 'Speed-H'. See configuration of inputs from M1 to M8 (I/O-20 to I/O-27).
[29] It is only available if four of digital inputs are set to 'Speed-L', 'Speed-M', 'Speed-H' and 'Speed-X'. See configuration of inputs from M1 to M8 (I/O-20 to I/O-27).
[30] It is only available if two of digital inputs are set to 'XCEL-L', 'XCEL-M'. See configuration of inputs from M1 to M8 (I/O-20 to I/O-27).
[31] It is only available if three of digital inputs are set to 'XCEL-L', 'XCEL-M' and 'XCEL-H'. See configuration of inputs from M1 to M8 (I/O-20 to I/O-27).

Display	Description	Range	Default value	Memory address	Function	Set during RUN
I/O ► 70 S0 mode Frequency	S0 analogue output mode (0-10V)	Frequency Current Voltage DC link Vtg Ext PID Out	Frequency	9446	Selection of the magnitude that the signal of 0-10Vdc supplied by analogue output S0 will be proportional.	YES
I/O ► 71 S0 adjust 100%	Setting of S0 analogue output	10 – 200%	100%	9447	It allows scaling the voltage level of S0 analogue input signal.	YES
I/O ► 72 S1 mode Voltage	S1 analogue output mode (0-10V)	See S0	Voltage	9448	Selection of the magnitude that the signal of 0-10Vdc supplied by analogue output S1 will be proportional.	YES
I/O ► 73 S1 adjust 100%	Setting of S1 analogue output	10 – 200%	100%	9449	It allows scaling the voltage level of S1 analogue input signal.	YES
I/O ► 74 FDT Freq 30.00Hz	Frequency detection level	0 – FU1-30 Hz	30.00Hz	944A	These parameters setting combined with output relays setting allow selecting different bandwidth where detecting the inverter speed and doing that these signals change their status.	YES
I/O ► 75 FDT band 10.00Hz	Frequency detection bandwidth		10.00Hz	944B		YES
I/O ► 76 Aux mode1 None	Selection of configuration for auxiliary relay 1	None FDT-1 FDT-2 FDT-3 FDT-4 FDT-5 OL IOL Stall OV LV OH LostCommand Run Stop Steady INV line COMM line SSearch Ready MMC	None	944C	It allows setting multi-functions outputs: **None:** Output relays do not actuate. **FDT-1:** Activation of output signals when foutput>freference – I/O-74/2. Example: If reference frequency is 50Hz and I/O-74=5, then 50-(10/2)=45Hz. Contact will close at frequencies higher than 45Hz. **FDT-2:** Contact will be closed when reference frequency is centered in I/O-74 being I/O-75 the bandwidth. If reference frequency is 40Hz, I/O-74=40Hz and I/O-75=4Hz, the contact will be closed from 38Hz to 42Hz. **FDT-3:** Contact would close at frequencies from (I/O-74 – I/O-75/2) to (I/O-74 + I/O-75/2). If I/O-74=30Hz and I/O-75=10Hz, then the contact will close from (30-(10/2)) to (30+(10/2)), that means, from 25Hz to 35Hz during acceleration. **FDT-4:** Contact is closed when output frequency is higher than I/O-74 value and remains closed until frequency decreases below I/O-74 – I/O-75/2. That means, the contact will close above 30Hz and will not open until frequency decreases below 25Hz. **FDT-5:** Operation opposite to FDT-4. **OL:** Overload. The contact is closed when current exceeds the overload value set in FU1-64 for the time set in FU1-65. **IOL:** If overload level remains for 1 minute, inverter turns off the output and will trip because of overload current. Stall: The contact is closed when current dynamic limitation is active. See FU1-70 and FU1-71. **OV:** Over voltage. The contact is closed with a high level of DC Link. **LV:** Low voltage. The contact is closed with a low level of DC Link. **OH:** The contact is closed when there is an over temperature of the inverter. Lost Command: The contact is closed when detection of reference signal loss has been activated. See I/O-17 to I/O-19. **Run:** The contact is closed when inverter is running. **Stop:** The contact is closed when inverter is stopped. **Steady:** The contact is closed when inverter is at steady status. **INV line, COMM line:** Both functions combined with a digital input as 'Exchange', allow the inverter commutation to the commercial power line. **SSearch:** The contact is closed when the Speed search is activated. See FU2-22 to FU2-24. **Ready:** The contact is closed when the inverter is ready for starting to operate. **MMC:** It is used to control multiple auxiliary motors. See APP group.	YES
I/O ► 77 Aux mode2 None	Selection of configuration for auxiliary relay 2		None	944D		YES
I/O ► 78 Aux mode3 None	Selection of configuration for auxiliary relay 3		None	944E		YES
I/O ► 79 Aux mode4 None	Selection of configuration for auxiliary relay 4		None	944F		YES

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>I/O ► Relay mode
80 010</td><td>Selection of configuration for fault relay</td><td>000 – 111</td><td>010</td><td>9450</td><td>It allows configuring the performance of fault relay according to the following table:
<table>
<tr><th>Bit</th><th>Adjus.</th><th>Display</th><th>Description</th></tr>
<tr><td rowspan="2">Bit 1
(LV)</td><td>0</td><td>000</td><td>Fault relay does not actuate with ‘Low voltage’ fault.</td></tr>
<tr><td>1</td><td>001</td><td>Fault relay actuates with ‘Low voltage’ fault.</td></tr>
<tr><td rowspan="2">Bit 2
(Fault)</td><td>0</td><td>000</td><td>Fault relay does not actuate with any fault.</td></tr>
<tr><td>1</td><td>010</td><td>Fault relay actuates with any fault different to ‘Low voltage’ and 'EMERG' fault.</td></tr>
<tr><td rowspan="2">Bit 3
(Tries)</td><td>0</td><td>000</td><td>Fault relay does not actuate according to the number of auto tries.</td></tr>
<tr><td>1</td><td>100</td><td>Fault relay actuates if number of auto tries set in FU2-25 decrease down to 0 because of fault. It is disabled when the function of restart is active.</td></tr>
</table></td><td>YES</td></tr>
<tr><td>I/O ► Out status
81 00000000</td><td>Activation status of digital outputs</td><td>00000000 – 11111111</td><td>00000000</td><td>9451</td><td>It indicates activation or deactivation status of digital outputs.</td><td>YES</td></tr>
<tr><td>I/O ► Relay On
82 0.0sec</td><td>On delay time of fault relay</td><td>0.0 – 999.9sec</td><td>0.0sec</td><td>9452</td><td>Delay time for the connection of fault relay.</td><td>YES</td></tr>
<tr><td>I/O ► Relay Off
83 0.0sec</td><td>Off delay time of fault relay</td><td>0.0 – 999.9sec</td><td>0.0sec</td><td>9453</td><td>Delay time for the disconnection of fault relay.</td><td>YES</td></tr>
<tr><td>I/O ► Fan Con. Sel
84 PowerOn Fan</td><td>Selection of cooling fan operation</td><td>PowerOn Fan
Run_Fan
Temper_Fan</td><td>PowerOn Fan</td><td>9454</td><td>PowerOn Fan: Cooling fan of the inverter is connected when power supply of the equipment is connected.
Run_Fan: Cooling fan of the inverter is connected when inverter is running.
Temper_Fan: Cooling fan of the inverter is connected when the temperature is increased above the value set in I/O-85.
Note: It is only available for inverters with a power rating higher than 30kW.</td><td>YES</td></tr>
<tr><td>I/O ► Fan Temp
85 70</td><td>Setting of inverter temperature</td><td>0 – 70</td><td>70</td><td>9455</td><td>Setting of temperature that cooling fan should be connected.
Note: It is only available for inverters with a power rating higher than 30kW.</td><td>YES</td></tr>
<tr><td>I/O ► V1 Unit Sel
86 Speed</td><td>Selection of displaying units for V1 signal</td><td rowspan="3">Speed
Percent
Bar
mBar
kPa
Pa</td><td>Speed</td><td>9456</td><td>Selection of displaying units for V1 signal. It affects to reference signal and feedback loop in PID mode.</td><td>NO</td></tr>
<tr><td>I/O ► I Unit Sel
87 Speed</td><td>Selection of displaying units for I signal</td><td>Speed</td><td>9457</td><td>Selection of displaying units for I signal. It affects to reference signal and feedback loop in PID mode.</td><td>NO</td></tr>
<tr><td>I/O ► PulseUnitSel
88 Speed</td><td>Selection of displaying units for A0, B0 signal</td><td>Speed</td><td>9458</td><td>Selection of displaying units for Pulse signal. It affects to reference signal and feedback loop in PID mode.</td><td>NO</td></tr>
<tr><td>I/O ► Inv No.
90 1</td><td>Slave number in communication net</td><td>1 – 250</td><td>1</td><td>945A</td><td>It sets the number of slave in a communication net that is applied to the inverter as participant of the field bus.</td><td>YES</td></tr>
</table>

<table>
<tr><th>Display</th><th>Description</th><th>Range</th><th>Default value</th><th>Memory address</th><th>Function</th><th>Set during RUN</th></tr>
<tr><td>**I/O ▶ 91 Baud rate 9600bps**</td><td>Transmission speed in communication net</td><td>1200bps
2400bps
4800bps
9600bps
19200bps</td><td>9600bps</td><td>945B</td><td>It sets the speed of transmission of the communication net.</td><td>YES</td></tr>
<tr><td>**I/O ▶ 92 COM Lost Cmd None**</td><td>Stop mode after reference signal loss in communication net</td><td>None
Free Run
Stop</td><td>None</td><td>945C</td><td>It allows selecting the stop mode after reference signal loss when inverter is controlled through communication net.
None: It continues operating even if the signal has been lost.
Free Run: Inverter turns off the output voltage and the motor stops by inertia.
Stop: Inverter applies a deceleration ramp to stop the motor.</td><td>YES</td></tr>
<tr><td>**I/O ▶ 93 COM Time Out 1.0sec**</td><td>Setting of time to determine speed reference signal loss</td><td>0.1 – 120.0sec</td><td>1.0sec</td><td>945D</td><td>Setting of the time that the inverter will wait for it before considering that the reference signal given by communication net has been lost.</td><td>YES</td></tr>
<tr><td>**I/O ▶ 94 Delay Time 5ms**</td><td>Setting for RS232/RS485 communication</td><td>2 – 1000ms</td><td>5ms</td><td>945E</td><td>It allows correctly setting the use of a RS232/RS485 converter.</td><td>YES</td></tr>
<tr><td>**I/O ▶ 95 In NO/NC Set 00000000000**</td><td>Logical function of digital inputs</td><td>00000000000 – 11111111111</td><td>00000000000</td><td>945F</td><td>It allows setting the logical function of the contacts for digital inputs: normally open contacts (0) or normally close contacts (1).</td><td>NO</td></tr>
<tr><td>**I/O ▶ 96 In CheckTime 1ms**</td><td>Check time for digital inputs</td><td>1 – 1000ms</td><td>1ms</td><td>9460</td><td>It is used when digital inputs are used for speed references or multiple acceleration ramps. Inverter considers the input value valid when the time set here has elapsed.</td><td>NO</td></tr>
<tr><td>**I/O ▶ 97 OH Trip Sel 010**</td><td>Selection of over temperature trip</td><td>000 – 111</td><td>010</td><td>9461</td><td>Selection of over temperature trip of the inverter according to the following table:</td><td>NO</td></tr>
<tr><td>**I/O ▶ 98 MotTripTemp 110**</td><td>Selection of over temperature trip of the motor</td><td>0 – 255ºC</td><td>110</td><td>9462</td><td>
<table>
<tr><th>Bit</th><th>Adjus.</th><th>Display</th><th>Description</th></tr>
<tr><td rowspan="2">Bit 1 (Drive)</td><td>0</td><td>000</td><td>Over temperature trip of the inverter does not actuate.</td></tr>
<tr><td>1</td><td>001</td><td>Inverter trips because of over temperature according to the level set in I/O-98.</td></tr>
<tr><td rowspan="2">Bit 2</td><td>0</td><td>000</td><td rowspan="2">Reserved</td></tr>
<tr><td>1</td><td>010</td></tr>
<tr><td rowspan="2">Bit 3 (Motor)</td><td>0</td><td>000</td><td>Over temperature trip of the motor does not actuate (PTC / NTC).</td></tr>
<tr><td>1</td><td>100</td><td>Over temperature trip of the motor actuates according to the external signal (PTC / NTC).</td></tr>
</table>
</td><td>NO</td></tr>
</table>

8.5. Applications Menu (APP)

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP ▶ Jump code **00 1**	Jump to desired parameters	1 to 99	1	9700	Any parameter of **APP** group can be directly selected from here without scrolling up/down to others parameters. You only need to introduce the number of desired parameter and press **PROG** key.	YES
APP ▶ proc PI mode **01 No**	Selection of PID operation mode	No Yes	No	9701	It allows selecting PID operation mode to control the speed reference according to the signal that will be desired for measuring (pressure, flow, ...)	NO
APP[32] ▶ App. mode **02 None**	Selection of operation with multiple motors	None MMC	None	9702	To select the operation mode of Multiple Auxiliary Motors. **Note:** Selecting this option, Output relays are automatically configured, the others relays can be configured for another functions.	NO
APP[32] ▶ AuxRefMode **04 No**	Selection of auxiliary reference in PID mode	No Yes	No	9704	When this value is set to 'Yes', the speed reference will be the signal set in APP-05 and DRV-04 will be ignored.	YES
APP[33] ▶ Aux Ref Sel **05 V1**	Selection of source for auxiliary reference in PID mode	Keypad-1 Keypad-2 V1 V1S I V1+I Pulse Int. 485 Ext. PID	V1	9705	Setting of the source signal for the speed reference of the inverter in PID mode, when APP-04 is set to 'Yes'.	NO
APP[32] ▶ PID F/B **06 I**	Selection of source for feedback signal	I V1 Pulse	I	9706	Selection of feedback signal source to close the control loop. **I:** If transducer sends an input signal. **V1:** If transducer sends a voltage signal. **Pulse:** If transducer sends a pulse input.	NO
APP[32] ▶ PID P-Gain **07 100.0%**	Proportional gain in PID mode	0.0 – 999.9%	100.0%	9707	It allows setting the proportional gain in PID mode. An increase of this value supplies a faster control response, but the system becomes more instable (oscillations in output).	NO
APP[32] ▶ PID I-Time **08 0.5seg**	Integral gain in PID mode	0.0 – 32.0sec	0.5sec	9708	It allows setting the integral gain in PID mode. If you increase this value, error in control response is reduced, that means, the system becomes more stable, but control speed is reduced.	YES
APP[32] ▶ PID D-Time **09 0.0ms**	Differential gain in PID mode	0.0 – 100.0ms	0.0ms	9709	It allows setting the differential gain in PID mode. An increase of this value increases the control action, becoming the system faster, but introducing more instability than proportional gain.	YES
APP[32] ▶ PID Limit-H **10 50.00Hz**	High limit of output frequency in PID mode	0.00 – 300.00Hz	50.00Hz	970A	It allows setting the maximum value of output frequency in PID mode. Even if the feedback signal does not reach the reference value, speed will not exceed the value set here.	YES
APP[32] ▶ PID Limit-L **11 0.50Hz**	Low limit of output frequency in PID mode	FU1-32 – 300.00Hz	0.50Hz	970B	It allows setting the minimum value of output frequency in PID mode. Even if the feedback signal exceeds the reference value, speed will not decrease below the value set here.	YES
APP[32] ▶ PID OutScale **12 100.0%**	Output scale in PID mode	0.0 – 999.9%	100.0%	970C	It sets the scale for the output in PID mode.	YES
APP[32] ▶ PID P2-Gain **13 100.0%**	Second proportional gain in PID mode	0.0 – 999.9%	100.0%	970D	Second proportional gain in PID mode that will be activated when it is selected through one of the digital inputs is configured as ‘P Gain2’.	NO
APP[32] ▶ P-gain Scale **14 100.0%**	Scale of proportional gain in PID mode	0.0 – 100.0%	100.0%	970E	It allows setting the scaling factor for the proportional gain applied at the moment.	NO

[32] It is only available if PID operation mode is activated, set in APP-01.
[33] It is only available if auxiliary reference mode is activated in APP-04.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP[32] ▶ PID Out Inv. 15 No	Output inversion in PID mode	No Yes	No	970F	It allows inverting the sense of PID, so that the inverter speed will increase as the feedback signal exceeds the reference. Otherwise, when the feedback signal is lower than the reference signal, the speed will decrease.	NO
APP[32] ▶ PID U Fbk 17 No	Transformation of feedback from linear to square	No Yes	No	9711	It is useful for pumps and fans. It converts the linear pattern of the feedback sensor in square pattern with no additional settings. The response in PID is very faster.	NO
APP[32] ▶ FB Filter 18 10ms	Filter for feedback signal	0 – 9999ms	10ms	9712	Filter for displaying of feedback signal.	NO
APP[34] ▶ 2nd Acc time 20 5.0sec	Acceleration time for second motor	0.0 – 600.0sec	5.0sec	9714	Setting of acceleration ramp for second motor.	NO
APP[34] ▶ 2nd Dec time 21 10.0sec	Deceleration time for second motor	0.0 – 600.0sec	10.0sec	9715	Setting of deceleration ramp for second motor.	YES
APP[34] ▶ 2ndBaseFreq 22 50.00Hz	Base frequency for second motor	30.00 – FU1-30 Hz	50.00Hz	9716	Setting of base frequency applicable to the second motor.	YES
APP[34] ▶ 2nd V/F 23 Linear	Voltage / Frequency pattern for second motor	Linear Square User V/F	Linear	9717	Setting of the relation factor of voltage / frequency applicable to the second motor. In case of User V/F, the steps will be the set ones for the first motor. See FU1-41 to FU1-48.	NO
APP[34] ▶ 2nd F-boost 24 2.0%	Torque boost in forward direction for second motor	0.0 – 15.0%	2.0%	9718	Setting of the torque boost in forward direction that will be applied to the second motor.	NO
APP[34] ▶ 2nd R-boost 25 2.0%	Torque boost in reverse direction for second motor	0.0 – 15.0%	2.0%	9719	Setting of the torque boost in reverse direction that will be applied to the second motor.	NO
APP[34] ▶ 2nd Stall 26 100%	Current limit for second motor	30 – 150%	100%	971A	Setting of the dynamic limitation of current for second motor.	NO
APP[34] ▶ 2ndETH1min 27 130%	Electronic thermal protection for 1 minute for second motor	APP-28 – 200%	130%	971B	Setting of the electronic thermal protection for 1 minute for second motor based on rated current of that motor introduced in APP-29.	NO
APP[34] ▶ 2ndETH cont 28 120%	Electronic thermal protection for continuous for second motor	50.00 – APP-27 (max 150%)	120%	971C	Setting of the electronic thermal protection for continuous for second motor based on rated current of that motor introduced in APP-29.	YES
APP[34] ▶ 2nd R-Curr 29 _._A	Rated current for second motor	1.0 – 200.0A	*	971D	Rated current of second motor.	YES
APP[35] ▶ Aux Mot Run 30 0	Auxiliary motors running	*	0	971E	Displaying of the amount of auxiliary motors running.	NO
APP[35] ▶ Starting Aux 31 1	Selection of starting for auxiliary motors	1 – 4	1	971F	Setting of the motor that will start the connection cycle of auxiliary motors. This allows setting the sequence of normal connection and additionally, in case of activating some mode of motors alternation.	NO
APP[35] ▶ AutoOp Time 32 00:00	Displaying of operation time in rotation mode	*	00:00	9720	It is not available in this software version.	YES
APP[35] ▶ Nbr Aux's 33 4	Number of auxiliary motors	0 – 4	4	9721	It allows setting the maximum number of auxiliary motors that we want to connect (maximum 4 motors).	NO
APP[32] ▶ Sleep Delay 40 60.0sec	Sleep delay time	0.0 – 999.9sec	60.0sec	9728	It allows setting the time that inverter will wait for it before activating sleep mode. In this status, turns off the output to the motor but it remains checking feedback deviation with regard to the reference for activating the output at the precise moment.	YES

[32] It is only available if PID operation mode is activated, set in APP-01.
[34] It is only available if one of digital inputs is set as '2nd Func' in terminals from M1 to M8. See I/O-20 to I/O-27. Values will be only applied when that configured input is activated.
[35] It is only available if PID mode has been activated in APP-01, and additionally, MMC mode is selected in APP-02.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP[32] ▶ Sleep Freq0 41 0.00Hz	Sleep frequency 0	0.00 – FU1-30 Hz	0.00Hz	9729	If the inverter receives the command 0 (DRV-00) as reference and feedback is equal or higher than this one, when the output frequency is equal or lower than the frequency set here for the time set in APP-40, sleep mode will be activated. Example: DRV-00 = 70.00% FBK = 70.20% APP-41 = 42.00Hz APP-40 = 20.0sec Output frequency ≤ 42.00Hz, then sleep mode will be activated.	YES
APP[32] ▶ Sleep Freq1 42 0.00Hz	Sleep frequency 1		0.00Hz	972A	Explanation of APP-41 is valid for APP-42, but for command 1 (DRV-05).	YES
APP[32] ▶ Sleep Freq2 43 0.00Hz	Sleep frequency 2		0.00Hz	972B	Explanation of APP-41 is valid for APP-43, but for command 2 (DRV-06)	YES
APP[32] ▶ Sleep Freq3 44 0.00Hz	Sleep frequency 3		0.00Hz	972C	Explanation of APP-41 is valid for APP-44, but for command 3 (DRV-07)	YES
APP[32] ▶ Sleep Freq4 45 0.00Hz	Sleep frequency 4		0.00Hz	972D	Explanation of APP-41 is valid for APP-45, but for command 4 (I/O-31)	YES
APP[32] ▶ Sleep Freq5 46 0.00Hz	Sleep frequency 5		0.00Hz	972E	Explanation of APP-41 is valid for APP-46, but for command 5 (I/O-32)	YES
APP[32] ▶ Sleep Freq6 47 0.00Hz	Sleep frequency 6		0.00Hz	972F	Explanation of APP-41 is valid for APP-47, but for command 6 (I/O-33)	YES
APP[32] ▶ Sleep Freq7 48 0.00Hz	Sleep frequency 7		0.00Hz	9730	Explanation of APP-41 is valid for APP-48, but for command 7 (I/O-34)	YES
APP[32] ▶ WakeUp level 49 2.0%	Wake up level for Sleep mode	0.0 – 100.0%	2.0%	9731	When the inverter is in sleep mode, and feedback decreases with regard to the command in an equal or higher percentage of the value set here, the inverter activates the output to the motor again. Previous example: DRV-00 = 70.00% FBK = 70.20% APP-41 = 42.00Hz APP-40 = 20.0sec Output frequency ≤ 42.00Hz, then sleep mode will be activated. APP-49 = 3.0% When FBK = 64.00%, then inverter is activated.	YES
APP[35] ▶ Start Freq 1 50 49.50Hz	Start frequency of auxiliary motor 1	0.00 – FU1-30 Hz	49.50Hz	9732	Multiple motors operation. When the feedback is hold below the command in a percentage equal or lower than the percentage set in APP-71 and the output frequency is above the value set here, the inverter will wait for the time set in APP-58 and then it will activate the output to start the first auxiliary motor MMC1. Example: DRV-00 = 70.00% FBK = 65.00% Output frequency = 50.00Hz APP-50 = 48.00Hz APP-71 = 4.0% APP-58 = 8.0sec, once elapsed this time, the output MMC1 = ON (contact A1 – C1 is closed).	YES
APP[35] ▶ Start Freq 2 51 49.50Hz	Start frequency of auxiliary motor 2		49.50Hz	9733	It is the same operation of APP-50, but for starting the second auxiliary motor MMC2.	YES
APP[35] ▶ Start Freq 3 52 49.50Hz	Start frequency of auxiliary motor 3		49.50Hz	9734	It is the same operation of APP-50, but for starting the third auxiliary motor MMC3.	YES
APP[35] ▶ Start Freq 4 53 49.50Hz	Start frequency of auxiliary motor 4		49.50Hz	9735	It is the same operation of APP-50, but for starting the fourth auxiliary motor MMC4.	YES

[32] It is only available if PID operation mode is activated, set in APP-01.
[35] It is only available if PID mode has been activated in APP-01, and additionally, MMC mode is selected in APP-02.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP[35] ▶ Stop Freq 1 54 20.00Hz	Stop frequency of auxiliary motor 1	0.00 – FU1-30 Hz	20.00Hz	9736	Multiple Motors Operation. When the feedback signal is hold above the command in a percentage equal or higher than the percentage set in APP-72 and the output frequency is below the value set here, inverter will wait for the time set in APP-59 and then it will deactivate the output for stopping the first auxiliary motor MMC1. Example: DRV-00 = 70.00% FBK = 75.00% Output frequency = 25.00Hz APP-54 = 30.00Hz APP-72 = 4.0% APP-59 = 8.0sec, once elapsed this time the output MMC1 = OFF (contact A1 – C1 is opened).	YES
APP[35] ▶ Stop Freq 2 55 20.00Hz	Stop frequency of auxiliary motor 2		20.00Hz	9737	It is the same operation of APP-54, but for stopping the second auxiliary motor MMC2.	YES
APP[35] ▶ Stop Freq 3 56 20.00Hz	Stop frequency of auxiliary motor 3		20.00Hz	9738	It is the same operation of APP-54, but for stopping the third auxiliary motor MMC3.	YES
APP[35] ▶ Stop Freq 4 57 20.00Hz	Stop frequency of auxiliary motor 4		20.00Hz	9739	It is the same operation of APP-54, but for stopping the fourth auxiliary motor MMC4.	YES
APP[35] ▶ Aux start DT 58 5.0sec	Delay time before connecting auxiliary motors	0.0 – 999.9sec	5.0sec	973A	Time that the inverter wait for before activating the outputs to connect auxiliary motors from MMC1 to MMC4.	YES
APP[35] ▶ Aux stop DT 59 5.0sec	Delay time before stopping auxiliary motors	0.0 – 999.9sec	5.0sec	973B	Time that the inverter wait for before deactivating the outputs to disconnect auxiliary motors from MMC1 to MMC4.	NO
APP[35] ▶ AUX AccTime 60 2.0sec	Time for the ramp at connecting auxiliary motors	0.0 – 600.0sec	2.0sec	973C	Time for fixing the compensation ramp during the connection of auxiliary motors (over pressures compensation).	YES
APP[35] ▶ AUX DecTime 61 2.0sec	Time for the ramp at disconnecting auxiliary motors	0.0 – 600.0sec	2.0sec	973D	Time for fixing the compensation ramp during the disconnection of auxiliary motors (low pressures compensation).	YES
APP[35]▶ AutoCh_Mode 66 0	Rotation mode of auxiliary motors	0 – 2	0	9742	It allows selecting the rotation mode of multiple motors. **Mode 0:** Rotation does not exist. **Mode 1:** Rotation of auxiliary motors exists. The connecting sequence is the same of the disconnecting sequence. The following motor to connect will be the last motor connected plus one. **Mode 2:** Inverter rotation for all of the motors of the system. The disconnecting sequence is the inverse one of the connecting sequence. The following motor to connect will be the last motor disconnected plus one.	YES
APP[35] ▶ AutoEx-intv 67 72:00	Operation time of the inverter for one of the motors	00:00 – 99:00 (hours:min)	72:00	9743	The time set here only affects to the rotation mode 2. The value is measured in hours and minutes (hh:mm) and this time is scored for the pump driven by the inverter. The rotation will be fulfilled whenever this time has expired.	YES
APP[35] ▶ Inter-lock 69 No	Detection of motors out of service	No Yes	No	9745	It allows activating the detection of auxiliary motors that are out of service, not to consider them at the moment of the connection. For this, It is necessary to configure so many digital inputs as auxiliary motors we have. The option of configuration is 'Interlock1 to 4', and the activation will be by opening a NC contact.	YES
APP[35] ▶ Aux STT FB 71 2%	Difference for starting auxiliary motors	0 – 100%	2%	9747	It allows setting the difference between the reference signal and the feedback signal needed to start an auxiliary motor.	YES
APP[35] ▶ Aux STP FB 72 0%	Difference for stopping auxiliary motors	0 – 100%	0%	9748	It allows setting the difference between the reference signal and the feedback signal needed to stop an auxiliary motor.	YES
APP[32] ▶ PrePID Freq 74 0.00Hz	Setting of filling frequency	0.00 – FU1-30 Hz	0.00Hz	974A	Pipe filling function. It allows setting the fixed speed that inverter will operate when receiving the run command independently of PID control. The equipment will remain operating at this speed until the feedback signal exceeds the level set in APP-75 or until the time set in APP-76 has elapsed. All this depends on the activation or deactivation status of 'Pipe broken' mode.	YES

[32] It is only available if PID operation mode is activated, set in APP-01.
[35] It is only available if PID has been activated in APP-01, and additionally, MMC mode is selected in APP-02.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP[32] ► PrePID F/B 75 0.0%	Level for leaving filling mode	0.0 – 100.0%	0.0%	974B	It allows setting the level needed to deactivate the filling function and activate PID regulation. If 'Pipe broken' mode is set to Yes, the feedback signal does not exceed the value set here and it expires the time set in APP-76, a 'Pipe broken' fault is generated and the inverter turns off the power supply to the motor. If the circumstances are the same, but 'Pipe broken' mode is set to No, the fault will be not generated. When the feedback signal reaches this value, filling function will be finished and PID operation mode will be activated.	YES
APP[32] ► PrePID dly 76 600sec	Time of filling function application	0 – 9999sec	600sec	974C	It allows fixing the time that inverter will apply the filling function and it will be considered for tripping because of 'Pipe Broken' fault when this function is activated.	YES
APP[32] ► Pbroken mode 77 No	Pipe broken trip during filling function	No Yes	No	974D	It allows selecting 'Pipe broken' mode during filling process. If this function is active, a fault will be generated and inverter turns off the power supply to the motor when the time set in APP-76 has elapsed if the feedback signal does not reach the value set in APP-75. Otherwise, if this function is not active, no fault will be generated and once elapsed the time, PID mode will be activated.	NO
APP ► Ext PI mode 80 No	External PID mode	No Yes	No	9750	It allows activating the external control of PID. This allows control a second system in PID mode using for that, input signals and digital outputs. It is necessary to configure a digital input as 'Ext PID Run', that when it is activated allows the inverter to start the second PID regulation. This regulation will actuate for one of the analogue outputs (S0 or S1) if it has been set as 'Ext PID Out'. Actuation of main PID is displayed in DRV-18 and actuation of external PID is displayed in DRV-20.	NO
APP[36] ► Ext Ref Sel 81 Keypad	Reference for External PID	I V1 Pulse Keypad	Keypad	9751	Selection of the reference source for External PID.	NO
APP[36] ► Ext Ref Perc 82 50.00%	Level for reference of External PID	0.00 – 100.00%	50.00%	9752	Scale of the reference for External PID.	NO
APP[36] ► Ext Fbk Sel 83 I	Feedback signal of External PID	I V1 Pulse	I	9753	Selection of the feedback signal source for closing the control loop In External PID. **I:** If the transducer sends a current signal. **V1:** If the transducer sends a voltage signal. **Pulse:** If the transducer sends a pulse signal	NO
APP[36] ► ExtPID Pgain 85 1.0%	Proportional gain for External PID	0.0 – 999.9%	1.0%	9755	It allows setting the proportional gain of External PID control. An increase of this value supplies a faster control response, but the system becomes more instable (oscillations in output).	NO
APP[36] ► ExtPID Itime 86 10.0sec	Integral gain for External PID	0.0 – 32.0sec	10.0sec	9756	It allows setting the integral gain of External PID control. If you increase this value, error in control response is reduced, that means, the system becomes more stable, but control speed is reduced.	NO
APP[36] ► ExtPID Dtime 87 0ms	Differential gain for External PID	0 – 2000ms	0ms	9757	It allows setting the differential gain of External PID control. An increase of this value increases the control action, becoming the system faster, but introducing more instability than proportional gain.	NO
APP[36] ► ExtPID lmt-H 88 100.00%	High limit for External PID	0.00 – 100.00%	100.00%	9758	It allows setting the maximum value of output frequency in External PID mode. Even if the feedback signal does not reach the reference value, speed will not exceed the value set here.	NO
APP[36] ► ExtPID lmt-L 89 0.00%	Low limit for External PID	0.00 – 30.00%	0.00%	9759	It allows setting the minimum value of output frequency in External PID mode. Even if the feedback signal exceeds the reference value, speed will not decrease below the value set here.	NO

[32] It is only available if PID operation mode is activated, set in APP-01.
[36] It is only available if PID operation mode is activated to control other external PID system set in APP-80.

Display	Description	Range	Default value	Memory address	Function	Set during RUN
APP[36] ► ExtPID Scale 90 100.0%	Output scale for External PID	0.0 – 999.9%	100.0%	975A	It sets the scale for the output of External PID control.	NO
APP[36] ► Ext P2-gain 91 100.0%	Second proportional gain for External PID	0.0 – 999.9%	100.0%	975B	Second proportional gain in External PID mode that will be activated when it is selected through one of digital inputs configured as 'P Gain2'.	NO
APP[36] ► Ext P Scale 92 100.0%	Scale of proportional gain for External PID	0.0 – 100.0%	100.0%	975C	It allows setting the scaling factor for the proportional gain applied at the moment, with regard to the External PID.	YES
APP[36] ► ExtPID Fgain 93 0.0%	F gain for External PID	0.0 – 999.9%	0.0%	975D	It is not available in this software version.	NO
APP[36] ► ExtPIDOutInv 95 No	Output inversion for External PID	No Yes	No	975F	It allows inverting the sense of External PID, so that the inverter speed will increase as the feedback signal exceeds the reference. Otherwise, when the feedback signal is lower than the reference signal, the speed will decrease.	NO
APP[36] ► ExtLoopTime 97 100ms	Activation time of External PID controller	50 – 200ms	100ms	9761	It allows setting the delay time to start the External PID.	YES

[36] It is only available if PID operation mode is activated to control other external PID system set in APP-80.

9. FAULT MESSAGES

9.1. Displayed Faults

When a fault occurs, the drive stops turning off the output voltage and displays the fault in DRV-12. The 5 latest trips can be stored from FU2-01 through FU2-05 saving also the operation conditions present on the drive at trip moment. Using **PROG** key before pressing **RESET**, it is possible to read the status present when trips occurred: it is possible to check Frequency, Current and status (acceleration, deceleration or steady status).

Screen	Protective Functions	Descriptions
OverCurrent1	Overcurrent protection.	The drive will trip whether the output current is higher than 200% of rated current value.
Over Voltage	Over voltage protection.	The inverter turns off its output if the DC voltage of the main circuit increases higher than the rated value when the motor decelerates or when regenerative energy flows back to the inverter due to a regenerative load. This fault can also occur due to a surge voltage generated at the power supply system.
Ext. Trip	External trip.	This function can be used when the user needs to turn off the output by an external trip signal. To use a normally open contact or a normally closed contact will depend on the inputs configuration set in I/O-95. The drive will cut the output to the motor protecting it from the situation detected through this terminal.
Emergency	Emergency stop (instantaneous disconnection)	Used for the emergency stop of the drive. The drive instantly turns off the output when the terminal configured as BX is ON, and returns to regular operation when this terminal is turned OFF. Take caution when using this function.
Low Voltage	Low voltage protection	The inverter turns off its output if the DC voltage is below the detection level because insufficient torque or over heating of the motor can occurs when the input voltage of the inverter drops.
Ground Fault	Ground fault protection	The inverter turns off its output when a ground fault occurs and the ground fault current is more than the internal setting value of the inverter. This function may protect the inverter when a ground fault occurs due to a low ground fault resistance.
Over Heat	Over heat protection	The inverter turns off the output if the heat sink is over heated due to a damaged cooling fan or an alien substance in the cooling system.
E-Thermal	Electro-thermal protection	The internal electronic thermal model of the inverter determines the over heating of the motor. If the motor is overloaded the inverter turns off the output. The inverter cannot protect the motor when driving a multi-pole motor or when driving multiple motors, so consider thermal relays or other thermal protective devices for each motor.
Over load	Current limit protection (over load protection)	The drive trips when the output current is 270% of the rated current overcoming the limit of temporary protection current (S/W)
HW-Diag	Inverter hardware fault	A fault signal is generated when an error occurs on the control circuitry of the drive. The following faults are included on this trip: Wdog error, EEP error, Phase error, Input Phase Open (fuse), NTC open error and ADC Offset error.
Over Current 2	IGBT short-circuit	The drive trips when a short-circuit occurs in the IGBT or in the output power.
Output Phase Open	Output phase is open	The drive will trip if one or more of the output phases (U,V,W) are open. The drive detects the output current to check that the output phase is open.
COM Error **CPU Error**	Communication error	This fault is displayed when the inverter cannot communicate with the keypad.
Inv. OLT	Inverter overload protection	The drive turns off the output when the output current is higher than the settings on the corresponding parameters (165% for 1 minute, 200% for 4 seconds).
NTC Open	Thermal sensor is open	The drive uses an external thermal sensor to detect motor over temperature. If this message is displayed it is possible that the wiring of the thermal sensor was disconnected or damaged. (The drive does not stop operation).
LOP **LOR** **LOV** **LOI**	Operating method when the frequency reference is lost.	According to the selection in I/O-18 (Operation method when frequency reference is lost) there are three options: the drive does not stop, the drive decelerates or the drive stops by free run. LOP: Displayed if frequency reference is set by control board and it is lost (DPRAM time is out). LOR: Displayed if frequency reference is set via the network and it is lost. LOV: Displayed if frequency reference is set by analogue input V1 and it is lost. LOI: Displayed if frequency reference is set by analogue input I and it is lost.

Screen	Protective Functions	Description
Under load	Inverter under load protection	The drive will turn off the output when the conditions of under load are present according to the levels set on the corresponding parameters of under load control. The under load current is a percentage of the rated current set in FU2-43.

To reset the fault, press the **RESET** key, active the digital input set as Reset (M4 by default) or turn off the input power supply of the drive and turn on again. If the problem persists, please contact with the technical service of POWER ELECTRONICS or an authorised agent.

9.2. Solution of Displayed Faults

Function	Cause	Solution
Over current protection.	Acceleration / deceleration time is too short compared with the inertia of the load (GD^2).	Increase the Acceleration / deceleration.
	The load is larger than the inverter rating.	Increase the inverter capacity.
	The drive tries to start the motor when it is still free running.	Ensure the current programming of the flying start conditions. Set correctly the inertia of the load and the parameters required to activate the speed search functionality. **Note:** Make sure that the system allows setting speed search function without any kind of risk for user or for the system.
	A ground fault or a short-circuit has occurred.	Check the output wiring.
	The mechanical brake of the motor is operating too fast.	Check the operation of the mechanical brake.
	The components of the power circuit are over heated due to a problem with the cooling fan or the cooling system.	Check the cooling fan. Check that the cooling fan is power supplied correctly and it is not obstructed by dirty.
	⚠ **Caution: Inverter operation must be started after the cause of the fault is removed to avoid damage to IGBTs inside the inverter.**	
Ground fault current	Ground fault current has occurred at the output wiring of the inverter.	Check the wiring of the inverter output.
	The insulation of the motor is damaged due to heat.	Replace the motor.
Over voltage	Deceleration time is too short compared with the load inertia (GD^2).	Increase deceleration time.
	Excessive power regeneration in the inverter.	Use an optional dynamic brake resistor (dynamic brake units).
	Line voltage is too high.	Check the commercial line voltage.
Current limit protection (overload)	Load exceeds the inverter rated power.	Increase the rated power of the motor and the inverter.
	Incorrect selection of the inverter rated power.	Select the correct rated power of the inverter.
	Incorrect setting of the V/F pattern.	Select a correct V/F pattern.
Overheat	Damaged cooling fan or an alien substance is into the cooling system.	Replace the cooling fan and/or eliminate the alien substances.
	Cooling system has fault.	Check for alien substances clogged in the cooling system.
	Ambient temperature is too high.	Keep ambient temperature below 50º or verify the capacity of the inverter according to this capacity.
Electronic thermal protection	Motor has been overheated.	Reduce load weight and/or operation duty.
	Load exceeds the inverter capacity.	Use an inverter with higher capacity.
	Electronic thermal protection level (ETH) is too low.	Set ETH level to an appropriate value.
	Incorrect selection of the inverter rated power.	Select the correct rated power of the inverter.
	Incorrect setting of the V/F pattern.	Select a correct V/F pattern.
	Inverter has been operated at low speed for too long.	Install a cooling fan with an external power supply to the motor.
External fault	An external fault has been produced.	Eliminate the cause of the fault at circuit connected through the input fault terminal configured for that.
Low voltage	Line voltage is low.	Check the commercial line voltage.
	Load exceeds the rated power of the line (welding machine, motor with high starting current connected to the commercial line).	Increase the line rated power.
	Faulty magnetic switch at the input side of the inverter.	Replace the magnetic switch.

Function	Cause	Solution
Over current 2	Short circuit between upper and lower IGBT.	Check IGBT.
	Short circuit at the inverter output.	Check the wiring of the inverter output circuit.
	Acceleration / deceleration time is too short compared with the inertia of the load (GD^2).	Increase acceleration / deceleration time.
Output phase open	Faulty contact of magnetic switch at output.	Check the magnetic switch of the output.
	Faulty output wiring.	Check the output wiring.
H/W fault	Wdog error (CPU fault).	Disconnect and connect again the input power. If the fault persists, contact with the technical service of Power Electronics.
	EEP error (memory fault).	
	ADC Offset (feedback circuit fault).	
	Open input fuse.	Replace the input fuse.
Communication error	Faulty connection between inverter and display.	Check the connector.
	Wrong operation of the inverter CPU.	Contact with the technical service of Power Electronics.
Operation method when the reference frequency is lost	LOP: Reference signal loss from the control board.	Check that the control board is not damaged to eliminate the fault.
	LOR: Reference signal loss from communication net.	Check that the communication net operates correctly.
	LOV: Reference signal loss given by analogue signal V1.	Check the wiring of the analogue voltage input V1.
	LOI: Reference signal loss given by I signal.	Check the wiring of the analogue current input I.
Inverter overload	Load exceeds the inverter rated power.	Increase the rated power of the motor or the inverter.
	Incorrect selection of the inverter rated power.	Select the correct rated power of the inverter.

9.3. Problems Solution

Fault situation	Checking
Motor does not spin	**Checking of main circuit:** Is the power supply (line) correct? (Is the LED of the inverter lit?) Is the motor correctly connected?
	Checking of the digital input signals: Check the operation of the start/stop signal of the inverter. Check the simultaneous operation of the forward/reverse run signals. Check the input signal of the reference frequency of the inverter.
	Checking of the parameters setting: Is the function of the prevention of reverse direction rotation motor activated? (FU1-01) Is the operation mode correctly configured? (DRV-03) Is the frequency command programmed to 00.00Hz?
	Checking of the load: Is the load too high or is the motor blocked? (mechanical brake)
	Others: Any fault message is displayed and/or is the alarm LED lit? (STOP LED blinks)
Motor spins in reverse direction rotation	Is the phases sequence U, V, W correct at the output terminals to the motor?
	Is the forward/reverse run signal correctly connected?
The difference between the rotation speed and the reference command is too high	Is the frequency reference signal correct? (Check the level of the input signal)
	Is the configuration of the following parameters correct? Low frequency limit (FU1-34), High frequency limit (FU1-35), Gains of analogue input signals (I/O-01 to I/O-16).
	Is the input line affected by an external noise? (Use an screened cable)
The inverter does not accelerate or decelerate softly	Is the programmed acceleration / deceleration time too short?
	Is the load too large?
	Is the value of the manual torque boost (FU2-68, 69) so high that it makes useless the function of current dynamic limitation?
Motor current is too high	Is the load too large?
	Is the value of the manual torque boost (FU2-68, 69) too high?
Rotation speed does not increase	Is the value of the high frequency limit (FU1-35) correct?
	Is the load too large?
	Is the value of the manual torque boost (FU2-68, 69) so high that it makes useless the function of current dynamic limitation?

Fault situation	Checking
Rotation speed oscillates when the inverter is running	**Checking of the load:** Does the load oscillate?
	Check the input signal: Does the signal of the reference frequency oscillate?
	Others: Is the wiring too long when the inverter uses V/F control? (More than 500mts)

9.4. Checking of Power Circuit Components

Before checking the power circuit components, be sure to disconnect the input power supply and wait for until the electrolytic capacitors of the main circuit (DCP-DCN) are discharged.

1. Checking of the rectifier and the inverter bridge for 3.7kW to 22kW.

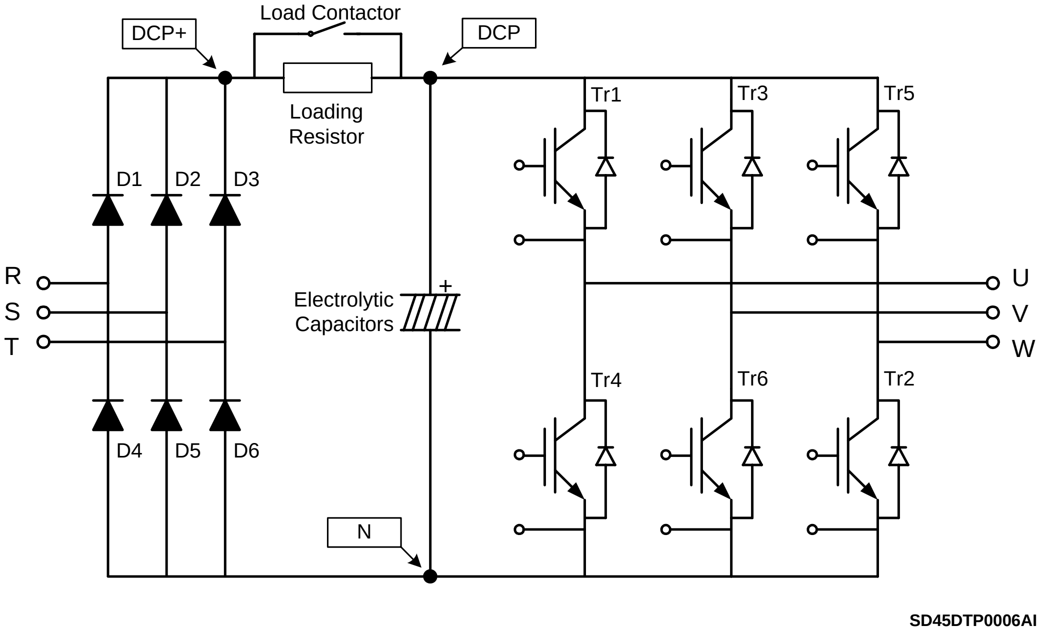


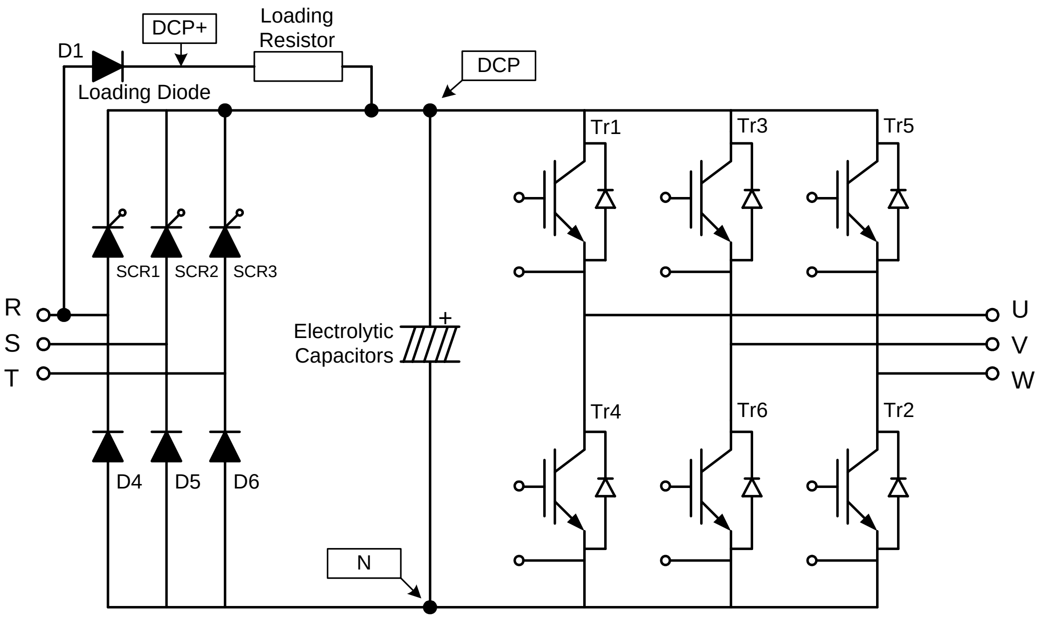
Figure 9.1. Drawing of rectifier and inverter bridge up to 22kW

- Disconnect the power wiring of RST and UVW terminals.
- Check if the power terminals of the inverter (R, S, T, U, V, W, P1 (or P2 or P), N) are still charged or not by using an appropriate tester.
- Wait for until the electrolytic capacitors (DCP – DCN) are discharged at a safety level.
- During test, huge amounts of ohms (approx. Mega ohms) will be displayed when we have an ‘Open’ situation. In case of ‘Close’ situation, the resistance values that will be displayed are around ten of ohms. Sometimes, the connection will seem to be closed due to the stored load into the Bus capacitors, but it will disappear soon and the value of Mega ohms will be displayed again.
- The displayed values of measurement are not always the same. These values change according to the tester used to carry out the measurements.

- Measurements can be carried out according to the attached table:

Module		Polarity test +	Polarity test -	Checking value	Element	Polarity test +	Polarity test -	Checking value
Diodes	D1	R	DCP+	Closed	D4	R	N	Open
		DCP+	R	Open		N	R	Closed
	D2	S	DCP+	Closed	D5	S	N	Open
		DCP+	S	Open		N	S	Closed
	D3	T	DCP+	Closed	D6	T	N	Open
		DCP+	T	Open		N	T	Closed
IGBT's	Tr1	U	DCP	Closed	Tr4	U	N	Open
		DCP	U	Open		N	U	Closed
	Tr3	V	DCP	Closed	Tr6	V	N	Open
		DCP	V	Open		N	V	Closed
	Tr5	W	DCP	Closed	Tr2	W	N	Open
		DCP	W	Open		N	W	Closed

2. Checking of the rectifier and the inverter bridge for 30kW to 75kW.



SD45DTP0007AI

Figure 9.2. Drawing of rectifier and inverter bridge from 30kW

- Measurements should be carried out following the same safety and precaution instructions recommended in the previous section.
- Measurements can be carried out according to the attached table:

Module		Polarity test +	Polarity test -	Checking value	Element	Polarity Test +	Polarity Test -	Checking value
Diodes	D1	R	DCP+	Closed	D4	R	N	Open
		DCP+	R	Open		N	R	Closed
	D5	S	N	Open	D6	T	N	Open
		N	S	Closed		N	T	Closed
IGBT's	Tr1	U	DCP	Closed	Tr4	U	N	Open
		DCP	U	Open		N	U	Closed
	Tr3	V	DCP	Closed	Tr6	V	N	Open
		DCP	V	Open		N	V	Closed
	Tr5	W	DCP	Closed	Tr2	W	N	Open
		DCP	W	Open		N	W	Closed

9.5. Maintenance

SD450 inverters consist of many electronic parts such as semiconductors devices. Nevertheless, temperature, humidity, vibrations and deteriorated components can reduce its efficiency. To avoid any possible irregularity, we recommend making periodic inspections.

9.5.1. Warnings

- Be sure to remove the input power while performing maintenance.
- Be sure to perform maintenance after checking the DC link capacitor has discharged. Check that the voltage between terminals P – N, or P1 – N or P2 – N, is below DC 30V. The bus capacitors in the inverter main circuit can still be charged even after the power supply is turned off.
- The correct output voltage of the inverter can only be measured by using a rectifier 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 inverter.

9.5.2. Routine Inspection

Be sure to check the following points before handling the inverter:

- Conditions of the installation site.
- Conditions of the inverter cooling system.
- Excessive vibrations.
- Excessive overheating.

9.5.3. Periodic Inspection

- Are there screws and bolts loose? Is there corrosion presence due to the ambient conditions? In this case, tighten them or replace the affected parts.
- Are there dust particles or dirty in the inverter cooling system? In this case, clean it with compressed air.
- Are there dust particles or dirty in control boards? In this case, clean it with compressed air.
- Are there connectors faulty? In this case, check the corresponding connector.
- Check the rotation direction of the cooling fan, the condition of capacitors and the connections of the magnetic contactor. Replace them if there are any abnormalities.

9.5.4. Megger / Dielectric Test.

Perform the megger test of the equipment after disconnecting the inverter. Test voltage should not be applied to the inverter. Megger test only should be performed for the power circuit (do not executed for the control circuit).
Use a DC 500V megger. Dielectric test should not be executed to the inverter; otherwise, IGBTs may be damaged.

9.6. Daily and Periodic Check Points

Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Instrument of measur.
			Daily	1 year	2 years			
All	Ambient conditions	Are there dust particles? Are the ambient temperature and the humidity proper?	o			See “Warnings”	Temperature: -10~+50 non freezing Humidity: Lower than 50% non condensing	Thermometer, Hygrometer, Recorder
	Module	Is there any noise or abnormal oscillations?	o			Visual and audible	There are no anomalies	
	Input voltage	Is the input voltage to the main circuit correct?	o			Measure the voltage between terminals R, S, T		Digital multimeter. Tester
Main circuit	All	Megger checking (between main circuit and ground) Has any fixed part been modified? Have over temperature signs been observed when the components have been cleaned?		o o o	o	Disconnect the cables of the inverter and short circuit terminals R, S, T, U, V, W and measure between them and ground. Tighten the screws. Visual checking.	More than 5MΩ No anomaly	Megger type DC 500V
	Conductor/ Cable	Is the conductor rusty? Is the sheathing of the cable damaged?		o o		Visual checking	No anomaly	
	Terminal	Has any damaged been produced?		o		Visual checking	No anomaly	
	IGBT's module Diodes module	Check the resistance value between each one of the terminals			o	Disconnect the cables of the inverter and measure the resistance value between: R, S, T ⇔ P, N and U, V, W ⇔ P, N with a tester	(See "Checking of Power Circuit Components")	Digital multimeter. Analogue tester
	Correct capacitor	Have fluid leakages been observed? Is the capacitor well fastened? Is any dilation or retraction sign observed? Measure the capacity	o o	o		Visual checking Measure the capacity with a proper instrument	No anomaly Higher than 85% of rated capacity	Instrument for measuring capacity
	Contactor	Is there any noise (similar to chatter sound) during running? Is the contact damaged?		o o		Audible checking Visual checking	No anomaly	
	Resistance	Is the insulation of the resistance damaged? Is the wiring of the resistance damaged (open)?		o o		Visual checking Disconnect one of the connections and measure with a tester	No anomaly Error should be included at ±10% of the displayed resistance value	Digital multimeter. Analogue tester
Control circuit and protections	Operating check	Is there any imbalance between output voltage phases? Displaying of the circuit status should not show any error after protection sequence has executed		o o		Measure voltage between output terminals U, V and W. Open the protection circuit of the inverter output	Balance voltage between phases for 200V (400V) is lower than 4V (8V). Faulty circuit operates according to the sequence.	Digital multimeter / Rectifier voltage meter

Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Instrument of measur.
			Daily	1 year	2 years			
Cooling system	Cooling fan	Is there any noise or abnormal oscillations? Is the cooling fan disconnected?	o	o		Disconnect the power supply (OFF) and rotate the fan manually. Tighten the connections again.	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 perceived?	o o			Audible, sensory and visual checking. Check if damages have been produced by overheating.	No anomaly	
	Insulation resistance	Megger checking (between terminals of the output circuit and ground terminal)			o	Disconnect the cables U, V and W and join them from one another. Check the resistance between this join and ground.	More than 5MΩ	Megger type 500V

Note: Values between ( ) are referred to the inverters of 400V model.
Note: Long life of the main components above indicated is based on a continuous operation for the stipulated load. These conditions can change according to the environment conditions.

10. RS485 COMMUNICATION

10.1. Introduction

Inverter can be controlled and monitored by the sequence program of a PLC or other master module.

Drives or other slave devices can be connected in a RS485 network to be controlled by a PLC or a computer. In this way, parameter settings and monitoring can be executed from a computer, using a user program.

To communicate, user can use any kind of RS232/485 converter, which specifications depend on the manufacturer.

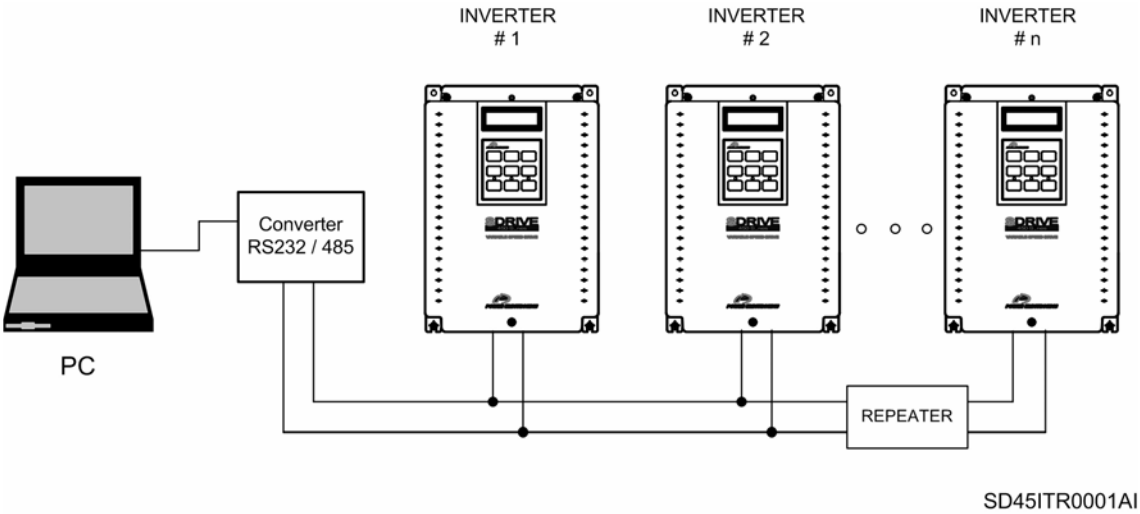


Figure 10.1 System configuration in RS485 network

Note: Install a repeater is recommended for upgrading the communication speed or in case of the length of the communication cable is higher than 1.200m. Its use is necessary to upgrade the communication quality in the noise high environment.

10.2. Specifications

General specifications.

- Communication method: RS485.
- Transmission form: Bus method, Multi drop Link System.
- Applicable drive: SD450.
- Converter: RS232 converter.
- Connectable drives: 31.
- Transmission distance: Below 1.200m maximum (within 700m recommended).

Specifications of the installation.

- Cable recommended: 0.75mm² (18AWG), Shield type twisted-pare.
- Installation: C+, C-, CM terminals of the TER2 connector on control board.
- Power supply: Insulated power supply from the inverter power supply.

Specifications of the communication.

- Communication speed: 19200 / 9600 / 4800 / 2400 / 1200 bps. Selectable.
- Control procedure: Asynchronous communication system.
- Communication system: Half duplex.
- Stop bit length: 1 bit.
- Sum check: 2 byte.
- Parity check: None.
- Protocol supported: Parameter Read/Write, Monitoring parameter register/execution Broadcasting.

10.3. Installation

10.3.1. Connection of the communication cable

Use C+ terminal to connect RS485 high signal and C- terminal to connect RS485 low signal.

If more than one inverter will be connected, to establish communication between them connect CM terminal.

Install a repeater for upgrading the communication speed or in case of the length of the communication cable is higher than 1.200m. Its use is necessary to upgrade the communication quality in the noise high environment.

To connect a terminator resistor (120Ω), set J3 switch ON (upper position). J3 switch is placed on the left side of the connector shown on the picture (TER2).

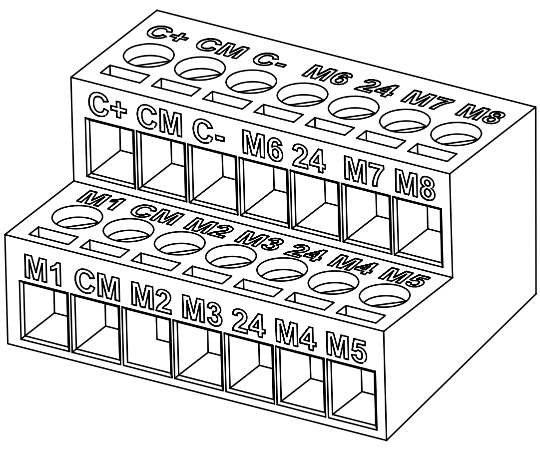


Figure 10.2 TER2 connector of control board

After connecting the cable, set the following parameters that refer to the communication as follows:

Parameter	Description	Setting	
DRV-03	Start / Stop control mode	Int.485	RS485 communication.
DRV-04	Frequency control mode	Int.485	RS485 communication.
DRV-91	Optional Start / Stop control mode	Keypad Fx/Rx-1 Fx/Rx-2	Selection of Start / Stop control mode when the inverter control will be given by communication net.
DRV-92	Optional frequency control mode	Keypad-1 Keypad-2 V1 V1S I V1 + I Pulse	Selection of the frequency control mode when the inverter control will be given by communication net.
I/O-20...27	Multi-function digital input. M1...M8 terminal	Main-drive	It allows that the inverter will be controlled through communication net without additional changes.
I/O-90	Slave number in communication net	1 – 250	Use different numbers in case of more than 1 inverter are installed.
I/O-91	Transmission speed in communication net	9600bps	(Default setting).
I/O-92	Stop mode after reference signal loss in communication net	None	It continues operating even if the signal has been lost.
I/O-93	Setting of time to determine speed reference signal loss	1.0seg	(Default setting).

10.3.2. Operation of the inverter in the communication network

After installing the equipment in the communication net, follow the steps below to operate with the inverter integrated in the network:

- Check if the computer and the inverter are connected correctly.
- Turn on the inverter, but do not connect the load until stable communication between the computer and the inverter is verified.
- Start the operating program for the inverter from the computer.
- Verify that the inverter operates in a correct way using the operating program from the computer.
- See '10.6 Fault solutions' if the communication is not operating correctly.

10.4. Communication protocol MODBUS-RTU

Computer or other devices can be 'master' and inverters will be 'slave'. In this way, inverter responds to Read / Write command from master.

Supported function code.

Function code	Description
0x03	Read multiple register
0x04	Read input register
0x06	Write single register
0x10	Write multiple register

Exception code.

<table>
<tr><th colspan="2">Function code</th><th>Description</th></tr>
<tr><td colspan="2">0x01</td><td>ILLEGAL FUNCTION
When master is sending a code different to a read / write command (see supported function codes).</td></tr>
<tr><td colspan="2">0x02</td><td>ILLEGAL DATA ADDRESS
When parameter address does not exist.</td></tr>
<tr><td colspan="2">0x03</td><td>ILLEGAL DATA VALUE
When data is a value out of range for an inverter parameter during the writing.</td></tr>
<tr><td colspan="2">0x06</td><td>SLAVE DEVICE BUSY</td></tr>
<tr><td>Defined by user</td><td>0x14</td><td>1. Write disabled (address 0x0004 value is 0).
2. Read only or not program during run.</td></tr>
</table>

10.5. Address list

10.5.1. Common Area

Address	Parameter	Scale	Units	R/W	Data value
0x0000	Inverter model			R	9: SD450
0x0001	Inverter capacity			R	3: 3.7kW 4: 5.5kW 5: 15kW 6: 18.5kW 7: 22kW 8: 30kW 9: 37kW A: 45kW B: 55kW C: 75kW
0x0002	Inverter input voltage			R	0: 220Vac 1:400Vac
0x0003	S/W version			R	(Ex) 0x0100: Version 1.0 (Ex) 0x0101: Version 1.1
0x0004	Parameters setting enabled/disabled			R/W	0: Write disabled 1: Write enabled
0x0005	Reference frequency	0.01	Hz	R/W	Start freq. to Max. freq.

Address	Parameter	Scale	Units	R/W	Data value
0x0006	Run command			R/W	Bit 0: Stop
					Bit 1: Forward run
					Bit 2: Reverse run
					Bit 3: Fault reset
					Bit 4: Emergency stop
				-	Bit 5: Not used
				R	Bit 6 – 7: Reference introduction 0: Terminals 1: Keypad 2: Reserve 3: Communication
					Bit 8 – 14: Reference frequency 0: DRV-00 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: Up/down zero 20 – 21: Reserve 22: Analogue V1 23: Analogue V1S 24: Analogue I 25: V1 + I 26: Pulses 27: Option 28: Communication 29: Option 30: Jog frequency 31: PID
					Bit 15: Network error
0x0007	Acceleration time	0.1	sec	R/W	
0x0008	Deceleration time	0.1	sec	R/W	
0x0009	Output current	0.1	A	R	
0x000A	Output frequency	0.01	Hz	R	
0x000B	Output voltage	1	V	R	
0x000C	DC Link voltage	1	V	R	
0x000D	Output power	0.1	kW	R	
0x000E	Inverter status			R	Bit 0: Stop
					Bit 1: Forward run
					Bit 2: Reverse run
					Bit 3: Fault
					Bit 4: Accelerating
					Bit 5: Decelerating
					Bit 6: Steady status
					Bit 7: DC braking
					Bit 8: Stopping
					Bit 9: Not used
					Bit 10: Brake open
					Bit 11: Forward run command
					Bit 12: Reverse run command
					Bit 13: Run/Stop command by Communic. (REM R/S)
					Bit 14: Reference freq. by Communic. (REM Freq.)

Address	Parameter	Scale	Units	R/W	Data value
0x000F	Trip information			R	Bit 0: OCT1 Bit 1: OV Bit 2: EXT-A Bit 3: BX Bit 4: LV Bit 5: RESERVE Bit 6: GF Bit 7: OHT Bit 8: ETH Bit 9: OLT Bit 10: HW-Diag Bit 11:RESERVE Bit 12:OCT2 Bit 13:OPT Bit 14:PO Bit 15:IOLT
0x0010	Input terminal status			R	Bit 0: M1 Bit 1: M2 Bit 2: M3 Bit 3: M4 Bit 4: M5 Bit 5: M6 Bit 6: M7 Bit 7: M8
0x0011	Output terminal status			R	Bit 0: AUX1 Bit 1: AUX2 Bit 2: AUX3 Bit 3: AUX4 Bit 4: Not used Bit 5: Not used Bit 6: Not used Bit 7: 3ACB
0x0012	V1			R	Value corresponding to 0V – +10V
0x0013	V2			R	Value corresponding to 0V – -10V when setting freq. mode to 2
0x0014	I			R	Value corresponding to 0mA – 20mA
0x0015	RPM			R	Output speed
0x001A	Display unit			R	0: Hz 1: rpm
0x001B	Pole number			R	Not used
0x001C	Custom version			R	Not used

Notes:

1. Run / Stop command by communication (address 0x0006)

   All of the bits are activated when changing their status from 0 to 1. For example, if the drive trips due to a fault during running, the drive cannot start after resetting the fault until the start command is given again.

2. Addresses 0x0005 and 0x0006

   The values of the addresses above indicated will be erased after the drive is power off. These addresses only keep their values while the drive is power on.

10.5.2. Basic Functions and Display Parameters Group (DRV)

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9100	37120	**DRV-00** **Cmd. Freq**	Reference frequency, output current (LCD)	0		0 – Max. freq.
9100	37120	**DRV-00** T/K 0.00Hz R 0.0%F 0.0%	Reference and feedback value	0		0 – 100
9101	37121	**DRV-01** **Acc. Time**	Acceleration time	200		0 – 6000
9102	37122	**DRV-02** **Dec. Time**	Deceleration time	300		0 – 6000
9103	37123	**DRV-03** **Drive mode**	Start / Stop control mode	1	Keypad Fx/Rx-1 Fx/Rx-2 Int.485	0 – 3
9104	37124	**DRV-04** **Freq mode**	Frequency control mode (Method to introduce reference frequency)	0	Keypad-1 Keypad-2 V1 V1S I V1 + I Pulse Int. 485 Ext. PID	0 – 8
9105	37125	**DRV-05** **Step Freq-1**	Speed at step frequency 1	100		Start freq. – Max. freq.
9106	37126	**DRV-06** **Step Freq-2**	Speed at step frequency 2	200		Start freq. – Max. freq.
9107	37127	**DRV-07** **Step Freq-3**	Speed at step frequency 3	300		Start freq. – Max. freq.
9108	37128	**DRV-08** **Current**	Output current	-		-
9109	37129	**DRV-09** **Speed**	Motor speed	-		-
910A	37130	**DRV-10** **DC link Vtg**	DC voltage	-		-
910B	37131	**DRV-11** **User disp**	User display selection	-		-
910C	37132	**DRV-12** **Fault**	Displayed fault in display	-		-
910E	37134	**DRV-14 TAR** **OUT**	Target / Output frequency displaying	-		-
910F	37135	**DRV-15 REF** **FBK**	Motor speed displaying	-		-
9110	37136	**DRV-16** **Hz/Rpm Disp**	Motor speed displaying	0	Hz Rpm	0 – 1
9112	37138	**R T** **F O** **DRV-18**	PID parameters displaying	-		-
9113	37139	**V1 V2** **V1S I** **DRV-19**	AD parameters	-		-
9114	37140	**R O** **F DRV-20**	Displaying of External PID parameters	-		-
915B	37211	**DRV-91** **Drive mode2**	Optional Start / Stop control mode	1	Keypad Fx/Rx-1 Fx/Rx-2	0 – 2
915C	37212	**DRV-92** **Freq mode2**	Optional frequency control mode (Method to introduce reference frequency)	0	Keypad-1 Keypad-2 V1 V1S I V1 + I Pulse	0 – 6

10.5.3. Functions Menu (FU1)

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9200	37376	**FU1-00 Jump code**	Jump to desired parameter	0		0 – FU1-30
9201	37377	**FU1-01 Run Prev.**	Prevention of direction rotation motor	0	None Forward Prev Reverse Prev	0 – 2
9202	37378	**FU1-02 Acc. pattern**	Acceleration pattern	0	Linear S-Curve U-Curve	0 – 2
9203	37379	**FU1 ► Dec. pattern 03 Linear**	Deceleration pattern	0	Linear S-Curve U-Curve	0 – 2
9204	37380	**FU1-04 Start Curve**	S-Curve start	50		0 – 100
9205	37381	**FU1-05 End Curve**	S-Curve end	50		0 – 100
920A	37386	**FU1-10 Pre-HeatMode**	Motor pre-heat	0	No Yes	0 – 1
920B	37387	**FU1-11 PreHeat Level**	Percentage of motor rated current	30		1 – 50
920C	37388	**FU1-12 PreHeatPerc**	Time of DC current application to the motor	100		1 – 100
9214	37396	**FU1-20 Start mode**	Inverter start mode	0	Accel DC – start Flying – start	0 – 2
9215	37397	**FU1-21 DCSt time**	Time of DC current application	0		0 - 600
9216	37398	**FU1-22 DCSt value**	DC current level before starting	50		0 – 150
9217	37399	**FU1-23 Stop mode**	Inverter stop mode	0	Decel DC – brake Free – run Fluxe – brake	0 – 3
9218	37400	**FU1-24 DCBlk time**	DC current application delay time	10		10 – 6000
9219	37401	**FU1-25 DCBr Frq**	DC brake starting frequency	500		10 – 6000
921A	37402	**FU1-26 DCBr time**	Time of DC current application	10		0 – 600
921B	37403	**FU1-27 DCBr value**	DC current level applied for DC brake	50		0 – 200
921C	37404	**FU1-28 Safety Stop**	Motor stopped at safety conditions from power supply loss	0	No Yes	0 – 1
921D	37405	**FU1-29 Line Freq**	Line frequency value	5000		4000 – 12000
921E	37406	**FU1-30 Max Freq**	Maximum output frequency of the inverter	5000		4000 – 12000
921F	37407	**FU1-31 Base Freq**	Output frequency for motor rated voltage	5000		3000 – 12000
9220	37408	**FU1-32 Start Freq**	Start frequency	50		1 - 1000
9221	37409	**FU1-33 Freq limit**	Frequency limits selection	0	No Yes	0 – 1
9222	37410	**FU1-34 F-limit Lo**	Low frequency limit	50		0 – FU1-35
9223	37411	**FU1-35 F-limit Hi**	High frequency limit	50000		FU1-34 – FU1-30
9228	37416	**FU1-40 V/F pattern**	Relation factor between voltage and frequency applied to the motor	0	Linear Square User V/F	0 – 2
9229	37417	**FU1-41 User Freq 1**	Frequency 1 (User V/F pattern)	1500		0 – FU1-30

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
922A	37418	**FU1-42** **User volt 1**	Voltage 1 (User V/F pattern)	25		0 – 100
922B	37419	**FU1-43** **User Freq 2**	Frequency 2 (User V/F pattern)	3000		0 – FU1-30
922C	37420	**FU1-44** **User volt 2**	Voltage 2 (User V/F pattern)	50		0 – 100
922D	37421	**FU1-45** **User Freq 3**	Frequency 3 (User V/F pattern)	4500		0 – FU1-30
922E	37422	**FU1-46** **User volt 3**	Voltage 3 (User V/F pattern)	75		0 – 100
922F	37423	**FU1-47** **User Freq 4**	Frequency 4 (User V/F pattern)	5000		0 – FU1-30
9230	37424	**FU1-48** **User volt 4**	Voltage 4 (User V/F pattern)	100		0 – 100
9231	37425	**FU1-49** **VAC 400.4V**	Input voltage setting	910		730 – 1150
9232	37426	**FU1-50** **Motor Volt**	Motor rated voltage	400		0 – 600
9233	37427	**FU1-51** **Energy save**	Energy save level enabled/disabled	0	None Manual Auto	0 – 2
9234	37428	**FU1-52** **Manual save%**	Energy save level	0		0 – 30
9236	37430	**FU1-54** **KiloWattHour**	Displaying of Mega and Kilo watts	-		-
9237	37431	**FU1-55** **Inv. Temp.**	Inverter temperature	25		0 – 160
9238	37432	**FU1-56** **Motor Temp.**	Motor temperature	25		0 – 160
923C	37436	**FU1-60** **ETH select**	Electronic thermal protection	1	No Yes	0 – 1
923D	37437	**FU1-61** **ETH 1min**	Electronic thermal protection level for 1 minute	150		FU1-62 – 200
923E	37438	**FU1-62** **ETH cont**	Electronic thermal protection level for continuous	105		50 – FU1-61 (max. 150)
923F	37439	**FU1-63** **Motor type**	Motor cooling mode	0	Self-cool Forced-cool	0 – 1
9240	37440	**FU1-64** **OL level**	Overload warning level	110		30 – 110
9241	37441	**FU1-65** **OL time**	Overload warning time	100		0 – 300
9242	37442	**FU1-66** **OLT select**	Overload trip selection	1	No Yes	0 – 1
9243	37443	**FU1-67** **OLT level**	Overload trip level	120		30 – 150
9244	37444	**FU1-68** **OLT time**	Overload trip time	600		0 – 600
9245	37445	**FU1-69** **Trip select**	Input / output phase loss protection	4 (Bit setting)		0 – 7 (Bit setting)
9246	37446	**FU1-70** **Stall prev.**	Stall prevention mode	0 (Bit setting)		0 – 7 (Bit setting)
9247	37447	**FU1-72** **Stall level**	Limitation current level	100		30 – 150
9248	37448	**FU1-73** **Acc/Dec ch F**	Frequency of acceleration and deceleration change	0		0 – FU1-30
9249	37449	**FU1-73** **Acc/Dec Freq**	Frequency for acceleration and deceleration	0	Max. Delta	0 – 1
924A	37450	**FU1-74** **Time scale**	Time scale	1	0.01sec 0.1sec 1sec	0 – 2
9250	37456	**FU1-80** **Up/Dn Save**	To memorize the reference of motorized potentiometer	0	No Yes	0 - 1

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9251	37457	**FU1-81 Run Delay T**	Delay time at the starting	0		0 – 6000
9255	37461	**FU1-85 ULT select**	Underload trip selection	0	No Yes	0 – 1
9256	37462	**FU1-86 ULT level**	Underload level	30		0 – 100
9257	37463	**FU1-87 ULT Freq**	Underload frequency	1500		FU1-31 – FU1-30
9258	37464	**FU1-88 ULT time**	Underload trip time	0		0 – 2000
925A	37466	**FU1-90 STOP Inertia**	Setting of load inertia	8		8 – 5000

10.5.4. Functions Menu (FU2)

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9300	37632	**FU2-00 Jump code**	Jump to desired parameter	40		1 – 99
9301	37633	**FU2-01 Last trip-1**	Last trip of fault history	-		-
9302	37634	**FU2-02 Last trip-2**	Last trip-1 of fault history	-		-
9303	37635	**FU2-03 Last trip-3**	Last trip-2 of fault history	-		-
9304	37636	**FU2-04 Last trip-4**	Last trip-3 of fault history	-		-
9305	37637	**FU2-05 Last trip-5**	Last trip-4 of fault history	-		-
9306	37638	**FU2-06 Erase trips**	Erase fault history	0	No Yes	0 – 1
9307	37639	**FU2-07 Dwell time**	Dwell time	0		0 – 100
9308	37640	**FU2-08 Dwell Freq**	Dwell frequency	500		FU1-32 – FU1-30
930A	37642	**FU2-10 Jump Freq**	Skip frequencies selection	0	No Yes	0 – 1
930B	37643	**FU2-11 jump Lo 1**	Setting of low frequency skip 1	1000		0 – FU2-12
930C	37644	**FU2-12 jump Hi 1**	Setting of high frequency skip 1	1500		FU2-11 – FU1-30
930D	37645	**FU2-1 jump Lo 2**	Setting of low frequency skip 2	2000		0 –FU2-14
930E	37646	**FU2-14 jump Hi 2**	Setting of high frequency skip 2	2500		FU2-13 – FU1-30
930F	37647	**FU2-15 jump Lo 3**	Setting of low frequency skip 3	3000		0 – FU2-16
9310	37648	**FU2-16 jump Hi 3**	Setting of high frequency skip 3	3500		FU2-15 – FU1-30
9314	37652	**FU2-20 Power-on run**	Restart after power supply fault	0	No Yes	0 – 1
9315	37653	**FU2-21 RST restart**	Restart after fault reset	0	No Yes	0 – 1
9316	37654	**FU2-22 Speed Search**	Speed search function	0 (Bit setting)		0 – 15 (Bit setting)
9317	37655	**FU2-23 SS P-Gain**	Proportional gain for speed search	200		0 - 9999
9318	37656	**FU2-24 SS I-Gain**	Integral gain for speed search	500		0 – 9999
9319	37657	**FU2-25 Retry number**	Tries of automatic fault resets	0		0 – 10
931A	37658	**FU2-26 Retry delay**	Time between tries of automatic fault resets	10		0 – 600
9328	37672	**FU2-40 Motor select**	Motor power setting	-	See prog. param. list (8.2)	0 – 15
9329	37673	**FU2-41 Pole number**	Number of motor poles	4		2 – 12
932A	37674	**FU2-42 Rated-Slip**	Rated slip frequency of the motor	-		0 – 10
932B	37675	**FU2-43 Rated-Curr**	Motor rated current	-		1 – 2000
932C	37676	**FU2-44 Noload-Curr**	No load current of the motor	-		5 – 2000
932D	37677	**FU2-45 Efficiency**	Motor efficiency	-		70 – 100
932E	37678	**FU2-46 Inertia rate**	Load inertia rate	0		0 – 8
932F	37679	**FU2-47 RPM factor**	Setting of gain for speed motor	100		1 – 1000
9330	37680	**FU2-48 Carrier freq**	Setting of carrier frequency	-		7 – 150

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9331	37681	**FU2-49** **PWM Select**	Selection of modulation mode	0	Normal 1 Normal 2 Low Leakage	0 – 2
933C	37692	**FU2-60** **Control mode**	Selection of inverter control mode	0	V/F Slip Compen Sensorless	0 – 2
933D	37693	**FU2-61** **Auto Tuning**	Auto tuning of motor parameters	0	No Yes	0 – 1
933E	37694	**FU2-62** **Rs**	Stator resistance	-		-
933F	37695	**FU2-63** **Lsigma**	Leakage inductance	-		-
9340	37696	**FU2-64** **PreExTime**	Pre-exciting time of the motor	10		0 – 600
9341	37697	**FU2-65** **SL P-Gain**	Proportional gain in Sensorless	1000		0 – 9999
9342	37698	**FU2-66** **SL I-Gain**	Integral gain in Sensorless	100		0 – 9999
9343	37699	**FU2-67** **Torque boost**	Torque boost setting	0	Manual Automatic	0 – 1
9344	37700	**FU2-68** **Fwd boost**	Manual torque boost in forward direction	20		0 – 150
9345	37701	**FU2-69** **Rev boost**	Manual torque boost in reverse direction	20		0 – 150
9350	37712	**FU2-80** **PowerOn disp**	Power on display	0	DRV-00 'Cmd. Freq.' DRV-01 'Acc. Time' DRV-02 'Dec. Time' DRV-03 'Drive mode' DRV-04 'Freq mode' DRV-05 'Step Freq-1' DRV-06 'Step Freq-2' DRV-07 'Step Freq-3' DRV-08 'Current' DRV-09 'Speed' DRV-10 'DC link Vtg' DRV-11 'User disp' DRV-12 'Fault None'	0 – 12
9351	37713	**FU2-81** **User disp**	Displaying for value displayed in DRV-11	0	Volts Watts	0 – 1
9352	37714	**FU2-82** **S/W PE x.x**	Software version	-		-
9353	37715	**FU2-83** **LastTripTime**	Time from the last fault	-		-
9354	37716	**FU2-84** **On-Time**	Time from the equipment was connected	-		-
9355	37717	**FU2-85** **Run-time**	Operation time	-		-
9357	37719	**FU2-87** **Power Set**	Power setting	1000		1 – 4000
935A	37722	**FU2-90** **Para. disp**	Selection of parameters displaying	0	Default All para Diff Para	0 – 2

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
935B	37723	**FU2-91 Para. read**	Parameters read	0	No Yes	0 – 1
935C	37724	**FU2-92 Para. write**	Parameters write	0	No Yes	0 – 1
935D	37725	**FU2-93 Para. init**	Parameters initialize	0	No All groups DRV FU1 FU2 I/O EXT COM APP	0 – 8
935E	37726	**FU2-94 Para. lock**	Parameters lock	0		0 – 9999
935F	37727	**FU2-95 Para. save**	Parameters save	0	No Yes	0 – 1

10.5.5. Inputs and Outputs Menu (I/O)

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9400	37888	**I/O-00 Jump code**	Jump to desired parameter	1		1 – 99
9401	37889	**I/O-01 V1 Filter**	Filter of analogue voltage input	250		0 – 9999
9402	37890	**I/O-02 V1 volt x1**	Minimum voltage of V1 input	0		0 – I/O-4
9403	37891	**I/O-03 V1 Freq y1**	Minimum frequency for minimum voltage of V1 input	0		0 – FU1-30
9404	37892	**I/O-04 V1 volt x2**	Maximum voltage of V1 input	1000		I/O-2 – 1200
9405	37893	**I/O-05 V1 Freq y2**	Maximum frequency for maximum voltage of V1 input	5000		0 – I/O-03
9406	37894	**I/O-06 I Filter**	Filter of analogue current input	250		0 – 9999
9407	37895	**I/O-07 I curr x1**	Minimum current of I input	400		0 – I/O-9
9408	37896	**I/O-08 I Freq y1**	Minimum frequency for minimum current of I input	0		0 – FU1-30
9409	37897	**I/O-09 I curr x2**	Maximum current of I input	1000		I/O-7 – 2000
940A	37898	**I/O-10 I Freq y2**	Maximum frequency for maximum current of I input	5000		0 – I/O-08
940B	37899	**I/O-11 P pulse set**	Selection of pulse input mode	1	(A+B) (A)	0 – 1
940C	37900	**I/O-12 P Filter**	Filter of pulse input	10	0 – 9999	
940D	37901	**I/O-13 P pulse x1**	Minimum pulse frequency of A0, B0 input	0		0 – I/O-15
940E	37902	**I/O-14 P Freq y1**	Minimum frequency for minimum pulse frequency of A0, B0 input	0		0 – FU1-30
940F	37903	**I/O-15 P pulse x2**	Maximum pulse frequency of A0, B0 input	0		I/O-13 – 100
9410	37904	**I/O-16 P Freq y2**	Maximum frequency for maximum pulse frequency of A0, B0 input	5000		0 – I/O-14
9411	37905	**I/O-17 Wire broken**	Criterion for signal loss of reference analogue input	0	None Half of x1 Less than x1	0 – 2
9412	37906	**I/O-18 Lostcommand**	Stop mode after analogue input signal loss	0	None FreeRun Stop	0 – 2
9413	37907	**I/O-19 Time out**	Delay time after reference signal loss	10		1 – 1200

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9414	37908	**I/O-20** **M1 define**	Multi-function digital input. M1 terminal	0	Speed-L Speed-M Speed-H XCEL-L XCEL-M XCEL-H DC-brake 2nd Func Exchange Reserved Up Down 3-Wire Ext Trip Pre-Heat iTerm Clear Open-loop Main-drive Analog hold XCEL stop P Gain2 Reserved Interlock1 Interlock2 Interlock3 Interlock4 Speed-X RST BX JOG FX RX ANA_CHG Pre-Excite Ext PID Run Up/Dn Clr	0 – 35
9415	37909	**I/O-21** **M2 define**	Multi-function digital input. M2 terminal	0	See I/O-20	0 – 35
9416	37910	**I/O-22** **M3 define**	Multi-function digital input. M3 terminal	1	See I/O-20	0 – 35
9417	37911	**I/O-23** **M4 define**	Multi-function digital input. M4 terminal	27	See I/O-20	0 – 35
9418	37912	**I/O-24** **M5 define**	Multi-function digital input. M5 terminal	28	See I/O-20	0 – 35
9419	37913	**I/O-25** **M6 define**	Multi-function digital input. M6 terminal	29	See I/O-20	0 – 35
941A	37914	**I/O-26** **M7 define**	Multi-function digital input. M7 terminal	30	See I/O-20	0 – 35
941B	37915	**I/O-27** **M8 define**	Multi-function digital input. M8 terminal	31	See I/O-20	0 – 35
941C	37916	**I/O-28** **In status**	Digital inputs status	0 (Bit display)		0 – 2047 (Bit display)
941D	37917	**I/O-29** **Ti Filt Num**	Filter of digital inputs	15		2 – 1000
941E	37918	**I/O-30** **Jog Freq**	Setting of jog frequency	1000		0 – FU1-30
941F	37919	**I/O-31** **Step Freq-4**	Speed at step frequency 4	4000		0 – FU1-30
9420	37920	**I/O-32** **Step Freq-5**	Speed at step frequency 5	5000		0 – FU1-30
9421	37921	**I/O-33** **Step Freq-6**	Speed at step frequency 6	4000		0 – FU1-30
9422	37922	**I/O-34** **Step Freq-7**	Speed at step frequency 7	3000		0 – FU1-30
9423	37923	**I/O-35** **Step Freq-8**	Speed at step frequency 8	2000		0 – FU1-30

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9424	37924	**I/O-36 Step Freq-9**	Speed at step frequency 9	1000		0 – FU1-30
9425	37925	**I/O-37 Step Freq-10**	Speed at step frequency 10	2000		0 – FU1-30
9426	37926	**I/O-38 Step Freq-11**	Speed at step frequency 11	3000		0 – FU1-30
9427	37927	**I/O-39 Step Freq-12**	Speed at step frequency 12	4000		0 – FU1-30
9428	37928	**I/O-40 Step Freq-13**	Speed at step frequency 13	5000		0 – FU1-30
9429	37929	**I/O-41 Step Freq-14**	Speed at step frequency 14	4000		0 – FU1-30
942A	37930	**I/O-42 Step Freq-15**	Speed at step frequency 15	3000		0 – FU1-30
9432	37932	**I/O-50 Acc time-1**	Acceleration time 1	200		0 – 6000
9433	37933	**I/O-51 Dec time-1**	Deceleration time 1	200		0 – 6000
9434	37934	**I/O-52 Acc time-2**	Acceleration time 2	300		0 – 6000
9435	37935	**I/O-53 Dec time-2**	Deceleration time 2	300		0 – 6000
9436	37936	**I/O-54 Acc time-3**	Acceleration time 3	400		0 – 6000
9437	37937	**I/O-55 Dec time-3**	Deceleration time 3	400		0 – 6000
9438	37938	**I/O-56 Acc time-4**	Acceleration time 4	500		0 – 6000
9439	37939	**I/O-57 Dec time-4**	Deceleration time 4	500		0 – 6000
943A	37940	**I/O-58 Acc time-5**	Acceleration time 5	400		0 – 6000
943B	37941	**I/O-59 Dec time-5**	Deceleration time 5	400		0 – 6000
943C	37942	**I/O-60 Acc time-6**	Acceleration time 6	300		0 – 6000
943D	37943	**I/O-61 Dec time-6**	Deceleration time 6	300		0 – 6000
943E	37944	**I/O-62 Acc time-7**	Acceleration time 7	200		0 – 6000
943F	37945	**I/O-63 Dec time-7**	Deceleration time 7	200		0 – 6000
9444	37956	**I/O-68 S0 Level**	Offset for S0 analogue output	0		0 – 1000
9445	37957	**I/O-69 S1 Level**	Offset for S1 analogue output	0		0 – 1000
9446	97958	**I/O-70 S0 mode**	S0 analogue output mode (0-10V)	0	Frequency Current Voltage DC link Vtg Ext PID Out	0 – 4
9447	37959	**I/O-71 S0 adjust**	Setting of S0 analogue output	100		10 – 200
9448	37960	**I/O-72 S1 mode**	S1 analogue output mode (0-10V)	2	See I/O-70	0 - 4
9449	37961	**I/O-73 S1 adjust**	Setting of S1 analogue output	100		10 – 200
944A	37962	**I/O-74 FDT Freq**	Frequency detection level	3000		0 – FU1-30
944B	37963	**I/O-75 FDT band**	Frequency detection bandwidth	1000		0 – FU1-30

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
944C	37964	**I/O-76** **Aux mode1**	Selection of configuration for auxiliary relay 1	0	None	0 – 20
					FDT-1	
					FDT-2	
					FDT-3	
					FDT-4	
					FDT-5	
					OL	
					IOL	
					Stall	
					OV	
					LV	
					OH	
					LostCommand	
					Run	
					Stop	
					Steady	
					INV line	
					COMM line	
					SSearch	
					Ready	
					MMC	
944D	37965	**I/O-77** **Aux mode2**	Selection of configuration for auxiliary relay 2	0	See I/O-76	0 – 20
944E	37966	**I/O-78** **Aux mode3**	Selection of configuration for auxiliary relay 3	0	See I/O-76	0 – 20
944F	37967	**I/O-79** **Aux mode4**	Selection of configuration for auxiliary relay 4	0	See I/O-76	0 – 20
9450	37968	**I/O-80** **Relay mode**	Selection of configuration for fault relay	2 (Bit setting)		0 – 7 (Bit setting)
9451	37969	**I/O-81** **Out status**	Activation status of digital outputs	0 (Bit display)		0 – 255 (Bit display)
9452	37970	**I/O-82** **Relay On**	On delay time of fault relay	0		0 – 9999
9453	37971	**I/O-83** **Relay Off**	Off delay time of fault relay	0		0 – 9999
9454	37972	**I/O-84** **Fan Con. Sel**	Selection of cooling fan operation	0	PowerOn Fan	0 – 2
					Run_Fan	
					Temper_Fan	
9455	37973	**I/O-85** **Fan Temp**	Setting of inverter temperature	70		0 – 70
9456	37974	**I/O-86** **V1 Unit Sel**	Selection of displaying units for V1 signal	0	Speed	0 – 5
					Percent	
					Bar	
					mBar	
					kPa	
					Pa	
9457	37975	**I/O-87** **I Unit Sel**	Selection of displaying units for I signal	0	See I/O-86	0 – 5
9458	37976	**I/O-88** **PulseUnitSel**	Selection of displaying units for A0, B0 signal	0	See I/O-86	0 – 5
945A	37978	**I/O-90** **Inv No.**	Slave number in communication net	1		1 – 250
945B	37979	**I/O-91** **Baud rate**	Transmission speed in communication net	3	1200bps	0 - 4
					2400bps	
					4800bps	
					9600bps	
					19200bps	
945C	37980	**I/O-92** **COM Lost Cmd**	Stop mode after reference signal loss in communication net	0	None	0 – 2
					Free Run	
					Stop	
945D	37981	**I/O-93** **COM Time Out**	Setting of time to determine speed reference signal loss	10		1 – 1200
945E	37982	**I/O-94** **Delay Time**	Setting for RS232/RS485 communication	5		2 – 1000

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
945F	37983	**I/O-95 In NO/NC Set**	Logical function of digital inputs	0 (Bit setting)		0 – 2047 (Bit setting)
9460	37984	**I/O-96 In CheckTime**	Check time for digital inputs	1		1 - 1000
9461	37985	**I/O-97 OH Trip Sel**	Selection of over temperature trip	2 (Bit setting)		0 – 7 (Bit setting)
9462	37986	**I/O-98 MotTripTemp**	Selection of over temperature trip of the motor	110		0 – 255

10.5.6. Applications Menu (APP)

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
9700	38656	**APP-00 Jump code**	Jump to desired parameters	1		1 – 99
9701	38657	**APP-01 proc PI mode**	Selection of PID operation mode	0	No Yes	0 – 1
9702	38658	**APP-02 App. mode**	Selection of operation with multiple motors	0	None MMC	0 – 1
9704	38660	**APP-04 AuxRefMode**	Selection of auxiliary reference in PID mode	0	No Yes	0 – 1
9705	38661	**APP-05 Aux Ref Sel**	Selection of source for auxiliary reference in PID mode	2	Keypad-1 Keypad-2 V1 V1S I V1 + I Pulse Int. 485 Ext. PID	0 – 8
9706	38662	**APP-06 PID F/B**	Selection of source for feedback signal	0	I V1 Pulse	0 – 2
9707	38663	**APP-07 PID P-Gain**	Proportional gain in PID mode	1000		0 – 9999
9708	38664	**APP-08 PID I-Time**	Integral gain in PID mode	5		0 – 320
9709	38665	**APP-09 PID D-Time**	Differential gain in PID mode	0		0 – 1000
970A	38666	**APP-10 PID Limit-H**	High limit of output frequency in PID mode	5000		0 – 30000
970B	38667	**APP-11 PID Limit-L**	Low limit of output frequency in PID mode	50		FU1-32 – 30000
970C	38668	**APP-12 PID OutScale**	Output scale in PID mode	1000		0 – 9999
970D	38669	**APP-13 PID P2-Gain**	Second proportional gain in PID mode	1000		0 – 9999
970E	38670	**APP-14 P-gain Scale**	Scale of proportional gain in PID mode	1000		0 – 1000
970F	38671	**APP-15 PID Out Inv.**	Output inversion in PID mode	0	No Yes	0 – 1
9711	38673	**APP-17 PID U Fbk**	Transformation of feedback from linear to square	0	No Yes	0 – 1
9712	38674	**APP-18 FB Filter**	Filter for feedback signal	10		0 – 9999
9714	38676	**APP-20 2nd Acc time**	Acceleration time for second motor	50		0 – 6000
9715	38677	**APP-21 2nd Dec time**	Deceleration time for second motor	100		0 – 6000
9716	38678	**APP-22 2ndBaseFreq**	Base frequency for second motor	5000		3000 – FU1-30
9717	38679	**APP-23 2nd V/F**	Voltage / Frequency pattern for second motor	0	Linear Square User V/F	0 – 2
9718	38680	**APP-24 2nd F-boost**	Torque boost in forward direction for second motor	20		0 – 150
9719	38681	**APP-25 2nd R-boost**	Torque boost in reverse direction for second motor	20		0 – 150
971A	38682	**APP-26 2nd Stall**	Current limit for second motor	100		30 – 150
971B	38683	**APP-27 2ndETH1min**	Electronic thermal protection for 1 minute for second motor	130		APP-28 – 200
971C	38684	**APP-28 2ndETH cont**	Electronic thermal protection for continuous for second motor	120		5000 – APP-27 (max. 150)
971D	38685	**APP-29 2nd R-Curr**	Rated current for second motor	-		10 – 2000

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
971E	38686	**APP-30 Aux Mot Run**	Auxiliary motors running	0		-
971F	38687	**APP-31 Starting Aux**	Selection of starting for auxiliary motors	1		1 – 4
9720	38688	**APP-32 AutoOp Time**	Displaying of operation time in rotation mode	0		-
9721	38689	**APP-33 Nbr Aux's**	Number of auxiliary motors	4		0 – 4
9728	38696	**APP-40 Sleep Delay**	Sleep delay time	600		0 – 9999
9729	38697	**APP-41 Sleep Freq0**	Sleep frequency 0	0		0 – FU1-30
972A	38698	**APP-42 Sleep Freq1**	Sleep frequency 1	0		0 – FU1-30
972B	38699	**APP-43 Sleep Freq2**	Sleep frequency 2	0		0 – FU1-30
972C	38700	**APP-44 Sleep Freq3**	Sleep frequency 3	0		0 – FU1-30
972D	38701	**APP-45 Sleep Freq4**	Sleep frequency 4	0		0 – FU1-30
972E	38702	**APP-46 Sleep Freq5**	Sleep frequency 5	0		0 – FU1-30
972F	38703	**APP-47 Sleep Freq6**	Sleep frequency 6	0		0 – FU1-30
9730	38704	**APP-48 Sleep Freq7**	Sleep frequency 7	0		0 – FU1-30
9731	38705	**APP-49 WakeUp level**	Wake up level for Sleep mode	20		0 – 1000
9732	38706	**APP-50 Start Freq 1**	Start frequency of auxiliary motor 1	4950		0 – FU1-30
9733	38707	**APP-51 Start Freq 2**	Start frequency of auxiliary motor 2	4950		0 – FU1-30
9734	38708	**APP-52 Start Freq 3**	Start frequency of auxiliary motor 3	4950		0 – FU1-30
9735	38709	**APP-53 Start Freq 4**	Start frequency of auxiliary motor 4	4950		0 – FU1-30
9736	38710	**APP-54 Stop Freq 1**	Stop frequency of auxiliary motor 1	2000		0 – FU1-30
9737	38711	**APP-55 Stop Freq 2**	Stop frequency of auxiliary motor 2	2000		0 – FU1-30
9738	38712	**APP-56 Stop Freq 3**	Stop frequency of auxiliary motor 3	2000		0 – FU1-30
9739	38713	**APP-57 Stop Freq 4**	Stop frequency of auxiliary motor 4	2000		0 – FU1-30
973A	38714	**APP-58 Aux start DT**	Delay time before connecting auxiliary motors	50		0 – 9999
973B	38715	**APP-59 Aux stop DT**	Delay time before stopping auxiliary motors	50		0 – 9999
973C	38716	**APP-60 AUX AccTime**	Time for the ramp at connecting auxiliary motors	20		0 – 6000
973D	38717	**APP-61 AUX DecTime**	Time for the ramp at disconnecting auxiliary motors	20		0 – 6000
9742	38722	**APP-66 AutoCh_Mode**	Rotation mode of auxiliary motors	0		0 – 2
9743	38723	**APP-67 AutoEx-intv**	Operation time of the inverter for one of the motors	4320		0 - 5940
9745	38725	**APP-69 Inter-lock**	Detection of motors out of service	0	No Yes	0 – 1
9747	38727	**APP-71 Aux STT FB**	Difference for starting auxiliary motors	2		0 – 100
9748	38728	**APP-72 Aux STP FB**	Difference for stopping auxiliary motors	0		0 – 100
974A	38730	**APP-74 PrePID Freq**	Setting of filling frequency	0		0 – FU1-30

Address		Screen	Description	Default value	Range	
16 bit	10 bit				Option	Values
974B	38731	**APP-75 PrePID F/B**	Level for leaving filling mode	0		0 – 100
974C	38732	**APP-76 PrePID dly**	Time of filling function application	600		0 – 9999
974D	38733	**APP-77 Pbroken mode**	Pipe broken trip during filling function	0	No Yes	0 – 1
9750	38736	**APP-80 Ext PI mode**	External PID mode	0	No Yes	0 – 1
9751	38737	**APP-81 Ext Ref Sel**	Reference for External PID	3	I V1 Pulse Keypad	0 – 3
9752	38738	**APP-82 Ext Ref Perc**	Level for reference of External PID	5000		0 – 10000
9753	38739	**APP-83 Ext Fbk Sel**	Feedback signal of External PID	0	I V1 Pulse	0 – 2
9755	38741	**APP-85 ExtPID Pgain**	Proportional gain for External PID	10		0 – 9999
9756	38742	**APP-86 ExtPID Itime**	Integral gain for External PID	100		0 – 320
9757	38743	**APP-87 ExtPID Dtime**	Differential gain for External PID	0		0 – 2000
9758	38744	**APP-88 ExtPID lmt-H**	High limit for External PID	10000		0 – 10000
9759	38745	**APP-89 ExtPID lmt-L**	Low limit for External PID	0		0 – 3000
975A	38746	**APP-90 ExtPID Scale**	Output scale for External PID	1000		0 – 9999
975B	38747	**APP-91 Ext P2-gain**	Second proportional gain for External PID	1000		0 – 9999
975C	38748	**APP-92 Ext P Scale**	Scale of proportional gain for External PID	1000		0 – 1000
975D	38749	**APP-93 ExtPID Fgain**	F gain for External PID	0		0 – 9999
975F	38751	**APP-95 ExtPIDOutInv**	Output inversion for External PID	0	No Yes	0 – 1
9761	38753	**APP-97 ExtLoopTime**	Activation time of External PID controller	100		50 – 200

10.6. Faults solution

Check points	Corrective measures
Is the power provided the converter?	Provide electric power to the converter.
Are the connections between converter and computer correct?	Refer to converter manual.
Is the connection between converter and communication card right?	Check the wiring (see ‘10.3 Installation’).
Is the communication port selected correctly from the user program?	Verify the selected communication port is the same port used to communicate.
Is master not polling?	Verify the master is polling the inverter.
Is baud rate of the computer and inverter correctly set?	Set the correct value in accordance with ‘10.3 Installation’.
Is the data format of user program right?	Revise user program.

11. OPTIONS

Inverter of SD450 Series has multiple options for different applications. Consult the following table and select the corresponding options for your application.

Option		Name	Dimensions	Description
External installation	Communication buses	**SD45TCD**	-	DeviceNet communication card DeviceNet protocol integrated CAN controller Inverter connection: Max. 64 Input voltage: DC 11 ~ 25V Bauds: 125, 250, 500k bps CSMA/CD-NBA method
		SD45TCP	-	Profibus communication net Connection to ProfiBus Network Device type: Profibus DP Slave Inverter connection: Max. 64 Bauds: Max. 12M bps
External installation	**Remote cable**	**SD4CF1**	5m	Removable cable 5m for remote panel.
	Dynamic braking	**DBSD4030**	See Group 1	Braking unit for inverters 3,7 to 11kW 400V
		DBSD4045		Braking unit for inverters 15 to 18,5kW 400V
		DBSD4075	See Group 2	Braking unit for inverters 22 to 30kW 400V
		DBSD4145		Braking unit for inverters 37 to 45kW 400V
		DBSD4145		Braking unit for inverters 55 to 75kW 400V

11.1. Dynamic Braking Unit

SD450 inverters have not DB circuits as standard component. If you need to conduct the regenerated energy you have to install an optional DB unit with the corresponding dynamic braking resistors. Any basic information about these braking units is included here. For additional information, consult the specifications of each concrete module.

11.1.1. Terminals Configuration

Terminals for dynamic braking units are the described ones in the attached table:

Group	Terminal	Description
Group 1	CM	Common terminal for the over temperature trip (OH).
	OH	Output terminal for the over temperature trip (Open collector: 20mA, 27Vdc).
	G	Ground terminal.
	B2	Connection for B2 terminal of the dynamic braking resistor.
	B1	Connection for B1 terminal of the dynamic braking resistor.
	N	Connection for N terminal of the inverter DC Bus.
	P	Connection for P terminal of the inverter DC Bus.
Group 2	G	Ground terminal.
	N	Connection for N terminal of the inverter DC Bus.
	B2	Connection for B2 terminal of the dynamic braking resistor.
	P/B1	Connection for B1 terminal of the dynamic braking resistor. Connection for P terminal of the inverter DC Bus.

11.1.2. Dimensions

Next, dynamic braking units of each group are shown:

a) Group 1.

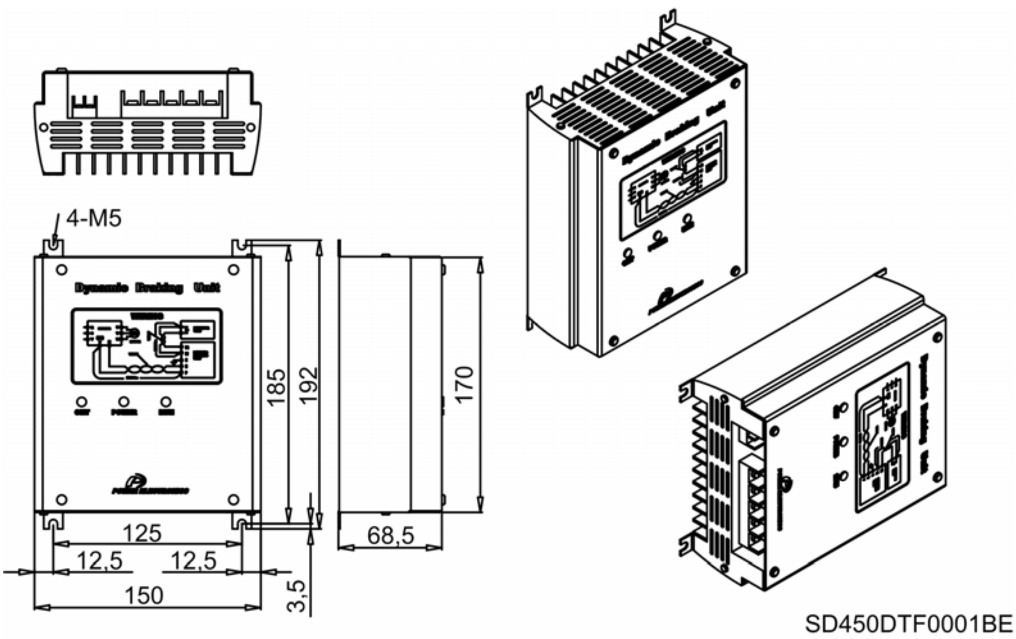


Figure 11.1. Dynamic braking unit for inverters from 3,7kW to 18,5kW

b) Group 2.

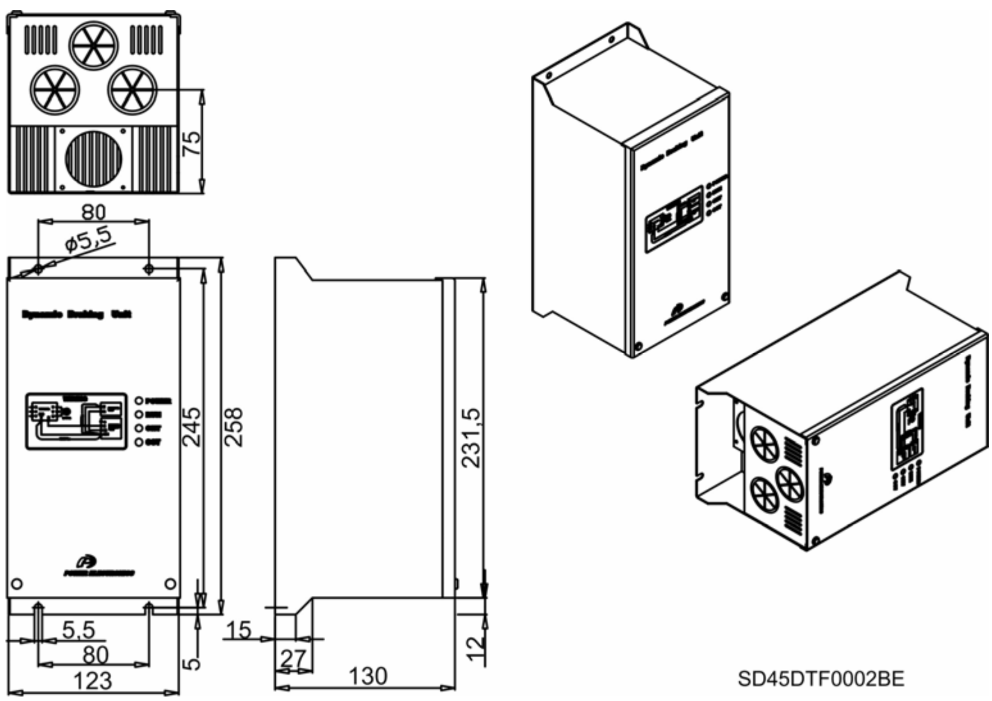
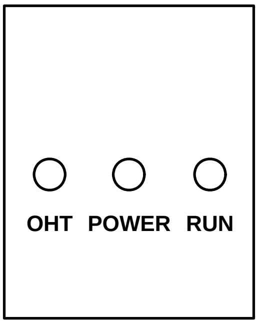


Figure 11.2. Dynamic braking unit for inverters from 22kW to 75kW

11.1.3. Leds Description

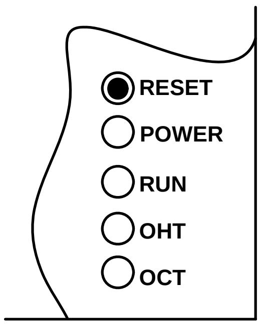
a) Group 1:



SD45DTF0003AE

Led	Description
OHT (Green)	When the heat sink is overheated and the level exceeds its set limit, overheat protection is activated and this led is turned on after the signal is shut off.
POWER (Red)	It is turned on when the braking unit receives power supply, because usually it is connected to the inverter.
RUN (Green)	It is blinking while dynamic braking unit is operating correctly due to the energy regenerated by the motor.

b) Group 2:



SD45DTF0004AE

Led	Description
RESET	Press this switch to release OCT fault (overcurrent). Pressing this switch the OCT led is turned off.
POWER (Green)	It is turned on when the braking unit receives power supply because usually it is connected to the inverter.
RUN (Green)	It is blinking while dynamic braking unit is operating correctly due to the energy regenerated by the motor.
OHT (Red)	When the heat sink is overheated and the level exceeds its set limit, overheat protection is activated and this led is turned on after the signal is shut off.
OCT (Red)	Over current trip signal. When an over current occurs in the IGBT, this protection function turns off the operation signal and the OCT led is turned on.

11.1.4. Wiring for Braking Units and Braking Resistor

Braking Resistor Terminals	Description
B1, B2	Connection terminals to connect to the dynamic braking unit. Only connect the cables according to the drawing above detailed. Connect the terminals of the dynamic braking resistor to the terminals B1 and B2 of the dynamic braking unit.
TH1, TH2	Thermal sensor of the resistor. Normal temperature (ambient): Normally closed (TH1 – TH2 closed). Over temperature of the resistor: Normally open (TH1 – TH2 open). Connect this signal to one input terminal configured as 'Ext. Trip'.

Wiring is detailed in the following figure:

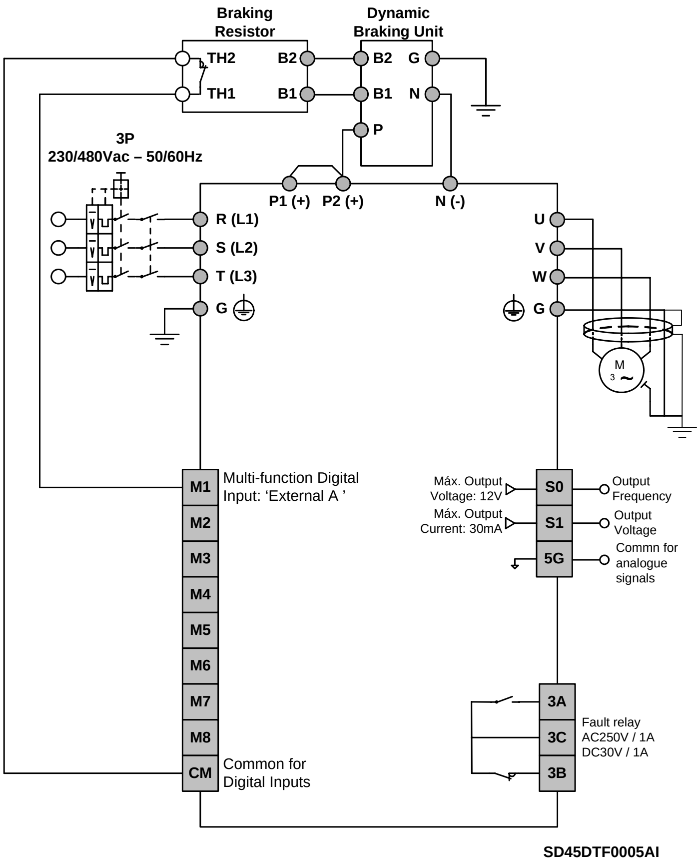


Figure 11.3. Wiring for dynamic braking units. Connection of the braking resistor trip

11.2. Dynamic Braking Resistor

11.2.1. Selection of the External Resistor (Optional)

Inverter model	Braking Unit model	kW	DB Resistor (Braking Torque of 150%)	
			Resistor (Ω)	Watts (W)
SD45008	DBSD4030	3,7	100	150
SD45012		5,5	70	300
SD45016		7,5	50	400
SD45024		11	35	600
SD45030	DBSD4045	15	25	800
SD45039		18,5	20	1000
SD45045	DBSD4075	22	17	1100
SD45060		30	12	1500
SD45075	DBSD4145	37	10	2000
SD45090		45	8	2500
SD45110		55	7	3000
SD45150		75	6	4000

*This table is based on ED of 5% with continuous braking time of 15 seconds. For other applications, consult with Technical Department of Power Electronics.

CAUTION

Do not touch the braking resistor during inverter operation since it could be very hot (more than 150ºC).
It is recommended to use braking resistors equipped with thermal sensors. Connect it to one of the programmable input terminals (M1 to M8) after selecting the option of 'Ext. Trip' in the corresponding I/O parameter.

12. COMMONLY USED CONFIGURATIONS

12.1. Start /Stop Command and Speed Reference by Keypad or Analogue Input

12.1.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Reference frequency	0.00	50Hz
DRV-01	Acceleration time	Acc. Time	30.0sec
DRV-02	Deceleration time	Dec. Time	30.0sec
DRV-03	Start /Stop control mode	Drive mode	**Keypad:** Start / Stop by keypad. **Fx/Rx-1:** Start / Stop by terminals. **Int. 485:** Start /Stop through communication bus.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1, Keypad – 2:** Frequency setting by keypad. **V1:** Potentiometer connected to the terminals V+, V1 and 5G. **V1S:** Potentiometer connected to the terminals V+, V1 and V-. **I:** 4-20mA / 0-20mA analogue input, terminals I and 5G. **Pulse:** Analogue pulse input, terminals A0 and B0. **Int. 485:** Reference frequency setting through communication bus.
FU1-23	Stop mode	Stop mode	**Decel:** Deceleration controlled by parameter DRV-02. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Deceleration not controlled. Stop by inertia. **Fluxe brake:** Fast stop using the energy regenerated to heat into the motor. (CAUTION WITH THIS OPTION).
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At that frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,1Hz – Minimum speed at the starting.
FU1-33	Frequency limits selection	Freq limit	**No:** Limits are set in parameters FU1-30 and FU1-32. **Yes:** Limits are set in parameters FU1-34 and FU1-35.
FU1-34	Low frequency limit	F-limit Lo	0.00Hz
FU1-35	High frequency limit	F-limit Hi	50.00Hz
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 are available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	Delay time at the starting (optional).
FU2-20	Restart after power supply fault	Power-on run	**No:** Inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	2.0 kHz

Parameter	Description	Display	Value
FU2-60	Control mode	Control mode	V/F control.
FU2-67	Torque boost setting	Torque boost	Manual
FU2-93	Parameters initialize	Para. Init	**All groups:** All of parameters are initialized with the factory settings.
I/O-01	Filter of analogue voltage input V1	V1 Filter	250ms (Filter of the analogue voltage input)
I/O-02	Minimum voltage of V1 input	V1 volt x1	0.00V (Minimum voltage of V1 input)
I/O-03	Frequency for minimum voltage of V1	V1 Freq y1	0Hz (Frequency for the minimum voltage of V1 input)
I/O-04	Maximum voltage of V1 input	V1 volt x2	10.0V (Maximum voltage of V1 input)
I/O-05	Frequency for maximum voltage of V1	V1 Freq y2	50Hz (Frequency for the maximum voltage of V1 input)
I/O-06	Filter of analogue current input I	I Filter	250ms (Filter of the analogue current input)
I/O-07	Minimum current of I input	I curr x1	4.00mA (Minimum current of I input)
I/O-08	Frequency for minimum current of I	I Freq y1	0Hz (Frequency for the minimum current of I input)
I/O-09	Maximum current of I input	I curr x2	20.00mA (Maximum current of I input)
I/O-10	Frequency for maximum current of I	I Freq y2	50Hz (Frequency for the maximum current of I input)

12.1.2. Connections Drawing

Terminals CM / M7: start command (NO status).
Terminals I / 5G: 4-20mA analogue input.
Terminals VR / V1 / 5G: 0-10 V analogue input.

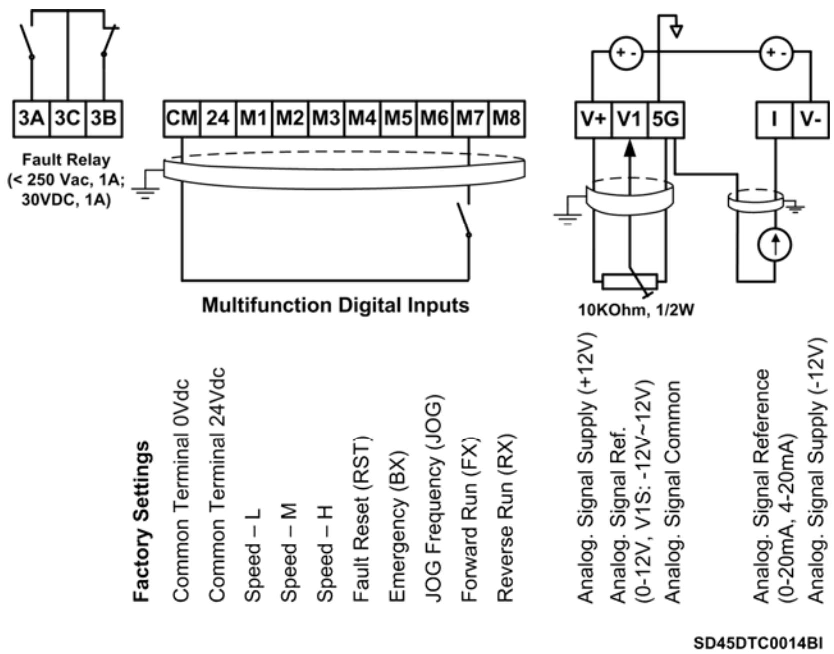


Figure 12.1. Start / Stop command and speed reference by keypad or analogue input

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW.

12.2. Multi-speed References via M1, M2 and M3 Terminals

12.2.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Reference frequency	0.00	50Hz
DRV-01	Acceleration time	Acc. Time	10.0sec
DRV-02	Deceleration time	Dec. Time	10.0sec
DRV-03	Start / Stop Control mode	Drive mode	**Keypad:** Start / Stop by keypad. **Fx/Rx-1:** Start / Stop by terminals. **Int. 485:** Start / Stop through communication bus.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1, Keypad – 2:** Frequency setting by keypad. **V1:** Potentiometer connected to the terminals V+, V1 and 5G. **V1S:** Potentiometer connected to the terminals V+, V1 and V-. **I:** 4-20mA / 0-20mA analogue input, terminals I and 5G. **Pulse:** Analogue pulse input, terminals A0 and B0. **Int. 485:** Reference frequency setting through communication bus.
DRV-05	Step frequency 1	Step Freq-1	30.00Hz (Multi-speed 1)
DRV-06	Step frequency 2	Step Freq-2	35.00Hz (Multi-speed 2)
DRV-07	Step frequency 3	Step Freq-3	40.00Hz (Multi-speed 3)
FU1-23	Stop mode	Stop mode	**Decel:** Deceleration controlled by parameter DRV-02. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Deceleration not controlled. Stop by inertia. **Fluxe brake:** Fast stop using the energy regenerated to heat into the motor. (CAUTION WITH THIS OPTION).
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,1Hz – Minimum speed at the starting.
FU1-33	Frequency limits selection	Freq limit	**No:** Limits are set in parameters FU1-30 and FU1-32. **Yes:** Limits are set in parameters FU1-34 and FU1-35 .
FU1-34	Low frequency limit	F-limit Lo	0.00Hz
FU1-35	High frequency limit	F-limit Hi	50.00Hz
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	Delay time at the starting (optional).
FU2-20	Restart after power supply fault	Power-on run	**No:** Inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	2.0 kHz

Parameter	Description	Display	Value
FU2-60	Control mode	Control mode	V/F control.
FU2-67	Torque boost setting	Torque boost	Manual
I/O-20	Configuration of M1 terminal	M1 define	Speed-L (Multi-speed 1)
I/O-21	Configuration of M2 terminal	M2 define	Speed-M (Multi-speed 2)
I/O-22	Configuration of M3 terminal	M3 define	Speed-H (Multi-speed 3)
I/O-31	Step frequency 4	Step Freq-4	45.00Hz (Multi-speed 4)
I/O-32	Step frequency 5	Step Freq-5	50.00Hz (Multi-speed 5)
I/O-33	Step frequency 6	Step Freq-6	47.00Hz (Multi-speed 6)
I/O-34	Step frequency 7	Step Freq-7	42.00Hz (Multi-speed 7)

Depending on the status of the input terminals M1, M2 and M3, different programmed frequencies can be selected:

Programmed frequency	Parameter	Speed-H (M3)	Speed-M (M2)	Speed-L (M1)
50.00Hz	DRV-00	0	0	0
30.00Hz	DRV-05	0	0	1
35.00Hz	DRV-06	0	1	0
40.00Hz	DRV-07	0	1	1
45.00Hz	I/O-31	1	0	0
50.00Hz	I/O-32	1	0	1
47.00Hz	I/O-33	1	1	0
42.00Hz	I/O-34	1	1	1

12.2.2. Connections Drawing

Terminals CM / M7: start command (NO status).
Terminals CM / M1: Multi-reference Speed-L (NO status).
Terminals CM / M2: Multi-reference Speed-M (NO status).
Terminals CM / M3: Multi-reference Speed-H (NO status).

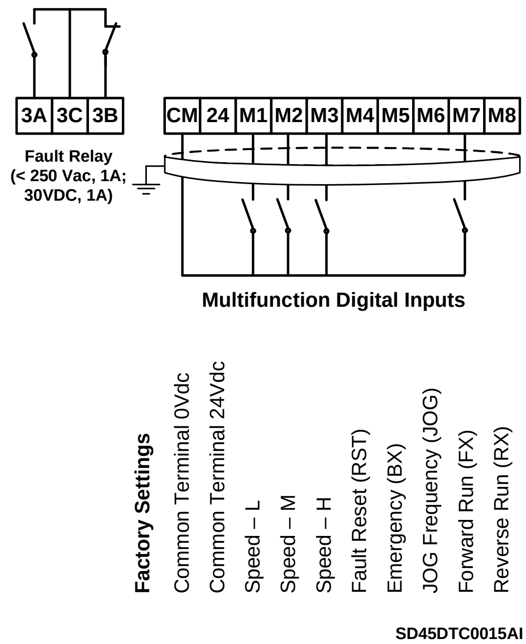


Figure 12.2. Multi-speed references via M1, M2 and M3 terminals

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW.

12.3. Control of one Pump, Eight Speed References and Manual Speed (Under-load) Without Pressure Group Functionality

12.3.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Pressure reference REF1	0.00	40.00% (20Hz) (Pressure reference, 20Hz x 2 =40% transducer range.)
DRV-00R	Reference and feedback values of PID	R 0.0% F 0.0%	R = Displaying of the reference value in % F = Displaying of the feedback value in % of sensor range.
DRV-01	Acceleration time	Acc. Time	10.0sec
DRV-02	Deceleration time	Dec. Time	10.0sec
DRV-03	Start / Stop control mode	Drive mode	**Keypad:** Start / Stop by keypad. **Fx/Rx-1:** Start / Stop by terminals. **Int. 485:** Start / Stop through communication bus.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1, Keypad – 2:** Frequency setting by keypad.
DRV-05	Pressure reference 1	Refer Perc-1	60.00% (Reference 1 – 30.00Hz)
DRV-06	Pressure reference 2	Refer Perc-2	70.00% (Reference 2 – 35.00Hz)
DRV-07	Pressure reference 3	Refer Perc-3	80.00% (Reference 3 – 40.00Hz)
FU1-23	Stop mode	Stop mode	**Decel:** Deceleration controlled by parameter DRV-02. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Deceleration not controlled. Stop by inertia. **Fluxe brake:** Fast stop using the energy regenerated to heat into the motor. (CAUTION WITH THIS OPTION).
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,2Hz – Minimum speed at the starting.
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 are available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	Delay time at the starting (optional).
FU1-85	Underload trip selection	ULT select	Yes
FU1-86	Underload level	ULT level	70% (Motor current at the frequency set in FU1-87).
FU1-87	Underload frequency	ULT freq	40.00Hz (Frequency for activating underload protection).
FU1-88	Underload trip time	ULT time	60.0sec
FU2-20	Restart after power supply fault	Power-on run	**No:** Inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	2.0 kHz

Parameter	Description	Display	Value
I/O-01	Filter of analogue voltage input	V1 Filter	250ms (Filter of the analogue voltage input)
I/O-02	Minimum voltage of V1 input	V1 volt x1	0.00V (Minimum voltage of V1 input)
I/O-03	Frequency for minimum voltage of V1	V1 Freq y1	0Hz (Frequency for the minimum voltage of V1 input)
I/O-04	Maximum voltage of V1 input	V1 volt x2	10.0V (Maximum voltage of V1 input)
I/O-05	Frequency for maximum voltage of V1	V1 Freq y2	50Hz (Frequency for the maximum voltage of V1 input)
I/O-06	Filter of analogue current input I	I Filter	250ms (Filter of the analogue current input)
I/O-07	Minimum current of I input	I curr x1	4.00mA (Minimum current of I input)
I/O-08	Frequency for minimum current of I	I Freq y1	0Hz (Frequency for the minimum current of I input)
I/O-09	Maximum current of I input	I curr x2	20.00mA (Maximum current of I input)
I/O-10	Frequency for maximum current of I	I Freq y2	50Hz (Frequency for the maximum current of I input)
I/O-20	Configuration of M1 terminal	M1 define	Speed-L (Multi-speed 1)
I/O-21	Configuration of M2 terminal	M2 define	Speed-M (Multi-speed 2)
I/O-22	Configuration of M3 terminal	M3 define	Speed-H (Multi-speed 3)
I/O-23	Configuration of M4 terminal	M4 define	Open-loop (When it is activated, it allows operating at manual speed)
I/O-25	Configuration of M6 terminal	M6 define	JOG frequency (Speed preset by parameter)
I/O-30	Setting of jog frequency	Jog Freq	80.00% (Speed preset by parameter – 40.00Hz)
I/O-31	Step frequency 4	Refer Perc-4	90.00% (Multi-speed 4 – 45.00Hz)
I/O-32	Step frequency 5	Refer Perc-5	100.00% (Multi-speed 5 – 50.00Hz)
I/O-33	Step frequency 6	Refer Perc-6	94.00% (Multi-speed 6 – 47.00Hz)
I/O-34	Step frequency 7	Refer Perc-7	84.00% (Multi-speed 7 – 42.00Hz)
I/O-76	Configuration for auxiliary relay 1	Aux mode1	Run (Programmable relay is activated when the inverter is running)
I/O-80	Configuration for fault relay	Relay mode	010 (Fault relay)
I/O-86	Selection of displaying units for V1 signal	V1 Unit Sel	**Percentage:** (if the feedback signal is V1). Only thus it will appear the parameter DRV-00R.
I/O-87	Selection of displaying units for I signal	I Unit Sel	**Percentage:** (If the feedback signal is I). Only thus it will appear the parameter DRV-00R.
I/O-88	Selection of displaying units for A0, B0 signal	PulseUnitSel	**Percentage:** (if the feedback signal is A0, B0). Only thus it will appear the parameter DRV-00R.
APP-01	Activation of PID mode	proc PI mode	Yes
APP-06	Feedback signal	PID F/B	I (4-20mA input)
APP-10	High frequency limit in PID mode	PID Limit-H	50.00Hz
APP-11	Low frequency limit in PID mode	PID Limit-L	20.00Hz
APP-15	Output inversion in PID mode	PID Out Inv.	Yes or No (depending on the application)
APP-40	Sleep delay time	Sleep Delay	20.0sec
APP-41	Sleep frequency 0	Sleep Freq0	39.00Hz (Freq. for activating sleep mode with the speed ref. 0 active)
APP-42	Sleep frequency 1	Sleep Freq1	39.00Hz (Freq. for activating sleep mode with the speed ref. 1 active)
APP-43	Sleep frequency 2	Sleep Freq2	39.00Hz (Freq. for activating sleep mode with the speed ref. 2 active)
APP-44	Sleep frequency 3	Sleep Freq3	39.00Hz (Freq. for activating sleep mode with the speed ref. 3 active)
APP-45	Sleep frequency 4	Sleep Freq4	39.00Hz (Freq. for activating sleep mode with the speed ref. 4 active)
APP-46	Sleep frequency 5	Sleep Freq5	39.00Hz (Freq. for activating sleep mode with the speed ref. 5 active)
APP-47	Sleep frequency 6	Sleep Freq6	39.00Hz (Freq. for activating sleep mode with the speed ref. 6 active)
APP-48	Sleep frequency 7	Sleep Freq7	39.00Hz (Freq. for activating sleep mode with the speed ref. 7 active)
APP-49	Wake up level	WakeUp level	5.0% (Starting pressure REF – FBK) Example: ref. 1 = 35% and FBK = 30% Starting at 30% because APP-49 = 5%

Depending on the status of the input terminals M1, M2 and M3, different programmed pressures can be selected:

Programmed pressure	Parameter	Speed-H (M3)	Speed-M (M2)	Speed-L (M1)
40.00%	DRV-00	0	0	0
60.00%	DRV-05	0	0	1
70.00%	DRV-06	0	1	0
80.00%	DRV-07	0	1	1
90.00%	I/O-31	1	0	0
100.00%	I/O-32	1	0	1
94.00%	I/O-33	1	1	0
84.00%	I/O-34	1	1	1

12.3.2. Connections Drawing

Terminals CM / JOG: Change to manual speed set in parameter I/O-25 (NO status).
Terminals CM / M1: Terminal 1 (NO status).
Terminals CM / M2: Terminal 2 (NO status).
Terminals CM / M3: Terminal 3 (NO status).
Terminals CM / M7: Start command.
Terminals A1/C1: Programmable output relay.
Terminals 3A, 3B, 3C: Programmable fault relay.

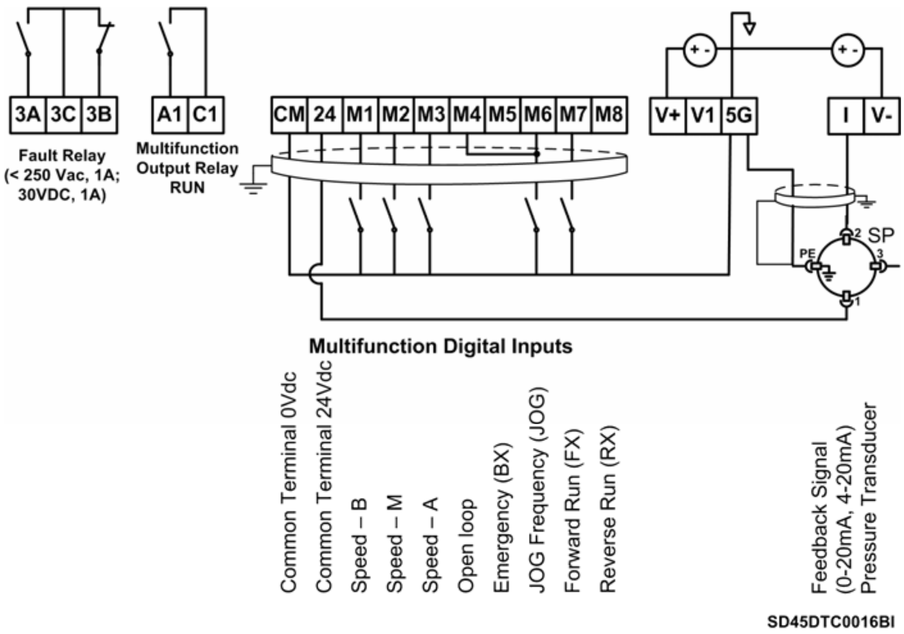


Figure 12.3. Control of one pump, eight speed references and manual speed

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW. For inverters with a capacity lower than 30kW, user should join 5G and CM terminals.

12.4. Control of 2 Pumps, Four Speed References and Speed Reference by Keypad (Under-load) as Pressure Group. Without MMC Optional Board

12.4.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Pressure reference REF1	0.00	40.00% (20Hz) (Pressure reference , 20Hz x 2 =40% transducer range)
DRV-00R	Reference and feedback values of PID	R 0.0% F 0.0%	R = Displaying of the reference value in % F = Displaying of the feedback value in % of sensor range.
DRV-01	Acceleration time	Acc. Time	40.0sec
DRV-02	Deceleration time	Dec. Time	40.0sec
DRV-03	Start / Stop control mode	Drive mode	**Keypad:** Start / Stop by keypad. **Fx/Rx-1:** Start / Stop by terminals. **Int. 485:** Start / Stop through communication bus.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1, keypad – 2:** Frequency setting by keypad.
DRV-05	Pressure reference 1	Refer Perc-1	60.00% (Reference 1 – 30.00Hz)
DRV-06	Pressure reference 2	Refer Perc-2	70.00% (Reference 2 – 35.00Hz)
DRV-07	Pressure reference 3	Refer Perc-3	80.00% (Reference 3 – 40.00Hz)
FU1-23	Stop mode	Stop mode	**Decel:** Deceleration controlled by parameter DRV-02. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Deceleration not controlled. Stop by inertia. **Fluxe brake:** Fast stop using the energy regenerated to heat into the motor. (CAUTION WITH THIS OPTION).
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,5Hz – Minimum speed at the starting.
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 are available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	0.0sec – Delay time at the starting (optional).
FU1-85	Underload trip selection	ULT select	Yes
FU1-86	Underload level	ULT level	65% (Motor current at the frequency set in FU1-87).
FU1-87	Underload frequency	ULT freq	48.00Hz (Frequency for activating underload protection).
FU1-88	Underload time	ULT time	60.0sec
FU2-20	Restart after power supply fault	Power-on run	**Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-22	Speed search function	Speed Search	0100: Speed search activated after an instant power supply fault.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-44	No load current	Noload-Curr	? A (Calculated based on 55% of In)
FU2-48	Carrier frequency	Carrier freq	3.0 KHz
FU2-67	Torque boost setting	Torque boost	Manual

Parameter	Description	Display	Value
I/O-06	Filter of analogue current input I	I Filter	250ms (Filter of the analogue current input)
I/O-07	Minimum current of I input	I curr x1	4.00mA (Minimum current of I input)
I/O-08	Frequency for minimum current of I	I Freq y1	0Hz (Frequency for the minimum current of I input)
I/O-09	Maximum current of I input	I curr x2	20.00mA (Maximum current of I input)
I/O-10	Frequency for maximum current of I	I Freq y2	50Hz (Frequency for the maximum current of I input)
I/O-20	Configuration of M1 terminal	M1 define	Speed-L (Multi-speed 1)
I/O-21	Configuration of M2 terminal	M2 define	Speed-M (Multi-speed 2)
I/O-22	Configuration of M3 terminal	M3 define	Open-loop (When it is activated, it allows operating at manual speed)
I/O-25	Configuration of M6 terminal	M6 define	Jog frequency (Speed preset by parameter)
I/O-30	Setting of jog frequency	Jog Freq	80.00% (Speed preset by parameter – 40.00Hz)
I/O-76	Configuration for auxiliary relay	Aux mode1	MMC (Multiple motors control)
I/O-80	Configuration for fault relay	Relay mode	010 (Fault relay)
I/O-86	Selection of displaying units for V1 signal	V1 Unit Sel	**Percentage:** (if the feedback signal is V1). Only thus it will appear the parameter DRV-00R.
I/O-87	Selection of displaying units for I signal	I Unit Sel	**Percentage:** (if the feedback signal is I). Only thus it will appear the parameter DRV-00R.
I/O-88	Selection of displaying units for A0, B0 signal	PulseUnitSel	**Percentage:** (if the feedback signal is A0, B0). Only thus it will appear the parameter DRV-00R.
APP-01	Activation of PID mode	proc PI mode	Yes
APP-02	Activation of pumps control	App. mode	MMC
APP-06	Feedback signal	PID F/B	I (4-20mA input)
APP-10	High freq. limit in PID	PID Limit-H	50.00Hz
APP-11	Low freq. limit in PID	PID Limit-L	20.00Hz
APP-33	Nbr of auxiliary motors	Nbr Aux's	1 (number of auxiliary motors for starting)
APP-40	Sleep delay time	Sleep Delay	20.0sec
APP-41	Sleep frequency 0	Sleep Freq0	39.00Hz (Freq. for activating sleep mode with the speed ref. 0 active)
APP-42	Sleep frequency 1	Sleep Freq1	39.00Hz (Freq. for activating sleep mode with the speed ref. 1 active)
APP-43	Sleep frequency 2	Sleep Freq2	39.00Hz (Freq. for activating sleep mode with the speed ref. 2 active)
APP-44	Sleep frequency 3	Sleep Freq3	39.00Hz (Freq. for activating sleep mode with the speed ref. 3 active)
APP-49	Wake up level	WakeUp level	5.0% (Starting pressure REF – FBK) Example: ref. 1 = 35% and FBK= 30% Starting at 30% because APP-49 = 5%
APP-50	Start frequency of auxiliary motor 1	Start Freq 1	49.80Hz
APP-54	Stop frequency of auxiliary motor 1	Stop Freq 1	43.00 Hz
APP-58	Delay time before connecting aux. motors	Aux start DT	180.0sec
APP-59	Delay time before stopping aux. motors	Aux stop DT	17.0sec
APP-71	Pressure difference for starting aux. motors	Aux STT FB	2%
APP-72	Pressure difference for stopping aux. motors	Aux STP FB	0%

Depending on the status of the input terminals P1and P2, different programmed pressures can be selected:

Programmed pressure	Parameter	Speed-M (M2)	Speed-L (M1)
40.00% - 20.00Hz	DRV-00	0	0
60.00% - 30.00Hz	DRV-05	0	1
70.00% - 35.00Hz	DRV-06	1	0
80.00% - 40.00Hz	DRV-07	1	1

12.4.2. Connections Drawing

Terminals CM / M4 Change to manual speed set in parameter I/O-25 (NO status).
Terminals CM / M1: Terminal 1 (NO status).
Terminals CM / M2: Terminal 2 (NO status).
Terminals CM / M7: Start command.
Terminals A1/C1: Pump 2 start.
Terminals 3A, 3B, 3C: Fault relay.

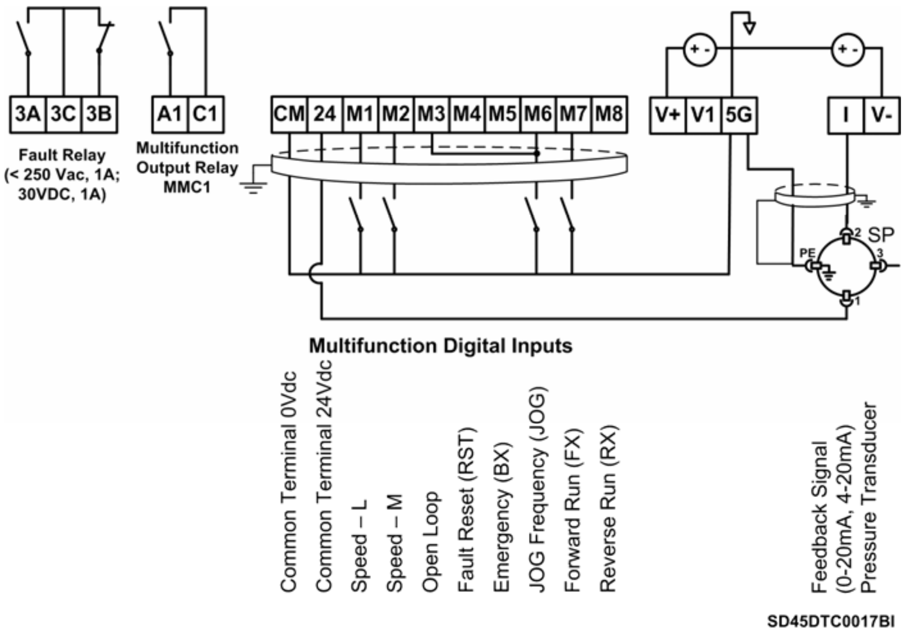


Figure 12.4. Control of two pumps, four speed references and speed reference by keypad as pressure group

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW. For inverters with a capacity lower than 30kW, user should join 5G and CM terminals.

12.5. Control of Four Pumps, Four Speed References and Speed Reference by Keypad (Under-load) as Pressure Group

12.5.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Pressure reference REF1	0.00	40.00% (20Hz) (Pressure reference, 20Hz x 2 =40% transducer range.)
DRV-00R	Reference and feedback value of PID	R 0.0% F 0.0%	R = Displaying of the reference value in % F = Displaying of the feedback value in % of sensor range.
DRV-01	Acceleration time	Acc. Time	10.0sec
DRV-02	Deceleration time	Dec. Time	10.0sec
DRV-03	Start / Stop control mode	Drive mode	**Keypad:** Start / Stop by terminals. **Fx/Rx-1:** Start / Stop by terminals. **Int. 485:** Start / Stop through communication bus.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1, Keypad – 2:** Frequency setting by keypad.
DRV-05	Pressure reference 1	Refer Perc-1	60.00% (Reference 1 – 30.00Hz)
DRV-06	Pressure reference 2	Refer Perc-2	70.00% (Reference 2 – 35.00Hz)
DRV-07	Pressure reference 3	Refer Perc-3	80.00% (Reference 3 – 40.00Hz)
FU1-23	Stop mode	Stop mode	**Decel:** Deceleration controlled by parameter DRV-02. **DC brake:** Inverter will stop by a DC current injection. **Free run:** Deceleration not controlled. Stop by inertia. **Fluxe brake:** Fast stop using the energy regenerated to heat into the motor. (CAUTION WITH THIS OPTION).
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,2Hz – Minimum speed at the starting.
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 are available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	0.0sec – Delay time at the starting (optional).
FU1-85	Underload trip selection	ULT select	Yes
FU1-86	Underload level	ULT level	60% (Motor current at the frequency set in FU1-87).
FU1-87	Underload frequency	ULT freq	50.00Hz (Frequency for activating underload protection).
FU1-88	Underload time	ULT time	60.0sec
FU2-20	Restart after power supply fault	Power-on run	**No:** Inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	3.0 KHz
FU2-67	Torque boost setting	Torque boost	Manual

Parameter	Description	Display	Value
I/O-06	Filter of analogue current input I	I Filter	250ms (Filter of the analogue current input)
I/O-07	Minimum current of I input	I curr x1	4.00mA (Minimum current of I input)
I/O-08	Frequency for minimum current of I	I Freq y1	0Hz (Frequency for the minimum current of I input)
I/O-09	Maximum current of I input	I curr x2	20.00mA (Maximum current of I input)
I/O-10	Frequency for maximum current of I	I Freq y2	50Hz (Frequency for the maximum current of I input)
I/O-20	Configuration of M1 terminal	M1 define	Speed-L (Multi-speed 1)
I/O-21	Configuration of M2 terminal	M2 define	Speed-M (Multi-speed 2)
I/O-22	Configuration of M3 terminal	M3 define	Open-loop (When it is activated, it allows operating at manual speed)
I/O-25	Configuration of M6 terminal	M6 define	Jog frequency (Speed preset by parameter)
I/O-30	Jog frequency	Jog Freq	80.00% (Speed preset by parameter – 40.00Hz)
I/O-76	Config. for aux. relay 1	Aux mode1	Run (Programmable relay is activated when the inverter is running)
I/O-80	Config. for fault relay	Relay mode	010 (Fault relay)
I/O-86	Selection of displaying units for V1 signal	V1 Unit Sel	**Percentage:** (if the feedback signal is V1). Only thus it will appear the parameter DRV-00R.
I/O-87	Selection of displaying units for I signal	I Unit Sel	**Percentage:** (if the feedback signal is I). Only thus it will appear the parameter DRV-00R.
I/O-88	Selection of displaying units for A0, B0 signal	PulseUnitSel	**Percentage:** (if the feedback signal is A0, B0). Only thus it will appear the parameter DRV-00R.
APP-01	Activation of PID mode	proc PI mode	Yes
APP-02	Activ. of pumps control	App. mode	MMC
APP-06	Feedback signal	PID F/B	I (4-20mA input)
APP-10	High freq. limit in PID	PID Limit-H	50.00Hz
APP-11	Low freq. limit in PID	PID Limit-L	20.00Hz
APP-15	Output inversion in PID	PID Out Inv.	Yes or No (depending on the application).
APP-31	Connection order of auxiliary pumps	Starting Aux	1 (The connection will start for the auxiliary motor 1).
APP-33	Nbr of auxiliary motors	Nbr Aux's	4 (number of auxiliary motors for starting)
APP-40	Sleep delay time	Sleep Delay	6.0sec
APP-41	Sleep frequency 0	Sleep freq0	39.00Hz (Freq. for activating sleep mode with the speed ref. 0 active)
APP-42	Sleep frequency 1	Sleep freq1	39.00Hz (Freq. for activating sleep mode with the speed ref. 1 active)
APP-43	Sleep frequency 2	Sleep freq2	39.00Hz (Freq. for activating sleep mode with the speed ref. 2 active)
APP-44	Sleep frequency 3	Sleep freq3	39.00Hz (Freq. for activating sleep mode with the speed ref. 3 active)
APP-49	Wake up level	WakeUp level	5.0% (Starting pressure REF–FBK). Example: ref.1= 35% and FBK= 30% Starting at 30% because APP-49 = 5%
APP-50	Start frequency of auxiliary motor 1	Start Freq 1	49.00Hz
APP-51	Start frequency of auxiliary motor 2	Start Freq 2	49.00Hz
APP-52	Start frequency of auxiliary motor 3	Start Freq 3	49.00Hz
APP-53	Start frequency of auxiliary motor 4	Start Freq 4	49.00Hz
APP-54	Stop frequency of auxiliary motor 1	Stop Freq 1	15.00 Hz
APP-55	Stop frequency of auxiliary motor 2	Stop Freq 2	15.00 Hz
APP-56	Stop frequency of auxiliary motor 3	Stop Freq 3	15.00 Hz
APP-57	Stop frequency of auxiliary motor 4	Stop Freq 4	15.00 Hz
APP-58	Delay time before connecting aux. motors	Aux start DT	20.0sec
APP-59	Delay time before stopping aux. motors	Aux stop DT	5.0sec
APP-71	Pressure difference for starting aux. motors	Aux STT FB	2%
APP-72	Pressure difference for stopping aux. motors	Aux STP FB	0%

Depending on the status of the input terminals M1and M2, different programmed pressures can be selected:

Programmed pressure	Parameter	Speed-M (M2)	Speed-L (M1)
80.00% - 40.00Hz	DRV-00	0	0
60.00% - 30.00Hz	DRV-05	0	1
70.00% - 35.00Hz	DRV-06	1	0
80.00% - 40.00Hz	DRV-07	1	1

12.5.2. Connections Drawing

Terminals CM / JOG: Change to manual speed set in parameter I/O-25 (NO status).
Terminals CM / M1: Terminal 1 (NO status).
Terminals CM / M2: Terminal 2 (NO status).
Terminals CM / M7: Start command.
Terminals A1 / C1: Start command of pump 1.
Terminals A2 / C2: Start command of pump 2.
Terminals A3 / C3: Start command of pump 3.
Terminals A4 / C4: Start command of pump 4.
Terminals 3A, 3C, 3B: Fault relay.

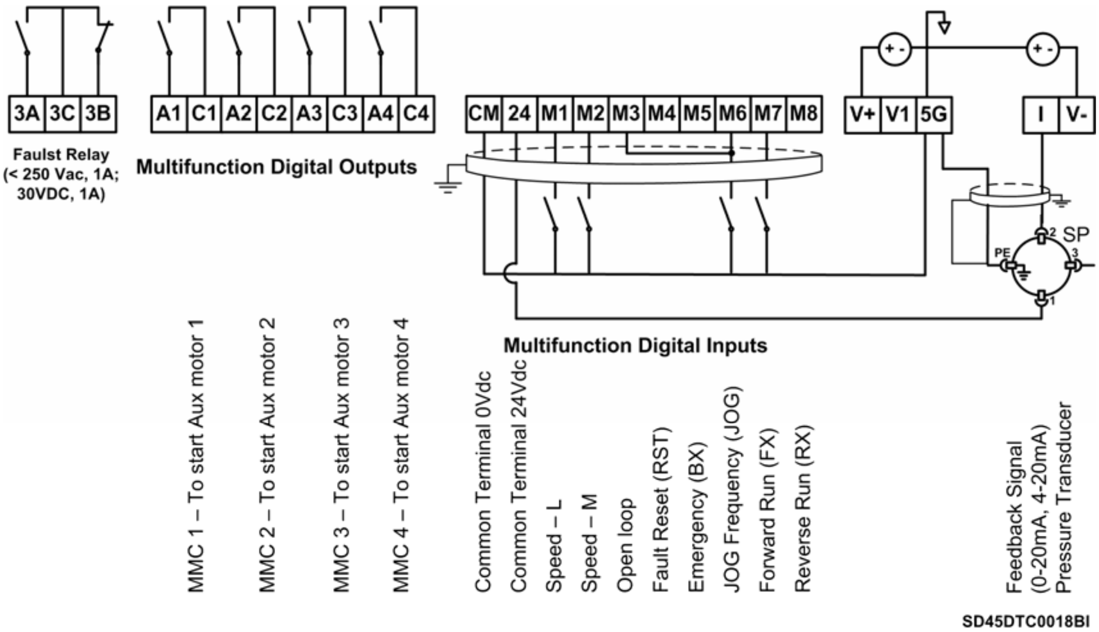


Figure 12.5. Control of four pumps, four speed references and speed reference by keypad as pressure group

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW. For inverters with a capacity lower than 30kW, user should join 5G and CM terminals.

12.6. Control of Speed by Pushbuttons

12.6.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Reference frequency	0.00	50.00Hz
DRV-01	Acceleration time	Acc. Time	30.0sec (It determines the acceleration ramp of the potentiometer).
DRV-02	Deceleration time	Dec. Time	30.0sec (It determines the deceleration ramp of the potentiometer).
DRV-03	Start / Stop control mode	Drive mode	**Fx/Rx-1:** Start / Stop by terminals.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1:** Frequency setting by keypad.
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,1Hz – Minimum speed at the starting.
FU1-33	Frequency limits selection	Freq limit	**Yes:** Limits are set in parameters FU1-34 and FU1-35.
FU1-34	Low frequency limit	F-limit Lo	25.00Hz
FU1-35	High frequency limit	F-limit Hi	50.00Hz
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-80	Save reference up / down	Up/Dn Save	**Yes:** The reference frequency, introduced by motorized potentiometer, will be memorized by the inverter.
FU1-81	Delay time at the starting	Run Delay T	5.0sec – Delay time at the starting.
FU2-20	Restart after power supply fault	Power-on run	**No:** inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	2.0 KHz
FU2-67	Torque boost setting	Torque boost	Manual
I/O-20	Configuration of M1 terminal	M1 define	3-Wire (Start / Stop by NC pushbutton)
I/O-21	Configuration of M2 terminal	M2 define	Up (Up speed NO pushbutton)
I/O-22	Configuration of M3 terminal	M3 define	Down (Down speed NO pushbutton)

12.6.2. Connections Drawing

Terminals CM / M7: Start pushbutton (NO status).
Terminals CM / M1: Stop pushbutton (NC status).
Terminals CM / M2: Up speed pushbutton (NO status).
Terminals CM / M3: Down speed pushbutton (NO status).

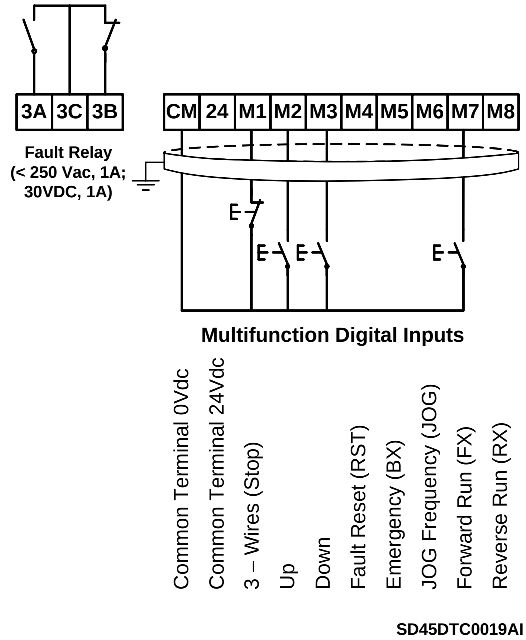


Figure 12.6. Control of speed by pushbuttons

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW.

Start command will be executed through a NO pushbutton between CM and M7 terminals. Stop command will be executed through a NC pushbutton between CM and M1 terminals. When the start command M7 is executed (CM common) the inverter will start holding the speed at 0.00Hz. When we press M2 pushbutton the speed will be increased up to minimum speed FU1-34, and if we follow pressing M2, the speed will follow being increased according to the acceleration ramp DRV-01. When we stop, the reference speed will be held if we activate the parameter FU1-80 (reference memorization).

12.7. Control of Four Pumps in Alternation mode and Four Speed References

12.7.1. Parameters Configuration

Parameter	Description	Display	Value
DRV-00	Pressure reference REF1	0.00	37.00% (18.50Hz) (Pressure reference, 18.50Hz x 2 =37.00% transducer range)
DRV-00R	Reference and feedback values of PID	R 37.0% F 0.0%	R = Displaying of the reference value in % F = Displaying of the feedback value in % of sensor range.
DRV-01	Acceleration time	Acc. Time	40.0sec
DRV-02	Deceleration time	Dec. Time	40.0sec
DRV-03	Start / Stop control mode	Drive mode	**Fx/Rx-1:** Start / Stop by terminals.
DRV-04	Frequency control mode	Freq mode	**Keypad – 1:** Frequency setting by keypad.
DRV-05	Pressure reference 1	Refer Porc-1	30.00% (Reference 1 – 15.00Hz)
DRV-06	Pressure reference 2	Refer Porc-2	40.00% (Reference 2 – 20.00Hz)
DRV-07	Pressure reference 3	Refer Porc-3	50.00% (Reference 3 – 25.00Hz)
FU1-29	Line frequency	Line Freq	50.00Hz – Frequency of the commercial line voltage.
FU1-30	Maximum frequency	Max Freq	50Hz – Maximum speed of the equipment.
FU1-31	Base frequency	Base Freq	50Hz – At this frequency, the inverter supplies the rated output voltage. Set this frequency according to the motor nameplate.
FU1-32	Start frequency	Start Freq	0,2Hz – Minimum speed at the starting.
FU1-49	Input voltage setting	VAC 400.4V – 91.0%	Setting of the commercial line voltage.
FU1-50	Motor rated voltage	Motor Volt	400V – Setting of the motor rated voltage.
FU1-60	Electronic thermal protection	ETH select	**Yes:** In this case, FU1-61 and FU1-62 are available.
FU1-61	Electronic thermal protection level for 1 minute	ETH 1min	150%
FU1-62	Electronic thermal protection level for continuous	ETH cont	105%
FU1-81	Delay time at the starting	Run Delay T	0.0sec – Delay time at the starting (optional).
FU2-20	Restart after power supply fault	Power-on run	**No:** Inverter will not restart after losing power supply and recovering it again. **Yes:** Inverter will restart after losing power supply and recovering it again.
FU2-21	Restart after fault reset	RST restart	**No:** Inverter will not restart after occuring a fault and resetting it. **Yes:** Inverter will restart after occuring a fault and resetting it.
FU2-40	Motor power setting	Motor select	3,7kW 5,5kW 7,5kW 11kW 15kW 18,5kW 22kW 30kW 37kW 45kW 55kW 75kW
FU2-41	Number of motor poles	Pole number	2 poles ≡ 3000 rpm 4 poles ≡ 1500 rpm 6 poles ≡ 750 rpm
FU2-43	Motor rated current	Rated-Curr	?A (Set the current according to the motor nameplate).
FU2-48	Carrier frequency	Carrier freq	3.0 KHz
FU2-67	Torque boost setting	Torque boost	Manual
I/O-06	Filter of analogue current input I	I Filter	250ms (Filter of the analogue current input)
I/O-07	Minimum current of I input	I curr x1	4.00mA (Minimum current of I input)
I/O-08	Frequency for minimum current of I	I Freq y1	0Hz (Frequency for the minimum current of I input)
I/O-09	Maximum current of I input	I curr x2	20.00mA (Maximum current of I input)
I/O-10	Frequency for maximum current of I	I Freq y2	50Hz (Frequency for the maximum current of I input)
I/O-20	Configuration of M1 terminal	M1 define	Interlock1 (Closed contact for out of service of auxiliary motor 1)
I/O-21	Configuration of M2 terminal	M2 define	Interlock2 (Closed contact for out of service of auxiliary motor 2)
I/O-22	Configuration of M3 terminal	M3 define	Interlock3 (Closed contact for out of service of auxiliary motor 3)

Parameter	Description	Display	Value
I/O-23	Configuration of M4 terminal	M4 define	Interlock4 (Closed contact for out of service of auxiliary motor 4)
I/O-24	Configuration of M5 terminal	M5 define	Speed-L (Multi-speed 1)
I/O-25	Configuration of M6 terminal	M6 define	Speed-M (Multi-speed 2)
I/O-76	Configuration for auxiliary relay 1	Aux mode1	MMC (Programmable relay for activating auxiliary motor 1)
I/O-77	Configuration for auxiliary relay 2	Aux mode2	MMC (Programmable relay for activating auxiliary motor 2)
I/O-78	Configuration for auxiliary relay 3	Aux mode3	MMC (Programmable relay for activating auxiliary motor 3)
I/O-79	Configuration for auxiliary relay 4	Aux mode4	MMC (Programmable relay for activating auxiliary motor 4)
I/O-80	Config. for fault relay	Relay mode	010 (Fault relay)
I/O-86	Selection of displaying units for V1 signal	V1 Unit Sel	**Percentage:** (If the feedback signal is V1). Only thus it will appear the parameter DRV-00R.
I/O-87	Selection of displaying units for I signal	I Unit Sel	**Percentage:** (If the feedback signal is I). Only thus it will appear the parameter DRV-00R.
I/O-88	Selection of displaying units for A0, B0 signal	PulseUnitSel	**Percentage:** (if the feedback signal is A0, B0). Only thus it will appear the parameter DRV-00R.
APP-01	Activation of PID mode	proc PI mode	Yes
APP-02	Activ. of pumps control	App. Mode	MMC
APP-06	Feedback signal	PID F/B	I (4-20mA input)
APP-07	Proportional gain in PID mode	PID P-Gain	100.0%
APP-08	Integral gain in PID mode	PID I-Time	0.5sec
APP-10	High freq. limit in PID	PID Limit-H	50.00Hz
APP-11	Low freq. limit in PID	PID Limit-L	20.00Hz
APP-15	Output inversion in PID	PID Out Inv.	No
APP-31	Connection order of auxiliary pumps	Starting aux	1 (The connection will start for the auxiliary motor 1).
APP-33	Nbr of auxiliary motors	Nbr Aux's	3 (number of auxiliary motors for starting)
APP-40	Sleep delay time	Sleep Delay	6.0sec
APP-41	Sleep frequency 0	Sleep Freq0	39.00Hz (Freq. for activating sleep mode with the speed ref. 0 active)
APP-42	Sleep frequency 1	Sleep Freq1	39.00Hz (Freq. for activating sleep mode with the speed ref. 1 active)
APP-43	Sleep frequency 2	Sleep Freq2	39.00Hz (Freq. for activating sleep mode with the speed ref. 2 active)
APP-44	Sleep frequency 3	Sleep Freq3	39.00Hz (Freq. for activating sleep mode with the speed ref. 3 active)
APP-49	Wake up level	WakeUp level	5.0% (Starting pressure REF–FBK). Example: ref.1= 35% and FBK= 30% Starting at 30% because APP-49 = 5%
APP-50	Start frequency of auxiliary motor 1	Start Freq 1	49.00Hz
APP-51	Start frequency of auxiliary motor 2	Start Freq 2	49.00Hz
APP-52	Start frequency of auxiliary motor 3	Start Freq 3	49.00Hz
APP-53	Start frequency of auxiliary motor 4	Start Freq 4	49.00Hz
APP-54	Stop frequency of auxiliary motor 1	Stop Freq 1	35.00 Hz
APP-55	Stop frequency of auxiliary motor 2	Stop Freq 2	35.00 Hz
APP-56	Stop frequency for auxiliary motor 3	Stop Freq 3	35.00 Hz
APP-57	Stop frequency for auxiliary motor 4	Stop Freq 4	35.00 Hz
APP-58	Delay time before connecting aux. motors	Aux start DT	180.0sec
APP-59	Delay time before stopping aux. motors	Aux stop DT	17.0sec
APP-60	Accel. time for the ramp of auxiliary motors	AUX AccTime	2.0 sec
APP-61	Dec. time for the ramp of auxiliary motors	AUX DecTime	2.0 sec
APP-66	Rotation mode (auto change) of aux. motors	AutoCh_Mode	**2:** Inverter rotates for all of the motors.
APP-67	Time for auto change	AutoEx-intv	**00:01:** Inverter will rotate if more than 1 minute has elapsed operating with the same motor.

Parameter	Description	Display	Value
APP-69	Detection of motors out of service	Inter-lock	**Yes:** Inverter will detect the motors that are out of service, and it will not consider them at the moment of connecting them until they are repaired.
APP-71	Pressure difference for starting aux. motors	Aux STT FB	2%
APP-72	Pressure difference for stopping aux. motors	Aux STP FB	0%

Depending on the status of the input terminals M5 and M6, different programmed pressures can be selected:

Programmed pressure	Parameter	Speed-M (M5)	Speed-L (M6)
37.00% - 18.50Hz	DRV-00	0	0
30.00% - 15.00Hz	DRV-07	0	1
40.00% - 20.00Hz	DRV-08	1	0
50.00% - 25.00Hz	DRV-09	1	1

12.7.2. Connections Drawing

Terminals CM / M7: Start command (NO status).
Terminals CM / M1: Thermal switch of Pump 1 (NC status).
Terminals CM / M2: Thermal switch of Pump 2 (NC status).
Terminals CM / M3: Thermal switch of Pump 3 (NC status).
Terminals CM / M4: Thermal switch of Pump 4 (NC status).
Terminals CM / M5: Selection of pressure reference (NO status).
Terminals CM / M6: Selection of pressure reference (NO status).
Terminals A1 / C1 (Aux Relay 1): Command of Contactor of Pump 1.
Terminals A2 / C2 (Aux Relay 2): Command of Contactor of Pump 2.
Terminals A3 / C3 (Aux Relay 3): Command of Contactor of Pump 3.
Terminals A4 / C4 (Aux Relay 4): Command of Contactor of Pump 4.

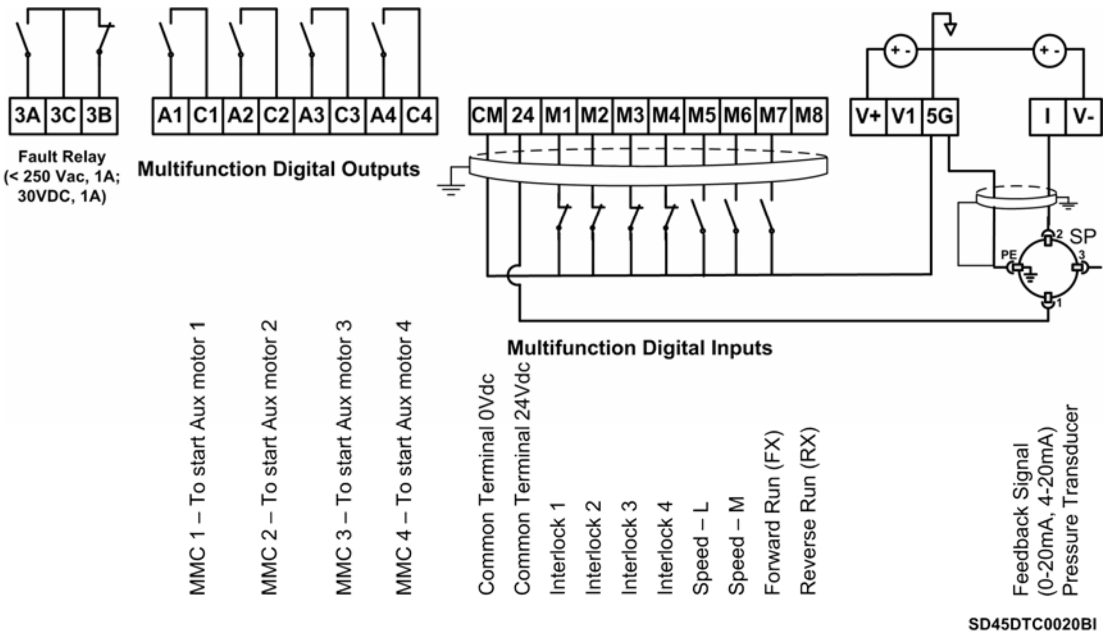


Figure 12.7. Control of four pumps in alternation mode and four speed references

Note: Control cables have to be screened and must be connected to the ground.
5G terminal will be CM terminal for inverters with a capacity equal or higher than 30kW. For inverters with a capacity lower than 30kW, user should join 5G and CM terminals.

13. CONFIGURATION REGISTER

VARIABLE SPEED DRIVE: SD450.
SERIAL No: MODEL:
APPLICATION:
DATE:
CUSTOMER:
NOTES:

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
	DRV GROUP: Basic functions and display parameters		
DRV-00 ► Cmd.Freq	0.00Hz	______	______
DRV-00 ► R 0.0%F 0.0%	0.0%	______	______
DRV-01 ► Acc. Time	20.0sec	______	______
DRV-02 ► Dec. Time	30.0sec	______	______
DRV-03 ► Drive mode	Fx/Rx-1	______	______
DRV-04 ► Freq mode	Keypad-1	______	______
DRV-05 ► Step Freq-1	10.00 Hz	______	______
DRV-06 ► Step Freq-2	20.00 Hz	______	______
DRV-07 ► Step Freq-3	30.00 Hz	______	______
DRV-08 ► Current	0.0 A	______	______
DRV-09 ► Speed	0rpm	______	______
DRV-10 ► DC link Vtg	----- V	______	______
DRV-11 ► User disp	Out 0.0 V	______	______
DRV-12 ► Fault	None	______	______
DRV-14 ► TAR / OUT	0.00Hz / 0.00Hz	______	______
DRV-15 ► REF / FBK	00.00% / 00.00%	______	______
DRV-16 ► Hz/Rpm Disp	Hz	______	______
DRV-18 R 0.0Hz T 0.0Hz F 0.0Hz O 0.0Hz	-	______	______
DRV-19 V1 0 V2 0 V1S 0 I 0	-	______	______
DRV-20 R 0.00% O 0.0% F 0.00% DRV-20	-	______	______
DRV-91 ► Drive mode2	Fx/Rx-1	______	______
DRV-92 ► Freq mode2	Keypad-1	______	______

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
	FU1 GROUP: Functions 1		
FU1-00 ► Jump code	1	________________	________________
FU1-01 ► Run Prev.	None	________________	________________
FU1-02 ► Acc. pattern	Linear	________________	________________
FU1-03 ► Dec. pattern	Linear	________________	________________
FU1-04 ► Start Curve	50%	________________	________________
FU1-05 ► End Curve	50%	________________	________________
FU1-10 ► Pre-Heat Mode	No	________________	________________
FU1-11 ► PreHeat Level	30%	________________	________________
FU1-12 ► PreHeat Perc	100%	________________	________________
FU1-20 ► Start mode	Accel	________________	________________
FU1-21 ► DC St time	0.0sec	________________	________________
FU1-22 ► DC St value	50%	________________	________________
FU1-23 ► Stop mode	Decel	________________	________________
FU1-24 ► DC Blk time	0.10sec	________________	________________
FU1-25 ► DC Br Frq	5.00Hz	________________	________________
FU1-26 ► DC Br time	1.0sec	________________	________________
FU1-27 ► DC Br value	50%	________________	________________
FU1-28 ► Safety Stop	No	________________	________________
FU1-29 ► Line Freq	50.00Hz	________________	________________
FU1-30 ► Max Freq	50.00Hz	________________	________________
FU1-31 ► Base Freq	50.00Hz	________________	________________
FU1-32 ► Start Freq	0.50Hz	________________	________________
FU1-33 ► Freq limit	No	________________	________________
FU1-34 ► F-limit Lo	0.50Hz	________________	________________
FU1-35 ► F-limit-Hi	50.00Hz	________________	________________
FU1-40 ► V/F pattern	Linear	________________	________________
FU1-41 ► User Freq 1	15.00Hz	________________	________________
FU1-42 ► User Volt 1	25%	________________	________________
FU1-43 ► User Freq 2	30.00Hz	________________	________________
FU1-44 ► User Volt 2	50%	________________	________________
FU1-45 ► User Freq 3	45.00Hz	________________	________________
FU1-46 ► User Volt 3	75%	________________	________________
FU1-47 ► User Freq 4	50.00Hz	________________	________________
FU1-48 ► User Volt 4	100%	________________	________________
FU1-49 ► VAC 400.4V	91.0%	________________	________________
FU1-50 ► Motor Volt	400V	________________	________________
FU1-51 ► Energy save	None	________________	________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
FU1-52 ► Manual save %	0%	__________	__________
FU1-54 ► KiloWattHour	0M 0.0kW	__________	__________
FU1-55 ► Inv. Temp.	25	__________	__________
FU1-56 ► Motor Temp.	0	__________	__________
FU1-60 ► ETH select	Yes	__________	__________
FU1-61 ► ETH 1min	150%	__________	__________
FU1-62 ► ETH cont	105%	__________	__________
FU1-63 ► Motor type	Self-cool	__________	__________
FU1-64 ► OL level	110%	__________	__________
FU1-65 ► OL time	10.0sec	__________	__________
FU1-66 ► OLT select	Yes	__________	__________
FU1-67 ► OLT level	120%	__________	__________
FU1-68 ► OLT time	60.0sec	__________	__________
FU1-69 ► Trip select	100	__________	__________
FU1-70 ► Stall prev.	000	__________	__________
FU1-71 ► Stall level	100%	__________	__________
FU1-72 ► Acc/Dec ch F	0.00Hz	__________	__________
FU1-73 ► Acc/Dec Freq	Max	__________	__________
FU1-74 ► Time scale	0.1sec	__________	__________
FU1-80 ► Up/Dn Save	No	__________	__________
FU1-81 ► Run Delay T	0.0sec	__________	__________
FU1-85 ► ULT select	No	__________	__________
FU1-86 ► ULT level	30%	__________	__________
FU1-87 ► ULT Freq	15.00Hz	__________	__________
FU1-88 ► ULT time	0.0sec	__________	__________
FU1-90 ► STOP Inertia	8	__________	__________
FU2 GROUP: Functions 2			
FU2-00 ► Jump code	40	__________	__________
FU2-01 ► Last trip-1	None	__________	__________
FU2-02 ► Last trip-2	None	__________	__________
FU2-03 ► Last trip-3	None	__________	__________
FU2-04 ► Last trip-4	None	__________	__________
FU2-05 ► Last trip-5	None	__________	__________
FU2-06 ► Erase trips	No	__________	__________
FU2-07 ► Dwell time	0.0sec	__________	__________
FU2-08 ► Dwell Freq	5.00Hz	__________	__________
FU2-10 ► Jump Freq	No	__________	__________
FU2-11 ► jump Lo 1	10.00Hz	__________	__________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
FU2-12 ► jump Hi 1	15.00Hz	________________	________________
FU2-13 ► jump Lo 2	20.00Hz	________________	________________
FU2-14 ► jump Hi 2	25.00Hz	________________	________________
FU2-15 ► jump Lo 3	30.00Hz	________________	________________
FU2-16 ► jump Hi 3	35.00Hz	________________	________________
FU2-20 ► Power-on run	No	________________	________________
FU2-21 ► RST restart	No	________________	________________
FU2-22 ► Speed Search	0000	________________	________________
FU2-23 ► SS P-Gain	200	________________	________________
FU2-24 ► SS I-Gain	500	________________	________________
FU2-25 ► Retry number	0	________________	________________
FU2-26 ► Retry delay	1.0sec	________________	________________
FU2-40 ► Motor select	__._kW	________________	________________
FU2-41 ► Pole number	4	________________	________________
FU2-42 ► Rated-Slip	_.__Hz	________________	________________
FU2-43 ► Rated-Curr	__._A	________________	________________
FU2-44 ► Noload-Curr	__._A	________________	________________
FU2-45 ► Efficiency	__%	________________	________________
FU2-46 ► Inertia rate	0	________________	________________
FU2-47 ► RPM factor	100%	________________	________________
FU2-48 ► Carrier freq	_._kHz	________________	________________
FU2-49 ► PWM Select	Normal1	________________	________________
FU2-60 ► Control mode	V/F	________________	________________
FU2-61 ► Auto Tuning	No	________________	________________
FU2-62 ► Rs	_.___ohm	________________	________________
FU2-63 ► Lsigma	_.__mH	________________	________________
FU2-64 ► PreEx Time	1.0sec	________________	________________
FU2-65 ► SL P-Gain	1000	________________	________________
FU2-66 ► SL I-Gain	100	________________	________________
FU2-67 ► Torque boost	Manual	________________	________________
FU2-68 ► Fwd boost	2.0%	________________	________________
FU2-69 ► Rev boost	2.0%	________________	________________
FU2-80 ► PowerOndisp	0	________________	________________
FU2-81 ► User disp	Volts	________________	________________
FU2-82 ► S/W PE x.x	S/W PE 1.1 Ver 0.3	________________	________________
FU2-83 ► LastTripTime	0:00:00:00:00	________________	________________
FU2-84 ► On-Time	0:00:00:00:00	________________	________________
FU2-85 ► Run-time	0:00:00:00:00	________________	________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
FU2-87 ► Power Set	100.0%		
FU2-90 ► Para. disp	Default		
FU2-91 ► Para. read	No		
FU2-92 ► Para. write	No		
FU2-93 ► Para. init	No		
FU2-94 ► Para. lock	0		
FU2-95 ► Para. save	No		
I/O GROUP: Inputs and Outputs			
I/O-00 ► Jump code	1		
I/O-01 ► V1 Filter	250ms		
I/O-02 ► V1 volt x1	0.00V		
I/O-03 ► V1 Freq y1	0.00Hz		
I/O-04 ► V1 volt x2	10.00V		
I/O-05 ► V1 Freq y2	50.00Hz		
I/O-06 ► I Filter	250ms		
I/O-07 ► I curr x1	4.00mA		
I/O-08 ► I Freq y1	0.00Hz		
I/O-09 ► I curr x2	20.00mA		
I/O-10 ► I Freq y2	50.00Hz		
I/O-11 ► P pulse set	(A)		
I/O-12 ► P Filter	10ms		
I/O-13 ► P pulse x1	0.0kHz		
I/O-14 ► P Freq y1	0.00Hz		
I/O-15 ► P pulse x2	10.0kHz		
I/O-16 ► P Freq y2	50.00Hz		
I/O-17 ► Wire broken	None		
I/O-18 ► Lostcommand	None		
I/O-19 ► Time out	1.0sec		
I/O-20 ► M1 define	Speed-L		
I/O-21 ► M2 define	Speed-M		
I/O-22 ► M3 define	Speed-H		
I/O-23 ► M4 define	RST		
I/O-24 ► M5 define	BX		
I/O-25 ► M6 define	JOG		
I/O-26 ► M7 define	FX		
I/O-27 ► M8 define	RX		
I/O-28 ► In status	00000000000		
I/O-29 ► Ti Filt Num	15ms		

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
I/O-30 ► Jog Freq	10.00Hz	__________	__________
I/O-31 ► Step Freq-4	40.00Hz	__________	__________
I/O-32 ► Step Freq-5	50.00Hz	__________	__________
I/O-33 ► Step Freq-6	40.00Hz	__________	__________
I/O-34 ► Step Freq-7	30.00Hz	__________	__________
I/O-35 ► Step Freq-8	20.00Hz	__________	__________
I/O-36 ► Step Freq-9	10.00Hz	__________	__________
I/O-37 ► Step Freq-10	20.00Hz	__________	__________
I/O-38 ► Step Freq-11	30.00Hz	__________	__________
I/O-39 ► Step Freq-12	40.00Hz	__________	__________
I/O-40 ► Step Freq-13	50.00Hz	__________	__________
I/O-41 ► Step Freq-14	40.00Hz	__________	__________
I/O-42 ► Step Freq-15	30.00Hz	__________	__________
I/O-50 ► Acc time-1	20.0sec	__________	__________
I/O-51 ► Dec time-1	20.0sec	__________	__________
I/O-52 ► Acc time-2	30.0sec	__________	__________
I/O-53 ► Dec time-2	30.0sec	__________	__________
I/O-54 ► Acc time-3	40.0sec	__________	__________
I/O-55 ► Dec time-3	40.0sec	__________	__________
I/O-56 ► Acc time-4	50.0sec	__________	__________
I/O-57 ► Dec time-4	50.0sec	__________	__________
I/O-58 ► Acc time-5	40.0sec	__________	__________
I/O-59 ► Dec time-5	40.0sec	__________	__________
I/O-60 ► Acc time-6	30.0sec	__________	__________
I/O-61 ► Dec time-6	30.0sec	__________	__________
I/O-62 ► Acc time-7	20.0sec	__________	__________
I/O-63 ► Dec time-7	20.0sec	__________	__________
I/O-68 ► S0 Level	0.0%	__________	__________
I/O-69 ► S1 Level	0.0%	__________	__________
I/O-70 ► S0 mode	Frequency	__________	__________
I/O-71 ► S0 adjust	100%	__________	__________
I/O-72 ► S1 mode	Voltage	__________	__________
I/O-73 ► S1 adjust	100%	__________	__________
I/O-74 ► FDT Freq	30.00Hz	__________	__________
I/O-75 ► FDT band	10.00Hz	__________	__________
I/O-76 ► Aux mode1	None	__________	__________
I/O-77 ► Aux mode2	None	__________	__________
I/O-78 ► Aux mode3	None	__________	__________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
I/O-79 ► Aux mode4	None	__________	__________
I/O-80 ► Relay mode	010	__________	__________
I/O-81 ► Out status	00000000	__________	__________
I/O-82 ► Relay On	0.0sec	__________	__________
I/O-83 ► Relay Off	0.0sec	__________	__________
I/O-84 ► Fan Con.Sel	PowerOn Fan	__________	__________
I/O-85 ► Fan Temp	70	__________	__________
I/O-86 ► V1 Unit Sel	Speed	__________	__________
I/O-87 ► I Unit Sel	Speed	__________	__________
I/O-88 ► PulseUnitSel	Speed	__________	__________
I/O-90 ► Inv No.	1	__________	__________
I/O-91 ► Baud rate	9600bps	__________	__________
I/O-92 ► COM Lost Cmd	None	__________	__________
I/O-93 ► COM Time Out	1.0sec	__________	__________
I/O-94 ► Delay time	5ms	__________	__________
I/O-95 ► In NO/NC Set	00000000000	__________	__________
I/O-96 ► In Check Time	1ms	__________	__________
I/O-97 ► OH Trip Sel	010	__________	__________
I/O-98 ► MotTripTemp	110	__________	__________
APP GROUP: Applications			
APP-00 ► Jump code	1	__________	__________
APP-01 ► proc PI mode	No	__________	__________
APP-02 ► App. mode	None	__________	__________
APP-04 ► AuxRefMode	No	__________	__________
APP-05 ► Aux Ref Sel	V1	__________	__________
APP-06 ► PID F/B	I	__________	__________
APP-07 ► PID P-Gain	100.0%	__________	__________
APP-08 ► PID I-Time	0.5sec	__________	__________
APP-09 ► PID D-Time	0.0ms	__________	__________
APP-10 ► PID Limit-H	50.00Hz	__________	__________
APP-11 ► PID Limit-L	0.50Hz	__________	__________
APP-12 ► PID OutScale	100.0%	__________	__________
APP-13 ► PID P2-Gain	100.0%	__________	__________
APP-14► P-gain Scale	100.0%	__________	__________
APP-15 ► PID Out Inv.	No	__________	__________
APP-17 ► PID U Fbk	No	__________	__________
APP-18 ► FB Filter	10ms	__________	__________
APP-20 ► 2nd Acc time	5.0sec	__________	__________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
APP-21 ► 2nd Dec time	10.0sec	________________	________________
APP-22 ► 2ndBaseFreq	50.00Hz	________________	________________
APP-23 ► 2 nd V/F	Linear	________________	________________
APP-24 ► 2nd F-boost	2.0%	________________	________________
APP-25 ► 2nd R-boost	2.0%	________________	________________
APP-26 ► 2nd Stall	100%	________________	________________
APP-27 ► 2ndETH1min	130%	________________	________________
APP-28 ► 2ndETH cont	120%	________________	________________
APP-29 ► 2nd R-Curr	_._A	________________	________________
APP-30 ► Aux Mot Run	0	________________	________________
APP-31 ► Starting Aux	1	________________	________________
APP-32 ► AutoOp Time	00:00	________________	________________
APP-33 ► Nbr Aux's	4	________________	________________
APP-40 ► Sleep Delay	60.0sec	________________	________________
APP-41 ► Sleep Freq0	0.00Hz	________________	________________
APP-42 ► Sleep Freq1	0.00Hz	________________	________________
APP-43 ► Sleep Freq2	0.00Hz	________________	________________
APP-44 ► Sleep Freq3	0.00Hz	________________	________________
APP-45 ► Sleep Freq4	0.00Hz	________________	________________
APP-46 ► Sleep Freq5	0.00Hz	________________	________________
APP-47 ► Sleep Freq6	0.00Hz	________________	________________
APP-48 ► Sleep Freq7	0.00Hz	________________	________________
APP-49 ► WakeUp level	2.0%	________________	________________
APP-50 ► Start Freq 1	49.50Hz	________________	________________
APP-51 ► Start Freq 2	49.50Hz	________________	________________
APP-52 ► Start Freq 3	49.50Hz	________________	________________
APP-53 ► Start Freq 4	49.50Hz	________________	________________
APP-54 ► Stop Freq 1	20.00Hz	________________	________________
APP-55 ► Stop Freq 2	20.00Hz	________________	________________
APP-56 ► Stop Freq 3	20.00Hz	________________	________________
APP-57 ► Stop Freq 4	20.00Hz	________________	________________
APP-58 ► Aux start DT	5.0sec	________________	________________
APP-59 ► Aux stop DT	5.0sec	________________	________________
APP-60 ► AUX AccTime	2.0sec	________________	________________
APP-61 ► AUX DecTime	2.0sec	________________	________________
APP-66► AutoCh_Mode	0	________________	________________
APP-67 ► AutoExt-intv	72:00	________________	________________
APP-69 ► Inter-lock	No	________________	________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
APP-71 ► Aux STT FB	2%	________________	________________
APP-72 ► Aux STP FB	0%	________________	________________
APP-74 ► PrePID Freq	0.00Hz	________________	________________
APP-75 ► PrePID F/B	0.0%	________________	________________
APP-76 ► PrePID dly	600sec	________________	________________
APP-77► Pbroken mode	No	________________	________________
APP-80 ► Ext PI mode	No	________________	________________
APP-81 ► Ext Ref Sel	Keypad	________________	________________
APP-82 ► Ext Ref Perc	50.00%	________________	________________
APP-83 ► Ext Fbk Sel	I	________________	________________
APP-85 ► ExtPID Pgain	1.0%	________________	________________
APP-86 ► ExtPID Itime	10.0sec	________________	________________
APP-87 ► ExtPID Dtime	0ms	________________	________________
APP-88 ► ExtPID lmt-H	100.00%	________________	________________
APP-89 ► ExtPID lmt-L	0.00%	________________	________________
APP-90 ► ExtPID Scale	100.0%	________________	________________
APP-91 ► Ext P2-gain	100.0%	________________	________________
APP-92 ► Ext P Scale	100.0%	________________	________________
APP-93 ► ExtPID Fgain	0.0%	________________	________________
APP-95 ► ExtPIDOutInv	No	________________	________________
APP-97 ► ExtLoopTime	100ms	________________	________________

POWER ELECTRONICS

24 hours technical assistance, 365 days a year

HEAD OFFICE | **C/ Leonardo da Vinci, 24 - 26, Parque Tecnológico · 46980 · Paterna · Valencia · Tel. +34 96 136 65 57· Fax. +34 96 131 82 01 | www.power-electronics.com**

SPANISH BRANCHES:

ARAGÓN Y LA RIOJA:	C/. Madre Rafols, 2 · Edificio Aida, 9ª-Ofic. 4 · 50004 · ZARAGOZA · Tel. +34 976 282 016 · Fax. +34 976 435 862
CATALUÑA:	Avda. de la Ferrería, 86 - 88 · 08110 · MONTCADA I REIXAC · BARCELONA ·Tel. +34 93 575 33 22 · Fax. +34 93 564 47 52
CENTRO:	Avda. Rey Juan Carlos I,84, 2ª-15 · 28916 · LEGANES · MADRID · Tel. +34 91 688 36 00 · Fax. +34 91 687 53 84
LEVANTE:	Leonardo da Vinci, 24 - 26 · Parque Tecnológico Paterna · 46980 · PATERNA · VALENCIA · Tel. +34 96 136 65 57 · Fax. +34 96 131 82 01 C/ Jorge Juan, 52 – Bajo · 12006 CASTELLÓN · Tel. 964 340 378 · Fax. 964 341 495 Pol. Residencial Santa Ana · Avda. Venecia, 17 · 30319 · CARTAGENA · MURCIA · Tel. +34 968 53 51 94 · Fax. +34 968 126 623
NORTE:	Parq. Tecnológico Vizcaya, Edificio 103, Planta 1ª · 48170 ·ZAMUDIO · BILBAO · Tel. +34 96 136 65 57 · Fax. +34 944 31 79 08
SUR:	C/ Averroes, 6, Edificio Eurosevilla · 41020 · SEVILLA · Tel. +34 95 426 01 43 · Fax. +34 95 451 57 73
CANARIAS:	C/ Valle Inclán, 9 ·35200 · TELDE · LAS PALMAS · Tel. +34 96 136 65 57 · Fax. +34 92 869 29 52
GERMANY:	Power Electronics Deutschland GmbH Conradtystrasse, 41 D-902441 · NÜRNBERG · Tel. +49 (911) 99 43 99 0 · Fax +49 (911) 99 43 99 8

www.power-electronics.com