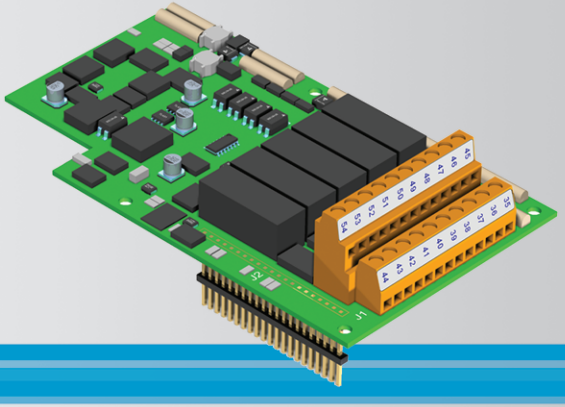
SD 700
Series

VARIABLE SPEED DRIVE



Getting Started Manual

I/O Expansion Board

POWER ELECTRONICS

SD700 Series

VARIABLE SPEED DRIVE

Getting Started Manual

I/O Expansion Board

Edition: May 2008

SD70IM03AI Rev. A

SAFETY SYMBOLS

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

	This symbol means improper operation may results in serious personal injury or death.
	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.

Edition May 2008

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
23 / 05 / 2008	A	First edition

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SAFETY INSTRUCTIONS

IMPORTANT!

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

WARNING

Be sure to take ESD (Electrostatic Discharge) protection measures when you touch the board.
Otherwise, the optional board may get damaged due to static charges.

Implement wiring change on the optional board after checking that the power supply is off.
Otherwise, there is a danger of connecting error and damage to the board.

Be sure to connect correctly the optional board to the inverter.
Otherwise, there is a danger of connecting error and damage to the board.

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

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

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

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

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

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

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

CAUTION

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

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

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

Do not apply power to a damaged inverter or to an inverter with parts missing even if the installation is complete.
Otherwise, fire or accident could occur.

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

WARNINGS

RECEPTION

- Material of Power Electronics 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 received merchandise corresponds with delivery note, models and serial numbers.
- Each board is supplied with a technical manual.

RECYCLING

- The packing of the drives must be recycled. For this reason it is necessary to separate different materials (plastics, paper, cardboard, wood, …) and settle them in corresponding containers.
- The residual parts of electrical devices must be collected in a selective manner in order to warranty the correct environmental treatment.

SAFETY

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

SAFETY

- Ensure that the mounting orientation is correct.
- Do not drop the inverter or subject it to impact.
- The SD700 drives contain static sensitive printed circuits boards. Use static safety procedures when handling these boards.

CONNECTION PRECAUTIONS

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

COMMISSIONING

- Follow the steps described in this manual.
- Always apply voltage and current signals to each terminal that are within levels indicated within this manual. Otherwise, damage to the optional board 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 SD700 Series, initialise all parameters back to factory default values.

EARTH CONNECTION

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

1. INTRODUCTION

1.1. Description of the I/O Expansion Board

The optional I/O Expansion Board offers the drive the possibility of increasing the amount of the analogue and digital inputs and outputs. This board includes:

- 4 Programmable Digital Inputs optically isolated.
- 1 Programmable Analogue Input.
- 5 Programmable Digital Outputs.
- 1 Programmable Analogue Output.

Thanks to the implementation of this board, the SD700 will have up to 10 programmable Digital Inputs and 8 Outputs, and 3 programmable Analogue Inputs and 3 Outputs. All of this gives the SD700 a high versatility and flexibility.

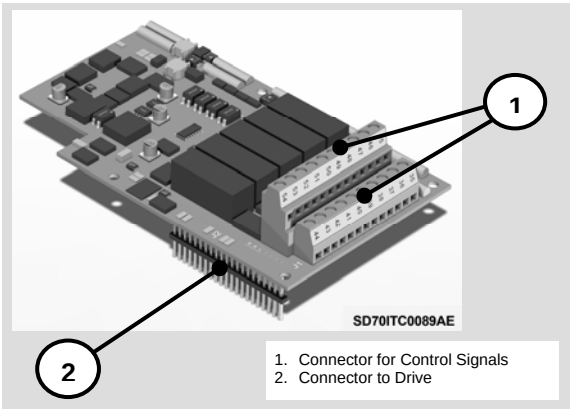

Figure 1.1 Description of the I/O Expansion Board

2. TECHNICAL CHARACTERISTICS

2.1. General Information

2.1.1. Contents of the I/O Expansion Board Kit

The I/O Expansion Board kit includes:

- 1 I/O Expansion Board.
- 4 mounting screws.
- 1 Getting Started Manual.

2.1.2. Specifications for the I/O Expansion Board

The inputs and outputs of the I/O Expansion Board have the same characteristics than the inputs and outputs of the drive.

- Digital Inputs: Programmable inputs and active high (24Vdc). Optically isolated.
- Analogue Output: Programmable and differential input.
  Operation rates
  - Current signal: 0 – 20mA, 4 – 20mA.
  - Voltage signal: 0 – 10Vdc, ±10Vdc.
- Digital Outputs: 5 programmable multi-function relays. (Normally Open Contacts, 250Vac, 8A or 30Vdc, 8A).
- Analogue Outputs. Programmable outputs in voltage / current.
  Operation rate
  - Voltage: 0 – 10Vdc, ±10Vdc.
  - Current: 0 – 20mA, 4 – 20mA.

3. INSTALLATION AND CONNECTION

3.1. Installation of the I/O Expansion Board

The I/O Expansion Board is directly connected to the SD700 drives of Power Electronics through a plug connector. After connecting this board to the drive, the new inputs and outputs will be available. User can configure them in the same way than the inputs and outputs integrated in the equipment as standard.

CAUTION

Motor controllers of Power Electronics operate with a high electric energy.
Make sure the power supply has been disconnected and wait for at least 10 minutes to guarantee that DC Link voltage is discharged, before installing the I/O Expansion Board. Otherwise, you may get personal injuries or an accident could occur.

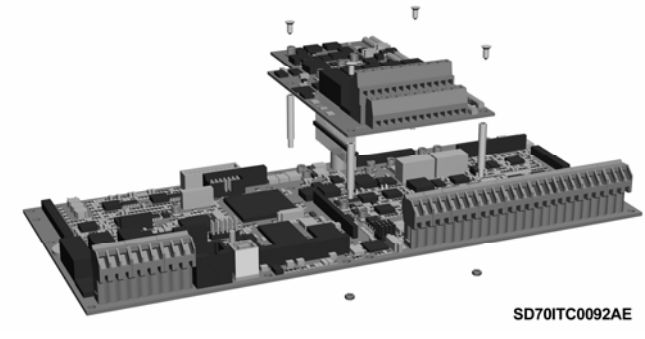

Figure 3.1 Installation of the I/O Expansion Board in the drive

3.2. Connection of the I/O Expansion Board

3.2.1. Description of the Connectors

There are two connectors in the I/O Expansion Board. One connector is used to connect this board to the control board of the SD700. The other connector is for user's connections, this means, to connect the control signals (wiring for the analogue and digital inputs and outputs).

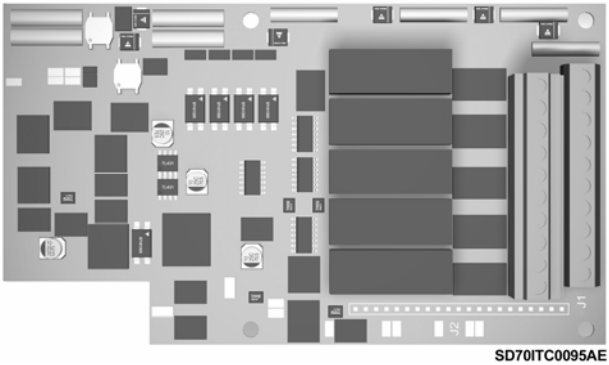

Figure 3.2 Location of the connectors in the I/O Expansion Board

CONNECTOR	DESCRIPTION
Connector to Drive (J2)	Plug connector used to connect the I/O Expansion Board to the control board of the drive.

CONNECTOR	DESCRIPTION
Connector for Control Signals (J1)	Connections of the control signals are realized through this connector, this means, the wiring for the inputs and outputs, according to the attached information:

	Lower Level		
	PIN	Signal	Description
DIGITAL INPUTS	35	+24V	+24V power supply for the activation of the digital inputs.
	36	DI7	Programmable Digital Input 7. It is powered from terminal 35 or an external 24Vdc power supply, the common terminal of which should be connected to terminal 40.
	37	DI8	Programmable Digital Input 8. See DI7.
	38	DI9	Programmable Digital Input 9. See DI7.
	39	DI10	Programmable Digital Input 10. See DI7
	40	Common	Common for digital inputs.
ANALOGUE INPUTS	41	AI3+	Voltage or current programmable Analogue Input 3 (V ó mA).
	42	AI3-	Common for Analogue Input 3.
ANALOGUE OUTPUTS	43	AO3+	Voltage or current programmable Analogue Output 3 (V ó mA).
	44	AO3-	Common for the Analogue Output 3.

CONNECTOR	DESCRIPTION
Connector for Control Signals (J1)	Note: Coming from the previous page.

	Upper Level		
	PIN	Signal	Description
DIGITAL OUTPUTS	45	RELAY 4 C	Comon for Digital Output 4.
	46	RELAY 4 NA	Digital Output 4. Programmable relay (NO). Potential free (Maximum: 250Vac, 8A; 30Vdc, 8A).
	47	RELAY 5 C	Common for Digital Output 5.
	48	RELAY 5 NA	Digital Output 5. See relay 4.
	49	RELAY 6 C	Common for Digital Output 6.
	50	RELAY 6 NA	Digital Output 6. See relay 4.
	51	RELAY 7 C	Common for Digital Output 7.
	52	RELAY 7 NA	Digital Output 7. See relay 4
	53	RELAY 8 C	Common for Digital Output 8.
	54	RELAY 8 NA	Digital Output 8. See relay 4.

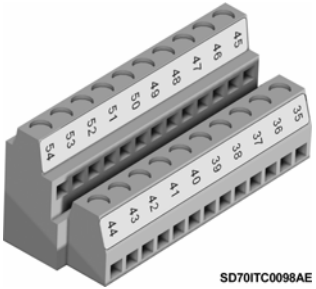

Figure 3.3 Detail of connector J1

3.2.2. Control Connections Drawing

The following figure shows the basic wiring for the control terminals of the J1 connector.

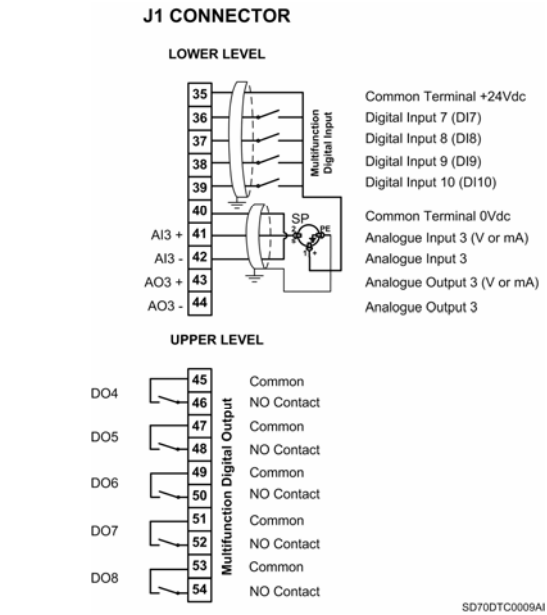

Figure 3.4 Example of basic wiring for the control terminals of the I/O Expansion Board

4. PARAMETER SETTING

Once the optional board is connected and after powering the drive, the software of the equipment will recognize this board and the corresponding settable parameters will be available and be visualized in the display. The setting of these parameters allows defining the use and the configuration of the new inputs and outputs.

As well as the new parameters, the installation of the I/O Expansion Board affects to some parameters that already exist in the drive.

Next, all programming and visualization parameters affected by the I/O Expansion Board are shown. Additionally, the new parameters are also described. Both existing parameters and new parameters are grouped in their corresponding groups, as the display shows all of them.

Note: The description of some parameters shown in this section refers to other parameters directly or indirectly linked between them. See 'Getting Started Manual' of SD700 in order to get more information about those parameters that are not described in this manual.

4.1. Group 3 – G3: References

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>1 REF1 SPD=LOCAL</td><td>G3.1 / Reference source 1 of speed</td><td rowspan="2">NONE
AI1
AI2
AI1+AI2
RES
LOCAL
MREF
PMOT
PID
AI3</td><td rowspan="2">LOCAL</td><td rowspan="2">It allows selecting the source 1 or 2 for the speed reference.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>AI3</td><td>Reference will be introduced through the Analogue Input 3.</td></tr></table>Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.</td><td>YES</td></tr>
<tr><td>2 REF2 SPD=LOCAL</td><td>G3.2 / Reference source 2 of speed</td><td>YES</td></tr>
</table>

4.2. Group 4 – G4: Inputs

4.2.1. Subgroup 4.1 – S4.1: Digital Inputs

Pumps program activation 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 73 (for G4.1.5 to G4.1.14) can be set, without taking into consideration the setting on parameter 'G4.1.4 DIGIT I MODE', which means a block setting only from DI1 (G4.1.5) to DI6 (G4.1.10).

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 to mode '00 – un used'. 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 (auxiliary pumps 6, 7 y 8 are only available when I/O Expansion Board is connected):

- Set any free digital input to options '52 FIX PUMP1 FLT', '53 FIX PUMP2 FLT', '54 FIX PUMP3 FLT', '55 FIX PUMP4 FLT', '56 FIX PUMP5 FLT' '71 FIX PUMP6 FLT', '72 FIX PUMP7 FLT', or '73 FIX PUMP8 FLT'.

- To enable the control of the pump in the corresponding screen G25.9.1, G25.9.2, G25.9.3, G25.9.4, G25.9.5, G25.9.13, G25.9.14 and G25.9.15 respectively.

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

- Disable the control of the pump in the corresponding screen G25.9.1, G25.9.2, G25.9.3, G25.9.4, G25.9.5, G25.9.13, G25.9.14 and G25.9.15 respectively.

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>11 DIGITL IN7=00</td><td>G4.1.11 / Multi-function Digital Input 7 configuration</td><td>00 – 74</td><td>00</td><td rowspan="4">It allows user to configure the digital inputs for individual use.
<table><tr><th>OPC</th><th>DESCRIP.</th><th>FUNCIÓN</th></tr><tr><td>71</td><td>FIX PUMP6 FLT</td><td>Auxiliary pump 6 fault. (NO).</td></tr><tr><td>72</td><td>FIX PUMP7 FLT</td><td>Auxiliary pump 7 fault. (NO).</td></tr><tr><td>73</td><td>FIX PUMP8 FLT</td><td>Auxiliary pump 8 fault. (NO).</td></tr></table></td><td>NO</td></tr>
<tr><td>12 DIGITL IN8=00</td><td>G4.1.12 / Multi-function Digital Input 8 configuration</td><td>00 – 74</td><td>00</td><td>NO</td></tr>
<tr><td>13 DIGITL IN9=00</td><td>G4.1.13 / Multi-function Digital Input 9 configuration</td><td>00 – 74</td><td>00</td><td>NO</td></tr>
<tr><td>14 DIGITL I10=00</td><td>G4.1.14 / Multi-function Digital Input 10 configuration</td><td>00 – 74</td><td>00</td><td>Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.</td><td>NO</td></tr>
</table>

4.2.2. Subgroup 4.5 – S4.5: Analogue Input 3

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>1 SENSOR 3 ?=N</td><td>G4.5.1 / Sensor of Analogue Input 3 enable</td><td>N
Y</td><td>N</td><td>It allows user to configure analogue input 3 for use with a sensor and activates the parameters which are necessary to set it up. See G4.5.2 up to G4.5.7.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>The analogue input will remained scaled in defaults units (%).</td></tr><tr><td>Y=YES</td><td>The analogue input and any variables relating to the analogue input will be configured in the engineering units selected in G4.5.2.</td></tr></table></td><td>NO</td></tr>
<tr><td>2 SENSOR 3= l/s[4]</td><td>G4.5.2 / Selection of sensor 3 units</td><td>%
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
Hz
rpm</td><td>l/s</td><td>It allows selection of different units of measurement for the analogue input 3 according to the sensor that is used. If this parameter is modified, the minimum and maximum values of the sensor range must be adjusted to ensure correct configuration. Therefore, the following set values should be checked:
'G4.5.5 Smi3=+0.0l/s' ➔ Minimum range of sensor.
'G4.5.7 Sma3=+10.0l/s' ➔ Maximum range of sensor.</td><td>NO</td></tr>
<tr><td>3 AIN3 FORMAT=mA</td><td>G4.5.3 / Analogue Input 3 format</td><td>V
mA</td><td>mA</td><td>It allows configuration of the analogue input 3 format for either a voltage or current signal. Set according to the sensor that will be used.</td><td>NO</td></tr>
</table>

[4] It will be available in case of G4.5.1=Y.

Parameter	Name / Description	Range	Default value	Function	Set on RUN
4 INmin3=+4mA AIN3 LOW RANGE	G4.5.4 / Minimum range Analogue Input 3	-10V to G4.5.6 +0mA to G4.5.6	+4mA	It determines the minimum voltage or current value for analogue input 3. Set according to the characteristics of the sensor that will be connected.	YES
5 Smi3=+0.0l/s[5] SENS3 LOW RANGE	G4.5.5 / Minimum range of sensor 3	-3200 to G4.5.7 Engineer. Units	+0.0Bar	It sets the minimum units value of the sensor connected to the analogue input 3. This value should also correspond to the minimum voltage or current level of the sensor set in G4.5.4. Note: This value should be checked if the units are changed in G4.5.2. It will be set to operate in open loop and close loop.	YES
6 INmax3=+20mA AIN3 HIGH RANGE	G4.5.6 / Maximum range Analogue Input 3	G4.5.4 to +10V G4.5.4 to +20mA	+20mA	It determines the maximum voltage or current value for the analogue input 3. Set according to the characteristics of the sensor that will be connected.	YES
7 Sma3=+10.0l/s[5] SENS3 HIGH RANGE	G4.5.7 / Maximum range of sensor 3	G4.5.5 to +3200 Engineer. Units	+10.0Bar	It sets the maximum units value of the sensor connected to the analogue input 3. This value should also correspond to the maximum voltage or current level of the sensor set in G4.5.6. Note: This value should be checked if the units are changed in G4.5.2. It is necessary to set this value in open loop and close loop configurations.	YES
8 SPD LO 3=+0% SPD LOW RNG AIN3	G4.5.8 / Speed for the minimum range of Analogue Input 3	-250% to G.4.5.9	+0%	It allows scaling of the speed reference to correspond with the minimum range of the analogue input 3 as set in G4.5.4. It is configured to set the speed reference via analogue input. Set the parameter G4.5.1=N. The value is a percentage of the motor rated speed.	YES

[5] It will be available in case of G4.5.1=Y.

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>9 SPD HI 3=+100%
SPD HIG RNG AIN3</td><td>G4.5.9 / Speed for the maximum range of Analogue Input 3</td><td>G4.5.8 to +250%</td><td>+100%</td><td>It allows scaling of the speed reference to correspond with the maximum range of the analogue input 3 as set in G4.5.6. It is configured to set the speed reference via analogue input. Set the parameter G4.5.1=N. The value is a percentage of the motor rated speed.</td><td>YES</td></tr>
<tr><td>14 AIN3 LOSS=N</td><td>G4.5.14 / Protection for Analogue Input 3 loss</td><td>N
Y</td><td>N</td><td>To set the drive stop mode when a loss of the analogue input 3 signal occurs.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>Function disabled.</td></tr><tr><td>Y=YES</td><td>When the analogue input level decreases down to zero value, sensor will be considered damaged and the drive will stop generating a fault 'F59 AIN3 LOSS'.</td></tr></table></td><td>YES</td></tr>
<tr><td>15 3 Z BAND=OFF
AIN3 ZERO BAND</td><td>G4.5.15 / Zero band filter for Analogue Input 3</td><td>OFF=0.0, 0.1 to 2.0%</td><td>OFF</td><td>Filtering of analogue input 3 signal. Setting this value we can filter analogue input 3 to avoid possible electrical noise preventing the analogue reading a zero value.</td><td>YES</td></tr>
<tr><td>16 FILTER3=OFF
AIN3 STABIL FILT</td><td>G4.5.16 / Low Pass filter for Analogue Input 3</td><td>OFF=0.0, 0.1 to 20.0%</td><td>OFF</td><td>It allows filtering the Analogue Input 3 signal. 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.</td><td>YES</td></tr>
</table>

4.3. Group 6 – G6: PID Control

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>1 SEL REF=MREF</td><td>G6.1 / Source selection for introducing reference signal</td><td>NONE
AI1
AI2
RESERV
MREF
LOCAL
locPID
AI3</td><td>MREF</td><td>It allows user to select the reference source for the setpoint of the PID regulator.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>AI3</td><td>PID setpoint introduced by Analogue Input 3.</td></tr></table>Note: See the remaining options to configure the parameter in ‘Getting Started Manual’ of SD700.</td><td>NO</td></tr>
<tr><td>3 SEL FBK=AI2</td><td>G6.3 / Selection of feedback signal source</td><td>NONE
AI1
AI2
RESERV
AI3</td><td>AI2</td><td>To select the source of the feedback signal for the PID control loop.
<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>AI3</td><td>Feedback signal through the Analogue Input 3.</td></tr></table>Note: See the remaining options to configure the parameter in ‘Getting Started Manual’ of SD700.</td><td>NO</td></tr>
</table>

4.4. Group 8 – G8: Outputs

4.4.1. Subgroup 8.1 – S8.1: Output Relays

Parameter	Name / Description	Range	Default value	Function	Set on RUN
14 SEL RELAY4=02	G8.1.14 / Selection of Relay 4 control source	00 to 33	02	It configures the operation of each output relay according to several options. Note: See all configuration options in parameter G8.1.1 in 'Getting Started Manual' of SD700.	NO
15 T R4 ON =0.0s R4 ACTIVAT DELAY	G8.1.15 / ON delay time for Relay 4	0.0 to 999s	0.0s	Allows user to set a delay time before activating relay 4. If during this ON delay time the activation condition disappears, the relay will not be activated.	YES
16 T R4 OF =0.0s R4 DEACTIV DELAY	G8.1.16 / OFF delay time for Relay 4	0.0 to 999s	0.0s	Allows user to set a delay time before deactivating relay 4. If during this OFF delay time the deactivation condition disappears, the relay will follow activated.	YES
17 INVERT REL4=N	G8.1.17 / Relay 4 inversion	N Y	N	It allows user to invert the logic of relay 4 functionality. Relay 4 has one normally open contact (connection 45/46 of the I/O Expansion Board). OPT. / FUNCTION: N=NO – No inversion. Y=YES – Inversion of relay logical function.	NO
18 SEL RELAY5=02	G8.1.18 / Selection of Relay 5 control source	00 to 33	02	It configures the operation of each output relay according to several options. Note: See all configuration options in parameter G8.1.1 in 'Getting Started Manual' of SD700.	NO
19 T R5 ON =0.0s R5 ACTIVAT DELAY	G8.1.19 / ON delay time for Relay 5	0.0 to 999s	0.0s	Allows user to set a delay time before activating relay 5. If during this ON delay time the activation condition disappears, the relay will not be activated.	YES

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>20 T R5 OF=0.0s
R5 DEACTIV DELAY</td><td>G8.1.20 / OFF delay time for Relay 5</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before deactivating relay 5.
If during this OFF delay time the deactivation condition disappears, the relay will follow activated.</td><td>YES</td></tr>
<tr><td>21 INVERT REL5=N</td><td>G8.1.21 / Relay 5 inversion</td><td>N
Y</td><td>N</td><td>It allows user to invert the logic of relay 5 functionality.
Relay 5 has one normally open contact (connection 47/48 of the I/O Expansion Board).<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>No inversion.</td></tr><tr><td>Y=YES</td><td>Inversion of relay logical function.</td></tr></table></td><td>NO</td></tr>
<tr><td>22 SEL RELAY6=02</td><td>G8.1.22 / Selection of Relay 6 control source</td><td>00 to 33</td><td>02</td><td>It configures the operation of each output relay according to several options.
Note: See all configuration options in parameter G8.1.1 in ‘Getting Started Manual’ of SD700.</td><td>NO</td></tr>
<tr><td>23 T R6 ON=0.0s
R6 ACTIVAT DELAY</td><td>G8.1.23 / ON delay time for Relay 6</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before activating relay 6.
If during this ON delay time the activation condition disappears, the relay will not be activated.</td><td>YES</td></tr>
<tr><td>24 T R6 OF =0.0s
R6 DEACTIV DELAY</td><td>G8.1.24 / OFF delay time for Relay 6</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before deactivating relay 6.
If during this OFF delay time the deactivation condition disappears, the relay will follow activated.</td><td>YES</td></tr>
<tr><td>25 INVERT REL6=N</td><td>G8.1.25 / Relay 6 inversion</td><td>N
Y</td><td>N</td><td>It allows user to invert the logic of relay 6 functionality.
Relay 6 has one normally open contact (connection 49/50 of the I/O Expansion Board).<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>No inversion.</td></tr><tr><td>Y=YES</td><td>Inversion of relay logical function.</td></tr></table></td><td>NO</td></tr>
<tr><td>26 SEL RELAY7=02</td><td>G8.1.27 / Selection of Relay 7 control source</td><td>00 to 33</td><td>02</td><td>It configures the operation of each output relay according to several options.
Note: See all configuration options in parameter G8.1.1 in ‘Getting Started Manual’ of SD700.</td><td>NO</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>27 T R7 ON=0.0s
R7 ACTIVAT DELAY</td><td>G8.1.27 / ON delay time for Relay 7</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before activating relay 7.
If during this ON delay time the activation condition disappears, the relay will not be activated.</td><td>YES</td></tr>
<tr><td>28 T R7 OF=0.0s
R7 DEACTIV DELAY</td><td>G8.1.28 / OFF delay time for Relay 7</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before deactivating relay 7.
If during this OFF delay time the deactivation condition disappears, the relay will follow activated.</td><td>YES</td></tr>
<tr><td>29 INVERT REL7=N</td><td>G8.1.29 / Relay 7 inversion</td><td>N
Y</td><td>N</td><td>It allows user to invert the logic of relay 7 functionality.
Relay 7 has one normally open contact (connection 51/52 of the I/O Expansion Board).
<table>
<tr><th>OPT.</th><th>FUNCTION</th></tr>
<tr><td>N=NO</td><td>No inversion.</td></tr>
<tr><td>Y=YES</td><td>Inversion of relay logical function.</td></tr>
</table></td><td>NO</td></tr>
<tr><td>30 SEL RELAY8=02</td><td>G8.1.30 / Selection of Relay 8 control source</td><td>00 to 33</td><td>02</td><td>It configures the operation of each output relay according to several options.
Note: See all configuration options in parameter G8.1.1 in 'Getting Started Manual' of SD700.</td><td>NO</td></tr>
<tr><td>31 T R8 ON=0.0s
R8 ACTIVAT DELAY</td><td>G8.1.31 / ON delay time for Relay 8</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before activating relay 8.
If during this ON delay time the activation condition disappears, the relay will not be activated.</td><td>YES</td></tr>
<tr><td>32 T R8 OF=0.0s
R8 DEACTIV DELAY</td><td>G8.1.32 / OFF delay time for Relay 8</td><td>0.0 to 999s</td><td>0.0s</td><td>Allows user to set a delay time before deactivating relay 8.
If during this OFF delay time the deactivation condition disappears, the relay will follow activated.</td><td>YES</td></tr>
<tr><td>33 INVERT REL8=N</td><td>G8.1.33 / Relay 8 inversion</td><td>N
Y</td><td>N</td><td>It allows user to invert the logic of relay 8 functionality.
Relay 8 has one normally open contact (connection 53/54 of the I/O Expansion Board).
<table>
<tr><th>OPT.</th><th>FUNCTION</th></tr>
<tr><td>N=NO</td><td>No inversion.</td></tr>
<tr><td>Y=YES</td><td>Inversion of relay logical function.</td></tr>
</table></td><td>NO</td></tr>
</table>

4.4.2. Subgroup 8.2 – S8.2: Analogue Outputs

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>11ANL OUT 3=01</td><td>G8.2.11 / Mode selection for Analogue Output 3</td><td>00 to 28</td><td>01</td><td>Analogue output 3 is programmable according to several configuration options.
<table><tr><th>OPT</th><th>DESCRIP.</th><th>FUNCTION</th></tr><tr><td>27</td><td>MACRO PUMP</td><td>0V = Pump OFF
10V = Pump ON
See note.
Units: -</td></tr><tr><td>28</td><td>ANLG INPUT 3</td><td>Analogue input 3 signal is transferred to analogue output.
Units: %</td></tr></table>Note: See the remaining options to configure the parameter in ‘Getting Started Manual’ of SD700.</td><td>NO</td></tr>
<tr><td>12 FORM 3=4-20mA</td><td>G8.2.12 / Format selection for Analogue Output 3</td><td>0-10V
±10V
0-20mA
4-20mA</td><td>4-20mA</td><td>Analogue output 3 is programmable in one of four possible formats according to the system requirements.</td><td>NO</td></tr>
<tr><td>13 MI RNG3=+0%
MIN RANG ANAOUT3</td><td>G8.2.13 / Low of range selection Analogue Output 3</td><td>-250% to +250%</td><td>+0%</td><td>Minimum level of analogue output 3. Minimum level setting can be higher than the maximum level setting. This allows the user to achieve inverse scaling. i.e. an increase in magnitude of the analogue input would result in an output frequency decrease and vice versa.</td><td>YES</td></tr>
</table>

Note:

- When **I/O Expansion Board** is **connected**, option 27 will be not available.
- When **I/O Expansion Board** is **not connected**, option 27 is not directly selectable by user for any analogue output. This option is automatically set for Analogue Input 1 when the user enables the fixed pump 4, and it will be automatically set to Analogue Input 2 when the user enables the fixed pump 5. For both outputs, the configuration will always be from 0 to 10V, where 0V means pump is OFF and 10V means pump connected.

Parameter	Name / Description	Range	Default value	Function	Set on RUN
14 MA RNG3=+100% MAX RANG ANAOUT3	G8.2.14 / High range selection of Analogue Output 3	-250% to +250%	+100%	Maximum level of analogue input 3. Maximum level setting can be lower than the minimum level setting. This allows the user to achieve inverse scaling. i.e. an increase in magnitude of the analogue input would result in an output frequency decrease and vice versa.	YES
15 FILTER 3=OFF FILTER ANAOUTPU3	G8.2.15 / Filter selection for Analogue Output 3	OFF=0.0 to 20.0s	OFF	Filter for analogue input 3 value. 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.	YES

4.5. Group 9 – G9: Comparators

4.5.1. Subgroup 9.1 – S9.1: Comparator 1

Parameter	Name / Description	Range	Deafult value	Function	Set on RUN
1 COMP 1 SEL=00	G9.1.1 / Source selection for Comparator 1	00 to 23	00	The source for comparator 1 can be set according to several configuration options. OPT | DESCRIP. | FUNCTION 23 | ANLG INPUT 3 | Signal connected to analogue input 3. Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.	YES

4.5.2. Subgroup 9.2 – S9.2: Comparator 2

Parameter	Name / Description	Range	Default value	Function	Set on RUN
1 COMP 2 SEL=00	G9.2.1 / Source selection for Comparator 2	00 to 23	00	Selection of Comparator 2 source. Selection options are the same as Comparator 1. See parameter G9.1.1.	YES

4.5.3. Subgroup 9.3 – S9.3: Comparator 3

Parameter	Name / Description	Range	Deafult value	Function	Set on RUN
1 COMP 3 SEL=00	G9.3.1 / Source selection for Comparator 3	00 to 23	00	Selection of Comparator 3 source. Selection options are the same as Comparator 1. See parameter G9.1.1.	YES

4.6. Group 25 – G25: Pump Control

Important note referred to Auxiliary Pumps when Pump Program is activated:

- **If I/O Expansion Board is not connected,** the auxiliary pumps 4 and 5 are controlled through analogue outputs 1 and 2 respectively. To select and enable them is described in 'Getting Started Manual' of SD700.
- **If I/O Expansion Board is connected,** the auxiliary pumps 4 and 5 are controlled by the output relays 4 and 5 of the I/O Expansion Board; it is not allowed controlling any auxiliary pump through the analogue outputs. There are not changes in order to select and enable them, and it is described in 'Getting Started Manual' of SD700.

4.6.1. Subgroup 25.2 – S25.2: PID Setting

Parameter	Name / Description	Range	Default value	Function	Set on RUN
1 PID SETP=LOCAL	G25.2.1 / PID setpoint source	LOCAL AI1 AI2 AI3	LOCAL	Selects the input source for the PID setpoint. OPT. – FUNCTION AI3 – Reference signal from Analogue Input 3. Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.	YES
2 PID aSTP=LOCAL	G25.2.2 / Alternative PID setpoint source	LOCAL AI1 AI2 AI3	LOCAL	Selects the input source to introduce the alternative PID setpoint. OPT. – FUNCTION AI3 – Reference signal from Analogue Input 3. Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.	YES

Parameter	Name / Description	Range	Default value	Function	Set on RUN
3 PID FBK=AI2	G25.2.3 / PID feedback source	AI1 AI2 PULSE AI3	AI2	Selects the input source for the system feedback signal. OPT. | FUNCTION AI3 | Reference signal from Analogue Input 3. Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.	YES

4.6.2. Subgroup 25.3 – S25.3: Start Conditions

Parameter	Name / Description	Range	Default value	Function	Set on RUN
9 FP T6 ON=10s FIX PMP6 STR DLY	G25.3.9 / Delay time to start fixed pump 6 (Relay 6)	OFF=0 to 6000s	10s	Set the delay time to start the fixed pump linked to the relay 6. Note: If time is too short, overpressure can be generated in the system. If time is too long, under-pressure can be generated.	YES
10 FP T7ON=10s FIX PMP7 STR DLY	G25.3.10 / Delay time to start fixed pump 7 (Relay 7)	OFF=0 to 6000s	10s	Set the delay time to start the fixed pump linked to the relay 7. Note: If time is too short, overpressure can be generated in the system. If time is too long, under-pressure can be generated.	YES
11 FP T8ON=10s FIX PMP8 STR DLY	G25.3.11 / Delay time to start fixed pump 8 (Relay 8)	OFF=0 to 6000s	10s	Set the delay time to start the fixed pump linked to the relay 8. Note: If time is too short, overpressure can be generated in the system. If time is too long, under-pressure can be generated.	YES

4.6.3. Subgroup 25.4 – S25.4: Stop Conditions

Parameter	Name / Description	Range	Default value	Function	Set on RUN
31 FP T6 OF=0s FPUMP6 STP DELAY	G25.4.31 / Delay time to stop fixed pump 6 (Relay 6)	0 to 6000s	0s	To set the delay time for the fixed pump assigned to the relay 6. Note: It time is too short, under-pressure could occur in the system. If time is too long over-pressure could occur.	YES
32 FP T7 OF=0s FPUMP7 STP DELAY	G25.4.32 / Delay time to stop fixed pump 7 (Relay 7)	0 to 6000s	0s	To set the delay time for the fixed pump assigned to the relay 7. Note: It time is too short, under-pressure could occur in the system. If time is too long over-pressure could occur.	YES
33 FP T8 OF=0s FPUMP8 STP DELAY	G25.4.33 / Delay time to stop fixed pump 8 (Relay 8)	0 to 6000s	0s	To set the delay time for the fixed pump assigned to the relay 8. Note: It time is too short, under-pressure could occur in the system. If time is too long over-pressure could occur.	YES

4.6.4. Subgroup 25.8 – S25.8: Setpoint Compensation due to Pressure Loss

Parameter	Name / Description	Range	Default value	Function	Set on RUN
6 COMP 6=0.0Bar SETPOINT COMPEN6	G25.8.6 / Compensation pressure at the starting of 6 fixed pumps	0.0 to 3276 Engineer. Units	0.0Bar	Allows automatic compensation of the system setpoint to prevent pressure loss in the pipe when 6 fixed speed pumps are started. Note: Default units of measurement which are displayed depend on the selected engineering units.	YES

Parameter	Name / Description	Range	Default value	Function	Set on RUN
7 COMP 7=0.0Bar SETPOINT COMPEN7	G25.8.7 / Compensation pressure at the starting of 7 fixed pumps	0.0 to 3276 Engineer. Units	0.0Bar	Allows automatic compensation of the system setpoint to prevent pressure loss in the pipe when 7 fixed speed pumps are started. Note: Default units of measurement which are displayed depend on the selected engineering units.	YES
8 COMP 8=0.0Bar SETPOINT COMPEN8	G25.8.8 / Compensation pressure at the starting of 8 fixed pumps	0.0 to 3276 Engineer. Units	0.0Bar	Allows automatic compensation of the system setpoint to prevent pressure loss in the pipe when 8 fixed speed pumps are started. Note: Default units of measurement which are displayed depend on the selected engineering units.	YES

4.6.5. Subgroup 25.9 – S25.9: Fixed Pumps Control

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>4 ENABLE PUMP4=N
Ver Nota</td><td>G25.9.4 / To enable fixed pump associated to output relay 4</td><td>N
Y</td><td>N</td><td>When activating pump control and selecting digital input as '55 FIX PUMP4 FLT', and after enabling this parameter, the relay 4 is configured to '28 PUMP CNTRL', to control fixed pumps. If the pump 4 associated to this relay is not needed, we recommend you disable it from here. In this way, the relay can be configured for other uses.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>To disable the fixed pump associated to the relay 4. The relay is programmed to '00 ALWAYS OFF' and free-configuration is allowed for it.</td></tr><tr><td>Y=YES</td><td>To enable the fixed pump associated to the relay 4. The relay is programmed to '28 PUMP CNTRL' and free-configuration is not allowed for it.</td></tr></table></td><td>YES</td></tr>
<tr><td>5 ENABLE PUMP5=N
Ver Nota</td><td>G25.9.5 / To enable fixed pump associated to output relay 5</td><td>N
Y</td><td>N</td><td>When activating pump control and selecting digital input as '56 FIX PUMP5 FLT', and after enabling this parameter, the relay 5 is configured to '28 PUMP CNTRL', to control fixed pumps. If the pump 5 associated to this relay is not needed, we recommend you disable it from here. In this way, the relay can be configured for other uses.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>To disable the fixed pump associated to the relay 5. The relay is programmed to '00 ALWAYS OFF' and free-configuration is allowed for it.</td></tr><tr><td>Y=YES</td><td>To enable the fixed pump associated to the relay 5. The relay is programmed to '28 PUMP CNTRL' and free-configuration is not allowed for it.</td></tr></table></td><td>YES</td></tr>
</table>

Note: The fixed pumps that are enabled or disabled from parameters G25.9.4 and G25.9.5, will be associated to the output relays 4 and 5 respectively, of the I/O Expansion Board, if only this board is connected.

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>13 ENABLE PMP6=N</td><td>G25.9.13 / To enable fixed pump associated to output relay 6</td><td>N
Y</td><td>N</td><td>When activating pump control and selecting digital input as '71 FIX PUMP6 FLT', and after enabling this parameter, the relay 6 is configured to '28 PUMP CNTRL', to control fixed pumps. If the pump 6 associated to this relay is not needed, we recommend you disable it from here. In this way, the relay can be configured for other uses.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>To disable the fixed pump associated to the relay 6. The relay is programmed to '00 ALWAYS OFF' and free-configuration is allowed for it.</td></tr><tr><td>Y=YES</td><td>To enable the fixed pump associated to the relay 6. The relay is programmed to '28 PUMP CNTRL' and free-configuration is not allowed for it.</td></tr></table></td><td>YES</td></tr>
<tr><td>14 ENABLE PMP7=N</td><td>G25.9.14 / To enable fixed pump associated to output relay 7</td><td>N
Y</td><td>N</td><td>When activating pump control and selecting digital input as '72 FIX PUMP7 FLT', and after enabling this parameter, the relay 7 is configured to '28 PUMP CNTRL', to control fixed pumps. If the pump 7 associated to this relay is not needed, we recommend you disable it from here. In this way, the relay can be configured for other uses.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>To disable the fixed pump associated to the relay 7. The relay is programmed to '00 ALWAYS OFF' and free-configuration is allowed for it.</td></tr><tr><td>Y=YES</td><td>To enable the fixed pump associated to the relay 7. The relay is programmed to '28 PUMP CNTRL' and free-configuration is not allowed for it.</td></tr></table></td><td>YES</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>15 ENABLE PMP8=N</td><td>G25.9.15 / To enable fixed pump associated to output relay 8</td><td>N
Y</td><td>N</td><td>When activating pump control and selecting digital input as '73 FIX PUMP8 FLT', and after enabling this parameter, the relay 8 is configured to '28 PUMP CNTRL', to control fixed pumps. If the pump 8 associated to this relay is not needed, we recommend you disable it from here. In this way, the relay can be configured for other uses.
<table>
<tr><th>OPT.</th><th>FUNCTION</th></tr>
<tr><td>N=NO</td><td>To disable the fixed pump associated to the relay 8. The relay is programmed to '00 ALWAYS OFF' and free-configuration is allowed for it.</td></tr>
<tr><td>Y=YES</td><td>To enable the fixed pump associated to the relay 8. The relay is programmed to '28 PUMP CNTRL' and free-configuration is not allowed for it.</td></tr>
</table></td><td>YES</td></tr>
</table>

4.6.6. Subgroup 25.10 – S25.10: Flow Limitation Algorithm

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>1 FLOW SEL=PULSE</td><td>G25.10.1 / Flow reading source</td><td>AI1
AI2
PULSE
AI3</td><td>PULSE</td><td>It selects the PID reference source of the instantaneous flow.
<table>
<tr><th>OPT.</th><th>FUNCTION</th></tr>
<tr><td>AI3</td><td>Reference from Analogue Input 3</td></tr>
</table>
Note: See the remaining options to configure the parameter in 'Getting Started Manual' of SD700.</td><td>YES</td></tr>
</table>

4.6.7. Subgroup 25.11 – S25.11: Registers (Read only)

<table>
<tr><th>Parameter</th><th>Name / Description</th><th>Range</th><th>Default value</th><th>Function</th><th>Set on RUN</th></tr>
<tr><td>6 P6 = -----0d -----0m</td><td>G25.11.6 / Operated time by Pump 6</td><td>-</td><td>-</td><td rowspan="3">This subgroup shows the amount of minutes and days operated by each auxiliary pump. It is especially useful when the alternation mode 2 (DUTY SHARE) is used to check if the operated times by the auxiliary pumps are equal.</td><td>-</td></tr>
<tr><td>7 P7 = -----0d -----0m</td><td>G25.11.7 / Operated time by Pump 7</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>8 P8 = -----0d -----0m</td><td>G25.11.8 / Operated time by Pump 8</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TIME RESTORE=N</td><td>G25.11.9 / Reset counters</td><td>N
S</td><td>N</td><td>It resets the counters of the pumps.<table><tr><th>OPT.</th><th>FUNCTION</th></tr><tr><td>N=NO</td><td>The counters of the pumps are not reset.</td></tr><tr><td>Y=YES</td><td>All of the counters of the pumps will be reset.</td></tr></table></td><td>NO</td></tr>
</table>

4.7. Parameters SV.3 – External Visualization

Screen	Units	Description
ANLG IN1 = +0.0V	V or mA	It shows the value of Analogue Input 1.
AIN1 Refr = +0.00%	% bottom scale AI1	It shows the value or the PID reference proportional to Analogue Input 1 in percentage.
AIN1 S = +0.00l/s	Engineering units	It shows the value of sensor 1 associated to the Analogue Input 1.
ANLG IN2 = +0.0V	V or mA	It shows the value of the Analogue Input 2.
AIN2 Refr = +0.00%	% bottom scale AI2	It shows the value or the PID reference proportional to the Analogue Input 2 signal.
AIN 2 S = +0.00Bar	Engineering units	It shows the value of sensor 2 associated to the Analogue Input 2.
ANL OUT1 = +4.0mA	V or mA	It shows the value of Analogue Output 1.
AOUT1 Refer = +0.0%	% associated magnitude	It shows the magnitude value associated to the Analogue Output 1 (speed, current ...).
ANL OUT2 = +4.0mA	V or mA	It shows the value of Analogue Output 2.
AOUT2 Refer = +0.0%	% associated magnitude	It shows the magnitude value associated to the Analogue Output 2 (speed, current ...).
DigI: 0000000 [1]	-	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 [1] This screen is shown if only I/O Expansion Board is not connected.
DigI: 00000000000 [2]	-	It shows whether the Digital Inputs are activated or not, from DI1 to DI6. Behind them, there is another input which shows the status of the motor PTC signal, and next, 4 inputs that show the activating status of the digital inputs of the I/O Expansion Board, from left to right DI7 to DI10. X: Active / 0: Not Active [2] This screen is shown if only I/O Expansion Board is connected.

<table>
<tr><th>Screen</th><th>Units</th><th>Description</th></tr>
<tr><td>Relays 1-3: X0 X</td><td>-</td><td>It shows whether the output relays 1-3 are activated or not.
X: Active / 0: Not Active</td></tr>
<tr><td>Relays 4-8: XXXXX [3]</td><td>-</td><td>It shows whether the output relays 4-8 are activated or not. These relays are on the I/O Expansion Board.
X: Active / 0: Not Active
[3] This screen is shown if only I/O Expansion Board is connected.</td></tr>
<tr><td>Speed M = +0.000m/s</td><td>Depending on config.</td><td>It shows the speed of the motor in engineering units.
Pressing ↔ 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>Centimetres / second</td></tr>
<tr><td>cm/m</td><td>Centimetres / 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.</td></tr>
<tr><td>ANLG IN3 = +0.0V</td><td>V or mA</td><td>It shows the value of Analogue Input 3.</td></tr>
<tr><td>AIN3 Refr = +0.00%</td><td>% bottom scale AI3</td><td>It shows the value or the PID reference proportional to Analogue Input 3 in percentage.</td></tr>
<tr><td>AIN3 S = +0.00Bar</td><td>Engineering units</td><td>It shows the value of sensor 3 associated to the Analogue Input 3.</td></tr>
<tr><td>ANL OUT3 = +4.0mA</td><td>V or mA</td><td>It shows the value of Analogue Output 3.</td></tr>
<tr><td>AO3 Refer = +0.0%</td><td>% associated magnitude</td><td>It shows the magnitude value associated to the Analogue Output 3 (speed, current ...).</td></tr>
</table>

4.8. Parameters SV.8 – Pump Control

<table>
<tr><th>Screen</th><th>Units</th><th>Description</th></tr>
<tr><td>R= 0.0Bar 0.0Bar</td><td>Engineering units</td><td>It shows the PID reference value (left hand) and the sensor value which is sent by the feedback signal (right hand).</td></tr>
<tr><td>REGL +0.0% +0.0%</td><td>% sensor range</td><td>See 'Getting Started Manual' of SD700.</td></tr>
<tr><td>1OFF 2OFF 3OFF</td><td>-</td><td>The status of the fixed pumps 1-3 is shown according to the next information:
<table><tr><th>Status</th><th>Description</th></tr><tr><td>OFF</td><td>Pump disabled by keypad.</td></tr><tr><td>RDY</td><td>Pump ready to start.</td></tr><tr><td>ON</td><td>Pump started.</td></tr><tr><td>FLT</td><td>Pump in a fault status (input which controls the signal is active).
Note: See digital input configuration in Pump Control mode. G1.7 and G4.1.4 parameters are linked to this.</td></tr></table></td></tr>
<tr><td>4OFF 5OFF</td><td>-</td><td>It shows the status of the fixed pumps 4-5 according to the above mentioned information.</td></tr>
<tr><td>6OFF 7OFF 8OFF</td><td>-</td><td>It shows the status of the fixed pumps 6-8 according to the above mentioned information.</td></tr>
<tr><td>Flow = 0.0l/s</td><td>Engineering units</td><td>It shows the present value read by the analogue input or by pulse input where sensor is connected.</td></tr>
<tr><td>STATUS PUMP PROGRAM</td><td>-</td><td>See 'Getting Started Manual' of SD700.</td></tr>
</table>

5. SUMMARY OF MODBUS ADDRESSES

Programming Parameters

Param.	Screen	Description	Address	Range	Modbus Range
G3.1	1 REF1 SPD=LOCAL	Reference source 1 of speed	40122	NONE AI1 AI2 AI1+AI2 RES LOCAL MREF PMOT PID EA3	0 to 9
G3.2	2 REF2 SPD=LOCAL	Reference source 2 of speed	40123	See G3.1	0 to 9
G4.1.11	11 DIGITL IN7=00	Multi-function Digital Input 7 configuration	41002	00 to 74	0 to 74
G4.1.12	12 DIGITL IN8=00	Multi-function Digital Input 8 configuration	41003	00 to 74	0 to 74
G4.1.13	13 DIGITL IN9=00	Multi-function Digital Input 9 configuration	41004	00 to 74	0 to 74
G4.1.14	14 DIGITL I10=00	Multi-function Digital Input 10 configuration	41005	00 to 74	0 to 74
G4.5.1	1 SENSOR 3 ?=N	Sensor of Analogue Input 3 enable	41114	N Y	0 to 1

Param.	Screen	Description	Address	Range	Modbus Range
G4.5.2	2 SENSOR 3= l/s	Selection of sensor 3 units	41116	% 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 Hz rpm	0 to 18
G4.5.3	3 AIN3 FORMAT=mA	Analogue Input 3 format	41112	V mA	0 to 1
G4.5.4	4 INmin3=+4mA	Minimum range Analogue Input 3	41104	-10V to G4.5.6 +0mA to G4.5.6	-10000 to +10000 0 to +20000
G4.5.5	5 Smi3=+0.0l/s	Minimum range of sensor 3	41107	-3200 to G4.5.7 Engineer. Units	-3200 to +3200
G4.5.6	6 INmax3=+20mA	Maximum range Analogue Input 3	41102	G4.5.4 to +10V G4.5.4 to +20mA	-10000 to +10000 0 to +20000
G4.5.7	7 Sma3=+10.0l/s	Maximum range of sensor 3	41105	G4.5.5 to +3200 Engineer. Units	-3200 to +3200
G4.5.8	8 SPD LO 3=+0%	Speed for the minimum range of Analogue Input 3	41103	-250% to G.4.5.9	-20480 to +20480
G4.5.9	9 SPD HI 3=+100%	Speed for the maximum range of Analogue Input 3	41101	G4.5.8 to +250%	-20480 to +20480
G4.5.14	14 AIN3 LOSS=N	Protection for Analogue Input 3 loss	41113	N Y	0 to 1

Param.	Screen	Description	Address	Range	Modbus Range
G4.5.15	15 3 Z BAND=OFF	Zero band filter for Analogue Input 3	41115	OFF=0.0, 0.1 to 2.0%	0 to 163
G4.5.16	16 FILTER3=OFF	Low Pass filter for Analogue Input 3	41117	OFF=0.0, 0.1 to 20.0%	0 to 200
G6.1	1 SEL REF=MREF	Source selection for introducing reference signal	40142	NONE AI1 AI2 RESERV MREF LOCAL locPID EA3	0 to 7
G6.3	3 SEL FBK=AI2	Selection of feedback signal source	40143	See G6.1	0 to 4
G8.1.14	14 SEL RELAY4=02	Selection of Relay 4 control source	41051	00 to 33	0 to 33
G8.1.15	15 T R4 ON=0.0s	ON delay time for Relay 4	41052	0.0 to 999s	0 to 9990
G8.1.16	16 T R4 OF=0.0s	OFF delay time for Relay 4	41053	0.0 to 999s	0 to 9990
G8.1.17	17 INVERT REL4=N	Relay 4 inversion	41054	N Y	0 to 1
G8.1.18	18 SEL RELAY5=02	Selection of Relay 5 control source	41055	00 to 33	0 to 33
G8.1.19	19 T R5 ON=0.0s	ON delay time for Relay 5	41056	0.0 to 999s	0 to 9990
G8.1.20	20 T R5 OF=0.0s	OFF delay time for Relay 5	41057	0.0 to 999s	0 to 9990
G8.1.21	21 INVERT REL5=N	Relay 5 inversion	41058	N Y	0 to 1
G8.1.22	22 SEL RELAY6=02	Selection of Relay 6 control source	41059	00 to 33	0 to 33

Param.	Screen	Description	Address	Range	Modbus Range
G8.1.23	23 T R6 ON=0.0s	ON delay time for Relay 6	41060	0.0 to 999s	0 to 9990
G8.1.24	24 T R6 OF =0.0s	OFF delay time for Relay 6	41061	0.0 to 999s	0 to 9990
G8.1.25	25 INVERT REL6=N	Relay 6 inversion	41062	N Y	0 to 1
G8.1.26	26 SEL RELAY7=02	Selection of Relay 7 control source	41063	00 to 33	0 to 33
G8.1.27	27 T R7 ON=0.0s	ON delay time for Relay 7	41064	0.0 to 999s	0 to 9990
G8.1.28	28 T R7 OF=0.0s	OFF delay time for Relay 7	41065	0.0 to 999s	0 to 9990
G8.1.29	29 INVERT REL7=N	Relay 7 inversion	41066	N Y	0 to 1
G8.1.30	30 SEL RELAY8=02	Selection of Relay 8 control source	41067	00 to 33	0 to 33
G8.1.31	31 T R8 ON=0.0s	ON delay time for Relay 8	41068	0.0 to 999s	0 to 9990
G8.1.32	32 T R8 OF=0.0s	OFF delay time for Relay 8	41069	0.0 to 999s	0 to 9990
G8.1.33	33 INVERT REL8=N	Relay 8 inversion	41070	N Y	0 to 1
G8.2.11	11 ANL OUT 3=01	Mode selection for Analogue Output 3	41201	00 to 28	0 to 28
G8.2.12	12 FORM 3=4-20mA	Format selection for Analogue Output 3	41202	0-10V ±10V 0-20mA 4-20mA	0 to 3
G8.2.13	13 MI RNG3=+0%	Low of range selection Analogue Output 3	41203	-250% to +250%	-20480 to +20480

Param.	Screen	Description	Address	Range	Modbus Range
G8.2.14	14 MA RNG3=+100%	High range selection of Analogue Output 3	41204	-250% to +250%	-20480 to +20480
G8.2.15	15 FILTER 3=OFF	Filter selection for Analogue Output 3	41205	OFF=0.0 to 20.0s	0 to 200
G9.1.1	1 COMP 1 SEL=00	Source selection for Comparator 1	40302	00 to 23	0 to 23
G9.2.1	1 COMP 2 SEL=00	Source selection for Comparator 2	40311	00 to 23	0 to 23
G9.3.1	1 COMP 3 SEL=00	Source selection for Comparator 3	40320	00 to 23	0 to 23
G25.2.1	1 PID SETP=LOCAL	PID setpoint source	42045	LOCAL AI1 AI2 AI3	0 to 3
G25.2.2	2 PID aSTP=LOCAL	Alternative PID setpoint source	42374	LOCAL AI1 AI2 AI3	0 to 3
G25.2.3	3 PID FBK=AI2	PID feedback source	42046	AI1 AI2 PULSE AI3	0 to 3
G25.3.9	9 FP T6 ON=10s	Delay time to start fixed pump 6 (Relay 6)	42406	2 to 6000s	20 to 60000
G25.3.10	10 FP T7ON=10s	Delay time to start fixed pump 7 (Relay 7)	42407	2 to 6000s	20 to 60000
G25.3.11	11 FP T8ON=10s	Delay time to start fixed pump 8 (Relay 8)	42408	2 to 6000s	20 to 60000
G25.4.31	31 FP T6 OF=0s	Delay time to stop fixed pump 6 (R6)	42409	2 to 6000s	20 to 60000
G25.4.32	32 FP T7 OF=0s	Delay time to stop fixed pump 7 (R7)	42410	2 to 6000s	20 to 60000

Param.	Screen	Description	Address	Range	Modbus Range
G25.4.33	33 FP T8 OF=0s	Delay time to stop fixed pump 8 (R8)	42411	2 to 6000s	20 to 60000
G25.8.6	6 COMP 6=0.0Bar	Compensation pressure at the starting of 6 fixed pumps	42415	0.0 to 3276 Engineer. Units	0 to 32760
G25.8.7	7 COMP 7=0.0Bar	Compensation pressure at the starting of 7 fixed pumps	42416	0.0 to 3276 Engineer. Units	0 to 32760
G25.8.8	8 COMP 8=0.0Bar	Compensation pressure at the starting of 8 fixed pumps	42417	0.0 to 3276 Engineer. Units	0 to 32760
G25.9.13	13 ENABLE PMP6=N	To enable fixed pump associated to output relay 6	42412	N Y	0 to 1
G25.9.14	14 ENABLE PMP7=N	To enable fixed pump associated to output relay 7	42413	N Y	0 to 1
G25.9.15	15 ENABLE PMP8=N	To enable fixed pump associated to output relay 8	42414	N Y	0 to 1
G25.10.1	1 FLOW SEL=PULSE	Flow reading source	42141	AI1 AI2 PULSE AI3	0 to 3
G25.11.6	6 P6 = -----0d -----0m	Operated time by Pump 6	42397 – d 42400 – m	-	Real value = Modbus value
G25.11.7	7 P7 = -----0d -----0m	Operated time by Pump 7	42398 – d 42401 – m	-	Real value = Modbus value
G25.11.8	8 P8 = -----0d -----0m	Operated time by Pump 8	42399 – d 42402 – m	-	Real value = Modbus value
G25.11.9	TIME RESTORE=N	Reset counters	42017	N Y	0 to 1

Visualization Parameters

Param.	Screen	Description	Address	Modbus Range
SV3.11 [1]	DigI: 0000000	Digital Inputs and PTC status	40196	Bit 0 = DI1 – Bit 5 = DI6 / Range: 0 to 1 Bit 6 = PTC / Range: 0 to 1 [1] This screen is shown if only the I/O Expansion Board is not connected.
SV3.11 [2]	DigI: 00000000000	Digital Inputs and PTC status	40196	Bit 0 = DI1 – Bit 5 = DI6 / Range: 0 to 1 Bit 6 = PTC / Range: 0 to 1 Bit 7 = DI7 / Range: 0 to 1 Bit 8 = DI8 / Range: 0 to 1 Bit 9 = DI9 / Range: 0 to 1 Bit 10 = DI10 / Range: 0 to 1 [2] This screen is shown if only the I/O Expansion Board is connected.
SV3.12	Relays 1-3: X0X	Output relays status (Relays 1-3)	40197	Bit 0 = R1 / Range: 0 to 1 Bit 1 = R2 / Range: 0 to 1 Bit 2 = R3 / Range: 0 to 1
SV3.13 [3]	Relays 4-8: XXXXX	Output relays status (Relays 4-8)	41307 → R4 41308 → R5 41309 → R6 41310 → R7 41311 → R8	0 to 1 [3] This screen is shown if only the I/O Expansion Board is connected.
SV3.15	ANLG IN3 = +0.0V	Average value of the Analogue Input 3	41301	Real value = (Modbus value / 1000)
SV3.16	AIN3 Refr = +0.00%	Speed reference or PID setpoint proportional to the AI3	41306	8192 = 100% maximum range of the AI3
SV3.17	AIN3 S = +0.00Bar	Value of sensor 3 associated to the AI3	41302	Real value = (Modbus value / 10)
SV3.18	ANL OUT3 = +4.0mA	It shows the value of the Analogue Output 3	41304	Real value = (Modbus value / 1000)
SV3.19	AO3 Refer = +0.0%	Value of the magnitude associated to the AO3	41305	8192 = 100% maximum range of the AO3
SV8.5	6OFF 7OFF 8OFF	Status of the fixed pumps 6, 7 and 8	42403 → B6 42404 → B7 42405 → B8	0 → OFF 1 → RDY 2 → ON 3 → FLT

6. FAULT MESSAGES

6.1. Description of Fault List

A fault has been added to the fault list of the SD700.

DISPLAY	DESCRIPTION
F59 AIN3 LOSS	The SD700 is not receiving a signal on Analogue Input 3 and 'G4.5.14 AIN3 LOSS' is set to 'Yes'. The signal connected to this input has been lost.

6.2. Procedure for Fault Solution

DISPLAY	POSSIBLE CAUSE	SOLUTION
F59 AIN3 LOSS	Analogue input cable has been come loose or disconnected (terminals 41 and 42 of the I/O Expansion Board).	Verify the wiring of the analogue signal.
	The sensor connected to the analogue input is damaged.	Verify the status of the device connected to the analogue input which provides the analogue signal.

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