SDRIVE
700 Series

VARIABLE SPEED DRIVE

variable speed drive

User Manual

POWER ELECTRONICS

SDRIVE

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User Manual

Edition: October 2007

SD70MT01CI 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 October 2007

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
10 / 04 / 2007	A	Software updating (2) to Software version SW Ver 1.3
11 / 06 / 2007	B	Chapter 12 (MODBUS Communication). Update of chapters 8, 9, 10 (Modbus addresses).
18 / 10 / 2007	C	Dimensions and connections for Frame 3 Update of chapters 11, 12. Updated software version SW 1.3 (08)

INDEX

SAFETY INSTRUCTIONS

IMPORTANT!

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

WARNING

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

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

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

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

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

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

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

CAUTION

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

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

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

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

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 700 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 700 technical manual.

SAFETY

- Before operating the drive, 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 drive with power applied and the front cover is removed.
- Handle the drive with care according to its weight.
- Install the drive according to the instructions within this manual.
- Do not place heavy objects on the drive.
- Ensure that the mounting orientation is correct.
- Do not drop the drive or subject it to impact.
- The SDRIVE 700 drives contain static sensitive printed circuits boards. Use static safety procedures when handling these boards.
- Avoid installing the drive in conditions that differ from those described in the *Technical Characteristics* section.

CONNECTION PRECAUTIONS

- To ensure correct operation of the drive it is recommended to use a SCREENED CABLE for the control wiring.
- For EMERGENCY STOP, make sure supply circuitry is open.
- Do not disconnect motor cables if input power supply remains connected. The internal circuits of the SDRIVE 700 series will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
- It is not recommended to use a 3-wire cable for long distances. Due to increased leakage capacitance between conductors, over-current protective feature may not operate correctly.
- Do not use power factor correction capacitors, surge suppressors, or RFI filters on the output side of the drive. Doing so may damage these components.
- Always check whether the DC Link LED is OFF before wiring terminals. The capacitors may hold high-voltage even after the input power is disconnected. Use caution to prevent the possibility of personal injury.

TRIAL RUN

- Verify all parameters before operating the drive. Alteration of parameters may be required depending on application and load.
- Always apply voltage and current signals to each terminal that are within levels indicated within this manual. Otherwise, damage to the drive 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 drive.
- Before programming or operating the SDRIVE 700 series, initialise all parameters back to factory default values.

EARTH CONNECTION

- The drive is a high frequency switching device and leakage current may flow. Ground the drive to avoid electrical shock. Use caution to prevent the possibility of personal injury.
- Connect only to the dedicated ground terminal of the drive. 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 drive ground terminal.

1. INTRODUCTION

1.1. Designation Code

SD 7 0115 5 2 1 12

CODE	PULSE NUMBER
-	6 Pulses
12	12 Pulses
18	18 Pulses

CODE	FILTER
1	First environment filter
2	Second environment filter

CODE	PROTECTION DEGREE
0	IP00 Degree protection
2	IP20 Degree protection
5	IP54 Degree protection

CODE	POWER SUPPLY
5*	380 – 500Vac
6	690Vac

CODE	CURRENT
115	115A
330	330A
…	…A

CODE	MODEL
7	700

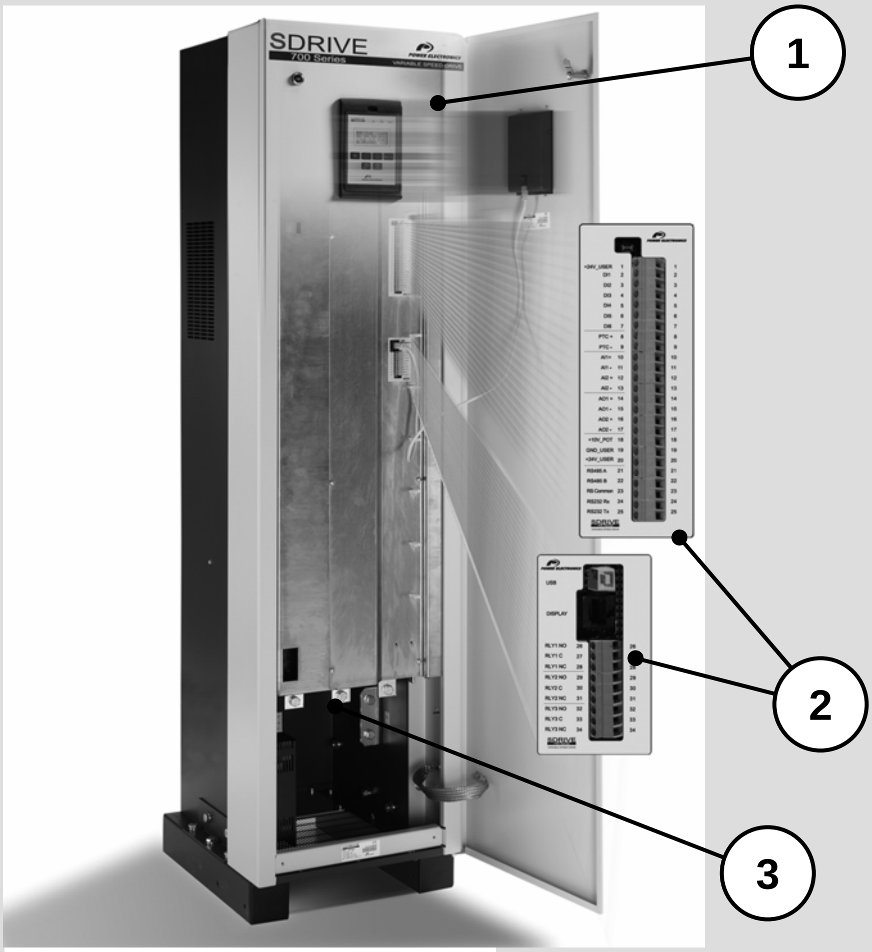
CODE	SERIES
SD	SDRIVE

* In case of 230Vac power supply, consult availability with Power Electronics.

1.2. Drive description

The SDRIVE700 is a UNIQUE drive:

- Due to its mechanical design.
  FFA (**F**ull **F**rontal **A**ccess) has reached an important objective: **to make easy**, in a significant way, its installation and maintenance thanks to its modular independence. It is available in IP00, IP20 and IP54.
- Due to features.
  First speed drive incorporating a **Graphical Display** with 3.5" TFT touch screen for fast and easy programming.
  - Real time clock and perpetual calendar.
  - USB 2.1 Communication Port.
  - Fibre Optic Port.
- Due to its reliability.
  FPA (**F**ault **P**reventing **A**lgorithms) is able to detect critical situations and correct them avoiding unnecessary downtime in production. Power Electronics has employed a new control strategy: **MCA** (**M**otion **C**ombined **A**lgorithms) combining all the advantages of different traditional motor control and ensuring robustness and stability.

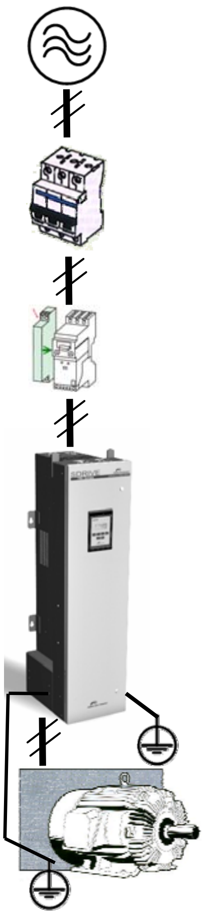


1. Removable Display
2. Control Terminals
3. Power Terminals

2. INSTALLATION AND CONNECTION

2.1. Basic Configuration

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



AC Power Supply	Use a power source with a voltage within the permissible range of drive input power rating. Equipment is provided to operate with the neutral connected to the ground.
Earth leakage circuit breaker (ELB)	Select circuit breakers or fuses in accordance with applicable national and local codes. We recommend using specified circuit breakers or fuses to operate with drive.
Inline Magnetic Contactor	Install if necessary. When installed, do not use it for the purpose of starting or stopping the drive.
Installation and wiring	To reliably operate the drive, install the drive in the proper orientation and with proper clearances. Incorrect terminal wiring could result in the equipment damage.
Motor	Do not connect power factor capacitors, surge arrestors or radio noise filters to the output side of the drive.

2.2. Environmental Conditions

Verify ambient conditions of mounting location.
Ambient temperature should not be below -30ºC or exceed 50ºC. It is necessary to consider the use of the equipment according to normal duty or heavy duty. It is recommended to consult the tables of standard types included in this manual to guarantee correct use of the equipment.
Relativity humidity should be less than 95% (non-condensing).
Altitude should be below 1.000m (3.300ft).

SD700 is offered with IP00, IP20 and IP54 protection degree. Nevertheless, we recommend protecting it from conductive dust (dry or wet) and water drops. As an electronic device, the SD700 will have a longer life if the installation is done properly in a clean place, with a correct ventilation system and protected from mechanical vibrations.

2.3. Drive Mounting

SD700 should be mounted vertically. It should be well fastened through the anchorages designed for this to avoid any movement.

If the drive is installed inside a cabinet the heated air must be vented out of the cabinet to ensure correct cooling. To avoid such a situation it is also necessary to leave enough horizontal and vertical space with any adjacent equipment.
We recommend cooling the cabinet to evacuate dissipated heat.

2.4. Power Connection and Control Wiring

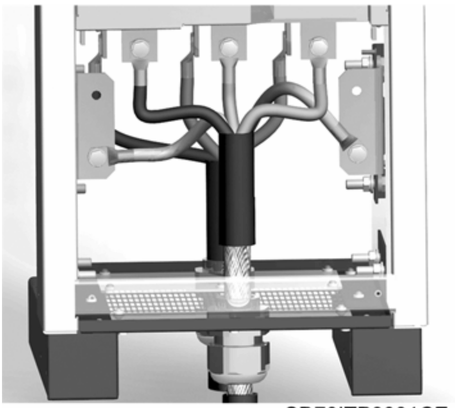
2.4.1. Power Wiring

Input terminals (drive supply) and output terminals (motor supply) are accessible from the bottom. SD700 is designed for working with 3-phase supply with the neutral connected to the earth.

It is not necessary to use power factor correction capacitors at the SD700 input, and do not connect them to the output of the drive.

Line voltage should be connected to L1, L2 and L3 terminals, and earth will be connected to the terminals assigned for this function.

Motor should be connected to the terminals indicated as U, V and W.



SD70ITP0001CE

Figure 2.1 Power Connection Detail

We recommend installing the drive according to the following connection:

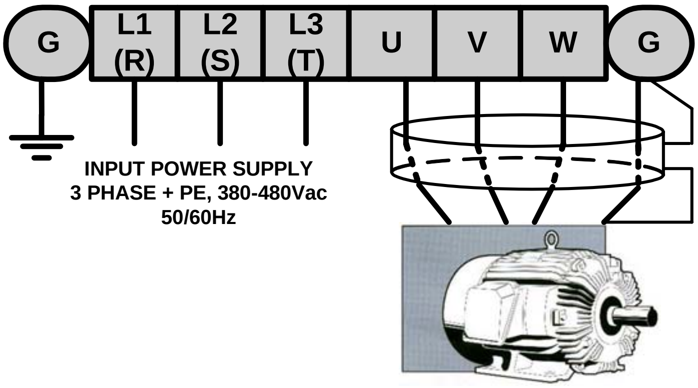


Figure 1.2 Power wiring connection

Note: It is recommended to use an earth cross section equal or higher than active wires cross section.

CAUTION

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

2.4.2. Control Wiring

Control wiring should be installed as far as possible from the power wiring. If you have to pass the control wiring next to the power wiring it should do perpendicularly. The cable should be screened and the shield should be connected to ground.
Do not use voltages of 24Vdc and 220Vac into the same cable.

2.4.3. Observations before Trial Run

Before applying voltage, we recommended to check that the power wiring is connected correctly and to verify that the connections are correctly fastened.

It is recommended to close the doors of SD700 before applying voltage the first time.

Before applying voltage to the drive and configuring it, make sure the line voltage is compatible with drive power supply. On the contrary, the drive will be damaged.
After applying voltage to the drive, verify the display is turned on and the status led of the DC bus is also illuminated.
Check line voltages when the display is lit. If the drive does not read one of the 3 phases then check input power wiring.
Before starting the SD700, the parameters should be programmed correctly for proper operation of the motor. Ensure the correct motor parameters are entered before giving the first “start” command to the drive.

WARNING

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.

3. POWER RANGE

3.1. Power Range at 400Vac

FRAME	CODE	Operation Temperature 50ºC HEAVY DUTY			Operation Temperature 40ºC HEAVY DUTY		
		I(A) Rated	Power (kW) at 400Vac	150% Overload	I(A) Rated	Power (kW) at 400Vac	120% Overload
1	SD70006 5x x xx	6	2,2	9	7,5	3	9
	SD70007 5x x xx	7,5	3	11	9,4	4	11
	SD70009 5x x xx	9	4	14	11	5,5	14
	SD70012 5x x xx	12	5,5	18	15	7,5	18
	SD70018 5x x xx	18	7,5	27	23	11	27
	SD70024 5x x xx	24	11	36	30	15	36
2	SD70032 5x x xx	32	15	48	40	18,5	48
	SD70038 5x x xx	38	18,5	57	48	22	57
	SD70048 5x x xx	48	22	72	60	30	72
3	SD70060 5x x xx	60	30	90	75	37	90
	SD70075 5x x xx	75	37	113	94	45	113
	SD70090 5x x xx	90	45	135	113	55	135
	SD70115 5x x xx	115	55	173	144	75	173
4	SD70150 5x x xx	150	75	225	188	90	225
	SD70170 5x x xx	170	90	255	213	110	255
5	SD70210 5x x xx	210	110	315	263	132	315
	SD70250 5x x xx	250	132	375	313	160	375
	SD70275 5x x xx	275	150	413	344	200	426
6	SD70330 5x x xx	330	160	495	413	220	495
	SD70370 5x x xx	370	200	555	463	250	555
	SD70460 5x x xx	460	250	690	575	315	690
7	SD70580 5x x xx	580	315	870	725	400	870
	SD70650 5x x xx	650	355	975	813	450	975
	SD70720 5x x xx	720	400	1080	900	500	1080
8	SD70840 5x x xx	840	450	1260	1050	560	1260
	SD70925 5x x xx	925	500	1388	1156	630	1388
9	SD71030 5x x xx	1030	560	1545	1288	710	1545
	SD71150 5x x xx	1150	630	1725	1438	800	1725
	SD71260 5x x xx	1260	710	1890	1575	900	1890
	SD71440 5x x xx	1440	800	2160	1800	1000	2160
10	SD71580 5x x xx	1580	900	2370	1975	1100	2370
	SD71800 5x x xx	1800	1000	2700	2250	1200	2700
11	SD72200 5x x xx	2200	1200	3300	2750	1500	3300

Table 3.1 Table of power and current data at 400V

NOTES:

- Rated power for standard A.C. motors of 4-pole (1500rpm).
- For higher power units contact Power Electronics.
- The motor nameplate must be checked to ensure that the selected variable speed drive is correct for each specific motor.

3.2. Power Range at 690Vac

FRAME	CODE	Operation Temperature 50ºC HEAVY DUTY			Operation Temperature 40ºC HEAVY DUTY		
		I(A) Rated	Power (kW) at 690Vac	150% Overload	I(A) Rated	Power (kW) at 690Vac	120% Overload
3	SD70052 6x x xx	52	45	78	65	55	78
	SD70062 6x x xx	62	55	93	78	75	93
	SD70080 6x x xx	80	75	120	100	90	120
4	SD70105 6x x xx	105	90	157	131	110	157
5	SD70130 6x x xx	130	110	195	163	132	195
	SD70150 6x x xx	150	132	225	188	160	225
	SD70170 6x x xx	170	160	255	213	200	255
6	SD70210 6x x xx	210	200	315	263	250	315
	SD70260 6x x xx	260	250	390	325	315	390
	SD70320 6x x xx	320	315	480	400	355	480
7	SD70385 6x x xx	385	355	578	481	450	578
	SD70460 6x x xx	460	450	690	575	500	690
8	SD70550 6x x xx	550	500	825	688	630	825
	SD70660 6x x xx	660	630	990	825	800	990
9	SD70750 6x x xx	750	710	1125	938	900	1125
	SD70840 6x x xx	840	800	1260	1050	1000	1260
	SD70950 6x x xx	950	900	1425	1188	1100	1425
10	SD71140 6x x xx	1140	1000	1710	1425	1300	1710
	SD71270 6x x xx	1270	1200	1905	1588	1600	1905
	SD71420 6x x xx	1420	1400	2130	1775	1700	2130
11	SD71500 6x x xx	1500	1500	2250	1875	1800	2250
	SD71800 6x x xx	1800	1800	2700	2250	2000	2700

Table 3.2 Table of power and current data at 690V

NOTES:

- Rated power for standard A.C. motors of 4-pole (1500rpm).
- For higher power units contact Power Electronics.
- The motor nameplate must be checked to ensure that the selected variable speed drive is correct for each specific motor.

4. TECHNICAL CHARACTERISTICS

INPUT	Power supply	380-500Vac, 550-690Vac (-20% to +10%) 3-Phase 230Vac optional*
	Input frequency	48 to 62 Hz
	Input current	≤ Output current
	Input power factor	≥ 0.98 (of fundamental)
	Power factor	≤ 0.88
	Momentary power loss	> 2sec (depending on the load)
	EMC input filter	Second environment, limits 3 and 4 First environment, limit 1 and 2 optional built in
	Harmonics filter	Choke coils 3% impedance
OUTPUT	Motor output voltage	0Vac to 100% Input voltage
	Output frequency	0 to ±250%
	Overload capacity	150% during 60sec at 50ºC
	Efficiency (at full load)	>97%
	Motor power (kW)	50 to 150% of SD700 rating
	Motor voltage	5 to 500Vac
	Control method	Vector control without encoder (Sensorless, open loop). Vector Control and V/Hz
	Carrier frequency	4 to 8kHz – PEWave (without losses)
	Output dV/dt filter	500 to 800V/µs (according to SD700 rating)
	Output cable length	Maximum 300 meters**
ENVIRONMENTAL CONDITIONS	Ambient temperature	Minimum: -30°C Maximum: +50°C
	Altitude	1000m
	Altitude de-rating	>1000m, 1% per 100m; 3000m maximum
	Degree protection	IP00, IP20 and IP54
	Ambient humidity	<95%, non-condensing
	Display degree protection	IP54
MOTOR PROTECTIONS	Rotor locked Motor overload (thermal model) Phase current imbalance, phase voltage imbalance Motor over-temperature (PTC signal) Speed limit Torque limit	
DRIVE PROTECTIONS	Output current limit Overload IGBT's overload Input phase loss Low input voltage, High input voltage DC Bus voltage limit Low DC Bus voltage High input frequency Low input frequency IGBT temperature Heat-sink over-temperature Power supply fault Drive thermal model Ground fault Software and Hardware fault Analogue input signal loss (speed reference loss)	
DIGITAL INPUTS	6 programmable inputs, active high (24Vdc) 1 PTC input: “k” = Conditions are correct. PTC resistance value is between 90Ω ±10% and 1K5 ±10% “F” = Possible short-circuit in wiring. PTC resistance value is lower than 90Ω ±10%, or excessive temperature in the motor, PTC resistance value is higher than 1K5 ±10% 1 programmable digital input (controlled by jumper, a fault is generated when it is disconnected, to avoid dangerous situations during programming) Additional features: Isolated power supply	

* Consult availability with Power Electronics.
** Cable length could be increased depending on cable type. Consult with Power Electronics.

ANALOGUE INPUTS	2 programmable and differential inputs. Operation modes: Current signal: 0 – 20mA, 4 – 20mA. Voltage signal: 0 – 10Vdc, ±10Vdc, differential Additional features: Optically insulated
ENCODER INPUTS	Optional encoder boards are available for two differential encoders (one available for the user, one available for vector control mode). Others types of encoders can be used as necessary Additional features: ▪ Voltages inputs from 5 to 24Vdc
DIGITAL OUTPUTS	3 programmable changeover relays (250Vac, 8A or 30Vdc, 8A)
ANALOGUE OUTPUTS	2 isolated programmable outputs: 0 – 20mA, 4 – 20mA, 0 – 10Vdc y ±10Vdc
POTENTIOMETER VOLTAGE	10Vdc power supply voltage for speed reference by potentiometer (26mA maximum)
USER POWER SUPPLY	24Vdc user power supply regulated and short-circuit protected
COMMUNICATION	From a communication perspective the SD700 will provide: Standard Hardware: USB Port, RS232 Port, RS485 Port Optional Hardware: Optic Fibre, Ethernet Software Protocols: Standard: Modbus-RTU Optional: Profibus, DeviceNet, TCP/IP, N2 Metasys
VISUALIZATION INFORMATION	Average current and 3-phase motor current Average voltage and 3-phase motor voltage Average input voltage and 3-phase input voltage Speed, Torque, Power, Power factor of motor Relay status Digital input status / PTC status Output comparator status Value of analogue inputs and sensors Analogue output value Motor overload status and drive overload status IGBT temperature Motor output frequency Fault history (6 last faults)
CONTROL MODES	Local from keypad Remote from digital inputs Serial communications
CONTROL PANEL	Type: Removable Length: 3 meters* Connection: RJ45 Alphanumeric Display: 4 lines of 16 characters Visualization Leds: LED ON: Control board is energized; LED RUN: Motor receiving power supply from SD700; LED FAULT: Blinking shows that a fault has occurred Keypad: 6 control keys to program the drive, start and stop/reset. Provided with independent memory Graphic Display: Optional graphical display with 3,5" TFT touch screen. Independent memory
OTHERS	Real time clock Perpetual calendar
CERTIFICATION	CE, UL, cUL, cTick

* Possibility of increasing length. Consult with Power Electronics.

5. DIMENSIONS

5.1. Dimensions of Frames 3, 4 and 5

REFERENCE 380 – 500V	REFERENCE 550 – 690V	DIMENSIONS											WEIGHT
		H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD70060 5x x xx	SD70052 6x x xx	853.5	838.5	300.5	200	140	358	-	827	15	-	-	-
SD70075 5x x xx	SD70062 6x x xx	853.5	838.5	300.5	200	140	358	-	827	15	-	-	-
SD70090 5x x xx	SD70080 6x x xx	853.5	838.5	300.5	200	140	358	-	827	15	-	-	-
SD70115 5x x xx	-	853.5	838.5	300.5	200	140	358	-	827	15	-	-	-
SD70150 5x x xx	SD70105 6x x xx	1245	1206	320	251	-	438.5	-	881	527.5	353.5	-	100
SD70170 5x x xx	-	1245	1206	320	251	-	438.5	-	881	527.5	353.5	-	100
SD70210 5x x xx	SD70130 6x x xx	1712	1667	431	396	-	528	460	1403.5	1240.5	81.5	-	180
SD70250 5x x xx	SD70150 6x x xx	1712	1667	431	396	-	528	460	1403.5	1240.5	81.5	-	180
SD70275 5x x xx	SD70170 6x x xx	1712	1667	431	396	-	528	460	1403.5	1240.5	81.5	-	180

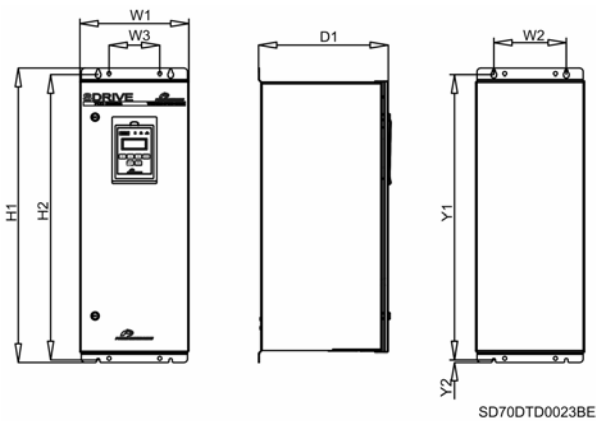


Figure 5.1 Dimensions of Frame 3

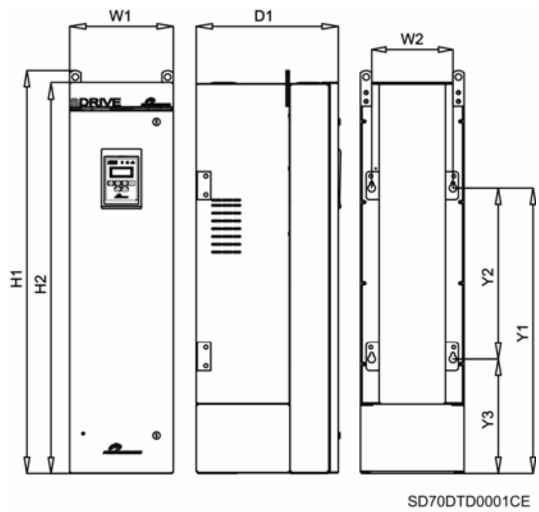


Figure 5.2 Dimensions of Frame 4

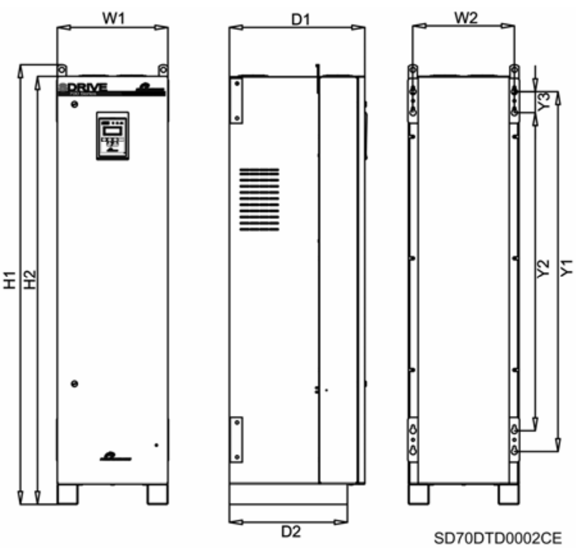


Figure 5.3 Dimensions of Frame 5

5.2. Dimensions of Frames 6 and 7

REFERENCE 380 – 500V	REFERENCE 550 – 690V	DIMENSIONS											WEIGHT
		H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD70330 5x x xx	SD70210 6x x xx	1712	1667	786	747	-	529	460	1602	1208.5	230.5	81.5	340
SD70370 5x x xx	SD70260 6x x xx	1712	1667	786	747	-	529	460	1602	1208.5	230.5	81.5	340
SD70460 5x x xx	SD70320 6x x xx	1712	1667	786	747	-	529	460	1602	1208.5	230.5	81.5	340
SD70580 5x x xx	SD70385 6x x xx	1712	1667	1132	1097	-	529	460	1602	1208.5	230.5	81.5	470
SD70650 5x x xx	SD70460 6x x xx	1712	1667	1132	1097	-	529	460	1602	1208.5	230.5	81.5	470
SD70720 5x x xx	-	1712	1667	1132	1097	-	529	460	1602	1208.5	230.5	81.5	470

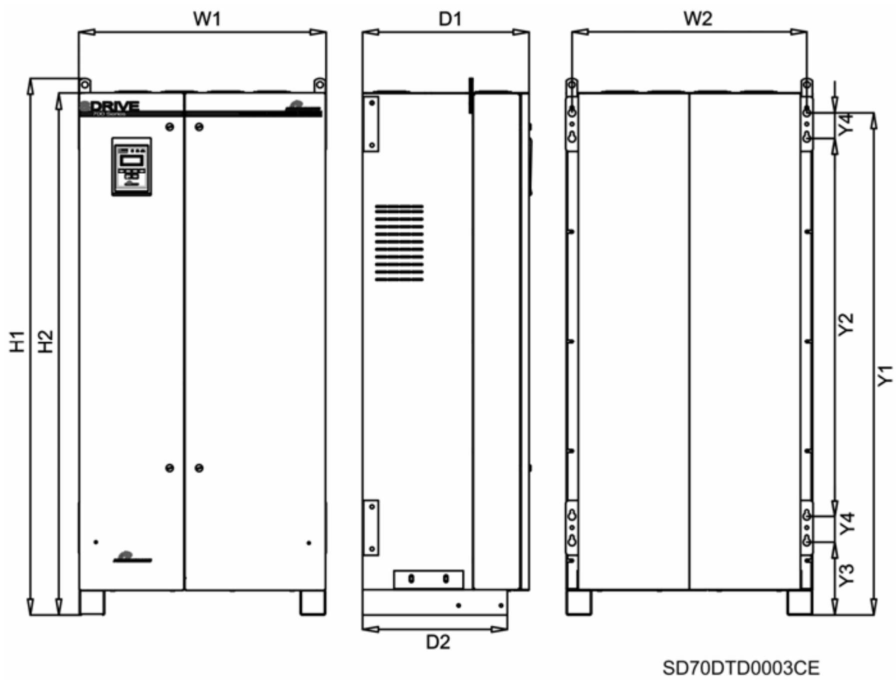


Figure 5.4 Dimensions of Frame 6

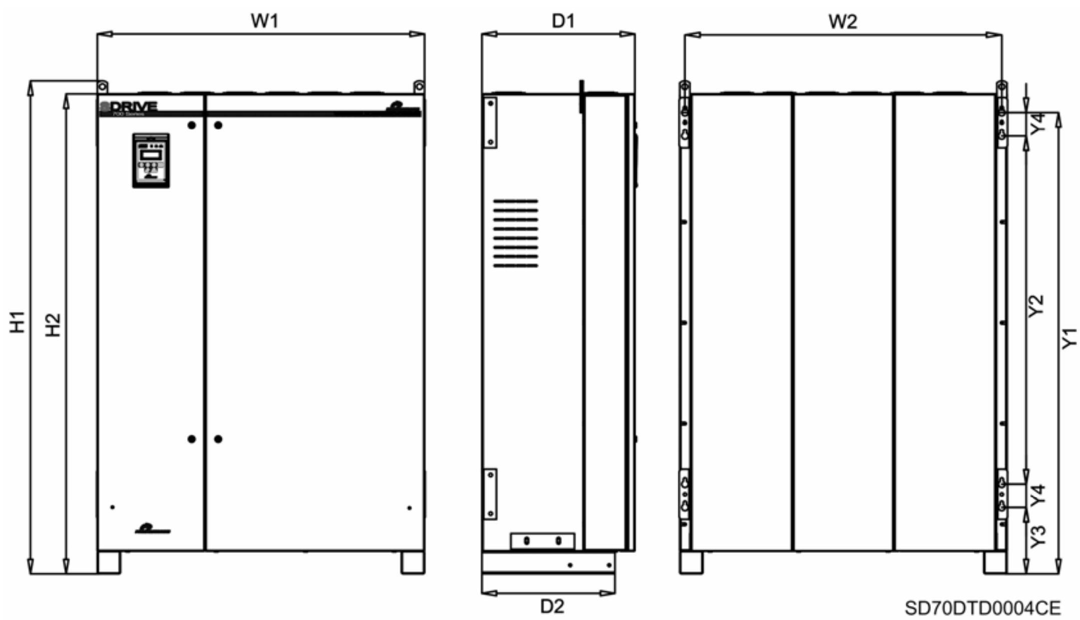


Figure 5.5 Dimensions of Frame 7

5.3. Dimensions of Frames 8 and 9

REFERENCE 380 – 500V	REFERENCE 550 – 690V	DIMENSIONS											WEIGHT
		H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD70840 5x x xx	SD70550 6x x xx	1712	1667	1482	1447	-	528	460	1619	1209	247.5	81.5	-
SD70925 5x x xx	SD70660 6x x xx	1712	1667	1482	1447	-	528	460	1619	1209	247.5	81.5	-
SD71030 5x x xx	SD70750 6x x xx	1712	1667	2352	747	38	528	460	1619	1209	247.5	81.5	-
SD71150 5x x xx	SD70840 6x x xx	1712	1667	2352	747	38	528	460	1619	1209	247.5	81.5	-
SD71260 5x x xx	SD70950 6x x xx	1712	1667	2352	747	38	528	460	1619	1209	247.5	81.5	-
SD71440 5x x xx	-	1712	1667	2352	747	38	528	460	1619	1209	247.5	81.5	-

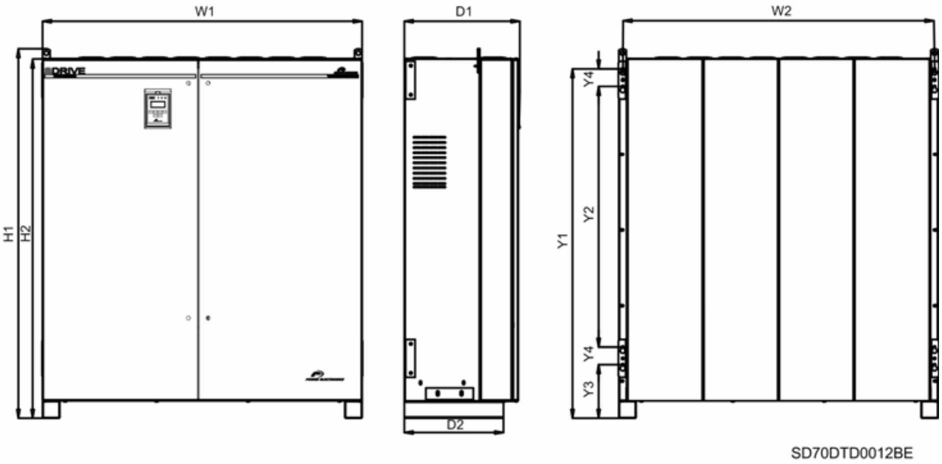


Figure 5.6 Dimensions of Frame 8

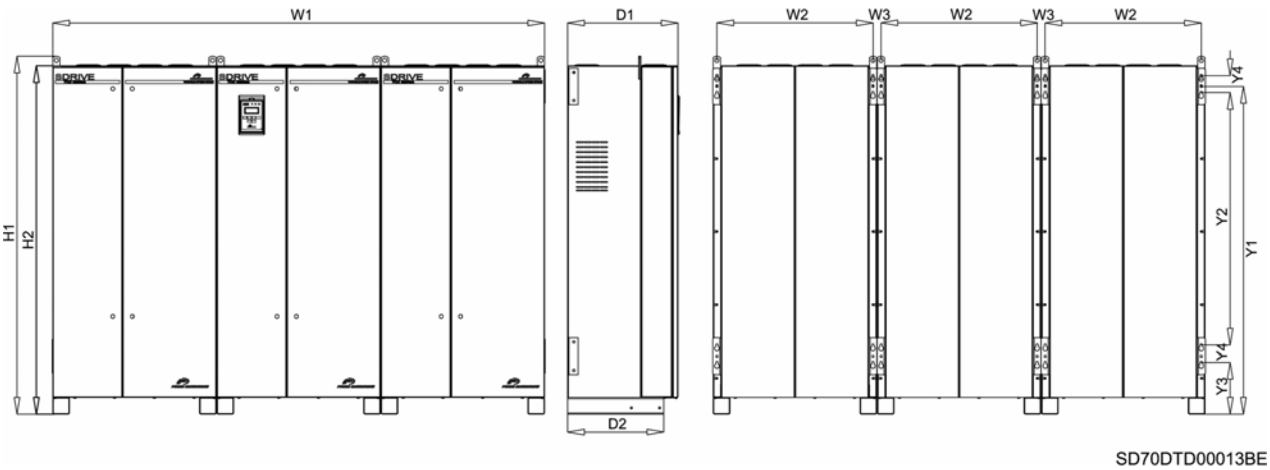


Figure 5.7 Dimensions of Frame 9

5.4. Dimensions of Frames 10 and 11

REFERENCE 380 – 500V	REFERENCE 550 – 690V	DIMENSIONS											WEIGHT
		H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD71580 5x x xx	SD71140 6x x xx	1712	1667	3402	1097	38	528	460	1619	1209	247.5	81.5	-
SD71800 5x x xx	SD71270 6x x xx	1712	1667	3402	1097	38	528	460	1619	1209	247.5	81.5	-
-	SD71420 6x x xx	1712	1667	3402	1097	38	528	460	1619	1209	247.5	81.5	-
SD72200 5x x xx	SD71500 6x x xx	1712	1667	4452	1447	38	528	460	1619	1209	247.5	81.5	-
-	SD71800 6x x xx	1712	1667	4452	1447	38	528	460	1619	1209	247.5	81.5	-

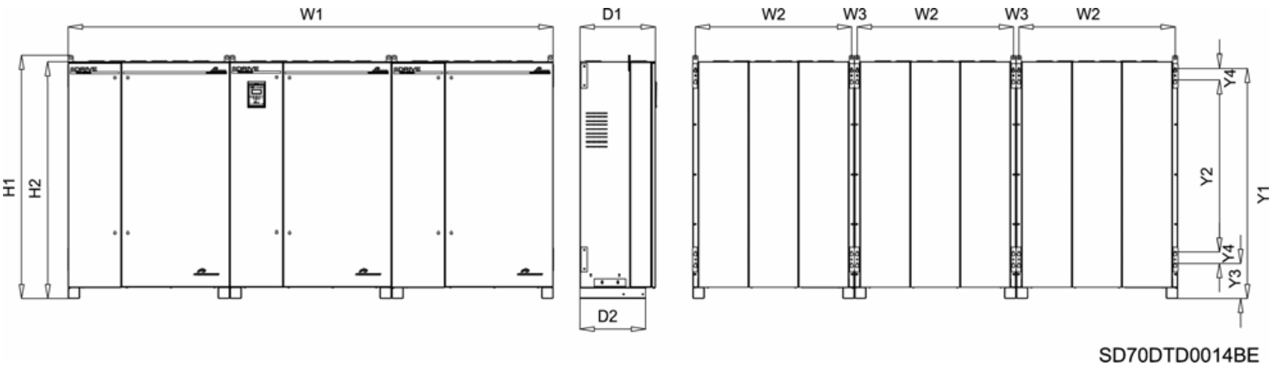


Figure 5.8 Dimensions of Frame 10

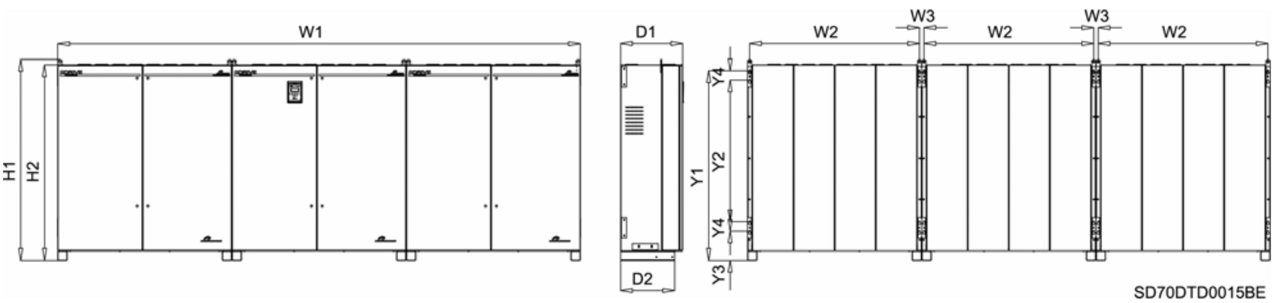


Figure 5.9 Dimensions of Frame 11

5.5. Dimensions of Frames 4 and 5 (IP00)

REFERENCE	DIMENSIONS											WEIGHT
	H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD70150 50 x xx	1124	1100.5	320	285	245	438.5	-	778.5	527.5	250.5	-	-
SD70170 50 x xx	1124	1100.5	320	285	245	438.5	-	778.5	527.5	250.5	-	-
SD70210 50 x xx	1124	1100.5	436	396	394	507	500	1136	650.5	250.5	81.5	118
SD70250 50 x xx	1124	1100.5	436	396	394	507	500	1136	650.5	250.5	81.5	118
SD70275 50 x xx	1124	1100.5	436	396	394	507	500	1136	650.5	250.5	81.5	118

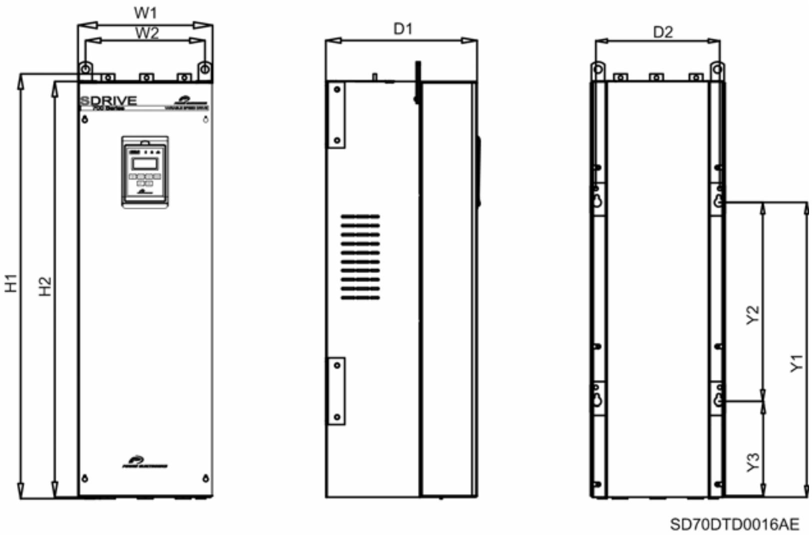


Figure 5.10 Dimensions of Frame 4 IP00

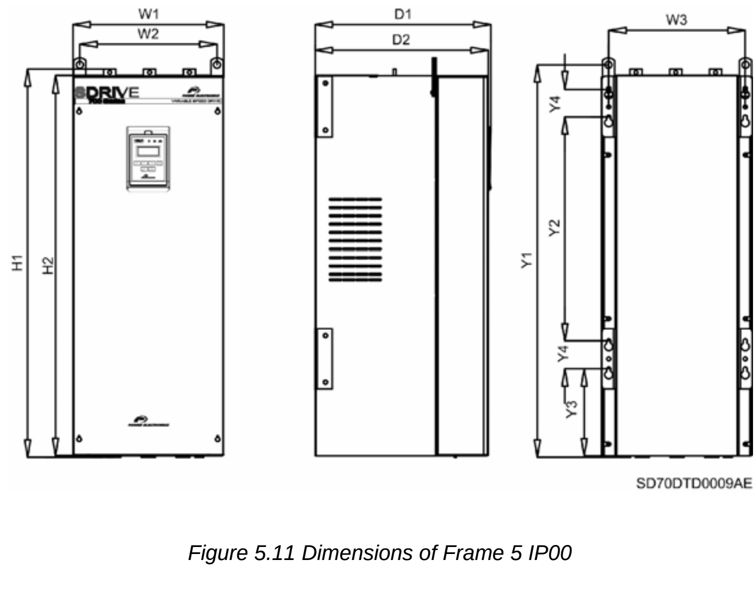


Figure 5.11 Dimensions of Frame 5 IP00

5.6. Dimensions of Frames 6 and 7 (IP00)

REFERENCE	DIMENSIONS											WEIGHT
	H1	H2	W1	W2	W3	D1	D2	Y1	Y2	Y3	Y4	
SD70330 50 x xx	1124	1100.5	786	746	744	507	500	1136	650.5	250.5	81.5	236
SD70370 50 x xx	1124	1100.5	786	746	744	507	500	1136	650.5	250.5	81.5	236
SD70460 50 x xx	1124	1100.5	786	746	744	507	500	1136	650.5	250.5	81.5	236
SD70580 50 x xx	1124	1100.5	1136	1096	1094	507	500	1136	650.5	250.5	81.5	350
SD70650 50 x xx	1124	1100.5	1136	1096	1094	507	500	1136	650.5	250.5	81.5	350
SD70720 50 x xx	1124	1100.5	1136	1096	1094	507	500	1136	650.5	250.5	81.5	350

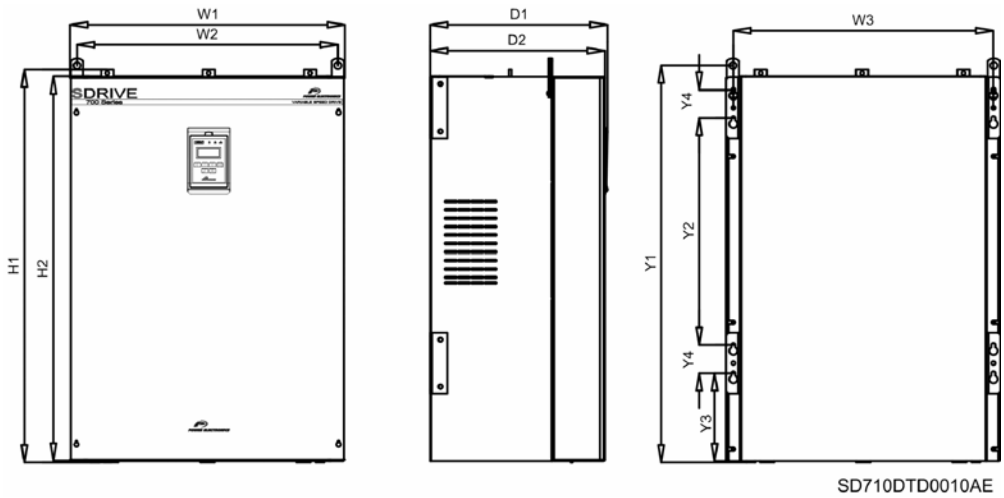


Figure 5.12 Dimensions of Frame 6 IP00

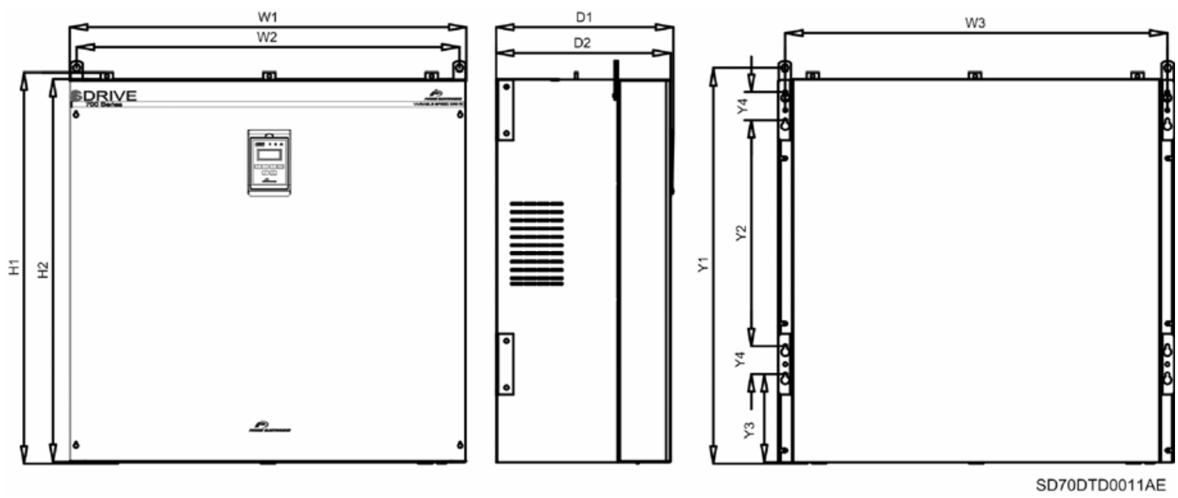


Figure 5.13 Dimensions of Frame 7 IP00

6. CONNECTION TERMINALS

6.1. Power Connections

6.1.1. Frame 3 Connections

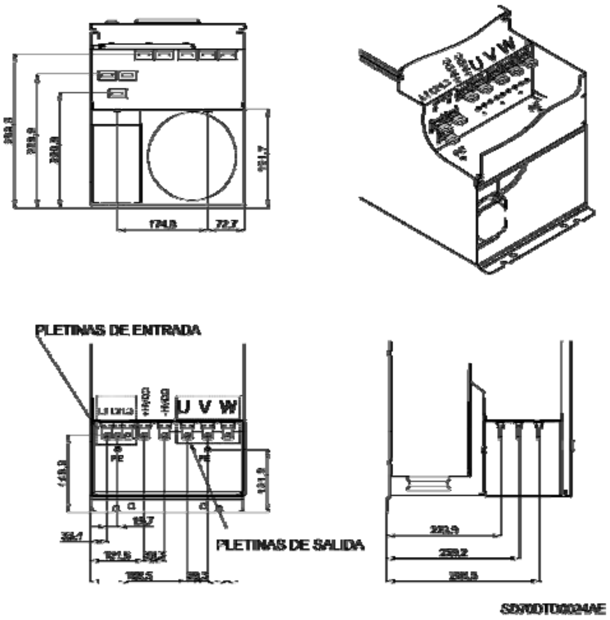


Figure 6.1 Power connections location for SD70060 5x – SD70115 5x and SD70052 6x – SD70080 6x

6.1.2. Frame 4 Connections

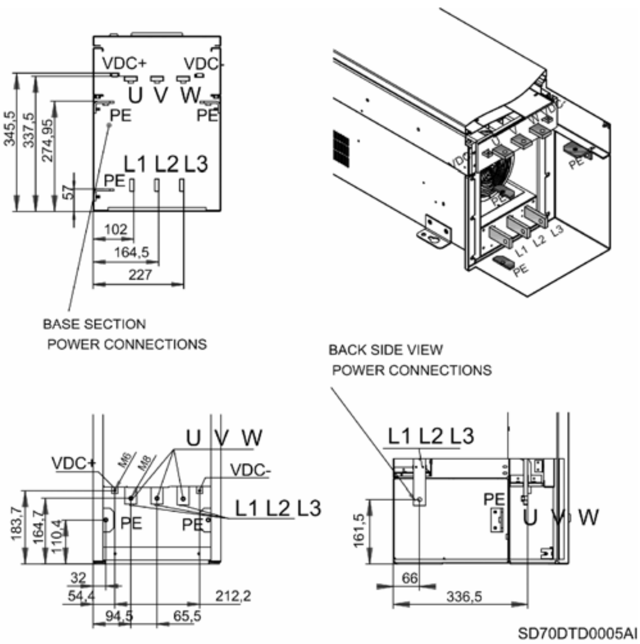


Figure 6.2 Power connections location for SD70150 5x – SD70170 5x and SD70105 6x

6.1.3. Frame 5 Connections

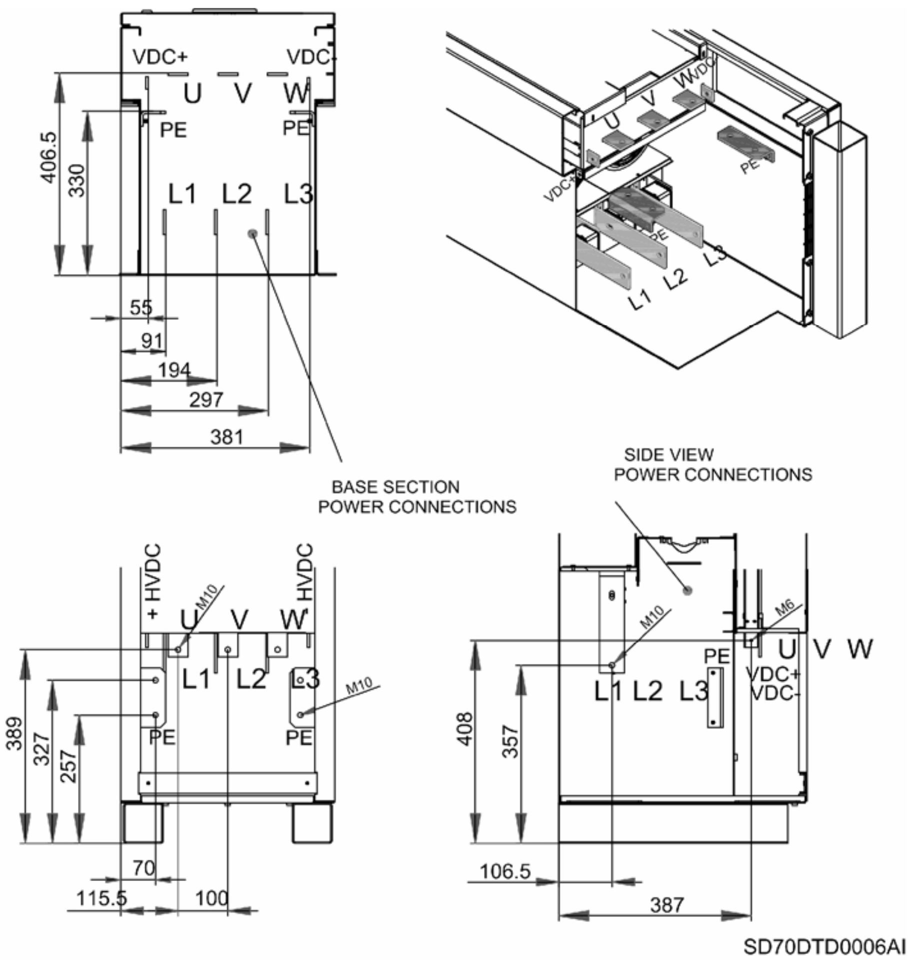


Figure 6.3 Power connections location for SD70210 5x – SD70275 5x and SD70130 6x – SD70170 6x

6.1.4. Frame 6 Connections

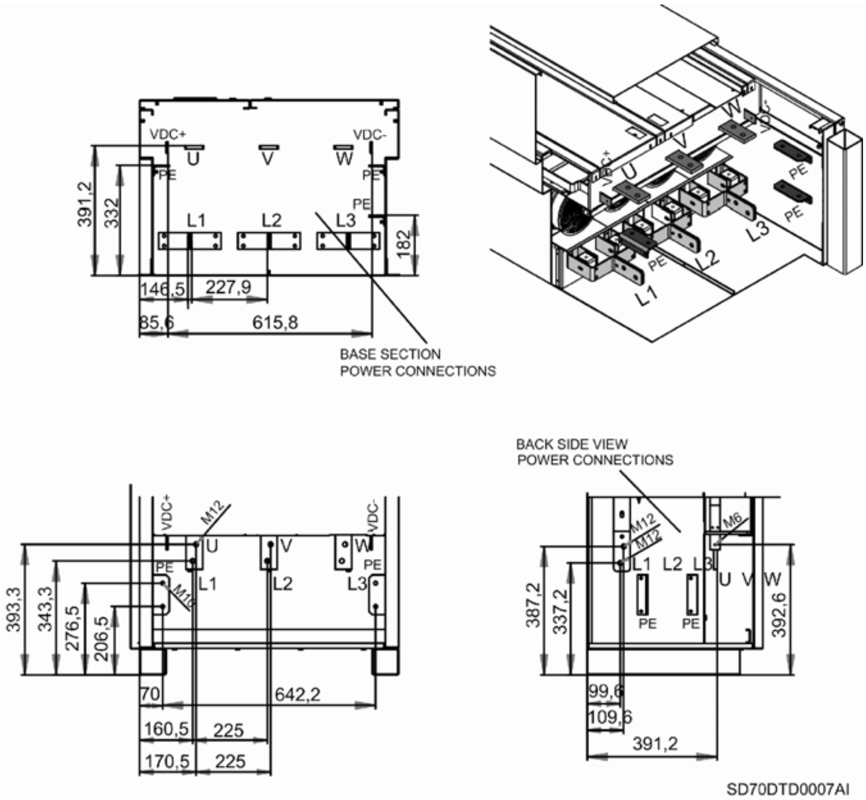


Figure 6.4 Power connections location for SD70330 5x – SD70460 6x and SD70210 6x – SD70320 6x

6.1.5. Frame 7 Connections

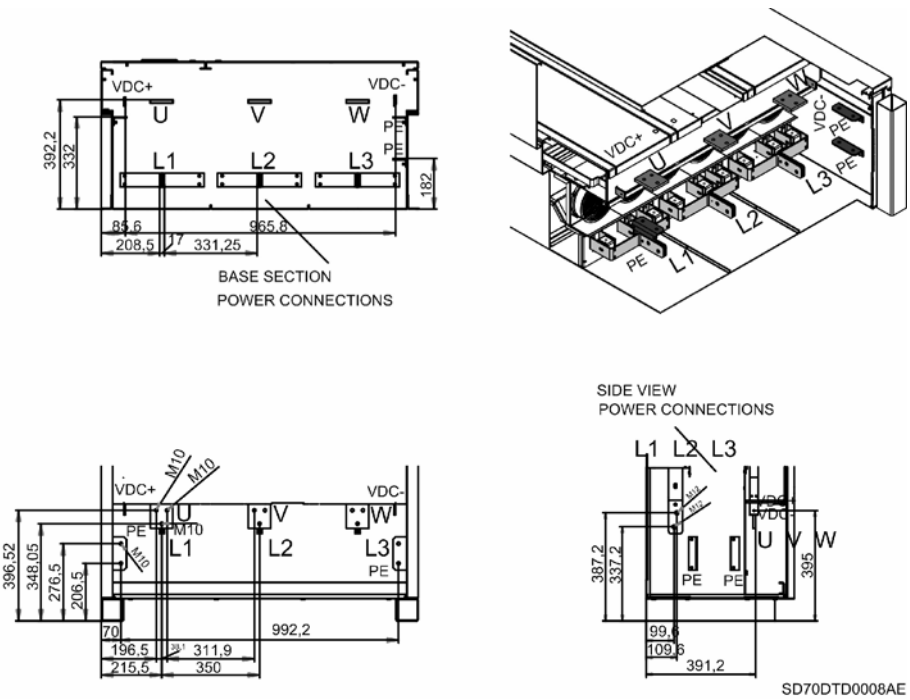


Figure 6.5 Power connections location for SD70580 5x – SD70720 5x and SD70385 6x – SD70460 6x

6.1.6. Frame 8 Connections

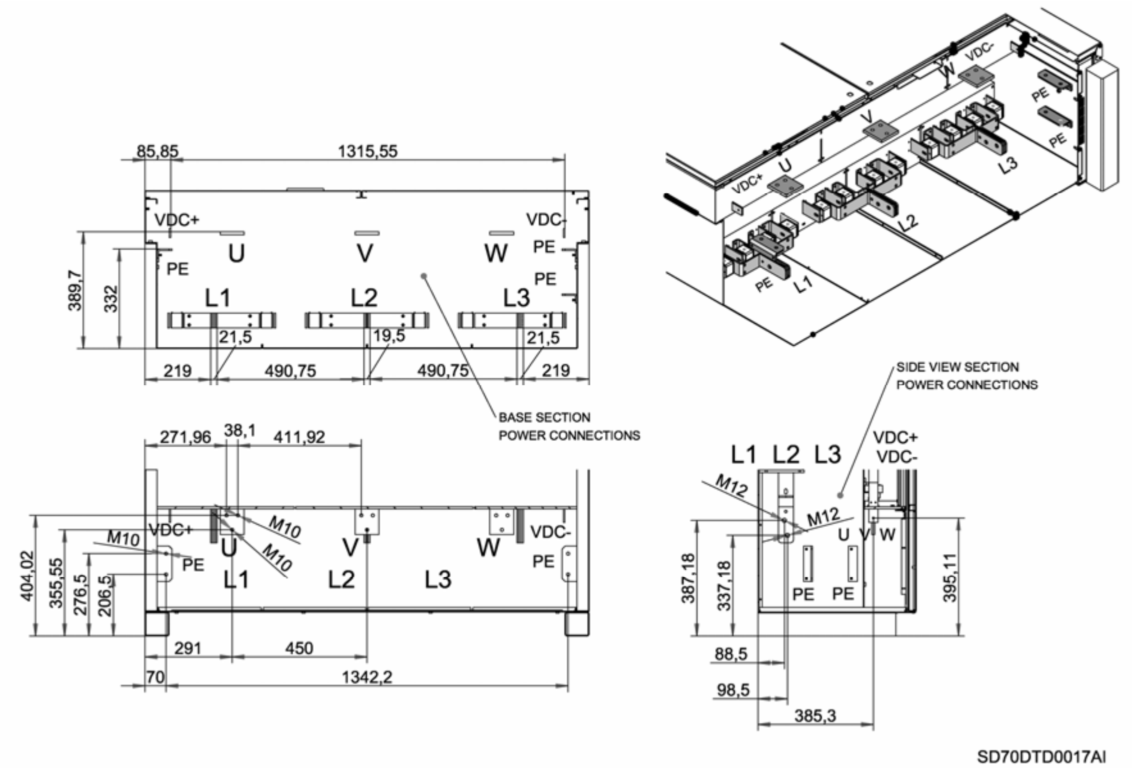


Figure 6.6 Power connections location for SD70840 5x – SD70925 5x and SD70550 6x – SD70660 6x

6.1.7. Frame 9 Connections

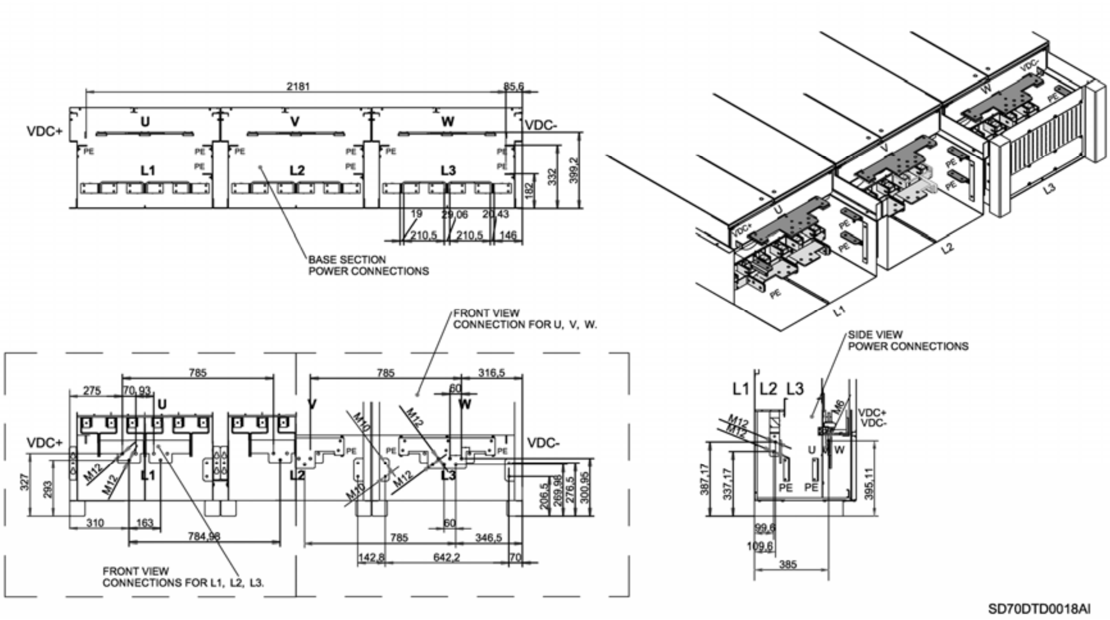


Figure 6.7 Power connections location for SD71030 5x – SD71440 5x and SD70750 6x – SD70950 6x

6.1.8. Frame 10 Connections

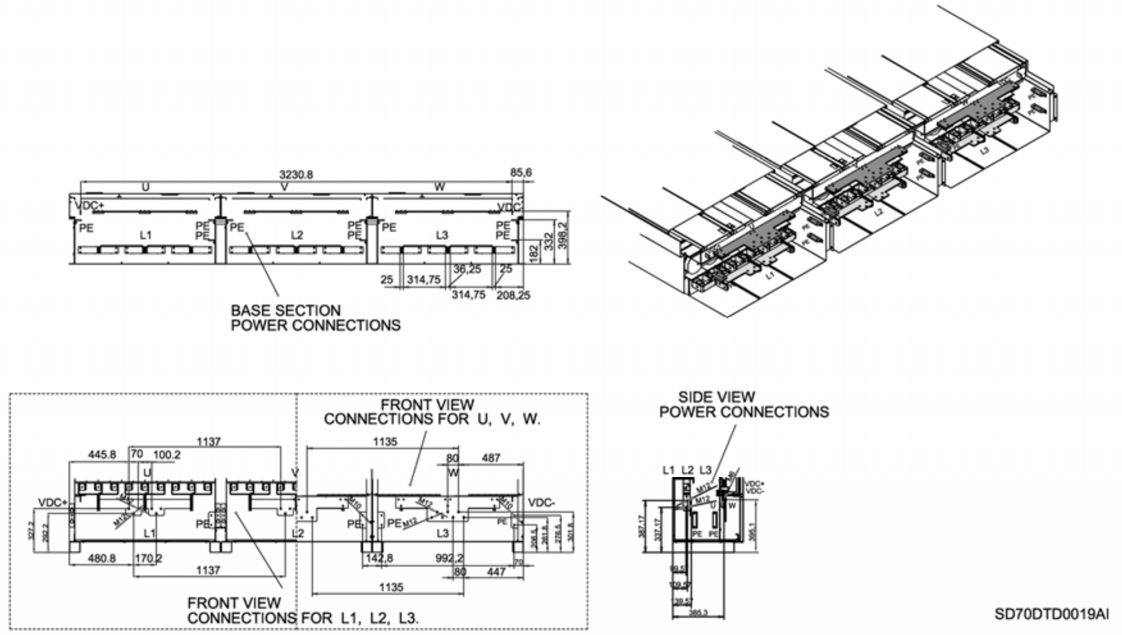


Figure 6.8 Power connections location for SD71580 5x – SD71800 5x and SD71140 6x – SD71420 6x

6.1.9. Frame 5 Connections – IP00

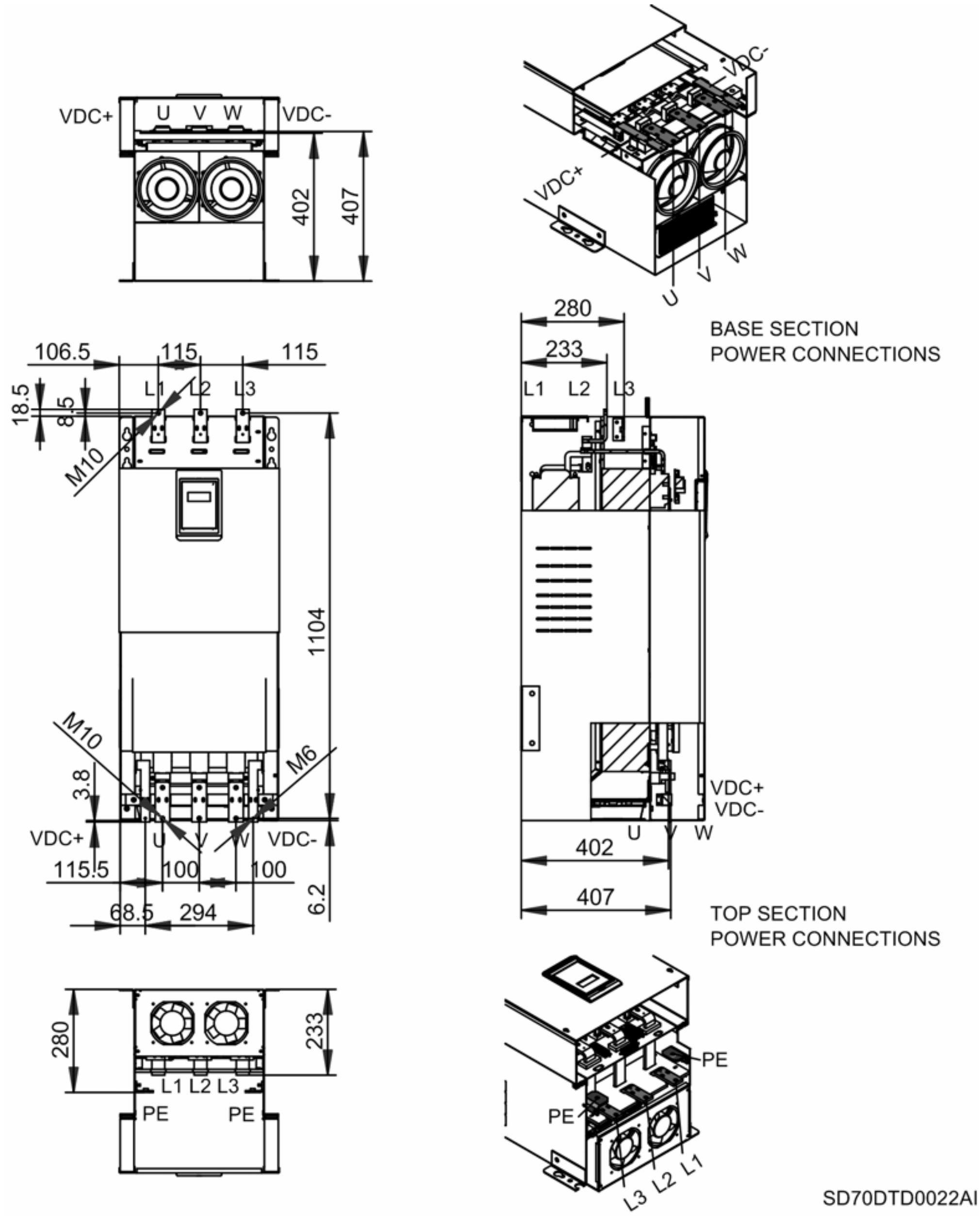


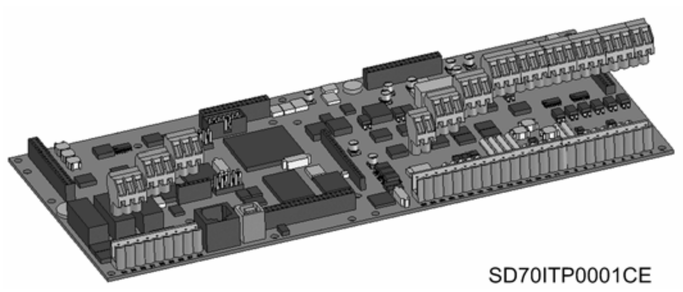
Figure 6.9 Power connections location for SD70210 50 – SD70275 50 – IP00

6.2. Control Connections

The following figure shows the SD700 control board. Although the control board is insulated galvanically, for safety reasons it is recommended not change the wiring while the equipment is connected to the input power supply.

CAUTION

Changes of control wiring or bridges 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.



Users access to the control board is via a series of terminals and plugs. As standard the control board is fitted with terminals and plugs for control input and output connections, display connection, communication serial port (RS232/RS485), communication USB port. Optional boards can be fitted for additional control input / outputs, fibre optic input / output, encoder inputs, serial communication interfaces, dynamic braking control, ...

Figure 6.10 Control board of SD700

6.2.1. Connectors and Jumpers Description

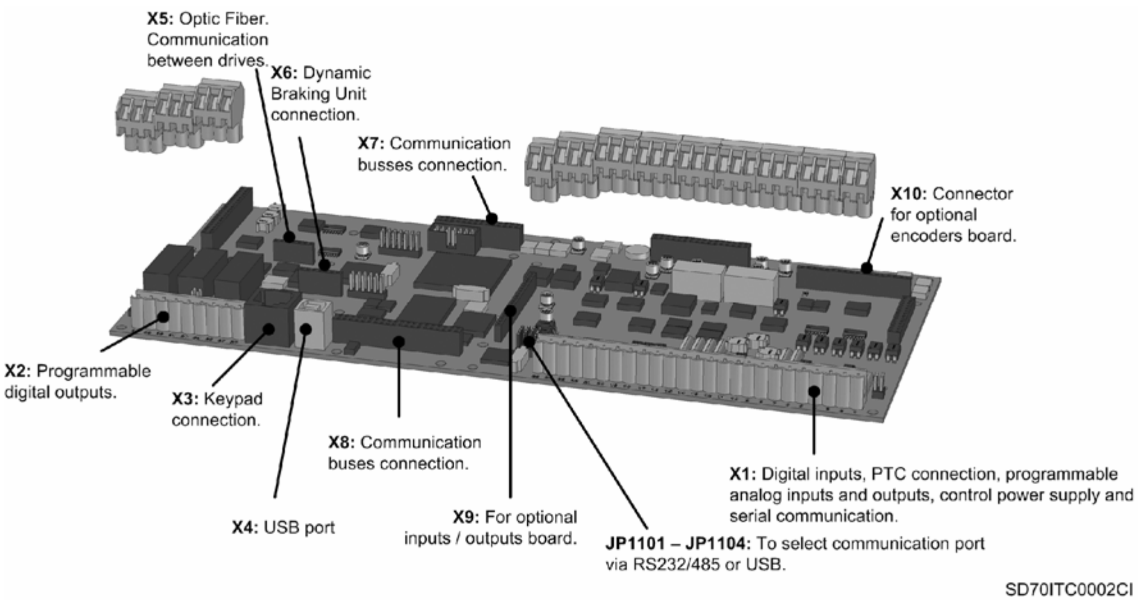


Figure 6.11 Location and description of user connectors

6.2.2. Control Wiring

The following figure provides an overview of the standard wiring of control terminals through the X1 and X2 user connectors.

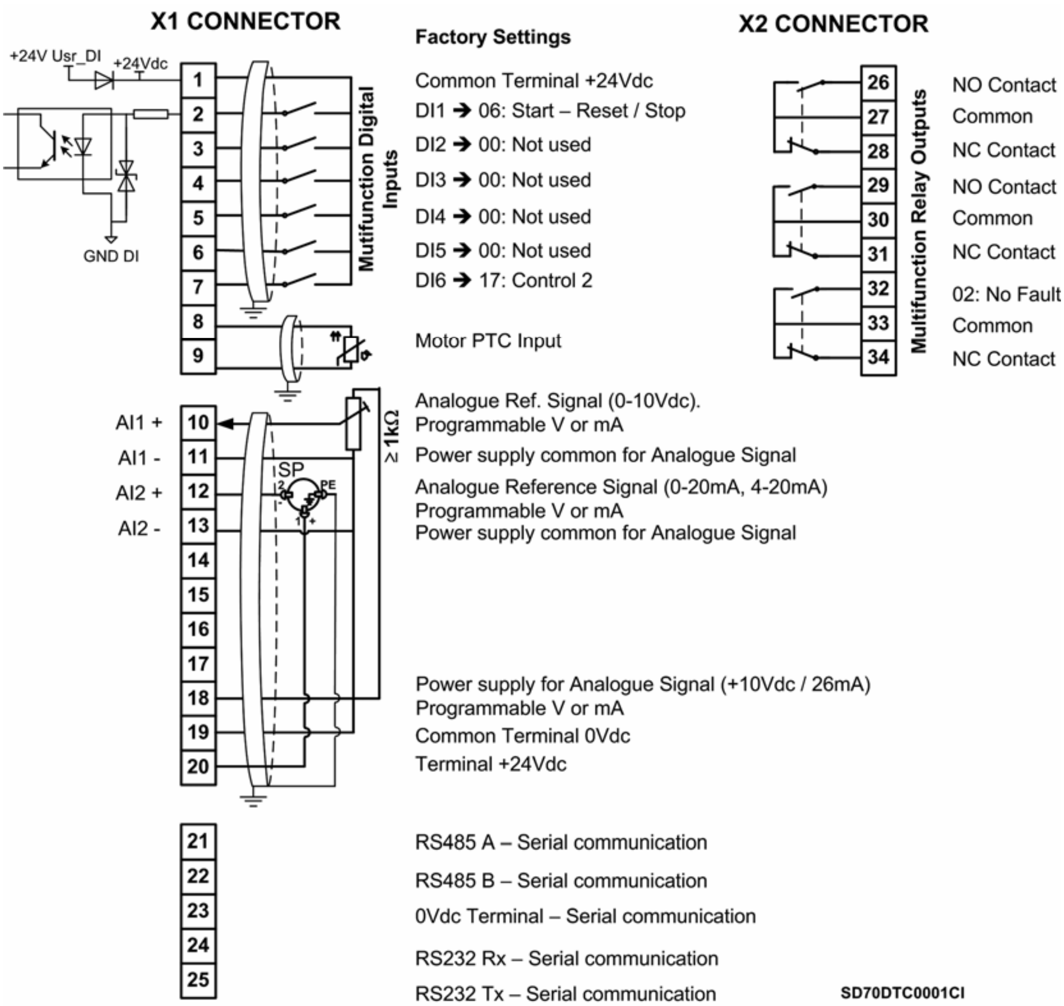


Figure 6.12 Example of standard wiring of control terminals

Digital inputs can be configured individually or collectively. Details on varying standard configurations are available to assist the user.
The following figure shows typical wiring configuration for a 3 wire start / stop push button system.

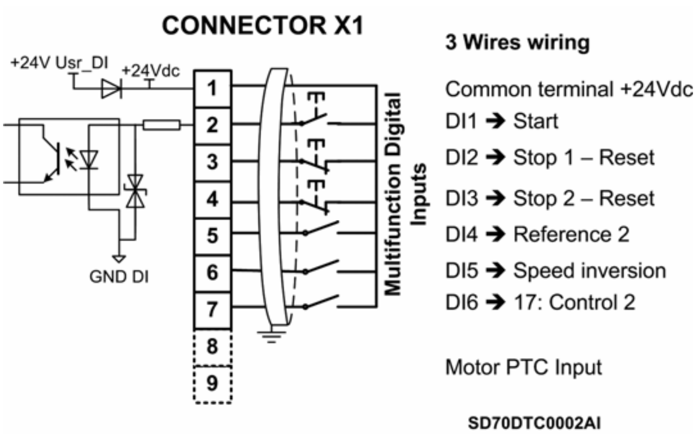


Figure 6.13 3-wire control terminals wiring

6.3. Control Terminals Description

		PIN	SIGNAL	DESCRIPTION
X1 CONNECTOR	DIGITAL INPUTS	1	+24V_USR	Power supply for digital inputs. Short circuit and overload protected. (Maximum +24Vdc, 180mA)
		2	DI1	Programmable Digital Input 1. Digital inputs are configured in the Input group. Their status can be displayed in the visualisation group. They can be supplied from terminal 1 or an external power 24Vdc supply. If an external power supply is used, the common should be connected to the terminal 19 (user GND).
		3	DI2	Programmable Digital Input 2. See DI1 description.
		4	DI3	Programmable Digital Input 3. See DI1 description.
		5	DI4	Programmable Digital Input 4. See DI1 description.
		6	DI5	Programmable Digital Input 5. See DI1 description.
		7	DI6	Programmable Digital Input 6. See DI1 description.
		8	PTC +	Control signal of the motor temperature through the connection of a PTC.
		9	PTC -	
	ANALOGUE INPUTS	10	AI1 +	Voltage or current programmable Analogue Input 1 (V or mA). Configurable for 0-10Vdc, ±10Vdc, 0-20mA or 4-20mA. Input resistance value in voltage mode is Ri=20kΩ. Input resistance value in current mode is Ri=250Ω.
		11	AI1 -	Common for Analogue Input 1.
		12	AI2 +	Voltage or current programmable Analogue Input 2 (V or mA). See AI1 description.
		13	AI2 -	Common for Analogue Input 2.
	ANALOGUE OUTPUTS	14	AO1 +	Voltage or current programmable Analogue Output 1 (V or mA). Configurable for 0-10Vdc, ±10Vdc, 0-20mA or 4-20mA.
		15	AO1 -	Common for Analogue Output 1.
		16	AO2 +	Voltage or current programmable Analogue Output 2 (V or mA). Configurable for 0-10Vdc, ±10Vdc, 0-20mA or 4-20mA.
		17	AO2 -	Common for Analogue Output 2.
	USER POWER SUPPLY	18	+10V_POT	10Vdc power supply for analogue inputs. Input power for maximum 2 potentiometers (R≥1kΩ).
		19	GND_USR	Common for analogue inputs (0Vdc).
		20	+24V_USR	User power supply. Allows for the supply to an external sensor. (Maximum: +24Vdc, 150mA).
	SERIAL COMMUNICATION	21	RS485 A	RS485 serial communication interface for Modbus.
		22	RS485 B	
		23	RS Common	Common for RS485 / RS232 serial communication signals.
		24	RS232 Rx	RS232 serial communication interface for Modbus.
		25	RS232 Tx	
X2 CONNECTOR	DIGITAL OUTPUTS	26	Relay1 NO	Digital Output 1. Programmable change over relay (NO / NC). Potential free (Maximum: 250Vac, 8A; 30Vdc, 8A).
		27	Relay1 C	
		28	Relay1 NC	
		29	Relay2 NO	Digital Output 2. Programmable change over relay (NO / NC). Potential free (Maximum: 250Vac, 8A; 30Vdc, 8A).
		30	Relay2 C	
		31	Relay2 NC	
		32	Relay3 NO	Digital Output 3. Programmable change over relay (NO / NC). Potential free (Maximum: 250Vac, 8A; 30Vdc, 8A).
		33	Relay3 C	
		34	Relay3 NC	

7. DISPLAY UNIT AND CONTROL KEYPAD

7.1. Keypad Unit Description

The display of the SD700 is removable for remote installation, as the illustration shows. There are three leds on the display which indicate the drive operational status, one LCD screen with 4 lines of 16 characters each and keys for control and parameter setting.

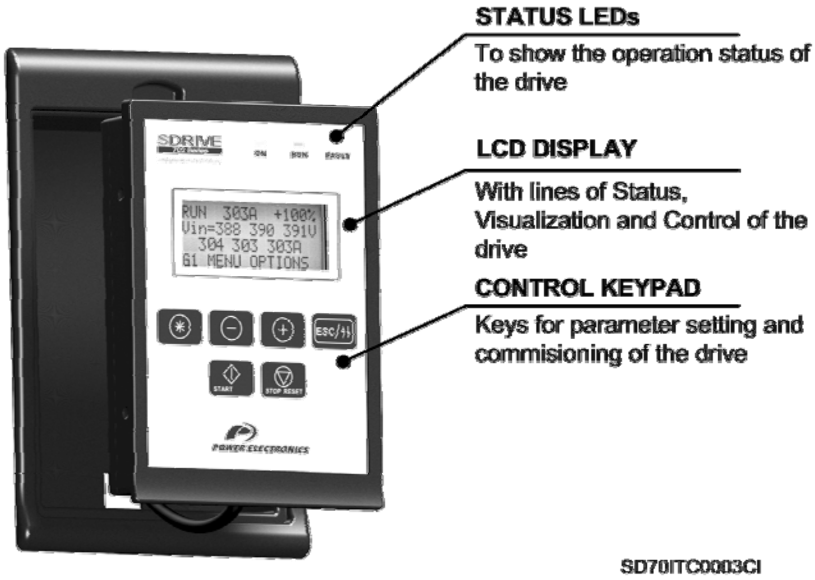


Figure 7.1 Display Unit and Keypad

7.1.1. LEDs for Status Indication

Leds offer an easy method of identifying if the SD700 is powered up, if the drive is supplying output voltage, or if the drive has tripped.

- **Led ON**: Yellow colour. When it is lit, indicates equipment is powered up.
- **Led RUN**: Green colour. When it is lit, indicates the motor is powered by the SD700.
- **Led FAULT**: Red colour. When it is blinking, indicates the equipment is in fault status.

Figure 7.2 Status Visualization

7.1.2. Alphanumeric LCD Display

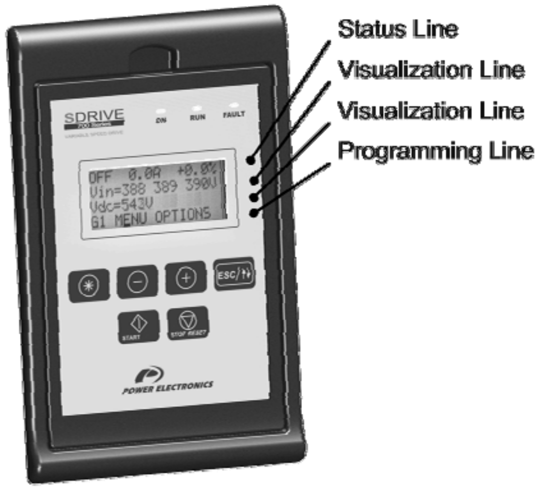
SD700 display has a LCD screen of four lines with sixteen characters each (16x4). Each line has different functions.

- **Status Line:** It is the top line.
It is always present and shows the SD700 status (STR – Start, STP – Stop, etc…).
It also shows the output current and the motor speed.
It is not configurable by the user.

- **Visualization Line 1:** It is the second line of the screen. It is always present and allows the selection of variables from the visualization menu.
It is configurable by the user.

- **Visualization Line 2:** It is the third line of the screen. It is always present and allows the selection of variables from the visualization menu.
It is configurable by the user.

- **Programming Line**: It is the fourth line.
It is used to display and / or set different parameters within the SD700.



SD70ITC0008AI

Figure 7.3 Detail of Display Lines

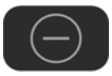
7.1.3. Control Keys

Function keys have multiple uses and can be operated individually or in combination with other keys:

It allows access to different parameters groups and sub-groups, it displays code explanations and allows adjustment of parameter values in combination with other keys. If a group has no sub-groups, it allows direct access to the parameters of the group.

To modify numeric parameters:

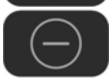
 &  Simultaneously pushed, the value will increase.

 &  Simultaneously pushed, the value will decrease.

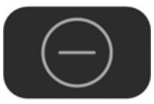
To modify parameters of numbered options:

 Pushing this key, the extended information will appear.

 &  Simultaneously pushed will ascend the user through the varying options.

 &  Simultaneously pushed will descend the user through the varying options.

It allows upward movement through the parameters groups and allows navigation for different parameters within a parameter group. It also allows the increase of parameters value.



It allows downward movement through the parameters groups and allows navigation for different parameters within a parameter group. It also allows the decrease of parameters value.

When pushed for 2 seconds (approx.) it allows navigation between the programming line and visualisation lines available to the user. It also offers the possibility of escaping back to the previous sub-group or group.

To start the drive from the keypad when the control has been set as local control (check drive configuration).

To stop the drive from the keypad when the control has been set as local control. In the case of tripping this key can be used to reset the drive, if local control is enabled.

In the following figure you can see a programming example where you can observe the operation explained previously.

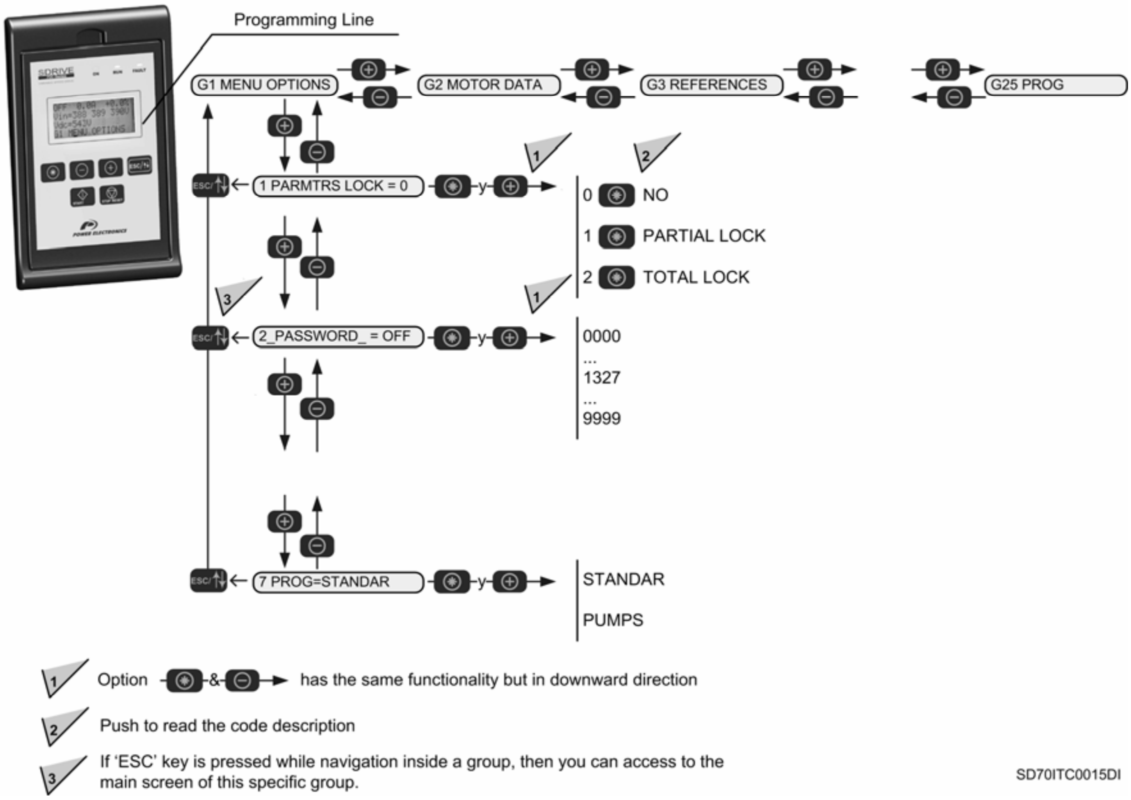


Figure 7.4 Example of parameters navigation

8. STATUS MESSAGES

8.1. Status Line

The upper line of the display corresponds to the status line. In this line we can display the equipment status, motor current (A) and the motor speed (%). It is always displayed and it is not programmable by the user.

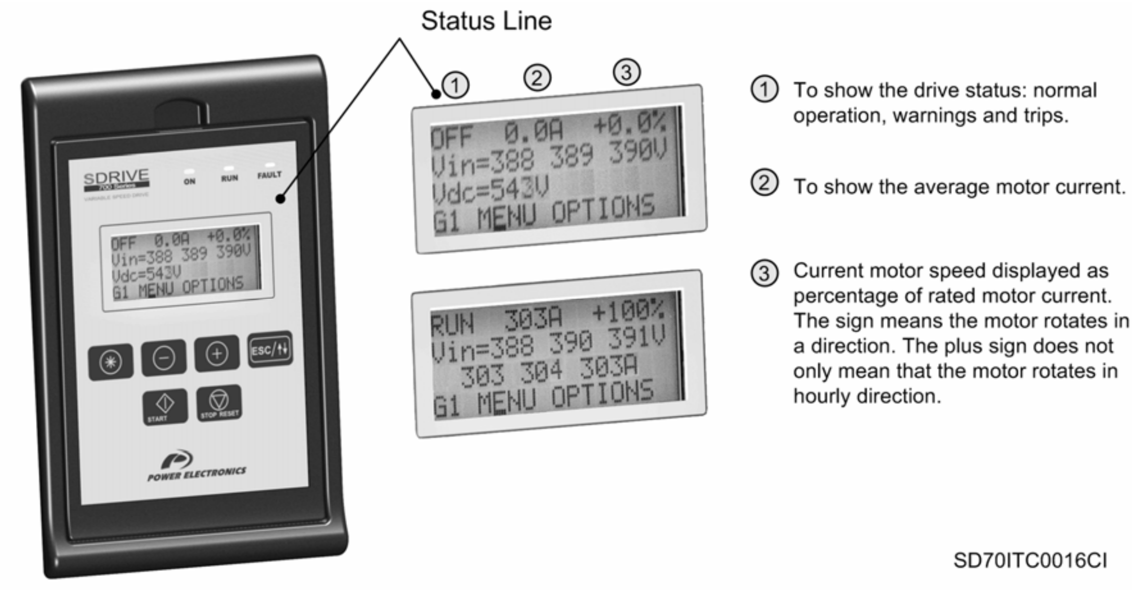


Figure 8.1 Status Line Description

GENERAL STATUS

Screen	**OFF 0.0A +0.0%**
Description	Present status of the drive First field of the display status line
Range	* (See chapters 8.2, 8.3 and 11)
Modbus address	**40219**
Modbus range	0 to 201

STATUS MESSAGES			
0 ➔ OFF	4 ➔ DEC	12 ➔ DCB	43 ➔ IN2
1 ➔ ON	5 ➔ SPG	15 ➔ TBR	49 ➔ HEA
2 ➔ ACL	6 ➔ EST	41 ➔ IN1	
3 ➔ RUN	10 ➔ SPN	42 ➔ IN2	

Note: See description of the status messages in chapter 8.2

WARNING MESSAGES			
61 ➔ MOL	66 ➔ TLT	70 ➔ AVI	91 ➔ S2L
63 ➔ MOC	67 ➔ VLT	71 ➔ OVV	
64 ➔ DOC	68 ➔ ACO	72 ➔ UNV	
65 ➔ ILT	69 ➔ AVO	90 ➔ S1L	

Note: See description of the warning messages in chapter 8.3

FAULT MESSAGES			
120 ➔ NFL	139 ➔ F19	158 ➔ F38	177 ➔ F57
121 ➔ F01	140 ➔ F20	159 ➔ F39	178 ➔ F58
122 ➔ F02	141 ➔ F21	160 ➔ F40	179 ➔ F59
123 ➔ F03	142 ➔ F22	161 ➔ F41	180 ➔ F60
124 ➔ F04	143 ➔ F23	162 ➔ F42	181 ➔ F61
125 ➔ F05	144 ➔ F24	163 ➔ F43	182 ➔ F62
126 ➔ F06	145 ➔ F25	164 ➔ F44	183 ➔ F63
127 ➔ F07	146 ➔ F26	165 ➔ F45	184 ➔ F64
128 ➔ F08	147 ➔ F27	166 ➔ F46	185 ➔ F65
129 ➔ F09	148 ➔ F28	167 ➔ F47	186 ➔ F66
130 ➔ F10	149 ➔ F29	168 ➔ F48	187 ➔ F67
131 ➔ F11	150 ➔ F30	169 ➔ F49	188 ➔ F68
132 ➔ F12	151 ➔ F31	170 ➔ F50	189 ➔ F69
133 ➔ F13	152 ➔ F32	171 ➔ F51	190 ➔ F70
134 ➔ F14	153 ➔ F33	172 ➔ F52	191 ➔ F71
135 ➔ F15	154 ➔ F34	173 ➔ F53	192 ➔ F72
136 ➔ F16	155 ➔ F35	174 ➔ F54	
137 ➔ F17	156 ➔ F36	175 ➔ F55	
138 ➔ F18	157 ➔ F37	176 ➔ F56	

Note: See description of the fault messages in chapter 11

Read / Write	Read Only

MOTOR OUTPUT CURRENT

Screen	**OFF 0.0A +0.0%**
Description	Motor output current Second field of the display status line
Units	A
Modbus address	**40163**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only

MOTOR SPEED

Screen	**OFF 0.0A +0.0%**
Description	Motor output speed Third field of the display status line
Units	%
Modbus address	**40170**
Modbus range	Real Value = (Modbus Value / 10) 8192 = 100% of the motor rated speed
Read / Write	Read Only

Notes:

Equipment status.
Parameter Equipment Status has Word size like the rest of Modbus parameters, but in this case, the more significant byte (MSB), is reserved for internal use (bit by bit). User should only use the less significant byte (LSB) to access to the information of the drive status.

Alternation of two statuses.
During the standard running of the equipment, the drive status value will appear in a stable and continuous way, only changing when the drive status changes (from 'Accelerating' to 'Run', for example). Nevertheless, there are two situations where the status value alternates between two statuses in a blink way:

- First case: If the equipment presents a Warning, this one will appear by alternating with the equipment status, for example, Normal status 'RUN' and the warning 'ILT' in alternative way.
- Second case: If a faults occurs, the status value will alternate between the last status of the drive before occurring the fault and the current fault number, for example, normal status 'RUN' and 'F40' in alternative way.

8.2. List of Status Messages

Screen	Name	Description
OFF	Deactivated power	Drive power is deactivated.
ON	Activated power	Drive power is activated.
ACL	Accelerating	Drive is increasing the output frequency. Motor increasing in speed, it is accelerating.
RUN	Running	Drive is operating at reference speed. Operation at steady status.
DEC	Decelerating	Drive is decreasing the output frequency. Motor decreasing in speed, it is decelerating.
SPG	Stopping	Drive is decreasing the output frequency due to a stop command. Motor is stopping by ramp until zero speed is reached.
ST0	Free run stop when a fault occurs	Drive is stopping by free run stop after a fault occurs (emergency stop). Motor stopping time is determined by inertia as the drive output has turned off.
SPN	Flying start	‘Flying start’ operation must be configured if required. The SD700 will search for the actual motor shaft speed once the drive has received a start command.
DCB	DC brake	SD700 is applying DC current injection to stop the motor.
HEA	Non condensing current is activated	SD700 is injecting DC current to prevent moisture condensing within the motor. CAUTION: Although the motor is not running there is dangerous voltage. Run Led will be lit during this process. Be careful to avoid damages and personal injury.
TBR	DC brake ON delay	Drive is applying a delay time before DC current injection is active. When this time is elapsed, the DC brake will be active.
IN1	Inch speed 1	SD700 is working according to inch speed 1 command and ‘Start + Inch speed 1' mode is active. When operated in this mode the "Start + Inch speed 1" command is dominant over other inputs programmed for "Start" functionality. Therefore if one input is configured as ‘Start’ and it is deactivated; in spite of this deactivated input, the drive will start when ‘Start + Inch speed 1' command is received. This is also valid for Inch speed 2 and 3.
IN2	Inch speed 2	SD700 is working according to inch speed 2 command. ‘Start + Inch speed 2' mode is active.
IN3	Inch speed 3	SD700 is working according to inch speed 3 command. ‘Start + Inch speed 3' mode is active.

8.3. List of Warning Messages

Screen	Name	Description
MOL	Motor overload	This message will appear when motor thermal model is increasing the estimated motor temperature.
MOC	Motor over-current	Motor current is higher than the rated current value.
DOC	Drive over-current	This message will appear if the output current is higher than 125% of the nominal current.
ILT	Current limitation	Current limit algorithm has been activated.
TLT	Torque limitation	Torque limit algorithm has been activated.
VLT	Voltage limitation	A high DC Link voltage level has been detected and the voltage limit control algorithm has been activated to protect the drive.
ACO	Asymmetric current	Asymmetry in output currents of the drive has been detected.
AVO	Output voltage imbalance	Asymmetry in output voltage of the drive has been detected.
AVI	Input voltage imbalance	Asymmetry in input voltage of the drive has been detected.
OVV	High input voltage	Input voltage of the equipment is reaching a dangerous level. The value is above the set value (protections settings).
UNV	Low input voltage	Input voltage of the equipment is reaching a dangerous level. The value is below the set value (protections settings).
S1L	Speed limit 1 reached	Motor speed has reached speed limit 1.
S2L	Speed limit 2 reached	Motor speed has reached speed limit 2.

9. VISUALIZATION AND STATUS PARAMETERS. GROUP G0

These parameters constantly indicate the input signal status and dynamic parameter status of the SD700. Visualization lines are the second and the third lines. The user can select the parameter to be displayed in each line from the different visualization options.

To select a display parameter you should move to the cursor to the second or third line. For this, you need to press **ESC / ↑↓** key for two seconds approximately. The cursor moves from one line to the next. Once located on the second or third line you can navigate like the programming line (line 4) and select the desired parameter to be displayed. Once selected these parameters are saved into memory. These parameters are then displayed on lines 2 and 3 whenever the drive is powered up.

Thanks to these lines user can display desired parameters and obtain additional information easily.

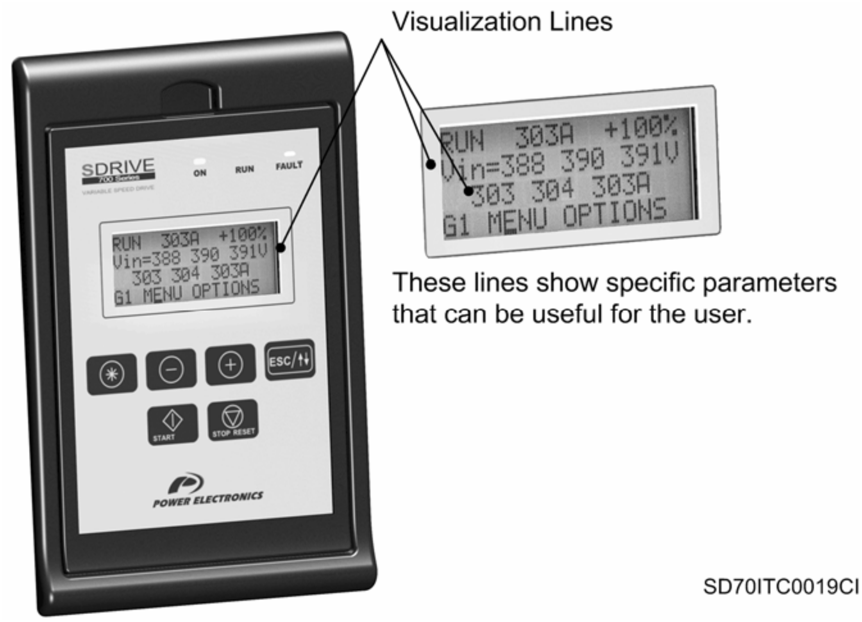


Figure 9.1 Visualization Lines Description

9.1. Parameters SV.1 – Motor Visualization

SV1.1 SPEED REFERENCE

Screen	**Sp Ref = +000%**
Units	% motor speed
Modbus address	**40162**
Modbus range	8192 = 100% of motor rated speed
Read / Write	Read Only
Description	It shows the present reference value of speed which is applied to the motor.

SV1.2 MOTOR SPEED

Screen	**Mtr Speed = +0rpm**
Units	rpm
Modbus address	**40169**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the motor speed in revs per minute.

SV1.3 MOTOR FREQUENCY

Screen	**Mtr Freq = +0.0Hz**
Units	Hz
Modbus address	**40167**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the operating frequency of the motor.

SV1.4 MOTOR VOLTAGE

Screen	**Mtr Vout = 0V**
Units	V
Modbus address	**40166**
Modbus address	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the present voltage applied to the motor.

SV1.5 MOTOR CURRENT

Screen	**Mtr Iout = 0.0A**
Units	A
Modbus address	**40163**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the present current flowing to the motor.

SV1.6	MOTOR TORQUE
Screen	**Mtr Torqe = 0.0%**
Units	% motor torque
Modbus address	**40164**
Modbus range	8192 = 100% of motor rated torque
Read / Write	Read Only
Description	It shows the present torque applied to the motor.

SV1.7	MOTOR POWER FACTOR
Screen	**Mtr Pfactr = 0.0**
Units	-
Modbus address	**40168**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the power factor of the motor.

SV1.8	MOTOR POWER CONSUMPTION
Screen	**Mtr Pwr = +0.0kW**
Units	kW
Modbus address	**40165**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the instantaneous power consumption of the motor.

SV1.9	CURRENT CONSUMPTION PER PHASE OF THE MOTOR
Screen	**0.0A 0.0A 0.0A**
Units	A
Modbus address	**40177 → Phase U** **40178 → Phase V** **40179 → Phase W**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the instantaneous current of each phase of the motor (U, V and W).

SV1.10	VOLTAGE APPLIED TO THE MOTOR PHASES
Screen	**Vmt = 0 0 0V**
Units	V
Modbus address	**40180 → Phases UV** **40181 → Phases VW** **40182 → Phases UW**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the instantaneous voltage applied to the motor terminals.

SV1.11	MOTOR PTC CONNECTION

Screen	**PTC Motor = 0**
Units	-
Modbus address	**40218**
Modbus range	0 to 1
Read / Write	Read Only
Description	It shows if the motor PTC (temperature sensor) is connected. X: PTC Connected 0: PTC Not Connected

SV1.12	MOTOR TEMPERATURE

Screen	**Motor Temp = 0.0%**
Units	% motor heat
Modbus address	**40173**
Modbus range	8192 = 100% of the motor temperature
Read / Write	Read Only
Description	It shows the estimated motor temperature. A level of 110% will cause an F25 trip (motor overload).

9.2. Parameters SV.2 – Drive Visualization

SV2.1	VOLTAGE APPLIED TO THE DRIVE
Screen	**390 390 390V**
Units	V
Modbus address	**40183 ➔ Phases RS** **40184 ➔ Phases ST** **40185 ➔ Phases RT**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the input instantaneous voltage applied to the drive (RS, ST, RT).

SV2.2	AVERAGE INPUT VOLTAGE TO THE DRIVE
Screen	**Inp Vol = 390V**
Units	V
Description	It shows the average input voltage to the drive.

SV2.3	FREQUENCY OF THE INPUT VOLTAGE TO THE DRIVE
Screen	**50.0 50.0 50.0Hz**
Units	Hz
Modbus address	**40159 ➔ Phases RS** **40160 ➔ Phases ST** **40161 ➔ Phases RT**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the frequency of the input voltage to the drive.

SV2.4	DC LINK VOLTAGE OF THE DRIVE
Screen	**Bus vol = 540V**
Units	Vdc
Modbus address	**40171**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows DC Link voltage of the drive.

SV2.5	IGBT TEMPERATURE
Screen	**IGBT Temp = +23ºC**
Units	ºC
Modbus address	**40176**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the temperature measured at the power stage of the drive output.

SV2.6 DRIVE TEMPERATURE

Screen	**Temp Equip = +26ºC**
Units	ºC
Modbus address	**40240**
Modbus range	Real Value = (Modbus Value / 100)
Read / Write	Read Only
Description	It shows the temperature measured inside the electronics chamber of the drive.

9.3. Parameters SV.3 – External Visualization

SV3.1	**AVERAGE VALUE OF THE ANALOGUE INPUT 1**
Screen	**ANLG IN1 = +0.0V**
Units	V or mA
Modbus address	**40186**
Modbus range	Real Value = (Modbus Value / 1000)
Read / Write	Read Only
Description	It shows the value of Analogue Input 1.

SV3.2	**REFERENCE VALUE OF THE ANALOGUE INPUT 1**
Screen	**AIN1 Refr = +0.00%**
Units	% bottom scale AI1
Modbus address	**40190**
Modbus range	8192 = 100% maximum range of the Analogue Input 1
Read / Write	Read Only
Description	It shows the value or the PID reference proportional to Analogue Input 1 in percentage.

SV3.3	**VALUE OF THE SENSOR 1 ASSOCIATED TO THE AI1**
Screen	**AIN1 S = +0.00l/s**
Units	Engineering units
Modbus address	**40262**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the value of sensor 1 associated to the Analogue Input 1.

SV3.4	**AVERAGE VALUE OF THE ANALOGUE INPUT 2**
Screen	**ANLG IN2 = +0.0V**
Units	V or mA
Modbus address	**40187**
Modbus range	Real Value = (Modbus Value / 1000)
Read / Write	Read Only
Description	It shows the value of the Analogue Input 2.

SV3.5	**REFERENCE VALUE OF THE ANALOGUE INPUT 2**
Screen	**AIN2 Refr = +0.00%**
Units	% bottom scale AI2
Modbus address	**40191**
Modbus range	8192 = 100% maximum range of the Analogue Input 2
Read / Write	Read Only
Description	It shows the value or the PID reference proportional to the Analogue Input 2 signal.

SV3.6 VALUE OF THE SENSOR 2 ASSOCIATED TO THE AI2

Screen	**AIN 2 S = +0.00Bar**
Units	Engineering units
Modbus address	**40263**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the value of sensor 2 associated to the Analogue Input 2.

SV3.7 ANALOGUE OUTPUT 1 VALUE

Screen	**ANL OUT1 = +4.0mA**
Units	V or mA
Modbus address	**40192**
Modbus range	Real Value = (Modbus Value / 1000)
Read / Write	Read Only
Description	It shows the value of Analogue Output 1.

SV3.8 VALUE OF THE MAGNITUDE ASSOCIATED TO AO1

Screen	**AOUT1 Refer = +0.0%**
Units	% associated magnitude
Modbus address	**40194**
Modbus range	8192 = 100% maximum range of the Analogue Output 1
Read / Write	Read Only
Description	It shows the magnitude value associated to the Analogue Output 1 (speed, current ...).

SV3.9 ANALOGUE OUTPUT 2 VALUE

Screen	**ANL OUT2 = +4.0mA**
Units	V or mA
Modbus address	**40193**
Modbus range	Real Value = (Modbus Value / 1000)
Read / Write	Read Only
Description	It shows the value of Analogue Output 2.

SV3.10 VALUE OF THE MAGNITUDE ASSOCIATED TO AO2

Screen	**AOUT2 Refer = +0.0%**
Units	% associated magnitude
Modbus address	**40195**
Modbus range	8192 = 100% maximum range of the Analogue Output 2
Read / Write	Read Only
Description	It shows the magnitude value associated to the Analogue Output 2 (speed, current ...).

SV3.11 STATUS OF DIGITAL INPUTS

Screen **Input DG: 000000 0**
Units -

Modbus address **40196**
Modbus range LSB ➔ BIT0 ➔ MFI1
BIT6 ➔ PTC
0 to 1
Read / Write Read Only

Description It shows whether the Digital Inputs are activated or not, from DI1 to DI6. The final is another input which shows the status of the motor PTC signal.
X: Active
0: Not Active

SV3.12 STATUS OF OUTPUT RELAYS

Screen **Relays: X 0 X**
Units -

Modbus address **40197**
Modbus range BIT 0 ➔ R1; Range from 0 to 1
BIT 1 ➔ R2; Range from 0 to 1
BIT 2 ➔ R3; Range from 0 to 1
Read / Write Read Only

Description It shows whether the output relays are activated or not.
X: Active
0: Not Active

SV3.13 MACHINE SPEED ASSOCIATED TO THE MOTOR

Screen **Speed M = +0.000m/s**
Units Depending on configuration

Modbus address **-** (This parameter is not accessible through Modbus communication)

Description It shows the speed of the motor in engineering units. Pressing $\boxed{*}$ key you can access to the following sub-parameters of configuration:

<table>
<tr><th>Screen</th><th>Range</th><th>Description</th></tr>
<tr><td>Scale ftr = 1</td><td>0.001 - 10</td><td>To set the ratio factor between motor speed and machine speed.</td></tr>
<tr><td>Units Ma = m/s</td><td>m/s
m/m
cm/s
cm/m
v/s
v/m</td><td>It allows selection of the units to be displayed.
<table>
<tr><th>Units</th><th>Description</th></tr>
<tr><td>m/s</td><td>Meters / second</td></tr>
<tr><td>m/m</td><td>Meters / minute</td></tr>
<tr><td>cm/s</td><td>Centimeters / second</td></tr>
<tr><td>cm/m</td><td>Centimeters / minute</td></tr>
<tr><td>v/s</td><td>Turns / second</td></tr>
<tr><td>v/m</td><td>Turns / minute</td></tr>
</table></td></tr>
</table>

Note: They both are settable during run.

9.4. Parameters SV.4 – Internal Visualization

SV4.1	**ACTUAL FAULT**
Screen	**Actual Fault = 00**
Units	-
Modbus address	**40235**
Modbus range	Fault Number
Read / Write	Read Only
Description	It shows the present code fault. See fault history 'G13 FAULT HISTORY'.

SV4.2	**DRIVE RATED CURRENT**
Screen	**Drive Curr = 170A**
Units	A
Modbus address	**40209**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the drive rated current (maximum current of the equipment at 50ºC).

SV4.3	**DRIVE RATED VOLTAGE**
Screen	**Drive Volt = 400V**
Units	V
Modbus address	**40210**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the drive rated voltage.

SV4.4	**SOFTWARE VERSION**
Screen	**S/W x.xx**
Units	-
Modbus address	**40206**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Description	It shows the software version installed into the equipment.

SV4.5	**HARDWARE VERSION**
Screen	**H/W y.y**
Units	-
Modbus address	**40207**
Modbus range	Real Value = (Modbus Value / 100)
Read / Write	Read Only
Description	It shows the hardware version of the equipment.

SV4.6 PID REFERENCE VALUE

Screen	**PID R% = +0.0%**
Units	% feedback range
Modbus address	**40204**
Modbus range	8192 = 100% maximum range of the Analogue Input
Read / Write	Read Only
Description	It shows the reference value in PID mode of the equipment standard program.

SV4.7 PID FEEDBACK VALUE

Screen	**PID F% = +0.0%**
Units	% AI used as feedback
Modbus address	**40205**
Modbus range	8192 = 100% maximum range of the Analogue Input
Read / Write	Read Only
Description	It shows the feedback value in PID mode of the equipment standard program.

SV4.8 PID ERROR VALUE

Screen	**PID Error = +0.0%**
Units	% feedback range
Modbus address	**40203**
Modbus range	8192 = 100% maximum range of the Analogue Input
Read / Write	Read Only
Description	It shows the error value in PID mode, that means, the difference between the reference value and the real value of the system feedback signal.

SV4.9 STATUS OF COMPARATORS

Screen	**Comparators: 000**
Units	-
Modbus address	**40232 ➔ Comparator 1** **40233 ➔ Comparator 2** **40234 ➔ Comparator 3**
Modbus range	0 to 1
Read / Write	Read Only
Description	It shows if comparators are activated or not. X: Active 0: Not Active.

9.5. Parameters SV.5 – Programmable Parameters

This group is not only a display group. Some parameters such as speed, pressure and inch speeds can be adjusted in this group. These parameters are also available in their corresponding parameter groups. This is a simple way to allow user adjustment of basic parameters without entering the main programming groups.

SV5.1	SPEED REFERENCE IN LOCAL MODE
Screen	**Local Sp = +100%**
Units	% motor speed
Modbus address	**40124**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It shows the speed reference value in local mode (introduced by keypad). See parameter 'G3.3 ➔ Local speed reference' for additional data.

SV5.2	PID REFERENCE IN LOCAL MODE
Screen	**PID Local = +100%**
Units	% feedback
Modbus address	**40149**
Modbus range	0.0% = 0 to 400% = 32760
Read / Write	YES
Description	It allows user to select the PID reference in local mode. See parameter 'G6.2 ➔ PID local reference' for additional data.

SV5.3	MULTI-REFERENCE 1
Screen	**Mref1 = +10.0%**
Units	% motor speed
Modbus address	**40052**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 1. See parameter 'G14.1 ➔ Multi-reference 1' for additional data.

SV5.4	MULTI-REFERENCE 2
Screen	**Mref2 = +20.0%**
Units	% motor speed
Modbus address	**40053**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 2. See parameter 'G14.2 ➔ Multi-reference 2' for additional data.

SV5.5	MULTI-REFERENCE 3
Screen	**Mref3 = +30.0%**
Units	% motor speed
Modbus address	**40054**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 3. See parameter 'G14.3 ➔ Multi-reference 3' for additional data.

SV5.6	MULTI-REFERENCE 4
Screen	**Mref4 = +40.0%**
Units	% motor speed
Modbus address	**40055**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 4. See parameter 'G14.4 ➔ Multi-reference 4' for additional data.

SV5.7	MULTI-REFERENCE 5
Screen	**Mref5 = +50.0%**
Units	% motor speed
Modbus address	**40056**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 5. See parameter 'G14.5 ➔ Multi-reference 5' for additional data.

SV5.8	MULTI-REFERENCE 6
Screen	**Mref6 = +60.0%**
Units	% motor speed
Modbus address	**40057**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 6. See parameter 'G14.6 ➔ Multi-reference 6' for additional data.

SV5.9	MULTI-REFERENCE 7
Screen	**Mref7 = +70.0%**
Units	% motor speed
Modbus address	**40058**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the speed value assigned to Multi-reference 7. See parameter 'G14.7 ➔ Multi-reference 7' for additional data.

SV5.10	INCH SPEED 1
Screen	**Inch Spd1 = 0.00%**
Units	% motor speed
Modbus address	**40092**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the step frequency 1 value. See parameter 'G15.1 ➔ Inch speed 1' for additional data.

SV5.11	INCH SPEED 2
Screen	**Inch Spd2 = 0.00%**
Units	% motor speed
Modbus address	**40093**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the step frequency 2 value. See parameter 'G15.2 ➔ Inch speed 2' for additional data.

SV5.12	INCH SPEED 3
Screen	**Vel Fija3 = 0.00%**
Units	% motor speed
Modbus address	**40094**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	It allows user to set the step frequency 3 value. See parameter 'G15.3 ➔ Inch speed 3' for additional data.

SV5.13	LOCAL MANUAL SPEED REFERENCE
Screen	**PMP manSP = +0.0%**
Units	% motor speed
Modbus address	**42042**
Modbus range	-250% = -20480 to +250% = 20480
Read / Write	YES
Description	To set the value of the manual speed reference in local. For additional details, check parameter 'G25.1.3 ➔ Value of speed reference for LOCAL source in manual mode'.

SV5.14	LOCAL SETPOINT 1 FOR PID
Screen	**PMP MRe1 = 0.0%**
Units	% motor speed
Modbus address	**42151**
Modbus range	0 – 32760
Read / Write	YES
Description	To set the local setpoint 1 for PID. Multi-reference 1. For additional details, check parameter 'G25.1.5 ➔ Local setpoint 1 for PID'.

SV5.15	**LOCAL SETPOINT 2 FOR PID**

Screen **PMP MRe2 = 0.0%**
Units % motor speed

Modbus address **42152**
Modbus range 0 – 32760
Read / Write YES

Description To set the local setpoint 2 for PID. Multi-reference 2. For additional details, check parameter 'G25.1.6 ➔ Local setpoint 2 for PID'.

SV5.16	**LOCAL SETPOINT 3 FOR PID**

Screen **PMP MRe3 = 0.0%**
Units % motor speed

Modbus address **42153**
Modbus range 0 – 32760
Read / Write YES

Description To set the local setpoint 3 for PID. Multi-reference 3. For additional details, check parameter 'G25.1.7 ➔ Local setpoint 3 for PID'.

SV5.17	**LOCAL SETPOINT 4 FOR PID**

Screen **PMP MRe4 = 0.0%**
Units % motor speed

Modbus address **42154**
Modbus range 0 – 32760
Read / Write YES

Description To set the local setpoint 4 for PID. Multi-reference 4. For additional details, check parameter 'G25.1.8 ➔ Local setpoint 4 for PID'.

SV5.18	**LOCAL SETPOINT 5 FOR PID**

Screen **PMP MRe5 = 0.0%**
Units % motor speed

Modbus address **42155**
Modbus range 0 – 32760
Read / Write YES

Description To set the local setpoint 5 for PID. Multi-reference 5. For additional details, check parameter 'G25.1.9 ➔ Local setpoint 5 for PID'.

SV5.19	**LOCAL SETPOINT 6 FOR PID**

Screen **PMP MRe6 = 0.0%**
Units % motor speed

Modbus address **42156**
Modbus range 0 – 32760
Read / Write YES

Description To set the local setpoint 6 for PID. Multi-reference 6. For additional details, check parameter 'G25.1.10 ➔ Local setpoint 6 for PID'.

SV5.20	**LOCAL SETPOINT 7 FOR PID**
Screen	**PMP MRe7 = 0.0%**
Units	% motor speed
Modbus address	**42157**
Modbus range	0 – 32760
Read / Write	YES
Description	To set the local setpoint 7 for PID. Multi-reference 7. For additional details, check parameter ‘G25.1.11 ➔ Local setpoint 7 for PID’.

SV5.21	**LOCAL SETPOINT 8 FOR PID**
Screen	**PMP MRe8 = 0.0%**
Units	% motor speed
Modbus address	**42158**
Modbus range	0 – 32760
Read / Write	YES
Description	To set the local setpoint 8 for PID. Multi-reference 8. For additional details, check parameter ‘G25.1.12 ➔ Local setpoint 8 for PID’.

SV5.22	**TIME FOR AUTOMATIC STOP**
Screen	**T AutOFF = OFF**
Units	Hours
Modbus address	**42044**
Modbus range	0 – 999
Read / Write	YES
Description	Time for Automatic Stop. For additional details, check parameter G25.1.13.

SV5.23	**REMAINING TIME FOR AUTOMATIC STOP**
Screen	**TIME OFF = OFF**
Units	Minutes
Modbus address	**42356**
Modbus range	0 – 6000
Read / Write	Read Only
Description	It shows the remaining time in minutes, for the automatic stopping of the system.

SV5.24	**MAXIMUM FLOW LEVEL**
Screen	**MAX flow = 1000l/s**
Units	Engineering units
Modbus address	**42143**
Modbus range	0 – 32760
Read / Write	YES
Description	It allows setting a level for the maximum flux as in parameter ‘G25.10.2 ➔ Maximum allowed flow’.

SV5.25	RESET LEVEL FOR THE FLOW CONTROL ALGORITHM

Screen	**RESET LEVL = +100%**
Units	% maximum range of sensor
Modbus address	**42145**
Modbus range	0 – 100
Read / Write	YES
Description	It allows setting a reset level for the flux control algorithm as in parameter 'G25.10.4 ➔ Flow percentage to reset algorithm'.

SV5.26	FLOW LEVEL FOR SLEEP MODE

Screen	**SLEP FLO = 0.0l/s**
Units	Engineering units
Modbus address	**42324**
Modbus range	0 – 32760
Read / Write	YES
Description	It allows setting a flow level to sleep the drive (sleep mode) as in parameter 'G25.4.11 ➔ Flow level to sleep the drive'.

9.6. Parameters SV.6 – Registers

This group includes several registers of general information about the drive use. Therefore, we can visualize a total and partial counter for running time (RUN).

SV6.1	TOTAL TIME OF RUNNING (RUN)
Screen	**TOT = d h**
Units	Days and Hours
Modbus address	**40550 ➔ Days** **40551 ➔ Hours**
Modbus range	Days ➔ Real Value = Modbus Value Hours ➔ 1 = 0.1hours
Read / Write	Read Only
Description	It shows the total time during which the drive is running (RUN).

SV6.2	PARTIAL TIME OF RUNNING (RUN)
Screen	**PAR = d h**
Units	Days and Hours
Modbus address	**40552 ➔ Days** **40553 ➔ Hours**
Modbus range	Days ➔ Real Value = Modbus Value Hours ➔ 1 = 0.1hours
Read / Write	Read Only
Description	It shows the partial time during which the drive is running (RUN).

SV6.3	RESET FOR PARTIAL TIME COUNTER OF RUNNING (RUN)
Screen	**CLEAR PARTIAL = N**
Units	-
Modbus address	**40554**
Modbus range	0 to 1 (N = 0, Y = 1)
Read / Write	YES
Description	It allows resetting the counter of partial time for running status (RUN).

9.7. Parameters SV.8 – Pump Control

SV8.1 VALUES OF PID REFERENCE AND FEEDBACK

Screen **R = 0.0Bar 0.0Bar**
Units Engineering units

Modbus address **42007 ➔ PID reference (left hand)**
42009 ➔ Feedback signal (right hand)
Modbus range Real Value = (Modbus Value / 10)
Read / Write Read Only

Description It shows the PID reference value (left hand) and the sensor value which is sent by the feedback signal (right hand).

SV8.2 DRIVE STATUS DURING PUMP CONTROL

Screen **REGL +0.0% +0.0%**
Units % sensor range

Modbus address **42002 ➔ Drive status (left hand)**
42006 ➔ PID reference (center)
42008 ➔ Feedback (right hand)
Modbus range 0 to 22

DRIVE STATUS			
0 ➔ REGL	6 ➔ NFLO	12 ➔ IRFA	18 ➔ FILL
1 ➔ PMAN	7 ➔ CAVS	13 ➔ FLOW	19 ➔ COMP
2 ➔ OMAN	8 ➔ CAVI	14 ➔ OFF	20 ➔ JOCK
3 ➔ HIPP	9 ➔ LOPR	15 ➔ SLEP	21 ➔ PRIM
4 ➔ HIPR	10 ➔ LOWA	16 ➔ BYPA	22 ➔ FINP
5 ➔ FLOD	11 ➔ CYCL	17 ➔ RAMP	

Note: See 'Description' for additional information about drive status while pump control is active

Read / Write Read Only

Description It shows the drive status during the pump control operation according to the following table:

Status	Description
REGL	Drive is regulating in PID mode.
PMAN	The drive is at protected manual mode.
OMAN	Drive is in manual mode, not protective mode.
HIPP	Drive is stopped (pause) due to high pressure, according to the read data in the analogue input.
HIPR	A fault due to high pressure has occurred according to the read data in the analogue input or in the digital input.
FLOD	The drive has stopped (Pause status) due to No Flow detection.
NFLO	The drive has tripped (Fault status) due to No Flow detection.
CAVS	The drive has stopped (Pause status) due to Cavitation.
CAVI	The drive has tripped (Fault status) due to Cavitation.
LOPR	The drive has tripped due to low pressure fault.
LOWA	The drive has tripped due to a fault detected in one of the digital inputs configured as 'No Water'
CYCL	The drive has tripped due to excessive starting cycles.
IRFA	The drive has tripped due to a fault in the irrigation equipment which has been detected in the digital input configured in that option.
FLOW	The drive is limiting the speed to limit the flow.
OFF	The drive has received the stop command.

Status	Description
SLEP	The drive is in sleep mode because there is no flow demand.
BYPA	The drive is forcing the speed after starting or stopping some of the fixed pumps.
RAMP	Setpoint ramp activated.
FILL	The drive is running at reduced speed because Pipe Fill function is active.
COMP	The time of automatic stop has expired and the drive is stopped.
JOCK	The Jockey pump is running.
PRIM	Priming pump is connected.
FINP	Fault occurred because the pressure switch is open.

Additionally, the reference in PID mode (as %) followed by feedback (as %) is shown.

SV8.3 STATUS OF FIXED PUMPS 1, 2 AND 3

Screen **1OFF 2OFF 3OFF**
Units -

Modbus address **42003 ➔ Fixed Pump 1**
42004 ➔ Fixed Pump 2
42005 ➔ Fixed Pump 3
Modbus range 0 ➔ OFF
1 ➔ RDY
2 ➔ ON
3 ➔ FLT
Read / Write Read Only

Description The status of the fixed pumps 1, 2 and 3 is shown according to the next information:

Status	Description
OFF	Pump disabled by keypad.
RDY	Pump ready to start.
ON	Pump started.
FLT	Pump in a fault status (input which controls the signal is active). **Note:** See digital input configuration (parameter ‘G4.1.4 ➔ Selection of digital inputs configuration’) in Pump Control mode (parameter ‘G1.7 ➔ Program activation’, option ‘PUMP’).

SV8.4 STATUS OF FIXED PUMPS 4 AND 5

Screen	**4OFF 5OFF**
Units	-
Modbus address	**42022 ➔ Fixed Pump 4** **42023 ➔ Fixed Pump 5**
Modbus range	0 ➔ OFF 1 ➔ RDY 2 ➔ ON 3 ➔ FLT
Read / Write	Read Only
Description	The status of the fixed pumps 4 and 5 is displayed according to the information shown in the parameter SV8.3.

SV8.5 READ FLOW VALUE

Screen	**Flow = 0.0l/s**
Units	Engineering units
Modbus address	**42142**
Modbus range	Real Value = (Modbus Value / 10)
Read / Write	Read Only
Description	It shows the present value read by the analogue input or by pulse input where sensor is connected.

SV8.6 STATUS OF PUMP PROGRAM

Screen	**ESTATUS PUMP PROGRAM**
Units	-
Modbus address	**42002**
Modbus range	0 to 22 (See 'Modbus range' in parameter SV8.2)
Read / Write	Read Only
Description	In the visualization lines of the display, it is possible to select this option. In this way the following messages are going to be shown according to the current program status:

Status	Description
PID REGULATION	Drive is regulating in PID mode.
PROTECTED MANUAL	The drive is at protected manual mode.
OVERRIDE MANUAL	Drive is in manual mode, not protective mode.
HI PRESSURE PAUS	Drive is stopped (pause) due to high pressure, according to the read data in the analogue input.
HI PRESSURE FAUL	A fault due to high pressure has occurred according to the read data in the analogue input or in the digital input.
NO FLOW PAUSE	The drive has stopped (Pause status) due to No Flow detection.
NO FLOW FAULT	The drive has tripped (Fault status) due to No Flow detection.
CAVITATION PAUSE	The drive has stopped (Pause status) due to Cavitation.
CAVITATION FAULT	The drive has tripped (Fault status) due to Cavitation.
LO PRESSURE FAUL	The drive has tripped due to low pressure fault.
LO WATER FAULT	The drive has tripped due to a fault detected in one of the digital inputs configured as 'No Water'
CYCLING FAULT	The drive has tripped due to excessive starting cycles.
IRRIGATOR FAULT	The drive has tripped due to a fault in the irrigation equipment which has been detected in the digital input configured in that option.
LIMITING FLOW	The drive is limiting the speed to limit the flow.
PUMP STOP	The drive has received the stop command.
SLEPT NO DEMAND	The drive is in sleep mode because there is no flow demand.
BYPASSING SPEED	The drive is forcing the speed after starting or stopping some of the fixed pumps.
SETPOINT RAMP	Setpoint ramp activated.
PIPE FILLING	The drive is running at reduced speed because Pipe Fill function is active.
COMPLETED	The time of automatic stop has expired and the drive is stopped.
JOCKEY PUMP ON	The Jockey pump is running.
PRIMING PUMP ON	The Priming pump (suction filling) is connected.
PRESSU SWITCH ON	The pressure switch is open.

10. DESCRIPTION OF PROGRAMMING PARAMETERS

The different parameters of the SD700 are displayed in the alphanumeric LCD. These parameters are organized in groups (G1 to G25). To access to the parameters or sub-groups which are in a lower level, press the * key. When you have accessed the desired parameter, this parameter will be shown as either a numerical value or a list of possible options.

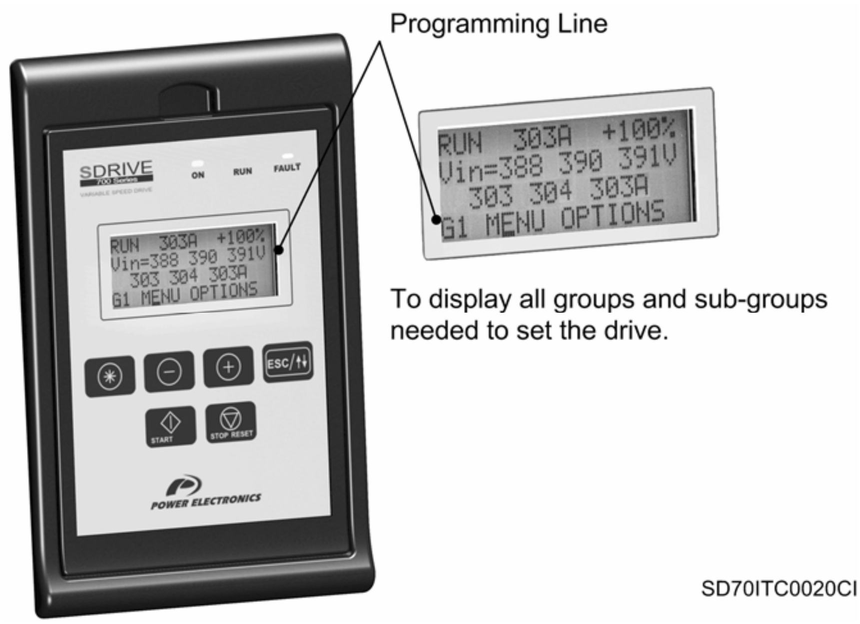


Figure 10.1 Detail of Programming Line.

See the information below for the whole parameter list and possible options of configuration.

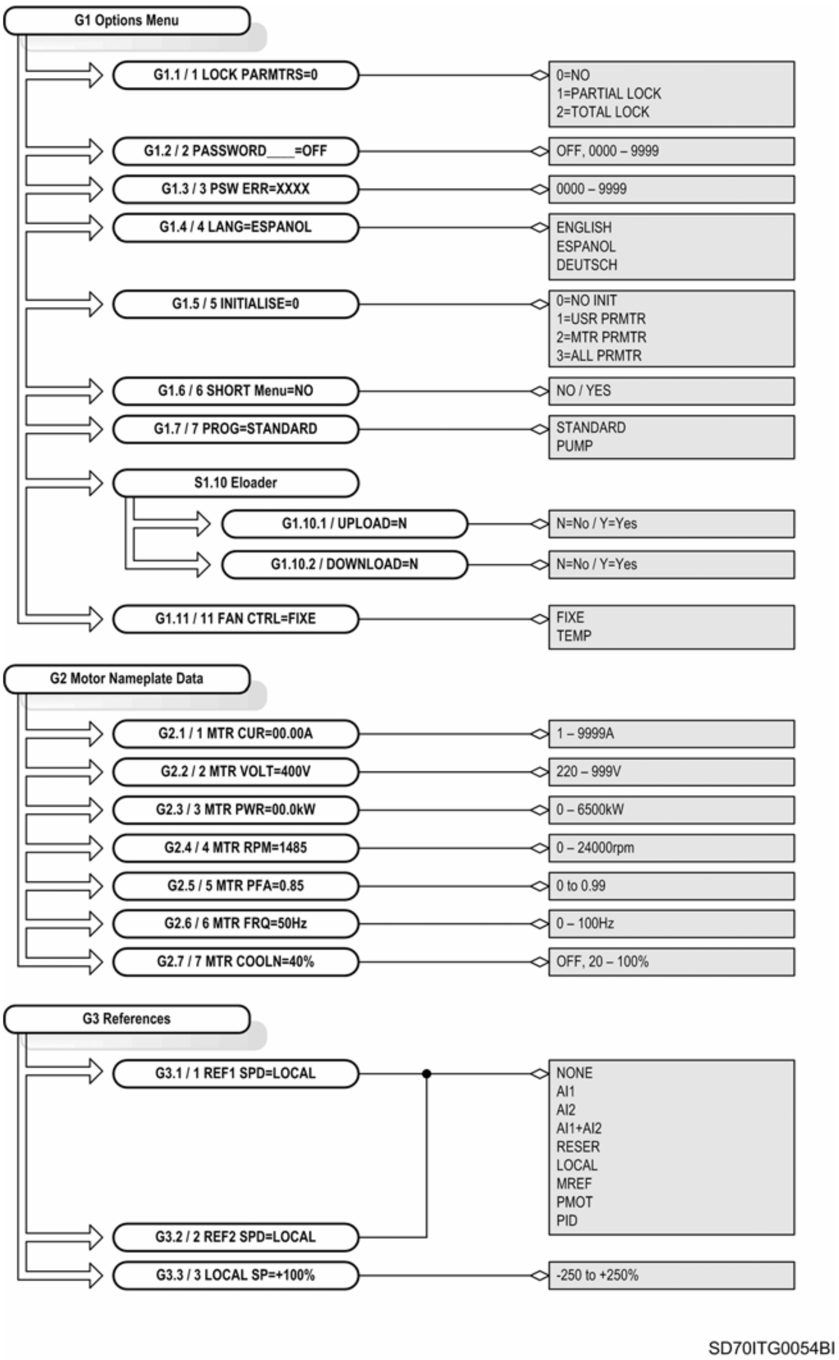


Figure 10.2 Parameters structure from group G1 to group G3

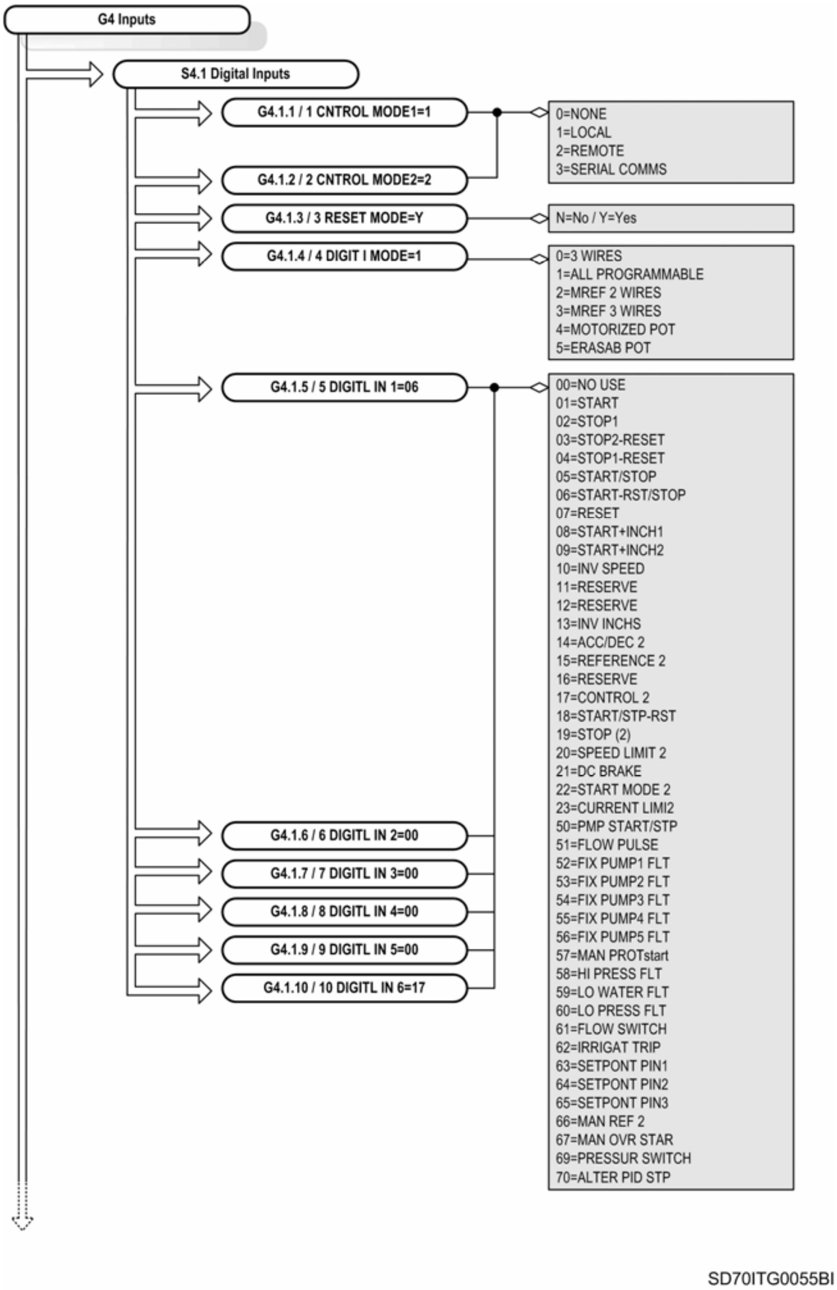


Figure 10.3 Parameters structure of subgroup S4.1 (G4)

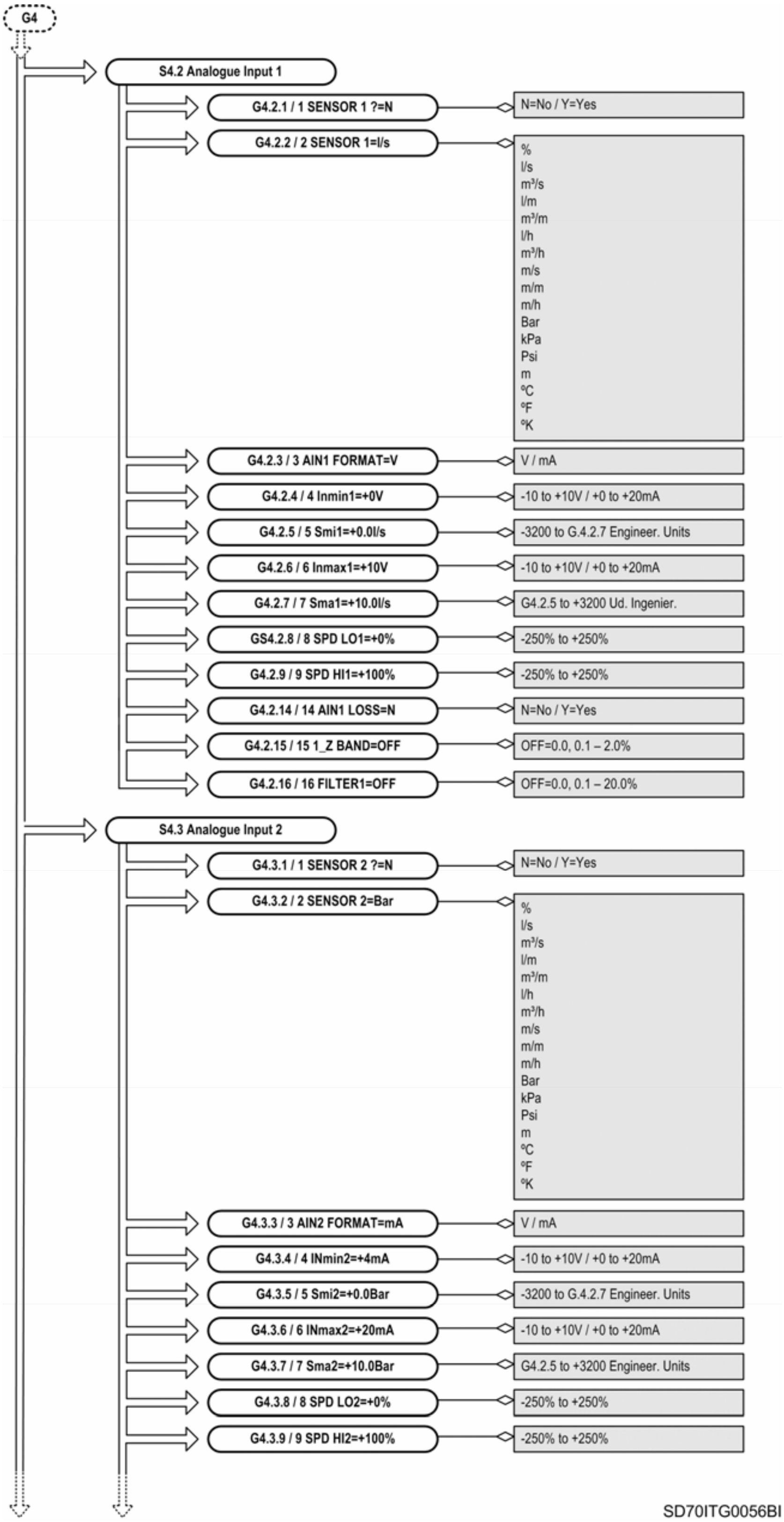


Figure 10.4 Parameters structure from subgroup S4.2 (G4) to subgroup S4.3 (G4)

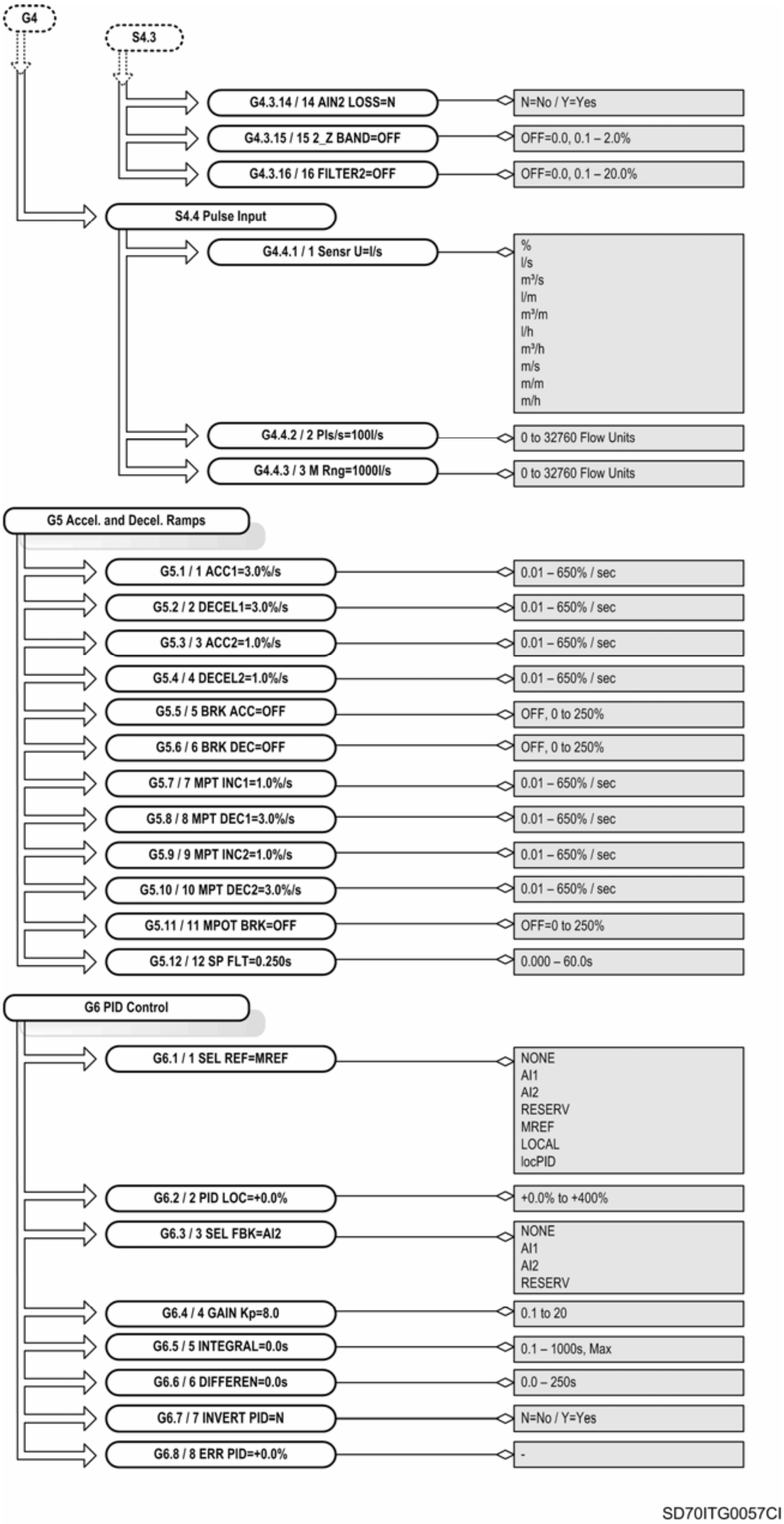


Figure 10.5 Parameters structure from subgroup S4.3 (G4) to group G7

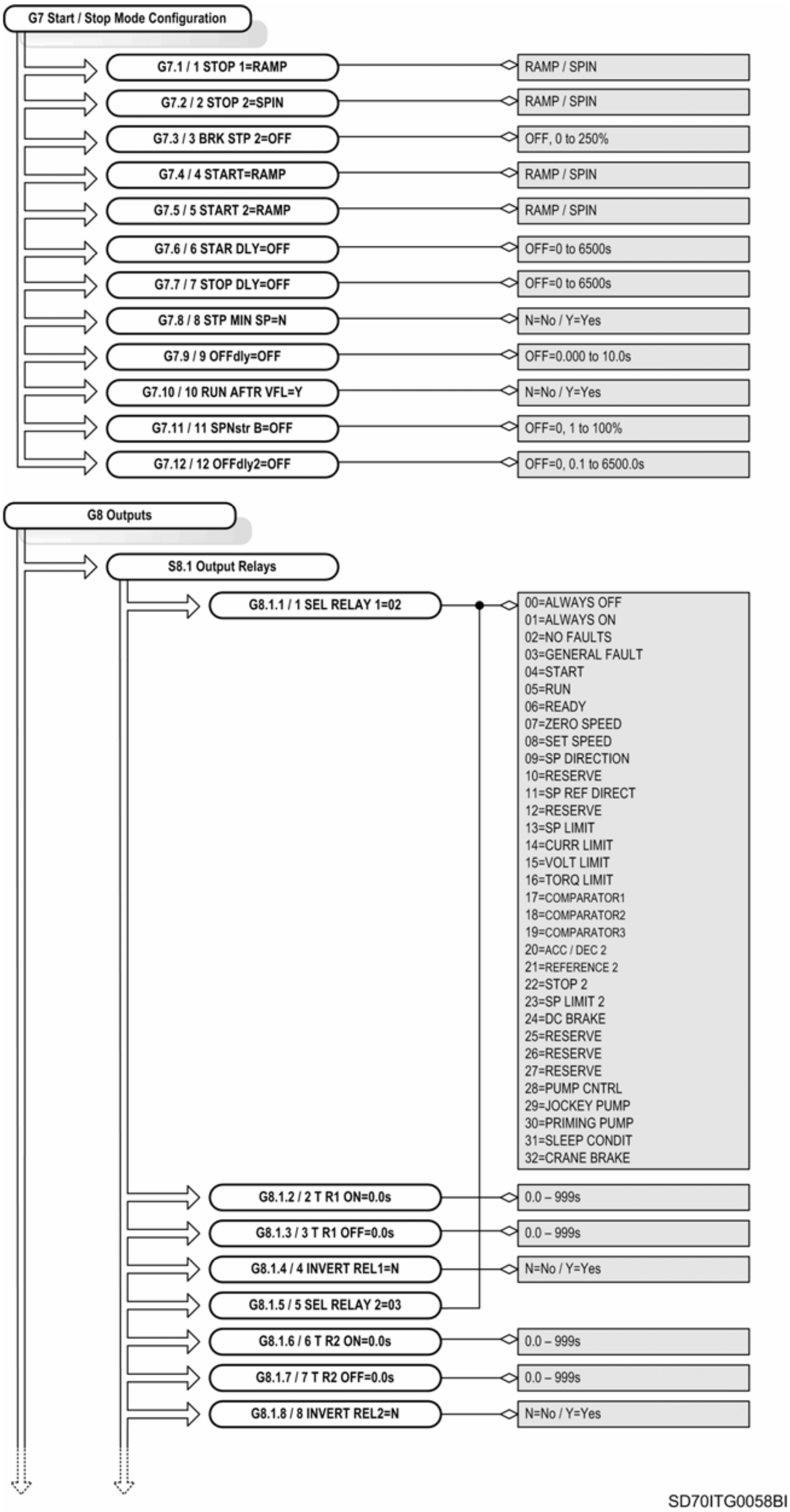


Figure 10.6 Parameters structure from group G7 to subgroup S8.1 (G8)

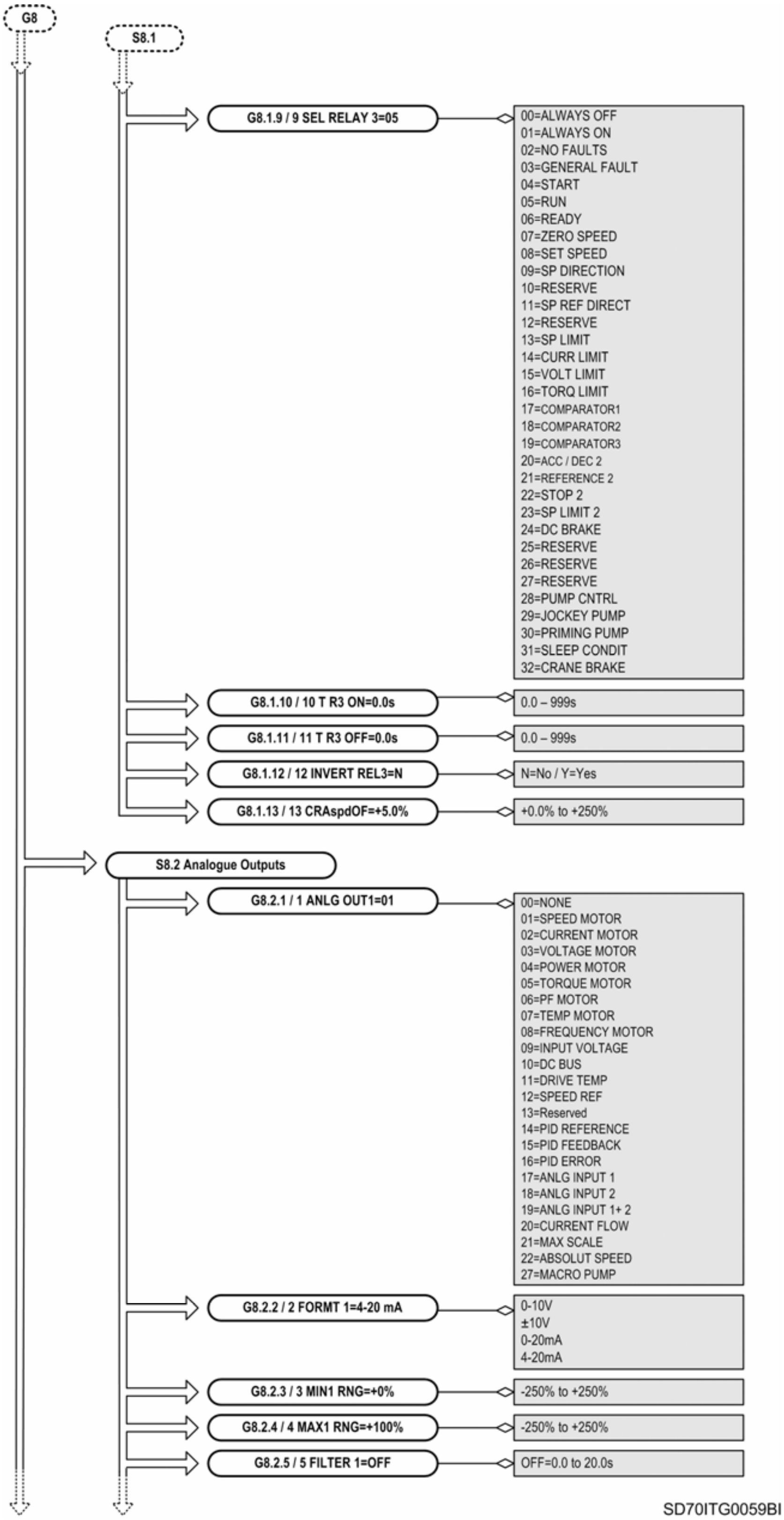


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Figure 10.7 Parameters structure from subgroup S8.1 (G8) to subgroup S8.2 (G8)

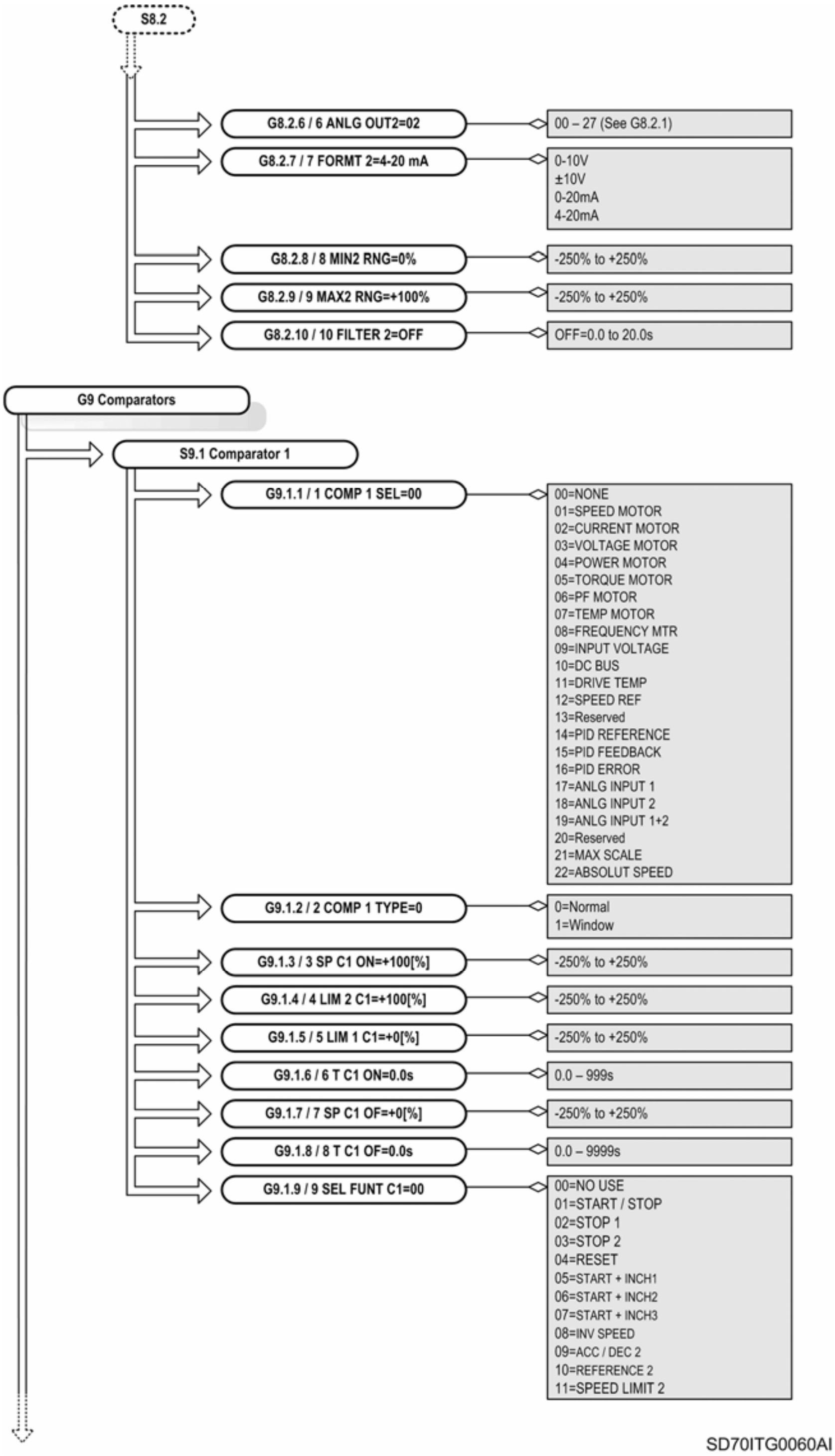

Figure 10.8 Parameters structure from subgroup S8.2 (G8) to subgroup S9.1 subgroup (G9)

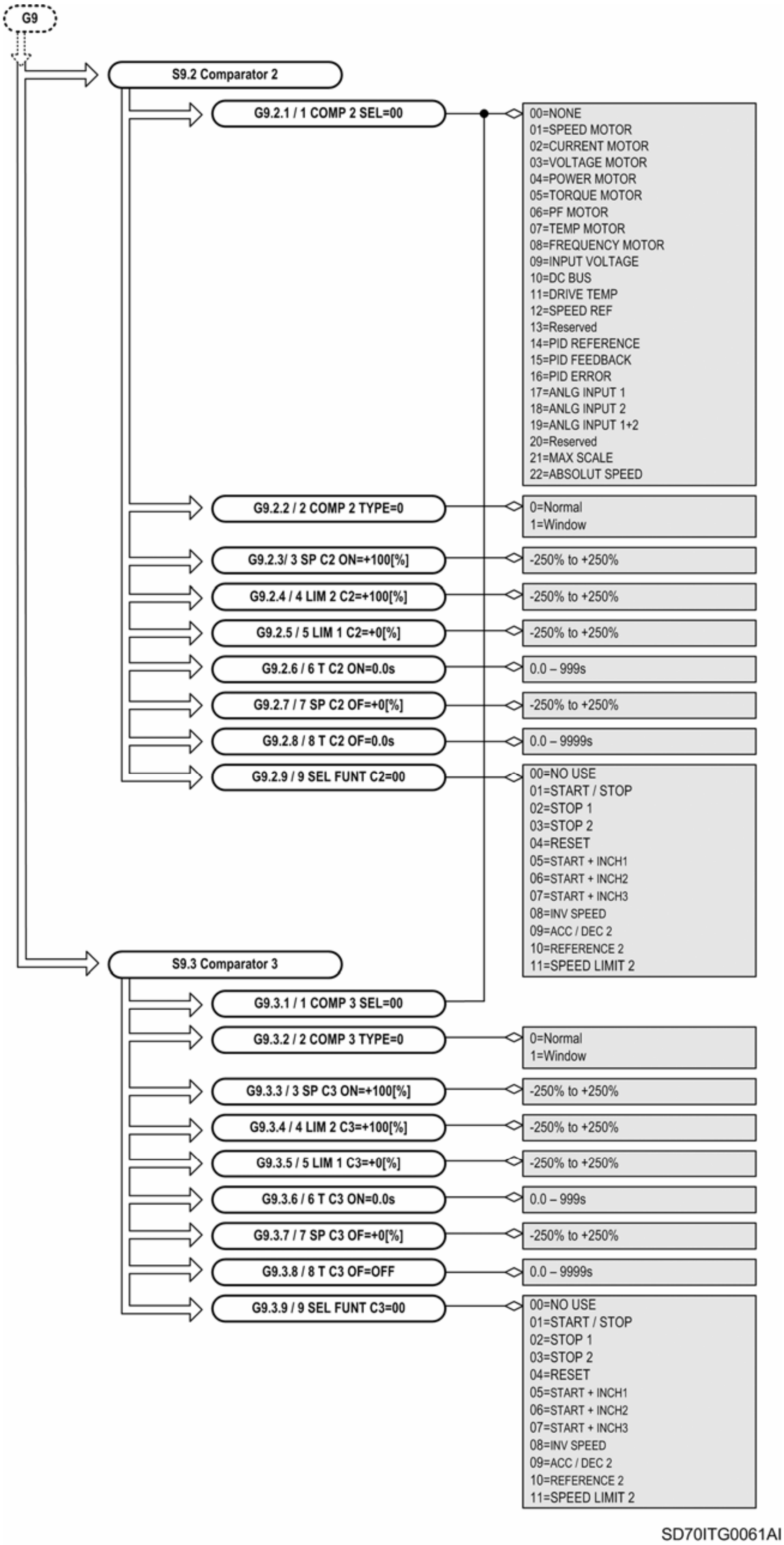

Figure 10.9 Parameters structure from subgroup S9.2 (G9) to subgroup S9.3 (G9)

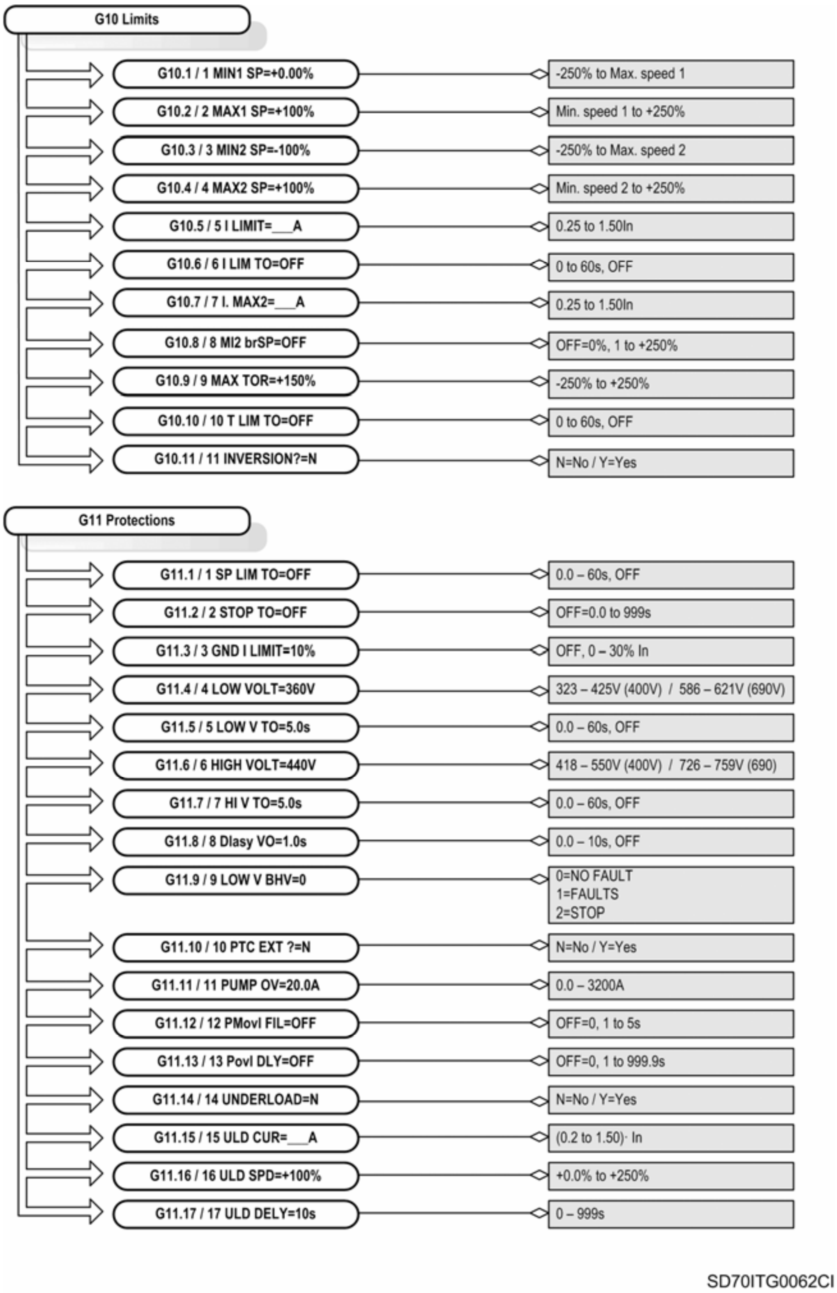

Figure 10.10 Parameters structure from subgroup G10 to group G11

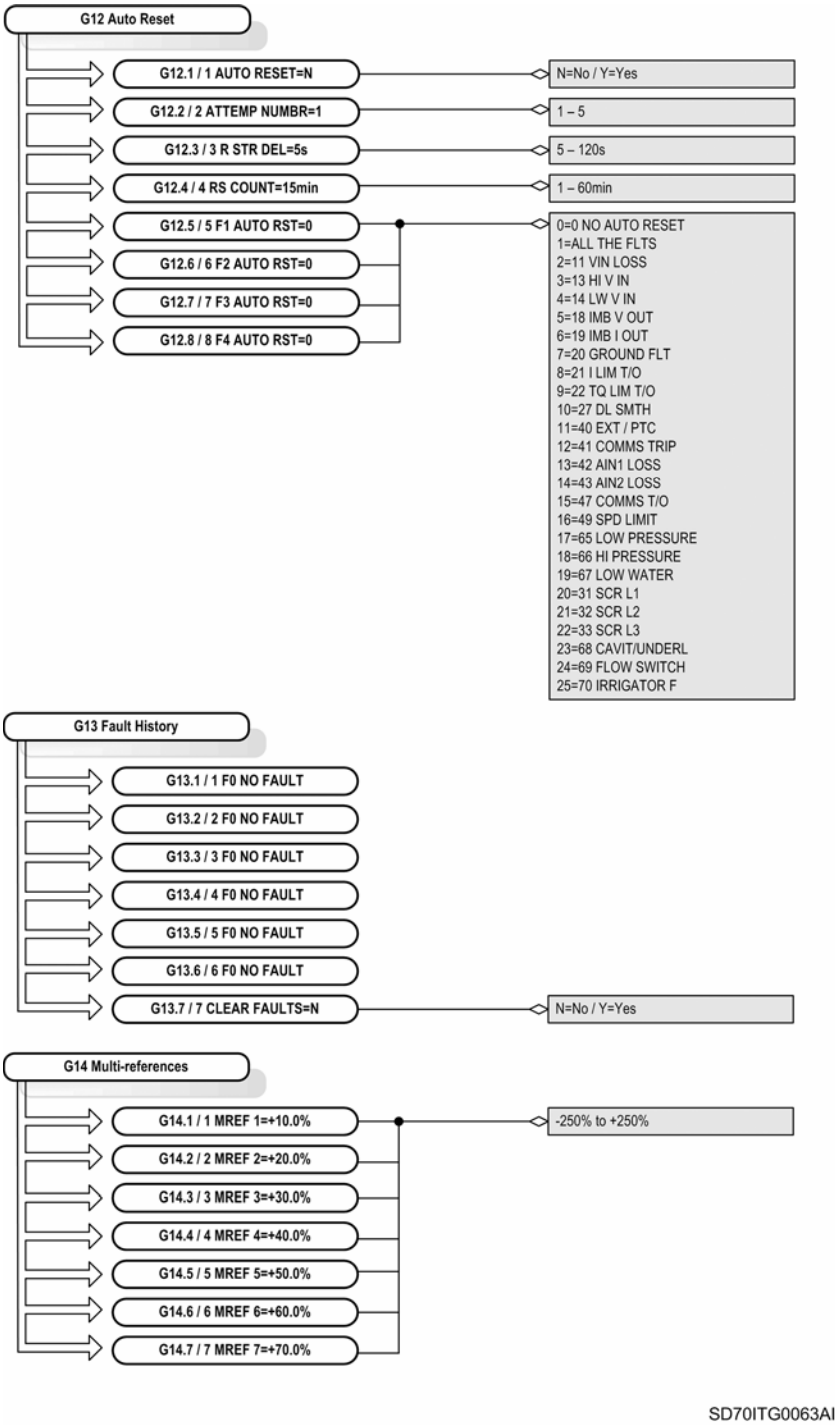

Figure 10.11 Parameters structure from group G12 to group G14

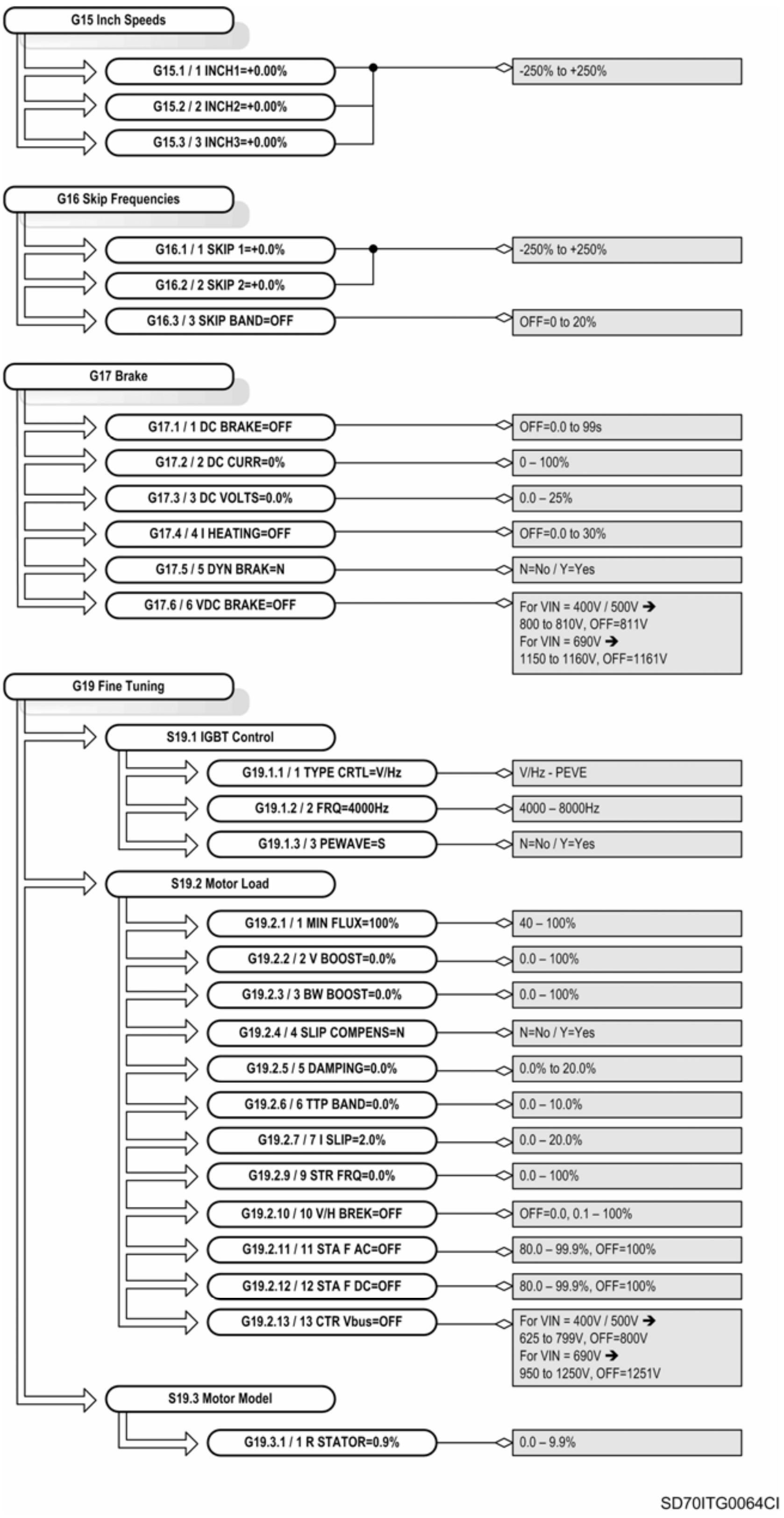

Figure 10.12 Parameters structure from group G15 to subgroup S19.3 (G19)

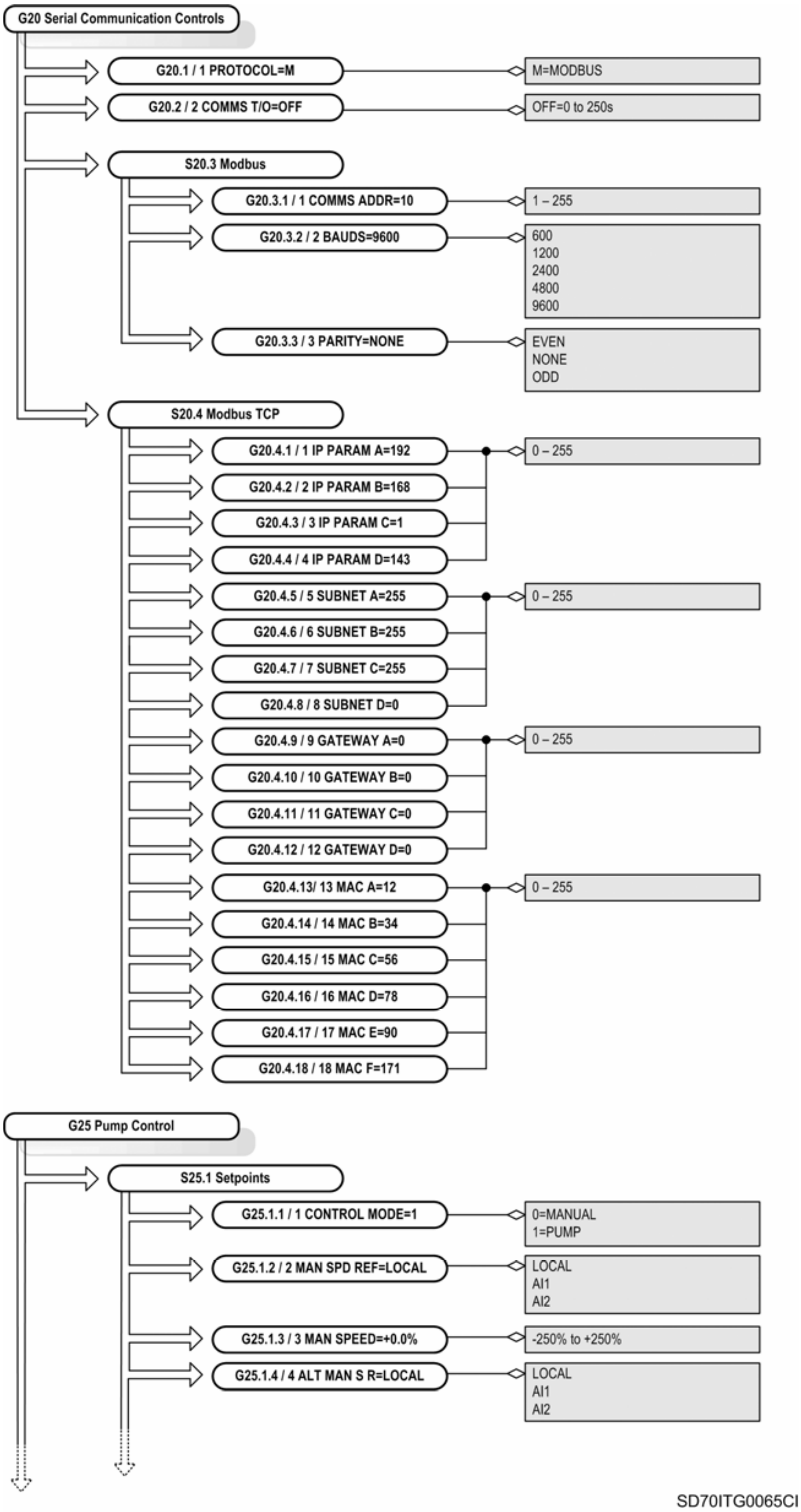

Figure 10.13 Parameters structure from group G20 to subgroup S25.1 (G25)

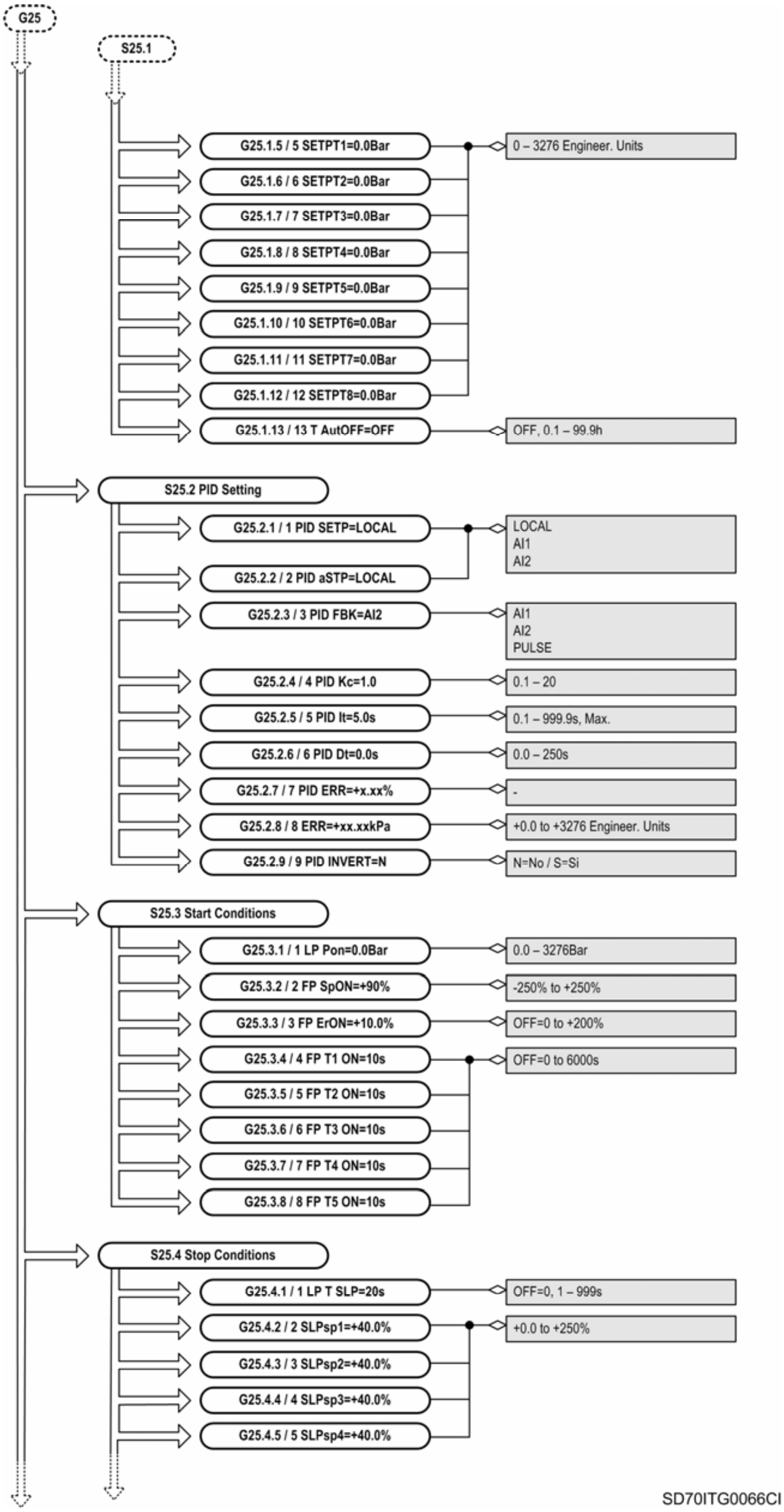

Figure 10.14 Parameters structure from subgroup S25.1 (G25) to subgroup S25.4 (G25)

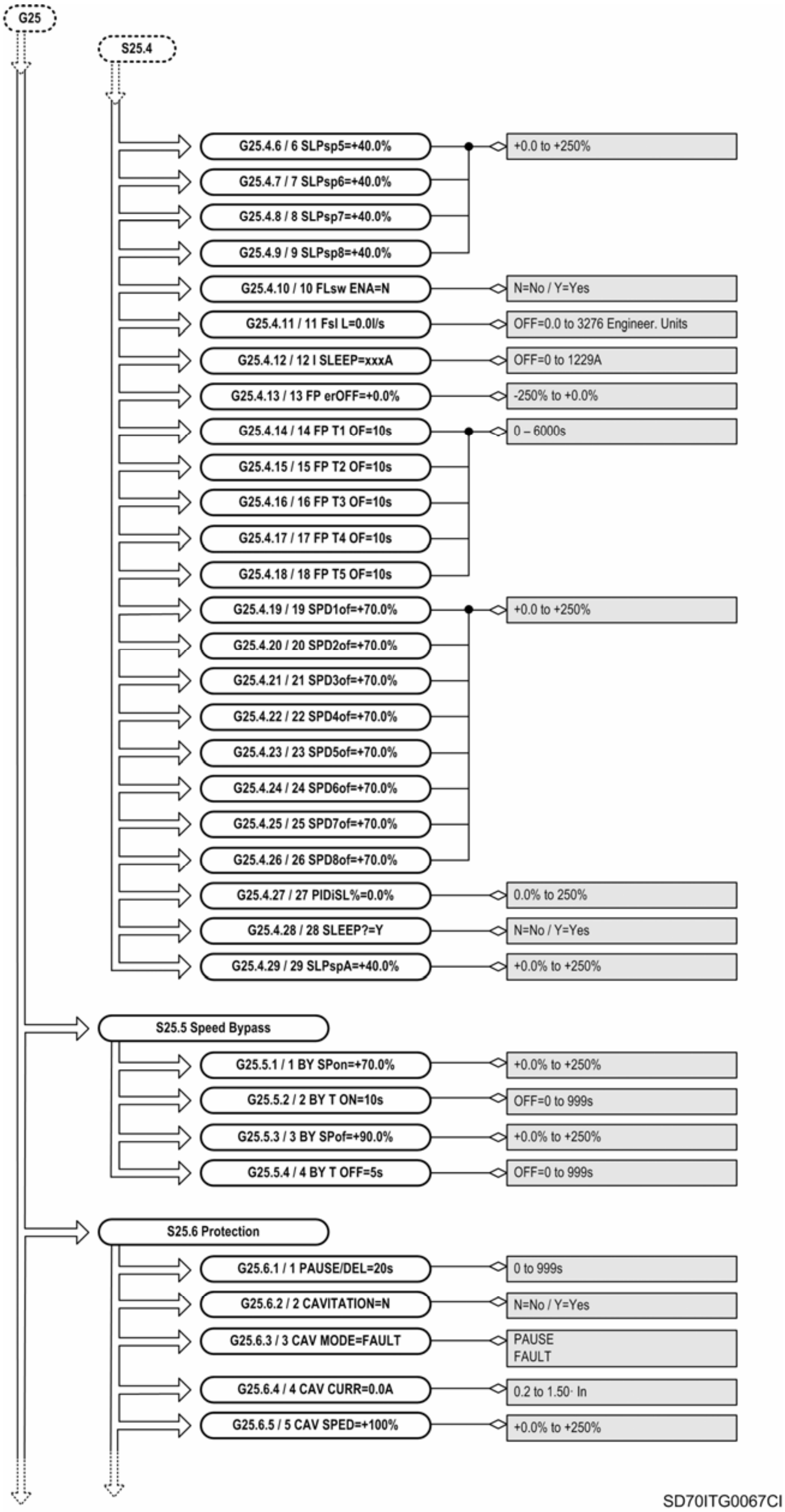

Figure 10.15 Parameters structure from subgroup S25.4 (G25) to subgroup S25.6 (G25)

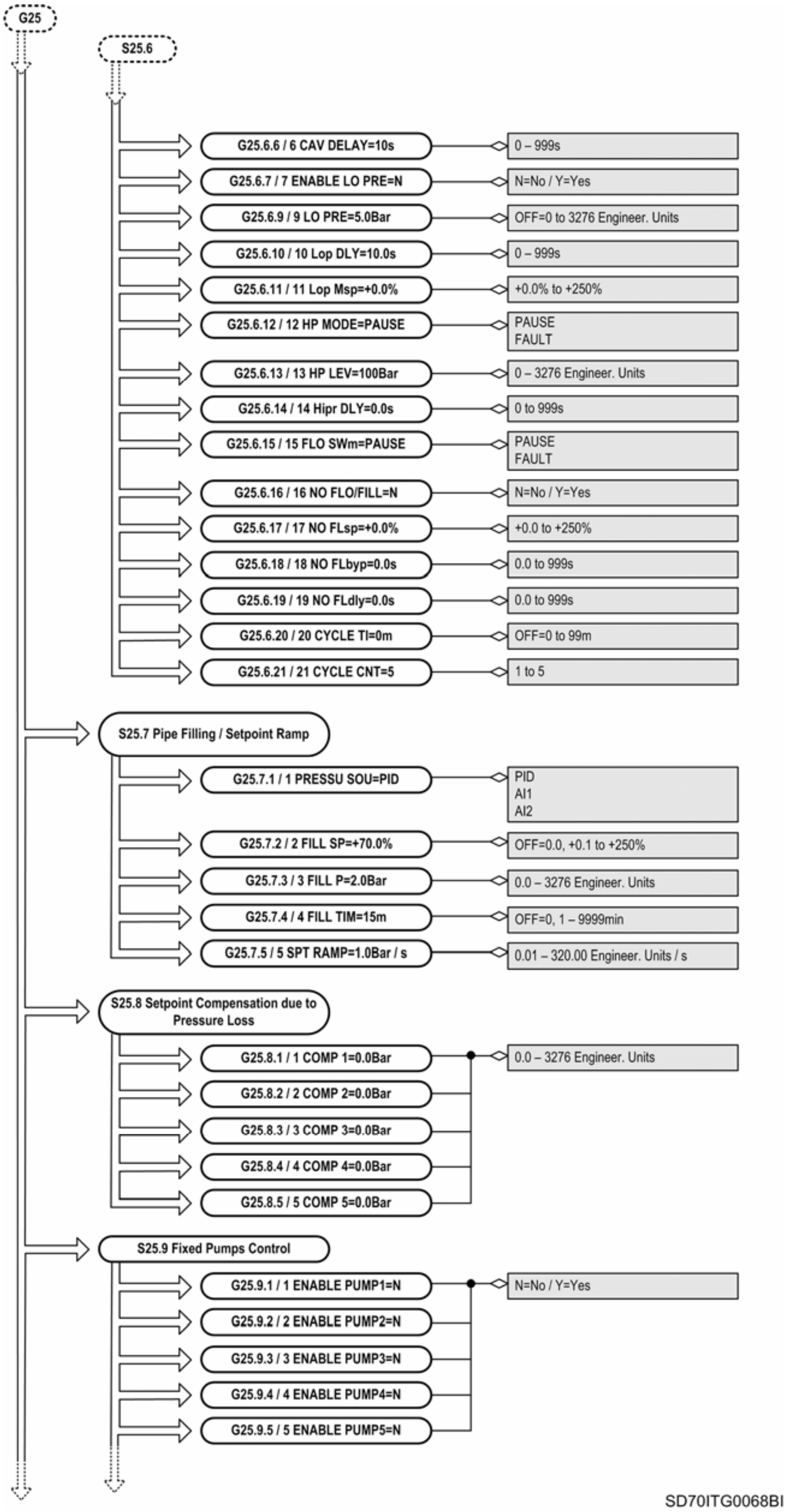

Figure 10.16 Parameters structure from subgroup S25.6 (G25) to subgroup S25.9 (G25)

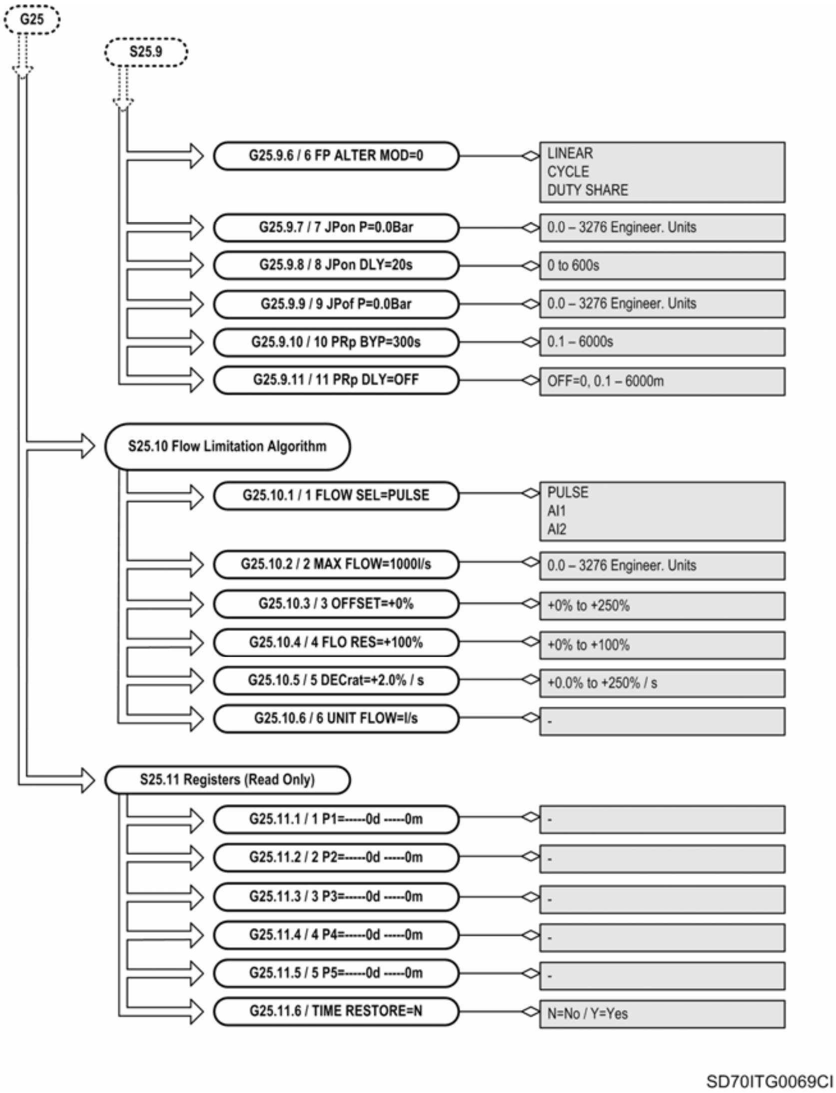

Figure 10.17 Parameters structure from subgroup S25.9 (G25) to subgroup S25.11 (G25)

10.1. Group 1 – G1: Options Menu

G1.1	PARAMETERS LOCK

Screen	**1 LOCK PARMTRS = 0**
Description	Parameters lock
Range	0 – 2 (See 'Function' for additional information)
Default value	0
Set on run	NO

Function

It allows user to lock the parameters setting totally or partially. The selected lock is executed by introducing a password in parameter 'G1.2 ➔ Access password'.
The different selectable options are detailed below:

0 ➔ NO

Parameters lock is not active.

1 ➔ PARTIAL LOCK

When the partial lock of the parameters is activated, we can only modify the value of the parameters G1.1 and G1.2 (parameters used for lock and unlock function), as well as the parameter 'G3.3 ➔ Local speed reference' and 'G6.2 ➔ PID local reference', whenever the option 'LOCAL' or 'locPID' is selected in 'G6.1 ➔ Source selection for introducing reference signal'. The remainder of the parameters cannot be modified but can be visualized.

2 ➔ TOTAL LOCK

When the total lock of the parameters is activated, we can only modify parameters G1.1 and G1.2 until the password is introduced again to unlock parameters.

G1.2	ACCESS PASSWORD

Screen	**2 PASSWORD____ =OFF** **2 PASSWORD____? OFF**
Description	Access password
Range	OFF, 0000 to 9999
Default value	0
Set on run	YES

Function

It allows user to introduce an access password to lock parameters and avoid unauthorized changes in the programming.

If we select option '1 ➔ PARTIAL LOCK' or '2 ➔ TOTAL LOCK' in parameter 'G1.1 ➔ PARAMETERS LOCK', this screen appears automatically to request the introduction of the access password:

2 PASSWORD____=OFF

Parameters lock is executed when we introduce the password and this one is memorized after elapsing a few seconds.

To unlock parameters setting you should access to the parameter G1.1 and select option '0 ➔ NO'. Next, this screen appears automatically to request the introduction of the access password:

2 PASSWORD____?OFF

Parameters unlock is executed once the password is introduced and after elapsing a few seconds. This password is the same one used for locking parameters.

G1.2b	UNLOCK PASSWORD RECOVERY

Screen **3 PSW ERR = XXXX**
Description Recovery of the unlock password (access)
Range 0000 to 9999
Default value 0000
Set on run YES

Function It supplies information to recover the introduced lock password, according to the expression:

Unlock password=(XXXX / 2) – 3

Note: This parameter appears when an incorrect password is introduced to unlock parameters.

G1.4	LANGUAGE SELECTION

Screen **4 LANG = ESPANOL**
Description Selection of the user language
Range ENGLISH
ESPANOL
DEUTSCH
Default value ESPANOL
Set on run NO

Function It allows user to select the language. All of the screens (parameters and configurable options for each parameter) will appear in the language selected by user.

G1.5	PARAMETERS INITIALIZE

Screen **5 INITIALISE = 0**
Description Parameters initialize to default values
Range 0 – 3
(See 'Function' for additional information)
Default value 0
Set on run NO

Function It allows selecting the parameters that we desire to initialize back to the factory default values (factory settings).

Options description:

0 ➔ NO INIT
Any parameter is initialized.

1 ➔ USR PRMTR
User parameters are only initialized, this is, all of the parameters groups, except for the groups G2 MOTOR NAMEPLATE DATA and G19 FINE TUNING.

2 ➔ MTR PRMTR
Motor data are only initialized, this is, parameters of the groups G2 and G19.

3 ➔ ALL PRMTR
All parameters of the drive are initialized.

G1.6 TO HIDE SOME CONFIGURATION MENUS

Screen	**6 SHORT Menu = NO**
Description	To hide some configuration menus
Range	NO YES
Default value	NO
Set on run	NO

Function

When this parameter is active, configuration menus are hidden. Groups G1 OPTIONS MENU, G10 LIMITS, and Visualization groups are only visible.

G1.7 PROGRAM ACTIVATION

Screen	**7 PROG = STANDARD**
Description	Program activation
Range	STANDARD PUMP
Default value	STANDARD
Set on run	NO

Function

It allows selecting additional functionalities. If option PUMP is selected, the extended functionality for the pump control (G25 PUMP CONTROL) will be available.

The group G25 will be hidden if the pump program is not active. Once selected the pump program, a character will appear in the upper line of the display, beside the drive status, indicating constantly that the pump program is active. The letter “b” appears in Spanish and the letter “p” for English / German.

The most of parameters relative to the pump control are located in group G25, except for those settings relative to inputs and outputs that can be found in groups G4 and G7.

Additionally, there are some visualization screens included in visualization groups SV.5 and SV.8.

⚠ **WARNING:** The activation of pump program changes the inputs and outputs configuration of the equipment automatically. See parameter ‘G4.1.4 ➔ Selection of Digital Input configuration’ for additional information. Output relays are also configured automatically (see ‘S8.1 Output Relays’). Make sure there is not a hazard of accidental starting to avoid property damage or personal injury.

10.1.1. Subgroup 1.10 – S1.10: Eloader (EEPROM loader)

G1.10.1	SAVE PARAMETERS FROM DRIVE TO DISPLAY

Screen	**UPLOAD = N**
Description	Save parameters from the drive to the display unit
Range	N Y
Default value	N
Set on run	NO

Function

When this parameter is set to ‘Y’, the parameters copy to the display starts automatically, saving the drive configuration. It exists one sub-screen that shows the load process:

UPLOADING....100%

When the load process is finished, this sub-screen disappears and ‘UPLOAD=N’ is displayed again.

G1.10.2	SAVE PARAMETERS FROM DISPLAY TO DRIVE

Screen	**DOWNLOAD = N**
Description	Save parameters from the display unit to the drive
Range	N Y
Default value	N
Set on run	NO

Function

When this parameter is set to ‘Y’, the copy of the parameters (stored into the display) to the drive starts automatically, modifying and programming the parameters of this new drive. It exists one sub-screen that shows he unload process:

DOWNLOADING....100%

When the unload process is finished, this sub-screen disappears and ‘DOWNLOAD=N’ is displayed again.

G1.11	DRIVE FAN CONTROL MODE

Screen	**11 FAN CTRL = FIXE**
Description	Control mode of the drive fan
Range	FIXE TEMP (See ‘Function’ for additional information)
Default value	FIXE
Set on run	YES
Modbus address	**40549**
Modbus range	0 to 1
Read / Write	YES

Function

It allows selecting the operation mode for drive fans.

Description of the options:

FIXE ➔ The fans of the drive are connected with the start command and they are disconnected after 3 minutes once the drive is stopped.

TEMP ➔ The fans are connected at 51ºC and they are disconnected when temperature is below 47ºC.

10.1.2. Remote Control Functions

HOST START CONTROL	
Screen	**-**
Range	0 – 1
Modbus address	**40562**
Modbus range	0 to 1
Read / Write	YES
Description	It allows giving the start command to the equipment through communications network.

HOST STOP CONTROL	
Screen	**-**
Range	0 – 1
Modbus address	**40563**
Modbus range	0 to 1
Read / Write	YES
Description	It allows giving the stop command to the equipment through communications network.

HOST RESET CONTROL	
Screen	**-**
Range	0 – 1
Modbus address	**40564**
Modbus range	0 to 1
Read / Write	YES
Description	It allows giving the reset command to the equipment through communications network.

HOST TRIP CONTROL	
Screen	**-**
Range	0 – 1
Modbus address	**40565**
Modbus range	0 to 1
Read / Write	YES
Description	It allows the equipment to generate a fault through communications network.

10.2. Group 2 – G2: Motor Nameplate Data

G2.1	MOTOR RATED CURRENT
Screen	**1 MTR CUR = 00.00A**
Extended info.	**MOTOR CURRENT**
Description	Motor rated current
Range	1 – 9999A, limited from 0.2 – 1.5 · In of the drive
Default value	* (Value depending on the drive rated current)
Set on run	YES
Modbus address	**40282**
Modbus range	1638 to 12288
Read / Write	YES
Function	It allows setting the motor rated current according to the motor nameplate.

G2.2	MOTOR RATED VOLTAGE
Screen	**2 MTR VOLT = 400V**
Extended info.	**MOTOR VOLTAGE**
Description	Motor rated voltage
Range	220 – 999V
Default value	400V
Set on run	YES
Modbus address	**40283**
Modbus range	220 to 999
Read / Write	YES
Function	It allows setting the motor rated voltage according to the motor nameplate.

G2.3	MOTOR RATED POWER
Screen	**3 MTR PWR = 00.0kW**
Extended info.	**MOTOR POWER**
Description	Motor rated power
Range	0.0 – 6500kW
Default value	* (Value depending on the drive rated current)
Set on run	YES
Modbus address	**40285**
Modbus range	0 to 65000
Read / Write	YES
Function	It allows setting the motor rated power according to the motor nameplate.

G2.4	MOTOR RPM
Screen	**4 MTR RPM = 1485**
Extended info.	**MOTOR SPEED(rpm)**
Description	Motor rpm
Range	0 – 24000rpm
Default value	1485
Set on run	YES
Modbus address	**40286**
Modbus range	0 to 24000
Read / Write	YES
Function	It allows setting the motor rated speed according to the motor nameplate.

G2.5	COSINE PHI
Screen	**5 MTR PFA = 0.85**
Extended info.	**MTR POWER FACTOR**
Description	Cosine Phi
Range	0 to 0.99
Default value	0.85
Set on run	YES
Modbus address	**40288**
Modbus range	0 to 99
Read / Write	YES
Function	It allows setting the motor cosine Phi according to the motor nameplate.

G2.6	MOTOR RATED FREQUENCY
Screen	**6 MTR FRQ = 50Hz**
Extended info.	**MOTOR FREQUENCY**
Description	Motor rated frequency
Range	1 – 100Hz
Default value	50Hz
Set on run	YES
Modbus address	**40284**
Modbus range	0 to 100
Read / Write	YES
Function	It allows setting the motor rated frequency according to the motor nameplate.

G2.7 MOTOR COOLING AT ZERO SPEED

Screen	**7 MTR COOL = 40%**
Extended info.	MOTOR COOLING
Description	Motor cooling at zero speed
Range	OFF, 20 – 100%
Default value	40%
Set on run	YES
Modbus address	**40287**
Modbus range	8274, 1638 to 8192
Read / Write	YES

Function

It calibrates the drive with the characteristics of the motor will be controlled. It provides information for the protection of the motor thermal model.

The following settings can be taken as reference:

Submersible pumps	➔	20%
Self-cool motor	➔	40%
Forced-cool motor	➔	100%

The drive capacity (kW) should be between 50% and 150% of the motor power. The motor must have from 2 to 12 poles.
If the motor power is in HP, convert them in kW by using the next formula:

$$kW = \frac{HP \cdot 746}{1000}$$

Thermal model is reset when disconnecting the drive power.

These parameters should be introduced before starting the drive. If we introduce illogical values, the drive will not operate correctly.
Introduce the rated parameters of the motor nameplate, current, voltage, frequency, power, speed (rpm) and cosine phi. When the motor nameplate offers multiple configuration possibilities, or the start-delta motor configuration of the winding has been modified, ensure the correct data is introduced for the appropriate configuration.

Calculate the motor cooling efficiency at zero speed and introduce that value (40% is a commonly used value). Where open structures, forced cooling or water-cool motors are used, a higher efficiency at zero speed will be obtained. If the equipment is operating at low speeds for a long time and trips are generated by the thermal model, and the motor is not too much hot, increase the % of the cooling. Thermal model is deactivated by introducing OFF. We advise installing a thermal protection independent to the motor.

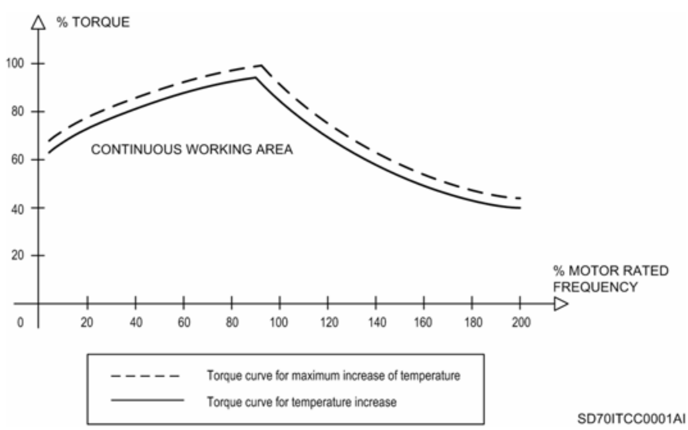

Figure 10.18 Specific thermal reduction of the motor

10.3. Group 3 – G3: References

G3.1	REFERENCE SOURCE 1 OF SPEED

Screen	**1 REF1 SPD = LOCAL**
Description	Reference source 1 of speed
Range	NONE AI1 AI2 AI1 + AI2 RESER LOCAL MREF PMOT PID (See 'Function' for additional information)
Default value	LOCAL
Set on run	YES
Modbus address	**40122**
Modbus range	0 to 8
Read / Write	YES

Function

It allows selecting the reference source 1 of speed.

Possible reference sources are the following ones:

NONE ➔ Reference source 1 has not been selected.

AI1 ➔ The reference will be introduced through the Analogue Input 1.

AI2 ➔ The reference will be introduced through the Analogue Input 2.

AI1 + AI2 ➔ The reference will be the addition of the signals introduced through the Analogue Inputs 1 and 2.

RESER ➔ Reserved for future use.

LOCAL ➔ The reference will be introduced by keypad and will be set in 'G3.3 ➔ Local speed reference'.

MREF ➔ Multi-reference. It allows activating different references by digital inputs. For this, you need to configure the digital inputs (See 'S4.1 ➔ Digital Inputs').

PMOT ➔ Reference taken by motorized potentiometer with or without reference memorizing.

PID ➔ It will take as reference the value set in the parameters of the PID function.

G3.2	REFERENCE SOURCE 2 OF SPEED

Screen	**2 REF2 SPD = LOCAL**
Description	Reference source 2 of speed
Range	NONE AI1 AI2 AI1 + AI2 RESER LOCAL MREF PMOT PID
Default value	LOCAL
Set on run	YES
Modbus address	**40123**
Modbus range	0 to 8
Read / Write	YES
Function	It allows selecting the reference source 2 of speed. See 'Function' in parameter 'G3.1 ➔ Reference source 1 of speed' for additional information about the configuration options.

G3.3	LOCAL SPEED REFERENCE

Screen	**3 LOCAL SPD = +100%**
Extended info.	**LOCAL SPEED**
Description	Local speed reference
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40124**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows user to set the value of the motor spinning speed whenever the reference source of speed is set to 'LOCAL' in parameter 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed', depending on the reference source selected.

10.4. Group 4 – G4: Inputs

10.4.1. Subgroup 4.1 – S4.1: Digital Inputs

G4.1.1 MODO DE CONTROL PRINCIPAL

Screen	**1 CNTROL MODE1 = 1**
Description	Main control mode
Range	0 – 3 (See 'Function' for additional information)
Default value	1
Set on run	YES
Modbus address	**40040**
Modbus range	0 ➔ NONE 1 ➔ LOCAL 2 ➔ REMOTE 3 ➔ SERIAL COMMS
Read / Write	YES

Function

It allows user to set the main control mode of the drive to give the orders that drive it (Start/Stop, Reset, ...).

The configuration options of the main control mode are:

0 ➔ NONE
Control mode 1 is not operative.

1 ➔ LOCAL
Drive control is realized from keypad, this is, the signals that control it is given through the keypad of the drive itself.

2 ➔ REMOTE
Drive control is realized through control terminals, this is, by activating or deactivating signals connected to the control terminals of the drive.

3 ➔ SERIAL COMMS
Drive control is realized through communication bus, this is, signals that drive the drive will be sent through it.

G4.1.2 ALTERNATIVE CONTROL MODE

Screen	**2 CNTROL MODE2 = 2**
Description	Alternative control mode
Range	0 – 3
Default value	2
Set on run	YES
Modbus address	**40041**
Modbus range	0 to 3
Read / Write	YES

Function	It allows user to set the secondary control mode (or alternative) of the drive to give the orders that drive it (Start/Stop, Reset, ...).

The configuration options of the alternative control mode are the same than the main control mode, therefore, see 'Function' in parameter 'G4.1.1 ➔ Main control mode' to obtain additional information.

Note: Control mode 2 (alternative) will be activated through digital inputs. For that, one of them should be configured (parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with the option '17 ➔ CONTROL 2'. When the input configured for that is activated, the alternative control mode will be activated, disabling the main control mode.

G4.1.3 RESET FROM KEYPAD

Screen	**3 RESET MODE = Y**
Description	Reset from keypad
Range	N S (See 'Function' for additional information)
Default value	Y
Set on run	YES
Modbus address	**40039**
Modbus range	0 to 1
Read / Write	YES

Function It enables or disables the possibility of resetting a fault from the keypad unit (LOCAL).

Options:

N ➔ NO
Reset from keypad unit is not possible.

Y ➔ YES
It is possible to reset the equipment by reset key from the keypad unit.

G4.1.4 SELECTION OF DIGITAL INPUTS CONFIGURATION

Screen	**4 DIGIT I MODE = 1**
Description	Selection of digital inputs configuration
Range	0 – 5 (See 'Function' for additional information)
Default value	1
Set on run	NO
Modbus address	**40038**
Modbus range	0 to 5
Read / Write	YES

Function

It determines the configuration mode of digital inputs. All of the selectable configuration modes assign specific functions to some digital inputs together except for the option ‘1 ➔ ALL PROGRAMMABLE’, that allows us to configure them individually.

Description of the configuration modes:

0 ➔ 3 WIRES

It allows controlling the functions of Start/Stop and Reset through the terminals of multi-function digital inputs. Digital inputs will be configured like this:

DI1: ’01 ➔ START’ (NO)
DI2: ’04 ➔ STOP1 – RESET’ (NC)
DI3: ’03 ➔ STOP2 – RESET’ (NC)
DI4: ’15 ➔ REFERENCE 2’ (NO)
DI5: ’10 ➔ INV SPEED’ (NC)
DI6: ’17 ➔ CONTROL 2’ (NO)

Push buttons are connected to the terminals of the digital inputs 1, 2 and 3. In this mode, all of the digital inputs are used, therefore, we cannot add other functionality to this configuration.

1 ➔ ALL PROGRAMMABLE

It allows user to configure each digital input individually. The functions assignment to the inputs is realized in parameters ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’.

2 ➔ MREF 2 WIRES

Two of the six digital inputs, DI5 and DI6, are configured to select the settings of multiple references, getting up to 4 references set before. These ones can be speed references or PID references. See group G14 MULTI-REFERENCES.

The four remaining inputs (DI1 to DI4) can be programmed individually in the parameters ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.8 ➔ Multi-function Digital Input 4 configuration’.

Note: To configure this mode, as well as selecting this option, it is necessary to realize one of the settings described below.

1. Choice of ‘multi-references’ as speed references.
   We should set the parameter ‘G3.1 ➔ Reference source 1 of speed’ and/or ‘G3.2 ➔ Reference source 2 of speed’ with option ‘MREF’.

2. Choice of ‘multi-references’ as PID references.
   First, we should enable the PID regulator in ‘G3.1 ➔ Reference source 1 of speed’ and/or ‘G3.2 ➔ Reference source 2 of speed’ option ‘PID’, and next, select option ‘MREF’ in parameter ‘G6.1 ➔ Source selection for introducing reference signal’.

3 ➔ MREF 3 WIRES

Three of the six digital inputs, DI4, DI5 and DI6, are configured to select the settings of the multiple references, getting up to 7 references set before. These ones can be speed references or PID references. See group G14 MULTI-REFERENCES.

The three remaining inputs (DI1 to DI3) can be programmed individually in the parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.7 ➔ Multi-function Digital Input 3 configuration'.

Note: To configure this mode, as well as selecting this option, it is necessary to realize one of the settings described below.

1. Choice of the 'multi-references' as speed references.
   We should set the parameter 'G3.1 ➔ Reference source 1 of speed' and/or 'G3.2 ➔ Reference source 2 of speed' with option 'MREF'.

2. Choice of the 'multi-references' as PID references.
   First, we should enable the PID regulator in 'G3.1 ➔ Reference source 1 of speed' and/or 'G3.2 ➔ Reference source 2 of speed' option 'PID', and next, select option 'MREF' in parameter 'G6.1 ➔ Source selection for introducing reference signal'.

4 ➔ MOTORIZED POT

It allows setting the speed reference by two push buttons connected to digital inputs:
DI5: Up (it increases the speed reference). Contact NO.
DI6: Down (it decreases the speed reference). Contact NC.

The reference limits will be the speed limits of the equipment that are set in group G10 LIMITS.

While 'Up' push button is pressed, the speed increase can be set according to a double ramp in group G5 ACCELERATION AND DECELERATION RAMPS. In case of decreasing the speed occurs the same thing, this is, that decrease can be set in the same way:

'G5.7 ➔ Ramp 1 for reference increase of motorized potentiometer'
'G5.8 ➔ Ramp 1 for reference decrease of motorized potentiometer'
'G5.9 ➔ Ramp 2 for reference increase of motorized potentiometer'
'G5.10 ➔ Ramp 2 for reference decrease of motorized potentiometer'
'G5.11 ➔ Speed for changing the acceleration and deceleration ramp'

See group G5 ACCELERATION AND DECELERATION RAMPS for additional information about these parameters.

Note: In this mode, the speed reference set by the potentiometer will be memorized even if the motor is stopped, and also if the power supply is lost.

Note: For using this function it is necessary to set 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' with option 'PMOT' according to the selected source.

We can observe the operation of the motorized potentiometer in the following figure.

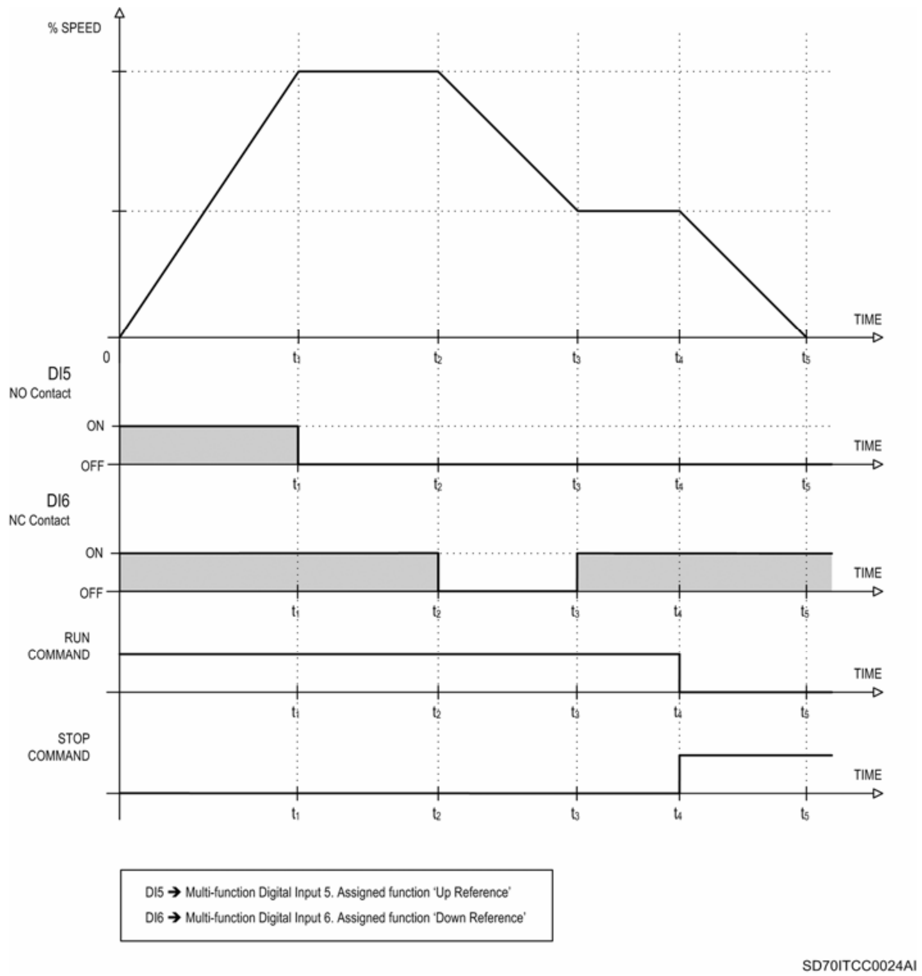

Figure 10.19 Motorized potentiometer operation

5 ➔ ERASAB POT

It operates like option '4 ➔ MOTORIZED POT', but when the motor is stopped or the power supply is lost, the speed reference will not be memorized, but the minimum reference value set in 'G10.1 ➔ Minimum speed limit 1' or 'G10.3 ➔ Minimum speed limit 2' will be taken.

DI5: Up (it increases the speed reference). Contact NO.
DI6: Down (it decreases the speed reference). Contact NC.

The reference limits will be the speed limits of the equipment that are set in group G10 LIMITS.

Like in the previous mode, we can set the increase and the decrease of the speed (while push buttons 'Up' or 'Down' are pressed) according to a double ramp for each case (settings in group G5 ACCELERATION AND DECELERATION RAMPS). Read option '4 ➔ MOTORIZED POT'.

See figure 10.19.

Note: For using this function it is necessary to set 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' with option 'PMOT' according to the selected source.

⚠ **Caution:** Digital input configuration changes automatically the settings of the digital inputs themselves. Make sure there is not a hazard of accidental starting to avoid personal injuries or property damages.

Pumps program activation, in ‘G1.7 ➔ Program activation’ set to ‘PUMP’, requires the following considerations:

There are some configuration options available when the pump program is active, which can be set in the same way that the options available in the standard program. Nevertheless, when the pump program is active, the drive will assume that only the configurable options from 50 to 69 (for ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’) can be set, without taking into consideration the setting on parameter ‘G4.1.4 ➔ Digital Input configuration selection’, which means a block setting.

All that means that the user will configure the pump program freely, according to his requirements, selecting the correct functionality and protections. For a correct programming of the digital inputs when the pump program is active, there is additional information in G25 PUMP CONTROL.

Note: Selection of the pump program will set all the Digital Inputs (from G4.1.5 to G4.1.10) to mode ‘00 ➔ NO USE’. If re-programming is needed, it will be necessary to configure their functionality in a separate way again. So it guarantees a safety installation operation, avoiding that hardware external to the equipment can cause any kind of damage.

Note: The digital outputs will also be affected due to pump control activation.

To select one auxiliary pump it is necessary to act in the following way:

- Set any free digital input to options ‘52 ➔ FIX PUMP1 FLT’, ’53 ➔ FIX PUMP2 FLT’, ’54 ➔ FIX PUMP3 FLT’, ’55 ➔ FIX PUMP4 FLT’ or ’56 ➔ FIX PUMP5 FLT’.
- To enable the control of the pump 1, 2, 3, 4 and/or 5 set the corresponding parameter G25.9.1, G25.9.2, G25.9.3, G25.9.4 and G25.9.5 respectively to ‘Y’.

To remove this pump configuration and release the relay for another use, the user should:

- Disable the control of the pump in the corresponding parameter G25.9.1, G25.9.2, G25.9.3, G25.9.4 or G25.9.5 respectively, by setting these parameters to ‘N’.

G4.1.5 MULTI-FUNCTION DIGITAL INPUT 1 CONFIGURATION

Screen	**5 DIGITL IN 1 = 06**
Description	Multi-function Digital Input 1 configuration
Range	00 – 70 (See ‘Function’ for additional information)
Default value	06
Set on run	NO
Modbus address	**40032**
Modbus range	0 to 70
Read / Write	YES

Function

It allows user to configure the Digital Input 1 for its individual use.

The configuration options for each multi-function digital input are the following ones:

00 ➔ NO USE
The input is not programmed.

01 ➔ START
‘Start’ command from a push button with a normally open contact (NO).

Note: For configuring this option, it is also necessary to configure another input as a ‘Stop’ command from a push button with a normally closed contact (NC) previously.

02 ➔ STOP1
‘Stop’ command in mode 1 from a push button with a normally closed contact (NC), according to the setting of the parameter ‘G7.1 ➔ Stop mode 1’.

03 ➔ STOP2 – RESET
‘Stop’ command in mode 2 from a push button with a normally closed contact (NC), according to the setting of the parameter ‘G7.2 ➔ Stop mode 2’. Activation of the input in this mode also acts as a ‘Reset’ signal.

04 ➔ STOP1 – RESET
‘Stop’ command in mode 1 from a push button with a normally closed contact (NC), according to the setting of the parameter ‘G7.1 ➔ Stop mode 1’. Activation of the input in this mode also acts as a ‘Reset’ signal.

05 ➔ START/STOP
It allows starting when closed and stopping when open (2 wires start / stop). (NO).

06 ➔ START-RST/STOP
It allows starting when closed and stopping when open (2 wires start / stop). Activation of this input also acts as a fault reset. (NO).

07 ➔ RESET
‘Reset’ signal by push button (NC).

08 ➔ START + INCH1
‘Start’ command and inch speed 1 (programmed in ‘G15.1 ➔ Inch speed 1’) taken as reference. (NO).

09 ➔ START + INCH2
'Start' command and inch speed 2 (programmed in 'G15.2 ➔ Inch speed 2') taken as reference. (NO).

Note: If two inputs, configured with options '08 ➔ START + INCH1' and '09 ➔ START + INCH2', are activated simultaneously, combination of 'Start + Inch speed 3' is obtained. Inch speed 3 is programmed in parameter 'G15.3 ➔ Inch speed 3'.

10 ➔ INV SPEED
It causes a deceleration of the motor until motor is stopped, and inverts the rotation direction. (NO).

Note: Rotation inversion must be enabled in parameter 'G10.11 ➔ To enable speed inversion'.

11 ➔ RESERVE
Reserved for future use.

12 ➔ RESERVE
Reserved for future use.

13 ➔ INV INCHS
It inverts the inch speed reference set in 'G15.1 ➔ Inch speed 1', 'G15.2 ➔ Inch speed 2' or 'G15.3 ➔ Inch speed 3'. (NO).

Note: Rotation inversion must be enabled in parameter 'G10.9 ➔ To enable speed inversion'.

14 ➔ ACC/DEC 2
It activates the use of the alternative acceleration and deceleration ramps programmed in 'G5.3 ➔ Acceleration ramp 2' and 'G5.4 ➔ Deceleration ramp 2'. (NO).

15 ➔ REFERENCE 2
It allows selecting the alternative speed reference programmed in 'G3.2 ➔ Reference source 2 of speed'. (NO).

16 ➔ RESERVE
Reserved for future use.

17 ➔ CONTROL 2
It activates the alternative control mode programmed in 'G4.1.2 ➔ Alternative control mode'. (NO).

18 ➔ START/STP – RST
Like option '06 ➔ START – RST/STOP', but 'Reset' signal will be activated after the drive is stopped. (NO).

19 ➔ STOP (2)
'Stop' command in mode 2 from a push button with a normally closed contact (NC), according to the setting of the parameter 'G7.2 ➔ Stop mode 2'.

20 ➔ SPEED LIMIT 2
Change to the alternative speed limits programmed in 'G10.3 ➔ Minimum speed limit 2' and 'G10.4 ➔ Maximum speed limit 2'. (NO).

21 ➔ DC BRAKE
It allows activating or deactivating dynamic brake unit. (NO).

22 ➔ START MODE 2
To select the alternative starting mode (Ramp / Spin) adjusted in parameter 'G7.5 ➔ Start mode 2'. (NO).

23 ➔ CURRENT LIMI2
To select the alternative current limit adjusted in 'G10.7 ➔ Alternative current limit'. (NO).

24 ➔ EXTERN EMERGE
To generate the fault 'F56 EMERGEN.STOP'. (NC).

50 ➔ PMP START/STP
Automatic starting of the system. (NO).

51 ➔ FLOW PULSE
Pulse input for the flowmeter. (NO).

52 ➔ FIX PUMP1 FLT
Auxiliary pump 1 fault. (NO).

53 ➔ FIX PUMP2 FLT
Auxiliary pump 2 fault. (NO).

54 ➔ FIX PUMP3 FLT
Auxiliary pump 3 fault. (NO).

55 ➔ FIX PUMP4 FLT
Auxiliary pump 4 fault. (NO).

56 ➔ FIX PUMP5 FLT
Auxiliary pump 5 fault. (NO).

57 ➔ MAN PROTstart
Manual starting including those protections enabled by the user. (NO).

58 ➔ HI PRESS FLT
High Pressure trip. (NC).

59 ➔ LO WATER FLT
No Water trip. (NC).

60 ➔ LO PRESS FLT
To detect a low pressure situation. (NO).

61 ➔ FLOW SWITCH
To connect an external flow switch (open / closed). (NC).

62 ➔ IRRIGAT TRIP
To detect an external fault from the irrigation equipment. (NO).

63 ➔ SETPONT PIN1
(Low bit).

Configuration of the low, medium and high bit respectively, for multiple PID setpoints selection, according to the following table:

DIGITAL INPUTS			**PID SETPOINT**
DI(z) = 65	**DI(y) = 64**	**DI(x) = 63**	
0	0	0	G25.1.5 'SETPT1'
0	0	X	G25.1.6 'SETPT2'
0	X	0	G25.1.7 'SETPT3'
0	X	X	G25.1.8 'SETPT4'
X	0	0	G25.1.9 'SETPT5'
X	0	X	G25.1.10 'SETPT6'
X	X	0	G25.1.11 'SETPT7'
X	X	X	G25.1.12 'SETPT8'

They are NO contacts.

64 ➔ SETPONT PIN2
(Medium bit).
See option ‘63’ above.

65 ➔ SETPONT PIN3
(High bit).
See option ‘63’ above.

66 ➔ MAN REF 2
To select the second source or the alternative source for the speed reference adjusted in ‘G3.2 ➔ Selection for speed reference 2’. (NO).

67 ➔ MAN OVR STAR
Manual starting without protections, for testing starting. (NO).

69 ➔ PRESSUR SWITC
Detection of the pressure existing in the system to be used with the Priming pump. (NO).

70 ➔ ALTER PID STP
When the input configured with this option is activated, the pump program will consider the alternative PID setpoint according to the setting of the parameter ‘G25.2.2 ➔ Alternative PID setpoint source’. (NO).

G4.1.6 MULTI-FUNCTION DIGITAL INPUT 2 CONFIGURATION

Screen	**6 DIGITL IN 2 = 00**
Description	Multi-function Digital Input 2 configuration
Range	00 – 70
Default value	00
Set on run	NO
Modbus address	**40033**
Modbus range	0 to 70
Read / Write	YES

Function: It allows user to configure the Digital Input 2 for its individual use.

See ‘Function’ in parameter ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ for additional information about the configuration options.

G4.1.7 MULTI-FUNCTION DIGITAL INPUT 3 CONFIGURATION

Screen	**7 DIGITL IN 3 = 00**
Description	Multi-function Digital Input 3 configuration
Range	00 – 70
Default value	00
Set on run	NO
Modbus address	**40034**
Modbus range	0 to 70
Read / Write	YES

Function: It allows user to configure the Digital Input 3 for its individual use.

See ‘Function’ in parameter ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ for additional information about the configuration options.

G4.1.8 MULTI-FUNCTION DIGITAL INPUT 4 CONFIGURATION

Screen	**8 DIGITL IN 4 = 00**
Description	Multi-function Digital Input 4 configuration
Range	00 – 70
Default value	00
Set on run	NO
Modbus address	**40035**
Modbus range	0 to 70
Read / Write	YES

Function: It allows user to configure the Digital Input 4 for its individual use.

See 'Function' in parameter 'G4.1.5 → Multi-function Digital Input 1 configuration' for additional information about the configuration options.

G4.1.9 MULTI-FUNCTION DIGITAL INPUT 5 CONFIGURATION

Screen	**9 DIGITL IN 5 = 00**
Description	Multi-function Digital Input 5 configuration
Range	00 – 70
Default value	00
Set on run	NO
Modbus address	**40036**
Modbus range	0 to 70
Read / Write	YES

Function: It allows user to configure the Digital Input 5 for its individual use.

See 'Function' in parameter 'G4.1.5 → Multi-function Digital Input 1 configuration' for additional information about the configuration options.

G4.1.10 MULTI-FUNCTION DIGITAL INPUT 6 CONFIGURATION

Screen	**10 DIGITL IN 6 = 17**
Description	Multi-function Digital Input 6 configuration
Range	00 – 70
Default value	17
Set on run	NO
Modbus address	**40037**
Modbus range	0 to 70
Read / Write	YES

Function: It allows user to configure the Digital Input 6 for its individual use.

See 'Function' in parameter 'G4.1.5 → Multi-function Digital Input 1 configuration' for additional information about the configuration options.

10.4.2. Subgroup 4.2 – S4.2: Analogue Input 1

G4.2.1	TO ENABLE SENSOR OF ANALOGUE INPUT 1

Screen	**1 SENSOR 1 ? = N**
Description	It enables the sensor of the Analogue Input 1
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	NO
Modbus address	**40268**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to use the Analogue Input 1 and to access to the needed parameters for configuring the sensor. See 'G4.2.2 ➔ Selection of sensor 1 units' up to 'G4.2.7 ➔ Maximum range of sensor 1'.

N ➔ NO

The analogue input will remain scaled in default units (%).

Y ➔ YES

The analogue input and any variables relating to the analogue input will be configured in the engineering units selected in 'G4.2.2 ➔ Selection of sensor 1 units'.

G4.2.2	SELECTION OF SENSOR 1 UNITS

Screen	**2 SENSOR 1 = l/s**
Description	Selection of units of measurement for the sensor 1
Range	%, l/s, m³/s, l/m, m³/m, l/h, m³/h, m/s, m/m, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK
Default value	l/s
Set on run	NO
Modbus address	**40272**
Modbus range	0 to 16
Read / Write	YES

Function

It allows selecting different units of measurement for the Analogue Input 1 according to the sensor that is going to be used.

If this parameter is modified, the minimum and maximum values are affected by the proper conversion. For this reason, the settings of the parameters 'G4.2.5 ➔ Minimum range of sensor 1' and 'G4.2.7 ➔ Maximum range of sensor 1' should be checked.

Note: This parameter is only available if 'G4.2.1 ➔ To Enable sensor of Analogue Input 1' is set to 'Y'.

G4.2.3 ANALOGUE INPUT 1 FORMAT

Screen	**3 AIN1 FORMAT = V**
Description	Analogue Input 1 format
Range	V mA
Default value	V
Set on run	NO
Modbus address	**40264**
Modbus range	0 to 1
Read / Write	YES

Function — It allows user to configure the format of the Analogue Input 1 to connect a voltage or current signal, according to the sensor or signal type used to introduce the reference.

G4.2.4 MINIMUM RANGE OF ANALOGUE INPUT 1

Screen	**4 INmin1 = +0V**
Extended info.	AIN1 LOW RANGE
Description	Minimum range of the Analogue Input 1
Range	-10 to +10V (max. G4.2.6) +0 to +20mA (max. G4.2.6)
Default value	+0V
Set on run	YES
Modbus address	**40248**
Modbus range	-10000 to +10000 (max. G4.2.6) 0 to +20000 (max. G4.2.6)
Read / Write	YES

Function — It allows setting the minimum voltage or current value for the Analogue Input 1 according to the characteristics of the sensor that is going to be connected.

G4.2.5 MINIMUM RANGE OF SENSOR 1

Screen	**5 Smi1 = +0.0l/s**
Extended info.	SENS1 LOW RANGE
Description	Minimum range of sensor 1
Range	-3200 to +3200 Engineering units (max. G4.2.7)
Default value	+0.0l/s
Set on run	YES
Modbus address	**40254**
Modbus range	-3200 to 3200 (max. G4.2.7)
Read / Write	YES

Function — It allows setting the minimum units value of the sensor connected to the Analogue Input 1. This value should also correspond to the minimum voltage or current level of the sensor set in 'G4.2.4 ➔ Minimum range of Analogue Input 1'.

Note: The setting of this parameter should be checked if the sensor units are changed in parameter 'G4.2.2 ➔ Selection of sensor 1 units'. It is necessary to set this value to operate in open loop and closed loop.

Note: This parameter will be only available if 'G4.2.1 ➔ To enable sensor of Analogue Input 1' is set to 'Y'.

G4.2.6 MAXIMUM RANGE OF ANALOGUE INPUT 1

Screen	**6 INmax1 = +10V**
Extended info.	**AIN1 HIGH RANGE**
Description	Maximum range of the Analogue Input 1
Range	-10 to +10V (min. G4.2.4) +0 to +20mA (min. G4.2.4)
Default value	+10V
Set on run	YES
Modbus address	**40244**
Modbus range	-10000 to +10000 (min. G4.2.4) 0 to +20000 (min. G4.2.4)
Read / Write	YES

Function: It allows setting the maximum voltage or current value for the Analogue Input 1 according to the characteristics of the sensor that is going to be connected.

G4.2.7 MAXIMUM RANGE OF SENSOR 1

Screen	**7 Sma1 = +10.0l/s**
Extended info.	**RNG ALTO SENSOR1**
Description	Maximum range of sensor 1
Range	-3200 to +3200 Engineering units (min. G4.2.5)
Default value	+10.0l/s
Set on run	YES
Modbus address	**40250**
Modbus range	-3200 to 3200 (min. G4.2.5)
Read / Write	YES

Function: It allows setting the maximum units value of the sensor connected to the Analogue Input 1. This value should also correspond to the maximum voltage or current level of the sensor set in 'G4.2.6 ➔ Maximum range of Analogue Input 1'.

Note: The setting of this parameter should be checked if the sensor units are changed in parameter 'G4.2.2 ➔ Selection of sensor 1 units'. It is necessary to set this value to operate in open loop and closed loop.

Note: This parameter will be only available if 'G4.2.1 ➔ To enable sensor of Analogue Input 1' is set to 'Y'.

G4.2.8 SPEED FOR THE MINIMUM RANGE OF ANALOGUE INPUT 1

Screen	**8 SPD LO1 = +0%**
Extended info.	**SPD LO RNG AIN1**
Description	Speed corresponding to the minimum range of the Analogue Input 1
Range	-250% to +250% (max. G4.2.9)
Default value	+0%
Set on run	YES
Modbus address	**40246**
Modbus range	-20480 to 20480 (max. G4.2.9)
Read / Write	YES

Function	If the Analogue Input 1 is used for introducing the speed reference (setting of parameter 'G4.2.1 ➔ To enable sensor of Analogue Input 1' to 'N'), we can set in this parameter the value of this reference corresponding to the minimum voltage or current level set in parameter 'G4.2.4 ➔ Minimum range of Analogue Input 1'.
	The value set here is a percentage of the motor rated speed ('G2.4 ➔ Motor rpm').

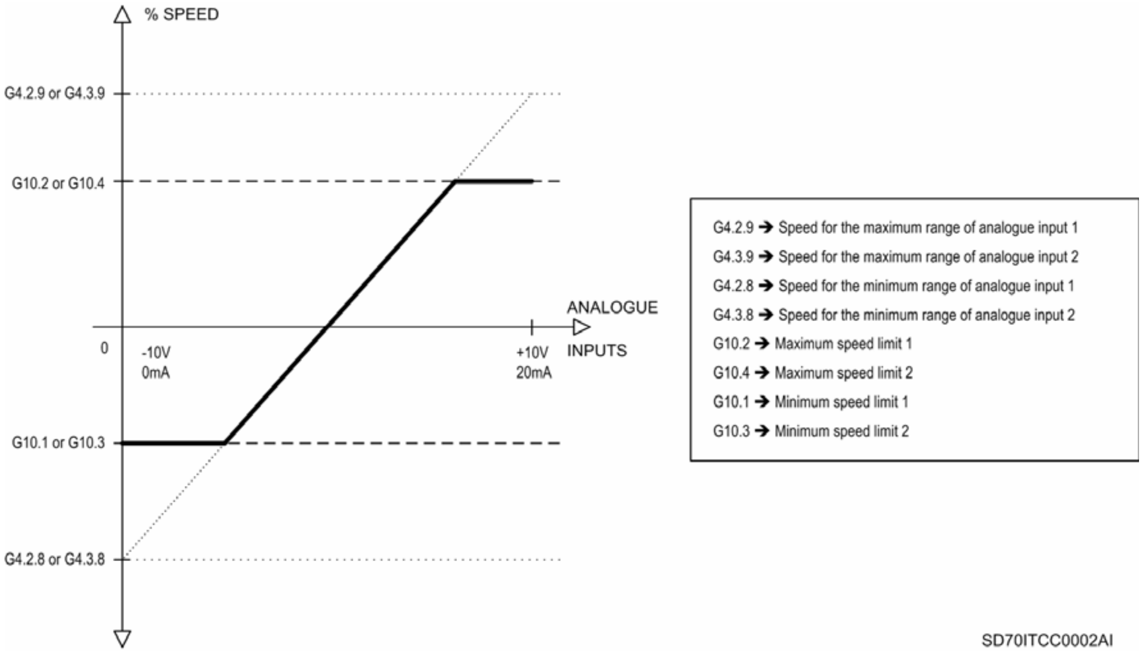

Figure 10.20 Scaling of the speed limits for the analogue inputs

G4.2.9 SPEED FOR THE MAXIMUM RANGE OF ANALOGUE INPUT 1

Screen	**9 SPD HI1 = +100%**
Extended info.	**SPD HIG RNG AIN1**
Description	Speed corresponding to the maximum range of the Analogue Input 1
Range	-250% to +250% (min. G4.2.8)
Default value	+100%
Set on run	YES
Modbus address	**40242**
Modbus range	-20480 to 20480 (min. G4.2.8)
Read / Write	YES
Function	If the Analogue Input 1 is used for introducing the speed reference (setting of parameter 'G4.2.1 ➔ To enable sensor of Analogue Input 1' to 'N'), we can set in this parameter the value of this reference corresponding to the maximum voltage or current level set in parameter 'G4.2.6 ➔ Maximum range of Analogue Input 1'.
	The value set here is a percentage of the motor rated speed ('G2.4 ➔ Motor rpm').
	See figure 10.20.

G4.2.14 PROTECTION FOR ANALOGUE INPUT 1 LOSS

Screen	**14 AIN1 LOSS = N**
Description	Protection for the Analogue Input 1 loss
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40266**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to decide about the behaviour of the equipment when the signal connected to the Analogue Input 1 is lost.

Options:

N ➔ NO

Disabled function.
Drive does not realize any action in case of the analogue input signal is lost.

Y ➔ YES

Drive will stop generating the fault 'F42 AIN1 LOSS', since the sensor will be considered damaged, when a sharp drop down to zero value in the level of the analogue input signal is detected.

G4.2.15 ZERO BAND FILTER FOR ANALOGUE INPUT 1

Screen	**15 1_Z_BAND = OFF**
Extended info.	**AIN1 ZERO BAND**
Description	Zero band filter for the Analogue Input 1
Range	OFF=0.0 – 2.0%
Default value	OFF
Set on run	YES
Modbus address	**40270**
Modbus range	0 to 163
Read / Write	YES

Function

Setting a value in this parameter, we obtain a filtering of the Analogue Input 1 signal, eliminating a possible electrical noise associated to the signal that impedes reading a zero value when it must be read.

The aim of this parameter is supplying a pre-defined zero area for controls by analogue inputs, especially for speed control. It eliminates small errors in the reference voltage near to zero reference point.

Note: The function of zero band filter is not applied to the reference signals through digital inputs, since these settings are absolute zero.

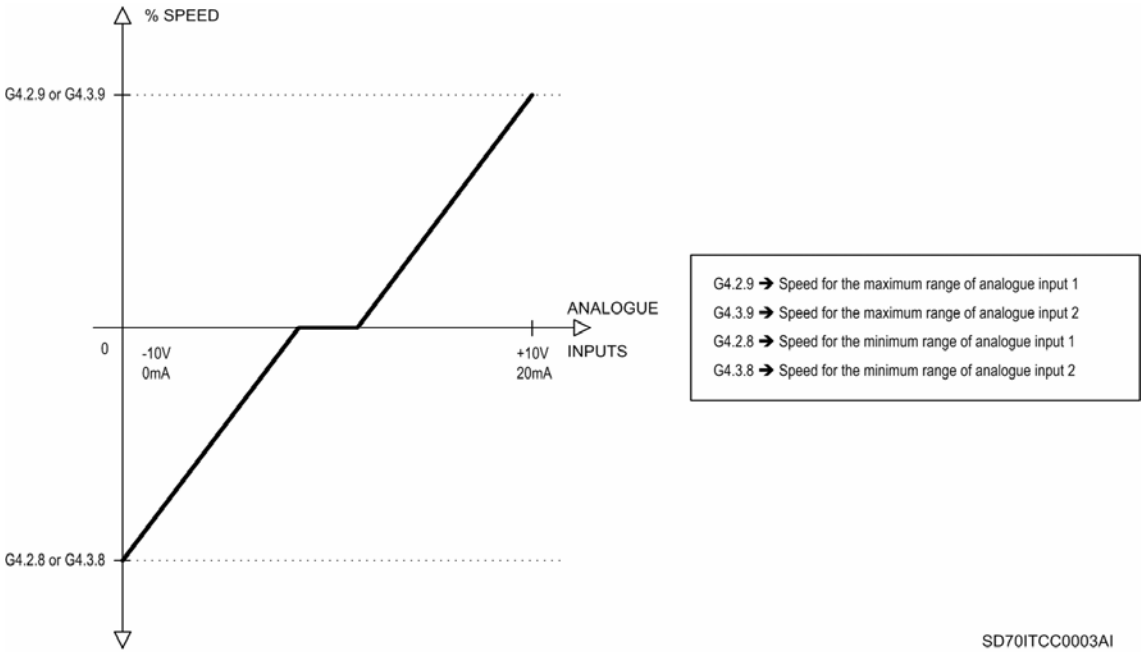

Figure 10.21 Analogue input of reference with zero band filter

G4.2.16 LOW PASS FILTER FOR ANALOGUE INPUT 1

Screen	**16 FILTER1 = OFF**
Extended info.	**AIN1 STABIL FILT**
Description	Low Pass filter for the Analogue Input 1
Range	OFF=0.0 – 20.0%
Default value	OFF
Set on run	YES
Modbus address	**40274**
Modbus range	0 to 200
Read / Write	YES

Function

It allows filtering the signal of the Analogue Input 1. By setting the value of this time constant we can eliminate possible instabilities in the value of the same ones due to noise, wiring faults, etc.

Note: When applying a Low Pass filter to any analogue signal, a delay time in the own signal is generated. This delay time is the value of the configured time constant approximately.

10.4.3. Subgroup 4.3 – S4.3: Analogue Input 2

G4.3.1	TO ENABLE SENSOR OF ANALOGUE INPUT 2

Screen	**1 SENSOR 2 ? = N**
Description	It enables the sensor of the Analogue Input 2
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	NO
Modbus address	**40269**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to use the Analogue Input 2 and to access to the needed parameters for configuring the sensor. See 'G4.3.2 ➔ Selection of sensor 2 units' up to 'G4.3.7 ➔ Maximum range of sensor 2'.

N ➔ NO

The analogue input will remain scaled in default units (%).

Y ➔ YES

The analogue input and any variables relating to the analogue input will be configured in the engineering units selected in 'G4.3.2 ➔ Selection of sensor 2 units'.

G4.3.2	SELECTION OF SENSOR 2 UNITS

Screen	**2 SENSOR 2 = Bar**
Description	Selection of units of measurement for the sensor 2
Range	%, l/s, m^3/s, l/m, m^3/m, l/h, m^3/h, m/s, m/m, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK
Default value	Bar
Set on run	NO
Modbus address	**40273**
Modbus range	0 to 16
Read / Write	YES

Function

It allows selecting different units of measurement for the Analogue Input 2 according to the sensor that is going to be used.

If this parameter is modified, the minimum and maximum values are affected by the proper conversion. For this reason, the settings of the parameters 'G4.3.5 ➔ Minimum range of sensor 2' and 'G4.3.7 ➔ Maximum range of sensor 2' should be checked.

Note: This parameter is only available if 'G4.3.1 ➔ To enable sensor of Analogue Input 2' is set to 'Y'.

G4.3.3 ANALOGUE INPUT 2 FORMAT

Screen	**3 AIN2 FORMAT = mA**
Description	Analogue Input 2 format
Range	V mA
Default value	mA
Set on run	NO
Modbus address	**40265**
Modbus range	0 to 1
Read / Write	YES

Function: It allows user to configure the format of the Analogue Input 2 to connect a voltage or current signal, according to the sensor or signal type used to introduce the reference.

G4.3.4 MINIMUM RANGE OF ANALOGUE INPUT 2

Screen	**4 INmin2 = +4mA**
Extended info.	**AIN2 LOW RANGE**
Description	Minimum range of the Analogue Input 2
Range	-10 to +10V (max. G4.3.6) +0 to +20mA (max. G4.3.6)
Default value	+4mA
Set on run	YES
Modbus address	**40249**
Modbus range	-10000 to +10000 (max. G4.3.6) 0 to +20000 (max. G4.3.6)
Read / Write	YES

Function: It allows setting the minimum voltage or current value for the Analogue Input 2 according to the characteristics of the sensor that is going to be connected.

G4.3.5 MINIMUM RANGE OF SENSOR 2

Screen	**5 Smi2 = +0.0Bar**
Extended info.	**SENS2 LOW RANGE**
Description	Minimum range of sensor 2
Range	-3200 to +3200 Engineering units (max. G4.3.7)
Default value	+0.0Bar
Set on run	YES
Modbus address	**40255**
Modbus range	-3200 to 3200 (max. G4.3.7)
Read / Write	YES

Function: It allows setting the minimum units value of the sensor connected to the Analogue Input 2. This value should also correspond to the minimum voltage or current level of the sensor set in ‘G4.3.4 ➔ Minimum range of Analogue Input 2’.

Note: The setting of this parameter should be checked if the sensor units are changed in parameter ‘G4.3.2 ➔ Selection of sensor 2 units’. It is necessary to set this value to operate in open loop and closed loop.

Note: This parameter will be only available if ‘G4.3.1 ➔ To enable sensor of Analogue Input 2’ is set to ‘Y’.

G4.3.6 MAXIMUM RANGE OF ANALOGUE INPUT 1

Screen	**6 INmax2 = +20mA**
Extended info.	**AIN2 HIGH RANGE**
Description	Maximum range of the Analogue Input 1
Range	-10 to +10V (min. G4.3.4) +0 to +20mA (min. G4.3.4)
Default value	+20mA
Set on run	YES
Modbus address	**40245**
Modbus range	-10000 to +10000 (min. G4.3.4) 0 to +20000 (min. G4.3.4)
Read / Write	YES

Function: It allows setting the maximum voltage or current value for the Analogue Input 2 according to the characteristics of the sensor that is going to be connected.

G4.3.7 MAXIMUM RANGE OF SENSOR 2

Screen	**7 Sma2 = +10.0Bar**
Extended info.	**SENS2 HIGH RANGE**
Description	Maximum range of sensor 2
Range	-3200 to +3200 Engineering units (min. G4.3.5)
Default value	+10.0Bar
Set on run	YES
Modbus address	**40251**
Modbus range	-3200 to 3200 (min. G4.3.5)
Read / Write	YES

Function: It allows setting the maximum units value of the sensor connected to the Analogue Input 2. This value should also correspond to the maximum voltage or current level of the sensor set in 'G4.3.6 ➔ Maximum range of Analogue Input 2'.

Note: The setting of this parameter should be checked if the sensor units are changed in parameter 'G4.3.2 ➔ Selection of sensor 2 units'. It is necessary to set this value to operate in open loop and closed loop.

Note: This parameter will be only available if 'G4.3.1 ➔ To enable sensor of Analogue Input 2' is set to 'Y'.

G4.3.8 SPEED FOR THE MINIMUM RANGE OF ANALOGUE INPUT 2

Screen	**8 SPD LO2 = +0%**
Extended info.	**SPD LO RNG AIN2**
Description	Speed corresponding to the minimum range of the Analogue Input 2
Range	-250% to +250% (max. G4.3.9)
Default value	+0%
Set on run	YES
Modbus address	**40247**
Modbus range	-20480 to 20480 (max. G4.3.9)
Read / Write	YES

Function	If the Analogue Input 2 is used for introducing the speed reference (setting of parameter 'G4.3.1 ➔ To enable sensor of Analogue Input 2' to 'N'), we can set in this parameter the value of this reference corresponding to the minimum voltage or current level set in parameter 'G4.3.4 ➔ Minimum range of Analogue Input 2'. The value set here is a percentage of the motor rated speed ('G2.4 ➔ Motor rpm'). See figure 10.20.

G4.3.9 SPEED FOR THE MAXIMUM RANGE OF ANALOGUE INPUT 2

Screen	**9 SPD HI2 = +100%**
Extended info.	**SPD HIG RNG AIN2**
Description	Speed corresponding to the maximum range of the Analogue Input 2
Range	-250% to +250% (min. G4.3.8)
Default value	+100%
Set on run	YES
Modbus address	**40243**
Modbus range	-20480 to 20480 (min. G4.3.8)
Read / Write	YES
Function	If the Analogue Input 1 is used for introducing the speed reference (setting of parameter 'G4.3.1 ➔ To enable sensor of Analogue Input 2' to 'N'), we can set in this parameter the value of this reference corresponding to the maximum voltage or current level set in parameter 'G4.3.6 ➔ Maximum range of Analogue Input 2'. The value set here is a percentage of the motor rated speed ('G2.4 ➔ Motor rpm'). See figure 10.20.

G4.3.14 PROTECTION FOR ANALOGUE INPUT 2 LOSS

Screen	**14 AIN2 LOSS = N**
Description	Protection for the Analogue Input 2 loss
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40267**
Modbus range	0 to 1
Read / Write	YES
Function	It allows user to decide about the behaviour of the equipment when the signal connected to the Analogue Input 2 is lost. Options: N ➔ NO Disabled function. Drive does not realize any action in case of the analogue input signal is lost. Y ➔ YES Drive will stop generating the fault 'F43 AIN2 LOSS', since the sensor will be considered damaged, when a sharp drop down to zero value in the level of the analogue input signal is detected.

G4.3.15 ZERO BAND FILTER FOR ANALOGUE INPUT 2

Screen	**15 2_Z_BAND=OFF**
Extended info.	**AIN2 ZERO BAND**
Description	Zero band filter for the Analogue Input 2
Range	OFF=0.0 – 2.0%
Default value	OFF
Set on run	YES
Modbus address	**40271**
Modbus range	0 to 163
Read / Write	YES

Function

Setting a value in this parameter, we obtain a filtering of the Analogue Input 2 signal, eliminating a possible electrical noise associated to the signal that impedes reading a zero value when it must be read.

The aim of this parameter is supplying a pre-defined zero area for controls by analogue inputs, especially for speed control. It eliminates small errors in the reference voltage near to zero reference point.

See figure 10.21.

Note: The function of zero band filter is not applied to the reference signals through digital inputs, since these settings are absolute zero.

G4.3.16 LOW PASS FILTER FOR ANALOGUE INPUT 2

Screen	**16 FILTER2 = OFF**
Extended info.	**AIN2 STABIL FILT**
Description	Low Pass filter for the Analogue Input 2
Range	OFF=0.0 – 20.0%
Default value	OFF
Set on run	YES
Modbus address	**40275**
Modbus range	0 to 200
Read / Write	YES

Function

It allows filtering the signal of the Analogue Input 2. By setting the value of this time constant we can eliminate possible instabilities in the value of the same ones due to noise, wiring faults, etc.

Note: When applying a Low Pass filter to any analogue signal, a delay time in the own signal is generated. This delay time is the value of the configured time constant approximately.

10.4.4. Subgroup 4.4 – S4.4: Pulse Input

This input is used for the flow limitation algorithm. See subgroup S25.10 Flow Limitation Algorithm.

For using this input you must have a flow meter with a pulse digital output of pulsewidth greater than 50ms.

G4.4.1	SENSOR UNITS OF PULSE INPUT
Screen	**1 Sensr U = l/m**
Description	Sensor units of pulse input
Range	%, l/s, m³/s, l/m, m³/m, l/h, m³/h, m/s, m/m, m/h
Default value	l/m
Set on run	YES
Modbus address	**40581**
Modbus range	0 to 9
Read / Write	YES
Function	It allows selecting the units of measurement for reading the flow.

G4.4.2	FLOWMETER CONFIGURATION
Screen	**2 Pls/s = 100l/s**
Extended info.	LIQU AMOUNT/PULS
Description	Flowmeter configuration
Range	0 to 32760 Flow units
Default value	100l/s
Set on run	YES
Modbus address	**40582**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows setting the amount of the fluid per pulse received. For example, if setting is ‘100l/s’ (default value) and the present flow is 500l/s, 5 pulses per second will be received.

G4.4.3	MAXIMUM RANGE OF FLOWMETER
Screen	**3 M Rng = 1000l/s**
Extended info.	FLOW MAX RANGE
Description	Maximum range of flowmeter
Range	0 to 32760 Flow units
Default value	1000l/s
Set on run	YES
Modbus address	**40583**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows setting the maximum range of the flowmeter. It is used to calculate the reset level of the flow control algorithm. The percentage set in ‘G25.10.4 ➔ Flow percentage to reset algorithm’ is linked to the value set in this parameter. For example, if 100 units are set as maximum range in this parameter, and we want that the reset level of the flow algorithm is below 30 units, then G25.10.4 should be set to ‘30%’.

10.5. Group 5 – G5: Acceleration and Deceleration Ramps

G5.1 ACCELERATION RAMP 1

Screen	**1 ACCE1 = 3.0%/s**
Extended info.	INITIAL ACCEL
Description	Acceleration ramp 1
Range	0.01 – 650%/s
Default value	3.0%/s
Set on run	YES
Modbus address	**40392**
Modbus range	10 to 65000
Read / Write	YES

Function

It allows user to set the acceleration ramp 1 according to the requirements of each process.

The setting is in acceleration units (increase in % of speed per second). For example, an acceleration ramp of 10%/s means that the drive increases its speed by 10% of motor rated speed per each second elapsed. If parameter 'G5.5 ➔ Speed for acceleration ramp change' is set to 'OFF', drive will search the reference speed by following the acceleration pattern set in this parameter.

See figures 10.22 and 10.23.

For instance, we have a motor of 50Hz and 4 poles with a synchronism rated speed of 1500rpm. If we set the acceleration ramp to 5%/s, motor will take 20 seconds to reach the 100% of its speed (1500rpm) from 0% (motor is completely stopped at the beginning).

Note: Usually, it should be used slower settings supported by the application. An acceleration ramp too much fast can cause equipment overload (ILT status), making that this ramp is ignored and replaced with a slower ramp automatically.

To get a better programming you must be realistic with these settings. If you need fast accelerations and/or decelerations, we advise you to use slower settings firstly until the remaining operations are checked.

G5.2 DECELERATION RAMP 1

Screen	**2 DECEL1 = 3.0%/s**
Extended info.	INITIAL DECEL
Description	Deceleration ramp 1
Range	0.01 – 650%/s
Default value	3.0%/s
Set on run	YES
Modbus address	**40394**
Modbus range	10 to 65000
Read / Write	YES

Function	It allows user to set the deceleration ramp 1 according to the requirements of each process.

The setting is in deceleration units (decrease in % of speed per second). For example, a deceleration ramp of 10%/s means that the drive decreases its speed by 10% of motor rated speed per each second elapsed. If parameter 'G5.6 ➔ Speed for deceleration ramp change' is set to 'OFF', drive will search the reference speed by following the deceleration pattern set in this parameter.

See figures 10.22 and 10.23.

Note: Usually, it should be used slower settings supported by the application. A deceleration ramp too much fast can cause motor regeneration to the drive (VLT). For this, drive will replace the set ramp with a slower ramp automatically.

To get a better programming you must be realistic with these settings. If you need fast accelerations and/or decelerations, we advise you to use slower settings firstly until the remaining operations are checked.

G5.3 ACCELERATION RAMP 2

Screen	**3 ACCE 2 = 1.0%/s**
Extended info.	SECOND ACCELE
Description	Acceleration ramp 2
Range	0.01 – 650%/s
Default value	1.0%/s
Set on run	YES
Modbus address	**40393**
Modbus range	10 to 65000
Read / Write	YES

Function: It allows user to set the alternative acceleration ramp according to the requirements of each process.

The setting is in acceleration units (increase in % of speed per second). For example, an alternative acceleration ramp of 10%/s means that the drive increases its speed by 10% of motor rated speed per each second elapsed. If parameter 'G5.5 ➔ Speed for acceleration ramp change' is set to a specific value, drive will search the reference speed by following the acceleration pattern set in parameter 'G5.1 ➔ Acceleration ramp 1', and once reached the change speed, drive will continue the search of the reference speed by applying the alternative acceleration pattern set in this parameter.

See parameter 'G5.1 ➔ Acceleration ramp 1' for additional information.

See figures 10.22 and 10.23.

G5.4 DECELERATION RAMP 2

Screen	**4 DECEL2 = 1.0%/s**
Extended info.	SECOND DECELE
Description	Deceleration ramp 2
Range	0.01 – 650%/s
Default value	1.0%/s
Set on run	YES
Modbus address	**40395**
Modbus range	10 to 65000
Read / Write	YES

Function	It allows user to set the alternative deceleration ramp according to the requirements of each process. The setting is in deceleration units (decrease in % of speed per second). For example, an alternative deceleration ramp of 10%/s means that the drive decreases its speed by 10% of motor rated speed per each second elapsed. If parameter 'G5.6 ➔ Speed for deceleration ramp change' is set to a specific value, drive will search the reference speed by following the deceleration pattern set in parameter 'G5.2 ➔ Deceleration ramp 1', and once reached the change speed, drive will continue the search of the reference speed by applying the alternative deceleration set in this parameter. See parameter 'G5.2 ➔ Deceleration ramp 2' for additional information. See figures 10.22 and 10.23.

G5.5 SPEED FOR ACCELERATION RAMP CHANGE

Screen	**5 BRK ACC = OFF**
Extended info.	**BREAKPOINT ACL**
Description	Speed for acceleration ramp change
Range	OFF, 0 to 250%
Default value	OFF
Set on run	YES
Modbus address	**40396**
Modbus range	0 to 20480
Read / Write	YES
Function	It allows using the alternative acceleration ramp (parameter G5.3). When drive is accelerating and the speed set in this parameter is reached, drive will start to apply the alternative acceleration ramp from that moment on. If this parameter is set to 'OFF' (default value), drive will only apply the acceleration ramp 1 (parameter G5.1).
Note:	The alternative acceleration ramp can be selected independently of drive speed. This selection can be realized through digital inputs (by configuring one of them with the option '14 ➔ ACC/DEC 2') or by using the output functions of comparators (for example, if the magnitude of the comparator is the drive rated current, when the drive output current exceeds a defined level, calculated as % of In, a ramp change occurs). See figures 10.22 and 10.23.

G5.6 SPEED FOR DECELERATION RAMP CHANGE

Screen	**6 BRK DEC = OFF**
Extended info.	**BREAKPOINT DCL**
Description	Speed for deceleration ramp change
Range	OFF, 0 to 250%
Default value	OFF
Set on run	YES
Modbus address	**40397**
Modbus range	0 to 20480
Read / Write	YES

Function It allows using the alternative deceleration ramp (parameter G5.4).
When the drive is decelerating and the speed set in this parameter is reached, drive will start to apply the alternative deceleration ramp from that moment on. If this parameter is set to 'OFF' (default value), drive will only apply the deceleration ramp 1 (parameter G5.2).

Note: The alternative deceleration ramp can be selected independently of drive speed. This selection can be realized through digital inputs (by configuring one of them with the option '14 ➔ ACC/DEC 2') or by using the output functions of comparators (for example, if the magnitude of the comparator is the drive rated current, when the drive output current is below a defined level, calculated as % of In, a ramp change occurs).

See figures 10.22 and 10.23.

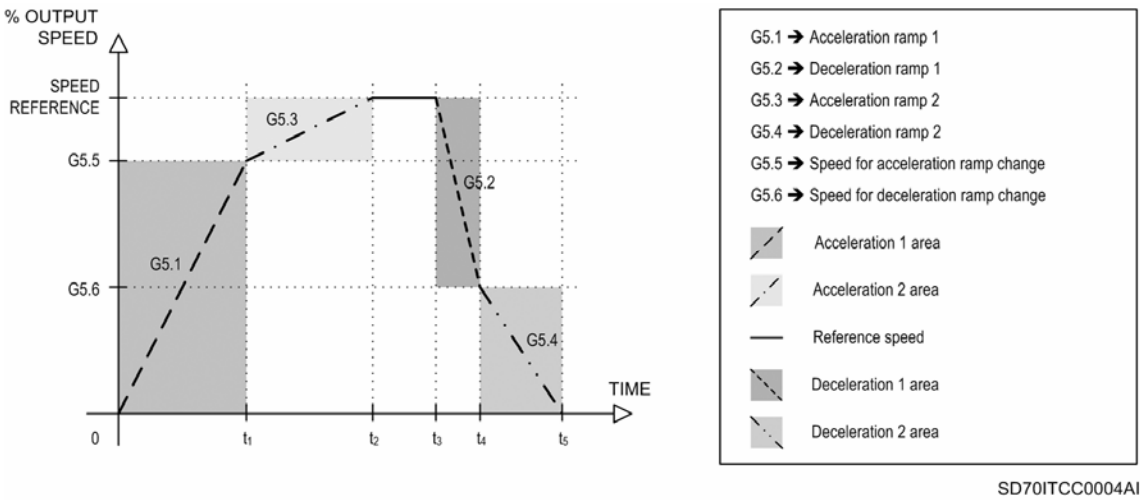

Figure 10.22 Main and alternative acceleration /deceleration ramps

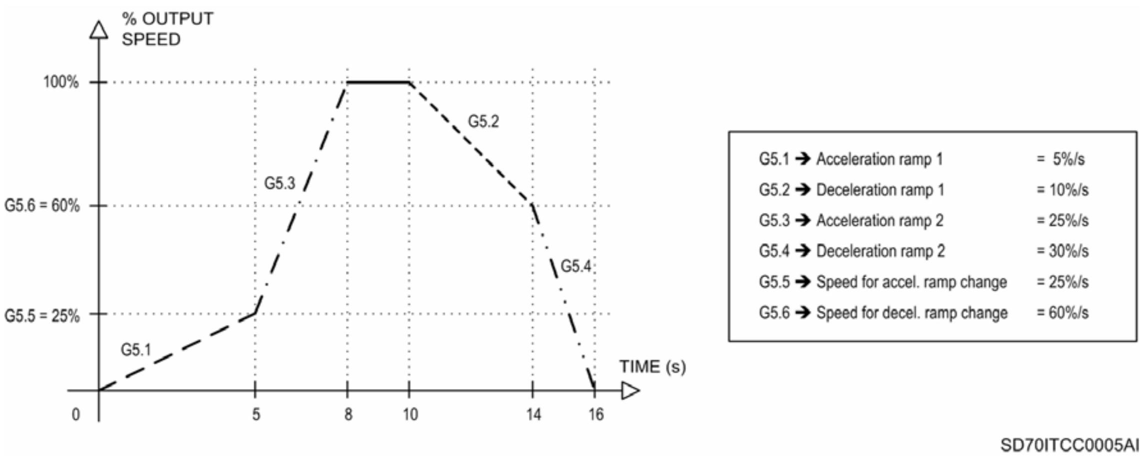

Figure 10.23 Application example of main and alternative acceleration / deceleration ramps

G5.7 RAMP 1 OF REFERENCE INCREASE FOR MOTORIZED POTENTIOMETER

Screen	**7 MPT INC1 = 1.0%/s**
Extended info.	**MOTO POT INC1**
Description	Ramp 1 of reference increase for motorized potentiometer function
Range	0.01 – 650%/s
Default value	1.0%/s
Set on run	YES
Modbus address	**40400**
Modbus range	10 to 65000
Read / Write	YES

Function

It allows setting the ramp 1 of reference increase for motorized potentiometer function.

This function is configured in 'G4.1.4 ➔ Selection of digital inputs configuration' with the option '4 ➔ MOTORIZED POT' or '5 ➔ ERASAB POT'. Additionally, it is necessary to set 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' with the option 'PMOT' depending on the selected source is 1 or 2.

With this function, user can introduce the speed reference by means of two push buttons connected to the digital inputs DI5 (up or increase the speed reference) and DI6 (down or decrease the speed reference).

While we press 'Up' push button, we can increase the speed by applying up to two different ramps previously set (ramps 1 and 2 of reference increase). The ramp change is set in parameter 'G5.11 ➔ Speed for ramp change with motorized potentiometer'. If G5.11 is set to 'OFF', any ramp change will not be done. In this case, the drive will search the reference speed by only applying the ramp 1 for reference increase of motorized potentiometer set in this parameter.

Setting is realized in acceleration units (increase in % of speed per second).

See figure 10.24.

G5.8 RAMP 1 OF REFERENCE DECREASE FOR MOTORIZED POTENTIOMETER

Screen	**8 MPT DEC1 = 3.0%/s**
Extended info.	**MOTO POT DEC1**
Description	Ramp 1 of reference decrease for motorized potentiometer function
Range	0.01 – 650%/s
Default value	3.0%/s
Set on run	YES
Modbus address	**40399**
Modbus range	10 to 65000
Read / Write	YES

Function

It allows setting the ramp 1 of reference decrease for motorized potentiometer function.

This function is configured in ‘G4.1.4 ➔ Selection of digital inputs configuration’ with the option ‘4 ➔ MOTORIZED POT’ or ‘5 ➔ ERASAB POT’. Additionally, it is necessary to set ‘G3.1 ➔ Reference source 1 of speed’ or ‘G3.2 ➔ Reference source 2 of speed’ with the option ‘PMOT’ depending on the selected source is 1 or 2.

With this function, user can introduce the speed reference by means of two push buttons connected to the digital inputs DI5 (up or increase the speed reference) and DI6 (down or decrease the speed reference).

While we press ‘Down’ push button, we can decrease the speed by applying up to two different ramps previously set (ramps 1 and 2 of reference decrease). The ramp change is set in parameter ‘G5.11 ➔ Speed for ramp change with motorized potentiometer’. If G5.11 is set to ‘OFF’, any ramp change will not be done. In this case, the drive will search the reference speed by only applying the ramp 1 for reference decrease of motorized potentiometer set in this parameter.

Setting is realized in deceleration units (decrease in % of speed per second).

See figure 10.24.

G5.9 RAMP 2 OF REFERENCE INCREASE FOR MOTORIZED POTENTIOMETER

Screen	**9 MPT INC2 = 1.0%/s**
Extended info.	**MOTO POT INC2**
Description	Ramp 2 of reference increase for motorized potentiometer function
Range	0.01 – 650%/s
Default value	1.0%/s
Set on run	YES
Modbus address	**40398**
Modbus range	10 to 65000
Read / Write	YES

Function

It allows setting the ramp 2 of reference increase for motorized potentiometer function.

This function is configured in ‘G4.1.4 ➔ Selection of digital inputs configuration’ with the option ‘4 ➔ MOTORIZED POT’ or ‘5 ➔ ERASAB POT’. Additionally, it is necessary to set ‘G3.1 ➔ Reference source 1 of speed’ or ‘G3.2 ➔ Reference source 2 of speed’ with the option ‘PMOT’ depending on the selected source is 1 or 2.

With this function, user can introduce the speed reference by means of two push buttons connected to the digital inputs DI5 (up or increase the speed reference) and DI6 (down or decrease the speed reference).

While we press ‘Up’ push button, we can increase the speed by applying up to two different ramps previously set (ramps 1 and 2 of reference increase). The ramp change is set in parameter ‘G5.11 ➔ Speed for ramp change with motorized potentiometer’. The drive will apply the ramp 1 until the speed exceeds the value set in G5.11. From that moment on, drive will start to apply the ramp 2. If G5.11 is set to ‘OFF’, any ramp change will not be done, and the drive will search the reference speed by only applying the ramp 1 for reference increase of motorized potentiometer set in this parameter.

Setting is realized in acceleration units (increase in % of speed per second).

See figure 10.24.

G5.10	RAMP 2 OF REFERENCE DECREASE FOR MOTORIZED POTENTIOMETER

Screen	**10 MPT DEC2 = 3.0%/s**
Extended info.	MOTO POT DEC2
Description	Ramp 2 of reference decrease for motorized potentiometer function
Range	0.01 – 650%/s
Default value	3.0%/s
Set on run	YES
Modbus address	**40401**
Modbus range	10 to 65000
Read / Write	YES

Function

It allows setting the ramp 2 of reference decrease for motorized potentiometer function.

This function is configured in 'G4.1.4 ➔ Selection of digital inputs configuration' with the option '4 ➔ MOTORIZED POT' or '5 ➔ ERASAB POT'. Additionally, it is necessary to set 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' with the option 'PMOT' depending on the selected source is 1 or 2.

With this function, user can introduce the speed reference by means of two push buttons connected to the digital inputs DI5 (up or increase the speed reference) and DI6 (down or decrease the speed reference).

While we press 'Up' push button, we can decrease the speed by applying up to two different ramps previously set (ramps 1 and 2 of reference decrease). The ramp change is set in parameter 'G5.11 ➔ Speed for ramp change with motorized potentiometer'. The drive will apply the ramp 1 until the speed is below the value set in G5.11. From that moment on, drive will start to apply the ramp 2. If G5.11 is set to 'OFF', any ramp change will not be done, and the drive will search the reference speed by only applying the ramp 1 for reference decrease of motorized potentiometer set in this parameter.

Setting is realized in deceleration units (decrease in % of speed per second).

See figure 10.24.

G5.11	SPEED FOR RAMP CHANGE WITH MOTORIZED POTENTIOMETER

Screen	**11 MPOT BRK = OFF**
Extended info.	MOTO POT BRKPOIN
Description	Speed for increase / decrease ramps change with motorized potentiometer
Range	OFF=0 to 250% (of speed reference)
Default value	OFF
Set on run	YES
Modbus address	**40402**
Modbus range	0 to 20480
Read / Write	YES

Function

This parameter allows using the alternative ramps of reference increase and decrease with motorized potentiometer function, selected in 'G4.1.4 ➔ Selection of digital inputs configuration' with the option '4 ➔ MOTORIZED POT' or '5 ➔ ERASAB POT', and also set 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' with the option 'PMOT' depending on the selected source is 1 or 2.

Change speed is set in this parameter. When the speed is above or below the change speed, drive will start to apply the alternative ramps. If this parameter is set to 'OFF', any ramp change will not be done, this is, drive only applies the ramps set in 'G5.7 ➔ Ramp 1 of reference increase for motorized potentiometer' and 'G5.8 ➔ Ramp 1 of reference decrease for motorized potentiometer'.

See figure 10.24.

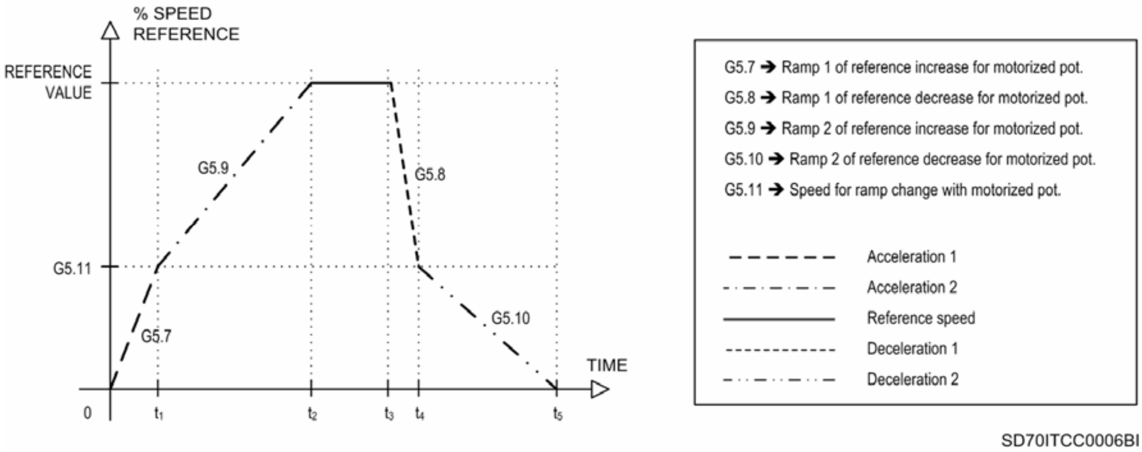

Figure 10.24 Main and alternative acceleration / deceleration ramps of motorized potentiometer

G5.12 TIME CONSTANT TO FILTER THE SPEED

Screen	**12 SP FLT = 0.250s**
Extended info.	**SMOOT SPD FILTER**
Description	Time constant for the filtering of speed signal
Range	0.000 – 60.0s
Default value	0.250s
Set on run	YES
Modbus address	**40403**
Modbus range	0 to 60000
Read / Write	YES

Function: It provides with S – Curve filter for the speed reference changes, including Start/Stop commands. The S – Curve filter limits acceleration and deceleration changes by making soft.

It is especially useful in cranes and elevators.

Note: If different value is not required, set to default value. A value different to ‘0’ will affect to the system response.

10.6. Group 6 – G6: PID Control

SDRIVE 700 is provided with a PID regulator that allows controlling automatically a process which depends on the physical variable according to the motor speed (for example, pressure, flow, height, current, temperature, etc.). The functions of PID regulator will be set in the parameters of this group, after enabling the PID regulator in parameters 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed' (option 'PID').
The PID regulator operates correctly with factory settings, nevertheless, if you want to optimize the setting, you can follow the next steps:

- Increase the proportional gain (parameter G6.3) until the first oscillation is taken place; then, set it to 40% of the value in which the oscillation occurred.
- Decrease the integration time (parameter G6.4) until the first oscillation is taken place; then, set it to 150% of the value in which the oscillation occurred.
- Increase the derivation time (parameter G6.5) until achieving a small impulse without occurring oscillation. Usually, derivation time does not exceed 25% of integration time.

G6.1	SOURCE SELECTION FOR INTRODUCING REFERENCE SIGNAL

Screen	**1 SEL REF = MREF**
Description	Selection of introduction source for PID regulator setpoint
Range	NONE AI1 AI2 RESERV MREF LOCAL locPID (See 'Function' for additional information)
Default value	MREF
Set on run	YES
Modbus address	**40142**
Modbus range	0 to 6
Read / Write	YES

Function

It allows user to select the source for introducing the setpoint of PID regulator.

Selection options:

NONE ➔ Source disabled.

AI1 ➔ Setpoint of PID regulator is introduced by Analogue Input 1.

AI2 ➔ Setpoint of PID regulator is introduced by Analogue Input 2.

RESERV ➔ Reserved for future use.

MREF ➔ Setpoint of PID regulator is introduced by means of digital inputs configured as multi-references (see parameter 'G4.1.4 ➔ Selection of digital inputs configuration', and 'G3.1 ➔ Reference source 1 of speed' or 'G3.2 ➔ Reference source 2 of speed').

LOCAL ➔ Setpoint of PID regulator is introduced by keypad. Value adjusted in 'G3.3 ➔ Local speed reference'.

locPID ➔ Setpoint of PID regulator is introduced by keypad. Value adjusted in 'G6.2 ➔ PID local reference'. It allows having two speed references set from keypad, since 'G3.3 ➔ Local speed reference' is not modified when this parameter is adjusted.

G6.2 PID LOCAL REFERENCE

Screen	**2 PID LOC = +0.0%**
Extended info.	PID LOCAL SETPOI
Description	Local reference for PID regulator
Range	+0.0% to +400%
Default value	+0.0%
Set on run	YES
Modbus address	**40149**
Modbus range	0 to 32760
Read / Write	YES

Function

Setpoint value of PID regulator is set in this parameter when option 'locPID' is selected in parameter 'G6.1 ➔ Source selection for introducing reference signal'.

The value of parameter 'G3.3 ➔ Local speed reference' is not modified when a setpoint value of PID regulator is set here. Parameter G3.3 together with this one, offer the possibility of having two references or setpoints adjusted from keypad for PID regulator.

Note: This parameter will only be available if 'G6.1 ➔ Source selection for introducing reference signal' is set to 'locPID'.

G6.3 SELECTION OF FEEDBACK SIGNAL SOURCE

Screen	**3 SEL FBK = AI2**
Description	Selection of feedback signal source for PID regulator
Range	NONE AI1 AI2 RESERV (See 'Function' for additional information)
Default value	AI2
Set on run	YES
Modbus address	**40143**
Modbus range	0 to 3
Read / Write	YES

Function

It allows selecting the source through which the feedback signal will be introduced to close the control loop.

Selection options are the following ones:

NONE ➔ The PID function is not active.

AI1 ➔ Feedback signal introduced through the Analogue Input 1.

AI2 ➔ Feedback signal introduced through the Analogue Input 2.

RESERV ➔ Reserve.

G6.4 PROPORTIONAL GAIN OF PID CONTROL

Screen	**4 GAIN Kp = 8.0**
Extended info.	PID PROPORTIONAL
Description	Proportional gain of PID control
Range	0.1 to 20
Default value	8.0
Set on run	YES
Modbus address	**40144**
Modbus range	1 to 200
Read / Write	YES

Function It allows setting the proportional gain of PID regulator.

Note: Usually, default value is enough for a good control. If a higher control response is required, increase this value. An increase of this value can introduce a higher instability to the system.

G6.5 INTEGRATION TIME OF PID CONTROL

Screen	**5 INTEGRAL = 0.0s**
Extended info.	PID INTEGRAL
Description	Integral time of PID control
Range	0.0 – 1000s, Max.
Default value	0.0s
Set on run	YES
Modbus address	**40145**
Modbus range	0 to 10000, 10001
Read / Write	YES

Function It allows setting the integration time of PID control.

Note: Usually, default value is enough for a good control. If this value is increased, system accuracy is improved, but its response can become slower.

G6.6 DERIVATION TIME OF PID CONTROL

Screen	**6 DIFFEREN = 0.0s**
Extended info.	PID DIFFERENTIAL
Description	Derivation time of PID control
Range	0.0 – 250s
Default value	0.0s
Set on run	YES
Modbus address	**40146**
Modbus range	0 to 2500
Read / Write	YES

Function It allows setting the derivation time of PID control.

Note: Usually, default value is enough for a good control. If this value is increased, then the system response is increased, but accuracy can decrease.

G6.7 PID OUTPUT INVERSION

Screen	**7 INVERT PID = N**
Description	Inversion of PID regulator output
Range	N Y (See ‘Function’ for additional information)
Default value	N
Set on run	NO
Modbus address	**40147**
Modbus range	0 to 1
Read / Write	YES

Function

It allows inverting the output of PID regulator.

Options:

N ➔ NO

Inversion disabled.

PID regulator responds in normal mode. When the feedback signal value is above the reference signal value, speed will be decreased. If the feedback signal is below the reference signal, speed will be increased.

In short, PID regulator responds with a speed increase from a feedback signal drop. This one is the normal setting when PID regulator is used for example, in a constant pressure control application. A pressure drop (feedback) due to a higher demand requires a speed increase of the pump to maintain the pressure.

Y ➔ YES

Inversion enabled.

PID regulator responds in inverse mode. When the feedback signal value is above the reference signal value, speed will be increased. If the feedback signal is below the reference signal, speed will be decreased.

This means that PID regulator response from a feedback signal drop is a decrease of the output speed. This is the typical response required when, for example, PID regulator is used for temperature control. A temperature decrease (feedback) due to a lower demand requires that fan speed decreases to maintain the temperature.

G6.8 PID CONTROL ERROR

Screen	**8 ERR PID = +0.0%**
Description	PID control error
Range	-
Default value	-
Set on run	-
Modbus address	**40148**
Modbus range	-
Read / Write	Read Only

Function

It shows the difference between the reference or setpoint value of PID regulator (source of which is set in ‘G6.1 ➔ Source selection for introducing reference signal’) and the feedback signal value of the process (source of which is set in ‘G6.3 ➔ Selection of feedback signal source’).

This parameter is read only.

10.7. Group 7 – G7: Start / Stop Mode Configuration

G7.1	STOP MODE 1

Screen	**1 STOP 1 = RAMP**
Description	Stop mode 1
Range	RAMP SPIN (See ‘Function’ for additional information)
Default value	RAMP
Set on run	YES
Modbus address	**40003**
Modbus range	0 to 1
Read / Write	YES

Function

It allows selecting the main stop mode of drive. The selected option must be the appropriate one for each application.

Selection options:

RAMP ➔ Drive will stop by applying a frequency ramp to stop the motor, this is, drive applies a ‘zero’ speed reference and decelerates down to that speed according to the pattern set in ‘G5.2 ➔ Deceleration ramp 1’.

SPIN ➔ Drive will turn off the output voltage to the motor and this one will stop by inertia. Stopping time is determined by system inertia.
This stop option is recommended for applications with big inertias (mills, fans, crushers, etc.), with the purpose of avoiding possible motor regeneration to the drive.

Note: Stop mode 1 or 2 (parameter G7.2) can be selected through a digital input (by configuring a digital input with options ’02 ➔ STOP1’ or ’04 ➔ STOP1 – RESET’ for stop mode 1, or with options ’19 ➔ STOP (2)’ or ’03 ➔ STOP2 – RESET’ for stop mode 2, in parameter ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’) or by configuring the output function of one of the comparators (options ’02 ➔ STOP 1’ and ’03 ➔ STOP 2’ in parameter ‘G9.1.9 ➔ Selection of output function for Comparator 1’, ‘G9.2.9 ➔ Selection of output function for Comparator 2’ or ‘G9.3.9 ➔ Selection of output function for Comparator 3’), or automatically by setting a changing speed in ‘G7.3 ➔ Changing speed for stop mode’.

See figures 10.25 and 10.27.

G7.2	STOP MODE 2

Screen	**2 STOP 2 = SPIN**
Description	Stop mode 2
Range	RAMP SPIN
Default value	SPIN
Set on run	YES
Modbus address	**40004**
Modbus range	0 to 1
Read / Write	YES

Function	It allows selecting the alternative stop mode of drive. The selected option must be the appropriate one for each application.

See parameter ‘G7.1 ➔ Stop mode 1’ to obtain information about selection options.

Note: Stop mode 1 or 2 (parameter G7.2) can be selected through a digital input (by configuring a digital input with options ’02 ➔ STOP1’ or ’04 ➔ STOP1 – RESET’ for stop mode 1, or with options ’19 ➔ STOP (2)’ or ’03 ➔ STOP2 – RESET’ for stop mode 2, in parameter ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’) or by configuring the output function of one of the comparators (options ’02 ➔ STOP 1’ and ’03 ➔ STOP 2’ in parameter ‘G9.1.9 ➔ Selection of output function for Comparator 1’, ‘G9.2.9 ➔ Selection of output function for Comparator 2’ or ‘G9.3.9 ➔ Selection of output function for Comparator 3’), or automatically by setting a changing speed in ‘G7.3 ➔ Changing speed for stop mode’.

See figures 10.25 and 10.27.

G7.3 CHANGING SPEED FOR STOP MODE

Screen	**3 BRK STP 2 = OFF**
Extended info.	**STP2 UNDER SPEED**
Description	Changing speed for stop mode (from stop by RAMP to Stop by SPIN)
Range	OFF=0 to 250%
Default value	OFF
Set on run	YES
Modbus address	**40005**
Modbus range	0 to 20480
Read / Write	YES

Function: Drive changes the stop mode from RAMP to SPIN by setting this parameter to a value different to zero, when drive is stopping and reaches the speed value set in this parameter.

We suppose that drive has the stop mode 1 or 2 set by RAMP (depending on the stop mode selected is the main or alternative one) as stop mode selected. When drive receives the stop command, the drive will stop by applying a deceleration ramp from the operating speed (steady status) until reaching the speed set here, and from that moment on, drive will apply the stop mode by SPIN (drive turns off the output to the motor and this one is stopped by inertia) until stopping. If this parameter is set to ‘OFF’, stop mode change will not be realized.

See figures 10.25 and 10.27.

Note: This parameter has only effect when stop mode 1 or 2 (depending on the mode selection) is set to ‘RAMP’.

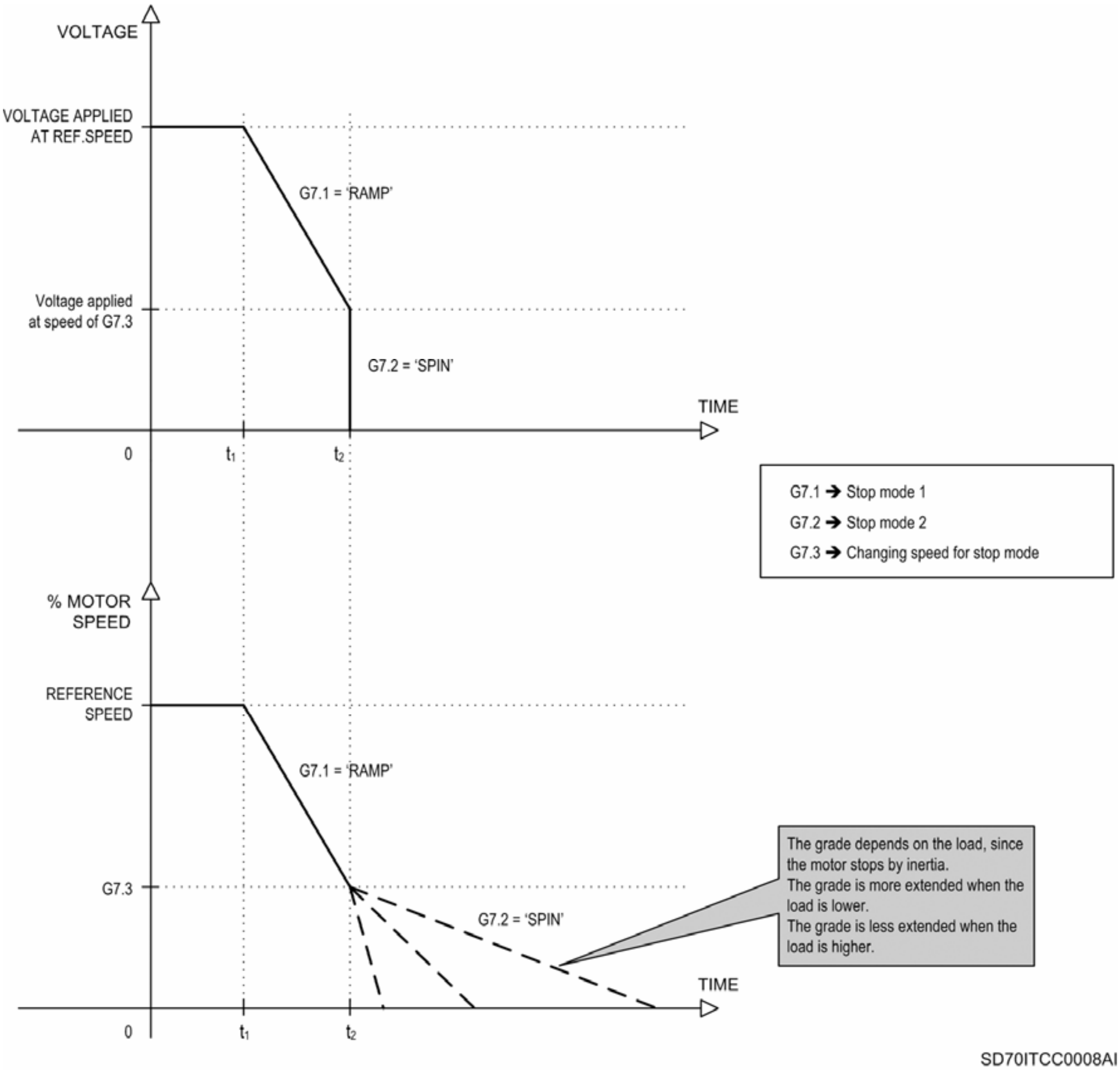

Figure 10.25 Change from stop mode by RAMP to stop mode by SPIN

Note: Stop mode 1 or 2 (parameter G7.2) can be selected through a digital input (by configuring a digital input with options '02 ➔ STOP1' or '04 ➔ STOP1 – RESET' for stop mode 1, or with options '19 ➔ STOP (2)' or '03 ➔ STOP2 – RESET' for stop mode 2, in parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') or by configuring the output function of one of the comparators (options '02 ➔ STOP 1' and '03 ➔ STOP 2' in parameter 'G9.1.9 ➔ Selection of output function for Comparator 1', 'G9.2.9 ➔ Selection of output function for Comparator 2' or 'G9.3.9 ➔ Selection of output function for Comparator 3'), or automatically by setting a changing speed in 'G7.3 ➔ Changing speed for stop mode'.

G7.4 START MODE

Screen	**4 START = RAMP**
Description	Start mode definition
Range	RAMP SPIN (See 'Function' for additional information)
Default value	RAMP
Set on run	YES
Modbus address	**40002**
Modbus range	0 to 1
Read / Write	YES

Function

It allows selecting the main start mode of the motor.

Selection options:

RAMP ➔ Drive will start by applying a frequency ramp to the motor until reaching the speed or setpoint value.
See figures 10.26 and 10.27.

SPIN ➔ In this mode, drive searches the motor shaft speed and the output frequency of the drive is set to match with the actual motor speed. From this point, the motor is accelerated up to the reference speed. This allows starting loads that are already rotating without braking the motor when the drive receives a start command, by accelerating progressively up to reference speed.
See figure 10.26.

If starting a load that are already rotating is required (for example, a fan) in a conventional way, several problems can appear due to the motor power supply starts from 0Hz to the reference frequency (setpoint of speed). This means that rotor would rotate faster that stator and a sudden braking of the load would be generated, due to this, a mechanical blow is produced and its consequent regeneration. If we select the option 'SPIN', then we can start loads in movement avoiding these problems.

Note: When drive starts by 'SPIN', rotation direction applied to the motor is the same rotation direction of reference speed. When speed reference is 0.0, rotation direction applied to the motor is positive.

The following figure shows the drive behaviour at starting by 'SPIN'. In this case, the starting is due to an input power loss and reestablishment of it again.

Drive can also start in this way if:

- Option 'SPIN' is configured (motor is stopped by inertia) in parameter 'G7.1 ➔ Stop mode 1' or 'G7.2 ➔ Stop mode 2' (depending on the stop mode selection realized before).

- Drive receives the stop command and starts to stop the motor. Drive receives the start command again before motor is stopped completely.

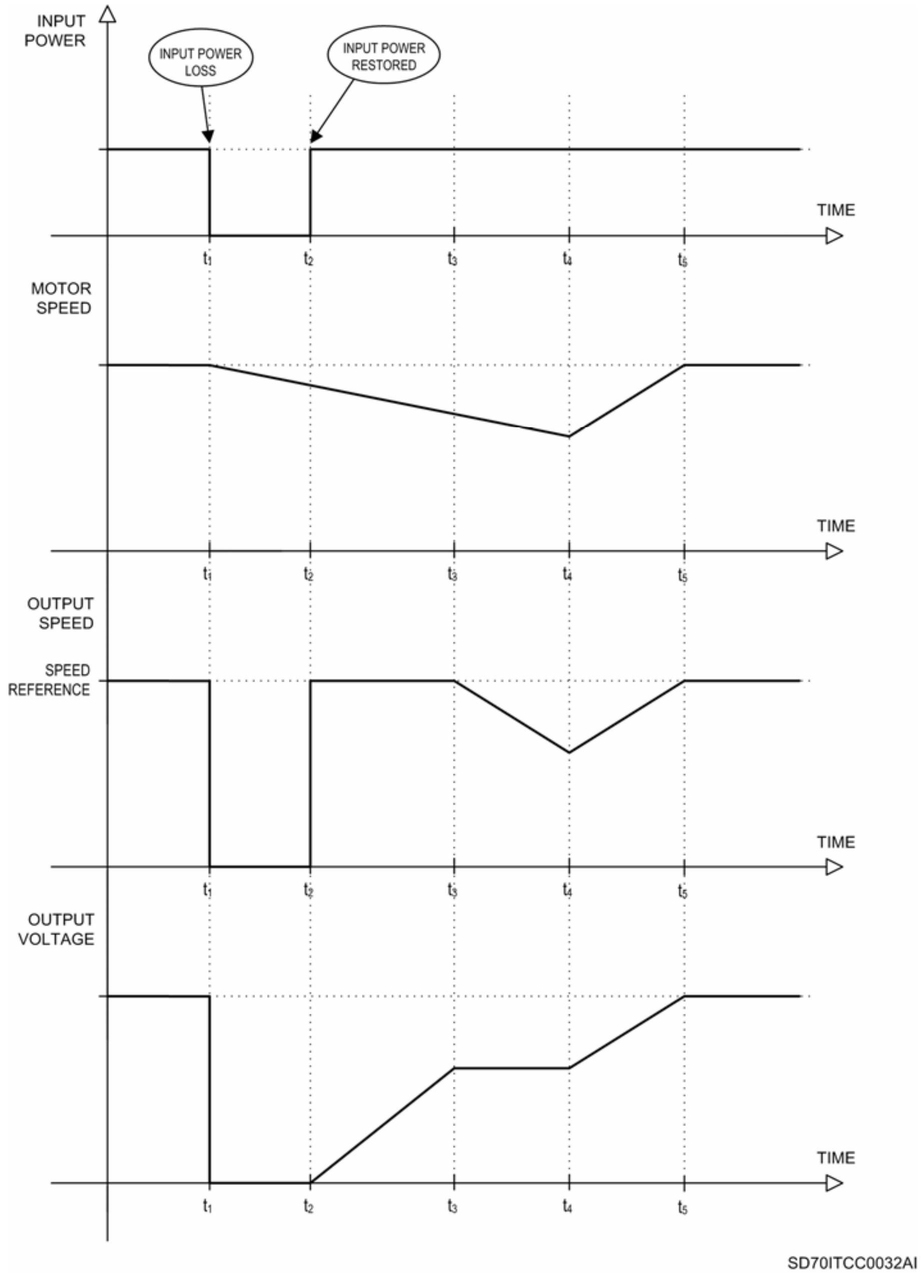

Figure 10.26 Start by 'SPIN' of drive when input power is lost and restored again

G7.5	START MODE 2

Screen	**5 START 2 = RAMP**
Description	Start mode 2 definition
Range	RAMP SPIN
Default value	RAMP
Set on run	YES
Modbus address	**40015**
Modbus range	0 to 1
Read / Write	YES

Function	It allows selecting the alternative start mode of the motor.
	See parameter 'G7.4 ➔ Start mode' to obtain information about selection options.
	See figures 10.26 and 10.27.
Note:	Start mode 2 (alternative start mode) is selected through a digital input configured with option '22 ➔ START MODE 2' (in parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration').

G7.6 START DELAY TIME

Screen	**6 START DLY = OFF**
Extended info.	**RETRASO ARRANQUE**
Description	Start delay time
Range	OFF=0 – 6500s
Default value	OFF
Set on run	YES
Modbus address	**40006**
Modbus range	0 to 65000
Read / Write	YES
Function	It allows setting a delay time from the drive receives the start command to begin the motor starting.
	See figure 10.27.

G7.7 STOP DELAY TIME

Screen	**7 STOP DLY = OFF**
Extended info.	**DELAY TO STOP**
Description	Stop delay time
Range	OFF=0 – 6500s
Default value	OFF
Set on run	YES
Modbus address	**40007**
Modbus range	0 to 65000
Read / Write	YES
Function	It allows setting a delay time from the drive receives the stop command to begin the motor stopping.
	See figure 10.27.

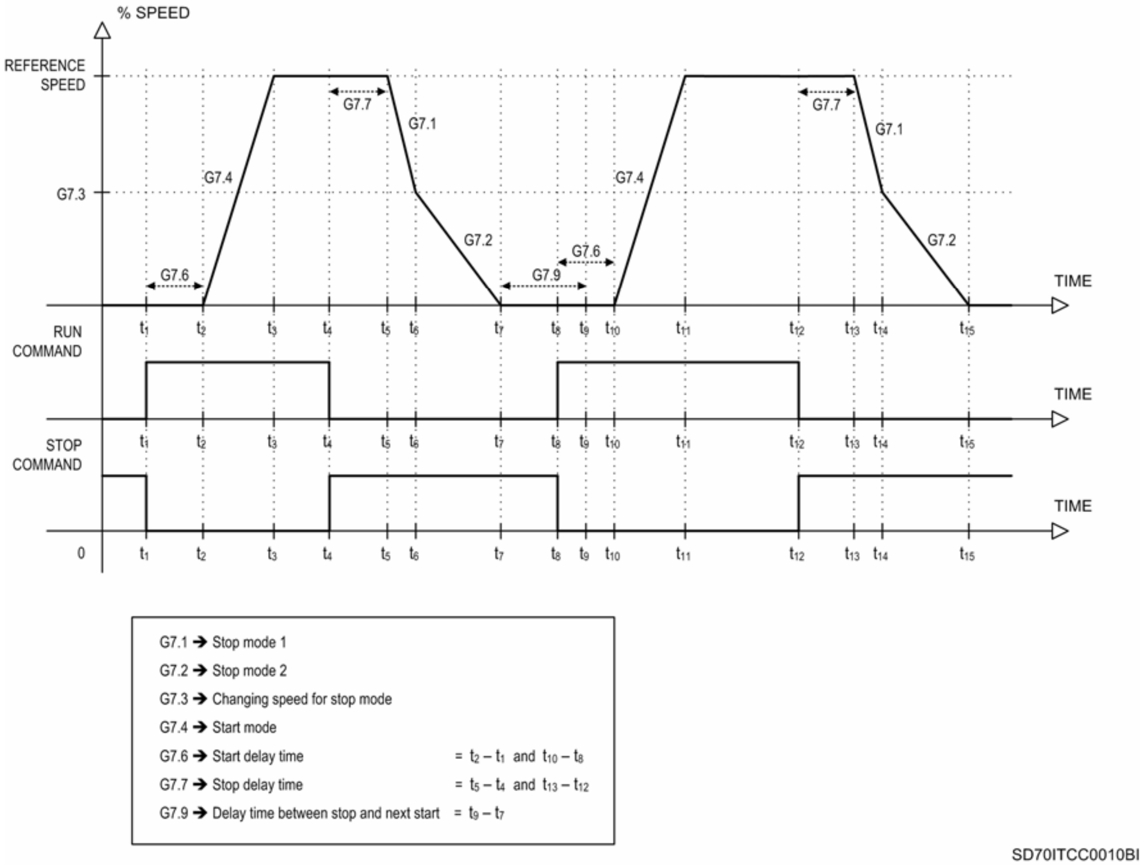

Figure 10.27 Parameters representation of group G7

G7.8	**MINIMUM STOP SPEED**

Screen	**8 STP MIN SP = N**
Description	Minimum stop speed
Range	N Y (See ‘Function’ for additional information)
Default value	N
Set on run	YES
Modbus address	**40008**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user the possibility of stopping the motor if the speed reference is below the lower speed limit.

Options:

N ➔ NO

If the drive is decelerating, motor will reach the minimum speed defined as lower speed limit (set in ‘G10.1 ➔ Minimum speed limit 1’ or ‘G10.3 ➔ Minimum speed limit 2’), even if speed reference is below these settings. For example, if ‘G10.1 ➔ Minimum speed limit 1’ is set to ‘+30.00%’, and the speed reference is +20.00%, then drive will operate at +30.00% and not below that value.

Y ➔ YES

If the drive is decelerating and the reference is below the lower speed limit, then drive will stop by spin.
While reference is below this limit, drive will be ready. Once reference exceeds the lower speed limit, the drive will start until reaching the reference value introduced, whenever the start command is activated.

Note: If stopping the motor when reference is below a predefined speed is required, this parameter must be set to 'Y'. Additionally, you must set the correct values in 'G10.1 ➔ Minimum speed limit 1' or 'G10.3 ➔ Minimum speed limit 2'.

G7.9 DELAY TIME BETWEEN STOP AND NEXT START

Screen	**9 OFFdly = OFF**
Extended info.	**DELAY AFTER STOP**
Description	Delay time to start after stopping the drive
Range	OFF=0.000 – 10.000s
Default value	OFF
Set on run	YES
Modbus address	**40014**
Modbus range	0 to 10000
Read / Write	YES

Function: It allows setting a delay time between the moment the drive has stopped and the next starting.

At the moment of the drive is stopped, it begins to count the time set in this parameter. Several situations can occur:

1. Drive receives the start command after elapsing the minimum time set in this parameter.
   In this case, the drive will not count any delay time more at the moment of the starting, whenever any delay time is not set in parameter 'G7.6 ➔ Start delay time'.

2. Drive receives the start command before elapsing the minimum time set in this parameter.
   In this case, if any delay time at the starting has not been set in G7.6, the drive will start immediately after elapsing the minimum time set here.
   If a start delay time has been set in G7.6, the drive will begin to count this time from the moment of receiving the start command. If the start delay time elapses before this minimum time, the drive will wait for this minimum time is elapsed to start. If the minimum time elapses before the start delay time, the drive will wait for the start delay time is elapsed to start.

In short, the drive will wait for the time set in this parameter at least before starting.

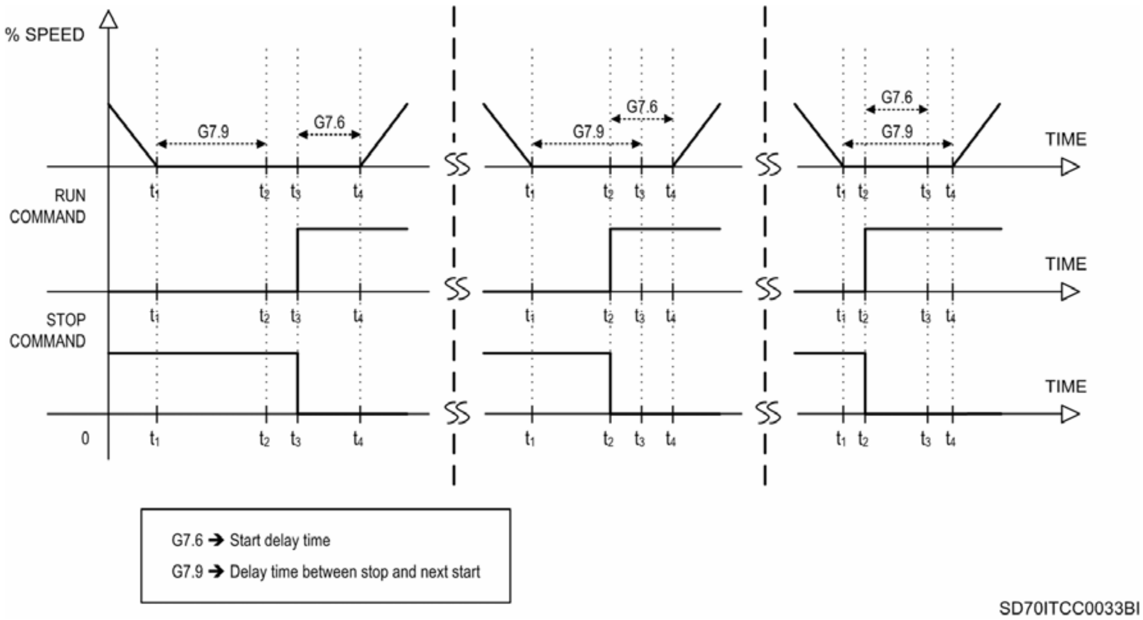

Figure 10.28 Drive starting and stopping according to the parameters G7.6 and G7.9

G7.10 RUN AFTER OCCURING POWER LOSS

Screen	**10 RUN AFTR VFL = Y**
Description	Run after occurring power loss
Range	N S (See 'Function' for additional information)
Default value	Y
Set on run	YES
Modbus address	**40009**
Modbus range	0 to 1
Read / Write	YES

Function

It allows setting the equipment to start automatically when input power is lost and restored immediately (power supply loss or instant power supply loss).

Configuration options:

N → NO

Drive will not start after recovering input power, even if the start command is activated. User must deactivated the start command and activate again. See figure 10.29.

Y → YES

Drive will start automatically when input power is restored after power loss occurring, whenever the start command follows activated. See figure 10.30.

Note: If Start/Stop control is realized from the keypad, the drive will not start automatically when input power is restored after power loss occurring, since the signal is not kept activated.

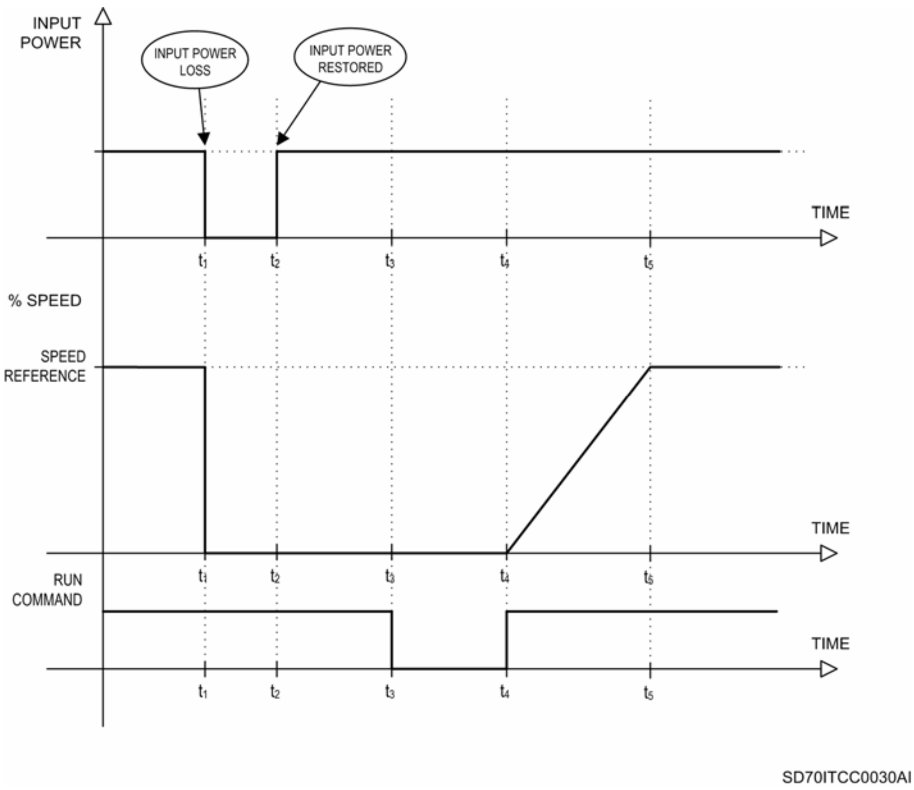

Figure 10.29 Parameter G7.10 set to 'N'. Running does not continue after recovering input power

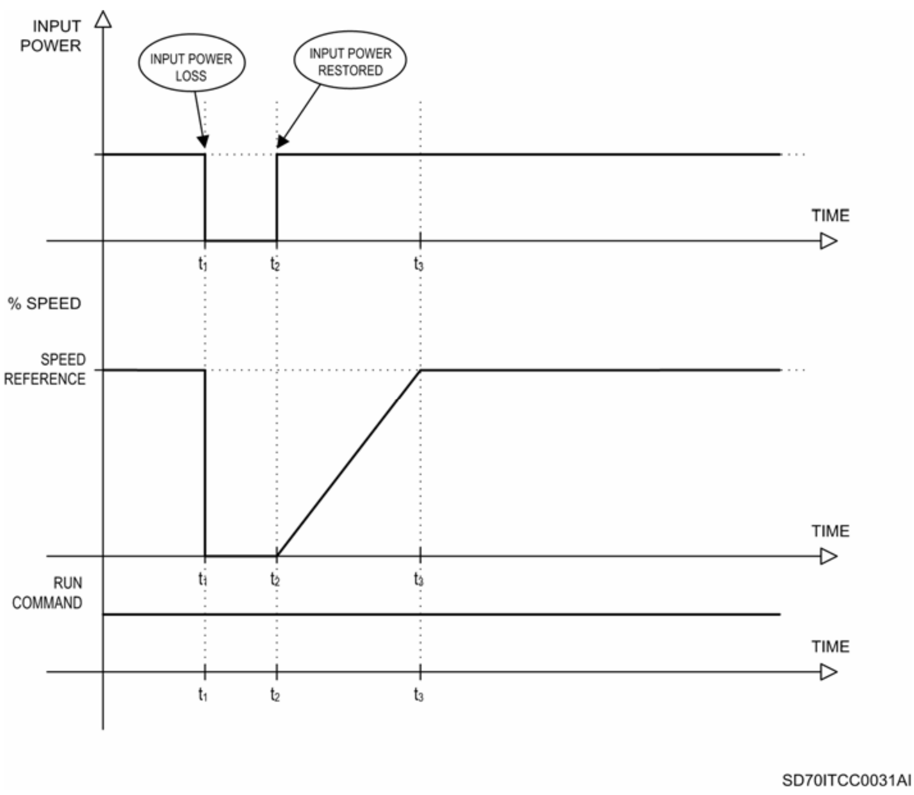

Figure 10.30 Parameter G7.10 set to 'Y'. Running continues after recovering input power

G7.11	ACCURACY SETTING FOR STARTING BY SPIN

Screen	**11 SPNstr B = OFF**
Extended info.	SPIN START TUNE
Description	Accuracy setting for starting by spin
Range	OFF=0, 1 – 100%
Default value	OFF
Set on run	YES
Modbus address	**40017**
Modbus range	0 to 1000
Read / Write	YES
Function	It allows setting the accuracy of the speed searching function when the drive starts by SPIN mode. Usually, the optimum value is between 2 and 5%. As the value is lower, more accuracy is required.

G7.12	DELAY TIME FOR START COMMAND AFTER STOP (2)

Screen	**12 OFFdly2 = OFF**
Extended info.	DELAY AFTER STP2
Description	Delay time for start command after stop (delay time between stop and next start (2))
Range	OFF=0.0 – 6500.0s
Default value	OFF
Set on run	YES
Modbus address	**40031**
Modbus range	0 to 65000
Read / Write	YES
Function	Delay time for start command after producing a stop. If the start command is given after the time set in this parameter has elapsed, the drive will start immediately.

10.8. Group 8 – G8: Outputs

10.8.1. Subgroup 8.1 – S8.1: Output Relays

G8.1.1	SELECTION OF RELAY 1 CONTROL SOURCE
Screen	**1 SEL RELAY 1 = 02**
Description	Selection of the control source for the Relay 1
Range	00 – 32 (See 'Function' for additional information)
Default value	02
Set on run	NO
Modbus address	**40362**
Modbus range	0 to 32
Read / Write	YES
Function	It allows configuring the operation for Relay 1 according to the following options:

00 ➔ ALWAYS OFF
Output is not active.

01 ➔ ALWAYS ON
When the drive is powered, the output relay is activated.

02 ➔ NO FAULTS
There is no fault in the drive. When a fault occurs, the relay will be activated.

03 ➔ GENERAL FAULT
Drive fault or low input voltage will activate the relay.

04 ➔ START
Relay is active when the drive has received the start command.

05 ➔ RUN
The relay will be energized after the drive is started.

06 ➔ READY
Drive is ready for start (no fault and no warning).

07 ➔ ZERO SPEED
Drive is running at zero speed.

08 ➔ SET SPEED
Speed has reached the value set as reference.

09 ➔ SP DIRECTION
The relay is activated when the speed direction is negative.

10 ➔ RESERVE
Reserved for future use.

11 ➔ SP REF DIRECT
The relay is activated when the speed reference direction is negative.

12 ➔ RESERVE
Reserved for future use.

13 ➔ SP LIMIT
Maximum or minimum speed limit 1 (main limits) has been reached, or maximum or minimum speed limit 2 (alternative limits) has been reached, depending on the selected limits. All of these limits are set in group G10 LIMITS.

14 ➔ CURR LIMIT
Limit of motor current adjusted in 'G10.5 ➔ Current limit' has been reached.

15 ➔ VOLT LIMIT
DC Bus voltage limit has been reached (740V).

16 ➔ TORQ LIMIT
Torque limit adjusted in G10.7 has been reached.

17 ➔ COMPARATOR1
When the Comparator 1 output is active, relay is activated. See group G9 COMPARATORS.

18 ➔ COMPARATOR2
When the Comparator 2 output is active, relay is activated. See group G9 COMPARATORS.

19 ➔ COMPARATOR3
When the Comparator 3 output is active, relay is activated. See group G9 COMPARATORS.

20 ➔ ACC / DEC 2
Relay is activated if the alternative acceleration / deceleration ramps are being used. These alternative ramps are set in 'G5.3 ➔ Acceleration ramp 2' and 'G5.4 ➔ Deceleration ramp 2') and are selected through one of the digital inputs (option '14 ➔ ACC/DEC 2' in parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration'), or by means of the output function of one of the comparators (option '09 ➔ ACC / DEC 2' in parameter 'G9.1.9 ➔ Selection of output function for Comparator 1' to 'G9.3.9 ➔ Selection of output function for Comparator 3').

21 ➔ REFERENCE 2
Relay is activated if reference 2 ('G3.2 ➔ Reference source 2 for speed') has been selected through one of the digital inputs (option '15 ➔ REFERENCE 2' in parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration'), or by means of the output function of one of the comparators (option '10 ➔ REFERENCE 2' in parameter 'G9.1.9 ➔ Selection of output function for Comparator 1' to 'G9.3.9 ➔ Selection of output function for Comparator 3').

22 ➔ STOP 2
Relay is activated if stop mode 2 (G7.2) is being used. Stop mode 2 is selected through one of the digital inputs (option '19 ➔ STOP 2' in parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration'), or by means of the output function of one of the comparators (option '03 ➔ STOP 2' in parameter 'G9.1.9 ➔ Selection of output function for Comparator 1' to 'G9.3.9 ➔ Selection of output function for Comparator 3').

23 ➔ SP LIMIT 2
Relay is activated if the alternative speed limits (‘G10.3 ➔ Minimum speed limit 2’ and ‘G10.4 ➔ Maximum speed limit 2’) have been selected through one of the digital inputs (option ’20 ➔ SPEED LIMIT 2’ in parameter ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’), or by means of the output function of one of the comparators (option ’03 ➔ STOP 2’ in parameter ‘G9.1.9 ➔ Selection of output function for Comparator 1’ to ‘G9.3.9 ➔ Selection of output function for Comparator 3’).

24 ➔ DC BRAKE
Relay is activated if DC brake is active.

25 ➔ RESERVE
Reserved for future use.

26 ➔ RESERVE
Reserved for future use.

27 ➔ RESERVE
Reserved for future use.

28 ➔ PUMP CNTRL
The equipment activates the relay to connect the fixed pump. See ‘G25.9.1 ➔ To enable fixed pump associated to Output Relay 1’ to ‘G25.9.3 ➔ To enable fixed pump associated to Output Relay 3’.

29 ➔ JOCKEY PUMP
For those periods of low demand if the drive is in sleep mode. This pump will stop when the pump of the drive is connected or when the demand disappears.

30 ➔ PRIMING PUMP
To fill the suction pipe. This pump will stop when the suction is filled and then the drive pump will start.

31 ➔ SLEEP CONDIT
The relay commutates if the equipment has the sleep conditions fulfilled or not. Once the equipment is stopping, the relay commutates again. This function operates together with the parameter ‘G25.4.28 ➔ To enable sleep mode’ (see this parameter).

32 ➔ CRANE BRAKE
The relay will be activated like in option ’05 RUN’, considering the ON delay time for the relay itself (parameters G8.1.2, G8.1.6 or G8.1.10 depending on the used relay) and will be deactivated when the motor speed is below the speed set in ‘G8.1.13 ➔ Speed for disconnecting relay in option Crane’.

G8.1.2 ON DELAY TIME FOR RELAY 1

Screen	**2 T R1 ON = 0.0s**
Extended info.	R1 ACTIVAT DELAY
Description	ON delay time for the Relay 1
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40363**
Modbus range	0 to 9999
Read / Write	YES

Function: It allows user to set a delay time before activating the Relay 1.

If during this time, the activation condition disappears, the relay will be not activated.

G8.1.3 OFF DELAY TIME FOR RELAY 1

Screen	**3 T R1 OFF = 0.0s**
Extended info.	**R1 DEACTIV DELAY**
Description	OFF delay time for the Relay 1
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40364**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows user to set a delay time before deactivating the Relay 1.

If during this time, the deactivation condition disappears, the relay will be not deactivated, this is, the relay will follow activated.

G8.1.4 RELAY 1 INVERSION

Screen	**4 INVERT REL1 = N**
Description	Logic inversion of the Relay 1
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	NO
Modbus address	**40365**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to invert the logic of the Relay 1.

Relay 1 has one normally open contact (terminals 26/27) and another normally closed contact (terminals 27/28).

N ➔ NO
No inversion.

Y ➔ YES
Inversion of relay logical function.

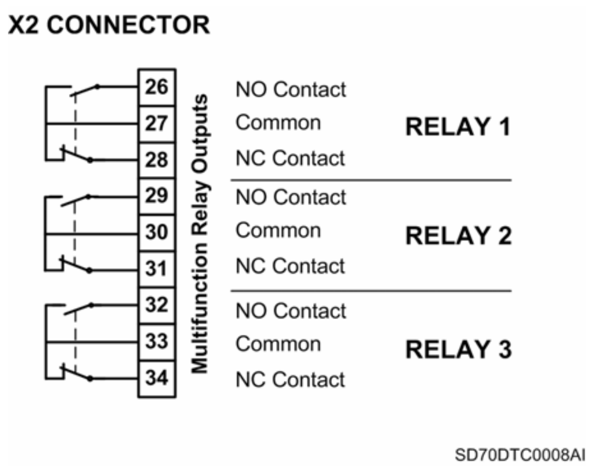

Figure 10.31 X2 connector. Connections for the outputs relays

G8.1.5 SELECTION OF RELAY 2 CONTROL SOURCE

Screen	**5 SEL RELAY 2 = 03**
Description	Selection of the control source for the Relay 2
Range	00 – 32
Default value	03
Set on run	NO
Modbus address	**40366**
Modbus range	0 to 32
Read / Write	YES

Function: It allows configuring the operation of the Relay 2.

See parameter 'G8.1.1 ➔ Selection of Relay 1 control source' to obtain information about the configuration options.

G8.1.6 ON DELAY TIME FOR RELAY 2

Screen	**6 T R2 ON = 0.0s**
Extended info.	**R2 ACTIVAT DELAY**
Description	ON delay time for the Relay 2
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40367**
Modbus range	0 to 9999
Read / Write	YES

Function: It allows user to set a delay time before activating the Relay 2.

If during this time, the activation condition disappears, the relay will be not activated.

G8.1.7 OFF DELAY TIME FOR RELAY 2

Screen	**7 T R2 OFF = 0.0s**
Extended info.	**R2 DEACTIV DELAY**
Description	OFF delay time for the Relay 2
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40368**
Modbus range	0 to 9999
Read / Write	YES

Function: It allows user to set a delay time before deactivating the Relay 2.

If during this time, the deactivation condition disappears, the relay will be not deactivated, this is, the relay will follow activated.

G8.1.8 RELAY 2 INVERSION

Screen	**8 INVERT REL2 = N**
Description	Logic inversion of the Relay 2
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	NO
Modbus address	**40369**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to invert the logic of the Relay 2.

Relay 2 has one normally open contact (terminals 29/30) and another normally closed contact (terminals 30/31).
See figure 10.31.

N ➔ NO
No inversion.

Y ➔ YES
Inversion of relay logical function.

G8.1.9 SELECTION OF RELAY 3 CONTROL SOURCE

Screen	**9 SEL RELAY 3 = 05**
Description	Selection of the control source for the Relay 3
Range	00 – 32
Default value	05
Set on run	NO
Modbus address	**40370**
Modbus range	0 to 32
Read / Write	YES

Function

It allows configuring the operation of the Relay 3.

See parameter 'G8.1.1 ➔ Selection of Relay 1 control source' to obtain information about the configuration options.

G8.1.10 RETARDO A LA CONEXIÓN DEL RELÉ 3

Screen	**10 T R3 ON = 0.0s**
Extended info.	**R3 ACTIVAT DELAY**
Description	ON delay time for the Relay 3
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40371**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows user to set a delay time before activating the Relay 3.

If during this time, the activation condition disappears, the relay will be not activated.

G8.1.11 OFF DELAY TIME FOR RELAY 3

Screen	**11 T R3 OFF = 0.0s**
Extended info.	R3 DEACTIV DELAY
Description	OFF delay time for the Relay 3
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40372**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows user to set a delay time before deactivating the Relay 3.

If during this time, the deactivation condition disappears, the relay will be not deactivated, this is, the relay will follow activated.

G8.1.12 RELAY 3 INVERSION

Screen	**12 INVERT REL3 = N**
Description	Logic inversion of the Relay 3
Range	N Y (See ‘Function’ for additional information)
Default value	N
Set on run	NO
Modbus address	**40373**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to invert the logic of the Relay 3.

Relay 3 has one normally open contact (terminals 32/33) and another normally closed contact (terminals 33/34).
See figure 10.31.

N ➔ NO
No inversion.

Y ➔ YES
Inversion of relay logical function.

G8.1.13 SPEED FOR DISCONNECTING RELAY IN OPTION CRANE

Screen	**13 CRAspdOF = +5.0%**
Extended info.	CRANE BRKoff SPD
Description	Speed for disconnecting the relay in option Crane
Range	+0.0% to +250%
Default value	+5.0%
Set on run	YES
Modbus address	**40597**
Modbus range	0 to 20480
Read / Write	YES

Function

This parameter allows setting the speed below which, any relay configured with option ‘32 CRANE BRAKE’ will be deactivated.

10.8.2. Subgroup 8.2 – S8.2: Analogue Outputs

G8.2.1	MODE SELECTION FOR ANALOGUE OUTPUT 1

Screen	**1 ANLG OUT1 = 01**
Description	Mode selection for the Analogue Output 1
Range	00 – 27 (See 'Function' for additional information)
Default value	01
Set on run	NO
Modbus address	**40342**
Modbus range	0 to 27
Read / Write	YES

Function

It allows user to configure the Analogue Input 1 according to the following options:

00 ➔ NONE
It is not used.

01 ➔ SPEED MOTOR
Signal proportional to the motor speed.
Units: %Motor speed.

02 ➔ CURRENT MOTOR
Signal proportional to the motor current.
Units: %Motor rated current.

03 ➔ VOLTAGE MOTOR
Signal proportional to the motor voltage.
Units: %Motor rated voltage.

04 ➔ POWER MOTOR
Signal proportional to the motor power.
Units: %Motor power.

05 ➔ TORQUE MOTOR
Signal proportional to the motor torque.
Units: %Motor torque.

06 ➔ PF MOTOR
Signal proportional to the motor power factor.
Units: %Motor rated Cosine Phi.

07 ➔ TEMP MOTOR
Signal proportional to the motor temperature.
Units: %Motor temperature.

08 ➔ FREQUENCY MTR
Signal proportional to the input frequency.
Units: %Input frequency (50Hz = 100%).

09 ➔ INPUT VOLTAGE
Signal proportional to the input voltage.
Units: %Equipment rated voltage.

10 ➔ DC BUS
Signal proportional to the DC Bus voltage.
Units: %Motor voltage x 1.414

11 ➔ DRIVE TEMP
Signal proportional to the drive temperature.
Units: %Drive temperature.

12 ➔ SPEED REF
Signal proportional to the speed reference.
Units: %Motor speed.

13 ➔ Reserved
Reserved for future use.

14 ➔ PID REFERENCE
Signal proportional to the reference in PID mode.
Units: %.

15 ➔ PID FEEDBACK
Signal proportional to the feedback in PID mode.
Units: %.

16 ➔ PID ERROR
Signal proportional to the error (difference between reference signal and feedback signal) in PID mode.
Units: %.

17 ➔ ANLG INPUT 1
Analogue Input 1 signal is transferred to analogue output.
Units: %.

18 ➔ ANLG INPUT 2
Analogue Input 2 signal is transferred to analogue output.
Units: %.

19 ➔ ANLG INPUT 1+2
Signal proportional to the addition of the two inputs. This allows course and fine setting of the signal.
Units: %.

20 ➔ CURRENT FLOW
Analogue signal proportional to the read flow through analogue input or pulse input.
Units: %.

21 ➔ MAX SCALE
It forces the output to the maximum value.
Units: 100% bottom scale.

22 ➔ ABSOLUT SPEED
Signal proportional to the motor speed without sign (absolute value).
Units: %Motor speed.

27 ➔ MACRO PUMP
0V = Pump OFF
10V = Pump ON
Units: -.

Note: This option is not directly programmable by user for any of the analogue outputs. This option is automatically set for Analogue Input 1 when the user enables the fixed pump 4 (in parameter 'G25.9.4 ➔ To enable fixed pump associated to Analogue Output 1'), and it will be automatically set to Analogue Input 2 when the user enables the fixed pump 5 (in parameter 'G25.9.5 ➔ To enable fixed pump associated to Analogue Output 5'). For both outputs, the configuration will always be from 0 to 10V, where 0V indicates that pump is disconnected and 10V indicates that pump is connected.

G8.2.2 FORMAT SELECTION FOR ANALOGUE OUTPUT 1

Screen	**2 FORMT 1 = 4-20mA**
Description	Format selection for the Analogue Output 1
Range	0 – 10V ± 10V 0 – 20mA 4 – 20mA
Default value	4 – 20mA
Set on run	NO
Modbus address	**40343**
Modbus range	0 to 3
Read / Write	YES
Function	It allows configuring the Analogue Output 1 in one of four possible formats according to the system requirements.

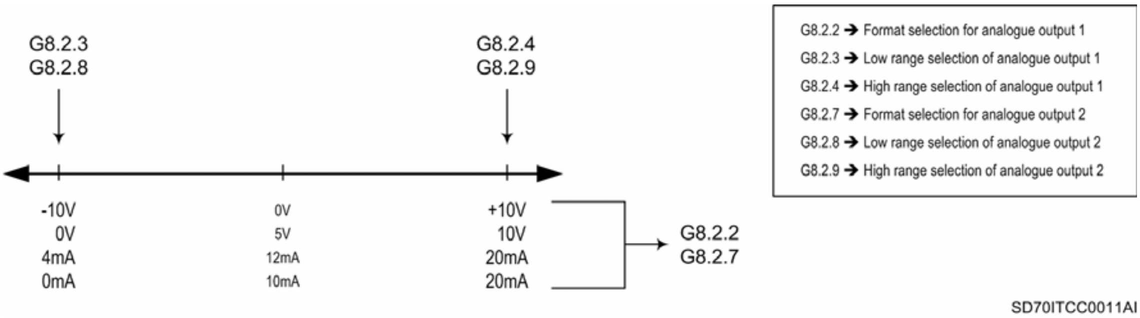

Figure 10.32 Format of analogue outputs

G8.2.3 LOW RANGE SELECTION OF ANALOGUE OUTPUT 1

Screen	**3 MIN1 RNG = +0%**
Extended info.	**MIN RANG ANAOUT1**
Description	Low range selection of Analogue Output 1
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40344**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows setting the minimum level of the Analogue Output 1. Minimum value setting can be higher than the value of maximum level. This allows the user to achieve inverse scaling. In this way, as the magnitude taken as reference in 'G8.2.1 ➔ Mode selection for Analogue Output 1' increases, the output will decrease and vice versa. See figure 10.32.

G8.2.4 HIGH RANGE SELECTION OF ANALOGUE OUTPUT 1

Screen	**4 MAX1 RNG = +100%**
Extended info.	MAX RANG ANAOUT1
Description	High range selection of Analogue Output 1
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40345**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows setting the maximum level of the Analogue Output 1.

Maximum value setting can be lower than the value of minimum level. This allows the user to achieve inverse scaling. In this way, as the magnitude taken as reference in 'G8.2.1 ➔ Mode selection for Analogue Output 1' increases, the output will decrease and vice versa.

See figure 10.32.

G8.2.5 FILTER SELECTION FOR ANALOGUE OUTPUT 1

Screen	**5 FILTER 1 = OFF**
Extended info.	FILTER ANAOUTPU1
Description	Filter selection for the Analogue Output 1
Range	OFF=0.0 – 20.0s
Default value	OFF
Set on run	YES
Modbus address	**40346**
Modbus range	0 to 200
Read / Write	YES

Function: It allows selecting a filter for the Analogue Output 1 value and, in the same time, setting a value.

Sometimes, if the analogue signal appears slightly unstable, improved stability and response can be achieved with the addition of a suitable filter value.

Note: Filter use can add a slight delay to the analogue output signal.

G8.2.6 MODE SELECTION FOR ANALOGUE OUTPUT 2

Screen	**6 ANLG OUT2 = 02**
Description	Mode selection for the Analogue Output 2
Range	00 – 27
Default value	02
Set on run	NO
Modbus address	**40347**
Modbus range	0 to 27
Read / Write	YES

Function: It allows user to configure the Analogue Input 2. For this, see parameter 'G8.2.1➔ Mode selection for Analogue Output 1' where different configuration options are listed and explained.

G8.2.7 FORMAT SELECTION FOR ANALOGUE OUTPUT 2

Screen	**7 FORMT 2 = 4-20mA**
Description	Format selection for the Analogue Output 2
Range	0 – 10V ± 10V 0 – 20mA 4 – 20mA
Default value	4 – 20mA
Set on run	NO
Modbus address	**40348**
Modbus range	0 to 3
Read / Write	YES
Function	It allows configuring the Analogue Output 1 in one of four possible formats according to the system requirements.

G8.2.8 LOW RANGE SELECTION OF ANALOGUE OUTPUT 2

Screen	**8 MIN2 RNG = +0%**
Extended info.	MIN RANG ANAOUT2
Description	Low range selection of Analogue Output 2
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40349**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows setting the minimum level of the Analogue Output 2. Minimum value setting can be higher than the value of maximum level. This allows the user to achieve inverse scaling. In this way, as the magnitude taken as reference in 'G8.2.6 ➔ Mode selection for Analogue Output 2' increases, the output will decrease and vice versa. See figure 10.32.

G8.2.9 HIGH RANGE SELECTION OF ANALOGUE OUTPUT 2

Screen	**9 MAX2 RNG = +100%**
Extended info.	MAX RANG ANAOUT2
Description	High range selection of Analogue Output 2
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40350**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows setting the maximum level of the Analogue Output 2. Maximum value setting can be lower than the value of minimum level. This allows the user to achieve inverse scaling. In this way, as the magnitude taken as reference in 'G8.2.6 ➔ Mode selection for Analogue Output 2' increases, the output will decrease and vice versa. See figure 10.32.

G8.2.10 FILTER SELECTION FOR ANALOGUE OUTPUT 2

Screen	**10 FILTER 2 = OFF**
Extended info.	FILTER ANAOUTPU2
Description	Filter selection for the Analogue Output 2
Range	OFF=0.0 – 20.0s
Default value	OFF
Set on run	YES
Modbus address	**40351**
Modbus range	0 to 200
Read / Write	YES

Function It allows selecting a filter for the Analogue Output 2 value and, in the same time, setting a value.

Sometimes, if the analogue signal appears slightly unstable, improved stability and response can be achieved with the addition of a suitable filter value.

Note: Filter use can add a slight delay to the analogue output signal.

Next, we expound some examples about how the analogue outputs must be configured.

Example 1.

We want to configure Analogue Output 1 as 0 to 10V output for a sensor to measure the speed motor of 1440rpm, rotating in inverse direction (-1440rpm), with a range from -3000rpm to +3000rpm. Motor rated speed is 1500rpm.

- Set mode of Analogue Output 1 in G8.2.1 to '01 ➔ SPEED MOTOR' (motor speed).
- Select format for Analogue Output 1 in G8.2.2 to '0 – 10V'.
- Set minimum and maximum values (high range and low range) of the Analogue Output 1 scale in parameters G8.2.3 (for low range) and G8.2.4 (for high range).

  G8.2.3 ➔ '-200%' since -3000rpm is -200% of the motor rated speed (1500rpm)
  G8.2.4 ➔ '+200%' since +3000rpm is +200% of the motor rated speed (1500rpm)

$$\frac{V_{max} - V_{min}}{Rng_{max} - Rng_{min}} \cdot (\text{Motor speed}) + V_{spd0}$$

Where,

V_{max}	➔ Maximum voltage of Analogue Output 1
V_{min}	➔ Minimum voltage of Analogue Output 1
Rng_{max}	➔ Maximum speed of the motor
Rng_{min}	➔ Minimum speed of the motor
$V_{vel\ 0}$	➔ Output voltage at zero speed of the motor (0rpm)

Replacing values,

$$\frac{10-0}{+3000-(-3000)} \cdot (-1440) + 5 = 2.6V$$

With this setting, the value of the Analogue Output 1 will be 2.6V when motor rotates in inverse direction at 1440rpm.

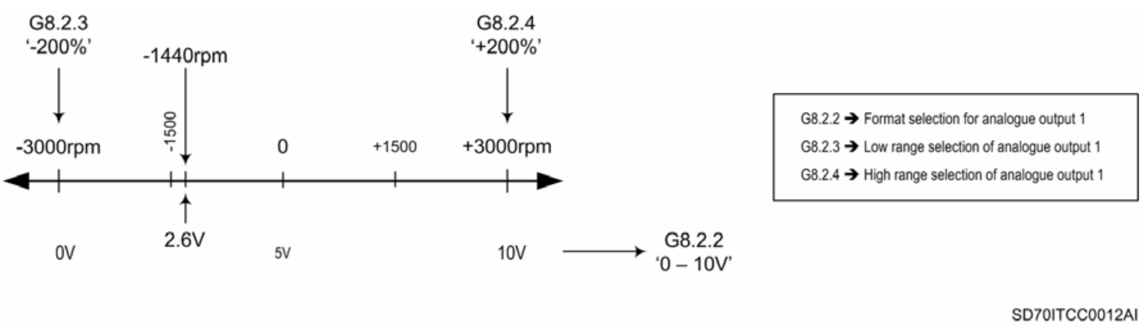

Figure 10.33 Example 1. Analogue Output 1 with format '0 – 10V'

Example 2.

Like previous example, now the same motor is rotating at -1440rpm (inverse direction rotation), with a range from -3000rpm to +3000rpm and 1500rpm as rated speed. Analogue Output 1 will be configured as ±10V output.

- Set mode of Analogue Output 1 in G8.2.1 to '01 ➔ SPEED MOTOR' (motor speed).
- Select format for Analogue Output 1 in G8.2.2 to '±10V'.
- Set minimum and maximum values (high range and low range) of the Analogue Output 1 scale in parameters G8.2.3 (for low range) and G8.2.4 (for high range).

  G8.2.3 ➔ '-200%' since -3000rpm is -200% of the motor rated speed (1500rpm)
  G8.2.4 ➔ '+200%' since +3000rpm is +200% of the motor rated speed (1500rpm)

Then,

$$\frac{+10-(-10)}{+3000-(-3000)}\cdot(-1440)+0=-4.8V$$

With this setting, the value of Analogue Output 1 will be -4.8V when motor rotates in inverse direction at 1440rpm.

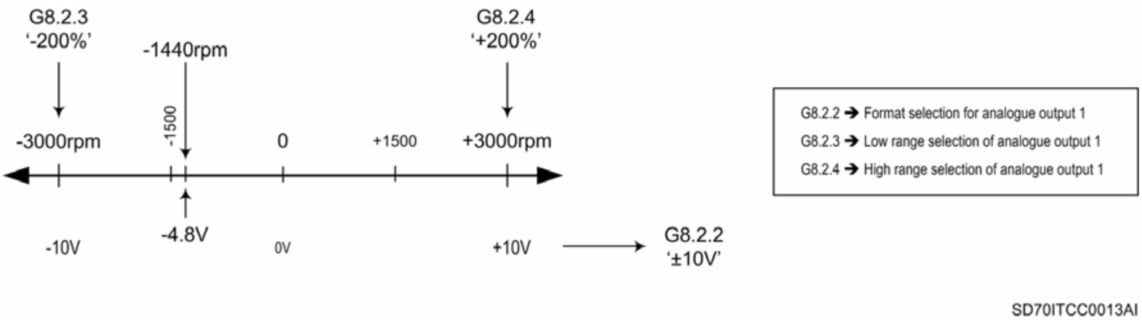

Figure 10.34 Example 2. Analogue Output 1 with format '±10V'

Example 3.

We want to configure Analogue Output 2 as 4 to 20mA output. This analogue value represents the current of the motor, the rated current of which is 20A with a consumption range from 0A to 50A.

- Set mode of Analogue Output 2 in G8.2.6 to '02 ➔ CURRENT MOTOR' (motor current).
- Select format for Analogue Output 2 in G8.2.7 to '4 – 20mA'.
- Set minimum and maximum values (high range and low range) of the Analogue Output 2 scale in parameters G8.2.8 (for low range) and G8.2.9 (for high range).

  G8.2.8 ➔ '+0%' (0A)
  G8.2.9 ➔ '+250%' since 50A is +250% of motor rated current (20A)

$$\frac{I_{max} - I_{min}}{Rng_{max} - Rng_{min}} \cdot (\text{Motor current}) + I_{int0}$$

Where,

I_{max}	➔ Maximum current of Analogue Output 2
I_{min}	➔ Minimum current of Analogue Output 2
Rng_{max}	➔ Maximum current of the motor
Rng_{min}	➔ Minimum current of the motor
$I_{int\,0}$	➔ Output current when motor current is 0A

Replacing the values,

$$\frac{20-4}{50-0} \cdot (20) + 4 = 10.4mA$$

With this setting, Analogue Output 2 will supply 10.4mA when motor current is 20A.

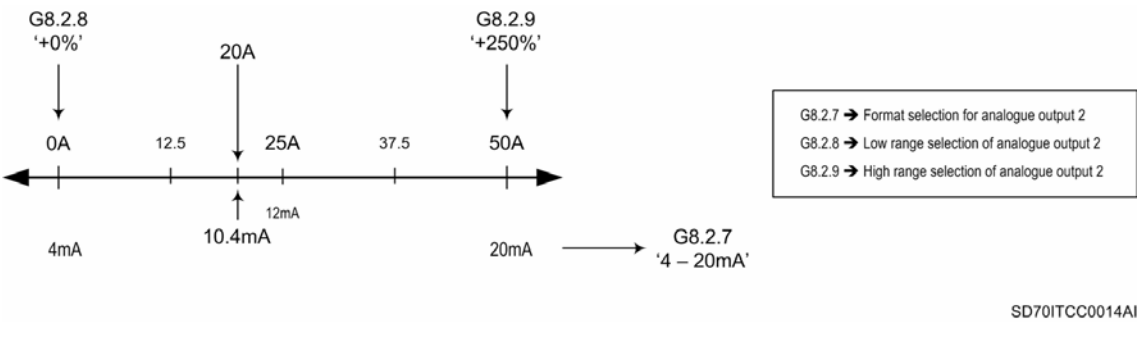

Figure 10.35 Example 3. Analogue Output 2 with format '4 – 20mA'

Example 4.

Now, we want to configure Analogue Output 2 as 0 to 20mA output, the analogue value of which represents the current of the previous motor, with a rated current of 20A and a consumption range from 0A to 50A.

- Set mode of Analogue Output 2 in G8.2.6 to '02 ➔ CURRENT MOTOR' (motor current).
- Select format for Analogue Output 2 in G8.2.7 to '0 – 20mA'.
- Set minimum and maximum values (high range and low range) of the Analogue Output 2 scale in parameters G8.2.8 (for low range) and G8.2.9 (for high range).

  G8.2.8 ➔ '+0%' (0A)
  G8.2.9 ➔ '+250%' since 50A is +250% of motor rated current (20A)

Then,

$$\frac{20-0}{50-0}\cdot(20)+0=8mA$$

Analogue Output 2 will supply 8mA when motor current is 20A.

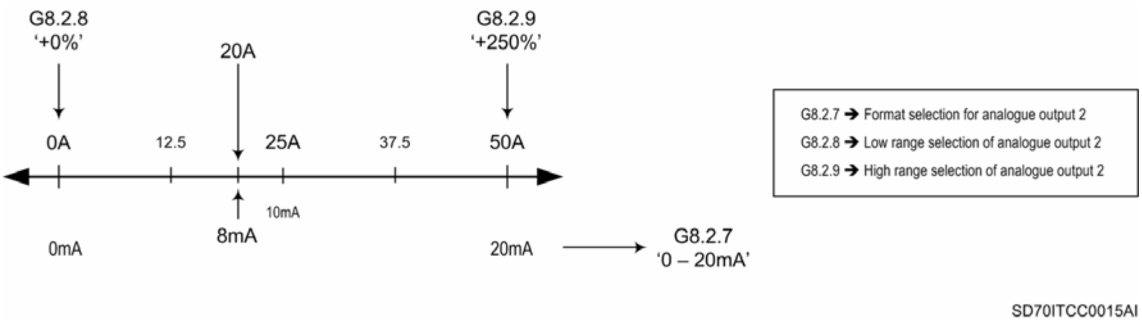

Figure 10.36 Example 4. Analogue Output 2 with format '0 – 20mA'

10.9. Group 9 – G9: Comparators

10.9.1. Subgroup 9.1 – S9.1: Comparator 1

G9.1.1	SOURCE SELECTION FOR COMPARATOR 1

Screen	**1 COMP 1 SEL = 00**
Description	Selection of the source for the Comparator 1
Range	00 – 22 (See 'Function' for additional information)
Default value	00
Set on run	YES
Modbus address	**40302**
Modbus range	0 to 22
Read / Write	YES

Function

It allows user to select the source for the Comparator 1 according to the following options:

00 ➔ NONE
There is no source for the comparator.

01 ➔ SPEED MOTOR
Comparison signal is motor speed.

02 ➔ CURRENT MOTOR
Motor current signal.

03 ➔ VOLTAGE MOTOR
Motor voltage signal.

04 ➔ POWER MOTOR
Motor power signal.

05 ➔ TORQUE MOTOR
Motor torque signal.

06 ➔ PF MOTOR
Motor cosine de phi.

07 ➔ TEMP MOTOR
Motor temperature signal.

08 ➔ FREQUENCY MTR
Drive input frequency.

09 ➔ INPUT VOLTAGE
Drive input voltage.

10 ➔ DC BUS
DC Bus voltage.

11 ➔ DRIVE TEMP
Drive temperature.

12 ➔ SPEED REF
Speed reference.

13 ➔ Reserved
Reserved for future use.

14 ➔ PID REFERENCE
Speed reference in PID mode.

15 ➔ PID FEEDBACK
System feedback signal.

16 ➔ PID ERROR
PID error signal (difference between reference signal and feedback signal of the sensor).

17 ➔ ANLG INPUT 1
Signal connected to Analogue Input 1.

18 ➔ ANLG INPUT 2
Signal connected to Analogue Input 2.

19 ➔ ANLG INPUT 1+2
Sum of signals connected to analogue inputs 1 and 2.

20 ➔ Reserved
Reserved for future use.

21 ➔ MAX SCALE
We will get a maximum value, forcing the comparator in order to obtain the needed status (always activated or deactivated).

22 ➔ ABSOLUT SPEED
Comparison signal is motor speed without sign (absolute value).

G9.1.2 TYPE SELECTION FOR COMPARATOR 1

Screen	**2 COMP 1 TYPE = 0**
Description	Selection of Comparator 1 type
Range	0 – 1 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**40303**
Modbus range	0 to 1
Read / Write	YES

Function — It allows selecting the operation mode of the Comparator 1. Operation modes are:

0 ➔ Normal
Comparator 1 will be activated when the ON condition is given (setting realized in 'G9.1.3 ➔ Activation value of Comparator 1 in normal mode') and will be deactivated when the OFF condition is given (setting realized in 'G9.1.7 ➔ Deactivation value of Comparator 1 in normal mode').

1 ➔ Window
Comparator 1 will be activated when signal is within the limit 1 (setting realized in 'G9.1.5 ➔ Limit 1 for Comparator 1 in window mode') and limit 2 (setting realized in 'G9.1.4 ➔ Limit 2 for Comparator 1 in window mode'), and additionally, limit 2 is higher than limit 1. If limit 2 is lower than limit 1, logical function of comparator output will be inverted.

In the following figure we can observe easily the behaviour of the comparator output for each operation mode.

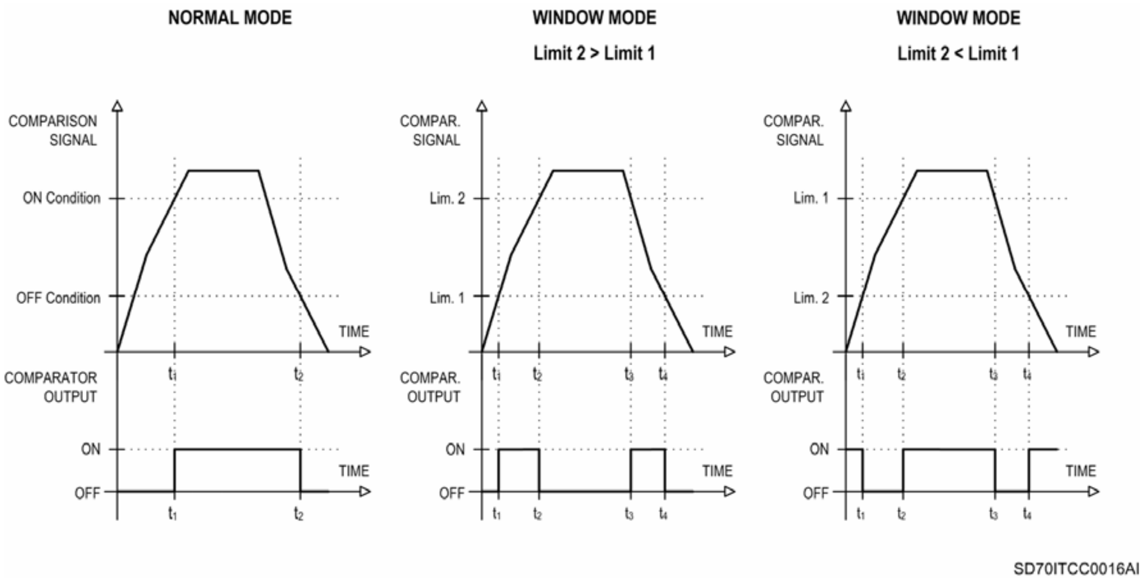

Figure 10.37 Operation modes of the comparators

G9.1.3 ACTIVATION VALUE OF COMPARATOR 1 IN NORMAL MODE

Screen	**3 SP C1 ON = +100%**
Extended info.	C1 ACTIVAT LEVEL
Description	Activation value of Comparator 1 in normal mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40305**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the activation value of the Comparator 1 output.

Output of Comparator 1 will be activated when source signal of Comparator 1 (selected in G9.1.1) is higher than the value set in this parameter, and additionally, ON delay time (set in G9.1.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 1 is set to normal mode (parameter 'G9.1.2 ➔ Type selection for Comparator 1' set to '0 ➔ Normal').

G9.1.4 LIMIT 2 FOR COMPARATOR 1 IN WINDOW MODE

Screen	**4 LIM 2 C1 = +100%**
Extended info.	**C1 WINDOW LIMIT2**
Description	Limit 2 of the Comparator 1 in window mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40305**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows defining one of the limits to activate Comparator 1 in window mode.

Output of Comparator 1 will be activated when source signal of Comparator 1 (selected in G9.1.1) is within the limit 1 (set in G9.1.5) and the limit 2, and additionally, ON delay time (set in G9.1.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 1 is set to window mode (parameter 'G9.1.2 ➔ Type selection for Comparator 1' set to '1 ➔ Window').

G9.1.5 LIMIT 1 FOR COMPARATOR 1 IN WINDOW MODE

Screen	**5 LIM 1 C1 = +0%**
Extended info.	**C1 WINDOW LIMIT1**
Description	Limit 1 of the Comparator 1 in window mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40304**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows defining one of the limits to activate Comparator 1 in window mode.

Output of Comparator 1 will be activated when source signal of Comparator 1 (selected in G9.1.1) is within the limit 1 and the limit 2 (set in G9.1.4), and additionally, ON delay time (set in G9.1.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 1 is set to window mode (parameter 'G9.1.2 ➔ Type selection for Comparator 1' set to '1 ➔ Window').

G9.1.6 ON DELAY TIME FOR COMPARATOR 1

Screen	**6 T C1 ON = 0.0s**
Extended info.	C1 ACTIVAT DELAY
Description	ON delay time to activate Comparator 1
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40306**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to activate the output of the Comparator 1.

When the activation condition of the output signal of Comparator 1 is given in normal or window mode, the timer delays the activation of this signal for the time set in this parameter.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.38, 10.39 and 10.40.

G9.1.7 DEACTIVATION VALUE OF COMPARATOR 1 IN NORMAL MODE

Screen	**7 SP C1 OF = +0%**
Extended info.	C1 DEACTIV LEVEL
Description	Deactivation value of Comparator 1 in normal mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40304**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the deactivation value of the Comparator 1 output.

Output of Comparator 1 will be deactivated when source signal of Comparator 1 (selected in G9.1.1) is lower than the value set in this parameter, and additionally, OFF delay time (set in G9.1.8) has elapsed.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 1 is set to normal mode (parameter 'G9.1.2 ➔ Type selection for Comparator 1' set to '0 ➔ Normal').

G9.1.8 OFF DELAY TIME FOR COMPARATOR 1

Screen	**8 T C1 OF = 0.0s**
Extended info.	C1 DEACTIV DELAY
Description	OFF delay time to deactivate Comparator 1
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40307**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to deactivate the output of the Comparator 1.

When the deactivation condition of the output signal of Comparator 1 is given in normal or window mode, the timer delays the deactivation of this signal for the time set in this parameter.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figures 10.38, 10.39 and 10.40.

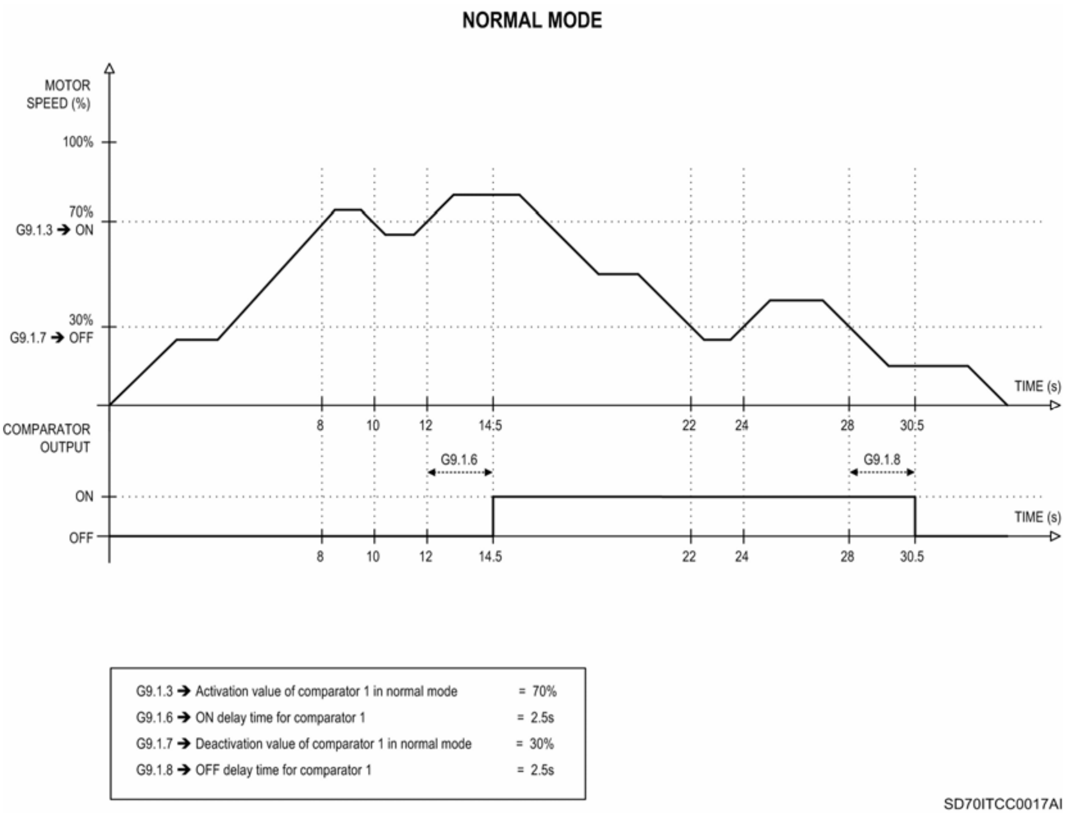

Figure 10.38 Example. Activation of Comparator 1 in normal mode

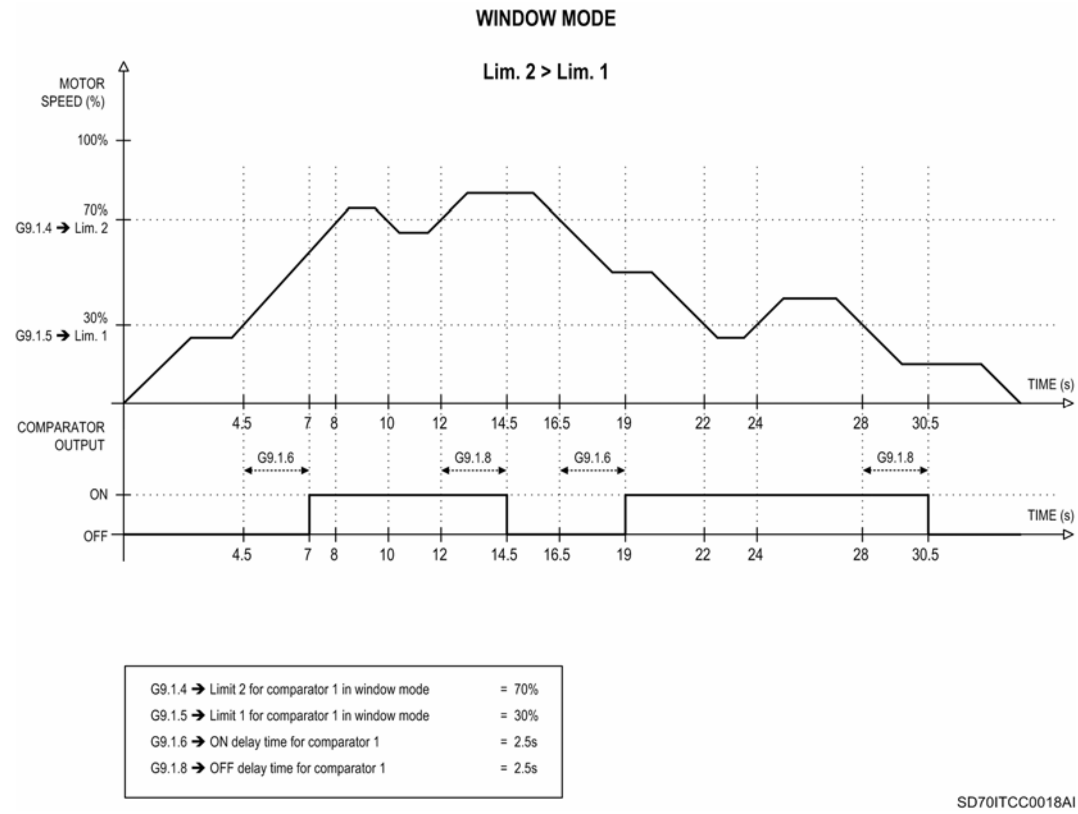

Figure 10.39 Example. Activation of Comparator 1 in window mode when limit 2 is higher than limit 1

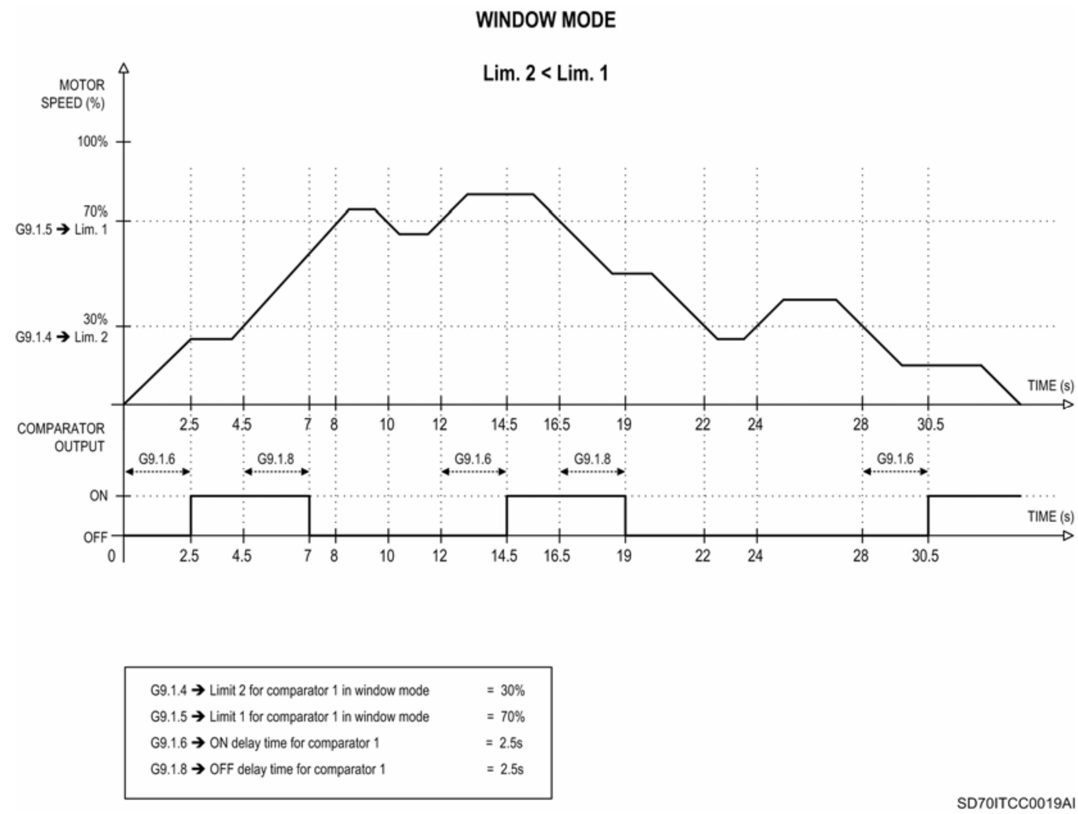

Figure 10.40 Example. Activation of Comparator 1 in window mode when limit 2 is lower than limit 1

G9.1.9 SELECTION OF OUTPUT FUNCTION FOR COMPARATOR 1

Screen	**9 SEL FUNT C1 = 00**
Description	Selection of the output function for the Comparator 1
Range	00 – 11 (See ‘Function’ for additional information)
Default value	00
Set on run	YES
Modbus address	**40308**
Modbus range	0 to 11
Read / Write	YES

Function It allows user to select which function will be activated by Comparator 1 according to the following options:

00 ➔ NO USE
Comparator output deactivated. Comparator has no effect.

01 ➔ START / STOP
When comparator output is activated, it will give the start command, and when comparator output is deactivated it will give the stop command.

02 ➔ STOP 1
Stop mode 1 is activated (set in G7.1) when comparator output is activated.

03 ➔ STOP 2
Stop mode 2 is activated (set in G7.2) when comparator output is activated.

04 ➔ RESET
When comparator output is activated, drive reset is executed.

05 ➔ START + INCH1
Output of comparator activates the start command and takes ‘inch speed 1’ as speed reference. When comparator output is activated, drive will start and will accelerate until the speed reference is reached (in this case the speed reference is inch speed 1, set in parameter G15.1).

06 ➔ START + INCH2
Output of comparator activates the start command and takes ‘inch speed 2’ as speed reference. When comparator output is activated, drive will start and will accelerate until the speed reference is reached (in this case the speed reference is inch speed 2, set in parameter G15.2).

07 ➔ START + INCH3
Output of comparator activates the start command and takes ‘inch speed 3’ as speed reference. When comparator output is activated, drive will start and will accelerate until the speed reference is reached (in this case the speed reference is inch speed 3, set in parameter G15.3).

08 ➔ INV SPEED
Activation of the comparator output inverts the speed, this is, the rotation direction of the motor. For that, drive applies a deceleration ramp until stopping the motor, and next, changes the rotation direction of the motor and accelerates until reaching the same speed value.

Note: Rotation inversion function must be enabled in parameter ‘G10.9 ➔ To enable speed inversion’.

09 ➔ ACC / DEC 2
When comparator output is activated, alternative ramps adjusted in ‘G5.3 ➔ Acceleration ramp 2’ and ‘G5.4 ➔ Deceleration ramp 2’ are activated.

10 ➔ REFERENCE 2
When comparator output is activated, the alternative reference selected in ‘G3.2 ➔ Reference source 2 of speed’ is activated.

11 ➔ SPEED LIMIT 2
When comparator output is activated, the alternative speed limits set in ‘G10.3 ➔ Minimum speed limit 2’ and ‘G10.4 ➔ Maximum speed limit 2’.

Note: If activation and deactivation levels are set to similar values and delay times are set to OFF, any noise that appears in the signals of selected source can cause an oscillation in the comparator, and therefore, an incorrect operation. You should set these levels keeping a reasonable margin between them, and if it is necessary, set a delay time to improve the operation.

10.9.2. Subgroup 9.2 – S9.2: Comparator 2

Comparator 2 operates in the same way of Comparator 1. Additionally, it includes the same setting parameters with the same configuration options. Therefore, figures 10.47, 10.48, 10.49 and 10.50 are also valid for this comparator. For this, we recommend observe these figures in order to understand better its operation.

G9.2.1	**SOURCE SELECTION FOR COMPARATOR 2**
Screen	**1 COMP 2 SEL = 00**
Description	Selection of the source for the Comparator 2
Range	00 – 22
Default value	00
Set on run	YES
Modbus address	**40311**
Modbus range	0 to 22
Read / Write	YES
Function	It allows user to select the source for the Comparator 2. Configuration options are the same than the options for Comparator 1. See 'Function' in parameter 'G9.1.1 ➔ Source selection for Comparator 1' to obtain information about configuration options.

G9.2.2	**TYPE SELECTION FOR COMPARATOR 2**
Screen	**2 COMP 2 TYPE = 0**
Description	Selection of Comparator 2 type
Range	0 – 1 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**40312**
Modbus range	0 to 1
Read / Write	YES
Function	It allows selecting the operation mode of the Comparator 2. Operation modes are: 0 ➔ Normal Comparator 2 will be activated when the ON condition is given (setting realized in 'G9.2.3 ➔ Activation value of Comparator 2 in normal mode') and will be deactivated when the OFF condition is given (setting realized in 'G9.2.7 ➔ Deactivation value of Comparator 2 in normal mode'). 1 ➔ Window Comparator 2 will be activated when signal is within the limit 1 (setting realized in 'G9.2.5 ➔ Limit 1 for Comparator 2 in window mode') and limit 2 (setting realized in 'G9.2.4 ➔ Limit 2 for Comparator 2 in window mode'), and additionally, limit 2 is higher than limit 1. If limit 2 is lower than limit 1, logical function of comparator output will be inverted. See figure 10.37 to observe the behaviour of the comparator output for each operation mode.

G9.2.3 ACTIVATION VALUE OF COMPARATOR 2 IN NORMAL MODE

Screen	**3 SP C2 ON = +100%**
Extended info.	C2 ACTIVAT LEVEL
Description	Activation value of Comparator 2 in normal mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40314**
Modbus range	-20480 to 20480
Read / Write	YES

Function It allows setting the activation value of the Comparator 2 output.

Output of Comparator 2 will be activated when source signal of Comparator 2 (selected in G9.2.1) is higher than the value set in this parameter, and additionally, ON delay time (set in G9.2.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 2 is set to normal mode (parameter 'G9.2.2 ➔ Type selection for Comparator 2' set to '0 ➔ Normal').

G9.2.4 LIMIT 2 FOR COMPARATOR 2 IN WINDOW MODE

Screen	**4 LIM 2 C2 = +100%**
Extended info.	C2 WINDOW LIMIT2
Description	Limit 2 of the Comparator 2 in window mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40314**
Modbus range	-20480 to 20480
Read / Write	YES

Function It allows defining one of the limits to activate Comparator 2 in window mode.

Output of Comparator 2 will be activated when source signal of Comparator 2 (selected in G9.2.1) is within the limit 1 (set in G9.2.5) and the limit 2, and additionally, ON delay time (set in G9.2.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 2 is set to window mode (parameter 'G9.2.2 ➔ Type selection for Comparator 2' set to '1 ➔ Window').

G9.2.5	LIMIT 1 FOR COMPARATOR 2 IN WINDOW MODE

Screen	**5 LIM 1 C2 = +0%**
Extended info.	C2 WINDOW LIMIT1
Description	Limit 1 of the Comparator 2 in window mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40313**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows defining one of the limits to activate Comparator 2 in window mode.

Output of Comparator 2 will be activated when source signal of Comparator 2 (selected in G9.2.1) is within the limit 1 and the limit 2 (set in G9.2.4), and additionally, ON delay time (set in G9.2.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 1 is set to window mode (parameter 'G9.2.2 ➔ Type selection for Comparator 2' set to '1 ➔ Window').

G9.2.6	ON DELAY TIME FOR COMPARATOR 2

Screen	**6 T C2 ON = 0.0s**
Extended info.	C2 ACTIVAT DELAY
Description	ON delay time to activate Comparator 2
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40315**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to activate the output of the Comparator 2.

When the activation condition of the output signal of Comparator 2 is given in normal or window mode, the timer delays the activation of this signal for the time set in this parameter.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.38, 10.39 and 10.40.

G9.2.7 DEACTIVATION VALUE OF COMPARATOR 2 IN NORMAL MODE

Screen	**7 SP C2 OF = +0%**
Extended info.	C2 DEACTIV LEVEL
Description	Deactivation value of Comparator 2 in normal mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40313**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the deactivation value of the Comparator 2 output.

Output of Comparator 2 will be deactivated when source signal of Comparator 2 (selected in G9.2.1) is lower than the value set in this parameter, and additionally, OFF delay time (set in G9.2.8) has elapsed.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 2 is set to normal mode (parameter 'G9.2.2 ➔ Type selection for Comparator 2' set to '0 ➔ Normal').

G9.2.8 OFF DELAY TIME FOR COMPARATOR 2

Screen	**8 T C2 OF = 0.0s**
Extended info.	C2 DEACTIV DELAY
Description	OFF delay time to deactivate Comparator 2
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40316**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to deactivate the output of the Comparator 2.

When the deactivation condition of the output signal of Comparator 2 is given in normal or window mode, the timer delays the deactivation of this signal for the time set in this parameter.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figures 10.38, 10.39 and 10.40.

G9.2.9 SELECTION OF OUTPUT FUNCTION FOR COMPARATOR 2

Screen	**9 SEL FUNT C2 = 00**
Description	Selection of the output function for the Comparator 2
Range	00 – 11
Default value	00
Set on run	YES
Modbus address	**40317**
Modbus range	0 to 11
Read / Write	YES

Function

It allows user to select which function will be activated by Comparator 2.

To get information about the configuration options, see ‘Function’ in parameter ‘G9.1.9 ➔ Selection of output function for Comparator 1’.

Note: If activation and deactivation levels are set to similar values and delay times are set to OFF, any noise that appears in the signals of selected source can cause an oscillation in the comparator, and therefore, an incorrect operation. You should set these levels keeping a reasonable margin between them, and if it is necessary, set a delay time to improve the operation.

10.9.3. Subgroup 9.3 – S9.3: Comparator 3

Comparator 3 operates in the same way of Comparator 1. Additionally, it includes the same setting parameters with the same configuration options. Therefore, figures 10.47, 10.48, 10.49 and 10.50 are also valid for this comparator. For this, we recommend observe these figures in order to understand better its operation.

G9.3.1	SOURCE SELECTION FOR COMPARATOR 3
Screen	**1 COMP 3 SEL = 00**
Description	Selection of the source for the Comparator 3
Range	00 – 22
Default value	00
Set on run	YES
Modbus address	**40320**
Modbus range	0 to 22
Read / Write	YES
Function	It allows user to select the source for the Comparator 3. Configuration options are the same than the options for Comparator 1. See 'Function' in parameter 'G9.1.1 ➔ Source selection for Comparator 1' to obtain information about configuration options.

G9.3.2	TYPE SELECTION FOR COMPARATOR 3
Screen	**2 COMP 3 TYPE = 0**
Description	Selection of Comparator 3 type
Range	0 – 1 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**40321**
Modbus range	0 to 1
Read / Write	YES
Function	It allows selecting the operation mode of the Comparator 3. Operation modes are: 0 ➔ Normal Comparator 3 will be activated when the ON condition is given (setting realized in 'G9.3.3 ➔ Activation value of Comparator 3 in normal mode') and will be deactivated when the OFF condition is given (setting realized in 'G9.3.7 ➔ Deactivation value of Comparator 3 in normal mode'). 1 ➔ Window Comparator 3 will be activated when signal is within the limit 1 (setting realized in 'G9.3.5 ➔ Limit 1 for Comparator 3 in window mode') and limit 2 (setting realized in 'G9.3.4 ➔ Limit 2 for Comparator 3 in window mode'), and additionally, limit 2 is higher than limit 1. If limit 2 is lower than limit 1, logical function of comparator output will be inverted. See figure 10.37 to observe the behaviour of the comparator output for each operation mode.

G9.3.3 ACTIVATION VALUE OF COMPARATOR 3 IN NORMAL MODE

Screen	**3 SP C3 ON = +100%**
Extended info.	C3 ACTIVAT LEVEL
Description	Activation value of Comparator 3 in normal mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40323**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the activation value of the Comparator 3 output.

Output of Comparator 3 will be activated when source signal of Comparator 3 (selected in G9.3.1) is higher than the value set in this parameter, and additionally, ON delay time (set in G9.3.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 3 is set to normal mode (parameter 'G9.3.2 ➔ Type selection for Comparator 3' set to '0 ➔ Normal').

G9.3.4 LIMIT 2 FOR COMPARATOR 3 IN WINDOW MODE

Screen	**4 LIM 2 C3 = +100%**
Extended info.	C3 WINDOW LIMIT2
Description	Limit 2 of the Comparator 3 in window mode
Range	-250% to +250%
Default value	+100%
Set on run	YES
Modbus address	**40323**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows defining one of the limits to activate Comparator 3 in window mode.

Output of Comparator 3 will be activated when source signal of Comparator 3 (selected in G9.3.1) is within the limit 1 (set in G9.3.5) and the limit 2, and additionally, ON delay time (set in G9.3.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 3 is set to window mode (parameter 'G9.3.2 ➔ Type selection for Comparator 3' set to '1 ➔ Window').

G9.3.5 LIMIT 1 FOR COMPARATOR 3 IN WINDOW MODE

Screen	**5 LIM 1 C3 = +0%**
Extended info.	C3 WINDOW LIMIT1
Description	Limit 1 of the Comparator 3 in window mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40322**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows defining one of the limits to activate Comparator 3 in window mode.

Output of Comparator 3 will be activated when source signal of Comparator 3 (selected in G9.3.1) is within the limit 1 and the limit 2 (set in G9.3.4), and additionally, ON delay time (set in G9.3.6) has elapsed.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.39 and 10.40.

Note: This parameter is only displayed if Comparator 3 is set to window mode (parameter 'G9.3.2 ➔ Type selection for Comparator 3' set to '1 ➔ Window').

G9.3.6 ON DELAY TIME FOR COMPARATOR 3

Screen	**6 T C3 ON = 0.0s**
Extended info.	C3 ACTIVAT DELAY
Description	ON delay time to activate Comparator 3
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40324**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to activate the output of the Comparator 3.

When the activation condition of the output signal of Comparator 3 is given in normal or window mode, the timer delays the activation of this signal for the time set in this parameter.
If, after the ON condition is given, this one disappears before elapsing ON delay time, the output of the comparator will be not activated.

See figures 10.38, 10.39 and 10.40.

G9.3.7 DEACTIVATION VALUE OF COMPARATOR 3 IN NORMAL MODE

Screen	**7 SP C3 OF = +0%**
Extended info.	C3 DEACTIV LEVEL
Description	Deactivation value of Comparator 3 in normal mode
Range	-250% to +250%
Default value	+0%
Set on run	YES
Modbus address	**40322**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the deactivation value of the Comparator 3 output.

Output of Comparator 3 will be deactivated when source signal of Comparator 3 (selected in G9.3.1) is lower than the value set in this parameter, and additionally, OFF delay time (set in G9.3.8) has elapsed.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figure 10.38.

Note: This parameter is only displayed if Comparator 3 is set to normal mode (parameter 'G9.3.2 ➔ Type selection for Comparator 3' set to '0 ➔ Normal').

G9.3.8 OFF DELAY TIME FOR COMPARATOR 3

Screen	**8 T C3 OF = 0.0s**
Extended info.	C3 DEACTIV DELAY
Description	OFF delay time to deactivate Comparator 3
Range	0.0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**40325**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a timer to deactivate the output of the Comparator 3.

When the deactivation condition of the output signal of Comparator 3 is given in normal or window mode, the timer delays the deactivation of this signal for the time set in this parameter.
If, after the OFF condition is given, this one disappears before elapsing OFF delay time, the output of the comparator will be not deactivated.

See figures 10.38, 10.39 and 10.40.

G9.3.9	**SELECTION OF OUTPUT FUNCTION FOR COMPARATOR 3**

Screen	**9 SEL FUNT C3 = 00**
Description	Selection of the output function for the Comparator 3
Range	00 – 11
Default value	00
Set on run	YES
Modbus address	**40326**
Modbus range	0 to 11
Read / Write	YES

Function

It allows user to select which function will be activated by Comparator 3.

To get information about the configuration options, see 'Function' in parameter 'G9.3.9 ➔ Selection of output function for Comparator 3'.

Note: If activation and deactivation levels are set to similar values and delay times are set to OFF, any noise that appears in the signals of selected source can cause an oscillation in the comparator, and therefore, an incorrect operation. You should set these levels keeping a reasonable margin between them, and if it is necessary, set a delay time to improve the operation.

10.10.Group 10 – G10: Limits

G10.1	MINIMUM SPEED LIMIT 1

Screen	**1 MIN1 SP = +0.00%**
Extended info.	SPEED MIN LIMIT1
Description	Minimum speed limit 1
Range	-250% to ‘G10.2’ %
Default value	+0.00%
Set on run	YES
Modbus address	**40102**
Modbus range	-20480 to ‘G10.2’
Read / Write	YES

Function — It allows setting the minimum speed limit 1 that the drive can apply to the motor.

It is set in % of motor rated speed.

Note: Commands to operate out of these limits are restricted to those limits.

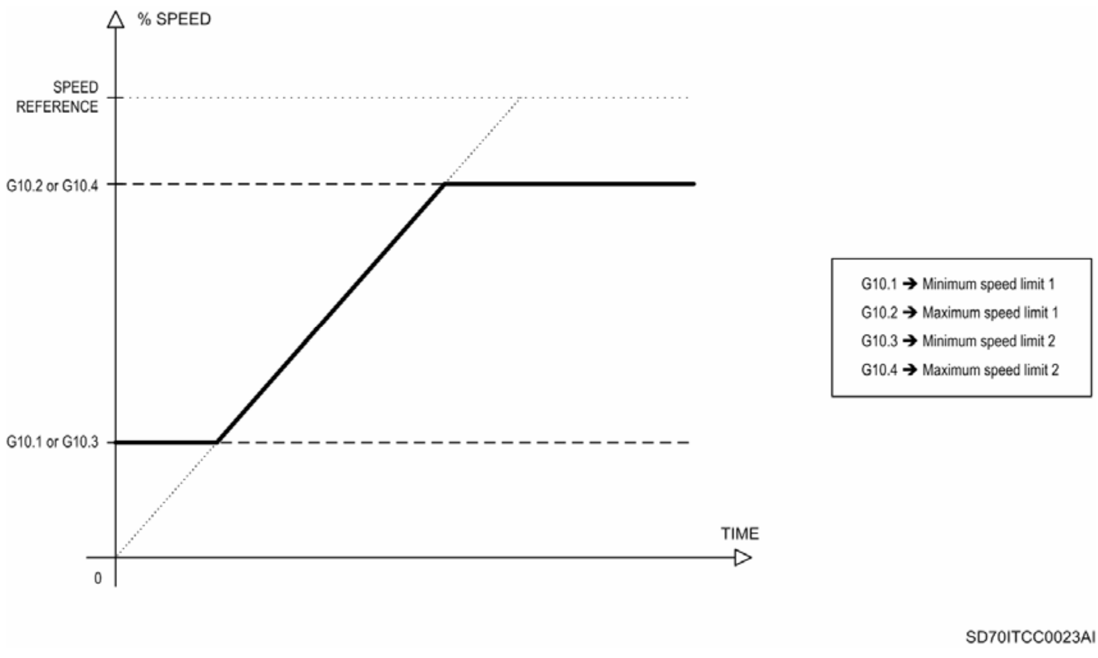

Figure 10.41 Speed applied when maximum and minimum speed limits are performing.

G10.2	MAXIMUM SPEED LIMIT 1
Screen	**2 MAX1 SP = +100%**
Extended info.	SPEED MAX LIMIT1
Description	Maximum speed limit 1
Range	‘G10.1’ % to +250%
Default value	+100%
Set on run	YES
Modbus address	**40104**
Modbus range	‘G10.1’ to 20480
Read / Write	YES

Function It allows setting the maximum speed limit 1 that the drive can apply to the motor.

It is set in % of motor rated speed.

Note: Commands to operate out of these limits are restricted to those limits.
See figure 10.41.

G10.3	MINIMUM SPEED LIMIT 2
Screen	**3 MIN2 SP = -100%**
Extended info.	SPEED MIN LIMIT2
Description	Minimum speed limit 2
Range	-250% to ‘G10.4’ %
Default value	-100%
Set on run	YES
Modbus address	**40103**
Modbus range	-20480 to ‘G10.4’
Read / Write	YES

Function It allows setting the minimum speed limit 2 that the drive can apply to the motor.

It is set in % of motor rated speed.

Note: Selection of minimum speed limit 2 and maximum speed limit 2 (alternative speed limits) is realized through one of the digital inputs (parameters from ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’ set to option ’20 ➔ SPEED LIMIT 2’) or by means of the output function of one of the comparators (parameters ‘G9.1.9 ➔ Selection of output function for Comparator 1’, ‘G9.2.9 ➔ Selection of output function for Comparator 2’ and ‘G9.3.9 ➔ Selection of output function for Comparator 3’ set to option ’11 ➔ SPEED LIMIT 2’).

Note: Commands to operate out of these limits are restricted to those limits.
See figure 10.41.

G10.4	MAXIMUM SPEED LIMIT 2
Screen	**4 MAX2 SP = +100%**
Extended info.	SPEED MAX LIMIT2
Description	Maximum speed limit 2
Range	‘G10.3’ % to +250%
Default value	+100%
Set on run	YES
Modbus address	**40105**
Modbus range	‘G10.3’ to 20480
Read / Write	YES

Function It allows setting the maximum speed limit 2 that the drive can apply to the motor.

It is set in % of motor rated speed.

Note: Selection of minimum speed limit 2 and maximum speed limit 2 (alternative speed limits) is realized through one of the digital inputs (parameters from ‘G4.1.5 ➔ Multi-function Digital Input 1 configuration’ to ‘G4.1.10 ➔ Multi-function Digital Input 6 configuration’ set to option ’20 ➔ SPEED LIMIT 2’) or by means of the output function of one of the comparators (parameters ‘G9.1.9 ➔ Selection of output function for Comparator 1’, ‘G9.2.9 ➔ Selection of output function for Comparator 2’ and ‘G9.3.9 ➔ Selection of output function for Comparator 3’ set to option ’11 ➔ SPEED LIMIT 2’).

Note: Commands to operate out of these limits are restricted to those limits.
See figure 10.41.

G10.5 CURRENT LIMIT

Screen	**5 I LIMIT = ___A**
Extended info.	**MAX CURRENT**
Description	Output current limit
Range	0.25·In to 1.50·In
Default value	* (depending on the drive capacity)
Set on run	YES
Modbus address	**40106**
Modbus range	2048 to 12288
Read / Write	YES

Function It allows setting the output current limit.
Motor current will be within this programmed limit. When this protection is active, the drive status of current limitation (ILT) is displayed.

Note: In normal operation status, avoid adjusting values very lower than value of motor rated current, since several effects (torque boost settings, fast acceleration and deceleration) can produce false results.

We do not recommend that current limit works constantly in applications when the motor is at steady status. Damage may occur to the motor and the torque variations can affect the load. Current limit should work only when an overload occurs, or due to excessive acceleration and deceleration values, or because motor data details are entered incorrectly.

G10.6 TRIP TIME BECAUSE OF CURRENT LIMIT

Screen	**6 I LIM TO = OFF**
Extended info.	**TIMOUT MAX CURRE**
Description	Trip time because of current limit
Range	0 to 60s, OFF
Default value	OFF
Set on run	YES
Modbus address	**40453**
Modbus range	0 to 600, 610
Read / Write	YES

Function It allows setting the trip time because of current limit has been reached.

This parameter provides with the possibility of tripping the drive automatically if current limit (set in G10.5) has been reached during a time set in this parameter.

G10.7 ALTERNATIVE CURRENT LIMIT

Screen	**7 I. MAX2 = ___A**
Extended info.	**MAX CURRENT 2**
Description	Alternative current limit
Range	0.25·In to 1.50·In
Default value	* (depending on the drive capacity)
Set on run	YES
Modbus address	**40109**
Modbus range	2048 to 12288
Read / Write	YES

Function

It allows setting the alternative output current limit.

Motor current will be within this programmed limit. When this protection is active, the drive status of current limitation (ILT) is displayed.

Note: In normal operation status, avoid adjusting values very lower than value of motor rated current, since several effects (torque boost settings, fast acceleration and deceleration) can produce false results.

We do not recommend that current limit works constantly in applications when the motor is at steady status. Damage may occur to the motor and the torque variations can affect the load. Current limit should work only when an overload occurs, or due to excessive acceleration and deceleration values, or because motor data details are entered incorrectly.

G10.8 CHANGE SPEED FOR I.MAX2 (ALTERNATIVE CURRENT LIMIT)

Screen	**8 MI2 brSP = OFF**
Extended info.	**MAX CURR BRK SPD**
Description	Change speed to alternative current limit
Range	OFF=0%, +1 to +250%
Default value	OFF
Set on run	YES
Modbus address	**40110**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed level to change from current limit 1 (set in G10.5) to current limit 2 (set in G10.7).
Additionally, it is possible to select the alternative current limit 2 by using one digital input (parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration 6') set to option '23 ➔ CURRENT LIMI2'.

G10.9 TORQUE LIMIT

Screen	**9 MAX TOR = +150%**
Extended info.	**MAX TORQUE**
Description	Torque limit
Range	-250% to +250%
Default value	+150%
Set on run	YES
Modbus address	**40107**
Modbus range	-20480 to 20480
Read / Write	YES

Function	It allows setting a torque limit value.
	This value is the maximum motor torque that the drive will allow the motor to supply to the load.
Note:	In applications with low and medium loads (clean water pumps, fans, etc.) where high torque is not required, default value is enough. Nevertheless, in applications with high load (mills, heavy tool, etc.) you must increase the torque limit to allow that drive reaches the torque values required by the load at specific moments.

G10.10 TRIP TIME BECAUSE OF TORQUE LIMIT

Screen	**10 T LIM TO = OFF**
Extended info.	**TIMEOUT MAX TORQ**
Description	Trip time because of torque limit
Range	0 to 60s, OFF
Default value	OFF
Set on run	YES
Modbus address	**40455**
Modbus range	0 to 600, 610
Read / Write	YES

Function	It allows setting the trip time because of torque limit has been reached.
	This parameter provides with the possibility of tripping the drive automatically if torque limit (set in G10.9) has been reached during a time set in this parameter.

G10.11 TO ENABLE SPEED INVERSION

Screen	**11 INVERSION? = N**
Description	To enable speed inversion
Range	N Y (See ‘Function’ for additional information)
Default value	N
Set on run	YES
Modbus address	**40108**
Modbus range	0 to 1
Read / Write	YES

Function

It enables or disables the possibility of inverting the motor speed. This function prevents the motor running in negative rotation direction.

N → NO

Disabled inversion.
Motor running in negative rotation direction is not allowed.

Y → YES

Enabled inversion.
Motor running in both rotation directions is allowed.

10.11.Group 11 – G11: Protections

G11.1 TRIP TIME BECAUSE OF SPEED LIMIT

Screen	**1 SP LIM TO = OFF**
Extended info.	TMAX LIMITIN SPD
Description	Trip time because of speed limit has been reached
Range	0 to 60s, OFF
Default value	OFF
Set on run	YES
Modbus address	**40452**
Modbus range	0 to 600, 610
Read / Write	YES

Function It allows setting a delay time to generate the fault 'F49 SPD LIMIT' when the drive reaches the predefined speed limit.

G11.2 MAXIMUM TIME FOR STOP LIMIT

Screen	**2 STOP TO = OFF**
Extended info.	TIMEOUT STOPPING
Description	Maximum time for stop limit
Range	OFF=0.0 to 999s
Default value	OFF
Set on run	YES
Modbus address	**40454**
Modbus range	0 to 9999
Read / Write	YES

Function It allows setting a maximum time of stop limit.

It supplies a safety function to stop the drive automatically if the motor has not stopped after the time set in this parameter has elapsed and if the drive has received a stop command. The drive will fault on 'F45 STOP T/O'.

This function is used to protect from uncontrolled stops where motor needs a longer time than the predict time to stop. As well as other protections integrated into the drive, this time can be set to turn off the output voltage and stop the motor by free run (spin) if this time has elapsed and the motor has not stopped completely. Controlled stop time is calculated in standard conditions during system operation. Stop limit time must be set to a higher value than controlled stop time value.

Note: With a high input voltage, the drive has a limited capacity to absorb in DC Bus the power regenerated by high inertial loads. This can prevent the equipment from following the speed reference beyond this limit. Stop limit time can be used to provide with protection from control losses due to excessive regeneration. Stop limit time is also useful to protect from incorrect setting of parameters of the PID regulator in closed loop control.

G11.3 GROUND FAULT DETECTION

Screen	**3 GND I LIMIT = 10%**
Extended info.	**GND CURR MAX LEV**
Description	Ground fault detection
Range	OFF, 0 – 30% In
Default value	10%
Set on run	YES
Modbus address	**40456**
Modbus range	0 to 2458
Read / Write	YES

Function: It allows setting a value of leakage current to ground.

It provides with the option of tripping the equipment (drive turns off the output to the motor) because of fault 'F20 GROUND FLT' automatically, if a leakage current higher than the value set in this parameter has been reached.

G11.4 LOW INPUT VOLTAGE LEVEL

Screen	**4 LOW VOLT = 360V**
Extended info.	**LO INPUT VOLTAGE**
Description	Minimum level of input voltage
Range	323 – 425V (for 400V) / 586 – 621V (for 690V)
Default value	360V (for 400V) / 600V (for 690V)
Set on run	YES
Modbus address	**40457**
Modbus range	3230 – 4250 (for 400V) / 5860 – 6210 (for 690V)
Read / Write	YES

Function: It allows setting a minimum level of input voltage.

Drive will trip (it turns off the output to the motor) because of fault 'F14 LW V IN' when average voltage, measured at the input of the equipment, is lower than the value set in this parameter during the time adjusted in 'G11.5 ➔ Trip time because of low input voltage'.

Note: Protection from low input voltage is a combination of this parameter and 'G11.5 ➔ Trip time because of low input voltage'.

Note: In case of the drive is powered with an input voltage of 690V, the default value of this parameter will be 600V and the range will be 586 – 621V.

G11.5 TRIP TIME BECAUSE OF LOW INPUT VOLTAGE

Screen	**5 LOW V TO = 5s**
Extended info.	**LO INP VOL TIMEO**
Description	Trip time because of low input voltage
Range	0.0 – 60s, OFF
Default value	5s
Set on run	YES
Modbus address	**40458**
Modbus range	0 to 600, 610
Read / Write	YES

Function	It allows setting a time, once elapsed it, a trip because of low input voltage will be generated.
	Drive will trip (it turns off the output to the motor) because of fault 'F14 LW V IN' when average voltage, measured at the input of the equipment, is lower than the value set in 'G11.4 ➔ Low input voltage level' during the time adjusted in this parameter.
Note:	Protection from low input voltage is a combination of parameter 'G11.4 ➔ Low input voltage level' and this one.

G11.6 HIGH INPUT VOLTAGE LEVEL

Screen	**6 HIGH VOLT = 440V**
Extended info.	HI INPUT VOLTAGE
Description	Maximum level of input voltage
Range	418 – 550V (for 400V) / 726 – 759V (for 690V)
Default value	440V (for 400V) / 740V (for 690V)
Set on run	YES
Modbus address	**40459**
Modbus range	4180 – 5500 (for 400V) / 7260 – 7590 (for 690V)
Read / Write	YES

Function	It allows setting a maximum level of input voltage.
	Drive will trip (it turns off the output to the motor) because of fault 'F13 HI V IN' when average voltage, measured at the input of the equipment, is higher than the value set in this parameter during the time adjusted in 'G11.7 ➔ Trip time because of high input voltage'.
Note:	Protection from high input voltage is a combination of this parameter and 'G11.7 ➔ Trip time because of high input voltage'.
Note:	In case of the drive is powered with an input voltage of 690V, the default value of this parameter will be 740V and the range will be 726 – 759V.

G11.7 TRIP TIME BECAUSE OF HIGH INPUT VOLTAGE

Screen	**7 HI V TO = 5s**
Extended info.	HI INP VOL TIMEO
Description	Trip time because of high input voltage
Range	0.0 – 60s, OFF
Default value	5s
Set on run	YES
Modbus address	**40460**
Modbus range	0 to 600, 610
Read / Write	YES

Function	It allows setting a time, once elapsed it, a trip because of high input voltage will be generated.
	Drive will trip (it turns off the output to the motor) because of fault 'F13 HI V IN' when average voltage, measured at the input of the equipment, is higher than the value set in 'G11.6 ➔ High input voltage level' during the time adjusted in this parameter.
Note:	Protection from high input voltage is a combination of parameter 'G11.6 ➔ High input voltage level' and this one.

G11.8 TRIP DELAY TIME DUE TO OUTPUT VOLTAGE IMBALANCE

Screen	**8 Dlasy VO = 1.0s**
Extended info.	**VOUT asyTRIP DLY**
Description	Trip delay time due to output voltage imbalance
Range	0.0 – 10s, OFF
Default value	1.0s
Set on run	YES
Modbus address	**40463**
Modbus range	0 to 100, 101
Read / Write	YES

Function

It allows setting a delay time before generating the trip when an output voltage imbalance has been detected. Once elapsed that time, drive will trip because of fault 'F18 IMB V OUT'.

G11.9 PERFORMANCE IN CASE OF INPUT POWER LOSS

Screen	**9 LOW V BHV = 0**
Description	Performance of the drive in case of input power loss occurs during operation
Range	0 – 2 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**40462**
Modbus range	0 to 2
Read / Write	YES

Function

It modifies the performance of the drive when input power drops while motor is running, according to the selected option:

0 ➔ NO FAULT
No action will be done by the drive.

1 ➔ FAULTS
Drive will trip because of fault 'F11 VIN LOSS'.

2 ➔ STOP
Drive will not trip because of fault and will try to control the motor stopping while DC Bus voltage level allows it.

G11.10 PTC MOTOR OPTION

Screen	**10 PTC EXT ? = N**
Description	To enable PTC motor option
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40462**
Modbus range	0 to 1
Read / Write	YES

Function	It allows user to enable or disable the PTC motor option.

A PTC sensor can be connected directly to the drive to detect high motor temperature (terminals 8 and 9 on control board). If PTC value is higher or equal than 1K5 ±10%, a fault will be generated in the drive 'F40 EXT / PTC'. On the other hand, if the value decreases below 90Ω ±10%, a fault will be generated too.

Options:

N ➔ NO
PTC motor option is disabled.

Y ➔ YES
PTC motor option is enabled.

G11.11 PUMP OVERLOAD LEVEL

Screen	**11 PUMP OV = 20.0A**
Extended info.	**PUMP OVERLOAD LV**
Description	Pump overload level
Range	0.0 – 3200A
Default value	20.0A
Set on run	YES
Modbus address	**40289**
Modbus range	0 to 32000
Read / Write	YES

Function: It allows setting the current value that determines the overload level of the pump.

The overload protection is a combination of this parameter together with parameters 'G11.12 ➔ Filter for pump overload' and 'G11.13 ➔ Trip delay time because of pump overload'.

When the output current of the drive is higher than the current set in this parameter during the time adjusted in parameter G11.13, the drive turns off its output generating the fault 'F57 PUMP OVERLOA'.

We can set the value for a low-pass filter to read the current in order to avoid oscillations by means of the parameter G11.12.

G11.12 FILTER FOR PUMP OVERLOAD

Screen	**12 PMovl FIL = OFF**
Extended info.	**PMP OVL FILTER**
Description	Filter for pump overload
Range	OFF=0, 1 to 5s
Default value	OFF
Set on run	YES
Modbus address	**40290**
Modbus range	0 to 50
Read / Write	YES

Function	It allows setting the value of the low-pass filter in order to avoid oscillations when the output current of the drive is read.

The overload protection is a combination of this parameter together with parameters 'G11.11 ➔ Pump overload level' and 'G11.13 ➔ Trip delay time because of pump overload'.
When the output current of the drive is higher than the current set in parameter G11.11 during the time adjusted in parameter G11.13, the drive turns off its output generating the fault 'F57 PUMP OVERLOA'.

G11.13 TRIP DELAY TIME BECAUSE OF PUMP OVERLOAD

Screen	**13 Povl DLY = OFF**
Extended info.	**PMP OVERLOAD DLY**
Description	Trip delay time because of pump overload
Range	OFF=0.0 – 999.9s
Default value	OFF
Set on run	YES
Modbus address	**40291**
Modbus range	0 to 9999
Read / Write	YES
Function	It allows setting a delay time to generate the drive trip because of pump overload.

The overload protection is a combination of this parameter together with parameters 'G11.11 ➔ Pump overload level' and 'G11.12 ➔ Filter for pump overload'.

When the output current of the drive is higher than the current set in parameter G11.11 during the time adjusted in this parameter, the drive turns off its output generating the fault 'F57 PUMP OVERLOA'.

We can set the value for a low-pass filter to read the current in order to avoid oscillations by means of the parameter G11.12.

G11.14 TO ENABLE UNDERLOAD PROTECTION

Screen	**14 UNDERLOAD = N**
Description	To enable or disable the underload protection of the pump
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42085**
Modbus range	0 to 1
Read / Write	YES
Function	It allows the possibility of protecting the pump from underload status.

N ➔ NO
Underload protection disabled.

Y ➔ YES
Underload protection enabled.

To protect the pump from underload status, it is necessary to realize the following settings:

a) Set to ‘Y’ this parameter.
b) Set a value of underload current in parameter G11.15, below which the first detection condition will be fulfilled.
c) Set a value of underload speed in parameter G11.16, above which the second detection condition will be fulfilled.
d) Set a delay time for activation of underload protection in parameter G11.17. Once elapsed, the last underload condition will be activated.

If three previous conditions are fulfilled, the drive will stop the pump to protect it from underload status.

G11.15 UNDERLOAD CURRENT

Screen	**15 ULD CUR = ___A**
Extended info.	UNDERLOAD CURREN
Description	Underload current
Range	(0.2 to 1.50)·In
Default value	* (This value depends on the drive capacity)
Set on run	YES
Modbus address	**42086**
Modbus range	0 to 12288
Read / Write	YES

Function

It allows setting a value for underload current, below which the first detection condition to activate the protection is fulfilled.

This parameter operates together with parameters ‘G11.16 ➔ Underload speed’ and ‘G11.17 ➔ Delay time to activate underload protection’.

See ‘Function’ in parameter ‘G11.14 ➔ To enable underload protection’ to obtain information about the setting of underload parameters.

G11.16 UNDERLOAD SPEED

Screen	**16 ULD SPD = +100%**
Extended info.	UNDERLOAD SPEED
Description	Underload speed
Range	+0.0% to +250%
Default value	+100%
Set on run	YES
Modbus address	**42087**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting a value for underload speed, above which the second detection condition to activate the protection is fulfilled.

This parameter operates together with parameters ‘G11.15 ➔ Underload current’ and ‘G11.17 ➔ Delay time to activate underload protection’.

See ‘Function’ in parameter ‘G11.14 ➔ To enable underload protection’ to obtain information about the setting of underload parameters.

G11.17	DELAY TIME TO ACTIVATE UNDERLOAD PROTECTION

Screen	**17 ULD DELY = 10s**
Extended info.	UNDERLOAD DELAY
Description	Delay time to activate underload protection
Range	0 – 999s
Default value	10s
Set on run	YES
Modbus address	**42088**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a delay time to activate the underload protection. The drive will wait for this time before activating the protection and then will stop.

This parameter operates together with parameters 'G11.15 ➔ Underload current' and 'G11.16 ➔ Underload speed'.

See 'Function' in parameter 'G11.14 ➔ To enable underload protection' to obtain information about the setting of underload parameters.

10.12.Group 12 – G12: Auto Reset

G12.1	AUTO RESET
Screen	**1 AUTO RESET = N**
Description	To enable or disable auto reset function
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40571**
Modbus range	0 to 1
Read / Write	YES

Function

It allows enabling or disabling auto reset function.

When this function is active, the drive is reset automatically after occurring a fault (it will be reset all of the faults programmed in parameters 'G12.5 ➔ Selection of fault 1 to be reset' to 'G12.8 ➔ Selection of fault 4 to be reset').

Options:

N ➔ NO
Auto reset function is disabled.

Y ➔ YES
Auto reset function is enabled.

⚠ **CAUTION:** Auto reset function can cause unexpected automatic startings. Before activating this function, ensure the installation fulfils the needed requirements to be configured in this way, to prevent property damages or personnel injuries.

G12.2	NUMBER OF AUTO RESET ATTEMPTS
Screen	**2 ATTEMP NUMBR = 1**
Extended info.	**MAX ATTEMPT NUMB**
Description	Number of auto reset attempts
Range	1 – 5
Default value	1
Set on run	YES
Modbus address	**40572**
Modbus range	1 to 5
Read / Write	YES

Function

It allows user to set the maximum number of auto reset attempts realized by the drive in case of a fault occurs.

This parameter together with 'G12.4 ➔ Reset time for the counter of auto reset attempts' control the drive to carry out auto reset function in a controller manner.

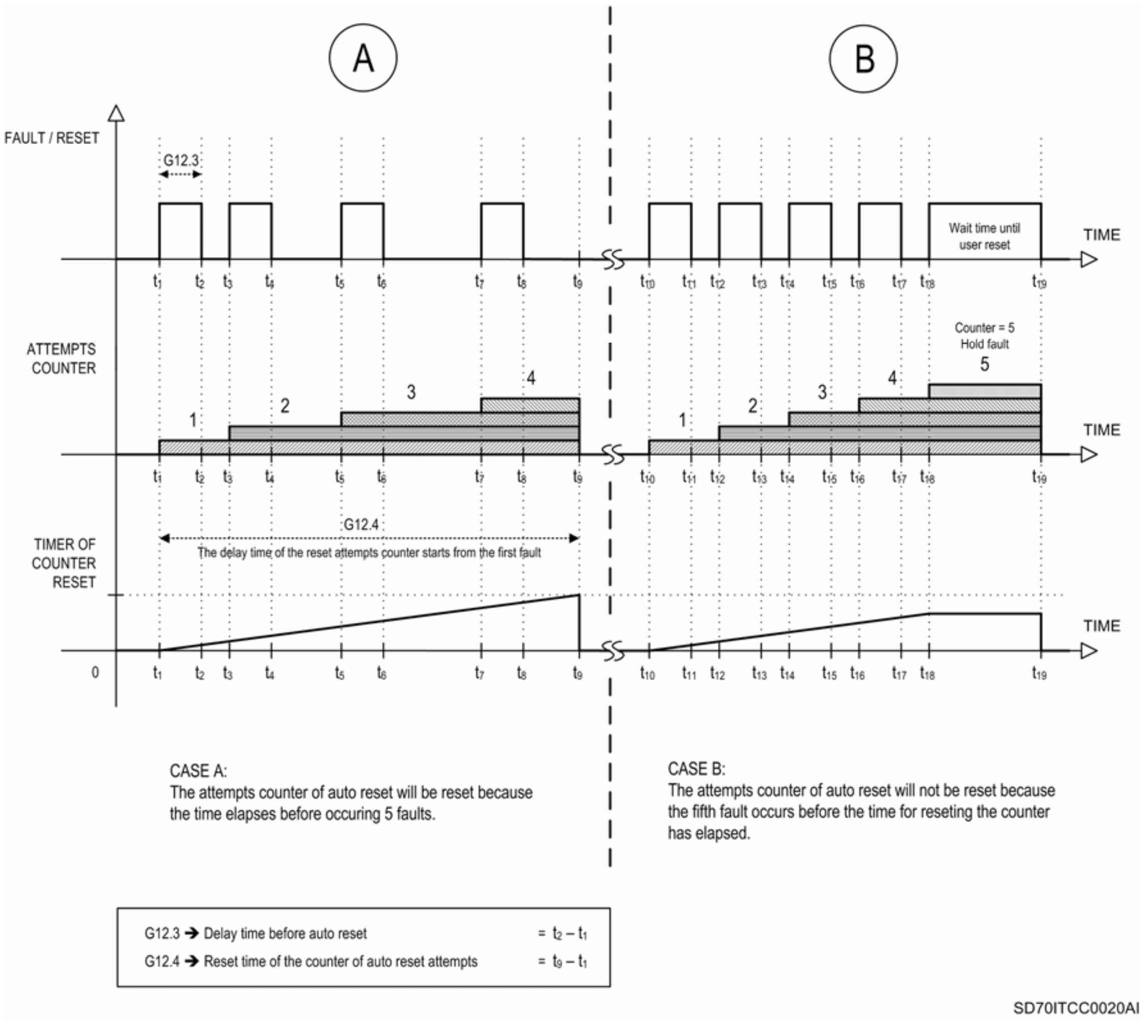

Figure 10.42 Example. Application of auto reset function for 5 faults

G12.3	DELAY TIME BEFORE AUTO RESET

Screen	**3 R STR DEL = 5s**
Extended info.	**TIME BEFORE RESET**
Description	Delay time before executing auto reset function
Range	5 – 120s
Default value	5s
Set on run	YES
Modbus address	**40573**
Modbus range	5 to 120
Read / Write	YES

Function It allows setting the time elapsed from occurring the fault to the fault is reset.

See figure 10.42.

G12.4 RESET TIME FOR COUNTER OF AUTO RESET ATTEMPTS

Screen	**4 RS COUNT = 15min**
Extended info.	AUTORESET TIMOUT
Description	Time to reset the counter of auto reset attempts
Range	1 – 60min
Default value	15min
Set on run	YES
Modbus address	**40574**
Modbus range	1 to 60
Read / Write	YES

Function

It allows setting the time, once elapsed it, the counter of auto reset attempts will be reset to zero. Two situations are possible:

1) Reset time of the counter elapses before the drive realizes the attempts number of auto reset adjusted in parameter G12.2. In this case, the counter will be reset to zero.
2) Drive realizes the attempts number of auto reset without achieving to start before the reset time of the attempts counter elapses. In this case, the fault is remained and the time value, at which the last faulty attempt of auto reset occurred, is remained by the reset timer of the attempts counter.

See figure 10.42.

G12.5 SELECTION OF FAULT 1 TO BE RESET

Screen	**5 F1 AUTO RST = 0**
Description	Selection of fault 1 to be reset
Range	0 – 25 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**40575**
Modbus range	0 to 25
Read / Write	YES

Function

If auto reset function is enabled in 'G12.1 ➔ AUTO RESET' (option 'Y'), the drive will consider the fault programmed here as resettable automatically. Fault 1 to be reset is selected according to the following options:

0 ➔ 0 NO AUTO RESET
There is no fault programmed. If parameters 'G12.5 ➔ Selection of fault 1 to be reset' to 'G12.8 ➔ Selection of fault 4 to be reset' are set like this, auto reset function is not executed.

1 ➔ ALL THE FLTS
All of the faults can be reset automatically.

2 ➔ 11 VIN LOSS
To reset fault F11, input power loss.

3 ➔ 13 HI V IN
To reset fault F13, high input voltage.

4 ➔ 14 LW V IN
To reset fault F14, low input voltage.

5 ➔ 18 IMB V OUT
To reset fault F18, output voltage imbalance.

6 ➔ 19 IMB I OUT
To reset fault F19, output current imbalance.

7 ➔ 20 GROUND FLT
To reset fault F20, ground fault.

8 ➔ 21 I LIM T/O
To reset fault F21, current limit time out.

9 ➔ 22 TQ LIM T/O
To reset fault F22, torque limit time out.

10 ➔ 27 DL SMTH
To reset fault F27, DC Bus charge fault.

11 ➔ 40 EXT / PTC
To reset fault F40, motor PTC fault.

12 ➔ 41 COMMS TRIP
To reset fault F41, fault signal from communication network.

13 ➔ 42 AIN1 LOSS
To reset fault F42, Analogue Input 1 signal loss.

14 ➔ 43 AIN2 LOSS
To reset fault F43, Analogue Input 2 signal loss.

15 ➔ 47 COMMS T/O
To reset fault F47, communication time out.

16 ➔ 49 SPD LIMIT
To reset fault F49, exceeded speed limit.

17 ➔ 65 LOW PRESSURE
To reset fault F65, minimum pressure.

18 ➔ 66 HI PRESSURE
To reset fault F66, maximum pressure.

19 ➔ 67 LOW WATER
To reset fault F67, low water.

20 ➔ 31 SCR L1
To reset fault F31, fault on phase L1 of rectifier.

21 ➔ 32 SCR L2
To reset fault F32, fault on phase L2 of rectifier.

22 ➔ 33 SCR L3
To reset fault F33, fault on phase L3 of rectifier.

23 ➔ 68 CAVIT/UNDERL
To reset fault F68, cavitation / underload trip.

24 ➔ 69 FLOW SWITCH
To reset fault F69, 'No Flow' trip.

25 ➔ 70 IRRIGATOR F
To reset fault F70, irrigator trip.

⚠ **CAUTION:** At the moment of selecting faults that can be reset, you should pay special attention to option '1 ➔ ALL THE FLTS'. In this case, the protections of the drive and the motor will be disabled. It is not recommended select this option since the drive could try to reset internal trips causing serious damage to the drive itself.

G12.6 SELECTION OF FAULT 2 TO BE RESET

Screen	**6 F2 AUTO RST = 0**
Description	Selection of fault 2 to be reset
Range	0 – 25
Default value	0
Set on run	YES
Modbus address	**40576**
Modbus range	0 to 25
Read / Write	YES

Function

If auto reset function is enabled in 'G12.1 ➔ AUTO RESET' (option 'Y'), the drive will consider the fault programmed here as resettable automatically. Fault 2 to be reset is selected according to the options explained in section 'Function' of parameter 'G12.5 ➔ Selection of fault 1 to be reset'.

⚠ **CAUTION:** At the moment of selecting faults that can be reset, you should pay special attention to option '1 ➔ ALL THE FLTS'. In this case, the protections of the drive and the motor will be disabled. It is not recommended select this option since the drive could try to reset internal trips causing serious damage to the drive itself.

G12.7 SELECTION OF FAULT 3 TO BE RESET

Screen	**7 F3 AUTO RST = 0**
Description	Selection of fault 3 to be reset
Range	0 – 25
Default value	0
Set on run	YES
Modbus address	**40577**
Modbus range	0 to 25
Read / Write	YES

Function

If auto reset function is enabled in 'G12.1 ➔ AUTO RESET' (option 'Y'), the drive will consider the fault programmed here as resettable automatically. Fault 3 to be reset is selected according to the options explained in section 'Function' of parameter 'G12.5 ➔ Selection of fault 1 to be reset'.

⚠ **CAUTION:** At the moment of selecting faults that can be reset, you should pay special attention to option '1 ➔ ALL THE FLTS'. In this case, the protections of the drive and the motor will be disabled. It is not recommended select this option since the drive could try to reset internal trips causing serious damage to the drive itself.

G12.8	SELECTION OF FAULT 4 TO BE RESET

Screen	**8 F4 AUTO RST = 0**
Description	Selection of fault 4 to be reset
Range	0 – 25
Default value	0
Set on run	YES
Modbus address	**40578**
Modbus range	0 to 25
Read / Write	YES

Function

If auto reset function is enabled in 'G12.1 ➔ AUTO RESET' (option 'Y'), the drive will consider the fault programmed here as resettable automatically. Fault 4 to be reset is selected according to the options explained in section 'Function' of parameter 'G12.5 ➔ Selection of fault 1 to be reset'.

⚠ **CAUTION:** At the moment of selecting faults that can be reset, you should pay special attention to option '1 ➔ ALL THE FLTS'. In this case, the protections of the drive and the motor will be disabled. It is not recommended select this option since the drive could try to reset internal trips causing serious damage to the drive itself.

10.13. Group 13 – G13: Fault History

G13.1	REGISTER 1 OF FAULT HISTORY
Screen	**1 F0 NO FAULT**
Extended info.	LAST FAULT=FXX
Description	Register 1 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40432**
Modbus range	-
Read / Write	Read Only

Function

The first parameter of this group allows visualizing the information about the last fault and additionally, it will be used as the first register of fault history.

Drive shows this screen in case of a trip has been produced in the equipment. By pressing [*] key two seconds approximately, you can access to the extended information that shows the fault order: LAST FAULT=Fxx (when fault is solved).

The equipment is reset by pressing the STOP-RESET key from display or by using an external reset (if it is connected). Some faults can be reset automatically by using auto reset function (see group G12 AUTO RESET).

Fault storage

It shows a list of the last five faults in chronological order. The most recent fault appears in first place (G13.1). Each time that a faults occurs the drive shows the fault in parameter G13.1. After the fault is solved and reset, this fault will be shifted to the following position of fault register (G13.2). The previous faults will shift down one position. The oldest fault message (stored in 'G13.6 ➔ Register 5 of fault history') will be lost.

By pressing [*] key two seconds approximately, you can access to the extended information that shows the fault order:

FIFTH FAULT=Fxx up to FIRST FAULT=Fxx

Next, all of the faults are shown:

0	➔	F0 NO FAULT	33	➔	F33 SCR L3
1	➔	F1 I LIM FLT	34	➔	F34 IGBT TEMP
2	➔	F2 V LIM FLT	35	➔	F35 PHSE L1 LOSS
3	➔	F3 PDINT FLT	36	➔	F36 PHSE L2 LOSS
4	➔	F4 U+DESAT	37	➔	F37 PHSE L3 LOSS
5	➔	F5 U-DESAT	40	➔	F40 EXT / PTC
6	➔	F6 V+DESAT	41	➔	F41 COMMS TRIP
7	➔	F7 V-DESAT	42	➔	F42 AIN1 LOSS
8	➔	F8 W+DESAT	43	➔	F43 AIN2 LOSS
9	➔	F9 W-DESAT	44	➔	F44 CAL FLT
10	➔	F10 NEG DESAT	45	➔	F45 STOP T/O
11	➔	F11 VIN LOSS	46	➔	F46 EEPROM FLT
12	➔	F12 IMB V IN	47	➔	F47 COMMS T/O
13	➔	F13 HI V IN	48	➔	F48 SPI COM
14	➔	F14 LW V IN	49	➔	F49 SPD LIMIT
15	➔	F15 CURL Vdc	50	➔	F50 PSU FAULT
16	➔	F16 HI Vdc	51	➔	F51 SCR TEMP
17	➔	F17 LW Vdc	52	➔	F52 SUPPLY FAN
18	➔	F18 IMB V OUT	53	➔	F53 INTRNAL TEMP
19	➔	F19 IMB I OUT	54	➔	F54 WATCHDOG TMR
20	➔	F20 GROUND FLT	56	➔	F56 EMERGEN.STOP
21	➔	F21 I LIM T/O	57	➔	F57 PUMP OVERLOA
22	➔	F22 TQ LIM T/O	65	➔	F65 LOW PRESSURE
25	➔	F25 MTR O/L	66	➔	F66 HI PRESSURE
27	➔	F27 DL SMTH	67	➔	F67 LOW WATER
28	➔	F28 MICRO FLT	68	➔	F68 CAVITATION
29	➔	F29 DSP FLT	69	➔	F69 FLOW SWITCH
30	➔	F30 WATCHDOG	70	➔	F70 IRRIGATOR FL
31	➔	F31 SCR L1	71	➔	F71 CYCLING
32	➔	F32 SCR L2	72	➔	F72 IN PRES SW

G13.2 REGISTER 2 OF FAULT HISTORY

Screen	**2 F0 NO FAULT**
Extended info.	**FIFTH FAULT=FXX**
Description	Register 2 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40433**
Modbus range	-
Read / Write	Read Only

Function: It allows visualizing the information of the fault stored in register 2 of fault history.

To obtain information about data storage in the different registers and visualize the fault list, see section ‘Function’ in parameter ‘G13.1 ➔ Register 1 of fault history’.

G13.3	**REGISTER 3 OF FAULT HISTORY**

Screen	**3 F0 NO FAULT**
Extended info.	**FOURTH FAULT=FXX**
Description	Register 3 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40434**
Modbus range	-
Read / Write	Read Only

Function It allows visualizing the information of the fault stored in register 3 of fault history.

To obtain information about data storage in the different registers and visualize the fault list, see section 'Function' in parameter 'G13.1 ➔ Register 1 of fault history'.

G13.4	**REGISTER 4 OF FAULT HISTORY**

Screen	**4 F0 NO FAULT**
Extended info.	**THIRD FAULT=FXX**
Description	Register 4 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40435**
Modbus range	-
Read / Write	Read Only

Function It allows visualizing the information of the fault stored in register 4 of fault history.

To obtain information about data storage in the different registers and visualize the fault list, see section 'Function' in parameter 'G13.1 ➔ Register 1 of fault history'.

G13.5	**REGISTER 5 OF FAULT HISTORY**

Screen	**5 F0 NO FAULT**
Extended info.	**SECOND FAULT=FXX**
Description	Register 5 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40436**
Modbus range	-
Read / Write	Read Only

Function It allows visualizing the information of the fault stored in register 5 of fault history.

To obtain information about data storage in the different registers and visualize the fault list, see section 'Function' in parameter 'G13.1 ➔ Register 1 of fault history'.

G13.6	REGISTER 6 OF FAULT HISTORY

Screen	**6 F0 NO FAULT**
Extended info.	**FIRST FAULT=FXX**
Description	Register 6 of fault history
Range	-
Default value	-
Set on run	-
Modbus address	**40437**
Modbus range	-
Read / Write	Read Only

Function: It allows visualizing the information of the fault stored in register 6 of fault history.

To obtain information about data storage in the different registers and visualize the fault list, see section 'Function' in parameter 'G13.1 ➔ Register 1 of fault history'.

G13.7	ERASE FAULT HISTORY

Screen	**7 CLEAR FAULTS = N**
Description	To erase fault history register
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40438**
Modbus range	0 to 1
Read / Write	YES

Function: It allows user to erase the faults stored in registers of fault history.

Options:

N ➔ NO
Function disabled.

Y ➔ YES
It erases fault history (last six faults). The screen returns to default value after all of the faults have been erased.

10.14. Group 14 – G14: Multi-references

This parameters group allows user to set multiple references for the equipment. These references will be activated by using digital inputs configured as multiple speed references or PID setpoints.

To use them like this, you must proceed in the following manner:

1) Select option '2 ➔ MREF 2 WIRES' or '3 ➔ MREF 3 WIRES' in parameter 'G4.1.4 ➔ Selection of digital inputs configuration'.
2) Once realized the previous setting, you must select if multi-references are speed references or PID setpoints.
   - If multi-references are speed references, you must only select the option 'MREF' in parameter 'G3.1 ➔ Reference source 1 of speed' or in 'G3.2 ➔ Reference source 2 of speed', depending on the reference source of speed is selected.
   - If multi-references are PID setpoints; first, you must to enable the PID regulator by selecting option 'PID' in 'G3.1 ➔ Reference source 1 of speed' or in 'G3.2 ➔ Reference source 2 of speed'. Next, you must select option 'MREF' in parameter 'G6.1 ➔ Source selection for introducing reference signal'.

When you select option '2 ➔ MREF 2 WIRES' in parameter 'G4.1.4 ➔ Selection of digital inputs configuration', digital inputs 5 and 6 are configured automatically to select multiple references (DI5 represents high bit and DI6 represents low bit). The combination of these inputs offers the possibility of selecting up to four different speed references or PID setpoints (depending on the selected option explained above).

The following table relates the inputs DI5 and DI6 to the selected multi-reference:

PARAMETER	REFERENCE	DI5	DI6
G14.4	MREF 4	0	0
G14.5	MREF 5	0	1
G14.6	MREF 6	1	0
G14.7	MREF 7	1	1

When you select option '3 ➔ MREF 3 WIRES' in parameter 'G4.1.4 ➔ Selection of digital inputs configuration', digital inputs 4, 5 and 6 are configured automatically to select multiple references (DI4 represents high bit and DI6 represents low bit). The combination of these inputs offers the possibility of selecting up to seven different speed references or PID setpoints (depending on the selected option explained above).

The following table relates the inputs DI4, DI5 and DI6 to the selected multi-reference:

PARAMETER	REFERENCE	DI4	DI5	DI6
G14.1	MREF 1	0	0	1
G14.2	MREF 2	0	1	0
G14.3	MREF 3	0	1	1
G14.4	MREF 4	1	0	0
G14.5	MREF 5	1	0	1
G14.6	MREF 6	1	1	0
G14.7	MREF 7	1	1	1

In the following figure you can observe the selection of multi-references according to the activation and/or deactivation of the digital inputs.

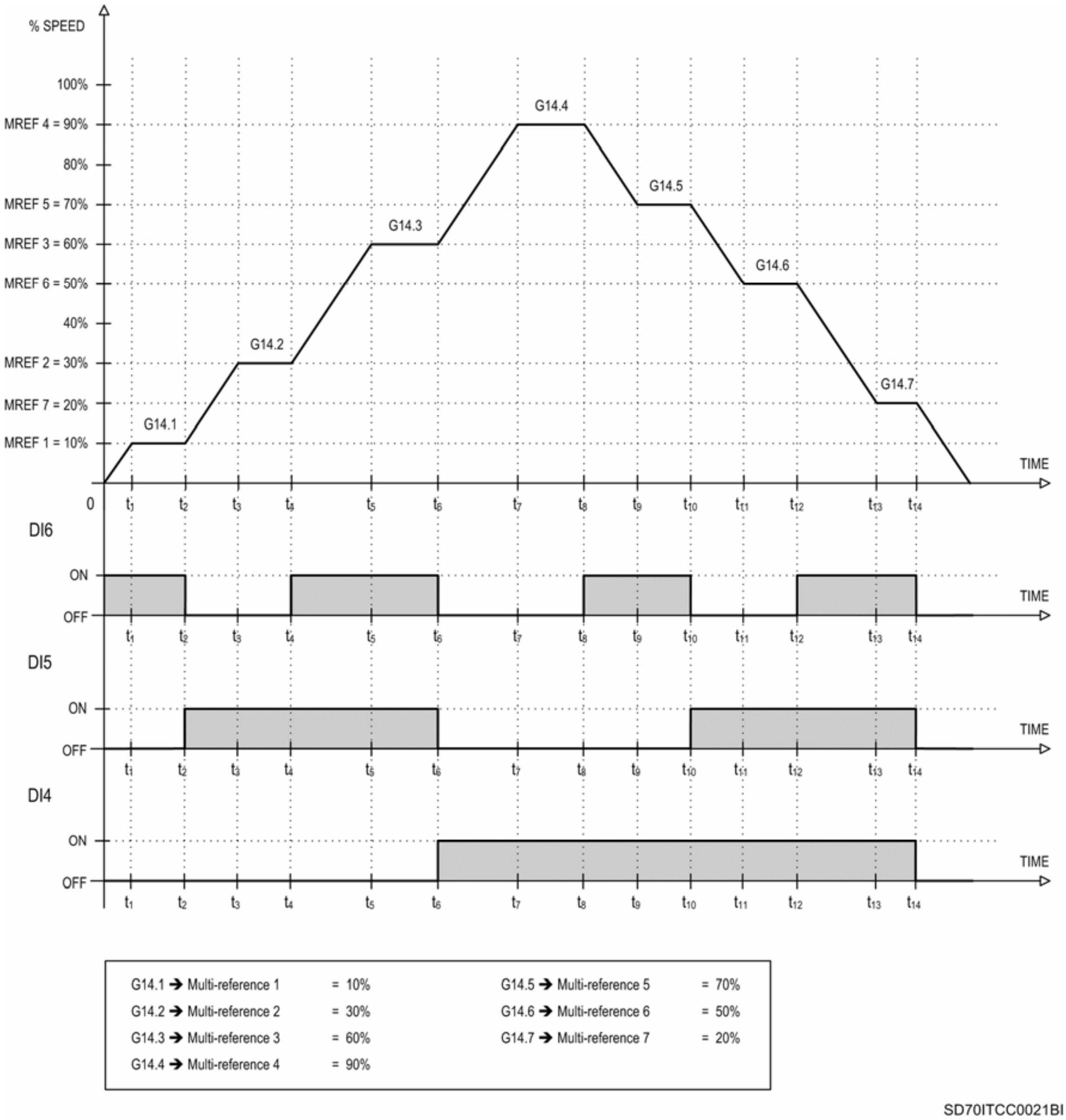

Figure 10.43 Selection of multi-references through digital inputs

G14.1	MULTI-REFERENCE 1
Screen	**1 MREF 1 = +10.0%**
Extended info.	**MULTI-REFERENCE1**
Description	Multi-reference 1
Range	-250% to +250%
Default value	+10.0%
Set on run	YES
Modbus address	**40052**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 1. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.2	MULTI-REFERENCE 2
Screen	**2 MREF 2 = +20.0%**
Extended info.	**MULTI-REFERENCE2**
Description	Multi-reference 2
Range	-250% to +250%
Default value	+20.0%
Set on run	YES
Modbus address	**40053**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 2. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.3	MULTI-REFERENCE 3
Screen	**3 MREF 3 = +30.0%**
Extended info.	**MULTI-REFERENCE3**
Description	Multi-reference 3
Range	-250% to +250%
Default value	+30.0%
Set on run	YES
Modbus address	**40054**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 3. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.4 MULTI-REFERENCE 4

Screen	**4 MREF 4 = +40.0%**
Extended info.	MULTI-REFERENCE4
Description	Multi-reference 4
Range	-250% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**40055**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 4. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.5 MULTI-REFERENCE 5

Screen	**5 MREF 5 = +50.0%**
Extended info.	MULTI-REFERENCE5
Description	Multi-reference 5
Range	-250% to +250%
Default value	+50.0%
Set on run	YES
Modbus address	**40056**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 5. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.6 MULTI-REFERENCE 6

Screen	**6 MREF 6 = +60.0%**
Extended info.	MULTI-REFERENCE6
Description	Multi-reference 6
Range	-250% to +250%
Default value	+60.0%
Set on run	YES
Modbus address	**40057**
Modbus range	-20480 to 20480
Read / Write	YES

Function: It allows user to set the value of multi-reference 6. This value is set in % of motor rated speed.

For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

G14.7	MULTI-REFERENCE 7

Screen	**7 MREF 7 = +70.0%**
Extended info.	MULTI-REFERENCE7
Description	Multi-reference 7
Range	-250% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**40058**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows user to set the value of multi-reference 7. This value is set in % of motor rated speed. For additional information, see chapter 10.14 (G14 MULTI-REFERENCES) and figure 10.43.

10.15.Group 15 – G15: Inch Speeds

This group of parameters allows setting the value of three possible inch speeds of the motor. Inch speed selection can be realized through a comparator output or by means of a digital input configured for this purpose, one input for inch speed 1 and other one for inch speed 2. For inch speed 3, a combination of two previous inputs is required.

To select an inch speed through a comparator output you must set the output function of the Comparator 1, 2 or 3 to option '05 ➔ START + INCH1', '06 ➔ START + INCH2' or '07 ➔ START + INCH3' for Comparator 1, 2 or 3 in parameter G9.1.9, G9.2.9 or G9.3.9 respectively.

In case of selecting an inch speed through digital input you must select option '08 ➔ START + INCH1' (for inch speed 1) or '09 ➔ START + INCH2' (for inch speed 2) in one of the parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration'. Inch speed 3 is selected by combination of the two digital inputs configured as inch speed 1 and 2.

	INPUTS	
SPEED	DIX	DIY
Inch speed 1	1	0
Inch speed 2	0	1
Inch speed 3	1	1

Note: The activation of this function includes the start command. Therefore, this signal prevails over any other input configured as start.

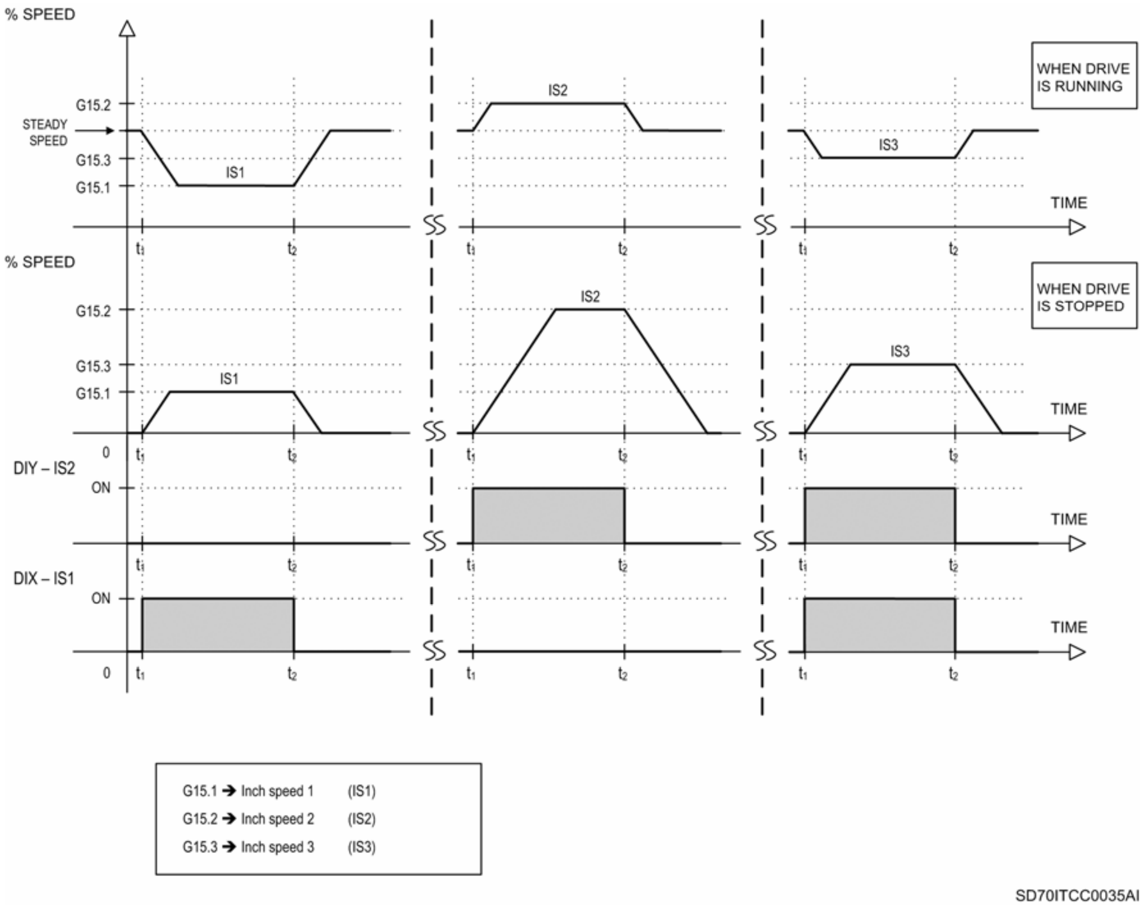

Figure 10.44 Operation of the SD700 according to the activation of the inch speeds through digital inputs

G15.1	INCH SPEED 1
Screen	**1 INCH1 = +0.00%**
Extended info.	**INCH SPEED 1**
Description	Inch speed 1
Range	-250% to +250%
Default value	+0.00%
Set on run	YES
Modbus address	**40092**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows user to set a value as inch speed 1. For more information, see chapter 10.15 (G15 INCH SPEEDS) and figure 10.44.

G15.2	INCH SPEED 2
Screen	**2 INCH2 = +0.00%**
Extended info.	**INCH SPEED 2**
Description	Inch speed 2
Range	-250% to +250%
Default value	+0.00%
Set on run	YES
Modbus address	**40093**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows user to set a value as inch speed 2. For more information, see chapter 10.15 (G15 INCH SPEEDS) and figure 10.44.

G15.3	INCH SPEED 3
Screen	**3 INCH3 = +0.00%**
Extended info.	**INCH SPEED 3**
Description	Inch speed 3
Range	-250% to +250%
Default value	+0.00%
Set on run	YES
Modbus address	**40094**
Modbus range	-20480 to 20480
Read / Write	YES
Function	It allows user to set a value as inch speed 3. For more information, see chapter 10.15 (G15 INCH SPEEDS) and figure 10.44.

10.16.Group 16 – G16: Skip Frequencies

G16.1	SKIP FREQUENCY 1

Screen	**1 SKIP 1 = +0.0%**
Extended info.	SKIP FREQUENCY 1
Description	Skip frequency 1
Range	-250% to +250%
Default value	+0.0%
Set on run	YES
Modbus address	**40132**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows user to set the first skip frequency.

With this, user achieves an operation area not selectable, this is, where reference speeds cannot be adjusted to avoid resonance frequencies. The drive will only take these reference values when is changing speed (during acceleration and deceleration), but it will not operation at these speed values.

One this value is set, the bandwidth adjusted in 'G16.3 ➔ Skip bandwidth' will be based on it, forming a frequency range that the drive will avoid.

See example and figure 10.45 in parameter 'G16.3 ➔ Skip bandwidth'.

G16.2	SKIP FREQUENCY 2

Screen	**2 SKIP 2 = +0.0%**
Extended info.	SKIP FREQUENCY 2
Description	Skip frequency 2
Range	-250% to +250%
Default value	+0.0%
Set on run	YES
Modbus address	**40133**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows user to set the second skip frequency.

With this, user achieves an operation area not selectable, this is, where reference speeds cannot be adjusted to avoid resonance frequencies. The drive will only take these reference values when is changing speed (during acceleration and deceleration), but it will not operation at these speed values.

One this value is set, the bandwidth adjusted in 'G16.3 ➔ Skip bandwidth' will be based on it, forming a frequency range that the drive will avoid.

See example and figure 10.45 in parameter 'G16.3 ➔ Skip bandwidth'.

G16.3 SKIP BANDWIDTH

Screen	**3 SKIP BAND = OFF**
Extended info.	**OFFSET BAND**
Description	Skip band
Range	OFF=0 – 20%
Default value	OFF
Set on run	YES
Modbus address	**40134**
Modbus range	0 to 1638
Read / Write	YES

Function

It allows setting the band of frequencies, inside of which, drive does not operate, in spite of the drive goes through that band of frequencies during the acceleration and deceleration.

Example.

We suppose that skip frequency 1 (G16.1) is set to ‘40%’, skip frequency 2 (G16.2) is set to ‘80%’, and the skip bandwidth is set to ‘20%’. The avoided frequencies will be from ‘40% - 10%’ to ‘40% + 10%’ and from ‘80% - 10%’ to ‘80% + 10%’, this is, from 30% to 50% and from 70% to 90%. Now, we suppose that reference frequency 1 (speed reference 1) is 55%, out of the two skip bandwidths. Reference frequency 2 (speed reference 2) is 85%, therefore, is inside of one skip bandwidth.

In the first case (reference frequency 1 = 55%), the drive will only take the frequency values that are inside of skip bandwidth while is accelerating or decelerating until reaching the value of 55% (in this case during the acceleration), speed at which the drive will remain operating.

In the second case, when reference frequency 2 is inside of one of the skip bandwidths (85%), two situations are possible:

a) Drive is accelerating; then, frequency will be increased up to 85%, it will not stop here, but it will be increased up to 90% (maximum limit value of the skip bandwidth).

b) Drive is decelerating; then, frequency will be decreased down to 85%, it will not stop here, but it will be decreased down to 70% (minimum limit value of the skip bandwidth).

In the following figure we can observe the behaviour of the frequency signal according to the skip frequencies and speed references.

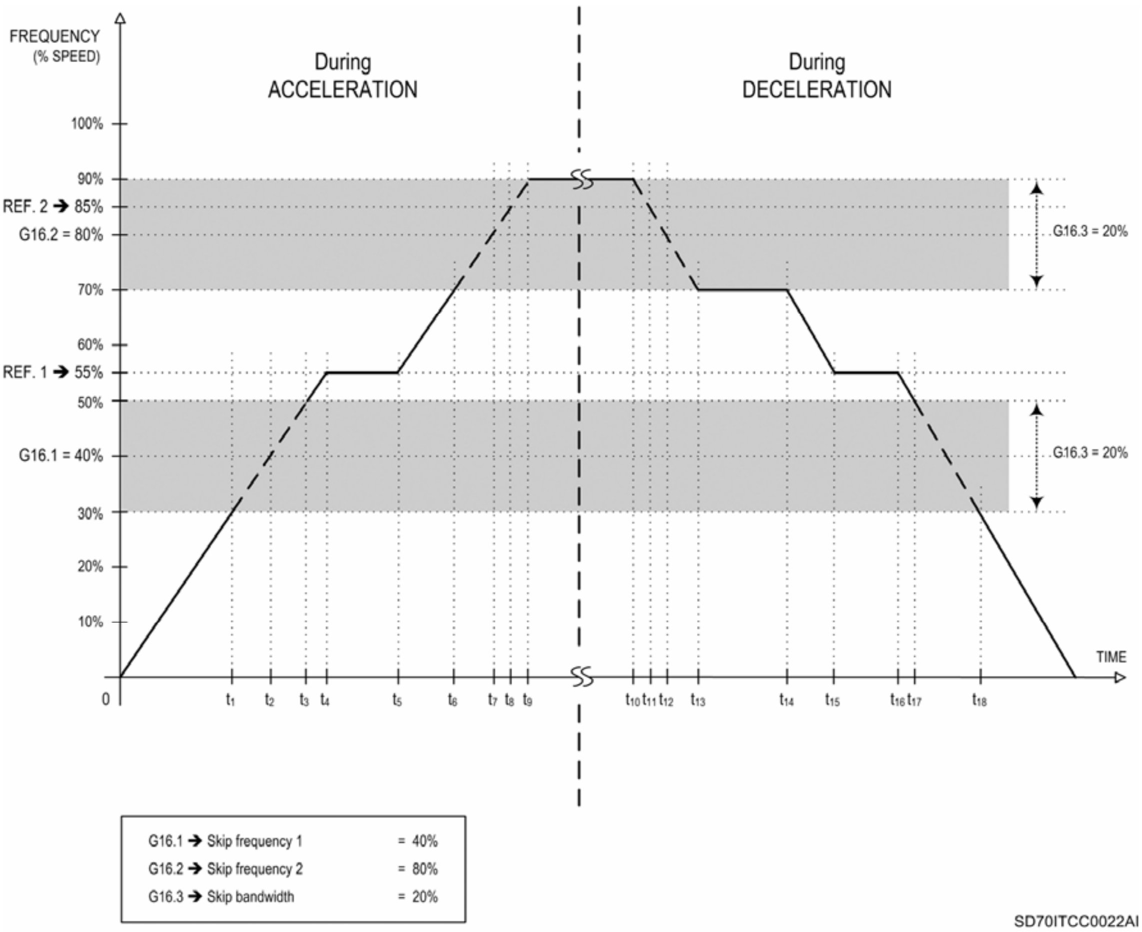

Figure 10.45 Example. Frequency signal according to the speed reference and skip frequencies

10.17.Group 17 – G17: Brake

G17.1 TIME FOR DC BRAKE ACTIVATION

Screen	**1 T DC BRAKE = OFF**
Extended info.	DC CURRENT LEVEL
Description	Time for DC brake activation
Range	OFF=0.0 – 99s
Default value	OFF
Set on run	YES
Modbus address	**40025**
Modbus range	0 to 990
Read / Write	YES

Function It allows user to set the time during which DC brake will be activated.

G17.2 CURRENT APPLIED TO THE BRAKE

Screen	**2 DC CURR = 0%**
Extended info.	DC CURRENT LEVEL
Description	Current applied to the brake
Range	0 – 100%
Default value	0%
Set on run	YES
Modbus address	**40022**
Modbus range	0 to 8192
Read / Write	YES

Function It allows setting the current value applied to the brake.

A proper current value must be set to brake the load inertia correctly. If this value is too low the load will not be stopped in time. On the other hand, if the value is too high the power components of the drive will be stressed.

G17.3 VOLTAGE APPLIED TO THE BRAKE

Screen	**3 DC VOLTS = 0.0%**
Extended info.	DC BR VOLT LEVEL
Description	Voltage applied to the brake
Range	0.0 – 25%
Default value	0.0%
Set on run	YES
Modbus address	**40023**
Modbus range	0 to 2048
Read / Write	YES

Function It allows setting the level of DC voltage applied to the brake.

A proper voltage value must be set to brake the load inertia correctly. If this value is too low the load will not be stopped in time. On the other hand, if the value is too high the power components of the drive will be stressed.

G17.4 NON CONDENSING HEATING CURRENT

Screen	**4 I HEATING = OFF**
Extended info.	**Idc HEATING**
Description	Non condensing heating current
Range	OFF=0.0 – 30%
Default value	OFF
Set on run	YES
Modbus address	**40024**
Modbus range	0 to 2458
Read / Write	YES

Function: It allows setting the DC current value to avoid humidity or condensation forming inside the motor.

Note: You must only modify this parameter if condensation or humidity problems inside the motor are present.

⚠ **CAUTION:** Although the motor is not running there is dangerous voltage. RUN led will be lit during this process. Be careful to avoid property damage and personal injuries.

G17.5 USE OF EXTERNAL BRAKE

Screen	**5 DYN BRAK = N**
Description	Use of external brake
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40026**
Modbus range	0 to 1
Read / Write	YES

Function: User must configure the drive if an external dynamic brake is going to be used.

Options:

N → NO
Application does not require the use of external brake.

Y → YES
External brake is going to be installed.

G17.6 VOLTAGE FOR ACTIVATING REGENERATION CONTROL

Screen	**6 VDC BRAKE = OFF**
Extended info.	**VDC BRAKE START**
Description	Voltage for activating the regeneration control
Range	For VIN = 400V / 500V ➔ 800 to 810V, OFF=811
	For VIN = 690V ➔ 1150 to 1160V, OFF=1161
Default value	OFF
Set on run	YES
Modbus address	**40509**
Modbus range	For VIN = 400V / 500V ➔ 800 to 810, 811
	For VIN = 690V ➔ 1150 to 1160, 1161
Read / Write	YES

Function

It allows setting the DC Bus voltage level to activate voltage regeneration control.

When an external brake is used, in some applications although braking resistors are not enough to dissipate energy returned to the drive at specific moments. In this case, the drive will use the regeneration control to limit DC bus voltage with the level value set here, by acting over motor deceleration.

10.18. Group 19 – G19: Fine Tuning

10.18.1. Subgroup 19.1 – S19.1: IGBT Control

G19.1.1	SELECTION OF CONTROL TYPE

Screen	**1 TYPE CTRL = V/Hz**
Description	Selection of control type
Range	V/Hz PEVE (See 'Function' for additional information)
Default value	V/Hz
Set on run	NO
Modbus address	**40522**
Modbus range	0 to 1
Read / Write	YES

Function It allows selecting the drive control type. Configuration options are:

V/Hz ➔ Scalar control mode.
Drive carries out the control by applying a voltage / frequency ramp to the motor.

PEVE ➔ Compensation of stator voltage drop.
Torque delivery is improved at specific moments when motor overload is present.

G19.1.2	COMMUTATION FREQUENCY

Screen	**2 FRQ = 4000 Hz**
Extended info.	**MODULAT FREQUENC**
Description	Commutation frequency
Range	4000 – 8000Hz
Default value	4000Hz
Set on run	YES
Modbus address	**40523**
Modbus range	4000 to 8000
Read / Write	YES

Function It allows modifying the commutation frequency of the output stage to the motor. This allows reducing the noise of the own motor.

G19.1.3	PEWAVE CONTROL

Screen	**3 PEWAVE=Y**
Description	Pewave control
Range	N Y (See 'Function' for additional information)
Default value	Y
Set on run	YES
Modbus address	**40524**
Modbus range	0 to 1
Read / Write	YES

Function

It allows user to select Pewave control.
This control mode improves motor noise tone.

N ➔ NO
Pewave control deactivated.

Y ➔ YES
Pewave control activated.
Commutation frequency (G19.1.2) is slightly modified on a random basis to improve the noise tone generated by the motor.

10.18.2. Subgroup 19.2 – S19.2: Motor Load

G19.2.1 MINIMUM FLUX

Screen	**1 MIN FLUX = 100%**
Extended info.	**MINIMUM FLUX**
Description	Minimum flux level
Range	40 – 100%
Default value	100%
Set on run	NO
Modbus address	**40502**
Modbus range	3277 to 8192
Read / Write	YES

Function It allows setting the minimum flux level used by the motor during low load conditions.

With this dynamic system of flux optimization, noise and power losses are reduced thanks to the automatic adaptation of the flux level during low load conditions. It is used in applications where load changes slowly (pumps, fans, ...). In these applications, the minimum value is introduced.
The more dynamic is the system behaviour, the more you must increase the minimum flux level. In applications that require dynamic behaviour, for example servos and cranes, you must set this parameter to default value (100%).

Note: If too low value is used can produce instability and current peaks. To avoid this, increase this parameter value.
The algorithm is disabled when this parameter is set to 100%.

G19.2.2 INITIAL VOLTAGE

Screen	**2 V BOOST = 0.0%**
Extended info.	**BOOST VOLTAGE**
Description	Initial voltage
Range	0.0 – 100%
Default value	0.0%
Set on run	YES
Modbus address	**40592**
Modbus range	0 to 8192
Read / Write	YES

Function It allows setting the initial voltage level to apply to the motor at the moment of starting. Using this function it is possible to improve breakaway torque when starting heavy loads.

This parameter is used in association with parameter 'G19.2.3 ➔ Torque boost band'.

Note: Set a low value first. Increase the value gradually until achieving a proper value to start correctly the installation.
Do not set values higher than needed ones, since this would produce current limitation and unnecessary overstress of the drive and motor.

G19.2.3 TORQUE BOOST BAND

Screen	**3 BW BOOST = 0.0%**
Extended info.	**BOOST BAND**
Description	Torque boost band
Range	0.0 – 100%
Default value	0.0%
Set on run	YES
Modbus address	**40593**
Modbus range	0 to 8192
Read / Write	YES

Function

It allows setting a band or range of frequencies during which torque boost set in 'G19.2.2 ➔ Initial voltage' will be applied at the moment of starting. Using this function it is possible to improve breakaway torque when starting heavy loads.

This parameter is used in association with previous parameter G19.2.2.

G19.2.4 SLIP COMPENSATION

Screen	**4 SLIP COMPENS = N**
Description	Slip compensation
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**40505**
Modbus range	0 to 1
Read / Write	YES

Function

If this function is active, it helps to compensate the slip on the motor. This function must be enabled in case of heavy load able to provoke a high slip during the starting.

N ➔ NO
Function disabled.

Y ➔ YES
Function enabled.

G19.2.5 DRIVE DAMPING

Screen	**5 DAMPING = 0.0%**
Description	Damping of the drive
Range	0.0 – 20.0%
Default value	0.0%
Set on run	YES
Modbus address	**40506**
Modbus range	0 to 1638
Read / Write	YES

Function

It allows setting a damping value for the drive when operates with no loaded motors.

If the motor is operating with no load and a high oscillation in the current is detected, then it is recommended to increase this value. Nevertheless, avoid operating with very high values (higher than 1.5%).

G19.2.6 COMPENSATING BANDWIDTH OF TORQUE TRANSITORY

Screen	**6 TTP BAND = 0.0%**
Description	Compensating bandwidth of torque transitory
Range	0.0 – 10.0%
Default value	0.0%
Set on run	YES
Modbus address	**40507**
Modbus range	0 to 819
Read / Write	YES

Function: It allows setting an initial value for a band of frequencies, where the torque transitory will be compensated.

This function helps in the starting when the load is heavy and a high torque boost is required. This value can be increased when strikes and oscillations are observed during the motor starting. Nevertheless, do not to modify this value unnecessarily since the motor operation will be affected.

G19.2.7 CURRENT LIMIT FACTOR

Screen	**7 I SLIP = 2.0%**
Extended info.	**I SLIP COMPENSAT**
Description	Current limit factor
Range	0.0 – 20.0%
Default value	2.0%
Set on run	YES
Modbus address	**40508**
Modbus range	0 to 1638
Read / Write	YES

Function: It allows setting the current limit factor.

It modifies the speed by reducing the output frequency to keep the output current within a controllable margins (display shows the warning message ILT). Adjusting this parameter can improve the stability of the current limit function considering the motor slip.

Note: We only recommend setting this value when limitation current action is unstable. Usually, this value must be set to the motor rated slip. A low value will improve the stability although the current limit action will operate earlier.

G19.2.9 INITIAL FREQUENCY

Screen	**9 STR FRQ = 0.0%**
Extended info.	**START FREQUENCY**
Description	Starting initial frequency
Range	0.0 – 100%
Default value	0.0%
Set on run	YES
Modbus address	**40594**
Modbus range	0 to 8192
Read / Write	YES

Function: It allows setting an initial frequency that will be applied at the moment of the drive starting.

G19.2.10 FREQUENCY V/Hz CHANGE

Screen	**10 V/H BREK = OFF**
Extended info.	**FRQ V/Hz CHANGE**
Description	Frequency V/Hz change
Range	OFF=0.0, 0.1 – 100%
Default value	OFF
Set on run	YES
Modbus address	**40018**
Modbus range	0 to 8192
Read / Write	YES

Function

It allows a frequency value, below which a special algorithm will be implemented. This algorithm will improve the instability of the drive.

In some applications, during a certain frequency range, excessive current oscillation may be generated, and this may cause the drive trip in overcurrent or over voltage protections. In order to avoid these oscillations, the value of this parameter must be decreased down to a certain frequency value, below which a special algorithm to improve the instability of the drive will be implemented, as mentioned before.

This parameter operates together with parameters 'G19.2.11 ➔ Stabilize factor in acceleration' and 'G19.2.12 ➔ Stabilize factor in deceleration'.

Note: Whenever there is no instability in the system (installation), do not modify the default value of this parameter.

G19.2.11 STABILIZE FACTOR IN ACCELERATION

Screen	**11 STA F AC = OFF**
Extended info.	**STABILIZE F ACC**
Description	Stabilize factor in acceleration
Range	80.0 – 99.9%, OFF=100%
Default value	OFF
Set on run	YES
Modbus address	**40019**
Modbus range	6554 to 8192
Read / Write	YES

Function

It allows setting a value as stabilize factor during acceleration.

Usually, the instability of the system is reduced during the acceleration by decreasing the value of this parameter.

This parameter operates together with parameter 'G19.2.10 ➔ Frequency V/Hz change'. See 'Function' in parameter G19.2.10 for additional information.

G19.2.12 STABILIZE FACTOR IN DECELERATION

Screen	**12 STA F DC = OFF**
Extended info.	**STABILIZE F DEC**
Description	Stabilize factor in deceleration
Range	80.0 – 99.9%, OFF=100%
Default value	OFF
Set on run	YES
Modbus address	**40020**
Modbus range	6554 to 8192
Read / Write	YES

Function	It allows setting a value as stabilize factor during deceleration. Usually, the instability of the system is reduced during the deceleration by decreasing the value of this parameter. This parameter operates together with parameter ‘G19.2.10 ➔ Frequency V/Hz change’. See ‘Function’ in parameter G19.2.10 for additional information.

G19.2.13 REGENERATION BUS VOLTAGE

Screen	**13 CTR Vbus = OFF**
Extended info.	**REGEN BUS VOL**
Description	Regeneration of bus voltage
Range	For VIN = 400V / 500V ➔ 625 to 799V, OFF=800V For VIN = 690V ➔ 950 to 1250V, OFF=1251V
Default value	OFF
Set on run	YES
Modbus address	**40021**
Modbus range	For VIN = 400V / 500V ➔ 625 to 799, 800 For VIN = 690V ➔ 950 to 1250, 1251
Read / Write	YES
Function	It allows setting a voltage value in order to remove over voltage fault. If the setting of the previous parameters ‘G19.2.10 ➔ Frequency V/Hz change’, ‘G19.2.11 ➔ Stabilize factor in acceleration’ and ‘G19.2.12 ➔ Stabilize factor in deceleration’ has not been enough to reduce the instability of the system, then, in case of fault ‘F2 V LIM FLT’ is produced, decrease the value of this parameter until the fault disappears. The optimum result will be obtained when this parameter is used together with the previous parameters G19.2.10, G19.2.11 y G19.2.12.

10.18.3. Subgroup 19.3 – S19.3: Motor Model

G19.3.1 STATOR RESISTANCE

Screen	**1 R STATOR = 0.9%**
Extended info.	**STATOR RESISTOR**
Description	Stator resistance (Rs)
Range	0.0 – 9.9%
Default value	0.9%
Set on run	YES
Modbus address	**40482**
Modbus range	0 to 811
Read / Write	YES

Function

It allows setting the value of the stator resistance.

This parameter is used to compensate for motor voltage drop. It is very important for applications with large torque transients, especially at low speed. If the resistance value is very low, then the motor torque produced at the starting will be reduced. When this value is increased, then the torque boost will be increased.

The value of the stator resistance is set as % of motor rated impedance. Consider the following table for approximate Rs values according to the motor power ratings:

Power (kW)	Rs value (%)
75	1.5 – 2
150	1 – 1.5
300	0.6 – 1.2
450	0.35 – 0.7
630	0.25 – 0.5

Note: If this value is set too high then increased motor current can reach the current limit (G10.5), avoiding motor speed increase. We recommend consulting the standard value table, since Rs value is variable according to the drive capacity.

10.19. Group 20 – G20: Serial Communication Controls

G20.1	COMMUNICATION PROTOCOL

Screen	**1 PROTOCOL = M**
Description	Communication protocol
Range	M
Default value	M
Set on run	YES

Function

It allows selecting the communication protocol to be used.

If you want to access to the drive internal variables through serial port, this parameter must be set to the desired protocol.

Option:

M ➔ MODBUS.

G20.2	LIMIT TIME FOR COMMUNICATION

Screen	**2 COMMS T/O = OFF**
Extended info.	COMMS TIMEOUT
Description	Limit time for serial communication
Range	OFF=0 – 250s
Default value	OFF
Set on run	YES
Modbus address	**40413**
Modbus range	0 to 250
Read / Write	YES

Function

It allows setting the limit time for serial communication.

This parameter provides with the option of generating a drive trip (F47 COMMS T/O) if the time elapsed from the last valid data transmission has exceeded the limit time set in this parameter. Serial communication with the drive is possible through RS232 terminals, RS485 terminals or USB port.

Note: Do not modify this parameter if is not necessary.

10.19.1. Subgroup 20.3 – S20.3: Modbus

G20.3.1	**COMMUNICATION ADDRESS**

Screen	**1 COMMS ADDR = 10**
Extended info.	**COMM ADDRESS**
Description	Drive address for communication
Range	1 – 255
Default value	10
Set on run	YES
Modbus address	**40414**
Modbus range	1 to 255
Read / Write	YES

Function	It allows assigning an identification address to the drive for communicating with it from the network. If communication is required with several drives, different address is required for each unit.

G20.3.2	**COMMUNICATION SPEED**

Screen	**2 BAUDS = 9600**
Description	Communication speed
Range	600 1200 2400 4800 9600
Default value	9600
Set on run	YES
Modbus address	**40415**
Modbus range	0 to 4
Read / Write	YES

Function	It is data transmission speed. It allows setting transmission rating for MODBUS serial communications. This transmission rating must be the same than the rating of the master of the communication bus on which the drive is integrated.

G20.3.3	**COMMUNICATION PARITY**

Screen	**3 PARITY = NONE**
Description	Selection of communication parity
Range	ODD NONE EVEN
Default value	NONE
Set on run	YES
Modbus address	**40416**
Modbus range	0 to 2
Read / Write	YES

Function	It allows setting the parity of MODBUS serial communication. It is used for data validation. If you do not want to validate data, set this parameter to 'NONE'. Parity selection must be the same than the parity of the master of the communication bus on which the drive is integrated.

10.19.2. Subgroup 20.4 – S20.4: Modbus TCP

This parameter group is used to configure the drive when it must operate in an Ethernet network communication.

G20.4.1	IP ADDRESS (A)

Screen	**1 IP PARAM A = 192**
Description	IP address (A) of the equipment
Range	0 – 255
Default value	192
Set on run	YES
Modbus address	**40374**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field A of the IP address assigned to the equipment in the local network of the user. This address must be provided by the network administrator of the own user. The format of the IP address is the following one: A.B.C.D. Therefore, the setting of this address is realized by introducing a value in each parameter that configure the complete address, this is, by assigning a value to each one of the 4 parameters (from parameter 'G20.4.1 ➔ IP address (A)' to parameter 'G20.4.4 ➔ IP address (D)'.

G20.4.2	IP ADDRESS (B)

Screen	**2 IP PARAM B = 168**
Description	IP address (B) of the equipment
Range	0 – 255
Default value	168
Set on run	YES
Modbus address	**40375**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field B of the IP address assigned to the equipment in the local network of the user. This address must be provided by the network administrator of the own user. See 'Function' in parameter 'G20.4.1 ➔ IP address (A)' for additional information.

G20.4.3	IP ADDRESS (C)

Screen	**3 IP PARAM C = 1**
Description	IP address (C) of the equipment
Range	0 – 255
Default value	1
Set on run	YES
Modbus address	**40376**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field C of the IP address assigned to the equipment in the local network of the user. This address must be provided by the network administrator of the own user. See 'Function' in parameter 'G20.4.1 ➔ IP address (A)' for additional information.

G20.4.4 IP ADDRESS (D)

Screen	**4 IP PARAM D = 143**
Description	IP address (D) of the equipment
Range	0 – 255
Default value	143
Set on run	YES
Modbus address	**40377**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field D of the IP address assigned to the equipment in the local network of the user. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.1 ➔ IP address (A)' for additional information.

G20.4.5 SUBNET MASK ADDRESS (A)

Screen	**5 SUBNET A = 255**
Description	Subnet Mask address (A)
Range	0 – 255
Default value	255
Set on run	YES
Modbus address	**40378**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field A of the Subnet Mask address of the local network of the user. This address must be provided by the network administrator of the own user.

The format of the Subnet Mask address is the following one: A.B.C.D.
Therefore, the setting of this address is realized by introducing a value in each parameter that configure the complete address, this is, by assigning a value to each one of the 4 parameters (from parameter 'G20.4.5 ➔ Subnet Mask address (A)' to parameter 'G20.4.8 ➔ Subnet Mask address (D)'.

G20.4.6 SUBNET MASK ADDRESS (B)

Screen	**6 SUBNET B = 255**
Description	Subnet Mask address (B)
Range	0 – 255
Default value	255
Set on run	YES
Modbus address	**40379**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field B of the Subnet Mask address of the local network of the user. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.5 ➔ Subnet Mask address (A)' for additional information.

G20.4.7	SUBNET MASK ADDRESS (C)

Screen	**7 SUBNET C = 255**
Description	Subnet Mask address (C)
Range	0 – 255
Default value	255
Set on run	YES
Modbus address	**40380**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field C of the Subnet Mask address of the local network of the user. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.5 ➔ Subnet Mask address (A)' for additional information.

G20.4.8	SUBNET MASK ADDRESS (D)

Screen	**8 SUBNET D = 0**
Description	Subnet Mask address (D)
Range	0 – 255
Default value	0
Set on run	YES
Modbus address	**40381**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field D of the Subnet Mask address of the local network of the user. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.5 ➔ Subnet Mask address (A)' for additional information.

G20.4.9	GATEWAY ADDRESS (A)

Screen	**9 GATEWAY A = 0**
Description	Gateway address (A)
Range	0 – 255
Default value	0
Set on run	YES
Modbus address	**40382**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field A of the Gateway address of the local network of the user. This address is needed to the drive access to an external network. This address must be provided by the network administrator of the own user.

The format of the Gateway address is the following one: A.B.C.D.
Therefore, the setting of this address is realized by introducing a value in each parameter that configure the complete address, this is, by assigning a value to each one of the 4 parameters (from parameter 'G20.4.9 ➔ Gateway address (A)' to parameter 'G20.4.12 ➔ Gateway address (D)'.

G20.4.10 GATEWAY ADDRESS (B)

Screen	**10 GATEWAY B = 0**
Description	Gateway address (B)
Range	0 – 255
Default value	0
Set on run	YES
Modbus address	**40383**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field B of the Gateway address of the local network of the user. This address is needed to the drive access to an external network. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.9 ➔ Gateway address (A)' for additional information.

G20.4.11 GATEWAY ADDRESS (C)

Screen	**11 GATEWAY C = 0**
Description	Gateway address (C)
Range	0 – 255
Default value	0
Set on run	YES
Modbus address	**40384**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field C of the Gateway address of the local network of the user. This address is needed to the drive access to an external network. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.9 ➔ Gateway address (A)' for additional information.

G20.4.12 GATEWAY ADDRESS (D)

Screen	**12 GATEWAY D = 0**
Description	Gateway address (D)
Range	0 – 255
Default value	0
Set on run	YES
Modbus address	**40385**
Modbus range	0 to 255
Read / Write	YES

Function: It allows setting the field D of the Gateway address of the local network of the user. This address is needed to the drive access to an external network. This address must be provided by the network administrator of the own user.

See 'Function' in parameter 'G20.4.9 ➔ Gateway address (A)' for additional information.

G20.4.13 MAC ADDRESS (A)

Screen	**13 MAC A = 12**
Description	MAC address (A)
Range	0 – 255
Default value	12
Set on run	YES
Modbus address	**40386**
Modbus range	0 to 255
Read / Write	YES

Function

It allows setting the field A of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics.

The format of the MAC address is the following one: A.B.C.D.E.F.
Therefore, the setting of this address is realized by introducing a value in each parameter that configure the complete address, this is, by assigning a value to each one of the 6 parameters (from parameter 'G20.4.13 ➔ MAC address (A)' to parameter 'G20.4.18 ➔ MAC address (D)'.

G20.4.14 MAC ADDRESS (B)

Screen	**14 MAC B = 34**
Description	MAC address (B)
Range	0 – 255
Default value	34
Set on run	YES
Modbus address	**40387**
Modbus range	0 to 255
Read / Write	YES

Function

It allows setting the field B of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics.

See 'Function' in parameter 'G20.4.13 ➔ MAC address (A)' for additional information.

G20.4.15 MAC ADDRESS (C)

Screen	**15 MAC C = 56**
Description	MAC address (C)
Range	0 – 255
Default value	56
Set on run	YES
Modbus address	**40388**
Modbus range	0 to 255
Read / Write	YES

Function

It allows setting the field C of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics.

See 'Function' in parameter 'G20.4.13 ➔ MAC address (A)' for additional information.

G20.4.16	MAC ADDRESS (D)
Screen	**16 MAC D = 78**
Description	MAC address (D)
Range	0 – 255
Default value	78
Set on run	YES
Modbus address	**40389**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field D of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics. See 'Function' in parameter 'G20.4.13 ➔ MAC address (A)' for additional information.

G20.4.17	MAC ADDRESS (E)
Screen	**17 MAC E = 90**
Description	MAC address (E)
Range	0 – 255
Default value	90
Set on run	YES
Modbus address	**40390**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field E of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics. See 'Function' in parameter 'G20.4.13 ➔ MAC address (A)' for additional information.

G20.4.18	MAC ADDRESS (F)
Screen	**18 MAC F = 171**
Description	MAC address (F)
Range	0 – 255
Default value	171
Set on run	YES
Modbus address	**40391**
Modbus range	0 to 255
Read / Write	YES
Function	It allows setting the field F of the MAC address. This address is unique and exclusive, and is associated to the LAN board / drive. It must be provided by Power Electronics. See 'Function' in parameter 'G20.4.13 ➔ MAC address (A)' for additional information.

10.20.Group 25 – G25: Pump Control

This parameters group will be available if parameter 'G1.7 ➔ Program activation' is set to option 'PUMP'.

10.20.1. Pumps Program General Description.

The objective of this functionality is to achieve a comprehensive control of the pumping systems using variable speed drives of SDRIVE 700 series, using in that cases the minimum peripherical devices as possible. The program comprises all that options which allows controlling the process correctly, avoiding the use of those external auxiliary devices such as timers, relays, PLC, etc.

This program has been thought to control the drive and additionally to control up to 5 auxiliary fixed pumps. Apart of this there is the possibility of using one of this pumps as Jockey pump (it will operate only under very low demand conditions in case of the drive is in sleep mode) or one pump can be used as Priming pump (it will operate to fulfil the aspiration pipe if the system requires this function).

10.20.2. Operation modes.

There are three operation modes basically:

- **Manual Protected Mode**: One of the digital inputs must be set as Automatic and a second digital input must be set as Protected Manual. Both inputs must be closed to start. In this operation mode the system protections are operative (for example, high pressure, cavitation, etc.). A main speed reference source and an alternative speed reference source exist, they are set by means of a digital input.

- **Manual Non Protected Mode**: This is an operation mode thought for commissioning and test of the system. It is not recommended for a normal operation since the protections are not active. There are two possibilities of configuring this mode:
  - Manual non protected mode with exclusive control from the keypad.
  - Manual non protected mode controlled by the digital inputs.

  A main speed reference source and an alternative speed reference source exist, they are set by means of a digital input.

- **Pumps Mode**: The drive will operate in regulation mode with all the available functions and the protections will be operative.

10.20.3. General Descriptions of Protections.

In case of the pump program is active, the drive will function in three different ways depending on the activated protections:

- **Faults of the Drive (Standard Program):** Here we can find those trips of the drive or trips of the installation that have been configured in the standard program of the drive. In case of any of these conditions occur, the motor controlled by the drive will stop, followed by the fixed pumps and the display will show the corresponding fault message.

- **Pause of the Pumps Program:** Certain protections can be configured to stop the drive temporary without tripping by fault. For all of them there is only one time to start after the pause, and this time will start once the cause which provoked the pause disappears. The protections which can be set in this way are:

- **High Pressure:** Configurable at Pause mode or at Fault mode. If it is set as Pause, the displayed message will be 'HI PRESSURE PAUS' but if this is set to Fault, the message will be 'F66 HI PRESSURE'.

- **No Flow:** Configurable at Pause mode or at Fault mode. If it is set as Pause, the displayed message will be 'NO PLOW PAUSE' but if this is set to Fault, the message will be 'F69 FLOW SWITCH'.

- **Cavitation:** Configurable at Pause mode or at Fault mode. If it is set as Pause, the displayed message will be 'CAVITATION PAUSE' but if this is set to Fault, the message will be 'F68 CAVIT/UNDERL'.

  Note: The pauses are not faults, consequently the do not generate a fault code and they will not be stored in the fault history.

- **Faults of Pumps Program:** That means the drive or installation faults that have been configured from the pump program. In case of any of these conditions occur, the motor controlled by the drive will stop, followed by the fixed pumps and the display will show the corresponding fault message. These fault will be treated in the same way than the general faults, some of them are:

  - **High Pressure Fault:** It can be provoked through a digital input which has been configured in this mode or by comparison of the received data of an analogue input. This information will be compared with the setting realized in parameters 'G25.6.11 ➔ Minimum speed for minimum pressure fault' to 'G25.6.13 ➔ Maximum pressure level'. The display will show 'F66 HI PRESSURE'.

  - **Low Pressure Fault:** Pipe broken possibility. The display will show 'F65 LOW PRESSURE'.

  - **No Water Fault:** This is especially useful in the use of level proves at wells. The display will show 'F67 LOW WATER'.

  - **Short Starting Cycle Fault:** Produced when the drive tries to start before the established time between a start and a stop has expired. For additional information, see 'G25.6.20 ➔ Cycle time of the drive'. In this case, the display will show 'F71 CYCLING'.

  - **Irrigation Equipment Fault:** Produced by a digital input configured for this objective. The display will show 'F70 IRRIGATOR F'.

  - **No Flow Fault:** Produced by a digital input configured in this option. The display will show 'F69 FLOW SWITCH'.

  - **Cavitation:** Produced by operation on underload conditions. The display will show 'F68 CAVIT/UNDERL'.

  - **Pressure Switch:** (Only with Priming pump). The Pressure switch is open out of the allowed time, indicating a sudden pressure loss. The display will show 'F72 IN PRESS SW'.

10.20.4. Inputs Configuration.

For inputs configuration, it is necessary to consider some rules which will help in order to get a correct system configuration.

- **Digital input for flow acquisition by pulse counter.**
  All digital input can be configured in this option '51 ➔ FLOW PULSE'. The parameters for setting the flowmeter are located in the subgroup S4.4 Pulse Input.

  The read flow can be used to limit the flow of the application, see group G25.10 Flow Limitation Algorithm. An analogue output can be configured to show this information (by setting the option '20 ➔ CURRENT FLOW'), in this way this information can be used for the PLC or even can be connected to the drive as a feedback signal in PID mode without needing the use of external converter of pulses signal into 4-20mA signal.

- **Inputs programming.**
  There are some configuration options available when the pump program is active, which can be set in the same way that the options available in the standard program.

  Nevertheless, when the pump program is active, the drive will assume that only the configurable options from 50 to 69 (for 'G4.1.5 ➔ Multi-function Digital Input 1 configuration 1' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') can be set, without taking into consideration the setting on parameter 'G4.1.4 ➔ Selection of digital inputs configuration', which means a block setting.

  All that means that the user will configure the pump program freely, according to his requirements, selecting the correct functionality and protections.

  The options for inputs configuration, standard program options as well as pump program options have been detailed in the corresponding group G4.1 Digital Inputs.

10.20.5. Inputs Configuration Rules.

It is necessary to have into consideration the following rules for a correct digital input configuration when the Pump Program is active:

- **Mutual Exclusion Rule:**
  - If the pump program is deactivated, the user can only set options from 0 to 23 for the digital inputs, which are options for functionalities related to the standard program.
  - If the pump program is active, the user can only set options from 50 to 69 for the digital inputs, which are options for functionalities related to the pump program.

- **System Start Terminal Rule (Automatic):**
  To ensure the start and the stop of the system, the user must first of all configure one of the digital inputs as option '50 ➔ PMP START/STP'. On the contrary, the drive does not allow configuring any other option. Once this is done, it is possible to configure the resting inputs as necessary (respecting always the configuration rules).

- **Rule for Multiple References Selection:**

  With the pump program is possible to operate using up to 8 different regulation setpoints in PID mode (settable in G25.1.5 to G25.1.12). To active each different setpoint 3 digital inputs configured as options 63, 64 and 65 can be used. It is necessary to take into consideration the following items:

  - No Digital Input could be configured as '64 ➔ SETPONT PIN2' unless previously other different input has been configured as '63 ➔ SETPONT PIN1'.
  - No Digital Input could be configured as '65 ➔ SETPONT PIN3' unless previously two different inputs have been configured as options '63 ➔ SETPONT PIN1' and '64 ➔ SETPONT PIN2'.

- **Rule for Selection / De-selection of Auxiliary Pumps:**

  For selecting one auxiliary pump it is necessary to act in the following way:

  - Set any digital input to options '52 ➔ FIX PUMP1 FLT', '53 ➔ FIX PUMP2 FLT', '54➔ FIX PUMP3 FLT', '55 ➔ FIX PUMP4 FLT' or '56 ➔ FIX PUMP5 FLT'.
  - To enable the control of the pump in the corresponding parameter G25.9.1, G25.9.2, G25.9.3, G25.9.4 and G25.9.5 respectively.

  To remove this fixed pump configuration and release the relay for another different use, it is necessary to:

  - To disable the control of the pump in the corresponding parameter G25.9.1, G25.9.2, G25.9.3, G25.9.4 and G25.9.5 respectively.

10.20.6. Outputs Configuration.

Regarding to the outputs, it is useful to take into account some considerations which will help for a correct configuration of the system.

- **Digital outputs.**

  There are some configuration options for the outputs that are only available if the pump program is operative, but they cannot be used in the standard program: '28 ➔ PUMP CNTRL', '29 ➔ JOCKEY PUMP' and '30 ➔ PRIMING PUMP'. The needed information has been detailed in the corresponding group G8.1 Digital Outputs.

- **Analogue outputs.**

  The options available in the standard program can also be used for the pump program, and additionally the option '20 ➔ CURRENT FLOW', that can be configured to provide the read flow at any of the analogue output formats.

  - Example 1 for configuring the analogue output as read flow.

    In case the flowmeter data configured in G4.4 are:

Units:	litres
Pulses / second:	100l/s
Maximum Range:	1000 litres

    Analogue output setting:

Format:	0 – 10V
Minimum Range:	0
Maximum Range:	100%

    For a read flow of 500 litres, the analogue output will be:

$$x = \frac{\text{Read value} * 10\text{V}}{\text{Maximum Range}} = \frac{500 * 10}{1000} = 5\text{V}$$

- Example 2 for configuring the analogue output as read flow.

  If the flowmeter data configured in G4.4 are:

Units:	litres
Pulses / second:	100l/s
Maximum Range:	1000 litres

  Analogue output setting:

Format:	4 – 20mA
Minimum Range:	0
Maximum Range:	100%

  For a read flow of 500 litres, the analogue output is:

$$x = \left(\left(\frac{ReadValue}{MaximumRange} \right) * (20 - 4) \right) + 4 = \left(\left(\frac{500}{1000} \right) * 16 \right) + 4 = 12mA$$

Additionally exists the option '27 ➔ MACRO PUMP', that it is not directly settable by the user for any of the analogue outputs. On the contrary, this option is automatically set for the program to the Analogue Output 1 in case of the user enables the Fixed Pump 4, and it will be automatically set for the Analogue Output 2 when the user enables the Fixed Pump 5. For both outputs, the format configuration will always be 0 to 10V, where 0 means the pump is OFF and 10V means the pump is ON.

10.20.7. Subgroup 25.1 – S25.1: Setpoints

G25.1.1	CONTROL MODE

Screen	**1 CONTROL MODE = 1**
Description	Control mode
Range	0 1 (See 'Function' for additional information)
Default value	1
Set on run	NO
Modbus address	**42035**
Modbus range	0 to 1
Read / Write	YES

Function

It allows selecting the control mode according to the following configuration options:

0 ➔ MANUAL

This control mode is thought for commissionings and tests. It is not thought for a continuous operation since protections are disabled. In this control mode display shows 'OVERRIDE MANUAL'.
With this option it is necessary to operate from the keypad, but the speed reference can be introduced by using an analogue input or by keypad.

1 ➔ PUMP

The drive will start in pump control mode. Selection of automatic operation in regulation mode (it allows to control flow, pressure).

G25.1.2	SOURCE SELECTION FOR SPEED REFERENCE IN MANUAL MODE

Screen	**2 MAN SPD REF = LOCAL**
Description	Selection of the source for the main speed reference in manual mode
Range	LOCAL AI1 AI2 (See 'Function' for additional information)
Default value	LOCAL
Set on run	NO
Modbus address	**42041**
Modbus range	0 to 2
Read / Write	YES

Function

It allows selecting the source for the speed reference when manual mode is activated by means of the activation of one digital input configured as 'MANUAL PROTECTED' or as 'OVERRIDE MANUAL' (parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration', option '57 ➔ MAN PROTstart' and '67 ➔ MAN OVR STAR' respectively).

Configuration options are the following ones:

LOCAL	➔	Speed reference is introduced from keypad.
AI1	➔	Speed reference is introduced by means of Analogue Output 1.
AI2	➔	Speed reference is introduced by means of Analogue Output 2.

G25.1.3 VALUE OF SPEED REFERENCE FOR LOCAL SOURCE IN MANUAL MODE

Screen	**3 MAN SPEED = +0.0%**
Extended info.	**MANUAL SPEED**
Description	Value of speed reference in manual mode when local source is selected
Range	-250% to +250%
Default value	+0.0%
Set on run	YES
Modbus address	**42042**
Modbus range	-20480 to 20480
Read / Write	YES

Function

It allows setting the speed reference of the drive to operate in manual mode (protected or not) when 'LOCAL' source has been selected (in parameter 'G25.1.2 ➔ Source selection for speed reference in manual mode' and/or 'G25.1.4 ➔ Source selection for alternative speed reference in manual mode') and whether the speed reference is the main reference or the alternative reference.

Therefore, it is possible to select one analogue input as source for main speed reference in 'G25.1.2 ➔ Source selection for speed reference in manual mode' (option 'AI1' or 'AI2'), and on the other hand, to select the keypad as source for alternative speed reference in 'G25.1.4 ➔ Source selection for alternative speed reference in manual mode' (option 'LOCAL'). In this way, when digital input configured as alternative reference (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration', option '15 ➔ REFERENCE 2') is activated, the speed of drive pump is the set one in this parameter from keypad. In case of the digital input configured as alternative is not activated and keypad is selected as source for main speed reference (parameter G25.1.2 set to 'LOCAL'), the value set here will be applied directly as speed reference of the drive pump. This functionality is interchangeable between main and alternative speed references, this is, we can select the main speed reference by analogue input and the alternative by keypad and vice versa.

G25.1.4 SOURCE SELECTION FOR ALTERNATIVE SPEED REFERENCE IN MANUAL MODE

Screen	**4 ALT MAN S R = LOCAL**
Description	Selection of the source for the alternative speed reference in manual mode
Range	LOCAL AI1 AI2
Default value	LOCAL
Set on run	YES
Modbus address	**42043**
Modbus range	0 to 2
Read / Write	YES

Function

It allows selecting the source for the alternative speed source in manual mode.

See 'Function' in parameter 'G25.1.2 ➔ Source selection for speed reference in manual mode' to obtain information about the configuration options.

G25.1.5 LOCAL SETPOINT 1 FOR PID

Screen	**5 SETPT1 = 0.0Bar**
Extended info.	LOCAL SETPOINT 1
Description	Local setpoint 1 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42151**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 1 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

In case of operating with unique local setpoint in PID mode, its value will be set in this parameter.

In case of operating with multiple PID setpoints, the speed applied for each case will depend on the activating status of the digital inputs configured with options '63 ➔ SETPONT PIN1' (Low Bit), '64 ➔ SETPONT PIN2' (Medium Bit) and '65 ➔ SETPONT PIN3' (High Bit) in parameters 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration'.

The assignment of multiple setpoints is realized according to the following table:

DIGITAL INPUTS			PID SETPOINT
DI(z)=65	DI(y)=64	DI(x)=63	
0	0	0	G25.1.5 'SETPT1'
0	0	X	G25.1.6 'SETPT2'
0	X	0	G25.1.7 'SETPT3'
0	X	X	G25.1.8 'SETPT4'
X	0	0	G25.1.9 'SETPT5'
X	0	X	G25.1.10 'SETPT6'
X	X	0	G25.1.11 'SETPT7'
X	X	X	G25.1.12 'SETPT8'

G25.1.6 LOCAL SETPOINT 2 FOR PID

Screen	**6 SETPT2 = 0.0Bar**
Extended info.	LOCAL SETPOINT 2
Description	Local setpoint 2 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42152**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 2 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.7 LOCAL SETPOINT 3 FOR PID

Screen	**7 SETPT3 = 0.0Bar**
Extended info.	LOCAL SETPOINT 3
Description	Local setpoint 3 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42153**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 3 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.8 LOCAL SETPOINT 4 FOR PID

Screen	**8 SETPT4 = 0.0Bar**
Extended info.	LOCAL SETPOINT 4
Description	Local setpoint 4 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42154**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 4 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.9 LOCAL SETPOINT 5 FOR PID

Screen	**9 SETPT5 = 0.0Bar**
Extended info.	LOCAL SETPOINT 5
Description	Local setpoint 5 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42155**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 5 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.10 LOCAL SETPOINT 6 FOR PID

Screen	**10 SETPT6 = 0.0Bar**
Extended info.	**LOCAL SETPOINT 6**
Description	Local setpoint 6 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42156**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 6 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.11 LOCAL SETPOINT 7 FOR PID

Screen	**11 SETPT7 = 0.0Bar**
Extended info.	**LOCAL SETPOINT 7**
Description	Local setpoint 7 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42157**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 7 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.12 LOCAL SETPOINT 8 FOR PID

Screen	**12 SETPT8 = 0.0Bar**
Extended info.	**LOCAL SETPOINT 8**
Description	Local setpoint 8 for PID
Range	0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42158**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the local setpoint 8 for PID.
It is possible to operate with the following units %, l/s, m/s, l/min, m³/min, l/h, m³/h, m/s, m/min, m/h, Bar, kPa, Psi, m, ºC, ºF, ºK. It depends on the units of the sensor used.

See 'Function' in parameter 'G25.1.5 ➔ Local setpoint 1 for PID' for additional information.

G25.1.13 TIME FOR AUTOMATIC STOP

Screen	**13 T AutOFF = OFF**
Extended info.	**AUTO-OFF DELAY**
Description	Setting of a time for automatic stop
Range	OFF, 0.1 – 99.9h
Default value	OFF
Set on run	YES
Modbus address	**42044**
Modbus range	0 to 999
Read / Write	YES

Function

It allows setting a time, after elapsing it, the drive will stop automatically. Once this time is set, this one starts elapsing immediately. At the moment of drive is stopped (once elapsed the time for automatic stop), parameter value become 'OFF' and the status of pump program will change to 'COMPLETED'. If you want to the drive to stop automatically again, you must adjust the stop time again.

There are two visualization parameters related to this parameter:

- 'SV5.22 ➔ T AutoOFF=OFF', it is directly parameter G25.1.13 translated to the visualization group SV5.
- 'SV5.23 ➔ TIME OFF=OFF', that shows the remaining time in minutes for automatic stop of the system.

10.20.8. Subgroup 25.2 – S25.2: PID Setting

G25.2.1	PID SETPOINT SOURCE

Screen	**1 PID SETP = LOCAL**
Description	Selection of the source for PID setpoint
Range	LOCAL AI1 AI2 (See 'Function' for additional information)
Default value	LOCAL
Set on run	YES
Modbus address	**42045**
Modbus range	0 to 2
Read / Write	YES

Function It allows selecting the source to introduce the PID setpoint.

Selection options:

LOCAL ➔ PID setpoint is introduced from keypad.

AI1 ➔ PID setpoint is introduced by means of Analogue Input 1.

AI2 ➔ PID setpoint is introduced by means of Analogue Input 2.

G25.2.2	ALTERNATIVE PID SETPOINT SOURCE

Screen	**2 PID aSTP = LOCAL**
Description	Selection of the alternative source for PID setpoint
Range	LOCAL AI1 AI2 (See 'Function' for additional information)
Default value	LOCAL
Set on run	YES
Modbus address	**42374**
Modbus range	0 to 2
Read / Write	YES

Function It allows selecting the alternative source to introduce the PID setpoint.

Selection options:

LOCAL ➔ PID setpoint is introduced from keypad.

AI1 ➔ PID setpoint is introduced by means of Analogue Input 1.

AI2 ➔ PID setpoint is introduced by means of Analogue Input 2.

G25.2.3 PID FEEDBACK SOURCE

Screen	**3 PID FBK = AI2**
Description	Selection of the source for PID feedback signal
Range	AI1 AI2 PULSE (See ‘Function’ for additional information)
Default value	AI2
Set on run	YES
Modbus address	**42046**
Modbus range	0 to 2
Read / Write	YES

Function It allows selecting the source to introduce PID feedback signal.

Selection options:

AI1 ➔ Feedback signal is introduced through Analogue Input 1.

AI2 ➔ Feedback signal is introduced through Analogue Input 2.

PULSE ➔ Feedback signal is introduced through configurable Multi-function Digital Input programmed for this purpose (parameter G4.1.5 to G4.1.10). See Subgroup S4.4 Pulse Input for additional information.

G25.2.4 PROPORTIONAL GAIN OF PID REGULATOR

Screen	**4 PID Kc = 1.0**
Extended info.	**PROPORTIONAL PID**
Description	Proportional gain of PID regulator
Range	0.1 – 20
Default value	1.0
Set on run	YES
Modbus address	**42047**
Modbus range	1 to 200
Read / Write	YES

Function It allows setting the value of the proportional gain for the PID regulator according to the requirements of the installation.

Note: The default value is usually proper for pump control application. Nevertheless, if it is necessary to have a higher control response, then increase this value. If this value is increased, a higher instability can be introduced in the system.

G25.2.5 INTEGRAL TIME OF PID REGULATOR

Screen	**5 PID It = 5.0s**
Extended info.	**INTEGRAL PID**
Description	Integral time of PID regulator
Range	0.1 – 999.9s, Max
Default value	5.0s
Set on run	YES
Modbus address	**42048**
Modbus range	1 to 9999, 10000
Read / Write	YES

Function	It allows setting the integral time of PID regulator according to the requirements of the installation.
Note:	The default value is usually proper for pump control application. If this value is increased, accuracy of the system is improved, but system response can be slow down.

G25.2.6 DERIVATION TIME OF PID REGULATOR

Screen	**6 PID Dt = 0.0s**
Extended info.	**DIFFERENTIAL PID**
Description	Derivation time of PID regulator
Range	0.0 – 250s
Default value	0.0s
Set on run	YES
Modbus address	**42049**
Modbus range	0 to 2500
Read / Write	YES

Function	It allows setting the derivation time of PID regulator according to the requirements of the installation.
Note:	The default value is usually proper for pump control application. Therefore, we recommend do not modify this setting. If this value is increased, the system response is improved but system accuracy can be reduced slightly.

G25.2.7 ERROR OF PID REGULATOR

Screen	**7 PID ERR = +xx.x%**
Description	Error of PID regulator
Range	+0 to +100%
Default value	-
Set on run	-
Modbus address	**42050**
Modbus range	-
Read / Write	Read Only

Function

It displays the difference between the value of PID setpoint (source of which is set in ‘G25.2.1 ➔ PID setpoint source’) and the value of the feedback signal of the process (source of which is set in ’G25.2.3 ➔ PID feedback source’) in percentage.

This parameter is read only.

G25.2.8 ERROR OF PID REGULATOR IN ENGINEERING UNITS

Screen	**8 ERR = +xx.xxkPa**
Description	Error of PID regulator in engineering units
Range	+0.0 to +3276 Engineering units
Default value	-
Set on run	-
Modbus address	**42051**
Modbus range	-
Read / Write	Read Only

Function It displays the difference between the value of PID setpoint (source of which is set in 'G25.2.1 ➔ PID setpoint source') and the value of the feedback signal of the process (source of which is set in 'G25.2.3 ➔ PID feedback source') in engineering units (Bar, kPa, m³/s, etc.).

This parameter is read only.

G25.2.9 PID OUTPUT INVERSION

Screen	**9 PID INVERT = N**
Description	Inversion of the PID regulator output
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42326**
Modbus range	-
Read / Write	YES

Function It is possible to get an inverse operation of the drive output in PID mode:

N ➔ NO

PID output inversion disabled.

In this case, the PID regulator response if the feedback decreases is an increasing of the output speed. This is the standard setting when the PID is used for an application of constant pressure control. If the pressure decreases (feedback signal) due to a higher demand, it is required to increase the pump speed to keep constant the pressure in the system.

Y ➔ YES

PID output inversion enabled.

In this case, the PID regulator response when the feedback signal is falling down is a reduction of the output speed. For example, this operation is typical for a temperature control by means of PID mode. A reduction of the temperature (feedback signal) due to a lower demand, requires that the speed of the fan is reduced to keep the temperature.

10.20.9. Subgroup 25.3 – S25.3: Start Conditions

General considerations for starting conditions.

During the setpoint ramp, neither the conditions for the activation of fixed pumps nor the conditions for sleep mode will be considered. Only when the drive is in regulation mode (see parameter 'G25.7.4 ➔ Setpoint ramp' for additional information) those conditions will be considered.
During the bypass process (connection of fixed pumps) these conditions will be not considered either.

G25.3.1	WAKE UP LEVEL OF THE DRIVE
Screen	**1 LP Pon = 0.0Bar**
Extended info.	AWAKENING LEVEL
Description	Wake up level of the drive
Range	0.0 – 3276Bar
Default value	0.0Bar
Set on run	YES
Modbus address	**42064**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows setting the wake up level of the drive. The value is set in units. For example, if the PID setpoint is 5Bar and the value set in this parameter is 2Bar, then we are placing the wake up level below 3Bar (5Bar – 2Bar = 3Bar).

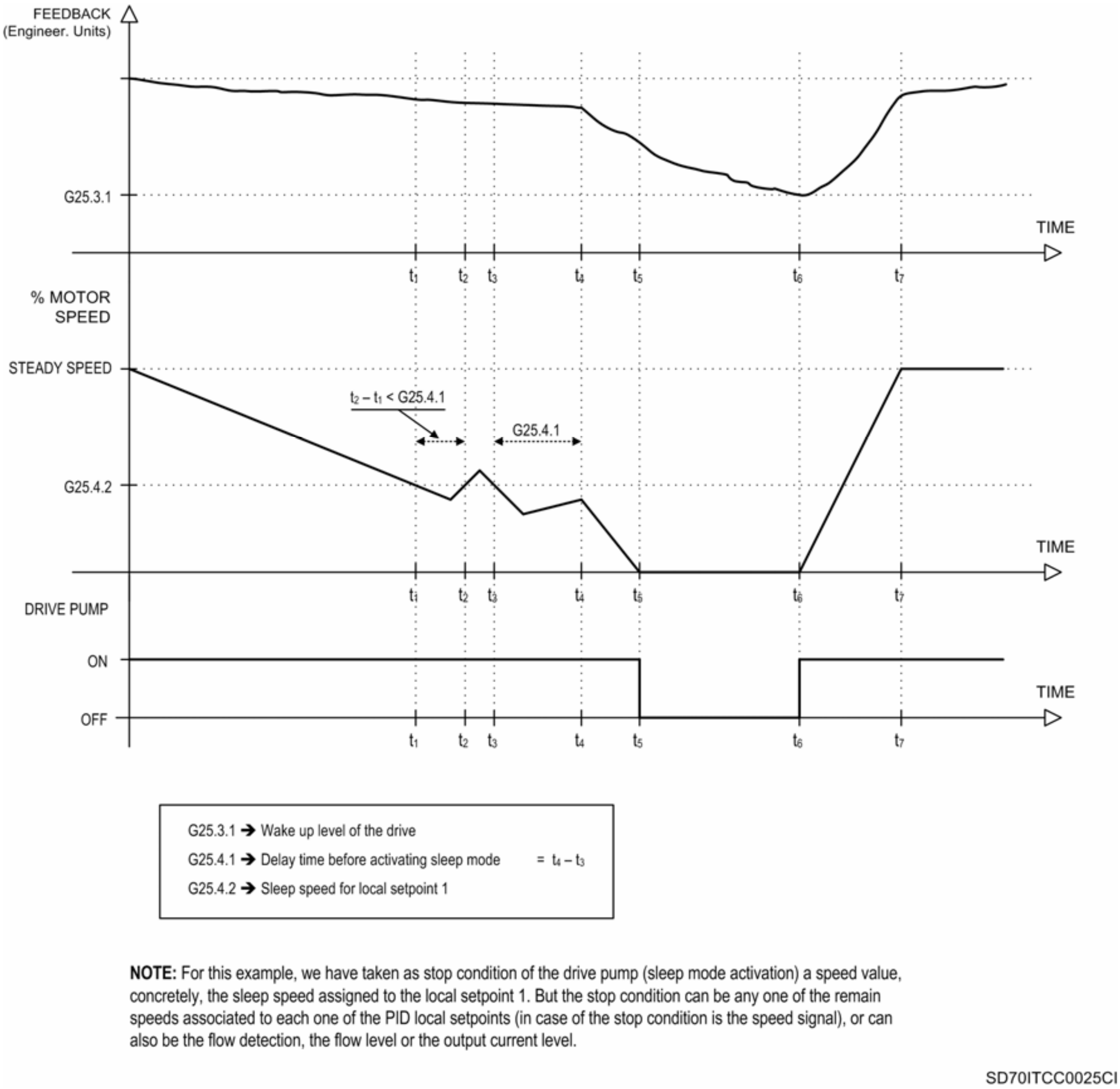

Figure 10.46 Activation and deactivation of Sleep Mode

G25.3.2 START SPEED FOR THE FIXED PUMPS

Screen	**2 FP SpON = +90.0%**
Extended info.	**FIX PMP STAR SPD**
Description	Start speed for the fixed pumps
Range	-250% to +250%
Default value	+90.0%
Set on run	YES
Modbus address	**42055**
Modbus range	-20480 to 20480
Read / Write	YES

Function It allows setting the drive speed above of which the fixed pumps will start.

This one is an optional condition that can be disabled. For that, you must set this parameter value to 0%, in that way, any speed for above of this one is able to start the pumps. This is, the speed of the drive is not considered to start the fixed pumps. So we force this condition to be fulfilled, therefore, it is not already a condition.

The value is set as percentage of motor speed.

At the moment of starting of the fixed pumps, additionally, it will also considered the start delay time for each fixed pump (parameter G25.3.4 to G25.3.8) and the PID error (parameter 'G25.3.3 ➔ Minimum PID error to start the fixed pumps').

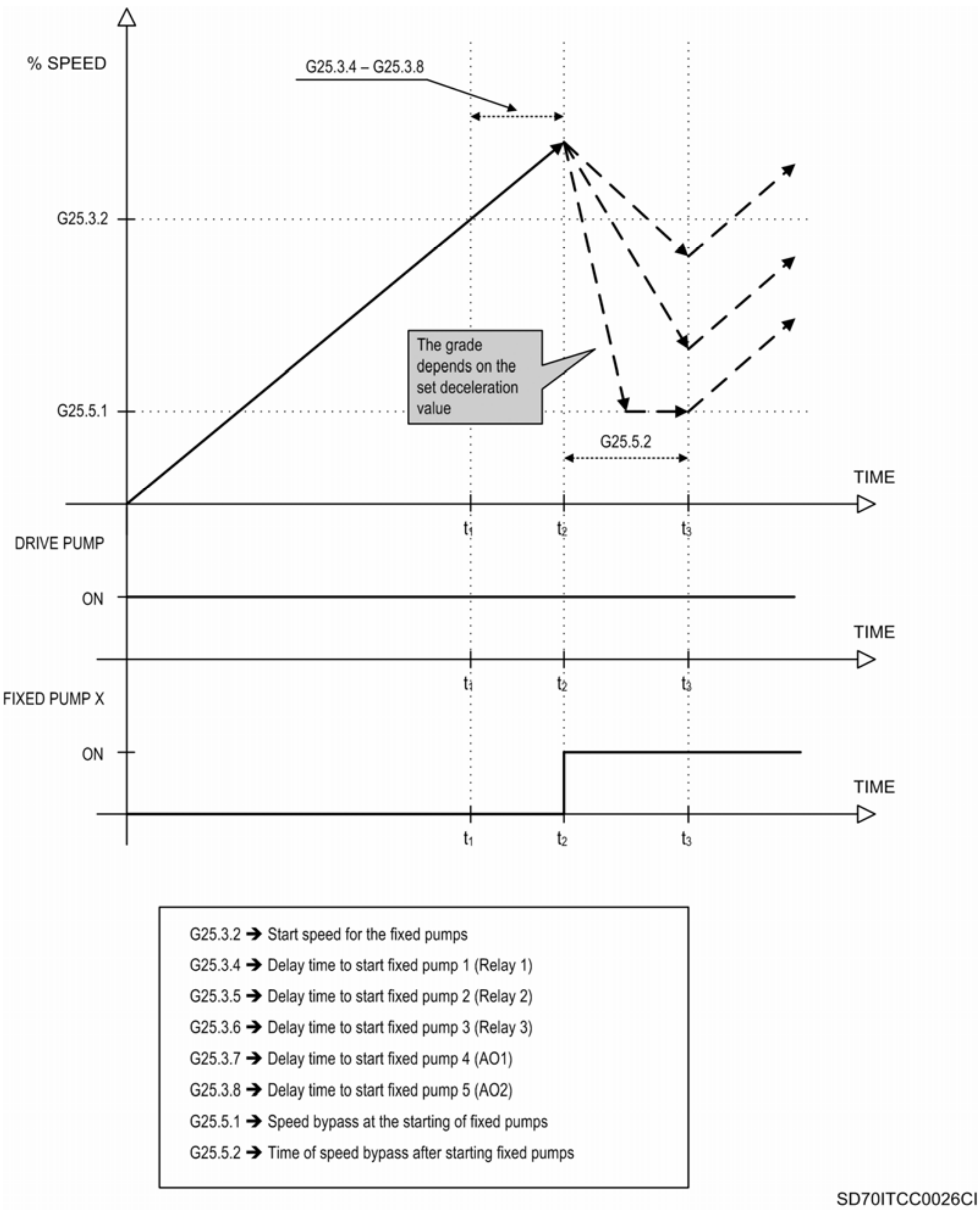

Figure 10.47 Starting of the fixed pumps according to the starting speed and the delay time for each pump

G25.3.3 MINIMUM PID ERROR TO START THE FIXED PUMPS

Screen	**3 FP ErON = +10.0%**
Extended info.	FIX PMP STAR ERR
Description	Minimum PID error to start the fixed pumps
Range	OFF=0 to +200%
Default value	+10.0%
Set on run	YES
Modbus address	**42056**
Modbus range	0 to 16384
Read / Write	YES

Function

It allows setting the PID error above of which the fixed pumps will start.

This one is an optional condition that can be considered or not, depending on the setting. If this parameter is set to 0.0%, any value could start the fixed pumps.

This parameter allows user to consider the PID error (%) when the fixed pumps must be started.

At the moment of starting of the fixed pumps, additionally, it will also considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the start delay time for each fixed pump (parameter G25.3.4 to G25.3.8).

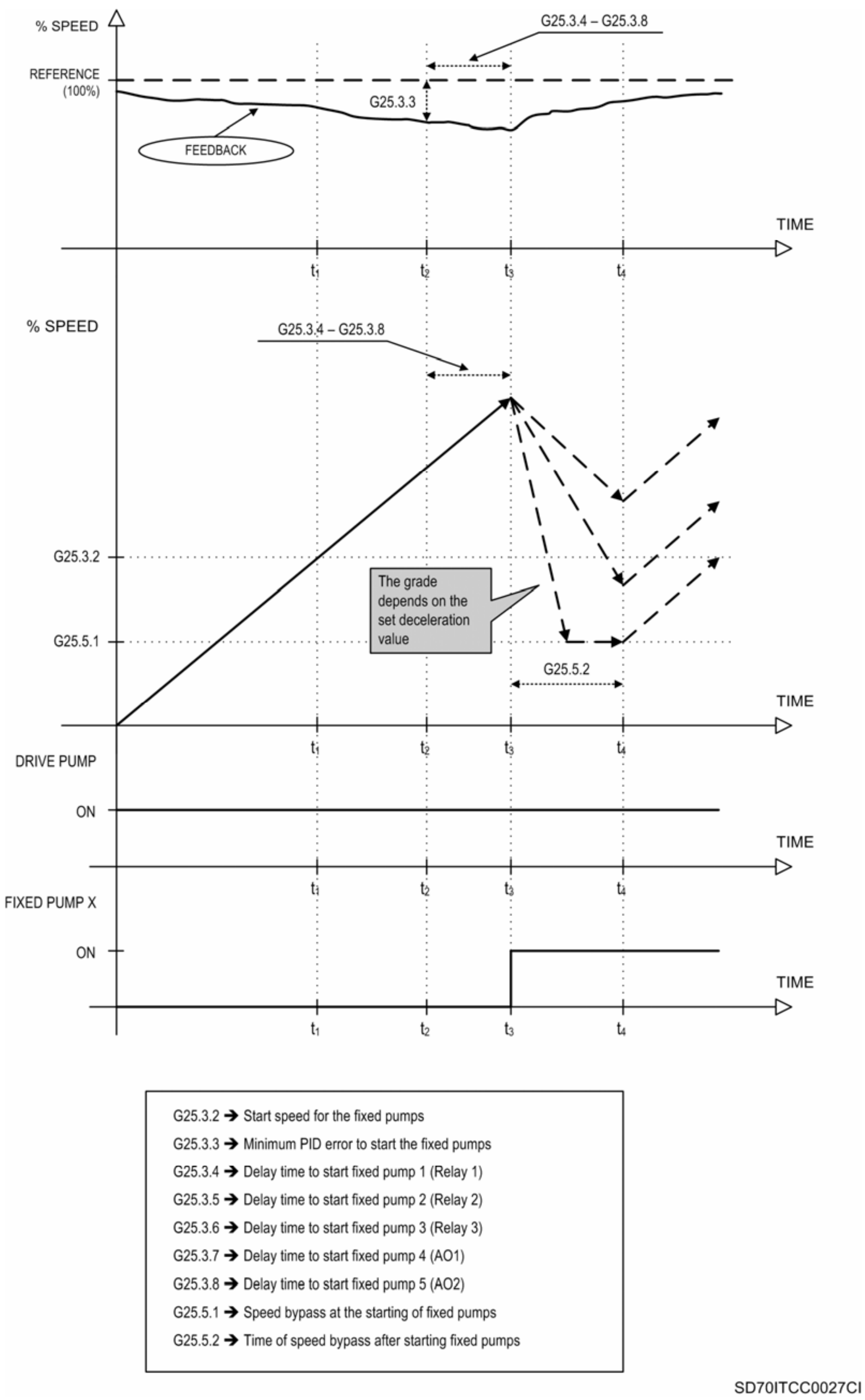

Figure 10.48 Starting of the fixed pumps according to the start speed, the PID error and the delay time for each pump

G25.3.4 DELAY TIME TO START FIXED PUMP 1 (RELAY 1)

Screen	**4 FP T1 ON = 10s**
Extended info.	**FIX PMP1 STR DLY**
Description	Delay time to start the fixed pump 1 (Relay 1)
Range	OFF=0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42062**
Modbus range	0 to 60000
Read / Write	YES

Function: It allows setting a delay time to start the fixed pump associated to the Relay 1.

At the moment of starting the fixed pumps, additionally, it will also be considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the PID error ('G25.3.3 ➔ Minimum PID error to start the fixed pumps').

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

See figures 10.47 and 10.48.

G25.3.5 DELAY TIME TO START FIXED PUMP 2 (RELAY 2)

Screen	**5 FP T2 ON = 10s**
Extended info.	**FIX PMP2 STR DLY**
Description	Delay time to start the fixed pump 2 (Relay 2)
Range	OFF=0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42065**
Modbus range	0 to 60000
Read / Write	YES

Function: It allows setting a delay time to start the fixed pump associated to the Relay 2.

At the moment of starting the fixed pumps, additionally, it will also be considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the PID error ('G25.3.3 ➔ Minimum PID error to start the fixed pumps').

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

See figures 10.47 and 10.48.

G25.3.6 DELAY TIME TO START FIXED PUMP 3 (RELAY 3)

Screen	**6 FP T3 ON = 10s**
Extended info.	**FIX PMP3 STR DLY**
Description	Delay time to start the fixed pump 3 (Relay 3)
Range	OFF=0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42066**
Modbus range	0 to 60000
Read / Write	YES

Function	It allows setting a delay time to start the fixed pump associated to the Relay 3.
	At the moment of starting the fixed pumps, additionally, it will also be considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the PID error ('G25.3.3 ➔ Minimum PID error to start the fixed pumps').
Note:	If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.
	See figures 10.47 and 10.48.

G25.3.7 DELAY TIME TO START FIXED PUMP 4 (AO1)

Screen	**7 FP T4 ON = 10s**
Extended info.	FIX PMP4 STR DLY
Description	Delay time to start the fixed pump 4 (Analogue Output 1)
Range	OFF=0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42067**
Modbus range	0 to 60000
Read / Write	YES
Function	It allows setting a delay time to start the fixed pump associated to the Analogue Output 1.
	At the moment of starting the fixed pumps, additionally, it will also be considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the PID error ('G25.3.3 ➔ Minimum PID error to start the fixed pumps').
Note:	If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.
	See figures 10.47 and 10.48.

G25.3.8 DELAY TIME TO START FIXED PUMP 5 (AO2)

Screen	**8 FP T5 ON = 10s**
Extended info.	FIX PMP5 STR DLY
Description	Delay time to start the fixed pump 5 (Analogue Output 2)
Range	OFF=0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42068**
Modbus range	0 to 60000
Read / Write	YES
Function	It allows setting a delay time to start the fixed pump associated to the Analogue Output 2.
	At the moment of starting the fixed pumps, additionally, it will also be considered the drive speed (parameter 'G25.3.2 ➔ Start speed for the fixed pumps') and the PID error ('G25.3.3 ➔ Minimum PID error to start the fixed pumps').
Note:	If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.
	See figures 10.47 and 10.48.

10.20.10. Subgroup 25.4 – S25.4: Stop Conditions

G25.4.1	DELAY TIME BEFORE ACTIVATING SLEEP MODE
Screen	**1 LP T SLP = 20s**
Extended info.	DRIVE SLEEP DELY
Description	Delay time before activating sleep mode
Range	OFF=0, 1 – 999s
Default value	20s
Set on run	YES
Modbus address	**42306**
Modbus range	0 to 9990
Read / Write	YES

Function: It allows setting a delay time to activate sleep mode. This delay time is applicable to the following conditions: sleep speed, 'No Flow' input, flow measurement and sleep current. If either of them is fulfilled, the time to activate sleep mode will start elapsing.

Note: Drive is configured to go to sleep according to the conditions of the installation as factory setting. Nevertheless, all of the parameters values described below must be checked properly according to each installation to guarantee a correct functionality. If you do not want the equipment goes in sleep mode, these parameters must be adjusted for that purpose.

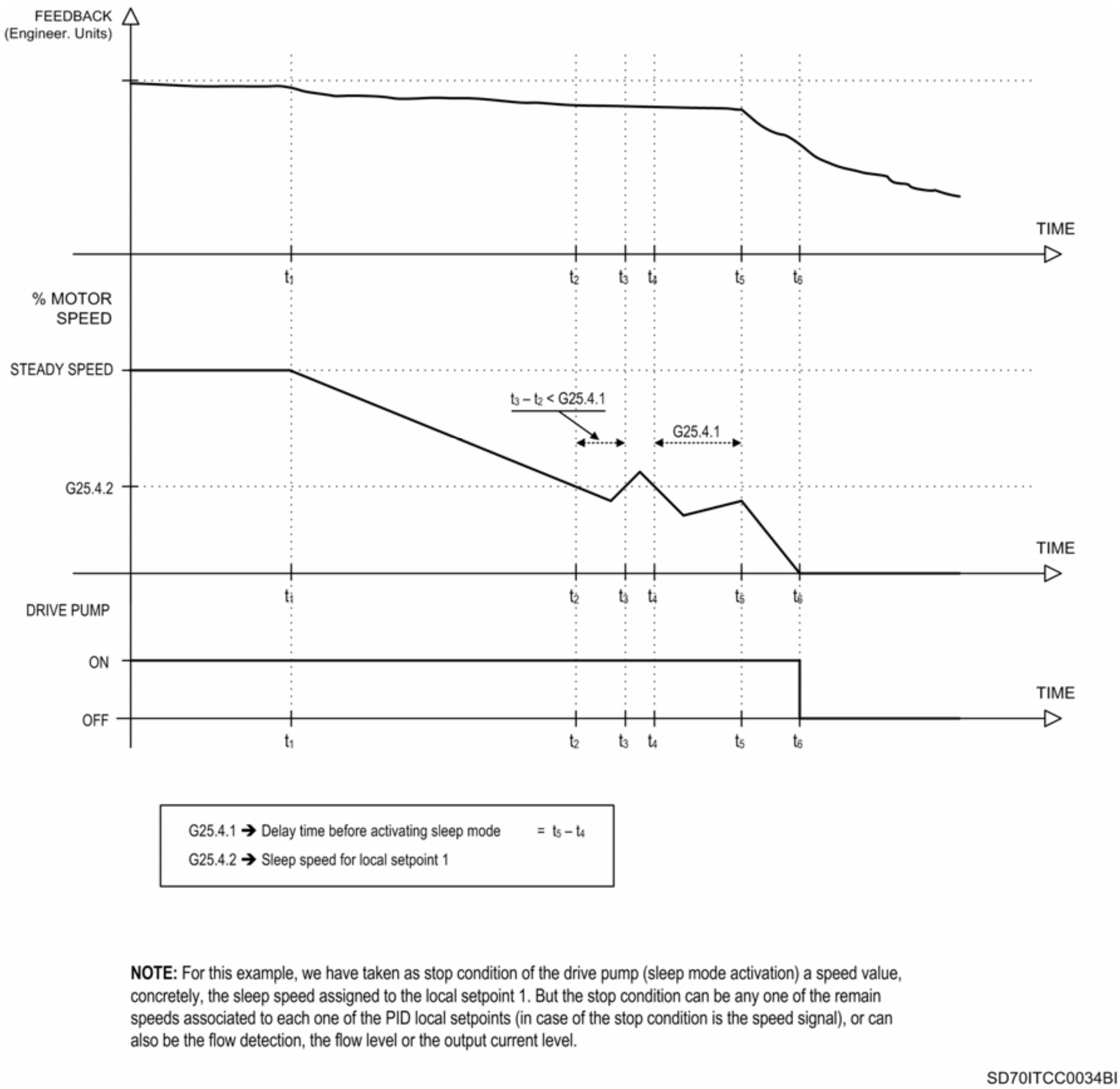

Figure 10.49 Sleep Mode deactivation

G25.4.2 SLEEP SPEED FOR LOCAL SETPOINT 1

Screen	**2 SLPsp1 = +40.0%**
Extended info.	**DRV SLEEP SPEED1**
Description	Sleep speed assigned to local setpoint 1
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42307**
Modbus range	0 to 20480
Read / Write	YES

Function It allows setting the value of the sleep speed 1, below which the drive will go to sleep whenever local setpoint 1 is selected. It is set in % of motor speed.

See figure 10.49.

G25.4.3 SLEEP SPEED FOR LOCAL SETPOINT 2

Screen	**3 SLPsp2 = +40.0%**
Extended info.	**DRV SLEEP SPEED2**
Description	Sleep speed assigned to local setpoint 2
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42308**
Modbus range	0 to 20480
Read / Write	YES

Function: It allows setting the value of the sleep speed 2, below which the drive will go to sleep whenever local setpoint 2 is selected. It is set in % of motor speed.

See figure 10.49.

G25.4.4 SLEEP SPEED FOR LOCAL SETPOINT 3

Screen	**4 SLPsp2 = +40.0%**
Extended info.	**DRV SLEEP SPEED3**
Description	Sleep speed assigned to local setpoint 3
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42309**
Modbus range	0 to 20480
Read / Write	YES

Function: It allows setting the value of the sleep speed 3, below which the drive will go to sleep whenever local setpoint 3 is selected. It is set in % of motor speed.

See figure 10.49.

G25.4.5 SLEEP SPEED FOR LOCAL SETPOINT 4

Screen	**5 SLPsp2 = +40.0%**
Extended info.	**DRV SLEEP SPEED4**
Description	Sleep speed assigned to local setpoint 4
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42310**
Modbus range	0 to 20480
Read / Write	YES

Function: It allows setting the value of the sleep speed 4, below which the drive will go to sleep whenever local setpoint 4 is selected. It is set in % of motor speed.

See figure 10.49.

G25.4.6 SLEEP SPEED FOR LOCAL SETPOINT 5

Screen	**6 SLPsp5 = +40.0%**
Extended info.	**DRV SLEEP SPEED5**
Description	Sleep speed assigned to local setpoint 5
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42311**
Modbus range	0 to 20480
Read / Write	YES
Function	It allows setting the value of the sleep speed 5, below which the drive will go to sleep whenever local setpoint 5 is selected. It is set in % of motor speed. See figure 10.49.

G25.4.7 SLEEP SPEED FOR LOCAL SETPOINT 6

Screen	**7 SLPsp2 = +40.0%**
Extended info.	**DRV SLEEP SPEED6**
Description	Sleep speed assigned to local setpoint 6
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42312**
Modbus range	0 to 20480
Read / Write	YES
Function	It allows setting the value of the sleep speed 6, below which the drive will go to sleep whenever local setpoint 6 is selected. It is set in % of motor speed. See figure 10.49.

G25.4.8 SLEEP SPEED FOR LOCAL SETPOINT 7

Screen	**8 SLPsp7 = +40.0%**
Extended info.	**DRV SLEEP SPEED7**
Description	Sleep speed assigned to local setpoint 7
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42313**
Modbus range	0 to 20480
Read / Write	YES
Function	It allows setting the value of the sleep speed 7, below which the drive will go to sleep whenever local setpoint 7 is selected. It is set in % of motor speed. See figure 10.49.

G25.4.9	SLEEP SPEED FOR LOCAL SETPOINT 8

Screen	**9 SLPsp8 = +40.0%**
Extended info.	**DRV SLEEP SPEED8**
Description	Sleep speed assigned to local setpoint 8
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42314**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the value of the sleep speed 8, below which the drive will go to sleep whenever local setpoint 8 is selected. It is set in % of motor speed.

See figure 10.49.

G25.4.10	TO ENABLE 'NO FLOW' INPUT TO SLEEP THE DRIVE

Screen	**10 FLsw ENA = N**
Description	To enable the 'No Flow' input to sleep the drive
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42323**
Modbus range	0 to 1
Read / Write	YES

Function

It allows enabling or disabling the 'No Flow' input with the purpose that the drive goes in sleep mode.

It operates when the drive speed is below the speed set in 'G25.6.17 ➔ Minimum stop speed by 'No Flow' detection', above which, 'No Flow' input only can operate as protection (PAUSE, FAULT).

Options:

N ➔ NO
'No Flow' input disabled.

Y ➔ YES
'No Flow' input enabled.
When this input is activated, and after delay time set 'G25.4.1 ➔ Delay time before activating sleep mode' has elapsed, the drive goes in sleep mode.

See figure 10.49.

G25.4.11 FLOW LEVEL TO SLEEP THE DRIVE

Screen	**11 Fsl L = 0.0l/s**
Extended info.	FLOW SLEEP LEVEL
Description	Flow level to sleep the drive
Range	OFF=0.0 to 3276 Flow units
Default value	0.0l/s
Set on run	YES
Modbus address	**42324**
Modbus range	0 to 32760
Read / Write	YES

Function It allows setting the flow level to activate the sleep mode.

The flow will be monitored and when it is below the level set in this parameter, delay time to activate sleep mode will start elapsing. Once elapsed this delay time, the drive will go in sleep mode.

So it allows setting the value of the flow read through pulse input or analogue input, below which, a situation of 'no demand' will be detected. This situation will send the drive to sleep.

When this parameter is set to 'OFF', it will be disabled. The source of flow reading is set in parameter 'G25.10.1 ➔ Flow reading source'.

See figure 10.49.

G25.4.12 OUTPUT CURRENT LEVEL TO SLEEP THE DRIVE

Screen	**12 I SLEEP = xxxA**
Extended info.	CURR SLEEP LEVEL
Description	Level of output current to sleep the drive
Range	OFF=0 to 1229A
Default value	xxxA
Set on run	YES
Modbus address	**42325**
Modbus range	0 to 12290
Read / Write	YES

Function It allows setting the output current level to activate the sleep mode.

Output current will be monitored and when it is below the level set in this parameter, delay time to activate sleep mode will start elapsing. Once elapsed this delay time, the drive will go in sleep mode.

So it allows setting the output current level, below which, a situation of 'no demand' will be detected. This situation will send the drive to sleep.

When this parameter is set to 'OFF', it will be disabled.

See figure 10.49.

Note: The drive can go to sleep in all of the conditions simultaneously. Any fulfilled condition will begin the delay time to activate sleep mode or will keep it active in case of the condition that began it disappears.

G25.4.13 MAXIMUM PID ERROR TO STOP THE FIXED PUMPS

Screen	**13 FP erOFF = +0.0%**
Extended info.	**FPUMP STOP ERROR**
Description	Maximum PID error to stop the fixed pumps
Range	-250% to +0.0%
Default value	+0.0%
Set on run	YES
Modbus address	**42072**
Modbus range	-20480 to 0
Read / Write	YES

Function

It allows setting the PID error below which, the fixed pumps will be stopped. Any error value more negative than the value set in this parameter will stop a fixed pump.

This one is an optional condition that can be considered or not according to the setting. If this parameter is set to +0.0%, this condition will not be considered.

This parameter allows user to consider the PID error (%) at the moment of stopping the fixed pumps.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the stop delay time for each fixed pump (G25.4.14 for pump 1, G25.4.15 for pump 2, G25.4.16 for pump 3, G25.4.17 for pump 4 and G25.4.18 for pump 5).

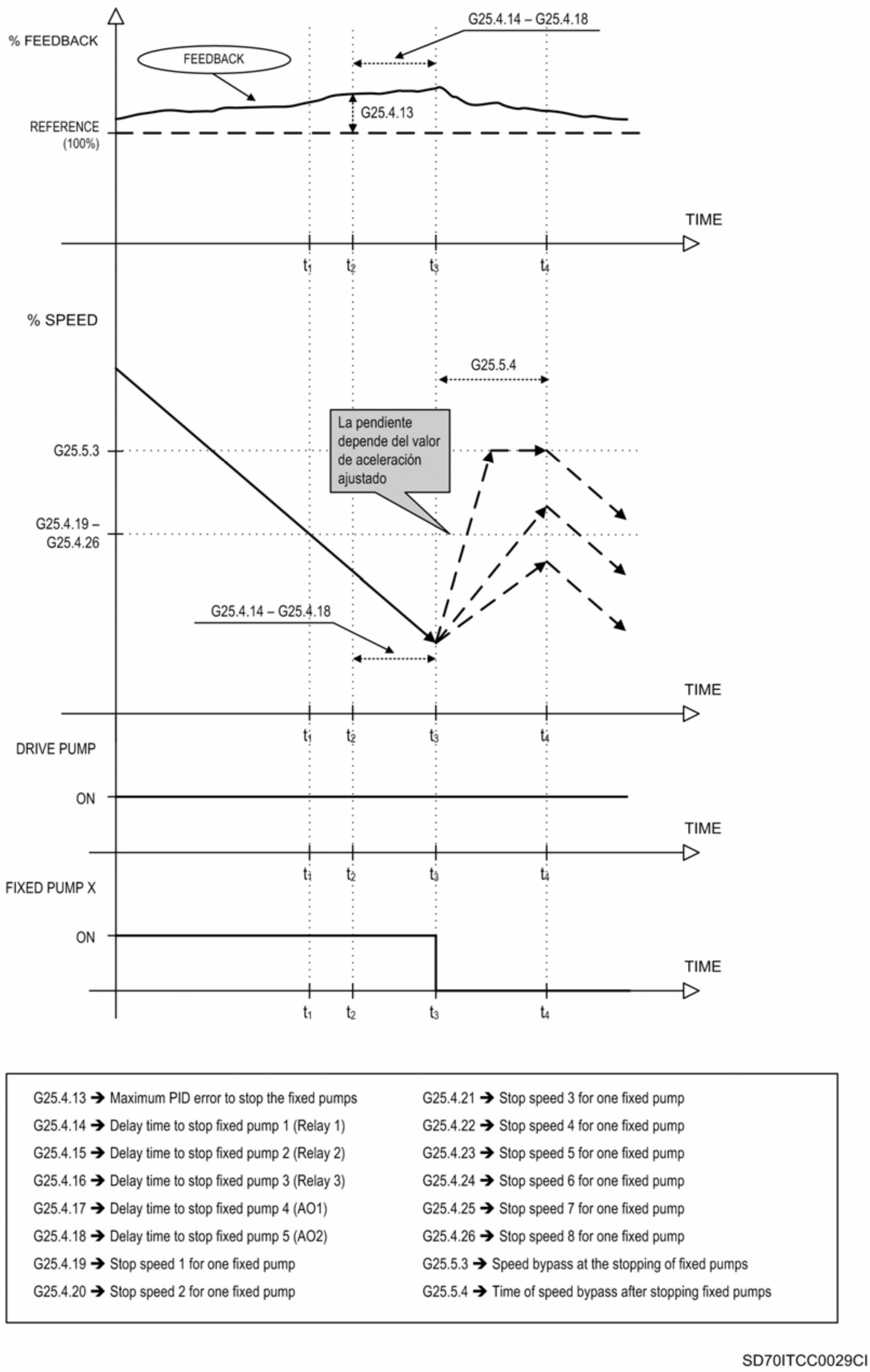

Figure 10.50 Stopping of the fixed pumps according to the stop speed associated to each local setpoint for PID, the PID error and the delay time for each pump

G25.4.14 DELAY TIME TO STOP FIXED PUMP 1 (RELAY 1)

Screen	**14 FP T1 OF = 10s**
Extended info.	**FPUMP1 STP DELAY**
Description	Delay time to stop the fixed pump 1 (Relay 1)
Range	0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42073**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting the delay time to stop the fixed pump associated to the Relay 1.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the PID error (‘G25.4.13 ➔ Maximum PID error to stop the fixed pumps’).

See figure 10.50.

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

G25.4.15 DELAY TIME TO STOP FIXED PUMP 2 (RELAY 2)

Screen	**15 FP T2 OF = 10s**
Extended info.	**FPUMP2 STP DELAY**
Description	Delay time to stop the fixed pump 2 (Relay 2)
Range	0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42077**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting the delay time to stop the fixed pump associated to the Relay 2.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the PID error (‘G25.4.13 ➔ Maximum PID error to stop the fixed pumps’).

See figure 10.50.

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

G25.4.16 DELAY TIME TO STOP FIXED PUMP 3 (RELAY 3)

Screen	**16 FP T3 OF = 10s**
Extended info.	**FPUMP3 STP DELAY**
Description	Delay time to stop the fixed pump 3 (Relay 3)
Range	0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42078**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting the delay time to stop the fixed pump associated to the Relay 3.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

G25.4.17 DELAY TIME TO STOP FIXED PUMP 4 (AO1)

Screen	**17 FP T4 OF = 10s**
Extended info.	**FPUMP4 STP DELAY**
Description	Delay time to stop the fixed pump 4 (Analogue Output 1)
Range	0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42079**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting the delay time to stop the fixed pump associated to the Analogue Output 1.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

G25.4.18 DELAY TIME TO STOP FIXED PUMP 5 (AO2)

Screen	**18 FP T5 OF = 10s**
Extended info.	**FPUMP5 STP DELAY**
Description	Delay time to stop the fixed pump 5 (Analogue Output 2)
Range	0 – 6000s
Default value	10s
Set on run	YES
Modbus address	**42080**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting the delay time to stop the fixed pump associated to the Analogue Output 2.

At the moment of stopping the fixed pumps, additionally, it will also be considered the drive speed (parameter G25.4.19 to G25.4.26, stop speeds assigned to each local setpoint, depending on the selected local setpoint) and the PID error (‘G25.4.13 ➔ Maximum PID error to stop the fixed pumps’).

See figure 10.50.

Note: If time is too short, overpressure can be generated in the system. On the contrary, if time is too long, under-pressure can be generated.

G25.4.19 STOP SPEED 1 FOR ONE FIXED PUMP

Screen	**19 SPD1of = +70.0%**
Extended info.	**FPUMP STP SPEED1**
Description	Stop speed for one fixed pump associated to the local setpoint 1
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42315**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 1 set in parameter ‘G25.1.5 ➔ Local setpoint 1 for PID’.

If you want the speed condition is not considered at the moment of stopping fixed pumps, you must set this parameter to a value that is always above the drive speed. In this way, this condition is always fulfilled, and therefore, it is not already a condition.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error (‘G25.4.13 ➔ Maximum PID error to stop the fixed pumps’).

See figure 10.50.

G25.4.20 STOP SPEED 2 FOR ONE FIXED PUMP

Screen	**20 SPD2of = +70.0%**
Extended info.	**FPUMP STP SPEED2**
Description	Stop speed for one fixed pump associated to the local setpoint 2
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42316**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 2 set in parameter 'G25.1.6 ➔ Local setpoint 2 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.21 STOP SPEED 3 FOR ONE FIXED PUMP

Screen	**21 SPD3of = +70.0%**
Extended info.	**FPUMP STP SPEED3**
Description	Stop speed for one fixed pump associated to the local setpoint 3
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42317**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 3 set in parameter 'G25.1.7 ➔ Local setpoint 3 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.22 STOP SPEED 4 FOR ONE FIXED PUMP

Screen	**22 SPD4of = +70.0%**
Extended info.	**FPUMP STP SPEED4**
Description	Stop speed for one fixed pump associated to the local setpoint 4
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42318**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 4 set in parameter 'G25.1.8 ➔ Local setpoint 4 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.23 STOP SPEED 5 FOR ONE FIXED PUMP

Screen	**23 SPD5of = +70.0%**
Extended info.	**FPUMP STP SPEED5**
Description	Stop speed for one fixed pump associated to the local setpoint 5
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42319**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 5 set in parameter 'G25.1.9 ➔ Local setpoint 5 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.24 STOP SPEED 6 FOR ONE FIXED PUMP

Screen	**24 SPD6of = +70.0%**
Extended info.	FPUMP STP SPEED6
Description	Stop speed for one fixed pump associated to the local setpoint 6
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42320**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 6 set in parameter 'G25.1.10 ➔ Local setpoint 6 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.25 STOP SPEED 7 FOR ONE FIXED PUMP

Screen	**25 SPD7of = +70.0%**
Extended info.	FPUMP STP SPEED7
Description	Stop speed for one fixed pump associated to the local setpoint 7
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42321**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 7 set in parameter 'G25.1.11 ➔ Local setpoint 7 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.26 STOP SPEED 8 FOR ONE FIXED PUMP

Screen	**26 SPD8of = +70.0%**
Extended info.	FPUMP STP SPEED8
Description	Stop speed for one fixed pump associated to the local setpoint 8
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42322**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the speed value below which the drive must remain for stopping a fixed pump whenever the operating setpoint is the local setpoint 8 set in parameter 'G25.1.12 ➔ Local setpoint 8 for PID'.

See 'Function' in parameter 'G25.4.19 ➔ Stop speed 1 for one fixed pump' for additional information.

At the moment of stopping the fixed pumps, additionally, it will also be considered the stop delay time for each fixed pump (parameter G25.4.14 to G25.4.18, depending on the what fixed is referred) and the PID error ('G25.4.13 ➔ Maximum PID error to stop the fixed pumps').

See figure 10.50.

G25.4.27 LEVEL FOR ACTIVATING SLEEP MODE IN PID INVERSE

Screen	**27 PIDiSL% = 0.0%**
Extended info.	PID INVE SLEEP %
Description	Level for activating the sleep mode in PID inverse
Range	0.0% – 250%
Default value	0.0%
Set on run	YES
Modbus address	**42327**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the level below which, the drive will go in sleep mode when the PID of the application is inverted (PID inversion is realized in parameter 'G25.2.9 ➔ PID output inversion').

The value is set in % of drive setpoint.

G25.4.28 TO ENABLE SLEEP MODE

Screen	**28 SLEEP? = Y**
Description	To enable sleep mode
Range	N Y (See 'Function' for additional information)
Default value	Y
Set on run	YES
Modbus address	**42358**
Modbus range	0 to 1
Read / Write	YES

Function	It allows enabling or disabling the sleep mode of the drive.

This parameter operates together with the option '31 SLEEP CONDIT' of the parameter 'G8.1.1 ➔ Selection of Relay 1 control source', 'G8.1.5 ➔ Selection of Relay 2 control source' and 'G8.1.9 ➔ Selection of Relay 3 control source'. User can disable the sleep option of the drive but a PLC receives the warning of fulfilled sleep conditions through the output relay configured with the option '31' and stops the system. See option '31' in parameter G8.1.1.

Options:

N ➔ NO
Sleep mode disabled.

Y ➔ YES
Sleep mode enabled.

G25.4.29 SLEEP SPEED WHEN SETPOINT IS INTRODUCED THROUGH ANALOGUE INPUT

Screen	**29 SLPspA = +40.0%**
Extended info.	**SLEP SPD STP ANA**
Description	Sleep speed when the setpoint is introduced through Analogue Input
Range	+0.0% to +250%
Default value	+40.0%
Set on run	YES
Modbus address	**42375**
Modbus range	0 to 20480
Read / Write	YES
Function	It allows setting the sleep speed 1, below which, the drive will activate the sleep mode, whenever the setpoint is selected to be introduced through Analogue Input 1 or 2.

It is set as percentage of motor speed.

10.20.11. Subgroup 25.5 – S25.5: Speed Bypass

G25.5.1	SPEED BYPASS AT THE STARTING OF FIXED PUMPS

Screen	**1 BY SPon = +70.0%**
Extended info.	**BYPASS ON SPEED**
Description	Speed bypass at the starting of fixed pumps
Range	+0.0% to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42081**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting a speed bypass value. The drive speed will be forced to the value set in this parameter during the time set in parameter 'G25.5.2 ➔ Time of speed bypass after starting fixed pumps' to avoid over-pressure situations in the system at the starting of a fixed pump.

See figures 10.47 and 10.48.

G25.5.2	TIME OF SPEED BYPASS AFTER STARTING FIXED PUMPS

Screen	**2 BY T ON = 10s**
Extended info.	**BYPASS ON DELAY**
Description	Time of speed bypass after starting fixed pumps
Range	OFF=0 – 999s
Default value	10s
Set on run	YES
Modbus address	**42082**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a value for the time of speed bypass. During this time, the drive speed will be forced to the value set in parameter 'G25.5.1 ➔ Speed bypass at the starting of fixed pumps' to avoid over-pressure situations in the system at the starting of a fixed pump.

See figures 10.47 and 10.48.

G25.5.3	SPEED BYPASS AT THE STOPPING OF FIXED PUMPS

Screen	**3 BY SPof = +90%**
Extended info.	**BYPASS OFF SPEED**
Description	Speed bypass at the stopping of fixed pumps
Range	+0.0% to +250%
Default value	+90%
Set on run	YES
Modbus address	**42083**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting a speed bypass value. The drive speed will be forced to the value set in this parameter during the time set in parameter 'G25.5.4 ➔ Time of speed bypass after stopping fixed pumps' to avoid under-pressure situations in the system at the stopping of a fixed pump.

See figure 10.50.

G25.5.4 TIME OF SPEED BYPASS AFTER STOPPING FIXED PUMPS

Screen	**4 BY T OFF = 5s**
Extended info.	**BYPASS OFF DELAY**
Description	Time of speed bypass after stopping fixed pumps
Range	OFF=0 – 999s
Default value	5s
Set on run	YES
Modbus address	**42084**
Modbus range	0 to 9999
Read / Write	YES

Function

It allows setting a value for the time of speed bypass. During this time, the drive speed will be forced to the value set in parameter 'G25.5.3 ➔ Speed bypass at the stopping of fixed pumps' to avoid under-pressure situations in the system at the stopping of a fixed pump.

See figure 10.50.

10.20.12. Subgroup 25.6 – S25.6: Protection

G25.6.1 DELAY TIME AFTER PROTECTION PAUSE

Screen	**1 PAUSE/DEL = 20s**
Extended info.	DELAY AFTER PAUS
Description	Delay time after protection pause
Range	0 – 999s
Default value	20s
Set on run	YES
Modbus address	**42336**
Modbus range	0 to 9990
Read / Write	YES

Function

It allows setting a value of delay time before the drive starts after stopping by protection pause. This delay time starts elapsing once the cause that produced the pause disappears.

For example, we suppose that a pause had been produced due to an over-pressure situation. Once the over-pressure condition disappears, the delay time set in this parameter starts elapsing, and when it is elapsed, the drive will start again.

This delay time will be applied to all of the pauses:

- **High pressure** (analogue feedback), if option 'PAUSE' is selected in parameter 'G25.6.12 ➔ Response from over-pressure'.
- **Cavitation**, if option 'PAUSE' is selected in parameter 'G25.6.3 ➔ Response from cavitation'.
- **No Flow Switch**, if option 'PAUSE' is selected in parameter 'G25.6.15 ➔ Response from 'No Flow' situation'.

Note: In case of 'Cavitation', when the equipment goes into 'pause', the drive is stopped and, therefore, it is not possible to continue monitoring values. Once the cavitation condition disappears, the delay time set in this parameter will start elapsing, and when this time is elapsed, the drive will start again.

G25.6.2 TO ENABLE CAVITATION PROTECTION

Screen	**2 CAVITATION = N**
Description	To enable protection of pump from cavitation situation
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42085**
Modbus range	0 to 1
Read / Write	YES

Function

It allows enabling or disabling the protection of pump from cavitation situation.

Options:

N ➔ NO
Protection from cavitation disabled.

Y ➔ YES
Protection from cavitation enabled.

To protect the pump from cavitation status, it is necessary to realize the following settings:

a) Set to 'Y' this parameter.

b) Set a value of cavitation current in parameter G25.6.4, below which the first detection condition will be fulfilled.

c) Set a value of cavitation speed in parameter G25.6.5, above which the second detection condition will be fulfilled.

d) Set a delay time for activation of cavitation protection in parameter G25.6.6. Once elapsed, the last cavitation condition will be activated.

e) Set a pause time for deactivation of cavitation protection in parameter G25.6.1. From this moment on, the drive will try to start again.

If three previous conditions are fulfilled, the drive will stop the pump to protect it from cavitation status (no water).

Note: To adjust cavitation parameters, Power Electronics recommend, whenever it is possible, follow the next steps:

- If the load is variable, adjust the application for the most frequent load value, for example, select a middle consumption for an irrigator water pump.
- Start the drive at manual speed.
- Set the drive speed to the minimum functional speed (minimum flow in case of pumps) or to the minimum operation level of your application.
- Make a note of the output current and the motor speed.
- Set the cavitation speed to the speed that you have made a note before.
- Set the cavitation current to 6% less than the current that you have made a note before.
- Set the desired activation time, for example, 10s.
- Check the system, and if it is necessary, set the parameters for an optimum response again.

G25.6.3 RESPONSE FROM CAVITATION

Screen	**3 CAV MODE = FAULT**
Description	Response of the drive from cavitation situation
Range	PAUSE FAULT (See 'Function' for additional information)
Default value	FAULT
Set on run	YES
Modbus address	**42344**
Modbus range	1 to 2
Read / Write	YES

Function: It allows selecting the response of the drive from cavitation situation:

PAUSE ➔ It will generate that the drive stops, and next, fixed pumps. 'CAVITATION PAUSE' will be displayed. Once elapsed the delay time after pause, the drive will start.

FAULT ➔ It will generate a fault, and next, fixed pumps will be stopped. In this case, the visualization will be 'F68 CAVIT/UNDERL'.

G25.6.4 CAVITATION CURRENT

Screen	**4 CAV CURR = ___A**
Extended info.	CAVITATION CURRE
Description	Cavitation current
Range	(0.2 to 1.50)·In
Default value	* (This value depends on the drive capacity)
Set on run	YES
Modbus address	**42086**
Modbus range	0 to 12288
Read / Write	YES

Function

It allows setting the cavitation current, below which the first detection condition to activate the protection is fulfilled. This parameter operates together with parameters 'G25.6.5 ➔ Cavitation speed' and 'G25.6.6 ➔ Delay time to activate cavitation protection'.

See 'Function' in parameter 'G25.6.2 ➔ To enable cavitation protection' to obtain information about the setting of cavitation parameters.

G25.6.5 SPEED CAVITATION

Screen	**5 CAV SPED = +100%**
Extended info.	CAVITATION SPEED
Description	Cavitation speed
Range	+0.0% to +250%
Default value	+100%
Set on run	YES
Modbus address	**42087**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the cavitation speed, above which the second detection condition to activate the protection is fulfilled. This parameter operates together with parameters 'G25.6.4 ➔ Cavitation current' and 'G25.6.6 ➔ Delay time to activate cavitation protection'.

See 'Function' in parameter 'G25.6.2 ➔ To enable cavitation protection' to obtain information about the setting of cavitation parameters.

G25.6.6 DELAY TIME TO ACTIVATE CAVITATION PROTECTION

Screen	**6 CAV DELAY = 10s**
Extended info.	CAVIT FLT DELAY
Description	Delay time to activate cavitation protection
Range	0 – 999s
Default value	10s
Set on run	YES
Modbus address	**42088**
Modbus range	0 to 9990
Read / Write	YES

Function

It allows setting the delay time to activate cavitation protection. The drive will wait for the time before activating the protection and then will stop. This parameter operates together with parameters 'G25.6.4 ➔ Cavitation current' and 'G25.6.5 ➔ Cavitation speed'.

See 'Function' in parameter 'G25.6.2 ➔ To enable cavitation protection' to obtain information about the setting of cavitation parameters.

G25.6.7 TO ENABLE LOW PRESSURE PROTECTION

Screen	**7 ENABLE LO PRE = N**
Description	To enable low pressure protection
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42090**
Modbus range	0 to 1
Read / Write	YES

Function

It allows the possibility of tripping because of low pressure fault 'F65 LOW PRESSURE' and stopping the pump.

N ➔ NO
Low pressure protection disabled.

Y ➔ YES
Low pressure protection enabled.

G25.6.9 MINIMUM PRESURE LEVEL

Screen	**9 LO PRE = 5.0Bar**
Extended info.	**LO PRESSURE LEVL**
Description	Minimum pressure level
Range	OFF=0 to 3276 Engineering units
Default value	5.0Bar
Set on run	YES
Modbus address	**42091**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the pressure level, below which the drive will trip because of low pressure fault (F65 LOW PRESSURE).

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.6.10 TRIP DELAY TIME BECAUSE OF MINIMUM PRESSURE FAULT

Screen	**10 Lop DLY = 10.0s**
Extended info.	**LO PRESS FLT DLY**
Description	Trip delay time because of minimum pressure fault
Range	0 – 999s
Default value	10.0s
Set on run	YES
Modbus address	**42092**
Modbus range	0 to 9990
Read / Write	YES

Function It allows setting a delay time because of minimum pressure fault. During this time, the pressure remains below the minimum pressure level set in parameter G25.6.9, generating a trip in the drive because of low pressure fault (F65 LOW PRESSURE).

Note: The protection from low pressure is deactivated during the pipe filling process.

If a pipe is broken during the pipe filling process or when the drive is stopped, then the pipe filling process does not finish by reached pressure, but by time. Once finished the stage of pipe filling, the breakage detection will be activated and will trip after elapsing the set time.
Additionally, it is necessary to consider, in case of existing enabled fixed pumps, these ones must be connected for the minimum pressure conditions are evaluated, otherwise, the drive executes the normal connection process of pumps before tripping because of minimum pressure.

G25.6.11 MINIMUM SPEED FOR MINIMUM PRESSURE FAULT

Screen	**11 Lop Msp = +0.0%**
Extended info.	LO PRESS MIN SPED
Description	Minimum speed for minimum pressure fault
Range	+0.0% to +250%
Default value	+0.0%
Set on run	YES
Modbus address	**42104**
Modbus range	0 to 20480
Read / Write	YES

Function It allows setting the minimum speed for the trip of minimum pressure fault 'F65 LOW PRESSURE' (possible broken pipe).

Although hardware or software conditions exist (favourable comparison) to trip because of minimum pressure fault, the trip is not produced while the present motor speed is not lower than the speed set in this parameter, if any of the enabled fixed pumps is not started either. In short, it is an additional safety measurement to guarantee the broken pipe detection with a higher reliability.

Note: This parameter value is set in % of motor rated speed.

G25.6.12 RESPONSE FROM OVER-PRESSURE

Screen	**12 HP MODE = PAUSE**
Description	Response of the drive from over-pressure situation
Range	PAUSE FAULT (See 'Function' for additional information)
Default value	PAUSE
Set on run	YES
Modbus address	**42337**
Modbus range	1 to 2
Read / Write	YES

Function It allows setting the response of the drive from over-pressure situation:

PAUSE ➔ It will generate the stopping of the drive, and next, of fixed pumps. 'HI PRESSURE PAUS' will be displayed. Once the high pressure condition disappears, if the delay time after pause has elapsed, the drive will start.

FAULT ➔ It will generate a fault, and next, fixed pumps will be stopped. In this case, the visualization will be 'F66 HI PRESSURE'.

G25.6.13 MAXIMUM PRESSURE LEVEL

Screen	**13 HP LEV = 100Bar**
Extended info.	HIGH PRESS LEVEL
Description	Maximum pressure level
Range	0 – 3276 Engineering units
Default value	100Bar
Set on run	YES
Modbus address	**42101**
Modbus range	0 to 32760
Read / Write	YES

Function: It allows setting the pressure level, above which the drive recognises a high pressure level by comparing with data received through analogue input (reading of PID feedback sensor). Once exceeded the detection threshold and elapsed the time set in parameter 'G25.6.14 ➔ Trip time because of high pressure', the drive will stop by PAUSE or will trip by FAULT, according to the setting realized in parameter 'G25.6.12 ➔ Response from over-pressure'.

G25.6.14 TRIP TIME BECAUSE OF HIGH PRESSURE

Screen	**14 HIpr DLY = 0.0s**
Extended info.	HI PRESS FLT DLY
Description	Trip time because of high pressure
Range	0 – 999s
Default value	0.0s
Set on run	YES
Modbus address	**42339**
Modbus range	0 to 9990
Read / Write	YES

Function: It allows setting the trip time because of high pressure. Once exceeded the detection level set in parameter 'G25.6.13 ➔ Maximum pressure level' and elapsed set in this parameter, the drive will stop by PAUSE or will trip by FAULT, according to the setting realized in 'G25.6.12 ➔ Response from over-pressure'.

G25.6.15 RESPONSE FROM 'NO FLOW' SITUATION

Screen	**15 FLO SWm = PAUSE**
Description	Response of the drive from 'No Flow' detection situation
Range	PAUSE FAULT (See 'Function' for additional information)
Default value	PAUSE
Set on run	YES
Modbus address	**42348**
Modbus range	1 to 2
Read / Write	YES

Function: It allows selecting the response of the drive from 'No Flow' detection situation:

PAUSE ➔ It will generate the stopping of the drive, and next, of fixed pumps. 'NO FLOW' will be displayed. Once the high pressure condition disappears, if the delay time after pause has elapsed, the drive will start.

FAULT ➔ It will generate a fault, and next, fixed pumps will be stopped. In this case, the visualization will be 'F69 FLOW SWITCH'.

G25.6.16	**HABILITACIÓN INTERRUPTOR DE 'NO FLUJO' EN EL LLENADO DE TUBERÍAS**

Screen	**16 NO FLO/FILL = N**
Description	To enable 'No Flow' switch during the pipe filling process
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42352**
Modbus range	0 to 1
Read / Write	YES

Function

It allows the possibility of enabling or disabling the 'No Flow' switch to stop the drive during the pipe filling process, according to the setting of the parameter 'G.25.6.14 ➔ Response from 'No Flow' situation'.

N ➔ NO

Protection from 'No Flow' situation is disabled.
The drive will ignore 'No Flow' input during the pipe filling process.

Y ➔ YES

Protection from 'No Flow' situation is enabled.
The drive will consider 'No Flow' input during the pipe filling process to stop.

G25.6.17	**MINIMUM STOP SPEED BECAUSE OF 'NO FLOW' DETECTION**

Screen	**17 NO FLsp = +0.0%**
Extended info.	**NO FLOW MIN SPED**
Description	Minimum stop speed because of 'No Flow' detection
Range	+0.0% to +250%
Default value	+0.0%
Set on run	YES
Modbus address	**42349**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the minimum stop speed of the drive because of 'No Flow' detection.

When the motor speed is higher that the speed set in this parameter, the 'No Flow' switch can generate a stopping by PAUSE or by FAULT, if the other conditions above mentioned are fulfilled. On the contrary, when the motor speed is lower than the speed set in this parameter, the 'No Flow' switch can generate that the drive goes in sleep mode, whenever the other needed conditions to activate the sleep mode are fulfilled. Therefore, when the drive speed is lower than the speed set in this parameter, the equipment will check the setting of the parameter 'G25.4.10 ➔ To enable 'No Flow' input to sleep the drive'. If this parameter has been set to 'Y', then the equipment will go to sleep if the other conditions to sleep are fulfilled.

G25.6.18 BYPASS TIME FOR 'NO FLOW' SWITCH

Screen	**18 NO FLbyp = 0.0s**
Extended info.	**NO FLO BYPAS DLY**
Description	Bypass time for 'No Flow' switch
Range	0.0 to 999s
Default value	0.0s
Set on run	YES
Modbus address	**42350**
Modbus range	0 to 9990
Read / Write	YES

Function

It allows setting the bypass time for the 'No Flow' switch. During this time 'No Flow' input is ignored. This time has only sense elapsed from the starting of the drive, whenever the pipe filling process is not activated.

If the filling option is has been activated, then the drive will check the setting of the parameter 'G25.6.16 ➔ To enable 'No Flow' switch during pipe filling process' before. If this parameter is set to 'Y', then the option of 'No Flow' during the pipe filling process is active. In this case, the bypass time will be counted although pipe filling process is active. On the contrary, if this parameter is set to 'N', then the option of 'No Flow' during the pipe filling process is not activated. In this case, the bypass time will start elapsing after pipe filling process finishes.

G25.6.19 TRIP DELAY TIME BECAUSE OF 'NO FLOW'

Screen	**19 NO FLdly = 0.0s**
Extended info.	**NO FLOW FLT DLY**
Description	Trip delay time because of 'No Flow' detection
Range	0.0 to 999s
Default value	0.0s
Set on run	YES
Modbus address	**42351**
Modbus range	0 to 9990
Read / Write	YES

Function

It allows setting the delay time from the 'No Flow' switch is opened to the drive stops. In case of the bypass delay time (G25.6.18) is also configured, both delay times will be considered.

G25.6.20 CYCLE TIME OF THE DRIVE

Screen	**20 CYCLE TI = 0m**
Extended info.	**CYCLE RESET DELY**
Description	Cycle time of the drive
Range	OFF=0 to 99m
Default value	0m
Set on run	YES
Modbus address	**42353**
Modbus range	0 to 99
Read / Write	YES

Function	It allows setting the time that must elapse from the drive stops to starts again, for the cycle counter (G25.6.21) is reset.

This protection is thought from situations where the drive has problems to keep the pressure and, for example, it goes in sleep mode to wake up immediately (a faulty check valve, incorrect setting of the parameters or problems with measurement sensor). This function also will operate together with cavitation protection avoiding that the drive pump is starting and stopping continuously in cavitation pauses.

If the drive starts a number of times without relaxing for the time set in this parameter, then the drive will trip because of fault ‘F71 CYCLING’, also stopping the fixed pumps.

G25.6.21 CYCLE COUNTER

Screen	**21 CYCLE CNT = 5**
Extended info.	MAX CYCLES ALLOW
Description	Cycle counter
Range	1 – 5
Default value	5
Set on run	YES
Modbus address	**42354**
Modbus range	1 to 5
Read / Write	YES
Function	It allows setting the maximum number of allowed cycles without relaxing. If this number is exceeded, then trip will be generated.

Note: Go to sleep and wake up is also considered a cycle.

10.20.13. Subgroup 25.7 – S25.7: Pipe Filling Process / Setpoint Ramp

G25.7.1 PRESSURE READING SOURCE

Screen	**1 PRESSU SOU = PID**
Description	Pressure reading source
Range	PID AI1 AI2 (See 'Function' for additional information)
Default value	PID
Set on run	YES
Modbus address	**42357**
Modbus range	0 to 2
Read / Write	YES

Function

It allows selecting the source for the reading of the pressure that determines the end of the pipe filling process (parameter G25.7.3).

The configurable options are the following ones:

PID → Pressure reading from feedback signal of the PID.

AI1 → Pressure reading from Analogue Input 1.

AI2 → Pressure reading from Analogue Input 2.

G25.7.2 SPEED FOR PIPE FILLING PROCESS

Screen	**2 FILL SP = +70.0%**
Extended info.	PIPE FILLING SPD
Description	Speed for pipe filling process
Range	OFF=0.0, +0.1 to +250%
Default value	+70.0%
Set on run	YES
Modbus address	**42116**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the reference speed during the pipe filling process.

G25.7.3 PRESSURE FOR THE END OF FILLING PROCESS

Screen	**3 FILL P = 2.0Bar**
Extended info.	PFILL END PRESSU
Description	Pressure level to finish the pipe filling process
Range	0.0 – 3276 Engineering units
Default value	2.0Bar
Set on run	YES
Modbus address	**42117**
Modbus range	0 to 32760
Read / Write	YES

Function	It allows setting the pressure level that determines the end of the pipe filling process. The sleep function of the drive is disabled during pipe filling process. Once the filling function is finished, the drive will go to the stage of setpoint ramp. The pressure level set in this parameter together with the time set in parameter 'G25.7.4 ➔ Safety time for pipe filling process' are the conditions to end the pipe filling process. The condition that is fulfilled before (pressure or time) will force the end of the pipe filling process, changing the equipment from 'FILL' status to setpoint ramp 'RAMP'.
Note:	Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.7.4 SAFETY TIME FOR PIPE FILLING PROCESS

Screen	**4 FILL TIM = 15m**
Extended info.	**PFILL END DELAY**
Description	Safety time for pipe filling process
Range	OFF=0, 1 – 9999min
Default value	15m
Set on run	YES
Modbus address	**42118**
Modbus range	0 to 9999
Read / Write	YES

Function	It allows setting a safety time to force the end of pipe filling process. The pressure level set in parameter 'G25.7.3 ➔ Pressure for the end of pipe filling process' together with the time set in this parameter are the conditions to end the pipe filling process. The condition that is fulfilled before (pressure or time) will force the end of the pipe filling process, changing the equipment from 'FILL' status to setpoint ramp 'RAMP'.
Note:	If this time is set to '0', the drive will not execute the pipe filling process.

G25.7.5 SETPOINT RAMP

Screen	**5 SPT RAMP = 1.0Bar/s**
Description	Setpoint ramp
Range	0.01 – 320.00 Engineering units /s
Default value	1.0Bar/s
Set on run	YES
Modbus address	**42119**
Modbus range	0 to 32000
Read / Write	YES

Function	It allows setting the ramp that will be applied to increase the setpoint. After finishing the pipe filling process, or if this process has not been realized from the beginning, the drive will adjust the setpoint value to the present value of the feedback signal provisionally. Then, the setpoint will be increased according to the ramp set in this parameter up to 5% below the real setpoint selected by user. In that moment, the drive will start the real regulation. During the setpoint ramp, the drive cannot go to sleep by 'no demand'. By setting a slow setpoint ramp, we achieve a smooth increase of the motor speed.
Note:	Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

10.20.14. Subgroup 25.8 – S25.8: Setpoint Compensation due to Pressure Loss

G25.8.1	COMPENSATION PRESSURE AT THE STARTING OF 1 FIXED PUMP
Screen	**1 COMP 1 = 0.0Bar**
Extended info.	**SETPOINT COMPEN1**
Description	Compensation pressure at the starting of one fixed pump
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42131**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows compensating the pressure loss in the pipe by increasing the setpoint automatically when one fixed pump is connected.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.8.2	COMPENSATION PRESSURE AT THE STARTING OF 2 FIXED PUMPS
Screen	**2 COMP 2 = 0.0Bar**
Extended info.	**SETPOINT COMPEN2**
Description	Compensation pressure at the starting of two fixed pumps
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42132**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows compensating the pressure loss in the pipe by increasing the setpoint automatically when two fixed pumps are connected.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.8.3	COMPENSATION PRESSURE AT THE STARTING OF 3 FIXED PUMPS
Screen	**3 COMP 3 = 0.0Bar**
Extended info.	**SETPOINT COMPEN3**
Description	Compensation pressure at the starting of three fixed pumps
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42133**
Modbus range	0 to 32760
Read / Write	YES

Function	It allows compensating the pressure loss in the pipe by increasing the setpoint automatically when three fixed pumps are connected.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.8.4 COMPENSATION PRESSURE AT THE STARTING OF 4 FIXED PUMPS

Screen	**4 COMP 4 = 0.0Bar**
Extended info.	**SETPOINT COMPEN4**
Description	Compensation pressure at the starting of four fixed pumps
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42134**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows compensating the pressure loss in the pipe by increasing the setpoint automatically when four fixed pumps are connected.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.8.5 COMPENSATION PRESSURE AT THE STARTING OF 5 FIXED PUMPS

Screen	**5 COMP 5 = 0.0Bar**
Extended info.	**SETPOINT COMPEN5**
Description	Compensation pressure at the starting of five fixed pumps
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42135**
Modbus range	0 to 32760
Read / Write	YES
Function	It allows compensating the pressure loss in the pipe by increasing the setpoint automatically when five fixed pumps are connected.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

10.20.15. Subgroup 25.9 – S25.9: Fixed Pumps Control

G25.9.1	TO ENABLE FIXED PUMP ASSOCIATED TO OUTPUT RELAY 1

Screen	**1 ENABLE PUMP1 = N**
Description	To enable the fixed pump associated to the Output Relay 1 (pump 1)
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42136**
Modbus range	0 to 1
Read / Write	YES

Function

It allows setting enabling or disabling the fixed pump associated to the Output Relay 1.

If this parameter is set to 'Y', when activating pump control in parameter 'G1.7 ➔ Program activation' (option 'PUMP') and configuring one digital input (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with option '52 ➔ FIX PUMP1 FLT', the Output Relay 1 is configured with option '28 ➔ PUMP CNTRL' to control fixed pumps. If the pump associated to this relay is not required, we recommend you disable it from this parameter. In this way, the relay can be configured for other uses.

N ➔ NO

To disable the fixed pump associated to the Output Relay 1. The relay is configured with the option '00 ➔ ALWAYS OFF' and free-configuration is allowed for it.

Y ➔ YES

To enable the fixed pump associated to the Output Relay 1. The relay is configured with the option '28 ➔ PUMP CNTRL' and free-configuration is not allowed for it.

G25.9.2	TO ENABLE FIXED PUMP ASSOCIATED TO OUTPUT RELAY 2

Screen	**2 ENABLE PUMP2 = N**
Description	To enable the fixed pump associated to the Output Relay 2 (pump 2)
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42137**
Modbus range	0 to 1
Read / Write	YES

Function

It allows setting enabling or disabling the fixed pump associated to the Output Relay 2.

If this parameter is set to 'Y', when activating pump control in parameter 'G1.7 ➔ Program activation' (option 'PUMP') and configuring one digital input (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with option '53 ➔ FIX PUMP2 FLT', the Output Relay 1 is configured with option '28 ➔ PUMP CNTRL' to control fixed pumps. If the pump associated to this relay is not required, we recommend you disable it from this parameter. In this way, the relay can be configured for other uses.

N ➔ NO
To disable the fixed pump associated to the Output Relay 2. The relay is configured with the option '00 ➔ ALWAYS OFF' and free-configuration is allowed for it.

Y ➔ YES
To enable the fixed pump associated to the Output Relay 2. The relay is configured with the option '28 ➔ PUMP CNTRL' and free-configuration is not allowed for it.

G25.9.3 TO ENABLE FIXED PUMP ASSOCIATED TO OUTPUT RELAY 3

Screen	**3 ENABLE PUMP3 = N**
Description	To enable the fixed pump associated to the Output Relay 3 (pump 3)
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42138**
Modbus range	0 to 1
Read / Write	YES

Function

It allows setting enabling or disabling the fixed pump associated to the Output Relay 3.

If this parameter is set to 'Y', when activating pump control in parameter 'G1.7 ➔ Program activation' (option 'PUMP') and configuring one digital input (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with option '54 ➔ FIX PUMP3 FLT', the Output Relay 3 is configured with option '28 ➔ PUMP CNTRL' to control fixed pumps. If the pump associated to this relay is not required, we recommend you disable it from this parameter. In this way, the relay can be configured for other uses.

N ➔ NO
To disable the fixed pump associated to the Output Relay 3. The relay is configured with the option '00 ➔ ALWAYS OFF' and free-configuration is allowed for it.

Y ➔ YES
To enable the fixed pump associated to the Output Relay 3. The relay is configured with the option '28 ➔ PUMP CNTRL' and free-configuration is not allowed for it.

G25.9.4 TO ENABLE FIXED PUMP ASSOCIATED TO ANALOGUE OUTPUT 1

Screen	**4 ENABLE PUMP4 = N**
Description	To enable the fixed pump associated to the Analogue Output 1 (pump 4)
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42148**
Modbus range	0 to 1
Read / Write	YES

Function	It allows setting enabling or disabling the fixed pump associated to the Analogue Output 1.

If this parameter is set to 'Y', when activating pump control in parameter 'G1.7 ➔ Program activation' (option 'PUMP') and configuring one digital input (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with option '55 ➔ FIX PUMP4 FLT', the Analogue Output 1 is configured with option '27 ➔ MACRO PUMP' to control fixed pumps. If the pump associated to this analogue output is not required, we recommend you disable it from this parameter. In this way, the analogue output can be configured for other uses.

N ➔ NO

To disable the fixed pump associated to the Analogue Output 1. This analogue output is configured with the option '00 ➔ NONE' and free-configuration is allowed for it.

Y ➔ YES

To enable the fixed pump associated to the Analogue Output 1. This analogue output is configured with the option '27 ➔ MACRO PUMP' and free-configuration is not allowed for it.

G25.9.5 TO ENABLE FIXED PUMP ASSOCIATED TO ANALOGUE OUTPUT 2

Screen	**5 ENABLE PUMP5 = N**
Description	To enable the fixed pump associated to the Analogue Output 2 (pump 5)
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	YES
Modbus address	**42149**
Modbus range	0 to 1
Read / Write	YES
Function	It allows setting enabling or disabling the fixed pump associated to the Analogue Output 2.

If this parameter is set to 'Y', when activating pump control in parameter 'G1.7 ➔ Program activation' (option 'PUMP') and configuring one digital input (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration') with option '56 ➔ FIX PUMP5 FLT', the Analogue Output 2 is configured with option '27 ➔ MACRO PUMP' to control fixed pumps. If the pump associated to this analogue output is not required, we recommend you disable it from this parameter. In this way, the analogue output can be configured for other uses.

N ➔ NO

To disable the fixed pump associated to the Analogue Output 2. This analogue output is configured with the option '00 ➔ NONE' and free-configuration is allowed for it.

Y ➔ YES

To enable the fixed pump associated to the Analogue Output 2. This analogue output is configured with the option '27 ➔ MACRO PUMP' and free-configuration is not allowed for it.

G25.9.6 ALTERNATION MODE OF FIXED PUMPS

Screen	**6 FP ALTER MOD = 0**
Description	Alternation mode of fixed pumps
Range	0 – 2 (See 'Function' for additional information)
Default value	0
Set on run	YES
Modbus address	**42139**
Modbus range	0 to 2
Read / Write	YES

Function

It allows selecting the alternation mode used by the drive to start the fixed pumps.

Options:

0 ➔ LINEAR
The drive will always start the fixed pumps by following the same sequence, 1, 2, 3, and will stop them in the same way, 1, 2, 3 (no alternation).

1 ➔ CYCLE
The first pump to start will be the next one to the last stopped pump.

2 ➔ DUTY SHARE
The drive will try to make the operation times of all available pumps equal.

G25.9.7 STARTING PRESSURE OF JOCKEY PUMP

Screen	**7 JPon P = 0.0Bar**
Extended info.	**JOCKEY ON PRESS**
Description	Starting pressure of Jockey pump
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42371**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the pressure level, below which the Jockey pump will start.

During periods of very low demand (for example, tank filling processor opening a couple of taps) the Jockey pump will start to cover this demand. This pump will only start if the drive is sleeping and additionally, there is some output relay (parameters 'G8.1.1 ➔ Selection of Relay 1 control source', 'G8.1.5 ➔ Selection of Relay 2 control source' and 'G8.1.9 ➔ Selection of Relay 3 control source') configured with the option '29 ➔ JOCKEY PUMP'.

G25.9.8 START DELAY TIME FOR JOCKEY PUMP

Screen	**8 JPon DLY = 20s**
Extended info.	JOCKEY ON DELAY
Description	Start delay time for Jockey pump
Range	0 – 600s
Default value	20s
Set on run	YES
Modbus address	**42372**
Modbus range	0 to 6000
Read / Write	YES

Function — It allows setting a delay time to start the Jockey pump.

This time will start elapsing after the condition to start this pump is fulfilled, this is, when the pressure is below the level set in parameter 'G25.9.7 ➔ Starting pressure of Jockey pump'.

G25.9.9 STOPPING PRESSURE OF JOCKEY PUMP

Screen	**9 JPof P = 0.0Bar**
Extended info.	JOCKEY OFF PRESS
Description	Stopping pressure of Jockey pump
Range	0.0 – 3276 Engineering units
Default value	0.0Bar
Set on run	YES
Modbus address	**42373**
Modbus range	0 to 32760
Read / Write	YES

Function — It allows setting the pressure level, above which the Jockey pump will stop.

If the drive pump starts, then the Jockey pump will stop automatically although the pressure level set in this parameter is not reached.

G25.9.10 BYPASS TIME FOR PRIMING PUMP

Screen	**10 PRp BYP = 300s**
Extended info.	PRIM.PUM.BYP.DLY
Description	Bypass time for the Priming pump
Range	0.1 – 6000s
Default value	300s
Set on run	YES
Modbus address	**42102**
Modbus range	0 to 60000
Read / Write	YES

Function — It allows setting the bypass time for the Priming pump.

Once stopped the Priming pump and started the drive, if the digital input configured as pressure switch (parameter 'G4.1.5 ➔ Multi-function Digital Input 1 configuration' to 'G4.1.10 ➔ Multi-function Digital Input 6 configuration', option '69 ➔ PRESSUR SWITC') is opened during the time set in this parameter, the fault 'F72 IN PRESS SW' will be produced.

Note: The fault F72 is only produced if there is some output relay configured with the option '30 ➔ PRIMING PUMP' (parameters G8.1.1, G8.1.5 and G8.1.9) and some digital input configured with the option '69 ➔ PRESSUR SWITC' (parameter G4.1.5 to G4.1.10).

G25.9.11 TRIP TIME OF F72 WHILE PRIMING PUMP IS CONNECTED

Screen	**11 PRp DLY = OFF**
Extended info.	**PRIM PUM FLTdly**
Description	Trip time of F72 while the Priming pump is connected
Range	OFF=0, 0.1 – 6000m
Default value	OFF
Set on run	YES
Modbus address	**42103**
Modbus range	0 to 60000
Read / Write	YES

Function

It allows setting a time to produce the fault F72 when the Priming pump is connected.

If the Priming pump is connected and the time set in this parameter has elapsed from the starting of this pump without detecting pressure in the pressure switch, the fault 'F72 IN PRESS SW' will be produced.

Note: The fault F72 is only produced if there is some output relay configured with the option '30 ➔ PRIMING PUMP' (parameters G8.1.1, G8.1.5 and G8.1.9) and some digital input configured with the option '69 ➔ PRESSUR SWITC' (parameter G4.1.5 to G4.1.10).

10.20.16. Subgroup 25.10 – S25.10: Flow Limitation Algorithm

G25.10.1 FLOW READING SOURCE

Screen	**1 FLOW SEL = PULSE**
Description	Flow reading source
Range	AI1 AI2 PULSE (See 'Function' for additional information)
Default value	PULSE
Set on run	YES
Modbus address	**42141**
Modbus range	0 to 2
Read / Write	YES

Function

It allows selecting the source to introduce the PID setpoint of the instantaneous flow.

Selection options:

AI1 ➔ Reference signal (PID setpoint) introduced through Analogue Input 1.

AI2 ➔ Reference signal (PID setpoint) introduced through Analogue Input 2.

PULSE ➔ Reference signal (PID setpoint) introduced by means of a pulse input connected to one Multi-function Digital Input (parameter G4.1.5 to G4.1.10, option '51 ➔ FLOW PULSE'). See Subgroup S4.4 Pulse Input for additional information.

G25.10.2 MAXIMUM ALLOWED FLOW

Screen	**2 MAX FLOW = 1000l/s**
Extended info.	MAX ALLOWED FLOW
Description	Value of maximum allowed flow
Range	0.0 – 3276 Engineering units
Default value	1000l/s
Set on run	YES
Modbus address	**42143**
Modbus range	0 to 32760
Read / Write	YES

Function

It allows setting the value of the maximum allowed flow.

When the present flow value is higher than the value set in this parameter plus the margin set in 'G25.10.3 ➔ Offset percentage over maximum flow' (G25.10.2 + G25.10.3), the flow limitation algorithm will be activated showing the drive status 'FLOW'. In that moment, the speed reference of the pump will start decreasing using the ramp set in 'G25.10.5 ➔ Deceleration ramp during algorithm'. The speed reference will decrease until the present flow is lower than the value set in this parameter minus the margin set in G25.10.3 (G25.10.2 – G25.10.3). In this moment, the speed will remain constant until the present flow is lower than the flow set in 'G25.10.4 ➔ Flow percentage to reset algorithm'. From this moment on, the PID regulator will take up the control again, and the drive will start to regulate normally.

Note: Default units of measurement which are displayed depend on the selected engineering units. See parameters 'G4.2.2 ➔ Selection of sensor 1 units' and 'G4.3.2 ➔ Selection of sensor 2 units'.

G25.10.3 OFFSET PERCENTAGE OVER MAXIMUM FLOW

Screen	**3 OFFSET = +0%**
Extended info.	**OFFSET MAX FLOW**
Description	Offset percentage over maximum flow
Range	+0% to +250%
Default value	+0%
Set on run	YES
Modbus address	**42144**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the offset margin over the maximum allowed flow to activate the flow limitation algorithm.

It is set in % of the value set in parameter 'G25.10.2 ➔ Maximum allowed flow'.

G25.10.4 FLOW PERCENTAGE TO RESET ALGORITHM

Screen	**4 FLO RES = +100%**
Extended info.	**FLOW RESET LEVEL**
Description	Flow percentage to reset algorithm
Range	+0 to +100%
Default value	+100%
Set on run	YES
Modbus address	**42145**
Modbus range	0 to 100
Read / Write	YES

Function

It allows setting the flow level to reset the flow limitation algorithm.

When the level of the instantaneous read in the source set in parameter G25.10.1 is below the value set in this parameter, the flow limitation algorithm will give the PID regulator the control.

It is set in % of the range of analogue input 1 or 2 (in case of selecting option '0 ➔ AI1' or '1 ➔ AI2' respectively in parameter 'G25.10.1 ➔ Flow reading source') or it is set in % of the value set in the parameter 'G4.4.3 ➔ Maximum range of flow meter' (in case of selecting the option '2 ➔ PULSE' as flow reading source in parameter G25.10.1).

G25.10.5 DECELERATION RAMP DURING ALGORITHM

Screen	**5 DECrat = +2.0%/s**
Extended info.	**FLOW DECEL RATE**
Description	Deceleration ramp during the flow limitation algorithm
Range	+0.0 to +250%/s
Default value	+2.0%/s
Set on run	YES
Modbus address	**42146**
Modbus range	0 to 20480
Read / Write	YES

Function

It allows setting the deceleration ramp that will be applied by the drive to decrease the pump speed until the read flow is lower than the flow set in parameter 'G25.10.2 ➔ Maximum allowed flow' minus the margin set in 'G25.10.3 ➔ Offset percentage over maximum flow' as offset or deviation margin.

G25.10.6	UNITS OF MEASUREMENT OF INSTANTANEOUS FLOW
Screen	**6 UNIT FLOW = l/s**
Description	Units of measurement of instantaneous flow
Range	-
Default value	l/s
Set on run	-
Modbus address	**42147**
Modbus range	0 to 9
Read / Write	Read Only
Function	Read only parameter that shows the units of measurement of the instantaneous flow, the source of which is set in parameter 'G25.10.1 ➔ Flow reading source'.

10.20.17. Subgroup 25.11 – S25.11: Registers (Read only)

This subgroup shows the time operated by each auxiliary pump. This time is visualized as amount of days and minutes.

It is especially useful when the alternation mode 'DUTY SHARE' (option '2' in parameter 'G25.9.6 ➔ Alternation mode of fixed pumps') is used to check if the operated times by the auxiliary pumps are equal.

G25.11.1	**OPERATED TIME BY PUMP 1**
Screen	**1 P1 = ----0d ----0m**
Description	Operated time by pump 1
Range	-
Default value	-
Set on run	-
Modbus address	**42011 ➔ m (minutes)** **42014 ➔ d (days)**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Function	Read only parameter. For additional information, see chapter 10.20.17 (S25.11 Registers).

G25.11.2	**OPERATED TIME BY PUMP 2**
Screen	**2 P2 = ----0d ----0m**
Description	Operated time by pump 2
Range	-
Default value	-
Set on run	-
Modbus address	**42012 ➔ m (minutes)** **42015 ➔ d (days)**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Function	Read only parameter. For additional information, see chapter 10.20.17 (S25.11 Registers).

G25.11.3	**OPERATED TIME BY PUMP 3**
Screen	**3 P3 = ----0d ----0m**
Description	Operated time by pump 3
Range	-
Default value	-
Set on run	-
Modbus address	**42013 ➔ m (minutes)** **42016 ➔ d (days)**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Function	Read only parameter. For additional information, see chapter 10.20.17 (S25.11 Registers).

G25.11.4 OPERATED TIME BY PUMP 4

Screen	**4 P4 = ----0d ----0m**
Description	Operated time by pump 4
Range	-
Default value	-
Set on run	-
Modbus address	**42018 ➔ m (minutes)** **42020 ➔ d (days)**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Function	Read only parameter. For additional information, see chapter 10.20.17 (S25.11 Registers).

G25.11.5 OPERATED TIME BY PUMP 5

Screen	**5 P5 = ----0d ----0m**
Description	Operated time by pump 5
Range	-
Default value	-
Set on run	-
Modbus address	**42019 ➔ m (minutes)** **42021 ➔ d (days)**
Modbus range	Real Value = Modbus Value
Read / Write	Read Only
Function	Read only parameter. For additional information, see chapter 10.20.17 (S25.11 Registers).

G25.11.6 RESET COUNTERS

Screen	**TIME RESTORE = N**
Description	Reset counters
Range	N Y (See 'Function' for additional information)
Default value	N
Set on run	NO
Modbus address	**42017**
Modbus range	0 to 1
Read / Write	YES

Function: It allows the possibility of resetting the counters of the pumps.

N ➔ NO
The counters of the pumps are not reset.

Y ➔ YES
All of the counters of the pumps will be reset.

11. MODBUS COMMUNICATION

11.1. Technical Specifications

11.1.1. Introduction

To guarantee a correct operation of the drive, peripheral elements should be selected correctly and should be connected properly. A wrong installation and/or application could cause a wrong operation of the system or a reduction of the long life of the equipment, and its parts may get damaged. This manual should be read carefully and understood before proceeding.

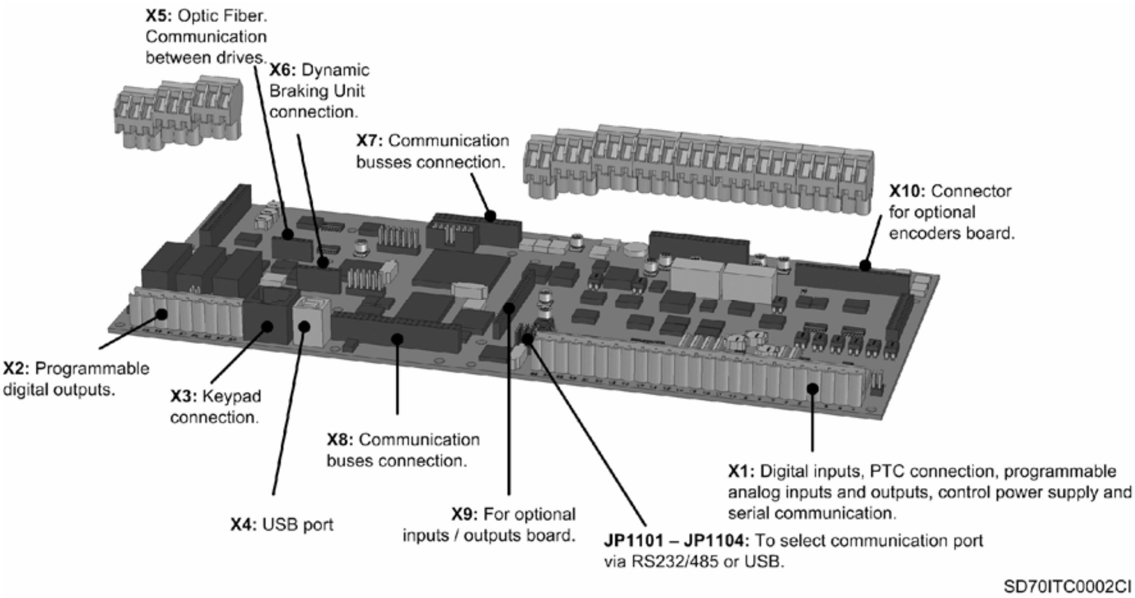

Figure 11.1 Location and description of the user connectors

The purpose of the Serial Communication Network of the SDRIVE 700 is integrate the drive itself into a network compatible with the protocol of Modbus communications. This is possible by using RS232 or RS485 physical communications port or USB port. For this, it is necessary modify the position of the jumper of the control board JP1101 – JP1104. Communications ports are clearly indicated in that connector. Put the jumper in the desired position according to your needs.

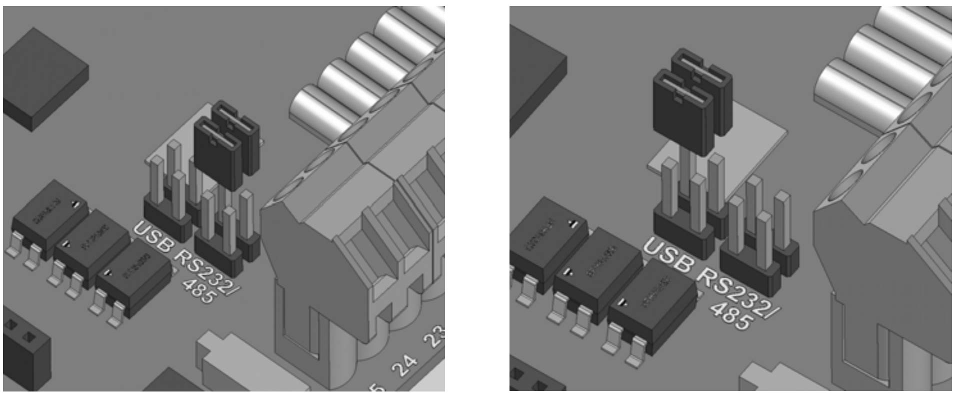

Figure 11.2 Jumper for communications port selection

Modbus communication system allows SD700 drive to be controlled and/or monitored as a slave by a Modbus master from a remote location.

RS485 network allows connecting up to 240 equipments in the same network. Nevertheless, RS232 network only allows connecting one unit (slave) into the network.

SD700 drive operates as a peripheral slave when is connected to Modbus system. This means that the drive do not start the communication task, master will be the one that starts this task. Practically all of the operating modes, parameters and drive characteristics are accessible through serial communications. For example, master can give start and stop order to the drive, control SD700 status, read the current used by the motor,... in short, master can access to the all of the possibilities of the drive.

11.1.2. Hardware

RS232	Physical level	3 cables, optically insulated, half duplex, RS232 single ending
	Terminals	23 ➔ RS Common (0Vdc) 24 ➔ RS232 Rx (receiving line) 25 ➔ RS232 Tx (transmitting line)
	Output signal level	'1' logical ≤ 6.5V regarding to 0V '0' logical ≥ 6.5V regarding to 0V
	Input signal level	'1' logical < +0.8V '0' logical > +2.4V
	Maximum line impedance	2500pF, 3kΩ
	Insulation	± 50Vdc regarding to the earth
	Programmable inputs via Modbus	7 digital inputs 2 programmable analogue inputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Programmable outputs via Modbus	3 relay outputs 2 programmable analogue outputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Maximum number of SD700 connected into a network	1
	Maximum cable length	15m
RS485	Physical level	2 cables, optically insulated, half duplex, RS485 differential mode
	Terminals	21 ➔ RS485 A (negative) 22 ➔ RS485 B (positive) 23 ➔ RS Common (0Vdc)
	Output signal level	'1' logical = +5V differential '0' logical = -5V differential
	Input signal level	'1' logical = +5V differential '0' logical = -5V differential
	Insulation	± 50Vdc regarding to the earth
	Programmable inputs via Modbus	7 digital inputs 2 programmable analogue inputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Programmable outputs via Modbus	3 relay outputs 2 programmable analogue outputs (0 – 10V, ±10V, 0 – 20mA, 4 – 20mA)
	Maximum number of SD700 connected into a network	240
	Maximum cable length	1000m
USB	Connector : USB 1.1 type B Controller FTDI chip Model FT232BM	For the correct operation of the USB connection you should install the proper drivers. For this, you only need to access to the information of the proper model in: http://www.ftdichip.com/Drivers/VCP.htm From here, you can download the required files and complete their correct installation.

Note: USB connection of SD700, in the USB connection of the SD700 a RS232 internal conversion is executed. For this reason, the transmission speed is the indicated one in the section RS232 (9600Baudios). USB connector type is USB 1.1 B (Slave).

Note: Installation in the driver Host of the SD700 USB, USB device of the SD700 will be detected by operating systems XP and 2000, it is only necessary to indicate the driver at the moment of the installation.
In case of operating systems before W98 / Me, execute a search of new Hardware in the device administrator, and complete the installation by indicating the drivers when the computer requires them.

11.1.3. Software

SW Version x.xx	Communication Protocol	Standard Modbus
	Transmission Mode	RTU (Remote Terminal Unit)
	Error Detection	CRC-16 (Sum Check)
	Transmission Speed	Selectable by user (600 / 1200 / 2400 / 4800 / 9600bps)
	Data length	8 data bit + optional parity
	Parity	Selectable by user (ODD / EVEN / NONE)
	Stop Bit	1
	Address Range	240 unicast addresses (1 – 240)
		1 broadcast address (0)
	Response Time	Minimum 3.5 character to 100ms maximum
	Supported Modbus functions	3 registers reading
		16 registers writing
	Supported exception codes	1 ➔ Illegal function
		2 ➔ Illegal data address
		3 ➔ Illegal data value
		6 ➔ Busy, rejected message
		7 ➔ NAK, negative acknowledgement

11.1.4. RS232 Connections

The following drawing shows a commonly wiring for a RS232 connection:

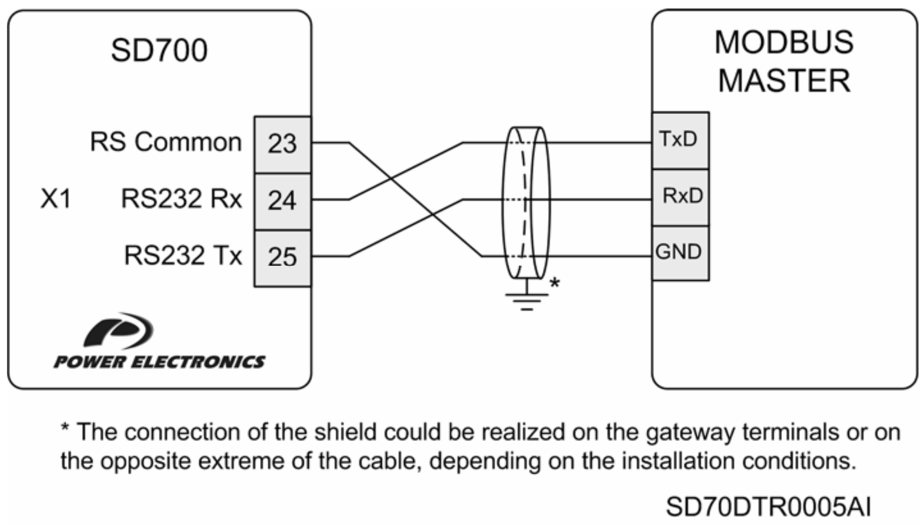

Figure 11.3 RS232 connection

11.1.5. RS485 Connections

The following drawing shows a commonly wiring for a RS485 connection:

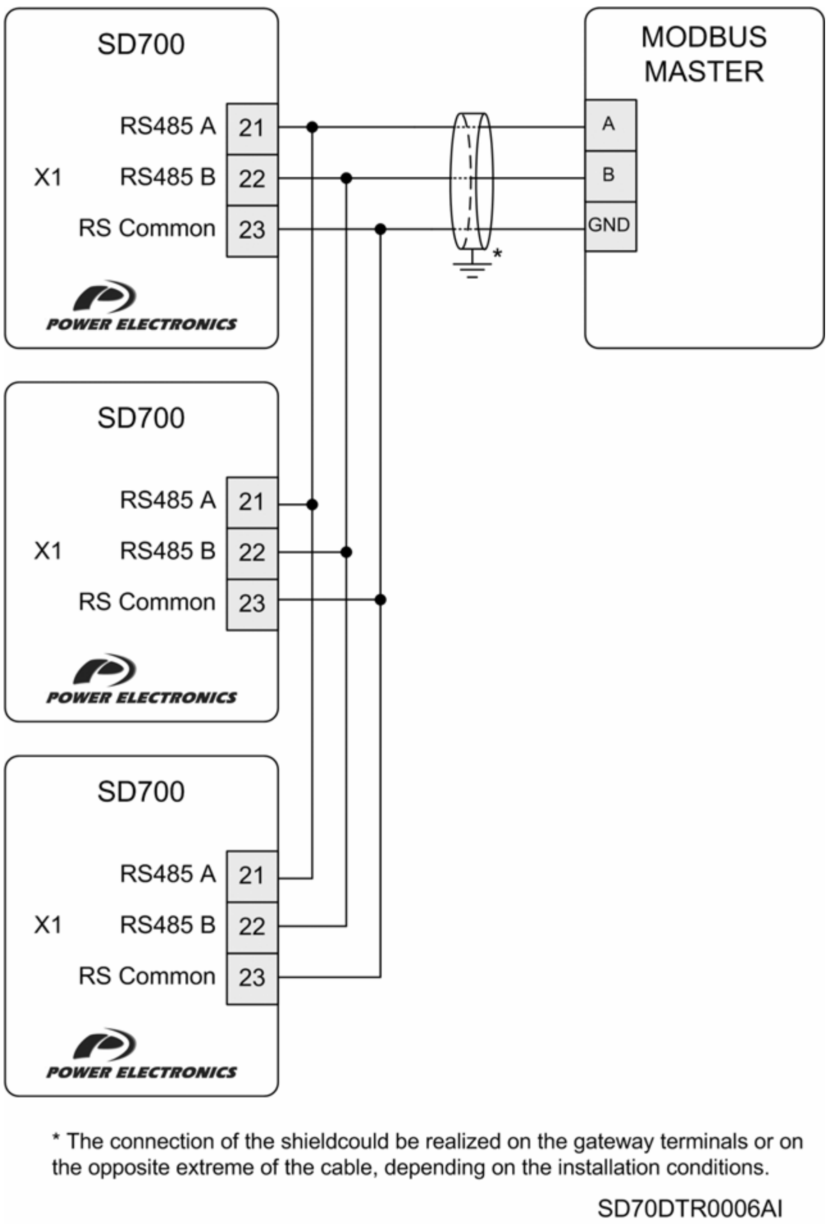

Figure 11.4 RS485 connection

11.2. Supported Modbus Function Codes

Serial communications protocol provided by SD700 drive adheres to Modbus Industrial standard communications protocol of Modicon. The drive uses reading and writing functions between all of the functions that exist in Modbus protocol. The used functions by the drive are the following ones:

Function	Description	Registers Number
3	Registers Reading	120
16	Registers Writing	120

The implementation of this function code in the drive allows reading up to 120 registers into a Parameters Group in a frame. If you want to access to a consecutive memory registers, but belonging to different groups, you should access in so many frames as groups are involved.

11.2.1. Modbus Function Code Nº 3: Registers Reading

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

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

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

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

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

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

Each register consists of 2 bytes (2x8bits=16 bits). This one is the default length of all of the registers that form the SD700.

11.2.1.1. Operation Example of Modbus Function Code Nº 3 (Registers Reading)

We suppose that we want to read the motor current (nameplate data) via communications. This data corresponds to the parameter G2.1 '1 MTR CUR=00.00A'. The frame that should be transmitted is:

Modbus Address	Modbus Function Code	Starting Data Address (40282)	Registers Number	CRC-16
0x0A	0x03	0x00A2	0x0001	0x2493

We suppose that instantaneous current of the equipment is 8,2 A. (Modbus value 82 decimal = 0x52 Hexadecimal). The answer of the slave will be:

Modbus Address	Modbus Function Code	Bytes Number	Data (address 20) (=110)	CRC-16
0x0A	0x03	0x02	0x0052	0x9C78

11.2.2. Modbus Function Code Nº 16: Registers Writing

This function code allows the Modbus controller (master) to write the content of the data registers indicated in the drive (slave), whenever those registers are not of Read only. Registers writing by the master does not impede the later modification of those registers by the slave.
The implementation of this function code in the drive allows writing up to 5 registers of the drive in a single frame.

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

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

The answer of the slaves includes:

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

11.3. Addressing Modes

11.3.1. Broadcast Addressing Mode

Broadcast addressing mode allows the master to access at the same time to all of the slaves connected to the Modbus network.

The Modbus function code that admits this global addressing mode is:

Function	Description
16	Registers Writing

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

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

11.4. Summary of Modbus Addresses in Numerical Order

Address	Screen	Description	Range	Modbus Range
40002	G7.4	Start mode	RAMP SPIN	0 to 1
40003	G7.1	Stop mode 1	RAMP SPIN	0 to 1
40004	G7.2	Stop mode 2	RAMP SPIN	0 to 1
40005	G7.3	Changing speed for stop mode	OFF = 0 to 250%	0 to 12280
40006	G7.6	Start delay time	OFF = 0 – 6500s	0 to 65000
40007	G7.7	Stop delay time	OFF = 0 – 6500s	0 to 65000
40008	G7.8	Minimum stop speed	N: No / Y: Yes	0 to 1
40009	G7.10	Run after occurring power loss	N: No / Y: Yes	0 to 1
40014	G7.9	Delay time between stop and next start	OFF = 0.000 – 10.000s	0 to 10000
40015	G7.5	Start mode 2	RAMP SPIN	0 to 1
40017	G7.11	Accuracy setting for starting by spin	OFF=0, 1 – 100%	0 to 1000
40018	G19.2.10	Frequency V/Hz change	OFF=0.0, 0.1 – 100%	0 to 8192
40019	G19.2.11	Stabilize factor in acceleration	80.0 – 99.9%, OFF=100%	6554 to 8192
40020	G19.2.12	Stabilize factor in deceleration	80.0 – 99.9%, OFF=100%	6554 to 8192
40021	G19.2.13	Regeneration bus voltage	For VIN = 400V / 500V ➔ 625 to 799V, OFF=800V For VIN=690V ➔ 950 to 1250V, OFF=1251V	For VIN = 400V / 500V ➔ 625 to 799, 800 For VIN=690V ➔ 950 to 1250, 1251
40022	G17.2	Current applied to the brake	0 – 100%	0 to 8192
40023	G17.3	Voltage applied to the brake	0.0 – 25%	0 to 2048
40024	G17.4	Non condensing heating current	OFF = 0.0 – 30%	0 to 2458
40025	G17.1	Time for DC brake activation	OFF = 0.0 – 99s	0 to 990
40026	G17.5	Use of external brake	N: No / Y: Yes	0 to 1
40031	G7.12	Delay time for start command after stop (2)	OFF=0.0 – 6500.0s	0 to 65000

Address	Screen	Description	Range	Modbus Range
40032	G4.1.5	Multi-function Digital Input 1 configuration	00: NO USE 01: START 02: STOP1 03: STOP2 – RESET 04: STOP1 – RESET 05: START/STOP 06: START–RST/STOP 07: RESET 08: START+INCH1 09: START+INCH2 10: INV SPEED 11: RESERVE 12: RESERVE 13: INV INCHS 14: ACC/DEC 2 15: REFERENCE 2 16: RESERVE 17: CONTROL 2 18: START/STP – RST 19: STOP (2) 20: SPEED LIMIT 2 21: DC BRAKE 22: START MODE 2 23: CURRENT LIMI2 24: EXTERN EMERGE 50: PMP START/STP 51: FLOW PULSE 52: FIX PUMP1 FLT 53: FIX PUMP2 FLT 54: FIX PUMP3 FLT 55: FIX PUMP4 FLT 56: FIX PUMP5 FLT 57: MAN PROTstart 58: HI PRESS FLT 59: LO WATER FLT 60: LO PRESS FLT 61: FLOW SWITCH 62: IRRIGAT TRIP 63: SETPONT PIN1 64: SETPON PIN2 65: SETPONT PIN3 66: MAN REF 2 67: MAN OVR START 69: PRESSUR SWITC 70: ALTER PID STP	0 to 70
40033	G4.1.6	Multi-function Digital Input 2 configuration	00 – 70 (See G4.1.5)	0 to 70
40034	G4.1.7	Multi-function Digital Input 3 configuration	00 – 70 (See G4.1.5)	0 to 70
40035	G4.1.8	Multi-function Digital Input 4 configuration	00 – 70 (See G4.1.5)	0 to 70
40036	G4.1.9	Multi-function Digital Input 5 configuration	00 – 70 (See G4.1.5)	0 to 70
40037	G4.1.10	Multi-function Digital Input 6 configuration	00 – 70 (See G4.1.5)	0 to 70
40038	G4.1.4	Selection of Digital Inputs configuration	0: 3 WIRES 1: ALL PROGRAMMABLE 2: MREF 2 WIRES 3: MREF 3 WIRES 4: MOTORIZED POT 5: ERASAB POT	0 to 5
40039	G4.1.3	Reset from keypad	N: No / Y: Yes	0 to 1
40040	G4.1.1	Main control mode	0: NONE 1: LOCAL 2: REMOTE 3: SERIAL COMMS	0 to 3
40041	G4.1.2	Alternative control mode	0: NONE 1: LOCAL 2: REMOTE 3: SERIAL COMMS	0 to 3

Address	Screen	Description	Range	Modbus Range
40052	G14.1 SV5.3	Multi-reference 1	-250% to +250%	-250% = -20480 to +250% = 20480
40053	G14.2 SV5.4	Multi-reference 2	-250% to +250%	-250% = -20480 to +250% = 20480
40054	G14.3 SV5.5	Multi-reference 3	-250% to +250%	-250% = -20480 to +250% = 20480
40055	G14.4 SV5.6	Multi-reference 4	-250% to +250%	-250% = -20480 to +250% = 20480
40056	G14.5 SV5.7	Multi-reference 5	-250% to +250%	-250% = -20480 to +250% = 20480
40057	G14.6 SV5.8	Multi-reference 6	-250% to +250%	-250% = -20480 to +250% = 20480
40058	G14.7 SV5.9	Multi-reference 7	-250% to +250%	-250% = -20480 to +250% = 20480
40092	G15.1 SV5.10	Inch speed 1	-250% to +250%	-250% = -20480 to +250% = 20480
40093	G15.2 SV5.11	Inch speed 2	-250% to +250%	-250% = -20480 to +250% = 20480
40094	G15.3 SV5.12	Inch speed 3	-250% to +250%	-250% = -20480 to +250% = 20480
40102	G10.1	Minimum speed limit 1	-250% to Max. speed 1	-250% = -20480 to G10.2
40103	G10.3	Minimum speed limit 2	-250% to Max. speed 2	-250% = -20480 to G10.4
40104	G10.2	Maximum speed limit 1	Min. speed 1 to +250%	G10.1 to +250% = 20480
40105	G10.4	Maximum speed limit 2	Min. speed 2 to +250%	G10.3 to +250% = 20480
40106	G10.5	Current limit	(0.25 to 1.50)· In	2048 to 12288
40107	G10.9	Torque limit	-250% to 250%	-250% = -20480 to +250% = 20480
40108	G10.11	To enable speed inversion	N: No / Y: Yes	0 to 1
40109	G10.7	Alternative current limit	N: No / Y: Yes	0 to 1
40110	G10.8	Change speed for I.max2	OFF=0%, +1 to +250%	0 to 20480
40122	G3.1	Reference source 1 of speed	NONE	0 to 8
			AI1	
			AI2	
			AI1 + AI2	
			RESER	
			LOCAL	
			MREF	
			PMOT	
			PID	
40123	G3.2	Reference source 2 of speed	NONE	0 to 8
			AI1	
			AI2	
			AI1 + AI2	
			RESER	
			LOCAL	
			MREF	
			PMOT	
			PID	
40124	G3.3 SV5.1	Local speed reference	-250% to +250%	-250% = -20480 to +250% = 20480
40132	G16.1	Skip frequency 1	-250 to +250%	-250% = -20480 to +250% = 20480
40133	G16.2	Skip frequency 2	-250 to +250%	-250% = -20480 to +250% = 20480
40134	G16.3	Skip bandwidth	OFF = 0 – 20%	0 to 1638
40142	G6.1	Source selection for introducing reference signal	NONE	0 to 6
			AI1	
			AI2	
			RESERV	
			MREF	
			LOCAL	
			locPID	
40143	G6.3	Selection of feedback signal source	NONE	0 to 3
			AI1	
			AI2	
			RESERV	

Address	Screen	Description	Range	Modbus Range
40144	G6.4	Proportional gain of PID control	0.1 – 20	1 to 200
40145	G6.5	Integration time of PID control	0.0 – 1000s, Max	0 to 10000, 10001
40146	G6.6	Derivation time of PID control	0.0 – 250s	0 to 2500
40147	G6.7	PID output inversion	N: No / Y: Yes	0 to 1
40148	G6.8	PID control error	Read only	-
40149	G6.2 SV5.2	PID local reference	0.0 – 400%	0 to 32760
40159	SV 2.3	Frequency of the input voltage to the drive	Read only	Frequency Real Value Phases RS = (Modbus Value / 10)
40160	SV 2.3	Frequency of the input voltage to the drive	Read only	Frequency Real Value Phases ST = (Modbus Value / 10)
40161	SV 2.3	Frequency of the input voltage to the drive	Read only	Frequency Real Value Phases RT = (Modbus Value / 10)
40162	SV1.1	Speed reference	Read only	8192 = 100% of motor rated speed
40163	SV1.5	Motor current	Read only	Real Value = (Modbus Value / 10)
40164	SV1.6	Motor torque	Read only	8192 = 100% of motor rated torque
40165	SV1.8	Motor power consumption	Read only	Real Value = (Modbus Value / 10)
40166	SV1.4	Motor voltage	Read only	Real Value = Modbus Value
40167	SV1.3	Motor frequency	Read only	Real Value = Modbus Value
40168	SV1.7	Motor power factor	Read only	Real Value = (Modbus Value / 10)
40169	SV1.2	Motor speed	Read only	Real Value = Modbus Value
40170	STATUS LINE	Motor speed. Third field of the first display line.	Read only	8192 = 100% of motor rated speed
40171	SV2.4	Voltage applied to the drive	Read only	Real Value = Modbus Value
40173	SV1.12	Motor temperature	Read only	8192 = 100% of motor temperature 110% = Trip
40176	SV2.5	IGBT temperature	Read only	Real Value = Modbus Value
40177	SV1.9	Current consumption per phase of the motor (Phase U)	Read only	Real Value Phase U = (Modbus Value / 10)
40178	SV1.9	Current consumption per phase of the motor (Phase V)	Read only	Real Value Phase V = (Modbus Value / 10)
40179	SV1.9	Current consumption per phase of the motor (Phase W)	Read only	Real Value Phase W = (Modbus Value / 10)
40180	SV1.10	Voltage applied to the motor phases (Phases UV)	Read only	Real Value Phases UV = Modbus Value
40181	SV1.10	Voltage applied to the motor phases (Phases VW)	Read only	Real Value Phases VW = Modbus Value
40182	SV1.10	Voltage applied to the motor phases (Phases UW)	Read only	Real Value Phases UW = Modbus Value
40183	SV2.1	Voltage applied to the drive (Phases RS)	Read only	Real Value Phases RS = Modbus Value
40184	SV2.1	Voltage applied to the drive (Phases ST)	Read only	Real Value Phases ST = Modbus Value
40185	SV2.1	Voltage applied to the drive (Phases RT)	Read only	Real Value Phases RT = Modbus Value
40186	SV3.1	Average value of the Analogue Input 1	Read only	Real Value = (Modbus Value / 1000)
40187	SV3.4	Average value of the Analogue Input 2	Read only	Real Value = (Modbus Value / 1000)
40190	SV3.2	Reference value of the Analogue Input 1	Read only	8192 = 100% Maximum range of the AI1
40191	SV3.5	Reference value of the Analogue Input 2	Read only	8192 = 100% Maximum range of the AI2
40192	SV3.7	Analogue Output 1 value	Read only	Real Value = (Modbus Value / 1000)
40193	SV3.9	Analogue Output 2 value	Read only	Real Value = (Modbus Value / 1000)
40194	SV3.8	Value of the magnitude associated to AO1	Read only	8192 = 100% Maximum range of the AO1
40195	SV3.10	Value of the magnitude associated to AO2	Read only	8192 = 100% Maximum range of the AO2

Address	Screen	Description	Range	Modbus Range
40196	SV3.11	Status of Digital Inputs	Read only	LSB = BIT0 = MFI1 BIT6 = PTC 0 to 1
40197	SV3.12	Status of Output Relays	Read only	BIT 0 = R1; Range from 0 to 1 BIT 1 = R2; Range from 0 to 1 BIT 2 = R3; Range from 0 to 1
40203	SV4.8	PID error value	Read only	8192 = 100% Maximum range of the Analogue Input
40204	SV4.6	PID reference value	Read only	8192 = 100% Maximum range of he Analogue Input
40205	SV4.7	PID feedback value	Read only	8192 = 100% Maximum range of he Analogue Input
40206	SV4.4	Software version	Read only	Real Value = Modbus Value
40207	SV4.5	Hardware version	Read only	Real Value = (Modbus Value / 100)
40209	SV4.2	Drive rated current	Read only	Real Value = (Modbus Value / 10)
40210	SV4.3	Drive rated voltage	Read only	Real Value = (Modbus Value / 10)
40218	SV1.11	Motor PTC connection	Read only	0 to 1
40219	STATUS LINE	General status. First field of the first display line.	Read only	0 to 201
40232	SV4.9	Status of comparators (Comparator 1)	Read only	0 to 1
40233	SV4.9	Status of comparators (Comparator 2)	Read only	0 to 1
40234	SV4.9	Status of comparators (Comparator 3)	Read only	0 to 1
40235	SV4.1	Actual fault	Read only	Fault number
40240	SV2.6	Drive temperature	Read only	Real Value = (Modbus Value / 10)
40242	G4.2.9	Speed for the maximum range of Analogue Input 1	G4.2.8 to +250%	G4.2.8 to +250% = 20480
40243	G4.3.9	Speed for the maximum range of Analogue Input 2	G4.3.8 to +250%	G4.3.8 to +250% = 20480
40244	G4.2.6	Maximum range of Analogue Input 1	G4.2.4 to +10V	G4.2.4 to 10000
			G4.2.4 to 20mA	G4.2.4 to 20000
40245	G4.3.6	Maximum range of Analogue Input 2	G4.3.4 to +10V	G4.3.4 to 10000
			G4.3.4 to 20mA	G4.3.4 to 20000
40246	G4.2.8	Speed for the minimum range of Analogue Input 1	-250% to G4.2.9	-250% = -20480 to G4.2.9
40247	G4.3.8	Speed for the minimum range of Analogue Input 2	-250% to G4.3.9	-250% = -20480 to G4.3.9
40248	G4.2.4	Minimum range of Analogue Input 1	-10V to G4.2.6	-10 = -1000 to G4.2.6
			0mA to G4.2.6	0 = 0 to G4.2.6
40249	G4.3.4	Minimum range of Analogue Input 2	-10V to G4.3.6	-10 = -1000 to G4.2.6
			0mA to G4.3.6	0 = 0 to G4.2.6
40250	G4.2.7	Maximum range of sensor 1	G4.2.5 to +3200 Engin. units	G4.2.5 to 3200
40251	G4.3.7	Maximum range of sensor 2	G4.3.5 to +3200 Engin. units	G4.3.5 to 3200
40254	G4.2.5	Minimum range of sensor 1	-3200 to G4.2.7 Engin. units	-3200 to G4.2.7
40255	G4.3.5	Minimum range of sensor 2	-3200 to G4.3.7 Engin. units	-3200 to G4.3.7
40262	SV3.3	Value of the sensor 1 associated to AI1	Read only	Real Value = (Modbus Value / 10)
40263	SV3.6	Value of the sensor 2 associated to AI2	Read only	Real Value = (Modbus Value / 10)
40264	G4.2.3	Analogue Input 1 format	V or mA	0 to 1
40265	G4.3.3	Analogue Input 2 format	V or mA	0 to 1
40266	G4.2.14	Protection for Analogue Input 1 loss	N: No / Y: Yes	0 to 1
40267	G4.3.14	Protection for Analogue Input 2 loss	N: No / Y: Yes	0 to 1
40268	G4.2.1	To enable sensor of Analogue Input 1	N: No / Y: Yes	0 to 1
40269	G4.3.1	To enable sensor of Analogue Input 2	N: No / Y: Yes	0 to 1
40270	G4.2.15	Zero band filter for Analogue Input 1	OFF=0.0 – 2.0%	0 to 163
40271	G4.3.15	Zero band filter for Analogue Input 2	OFF=0.0 – 2.0%	0 to 163

Address	Screen	Description	Range	Modbus Range
40272	G4.2.2	Selection of sensor 1 units	%	0 to 16
			l/s	
			m³/s	
			l/m	
			m³/m	
			l/h	
			m³/h	
			m/s	
			m/m	
			m/h	
			Bar	
			kPa	
			Psi	
			M	
			ºC	
			ºF	
			ºK	
40273	G4.3.2	Selection of sensor 2 units	%	0 to 16
			l/s	
			m³/s	
			l/m	
			m³/m	
			l/h	
			m³/h	
			m/s	
			m/m	
			m/h	
			Bar	
			kPa	
			Psi	
			m	
			ºC	
			ºF	
			ºK	
40274	G4.2.16	Low Pass filter for Analogue Input 1	OFF = 0.0 – 20.0%	0 to 200
40275	G4.3.16	Low Pass filter for Analogue Input 2	OFF = 0.0 – 20.0%	0 to 200
40282	G2.1	Motor rated current	1 – 9999A limited from (0.2 – 1.5·In)	1638 to 12288
40283	G2.2	Motor rated voltage	220 – 999V	220 to 999
40284	G2.6	Motor rated frequency	0 – 100Hz	0 to 100
40285	G2.3	Motor rated power	0.0 – 6500kW	0 to 65000
40286	G2.4	Motor rpm	0 – 24000 rpm	0 to 24000
40287	G2.7	Motor cooling at zero speed	OFF, 20 – 100%	8274, 1638 to 8192
40288	G2.5	Phi cosine	0 to 0.99	0 to 99
40289	G11.11	Pump overload level	0.0 – 3200A	0 to 32000
40290	G11.12	Filter for pump overload	OFF=0, 1 to 5s	0 to 50
40291	G11.13	Trip delay time because of pump overload	OFF=0.0 – 999.9s	0 to 9999
40302	G9.1.1	Source selection for Comparator 1	00: NONE	0 to 22
			01: SPEED MOTOR	
			02: CURRENT MOTOR	
			03: VOLTAGE MOTOR	
			04: POWER MOTOR	
			05: TORQUE MOTOR	
			06: PF MOTOR	
			07: TEMP MOTOR	
			08: FREQUENCY MTR	
			09: INPUT VOLTAGE	
			10: DC BUS	
			11: DRIVE TEMP	
			12: SPEED REF	
			13: Reserved	
			14: PID REFERENCE	
			15: PID FEEDBACK	
			16: PID ERROR	
			17: ANLG INPUT 1	
			18: ANLG INPUT 2	
			19: ANLG INPUT 1+ 2	
			20: Reserved	
			21: MAX SCALE	
			22: ABSOLUT SPEED	

Address	Screen	Description	Range	Modbus Range
40303	G9.1.2	Type selection for Comparator 1	0: Normal 1: Window	0 to 1
40304	G9.1.5 G9.1.7	G9.1.5 / Limit 1 for Comparator 1 in Window mode G9.1.7 / Deactivation value of Comparator 1 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40305	G9.1.4 G9.1.3	G9.1.4 / Limit 2 for Comparator 1 in Window mode G9.1.3 / Activation value of Comparator 1 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40306	G9.1.6	ON delay time for Comparator 1	0.0 – 999s	0 to 9999
40307	G9.1.8	OFF delay time for Comparator 1	0.0 – 9999s	0 to 9999
40308	G9.1.9	Selection of output function for Comparator 1	00: NONE 01: START / STOP 02: STOP 1 03: STOP 2 04: RESET 05: START + INCH1 06: START + INCH2 07: START + INCH3 08: INV SPEED 09: ACC / DEC 2 10: REFERENCE 2 11: SPEED LIMIT 2	0 to 11
40311	G9.2.1	Source selection for Comparator 2	00 – 22 (See G9.1.1)	0 to 22
40312	G9.2.2	Type selection for Comparator 2	0: Normal 1: Window	0 to 1
40313	G9.2.5 G9.2.7	G9.2.5 / Limit 1 for Comparator 2 in Window mode G9.2.7 / Deactivation value of Comparator 2 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40314	G9.2.4 G9.2.3	G9.2.4 / Limit 2 for Comparator 2 in Window mode G9.2.3 / Activation value of Comparator 2 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40315	G9.2.6	ON delay time for Comparator 2	0.0 – 999s	0 to 9999
40316	G9.2.8	OFF delay time for Comparator 2	0.0 – 9999s	0 to 9999
40317	G9.2.9	Selection of output function for Comparator 2	00 – 11 (See G9.1.9)	0 to 11
40320	G9.3.1	Source selection for Comparator 3	00 – 22 (See G9.1.1)	0 to 22
40321	G9.3.2	Type selection for Comparator 3	0: Normal 1: Window	0 to 1
40322	G9.3.5 G9.3.7	G9.3.5 / Limit 1 for Comparator 3 in Window mode G9.3.7 / Deactivation value of Comparator 3 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40323	G9.3.4 G9.3.3	G9.3.4 / Limit 2 for Comparator 3 in Window mode G9.3.3 / Activation value of Comparator 3 in Normal mode	-250% to +250%	-250% = -20480 to +250% = 20480
40324	G9.3.6	ON delay time for Comparator 3	0.0 – 999s	0 to 9999
40325	G9.3.8	OFF delay time for Comparator 3	0.0 – 9999s	0 to 9999
40326	G9.3.9	Selection of output function for Comparator 3	00 – 11 (See G9.1.9)	0 to 11

Address	Screen	Description	Range	Modbus Range
40342	G8.2.1	Mode selection for Analogue Output 1	00: NONE 01: SPEED MOTOR 02: CURRENT MOTOR 03: VOLTAGE MOTOR 04: POWER MOTOR 05: TORQUE MOTOR 06: PF MOTOR 07: TEMP MOTOR 08: FREQUENCY MTR 09: INPUT VOLTAGE 10: DC BUS 11: DRIVE TEMP 12: SPEED REF 13: Reserved 14: PID REFERENCE 15: PID FEEDBACK 16: PID ERROR 17: ANLG INPUT 1 18: ANLG INPUT 2 19: ANLG INPUT 1+ 2 20: CURRENT FLOW 21: MAX SCALE 22: ABSOLUT SPEED 27: MACRO PUMP	0 to 27
40343	G8.2.2	Format selection for Analogue Output 1	0-10V ±10V 0-20mA 4-20mA	0 to 3
40344	G8.2.3	Low range selection of Analogue Output 1	-250% to +250%	-250% = -20480 to +250% = 20480
40345	G8.2.4	High range selection of Analogue Output 1	-250% to +250%	-250% = -20480 to +250% = 20480
40346	G8.2.5	Filter selection for Analogue Output 1	OFF = 0.0 – 20.0s	0 to 200
40347	G8.2.6	Mode selection for Analogue Output 2	00 – 27 (See G8.2.1)	0 to 27
40348	G8.2.7	Format selection for Analogue Output 2	0-10V ±10V 0-20mA 4-20mA	0 to 3
40349	G8.2.8	Low range selection of Analogue Output 2	-250% to +250%	-250% = -20480 to +250% = 20480
40350	G8.2.9	High range selection of Analogue Output 2	-250% to +250%	-250% = -20480 to +250% = 20480
40351	G8.2.10	Filter selection for Analogue Output 2	OFF = 0.0 – 20.0s	0 to 200

Address	Screen	Description	Range	Modbus Range
40362	G8.1.1	Selection of Relay 1 control source	00: ALWAYS OFF	0 to 32
			01: ALWAYS ON	
			02: NO FAULTS	
			03: GENERAL FAULT	
			04: START	
			05: RUN	
			06: READY	
			07: ZERO SPEED	
			08: SET SPEED	
			09: SP DIRECTION	
			10: RESERVE	
			11: SP REF DIRECT	
			12: RESERVE	
			13: SP LIMIT	
			14: CURR LIMIT	
			15: VOLT LIMIT	
			16: TORQ LIMIT	
			17: COMPARATOR 1	
			18: COMPARATOR2	
			19: COMPARATOR3	
			20: ACC / DEC 2	
			21: REFERENCE 2	
			22: STOP 2	
			23: SP LIMIT 2	
			24: DC BRAKE	
			25: RESERVE	
			26: RESERVE	
			27: RESERVE	
			28: PUMP CNTRL	
			29: JOCKEY PUMP	
			30: PRIMING PUMP	
			31: SLEEP CONDIT	
			32: CRANE BRAKE	
40363	G8.1.2	ON delay time for Relay 1	0.0 – 999s	0 to 9999
40364	G8.1.3	OFF delay time for Relay 1	0.0 – 999s	0 to 9999
40365	G8.1.4	Relay 1 inversion	N: No / Y: Yes	0 to 1
40366	G8.1.5	Selection of Relay 2 control source	00 – 32 (See G8.1.1)	0 to 32
40367	G8.1.6	ON delay time for Relay 2	0.0 – 999s	0 to 9999
40368	G8.1.7	OFF delay time for Relay 2	0.0 – 999s	0 to 9999
40369	G8.1.8	Relay 2 inversion	N: No / Y: Yes	0 to 1
40370	G8.1.9	Selection of Relay 3 control source	00 – 32 (See G8.1.1)	0 to 32
40371	G8.1.10	ON delay time for Relay 3	0.0 – 999s	0 to 9999
40372	G8.1.11	OFF delay time for Relay 3	0.0 – 999s	0 to 9999
40373	G8.1.12	Relay 3 inversion	N: No / Y: Yes	0 to 1
40374	G20.4.1	IP address (A)	0 – 255	0 to 255
40375	G20.4.2	IP address (B)	0 – 255	0 to 255
40376	G20.4.3	IP address (C)	0 – 255	0 to 255
40377	G20.4.4	IP address (D)	0 – 255	0 to 255
40378	G20.4.5	Subnet address (A)	0 – 255	0 to 255
40379	G20.4.6	Subnet address (B)	0 – 255	0 to 255
40380	G20.4.7	Subnet address (C)	0 – 255	0 to 255
40381	G20.4.8	Subnet address (D)	0 – 255	0 to 255
40382	G20.4.9	Gateway address (A)	0 – 255	0 to 255
40383	G20.4.10	Gateway address (B)	0 – 255	0 to 255
40384	G20.4.11	Gateway address (C)	0 – 255	0 to 255
40385	G20.4.12	Gateway address (D)	0 – 255	0 to 255
40386	G20.4.13	MAC address (A)	0 – 255	0 to 255
40387	G20.4.14	MAC address (B)	0 – 255	0 to 255
40388	G20.4.15	MAC address (C)	0 – 255	0 to 255
40389	G20.4.16	MAC address (D)	0 – 255	0 to 255
40390	G20.4.17	MAC address (E)	0 – 255	0 to 255
40391	G20.4.18	MAC address (F)	0 – 255	0 to 255
40392	G5.1	Acceleration ramp 1	0.01 – 650% / sec	10 to 65000
40393	G5.3	Acceleration ramp 2	0.01 – 650% / sec	10 to 65000
40394	G5.2	Deceleration ramp 1	0.01 – 650% / sec	10 to 65000
40395	G5.4	Deceleration ramp 2	0.01 – 650% / sec	10 to 65000
40396	G5.5	Speed for acceleration ramp change	OFF = 0 to 250%	0 to 20480
40397	G5.6	Speed for deceleration ramp change	OFF = 0 to 250%	0 to 20480

Address	Screen	Description	Range	Modbus Range
40398	G5.9	Ramp 2 of reference increase for motorized potentiometer	0.01 – 650% / sec	10 to 65000
40399	G5.8	Ramp 1 of reference decrease for motorized potentiometer	0.01 – 650% / sec	10 to 65000
40400	G5.7	Ramp 1 of reference increase for motorized potentiometer	0.01 – 650% / sec	10 to 65000
40401	G5.10	Ramp 2 of reference decrease for motorized potentiometer	0.01 – 650% / sec	10 to 65000
40402	G5.11	Speed for ramp change with motorized potentiometer	OFF = 0 to 250%	0 to 20480
40403	G5.12	Time constant to filter the speed	0.000 – 60.0s	0 to 60000
40413	G20.2	Limit time for communication	OFF = 0 – 250s	0 to 250
40414	G20.3.1	Communication address	1 – 255	1 to 255
40415	G20.3.2	Communication speed	600 1200 2400 4800 9600	0 to 4
40416	G20.3.3	Communication parity	ODD NONE EVEN	0 to 2
40432	G13.1	Screen for general fault	Read only	-
40433	G13.2	Register 1 of fault history	Read only	-
40434	G13.3	Register 2 of fault history	Read only	-
40435	G13.4	Register 3 of fault history	Read only	-
40436	G13.5	Register 4 of fault history	Read only	-
40437	G13.6	Register 5 of fault history	Read only	-
40438	G13.7	Erase fault history	N: No / Y: Yes	0 to 1
40452	G11.1	Trip time because of speed limit	0.0 – 60s, OFF	0 to 600, 610
40453	G10.6	Trip time because of current limit	0 to 60s, OFF	0 to 600, 610
40454	G11.2	Maximum time for stop limit	OFF = 0.0 – 999s	0 to 9999
40455	G10.10	Trip time because of torque limit	0 to 60s, OFF	0 to 600, 610
40456	G11.3	Ground fault detection	OFF, 0 – 30% In	0 to 2458
40457	G11.4	Low input voltage level	323 – 425V (400V) 586 – 621V (690V)	3230 to 4250 5860 to 6210
40458	G11.5	Trip time because of low input voltage	0.0 – 60s, OFF	0 to 600, 610
40459	G11.6	High input voltage level	418 – 550V (400V) 726 – 759V (690V)	4180 to 5500 7260 to 7590
40460	G11.7	Trip time because of high input voltage	0.0 – 60s, OFF	0 to 600, 610
40461	G11.9	Performance in case of input power loss	0: NO FAULT 1: FAULTS 2: STOP	0 to 2
40462	G11.10	PTC motor option	N: No / Y: Yes	0 to 1
40463	G11.8	Trip delay time due to output voltage imbalance	0.0 – 10s, OFF	0 to 100, 101
40482	G19.3.1	Stator resistance (Rs)	0.0 – 9.9%	0 to 811
40502	G19.2.1	Minimum flux	40 – 100%	3277 to 8192
40505	G19.2.4	Slip compensation	N: No / Y: Yes	0 to 1
40506	G19.2.5	Drive damping	0.0 – 20.0%	0 to 1638
40507	G19.2.6	Compensating bandwidth of torque transitory	0.0 – 10.0%	0 to 819
40508	G19.2.7	Current limit factor	0.0 – 20.0%	0 to 1638
40509	G17.6	Voltage for activating regeneration control	For VIN = 400V / 500V ➔ 800 to 810V, OFF=811V For VIN=690V ➔ 1150 to 1160V, OFF=1161V	For VIN = 400V / 500V ➔ 800 to 810, 811 For VIN=690V ➔ 1150 to 1160, 1161
40522	G19.1.1	Selection of control type	V/Hz PEVE	0 to 1
40523	G19.1.2	Commutation frequency	4000 – 8000Hz	4000 to 8000
40524	G19.1.3	Pewave control	N: No / Y: Yes	0 to 1
40549	G1.11	Drive fan control mode	FIXE TEMP	0 to 1
40550	SV6.1	Total time of running (RUN) (Days)	Read only	Real Value = Modbus Value
40551	SV6.1	Total time of running (RUN) (Hours)	Read only	1 = 0.1 hours
40552	SV6.2	Partial time of running (RUN) (Days)	Read only	Real Value = Modbus Value
40553	SV6.2	Partial time of running (RUN) (Hours)	Read only	1 = 0.1 hours

Address	Screen	Description	Range	Modbus Range
40554	SV6.3	Reset for partial time counter of running (RUN)	N: No / Y: Yes	0 to 1
40562	HOST CONTROL	It allows giving the start command to the equipment through communications network	0 – 1	0 to 1
40563	HOST CONTROL	It allows giving the stop command to the equipment through communications network	0 – 1	0 to 1
40564	HOST CONTROL	It allows giving the reset command to the equipment through communications network	0 – 1	0 to 1
40565	HOST CONTROL	It allows the equipment to generate a fault through communications network	0 – 1	0 to 1
40571	G12.1	Auto Reset	N: No / Y: Yes	0 to 1
40572	G12.2	Number of Auto Reset attempts	1 – 5	1 to 5
40573	G12.3	Delay time before Auto Reset	5 – 120s	5 to 120
40574	G12.4	Reset time for the counter of Auto Reset attempts	1 – 60min	1 to 60
40575	G12.5	Selection of fault 1 to be reset	0: 0 NO AUTO RESET 1: ALL OF THE FLTS 2: 11 VIN LOSS 3: 13 HI V IN 4: 14 LW V IN 5: 18 IMB V OUT 6: 19 IMB I OUT 7: 20 GROUND FLT 8: 21 I LIM T/O 9: 22 TQ LIM T/O 10: 27 DL SMTH 11: 40 EXT / PTC 12: 41COMMS TRIP 13: 42 AIN1 LOSS 14: 43 AIN2 LOSS 15: 47 COMMS T/O 16: 49 SPD LIMIT 17: 65 LOW PRESSURE 18: 66 HI PRESSURE 19: 67 LOW WATER 20: 31 SCR L1 21: 32 SCR L2 22: 33 SCR L3 23: 68 CAVIT/UNDERL 24: 69 FLOW SWITCH 25: 70 IRRIGATOR F	0 to 25
40576	G12.6	Selection of fault 2 to be reset	00 – 25 (See G12.5)	0 to 25
40577	G12.7	Selection of fault 3 to be reset	00 – 25 (See G12.5)	0 to 25
40578	G12.8	Selection of fault 4 to be reset	00 – 25 (See G12.5)	0 to 25
40581	G4.4.1	Sensor units of Pulse Input	% l/s m^3/s l/m m^3/m l/h m^3/h m/s m/m m/h	0 to 9
40582	G4.4.2	Flowmeter configuration	0 to 32760 Flow units	0 to 32760
40583	G4.4.3	Maximum range of flowmeter	0 to 32760 Flow units	0 to 32760
40592	G19.2.2	Initial voltage	0.0 – 100%	0 to 8192
40593	G19.2.3	Torque boost band	0.0 – 100%	0 to 8192
40594	G19.2.9	Initial frequency	0.0 – 100%	0 to 8192
40597	G8.1.13	Speed for disconnecting relay in option Crane	+0.0% to +250%	0 to 20480

Address	Screen	Description	Range	Modbus Range
42002	SV8.2 / SV8.6	Drive status during pump control. First field of the visualization screen.	Read only	0 ➔ REGL 1 ➔ PMAN 2 ➔ OMAN 3 ➔ HIPP 4 ➔ HIPR 5 ➔ FLOD 6 ➔ NFLO 7 ➔ CAVS 8 ➔ CAVI 9 ➔ LOPR 10 ➔ LOWA 11 ➔ CYCL 12 ➔ IRFA 13 ➔ FLOW 14 ➔ OFF 15 ➔ SLEP 16 ➔ BYPA 17 ➔ RAMP 18 ➔ FILL 19 ➔ COMP 20 ➔ JOCK 21 ➔ PRIM 22 ➔ FINP
42003	SV8.3	Status of fixed pumps 1, 2 and 3 (Pump 1)	Read only	0 ➔ OFF 1 ➔ RDY 2 ➔ ON 3 ➔ FLT
42004	SV8.3	Status of fixed pumps 1, 2 and 3 (Pump 2)	Read only	0 – 3 (See 42003)
42005	SV8.3	Status of fixed pumps 1, 2 and 3 (Pump 3)	Read only	0 – 3 (See 42003)
42006	SV8.2	Drive status during pump control. (PID Reference). Second field of the visualization screen.	Read only	8192 = 100% Maximum range of the Analogue Input
42007	SV8.1	Values of PID reference and feedback. (PID Reference).	Read only	Real Value = (Modbus Value / 10)
42008	SV8.2	Drive status during pump control. (Feedback). Third field of the visualization screen.	Read only	8192 = 100% Maximum range of the Analogue Input
42009	SV8.1	Values of PID reference and feedback. (Feedback).	Read only	Real Value = (Modbus Value / 10)
42011	G25.11.1	Operated time by Pump 1 (minutes)	Read only	-
42012	G25.11.2	Operated time by Pump 2 (minutes)	Read only	-
42013	G25.11.3	Operated time by Pump 3 (minutes)	Read only	-
42014	G25.11.1	Operated time by Pump 1 (days)	Read only	-
42015	G25.11.2	Operated time by Pump 2 (days)	Read only	-
42016	G25.11.3	Operated time by Pump 3 (days)	Read only	-
42017	G25.11.6	Reset counters	Read only	-
42018	G25.11.4	Operated time by Pump 4 (minutes)	Read only	-
42019	G25.11.5	Operated time by Pump 5 (minutes)	Read only	-
42020	G25.11.4	Operated time by Pump 4 (days)	Read only	-
42021	G25.11.5	Operated time by Pump 5 (days)	Read only	-
42022	SV8.4	Status of fixed pumps 4 and 5 (Pump 4)	Read only	0 – 3 (See 42003)
42023	SV8.4	Status of fixed pumps 4 and 5 (Pump 5)	Read only	0 – 3 (See 42003)
42035	G25.1.1	Control mode	MANUAL PUMP	0 to 1
42041	G25.1.2	Source selection for speed reference in manual mode	LOCAL AI1 AI2	0 to 2
42042	G25.1.3 SV5.13	Value of speed reference for local source in manual mode	-250% to +250%	-20480 to 20480
42043	G25.1.4	Source for the alternative speed reference in manual mode	LOCAL AI1 AI2	0 to 2
42044	G25.1.13 SV5.22	Time for automatic stop	OFF, 0.1 – 99.9h	0 to 999
42045	G25.2.1	PID setpoint source	LOCAL AI1 AI2	0 to 2

Address	Screen	Description	Range	Modbus Range
42046	G25.2.3	PID feedback source	AI1 AI2 PULSE	0 to 2
42047	G25.2.4	Proportional gain of PID regulator	0.1 – 20	1 to 200
42048	G25.2.5	Integral time of PID regulator	0.1 – 999.9s, Max.	1 to 9999; 10000
42049	G25.2.6	Derivation time of PID regulator	0.0 – 250s	0 to 2500
42050	G25.2.7	Error of PID regulator	Read only	-
42051	G25.2.8	Error of PID regulator in engineering units	Read only	-
42055	G25.3.2	Start speed for the fixed pumps	-250% to +250%	-20480 to 20480
42056	G25.3.3	Minimum PID error to start the fixed pumps	OFF=0 to +200%	0 to 16384
42062	G25.3.4	Delay time to start fixed pump 1 (Relay 1)	OFF=0 – 6000s	0 to 60000
42064	G25.3.1	Wake up level of the drive	0.0 – 3276Bar	0 to 32760
42065	G25.3.5	Delay time to start fixed pump 2 (Relay 2)	OFF=0 – 6000s	0 to 60000
42066	G25.3.6	Delay time to start fixed pump 3 (Relay 3)	OFF=0 – 6000s	0 to 60000
42067	G25.3.7	Delay time to start fixed pump 4 (AO1)	OFF=0 – 6000s	0 to 60000
42068	G25.3.8	Delay time to start fixed pump 5 (AO2)	OFF=0 – 6000s	0 to 60000
42072	G25.4.13	Maximum PID error to stop the fixed pumps	-250% to +0.0%	-20480 to 0
42073	G25.4.14	Delay time to stop fixed pump 1 (Relay 1)	0 – 6000s	0 to 60000
42077	G25.4.15	Delay time to stop fixed pump 2 (Relay 2)	0 – 6000s	0 to 60000
42078	G25.4.16	Delay time to stop fixed pump 3 (Relay 3)	0 – 6000s	0 to 60000
42079	G25.4.17	Delay time to stop fixed pump 4 (AO1)	0 – 6000s	0 to 60000
42080	G25.4.18	Delay time to stop fixed pump 5 (AO2)	0 – 6000s	0 to 60000
42081	G25.5.1	Speed bypass at the starting of fixed pumps	+0.0% to +250%	0 to 20480
42082	G25.5.2	Time of speed bypass after starting fixed pumps	OFF=0 – 999s	0 to 9999
42083	G25.5.3	Speed bypass at the stopping of fixed pumps	+0.0% to +250%	0 to 20480
42084	G25.5.4	Time of speed bypass after stopping fixed pumps	OFF=0 – 999s	0 to 9999
42085	G11.14	To enable underload protection	N: No / Y: Yes	0 to 1
42085	G25.6.2	To enable cavitation protection	N: No / Y: Yes	0 to 1
42086	G11.15	Underload current	0.2 to 1.5· In	0 to 12288
42086	G25.6.4	Cavitation current	0.2 to 1.5· In	0 to 12288
42087	G11.16	Underload speed	+0.0% to +250%	0 to 20480
42087	G25.6.5	Cavitation speed	+0.0% to +250%	0 to 20480
42088	G11.17	Delay time to activate underload protection	0 – 999s	0 to 9999
42088	G25.6.6	Delay time to activate cavitation protection	0 – 999s	0 to 9999
42090	G25.6.7	To enable low pressure protection	N: No / Y: Yes	0 to 1
42091	G25.6.9	Minimum pressure level	OFF=0 to 3276 Eng. Units	0 to 32760
42092	G25.6.10	Trip delay time because of minimum pressure fault	0 – 999s	0 to 9990
42101	G25.6.13	Maximum pressure level	0 – 3276 Eng. Units	0 to 32760
42102	G25.9.10	Bypass time for Priming pump	0.1 – 6000s	0 to 60000
42103	G25.9.11	Trip time of F72 while Priming pump is connected	OFF=0, 0.1 – 6000m	0 to 60000
42104	G25.6.11	Minimum speed for minimum pressure fault	+0.0% to +250%	0 to 20480
42116	G25.7.2	Speed for pipe filling process	OFF=0.0, +0.1 to +250%	0 to 20480
42117	G25.7.3	Pressure for the end of pipe filling process	0.0 – 3276 Eng. Units	0 to 32760
42118	G25.7.4	Safety time for pipe filling process	OFF=0, 1 – 9999min	0 to 9999
42119	G25.7.5	Setpoint ramp	0.01 – 320.00 Eng. Units /s	0 to 32000
42131	G25.8.1	Compensation pressure at the starting of 1 fixed pump	0.0 – 3276 Eng. Units	0 to 32760
42132	G25.8.2	Compensation pressure at the starting of 2 fixed pumps	0.0 – 3276 Eng. Units	0 to 32760
42133	G25.8.3	Compensation pressure at the starting of 3 fixed pumps	0.0 – 3276 Eng. Units	0 to 32760
42134	G25.8.4	Compensation pressure at the starting of 4 fixed pumps	0.0 – 3276 Eng. Units	0 to 32760

Address	Screen	Description	Range	Modbus Range
42135	G25.8.5	Compensation pressure at the starting of 5 fixed pumps	0.0 – 3276 Eng. Units	0 to 32760
42136	G25.9.1	To enable fixed pump associated to Output Relay 1	N: No / Y: Yes	0 to 1
42137	G25.9.2	To enable fixed pump associated to Output Relay 2	N: No / Y: Yes	0 to 1
42138	G25.9.3	To enable fixed pump associated to Output Relay 3	N: No / Y: Yes	0 to 1
42139	G25.9.6	Alternation mode of fixed pumps	LINEAR CYCLE DUTY SHARE	0 to 2
42141	G25.10.1	Flow reading source	AI1 AI2 PULSE	0 to 2
42142	SV8.5	Read flow value	Read only	Real Value = (Modbus Value / 10)
42143	G25.10.2 SV5.24	Maximum allowed flow	0.0 – 3276 Eng. Units	0 to 32760
42144	G25.10.3	Offset percentage over maximum flow	+0% to +250%	0 to 20480
42145	G25.10.4 SV5.25	Flow percentage to reset algorithm	+0% to +100%	0 to 100
42146	G25.10.5	Deceleration during algorithm	+0.0% to +250%	0 to 20480
42147	G25.10.6	Units of measurement of instantaneous flow	Read only	0 to 9
42148	G25.9.4	To enable fixed pump associated to Analogue Output 1	N: No / Y: Yes	0 to 1
42149	G25.9.5	To enable fixed pump associated to Analogue Output 2	N: No / Y: Yes	0 to 1
42151	G25.1.5 SV5.14	Local setpoint 1 for PID	0 – 3276 Eng. Units	0 to 32760
42152	G25.1.6 SV5.15	Local setpoint 2 for PID	0 – 3276 Eng. Units	0 to 32760
42153	G25.1.7 SV5.16	Local setpoint 3 for PID	0 – 3276 Eng. Units	0 to 32760
42154	G25.1.8 SV5.17	Local setpoint 4 for PID	0 – 3276 Eng. Units	0 to 32760
42155	G25.1.9 SV5.18	Local setpoint 5 for PID	0 – 3276 Eng. Units	0 to 32760
42156	G25.1.10 SV5.19	Local setpoint 6 for PID	0 – 3276 Eng. Units	0 to 32760
42157	G25.1.11 SV5.20	Local setpoint 7 for PID	0 – 3276 Eng. Units	0 to 32760
42158	G25.1.12 SV5.21	Local setpoint 8 for PID	0 – 3276 Eng. Units	0 to 32760
42306	G25.4.1	Delay time before activating sleep mode	OFF=0, 1 – 999s	0 to 9990
42307	G25.4.2	Sleep speed for local setpoint 1	+0.0% to +250%	0 to 20480
42308	G25.4.3	Sleep speed for local setpoint 2	+0.0% to +250%	0 to 20480
42309	G25.4.4	Sleep speed for local setpoint 3	+0.0% to +250%	0 to 20480
42310	G25.4.5	Sleep speed for local setpoint 4	+0.0% to +250%	0 to 20480
42311	G25.4.6	Sleep speed for local setpoint 5	+0.0% to +250%	0 to 20480
42312	G25.4.7	Sleep speed for local setpoint 6	+0.0% to +250%	0 to 20480
42313	G25.4.8	Sleep speed for local setpoint 7	+0.0% to +250%	0 to 20480
42314	G25.4.9	Sleep speed for local setpoint 8	+0.0% to +250%	0 to 20480
42315	G25.4.19	Stop speed 1 for one fixed pump	+0.0% to +250%	0 to 20480
42316	G25.4.20	Stop speed 2 for one fixed pump	+0.0% to +250%	0 to 20480
42317	G25.4.21	Stop speed 3 for one fixed pump	+0.0% to +250%	0 to 20480
42318	G25.4.22	Stop speed 4 for one fixed pump	+0.0% to +250%	0 to 20480
42319	G25.4.23	Stop speed 5 for one fixed pump	+0.0% to +250%	0 to 20480
42320	G25.4.24	Stop speed 6 for one fixed pump	+0.0% to +250%	0 to 20480
42321	G25.4.25	Stop speed 7 for one fixed pump	+0.0% to +250%	0 to 20480
42322	G25.4.26	Stop speed 8 for one fixed pump	+0.0% to +250%	0 to 20480
42323	G25.4.10	To enable 'No Flow' input to sleep the drive	N: No / Y: Yes	0 to 1
42324	G25.4.11 SV5.26	Flow level to sleep the drive	OFF=0.0 to 3276 Flow units	0 to 32760
42325	G25.4.12	Output current level to sleep the drive	OFF=0 to 1229A	0 to 12290
42326	G25.2.9	PID output inversion	N: No / Y: Yes	0 to 1

Address	Screen	Description	Range	Modbus Range
42327	G25.4.27	Sleep level in inverse mode	0.0% – 250%	0 to 20480
42336	G25.6.1	Delay time after protection pause	0 – 999s	0 to 9990
42337	G25.6.12	Response from over-pressure	PAUSE FAULT	1 to 2
42339	G25.6.14	Trip time because of high pressure	0 – 999s	0 to 9990
42344	G25.6.3	Response from cavitation	PAUSE FAULT	1 to 2
42348	G25.6.15	Response from ‘No Flow’ situation	PAUSE FAULT	1 to 2
42349	G25.6.17	Minimum stop speed because of ‘No Flow’ detection	+0.0% to +250%	0 to 20480
42350	G25.6.18	Bypass time for ‘No Flow’ switch	0.0 – 999s	0 to 9990
42351	G25.6.19	Trip delay time because of ‘No Flow’	0.0 – 999s	0 to 9990
42352	G25.6.16	To enable ‘No Flow’ switch during pipe filling process	N: No / Y: Yes	0 to 1
42353	G25.6.20	Cycle time of the drive	OFF=0 – 99m	0 to 99
42354	G25.6.21	Cycle counter	1 – 5	1 to 5
42356	SV5.23	Remaining time for automatic stop	Read only	0 to 6000
42357	G25.7.1	Pressure reading source	PID AI1 AI2	0 to 2
42358	G25.4.28	To enable sleep mode	N: No / Y: Yes	0 to 1
42371	G25.9.7	Starting pressure of Jockey pump	0.0 – 3276 Eng. Units	0 to 32760
42372	G25.9.8	Start delay time for Jockey pump	0 – 600s	0 to 6000
42373	G25.9.9	Stopping pressure of Jockey pump	0.0 – 3276 Eng. Units	0 to 32760
42374	G25.2.2	Alternative PID setpoint source	LOCAL AI1 AI2	0 to 2
42375	G25.4.29	Sleep speed when setpoint is introduced through Analogue Input	+0.0% to +250%	0 to 20480

11.5. Annexe A. Physical Level

The SD700 drive can be connected to a RS485 network by a twisted-pare cable where more equipment is also connected.

RS232 physical port has two separated lines for receiving (Rx) and transmitting (Tx). It allows the net to work in full duplex mode. Full duplex means that the master can transmit and receive data simultaneously.

RS485 physical port used in the drive, uses the same twisted-pare cable in the reception (Rx) and in the transmission (Tx). It only allows the RS485 system to work in half duplex mode. Half duplex means that the master cannot transmit and receiver information simultaneously. In a half duplex system, it usually uses the Request-To-Send line (RTS) to control the information flux via half duplex system in a RS232 system.

11.6. Annexe B. Modbus Communication Protocol

11.6.1. RTU Frame Group

In the RTU frame group, data are transmitted and received as sequences of 8 bits. When you want to transmit a register of 16 bits, it is divided in two sections of 8 bits, and the more significant byte (MSB) is transmitted firstly.
If more than 3.5 byte periods between the characters reception, drive considers that the next received byte will correspond to a different frame and it also will consider finished the present frame.

11.6.2. Address Field

The address field has 8 bits length and allows addressing 1-240 single addresses, 241-255 group addresses, and one (0) broadcast addresses.
Each SD700 drive is identified with an address that the master uses to communicate with it.
All of the SDRIVE 700 drives recognize and execute messages with groupcast or broadcast addressing, but do not answer to the master with a confirmation.

11.6.3. Function Field

The function field indicates to the addressed equipment the action to execute. When the slave detects that a communication error has occurred, the more significant bit of this field takes value '1' to indicate to the master this abnormal situation. There is more information about the exception codes in section 12.5.6.

11.6.4. Data Field

Data field is used to transmit information to the addressed slaves and from them. The length of data field is 16 (or multiple) bits (transmitted in 2 bytes – byte more significant firstly).

11.6.5. Sum Check (CRC)

Sum check is used by the master and slave to detect transmission errors. This code is added at the end of the transmitted frame. The characteristic polynomial of this code is:

$$CRC\text{-}16 = x^{16} + x^{15} + x^2 + 1$$

Receiver calculates the CRC of the received messages and compares it with the sum check (CRC) received. If an error occurs, the entire message is ruled out. It is not possible to recover errors inside the message.

11.6.5.1. Theory

The entire message (with no start / stop bits nor parity bit) is considered like a continuous sequence to be processed with the more significant byte transmitted firstly.
The message is multiplied by 2^{16} (2 bytes on the left hand) and then is divided by the polynomial shown above.

Quotient is rejected and the rest of 16 bits is added to the message. This rest is initialized to 0FFFFH to avoid a possible sequence of zeros as a valid sequence.

Receiver receives the complete sequence and executes the division with the same characteristic polynomial; if the message has been received with no errors, the rest of the division is zero.

The device used for data serial transmission will send the less significant bit LSB of each character firstly. In the CRC generation, the first transmitted bit is defined like the more significant bit of the dividend.

By convenience, we suppose that there are not carries, and assume that the more significant bit MSB is the right one. For this, if we want to be solid, the bit order of the characteristic polynomial should be inverted. The more significant byte is ruled out if only affects to the quotient and does not affect to the rest.
In this way, original polynomial

$$x^{16}+x^{15}+x^2+1 = 1100\ 0000\ 0000\ 00101$$

becomes like this

1010 0000 0000 0001 (A001H)

11.6.6. Exception Codes

Protocol errors and data range errors generate an answer of SD700 with an exception answer.

An exception answer consists of the slave address that has detected the error, the function code received by the slave (more significant bit with ‘1’ value to indicate the exception answer), the error code, and the sum check (CRC).

The exception codes and its causes are summarized in the following table:

Code	Name	Cause
01	Illegal function	The function code received by the slave is out of range. The range of valid function code is the code 3 and 16
02	Illegal data address	Data address received by the slave is out of range
03	Illegal data value	Data value received by the slave is out of range
06	Busy, rejected message.	The slave cannot execute the action required by the master immediately
07	Acknowledgement	The required action cannot be executed

12. FAULT MESSAGES. DESCRIPTIONS AND ACTIONS

When a fault occurs the SD700 will stop the motor and show the generated fault on the display. You can display this fault in the programming line (lower line) while motor current and the speed values at the moment of the fault are displayed in the upper line.
It is possible to navigate through the additional display lines to access other status parameters without resetting the fault. These additional status parameters offer further information about the moment at which the fault occurred. Additionally, the FAULT led will blink and the fault message will be displayed until the fault is remedied and the drive is reset.

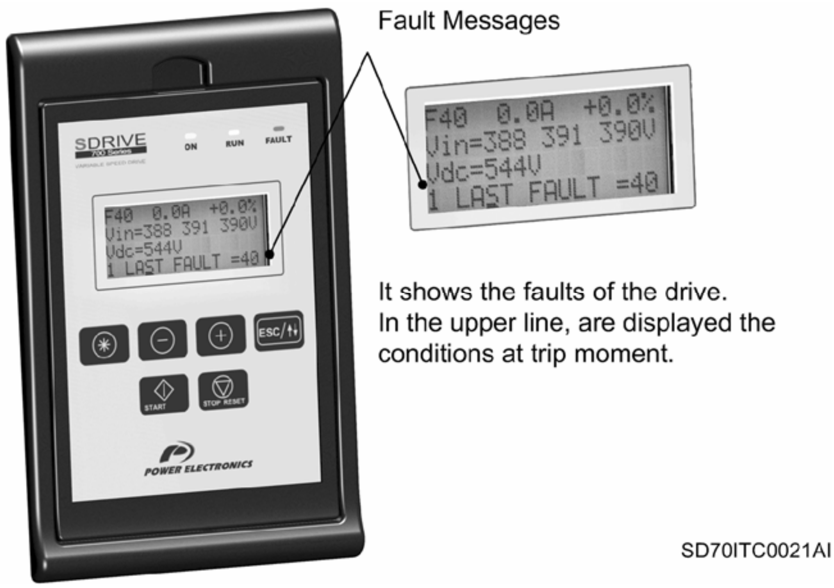

Figure 11.1 Fault displaying - Programming Line

12.1. Description of Faults List

DISPLAY	DESCRIPTION
F0 NO FAULT	Drive is operative. There is no fault.
F1 I LIM FLT	Output current has reached a dangerous level. Its value is above 220% of the drive rated current. Protection is activated instantaneously.
F2 V LIM FLT	DC Bus voltage has reached a dangerous level >850Vdc. Hardware Protection. Drive will turn off the output to the motor.
F3 PDINT FLT	DC Bus voltage and the output current of the equipment have reached dangerous levels.
F4 U+DESAT	Internal protection within the appropriate IGBT semiconductor has acted.
F5 U - DESAT	
F6 V + DESAT	
F7 V - DESAT	
F8 W + DESAT	
F9 W - DESAT	
F10 NEG IGBT	Automatic internal protection of several of the IGBT semiconductors has acted.
F11 VIN LOSS	Power supply loss of any input phase for a time higher than 20ms has occurred.
F12 IMB V IN	Input voltage imbalance greater than ±10% of average input power supply of SD700 for a time higher than 100ms.
F13 HI V IN	Average supply voltage has exceeded the value set in ‘G11.6 HIGH VOLT’ for greater than the time set in 'G11.7 HIGH V TO'.
F14 LW V IN	Average supply voltage is lower than the value set in ‘G11.4 LOW VOLT’ for greater than the time set in ‘G11.5 LOW V TO’.
F15 CURL Vdc	Unstable bus voltage. There is a DC Bus voltage ripple higher than 100Vdc for more than 1.1sec.
F16 HI Vdc	DC Bus voltage has exceeded critical operating level (>850Vdc). Software Protection.
F17 LW Vdc	DC Bus voltage is lower than critical operating level (<350Vdc).

DISPLAY	DESCRIPTION
F18 IMB V OUT	Voltage imbalance of more than ±5% of the average drive output average voltage for a time higher than 100ms.
F19 IMB I OUT	Current imbalance of more than ±25% of the average output motor current for a time higher than 1s.
F20 GROUND FLT	Current level to the ground has exceeded the level set in 'G11.3 GND I LIMT'.
F21 I LIM T/O	Motor current has exceeded the current limit set in 'G10.5 I LIMIT' for the time set in 'G10.6 I LIM TO'.
F22 TQ LIM T/O	Motor torque has exceeded the torque limit set in parameter 'G10.7 MAX TOR' for the time set in 'G10.8 T LIMT TO'.
F25 MTR O/L	Motor overload calculated by SD700 thermal model has exceeded 110%.
F27 DL SMTH	DC Bus has not charged in the expected time.
F28 MICRO FLT	Microprocessor has detected wrong data.
F29 DSP FLT	DSP has detected wrong data.
F30 WATCHDOG	An unknown fault has reset the microprocessor of the control board.
F31 SCR L1	Trip on conduction status of thyristor 1. The thyristor has not turned on correctly.
F32 SCR L2	Trip on conduction status of thyristor 2. The thyristor has not turned on correctly.
F33 SCR L3	Trip on conduction status of thyristor 3. The thyristor has not turned on correctly.
F34 IGBT TEMP	IGBT internal temperature has reached a level of 110°C (See parameter SV2.4).
F35 PHSE L1 LOSS	Input phase L1 is not present. Phase fault.
F36 PHSE L2 LOSS	Input phase L2 is not present. Phase fault.
F37 PHSE L3 LOSS	Input phase L3 is not present. Phase fault.
F40 EXT / PTC	External trip or motor PTC device has operated (terminals 8 and 9). Values lower than 90Ω ±10% or higher than 1K5 ± 10% generate the fault.
F41 COMMS TRIP	Trip generated through RS232 or RS485 communication. Master (PLC or PC) is generating a fault in the SD700 through serial communication.
F42 AIN1 LOSS	The SD700 is not receiving a signal on Analogue Input 1 and 'G4.2.14 AIN1 LOSS' is set to 'Yes'. The signal connected to this input has been lost.
F43 AIN2 LOSS	The SD700 is not receiving a signal on the Analogue Input 2 and 'G4.3.14 AIN2 LOSS' is set to 'Yes'. The signal connected to this input has been lost.
F44 CAL FLT	Internal reference voltage levels are wrong.
F45 STOP T/O	Trip generated due to excessive stopping time. The elapsed time from stop signal activation has exceeded the value set in parameter 'G11.2 STOP TO'.
F46 EEPROM FLT	Non-volatile memory (EEPROM) is faulty.
F47 COMMS T/O	Trip generated due to excessive delay of serial communication. The elapsed time from the last valid data transmission has exceeded the time set in parameter 'G20.2 COMMS T/O'.
F48 SPI COM	Trip because data bus transfer is wrong.
F49 SPD LIMIT	Motor speed has exceeded the speed limit (parameters G10.1 to G10.4) for the time set in 'G11.1 SP LIM TO'.
F50 PSU FAULT	Internal power supply is not supplying the correct voltage. One voltage level has decreased to zero value for 100ms approx.
F52 SUPPLY FAN	A fault in the power supply to the cooling fans has occurred.
F51 SCR TEMP	Rectifier heat sink temperature has reached a dangerous level.
F52 SOFT C TEMP	Overheating of the DC Bus soft charge resistors has occurred.
F53 INTRNAL TEMP	Internal temperature of the SD700 control electronics chamber has reached a dangerous level.
F54 WATCHDOG TMR	Internal fault of the microcontroller.
F56 EMERGEN.STOP	Digital input configured as 'EXTERN EMERGE' has been activated (NC contact).
F57 PUMP OVERLOA	This fault is generated when the output current of the drive is higher than the current set in 'G11.11 PUMP OV' during the time adjusted in 'G11.13 Povl DLY'.
F65 LOW PRESSURE	Active only when operating in Pump Control mode. Trip generated when the pressure level is lower than the minimum pressure level set in 'G25.6.7 LoPre'.
F66 HI PRESSURE	Active only when operating in Pump Control mode. External trip produced when digital input configured in this option (Hi Pressure Switch) is closed.
F67 LOW WATER	External trip produced when Pump Program (G25) is activated and one of the digital inputs has been set as '59 LO WATER FLT'. Under these conditions, if a contact is opened on this digital input, this fault is generated indicating that the pump is working with no load.
F68 CAVIT/UNDERL	When the motor current is lower than the cavitation current and the motor speed is higher or equal than the cavitation speed during the time set for that purpose, the fault or the pause is produced according to the setting realized. This protection is to avoid that pump operates with no water (detection is realized by under-load).
F69 FLOW SWITCH	The digital input configured as flow detection indicates flow absence according to the settings realized in the corresponding parameters. See the protections set in G25.6 to obtain more detailed information.
F70 IRRIGATOR F	The digital input configured as '62 IRRIGAT TRIP' detects that an external fault in the irrigating equipment has been produced.
F71 CYCLING	Conditions set in group G25.6 are not met regarding to the cycle time of the drive and the cycle counter. The SD700 has started a number of times higher than the allowed number without relaxing the established time.
F72 IN PRES SW	This fault is produced because of two causes: 1. After starting the system, the time set in G25.9.11 has been exceeded without the digital input configured as PRESSUR SWITC is activated. 2. After the Priming pump has stopped and the drive pump has started, the digital input configured as PRESSUR SWITC is opened during the time set in G25.9.10.

12.2. Procedure for Fault Solutions

DISPLAY	POSSIBLE CAUSE	ACTIONS
F0 NO FAULT		
F1 I LIM FLT	Motor output short circuit: Wiring fault. Circuit fault. Motor fault.	Check output cables and motor for possible wiring faults or short circuits.
F2 V LIM FLT	High voltage peak on the input. High load regeneration. Deceleration ramp too high (parameters 'G5.2 DECEL1' and 'G5.4 DECEL2').	Check conditions of input power supply. Decrease deceleration ramps.
F3 PDINT FLT	See faults F1 and F2.	See faults F1 and F2.
F4 U+ DESAT F5 U- DESAT F6 V+ DESAT F7 V- DESAT F8 W+ DESAT F9 W- DESAT	Short circuit. Extreme over current, equipment overload. Wiring fault; circuit fault. Desaturation of IGBT; IGBT fault.	Check if there are possible wiring faults or a motor fault. If the fault persists after disconnecting output wires request technical assistance.
F10 NEG DESAT	Short circuit. Extreme over current; equipment overload. Wiring fault; circuit fault. Desaturation of IGBT; IGBT fault.	Check conditions of input power supply and wiring conditions.
F11 VIN LOSS	Input power is incorrect, damaged fuses.	Check conditions of input power supply.
	Input wiring is incorrect.	Check wiring.
F12 IMB V IN	Input power is incorrect, damaged fuses.	Check conditions of input power supply.
	Input wiring is incorrect.	Check wiring.
F13 HI V IN	Input power is incorrect.	Check input power conditions.
	Incorrect setting of parameter 'G11.6 HIGH VOLT'.	Check parameters settings.
F14 LW V IN	Input power is incorrect, damaged fuses.	Check input power conditions.
	Incorrect setting of parameter 'G11.4 LOW VOLT'.	Check parameters settings.
F15 CURL Vdc	Input power is incorrect. Motor is driving an unstable load. One of the input fuses is damaged.	Check input power conditions, load type of the application, and all of the motor mechanical parts. If the fault persists after disconnecting output wires, request technical assistance.
F16 HI Vdc	High voltage peak on the input.	Check conditions of input power supply.
	High load regeneration.	Check stop conditions of the drive.
	Deceleration ramp too high (parameters 'G5.2 DECEL1' and 'G5.4 DECEL2').	Decrease deceleration ramps.
F17 LW Vdc	Input power is wrong, damaged fuses.	Check conditions of input power supply.
F18 IMB V OUT	Motor is driving an unstable load. Motor wiring fault. Motor is wrong.	Check motor circuit completely in case of possible wiring faults or motor fault. If the fault persists after disconnecting output wires, request technical assistance.
F19 IMB I OUT	Motor is supporting unstable loads. Motor wiring fault. Motor is wrong.	Check motor circuit completely in case of possible wiring faults or motor fault.
F20 GROUND FLT	Motor or wiring has short-circuited to ground.	Disconnect the motor and wiring of the SD700 and check motor insulation.
	Ground is incorrectly connected or wrong.	Check and improve the ground connection system.
F21 I LIM T/O	Motor stalled. Heavy load. Motor mechanical brake is coupled.	Check the motor load. Increase maximum current limit.
F22 TQ LIM T/O	Motor stalled. Heavy load. Motor mechanical brake is coupled.	Check the motor load. Increase maximum torque limit.

<table>
<tr><th>DISPLAY</th><th>POSSIBLE CAUSE</th><th>ACTIONS</th></tr>
<tr><td rowspan="4">F25 MTR O/L</td><td>High current used by the motor due to heavy load.</td><td rowspan="4">Check the motor load.
Check the setting of parameters ‘G2.1 MTR CUR’ and ‘G2.7 MTR COOL’ relating to the motor thermal model. Increasing the parameter ‘G2.7 MTR COOL’, can be undertaken when there is a motor PTC fitted and it is connected to the SD700.</td></tr>
<tr><td>The load exceeds the capacity of motor cooling under normal operating conditions.</td></tr>
<tr><td>Incorrect setting of the thermal model parameters.</td></tr>
<tr><td>Phase loss of the motor or a fault in motor windings.</td></tr>
<tr><td>F27 DL SMTH</td><td>Potential damage to the soft charge resistors of the SD700.</td><td>Try to reset the fault. Disconnect and re-connect again the input power. If the fault persists contact Power Electronics for technical service.</td></tr>
<tr><td rowspan="2">F28 MICRO FLT</td><td>Input power fault.</td><td rowspan="2">Disconnect and re-connect SD700 input power of the drive. If the same fault appears, initialize all of the parameters (parameter ‘G1.5 INITIALISE’) and connect the input power again. If the fault persists, request technical assistance.</td></tr>
<tr><td>Parameters setting is not recognised.</td></tr>
<tr><td rowspan="2">F29 DSP FLT</td><td>Input power fault.</td><td rowspan="2">Disconnect and connect again SD700 input power. If the same fault appears, initialize all of the parameters (parameter ‘G1.5 INITIALISE’) and connect the input power again. If the fault persists, request technical assistance.</td></tr>
<tr><td>Parameters setting is incoherent.</td></tr>
<tr><td>F30 WATCHDOG</td><td>Input power fault.</td><td>Reset the fault; If the fault persists, request technical assistance.</td></tr>
<tr><td>F31 SCR L1</td><td rowspan="3">A conduction fault has been produced in the corresponding thyristor. The thyristor is OFF when it should be on.</td><td rowspan="3">Try to reset the fault. Disconnect and re-connect again the input power. If the fault persists request technical assistance.</td></tr>
<tr><td>F32 SCR L2</td></tr>
<tr><td>F33 SCR L3</td></tr>
<tr><td rowspan="3">F34 IGBT TEMP</td><td>Blocked or poor ventilation.</td><td>Check if there is an object blocking ventilation. Improve the cooling.</td></tr>
<tr><td>Heat sink and cooling fan fault on the SD700.</td><td>Check if the heat sink and the cooling fan are operating correctly.</td></tr>
<tr><td>Ambient temperature is higher than 50°C.</td><td>Check the cooling and thermal conditions. Request technical assistance.</td></tr>
<tr><td>F35 PHSE L1 LOSS</td><td>Input phase L1 is not connected correctly or there is no voltage on it.</td><td rowspan="3">Verify the wiring of the input power supply of the drive. Check input voltage and input fuses.</td></tr>
<tr><td>F36 PHSE L2 LOSS</td><td>Input phase L2 is not connected correctly or there is no voltage in it.</td></tr>
<tr><td>F37 PHSE L3 LOSS</td><td>Input phase L3 is not connected correctly or there is no voltage in it.</td></tr>
<tr><td rowspan="3">F40 EXT / PTC</td><td>External trip device has operated.</td><td>Check the external trip switch (if exists).</td></tr>
<tr><td>Motor is overheated (motor load exceeds the cooling capacity at operating speed).</td><td>Check motor temperature.
To reset the fault the motor must be return to normal temperature.</td></tr>
<tr><td>Fault in sensor connection.</td><td>Check sensor wiring.</td></tr>
<tr><td>F41 COMMS TRIP</td><td>Trip generated by a computer through serial communication.</td><td>Disconnect the SD700 from the communication network and verify if the fault is generated again.</td></tr>
<tr><td>F42 AIN1 LOSS</td><td>Analogue input cable has been come loose or disconnected (terminals 10 and 11).</td><td>Verify the wiring and the device which provides the analogue signal.</td></tr>
<tr><td>F43 AIN2 LOSS</td><td>Analogue input cable has been come loose or disconnected (T12 and T13).</td><td>Verify the wiring and the device which provides the analogue signal.</td></tr>
<tr><td>F44 CAL FLT</td><td>SD700 fault.</td><td>Verify drive select. Request technical assistance.</td></tr>
<tr><td rowspan="2">F45 STOP T/O</td><td>Deceleration ramps (parameters ‘G5.2 DECEL1’ and ‘G5.4 DECEL2’) are too slow.</td><td rowspan="2">Verify that the time set in parameter ‘G11.2 STOP TO’ to stop the system after setting deceleration ramps and checking the system performance.</td></tr>
<tr><td>SD700 is voltage limiting voltage due to regeneration from the motor.</td></tr>
<tr><td>F46 EEPROM FLT</td><td>Integrated circuit fault.</td><td>Request technical assistance.</td></tr>
</table>

DISPLAY	POSSIBLE CAUSE	ACTIONS
F47 COMMS T/O	Communications cable has been come loose or cut.	Verify the wiring of communications system.
	Master device has not sent valid data in the required frame or it has sent incorrect data.	Verify the data and settings of the master device.
F48 SPI COM	Input power fault.	Reset the equipment and if the fault persists request technical assistance.
F49 SPD LIMIT	Speed reference is higher than the speed limit.	Check the reference source and the motor load.
	Motor speed is out of control or motor is accelerating because of the load.	Verify speed limits.
F50 PSU FAULT	Damaged power supply.	Reset the equipment and if the fault persists request technical assistance.
F51 SCR TEMP	Temperature limits for SD700 rectifier have been exceeded.	Verify that the ambient conditions are proper for the equipment. Be sure that there is nothing obstructing the cooling fans (dust, papers, dirt, etc) and that these rotate correctly.
F52 SOFT C TEMP	Fans of the equipment are operating wrong.	Verify that fans are not obstructed. Check that fans are not dirty and rotate correctly.
	Power supply of the fans has been overheated.	Wait for the temperature of the power supply decreases down to a value in normal conditions and restart it. You can disconnect the equipment, connect it again, and restart the power supply again. If the fault persists request technical assistance of Power Electronics.
F53 INTRNAL TEMP	The limit of internal temperature of the electronics chamber has been exceeded.	Verify that the ambient conditions are proper for the equipment. Be sure that there is nothing obstructing the cooling fans (dust, papers, dirt in general) and that these rotate correctly.
F54 WATCHDOG TMR	A fault in the microcontroller has occurred.	Disconnect and re-connect the input power of the drive. If the fault persists request technical assistance of Power Electronics.
F56 EMERGEN.STOP	An external trip has been produced by closing a contact on the digital input configured in this option.	Verify the wiring of digital input. Check the installation.
F57 PUMP OVERLOA	High current used by the motor due to heavy load.	Check the motor load. Check if the motor cooling is appropriate. Check the setting of the parameters related to pump overload in group G11.
	The load exceeds the capacity of the motor cooling under normal operating conditions.	
	Incorrect setting of the parameters related to pump overload.	
	Phase loss of the motor or a fault in motor windings.	
F65 LOW PRESSURE	Pressure reference is lower than the minimum pressure level (Active in Pump Control mode only).	Verify the setting of minimum pressure level.
		Check the operation of the low pressure switch detector.
		Check the status of the analogue inputs 1 and 2 in parameters SV3.1 and SV3.4 in displaying group G0.
F66 HI PRESSURE	An external trip has been produced by closing a contact on the digital input configured in this option (Active in Pump Control mode only).	Check if the pressure of the installation exceeds the set limits.
		Verify the wiring of digital input.
F67 LOW WATER	An external trip has been produced by opening a contact on the digital input. (Active in Pump Control mode only)	A contact has activated to indicate that there is a fault by lack of water. Verify the conditions of the installation
		Verify the wiring of digital input.

DISPLAY	POSSIBLE CAUSE	ACTIONS
F68 CAVIT/UNDERL	The pump is operating with no load.	Check if the pump of the installation is not operating with no water.
	Settings of the drive in protections group G25.6 are incorrect.	Verify the settings of the parameters referred to the cavitation protection depending on the installation.
F69 FLOW SWITCH	The digital input configured as flow detection indicates absence of the same one.	Check if the pump has water.
		Check if the flow detector has water and is connected correctly.
		Check the settings in group G25.6.
F70 IRRIGATOR F	An external trip to the drive has been produced by closing a contact on the digital input configured as IRRIGAT TRIP.	Verify your irrigating equipment and check if the connections between the drive and the irrigating equipment are correct.
F71 CYCLING	The drive shows several start / stop cycles (wake up / sleep) in a short time.	Verify possible leakages in the installation.
		Verify the settings of this protection in group G25.6.
F72 IN PRES SW	Breakage or low water in aspiration circuit.	Verify the water level in the aspiration circuit (well, tank, etc.).
		Verify the status of the pressure switch.

12.3. Maintenance

SD700 drives consist of many electronic parts such as semiconductor devices. Temperature, humidity, vibration and deteriorated components can reduce its efficiency. To avoid any possible irregularity we recommend making periodic inspections.

12.3.1. 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 VDC(+) – VDC(-) is below DC 30V. The bus capacitors in the drive main circuit can still be charged even after the power is turned off.
- The correct output voltage of the drive can only be measured by using an RMS voltage meter. Others voltage meters, including digital voltage meters, are likely to display incorrect values caused by the high frequency PWM output voltage of the drive.

12.3.2. Routine inspection

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

- Installation site conditions.
- Drive cooling system conditions.
- Excessive vibrations.
- Excessive overheating.

12.3.3. Daily and periodic inspections

Inspection site	Inspection element	Inspection	Period			Inspection method	Criterion	Instrument of Measurement
			Daily	1 year	2 years			
All	Ambient conditions	Are there dust particles? Are the ambient temperature and the humidity within specification?	o			See “Warnings”	Temperature: -30 to +50 Humidity: below 95% non-condensing.	Thermometer, Hygrometer, Recorder.
All	Module	Are there any abnormal noises or oscillations?	o			Visual and audible.	There are no anomalies.	
All	Input power	Is the input power to the main circuit correct?	o			Measure the voltage between terminals R, S, T and N.		Digital multimeter. Tester.
Main circuit	Conductor/ Cable	Is the conductor corroded? Is the sheathing of the cable damaged?		o o		Visual check.	No anomaly.	
Main circuit	Terminal	Is any damage visible?		o		Visual check.	No anomaly.	
Main circuit	IGBT's module Diodes module and Rectifier	Check the resistance value between each one of the terminals			o	Disconnect the cables of the drive and measure the resistance value between: R, S, T $\Leftrightarrow$ VDC+, VDC- and U, V, W $\Leftrightarrow$ VDC+, VDC- with a tester > $10k\Omega$		Digital multimeter. Analogue tester.
Main circuit	Correct capacitor	Have fluid leakages been observed? Is the capacitor well fastened? Is any dilation or retraction sign observed? Measure the capacitance	o o	o		Visual check. Measure the capacitance with a proper instrument.	No anomaly Capacitance higher than 85% of rated capacitance.	Instrument for measuring capacity.
Main circuit	Contactor	Is there any contactor chatter? Is the contact damaged?		o o		Audible check. Visual check.	No anomaly.	
Control circuit and Protections	Operating check	Is there any imbalance between output voltage phases?		o		Measure voltage between output terminals U, V and W.	Balanced voltage between phases i.e. lower than 8V difference for 400V models.	Digital multimeter / RMS voltage meter.
Cooling system	Cooling fan	Are there any abnormal noises or oscillations? Is the cooling fan disconnected?	o	o		Disconnect the power supply (OFF) and rotate the fan manually. Check the connections.	Fan should rotate effortlessly. No anomaly.	
Display	Measurement	Is the displayed value correct?	o	o		Check the reading instrument with an external measurement.	Check the specified values and the control values.	Voltage meter / Current meter etc.
Motor	All	Is there any noise or abnormal vibrations? Has any unusual smell been perceived?	o o			Audible, sensory and visual check. Check if damages have been produced by overheating.	No anomaly.	
Motor	Insulation resistance	Megger check (between terminals of output circuit and ground terminal)			o	Disconnect the cables U, V and W and join them together. Check the resistance between this join and ground.	More than 5MΩ	Megger type 500V

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

13. COMMONLY USED CONFIGURATIONS

13.1. Start / Stop Commands and Speed Reference by Keypad

13.1.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = STANDARD	G1.7 / Program activation	STANDARD
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G3: References.		
1 REF1 SPD=LOCAL	G3.1 / Speed reference source 1	LOCAL ➔ Reference will be determined by keypad and is set in G3.3 'Local Speed Reference'.
3 LOCAL SPD=+100%	G3.3 / Local Speed Reference	100%
G4: Inputs – S4.1: Digital Inputs.		
1 CNTROL MODE1=1	G4.1.1 / Main Control Mode	1 ➔ LOCAL (Drive control is done by keypad).
3 RESET MODE=Y	G4.1.3 / Reset by keypad	Y ➔ YES (Enables reset by keypad).

13.2. Start / Stop Commands by Terminals and Speed Reference by Analogue Input

13.2.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = STANDARD	G1.7 / Program activation	STANDARD
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G3: References.		
1 REF1 SPD=LOCAL	G3.1 / Speed reference source 1	LOCAL ➔ Reference will be introduced by keypad and is set in G3.3 'Local Speed Reference'.
2 REF2 SPD=LOCAL	G3.2 / Speed reference source 2	AI1 ➔ Reference will be introduced by Analogue Input 1.
3 LOCAL SPD=+100%	G3.3 / Local Speed Reference	+100%

Parameter	Name / Description	Value
G4: Inputs – S4.1: Digital Inputs.		
1 CNTROL MODE1=2	G4.1.1 / Main Control Mode	2 ➔ REMOTE (Drive control is done through control terminals).
4 DIGIT I MODE=1	G4.1.4 / Digital Inputs configuration selection	1 ➔ ALL PROGRAMMABLE (all digital inputs can be individually configured by the user).
5 DIGITL IN 1=05	G4.1.5 / Multi-function Digital Input 1 configuration	05 ➔ Start/Stop (Allows the start/stop command to be given by a switch).
6 DIGITL IN 2=15	G4.1.6 / Multi-function Digital Input 2 configuration	15 ➔ Reference 2 (It allows selecting the alternative speed reference programmed in G3.2.)

13.2.2. Connections drawing

Terminals 1 and 2: start / stop command (NO status).
Terminals 1 and 3: alternative reference command (NO status).

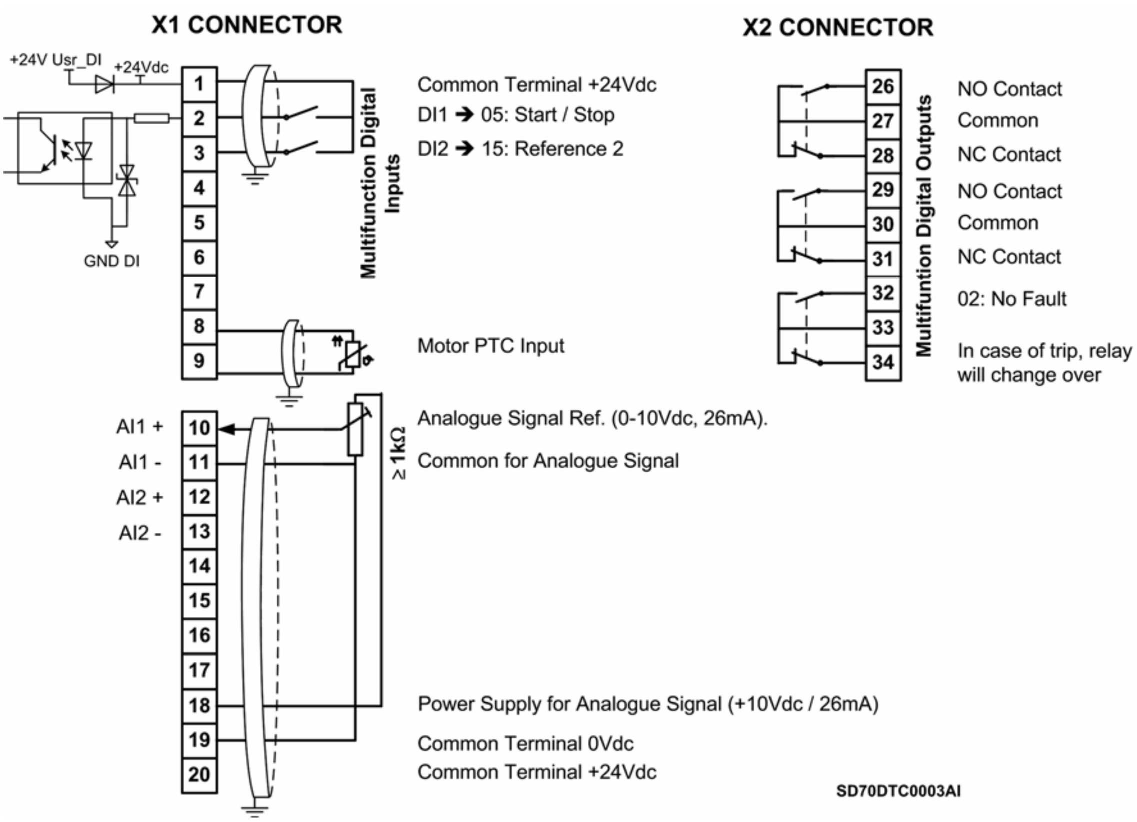

Figure 13.1 Start / Stop commands by terminals and speed reference by analogue input

Note: Use screened cables for the controls and connect screen to ground.

13.3. Start / Stop Commands by Terminals and Speed Reference by Motorized Potentiometer

13.3.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = STANDARD	G1.7 / Program activation	STANDARD
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G3: References.		
1 REF1 SPD=PMOT	G3.1 / Speed reference source 1	PMOT ➔ Motorized potentiometer with or without reference memory.
G4: Inputs – S4.1: Digital Inputs.		
1 CNTROL MODE1=2	G4.1.1 / Main Control Mode	2 ➔ REMOTE (Drive control is done through control terminals).
4 DIGIT I MODE=1	G4.1.4 / Digital Inputs configuration selection	4 ➔ MOTORIZED POT (It assigns the function of up and down speed reference to two of the digital inputs. DI5 = Up (NO Contact) and DI6 = Down (NC Contact). Reference is memorized) 5 ➔ ERASAB POT (As per above mode without memorizing the reference).
5 DIGITL IN 1=05	G4.1.5 / Multi-function Digital Input 1 configuration	05 ➔ Start/Stop (Allows the start/stop command to be given by a switch).
G5: Inputs: Acceleration and Deceleration Ramps.		
7 PMT ACL1=1.0% / s	G5.7 / Ramp 1 of reference increase for motorized potentiometer	1.0% / s (Modify these ramps to tune operation). If the ramp is increased the speed reference response will be faster. If the ramp is decreased the speed reference response will be slower.
8 PMT DCL1=3.0% / s	G5.8 / Ramp 1 of reference decrease for motorized potentiometer	3.0% / s (Modify these ramps to tune operation). If the ramp is increased the speed reference response will be faster. If the ramp is decreased the speed reference response will be slower.

13.3.2. Connections Drawing

Terminals 1 and 2: start / stop command (NO status).
Terminals 1 and 6: up speed command (NO status).
Terminals 1 and 7: down speed command (NC status).

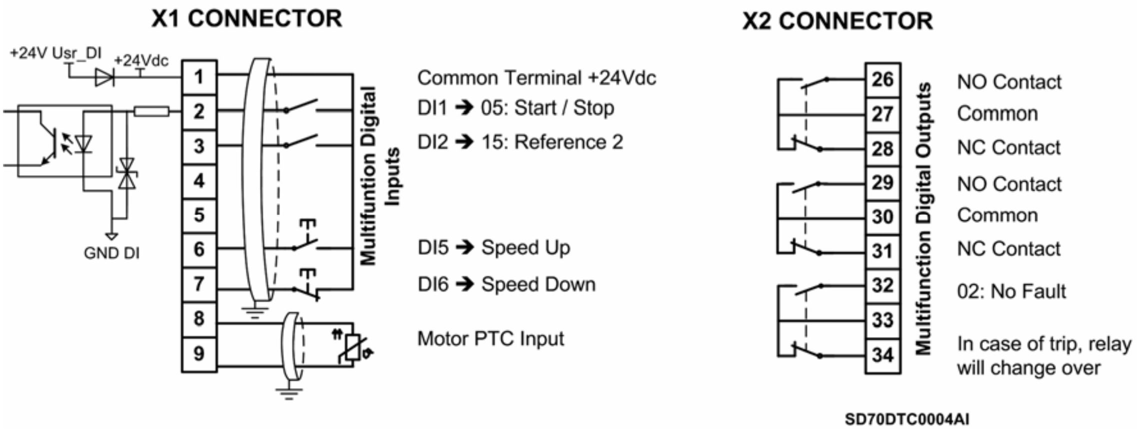

Figure 13.2 Start / Stop commands by terminals and speed reference by motorized potentiometer

Note: Use screened cables for the controls and connect the screen to the ground.

13.4. Start / Stop Commands by Terminals and Seven Speed References Selectable by Digital Inputs

13.4.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = STANDARD	G1.7 / Program activation	STANDARD
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G3: References.		
1 REF1 SPD=MREF	G3.1 / Speed reference source 1	MREF ➔ Multiple speed references activated by digital inputs.
G4: Inputs – S4.1: Digital Inputs.		
1 CNTROL MODE1=2	G4.1.1 / Main Control Mode	2 ➔ REMOTE (Drive control is done through control terminals).
4 DIGIT I MODE=3	G4.1.4 / Digital Inputs configuration selection	3 ➔ MREF 3 WIRES (Automatically programs digital inputs 4, 5 and 6 as multiple speed references for up to 7 different values. The others digital inputs remain user configurable).
5 DIGITL IN 1=05	G4.1.5 / Multi-function Digital Input 1 configuration	05 ➔ Start/Stop (Allows the start/stop command to be given by a switch).
G14: Multi-references.		
1 MREF 1=+10.0%	G14.1 / Multi-reference 1	+10.0% (Allows setting the setpoint 1 value for the drive. It should be set according to the application requirements).
2 MREF 2=+20.0%	G14.2 / Multi-reference 2	+20.0% (Allows setting the setpoint 2 value for the drive. It should be set according to the application requirements).
3 MREF 3=+30.0%	G14.3 / Multi-reference 3	+30.0% (Allows setting the setpoint 3 value for the drive. It should be set according to the application requirements).
4 MREF 4=+40.0%	G14.4 / Multi-reference 4	+40.0% (Allows setting the setpoint 4 value for the drive. It should be set according to the application requirements).
5 MREF 5=+50.0%	G14.5 / Multi-reference 5	+50.0% (Allows setting the setpoint 5 value for the drive. It should be set according to the application requirements).
6 MREF 6=+60.0%	G14.6 / Multi-reference 6	+60.0% (Allows setting the setpoint 6 value for the drive. It should be set according to the application requirements).
7 MREF 7=+70.0%	G14.7 / Multi-reference 7	+70.0% (Allows setting the setpoint 7 value for the drive. It should be set according to the application requirements).

13.4.2. Connections Drawing

Terminals 1 and 2: start / stop command (NO status).
Terminals 1 and 5: multi-reference A (NO status).
Terminals 1 and 6: multi-reference M (NO status).
Terminals 1 and 7: multi-reference B (NO status).

SPEED	REF	Digital Input 4 Multi-reference-A	Digital Input 5 Multi-reference-M	Digital Input 6 Multi-reference-B
G14.1 = +10.0%	MREF1	0	0	X
G14.2 = +20.0%	MREF2	0	X	0
G14.3 = +30.0%	MREF3	0	X	X
G14.4 = +40.0%	MREF4	X	0	0
G14.5 = +50.0%	MREF5	X	0	X
G14.6 = +60.0%	MREF6	X	X	0
G14.7 = +70.0%	MREF7	X	X	X

Note: 0: Not active and X: Active.

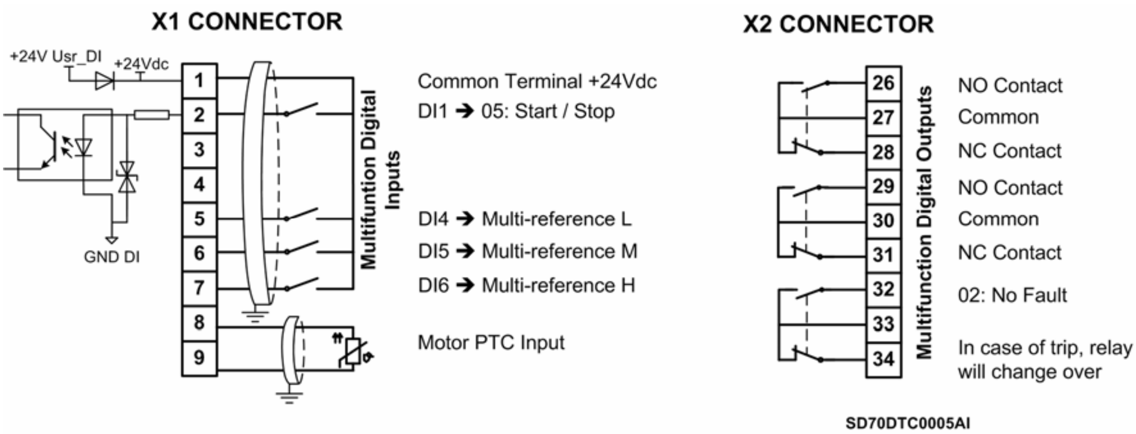

Figure 13.3 Start / Stop commands by terminals and 7 speeds by digital inputs

Note: Use screened cables for the controls and connect the screen to ground.

13.5. Pressure Group Control with 3 Auxiliary Pumps, Start and Stop on Demand

13.5.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = PUMP	G1.7 / Program Activation	PUMP (It activates the extended functionality of the pump control in group G25).
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G4: Inputs – S4.1: Digital Inputs.		
5 DIGITL IN 1=50	G4.1.5 / Multi-function Digital Input 1 configuration	50 ➔ PMP START/STP (Automatic starting of the system).
6 DIGITL IN 2=52	G4.1.6 / Multi-function Digital Input 2 configuration	52 ➔ FIX PUMP1 FLT (Detection of auxiliary pump 1 in fault status).
7 DIGITL IN 3=53	G4.1.7 / Multi-function Digital Input 3 configuration	53 ➔ FIX PUMP2 FLT (Detection of auxiliary pump 2 in fault status).
8 DIGITL IN 4=54	G4.1.8 / Multi-function Digital Input 4 configuration	54 ➔ FIX PUMP3 FLT (Detection of auxiliary pump 3 in fault status).

Parameter	Name / Description	Value
G25: Pump Control - S25.1: Setpoints.		
1 CONTROL MODE=1	G25.1.1 / Control mode	1 ➔ Pumps. The drive will start in pump control mode.
5 SETPT1=x.xBar	G25.1.5 / Setpoint 1 for the PID	x.xBar ➔ Local setpoint 1. (Set according to the installation).
G25: Pump Control - S25.2: PID Setting.		
1 PID SETP=LOCAL	G25.2.1 / PID reference source	LOCAL ➔ Speed reference introduced by keypad.
3 PID FBK=AI2	G25.2.3 / PID feedback source	AI2 ➔ Feedback signal connected to Analogue Input 2.
G25: Pump Control – S25.3: Start Conditions.		
1 Lp Pon=0.0Bar	G25.3.1 / Wake up level of the drive	x.xBar ➔ When demand decreases, the drive can go in sleep mode. (It allows setting the wake up level for the drive. This value is set as units of PID setpoint).
2 FP SpON=90.0%	G25.3.2 / Start speed for the fixed pumps	90.0% ➔ It sets the drive speed above which fixed pumps will start. (Set according to the installation).
3 FP ErON=10.0%	G25.3.3 / Minimum PID error to start fixed pumps	10.0% ➔ This parameter allows user to consider the PID error (%) at the moment of starting fixed pumps.
4 FP T1 ON=10.0s	G25.3.4 / Delay time to start fixed pump 1	10.0s ➔ It sets the delay time to start the fixed pump associated to the Relay 1.
5 FP T2 ON=10.0s	G25.3.5 / Delay time to start fixed pump 2	10.0s ➔ It sets the delay time to start the fixed pump associated to the Relay 2.
6 FP T3 ON=10.0s	G25.3.6 / Delay time to start fixed pump 3	10.0s ➔ It sets the delay time to start the fixed pump associated to the Relay 3.
G25: Pump Control – S25.4: Stop Conditions.		
1 LP T SLP=20s	G25.4.1 / Delay time before activating sleep mode	20s ➔ This delay time will be applied to any conditions that activate the sleep mode. These conditions are: sleep speed, No Flow input, Flow measurement and sleep current.
2 SLPsp1=+40.0%	G25.4.2 / Sleep speed for local setpoint 1	+40.0% ➔ The drive will sleep below the value set here whenever local setpoint 1 is selected.
13 FP erOFF=+0.0%	G25.4.13 / Maximum PID error to stop fixed pumps	0.0% ➔ This parameter allows user to consider the PID error (%) at the moment of stopping fixed pumps. (Set according to the requirements).
14 FP T1 OF=10s	G25.4.14 / Delay time to stop fixed pump 1	10s ➔ It sets the delay time to stop the fixed pump associated to the Relay 1.
15 FP T2 OF=10s	G25.4.15 / Delay time to stop fixed pump 2	10s ➔ It sets the delay time to stop the fixed pump associated to the Relay 2.
16 FP T3 OF=10s	G25.4.16 / Delay time to stop fixed pump 3	10s ➔ It sets the delay time to stop the fixed pump associated to the Relay 3.
19 SPD1of=+70.0%	G25.4.19 / Stop speed 1 for one fixed pump	+70.0% ➔ It sets the speed below which the drive must remain to stop one fixed pump whenever the operating setpoint is local setpoint 1 adjusted in G25.1.5.
G25: Pump Control – S25.9: Fixed Pumps Control.		
1 ENABLE PUMP1=Y	G25.9.1 / To enable fixed pump associated to Relay 1	Y=YES ➔If setting is set to NO Relay 1 will be free for user configuration. If set to YES Relay 1 will be pre-defined as fixed speed pump 1.
2 ENABLE PUMP2=Y	G25.9.2 / To enable fixed pump associated to Relay 2	Y=YES ➔If setting is set to NO Relay 2 will be free for user configuration. If set to YES Relay 2 will be pre-defined as fixed speed pump 2.
3 ENABLE PUMP3=Y	G25.9.3 / To enable fixed pump associated to Relay 3	Y=YES ➔If setting is set to NO Relay 3 will be free for user configuration. If set to YES Relay 3 will be pre-defined as fixed speed pump 3.
4 FP ALTER MOD=1	G25.9.4 / To enable fixed pump alternation mode	1 ➔ Cycle (The pump that starts will be the next pump in sequence to the last pump stopped).

13.5.2. Connections Drawing

There are several configuration options available when pump program is activated. These options can be configured like in standard program.

Nevertheless, unlike standard program, when pump program is activated, the drive will only allow setting the options of each digital input (from G4.1.5 to G4.1.10) and will not consider the setting realized in parameter ‘G4.1.4 DIGIT I MODE’, where digital inputs are set in groups.

This means that user will configure the pump program as he wants, by selecting the functionality and protections that he needs. For a correct configuration of the inputs when pump program is active, see chapter G25 Pump Control to get additional information.

Note: If the Pump Control program is selected and then de-selected, all of the Digital Inputs will be reset to mode ‘00’ (i.e. unused). It will be necessary to individually configure Digital Input functionality to suit the application should this occur. This guarantees safe installation and operation in order to prevent any external hardware causing damage to the equipment.

Note: Digital outputs will be affected by pump control activation.

To select an auxiliary pump you must proceed like this:

- Set any free digital input to the options ‘52 FIX PUMP1 FLT’, ‘53 FIX PUMP2 FLT’ or ‘54 FIX PUMP3 FLT’.
- Enable the pump control in the corresponding parameter G25.9.1, G25.9.2 and G25.9.3 respectively.

To remove the configuration of that fixed pump and release the relay for other use you must: Disable the pump control in the corresponding parameter G25.9.1, G25.9.2 and G25.9.3 respectively.

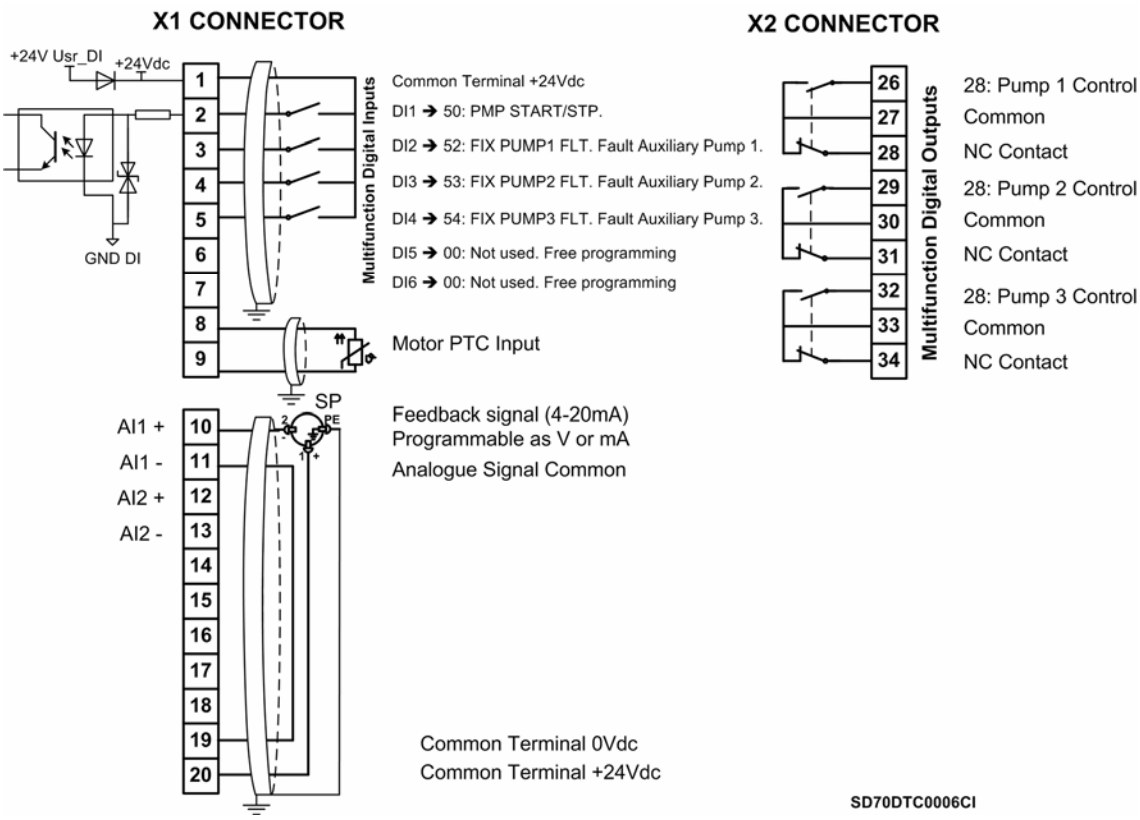

Figure 13.4 Pressure Group Control with 3 Auxiliary Pumps, Start and Stop on demand

Note: Use screened cables for the controls and connect the screen to ground.

13.6. Pressure Group Control with Eight Pressure References

13.6.1. Parameters Configuration

Parameter	Name / Description	Value
G1: Options Menu.		
4 LANG=ENGLISH	G1.4 / Language selection	ENGLISH
7 PROG = PUMP	G1.7 / Program Activation	PUMP (It activates the extended functionality of the pump control in group G25).
G2: Motor Nameplate.		
1 MTR CURR=00.00A	G2.1 / Motor rated current	__A (Set according to motor nameplate).
2 MTR VOLT=400V	G2.2 / Motor rated voltage	__V (Set according to motor nameplate).
3 MTR PWR=00.0kW	G2.3 / Motor rated power	__kW (Set according to motor nameplate).
4 MTR RPM=1485	G2.4 / Motor rpm	__rpm (Set according to motor nameplate).
5 MTR PFA=0.85	G2.5 / Cosine Phi	__ (Set according to motor nameplate).
6 MTR FRQ=50Hz	G2.6 / Motor frequency	__Hz (Set according to motor nameplate).
7 MTR COOL=40%	G2.7 / Motor cooling at zero speed	Use the following values as a reference: Submersible pumps ➔ 20% Self-cool motor ➔ 40% Force-cooled motor ➔ 100%
G3: References.		
1 REF1 SPD=PID	G3.1 / Speed reference source 1	PID ➔ The reference value is set for PID functionality.
G4: Inputs – S4.1: Digital Inputs.		
5 DIGITL IN 1=50	G4.1.5 / Multi-function Digital Input 1 configuration	50 ➔ PMP START/STP (Automatic starting of the system).
6 DIGITL IN 2=63	G4.1.6 / Multi-function Digital Input 2 configuration	63 ➔ SETPONT PIN1 (low bit configuration for the selection of multiple setpoints).
7 DIGITL IN 3=64	G4.1.7 / Multi-function Digital Input 3 configuration	64 ➔ SETPONT PIN2 (middle bit configuration for the selection of multiple setpoints).
8 DIGITL IN 4=65	G4.1.8 / Multi-function Digital Input 4 configuration	65 ➔ SETPONT PIN3 (high bit configuration for the selection of multiple setpoints).
G4: Inputs – S4.3: Analogue Input 2.		
1 SENSOR 2 ?=S	G4.3.1 / To enable sensor of Analogue Input 2	Y=YES ➔ Ii allows enabling the sensor of the Analogue Input 2 that will be used for PID feedback.
2 SENSOR 2=Bar	G4.3.2 / Selection of sensor 2 units	Bar ➔ These units must be set according to type of sensor that user will use in the installation.
3 AIN2 FORMAT=mA	G4.3.3 / Analogue Input 2 Format	mA ➔ These units must be set according to the type of sensor that user will use in the installation.
4 INmin2=+4mA	G4.3.4 / Minimum range of Analogue Input 2	+4mA ➔ These units must be set according to the type of sensor that user will use in the installation.
5 Smi2=+0.0Bar	G4.3.5 / Minimum range of sensor 2	+0.0Bar ➔ This range must be set according to the type of sensor that user will use in the installation.
6INmax2=+20mA	G4.3.6 / Maximum range of Analogue Input 2	+20mA ➔ These units must be set according to the type of sensor that user will use in the installation.
7 Sma2=+10.0Bar	G4.3.7 / Maximum range of sensor 2	+10.0Bar ➔ This range must be set according to the type of sensor that user will use in the installation.
G25: Pump Control – S25.1: Setpoints.		
1 CONTROL MODE=1	G25.1.1 / Control mode	1 ➔ Pumps. The drive will start in pump control mode.
5 SETPT1=1.0Bar	G25.1.5 / Local setpoint 1 for the PID	1.0Bar ➔ It allows user to set the value of the speed reference 1 for the equipment. (Set according to the requirements of the applic.)
6 SETPT2=2.0Bar	G25.1.6 / Local setpoint 2 for the PID	2.0Bar ➔ It allows user to set the value of the speed reference 2 for the equipment. (Set according to the requirements of the applic.)
7 SETPT3=3.0Bar	G25.1.7 / Local setpoint 3 for the PID	3.0Bar ➔ It allows user to set the value of the speed reference 3 for the equipment. (Set according to the requirements of the applic.)
8 SETPT4=4.0Bar	G25.1.8 / Local setpoint 4 for the PID	4.0Bar ➔ It allows user to set the value of the speed reference 4 for the equipment. (Set according to the requirements of the applic.)
9 SETPT5=5.0Bar	G25.1.9 / Local setpoint 5 for the PID	5.0Bar ➔ It allows user to set the value of the speed reference 5 for the equipment. (Set according to the requirements of the applic.)
10 SETPT6=6.0Bar	G25.1.10 / Local setpoint 6 for the PID	6.0Bar ➔ It allows user to set the value of the speed reference 6 for the equipment. (Set according to the requirements of the applic.)
11 SETPT7=7.0Bar	G25.1.11 / Local setpoint 7 for the PID	7.0Bar ➔ It allows user to set the value of the speed reference 7 for the equipment. (Set according to the requirements of the applic.)
12 SETPT8=8.0Bar	G25.1.12 / Local setpoint 8 for the PID	8.0Bar ➔ It allows user to set the value of the speed reference 8 for the equipment. (Set according to the requirements of the applic.)

Parameter	Name / Description	Value
G25: Pump Control – S25.2: PID Setting.		
3 PID FBK=AI2	G25.2.3 / PID feedback source	AI2 ➔ It allows selecting Analogue Input 2 as feedback signal for PID regulator.
G25: Pump Control – S25.3: Start Conditions.		
1 LP Pon=0.0Bar	G25.3.1 / Wake up level of the drive	x.xBar ➔ When demand decreases, the drive can go in sleep mode. (It allows setting the wake up level for the drive. This value is set as units of PID setpoint).
G25: Pump Control – S25.4: Stop Conditions.		
1 LP T SLP=20s	G25.4.1 / Delay time before activating sleep mode	20s ➔ This delay time will be applied to any conditions that activate the sleep mode. These conditions are: sleep speed, No Flow input, Flow measurement and sleep current. If anyone of them is met, the time to activate sleep mode will start elapsing.
2 SLPsp1=+40.0%	G25.4.2 / Sleep speed for local setpoint 1	+40.0% ➔ It allows setting the sleep speed 1 below which the drive will sleep whenever local setpoint 1 is selected. (Set according to the installation).
3 SLPsp2=+42.0%	G25.4.3 / Sleep speed for local setpoint 2	+42.0% ➔ It allows setting the sleep speed 2 below which the drive will sleep whenever local setpoint 2 is selected. (Set according to the installation).
4 SLPsp3=+44.0%	G25.4.4 / Sleep speed for local setpoint 3	+44.0% ➔ It allows setting the sleep speed 3 below which the drive will sleep whenever local setpoint 3 is selected. (Set according to the installation).
5 SLPsp4=+46.0%	G25.4.5 / Sleep speed for local setpoint 4	+46.0% ➔ It allows setting the sleep speed 4 below which the drive will sleep whenever local setpoint 4 is selected. (Set according to the installation).
6 SLPsp=+48.0%	G25.4.6 / Sleep speed for local setpoint 5	+48.0% ➔ It allows setting the sleep speed 5 below which the drive will sleep whenever local setpoint 5 is selected. (Set according to the installation).
7 SLPsp=+50.0%	G25.4.7 / Sleep speed for local setpoint 6	+50.0% ➔ It allows setting the sleep speed 6 below which the drive will sleep whenever local setpoint 6 is selected. (Set according to the installation).
8 SLPsp=+52.0%	G25.4.8 / Sleep speed for local setpoint 7	+52.0% ➔ It allows setting the sleep speed 7 below which the drive will sleep whenever local setpoint 7 is selected. (Set according to the installation).
9 SLPsp8=+54.0%	G25.4.9 / Sleep speed for local setpoint 8	+54.0% ➔ It allows setting the sleep speed 8 below which the drive will sleep whenever local setpoint 8 is selected. (Set according to the installation).

13.6.2. Connections Drawing

Terminals 1 and 2: start / stop command (NO status).
Terminals 1 and 3: setpoint pin 1 – PID mode (NO status).
Terminals 1 and 4: setpoint pin 2 – PID mode (NO status).
Terminals 1 and 5: setpoint pin 3 – PID mode (NO status).

SPEED	SETPT	Digital Input 4 SETPONT PIN3	Digital Input 3 SETPONT PIN2	Digital Input 2 SETPONT PIN 1
G25.1.5 =1.0Bar	SETPT1	0	0	0
G25.1.6 =2.0Bar	SETPT2	0	0	X
G25.1.7 =3.0Bar	SETPT3	0	X	0
G25.1.8 =4.0Bar	SETPT4	0	X	X
G25.1.9 =5.0Bar	SETPT5	X	0	0
G25.1.10 =6.0Bar	SETPT6	X	0	X
G25.1.11 =7.0Bar	SETPT7	X	X	0
G25.1.12 =8.0Bar	SETPT8	X	X	X

Note: 0: Not active and X: Active.

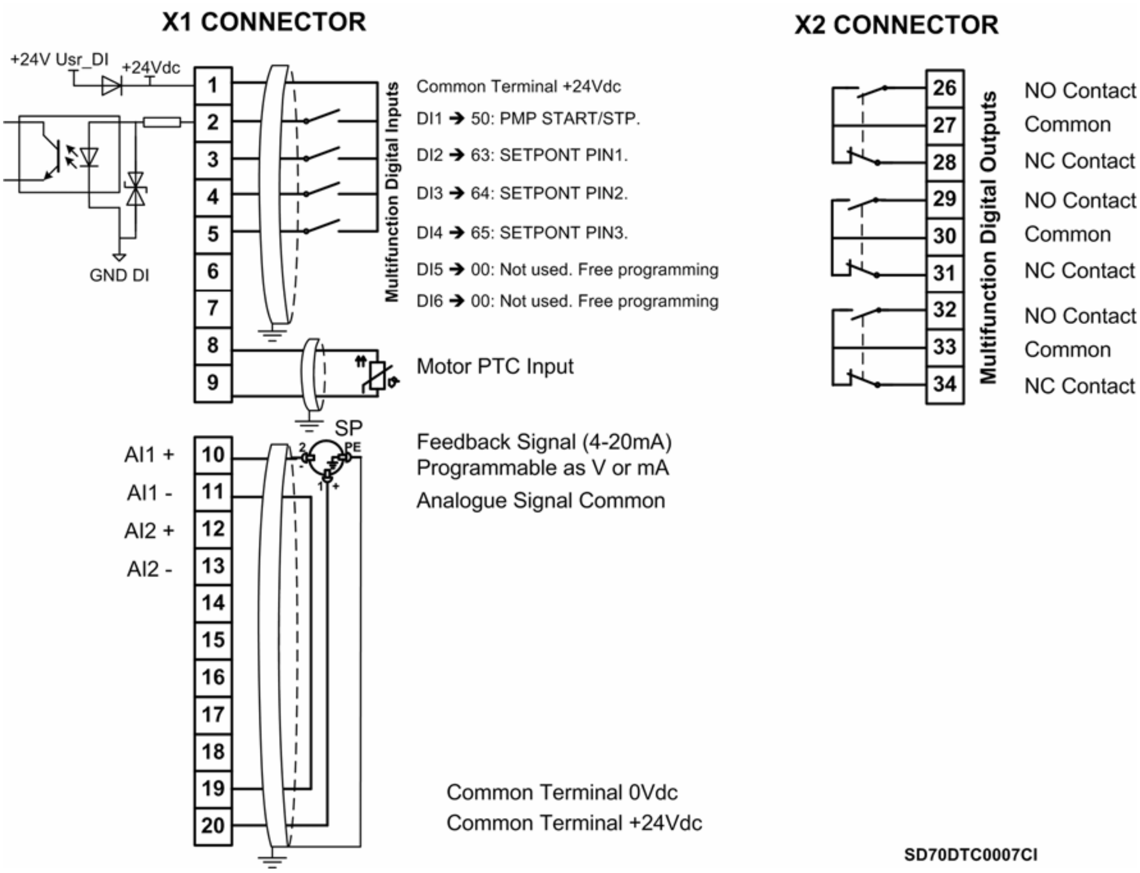

Figure 13.5 Pressure Group Control with Eight Pressure Setpoints

Note: Use screened cables for the control and connect the screen to ground.

14. CONFIGURATION REGISTER

VARIABLE SPEED DRIVE: SD700.
SERIAL Nº: MODEL:
APPLICATION:
DATE:
CUSTOMER:
NOTES:

To save parameters into the display: The SD700 can copy the drive configuration into the display to use at a later stage if necessary. This allows the user to test different settings without losing current configuration of the equipment, program multiple drives using one display, or to keep a copy of the drive configuration for future commissioning requirements. To achieve this follow the steps described below:

- Go into subgroup S1.10.
- To memorize parameters into the display:
  - o Set G1.10.1 UPLOAD=Y.
  - o The display will show: UPLOADING…100%. Current parameter setting of the drive has been stored into the display.
- To transfer memorized data from display to drive:
  - o Set G1.10.2 DOWNLOAD=Y.
  - o The display will show: DOWNLOADING…100%. Memorized setting inside the display will be transferred to the drive.

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G1: Options Menu			
1 LOCK PARMTRS=0	0	___________________	___________________
2 PASSWORD_=OFF	OFF	___________________	___________________
3 PSW ERR=XXXX	XXXX	___________________	___________________
4 LANG=ESPANOL	ESPANOL	___________________	___________________
5 INITIALISE=0	0	___________________	___________________
6 SHORT Menu=NO	NO	___________________	___________________
7 PROG = STANDARD	STANDARD	___________________	___________________
G1: Options Menu – S1.10: Eloader			
UPLOAD=N		___________________	___________________
DOWNLOAD=N		___________________	___________________
G1: Options Menu			
11 FAN CTRL=FIXE	FIXE	___________________	___________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G2: Motor Nameplate Data			
1 MTR CUR=00.00A MOTOR CURRENT	00.00A	____________	____________
2 MTR VOLT=400V MOTOR VOLTAGE	400V	____________	____________
3 MTR PWR=00.0kW MOTOR POWER	00.0kW	____________	____________
4 MTR RPM=1485 MOTOR SPEED (rpm)	1485	____________	____________
5 MTR PFA=0.85 MTR POWER FACTOR	0.85	____________	____________
6 MTR FRQ=50Hz MOTOR FREQUENCY	50Hz	____________	____________
7 MTR COOL=40% MOTOR COOLING	40%	____________	____________
G3: References			
1 REF1 SPD=LOCAL	LOCAL	____________	____________
2 REF2 SPD=LOCAL	LOCAL	____________	____________
3 LOCAL SPD=+100% LOCAL SPEED	+100%	____________	____________
G4: Inputs – S4.1: Digital Inputs			
1 CNTROL MODE1=1	1	____________	____________
2 CNTROL MODE2=2	2	____________	____________
3 RESET MODE=Y	Y	____________	____________
4 DIGIT I MODE=1	1	____________	____________
5 DIGITL IN 1=06	06	____________	____________
6 DIGITL IN 2=00	00	____________	____________
7 DIGITL IN 3=00	00	____________	____________
8 DIGITL IN 4=00	00	____________	____________
9 DIGITL IN 5=00	00	____________	____________
10 DIGITL IN 6=17	17	____________	____________
G4: Inputs – S4.2: Analogue Input 1			
1 SENSOR 1 ?=N	N	____________	____________
2 SENSOR 1= l/s	l/s	____________	____________
3 AIN1 FORMAT=V	V	____________	____________
4 INmin1=+0V AIN1 LOW RANGE	+0V	____________	____________
5 Smi1=+0.0l/s SENS1 LOW RANGE	+0.0l/s	____________	____________
6 INmax1=+10V AIN1 HIGH RANGE	+10V	____________	____________
7 Sma1=+10.0l/s SENS1 HIGH RANGE	+10.0l/s	____________	____________
8 SPD LO1=+0% SPD LO RNG AIN1	+0%	____________	____________
9 SPD HI1=+100% SPD HIG RNG AIN1	+100%	____________	____________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
14 AIN1 LOSS=N	N		
15 1_Z BAND=OFF AIN1 ZERO BAND	OFF		
16 FILTER1=OFF AIN1 STABIL FILT	OFF		
G4 Inputs – S4.3: Analogue Input 2			
1 SENSOR 2 ?=N	N		
2 SENSOR 2=Bar	Bar		
3 AIN2 FORMAT=mA	mA		
4 INmin2=+4mA AIN2 LOW RANGE	+4mA		
5 Smi2=+0.0Bar SENS2 LOW RANGE	+0.0Bar		
6 INmax2=+20mA AIN2 HIGH RANGE	+20mA		
7 Sma2=+10.0Bar SENS2 HIGH RANGE	+10.0Bar		
8 SPD LO2=+0% SPD LO RNG AIN2	+0%		
9 SPD HI2=+100% SPD HIG RNG AIN2	+100%		
14 AIN2 LOSS=N	N		
15 2_Z BAND=OFF AIN2 ZERO BAND	OFF		
16 FILTER2=OFF AIN2 STABIL FILT	OFF		
G4: Inputs – S4.4: Pulse Input			
1 Sensr U=l/m	l/m		
2 Pls/s = 100 l/s LIQU AMOUNT/PULS	100l/s		
3 M Rng=1000 l/s FLOW MAX RANGE	1000l/s		
G5: Acceleration and Deceleration Ramps			
1 ACCE 1=3.0% / s INITIAL ACCEL	3.0% / s		
2 DECEL 1=3.0% / s INITIAL DECEL	3.0% / s		
3 ACCE 2=1.0% / s SECOND ACCELE	1.0% / s		
4 DECEL 2=1.0% / s SECOND DECELE	1.0% / s		
5 BRK ACC=OFF BREAKPOINT ACL	OFF		
6 BRK DEC=OFF BREAKPOINT DCL	OFF		
7 PMT ACL1=1.0% / s MOTO POT INC1	1.0% / s		
8 PMT DCL1=3.0% / s MOTO POT DEC1	3.0% / s		
9 PMT ACL2=1.0% / s MOTO POT INC2	1.0% / s		
10 PMT DCL2=3.0% / s MOTO POT DEC2	3.0% / s		
11 PMOT BRK=OFF MOTO POT BRKPOIN	OFF		
12 SP FLT = 0.250s SMOOT SPD FILTER	0.250s		

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G6: PID Control			
1 SEL REF=MREF	MREF	____________	____________
2 PID LOC=+0.0% PID LOCAL SETPOI	+0.0%	____________	____________
3 SEL FBK=AI2	AI2	____________	____________
4 GAIN Kp=8.0 PID PROPORTIONAL	8.0	____________	____________
5 INTEGRAL = 0.0s PID INTEGRAL	0.0s	____________	____________
6 DIFFEREN = 0.0s PID DIFFERENTIAL	0.0s	____________	____________
7 INVERT PID=N	N	____________	____________
8 ERR PID = +0.0%	+0.0%	____________	____________
G7: Start / Stop Mode Configuration			
1 STOP 1 = RAMP	RAMP	____________	____________
2 STOP 2 = SPIN	SPIN	____________	____________
3 BRK STP 2 = OFF STP2 UNDER SPEED	OFF	____________	____________
4 START = RAMP	RAMP	____________	____________
5 START 2 = RAMP	RAMP	____________	____________
6 START DLY = OFF DELAY TO START	OFF	____________	____________
7 STOP DLY = OFF DELAY TO STOP	OFF	____________	____________
8 STP MIN SP = N	N	____________	____________
9 OFFRet = OFF DELAY AFTER STOP	OFF	____________	____________
10 RUN AFTR VFL = Y	Y	____________	____________
11 SPNstr B=OFF SPIN START TUNE	OFF	____________	____________
12 OFFdly2=OFF DELAY AFTER STP2	OFF	____________	____________
G8: Outputs – S8.1: Output Relays			
1 SEL RELAY 1=02	02	____________	____________
2 T R1 ON=0.0s R1 ACTIVAT DELAY	0.0s	____________	____________
3 T R1 OFF=0.0s R1 DEACTIV DELAY	0.0s	____________	____________
4 INVERT R1=N	N	____________	____________
5 SEL RELAY 2=03	03	____________	____________
6 T R2 ON=0.0s R2 ACTIVAT DELAY	0.0s	____________	____________
7 T R2 OFF=0.0s R2 DEACTIV DELAY	0.0s	____________	____________
8 INVERT R2=N	N	____________	____________
9 SEL RELAY 3=05	05	____________	____________
10 T R3 ON=0.0s R3 ACTIVAT DELAY	0.0s	____________	____________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
11 T R3 OFF=0.0s R3 DEACTIV DELAY	0.0s		
12 INVERT R3=N	N		
13 CRAspdOF=+5.0% CRANE BRKoff SPD	+5.0%		
G8: Outputs – S8.2: Analogue Outputs			
1 ANLG OUT 1=01	01		
2 FORMT 1=4-20 mA	mA		
3 MIN1 RNG=0% MIN RANG ANAOUT1	+0%		
4 MAX1 RNG=+100% MAX RANG ANAOUT1	+100%		
5 FILTER 1=OFF FILTER ANAOUTPU1	OFF		
6 ANLG OUT 2=02	02		
7 FORMT 2=4-20 mA	4-20mA		
8 MIN2 RNG=0% MIN RANG ANAOUT2	+0%		
9 MAX2 RNG=+100% MAX RANG ANAOUT2	+100%		
10 FILTER 2=OFF FILTER ANAOUTPU2	OFF		
G9: Comparators – S9.1: Comparator 1			
1 COMP 1 SEL=00	00		
2 COMP 1 TYPE=0	0		
3 SP C1 ON=+100[%] C1 ACTIVAT LEVEL	+100[%]		
4 LIM 2 C1=+100[%] C1 WINDOW LIMIT2	+100[%]		
5 LIM 1 C1=+0[%] C1 WINDOW LIMIT1	+0[%]		
6 T C1 ON=0.0s C1 ACTIVAT DELAY	0.0s		
7 SP C1 OF=0[%]] C1 DEACTIV LEVEL	+0[%]		
8 T C1 OF=0.0s C1 DEACTIV DELAY	0.0s		
9 SEL FUNT C1=00	00		
G9: Comparators – S9.2: Comparator 2			
1 COMP 2 SEL=00	00		
2 COMP 2 TYPE=0	0		
3 SP C2 ON=+100[%] C2 ACTIVAT LEVEL	+100[%]		
4 LIM 2 C2=+100[%] C2 WINDOW LIMIT2	+100[%]		
5 LIM 1 C2=+0[%] C2 WINDOW LIMIT1	+0[%]		
6 T C2 ON=0.0s C2 ACTIVAT DELAY	0.0s		
7 SP C2 OF=0[%] C2 DEACTIV LEVEL	+0[%]		
8 T C2 OF=0.0s C2 DEACTIV DELAY	0.0s		
9 SEL FUNT C2=00	00		

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G9: Comparators – S9.3: Comparator 3			
1 COMP 3 SEL=00	00	____________________	____________________
2 COM 3 TYPE=0	0	____________________	____________________
3 SP C3 ON=+100[%] C3 ACTIVAT LEVEL	+100[%]	____________________	____________________
4 LIM 2 C3=+100[%] C3 WINDOW LIMIT2	+100[%]	____________________	____________________
5 LIM 1 C3=+0[%] C3 WINDOW LIMIT1	+0[%]	____________________	____________________
6 T C3 ON=0.0s C3 ACTIVAT DELAY	0.0s	____________________	____________________
7 SP C3 OF=0[%]] C3 DEACTIV LEVEL	+0[%]	____________________	____________________
8 T C3 OF=0.0s C3 DEACTIV DELAY	0.0s	____________________	____________________
9 SEL FUNT C3=00	00	____________________	____________________
G10: Limits			
1 MIN1 SP=+0.00% SPEED MIN LIMIT1	+0.00%	____________________	____________________
2 MAX1 SP=+100% SPEED MAX LIMIT1	+100%	____________________	____________________
3 MIN2 SP=-100% SPEED MIN LIMIT2	-100%	____________________	____________________
4 MAX2 SP=+100% SPEED MAX LIMIT2	+100%	____________________	____________________
5 I LIMIT=___A MAX CURRENT	___A	____________________	____________________
6 I LIM TO = OFF TIMOUT MAX CURRE	OFF	____________________	____________________
7 I. MAX2=____A MAX CURRENT 2	___A	____________________	____________________
8 MI2 brSP=OFF MAX CURR BRK SPD	OFF	____________________	____________________
9 MAX TOR=+150% MAX TORQUE	+150%	____________________	____________________
10 T LIM TO=OFF TIMEOUT MAX TORQ	OFF	____________________	____________________
11 INVERSION?=N	N	____________________	____________________
G11: Protections			
1 SP LIM_TO=OFF TMAX LIMITIN SPD	OFF	____________________	____________________
2 STOP TO=OFF TIMEOUT STOPPING	OFF	____________________	____________________
3 GND I LIMIT=10% GND CURR MAX LEV	10%	____________________	____________________
4 LOW VOLT=360V LO INPUT VOLTAGE	360V	____________________	____________________
5 LOW V TO=5s LO INP VOL TIMEO	5s	____________________	____________________
6 HIGH VOLT=440V HI INPUT VOLTAGE	440V	____________________	____________________
7 HI V TO=5s HI INP VOL TIMEO	5.0s	____________________	____________________
8 Dlasy VO = 1.0s VOUT asyTRIP DLY	1.0s	____________________	____________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
9 LOW V BHV=0	0		
10 PTC EXT ?=N	N		
11 PUMP OV=20.0A PUMP OVERLOAD LV	20.0A		
12 PMovl FIL=OFF PMP OVL FILTER	OFF		
13 Povl DLY=OFF PMP OVERLOAD DLY	OFF		
14 UNDERLOAD=N	N		
15 ULD CUR=___A UNDERLOAD CURREN	___A		
16 ULD SPD=+100% UNDERLOAD SPEED	+100%		
17 ULD DELY=10s UNDERLOAD DELAY	10s		
G12: Auto Reset			
1 AUTORESET=N	N		
2 ATTEMP NUMBR=1 MAX ATTEMPT NUMB	1		
3 R STR DEL=5s TIME BEFORE RESET	5s		
4 RS COUNT=15Min AUTORESET TIMOUT	15min		
5 F1 AUTO RST=0	0		
6 F2 AUTO RST=0	0		
7 F3 AUTO RST=0	0		
8 F4 AUTO RST=0	0		
G13: Fault History			
1 F0 NO FAULT LAST FAULT=FXX	-		
2 F0 NO FAULT FIFTH FAULT=FXX	-		
3 F0 NO FAULT FOURTH FAULT=FXX	-		
4 F0 NO FAULT THIRD FAULT=FXX	-		
5 F0 NO FAULT SECOND FAULT=FXX	-		
6 F0 NO FAULT FIRST FAULT=FXX	-		
7 CLEAR FAULTS=N	N		
G14: Multi-references			
1 MREF 1=+10.0% MULTI-REFERENCE1	+10.0%		
2 MREF 2=+20.0% MULTI-REFERENCE2	+20.0%		
3 MREF 3=+30.0% MULTI-REFERENCE3	+30.0%		
4 MREF 4=+40.0% MULTI-REFERENCE4	+40.0%		
5 MREF 5=+50.0% MULTI-REFERENCE5	+50.0%		

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
6 MREF 6=+60.0% MULTI-REFERENCE6	+60.0%	________	________
7 MREF 7=+70.0% MULTI-REFERENCE7	+70.0%	________	________
G15: Inch Speeds			
1 INCH1=+0.00% INCH SPEED 1	+0.00%	________	________
2 INCH2=+0.00% INCH SPEED 2	+0.00%	________	________
3 INCH3=+0.00% INCH SPEED 3	+0.00%	________	________
G16: Skip Frequencies			
1 SKIP 1=+0.0% SKIP FREQUENCY 1	+0.0%	________	________
2 SKIP 2=+0.0% SKIP FREQUENCY 2	+0.0%	________	________
3 SKIP BAND=OFF OFFSET BAND	OFF	________	________
G17: Brake			
1 T DC BRAKE=OFF DC BRAKING TIME	OFF	________	________
2 DC CURR=0% DC CURRENT LEVEL	0%	________	________
3 DC VOLTS=0.0% DC BR VOLT LEVEL	0.0%	________	________
4 I HEATING=OFF Idc HEATING	OFF	________	________
5 DYN BRAK=N	N	________	________
6 VDC BRAKE=OFF VDC BRAKE START	OFF	________	________
G19: Fine Tuning – S19.1: IGBT Control			
1 TYPE CRTL=V/Hz	V / Hz	________	________
2 FRQ=4000 MODULAT FREQUENC	4000	________	________
3 PEWAVE=Y	Y	________	________
G19: Fine Tuning – S19.2: MTR Load			
1 MIN FLUX = 100% MINIMUM FLUX	100%	________	________
2 V BOOST = 0.0% BOOST VOLTAGE	0.0%	________	________
3 BW BOOST=0.0% BOOST BAND	0.0%	________	________
4 SLIP COMPENS=N	N	________	________
5 DAMPING=0.0%	0.0%	________	________
6 TTP BAND=0.0%	0.0%	________	________
7 I SLIP=2.0% I SLIP COMPENSAT	2.0%	________	________
9 STR FRQ = 0.0% START FREQUENCY	0.0%	________	________
10 V/H BREK=OFF FRQ V/Hz CHANGE	OFF	________	________
11 STA F AC=OFF STABILIZE F ACC	OFF	________	________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
12 STA F DC=OFF STABILIZE F DEC	OFF	____________	____________
13 CTR Vbus=OFF REGEN BUS VOLT	OFF	____________	____________
G19: Fine Tuning – S19.3: MTR Model			
1 R STATOR=0.9% STATOR RESISTOR	0.9%	____________	____________
G20: Serial Communication Controls			
1 PROTOCOL=M	M	____________	____________
2 COMMS T/O=OFF COMMS TIMEOUT	OFF	____________	____________
G20: Serial Communication Controls – S20.3: Modbus			
1 COMMS ADDR=10 COMM ADDRESS	10	____________	____________
2 BAUDS=9600	9600	____________	____________
3 PARITY=NONE	NONE	____________	____________
G20: Serial Communication Controls – S20.4: Modbus TCP			
1 IP PARAM A=192	192	____________	____________
2 IP PARAM B=168	168	____________	____________
3 IP PARAM C=1	1	____________	____________
4 IP PARAM D=143	143	____________	____________
5 SUBNET A=255	255	____________	____________
6 SUBNET B=255	255	____________	____________
7 SUBNET C=255	255	____________	____________
8 SUBNET D=0	0	____________	____________
9 GATEWAY A=0	0	____________	____________
10 GATEWAY B=0	0	____________	____________
11 GATEWAY C=0	0	____________	____________
12 GATEWAY D=0	0	____________	____________
13 MAC A=12	12	____________	____________
14 MAC B=34	34	____________	____________
15 MAC C=56	56	____________	____________
16 MAC D=78	78	____________	____________
17 MAC E=90	90	____________	____________
18 MAC F=171	171	____________	____________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G25: Pump Control – S25.1 Setpoints			
1 CONTROL MODE=1	1	________	________
2 MAN SPD REF= LOC	LOC	________	________
3 MAN SPEED=+0.0% MANUAL SPEED	+0.0%	________	________
4 ALT MAN S R=LOCAL	LOCAL	________	________
5 SETPT1=0.0Bar LOCAL SETPOINT 1	0.0Bar	________	________
6 SETPT2=0.0Bar LOCAL SETPOINT 2	0.0Bar	________	________
7 SETPT3=0.0Bar LOCAL SETPOINT 3	0.0Bar	________	________
8 SETPT4=0.0Bar LOCAL SETPOINT 4	0.0Bar	________	________
9 SETPT5=0.0Bar LOCAL SETPOINT 5	0.0Bar	________	________
10 SETPT6=0.0Bar LOCAL SETPOINT 6	0.0Bar	________	________
11 SETPT7=0.0Bar LOCAL SETPOINT 7	0.0Bar	________	________
12 SETPT8=0.0Bar LOCAL SETPOINT 8	0.0Bar	________	________
13 T AutOFF=OFF AUTO-OFF DELAY	OFF	________	________
G25: Pump Control – S25.2: PID Setting			
1 PID SETP=LOCAL	LOCAL	________	________
2 PID aSTP=LOCAL	LOCAL	________	________
3 PID FBK=AI2	AI2	________	________
4 PID Kc=1.0 PROPORTIONAL PID	1.0	________	________
5 PID It=5.0s INTEGRAL PID	5.0s	________	________
6 PID Dt=0.0s DIFFERENTIAL PID	0.0s	________	________
7 PID ERR=+xx.x%	-	________	________
8 ERR=+xx.xxkPa	-	________	________
9 PID INVERT=N	N	________	________
G25: Pump Control – S25.3: Start Conditions			
1 LP Pon=0.0Bar AWAKENING LEVEL	0.0Bar	________	________
2 FP SpON=+90.0% FIX PMP STAR SPD	+90.0%	________	________
3 FP ErON=+10.0% FIX PMP STAR ERR	+10.0%	________	________
4 FP T1 ON=10s FIX PMP1 STR DLY	10s	________	________
5 FP T2 ON=10s FIX PMP2 STR DLY	10s	________	________
6 FP T3 ON=10s FIX PMP3 STR DLY	10s	________	________
7 FP T4 ON=10s FIX PMP4 STR DLY	10s	________	________
8 FP T5 ON=10s FIX PMP5 STR DLY	10s	________	________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G25: Pump Control – S25.4: Stop Conditions			
1 LP T SLP=20s DRIVE SLEEP DELY	20s	________	________
2 SLPsp1=+40.0% DRV SLEEP SPEED1	+40.0%	________	________
3 SLPsp2=+40.0% DRV SLEEP SPEED2	+40.0%	________	________
4 SLPsp3=+40.0% DRV SLEEP SPEED3	+40.0%	________	________
5 SLPsp4=+40.0% DRV SLEEP SPEED4	+40.0%	________	________
6 SLPsp5=+40.0% DRV SLEEP SPEED5	+40.0%	________	________
7 SLPsp6=+40.0% DRV SLEEP SPEED6	+40.0%	________	________
8 SLPsp7=+40.0% DRV SLEEP SPEED7	+40.0%	________	________
9 SLPsp8=+40.0% DRV SLEEP SPEED8	+40.0%	________	________
10 FLsw ENA=N	N	________	________
11 Fsl L=0.0l/s FLOW SLEEP LEVEL	0.0l/s	________	________
12 I SLEEP=xxxA CURR SLEEP LEVEL	xxxA	________	________
13 FP erOFF=+0.0% FPUMP STOP ERROR	+0.0%	________	________
14 FP T1 OF=10s FPUMP1 STP DELAY	10s	________	________
15 FP T2 OF=10s FPUMP2 STP DELAY	10s	________	________
16 FP T3 OF=10s FPUMP3 STP DELAY	10s	________	________
17 FP T4 OF=10s FPUMP4 STP DELAY	10s	________	________
18 FP T5 OF=10s FPUMP5 STP DELAY	10s	________	________
19 SPD1of=+70.0% FPUMP STP SPEED1	+70.0%	________	________
20 SPD2of=+70.0% FPUMP STP SPEED2	+70.0%	________	________
21 SPD3of=+70.0% FPUMP STP SPEED3	+70.0%	________	________
22 SPD4of=+70.0% FPUMP STP SPEED4	+70.0%	________	________
23 SPD5of=+70.0% FPUMP STP SPEED5	+70.0%	________	________
24 SPD6of=+70.0% FPUMP STP SPEED6	+70.0%	________	________
25 SPD7of=+70.0% FPUMP STP SPEED7	+70.0%	________	________
26 SPD8of=+70.0% FPUMP STP SPEED8	+70.0%	________	________
27 PIDiSL%=0.0% PID INVE SLEEP %	0.0%	________	________
28 SLEEP?=Y	Y	________	________
29 SLPspA=+40.0% SLEP SPD STP ANA	+40.0%	________	________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G25: Pump Control – S25.5: Speed Bypass			
1 BY SPon=+70.0% BYPASS ON SPEED	+70.0%	________________	________________
2 BY T ON=10s BYPASS ON DELAY	10s	________________	________________
3 BY SPof=+90.0% BYPASS OFF SPEED	+90%	________________	________________
4 BY T OFF=5s BYPASS OFF DELAY	5s	________________	________________
G25: Pump Control – S25.6: Protection			
1 PAUSE/DEL=20s DELAY AFTER PAUS	20s	________________	________________
2 CAVITATION=N	N	________________	________________
3 CAV MODE=FAULT	FAULT	________________	________________
4 CAV CURR=___A CAVITATION CURRE	___A	________________	________________
5 CAV SPED=+100% CAVITATION SPEED	+100%	________________	________________
6 CAV DELAY=10s CAVIT FLT DELAY	10s	________________	________________
7 ENABLE LO PRE=N	N	________________	________________
9 LO PRE=5.0Bar LO PRESSURE LEVL	5.0Bar	________________	________________
10 Lop DLY=10.0s LO PRESS FLT DLY	10.0s	________________	________________
11 Lop Msp=+0.0% LO PRESS MIN SPED	+0.0%	________________	________________
12 HP MODE=PAUSE	PAUSE	________________	________________
13 HP LEV=100Bar HIFH PRESS LEVEL	100Bar	________________	________________
14 HIpr DLY=0.0s HI PRESS FLT DLY	0.0s	________________	________________
15 FLO SWm=PAUSE	PAUSE	________________	________________
16 NO FLO/FILL=N	N	________________	________________
17 NO FLsp=+0.0% NO FLOW MIN SPED	+0.0%	________________	________________
18 NO FLbyp=0.0s NO FLO BYPAS DLY	0.0s	________________	________________
19 NO FLdly=0.0s NO FLOW FLT DLY	0.0s	________________	________________
20 CYCLE TI=0m CYCLE RESET DELY	0m	________________	________________
21 CYCLE CNT=5 MAX CYCLES ALLOW	5	________________	________________
G25: Pump Control – S25.7: Pipe Filling / Setpoint Ramp			
1 PRESSU SOU=PID	PID	________________	________________
2 FILL SP=+70.0% PIPE FILLING SPD	+70%	________________	________________
3 FILL P=2.0Bar PFILL END PRESSU	2.0%	________________	________________
4 FILL TIM=15m PFILL END DELAY	15m	________________	________________
5 SPT RAMP=1.0Bar / s	1.0Bar / s	________________	________________

PARAMETERS	FACTORY SETTINGS	SETTING 1	SETTING 2
G25: Pump Control – S25.8: Setpoint Compensation due to Pressure Loss			
1 COMP 1=0.0Bar SETPOINT COMPEN1	0.0Bar	___________________	___________________
2 COMP 2=0.0Bar SETPOINT COMPEN2	0.0Bar	___________________	___________________
3 COMP 3=0.0Bar SETPOINT COMPEN3	0.0Bar	___________________	___________________
4 COMP 4=0.0Bar SETPOINT COMPEN4	0.0Bar	___________________	___________________
5 COMP 5=0.0Bar SETPOINT COMPEN5	0.0Bar	___________________	___________________
G25: Pump Control – S25.9: Fixed Pumps Control			
1 ENABLE PUMP 1=N	N	___________________	___________________
2 ENABLE PUMP2=N	N	___________________	___________________
3 ENABLE PUMP3 =N	N	___________________	___________________
4 ENABLE PUMP4=N	N	___________________	___________________
5 ENABLE PUMP5=N	N	___________________	___________________
6 FP ALTER MOD=0	0	___________________	___________________
7 JPon P=0.0Bar JOCKEY ON PRESS	0.0Bar	___________________	___________________
8 JPon DLY=20s JOCKEY ON DELAY	20s	___________________	___________________
9 JPof P=0.0Bar JOCKEY OFF PRESS	0.0Bar	___________________	___________________
10 PRp BYP=300s PRIM.PUM.BYP.DLY	300s	___________________	___________________
11 PRp DLY=OFF PRIM PUM FLTdly	OFF	___________________	___________________
G25: Pump Control – S25.10: Flow Limitation Algorithm			
1 FLOW SEL=PULSE	PULSE	___________________	___________________
2 MAX FLOW=1000 l/s MAX ALLOWED FLOW	1000 l/s	___________________	___________________
3 OFFSET=+0% OFFSET MAX FLOW	+0%	___________________	___________________
4 FLO RES=+100% FLOW RESET LEVEL	+100%	___________________	___________________
5 DECrat=+2.0% / s FLOW DECEL RATE	+2.0% / s	___________________	___________________
6 UNIT FLOW= l/s	l/s	___________________	___________________
G25: Pump Control – S25.11: Registers (Read only)			
1 P1 = -----0d -----0m	-	___________________	___________________
2 P2 = -----0d -----0m	-	___________________	___________________
3 P3 = -----0d -----0m	-	___________________	___________________
4 P4 = -----0d -----0m	-	___________________	___________________
5 P5 = -----0d -----0m	-	___________________	___________________
TIME RESTORE=N	N	___________________	___________________

DECLARATION OF CONFORMITY CE

The Company:

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Declares under its own responsability, that the product:

Frequency Inverter for A.C. motors

Brand: Power Electronics
Model name: SDRIVE 700 Series

Is in conformity with the following European Directives:

References	Title
73/23/CEE	Electrical Material intended to be used with certain limits of voltage
93/68/CEE	Modification of Directive 73/23/CEE
89/336/CEE	Electromagnetic Compatibility
92/31/CEE	Modification of Directive 89/336/CEE
93/68/CEE	Modification of Directive 89/336/CEE

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

References	Title
UNE EN 50178: 1998	Electronic equipment for use in power installations

References of the armonized technical norms applied under the Electronic Compatibility Directive:

References	Title
UNE EN 61800-3: 1998	Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods.
UNE-EN 61800-3/A11:2002	Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods.

Paterna, September 3rd 2005

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