SDRIVE
250 Series

VARIABLE SPEED DRIVE

variable speed drive

Getting Started Manual

POWER ELECTRONICS

SDRIVE
250 Series

VARIABLE SPEED DRIVE

frequency converter

Getting Started Manual

Edition: july 2006

SD25IM01CI Rev. C

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 july 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
01 / 03 / 2006	A	Updated software version SW UE 1.7
01 / 07 / 2006	B	Updated MODBUS communication
12 / 07 / 2006	C	Updated chapter OPTIONS

INDEX

SAFETY INSTRUCTIONS

IMPORTANT!

- Safety instructions showed in this manual are useful to teach user how to use the product in a correct and safety way with the purpose of preventing possible personal injuries or property damages.
- Safety messages included here are classified as it 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 the 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, fire or accident could occur.

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

WARNINGS

RECEPTION

- The SDRIVE 250 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 250 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.
- Do not drop the inverter or subject it to impact.
- The SDRIVE 250 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 250 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.
- Maximum length recommended of used cables for connecting the inverter and the motor is 50m. For longer distances, consult with 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 inverter, initialise all parameters back to factory default values.

EARTH CONNECTION

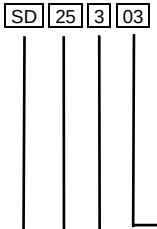
- The inverter is a high frequency switching device, and leakage current may flow. Ground the inverter to avoid electrical shock. Use caution to prevent the possibility of personal injury.
- Connect only to the dedicated ground terminal of the inverter. Do not use the case or the chassis screw for grounding.

- 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

EXAMPLE



CODE	CURRENT
01	1A
03	3A
...	...A

CODE	POWER SUPPLY
2	220V
3	400V

CODE	MODEL
25	250

CODE	SERIES
SD	SDRIVE

1.2. Power range

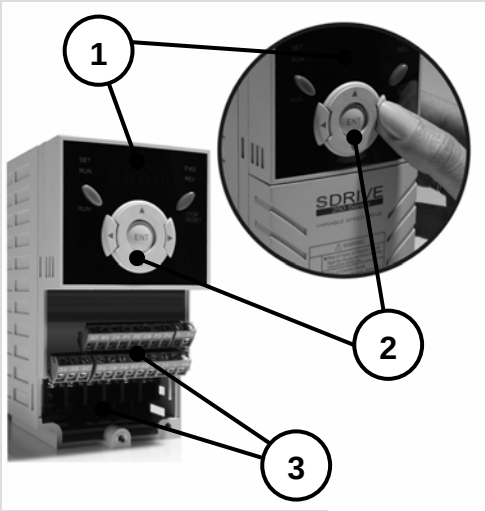
REFERENCE	FRAME	kW	I(A)
SD25203	1	0,4	3
SD25205		0,75	5
SD25301		0,4	1
SD25302		0,75	2
SD25208	2	1,5	8
SD25304		1,5	4
SD25212	3	2,2	12
SD25217		4	17
SD25306		2,2	4
SD25309		4	9
SD25224	4	5,5	24
SD25232		7,5	32
SD25312		5,5	12
SD25316		7,5	16

Standard motors: 4 POLE

Software version: S/W UE 1.x

1.3. Drive description

The SD250 Series offers a competitive solution within everybody reach, available in models up to 7,5kW, its great motor control and compact size make it ideal for any application.

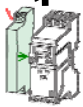
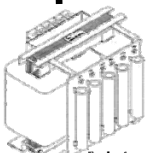


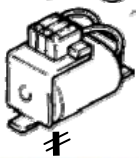
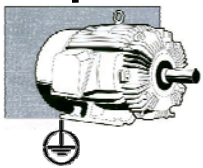
1. Display
2. Keypad
3. Power and Control terminals

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 made to ensure proper operation. An inverter incorrect application or installation can result in system malfunction or reduction in product life as well as component damage. This manual should be read and understood carefully before proceeding.

	AC Source Supply	Use the power supply within the range of inverter input power rating.
	MCCB or Ground leakage circuit breaker (ELB)	Select circuit breakers according to national and local legislation.
	Magnetic Contactor	Install it if it is necessary. When installed it do not use for the purpose of starting and stopping the inverter.
	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 inverter.

2.2. Environmental conditions

Check the environment conditions of the installation site.
Ambient temperature should not be below -10ºC (14ºF) or above 50ºC (122ºF).
Relative humidity should be below 90% (no condensation).
Altitude should be below 1.000m (3.300ft).

The inverter should be mounted on a vertical surface. Leave a sufficient space (horizontally and vertically) respect to adjacent equipment.

- A = Higher to 100mm
- B = Higher to 50mm

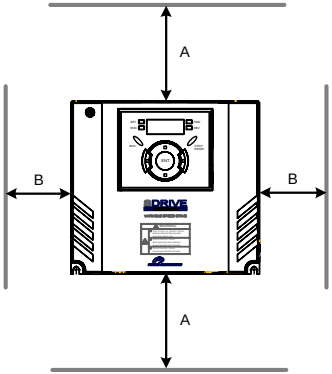


Figure 2.1 SDRIVE 250 mounting

When two or more inverters are installed or a cooling fan is mounted in a panel, the inverters and fan must be installed in proper positions with extreme care to keep the ambient temperature below the permissible range.

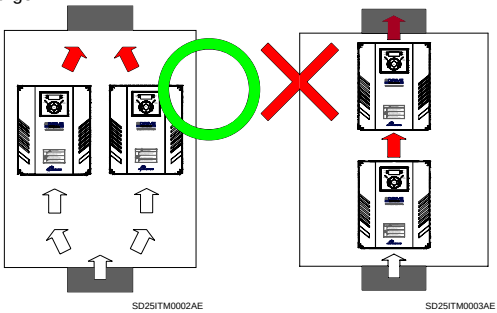


Figure 2.2 Multiple installation of inverters in a panel

Note: Take caution on proper heat ventilation when installing inverters and fans in a panel.

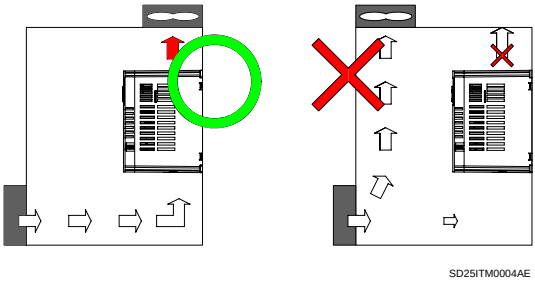


Figure 2.3 Inverter heat ventilation

2.3. Power terminals wiring

SYMBOL	DESCRIPTION
R	AC Line Voltage input
S	(3-phase, AC 200 ~ 230V)
T	(3-phase, AC 380 ~ 480V)
B1	Dynamic Brake Resistor connection terminals
B2	
U	Motor connection terminals
V	(3-phase, AC 200 ~ 230V)
W	(3-phase, AC 380 ~ 480V)
G	Ground

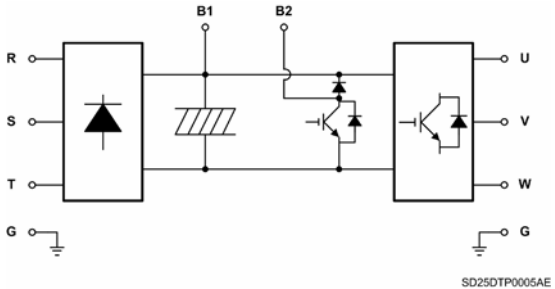


Figure 2.4 Connection of power terminals

2.3.1. Power terminals detail

Frame 1	SD25203 SD25205 SD25301 SD25302
Frame 2	SD25208 SD25304

Figure 2.5 Power terminals detail. Frames 1 and 2

Frame 3	SD25212 SD25217 SD25306 SD25309

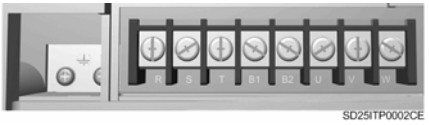


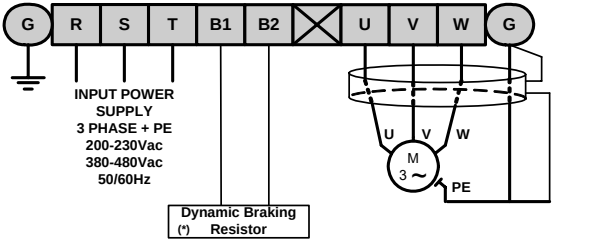
Figure 2.6 Power terminals detail. Frame 3

Frame 4	SD25224 SD25232 SD25312 SD25316

Figure 2.7 Power terminals detail. Frame 4

2.3.2. Configuration of Frames 1 and 2

This configuration is valid for Frame 1 (SD25203/05, SD25301/02) and Frame 2 (SD25203/05, SD25301/02) models.



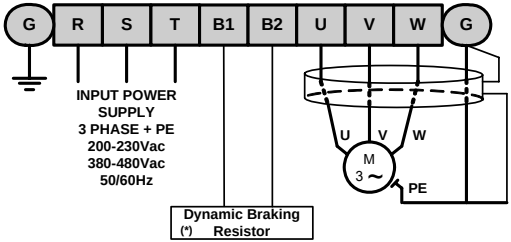
Motor cable shield should be connected to the drive and additionally to the general earth of the installation.
(*) Options

SD25DTP0001AI

Figure 2.8 Power connections for Frames 1 and 2

2.3.3. Configuration of Frame 3

This configuration is valid for Frame 3 models (SD25212/17, SD25306/09).



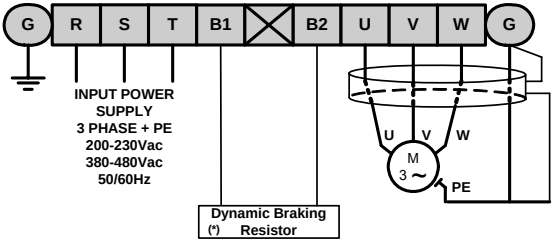
Motor cable shield should be connected to the drive and additionally to the general earth of the installation.
(*) Options

SD25DTP0002AI

Figure 2.9 Power connections for Frame 3

2.3.4. Configuration of Frame 4

This configuration is valid for Frame 4 models (SD25224/32, SD25312/16).



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

SD25DTP0003AI

Figure 2.10 Power connections for Frame 4

2.3.5. Wiring and cross section of terminals

Consult the following table for wiring, terminals cross section and necessary screws to connect the power input (R, S, T) and the output to the motor (U, V, W).

INVERTER			Terminal screw size	Screw torque[1] (Kgf·cm)	Cable[2]			
					mm²		AWG	
					R,S,T	U,V,W	R,S,T	U,V,W
SD25203	0,4kW	0,5CV	M3.5	10	2,5	2,5	14	14
SD25205	0,75kW	1CV	M3.5	10	2,5	2,5	14	14
SD25208	1,5kW	2CV	M3.5	10	2,5	2,5	14	14
SD25212	2,2kW	3CV	M4	15	2,5	2,5	14	14
SD25217	4kW	5,4CV	M4	15	4	4	12	12
SD25224	5,5kW	7,5CV	M5	25	6	6	10	10
SD25232	7,5kW	10CV	M5	25	10	10	8	8
SD25301	0,4Kw	0,5CV	M3.5	10	2,5	2,5	14	14
SD25302	0,75kW	1CV	M3.5	10	2,5	2,5	14	14
SD25304	1,5kW	2CV	M4	15	2,5	2,5	14	14
SD25306	2,2kW	3CV	M4	15	2,5	2,5	14	14
SD25309	4kW	5,4CV	M4	15	2,5	2,5	14	14
SD25312	5,5kW	7,5CV	M5	25	4	4	12	12
SD25316	7,5kW	10CV	M5	25	4	4	12	12

[1] 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.

[2] Use copper 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. Power supply and motor connection

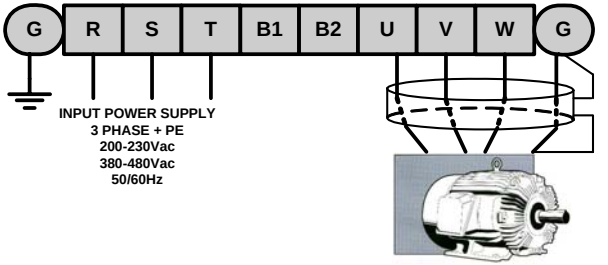


Figure 2.11 Power supply and motor connection

Power supply must be connected to the R, S, and T 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 control digital input (FX - P1 multi-function input) is on, the motor should be rotate counter clockwise when is viewed from the load side of the motor. If the motor rotate in the reverse, switch the U and V terminals.

2.5. Control terminals wiring

2.5.1. Control terminals detail

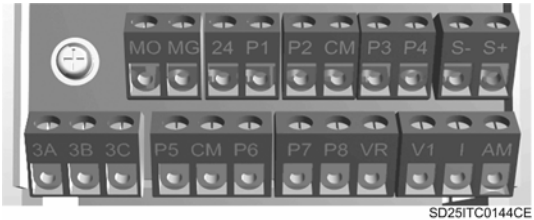


Figure 2.12 Detail 1 of control terminals

Connection precautions

Use screened or braided wires to connect the circuit control, separating these cables of the main power supply and other high voltage circuits.
We recommend the use of screened cables with a minimum section of 0.5mm² for control terminals connection.

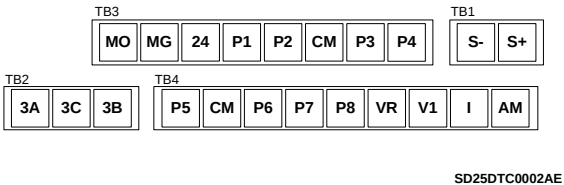


Figure 2.13 Detail 2 of control terminals

Control terminals description

TYPE		SYMBOL	NAME	DESCRIPTION
Input Signals	Digital Inputs	P1	Forward Run Command	When the contact is activated on this terminal, the inverter runs in forward direction and stops when the contact is deactivated (FX is the factory default). Also it can be configured as P1 – P8.
		P2	Reverse Run Command	When the contact is activated on this terminal, the inverter runs in reverse direction and stops when the contact is deactivated (RX is the factory default). Also it can be configured as P1 – P8.
		P3	Emergency Stop	When the contact is activated over this terminal (BX signal is ON) the inverter output is disconnected. When motor uses an electric brake to stop, BX function is used to disconnect the output signal. When BX signal is OFF and FX signal (or RX) is ON, The motor continues operating. Be careful. Also it can be configured as P1 – P8.
		P4	Fault Reset	When the contact is activated on this terminal, the inverter is reset after a failure occurs (RST is the factory default). Also it can be configured as P1 – P8.
		P5	Jog Operation	When the contact is activated on this terminal, the inverter runs in fixed speed programmed as JOG frequency and stops when the contact is deactivated (JOG Freq. Is the factory default). Also it can be configured as P1 – P8.
		P6, P7, P8	Configurable Digital Inputs 6, 7 and 8	Configurable input terminals where digital inputs are defined (Multi-step freq.-Low, Multi-step freq.-Middle and Multi-step freq.-High are the factory defaults) Also it can be configured as P1 – P8.
		CM	(NPN) Common / 24V Common	Common terminal for NPN input contacts and Common terminal for DC 24V external supply too.

Control terminals description

TYPE		SYMBOL	NAME	DESCRIPTION
Input Signals	Analogue Inputs	VR	Supply for Analog. signal (+12V)	Supply for the reference analogue signal (Potentiometer: 1 – 5kΩ). Maximum output: DC +10V, 100mA.
		V1	Reference Frequency signal (Voltage)	Terminal used for giving the inverter the speed reference, using a voltage supply between DC 0-10V.
		I	Reference Frequency signal (Current)	Terminal used for giving the inverter the speed reference, using a current supply between 0-20mA. (Internal resistor: 500Ω).
Output Signals	Digital Outputs	3A, 3C, 3B	Multi-function Relay	Active commutate contact (250Vac, 1A; 30Vdc, 1A). With fault: 3A-3C Close (3B-3C Open). Without fault: 3B-3C Close (3A-3C Open).
		MO	Multi-function Output for open collector	Below DC 26V, 100mA.
		MG	Ground terminal for external power supply	
	Analog. Outputs	AM	Multi-function Output Terminal	Multi-function output signal DC 0 – 10V, max. 100mA.
		24	(PNP) Common / DC 24V External power supply	DC 24V common terminal for PNP input contacts. It can be used for external power supply (maximum: +24V, 100mA).
RS485	Communications	S+, S-	RS485 High and Low signals	RS485 communication signals.

SD250 Series provides two operation modes to connect input signals: NPN or PNP. The corresponding methods of connection are showed below:

NPN mode: When S8 is set to NPN (high position). In this case, input terminals will be activated using internal power supply of the inverter. CM terminal (DC 24V GND) will be the common terminal for input signal contacts.

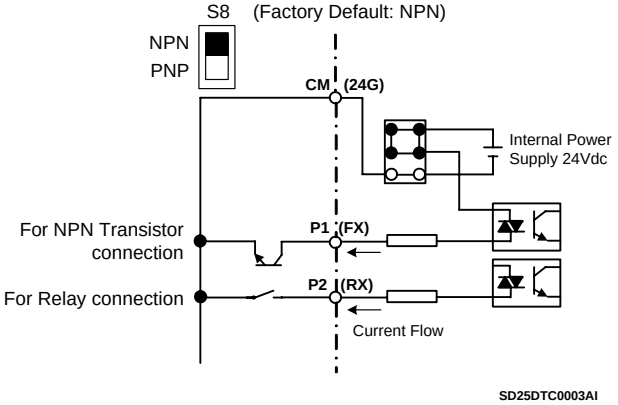


Figure 2.14 Control terminals in NPN configuration

PNP mode (external power supply): When S8 is set to PNP (low position). In this case, input terminals will be activated using DC 24V external power supply, but with the reference terminal joined to the inverter CM terminal. 24 terminal (DC 24V) of the above-mentioned power supply will be the common terminal for input signal contacts.

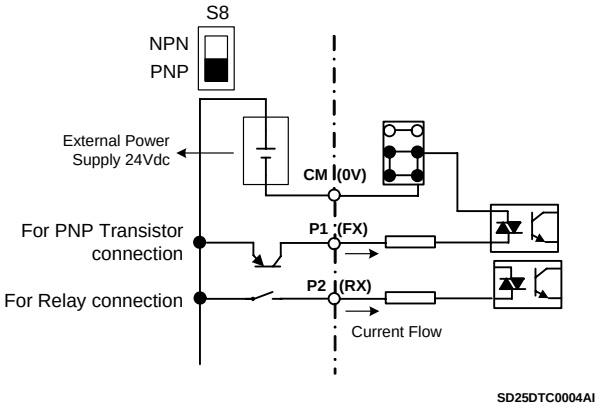


Figure 2.15 Control terminals in PNP configuration and external power supply

2.5.2. Basic connection of control terminals

Connection of digital input and output is common for all inverter powers, just as the following figure shows:

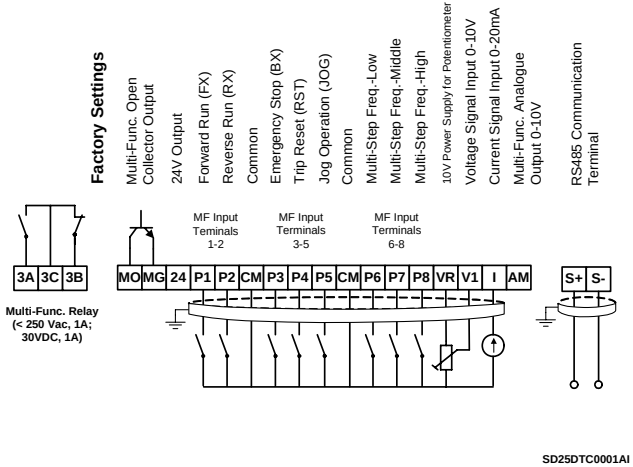


Figure 2.16 Basic connection of control terminals for SD250 Series

3. TECHNICAL CHARACTERISTICS

INPUT	Power supply	AC 200 to 230Vac (-15%, +10%) (3-phase) AC 380 to 480Vac (-15%, +10%) (3-phase)
	Input frequency	50 ÷ 60Hz ± 5%
	Input power factor	> 0.98 (of fundamental)
	Momentary power loss	> 15ms
OUTPUT	Motor output voltage	AC 0V to Input Voltage
	Overload capacity	150% for 60 seconds
	Frequency ratings	0.01Hz to ± 400Hz
	Efficiency (at full load)	>98%
	Control method	Space vector technology
	Carrier frequency	Maximum 15kHz
ENVIRONMENTAL CONDITIONS	Degree of 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 DC 0-10V input, DC ±10V, 1 4-20mA/0-20mA input
	Digital inputs	8 programmable inputs
	Analogue outputs	1 DC 0-10V input
	Relay outputs	1 change over multi-function relay (AC250V, 1A; DC30V, 1A) 1 open collector transistor relay (26Vdc, 100mA)
	Display unit	Digitally programmable with independent memory (optional)
	Communications port	RS485 ModBus RTU protocol (DeviceNet or Profibus optional)
	Dynamic braking unit	Integrated
	Normative	CE, UL, cUL, cTick

MOTOR PROTECTIONS	Motor thermal model Ground fault Overload warning Motor stall warning Dynamic brake resistor thermal model Torque limit and torque limit time (adjustable) Under voltage 20% dynamic brake duty cycle Input and output phase loss Phases current imbalance Stall protection Short circuit Over voltage Mean torque 100% of braking during 5sec Communications fault
SDRIVE 250 SETTINGS	Thermal model (software) IGBTs overload Over voltage fault Hardware fault Heatsink over temperature Output current limit Regeneration limit Cooling fan fault Pressure group function Double acceleration ramp Second motor setting

4. DIMENSIONS

4.1. Dimensions of Frame 1

REFERENCE	DIMENSIONS (mm.)								RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D	Ø	A	B	L	Y	W	X	H	Inverter + Filter
SD25203	128	119	70	65,5	130	4,0	4,5	4,0	175	161	76,5	53	40	0,76 + 1,2
SD25205	128	119	70	65,5	130	4,0	4,5	4,0	175	161	76,5	53	40	0,77 + 1,2
SD25301	128	119	70	65,5	130	4,0	4,5	4,0	175	161	76,5	53	40	0,76 + 1,2
SD25302	128	119	70	65,5	130	4,0	4,5	4,0	175	161	76,5	53	40	0,77 + 1,2

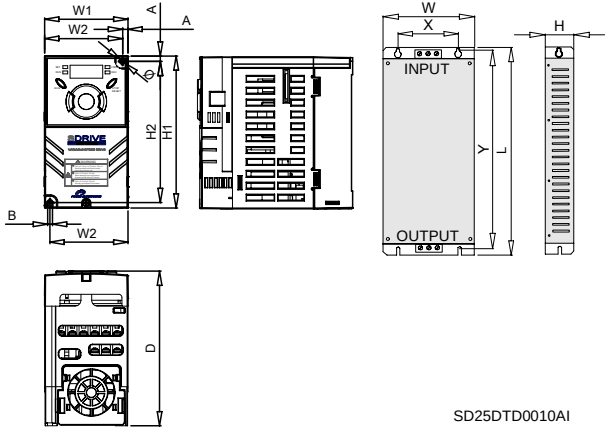


Figure 4.1 Dimensions of Frame 1

4.2. Dimensions of Frame 2

REFERENCE	DIMENSIONS (mm.)								RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D	Ø	A	B	L	Y	W	X	H	Inverter + Filter
SD25208	128	120	100	95,5	130	4,5	4,5	4,5	176,5	162,5	107,5	84	40	1,12 + 1,3
SD25304	128	120	100	95,5	130	4,5	4,5	4,5	176,5	162,5	107,5	84	40	1,12 + 1,3

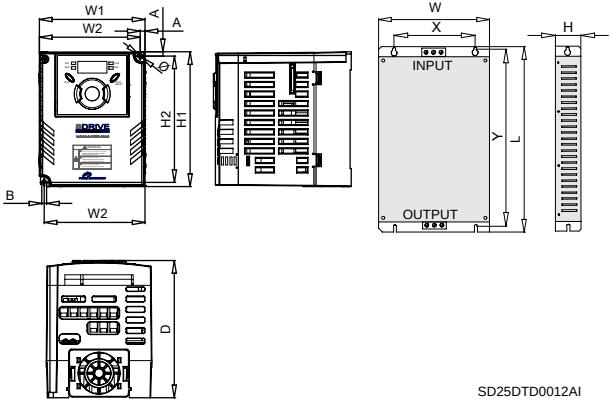


Figure 4.2 Dimensions of Frame 2

4.3. Dimensions of Frame 3

REFERENCE	DIMENSIONS (mm.)								RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D	Ø	A	B	L	Y	W	X	H	Inverter + Filter
SD25212	128	120,5	140	132	155	4,5	4,5	4,5	176,5	162,5	147,5	124	45	1,84 + 1,8
SD25217	128	120,5	140	132	155	4,5	4,5	4,5	176,5	162,5	147,5	124	45	1,89 + 1,8
SD25306	128	120,5	140	132	155	4,5	4,5	4,5	176,5	162,5	147,5	124	45	1,84 + 1,8
SD25309	128	120,5	140	132	155	4,5	4,5	4,5	176,5	162,5	147,5	124	45	1,89 + 1,8

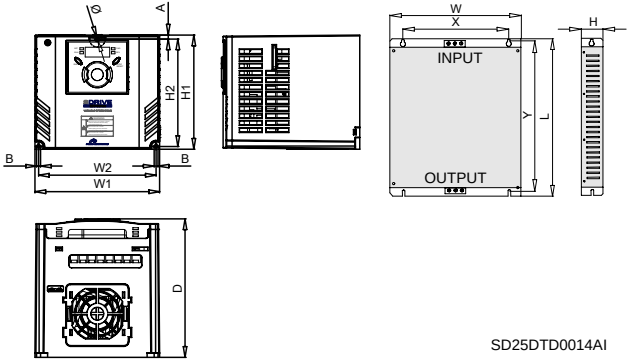


Figure 4.3 Dimensions of Frame 3

4.4. Dimensions of Frame 4

REFERENCE	DIMENSIONS (mm.)								RFI FILTERS					NET WEIGHT
	H1	H2	W1	W2	D	Ø	A	B	L	Y	W	X	H	Inverter + Filter
SD25224	220	210	180	170	170	4,5	5,0	4,5	270	252	189,5	162	60	3,66 + 2,5
SD25232	220	210	180	170	170	4,5	5,0	4,5	270	252	189,5	162	60	3,66 + 2,5
SD25312	220	210	180	170	170	4,5	5,0	4,5	270	252	189,5	162	60	3,66 + 2,5
SD25316	220	210	180	170	170	4,5	5,0	4,5	270	252	189,5	162	60	3,66 + 2,5

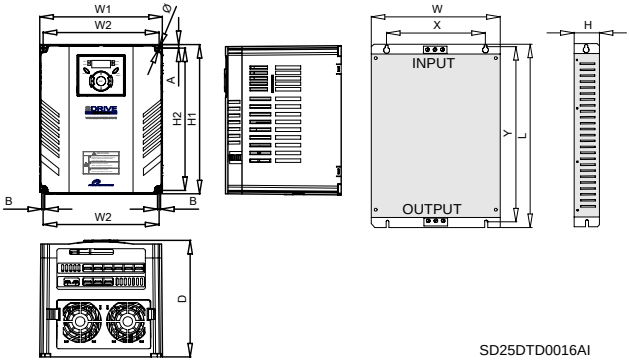


Figure 4.4 Dimensions of Frame 4

5. POWER RANGE

REFERENCE	FRAME	STANDARD TYPES			
		V (-15%, +10%)	I (A)	kW	CV
SD25203	1	200-230 III	3	0,4	0,5
SD25205		200-230 III	5	0,75	1
SD25301		380-480 III	1,25	0,4	0,5
SD25302		380-480 III	2,5	0,75	1
SD25208	2	200-230 III	8	1,5	2
SD25304		380-480 III	4	1,5	2
SD25212	3	200-230 III	12	2,2	3
SD25217		200-230 III	17	4	5,4
SD25306		380-480 III	6	2,2	3
SD25309		380-480 III	9	4	5,4
SD25224	4	200-230 III	24	5,5	7,5
SD25232		200-230 III	32	7,5	10
SD25312		380-480 III	12	5,5	7,5
SD25316		380-480 III	16	7,5	10

6. CONFORMITY DECLARATION

Directives from which the conformity is declared are:

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

Producto	**VARIADOR (Equipo de Variador de Velocidad)**
Product	**Variable Speed Drive**
Marca comercial **Trade Mark**	**POWER ELECTRONICS**
Modelo /Tipo Ref. **Model / Type Ref.**	**SDRIVE 250 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):**
  Electromagnetic Compatibility. Generic emission standards. Part 2: Industrial environment.
- **EN 55011/A2 (2002):**
  Industrial, scientific and medical (ISM) radio-frequency equipment – Radio disturbance characteristics – Limits and methods of measurement.
- **EN 50082-2 (1995):**
  Electromagnetic Compatibility. Generic immunity standard. Part 2: Industrial environment.
- **EN 61000-4-2/A2 (2001)**
  Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.
- **ENV 50140 (1993):**
  Electromagnetic compatibility. Basic immunity. Radiated, radio-frequency electromagnetic field. Immunity test.
- **ENV 50204 (1995):**
  Radiated electromagnetic field from digital radio telephones. Immunity test.
- **EN 61000-4-4/A2 (2001):**
  Electromagnetic compatibility (EMC) -- Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.
- **ENV 50141 (1993):**
  Electromagnetic compatibility. Basic immunity standard. Conducts disturbances induced by radio-frequency fields. Immunity test.
- **EN 61800-3/A11 (2000):**
  Adjustable speed electrical power drive systems -- Part 3: EMC product standard including specific test methods.

- **EN 61000-4-3/A1 (2002):**
  Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.
- **EN 61000-4-5/A1 (2001):**
  Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques - Surge immunity test.
- **EN 61000-4-6/A1 (2001):**
  Electromagnetic compatibility (EMC) -- Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
- **EN 61000-2-4 (2002):**
  Electromagnetic compatibility (EMC) -- Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances.
- **EN 60146-1-1/A1 (1997):**
  Semiconductor converters. General requirements and line commutated converters. Part 1-1: Specifications of basic requirements.

7. PROGRAMMING KEYPAD

7.1. Parameters groups

SDRIVE 250 Series inverter has available four independent parameters groups according to its function indicated at the following table:

Parameters group	Display	Description
Main menu	DRV	Basic parameters that are necessaries to inverter performance. Parameters such as Frequency command (reference frequency), acceleration/deceleration time.
Function 1 menu	FU1 (F)	Operation basic parameters to set output frequency and voltage. Run/Stop, frequency limits, torque boost, thermal protections.
Function 2 menu	FU2 (H)	Operation advanced parameters to set PID operation and a second motor. Fault history, motor nameplate, second acceleration/ deceleration, save parameters keypad/inverter, parameter lock.
I/O	I/O (I)	Parameters that are necessaries to configure a sequence using multi-function input/output terminals. Input and output settings, multiple frequency and acceleration select.

Note: See figure on next page.

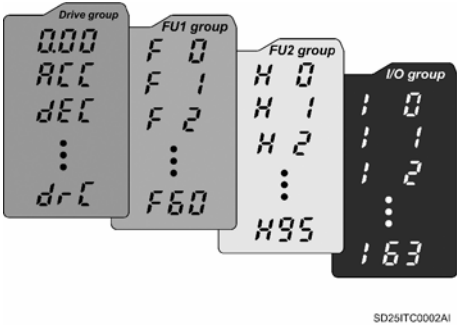


Figure 7.1 Parameters group of SD250 inverters

7.2. Keypad / display characteristics

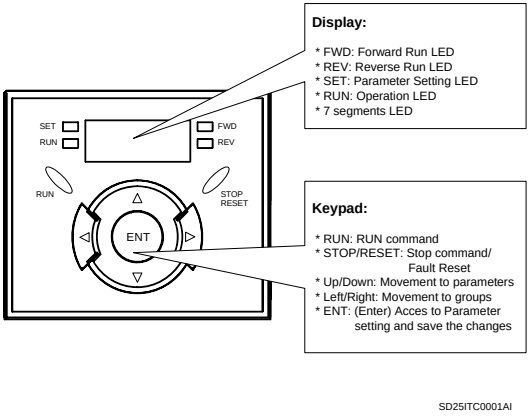
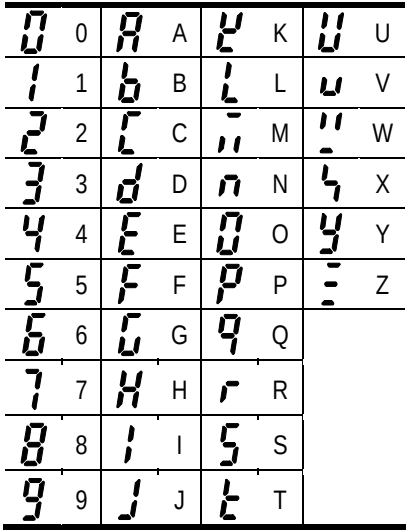


Figure 7.2 Keypad / Display of SD250 inverters

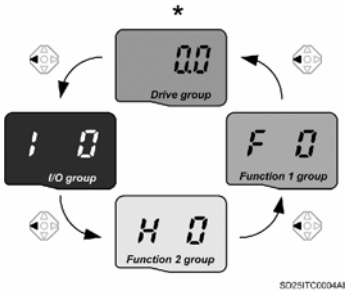
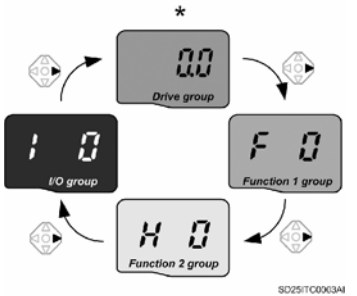
DISPLAY			
FWD		Lit during Forward Run.	Blinks when a fault occurs.
REV		Lit during Reverse Run.	
RUN		Lit during operation.	
SET		Lit during parameters setting.	
7 Segments		Display operation status and parameter information.	
KEYPAD			
RUN		It allows giving the Run command (RUN).	
STOP/RESET		STOP: It allows giving the Stop command during operation. RESET: It allows giving the Reset command after a fault is occurred.	
▲	UP	Used to scroll up through parameters or increase parameter value when it is being programmed.	
▼	DOWN	Used to scroll down through parameters or decrease parameter value when it is being programmed.	
◄	LEFT	Used to jump to other parameter groups counter clockwise or move cursor to the left to change the parameter value.	
►	RIGHT	Used to jump to other parameter groups clockwise or move cursor to the right to change the parameter value.	
●	ENTER	Used to set the parameter value or save the changed parameter value.	

7.3. Alphanumerical displaying



7.4. Movement to different groups

It is only available from the first parameter of each group as the showed figure below:

	Movement to different groups counter clockwise using left (◀) key.
	Movement to different groups clockwise using right (▶) key.

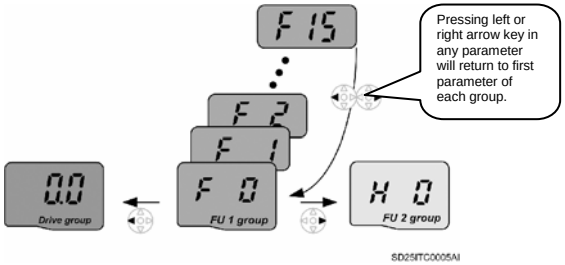
* Reference frequency can be set at **0.0** (the first parameter of drive group), even though the preset value is 0.0, it is user-settable. The changed frequency will be displayed after is changed.

7.4.1. Movement to other groups from the first parameter of each group

1		- **The first parameter in Drive group (DRV) "0.00"** will be displayed when AC input power is applied. - Press the right arrow (▶) key once to go to Function 1 group (F).
2		- **The first parameter in Function 1 group (F), 'F0'** will be displayed. - Press the right arrow (▶) key once to go to Function 2 group (H).
3		- **The first parameter in Function 2 group (H), 'H0'** will be displayed. - Press the right arrow (▶) key once to go to I/O group (I).
4		- **The first parameter in I/O group (I), 'I0'** will be displayed. - Press the right arrow (▶) key once again to return to Drive group (DRV).
5		- Return to **the first parameter in Drive group (DRV) "0.00"**.

Note: If the left arrow (◀) key is used, the above will be executed in the reverse order.

7.4.2. Movement to other groups from any parameter (not the first parameter) of a group

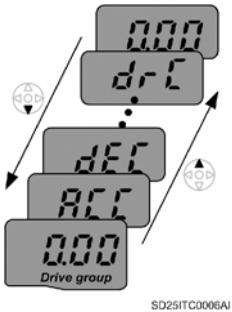


To move from F15 to Function 2 group:

1	F15	- From F15, press the left (◀) or right arrow (▶) key. Pressing the key goes to the first parameter of the group.
2	F0	- The first code in Function 1 group, F0, is displayed. - Press the right arrow (▶) key.
3	H0	- The first parameter in Function 2 group, H0, will be displayed.

7.5. Movement to different parameters of a group

7.5.1. Movement through parameters of Drive group

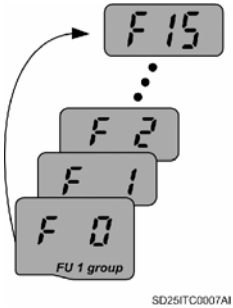


1		- From the first parameter of Drive group "0.00", press the up (▲) key once.
2		- The second parameter in Drive group 'ACC' is displayed. - Press the up (▲) key once.
3		- The third parameter in Drive group 'dEC' is displayed. - Keep pressing the up (▲) hey until the last parameter appears.
4		- The last parameter in Drive group 'drC' is displayed. - Press the up (▲) key again.
5		- Return to the first parameter of Drive group.

Note: Use the down (▼) key for the opposite order.

7.5.2. Parameter jump

Direct movement from F0 to F15.

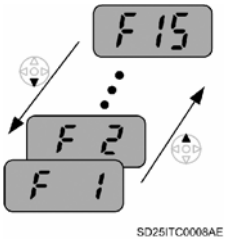


1		- Press the **Ent** key in F0.
2		- "1" (F1 parameter number) is displayed. Use the up (▲) key to set to "5".
3		- "**0**5" is displayed by pressing the left (◀) key once to move the cursor to the left. The numeral which has the cursor is displayed brighter. In this case, "**0**" is active. - Use the up (▲) key to set to "1".
4		- "**1**5" is set. - Press the **Ent** key once.
5		- Movement to F15 has been completed.

Note: Function 2 group and I/O group are settable in the same way.

7.5.3. Movement through parameters of a group step by step

Movement from F1 to F15 in FU 1 group.



1	F 1	- From F1, continue pressing the up (▲) key until F15 is displayed.
2	F 15	- Movement to F15 has been completed.

Note: Applicable to Function 2 and I/O groups.

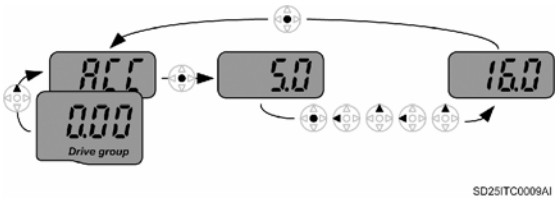
Note: Some parameters are not displayed while moving through parameters using the up (▲)/down (▼) keys. That is because it is programmed that some parameters are intentionally left blank for future use or are invisible because they are not used by user.

For example, when 'F24 ➔ Frequency limits selection' is set to '0 ➔ No', 'F25 ➔ High frequency limit' and 'F26 ➔ Low frequency limit' are not displayed during movement through parameters. But when 'F24' is set to '1 ➔ Yes', 'F25' and 'F26' will appear on the display.

7.6. Parameters setting

7.6.1. Change parameter values in Drive group

Change of ACC time from 5.0 sec to 16.0 sec.



1		- From the first parameter "0.00", press the up (▲) key once to go to the second parameter.
2		- 'ACC' (Accel time) is displayed. - Press the **Ent** key once.
3		- Preset value is "5.**0**", and the cursor is in the digit "**0**". - Press the left (◀) once to move the cursor to the left.
4		- The digit "**5**" is active. Then press the up (▲) key once.
5		- The value is increased to "**6**.0". - Press the left (◀) key to move the cursor to the left.

6		- "**0**.60" is displayed. The first "**0**" is active. - Press the up (▲) key once.
7		- "**1**6.0" is set. - Press the **Ent** key once. - "**1**6.0" is blinking. - Press the **Ent** key again to return to the parameter name.
8		- '**ACC**' is displayed. **Acceleration time** has been changed from "5.0" to "16.0" sec.

Note: Pressing the left (◀)/ right (▶)/ up (▲)/ down (▼) keys while the cursor is blinking, the parameter value change will be cancelled. Pressing the **Ent** key in this status will enter the value into memory.

7.6.2. Frequency setting

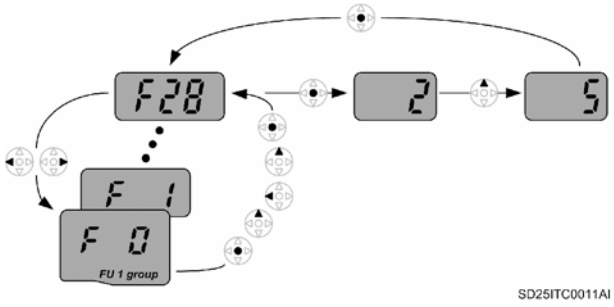
Setting of run frequency to 30.05Hz in Drive group.

1		- In “0.00”, press the **Ent** key once.
2		- The second decimal “**0**” becomes active. - Press the up (▲) key until “5” is displayed.
3		- Press the left (◀) key once.
4		- The first decimal “**0**” becomes active. - Press the left (◀) key once.
5		- Press the left (◀) key once.
6		- Set “3” using the up (▲) key.
7		- Press the **Ent** key. - “30.05” is blinking. - Press the **Ent** key.
8		- “30.05” is entered into memory.

Note: SD250 display can be extended to 5 digits using left (◀)/ right (▶) keys.

7.6.3. Change of a parameter value in Function 1 group

Change of F28 parameter value from “2” to “5”.



1		- In F0, press the **Ent** key once.
2		- “1” (parameter number of F1) is displayed. - Increase the value to “8” pressing the up (▲) key.
3		- When “8” is set, press the left (◀) key once.
4		- “**0**” is active. - Increase the value to “2” pressing the up (▲) key.
5		- “**2**8” is displayed. - Press the **Ent** key once.

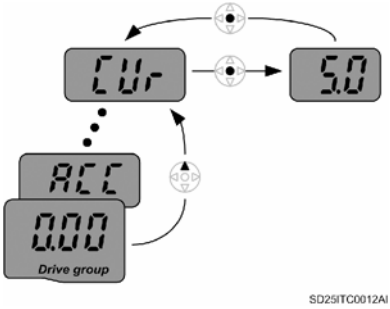
6		- The parameter number 28 (F28) is displayed. - Press the Ent key once to check the set value.
7		- The preset value “2” is displayed. - Increase the value to “5” using the up (▲) key.
8		- Press the Ent key.
9		- Parameter number will appear next. Parameter value change is complete. - Press the left (◀) or right (▶) key until arrive to the first parameter of the group.
10		- Movement to the first parameter of Function 1 group is complete.

Note: Applicable to parameters value setting in Function 2 and I/O groups too.

7.7. Operation status monitoring

7.7.1. Output current display

Monitoring of output current in Drive group.

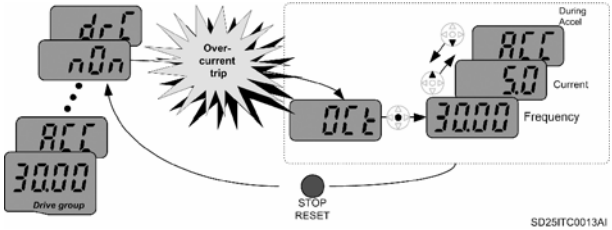


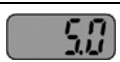
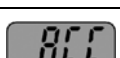
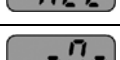
1	0.00	- In "0.0", continue pressing the up (▲) or down (▼) key until 'CUr' is displayed.
2	CUr	- Monitoring of output current is provided in this parameter. - Press the Ent key once to check the current.
3	5.00	- Present output current is 5A. - Press the Ent key once to return to the parameter name.
4	CUr	- Return to the output current monitoring parameter.

Note: Other parameters in Drive group such as 'dCL ➔ Inverter DC Link current or 'vOL ➔ Inverter output voltage' can be monitored in the same way.

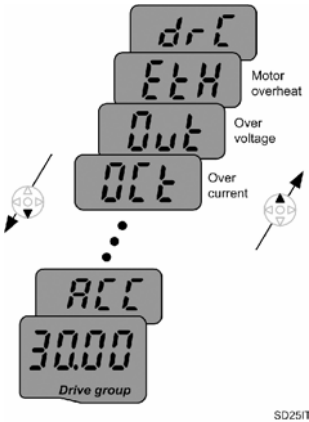
7.7.2. Fault display

How to monitor fault condition in Drive group.



1		- This message appears when an Over current fault occurs. - Press the Ent or up (▲) or down (▼) key once.
2		- The run frequency at the time of fault (30.0) is displayed. - Press the up (▲) key once.
3		- The output current at the time of fault is displayed. - Press the up (▲) key once.
4		- Operation status is displayed. A fault occurred during acceleration. - Press the STOP/RESET key once.
5		- The fault condition is cleared and “nOn” is displayed.

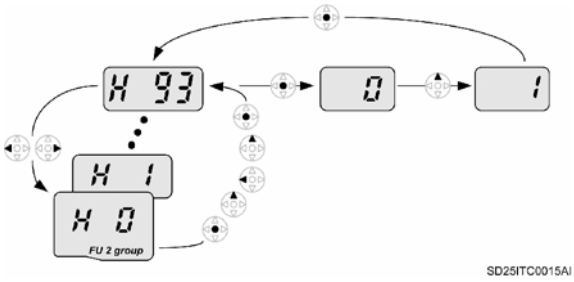
When more than one fault occur at the same time.



- Maximum three faults information is displayed as shown left.

7.7.3. Parameters initialize

How to initialize parameters of all four groups in H93.



1	H 0	- In H0, press the **Ent** key once.
2	1	- Parameter number of H1, "1", is displayed. - Increase the value to "3" pressing the up (▲) key several times.
3	3	- In "**3**", press the left (◀) key once to move the cursor to the left.
4	03	- "**0**3" is displayed and **0** is active. - Increase the value to "9" pressing the up (▲) key several times.
5	93	- "**9**3" is displayed. - Press the **Ent** key once.

6		- The parameter number H93 is displayed. - Press the **Ent** key once.
7		- Present value is “0”. - Press the up (▲) key once to set to “1” to activate parameter initialize.
8		- Press the **Ent** key once.
9		- Return to the parameter number after blinking. Parameter initialize has been completed. - Press the left (◀) or right (▶) key.
10		- Return to H0.

8. PARAMETER LIST

8.1. Drive group (DRV)

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
0.00	Reference frequency	0.00 – 400Hz	0.00Hz	A100	This parameter sets the frequency that the inverter is commanded to output. During Stop: Reference frequency. During Run: Output frequency. During Multi-step operation: Multi-step frequency 0. It cannot be set higher than 'F21 ➔ Maximum frequency'.	YES
ACC	Acceleration time	0.0 – 6000 sec	5.0 sec	A101	This parameter sets the accel/decel time. During multi-accel/decel operation (multiple accelerations / decelerations) this parameter serves as accel/decel time 0.	YES
dEC	Deceleration time		10.0 sec	A102		YES
drv	Drive mode	0 – 3	1	A103	0: Run/Stop by Run/Stop key on the keypad 1: Terminal operation – FX: Motor forward run, RX: Motor reverse run 2: Terminal operation – FX: Run/Stop enable, RX: Reverse rotation selection 3: Communication RS485	NO

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
Frq	Frequency setting mode	0 – 7	0	A104	0 Digital: Keypad setting 1 1 Digital: Keypad setting 2 2 Analogue: V1 Mode 1: -10 – +10V 3 Analogue: V1 Mode 2: 0 – +10V 4 Analogue: Terminal I: 0 – 20mA 5 Analogue: Terminal V1 Mode 1 setting + Terminal I 6 Analogue: Terminal V1 Mode 2 setting + Terminal I 7 Communication: RS485	NO
REF	PID Reference	-	-	A105	Displaying of PID reference.	-
FBK	PID Feedback	-	-	A106	Displaying of PID feedback.	-
St1	Multi-step frequency 1	0.00 – 400Hz	10.00Hz	A107	It sets multi-step frequency 1 during multi-step operation.	YES
St2	Multi-step frequency 2		20.00Hz	A108	It sets multi-step frequency 2 during multi-step operation.	YES
St3	Multi-step frequency 3		30.00Hz	A109	It sets multi-step frequency 3 during multi-step operation.	YES
CUr	Output current	-	-	A10A	It displays the output current to the motor.	-
rPM	Motor RPM	-	-	A10B	It displays the number of motor RPM.	-
dCL	Inverter DC Link voltage	-	-	A10C	It displays DC Link voltage inside the inverter.	-

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
vOL	User display selection	vOL Por tOr	vOL	A10D	This parameter displays the item selected at 'H73 ➔ Selection of user screen'. vOL: Output voltage Por: Output power tOr: Torque	-
nOn	Fault display	-	-	A10E	It displays the types of faults, frequency and operating status at the time of the fault.	-
drC	Selection of motor rotation direction	F, r	F	A10F	Sets the direction of motor rotation when 'drv ➔ Drive mode' is set to either 0 or 1. F: Forward r: Reverse	YES
drv2[1]	Drive mode 2	0 – 2	1	A110	0: Run/Stop by Run/Stop key on the keypad 1: Terminal operation – FX: Motor Forward Run, RX: Motor Reverse Run 2: Terminal operation – FX: Run/Stop enable, RX: Reverse rotation selection	YES

[1] It is only displayed when, at least, one of the multi-function input terminals P1 – P8 (I17 – I24) is set to '22 ➔ Exchange from option to inverter', 'drv ➔ Drive mode' is set to '3 ➔ RS485 Communication' and 'frq ➔ Frequency setting mode' is set to '7 ➔ RS485 Communication'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
Frq2[2]	Frequency setting mode 2	0 – 6	0	A111	0 Digital: Keypad setting 1 1 Digital: Keypad setting 2 2 Analogue: V1 Mode 1: -10 – +10V 3 Analogue: V1 Mode 2: 0 – +10V 4 Analogue: Terminal I: 0 – 20mA 5 Analogue: Terminal V1 Mode 1 setting + Terminal I 6 Analogue: Terminal V1 Mode 2 setting + Terminal I	YES
Frq3[3]	Frequency setting mode 3	0 – 7	0	A112	0 Digital: Keypad setting 1 1 Digital: Keypad setting 2 2 Analogue: V1 Mode 1: -10 – +10V 3 Analogue: V1 Mode 2: 0 – +10V 4 Analogue: Terminal I: 0 – 20mA 5 Analogue: Terminal V1 Mode 1 setting + Terminal I 6 Analogue: Terminal V1 Mode 2 setting + Terminal I 7 Communic.: RS485	YES

[2] It is only displayed when, at least, one of the multi-function input terminals P1 – P8 (I17 – I24) is set to '22 ➔ Exchange from option to inverter', 'drv ➔ Drive mode' is set to '3 ➔ RS485 Communication' and 'frq ➔ Frequency setting mode' is set to '7 ➔ RS485 Communication'.

[3] It is only displayed when, at least, one of the multi-function input terminals P1 – P8 (I17 – I24) is set to '26 ➔ Open loop 1' and 'H40 ➔ Selection of Control mode' is set to '2 ➔ PID Feedback control'.

8.2. Function 1 group (F)

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F0	Parameter jump	0 – 99	0	-	Parameter selection to jump	YES
F1	Prevention of motor rotation direction	0 – 2	0	A201	0 Forward and Reverse Run enabled. 1 Forward Run disabled. 2 Reverse Run disabled.	NO
F2	Acceleration pattern	0 – 1	0	A202	0 Linear 1 S – Curve	NO
F3	Deceleration pattern			A203		
F4	Stop mode	0 – 2	0	A204	0 Decelerate to stop. 1 DC Brake to stop (DC current injection). 2 Free run to stop (motor will stop by inertia).	NO
F8[4]	DC Brake start frequency	0.00 – 60.00Hz	5.00Hz	A208	Setting of the frequency from which the inverter will start to inject DC current during deceleration. It cannot be set below 'F23 ➔ Start frequency'.	NO
F9[4]	DC current application delay time	0.1 – 60.0 sec	0.1 sec	A209	When DC brake frequency is reached, the inverter holds the output for the set time before starting DC current injection to stop.	NO

[4] It is only displayed when 'F4 ➔ Stop mode' is set to '1 ➔ DC brake to stop'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F10[5]	DC current level for DC brake	0 – 200%	50%	A20A	It sets DC current level applied to the motor during 'DC brake'. The value is set in percentage of 'H33 ➔ Motor rated current'.	NO
F11[5]	DC current application time	0.0 – 60.0 sec	1.0 sec	A20B	During this time, the inverter applies DC current injection during 'DC brake' operation.	NO
F12	DC current level before starting	0 – 200%	50%	A20C	Sets DC current level applied to the motor before the inverter starts. If 'F12' is set to '0', 'DC start' is disable. The value is set in percentage of 'H33 ➔ Motor rated current'. If set value is greater than the value of 'H33', motor may get overheating.	NO
F13	DC current application time before starting	0.0 – 60.0 sec	0 sec	A20D	During this time, DC current is applied before starting motor acceleration. If 'F13' is set to '0', 'DC start' is disabled.	NO
F14	Time for magnetizing a motor	0.0 – 60.0 sec	1.0 sec	A20E	With this parameter the current is applied to the motor during the set time, before motor accelerates during Sensorless vector control. The current value is set in 'H34 ➔ No load motor current'.	NO
F20	Jog frequency	0.00 – 400Hz	10.00Hz	A214	In this parameter, the reference frequency for jog frequency operation is set. This value cannot be set above 'F21 ➔ Maximum frequency'.	NO

[5] It is only displayed when 'F4 ➔ Stop mode' is set to '1 ➔ DC brake to stop'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F21[6]	Maximum frequency	40.00 – 400Hz	50.00Hz	A215	This parameter sets the highest frequency the inverter can output. It is the reference frequency for acceleration/deceleration (See 'H70 ➔ Frequency reference for accel/decel'). **Caution:** Any frequency cannot be set above Maximum frequency except Base frequency.	NO
F22	Base frequency	30.00 – 400Hz	50.00Hz	A216	The inverter outputs its rated voltage to the motor at this frequency (see motor nameplate).	NO
F23	Start frequency	0.10 – 10Hz	0.50Hz	A217	The inverter starts to output its voltage at this frequency. It is the low limit of frequency.	NO
F24	Frequency limits selection	0 – 1	0	A218	This parameter sets high and low limit of run frequency.	NO
F25[7]	High frequency limit	0.00 – 400Hz	50.00Hz	A219	This parameter sets high limit of the run frequency. It cannot be set above 'F21 ➔ Maximum frequency'.	NO
F26[7]	Low frequency limit	0.10 – 400Hz	0.50Hz	A21A	This parameter sets low limit of the run frequency. It cannot be set above 'F25 ➔ High frequency limit' and below 'F23 ➔ Start frequency'.	NO

[6] If 'H40 ➔ Stop mode' is set to '3 ➔ Sensorless open loop vector control', Maximum frequency is settable up to 300Hz.
[7] It is only displayed when 'F24 ➔ Frequency limits selection' is set to '1 ➔ Frequency limit settings enabled'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F27	Torque boost selection	0 – 1	0	A21B	0: Manual torque boost. Settable in two rotation motor directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'. 1: Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters and supplies the corresponding voltage level.	NO
F28	Torque boost in forward direction	0 – 15%	2%	A21C	This parameter sets the amount of torque boost applied to a motor during forward run. It is set in percentage of maximum output voltage.	NO
F29	Torque boost in reverse direction		2%	A21D	This parameter sets the amount of torque boost applied to a motor during reverse run. It is set in percentage of maximum output voltage.	NO
F30	V/F Pattern	0 – 2	0	A21E	0: Linear, for constant torque applications. 1: Square, for variable torque applications. 2: User V/F, settable by user for special applications.	NO

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F31[8]	User V/F frequency 1	0.00 – 400Hz	12.50Hz	A21F	User can customize Voltage/Frequency pattern. It cannot be set above 'F21 ➔ Maximum frequency'. The value of voltage is set in percentage of 'H70 ➔ Motor rated voltage'. The values of the lower-numbered parameters cannot be set above those of higher-numbered.	NO
F32[8]	User V/F voltage 1	0 – 100%	25%	A220		NO
F33[8]	User V/F frequency 2	0.00 – 400Hz	25.00Hz	A221		NO
F34[8]	User V/F voltage 2	0 – 100%	50%	A222		NO
F35[8]	User V/F frequency 3	0.00 – 400Hz	37.50Hz	A223		NO
F36[8]	User V/F voltage 3	0 – 100%	75%	A224		NO
F37[8]	User V/F frequency 4	0.00 – 400Hz	50.00Hz	A225		NO
F38[8]	User V/F voltage 4	0 – 100%	100%	A226		NO
F39	Output voltage setting	40 – 110%	100%	A227	This parameter sets the value of output voltage. The set value is a % of input voltage.	NO
F40	Energy saving level	0 – 30%	0%	A228	The inverter decreases output voltage according to this setting, after accelerating until reaching reference frequency.	YES
F50	Selection of Electronic thermal protection	0 – 1	0	A232	This parameter protects the motor from possible overheating. The inverter trips when the protect function is active.	YES

[8] It is available when parameter 'F30 ➔ V/F Pattern' is set to '2 ➔ User V/F'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
F51[9]	Level of Electronic thermal protection for 1 minute	50 – 200%	150%	A233	It allows setting set the current value from which the inverter decides on the motor is overheated. The set value is the percentage of 'H33 ➔ Motor rated current'. It cannot be set below 'F52 ➔ Level of Electronic thermal protection for continuous'.	YES
F52[9]	Level of Electronic thermal protection for continuous	50 – 150%	100%	A234	It allows setting the current value from which the inverter can operate in continuous. This value cannot be set higher than the value of 'F51 ➔ Level of Electronic thermal protection for 1 minute'.	YES
F53[9]	Motor cooling mode	0 – 1	0	A235	0 – Auto-cooling: Standard motor having cooling fan directly connected to the shaft. 1 – Forced cooling: Separated motor to power a cooling fan is used.	YES
F54	Overload warning level	30 – 150%	150%	A236	This parameter sets the current value to generate an alarm signal at a relay or multi-function output terminal (See 'I54 ➔ Multi-function output terminal configuration', 'I55 ➔ Multi-function relay select'). The set value is a percentage of 'H33 ➔ Motor rated current'.	YES
F55	Overload warning time	0 – 30 sec	10 sec	A237	It sets the time through which the current has to be current value set as overload current level to generate an alarm signal.	YES
F56	Overload trip selection	0 – 1	1	A238	This parameter turns off the inverter output when motor is overloaded.	YES

[9] Set 'F50 ➔ Selection of Electronic thermal protection' to '1 ➔ Electronic thermal protection enabled' to display this parameter.

<table>
<tr><th>Parameter</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>F57</td><td>Overload trip level</td><td>30 – 200%</td><td>180%</td><td>A239</td><td>With this parameter the overload current value is set to generate a trip protecting motor and inverter.
The value is a percentage of the value of ‘H33 ➔ Motor rated current’.</td><td>YES</td></tr>
<tr><td>F58</td><td>Overload trip time</td><td>0 – 60 sec</td><td>60 sec</td><td>A23A</td><td>Setting of the time which will have to elapse with the inverter current level above the value set in ‘F57 ➔ Overload trip level’ to generate its trip.</td><td>YES</td></tr>
<tr><td>F59</td><td>Stall prevention mode</td><td>0 – 7</td><td>0</td><td>A23B</td><td>It allows setting the current dynamic limitation during acceleration, deceleration and steady status.
<table>
<tr><th></th><th>During Decel.</th><th>During steady status</th><th>During Accel.</th></tr>
<tr><td></td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>4</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>6</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>7</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td><td>NO</td></tr>
<tr><td>F60</td><td>Stall prevention level</td><td>30 – 150%</td><td>150%</td><td>A23C</td><td>The set value is a percentage of the value of ‘H33 ➔ Motor rated current’.</td><td>NO</td></tr>
<tr><td>F63</td><td>Up/Down Save</td><td>0 – 1</td><td>0</td><td>A23F</td><td>Defines if the inverter should memorize the reference frequency set by motorized potentiometer.
<table>
<tr><td>0</td><td>NO</td></tr>
<tr><td>1</td><td>YES</td></tr>
</table></td><td>YES</td></tr>
<tr><td>F64[10]</td><td>Refer. value displaying for motorized potentiometer</td><td>0.00 – 400Hz</td><td>-</td><td>A240</td><td>Displaying of the reference value introduced by motorized potentiometer.</td><td>-</td></tr>
</table>

[10] This parameter is only displayed if ‘F63 ➔ Up/Down Save’ is set to ‘1 ➔ YES’.

8.3. Function 2 group (H)

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H0	Parameter jump	0 – 99	1	A300	Parameter selection to jump.	YES
H1	Fault history 1	-	nOn	A301	It stores information on the types of faults, the frequency, the current and the acceleration/deceleration condition at the time of fault. The latest fault is automatically stored in the 'H1 ➔ Fault history 1'.	-
H2	Fault history 2	-	nOn	A302		-
H3	Fault history 3	-	nOn	A303		-
H4	Fault history 4	-	nOn	A304		-
H5	Fault history 5	-	nOn	A305		-
H6	Reset fault history	0 – 1	0	A306	It allows clearing the fault history stored from 'H1' to 'H5'.	YES
H7	Dwell frequency	0.10 – 400Hz	5.00Hz	A307	It allows setting the previous speed with which inverter operates before applying the acceleration ramp, after command run is received (Dwell function). Dwell frequency can be set within the range of the values of 'F21 ➔ Maximum frequency' and 'F23 ➔ Start frequency'.	NO
H8	Dwell time	0.0 – 10 sec	0.0 sec	A308	It allows setting a time to the inverter operates with a stipulated speed before applying the acceleration ramp (Dwell function).	NO

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H10	Selection of resonant frequencies	0 – 1	0	A30A	It allows setting up to three frequency ranges which will be avoided when the inverter operates at steady status. During acceleration and deceleration the ranges before mentioned are not considered. If speed reference was included in one of those ranges, the inverter operates with the minimum speed of that range. It allows preventing resonances and vibrations on the structure of the machine.	NO
H11[11]	Low resonant frequency range 1	0.10 – 400Hz	10.00Hz	A30B	It sets low/high resonant frequency of the ranges 1, 2, or 3 to avoid at steady status. Operation frequency cannot be set to a value included into those ranges, that is, it cannot be set to a value included between 'H11' and 'H12', between 'H13' and 'H14', and between 'H15 and 'H16'. The frequency values of the low numbered parameters cannot be set above those of the high numbered ones. Settable within the range of 'F21 ➔ Maximum frequency' and 'F23 ➔ Start frequency'.	NO
H12[11]	High resonant frequency range 1		15.00Hz	A30C		NO
H13[11]	Low resonant frequency range 2		20.00Hz	A30D		NO
H14[11]	High resonant frequency range 2		25.00Hz	A30E		NO
H15[11]	Low resonant frequency range 3		30.00Hz	A30F		NO
H16[11]	High resonant frequency range 3		35.00Hz	A310		NO

[11] It is only displayed when 'H10 ➔ Selection of resonant frequencies' is set to '1 ➔ Setting of resonant frequency ranges enabled'.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H17[12]	S-Curve start	1 – 100%	40%	A311	It allows setting the start of the S–Curve selected in acceleration pattern. If it is set higher, linear zone gets smaller.	NO
H18[12]	S-Curve end	1 – 100%	40%	A312	It allows setting the end of the S–Curve selected in deceleration pattern. If it is set higher, linear zone gets smaller.	NO
H19	Selection of input/output phase loss protection	0 – 3	0	A313	0 Disabled. 1 Output phase protection. 2 Input phase protection. 3 Input/output phase protection.	YES
H20	Restart after power supply fault	0 – 1	0	A314	Allows the inverter to restart automatically after a power supply fault occurs and restore it again. This parameter is activated when 'drv ➔ Drive mode' is set to '1 or 2 ➔ Terminal operation'. Motor starts acceleration after AC power is applied while FX or RX terminal is ON.	YES
H21	Restart after fault reset	0 – 1	0	A315	Allows the inverter to restart automatically after reset signal has been received after a fault occurs. This parameter is activated when 'drv ➔ Drive mode' is set to '1 or 2 ➔ Terminal operation'. Motor accelerates after the fault condition is reset while FX or RX terminal is ON.	YES

[12] 'H17', 'H18' are used when 'F2 ➔ Acceleration pattern', 'F3 ➔ Deceleration pattern' are set to '1 ➔ S–Curve' respectively.

<table>
<tr><th>Parameter</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>H22[13]</td><td>Speed search function</td><td>0 – 15</td><td>0</td><td>A316</td><td>This function allows restarting automatically after a fault occurs or after a power supply loss without waiting for motor stops.
Case 1: Restart after power supply fault.
Case 2: Restart after instant power failure.
Case 3: Speed search active after fault reset.
Case 4: Normal acceleration.
<table>
<tr><th></th><th>Case 1</th><th>Case 2</th><th>Case 3</th><th>Case 4</th></tr>
<tr><th></th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>4</td><td>-</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>-</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>6</td><td>-</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>7</td><td>-</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>8</td><td>✓</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>✓</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>10</td><td>✓</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>11</td><td>✓</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>12</td><td>✓</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>13</td><td>✓</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>14</td><td>✓</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>15</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>YES</td></tr>
<tr><td>H23</td><td>Current level for Speed search</td><td>80 – 200%</td><td>100%</td><td>A317</td><td>This parameter limits the amount of current during speed search.
The set value is a percentage of ‘H33 ➔ Motor rated current’.</td><td>YES</td></tr>
<tr><td>H24</td><td>P gain for Speed search</td><td>0 – 9999</td><td>100</td><td>A318</td><td>It is the proportional gain which should be set considering the load inertia and the load torque.</td><td>YES</td></tr>
</table>

[13] ’4 ➔ ‘Normal acceleration’ has first priority. Even though this option is selected along with others bits, Inverter performs Speed search according to ‘4’.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H25	I gain for Speed search	0 – 9999	200	A319	It is the integral gain which should be set considering the load inertia and the load torque.	YES
H26	Tries of automatic fault resets (Auto-restart)	0 – 10	0	A31A	This function serves to the inverter restarts after a fault occurs. This parameter sets the number of restart tries. This function is deactivated if the restart tries is outnumbered. This function is active when 'drv ➔ Drive mode' is set to '1 or 2 ➔ Terminal operation'. Deactivated when some of the protection functions is active (OHT, LVT, EXT, HWT etc.).	YES
H27	Time between tries of automatic fault resets	0.0 – 60 sec	1.0 sec	A31B	This parameter sets the wait time between an automatic fault reset and the next one.	YES
H30	Motor power setting	0.2 – 7.5kW	*	A31E	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW	NO
H31	Selection of number of motor poles	2 – 12	4	A31F	Sets the number of poles of the motor which is used. This setting is displayed by 'rPM ➔ Motor RPM' in Drive group.	NO
H32	Rated slip frequency	0 – 10Hz	*	A320	$f_s = f_r - \left(\frac{rpm \times P}{120}\right)$ Where, f_s = Rated slip frequency f_r = Rated frequency rpm = Motor RPM P = Number of motor poles	NO
H33	Motor rated current	0.5 – 50A	*	A321	Motor rated current which appears on the motor nameplate is entered in this parameter.	NO

* Depending on the motor will be used.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H34	No load motor current	0.1 – 20A	*	A322	Enter the current value detected when the motor is rotating in rated rpm after the load connected to the motor shaft is removed.	NO
H36	Motor efficiency	50 – 100%	*	A324	Enter the motor efficiency (see motor nameplate).	NO
H37	Load inertia rate	0 – 2	0	A325	Select one of the following according to motor inertia. 0 Less than 10 times. 1 10 times. 2 More than 10 times.	NO
H39	Setting of Carrier frequency (commutation frequency)	1 – 15kHz	3kHz	A327	It allows setting carrier frequency depending on the frame of the inverter. This parameter affects the audible sound of the motor, noise emission from the inverter, inverter temp, and leakage current.	YES
H40	Selection of Control mode	0 – 3	0	A328	0 Volts/Frequency control. 1 Slip Compensation control. 2 PID Feedback control. 3 Sensorless vector control.	NO
H41	Auto-tuning of motor parameters	0 – 1	0	A329	It allows measuring automatically all necessary parameters to operate in control mode selected. If this parameter is set to '1', parameters 'H42 ➔ Stator resistance' and 'H44 ➔ Leakage inductance' are measured.	NO
H42	Stator resistance (Rs)	0 – 28Ω	-	A32A	Calculation of the stator resistance depending on the motor capacity.	NO
H44	Leakage inductance (Lσ)	0.0 – 300.0 mH	-	A32C	Calculation of the leakage inductance depending on the motor capacity.	NO

* Depending on the motor will be used.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H45[14]	Sensorless P gain	0 – 32767	1000	A32D	This parameter sets the value of P gain which will be used in sensorless vector control. Very high value supplies a very fast response, but the system can become unstable. Set an appropriate value for your application.	YES
H46[14]	Sensorless I gain		100	A32E	This parameter sets the value of I gain which will be used in sensorless vector control. Very low value supplies more stable and lower response, but the inverter can turn off the output during speed control. Set an appropriate value for your application.	YES
H50[15]	PID Feedback setting	0 – 1	0	A332	0 Terminal I input (0 – 20mA) 1 Terminal V1 input (0 – 10V)	NO
H51[15]	P gain for PID mode	0.0 – 999.9 %	300.0%	A333	These parameters allow setting the gains for the PID mode.	YES
H52[15]	I gain (Integral time) for PID mode	0.1 – 32.0 sec	1.0 sec	A334		YES
H53[15]	D gain (Differential time) for PID mode	0.0 – 30.0 sec	0.0 sec	A335		YES
H54[15]	F gain for PID mode	0.0 – 999.9 %	0.0%	A336	This parameter sets The F gain for PID mode.	YES
H55[15]	High limit of output frequency in PID mode	0.10 – 400Hz	50.00Hz	A337	Setting of the maximum value of the output frequency in PID mode. The value is settable within the range of 'F21 ➔ Maximum frequency' and 'F23 ➔ Start frequency'.	YES

[14] Set 'H40 ➔ Selection of Control mode' to '3 ➔ Sensorless Vector control' to display this parameter.
[15] Set 'H40 ➔ Selection of Control mode' to '2 ➔ PID Feedback control' to display this parameter.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H56[16]	Low limit of output frequency in PID mode	0.10 – 400Hz	0.50Hz	A338	Setting of the minimum value of the output frequency in PID mode. The value is settable within the range of 'F21 ➔ Maximum frequency' and 'F23 ➔ Start frequency'.	YES
H57[16]	Output inversion in PID mode	0 – 1	0	A339	0 Normal 1 Inversion	NO
H60	Selection of self-diagnostic	0 – 3	0	A33C	To activate this function is necessary, as well as this parameter setting, configure one of the multi-function digital inputs (I17 – I24) a '20 ➔ Self-diagnostic function'. 0 Self-diagnostic disabled. 1 IGBT fault/Ground fault. 2 Output phase loss/Ground fault. 3 Ground fault.	NO
H63	Sleep delay time	0 – 999 sec	60 sec	A33F	This parameter fixes the time that the inverter waits for it before activating sleep mode.	YES
H64	Sleep frequency	0.00 – 400Hz	0.0Hz	A340	This parameter sets the value of sleep frequency.	YES
H65	Wake up level in Sleep mode	0 – 50%	2%	A341	When the inverter is in Sleep mode, and the feedback decreases regarding the order in an equal or higher percentage of the value set here, the inverter activates the output to the motor again.	YES
H69	Frequency of accel/decel change	0.00 – 400Hz	0Hz	A345	This parameter sets the frequency level from which accel/decel ramps applied to the inverter will be changed.	NO
H70	Reference frequency for accel/decel	0 – 1	0	A346	0 Based on Maximum frequency (F21). 1 Based on Delta frequency.	NO

[16] Set 'H40 ➔ Selection of Control mode' to '2 ➔ PID Feedback control' to display this parameter.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H71	Accel/Decel time scale	0 – 2	1	A347	0 Unit of time: 0.01 sec. 1 Unit of time: 0.1 sec. 2 Unit of time: 1 sec.	YES
H72	Power on display (first screen)	0 – 15	0	A348	According to the code entered here, a different parameter will be displayed when the inverter loses the power supply and recovers it again. 0 Reference frequency. 1 Acceleration time. 2 Deceleration time. 3 Drive mode. 4 Frequency mode. 5 Step freq.-1. 6 Step freq.-2. 7 Step freq.-3. 8 Output current. 9 Motor Rpm. 10 Inverter DC Link voltage. 11 Selection of user screen (H73). 12 Fault display. 13 Direction of motor rotation select. 14 Output current 2 15 Motor Rpm 2.	YES
H73	Selection of user screen	0 – 2	0	A349	One of the following data can be monitored by 'vOL ➔ Selection of user screen': 0 Output voltage (V). 1 Output power (kW). 2 Torque (kgf · m).	YES
H74	Displaying of gain for motor rpm	1 – 1000%	100%	A34A	This parameter is used to change the motor speed display, from rotation speed (r/min) to mechanical speed (m/mi).	YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H75	Selection of operation rate limit of dynamic brake resistor	0 – 1	0	A34B	0 Unlimited. 1 Use dynamic brake resistor for the time set in 'H76'.	YES
H76	Operation rate of dynamic brake resistor	0 – 30%	10%	A34C	This parameter sets the percentage of the dynamic brake resistor value that is activated during one sequence of operation.	YES
H77[17]	Cooling fan control	0 – 1	0	A34D	0 Always connected. 1 Active when its temp is higher than inverter protection limit temp. Activated only during operation when its temp is below that of inverter protection limit.	YES
H78	Selection of operation mode when cooling fan malfunctions	0 – 1	0	A34E	0 Continuous operation when cooling fan malfunctions. 1 Operation stopped when cooling fan malfunctions.	YES
H79	Software Version	-	EU 1.x	A34F	This parameter displays the inverter software version.	-

[17] Exception: Since SD25203/SD25301 this parameter is hidden.

<table>
<tr><th>Parameter</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>H81[18]</td><td>Accel. time for second motor</td><td rowspan="2">0.0 – 6000 sec</td><td>5.0 sec</td><td>A351</td><td rowspan="11">Parameters settings for the second motor. Correspondence with the settable parameters of the first motor:

<table><tr><th>2nd motor parameters settings</th><th>1st motor parameters settings</th></tr><tr><td>H81</td><td>ACC</td></tr><tr><td>H82</td><td>dEC</td></tr><tr><td>H83</td><td>F22</td></tr><tr><td>H84</td><td>F30</td></tr><tr><td>H85</td><td>F28</td></tr><tr><td>H86</td><td>F29</td></tr><tr><td>H87</td><td>F60</td></tr><tr><td>H88</td><td>F51</td></tr><tr><td>H89</td><td>F52</td></tr><tr><td>H90</td><td>H33</td></tr></table>
Parameters descriptions referred to the first motor are valid for the same parameters refer to the second motor.</td><td>YES</td></tr>
<tr><td>H82[18]</td><td>Decel. time for second motor</td><td>10.0 sec</td><td>A352</td><td>YES</td></tr>
<tr><td>H83[18]</td><td>Base frequency for second motor</td><td>30.00 – 400Hz</td><td>60.00Hz</td><td>A353</td><td>NO</td></tr>
<tr><td>H84[18]</td><td>V/F Pattern for second motor</td><td>0 – 2</td><td>0</td><td>A354</td><td>NO</td></tr>
<tr><td>H85[18]</td><td>Forward torque boost for second motor</td><td rowspan="2">0 – 15%</td><td>5%</td><td>A355</td><td>NO</td></tr>
<tr><td>H86[18]</td><td>Reverse torque boost for second motor</td><td>5%</td><td>A356</td><td>NO</td></tr>
<tr><td>H87[18]</td><td>Stall prevention level for second motor</td><td>30 – 150%</td><td>150%</td><td>A357</td><td>NO</td></tr>
<tr><td>H88[18]</td><td>Electronic thermal protection for 1 minute for second motor</td><td rowspan="2">50 – 200%</td><td>150%</td><td>A358</td><td>YES</td></tr>
<tr><td>H89[18]</td><td>Electronic thermal protection for continuous for second motor</td><td>100%</td><td>A359</td><td>YES</td></tr>
<tr><td>H90[18]</td><td>Motor rated current for second motor</td><td>0.1 – 50A</td><td>*</td><td>A35A</td><td>NO</td></tr>
</table>

[18] It is only displayed if, at least, one of the multi-function digital inputs (I17 – I24) is set to '12 ➔ Second motor select'.

* Depending on the motor will be used.

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H91[19]	Parameters read	0 – 1	0	A35B	It copies the parameters from the inverter and save them into the remote keypad.	NO
H92[19]	Parameters write	0 – 1	0	A35C	It copies the parameters from the remote keypad and save them into the inverter.	NO
H93	Parameters initialize	0 – 5	0	A35D	This parameter is used to initialize parameters back to the factory default value. 0 - 1 All parameter groups are initialized to factory default value. 2 Only Drive group is initialized. 3 Only Function 1 group is initialized. 4 Only Function 2 group is initialized. 5 Only I/O group is initialized.	NO
H94	Password register	0 – FFFF	0	A35E	Password for 'H95 ➔ Parameters lock'. It is set as Hexadecimal value. **Note:** To register a password for the first time: 1. In 'H94', press 'Ent' key twice. 2. Register the password (except '0') and press 'Ent' key (the value will blink). 3. Press 'Ent' key again to save the value and return to 'H94'. **Note:** To change the password you have to proceed in the same way, but it is necessary to introduce the current password between steps 1 and 2.	YES

[19] It is only displayed with remote keypad (option for read and write parameters).

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
H95	Parameters lock	0 – FFFF	0	A35F	This parameter is able to lock or unlock parameters by typing password registered before in 'H94 → Password register'. UL (Unlock): Parameters change enabled. L (Lock): Parameters change disabled.	YES

8.4. I/O group (I)

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I0	Parameter jump	0 – 99	1	-	Parameter selection to jump.	YES
I2	Minimum voltage of NV input	0.00 – -10V	0.00V	A402	It sets the minimum voltage of the NV input (-10V – 0V).	YES
I3	Minimum freq. for NV input at min. voltage	0.00 – 400Hz	0.00Hz	A403	It sets the inverter output minimum frequency at minimum voltage of the NV input.	YES
I4	Maximum voltage of NV input	0.00 – -10V	10.00V	A404	It sets the maximum voltage of the NV input.	YES
I5	Maximum freq. for NV input at max. voltage	0.00 – 400Hz	50.00Hz	A405	It sets the inverter output maximum frequency at maximum voltage of the NV input.	YES
I6	Filter time constant for analog. voltage of V1 input	0 – 9999 ms	10ms	A406	It sets the responsiveness of V1 input (0 – +10V).	YES
I7	Minimum voltage of V1 input	0 – 10V	0V	A407	It sets the minimum voltage of the V1 input.	YES
I8	Minimum freq. for V1 input at min. voltage	0.00 – 400Hz	0.00	A408	It sets the inverter output minimum frequency at minimum voltage of the V1 input.	YES
I9	Maximum voltage of V1 input	0 – 10V	10V	A409	It sets the maximum voltage of the V1 input.	YES
I10	Maximum freq. for V1 input at max. voltage	0.00 – 400Hz	50.00Hz	A40A	It sets the inverter output maximum frequency at maximum voltage of the V1 input.	YES
I11	Filter time constant for analog. current of I input	0 – 9999 ms	10ms	A40B	It sets the input section's internal filter constant for I input.	YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I12	Minimum current of I input	0.00 – 20.00mA	4.00mA	A40C	It sets the minimum current of I input.	YES
I13	Minimum freq. for I input at minimum current	0.00 – 400Hz	0.00Hz	A40D	It sets the inverter output minimum frequency at minimum current of I input.	YES
I14	Maximum current of I input	0.00 – 20.00mA	20.00mA	A40E	It sets the maximum current of I input.	YES
I15	Maximum freq. for I input at maximum current	0.00 – 400Hz	50.00Hz	A40F	It sets the inverter output maximum frequency at maximum current of I input.	YES
I16	Criteria for signal loss of reference analogue input	0 – 2	0	A410	0 Disabled. 1 Activated below half of minimum set value. 2 Activated below minimum set value. When the time set in 'I63 ➔ Time to determine speed reference signal loss' has elapsed, on which any reference signal is applied to the inverter, or a reference signal which value is below half of (if 'I16' is set to '1'), or only below (if 'I16' is set to '2') minimum set value (which can be a voltage or current value) is applied, the inverter will stop according to the setting of 'I62 ➔ Stop mode when reference signal loss occurs'.	YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I17	Configuration of multi-function digital input P1	0 – 27	0	A411	0 Forward Run command. 1 Reverse Run command. 2 Emergency stop trip. 3 Fault reset. 4 Jog operation command. 5 Low Speed (Multi-step freq.). 6 Middle Speed (Multi-step freq.). 7 High Speed (Multi-step freq.). 8 Low Accel/Decel (Multi-accel/decel). 9 Middle Accel/Decel (Multi-accel/decel). 10 High Accel/Decel (Multi-accel/decel). 11 DC brake. 12 Selection of second motor. 13 -Reserved- 14 -Reserved- 15 Up – Frequency increase. 16 Down – Frequency decrease. 17 3-wire operation. 18 External trip: A Contact (EtA). 19 External trip: B Contact (EtB). 20 Self-diagnostic function. 21 Exchange between PID operation and V/F operation. 22 Exchange from option to inverter. 23 Analogue hold. 24 Accel/decel disabled. 25 Initialization. Up/Down Save frequency. 26 Open loop 1. 27 Fire mode (see parameter 'I90').	YES
I18	Configuration of multi-function digital input P2		1	A412		YES
I19	Configuration of multi-function digital input P3		2	A413		YES
I20	Configuration of multi-function digital input P4		3	A414		YES
I21	Configuration of multi-function digital input P5		4	A415		YES
I22	Configuration of multi-function digital input P6		5	A416		YES
I23	Configuration of multi-function digital input P7		6	A417		YES
I24	Configuration of multi-function digital input P8		7	A418		YES

<table>
<tr><th>Parameter</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>I25</td><td>Input terminals status</td><td>-</td><td>0</td><td>A419</td><td><table><tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr><tr><td>P8</td><td>P7</td><td>P6</td><td>P5</td><td>P4</td><td>P3</td><td>P2</td><td>P1</td></tr></table></td><td>YES</td></tr>
<tr><td>I26</td><td>Output terminals status</td><td>-</td><td>0</td><td>A41A</td><td><table><tr><td>Bit 1</td><td>Bit 0</td></tr><tr><td>3AC</td><td>MO</td></tr></table></td><td>YES</td></tr>
<tr><td>I27</td><td>Filter time constant for digital inputs</td><td>1 – 15</td><td>4</td><td>A41B</td><td>Filter for digital inputs, effective in case of inputs are affected by the noise. If this value is increased, the response time is getting slower.</td><td>YES</td></tr>
<tr><td>I30</td><td>Multi-step frequency 4</td><td rowspan="4">0.00 – 400Hz</td><td>30.00Hz</td><td>A41E</td><td rowspan="4">Frequency values which will be applied as multiple speeds are set in these parameters. It cannot be set greater than ‘F21 ➔ Maximum frequency’.</td><td>YES</td></tr>
<tr><td>I31</td><td>Multi-step frequency 5</td><td>25.00Hz</td><td>A41F</td><td>YES</td></tr>
<tr><td>I32</td><td>Multi-step frequency 6</td><td>20.00Hz</td><td>A420</td><td>YES</td></tr>
<tr><td>I33</td><td>Multi-step frequency 7</td><td>15.00Hz</td><td>A421</td><td>YES</td></tr>
</table>

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I34	Multi-accel. time 1	0.0 – 6000 sec	3.0 sec	A422	Setting of the time values which will be applied as multiple acceleration and deceleration ramps.	YES
I35	Multi-decel. time 1		3.0 sec	A423		YES
I36	Multi-accel. time 2		4.0 sec	A424		YES
I37	Multi-decel. time 2		4.0 sec	A425		YES
I38	Multi-accel. time 3		5.0 sec	A426		YES
I39	Multi-decel. time 3		5.0 sec	A427		YES
I40	Multi-accel. time 4		6.0 sec	A428		YES
I41	Multi-decel. time 4		6.0 sec	A429		YES
I42	Multi-accel. time 5		7.0 sec	A42A		YES
I43	Multi-decel. time 5		7.0 sec	A42B		YES
I44	Multi-accel. time 6		8.0 sec	A42C		YES
I45	Multi-decel. time 6		8.0 sec	A42D		YES
I46	Multi-accel. time 7		9.0 sec	A42E		YES
I47	Multi-decel. time 7		9.0 sec	A42F		YES

<table>
<tr><th>Parameter</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>I50</td><td>Analogue output mode</td><td>0 – 3</td><td>0</td><td>A432</td><td>
<table>
<tr><th></th><th>Parameter</th><th colspan="2">Output to 10V</th></tr>
<tr><th></th><th></th><th>200V</th><th>400V</th></tr>
<tr><td>0</td><td>Output frequency</td><td colspan="2">Maximum freq.</td></tr>
<tr><td>1</td><td>Output current</td><td colspan="2">150 %</td></tr>
<tr><td>2</td><td>Output voltage</td><td>AC 282V</td><td>AC 564V</td></tr>
<tr><td>3</td><td>Inverter DC Link voltage</td><td>DC 400V</td><td>DC 800V</td></tr>
</table>
</td><td>YES</td></tr>
<tr><td>I51</td><td>Analogue output setting</td><td>10 – 200%</td><td>100%</td><td>A433</td><td>Based on 10V.</td><td>YES</td></tr>
<tr><td>I52</td><td>Level of frequency detection</td><td rowspan="2">0.00 – 400Hz</td><td>30.00Hz</td><td>A434</td><td rowspan="2">These parameters are used when ‘I54 ➔ Multi-function output configuration’ or ‘I55 ➔ Multi-function relay configuration’ are set between 0-4.
Cannot be set higher than ‘F21 ➔ Maximum frequency’.</td><td>YES</td></tr>
<tr><td>I53</td><td>Bandwidth of frequency detection</td><td>10.00Hz</td><td>A435</td><td>YES</td></tr>
</table>

<table>
<tr><th>Parameter</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>I54</td><td>Multi-function output (MO) configuration</td><td rowspan="2">0 – 18</td><td>12</td><td>A436</td><td rowspan="2">Multi-function output and/or multi-function relay will be activated when selected condition is given according to following table.
If they are set to '17 ➔ Fault output', the multi-function output and/or relay will be activated according to the setting of 'I56 ➔ Fault relay configuration'.
<table><tr><td>0</td><td>FDT-1</td></tr><tr><td>1</td><td>FDT-2</td></tr><tr><td>2</td><td>FDT-3</td></tr><tr><td>3</td><td>FDT-4</td></tr><tr><td>4</td><td>FDT-5</td></tr><tr><td>5</td><td>Overload (OLt).</td></tr><tr><td>6</td><td>Inverter overload (IOLt).</td></tr><tr><td>7</td><td>Motor stall.</td></tr><tr><td>8</td><td>Over voltage trip (Ovt).</td></tr><tr><td>9</td><td>Low voltage trip (Lvt).</td></tr><tr><td>10</td><td>Inverter overheating (OHt).</td></tr><tr><td>11</td><td>Reference signal loss.</td></tr><tr><td>12</td><td>During Run.</td></tr><tr><td>13</td><td>During Stop.</td></tr><tr><td>14</td><td>During steady status.</td></tr><tr><td>15</td><td>During Speed search.</td></tr><tr><td>16</td><td>Wait time for run signal input.</td></tr><tr><td>17</td><td>Fault output.</td></tr><tr><td>18</td><td>Warning for cooling fan trip.</td></tr></table></td><td>YES</td></tr>
<tr><td>I55</td><td>Multi-function relay (30A, B, C) configuration</td><td>17</td><td>A437</td><td>YES</td></tr>
</table>

<table>
<tr><th>Parameter</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>I56</td><td>Fault relay configuration</td><td>0 – 7</td><td>2</td><td>A438</td><td>If ‘I54 ➔ Multi-function output configuration’ and/or ‘I55 ➔ Multi-function relay configuration’ are set to ‘17 ➔ Fault output’, the multi-function output and/or relay will be activated when a fault occurs according to the configuration of ‘I56’.
<table>
<tr><th></th><th>Tries of auto fault reset (H26)</th><th>With any different fault of ‘Low voltage’</th><th>With ‘Low voltage fault</th></tr>
<tr><td></td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>0</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>-</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>4</td><td>✓</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>✓</td><td>-</td><td>✓</td></tr>
<tr><td>6</td><td>✓</td><td>✓</td><td>-</td></tr>
<tr><td>7</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td><td>YES</td></tr>
<tr><td>I57</td><td>Output configuration when communic. error occurs</td><td>0 – 3</td><td>0</td><td>A439</td><td>When a communication error occurs ‘Err’, the multi-function output and/or relay can be activated.
<table>
<tr><th></th><th>Multi-function relay</th><th>Multi-function output</th></tr>
<tr><td></td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>0</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>✓</td></tr>
<tr><td>2</td><td>✓</td><td>-</td></tr>
<tr><td>3</td><td>✓</td><td>✓</td></tr>
</table></td><td>YES</td></tr>
<tr><td>I59</td><td>Selection of communic. protocol</td><td>0 – 1</td><td>0</td><td>A43B</td><td>Setting of communication protocol.
<table>
<tr><td>0</td><td>Modbus RTU</td></tr>
<tr><td>1</td><td>LS BUS</td></tr>
</table></td><td>NO</td></tr>
<tr><td>I60</td><td>Slave number in communic. net</td><td>1 – 250</td><td>1</td><td>A43C</td><td>Setting for RS485 communication.</td><td>YES</td></tr>
</table>

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I61	Transmission speed in communic. net	0 – 4	3	A43D	Setting of transmission speed for RS485 communication. 0 – 1200 bps 1 – 2400 bps 2 – 4800 bps 3 – 9600 bps 4 – 19200 bps	YES
I62	Stop mode after reference signal loss	0 – 2	0	A43E	This parameter is used when the reference frequency is given by V1/I terminals or by RS485. The inverter operates according to this parameter setting after the time set in 'I63 ➔ Time to determine speed reference signal loss' is elapsed. 0 – Non stop: continuous operation at the previous frequency to the reference frequency loss. 1 – Free run: the inverter turns off the output and the motor is stopped by inertia. 2 – Decel. to stop: the inverter applies a deceleration ramp. This parameter is enable when 'I16 ➔ Criteria for reference analogue input signal loss' is set to '1 ➔ Activated below half of minimum set value' or to '2 ➔ Activated below minimum set value'.	YES
I63	Time to determine speed reference signal loss	0.1 – 120 sec	1.0 sec	A43F	Setting of the time that the inverter will wait it before considering that the reference signal has been lost. In that moment, The inverter operates according to the setting of 'I62 ➔ Stop mode after reference signal loss'. This parameter is enable when 'I16 ➔ Criteria for reference analogue input signal loss' is set to '1 ➔ Activated below half of minimum set value' or to '2 ➔ Activated below minimum set value'.	YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I64	Communic. time setting	2 – 100ms	5ms	A440	Frame communication time.	YES
I65	Parity/Stop bit setting	0 – 3	0	A441	When the protocol is set, the communication format can be set. 0 Parity: None, Bit Stop: 1 1 Parity: None, Bit Stop: 2 2 Parity: Odd, Bit Stop: 1 3 Parity: Even, Bit Stop: 1	YES
I66	Read address register 1	0 – A4FF	5	A442	The user can register up to 8 discontinuous addresses and read all of them with one read command.	YES
I67	Read address register 2		6	A443		YES
I68	Read address register 3		7	A444		YES
I69	Read address register 4		8	A445		YES
I70	Read address register 5		9	A446		YES
I71	Read address register 6		A	A447		YES
I72	Read address register 7		B	A448		YES
I73	Read address register 8		C	A449		YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I74	Write address register 1	0 – A4FF	5	A44A	The user can register up to 8 discontinuous addresses and write in all of them with one write command.	YES
I75	Write address register 2		6	A44B		YES
I76	Write address register 3		7	A44C		YES
I77	Write address register 4		8	A44D		YES
I78	Write address register 5		9	A44E		YES
I79	Write address register 6		A	A44F		YES
I80	Write address register 7		B	A450		YES
I81	Write address register 8		C	A451		YES
I82	Fire mode frequency	0.00 – 400Hz	50.00Hz	A452	Reference frequency when the inverter operates in Fire mode. See parameter 'I90 ➔ Fire mode'.	YES
I83	Minimum scaling factor for PID Feedback	0.0 – 100.0	0.0	A453	Minimum scaling factor for PID Feedback.	YES
I84	Maximum scaling factor for PID Feedback	0.0 – 100.0	100.0	A454	Maximum scaling factor for PID Feedback.	YES

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I85	Selection of contact type A (NO), or B (NC) for multi-function output (MO)	0 – 1	0	A455	This parameter sets the contact type for MO multi-function digital input. 0 A Contact (Normally open). 1 B Contact (Normally close).	YES
I86	On delay time for multi-function output (MO)	0.0 – 10.0 sec	0.0 sec	A456	Delay time for connection of multi-function output (MO) contact.	NO
I87	Off delay time for multi-function output (MO)	0.0 – 10.0 sec	0.0 sec	A457	Delay time for disconnection multi-function output (MO) contact.	NO
I88	On delay time for multi-function relay 30A, B, C	0.0 – 10.0 sec	0.0 sec	A458	Delay time for connection of 30A, B, C multi-function relay contact.	NO
I89	Off delay time for multi-function relay 30A, B, C	0.0 – 10.0 sec	0.0 sec	A459	Delay time for disconnection of 30A, B, C multi-function relay contact.	NO

Parameter	Description	Range	Default value	Memory address	Function	Set during RUN
I90	Fire mode	0 – 1	-	A45A	It allows displaying if Fire mode has been activated. This value is not initialized. If this value changes to '1', the warranty of the equipment is not valid any more. This operation mode is used as an emergency start. The inverter ignores all of faults and tries to start automatically. To activate Fire mode you should configure one of the multi-function digital inputs (I17-I24) as '27 ➔ Fire mode' and then activate it. In this operation mode, control mode is changed to V/F and acceleration and deceleration times change to 10s. Moreover, frequency reference is introduced by 'I82 ➔ Fire mode frequency'. To come back to the previous status (before Fire mode activation) you must turn off the inverter power and then turn on again. _____ **Caution:** the inverter may get damaged. 0 – No. Fire mode has not been activated. 1 – Yes. Fire mode has been activated.	-

9. FAULT MESSAGES

9.1. Displayed faults

Display	Protection function	Description
	Overload	The inverter turns off its output when its output current is above 200% of the inverter rated current.
	Ground fault current	The inverter turns off its output when a ground faults occurs and the ground fault current is more than the internal setting value of the inverter. Over current protection function protects the inverter against any ground fault caused by a small earth leakage resistor.
	Inverter overload	The inverter turns off its output when its output current is greater than the rated level (150% for 1 minute).
	Overload trip	The inverter turns off its output when its output current is at 150% of the inverter rated current for more than the current limit time (1 minute).
	Inverter overheat	The inverter turns off its output when is overheated due to a damaged cooling fan or an alien substance present in the cooling system.
	Output phase loss	The inverter turns of its output when one or more of the output phase (U, V, W) is disconnected (open). The inverter detects the output current to check the phase loss of the output.
	Over voltage	The inverter turns off its output if the DC voltage of the main circuit exceeds the internal configured value (400V) when the motor accelerates or the regenerative motor energy, returned thorough the inverter, is too high for the DC Link capacitors. This fault can also occur due to a surge voltage generated at the power supply system.
	Low voltage	The inverter turns off its output if the DC voltage is below the detection level (180V) because insufficient torque or overheating of the motor can occur when the input voltage of the inverter drops.

Display	Protection function	Description
	Electronic thermal protection	The electronic thermal protection of the inverter determines the overheating of the motor. If the motor is overloaded the inverter turns off the output. The inverter cannot protect the motor when driving a motor having more than 4 poles or multiples motors. For this reason, is recommended to install a thermal protection for each motor.
	Input phase loss	The inverter turns off its output when one of the R, S, T phases is disconnected (open) or when the electrolytic capacitor needs to be replaced.
	Self-diagnostic malfunction	Displayed when IGBT damaged, output phase short, output phase ground fault or output phase open occurs.
	Parameter save error	Displayed when user-setting parameters fails to be entered into memory.
	Inverter hardware fault	A fault signal is generated when an error occurs in the control circuitry of the inverter.
	Communication error	Displayed when the inverter cannot communicate with the keypad/display unit.
	Remote keypad communication error	This fault is displayed when the inverter and remote keypad do not communicate each other. It does not stop inverter operation.
	Keypad error	Displayed after inverter resets keypad when keypad error occurs and this status is hold for a certain time.
	Cooling fan fault	This fault is displayed when a fault condition occurs in the inverter cooling fan.
	Emergency stop (instant cut off)	Used for the emergency stop of the inverter. The inverter instantly turns off the output when BX terminal is ON and turns on again when BX terminal is OFF. If you use this function, be careful.

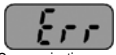
Display	Protection function	Description
	External fault A contact (NO) input	The inverter turns off the output if some of the multi-function digital inputs (I17 – I24) set to '18 ➔ External trip: A Contact (EtA)' is activated.
	External fault B contact (NC) input	The inverter turns off the output if some of the multi-function digital inputs (I17 – I24) set to '19 ➔ External trip: B Contact (Etb)' is activated.
	Operation method when the reference frequency is lost	When inverter operation is set using analogue input (0 – 10V or 0 – 20mA) or using communication net (RS485 option) and reference signal is lost, operation mode is done according to the method set in 'I62 ➔ Stop mode after reference signal loss'.
	NTC open	NTC is disconnected. Outputs are disabled.

9.2. Displayed faults remedy

Display / Function	Cause	Remedy
 Over current	Acceleration / deceleration time is too short compared to the load inertia (GD^2).	Increase the acceleration / deceleration time.
	Load is greater than the inverter rated power.	Increase the inverter rated power.
	Inverter tries to start when the motor is free running.	Check the correct programming of the start conditions when the motor is running. Set an appropriate inertia load value and set parameters which active speed search correctly. **Note:** Safety conditions which allow to appropriate start when motor is running depend on each installation.
	Output short circuit or ground fault has occurred.	Check output wiring.
	Mechanical brake of the motor is operating too fast.	Check the mechanical brake operation.
	Components of power circuit have been overheated due to the cooling fan malfunction.	Check the cooling fan. Verify the cooling fan is power supplied correctly and there is not any alien substance into it.
	Caution: When an over current fault occurs, operation must be started after the cause is removed to avoid damage to IGBT 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.
 Inverter overload	Load is greater than the inverter rated power.	Increase the rated power of the motor and the inverter.
 Overload trip	Torque boost scale is set too large.	Reduce torque boost scale.

Display / Function	Cause	Remedy
 Inverter overheat	Cooling fan damaged or an alien substance is into the cooling system.	Replace the cooling fans 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 under 50ºC or verify the capacity of the inverter according to this capacity.
 Output phase loss	Faulty contact of magnetic switch at output.	Check the magnetic switch of the output.
	Faulty output wiring.	Check the output wiring.
 Over voltage	Deceleration time is too short compared to the load inertia (GD^2).	Increase deceleration time.
	Regenerative load is at the inverter output.	Use an optional dynamic brake resistor.
	Line voltage is too high.	Check line voltage.
 Low voltage	Line voltage is low.	Check line voltage.
	Load larger than line capacity is connected to 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.
 Electronic thermal protection	Motor has been overheated.	Reduce load weight and/or operation duty.
	Load is greater than inverted rated capacity.	Use an inverter with higher capacity.
	Electronic thermal protection level (ETH) is set too low.	Set ETH level to an appropriate value.
	Inverter rated power is incorrectly selected.	Select correct inverter rated power.
	Inverter has been operated at low speed for too long.	Install a cooling fan with an external power supply to motor.

Display / Function	Cause	Remedy
 Cooling fan fault	An alien substance is clogged in a ventilating slot.	Check the ventilating slot and remove the clogged substances.
	The inverter has been in use without changing the damaged cooling fan.	Replace the cooling fan.
 External fault A contact input  External fault B contact input	The terminal set to '18 → External trip: A Contact' and/or the terminal set to '19 → External trip: B Contact' are ON.	Eliminate the cause of fault at circuit connected to defined terminal as external fault A and/or B contact input.
 Operating method when the reference frequency is lost	No reference frequency is applied to V1 and/or I inputs.	Check the wiring of V1 and/or I inputs. Check the reference frequency level.
 Remote keypad communication error	Communication error between inverter keypad unit and remote keypad.	Check for connection of communication line and connector.

Display / Function	Cause	Remedy
 Parameter save error  Inverter hardware fault  Communication error  Keypad error	'EEP': Parameter save error. 'HWT': Inverter hardware fault. 'Err': Communication error. 'COM': Keypad error.	Get in contact with an official distributor of POWER ELECTRONICS.

9.3. Maintenance

9.3.1. 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 is below DC 30V. The bus capacitors in the inverter main circuit can still be charged even after the power is turned off.
- The correct output voltage of the inverter can only be measured by using a rectifier voltage meter. Others voltage meters, including digital voltage meters, are likely to display incorrect values caused by the high frequency PWM output voltage of the inverter.

9.3.2. Routine inspection

- Make sure there are proper conditions in the location of the installation.
- Make sure there are proper conditions to inverter cooling system.
- Check unusual vibration and noise.
- Check unusual overheating.

9.3.3. Periodic inspection

- Check if there are screws and bolts loose. In this case, tighten them or replace them.
- Check if there is corrosion presence due to ambient conditions. In this case, replace the affected parts.
- Check the rotation condition of the cooling fan, the condition of capacitors and the connections with the magnetic contactor. Replace them if there are any abnormalities.

9.3.4. Part replacement

Inverters of SD250 Series consist of many electronic parts such as semiconductor devices. The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or failure of the inverter. For preventive maintenance, the parts must be changed periodically. The parts replacement guidelines are indicated in the following table. LED's and other short-life parts must also be changed during periodic inspection.

Part	Periodic change	Description
Cooling fan	3 years	Replacement (as required)
DC Link capacitor in main circuit	4 years	Replacement (as required)
Electrolytic capacitor on control board	4 years	Replacement (as required)
Relays	-	Replacement (as required)

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 computer. In this way, parameters setting 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.

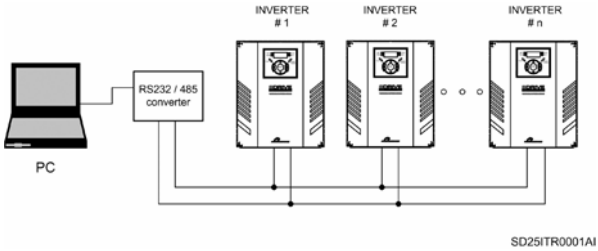


Figure 10.1 System configuration in RS485 network

10.2. Specifications

General specifications.

- Communication method: RS485.
- Transmission form: Bus method, Multi drop Link System.
- Applicable drive: SD250.
- Converter: RS232 converter.
- Connectable drives: Maximum 31.
- Transmission distance: Below 1.200m maximum (within 700m recommended).

Specifications of the installation.

- Cable recommended: 0.75mm² (18AWG), Shield type twisted-pare.
- Installation: S+ and S- terminals of TB1 connector located 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 system.
- Character system: ASCII (8 bit).
- Stop bit length: 2 bit (Modbus-RTU).
- Sum check: 2 byte.
- Parity check: None.

10.3. Installation

10.3.1. Connection of the communication cable

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

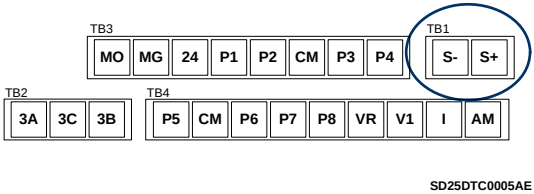


Figure 10.2 TB1 connector of the control board

After connecting the cable, set the following parameters as follows:

Param.	Description	Setting	
drv	Drive mode	3	RS485 communication.
Frq	Frequency setting mode	7	RS485 communication.
I60	Slave No. in communication net	1 – 250	Use different numbers in case of more than 1 inverter are installed.
I61	Transmission speed in communication net	3	3: 9.600bps (factory setting).
I62	Stop mode after reference signal loss	0	Non stop (factory setting).
I63	Time to determine speed reference signal loss	1.0sec	(Factory setting).
I59	Selection of communication protocol	0	0: Modbus RTU

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 Faults solution' 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.

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

10.5. Address list

10.5.1. Common Area

Address	Parameter	Scale	Unit	R/W	Data value
0x0000	Inverter model			R	A: SD250
0x0001	Inverter capacity			R	FFFF: 0.4kW 0000: 0.75kW 0002: 1.5kW 0003: 2.2kW 0004: 3.7kW 0005: 4.0kW 0006: 5.5kW 0007: 7.5kW
0x0002	Inverter input voltage			R	0: 220Vac 1:440Vac
0x0003	S/W version			R	(Ex) 0x0100: Version 1.0 (Ex) 0x0101: Version 1.1
0x0004	Parameter Lock			R/W	0: Lock (default) 1: Unlock
0x0005	Reference frequency	0.01	Hz	R/W	Start. freq. to Max. freq.

Address	Parameter	Scale	Unit	R/W	Data value
0x0006	Run command			R/W	Bit 0: Stop
					Bit 1: Forward run
					Bit 2: Reverse run
				W	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
					Bit: 9: Up speed
					Bit 10: Down speed
					Bit 11: Up/down zero
					Bit 12: Analogue V0
					Bit 13: Analogue V1
					Bit 14: Analogue I
					Bit 15: V0 + I
					Bit 16: V1 + I
					Bit 17: Jog frequency
					18: PID
					19: Communication
					20 to 31: Reserve
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	0.1	V	R	
0x000C	DC Link voltage	0.1	V	R	
0x000D	Output power	0.1	kW	R	

Address	Parameter	Scale	Unit	R/W	Data value
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: REM R/S
					Bit 14: REM Freq.
0x000F	Fault information			R	Bit 0: OCT
					Bit 1: OVT
					Bit 2: EXT-A
					Bit 3: EST (BX)
					Bit 4: COL
					Bit 5: GFT
					Bit 6: OHT
					Bit 7: ETH
					Bit 8: OLT
					Bit 9: HW-Diag
					Bit 10: EXT-B
					Bit 11:EEP
					Bit 12:FAN
					Bit 13:PO
					Bit 14:IOLT
					Bit 15:LVT
0x0010	Input terminal status			R	Bit 0: P1
					Bit 1: P2
					Bit 2: P3
					Bit 3: P4
					Bit 4: P5
					Bit 5: P6
					Bit 6: P7
					Bit 7: P8

Address	Parameter	Scale	Unit	R/W	Data value
0x0011	Output terminal status			R	Bit 0: Not used
					Bit 1: Not used
					Bit 2: Not used
					Bit 3: Not used
					Bit 4: MO
					Bit 5: Not used
					Bit 6: Not used
					Bit 7: 30AC
0x0012	V1	0 a 3FF		R	Value corresponding to 0V – +10V
0x0013	V2	0 a 3FF		R	Value corresponding to 0V – -10V when setting freq mode to 2
0x0014	I	0 a 3FF		R	Value corresponding to 0 – 20mA
0x0015	RPM			R	Output speed
0x001A	Display unit			R	Not used
0x001B	Pole number			R	Not used
0x001C	Custom version			R	Not used
0x001D	Trip information			R	Bit 0: COM (I/O board reset)
					Bit 1 – 15: 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. Drive group (DRV)

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A100	41216	D00 (0.00)	Reference frequency	0	Max. Freq.	0
A101	41217	D01 (ACC)	Acceleration time	50	60000	0
A102	41218	D02 (dEC)	Deceleration time	100	60000	0
A103	41219	D03 (drv)	Drive mode	1	3	0
A104	41220	D04 (Frq)	Frequency setting mode	0	7	0
A105	41221	D05 (REF)	PID reference	0	1	0
A106	41222	D06 (FBK)	PID feedback	0	1	0
A107	41223	D07 (St1)	Multi-step frequency 1	1000	Max. Freq.	0
A108	41224	D08 (St2)	Multi-step frequency 2	2000	Max. Freq.	0
A109	41225	D09 (St3)	Multi-step frequency 3	3000	Max. Freq.	0
A10A	41226	D10 (CUr)	Output current	0	1	0
A10B	41227	D11 (rPM)	Motor RPM	0	1800	0
A10C	41228	D12 (dCL)	Inverter DC Link voltage	0	65535	0
A10D	41229	D13 (vOL)	User display selection	0	1	0
A10E	41230	D14 (nOn)	Fault display	0	1	0
A10F	41231	D15 (drC)	Selection of motor rotation direction	0	1	0
A110	41232	D16 (drv2)	Drive mode 2	1	2	0
A111	41233	D17 (Frq2)	Frequency setting mode 2	0	6	0
A112	41234	D18 (Frq3)	Frequency setting mode 3	0	7	0

10.5.3. Function 1 group (F)

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A201	41473	F1	Prevention of motor rotation direction	0	2	0
A202	41474	F2	Acceleration pattern	0	1	0
A203	41475	F3	Deceleration pattern	0	1	0
A204	41476	F4	Stop mode	0	2	0
A208	41480	F8	DC brake start frequency	500	6000	Start. Freq.
A209	41481	F9	DC current application delay time	10	6000	0
A20A	41482	F10	DC current level for DC brake	50	200	0
A20B	41483	F11	DC current application time	10	600	0
A20C	41484	F12	DC current level before starting	50	200	0
A20D	41485	F13	DC current application time before starting	0	600	0
A20E	41486	F14	Time for magnetizing a motor	10	600	0
A214	41492	F20	Jog frequency	1000	Max. Freq.	0
A215	41493	F21	Maximum frequency	500	Max. Freq.	4000
A216	41494	F22	Base frequency	6000	Max. Freq.	3000
A217	41495	F23	Start frequency	50	1000	0
A218	41496	F24	Frequency limits selection	0	1	0
A219	41497	F25	High frequency limit	6000	Max. Freq.	0
A21A	41498	F26	Low frequency limit	50	High limit	Start freq.
A21B	41499	F27	Torque boost selection	0	1	0
A21C	41500	F28	Torque boost in forward direction	20	150	0
A21D	41501	F29	Torque boost in reverse direction	20	150	0
A21E	41502	F30	V/F Pattern	0	2	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A21F	41503	F31	User V/F frequency 1	1250	Max. Freq.	0
A220	41504	F32	User V/F voltage 1	25	100	0
A221	41505	F33	User V/F frequency 2	2500	Max. Freq.	0
A222	41506	F34	User V/F voltage 2	500	100	0
A223	41507	F35	User V/F frequency 3	3750	Max. Freq.	0
A224	41508	F36	User V/F voltage 3	75	100	0
A225	41509	F37	User V/F frequency 4	5000	Max. Freq.	0
A226	41510	F38	User V/F voltage 4	100	100	0
A227	41511	F39	Output voltage setting	1000	1100	400
A228	41512	F40	Energy saving level	0	30	0
A232	41522	F50	Electronic thermal protection	1	1	0
A233	41523	F51	Level of Electronic thermal protection for 1 minute	150	200	F52
A234	41524	F52	Level of Electronic thermal protection for continuous	100	F51	50
A235	41525	F53	Motor cooling mode	0	1	0
A236	41526	F54	Overload warning level	150	150	30
A237	41527	F55	Overload warning time	100	300	0
A238	41528	F56	Overload trip selection	1	1	0
A239	41529	F57	Overload trip level	180	200	30
A23A	41530	F58	Overload trip time	600	600	0
A23B	41531	F59	Stall prevention mode	0	7	0
A23C	41532	F60	Stall prevention level	150	150	30
A23F	41535	F63	Up/Down Save	0	1	0
A240	41536	F64	Reference value displaying	0	Max. Freq.	0

10.5.4. Function 2 group (H)

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A300	41728	H0	Parameter jump	1	100	0
A301	41729	H1	Fault history 1	0	1	0
A302	41730	H2	Fault history 2	0	1	0
A303	41731	H3	Fault history 3	0	1	0
A304	41732	H4	Fault history 4	0	1	0
A305	41733	H5	Fault history 5	0	1	0
A306	41734	H6	Reset fault history	0	1	0
A307	41735	H7	Dwell frequency	500	Max. Freq.	Start freq.
A308	41736	H8	Dwell time	0	100	0
A30A	41738	H10	Selection of resonant frequencies	0	1	0
A30B	41739	H11	Low resonant frequency range 1	1000	H12	Start freq.
A30C	41740	H12	High resonant frequency range 1	1500	Max. Freq.	H11
A30D	41741	H13	Low resonant frequency range 2	2000	H14	Start freq.
A30E	41742	H14	High resonant frequency range 2	2500	Max. Freq.	H13
A30F	41743	H15	Low resonant frequency range 3	3000	H16	Start freq.
A310	41744	H16	High resonant frequency range 3	3500	Max. Freq.	H15
A311	41745	H17	S-Curve start	40	100	1
A312	41746	H18	S-Curve end	40	100	1
A313	41747	H19	Selection of input/output phase loss protection	0	3	0
A314	41748	H20	Restart after power supply fault	0	1	0
A315	41749	H21	Restart after fault reset	0	1	0
A316	41750	H22	Speed search function	0	15	0
A317	41751	H23	Current level for speed search	100	200	80
A318	41752	H24	P gain for Speed search	100	9999	0
A319	41753	H25	I gain for Speed search	1000	9999	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A31A	41754	H26	Tries of automatic fault resets (Auto-restart)	0	10	0
A31B	41755	H27	Time between tries of automatic fault resets	10	600	0
A31E	41758	H30	Motor power setting	7	7	0
A31F	41759	H31	Selection of number of motor poles	4	12	2
A320	41760	H32	Rated slip frequency	233	1000	0
A321	41761	H33	Motor rated current	263	500	10
A322	41762	H34	No load motor current	110	200	1
A324	41764	H36	Motor efficiency	87	100	50
A325	41765	H37	Load inertia rate	0	2	0
A327	41767	H39	Setting of carrier frequency	30	150	10
A328	41768	H40	Selection of control mode	0	3	0
A329	41769	H41	Auto-tuning of motor parameters	0	1	0
A32A	41770	H42	Stator resistance (Rs)	2500	14000	0
A32C	41772	H44	Leakage inductance	2600	30000	0
A32D	41773	H45	Sensorless P gain	1000	32767	0
A32E	41774	H46	Sensorless I gain	10	32767	0
A332	41778	H50	PID feedback setting	0	1	0
A333	41779	H51	P gain for PID mode	3000	9999	0
A334	41780	H52	I gain for PID mode	100	3200	10
A335	41781	H53	D gain for PID mode	0	3000	0
A336	41782	H54	F gain for PID mode	0	9999	0
A337	41783	H55	High limit of output frequency in PID mode	6000	Max. Freq.	Start freq.
A338	41784	H56	Low limit of output frequency in PID mode	50	Max. Freq.	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A33F	41791	H63	Sleep delay time	60	999	0
A340	41792	H64	Sleep frequency	0	Max. Freq.	0
A341	41793	H65	Wake up level in Sleep mode	20	500	0
A345	41797	H69	Frequency of accel/decel change	0	Max. Freq.	0
A346	41798	H70	Reference frequency for accel/decel	0	1	0
A347	41799	H71	Accel/Decel time scale	1	2	0
A348	41800	H72	Power on display	0	13	0
A349	41801	H73	Selection of user screen	0	2	0
A34A	41802	H74	Displaying of gain for motor rpm	100	1000	1
A34B	41803	H75	Selection of operation rate limit of dynamic brake resistor	1	1	0
A34C	41804	H76	Operation rate of dynamic brake resistor	10	30	0
A34D	41805	H77	Cooling fan control	0	1	0
A34E	41806	H78	Selection of operation mode when cooling fan malfunctions	0	1	0
A34F	41807	H79	Software version	See manual	100	0
A351	41809	H81	Accel. time for second motor	50	60000	0
A352	41810	H82	Decel. time for second motor	100	60000	0
A353	41811	H83	Base frequency for second motor	6000	Max. Freq.	3000
A354	41812	H84	V/F Pattern for second motor	0	2	0
A355	41813	H85	Forward torque boost for second motor	50	150	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A356	41814	H86	Reverse torque boost for second motor	50	150	0
A357	41815	H87	Stall prevention level for second motor	150	150	30
A358	41816	H88	Electronic thermal protection for 1 minute for second motor	150	200	H89
A359	41817	H89	Electronic thermal protect. for continuous for second motor	100	H88	50
A35A	41818	H90	Motor rated current for second motor	263	500	10
A35B	41819	H91	Parameters read	0	1	0
A35C	41820	H92	Parameters write	0	1	0
A35D	41821	H93	Parameters initialize	0	5	0
A35E	41822	H94	Password register	0	65535	0
A35F	41823	H95	Parameters lock	0	65535	0

10.5.5. I/O group (I)

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A402	41986	I2	Minimum voltage of NV input	0	1000	0
A403	41987	I3	Minimum freq. for NV input at min. voltage	0	Max. Freq.	0
A404	41988	I4	Maximum voltage of NV input	1000	1000	0
A405	41989	I5	Maximum freq. for NV input at max. voltage	6000	Max. Freq.	0
A406	41990	I6	Filter time constant for analog. voltage of V1 input	10	9999	0
A407	41991	I7	Minimum voltage of V1 input	0	1000	0
A408	41992	I8	Minimum freq. for V1 input at min. voltage	0	Max. Freq.	0
A409	41993	I9	Maximum voltage for V1 input	1000	1000	0
A40A	41994	I10	Maximum freq. for V1 input at max. voltage	6000	Max. Freq.	0
A40B	41995	I11	Filter time constant for analog. current of I input	10	9999	0
A40C	41996	I12	Minimum current of I input	400	2000	0
A40D	41997	I13	Minimum freq. for I input at minimum current	0	Max. Freq.	0
A40E	41998	I14	Maximum current of I input	2000	2000	0
A40F	41999	I15	Maximum freq. for I input at max. current	6000	Max. Freq.	0
A410	42000	I16	Criteria for signal loss of reference analogue input	0	2	0
A411	42001	I17	Configuration of multi-function digital input P1	0	27	0
A412	42002	I18	Configuration of multi-function digital input P2	1	27	0
A413	42003	I19	Configuration of multi-function digital input P3	2	27	0
A414	42004	I20	Configuration of multi-function digital input P4	3	27	0
A415	42005	I21	Configuration of multi-function digital input P5	4	27	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A416	42006	I22	Configuration of multi-function digital input P6	5	27	0
A417	42007	I23	Configuration of multi-function digital input P7	6	27	0
A418	42008	I24	Configuration of multi-function digital input P8	7	27	0
A419	42009	I25	Input terminals status	0	255	0
A41A	42010	I26	Output terminals status	0	3	0
A41B	42011	I27	Filter time constant for digital inputs	15	50	2
A41E	42014	I30	Multi-step frequency 4	3000	Max. Freq.	0
A41F	42015	I31	Multi-step frequency 5	2500	Max. Freq.	0
A420	42016	I32	Multi-step frequency 6	2000	Max. Freq.	0
A421	42017	I33	Multi-step frequency 7	1500	Max. Freq.	0
A422	42018	I34	Multi-accel time 1	30	60000	0
A423	42019	I35	Multi-decel time 1	30	60000	0
A424	42020	I36	Multi-accel time 2	40	60000	0
A425	42021	I37	Multi-decel time 2	40	60000	0
A426	42022	I38	Multi-accel time 3	50	60000	0
A427	42023	I39	Multi-decel time 3	50	60000	0
A428	42024	I40	Multi-accel time 4	60	60000	0
A429	42025	I41	Multi-decel time 4	60	60000	0
A42A	42026	I42	Multi-accel time 5	70	60000	0
A42B	42027	I43	Multi-decel time 5	70	60000	0
A42C	42028	I44	Multi-accel time 6	80	60000	0
A42D	42029	I45	Multi-decel time 6	80	60000	0
A42E	42030	I46	Multi-accel time 7	90	60000	0
A42F	42031	I47	Multi-decel time 7	90	60000	0
A432	42034	I50	Analogue output mode	0	3	0
A433	42035	I51	Analogue output setting	100	200	10
A434	42036	I52	Level of frequency detection	3000	Max. Freq.	0
A435	42037	I53	Bandwidth of frequency detection	1000	Max. Freq.	0
A436	42038	I54	Multi-function output (MO) configuration	12	18	0
A437	42039	I55	Multi-function relay (30A, B, C) configuration	17	18	0
A438	42040	I56	Fault relay configuration	2	7	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A439	42041	I57	Output configuration when communication error occurs	0	3	0
A43B	42043	I59	Selection of communication protocol	0	1	0
A43C	42044	I60	Slave number in communication net	1	250	1
A43D	42045	I61	Transmission speed in communication net	3	4	0
A43E	42046	I62	Stop mode after reference signal loss	0	2	0
A43F	42047	I63	Time to determine speed reference signal loss	10	1200	1
A440	42048	I64	Communication time setting	5	100	2
A441	42049	I65	Parity/Stop bit setting	0	3	0
A442	42050	I66	Read address register 1	5	42239	0
A443	42051	I67	Read address register 2	6	42239	0
A444	42052	I68	Read address register 3	7	42239	0
A445	42053	I69	Read address register 4	8	42239	0
A446	42054	I70	Read address register 5	9	42239	0
A447	42055	I71	Read address register 6	10	42239	0
A448	42056	I72	Read address register 7	11	42239	0
A449	42057	I73	Read address register 8	12	42239	0
A44A	42058	I74	Write address register 1	5	42239	0
A44B	42059	I75	Write address register 2	6	42239	0
A44C	42060	I76	Write address register 3	7	42239	0
A44D	42061	I77	Write address register 4	8	42239	0
A44E	42062	I78	Write address register 5	9	42239	0

Address		Param.	Description	Default value	Range	
16 bit	10 bit				Max.	Min.
A44F	42063	I79	Write address register 6	10	42239	0
A450	42064	I80	Write address register 7	11	42239	0
A451	42065	I81	Write address register 8	12	42239	0
A452	42066	I82	Fire mode frequency	5000	Max. Freq.	0
A453	42067	I83	Minimum scaling factor for PID feedback	0	1000	0
A454	42068	I84	Maximum scaling factor for PID feedback	1000	1000	0
A455	42069	I85	Selection of contact type A or B for multi-function output	0	1	0
A456	42070	I86	ON delay time for multi-function output	0	100	0
A457	42071	I87	OFF delay time for multi-function output	0	100	0
A458	42072	I88	ON delay time for multi-function relay	0	100	0
A459	42073	I89	OFF delay time for multi-function relay	0	100	0
A45A	42074	I90	Fire mode	0	1	0

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

11.1. Braking resistors

Reference	Input voltage (V)	Inverter capacity (kW)	100% Braking		150% Braking	
			Ω	W*	Ω	W*
SD25203	200	0,4	400	50	300	100
SD25205		0,75	200	100	150	150
SD25208		1,5	100	200	60	300
SD25212		2,2	60	300	50	400
SD25217		4	40	500	33	600
SD25224		5,5	30	700	20	800
SD25232		7,5	20	1000	15	1200
SD25301	400	0,4	1800	50	1200	100
SD25302		0,75	900	100	600	150
SD25304		1,5	450	200	300	300
SD25306		2,2	300	300	200	400
SD25309		4	200	500	130	600
SD25312		5,5	120	700	85	1000
SD25316		7,5	90	1000	60	1200

Note: The values of the braking resistors that appear in the table are the minimum values recommended. For a customized calculation and adjusted to your application consult with Power Electronics.

* Power is based on 5% of enable duty with continuous braking during 15 seconds.

11.2. Conduit Box

The next table indicates the model of the box corresponding to each inverter:

Conduit Box	Inverter Frame	Inverter
MODEL 1	1	SD25203
		SD25205
		SD25301
		SD25302
MODEL 2	2	SD25208
		SD25304
MODEL 3	3	SD25212
		SD25217
		SD25306
		SD25309
MODEL 4	4	SD25224
		SD25232
		SD25312
		SD25316

11.2.1. Dimensions of Conduit Box Model 1

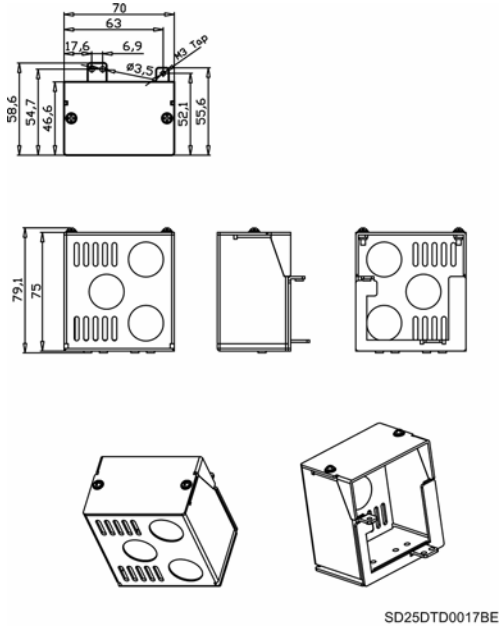


Figure 11.1 Dimensions of Conduit Box Model 1

11.2.2. Dimensions of Conduit Box Model 2

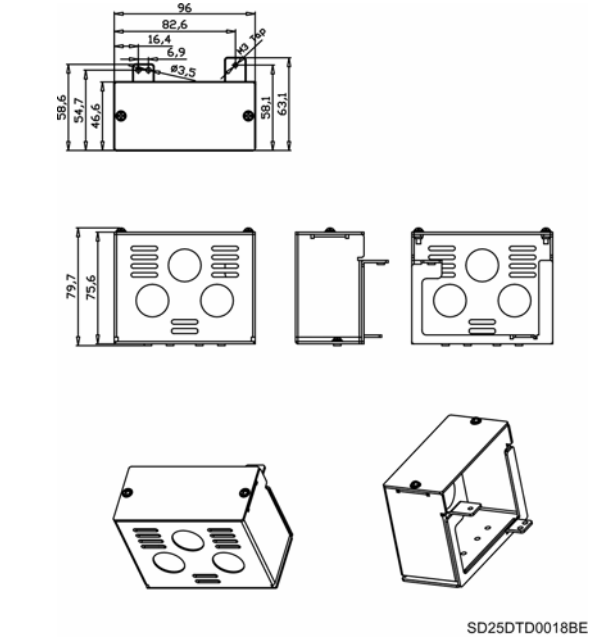


Figure 11.2 Dimensions of Conduit Box Model 2

11.2.3. Dimensions of Conduit Box Model 3

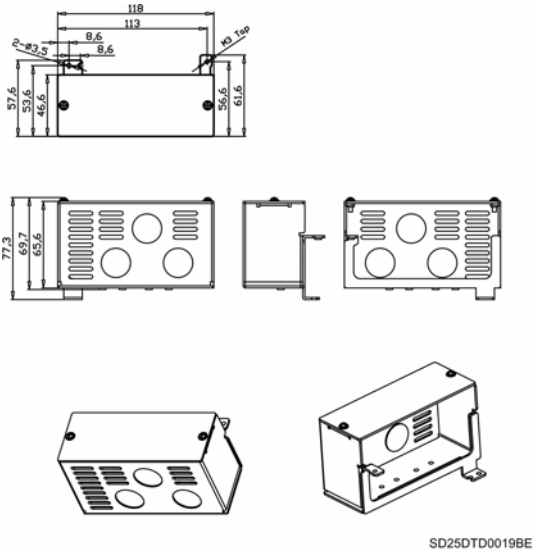


Figure 11.3 Dimensions of Conduit Box Model 3

11.2.4. Dimensions of Conduit Box Model 4

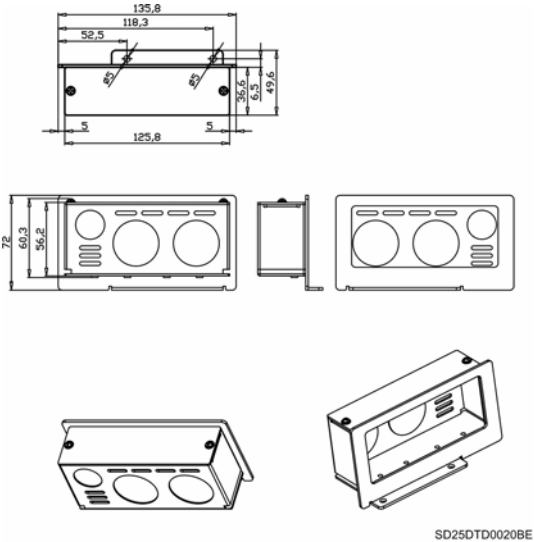


Figure 11.4 Dimensions of Conduit Box Model 4

11.2.5. Installation

Installation for Conduit Box from Model 1 to Model 3:

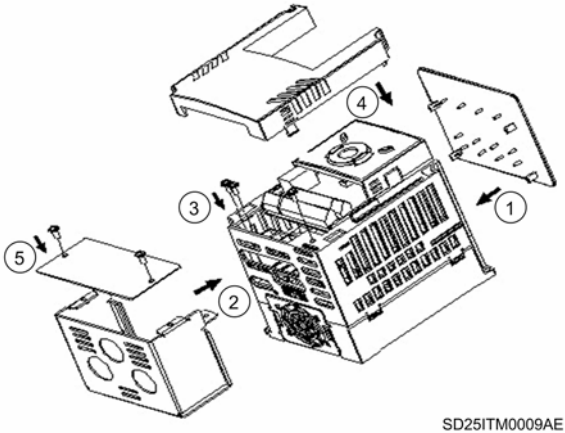


Figure 11.5 Installation for Conduit Box from Model 1 to Model 3

Installation for Conduit Box Model 4:

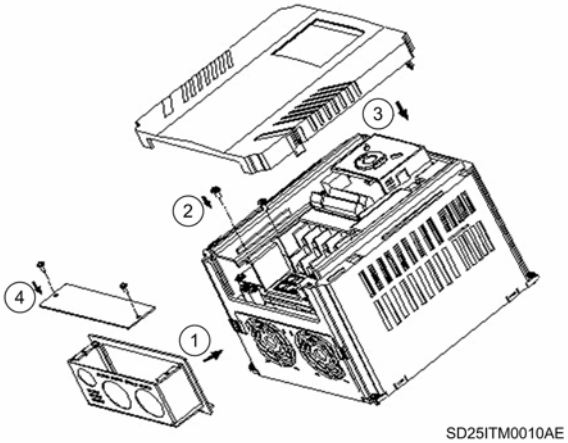


Figure 11.6 Installation for Conduit Box Model 4

11.3. Remote keypad / display unit

Reference	Description
SD25CF1	Remote keypad / display unit + remote cable 5 meters

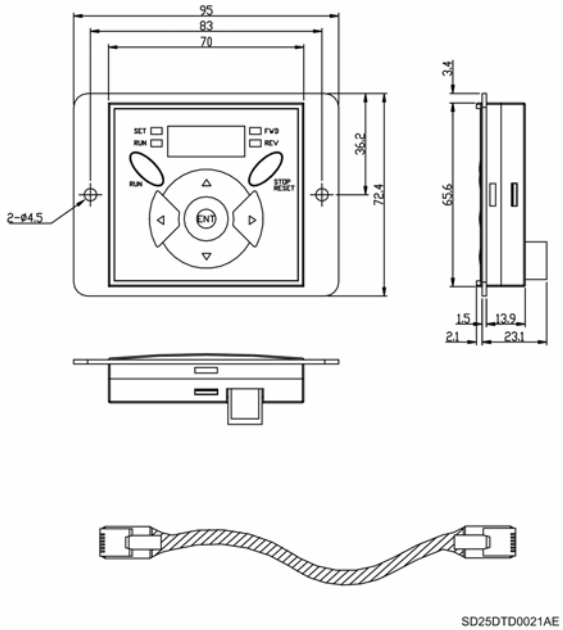


Figure 11.7 Remote keypad / display unit and remote cable

11.3.1. Installation

1) Take off the top cover and remove the hole cover on the side of the keypad / display unit integrated in the equipment to connect the remote cable.

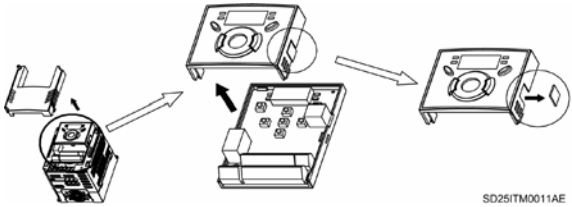


Figure 11.8 Installation of remote keypad / display unit. Step 1

2) Connect the remote cable as shown below and replace the top cover.

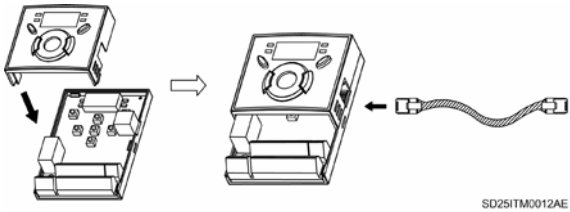


Figure 11.9 Installation of remote keypad / display unit. Step 2

3) Connect the other side of the remote cable to the remote keypad / display unit.

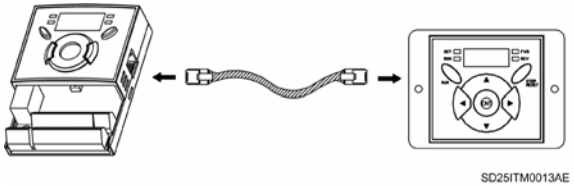


Figure 11.10 Installation of remote keypad / display unit. Step 3

Use precautions

- Parameter read is not available until parameter write is executed since the memory of the remote unit is empty at the beginning.
- Do not use a remote cable different to the cable supplied by Power Electronics. Otherwise, malfunction may occur due to noise input or voltage drop in the remote unit.
- Check the connection of the remote cable if '----' is displayed in the remote unit.

12. COMMONLY USED CONFIGURATIONS

Caution: The following instructions are based on the fact of all parameters are set to the factory default values. Results may be different if parameter values are modified. In this case, initialize the values of all parameters to return to the default values and follow the instructions below.

12.1. Start/Stop commands by terminals and speed setting by potentiometer

12.1.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	50.00Hz
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad. **3:** V1 (Potentiometer, VR, V1 and CM terminals). **4:** I (analogue current input, CM and I terminals).
F4	0	Stop mode	**0:** Decelerate to stop. **1:** DC brake to stop. **2:** Free run to stop.
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz

Parameter	Default value	Description	Set value
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the start).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.
H20	0	Restart after power supply fault	**0:** NO (Does not restart after power supply fault). **1:** YES (Restart after power supply fault).
H21	0	Restart after fault reset	**0:** NO **1:** YES
H30	*	Motor power setting	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
H79	EU 1.x	Software Version	-
H93	0	Parameters initialize	**1:** All parameter groups are initialized to factory default value (only if as required).

Parameter	Default value	Description	Set value
I6	10	Filter time constant for analogue voltage of V1 input	10ms (Filter for analogue voltage input).
I7	0V	Minimum voltage of V1 input	0.00V (Setting of minimum voltage V1 input).
I8	0.00	Minimum freq. for V1 input at min. voltage	0.00Hz (the output minimum frequency at minimum voltage of the V1 input).
I9	10V	Maximum voltage of V1 input	10.0V (setting of maximum voltage V1 input).
I10	50.00Hz	Maximum freq. for V1 input at max. voltage	50.00Hz (the output maximum frequency at minimum voltage of the V1 input).
I11	10ms	Filter time constant for analogue current of I input	10ms (Filter for analogue current input).
I12	4.00mA	Minimum current of I input	4.00mA (Setting of minimum current I input).
I13	0.00Hz	Minimum freq. for I input at min. voltage	0.00Hz (the output minimum frequency at minimum current of the I input).
I14	20.00mA	Maximum current of I input	20.00mA (Setting of maximum current I input).
I15	50.00Hz	Maximum freq. for I input at max. voltage	50.00Hz (The output maximum frequency at maximum current of the I input).

12.1.2. Connections drawing

Terminals CM/FX:	Run command (NO status).
Terminals I/CM:	4 – 20mA analogue input.
Terminals VR/V1/CM:	0 – 10V analogue input.

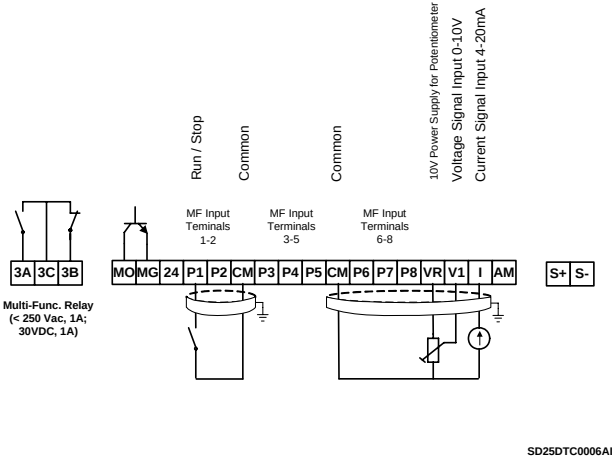


Figure 12.1 Start/Stop commands by terminals and speed setting by potentiometer

12.2. Start/Stop commands by keypad and speed setting by potentiometer

12.2.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	50.00Hz
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys).
frq	0	Frequency setting mode	**0:** Keypad. **3:** V1 (Potentiometer, VR, V1 and CM terminals). **4:** I (analogue current input, CM and I terminals).
F4	0	Stop mode	**0:** Decelerate to stop. **1:** DC brake to stop. **2:** Free run to stop.
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the start).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.

Parameter	Default value	Description	Set value
H20	0	Restart after power supply fault	**0:** NO (Does not restart after power supply fault). **1:** YES (Restart after power supply fault).
H21	0	Restart after fault reset	**0:** NO **1:** YES
H30	*	Motor power setting	0.2 — 0.2kW “ — “ 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
H79	EU 1.x	Software Version	-
H93	0	Parameters initialize	**1:** All parameter groups are initialized to factory default value (only if as required).
I6	10	Filter time constant for analogue voltage of V1 input	10ms (Filter for analogue voltage input).
I7	0V	Minimum voltage of V1 input	0.00V (Setting of minimum voltage V1 input).
I8	0.00	Minimum freq. for V1 input at min. voltage	0.00Hz (the output minimum frequency at minimum voltage of the V1 input).
I9	10V	Maximum voltage of V1 input	10.0V (setting of maximum voltage V1 input).
I10	50.00Hz	Maximum freq. for V1 input at max. voltage	50.00Hz (the output maximum frequency at minimum voltage of the V1 input).

Parameter	Default value	Description	Set value
I11	10ms	Filter time constant for analogue current of I input	10ms (Filter for analogue current input).
I12	4.00mA	Minimum current of I input	4.00mA (Setting of minimum current I input).
I13	0.00Hz	Minimum freq. for I input at min. voltage	0.00Hz (the output minimum frequency at minimum current of the I input).
I14	20.00mA	Maximum current of I input	20.00mA (Setting of maximum current I input).
I15	50.00Hz	Maximum freq. for I input at max. voltage	50.00Hz (The output maximum frequency at maximum current of the I input).

12.2.2. Connections drawing

Terminals I/CM: 4 – 20mA analogue input.
Terminals VR/V1/CM: 0 – 10V analogue input.

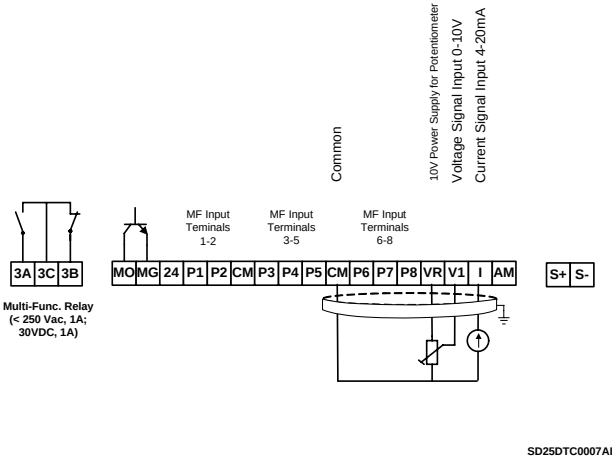


Figure 12.2 Start/Stop commands by keypad and speed setting by potentiometer

12.3. Multi-speed commands (multi-step frequencies) using P6, P7 and P8

12.3.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	50.00Hz (multi-speed 0).
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys). **1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad.
st1	10.00Hz	Multi-step frequency 1	30.00Hz (multi-speed 1).
st2	20.00Hz	Multi-step frequency 2	35.00Hz (multi-speed 2).
st3	30.00Hz	Multi-step frequency 3	40.00Hz (multi-speed 3).
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the starting).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz

Parameter	Default value	Description	Set value
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.
H30	*	Motor power setting	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
I22	5	Configuration of multi-function digit. input P6	**5:** Low Speed.
I23	6	Configuration of multi-function digit. Input P7	**6:** Middle Speed.
I24	7	Configuration of multi-function digit. input P8	**7:** High Speed.
I30	30.00Hz	Multi-step frequency 4	45.00Hz (multi-speed 4).
I31	25.00Hz	Multi-step frequency 5	50.00Hz (multi-speed 5).
I32	20.00Hz	Multi-step frequency 6	47.00Hz (multi-speed 6).
I33	15.00Hz	Multi-step frequency 7	42.00Hz (multi-speed 7).

Depending on the status of P6, P7 and P8 input terminal we can select different programmed frequencies:

Programmed frequency	Parameter	High Speed (P8)	Middle Speed (P7)	Low Speed (P6)
50.00Hz	0.00	0	0	0
30.00Hz	st1	0	0	1
35.00Hz	st2	0	1	0
40.00Hz	st3	0	1	1
45.00Hz	I30	1	0	0
50.00Hz	I31	1	0	1
47.00Hz	I32	1	1	0
42.00Hz	I33	1	1	1

12.3.2. Connections drawing

Terminals CM/FX:	Run command (NO status).
Terminals CM/P6:	Multi-speed 1 (NO status).
Terminals CM/P7:	Multi-speed 2 (NO status).
Terminals CM/P8:	Multi-speed 3 (NO status).

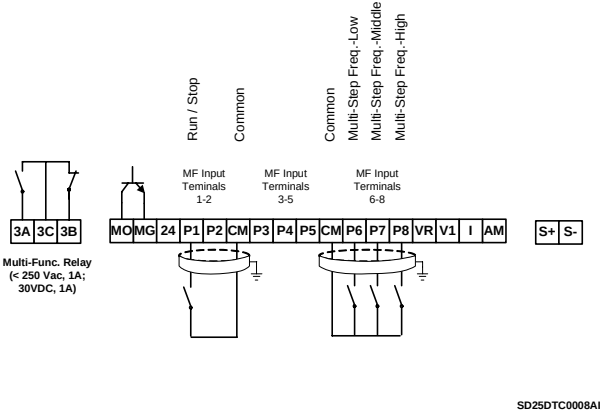


Figure 12.3 Multi-speed commands using P6, P7 and P8

12.4. Constant pressure control and automatic stop at zero level flow. Frequency command set by keypad

12.4.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	20.00Hz (Pressure command, 20Hz * 2 = 40% transducer range).
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys). **1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad.
REF	10.00Hz	PID Reference	40.00Hz (Displays the reference in % of sensor range).
FBK	20.00Hz	PID Feedback	...Hz (Displays the feedback in % of sensor range).
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the starting).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 → Torque boost in forward direction' and in 'F29 → Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.

Parameter	Default value	Description	Set value
H30	*	Motor power setting	0.2 — 0.2kW “ — “ 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
H40	0	Selection of Control mode	**2:** PID Feedback control (Speed control driven by PID mode).
H50	0	PID Feedback setting	**0:** I input (Feedback given by a 0 – 20mA signal).
H51	300.0	P gain for PID mode	300.0
H52	1.0	I gain for PID mode	1.0
H53	0.0	D gain for PID mode	0.0
H55	50.00	High limit of output frequency in PID mode	50.00Hz
H56	0.50	Low limit of output frequency in PID mode	30.00Hz
H63	60 sec	Sleep delay time	40 sec (Delay time to inverter stops).
H64	0.00Hz	Sleep frequency	30.00Hz (Frequency from which the stop condition is given).
H65	2%	Wake up level in Sleep mode	15% (% of feedback to restart).
H79	EU 1.x	Software Version	-

Parameter	Default value	Description	Set value
I11	10ms	Filter time constant for analogue current of I input	10ms (Filter for analogue current input).
I12	4.00mA	Minimum current of I input	4.00mA (Setting of minimum current I input).
I13	0.00Hz	Minimum freq. for I input at min. voltage	0.00Hz (the output minimum frequency at minimum current of the I input).
I14	20.00mA	Maximum current of I input	20.00mA (Setting of maximum current I input).
I15	50.00Hz	Maximum freq. for I input at max. voltage	50.00Hz (The output maximum frequency at maximum current of the I input).

12.4.2. Connections drawing

Terminals CM/FX: Run command (NO status).

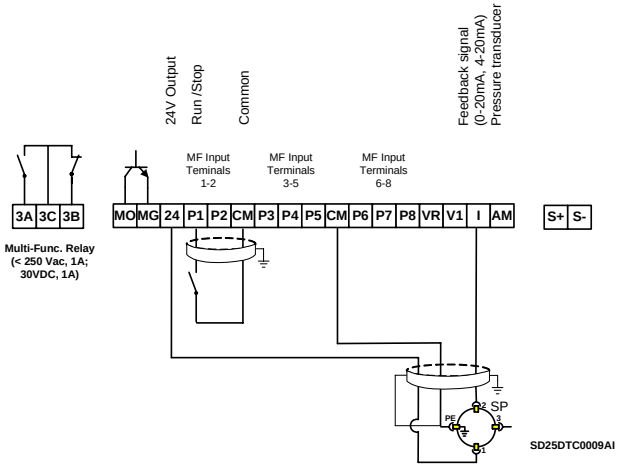


Figure 12.4 Constant pressure control and automatic stop at zero level flow. Frequency command set by keypad

12.5. Automatic constant pressure control mode up to four reference frequencies and jog frequency as manual mode

12.5.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	20.00Hz (Pressure command, 20Hz * 2 = 40% transducer range).
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys). **1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad.
st1	10.00Hz	Multi-step frequency 1	30.00Hz (Pressure command 1).
st2	20.00Hz	Multi-step frequency 2	35.00Hz (Pressure command 2).
st3	30.00Hz	Multi-step frequency 3	40.00Hz (Pressure command 3).
REF	10.00Hz	PID Reference	40.00Hz (Displays the reference in % of sensor range).
FBK	20.00Hz	PID Feedback	...Hz (Displays the feedback in % of sensor range).
F20	50.00Hz	Jog frequency	?Hz (Set by user).
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the start).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).

Parameter	Default value	Description	Set value
F25	50.00Hz	High frequency limit	50.00Hz
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.
H30	*	Motor power setting	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
H40	0	Selection of Control mode	**2:** PID Feedback control (Speed control driven by PID mode).
H50	0	PID Feedback setting	**0:** I input (Feedback given by a 0 – 20mA signal).
H51	300.0	P gain for PID mode	300.0
H52	1.0	I gain for PID mode	1.0
H53	0.0	D gain for PID mode	0.0
H55	50.00	High limit of output frequency in PID mode	50.00Hz
H56	0.50	Low limit of output frequency in PID mode	30.00Hz
H63	60 sec	Sleep delay time	40 sec (Delay time to inverter stops).

Parameter	Default value	Description	Set value
H64	0.00Hz	Sleep frequency	30.00Hz (Frequency from which the stop condition is given).
H65	2%	Wake up level in Sleep mode	15% (% of feedback to restart).
H79	EU 1.x	Software Version	-
I11	10ms	Filter time constant for analogue current of I input	10ms (Filter for analogue current input).
I12	4.00mA	Minimum current of I input	4.00mA (Setting of minimum current I input).
I13	0.00Hz	Minimum freq. for I input at min. voltage	0.00Hz (the output minimum frequency at minimum current of the I input).
I14	20.00mA	Maximum current of I input	20.00mA (Setting of maximum current I input).
I15	50.00Hz	Maximum freq. for I input at max. voltage	50.00Hz (The output maximum frequency at maximum current of the I input).
I21	4	Configuration of multi-function digit. Input P5	**4:** Jog operation. Set to 40Hz before in F20 (Jog frequency).
I22	5	Configuration of multi-function digit. input P6	**5:** Low Speed.
I23	6	Configuration of multi-function digit. Input P7	**6:** Middle Speed.
I24	7	Configuration of multi-function digit. input P8	**26:** Open loop 1.

Programmed frequency	Parameter	Middle Speed (P7)	Low Speed (P6)	Command
50.00Hz	0.00	0	0	M0
30.00Hz	st1	0	1	M1
35.00Hz	st2	1	0	M2
40.00Hz	st3	1	1	M3

12.5.2. Connections drawing

Terminals CM/FX: Run command (NO status).
Terminals CM/P5 – JOG: Manual speed (set frequency before).
Terminals CM/P6: Pressure command 1 (NO status).
Terminals CM/P7: Pressure command 2 (NO status).
Terminals CM/P8: Change to manual speed (NO status)

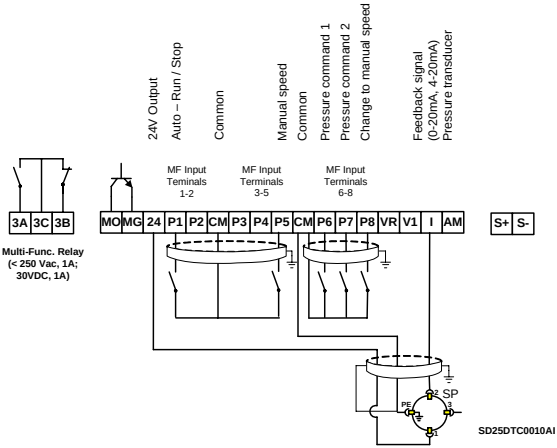


Figure 12.5 Automatic constant pressure control mode up to four reference frequencies and jog frequency as manual mode (set by keypad)

12.6. Constant pressure control up to eight commands and automatic stop at zero level flow. No jog frequency function at manual mode

12.6.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	20.00Hz (Pressure command, 20Hz * 2 = 40% transducer range).
ACC	5.0 sec	Acceleration time	10.0 sec
dEC	10.0 sec	Deceleration time	10.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys). **1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad.
st1	10.00Hz	Multi-step frequency 1	30.00Hz (Pressure command 1).
st2	20.00Hz	Multi-step frequency 2	35.00Hz (Pressure command 2).
st3	30.00Hz	Multi-step frequency 3	40.00Hz (Pressure command 3).
REF	10.00Hz	PID Reference	40.00Hz (Displays the reference in % of sensor range).
FBK	20.00Hz	PID Feedback	...Hz (Displays the feedback in % of sensor range).
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the start).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz

Parameter	Default value	Description	Set value
F26	0.50Hz	Low frequency limit	0.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.
H30	*	Motor power setting	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H39	3kHz	Setting of Carrier frequency	5kHz
H40	0	Selection of Control mode	**2:** PID Feedback control (Speed control driven by PID mode).
H50	0	PID Feedback setting	**0:** I input (Feedback given by a 0 – 20mA signal).
H51	300.0	P gain for PID mode	300.0
H52	1.0	I gain for PID mode	1.0
H53	0.0	D gain for PID mode	0.0
H55	50.00	High limit of output frequency in PID mode	50.00Hz
H56	0.50	Low limit of output frequency in PID mode	30.00Hz
H63	60 sec	Sleep delay time	40 sec (Delay time to inverter stops).
H64	0.00Hz	Sleep frequency	30.00Hz (Frequency from which the stop condition is given).

Parameter	Default value	Description	Set value
H65	2%	Wake up level in Sleep mode	15% (% of feedback to restart).
H79	EU 1.x	Software Version	-
I11	10ms	Filter time constant for analogue current of I input	10ms (Filter for analogue current input).
I12	4.00mA	Minimum current of I input	4.00mA (Setting of minimum current I input).
I13	0.00Hz	Minimum freq. for I input at min. voltage	0.00Hz (the output minimum frequency at minimum current of the I input).
I14	20.00mA	Maximum current of I input	20.00mA (Setting of maximum current I input).
I15	50.00Hz	Maximum freq. for I input at max. voltage	50.00Hz (The output maximum frequency at maximum current of the I input).
I22	5	Configuration of multi-function digit. input P6	**5:** Low Speed.
I23	6	Configuration of multi-function digit. Input P7	**6:** Middle Speed.
I24	7	Configuration of multi-function digit. input P8	**26:** Open loop 1.
I30	30.00Hz	Multi-step frequency 4	45.00Hz (multi-speed 4).
I31	25.00Hz	Multi-step frequency 5	50.00Hz (multi-speed 5).
I32	20.00Hz	Multi-step frequency 6	47.00Hz (multi-speed 6).
I33	15.00Hz	Multi-step frequency 7	42.00Hz (multi-speed 7).

Programmed frequency	Parameter	High Speed (P8)	Middle Speed (P7)	Low Speed (P6)	Command
50Hz	0.00	0	0	0	M0
30Hz	st1	0	0	1	M1
35Hz	st2	0	1	0	M2
40Hz	st3	0	1	1	M3
45Hz	I30	1	0	0	M4
50Hz	I31	1	0	1	M5
47Hz	I32	1	1	0	M6
42Hz	I33	1	1	1	M7

12.6.2. Connections drawing

Terminals CM/FX:	Run command (NO status).
Terminals CM/P6:	Pressure command 1 (NO status).
Terminals CM/P7:	Pressure command 2 (NO status).
Terminals CM/P8:	Pressure command 3 (NO status).

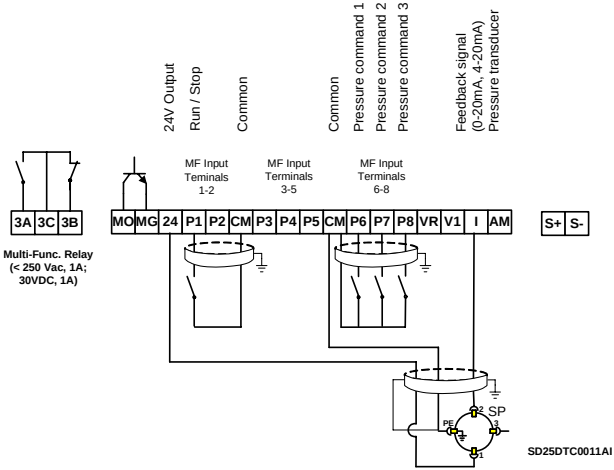


Figure 12.6 Constant pressure control up to eight commands and automatic stop at zero level flow. No jog frequency function at manual mode

12.7. Speed control (up/down potentiometer) and Start/Stop commands by push buttons

12.7.1. Parameters configuration

Parameter	Default value	Description	Set value
0.00	0.00Hz	Reference frequency	20.00Hz
ACC	5.0 sec	Acceleration time	30.0 sec (It determines the potentiometer ramp).
dEC	10.0 sec	Deceleration time	30.0 sec
drv	1	Drive mode	**0:** Setting by keypad (RUN/STOP keys). **1:** Run/Stop by terminals FX – Forward or Rx – Reverse.
frq	0	Frequency setting mode	**0:** Keypad.
F21	50.00Hz	Maximum frequency	50.00Hz
F22	50.00Hz	Base frequency	50.00Hz
F23	0.50Hz	Start frequency	0.10Hz (Minimum speed at the start).
F24	0	Frequency limits selection	**0:** NO (Limits are established by max. freq. and start freq.). **1:** YES (Limits are established by high and low frequency limits).
F25	50.00Hz	High frequency limit	50.00Hz
F26	0.50Hz	High frequency limit	25.00Hz
F27	0	Torque boost selection	**0:** Manual torque boost (Settable in two motor rotation directions separately, in 'F28 ➔ Torque boost in forward direction' and in 'F29 ➔ Torque boost in reverse direction'). **1:** Auto torque boost. The inverter calculates automatically the torque boost based on motor parameters.

Parameter	Default value	Description	Set value
F63	0	Up/Down Save	**0:** NO (The reference frequency set by motorized potentiometer is not memorized). **1:** YES (The reference frequency set by motorized potentiometer is memorized).
F64	-	Reference value displaying	Reference value is displayed.
H30	*	Motor power setting	0.2 — 0.2kW " — " 5.5 — 5.5kW 7.5 — 7.5kW
H33	*	Motor rated current	?A (See motor nameplate).
H79	EU 1.x	Software Version	-
I22	5	Configuration of multi-function digit. input P6	**17:** 3-wire operation (Start/Stop by NC push button).
I23	6	Configuration of multi-function digit. Input P7	**15:** Up frequency (NO push button to increase speed).
I24	7	Configuration of multi-function digit. input P8	**16:** Down frequency (NO push button to decrease speed).

Run command will be given with a NO push buttons between CM and FX terminals. When run command (FX) is activated (CM common), the inverter will start and will keep the speed at 0Hz. When P7 push button is pressed, the speed increases up to minimum speed (F24), and if P7 follows pressed will follow increasing according to ACC acceleration ramp.

12.7.2. Connections drawing

Terminals CM/FX:	Run push button (NO status).
Terminals CM/P6:	Stop push button (NC status).
Terminals CM/P7:	Up frequency push button (NO status).
Terminals CM/P8:	Down frequency push button (NO status).

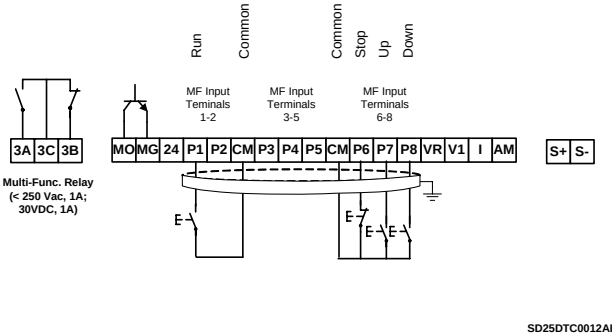


Figure 12.7 Speed control (up/down potentiometer) and Start/Stop commands by push buttons

13. CONFIGURATION REGISTER

VARIABLE SPEED DRIVE: SD250.
SERIAL No: MODEL:
APPLICATION:
DATE:
CUSTOMER:
NOTES:

PARAMETER / DESCRIPTION	DEFAULTS SETTINGS	SETTING 1	SETTING 2
	DRIVE group (DRV)		
0.00 Reference frequency	0.00Hz		
ACC Acceleration time	5.0 sec		
dEC Deceleration time	10.0 sec		
drv Drive mode	1		
Frq Frequency setting mode	0		
REF PID Reference	-		
FBK PID Feedback	-		
St1 Multi-step frequency 1	10.00Hz		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
St2 Multi-step frequency 2	20.00Hz		
St3 Multi-step frequency 3	30.00Hz		
CUr Output current	-		
rPM Motor RPM	-		
dCL Inverter DC Link voltage	-		
vOL User display selection	vOL		
nOn Fault display	-		
drC Selection of motor rotation direction	F		
drv2 Drive mode 2	1		
Frq2 Frequency setting mode 2	0		
Frq3 Frequency setting mode 3	0		
FUNCTION 1 group (F)			
F0 Parameter jump	0		
F1 Prevention of motor rotation direction	0		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
F2 Acceleration pattern	0		
F3 Deceleration pattern	0		
F4 Stop mode	0		
F8 DC Brake start frequency	5.00Hz		
F9 DC current application delay time	0.1 sec		
F10 DC current level for DC brake	50%		
F11 DC current application time	1.0 sec		
F12 DC current level before starting	50%		
F13 DC current application time before starting	0 sec		
F14 Time for magnetizing a motor	1.0 sec		
F20 Jog frequency	10.00Hz		
F21 Maximum frequency	50.00Hz		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
F22 Base frequency	50.00Hz		
F23 Start frequency	0.50Hz		
F24 Frequency limits selection	0		
F25 High frequency limit	50.00Hz		
F26 Low frequency limit	0.50Hz		
F27 Torque boost selection	0		
F28 Torque boost in forward direction	2%		
F29 Torque boost in reverse direction	2%		
F30 V/F Pattern	0		
F31 User V/F frequency 1	12.50Hz		
F32 User V/F voltage 1	25%		
F33 User V/F frequency 2	25.00Hz		
F34 User V/F voltage 2	50%		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
F35 User V/F frequency 3	37.50Hz		
F36 User V/F voltage 3	75%		
F37 User V/F frequency 4	50.00Hz		
F38 User V/F voltage 4	100%		
F39 Output voltage setting	100%		
F40 Energy saving level	0%		
F50 Selection of Electronic thermal protection	0		
F51 Level of Electronic thermal protection for 1 minute	150%		
F52 Level of Electronic thermal protection for continuous	100%		
F53 Motor cooling mode	150%		
F54 Overload warning level	150%		
F55 Overload warning time	10 sec		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
F56 Overload trip selection	1		
F57 Overload trip level	180%		
F58 Overload trip time	60 sec		
F59 Stall prevention mode	0		
F60 Stall prevention level	150%		
F63 Up/Down Save	0		
F64 Reference value displaying	-		
FUNCTION 2 group (H)			
H0 Parameter jump	1		
H1 Fault history 1	nOn		
H2 Fault history 2	nOn		
H3 Fault history 3	nOn		
H4 Fault history 4	nOn		
H5 Fault history 5	nOn		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
H6 Reset fault history	0		
H7 Dwell frequency	5.00Hz		
H8 Dwell time	0.0 sec		
H10 Selection of resonant frequencies	0		
H11 Low resonant frequency range 1	10.00Hz		
H12 High resonant frequency range 1	15.00Hz		
H13 Low resonant frequency range 2	20.00Hz		
H14 High resonant frequency range 2	25.00Hz		
H15 Low resonant frequency range 3	30.00Hz		
H16 High resonant frequency range 3	35.00Hz		
H17 S-Curve start	40%		
H18 S-Curve end	40%		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
H19 Selection of input/output phase loss protection	0		
H20 Restart after power supply fault	0		
H21 Restart after fault reset	0		
H22 Speed search function	0		
H23 Current level for Speed search	100%		
H24 P gain for Speed search	100		
H25 I gain for Speed search	200		
H26 Tries of automatic fault resets (Auto-restart)	0		
H27 Time between tries of automatic fault resets	1.0 sec		
H30 Motor power setting	_ _kW		
H31 Selection of number of motor poles	4		
H32 Rated slip frequency	_ _Hz		
H33 Motor rated current	_ _A		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
H34 No load motor current	– –A		
H36 Motor efficiency	– –%		
H37 Load inertia rate	0		
H39 Setting of Carrier frequency (commutation freq.)	3kHz		
H40 Selection of Control mode	0		
H41 Auto-tuning of motor parameters	0		
H42 Stator resistance (Rs)	-		
H44 Leakage inductance (Lσ)	-		
H45 Sensorless P gain	1000		
H46 Sensorless I gain	100		
H50 PID Feedback setting	0		
H51 P gain for PID mode	300.0%		
H52 I gain (Integral time) for PID mode	1.0 sec		

PARAMETER / DESCRIPTION	DEFAULT VALUE	SETTING 1	SETTING 2
H53 D gain (Differential time) for PID mode	0.0 sec		
H54 F gain for PID mode	0.0%		
H55 High limit of output frequency in PID mode	50.00Hz		
H56 Low limit of output frequency in PID mode	0.50Hz		
H57 Output inversion in PID mode	0		
H60 Selection of self-diagnostic	0		
H63 Sleep delay time	60 sec		
H64 Sleep frequency	0.0Hz		
H65 Wake up level in Sleep mode	2%		
H69 Frequency of accel/decel change	0Hz		
H70 Reference frequency for accel/decel	0		
H71 Accel/Decel time scale	1		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
H72 Power on display (first screen)	0		
H73 Selection of user screen	0		
H74 Displaying of gain for motor rpm	100%		
H75 Selection of operation rate limit of dynamic brake resistor	0		
H76 Operation rate of dynamic brake resistor	10%		
H77 Cooling fan control	0		
H78 Selection of operation mode when cooling fan malfunctions	0		
H79 Software Version	EU 1.x		
H81 Accel. time for second motor	5.0 sec		
H82 Decel. time for second motor	10.0 sec		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
H83 Base frequency for second motor	60.00Hz		
H84 V/F Pattern for second motor	0		
H85 Forward torque boost for second motor	5%		
H86 Reverse torque boost for second motor	5%		
H87 Stall prevention level for second motor	150%		
H88 Electronic thermal protection for 1 minute for second motor	150%		
H89 Electronic thermal protection for continuous for second motor	100%		
H90 Motor rated current for second motor	_ _A		
H91 Parameters read	0		
H92 Parameters write	0		
H93 Parameters initialize	0		
H94 Password register	0		
H95 Parameters lock	0		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
	I/O group (I)		
I0 Parameter jump	1		
I2 Minimum voltage of NV input	0.00V		
I3 Minimum freq. for NV input at min. voltage	0.00Hz		
I4 Maximum voltage of NV input	10.00V		
I5 Maximum freq. for NV input at max. voltage	50.00Hz		
I6 Filter time constant for analogue voltage of V1 input	10ms		
I7 Minimum voltage of V1 input	0V		
I8 Minimum freq. for V1 input at min. voltage	0.00		
I9 Maximum voltage of V1 input	10V		
I10 Maximum freq. for V1 input at max. voltage	50.00Hz		
I11 Filter time constant for analogue current of I input	10ms		
I12 Minimum current of I input	4.00mA		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I13 Minimum freq. for I input at minimum voltage	0.00Hz		
I14 Maximum current of I input	20.00 mA		
I15 Maximum freq. for I input at maximum voltage	50.00 Hz		
I16 Criteria for signal loss of reference analogue input	0		
I17 Configuration of multi-function digital input P1	0		
I18 Configuration of multi-function digital input P2	1		
I19 Configuration of multi-function digital input P3	2		
I20 Configuration of multi-function digital input P4	3		
I21 Configuration of multi-function digital input P5	4		
I22 Configuration of multi-function digital input P6	5		
I23 Configuration of multi-function digital input P7	6		
I24 Configuration of multi-function digital input P8	7		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I25 Input terminals status	0		
I26 Output terminals status	0		
I27 Filter time constant for digital inputs	4		
I30 Multi-step frequency 4	30.00 Hz		
I31 Multi-step frequency 5	25.00 Hz		
I32 Multi-step frequency 6	20.00 Hz		
I33 Multi-step frequency 7	15.00 Hz		
I34 Multi-accel. time 1	3.0 sec		
I35 Multi-decel. time 1	3.0 sec		
I36 Multi-accel. time 2	4.0 sec		
I37 Multi-decel. time 2	4.0 sec		
I38 Multi-accel. time 3	5.0 sec		
I39 Multi-decel time 3	5.0 sec		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I40 Multi-accel. time 4	6.0 sec		
I41 Multi-decel. time 4	6.0 sec		
I42 Multi-accel. time 5	7.0 sec		
I43 Multi-decel. time 5	7.0 sec		
I44 Multi-accel. time 6	8.0 sec		
I45 Multi-decel. time 6	8.0 sec		
I46 Multi-accel. time 7	9.0 sec		
I47 Multi-decel. time 7	9.0 sec		
I50 Analogue output mode	0		
I51 Analogue output setting	100%		
I52 Level of frequency detection	30.00 Hz		
I53 Bandwidth of frequency detection	10.00 Hz		
I54 Multi-function output (MO) configuration	12		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I55 Multi-function relay (30A, B, C) configuration	17		
I56 Fault relay configuration	2		
I57 Output configuration when communication error occurs	0		
I59 Selection of communication protocol	0		
I60 Slave number in communication net	1		
I61 Transmission speed in communication net	3		
I62 Stop mode after reference signal loss	0		
I63 Time to determine speed reference signal loss	1.0 sec		
I64 Communication time setting	5ms		
I65 Parity/Stop bit setting	0		
I66 Read address register 1	5		
I67 Read address register 2	6		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I68 Read address register 3	7		
I69 Read address register 4	8		
I70 Read address register 5	9		
I71 Read address register 6	A		
I72 Read address register 7	B		
I73 Read address register 8	C		
I74 Write address register 1	5		
I75 Write address register 2	6		
I76 Write address register 3	7		
I77 Write address register 4	8		
I78 Write address register 5	9		
I79 Write address register 6	A		
I80 Write address register 7	B		

PARAMETER / DESCRIPTION	DEFAULT SETTINGS	SETTING 1	SETTING 2
I81 Write address register 8	C		
I82 Fire mode frequency	50.00 Hz		
I83 Minimum scaling factor for PID Feedback	0.0		
I84 Maximum scaling factor for PID Feedback	100.0		
I85 Selection of contact type A (NO), or B (NC) for multi-function output (MO)	0		
I86 On delay time for multi-function output (MO)	0.0 sec		
I87 Off delay time for multi-function output (MO)	0.0 sec		
I88 On delay time for multi-function relay (30A, B, C)	0.0 sec		
I89 Off delay time for multi-function relay (30A, B, C)	0.0 sec		
I90 Fire mode	-		

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