V5

DIGITAL SOFT STARTER

User's Manual MT0001 Rev. F

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POWER ELECTRONICS

CONSIGMENT

❑ RECEPTION

- V5 soft-starters are carefully tested and properly packed before leaving the factory.
- In the event of transport damage, please ensure that you notify the transport agency and ***POWER ELECTRONICS (+34 96 136 65 57) or your nearest agent***, within 24hrs from receipt of the goods.

❑ UNPACKING

Check the V5 packing for the following contents:

- V5 soft starter. Make sure soft starter model and serial number matches the markings on the box, delivery note and is the correct unit ordered.
- V5 Technical Manual.

❑ SECURITY

- It is installer's responsibility to ensure the configuration and installation of the V5 meets the requirements of any site specific, local and national electrical regulations.
- The V5 operates from a HIGH VOLTAGE, HIGH ENERGY ELECTRICAL SUPPLY. Always isolate before servicing.
- Service only by qualified personnel. In case of any service or installation questions please contact Power Electronics Technical Department or your local distributor.
- Always wear safety glasses when operating with the door opened.
- The V5 contains static sensitive printed circuit boards. Use static safe procedures when handling these boards.
- During acceleration and deceleration mode, it is recommended to unplug a capacitor battery.
- The SCR's used at the power circuite are electronic switches therefore it is recommended to use the configurations as shown on Fig. 2.1 or Fig. 2.2 of this manual.

REVISIONS

Date	Revision	Description
November 2002	A	
January 2003	B	Add “Starts limits/hour” in PROTECTIONS (page 14). Changes in DT0008C, Control terminals. Delete DT0019C and DT0020C in G4. ACCELERATION.
July 2003	C	Error corrections.
September 2003	D	New software rev. 2.0. New hardware rev. E
November 2003	E	G16 pump control group added. New software rev. 2.1. Hardware rev. E
September 2004	F	Update power ratings.

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1. MOUNTING AND WIRING

1.1 ENVIRONMENTAL CONDITIONS

The maximum ambient/working temperature for the V5 is 45ºC. The V5 can be operated in a higher ambient temperature of up to 50ºC by de-rating the soft starter by 2% for every degree over 45ºC.

Example: For a 75kW Motor with rated current of 136Amps and a working (ambient) temperature for the V5 of 50ºC.

Soft-Starter required: At 45ºC the soft starter required would be a V50145 (145Amps). However at 50ºC ambient the soft starter should be oversized by 2% for every degree over 45ºC and hence the soft starter's increased rating is:

2% x 5ºC = 10% increased rating.
I motor x 10%=136 x 1.1=149,6Amp

The soft starter therefore required is a V50170 (170Amps).

1.2 IEC PROTECTION

The V5 soft starter ingress protection is IP20. This means that the soft starter is protected against finger contact with hazardous or moving parts inside the enclosure, and protection of against ingress of foreign objects with a diameter greater than 12mm.

1.3 MOUNTING

The V5 soft starter is designed for vertical mounting. Input bus bars are located in the top and motor bus bars must be connected at the bottom, except for models V50009 to V50090 where both, input and output must be connected at the bottom.

To improve heat dissipation, it is recommended to mount the soft starter on a metal gear plate.

When installed within a cabinet, proper ventilation is to be provided. A minimum of 40mm side clearance and 150mm top and bottom distance is to be kept between soft starters and or side of the enclosure.

Do not install V5 above any heat source, unless heat airflow is forced out of the cabinet.

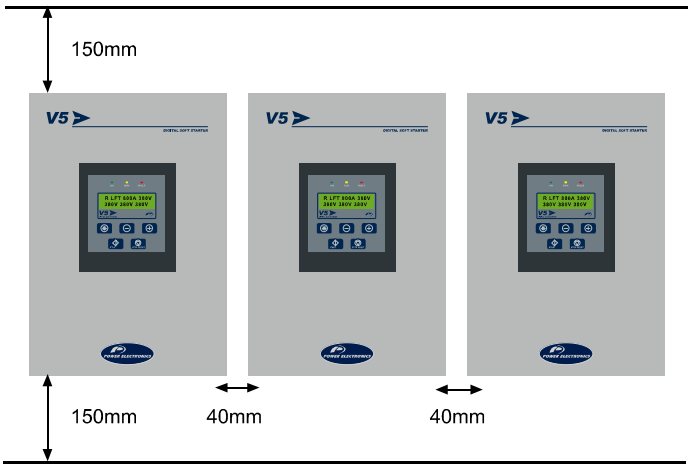

Figure 1. Vertical mounting.

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1.4 POWER LOSS DISSIPATION

The V5 has a power loss of 3 watts per amp.
For example this means that a V50210 has a power loss of 630 watts at full load.

1) Without forced cooling:

Practical example:
Ambient temperature is 30ºC (Ta).
Maximum working temperature of the V5 is 45ºC (Tr).
Power loss of the soft starter is 3 watts per amp at full load and 6 watts per amp during the start (only with more than 6 starts per hour).
If the V50017 motor load draws 15A continuously, our power loss will equal:

P = I_m *x Losses per Amp*
P = 15 x 3 = 45 watts

This is the worst case assuming a duty cycle of 100% at full load (45W). You must also take the losses of switches, contactors, relays, etc, into account (20 watts):

P_{loss}= 45 + 20 = 65 watts

The heat transfer coefficient of metals and polyester must be known (depending on enclosure type):

- **Polyester:** 3.5 W /m^2 K°
- **Metal:** 5.5 W /m^2 K°

The minimum surface area required for a metal enclosure without forced cooling is:

Surface= P_{loss} / K x (Tr – Ta)
Surface = 65W / (5.5W/ m² x (45K – 30K) = 0.78 m²

Choose a 800x600x400 cabinet, the total area of dissipation is:

Area= Door + 2 (side) + Top Covers
Area= (0,8m x 0,6m) + 2 x (0,8m x 0,4m) + (0,6m x 0,4m) = 1,36m².

The area of the cabinet is high enough to dissipate the total power loss.

NOTE: **When using adjoining cabinets, only take one side into account to determine the total surface area in any thermal calculations.**

2) With forced cooling:

The power loss dissipated is the same as without forced cooling, however here you must calculate the air flow required to obtain the desired differential temperature between the inside and the outside of the enclosure.
Example: We have a V50017 working at 30ºC ambient temperature. We want the air inside the cabinet less than 45ºC:

P_{loss} = Total power loss dissipated.
Tr = Maximum temperature inside the cabinet .
Ta = Ambient temperature.
Ø = Airflow required in m^3/min.

Area= P_{loss} / 20 x (Tr – Ta)
Area= 65 / 20 x (45 – 30) = 0.22m^3/min

NOTE: **Using filters at the air intake/exhaust of the cabinet should protect the V5 from dust.**

1. 5 WIRING CONFIGURATION

Most electrical wiring regulations require a mains isolator on solid state equipment. The V5 falls in to this category. This is to ensure there is an air break in the circuit as semiconductors cannot be relied upon to be safe isolation. There are many choices, the most common are thermal magnetic protection with a trip coil in conjunction with a contactor.

Magnetic protection is required to protect the V5 from damage due in the event of a short circuit within the V5 or on the output cabling or motor. When faster protection is desired, semiconductor fuses are recommended. The fuses should be mounted as close to the V5 as possible. Power factor correction capacitors must not be connected after the fuses or on the output of the V5.

The V5 protects the motor with electronic overload sensing, so an external overload relay is not necessary. If multiple motors are connected, separate overloads are required for each motor.

An isolator can be fitted after the V5 but is recommended for off load use only. Whilst a motor isolator is not necessary for the operation of the V5, site standards or electrical wiring regulations may require this to be installed.
If a contactor is to be fitted, one of the V5 output relays can be used to energise this on receiving an external start signal. (G7.1 Relay 1 = 11 Instantaneous).

- **Standard configuration.**

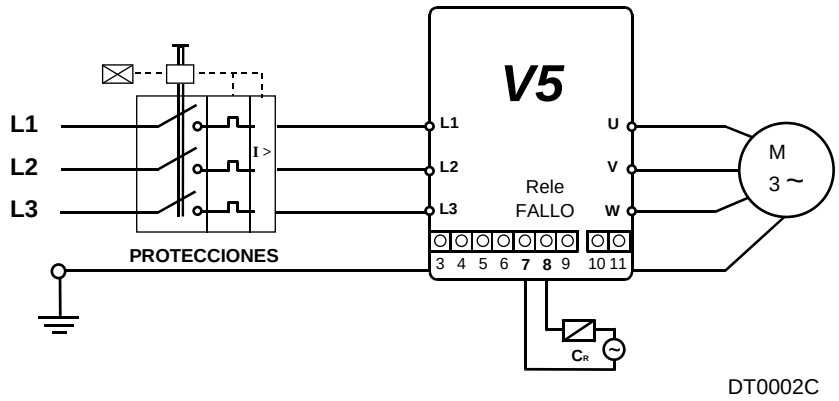

Figure 2.1 Recommended power wiring.

NOTE: RELAY 3 (Terminals 7 and 8) set to mode GENERAL FAULT G7.3= 09

- **Configuration with supply contactor**

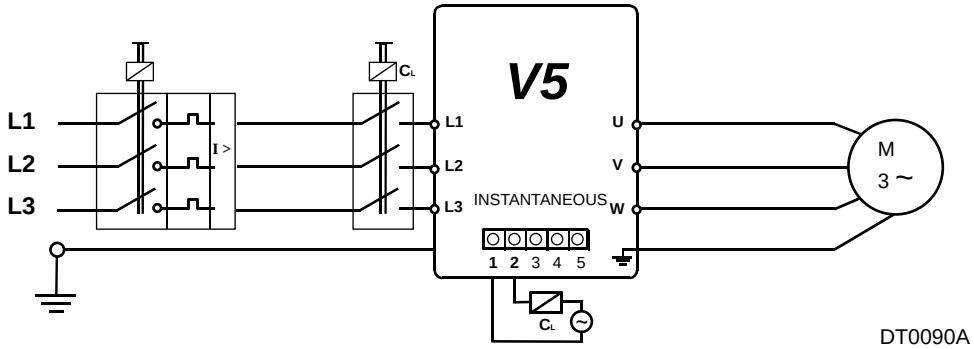

Figure 2.2 Supply contactor (CL) configuration.

NOTE: RELAY 1 (Terminals 1 and 2) set as INSTANTANEOUS G7.1= 14

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- **By-pass configuration.**

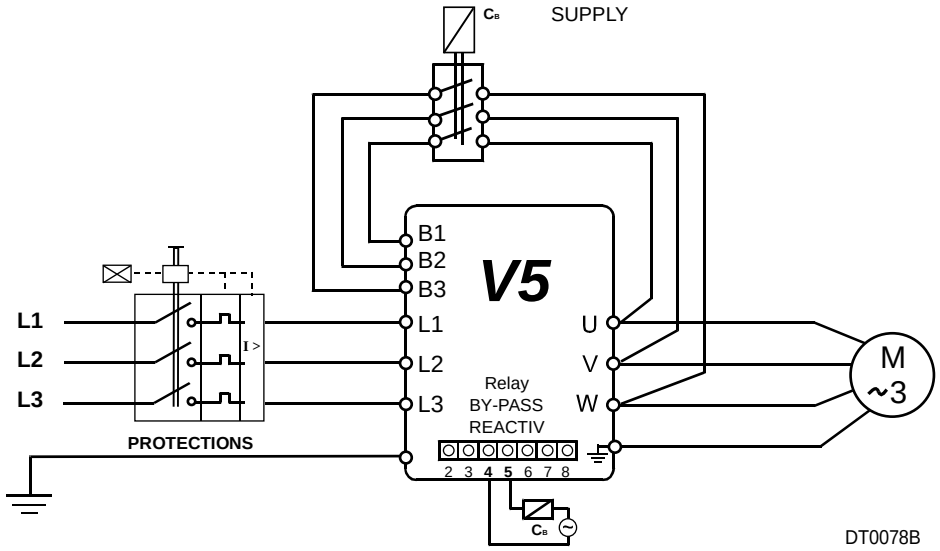


Figure 2.3 By-pass configuration.

NOTE: RELAY 2 (Terminals 4 and 5) set as BY-PASS / REACT G7.2= 15
By-pass contactor can be AC1 category.

- **Configuration for compensation capacitors.**

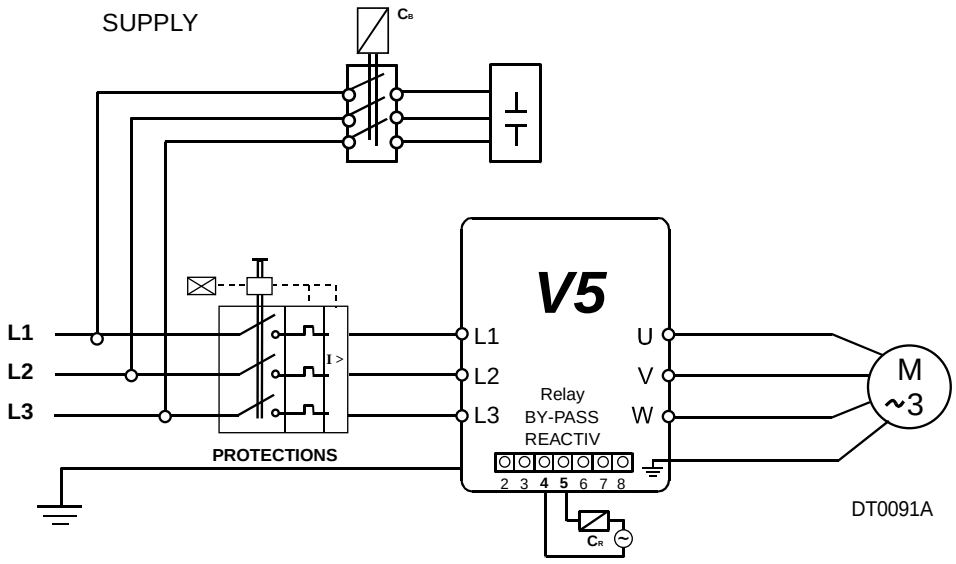


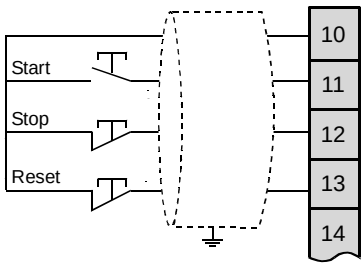
Figure 2.4 Relay configuration.

NOTE: RELAY 2 (Terminals 4 and 5) set as BY-PASS / REACT G7.2= 15.
To avoid damages do not connect capacitors at the output of the V5
This circuitry is only valid if compensation capacitors are operating for the motor connected to the V5.

CONTROL WIRING
The following control wiring diagram corresponds to the standard configuration for external Start/Stop pushbuttons.

NOTE: Wiring distance.
Control wiring should not be run in parallel with power input or output cables to the motor. There should be a minimum distance of 300mm between power and control cables, and should be crossed at right angles.

Inputs and outputs.
All signals do need to be screened when running in parallel with power cables.



DT0003D

Figure 3. Control wiring.

1. 6 CHECKS BEFORE COMMISSIONING THE V5 SOFTSTARTER

1. Check for foreign objects in the V5 cabinet – particularly that left there from installation.

2. Check that the control board supply (L - N, 230Vca +/-10%) is connected.

3. Check that the power supply is connected to the terminals L1, L2, L3 and the motor is connected to the terminals U, V, W. Confirm that the supply is according to the V5 specifications. The motor current should not exceed the V5 rating.

4. Check all control wiring, close V5 cabinet and ensure the installation is electrically safe and that it is safe to run the motor.

5. It is recommended that all digital inputs are disconnected before applying voltage to the V5 for the first time to prevent accidentally starting the motor. It is also recommended not to apply main voltage (3ph~) before commissioning the soft starter.

6. Digital input status can be checked through screen **G0: DIG INPUT= X 0 0 0 0 F.**
   X indicates this digital input is on, 0 indicates the digital input is off.
   K indicates PTC input is not active.
   F indicates PTC input is active.
   As default, the digital inputs are disabled G6.1 OPER MODE=1 (LOCAL). This means that the V5 start and stop can only be controlled via the display unit pushbuttons.

7. The default configuration for the digital outputs is as follows:

   Relay 1: *Instantaneous* — Switch ON = V5 accelerates.
   Switch OFF= Deceleration of the V5 is finished.

   Relay 2: *Bypass* — Switch ON at end of ramp up.
   Switch OFF at start of ramp down.

   Relay 3: *Fault* — Energized on fault conditions.

   Relay configuration can be modified through Screen Group G7 - Outputs.

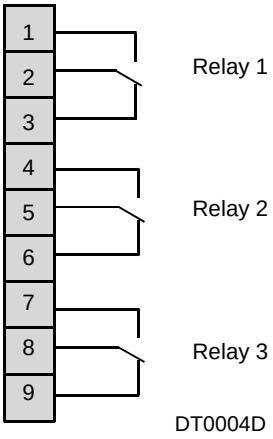


Figure 4. Relays configuration.

8. Ensure the stop circuit is open before configuring the V5 to work in 3-wire mode.

9. Set the motor (rated) nameplate and start/stop parameters, protection and user parameters.

10. Set jumpers as follows.

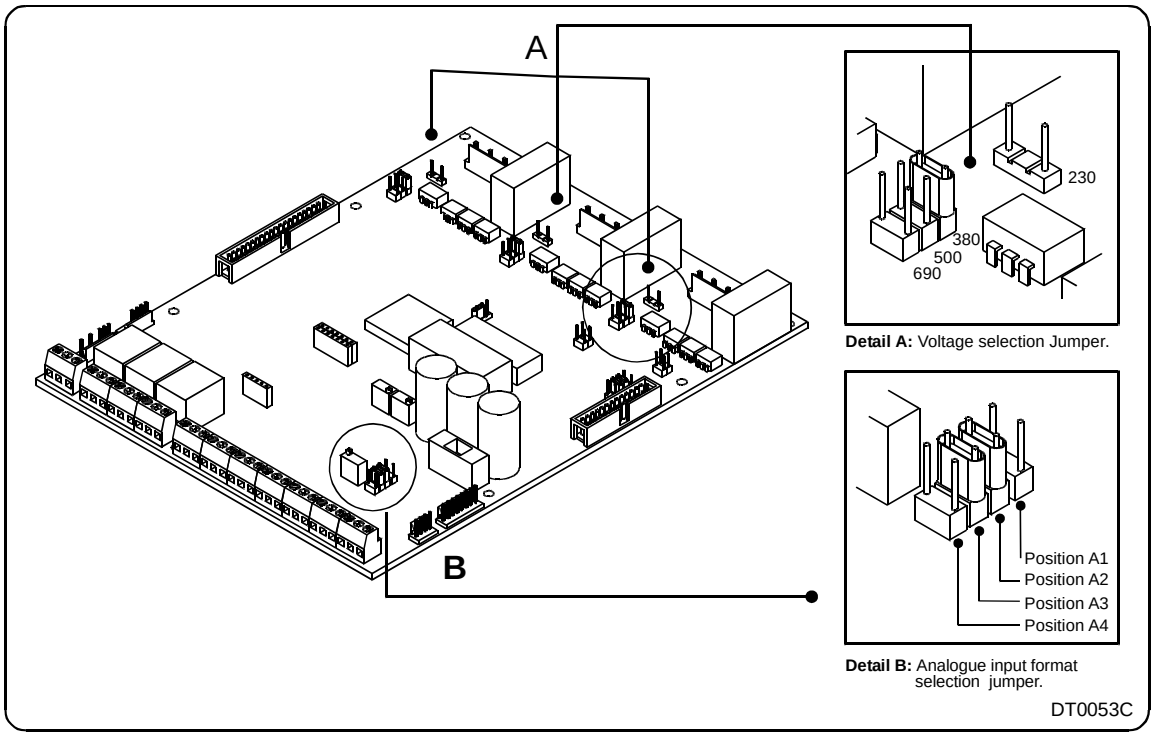


Figure 5. Set Jumpers.

DETAIL A	**VOLTAGE SELECTION JUMPER**
Description	Select motor voltage.
Function	Set input supply voltage.
Adjustment	Position 1: 230V Position 2: 400V Position 3: 500V Position 4: 690V

***NOTE*:** **230V/400V/500V soft starter use control board with reference E001.**
690V soft starter use control board with reference E002.

DETAIL B	**ANALOGUE INPUT FORMAT SELECTION JUMPER**
Description	Select Analogue input formats.
Default value	AI1= (0-10V) AI2= (0-20mA)
Function	Set Analogue input operating formats.
Adjustment	Position A1: 0-20mA/ 4-20mA (Analogue input 1). Position A2: 0-10V (Analogue input 1). Position A3: 0-20mA/ 4-20mA (Analogue input 2). Position A4: 0-10V (Analogue input 2).

2. ELECTRICAL SPECIFICATIONS

INPUT

Input voltage.	230-500V(~3ph), -20%+10%, 690V.
Supply frequency.	47-62 Hz.
Control Voltage.	230V +/-10%, other voltages on demand.

OUTPUT

Output voltage.	0 - 100% Supply Voltage.
Output frequency.	47 - 62 Hz.
Efficiency (at full load).	> 99%

ENVIRONMENTAL CONDITIONS

Ambient temperature.	Minimum: -10ºC. Maximum: 45ºC – De-rating up to 50ºC.
Altitude losses.	>1000m 1% each 100m, maximum 3000m.
Protection degree.	IP20

PROTECTIONS	Input phase loss. Input phase sequence. High/low input voltage. Starting current limit. Locked Rotor. Motor overload (thermal model). Motor underload. Phase unbalance > 40%. Motor over temperature (PTC - normal status 150R - 2K7). Shearpin current. Number of starts / hour
V5 PROTECTIONS	Thyristor fault. V5 over temperature.
SETTING	Torque surge (Power Electronics exclusive starting method). Initial torque. Initial torque time. Acceleration time. Current limit: 1 to 5 In. Overload: 0.8 to 1.2 In, Overload slope: 0 to 10. Deceleration time/Freewheel stop. DC braking. Slow speed (1/7of fundamental frequency). Dual setting. Number of starts allowed. Torque control. Water hammer surge control stop. For other settings refer to G1 to G16 sections of the present manual.
INPUT SIGNALS	2 Analogue inputs 0-10V, 4-20mA. 5 configurable digital inputs. 1 PTC input.
OUTPUT SIGNALS	1 Analogue output 4-20mA. 3 output relays changeover (10A 250Vac non inductive).
SERIAL COMMUNICATIONS	Physical level RS232/RS485. Options available. Modbus communication industrial protocol. Profibus and DeviceNet via interface.

INFORMATION DISPLAY

Phase current.
Supply voltage
Relays status.
Digital inputs/PTC status.
Analogue inputs value.
Analogue output value.
Overload status.
Motor supply frequency.
Motor power factor.
Developed power, motor shaft torque.
Fault history (5 most recent faults).

CONTROL SOURCES :
(Start/Stop-Reset)

Local via keypad.
Remote via digital inputs.
Remote via Serial Communication.(Modbus RS232/RS485).

LED'S INDICATIONS

LED 1 Green, voltage present on control board.
LED 2 Orange .
Blinking: motor accelerating/decelerating.
On: motor running.
LED 3 Red on, fault present.

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3. DIMENSIONS

FRAME 1	
CODE	**V50009/.6-V50090/.6**
H (mm)	414
W (mm)	224
D (mm)	230
Weight (Kg.)	12,0

Table 1. Frame 1

FRAME 2	
CODE	**V50110/.6-V50210/.6**
H (mm)	524
W (mm)	314
D (mm)	260
Weight (Kg.)	18,5

Table 2. Frame 2

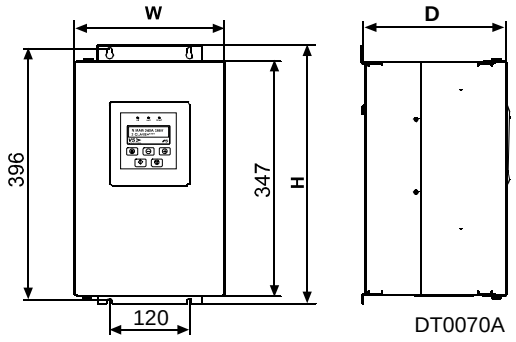

Figure 6. Dimensions frame 1

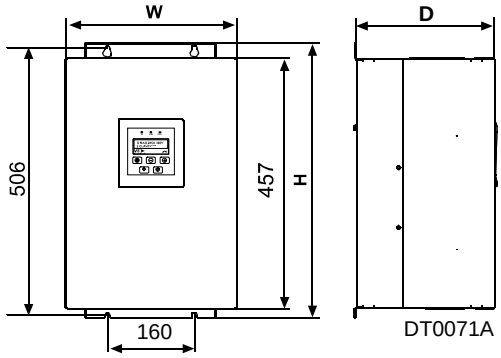

Figure 7. Dimensions frame 2

FRAME 3	
CODE	**V50275/.6-V50460/.6**
H (mm)	791
W (mm)	580
D (mm)	309
Weight (Kg.)	56,0

Table 3. Frame 3

FRAME 4	
CODE	**V50580/.6-V50900/.6**
H (mm)	926
W (mm)	640
D (mm)	324
Weight (Kg.)	80,0

Table 4. Frame 4

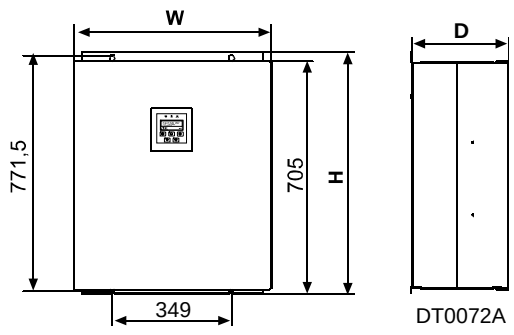

Figure 8. Dimensions frame 3

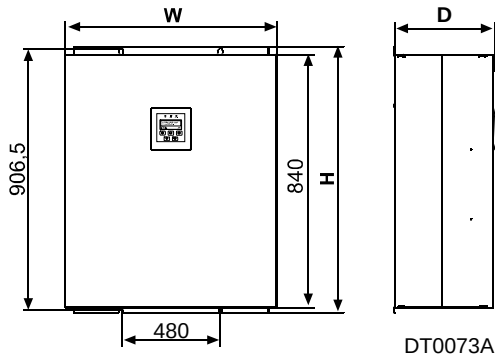

Figure 9. Dimensions frame 4

4. STANDARD POWER RATINGS

IP RATING	FRAME	REFERENCE	I (A)	230V kW	400V kW	440V kW	500V kW
IP20	1	**V50009**	9	2	4	5	5,5
		V50017	17	5	7	9	11
		V50030	30	9	15	18,5	18
		V50045	45	14	22	25	30
		V50060	60	18	30	35	40
		V50075	75	22	37	45	50
		V50090	90	25	45	55	65
	2	**V50110**	110	35	55	65	80
		V50145	145	45	75	90	100
		V50170	170	50	90	110	115
		V50210	210	65	110	120	150
		V50250	250	75	132	160	180
	3	**V50275**	275	85	150	170	200
		V50330	330	100	185	200	220
		V50370	370	115	200	220	257
		V50460	460	145	250	270	315
	4	**V50580**	580	185	315	375	415
		V50650	650	200	355	425	460
		V50800	800	250	450	500	560
		V50900	900	280	500	560	630

Table 5. Standard ratings for 230V and 500V supply voltage.

IP RATING	FRAME	REFERENCE	I (A)	690V KW
IP20	1	**V50009.6**	9	7,5
		V50017.6	17	15
		V50030.6	30	30
		V50045.6	45	45
		V50060.6	60	60
		V50075.6	75	75
		V50090.6	90	90
	2	**V50110.6**	110	110
		V50145.6	145	140
		V50170.6	170	160
		V50210.6	210	200
		V50250.6	250	230
	3	**V50275.6**	275	250
		V50330.6	330	315
		V50370.6	370	355
		V50460.6	460	450
	4	**V50580.6**	580	560
		V50650.6	650	630
		V50800.6	800	800
		V50900.6	900	900

Table 6. Standard ratings for 690V supply voltage.

- *For higher power ratings, contact to Power Electronics customer support.*

5. CONFORMITY DECLARATION

CERTIFICADO DE ENSAYO / TEST CERTIFICATE
Nº. 16157CEM.001

Producto **Product**	**: ARRANCADOR ELECTRONICO DIGITAL** **: DIGITAL SOFT-STARTER**
Marca comercial **Trade Mark**	**: POWER ELECTRONICS**
Modelo /Tipo Ref. **Model / Type Ref.**	**: SERIE V5**
Fabricante **Manufacturer**	**: POWER ELECTRONICS ESPAÑA, S.L.**
Peticionario **Tested on request of**	**: POWER ELECTRONICS ESPAÑA, S.L.**
Otros datos de identificación- n/s **Full identification f the product-s/n**	**: Arrancador a semiconductor para motores de inducción en régimen de baja tensión. Nº de serie: 100053.** **: Starter to semiconductor for induction motors in low voltage regime. Serial number: 100053.**
Norma(s) de referencia **Standard(s)**	**: Sobre la muestra M/02 / On the sample S/02** **EMISIÓN ELECTROMAGNÉTICA / EM Emission.** - **UNE EN 60947-4-2,1998:** **- CISPR 11, 1990:** Conducida continua/Cont. conducted (Grupo 2 Clase A / Group 2 Class A) ; - **CISPR 11, 1990:** Radiada/Radiated (Group 1 Clase A / Group 1 Class A). **INMUNIDAD ELECTROMAGNÉTICA / EM Immunity.** - **UNE EN 60947-4-2,1998:** **- EN 61000-4-3 (1996) & ENV 50204 (1995):** Campo radiado EM de RF / EM Radiated field of RF; **- EN 61000-4-3 (1996),** RF en modo común / RF common mode; **- EN 61000-4-11 (1994),** Interrupciones de alimentación / Dips, interruptions. - **EN 50082-2 (1995),** Inmunidad industrial / Industrial Inmunity: **- EN 61000-4-8 (1993),** Campo magnético a 50 Hz / 50Hz H- field; **Sobre la muestra M / 03 / On the sample S/03:** **EMISIÓN ELECTROMAGNÉTICA / EM Emission.** **- EN 61000-3-2 1995 / A1: 1998 / A2: 1998 / A14: 2000,** Armónicos / Harmonics. **INMUNIDAD ELECTROMAGNÉTICA / EM Immunity.** - **UNE EN 60947-4-2,1998:** **- EN 61000-4-2 (1995):** Descarga electrostática / ESD; **- EN 61000-4-4 (1995),** Ráfagas de transitorios rápidos / EFT burst; **- EN 61000-4-5 (1995),** Onda de choque / Surges;
Certificado basado en el informe **Test certificate based on the test report**	**: Nº 16157IEM.001 DE FECHA / dated: 2002-07-02**
Resultado **Summary**	**: CONFORME** **COMPLIANT**

CETECOM es un laboratorio de ensayo acreditado por la Entidad Nacional de Acreditación (ENAC), para los ensayos indicados en el Certificado Nº 51/LE203. No están incluidos los ensayos de armónicos.
CETECOM is a testing laboratory accredited by ENAC (Entidad Nacional de Acreditación) to carry out the tests dercribed in the Certificate Nº 51/LE203. There are not included the harmonics tests.
Nota: Este certificado de ensayo es aplicable a la unidad(es) del producto y los correspondientes ensayos que se indican en el informe de referencia.
Note: This test certificate is applicable to the unit(s) of the product submitted and the corresponding tests shown in the reference report.

Málaga, a 5 de Julio de 2002

Antonio Rojas
Consultor EMC
EMC Consultant

Francisco Broissin
Director de Área
Area Director

Centro de Tecnología de las Comunicaciones, S.A.
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http://www.cetecom.es

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6. DISPLAY UNIT AND KEYPAD OPERATION

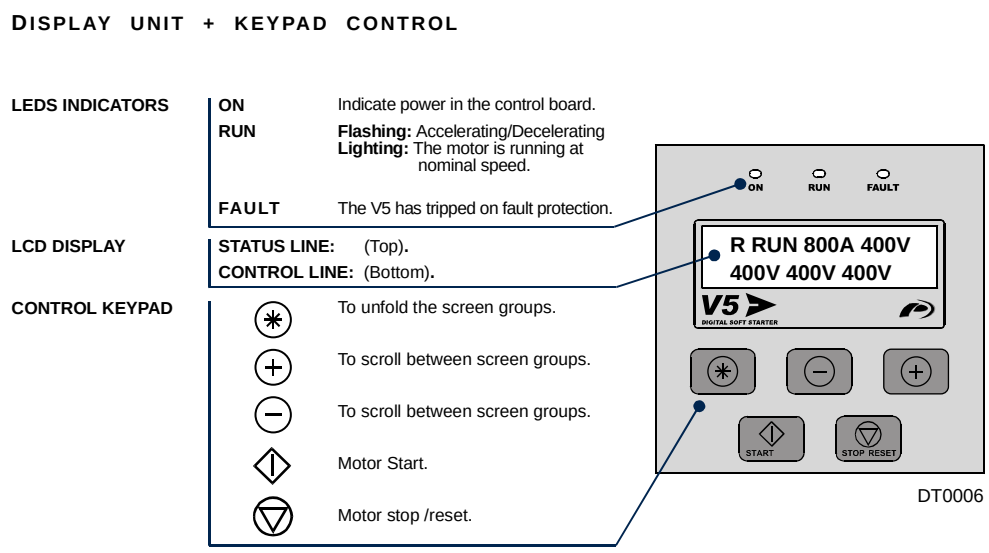

Figure 10. Display Unit.

6.1 THE LCD DISPLAY

The V5 has a sixteen character by two line (16x2) LCD display. Each line has a different function.

- The **STATUS LINE** is always present and shows V5 status, phase current and supply voltage.
- The **CONTROL LINE** of the display is used to view and/or adjust the V5 commissioning parameters.

6.2 DIE TASTATUR

- (+) and (−) — These keys are used to scroll between groups.
- (✳) — This can be used to unfold a screen group.
- (+) and (−) — Used to scroll between screens within the selected screen group.
- (✳) and (+) or (−) — Press at the same time to adjust the selected parameter.
- (−) — Press to scroll back and return to screen group.

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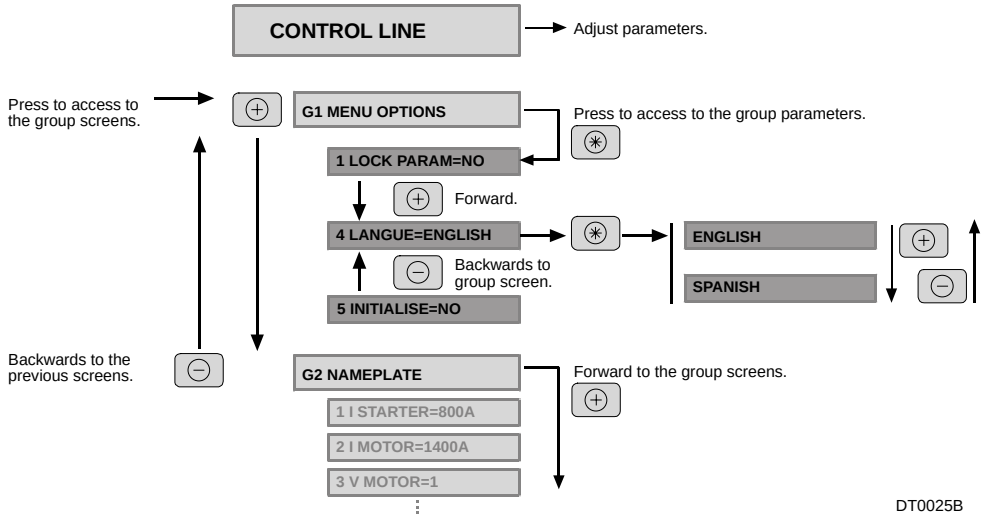


Figure 11. Programming examples.

6.3 THE START AND STOP-RESET / SLOW SPEED BUTTONS.

These pushbuttons enable starting and stopping of the motor from the display unit and also running at slow speed:

- ❑ START Start & Slow Speed +.
- ❑ STOP RESET Stop & Reset & Slow Speed -.

7. CONTROL INPUTS AND OUTPUTS

The next figure provides the electrical specification of all V5 control inputs and outputs. Each input and output is individually described below.

- Control Inputs/Outputs.
- Serial Comms (RS232/RS485).

7.1 CONTROL TERMINALS.

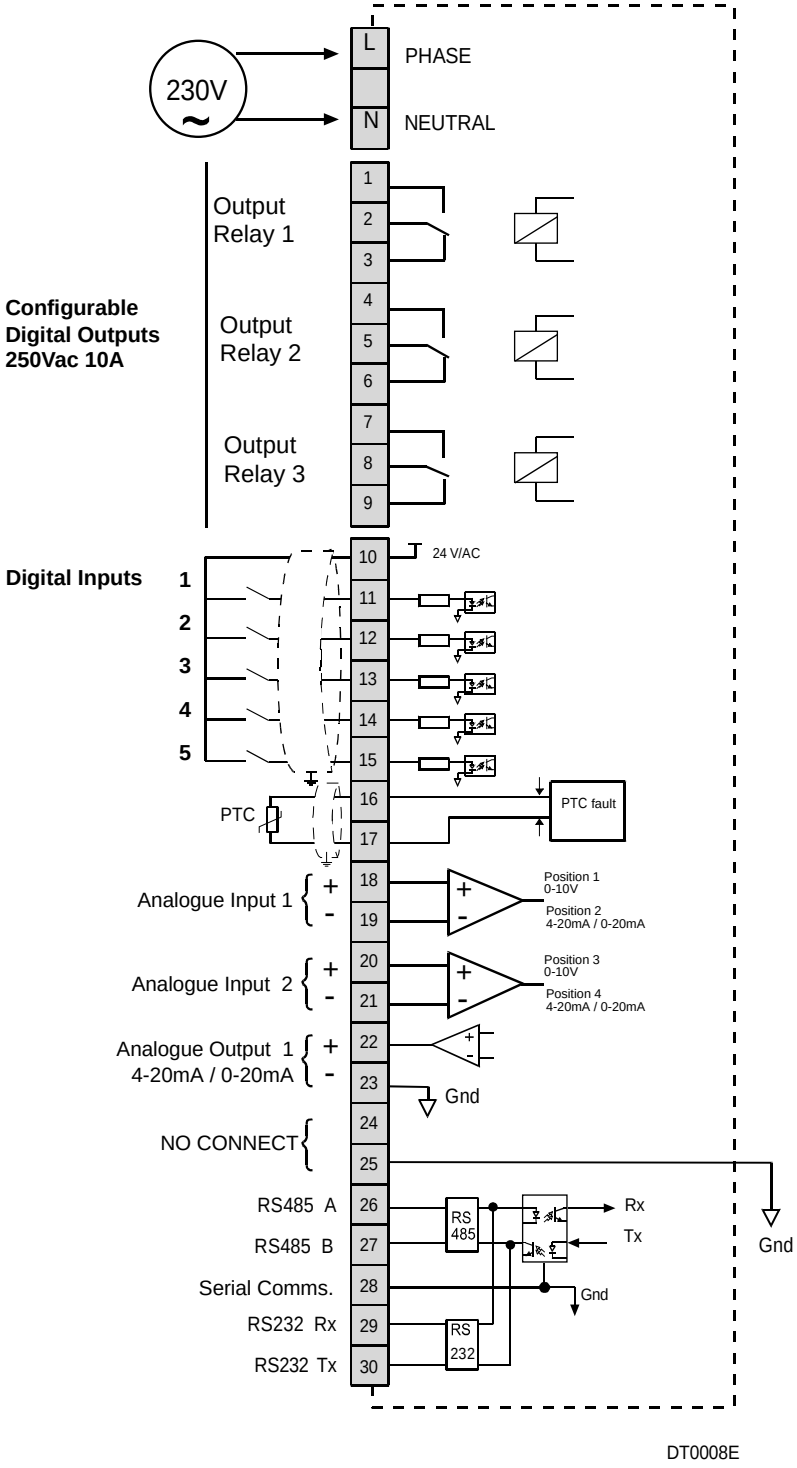


Figure 12. Control Terminals.

7.2 TERMINAL DESCRIPTIONS

Control board supply voltage.
Input terminals for control board supply voltage (230V +/-10%). Other voltage ratings are available on demand.
Note that the unsed terminal between L and N is purely to ensure electrical clearances.
Terminals T1 to T9. Output relays.
Selection of their function is made through Group 7 OUTPUTS. Avoid settings that cause relays to switch excessively as this will reduce their life expectancy.
The maximum allowable ratings for the relay outputs are 250V/AC / 10A or 30V/DC 10A.

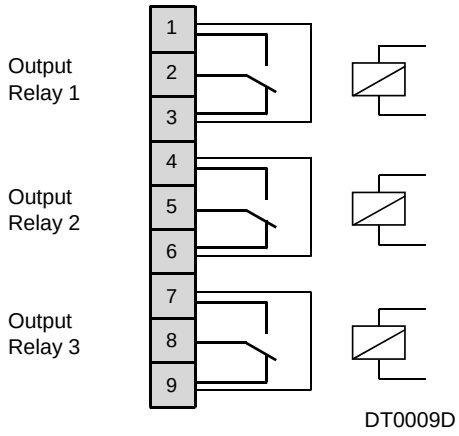


Figure 13. Relay outputs.

Terminal 10. 24V/DC Input switch.
This terminal provides the 24V supply for the 5 digital inputs at terminals T11 to T15. This terminal is fuse (E0141) protected (250V,1A) for overload/short-circuit protection. The fuse is located at the bottom right of the control board.

Terminal T11 to T15. Digital Inputs.
The function of the digital inputs can be programmed from the keyboard, at the group G6 INPUT.

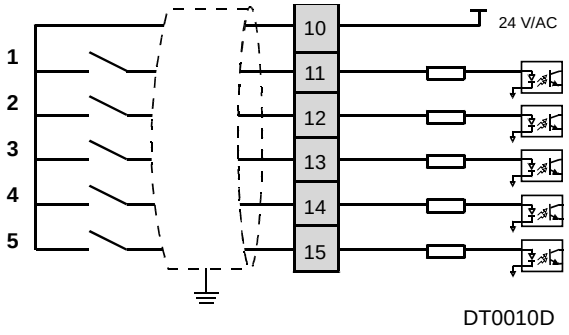


Figure 14. Digital inputs.

Terminals T16 and T17. Motor PTC.
This is a digital input for thermal protection trip (F8 Motor PTC), which switches when the resistance between these terminals exceeds the following limits: 150 ohms < PTC Resistance < 2.7kohms. To protect the motor after tripping due to PTC alarm against further thermal overload, the PTC resistance must be less than 270 Ohms to reset the softstarter.

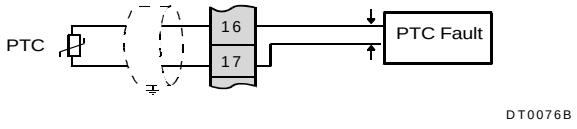
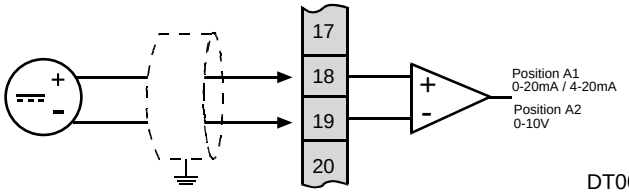


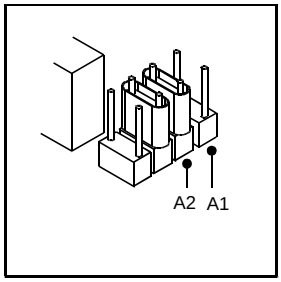
Figure 15. PTC motor inputs.

Terminals T18 (T19) y T20 (T21).
Analogue inputs configuration.
The function of the Analogue inputs can be programmed from the keyboard at the group G6 Inputs.
To select 4-20mA or 0-10V you have to switch the jumpers as described below. See section 1.6 for details.

Analogue input 1 (T18-T19).
Position A1 : 0 –20mA/4-20mA.
Position A2 : 0-10V



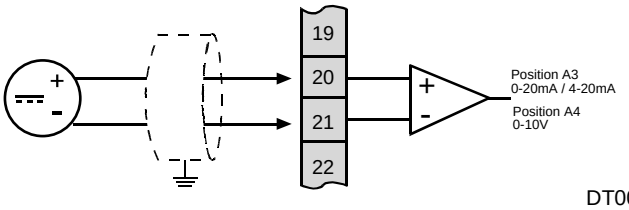
DT0011E



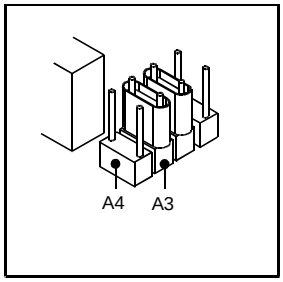
DT0097A

Figure 16. Analogue input 1.

***Analogue input* 2(T20-T21).**
Position A3 : 0 –20mA/4-20mA.
Position A4 : 0-10V



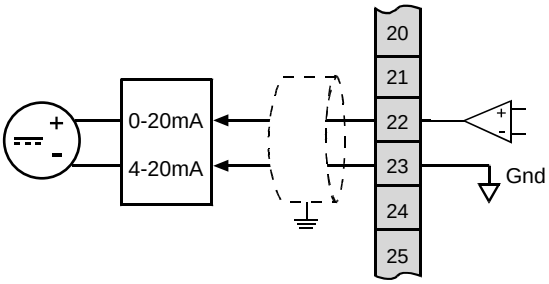
DT0012E



DT0069B

Figure 17. Analogue input 2.

Terminal T22 (and T23). Analogue Output.
This Analogue output can have its format and source configured. Formats can be 0-10V, 0-20mA or 4-20mA. Configuration is done from group G7 Outputs.



DT0013D

Figure 18. Analogue output.

Terminal T25. Analogue 0V connection.

Terminal T26 to T30. RS485/RS232 Connections.
These terminals are provided for serial communications connection.

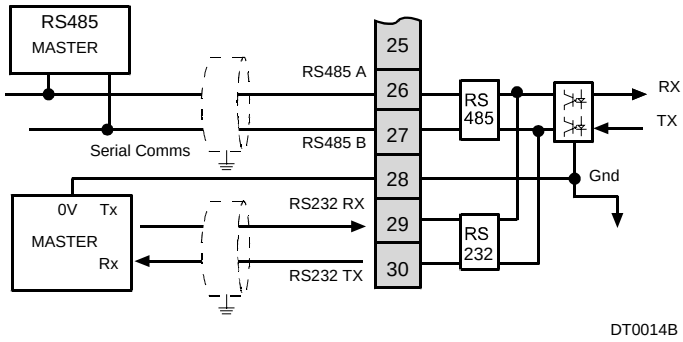


Figure 19. Serial Comms.

8. FAULT MESSAGES , DESCRIPTIONS AND ACTIONS.

When a fault occurs, the V5 will stop the motor and will display the fault that caused the trip. The red LED and fault message will remain until the fault has been removed and the soft starter is reset. To reset the V5 either press the (Stop/Reset) key or operate an external reset, by opening a normally closed contact (NC), configured to any of the digital inputs of the V5.

Fault	**F0**	**NO FAULTS**
Description		No fault detected.
Possible Cause		Normal operation.
Action		None required.

Fault	**F1**	**PHA MISING**
Description		Supply phase loss.
Possible Cause		Loss of phase, fuse failure, cable fault, motor winding fault.
Action		Check supply, all cables, motor. **If the problem persists, call Power Electronics or an authorised distributor.**

Fault	**F2**	**WRONG PH / SQ**
Description		Incorrect input supply phase sequence.
Possible Cause		The mains phase sequence doesn't correspond to G3.1 (1 PHASE SEQUEN=2)
Action		Swap two input phase over or change G3.1 Phase Sequence to suit supply phase sequence.

Fault	**F3**	**ASYM CURR**
Description		Phase current imbalance.
Possible Cause		There is a current imbalance higher than 40%.
Action		Check the motor; check the load and the coupling between both. Check input power supply is always balanced. Check thyristors. **If the problem persists, call Power Electronics or an authorised distributor.**

Fault	**F4**	**OVER LOAD.**
Description		Calculated motor overload has reached an unacceptable level.
Possible Cause		Motor overload. If the trip is produced during start, it could be a mechanical problem. If it occurs when the motor is running at nominal speed, probable causes could be a wrong setting at G.3.2. screen or a change of the load conditions. Wrong nameplate values.
Action		Check that current from the G3.2 screen is the same as the motor. Check working conditions of motor. Check load. Check nameplates. If the trip is occurring during the start: Check mechanical conditions. Check there is not a power input supply voltage drop greater than 10%. Increase acceleration ramp (high inertia applications). Increase overload curve in G3.3 screen. Increase current limit.

Fault	**F5**	**UNDER LOAD.**
Description		Motor under load.
Possible Cause		Motor current draw is lower than that set in G3.6 screen. Soft starter has been working during for longer than the one set in G3.7 screen. Motor working with no load. Wrong setting of under load conditions.
Action		Check that mechanical parts coupled to the motor are ok and that the motor is not working unloaded In case of pump application, check there is no air inside the pipe network and that the pump suction is not obstructed. Wrong adjustment, set again under load settings G3.6 and G3.7.

Fault	**F6**	**PEAK CURR**
Description		V5 peak current output exceeded. The current is higher than six times nominal.
Sense level		(6xIn). V5 Rated Current.
Possible Cause		Rotor locked. Short circuit in output circuit. V5 current transformers failure. Torque pulse setting too high.
Action		Check cables and motor. Reduce Torque pulse setting. **If the problem persists, call Power Electronics or an authorised distributor.**

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Fault	**F7**	**STARTER OT**
Description		Heat sink too hot (>85ºC).
Sense level		(> 85°C).
Possible Cause		Insufficient cooling. Fan failure. Ambient temperature too high (>45ºC). The actual current is higher than the nominal.
Action		Check fans and cooling paths. Check the ambient temperature during normal operation doesn't exceed 45ºC or 50ºC with re-rating. Check that correct re-rating has been applied if higher than 45ºC. Check that actual motor current is the same or smaller than the V5 nominal current.

Fault	**F8**	**MOTOR PTC .**
Description		External trip (Motor PTC) has operated (Terminals T16-T17).
Sense level		150ohms<PTC <2.7kohms >>ok. other >> fault.
Possible Cause		Motor over temperature. Fault in sensor wiring (open-circuit, short-circuit)
Action		Check motor is not overloaded. Check PTC wiring, check PTC. If there is no PTC connected, select G3.5 MOTOR PTC=NO

Fault	**F9**	**SHEARPIN**
Description		Shearpin current trip.
Sense level		G3.8 Shearpin Current.
Possible Cause		The motor has drawn a higher current than Shearpin protection setting at G3.8. Rotor locked due to a mechanical obstruction.
Action		Check if it's possible that motor reaches the Shearpin current under normal operation, and if so, increase the value of that protection. Check motor, cables and load and the reason of the over current.

Fault	**F10**	**OVER VOLT**
Description		High supply voltage for too long period.
Sense level		The combination of parameters G3.12 OVERVOLTAGE and G3.13 OVERVOLTAGE DELAY.
Possible Cause		Fluctuating power supply, wrong settings; the input voltage of each phase in parameter G3.12; and the time set in G3.13.
Action		Check supply voltage and set G3.12 and G3.13. Check supply.

Fault	**F11**	**UNDER VOLT**
Description		Low voltage supply for too long period.
Sense level		The combination of parameters G3.10 UNDERVOLTAGE and G3.11 UNDERVOLTAGE DELAY.
Possible Cause		Impedance of input power supply is too high. Excess current draw, weak supply. Check the input voltage of each phase is higher than G3.10 parameter and during the time set in G3.11 parameter.
Action		Check supply, check values at G3.10 and G3.11. Check supply.

Fault	**F12**	**EXCESIV STR**
Description		Maximum number of starts exceeded.
Sense level		Maximum number of starts set at G3.14 START LIMIT during time period set at G3.15 SRT/INT.
Possible Cause		Excessive number of starts/stop during the normal operation. Rotor locked or motor overloaded during the start so the ramp up couldn't be completed.
Action		Check motor and load conditions. Check values of parameters G3.14, G3.15 are coherent with the application.

Fault	**F13**	**MEMORY FLT**
Description		Fault reading SRAM.
Possible Cause		Writing error, faulty memory.
Action		Attempt to reinitialise the V5 (1.5 INITIALISE) . **If the problem persists, call Power Electronics or an authorised distributor.**

Fault	**F14**	**SCR1 FAULT**
	F15	**SCR2 FAULT**
	F16	**SCR3 FAULT**
	F17	**SCR_S FLT**
Description		F14 Thyristor Fault L1, disconnected motor at L1. F15 Thyristor Fault L2, disconnected motor at L2. F16 Thyristor Fault L3, disconnected motor at L3. F17 Thyristors Fault , disconnected motor.
Possible Cause		Thyristor fault, motor disconnected, excessive number of starts, excessive temperature, over voltage.
Action		Check motor, cables and fans. Check thyristors and excessive environmental temperature. Check input supply voltage. **If the problem persists, call Power Electronics or an authorised distributor.**
***NOTE*:**		**This fault can only be reset via the display unit.**

Fault	**F18**	**EXCES T LS**
Description		Slow speed working time exceeded.
Sense level		G12.2 Slow Speed T/O.
Possible Cause		Excessive running time at slow speed.
Action		Check the control. Check value of parameter G12.2 .

Fault	**F19**	**LS DISABLE**
Description		Slow Speed not allowed.
Possible Cause		Slow Speed mode is blocked if one of these 2 options are selected: No phase sequence (G3.1 Phase Sequence) at the input. You need to select L1 L2 L3 or L2 L1 L3 sequence. DC Brake stop selected (G13.1 DC Brake).
Action		Set phase sequence at the input. Make sure no DC Brake is selected.

Fault	**F20**	**COMS T/OUT**
Description		Serial communication Time Out exceeded.
Possible Cause		No communication from the Master for the time specified at G14.1 CommTime Out. RS232/RS485 communication link fault.
Action		Check if the Master is trying to communicate to slave at a rate higher than specified at G14.1 COM TIME O Check the RS232/RS485 wiring. Check communication parameters.

Fault	**F21**	**EXTRN TRIP**
Description		An external fault has occurred through a digital input.
Possible Cause		There is a digital input activated and set as external fault.
Action		Check configuration of digital inputs. Check the status of the digital inputs for correctness.

Fault	**F22**	**CUR FLT**
Description		Large current unbalance is occurring among phases.
Possible Cause		Large current unbalance occurs due to a sudden voltage drop in any of the V5 input phases. Possible disconnection of one phase.
Action		Check input power wiring. Check motor connection. Check supply voltage is correct.
***NOTE*:**		**In case of working with lamps for testing purposes at the output set the motor current to 1 A to avoid this fault.**

Fault	**F23**	**CUR FLT 2**
Description		Large current unbalance is occurring among phases.
Possible Cause		Large current unbalance occurs due to a sudden voltage rise in any of the V5 input phases.
Action		Check input power wiring. Check supply voltage is correct.

Fault	**F24**	**HIGH PRESSURE**
Description		High pressure time protection.
Possible Cause		The V5 is running and the pressure switch opens for longer than the time entered in screen G16.4. Overpressure.
Action		Check hydraulic installation. Check pressure switch. Check proper wiring from pressure switch to V5 digital input 1. The V5 will require resetting on the display or via D INPUT 5 if

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configured for 2 wire start/stop. Check parameter setting is done according to application requirements.

Fault	**F25**	**LOW PRESSURE**
Description		Low pressure protection.
Possible Cause		The V5 is running and the pressure switch opens for longer than the time entered in screen G16.5.
Action		Check hydraulic installation (broken pipes). Check pump has got water. Check pressure switch. Check proper wiring from pressure switch to V5 digital input 2. The V5 will require resetting on the display or via D INPUT 5 if configured for 2 wire start/stop. Check parameter setting is done according to application requirements.

Fault	**F26**	**FLOW SWITCH**
Description		No flow protection.
Possible Cause		The flow switch is ignored for the time set in screen G16.7 on receipt of a valid start signal. After this time the V5 will trip if no flow is indicated for longer than the time set in screen G16.8. No water in the pump.
Action		Check proper pump water supply. Check flow switch. Check proper wiring form flow switch to V5 digital input 3. The V5 will require resetting on the display or via D INPUT 5 if configured for 2 wire start/stop. Check parameter setting is done according to application requirements.

Fault	**F27**	**DEEP WELL PROBE**
Description		Low level protection
Possible Cause		The well probe controller (or other level controller) detects a lack of water. The tank or pump has no water.
Action		Check water level. Check hydraulic installation. Check level switch. Check proper wiring from deep well probe flow controller to V5 digital input 4. The V5 will not reset unless the low water fault has been cleared (D INPUT 4 closed). Check parameter setting is done according to application requirements.

9. STATUS INDICATIONS

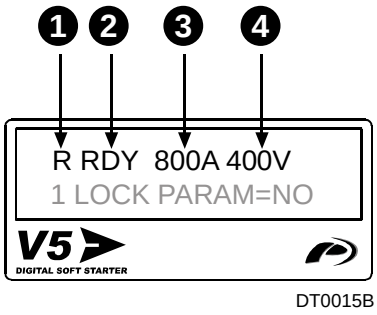


Figure 20. Status indications.

Reference table:

1. Control mode indication: Local (L) , Remote (R), Seriel Comms (C), Jog (G), Pump control (P).
2. V5 status indication.
3. Average phase current.
4. Average input voltage.

V5 STATUS INDICATION

Indication	**RDY**
Description	READY
Note	The V5 is ready to run.

Indication	**ITQ**
Description	INITIAL TORQUE
Note	The V5 is applying the Initial Torque specified at G4.4 Initial Torque for the time specified at G4.5 Initial Torque Time.

Indication	**ACL**
Description	ACCELERATING
Note	Motor is accelerating.

Indication	**RUN**
Description	RUNS AT CURRENT SPEED
Note	The motor runs at nominal Speed.

Indication	**DEC**
Description	DECELERATING
Note	The Motor is stopping.

Indication	**HAM**
Description	HAMMER
Note	Water Hammer algorithm is operating.

Indication	**LS+**
Description	SLOW SPEED +
Note	V5 is applying SS+ (CLOCKWISE).

Indication	**LS-**
Description	SLOW SPEED -
Note	V5 is applying SS- (ANTI-CLOCKWISE).

Indication	**DCB**
Description	DC BRAKE
Note	DC Brake current applied at the end of the ramp down.

Indication	**UNV**
Description	UNDERVOLTAGE
Note	Low mains supply.

Indication	**OVV**
Description	OVERVOLTAGE
Note	High mains supply.

Indication	**OVL**
Description	OVERLOAD
Note	Overload condition.

Indication	**UDL**
Description	UNDERLOAD
Note	Under load condition.

Indication	**PTC**
Description	MOTOR PTC
Note	Motor PTC fault.

Indication	**OVT**
Description	SOFT-STARTER OVERTEMPERATURE
Note	The temperature inside the soft starter is too high.

Indication	**SHP**
Description	SHEARPIN CURRENT
Note	The shearpin function has switched off the soft starter.

Indication	**ASY**
Description	ASYMMETRIC CURRENT
Note	Asymmetric current at the motor.

Indication	**FLT**
Description	FAULT
Note	A fault has awitched off the Soft-Starter.

Indication	**STD**
Description	START DELAY
Note	The V5 delays the start signal set in screen G4.1 Start delay.

Indication	**EXT**
Description	EXTERNAL FAULT
Note	Fault status is active due to an external fault command through one of the digital inputs.

Indication	**P/T**
Description	TORQUE PULSE
Note	The V5 is applying torque pulse set in screen G4.2 moment during the time set in screen G4.3.

Indication	**ILT**
Description	CURRENT LIMIT
Note	The V5 has reached a maximum current level allowed in screen G4.7. Current limit.

Indication	**HIP**
Description	HIGH PRESSURE
Note	It warns during the time entered in screen G16.4.

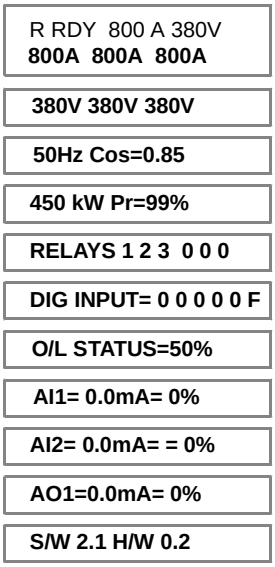
Indication	**LOP**
Description	LOW PRESSURE
Note	It warns during the time entered in screen G16.5. and G16.6.

Indication	**NOF**
Description	NO FLOW
Note	It warns during the time entered in screen G16.7 and G16.8.

Indication	**LWA**
Description	LOW WATER
Note	It warns during the time entered in screen G16.9.

10. GENERAL INFORMATION SCREENS

The bottom line displays the **General Information** and parameter screens **(G1 to G16).**
The general information screens show information related to the motor and V5 status:



DT0074D

- Phase current.
- Supply voltage at the V5 input.
- Supply frequency. Motor cos phi (only while V5 is running).
- Motor power (instantaneous). Motor torque
- Relay status.
- Status digital inputs, Motor PTC.
- Motor Load status.
- Analogue input 1 value.
- Analogue input 2 value.
- Analogue output 1 value.
- Hardware and software revision.

PHASE CURRENT

Screen	**800A 800A 800A**
Description	L1, L2, L3 phase current.
Range	0 to 9999A
Units	Amperes
Attribute	Read only.
Function	Shows the instantaneous current of the three incoming phases.

SUPPLY VOLTAGE

Screen	**380V 380V 380V**
Description	L1-L2, L2-L3, L1-L3 Line voltage.
Range	0 to 999
Units	Volts
Attribute	Read only.
Function	Shows the line-to-line input voltage.

SUPPLY FREQUENCY, MOTOR COS PHI

Screen	**Fr=50Hz Cos=0.85**
Description	Supply frequency and actual motor phi cosine.
Range	0 to 99Hz, 0 to 1
Units	Hertz. Cos Phi
Attribute	Read only.
Function	Shows the supply frequency and cos phi of the motor.
***NOTE*:**	**This screen is only visible while the motor is running.**

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ACTIVE POWER, MOTOR TORQUE

Screen	**P=450kW Pr=99%**
Description	Active power, motor torque.
Range	1 to 999kW,0 to 999%
Units	kilowatts, percentage of nominal motor torque.
Attribute	Read only.
Function	Shows the instantaneous kilowatts and percentage of nominal motor torque.
***NOTE*:**	**This screen is only visible while the motor is running.**

RELAY STATUS

Screen	**RELAYS 1 2 3 0 0 0**
Description	Status of relay 1, 2, 3.
Range	0 de-energised, X energised.
Units	none
Attribute	Read only.
Function	Shows the relay status if the relays are energised (X) or de-energised (0).

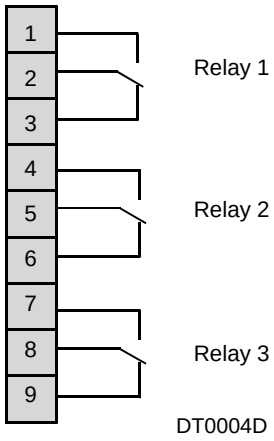


Figure 21. Relay status.

DIGITAL INPUTS

Screen	**DIG INPUT= 0 0 0 0 0 F**
Description	Digital inputs 1, 2, 3, 4, 5 & PTC status.
Range	0 =open, X =closed. K = PTC ok, F = fault in PTC wiring.
Units	none.
Attribute	Read only.
Function	Shows status of the digital inputs and the status of the PTC input.

Reference table to digital inputs & motor PTC :

1. Digital Input 1 (Terminal T11)	0 open, X closed
2. Digital Input 2 (Terminal T12)	0 open, X closed
3. Digital Input 3 (Terminal T13)	0 open, X closed
4. Digital Input 4 (Terminal T14)	0 open, X closed
5. Digital Input 5 (Terminal T15)	0 open, X closed
6. Input to motor PTC (Terminal T16 and T17)	k = o.k., F = fault

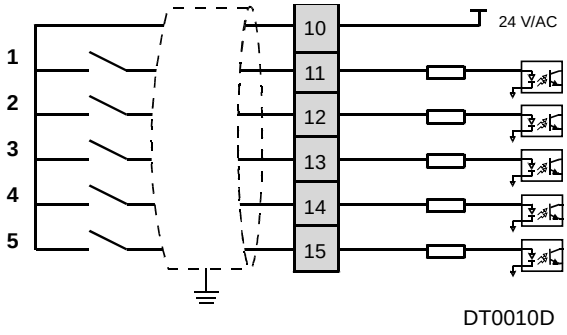


Figure 22. Digital inputs.

MOTOR OVERLOAD STATUS

Screen	**O/L STATUS=0%**
Description	Motor Overload status.
Range	0 to 100%
Attribute	Read only.
Function	When the motor current is lower than the overload current set at G3.2, the overload status is 1%. As soon as the current increases above the overload current, the overload factor begins to increase, the more the difference is, the faster the overload factor grows, until this reaches 100%, when the soft starter will trip and show overload fault.

ANALOGUE INPUT 1 STATUS

Screen	**AI1=0.00mA = 0%**
Description	Analogue input 1 value, value in user units. The value could be amps or volts depending on the option selected at G6.8, 0 or 1 for Amps and 2 for Volts. The user unit should be Bar, ºC, m, % and is selected from G6.10.
Range	0.0 to 10.0V/ 0 to 20mA/ 4.0 to 20.0mA.
Units	Volts or mA, user selectable units.
Attribute	Read Only.
Function	Shows the value of analogue Input 1 (volts, mA) according to the option selected at G6.8, and the value in user units according to the option selected at G6.10 and with the scale selected at G6.9.

ANALOGUE INPUT 2 STATUS

Screen	**AI2=0.00mA = 0%**
Description	Analogue input 2 status, value in user units.
Range	0.0 to 10.0V/ 0 to 20mA/ 4.0 to 20.0mA.
Units	Volts or mA, User selectable units.
Attribute	Read Only.
Function	Shows the value at the Analogue Input 2 (volts, mA) according to the option selected at G6.11, and the value in user units according to the option selected at G6.13 and with the scale selected at G6.12.

ANALOGUE OUTPUT 1 STATUS

Screen	**AO1=0.00mA =0%**
Description	Status of the Analogue Output 1. Analogue Output value in absolute units, value in percentage of the Analogue output range.
Range	0.0/4.0 a 20.0mA
Units	Milliamps, percentage relative to the Analogue output. range.
Attribute	Read only.
Function	Displays the absolute value of the Analogue output 1, in real units and percentage over the range of the Analogue output 1.The Analogue output should be related to the source selected at G7.4

SOFTWARE AND HARDWARE REVISION

Screen	**S/W 2.1 H/W 2.0**
Description	Software and Hardware revision.
Function	Displays the actual software (S/W) and hardware (H/W) revision.

11. COMMISSIONING SCREENS

All those parameters displayed in the V5 are organised in various groups (G1 to G16). By pressing the "*" key it is possible to open each individual screen group.

R RUN 800A 380V	RANGE
G1 MENU OPTIONS	
1 LOCK PARAM=NO	YES/NO
2 PASSWORD=0	OFF, 000 to 9999
3 WRONG P/W=XXXX	0000 to 9999
4 LANGUE=ENGLISH	ENGLISH
	ESPANOL
	DEUTSCH
5 INITIALISE=NO	YES/NO
6 COMMISSION=YES	YES/NO
G2 NAMEPLATE	
1 ISTARTER=_ _ _A	7, 17, 30, …1600
2 I MOTOR=_ _ _ _A	1 to 1600
3 V MOTOR=2	1 220_240
	2 380_440
	3 460_525
	4 660_690
4 P MOTOR=_ _ _Kw	4 to 999
5 COS PHI M=85%	40% to 99%
6 FREQ=50Hz	50 Hz
	50Hz/60Hz
G3 PROTECTIONS	
1 PHASE SEQUEN=2	1 NO SEQ PROTECT
	2 L1 L2 L3 SEQ
	3 INVERSED SEQ
2 OV LOAD=800A	0,6 to 1,5 x In
3 OV/LOAD T=5	1 to 10
4 OVL FAC=100%	100 to 500%
5 MOTOR PTC=NO	YES/NO
6 UNLOAD=0.0A	0 to 0,9 x In
7 UNLOAD T=0FF	0 to 99 s, OFF
8 SHRPIN=OFF	0,6 to 1,2 x In, OFF
9 ASYM I ENAB=Y	YES / NO
10 UNDER V=320V	162 to 208V @ 220V
	280 to 360V @ 400V
	350 to 450V @ 500V
	508 to 653V @ 690V
11 U/V DELAY=5s	0 to 10, OFF
12 OVERVOLT=440V	231 to 266V @ 230V
	400 to 460V @ 400V
	500 to 575V @ 500V
	726 to 835V @ 690V
13 O/V DELAY=5s	0 to 10 s, OFF
14 START LIMIT=3	1 to 10
15 STR/ INT=15Min	0 to 60 Min., OFF
G4 ACCELERATION	
1 STR DELAY=0s	0 to 600
2 PULS TORQ=50%	50 to 100%
3 PULS TQ T=OFF	0,1 to 0.9, OFF
4 INIT TORQ=35%	30 to 99%
5 INIT TQ T=1s	0 to 10
6 ACEL TIME=6s	0 to 180
7 I LIMIT=2800A	1.5 to 5 x In
G5 DECELERATION	
1 FREWEL STP=YES	YES /NO
2 DECL TIME=12s	1 to 180
3 DEC MD SEL=1	1 NORMAL CURVE
	2 HAMMER PREVENT
4 HAMR FACT=75%	1 to 99%
5 MINI TORQ=1%	1 to 99
G6 INPUTS	
1 OPER MODE=1	0 DISABLE
	1 LOCAL
	2 REMOTE
	3 SERIAL COMMS
	4 LOCAL JOG L/S
	5 PUMP CTRL-1
2 LOCAL RESET=Y	YES/NO
3 DINPUT1 SEL=4 4 DINPUT2 SEL=0 5 DINPUT3 SEL=0 6 DINPUT4 SEL=0 7 DINPUT5 SEL=0	0 UNUSED
	1 START
	2 STOP PUSH BUTON
	3 STOP-RESET N/C
	4 START-STOP N/O
	5 RESET N/C
	6 LOW SPEED (+)
	7 LOW SPEED (-)
	8 DC BREAK
	9 DUAL SETTING
	10 EXTERNAL TRIP
8 ANI1 FORMAT=1	0 0_20mA
	1 4_20mA
	2 0_10V
9 AI1 RANGE 0_10	0 to 999
10 AI1 UNITS=OFF	Bar, ºC, m
11 ANI2 FORMAT=1	0 0-20mA
	1 4-20mA
	2 0-10V
12 AI2RANGE 0_10	0 to 999

13 AI2 UNITS=OFF	Bar, ºC, m
G7 OUTPUTS	
1 REL1 SEL ON=14 2 REL2 SEL ON=15	0 ALWAYS OFF
	1 ALWAYS ON
3 REL3 SEL ON=9	2 OVLOAD WARNING
	3 UNLOAD WARNING
	4 OV VOL WARNING
	5 UN VOL WARNING
	6 COMPARATOR 1
	7 COMPARATOR 2
	8 COMPARATOR 3
	9 FAULTS
	10 NO FAULTS
	11 SCR_S FAULT
	12 FAULT RESET
	13 STARTER READY
	14 INSTANTANEOUS
	15 BYPAS/REACTIV
	16 DELAYED
	17 HIGH PRESSURE
	18 LOW PRESSURE
	19 NO FLOW
	20 LOW WATER
	21 PUMP FAULT
4 ANLOG1 SEL=0	0 UNUSED
	1 MOTOR CURRENT
	2 MOTOR POWER
	3 MOTOR TORQUE
	4 COSINUS PHI
	5 INPUT VOLTAGE
	6 ANALOG I1 ECHO
	7 ANALOG I2 ECHO
5 AO1 FORMAT=0	0 0-20mA
	1 4-20mA
6 AO1 LOW=0%	0 to 500%
7 AO1 HIGH=100%	0 to 500%
G8 DUAL SETTING	
1 DUALSETING=N	YES/NO
2 PLS TORQ2=50%	50 to 500%
3 PLS TQ T2=OFF	0.1 to 0.9s, OFF
4 INIT TRQ2=30%	30 to 99%
5 INIT TQ T2=1s	0 to 10
6 ACC TIME2 =12s	0 to 180
7 I LIMIT2=2800A	1.5 to 5 x In
8 FREWEL STP2=N	YES / NO
9 DEC TIME2=12s	0 to 180
10 DEC MD SEL2=1	1 NORMAL
	2 HAMMER PREVENT
11 HAMR FAC2=75%	1 to 99
12 MINI TRQ2=1%	1 to 99%
13 PHASE SEQ2=2	1 NO SEQ PROTECT
	2 L1 L2 L3 SEQ
	3 INVERSED SEQ
14 OVLOAD2=800A	0,6 to 1,5 x In
15 OV/LOAD T2=5	1 to 10
16 OVL FAC2=100%	100 to 500%
17 MOTOR PTC2=N	YES / NO
18 UNLOAD2=0.0A	0 to 0,9 x In
19 UNLOAD T2=OFF	0 to 99s, OFF
20 SHRPIN2=OFF	0,6 to 1,2 x In, OFF
21 ASYM I ENB2=N	YES/NO
22 I MTR2=30A	9 to 1200
23 V MTR2=2	1 220_240
	2 380_440
	3 460_525
	4 660_690
24 P MTR2=4.0Kw	4 to 999Kw
25 COS PHI 2=85%	0,40 to 0,99%
26 FREQ 2=50Hz	50 Hz
	50Hz/60Hz
G9 COMPARATOR	
1 COMPR1 SEL=1	0 UNUSED
	1 MOTOR CURRENT
	2 MOTOR POWER
	3 MOTOR TORQUE
	4 COSINUS PHI
	5 INPUT VOLTAGE
	6 ANALOG INPUT 1
	7 ANALOG INPUT 2
	8 O/LOAD STATUS
2 COMP1 ON=100%	0 to 500%
3 COMP1 OFF=80%	0 to 500%
4 T COMP1 ON=5s	0 to 99
5 T COMP1 OFF=5s	0 to 99
6 COMPR2 SEL=1	0 UNUSED
	1 MOTOR CURRENT
	2 MOTOR POWER
	3 MOTOR TORQUE
	4 COSINUS PHI
	5 INPUT VOLTAGE
	6 ANALOG INPUT 1
	7 ANALOG INPUT 2
	8 O/LOAD STATUS
7 COMP2 ON=100%	0 to 500%
8 COMP2 OFF=80%	0 to 500%
9 T COMP2 ON=5s	0 to 99
10 TCMP2 OFF=5s	0 to 99
11 CMPR3 SEL=1	0 UNUSED
	1 MOTOR CURRENT
	2 MOTOR POWER
	3 MOTOR TORQUE
	4 COSINUS PHI
	5 INPUT VOLTAGE

ENGLISH

	6 ANALOG INPUT 1
	7 ANALOG INPUT 2
	8 O/LOAD STATUS
12 CMP3 ON=100%	0 to 500%
13 CMP3 OFF=80%	0 to 500%
14 T CMP3 ON=5s	0 to 99
15 TCMP3 OFF=5s	0 to 99
G10 FAULT HISTOR	
1 NO FAULT	LAST FAULT=F0
2 NO FAULT	FOURTH FAULT=F0
3 NO FAULT	THIRD FAULT=F0
4 NO FAULT	SECOND FAULT=F0
5 NO FAULT	FIRST FAULT=F0
6 DELET FAULTS=N	YES/NO
G11 STATIST INFO	
1 STARTS100000	
2 STARTS200000	
3 DEL STARTS2=NO	
4 H1=00000h:00m	
5 H2=00000h:00m	
6 DEL HOURS2=NO	
7 TOTAL FLT=00	
8 FAULT2=0	
9 DEL FAULT2=NO	
10 KWH=000000	
G12 LOW SPEED	
1 L/S ACC-DEC =N	YES / NO
2 L SPD TORQ =30%	30 to 99%
3 L.S MAX T =0s	0 to 60
4 L.S ACL T=0s	0 to 60, OFF
5 L.S DEC T=0s	0 to 60, OFF
G13 DC BRAKE	
1 DCBRAK SEL=NO	YES / NO
2 DC BRAK I=50%	30 to 99%
3 DC BRAKE T=0s	0 to 99s
4 EXTERNAL B=NO	YES / NO
G14 SERIAL COMMS	
1 COM TIME O=OFF	OFF, 0 a 25

2 COM ADRESS=10	0 to 240
3 BAUD COM=OFF	OFF, 1200, 2400, 4800, 9600
4 EVEN PARITY=N	NO=NO PARITY
	YES=EVEN PARITY
G15 AUTO RESET	
1 AUTO RESET=NO	YES / NO
2 ATTEMP NUMBR=5	1 to 5
3 R STR DEL=5s	5 to 120s
4 RS COUNT=15Min	1 to 60
	0 NO AUTO RESET
	1 PHAS MISING
	2 WRONG PH/SQ
	3 ASYM CURR
	4 OVER LOAD
	5 UNDER LOAD
	6 STARTER OVT
	7 MOTOR PTC
	8 SHEAR PIN
5 F1 AUTO RST=0 6 F2 AUTO RST=0 7 F3 AUTO RST=0 8 F4 AUTO RST=0	9 OVER VOLT
	10 UNDER VOLT
	11 SCR_1 FAULT
	12 SCR_2 FAULT
	13 SCR_3 FAULT
	14 SCR_S FLT
	15 EXCESIV LS T
	16 COMMS T/OUT
	17 EXTERN TRIP
	18 CUR FLT
	19 CUR2 FLT
	20 ALL THE FLTS
G16 PUMP CONTROL 1	
1 SET IT =	000Hrs
2 I TIME =	000Hrs
3 START MODE =	0
4 HI PR DEL =	00s
5 L PR DEL=	0000s
6 L PR BYP =	0000s
7 FLO BYP =	0000s
8 FLO DEB =	00s
9 LO WTR DEL =	00s

Figure 23. V5 parameters.

G1 MENU OPTIONS

G1.1 LOCK PARAMETERS

Screen	**1 LOCK PARAM=NO**
Description	Changes the parameter status to read only.
Range	Yes/No.
Default Value	No
Function	If this function is active a password is required to be written in screen G1.2.

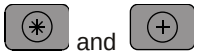
G1.2 PASSWORD

Screen	**2 PASSWORD= xxxx**
Description	Password to get full access to all screens
Range	OFF, 0000 a 9999
Default Value	0
Function	Allows the commissioning user to set a password to protect against un-authorised modification of the parameters.
Setting up	Once set to normal mode as described above, a password may be set up. Unfold screen Group 1 and scroll to screen 1; select: 1 LOCK PARAM=YES.

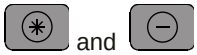
Press "+" or "-" and the next screen should appear to set the required password
2 PASSWORD= xxxx.
To unlock the soft starter parameters the following steps are necessary:

1. Go to G1.1 1 LOCK PARAM= Yes
2. The screen 2 Password=xxxx appears, where the valid password must be entered.

PASSWORD = XXXX



In case of an invalid password is entered, the next screen appears:
3 WRONG P/W=xxxx



where Password= **(Err Pw/2)-3**

G1.3 PASSWORD ERROR

Screen	**3 WRONG P/W=XXXX**
Description	Incorrect password information to unlock the Soft Starter.
Range	0000 a 9999
Default Value	0000
Function	This provides the required recovery information to unlock the soft starter, according to the expression: **PASSWORD = (WRONG PW/2)-3**

G1.4 LANGUAGE

Screen	**4 LANGUE=ENGLISH**
Description	Selects language of screen list.
Range	English. Español. Deutsch
Default Value	English.
Function	Determines the languages displayed by the V5.

G1.5 INITIALISE

Screen	**5 INITIALISE=NO**
Description	Initialise the soft starter to default values.
Range	Yes/No.
Default Value	No.
Function	Initialise the V5 parameters to default values.

G1.6 COMMISSIONING

Screen	**6 COMMISSION=YES**
Description	Disable the screen groups.
Range	Yes/No.
Default Value	Yes.
Function	COMMISSIONING=Yes, it allows all parameter setting. COMMISSIONING=No, it does not permit parameter setting. It permits parameter to be displayed.

G2 NAMEPLATE

G2.1 SOFT STARTER CURRENT

Screen	**1 I STARTER = 900A**
Description	Rated (nameplate) soft starter current.
Range	7, 17, 30, 45, ..., 1600
Units	Amps.
Default Value	Rated (nameplate) soft starter current.
Function	Calibrates the soft starter according to nominal current. This is necessary for correct soft starter protection.
Adjust	Leave as default setting. To modify nominal current push (*) key for 5 seconds. By that time the letter I will change to i and the current value can be modified.

G2.2 MOTOR CURRENT

Screen	**2 I MOTOR=900A**
Description	Rated (Nameplate) motor current.
Range	9 to 1600
Units	Amps.
Default Value	Depends on V5 rated current.
Function	Set the nominal current of the motor. This is necessary for correct motor protection.
Adjust	Set this value according to rated (nameplate) motor current.

G2.3 MOTOR VOLTAGE

Screen	**3 V MOTOR=2**
Description	Rated (Nameplate) Motor Voltage
Range	220-240V 380-440V 500-525V 660-690V
Units	Volts
Default Value	2. 380-440V
Function	Adjust nominal motor voltage.
Adjust	Set this parameter according to input voltage at the soft starter input. Make sure this value is also relevant for the rated (Nameplate) motor voltage.

G2.4 MOTOR POWER

Screen	**4 P MOTOR =450kW**
Description	Rated (nameplate) motor power.
Range	0 a 999kW
Units	kilowatts
Default Value	11
Function	Set the nominal motor power rating.

G2.5 MOTOR COS PHI

Screen	**5 COS PHI M=85%**
Description	Motor power factor
Range	0 to 100%
Unit	%
Default value	85%
Function	Set the rated (nameplate) motor cos phi to for calculating the instantaneous torque developed by the motor.

G2.6 SUPPLY FREQUENCY

Screen	**6 FREQ= 50Hz**
Description	Supply frequency.
Range	50 Hz, 50/60 Hz
Units	Hz
Default value	50Hz
Function	Set the mains frequency.
Adjust	Where the mains frequency is 50Hz, leave as default. Where the mains frequency is unknown or different than 50Hz (60Hz) set 50/60Hz.

NOTE: **When you set 50/60Hz the V5 starts an algorithm to detect the mains frequency. This algorithm is off when setting 50Hz.**

G3 PROTECTIONS

G3.1. PHASE SEQUENCE

Screen	**1 PHASE SEQUEN=2**
Description	Phase sequence at the input of the soft starter.
Range	1 NO SEQ PROTECT. 2 L1 L2 L3 SEQ. 3 INVERSED SEQ.
Default Value	2 L1 L2 L3 seq.
Function	This parameter sets the correct phase sequence at the input, when power on the V5. It can happen that the soft starter tries to start with a phase sequence at the input different than the one which has been set. In this case the soft starter trips on F2 WRONG PH/SQ.
Adjust	Determine input phase sequence; adjust this parameter according to this sequence.
***NOTE*:**	**When operating at SLOW SPEED or DC BRAKE a phase sequence must be selected (L1 L2 L3 or Inverse Sequence). The option 1 NO SEQ PROTECT is not allowed for these modes.**

G3.2 OVERLOAD MOTOR CURRENT

Screen	**2 OV LOAD=800A**
Description	Overload motor current.
Range	0.6 to 1.5 x Inom, where Inom equals to the rated soft starter current.
Unit	A
Default Value	1.0 x Inom.
Function	This parameter sets the overload motor current protection at nominal conditions. The time for this protection to trip depends on the actual current drawn by the motor and the parameter G3.3.
Adjust	Enter the rated (nameplate) motor current value.

G3.3 OVERLOAD CURVE

Screen	**3 OV/LOAD T=5**
Description	Overload curve.
Range	1 to 10 1 Fastest curve. 10 Slowest curve.
Default Value	5
Function	The overload curve determines the response time under overload conditions. There is a non-linear relation between the overload parameter (G3.2 OV LOAD) and this parameter, in order to set the time required for tripping on F4 OVERLOAD. If 3 OV/LOAD T =1 is selected then the response time for an overload condition is almost immediate, but if OV/LOAD T=10 then takes the soft starter trips on F4 OVERLOAD after a time delay.
Adjust	If you need a fast response under overload conditions, please select OV/LOAD T =1. If you need a slow response, then select OV/LOAD T =10. For normal operation leave this value as default (OV/LOAD T =5).

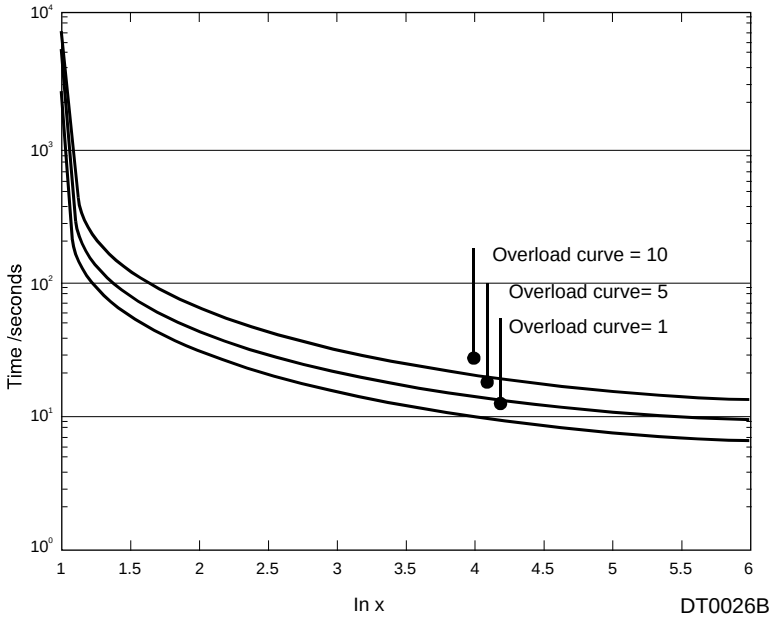


Figure 24. Overload curve.

G3.4 STARTING OVERLOAD FACTOR

Screen	**4 OVL FAC=100%**
Description	Starting Overload Factor.
Range	100 to 500%
Unit	Percentage of % G3.3 OVERLOAD CURVE.
Default Value	100%
Function	This parameter adjusts the OVERLOAD CURVE DURING ACCELERATION. This parameter can be used to accelerate high inertia load. In case of pumps, fans (Torque = K x Speed^2) leave as default (100%). This parameter is only active during acceleration and not at normal running conditions, where only G3.2 & G3.3 are active.
Adjust	For low inertia applications like pumps, fans (Torque = K x Speed²) the default value (100%) active. Mills, crushers and centrifuges (high inertia moment) will normally require a start with low starting overload factor (150%) and increase this value until the load accelerates without tripping on F4 OVERLOAD.

G3.5 MOTOR PTC

Screen	**5 MOTOR PTC=NO**
Description	Enable/Disable PTC motor option.
Range	Yes/No
Default Value	No
Function	The soft starter allows the connection of a standard motor PTC (Terminals T16-T17) to detect overheating of the motor. Every input resistance between 100ohm and 1.7kohms is taken as a correct value (ok) and every value found out of this range is taken as a fault (fault). If the MOTOR PTC is set to “Yes” and the input resistance at terminals T16-T17 is out of the valid range, then the soft starter should trip on F8 MOTOR PTC. To protect the motor after tripping due to PTC failure against further thermal overload, the PTC resistance must be less than 260 Ohms to reset the softstarter again. In case of a resistance below 100 Ohms the V5 can be reset after the PTC has reached again a value of more than 160 Ohms.
Adjust	Depending on the availability of a valid Motor PTC, select Yes or No.

G3.6 UNDERLOAD CURRENT

Screen	**6 UNLOAD=0.0A**
Description	Under load current.
Range	0 to 0.9 x In, where In is the nominal current of the soft starter.
Unit	A
Default Value	0.0
Function	Under load current determines the current level the motor must not operate below.
Adjust	Usually leave as 50% of the nominal current of the motor.
Applications	This protection helps to detect mechanical problems such as broken shafts, belts, ... when this occurs, the motor will run under no load conditions. When working with pumps, this protection helps to detect no load pump operation, due to a lack of water or pump input pipe water position.

G3.7 UNDERLOAD DELAY

Screen	**7 UNLOAD T=OFF**
Description	Under load delay.
Range	0 to 99sec., OFF
Unit	Seconds
Default Value	OFF
Function	This parameter sets the maximum allowable operation time under under load conditions before tripping.
Adjust	Depends on the application, but should be set to trip as soon as a condition occurs.
Applications	Pumps, fans.

G3.8 SHEARPIN CURRENT

Screen	**8 SHRPIN=OFF**
Description	Shearpin current.
Range	OFF, 0.7 to 1.2 x In (Nominal current of the soft starter).
Unit	Amps.
Default Value	OFF
Function	The soft starter will stop immediately when the current drawn by the motor reaches this value during normal operation. This parameter is off during acceleration or deceleration. The stop should be done in a controlled way.
Adjust	Set current value for the V5 to stop.
Application	Oversized electrical motors used for starting, but working under nominal conditions at running, may only reach the Shearpin current because of mechanical problems locked rotors, etc.

G3.9 ASYMMETRYCAL CURRENT

Screen	**9 ASYM I ENB=Y**
Description	Asymmetrical current.
Range	Yes/No
Default Value	Yes
Function	Enable/Disable the asymmetric current protection at the soft starter. When enabled, the soft starter will trip on F3 ASYM CURR if there is a current imbalance greater than 40%.

G3.10 LOW VOLTAGE

Screen	**10 UNDER V=320V**
Description	Under voltage
Range	162 to 208V @ 220V 280 to 360V @ 400V 350 to 450V @ 500V 508 to 653V @ 690V
Unit	Volts
Default Value	320V
Function	To protect the motor or other equipment from low mains voltage. Low voltage will usually increase the motor current .
Adjust	Set the minimum tolerable level in conjunction with 11 Under voltage Delay.

G3.11 UNDERVOLTAGE DELAY

Screen	**11 U/V DELAY=5s**
Description	Under voltage delay.
Range	OFF, 0 to10
Unit	Seconds
Default Value	5
Function	This parameter sets the maximum operation time for under voltage conditions before tripping.
Adjust	Set to maximum under voltage operation time allowed.

G3.12 OVERVOLTAGE

Screen	**12 OVERVOLT=440V**
Description	Over voltage
Range	254 to 266V @ 230V 440 to 460V @ 400V 550 to 575V @ 500V 726 to 835V @ 690V
Unit	Volts
Default Value	440V
Function	To protect the motor from high input voltage.
Adjust	Set the maximum level tolerable in conjunction with the 13 Over voltage timeout.

G3.13 OVERVOLTAGE TIMEOUT

Screen	**13 O/V DELAY=5s**
Description	Over voltage timeout.
Range	OFF, 0 to 10 sec
Unit	Seconds
Default Value	5
Function	This parameter sets the maximum operation time during over voltage conditions before tripping.
Adjust	Set to maximum over voltage operation time allowed.

G3.14 STARTS LIMIT

Screen	**14 START LIMIT=3**
Description	Maximum number of starts.
Range	1 a 10
Default Value	3
Function	Establish the maximum number of starts allowed before tripping on F12 EXCESIV STR.
Adjust	Set maximum number of starts allowed for the specified time at 15:START INTERVAL.

G3.15 START INTERVAL

Screen	**15 STR/INT=15Min**
Description	Time interval for the number of starts specified at G3.14 START LIMIT.
Range	OFF, 0 - 60min.
Unit	Minutes
Default Value	15 Min
Function	Establish the time allowed between the first and the last start in G3.14:START LIMIT before tripping on F12 EXCESIV STR.
Adjust	Set the time limit for the maximum number of starts to occur.
Applications	Mills, crushers, and applications where an excessive number of starts could damage the motor due to very high current during acceleration.

G4 ACCELERATION

G4.1 START DELAY

Screen	**1 STR DELAY=0s**
Description	Delay of the start.
Range	0 to 600
Unit	Seconds
Default Value	0
Function	Sets the time the V5 will wait after a start command has been provided and acceleration will start.
Adjust	This value needs to be set in accordance with the application.

G4.2 TORQUE PULSE

Screen	**2 PULS TORQ =50%**
Description	Torque Pulse
Range	50 to 100%
Unit	% of rated Motor torque
Default Value	50%
Function	Choose the torque pulse level applied to the motor for the time specified at G4.3
Adjust	This value needs to be set in conjunction with G4.3 to initiate a first move of the motor.

G4.3 TORQUE PULSE TIME

Screen	**3 PULS TQ T=OFF**
Description	Torque Pulse Time.
Range	Off, 0.1 to 0.9s
Unit	Seconds
Default Value	OFF
Function	Sets the time for the G4.2 PULS TORQ to be applied.

G4.4 INITIAL TORQUE

Screen	**4 INIT TORQ=35%**
Description	Initial Torque
Range	30 to 99%
Unit	% of rated Motor torque
Default Value	35%
Function	Establish the initial torque to be applied to the motor at the beginning of the ramp up.
Adjust:	It is recommended to begin with a low initial torque value, normally default. Observe motor rotation immediately after start command. If the motor doesn't spin, machine torque requirement may be higher, and it may be necessary to increase this until the motor starts to turn normal after a start command has been applied. If a very high current is noticed at the very beginning of starting process, this could be due to an initial torque setting that is too high - this must be decreased until a proper value is achieved.
Applications	For submerged pumps, generally a torque between 40% and 45% is required. For applications such as mills or crushers, the required torque is normally between 40% and 50%.
***NOTE*:**	**These values are typical adjustments. Each application requires individual settings to achieve the best performance.**

G4.5 INITIAL TORQUE TIME

Screen	**5 INIT TQ T=1s**
Description	Initial torque time
Range	0 to 10
Unit	Seconds
Default Value	1
Function	Set the time for 3 INITIAL TORQUE to be applied to the motor.
Adjust	When working with high inertia loads, increase this value in conjunction with parameter G4.4 INITIAL TORQUE, until the motor begins to turn. All other applications should leave this value as default.

Applications — In pumps a usual value is 0, and in heavy load machines it can vary between 1 and 3 seconds.

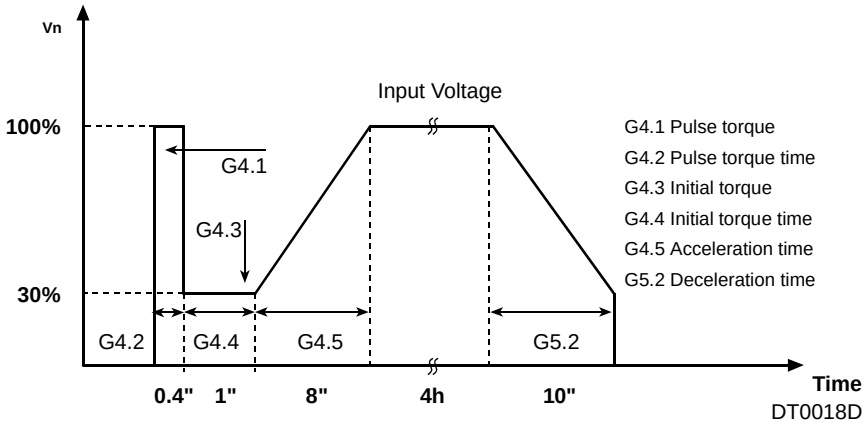


Figure. 25 Pulse torque.

G4.6 ACCELERATION TIME

Screen	**6 ACEL TIME=6s**
Description	Acceleration Time.
Range	0 to 180
Unit	Seconds
Default Value	6
Function	Adjusts the motor acceleration time from standstill to nominal speed, provided that no current limit occurs as that will cause a longer acceleration time.
Adjust	Depending on the application, the time set will vary in order to make sure no current limit takes place during acceleration. If this occurs, the acceleration time or acceleration current limit settings will need to be increased.
Applications	In submerged pumps, the usual acceleration time is between 4 and 8 seconds. With very high inertial loads, that can vary between 20 and 60 seconds.
***NOTE*:**	**These values are typical adjustments. Each application requires individual settings to achieve the best performance.**

G4.7 CURRENT LIMIT

Screen	**7 I LIMIT=1400A**
Description	Current limit at acceleration/deceleration
Range	0 to 5x nominal current of the soft starter.
Unit	Amps
Default Value	3 x In
Function	Maximum current a motor can draw during the acceleration/deceleration.
Adjust	Set the maximum current a motor can draw during the acceleration/deceleration of the motor. Typically set to 2.5 to 3x nominal current of the motor. Values below 2 times of the motor rated current should be avoided. Under this conditions the resulting motor torque is normally insufficient to generate a successful start at full load; also the soft starter could trip on F4 Overload.

G5 DECELERATION

G5.1 FREWHEEL STOP

Screen	**1 FREWEL STP=YES**
Description	Freewheel stop
Range	Yes/No
Default Value	Yes
Function	Set the required stop mode. The stop could be controlled through a ramp down voltage or uncontrolled where the time to stop depends on the inertia of the load.
Adjust	If a controlled stop is required select 1 FREWELSTOP=No, and 1 FREWELSTOP=Yes for a spinning stop.

G5.2 DECELERATION TIME

Screen	**2 DECL TIME=12s**
Description	Deceleration Time.
Range	0 to180
Unit	Seconds
Default Value	12
Function	Establish the required time for a controlled stop.
Adjust	Begin with a short time (10 or 15 seconds) and increase it until desired stop is achieved. If no satisfactorily results are obtained set hammer algorithm in G5.3.

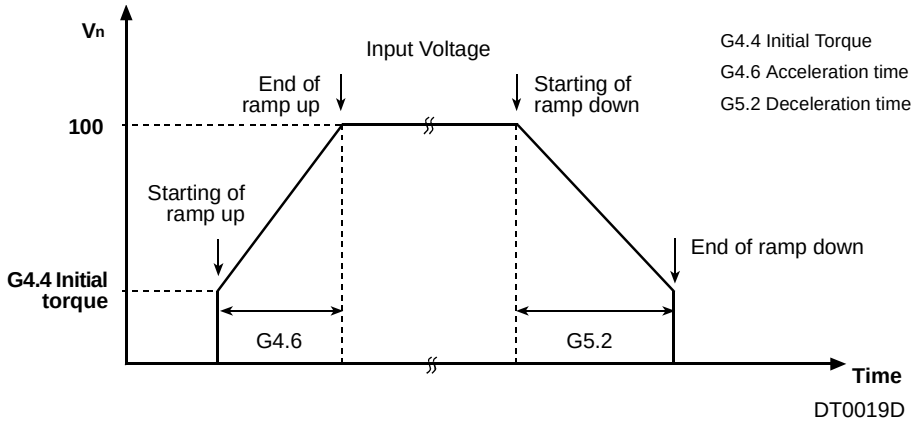


Figure 26. Deceleration curve.

G5.3 MOTOR DECELERATION ALGORITHM

Screen	**3 DEC MD SEL= 1**
Description	Deceleration mode select .
Range	1 Normal Curve. 2 Hammer prevent.
Default Value	1 Normal
Function	In applications where it is necessary to avoid water hammer effect, select this algorithm. In other applications, the normal deceleration ramp is sufficient.
Adjust	In applications with water hammer problems during deceleration, select the hammer algorithm. In other applications set normal deceleration algorithm. When selecting the hammer algorithm for the deceleration, 2 parameters must be set to properly adjust the stop. Percentage of time the hammer algorithm is active during the deceleration time. Minimum torque the motor must deliver during the stop. For correct adjustment of the deceleration time in applications with hammer problems it may be necessary to perform an interactive process by trial and error until the application is correctly commissioned.

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G5.4 HAMMER FACTOR

Screen	**4 HAMR FACT=75%**
Description	Hammer factor.
Range	0 to 100
Unit	Percentage of the motor deceleration time (G6.2).
Default Value	75%
Function	Set the percentage of time for the hammer algorithm is to be active during deceleration.

G5.5 MINIMUM TORQUE

Screen	**5 MINI TORQ=1%**
Description	Minimum torque to be applied during deceleration (when hammer algorithm is active).
Range	0 to 80
Unit	% of Parameter G5.4 HAMER FACT.
Default Value	1%
Function	Set the minimum torque to be applied during deceleration (for Hammer Algorithm) .

DECELERATION HAMMER ALGORITHM

The Hammer effect.
The velocity of a liquid column has a certain inertia proportional to speed and mass. When the motor flux (pump) is stopped quickly, or for instance a valve is closed, the inertia becomes a sudden pressure increase.

The larger the pipe and the higher the liquid velocity, the bigger the pressure overload will be. The force of this overpressure can damage any pipe work. This phenomenon is known as WATER HAMMER effect. The main causes of this effect are:

1. Fast opening and closing of a valve.
2. Start and stop of the pump.
3. Accumulation and movement of air pockets inside the pipe work.

The deceleration hammer algorithm.
This algorithm is designed to detect the presence of pipe related overpressure problems during deceleration of the pump. By changing motor deceleration ramp, the water column is controlled, eliminating deceleration overpressure and burst pipes.

In order to adjust the soft starter parameters correctly to prevent the hammer effect, the conditions when hammer occurs need to be known for the correct minimum motor torque to be provided at all times during deceleration.

G6 INPUTS

G6.1 CONTROL MODE

Screen **1 OPER MODE=1**
Description Control mode source
Range 0 to 4
Default value 0 Not enabled.
Function Set the control mode of the soft starter.

Nr.	MODE	DESCRIPTION	DISPLAY
0	Disable	No control source enabled. There is no way to Start/Stop-Reset the V5.	
1	Local	Start/Stop-Reset enabled by keypad.	L
2	Remote	Start/Stop-Reset enabled by digital inputs.	R
3	Serial Comms	Start/Stop-Reset enabled by serial comms.	C
4	Local Jog V/S	Jog Slow Speed controlled by keypad.	G
5	Pump ctrl-1	Pump control 1 enable.	P

Table 7. Control mode.

G6.2 LOCAL RESET

Screen **2 LOCAL RESET=Y**
Description Local reset control.
Range No/Yes
Default value Yes
Function Enable local reset via keypad.

G6.3 DIGITAL INPUT 1

Screen **3 D INPUT1 SEL=4**
Description Multifunction 1 input.
Range 0 to 10
Default Value 0 Not Used.
Function Select the task of the digital input once it is active (X).
Adjust See the table below.

Nr.	MODE	STATUS	FUNCTION
0	Not active	NA	Input has no effect.
1	Start	NO	Commands start.
2	Stop	NC	Commands stop.
3	Stop-Reset	NC	Commands stop; Reset on opening edge.
4	Start-Stop	NO	Commands start when closed; Stop when open.
5	Reset	NC	Reset on opening edge.
6	Slow Speed +	NA	Slow Speed +.
7	Slow Speed -	NA	Slow Speed -.
8	DC Brake	NA	Active DC Brake.
9	Dual setting	NA	Active Dual setting.
10	External trip	NC	Error occurs once this contact is opened.

Table 8. Inputs functions.

G6.4 DIGITAL INPUT 2

Screen	**4 DINPUT2 SEL=0**
Description	Multifunction 2 input.
Range	0 to 10
Default Value	0 Not Used
Function	Select the task of the digital input once it is active (X)
Adjust	See table 8. G6.3.

G6.5 DIGITAL INPUT 3

Screen	**5 DINPUT3 SEL=0**
Description	Multifunction 3 input.
Range	0 to 10
Default Value	0 Not Used
Function	Select the task of the digital input once it is active (X)
Adjust	See table 8. G6.3.

G6.6 DIGITAL INPUT 4

Screen	**6 DINPUT4 SEL=0**
Description	Multifunction 4 input
Range	0 to 10
Default Value	0 Not Used
Function	Select the task of the digital input once it is active (X)
Adjust	See table 8. G6.3.

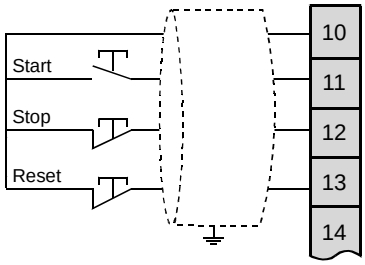
G6.7 DIGITAL INPUT 5

Screen	**7 DINPUT5 SEL=0**
Description	Multifunction 5 input.
Range	0 to 10
Default Value	0 Not Used
Function	Select the task of the digital input once it is active (X)
Adjust	See table 8. G6.3.

CONTROL CONNECTION EXAMPLES

Example 1: 3 Wire START / STOP.

G6.3: Mode 01 = START (T11).
G6.4: Mode 02 = STOP (T12).
G6.5: Mode 05 = RESET (T13).

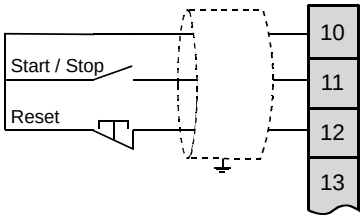


DT0003D

Figure 27. 3 Wire Start / Stop.

Example 2: START / STOP contact and RESET Pushbutton.

G6.3: Mode 04 = START / STOP (T11).
G6.4: Mode 05 = RESET (T12).

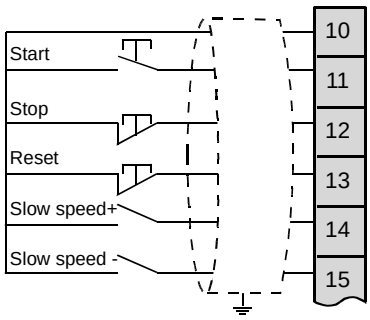


DT0022C

Figure 28. 2 Wire Start / Stop.

Example 3: START, STOP, RESET pushbutton, Slow Speed+ contact and Slow Speed – contact.

G6.3: Mode 01 = START (T11).
G6.4: Mode 02 = STOP (T12).
G6.5: Mode 05 = RESET (T13).
G6.6: Mode 06 = SLOW SPPED + (T14).
G6.7: Mode 07 = SLOW SPPED – (T15).

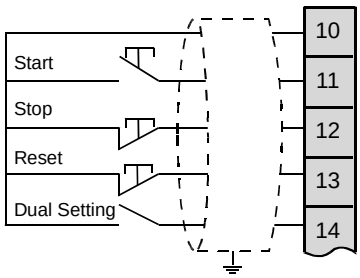


DT0027C

Figure 29. 3 Wire & Slow Speed +/Slow Speed -.

Example 4: START, STOP, RESET pushbutton and DUAL SETTING contact.

G6.3 : Mode 01 = START (T11).
G6.4 : Mode 02 = STOP (T12).
G6.5 : Mode 05 = RESET (T13).
G6.6 : Mode 09 = DUAL SETTING (T14).



DT0023C

Figure 30. 3 Wire & Dual Setting.

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Example 5: START, STOP, RESET pushbutton and DC BRAKE contact.

G6.3: Mode 01 = START (T11).
G6.4: Mode 02 = STOP (T12).
G6.5: Mode 05 = RESET (T13).
G6.6: Mode 08 = DC-BRAKE (T14).

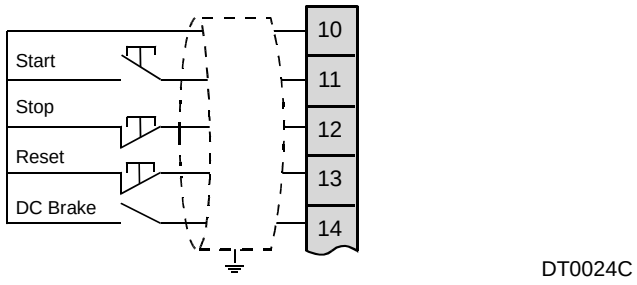

Figure 31. 3 Wire & DC Breaking.

G6.8 ANALOGUE INPUT1 FORMAT

Screen	**8 ANI1 FORMAT =1**
Description	Analogue Input 1 Format.
Range	0 = 0-20mA 1 = 4-20mA 2 = 0-10V
Default Value	1 = 4-20mA

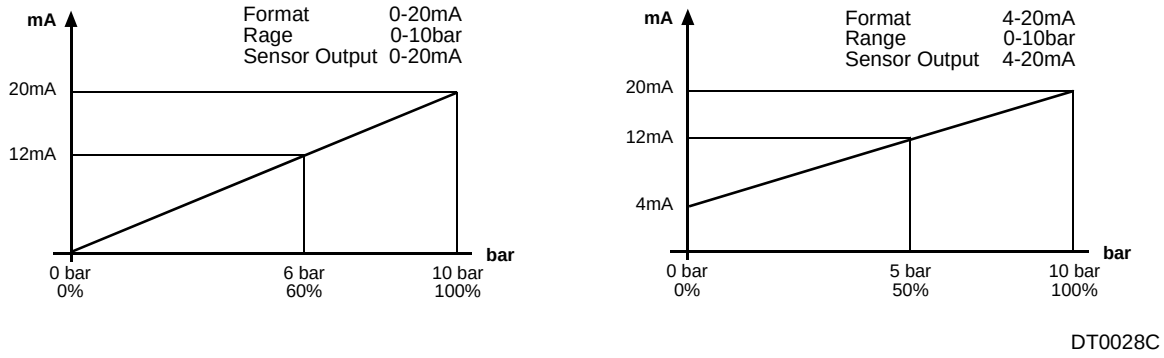

Figure 32. Analogue input 1 scaled as 0-20mA / 4-20mA.

G6.9 ANALOGUE INPUT 1 RANGE

Screen	**9 AI1 RANGE 0_10**
Description	Range of the Analogue input 1 in absolute units.
Range	0 to 999
Default Value	0-10
Adjust	Set according to the range of the connected transducer.

G6.10 ANALOGUE INPUT 1 UNIT

Screen	**10 AI1 UNITS=OFF**
Description	Analogue Input 1 unit .
Range	Bar, ºC, mtr (meters), OFF
Default Value	OFF
***NOTE*:**	**See section 6.5.2 TERMINAL DESCRIPTION**

G6.11 ANALOGUE INPUT 2 FORMAT

Screen	**11 ANI2 FORMAT =1**	
Description	Analogue Input 2 Format.	
Range	0	0-20mA
	1	4-20mA
	2	0-10V
Default Value	1	4-20mA

G6.12 ANALOGUE INPUT 1 RANGE

Screen	**12 AI2 RANGE 0-10**
Description	Set the range of the Analogue input 2 in absolute units.
Range	0 to 9999
Default Value	10
Adjust	Set according to the range of the connected transducer.

G6.13 ANALOGUE INPUT 2 UNITS

Screen	**13 AI2 UNITS=OFF**
Description	Analogue Input 2 unit .
Range	Bar, ºC, mtr (meters), OFF
Default Value	OFF

ANALOG INPUT CONNECTIONS EXAMPLES

- **Analogue input 1 (ANI1) 4-20mA (10 bar pressure transducer) .**

  ANI1: G6.8 = 8 ANI1 FORMAT =1
  G6.9 = 9 AI1 RANGE=10
  G6.10 = 10 AI1 UNITS=BAR

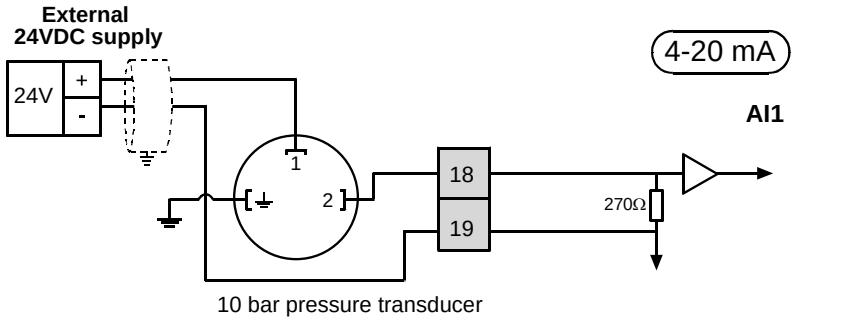

Figure 33. Pushbuttons in pressure transductor ANI1.

- **Analogue input 2 (ANI2) 0-10V (50ºC Temperature transducer).**
  ANI2: G6.11 = 11 ANI2 FORMAT=2
  G6.12 = 12 AI2 RANGE =50
  G6.13 = 13 ANI2 UNITS = ºC

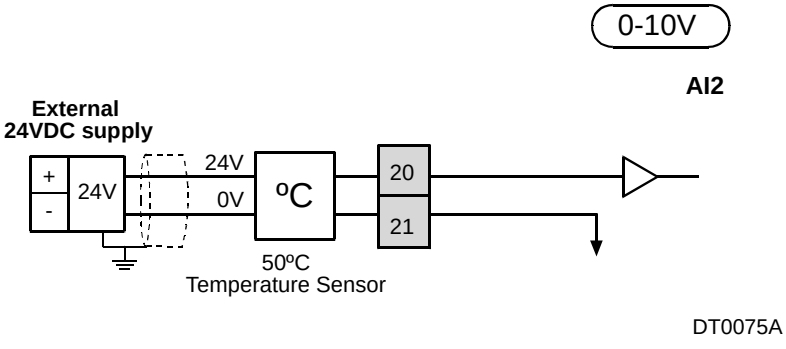

Figure 34. Pushbuttons in pressure temperature ANI2.

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G7 OUTPUTS

G7.1 RELAY 1

Screen	**1 REL1 SEL ON=14**
Description	Relay 1 control source selection.
Range	1 to 21 (see table 9).
Default Value	14 Instantaneous
Function	Provides the ability to link each relay to one of the outputs shown below
Adjust	No changes are required if relays are not in use. Select the desired source for each relay. If necessary, set up associated level setting screens (G9 Comparators)

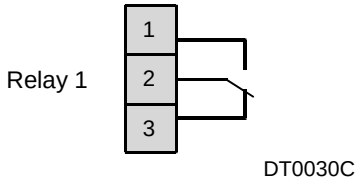

Figure 35. Relay 1.

G7.2 RELAY 2

Screen	**2 REL1 SEL ON=15**
Description	Relay 2 control source selection.
Range	1 to 21 (see table 9).
Default Value	15 Bypass/React.
Function	Provides the ability to link each relay to one of the outputs shown below
Adjust	No changes are required if relays are not in use. Select the desired source for each relay. If necessary, set up associated level setting screens (G9 Comparators).

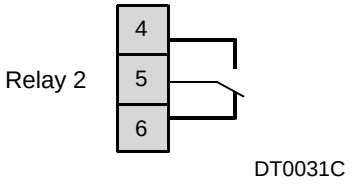

Figure 36. Relay 2.

G7.3 RELAY 3

Screen	**3 REL1 SEL ON=9**
Description	Relay 3 control source selection.
Range	1 to 21 (see table 9).
Default Value	9 Faults.
Function	Provides the ability to link each relay to one of the outputs shown below.
Adjust	No changes are required if relays are not in use. Select the desired source for each relay. If necessary, set up associated level setting screens (G9 Comparators).

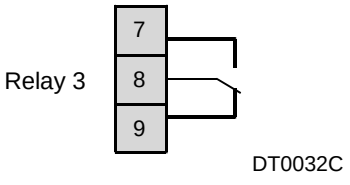

Figure 37. Relay 3.

***NOTE*:** **Relay 3 can be configured the same as relay 1 and 2, with the 21 possible adjustments except if the EXTERNAL BRAKE option has been selected in screen**

G13.4. In that case, relay 3 will remain internally adjusted, for control of the EXTERNAL DC BRAKE and cannot be configured.

RELAY TABLE SELECTION		
MODE	**FUNCTION**	**DESCRIPTION**
0	Not active	Relay is disable, not used.
1	Active	Relay is enabled.
2	Warning overload	The motor current exceeds the value adjusted in parameter G3.2 (OVERLOAD CURRENT).
3	Warning under load	The motor current is below the value adjusted in parameter G3.6 (UNDERLOAD CURRENT).
4	Warning over voltage	The mains voltage is equal or higher than G3.12 (OVERVOLTAGE).
5	Warning low voltage	The mains voltage is less or equal than G3.10 (UNDERVOLTAGE).
6	Comparator 1	Relay enables when the value of the parameter set in screen G9.1 is above screen G9.2 value after time set in screen G9.4. Relay disables when the value of the parameter set in screen G9.1 is below screen G9.3 value after time set in screen G9.5.
7	Comparator 2	Relay enables when the value of the parameter set in screen G9.6 is above screen G9.7 value after time set in screen G9.9. Relay disables when the value of the parameter set in screen G9.6 is below screen G9.8 value after time set in screen G9.10.
8	Comparator 3	Relay enables when the value of the parameter set in screen G9.11 is above screen G9.12 value after time set in screen G9.14. Relay disables when the value of the parameter set in screen G9.11 is below screen G9.13 value after time set in screen G9.15.
9	General Fault	Relay will be active a fault occurs.
10	No fault	Will be active if no faults are present (failsafe).
11	Thyristor fault	One or more thyristors are fault.
12	Autoreset Fault	Relay enables when screen G15.2 Attemp numbr setting is passed over.
13	Ready	The soft starter is ready to run the motor.
14	Run	ON at the beginning of the ramp up / OFF at the end of the ramp down.
15	Bypass/React	ON at the end of the ramp up / OFF at the beginning of the ramp down.
16	Delay	ON at the end of the ramp up / OFF at the end of the ramp down.
17	High pressure	The V5 is running and the pressure switch opens for longer than the time entered in screen G16.4
18	Low pressure	The V5 is running and the pressure switch opens for longer than the time entered in screen G16.5.
19	No flow	The flow switch is ignored for the time set in screen G16.6 on receipt of a valid start signal. After this time the V5 will trip if no flow is indicated for longer than the time set in screen G16.7.
20	Low water	The well probe controller (or other level controller) detects a lack of water.
21	Pump fault	A fault from F24 to F27 and F5 has occurred. Pump related faults.

Table 9. Relay selection.

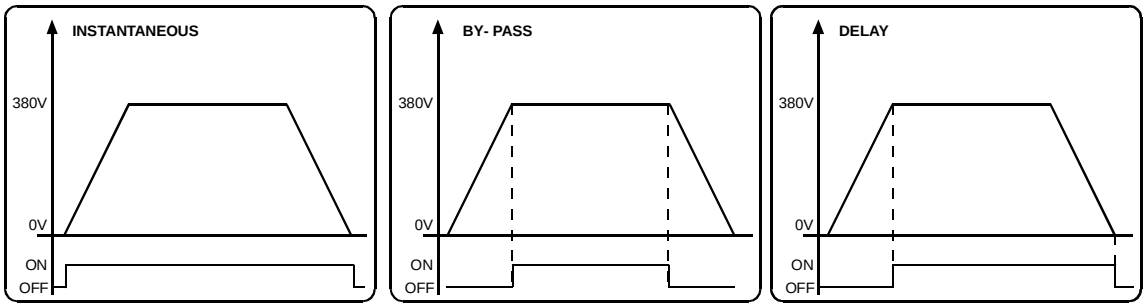

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Figure 38. Relay's switch on / off mode 11, 12 and 13.

G7.4 ANALOGUE OUTPUT SOURCE SELECTION

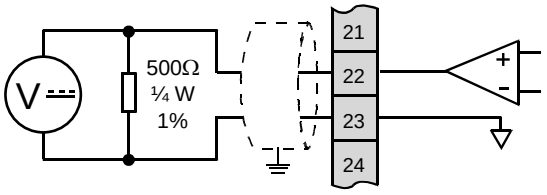
Screen	**4 ANALOG1 SEL=0**
Description	Analogue output source selection.
Range	0 to 7,
Default Value	0
Function	Provides the ability to select the driving source of the Analogue output, from the following list.
Adjust	See table 10.

Nr.	DESCRIPTION
0	UNUSED
1	MOTOR CURRENT
2	MOTOR POWER
3	MOTOR TORQUE
4	COSINUS PHI
5	INPUT VOLTAGE
6	ANALOG I 1 ECHO
7	ANALOG I 2 ECHO

Table 10. Analogue output selection*.*

G7.5 ANALOGUE OUTPUT FORMAT

Screen	**5 AO1 FORMAT=0**
Description	Analogue output format.
Range	0 or 1, 0 = 0-20 mA 1 = 4-20 mA
Default Value	0 = 0-20 mA
Function	Select the electrical format of the Analogue output.



DT0036D

Figure 39. Analogue output 0-10V.

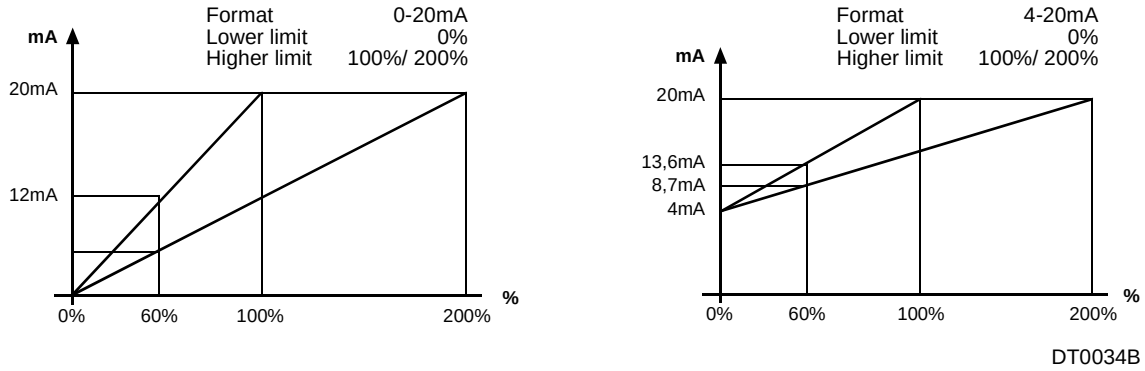


Figure 40. Analogue output 0-20mA and 4-20mA.

Example:

$$\text{OUTPUT} = 4 + \frac{16}{\text{High Lim.} - \text{Low Lim.}} \times (X\%)$$

$$60\% = 4 + \frac{16}{100\%} \times (60\%) = 13{,}6\text{mA}$$

G7.6 ANALOGUE OUTPUT LOW SETPOINT

Screen	**6 AO1 LOW=0%**
Description	Analogue Output low set point.
Range	0 to 500.
Default Value	0%

G7.7 ANALOGUE OUTPUT HIGH SETPOINT

Screen	**7 AO1 HIGH=100%**
Description	Analogue Output high set point.
Range	0 to 500.
Default Value	100

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G8 DUAL SETTING

G8.1 DUAL SETTING

Screen	**1 DUALSETING=NO**
Description	Dual Setting.
Range	Yes/No
Default Value	No
Function	Enable/Disable a second adjustment for G4 Acceleration, G5 Deceleration and for the overload curve (G3.3 Overload Curve).
Adjust	When a second parameter is required set select Dual Setting to Yes. This second adjustment is activated by one of digital inputs.
Applications	Mills, crushers and any application that at a certain operation stage requires a harder/softer parameter set.

G8.2 TORQUE PULSE 2

Screen	**2 PLS TORQ2=50%**
Description	Dual setting Torque Pulse
Range	50 a 100%
Unit	% of rated Motor torque
Default Value	50%
Function	Choose the torque pulse level applied to the motor for the time specified at G8.3
Adjust	Set this value in conjunction with G8.3 to initiate a first acceleration of the motor.

G8.3 PULSE TORQUE TIME 2

Screen	**3 PLS TQ T2=OFF**
Description	Dual setting Pulse Time.
Range	OFF, 0 to 0.9s
Units	Seconds
Default Value	OFF
Function	Refer to G4.3.
Adjust	Refer to G4.3

G8.4 INITIAL TORQUE 2

Screen	**4 INIT TRQ2 =30%**
Description	Dual setting Initial Torque.
Range	30 to 99%
Default Value	30%
Function	Refer to G4.4
Adjust	Refer to G4.4

G8.5 INITIAL TORQUE TIME 2

Screen	**5 INIT TQ T2=1s**
Description	Dual setting Initial Torque Time .
Range	0 a 10
Units	seconds
Default Value	1
Function	Refer to G8.4
Adjust	Refer to G4.5

G8.6 ACCELERATION TIME 2

Screen	**6 ACC TIME2=12s**
Description	Dual Setting Acceleration Time.
Range	0 to 180
Units	Seconds
Default Value	12
Function	Refer to G4.6
Adjust	Refer to G4.6

G8.7 CURRENT LIMIT 2

Screen	**7 I LIMIT2 =2800A**
Description	Dual Setting current limit.
Range	1 to 5xIn, In soft starter rated (nameplate) current.
Units	Amps
Default Value	3xIn
Function	Refer to G4.7
Adjust	Refer to G4.7

G8.8 FREEWHEEL STOP 2

Screen	**8 FREWEL STP2=N**
Description	Dual setting spin stop.
Range	Yes/No
Default Value	No
Function	Refer to G5.1.
Adjust	Refer to G5.1.

G8.9 DECELERATION TIME 2

Screen	**9 DEC TIME2=12s**
Description	Dual setting deceleration time.
Range	0 to 180
Units	Seconds.
Default Value	12
Function	Refer to G5.2.
Adjust	Refer to G5.2.

G8.10 MOTOR DECELERATION ALGORITHM 2

Screen	**10 DEC MD SEL2= 1**
Description	Dual setting deceleration mode select.
Range	1 Normal Curve. 2 Hammer prevent.
Default Value	1 Normal
Function	In applications where it's desired to avoid water hammer effect, select this algorithm. In other applications, the normal deceleration ramp is sufficient.
Adjust	In applications with water hammer problems during deceleration, select the hammer algorithm. In other applications set normal deceleration algorithm. When selecting the hammer algorithm for the deceleration, 2 parameters must be set to properly adjust the stop. Percentage of time the hammer algorithm is active during the deceleration time. Minimum torque the motor must deliver during the stop. To correctly adjust the deceleration of such an application with hammer problems you may need to perform an interactive process by trial and error until the application is correctly commissioned.

G8.11 HAMMER FACTOR 2

Screen	**11 HAMR FAC2=75%**
Description	Dual setting hammer factor.
Range	0 to 99
Unit	Percentage of the motor deceleration time (G8.9).
Default Value	75%
Function	Set the percentage of time for the hammer algorithm is to be active during deceleration.

G8.12 MINIMUM TORQUE 2

Screen	**12 MINI TRQ2=1%**
Description	Dual setting of minimum torque to be applied during deceleration (when hammer algorithm is active).
Range	0 to 99%
Unit	% of Parameter G8.11 HAMER FACT2.
Default Value	1%
Function	Set the minimum torque to be applied during deceleration (for Hammer Algorithm) .

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G8.13 PHASE SEQUENCE 2

Screen	**13 PHASE SEQ2=2**
Description	Dual setting in phase sequence at the input of the soft starter.
Range	1 NO SEQ PROTECT. 2 L1 L2 L3 SEQ. 3 INVERSED SEQ.
Default Value	2 L1 L2 L3 seq.
Function	This parameter sets the correct phase sequence at the input, when starting the motor. It can happen that the soft starter tries to start with a phase sequence at the input different than the one we have set. In this case the soft starter trips on F2 WRONG PH/SQ.
Adjust	Determine your input phase sequence; adjust this parameter according to this sequence.

***NOTE*:** **When operating at SLOW SPEED or DC BRAKE you must always select a phase sequence (L1 L2 L3 or Inverse Sequence). The option 1 NO SEQ PROTECT is not allowed for these modes.**

G8.14 OVERLOAD MOTOR CURRENT 2

Screen	**14 OV LOAD2=1200A**
Description	Dual setting of overload motor current.
Range	0.6 to 1.5 x Inom, where Inom relates to the rated soft starter current.
Unit	A
Default Value	1.0 x Inom.
Function	This parameter sets the overload motor current protection at nominal conditions. The time for this protection to trip depends on the actual current drawn by the motor and the parameter G3.3.
Adjust	Enter the rated (nameplate) motor current value.

G8.15 OVERLOAD CURVE 2

Screen	**15 OV/LOAD T2=5**
Description	Dual setting of overload curve.
Range	1 to 10 1 Fastest curve. 10 Slowest curve.
Default Value	5
Function	The overload curve determines the response time under overload conditions. There is a non-linear relation between the overload parameter (G3.2 OVERLOAD) and this parameter, in order to set the time required for tripping on F4 OVERLOAD. If 3 OV/LOAD T =1 is selected then the response time for an overload condition is almost immediate, but if OV/LOAD T =10 then takes the soft starter trips on F4 OVERLOAD after a time delay.
Adjust	If you need a fast response under overload conditions, please select O OV/LOAD T =1. If you need a slow response, then select OV/LOAD T =10. For normal operation leave this value as default (OV/LOAD T =5).

G8.16 STARTING OVERLOAD FACTOR 2

Screen	**16 OVL FAC2=100%**
Description	Dual setting starting Overload Factor.
Range	100 to 500%
Unit	Percentage of % G3.3 OV/LOAD T.
Default Value	100%
Function	This parameter adjusts the OVERLOAD CURVE DURING ACCELERATION. Use this parameter when trying to accelerate high inertia load. In case of pumps, fans (Torque = K x Speed^2) leave as default (100%). This parameter is only active during acceleration and not in normal running conditions, where only G3.2 & G3.3 are active.
Adjust	For low inertia pumps, fans (Torque = K x Speed²) leave as default value (100%) For mills, crushes and centrifuges (high inertia moment) start with low starting overload factor (150%) and increase this value till we can accelerate this load without tripping on F4 OVERLOAD.

G8.17 MOTOR PTC 2

Screen	**17 MTR PTC2=N**
Description	Dual setting Enable/Disable PTC motor option.
Range	Yes/No
Default Value	No
Function	The soft starter allows for the connection of a standard motor PTC (Terminals T16-T17) to detect overheating of the motor. Every input resistance between 150ohm and 2.7kohms is taken as a correct value (ok) and every value found out of this range is taken as a fault (fault). If you select MOTOR PTC =Yes and the input resistance at terminals T16-T17 is out of the valid range, then the soft starter should trip on F8 MOTOR PTC. To protect the motor after tripping due to PTC alarm against further thermal overload, the PTC resistance must be less than 270 Ohms to reset the softstarter.
Adjust	Depending on availability of a valid Motor PTC, select Yes or No.

G8.18 UNDERLOAD CURRENT 2

Screen	**18 UNLOAD2=0.0A**
Description	Dual setting of under load current.
Range	0 to 0.9 x In, where In is the nominal current of the soft starter.
Unit	Amps
Default Value	0.0
Function	Under load current determines the current level the motor must not operate below.
Adjust	Usually leave as 50% of the nominal current of the motor.
Applications	This protection helps to detect mechanical problems such as broken shafts, belts, ... when this occurs, the motor will running under no load conditions. When working with pumps, this protection help to detect no load pump operation, due to a lack of water or pump input pipe water position.

G8.19 UNDERLOAD DELAY 2

Screen	**19 UNLOAD T2=OFF**
Description	Dual setting of under load delay.
Range	0 to 99sec., OFF
Unit	Seconds
Default Value	OFF
Function	This parameter sets the maximum allowable operation time under under load conditions before tripping.
Adjust	Depends on the application, but should be set to trip as soon as a condition occurs.
Applications	Pumps, fans.

G8.20 SHEARPIN CURRENT 2

Screen	**20 SHRPIN2=OFF**
Description	Dual setting Shearpin current.
Range	OFF, 0.6 to 1.2 x In (Nominal current of the soft starter).
Unit	A
Default Value	OFF
Function	The soft starter should stop immediately when the current drawn by the motor reaches this value during nominal conditions. This parameter is off during acceleration or deceleration. The stop should be done in a controlled way.
Adjust	Set current value for the V5 to stop.
Application	Oversized electrical motors used for starting, but working under nominal conditions at running, it may only reach the Shearpin current due to mechanical problems like locked rotors, etc.

G8.21 ASYMMETRYCAL CURRENT 2

Screen	**21 ASYM I ENB2=N**
Description	Dual setting of an asymmetrical current.
Range	Yes/No
Default Value	N
Function	Enable/Disable the asymmetric current protection at the soft starter. When enabled, the soft starter will trip on F3 ASYMMETRIC CURRENT if there is a current imbalance greater than 40%.

G8.22 MOTOR CURRENT 2

Screen	**22 I MTR2=30A**
Description	Dual setting rated (Nameplate) motor current.
Range	9 to 1200
Units	A
Default Value	Depends on V5 rated current.
Function	Set the nominal current of the motor. This is necessary for correct motor protection.
Adjust	Set this value according to rated (nameplate) motor current.

G8.23 MOTOR VOLTAGE 2

Screen	**23 V MTR2=2**
Description	Dual setting rated (Nameplate) Motor Voltage
Range	220-240V 380-440V 500-525V 660-690V
Units	Volts
Default Value	2. 380-440V
Function	Adjust nominal motor voltage.
Adjust	Set this parameter according to input voltage at the soft starter input. Make sure this value is also relevant for the rated (Nameplate) motor voltage.

G8.24 MOTOR POWER 2

Screen	**24 P MTR 2 =4.0kW**
Description	Dual setting rated (nameplate) motor power.
Range	0 to 999
Units	kW
Default Value	4.0
Function	Set the nominal motor power rating.

G8.25 MOTOR COS PHI 2

Screen	**25 COS PHI 2=85%**
Description	Dual setting motor power factor.
Range	0,4 to 0,99
Unit	%
Default value	85%
Function	Set the rated (nameplate) motor cos phi to for calculating the instantaneous torque developed by the motor.

G8.26 SUPPLY FREQUENCY 2

Screen	**6 FREQ 2= 50Hz**
Description	Dual setting supply frequency.
Range	50 Hz, 50/60 Hz
Units	Hz
Default value	50Hz
Function	Set the mains frequency.
Adjust	Where the mains frequency is 50Hz, leave as default. Where the mains frequency is unknown or different than 50Hz (60Hz) set 50/60Hz.
NOTE:	**When you set 50/60Hz the V5 starts an algorithm to detect the mains frequency. This algorithm is off when setting 50Hz.**

G9 COMPARATORS

The parameters of this group will activate the output relays according to:

Comparator1 Source = (G9.1); On = (G9.2); OFF = (G9.3); ON Delay Time = (G9.4); OFF Delay time = (G9.5)
Comparator2 Source = (G9.6); On = (G9.7); OFF = (G9.8); ON Delay Time = (G9.9); OFF Delay time = (G9.10)
Comparator3 Source = (G9.11); On = (G9.12); OFF = (G9.13); ON Delay Time = (G9.14); OFF Delay time = (G9.15)

G9.1 COMPARATOR 1 SOURCE SELECTION

Screen **1 COMPR1 SEL=1**
Description Comparator source selection.
Range 0 to 8

Nr.	SOURCE
0	UNUSED
1	MOTOR CURRENT
2	MOTOR POWER
3	MOTOR TORQUE
4	COSINUS PHI
5	INPUT VOLTAGE
6	ANALOG INPUT 1
7	ANALOG INPUT 2
8	O/LOAD STATUS

Table 11. Comparator selection.

G9.2 COMPARATOR 1 ON SETPOINT

Screen **2 COMP1 ON=100%**
Description Comparator 1 ON set point.
Range 0 to 500%
Unit % of function selected (G9.1).
Default Value 100%
Function Set the comparator ON set point. If the value of the source selected is higher than the ON set point for the time specified at G9.4, the output state of this comparator changes to ON. One of these relays must be selected as a comparator, see screens group G7.

G9.3 COMPARATOR 1 OFF SETPOINT

Screen **3 COMP1 OFF=80%**
Description Comparator1 OFF set point.
Range 0 to 500 %,
Units % of function selected (G9.1).
Default Value 0.6 x In.
Function Set the comparator OFF set point. If the value of the source selected is lower than this OFF set point for the time specified at G9.4 the output of this comparator changes to OFF. One of these relays must be selected as a comparator, see screen group G7.

G9.4 COMPARATOR 1 ON DELAY

Screen **4 T COMP1 ON=5s**
Description Comparator 1 ON delay.
Range 0 to 99 .
Unit Seconds.
Default Value 5
Function Set the ON delay condition for the comparator.

G9.5 COMPARATOR 1 OFF DELAY

Screen	**5 T COMP1 OFF=5s**
Description	Comparator 1 OFF delay.
Range	0 to 99
Unit	Seconds.
Default Value	5
Function	Set the OFF delay condition for the comparator.

EXAMPLE: **When motor current exceeds rated current a relay could be used to warn against motor overload.**

G9.1 COMPR1 SEL = 1
G9.2 COMP1 ON = 100%
G9.3 COMP1 OFF = 80%
G9.4 T COMP1 ON = 10s
G9.5 T COMP1 OFF = 10s

G7.1 REL1 SEL= 6

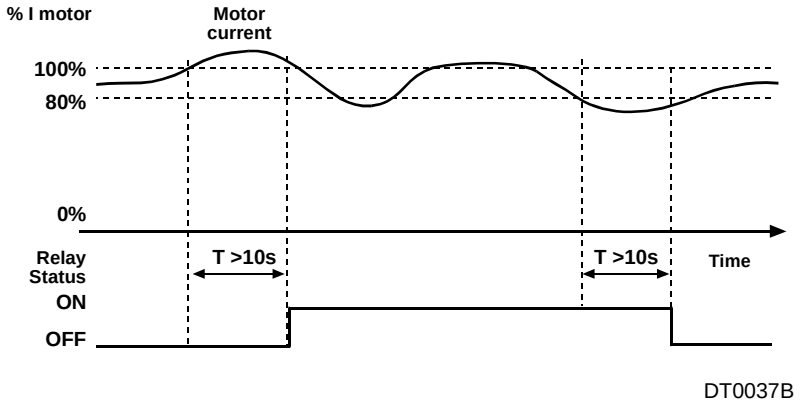

Figure 41. Comparator relay configuration.

G9.6 COMPARATOR 2 SOURCE SELECTION

Screen	**6 COMPR2 SEL=1**
Description	Comparator 2 source selection.
Range	0 to 8 (See table 11 in G9.6)

G9.7 COMPARATOR 2 ON SETPOINT

Screen	**2 COMP2 ON=100%**
Description	Comparator 2 ON set point.
Range	0 to 500%
Unit	% of function selected (G9.6).
Default Value	100%
Function	Set the comparator ON set point. If the value of the source selected is higher than the ON set point for the time specified at G9.4, the output state of this comparator changes to ON. One of these relays must be selected as a comparator, see screens group G7.

G9.8 COMPARATOR 2 OFF SETPOINT

Screen	**8 COMP2 OFF=80%**
Description	Comparator 2 OFF set point.
Range	0 to 500 %,
Units	% of function selected (G9.6).
Default Value	80.
Function	Set the comparator OFF set point. If the value of the source selected is lower than this OFF set point for the time specified at G9.10 the output of this comparator changes to OFF. One of these relays must be selected as a comparator, see screen group G7.

G9.9 COMPARATOR 2 ON DELAY

Screen	**9 T COMP2 ON=5s**
Description	Comparator 2 ON delay.
Range	0 to 99 .
Unit	Seconds.
Default Value	5
Function	Set the ON delay condition for the comparator 2.

G9.10 COMPARATOR 2 OFF DELAY

Screen	**10 T CMP2 OFF=5s**
Description	Comparator 2 OFF delay.
Range	0 to 99
Unit	Seconds.
Default Value	5
Function	Set the OFF delay condition for the comparator.

G9.11 COMPARATOR 3 SOURCE SELECTION

Screen	**11 COMPR3 SEL=1**
Description	Comparator 3 source selection.
Range	0 to 8 (See table 11 in G9.1)

G9.12 COMPARATOR 3 ON SETPOINT

Screen	**12 COMP3 ON=100%**
Description	Comparator 3 ON set point.
Range	0 to 100%
Unit	% of function selected (G9.11).
Default Value	100%
Function	Set the comparator ON set point. If the value of the source selected is higher than the ON set point for the time specified at G9.14, the output state of this comparator changes to ON. One of these relays must be selected as a comparator, see screens group G7.

G9.13 COMPARATOR 2 OFF SETPOINT

Screen	**13 COMP2 OFF=80%**
Description	Comparator 3 OFF set point.
Range	0 to 500 %,
Units	% of function selected (G9.11).
Default Value	80%.
Function	Set the comparator OFF set point. If the value of the source selected is lower than this OFF set point for the time specified at G9.14 the output of this comparator changes to OFF. One of these relays must be selected as a comparator, see screen group G7.

G9.14 COMPARATOR 3 ON DELAY

Screen	**14 T COMP3 ON=5s**
Description	Comparator 3 ON delay.
Range	0 to 99 .
Unit	Seconds.
Default Value	5
Function	Set the ON delay condition for the comparator.

G9.15 COMPARATOR 3 OFF DELAY

Screen	**15 T CMP3 OFF=5s**
Description	Comparator 3 OFF delay.
Range	0 to 99
Unit	Seconds.
Default Value	5
Function	Set the OFF delay condition for the comparator.

G10 FAULT SCREENS

G10.1 – G10.5 FAULT HISTORY

Screen

G10.1 WRONG PHSQ/ITQ
G10.2 PHA MISING/ITQ
G10.3 MEMORY FLT:RDY
G10.4 EXTRN TRIP:RDY
G10.5 PHA MISING:RUN

Description: The last fault will be displayed as per table12 by pressing the " * " key.

Function: Shows the last fault the soft starter tripped on. When a fault occurs, the soft starter automatically shows this screen. At the same time, the fault led lights up. This fault may be reset by pressing the STOP-RESET button on the display unit (if enabled) or using an externally configured RESET input.

FAULT	DISPLAY TEST	DESCRIPTION
F0	NO FAULT	No fault.
F1	PHA MISING	Phase input missing.
F2	WRONG PH/SQ	Wrong input phase sequence.
F3	ASYM CURR	Unbalanced current consumption.
F4	OVER LOAD	Excessive current consumption.
F5	UNDER LOAD	Under load motor.
F6	PEAK CURR	The current has been higher than 6 times the nominal.
F7	STARTER OT	Excessive temperature in the radiator (>85ºC).
F8	MOTOR PTC	Shoot by the PTC of the motor.
F9	SHEAR PIN	The motor current has reached the Shearpin protection.
F10	OVER VOLT	Too high input voltage.
F11	UNDER VOLT	Too low input voltage for too much time.
F12	EXCESIV STR	Excessive number of starts.
F13	MEMORY FLT	Fault in data memory.
F14	SCR1 FAULT	Thyristor fault in phase L1, disconnected motor in L1.
F15	SCR2 FAULT	Thyristor fault in phase L2, disconnected motor in L2.
F16	SCR3 FAULT	Thyristor fault in phase L3, disconnected motor in L3.
F17	SCR_S FLT	Thyristor fault, disconnected motor.
F18	EXCES T LS	Too much time at slow speed mode.
F19	LS DISABLE	It's not possible to work at Slow Speed mode.
F20	COMS T/OUT	Too much time without Serial Communications.
F21	EXTRN TRIP	An external fault has occured through a digital input
F22	CUR FLT	Large current imbalance occurs due to a sudden voltaje drop in any of the V5 input phases.
F23	CUR FLT2	Large current imbalance occurs due to a sudden voltaje rise in any of the V5 input phases
F24	HIGH PRESSURE	Overpressure, the V5 is running and the pressure switch opens for longer then the time entered in screen G16.4.
F25	LOW PRESSURE	The V5 is running and the pressure switch opens for longer than the time entered in screen G16.5.
F26	FLOW SWITCH	No water in the pump, then the flow switch is ignored for the time set in screen G16.7 on receip on a valid start signal.
F27	DEEP WELL PROBE	The tank or pump has not water.

Table 12. Fault screens.

Nr.	MODE	DESCRIPTION
0	DRY	Ready.
1	ITQ	Initial Torque.
2	ACL	Acceleration.
3	RUN	Runs at current speed
4	DEC	Deceleration.
5	HAM	Hammer
6	LS+	Slow Speed +.
7	LS-	Slow Speed -.
8	DCB	DC Brake.
9	UNV	Undervoltage.
10	OVV	Overvoltage.
11	OVL	Overload.
12	UDL	Underload.
13	PTC	Motor PTC.
14	PVT	Soft-Starter overtemperature.
15	SHP	Shearpin current.
16	ASY	Asymmetric current.
17	FLT	Fault.
18	STD	Start delay.
19	EXT	External fault.
20	P/T	Torque Pulse.
21	ILT	Current limit.
22	HIP	High pressure.
23	LOP	Low pressure.
24	NOF	No flow.
25	LWA	Low water.

Table 13. Status Screen.

EXAMPLE: When fault occurs led red will light and status line (upper line) will show FEH. The average current and voltage displayed are the values right when fault occured.

Botton line will show the fault name and the status of V5 when the fault occurred separated by "/" in case automatic reset was no activated, or by ":" in case it was activated

If "*" key is pressed it will display the posistion of the fault in the history and the number related to it.

G10.6 CLEAR FAULT

Screens **6 DELET FAULTS=N**
Description Clear History Fault.
Range Yes/No
Default Value No
Function Clear the fault history log which resets the above screens back to the default setting NO FAULTS.
Adjust Select YES (Y) to clear the fault history log. The screen will automatically reset back to the default value NO (N) once the fault history is cleared.

NOTE: **Once the fault history log is cleared, the following screens are displayed as:**

SCREEN	DISPLAY	Press (*)
G10.1	1 NO FAULT	1 LAST FAULT=F0
G10.2	2 NO FAULT	2 FOURTH FAULT=F0
G10.3	3 NO FAULT	3 THIRD FAULT=F0
G10.4	4 NO FAULT	4 SECOND FAULT=F0
G10.5	5 NO FAULT	5 FIRST FAULT=F0

G11 STATISTICS

This group of parameters shows valuable information on number of starts, working hours, fault trips and kWh.

G11.1 TOTAL START COUNTER

Screen	**1 STARTS100000**
Description	Total number of starts.
Function	Shows the total number of the V5 starts. This record cannot be reset to zero.

G11.2 START COUNTER 2

Screen	**2 STARTS200000**
Description	Counter of starts 2.
Function	Shows the number of the V5 starts made after G11.3 has been cleared. This parameter can be reset to zero.

G11.3 CLEAR START COUNTER 2

Screen	**3 DEL STARTS2=NO**
Description	Clears counter of starts 2
Range	YES or NO
Default value	NO
Function	It resets to 0 the number of starts displayed in G11.2.

G11.4 TOTAL OF WORKING HOURS COUNTER

Screen	**4 H1 =00000h:00m**
Description	Total of working hours
Function	Shows the total soft starter operation hours. This record cannot be reset to zero.

G11.5 WORKING HOURS COUNTER 2

Screen	**5 H2= 00000h:00m**
Description	Working hours counter 2.
Function	Shows the number of the V5 operations hours made G11.6 has been cleared.

G11.6 CLEAR WORKING HOURS COUNTER 2

Screen	**6 DEL HOURS2=NO**
Description	Clear working hours counter 2.
Range	YES or NO
Default value	NO
Function	It resets to 0 the number of working hours displayed in G11.5.

G11.7 TOTAL FAULTS COUNTER

Screen	**7 TOTAL FLT=00**
Description	Total number of faults counter.
Function	Shows the total number where the V5 has tripped due to faults.

G11.8 FAULTS COUNTER 2

Screen	**8 FAULT 2=0**
Description	Faults counter 2
Function	Shows the number of faults occurred after G11.9 has been cleared.

G11.9 CLEAR FAULTS COUNTER 2

Screen	**9 DEL FAULT2=NO**
Description	Clear faults counter 2.
Range	YES or NO
Default value	NO
Function	resets to 0 the number of faults displayed in G11.8.

G11.10 TOTAL KWH COUNTER

Screen	**10 KWH=000000**
Description	Total number of KWH done by the V5.
Function	Shows the total value of KWH done by the V5. This parameter cannot be reset to zero.

G12 SLOW SPEED

The V5 can work at slow speed mode in three different ways:

1. **From keypad: Set screen** G6.1 to MODE 4 (LOKAL JOG-JOG+), by pressing START, the motor will turn at slow speed (+), and when pressing stop motor will turn at slow speed (-).

2. **From digital inputs: Any of the digital inputs can be set to 6 for the motor to run at (+) slow speed or to option 7 for the motor to run at (-) slow speed**.

3. **Automatic: By this operation mode**, when providing start command the V5 will execute the following sequence. First it will turn at (+) slow speed during the time set in screen G12.4, then it will acelérate to nominal speed and after stop command it will run at (-) slow speed during the time set in screen G12.5 after deceleration.

NOTE: Slow speed will be used only for short time motor positioning operation.

G12.1 SLOW SPEED MODE

Screen	**1 L/S ACC-DEC =N**
Description	Slow speed mode.
Range	NO /YES, NO: No Slow Speed. YES: Slow Speed at Accel/Decel.
Default Value	No Slow Speed.
Function	Enable/Disable slow speed during the acceleration/deceleration.
Adjust	When slow speed is not required set to 0. Otherwise, set to 1.

G12.2 SLOW SPEED TORQUE

Screen	**2 L SPD TORQ =30%**
Description	Slow Speed Torque.
Range	0 to 100 %
Default Value	30%
Function	Provides the torque applied to the motor during slow speed process.
Adjust	The level depends on the load. Start at low values and increase until the motor operates at slow speed mode.

G12.3 SLOW SPEED TIMEOUT

Screen	**3 L.S MAX T =0s**
Description	Slow Speed Timeout.
Range	0 to 60.
Units	Seconds.
Default Value	0s.
Function	Timeout condition while working at slow speed. When exceeded, the soft starter will trip on F18 Timeout slow Speed.
Adjust	Continuous slow speed time, will cause overheating in the motor and the soft starter. Therefore a maximum slow speed time operation must be set if slow speed is required, to protect both motor and soft starter and enabling tripping on F18.

G12.4 SLOW SPEED ACCELERATION TIME

Screen	**4 L.S ACL T=0s**
Description	Slow Speed Acceleration Time.
Range	0 to 60, OFF.
Units	Seconds.
Default Value	0s
Function	Run time at slow speed before the ramp up starts.
Adjust	Set the required time for the motor to work at slow speed before accelerating.

G12.5 SLOW SPEED DECELERATION TIME

Screen	**5 L.S DEC T=0s**
Description	Slow speed Deceleration Time .
Range	0 to 60, OFF.
Units	Seconds.
Default Value	0s.
Function	Run time at slow speed after deceleration.
Adjust	Sets the required time for the motor to work at slow speed after decelerating.

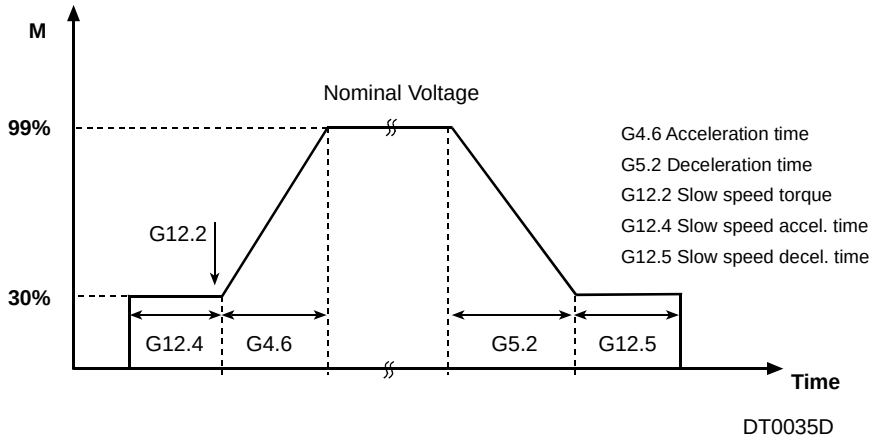

Figure 42. Work at slow speed in auto mode.

G13 DC - BRAKE

G13.1 DC BRAKE SELECTION

Screen	**1 DC BRAK SEL=N**
Description	DC Brake selection.
Range	YES/NO
Default Value	NO
Function	Enable/Disable DC brake. This option, will enable a continuous current to be applied for a determined torque (G13.2) and for a determined time(G13.3).when the deceleration ramp is complete.
Applications	Ball mills, motor shaft positioning.

***NOTE*:** **For high inertia applications, an external DC brake unit could be required.**

G13.2 DC CURRENT

Screen	**2 DC BRAK I=50%**
Description	DC Current injection.
Range	0 to 99%
Unit	% of the achievable torque.
Default Value	50%
Function	Set the DC current to be applied to the motor. It must be considered that the brake energy dissipates entirely in the motor. A stop with high DC current or a stop that lasts for too long may cause overheating of the motor.

G13.3 DC TIME

Screen	**3 DC BRAKE T =0s**
Description	DC Brake time.
Range	0 to 99, OFF
Unit	Seconds
Default Value	0s.
Function	Sets the time for the DC current to be applied.
Adjust	The stopping rate of a motor using DC Brake current injection depends on the DC current applied (G13.2) for a preset time (G13.3). The adjustments of these 2 variables and the inertia of the system will determine the deceleration time of the motor. Applying an excessive brake current could cause overheating of the motor – The same applies if the DC injection time is too long. However lower current or shorter time than necessary may not stop the motor as required.

G13.4 EXTERNAL BRAKE

Screen	**4 EXTERNAL B=N**
Description	Enables external Brake unit at output relay 3.
Range	Yes/No
Default Value	No
Function	This Parameter sets the V5 to work with an external brake unit. Relay 3 is dedicated to control the Brake Unit activation. See screen G7.3.

G14 SERIAL COMMUNICATION

In case RS232/485 is in use.

G14.1 SERIAL COMMUNICATION TIMEOUT

Screen	**1 COM TIME O=OFF**
Description	Serial Communication Timeout.
Range	OFF, 0 to 25
Units	Seconds
Default Value	OFF
Function	Timeout condition for serial communication. When the time without communication exceeds this parameter the soft starter will trip by F20 Communication Timeout.
Adjust	This timeout is used to detect the loss of this communication between master – slave. The V5 stops the motor until the communication is re-established and reset. In certain cases continuous communication is necessary.

G14.2 MODBUS DEVICE ADDRESS

Screen	**2 COM ADRESS=10**
Description	Modbus Device Address.
Range	0 a 240
Default Value	10
Function	Sets Modbus Address for the V5.

G14.3 MODBUS COMMUNICATION BAUD RATE

Screen	**3 BAUD RATE=9600**
Description	Modbus Communication Baud Rate.
Range	OFF, 1200, 2400, 4600, 9600.
Units	baud
Default Value	OFF
Function	Set the baud rate for Serial Communication.

G14.4 EVEN PARITY

Screen	**4 EVEN PARITY=N**
Description	Modbus communication parity.
Range	NO= (No parity) YES= (Even parity)
Default Value	NO
Function	Enable even parity (YES) or set no parity (NO).

G15 AUTO RESET

This group enables V5 to be automatically reset. Once reset is done, the V5 will start again in case the fault occured during start command, acceleration and run. If the fault occurred in ready status “RDY” it will autoreset and comes back to “RDY” again.

G15.1 AUTO RESET

Screen	**1 AUTO RESET=NO**
Description	Enable or disable automatic reset
Range	YES / NO
Default Value	NO
Function	Enable / Disable V5 automatic reset function.

G15.2 ATTEMPT NUMBER

Screen	**2 ATTEMP NUMBR=5**
Description	Number of auto reset attempts before tripping due to fault.
Range	1 to 5
Units	Attempt
Default Value	5
Function	Provides the number of attempts to reset the V5 before it trips.

G15.3 RESET DELAY TIME

Screen	**3 R STR DEL=5s**
Description	Time delay from fault event to auto reset.
Range	5 to 120s
Units	Seconds
Default Value	5
Function	Allows to select the period of time between the fault trip and the auto reset.

G15.4 RESET TIME OF THE ATTEMPT COUNTER

Screen	**4 RS COUNT=15Min**
Description	Time after the attempt counter (G15.2) will be reset.
Range	1 to 60
Units	Minutes
Default Value	15
Function	It alllows to select the time the V5 has to run without fault and after this the internal attempt counter will be reset.

G15.5 AUTORESET FAULT 1 SELECTION

Screen	**5 F1 AUTO RST=0**
Description	The fault which will be reset automatically.
Range	0 to 20 (See next table)
Units	No
Default Value	0
Function	It selects fault no1 for the auto reset mode.

FAULT	FAULT LIST
0	0 NO AUTO RESET
1	1 PHAS MISING
2	2 WRONG PH/SQ
3	3 ASYM CURR
4	4 OVER LOAD
5	5 UNDER LOAD
6	6 STARTER OVT
7	7 MOTOR PTC
8	8 SHEAR PIN
9	9 OVER VOLT
10	10 UNDER VOLT
11	11 SCR_1 FAULT
12	12 SCR_2 FAULT
13	13 SCR_3 FAULT
14	14 SCR_S FLT
15	15 EXCESIV LS T
16	16 COMMS T/OUT
17	17 EXTERN TRIP
18	18 CUR FLT
19	19 CUR2 FLT
20	20 ALL THE FLTS

***NOTE*:** **Option 20 will automatically reset any of the above table faults.**

G15.6 AUTORESET FAULT 2 SELECTION

Screen	**6 F2 AUTO RST=0**
Description	The fault which will be reset automatically
Range	0 to 20 (See table G15.5)
Units	NO
Default Value	0
Function	It selects fault no2 for the auto reset mode.

G15.7 AUTORESET FAULT 3 SELECTION

Screen	**7 F3 AUTO RST=0**
Description	The fault which will be reset automatically
Range	0 to 20 (See table G15.5)
Units	NO
Default Value	0
Function	It selects fault no3 for the auto reset mode.

G15.8 AUTORESET FAULT 4 SELECTION

Screen	**8 F4 AUTO RST=0**
Description	The fault which will be reset automatically
Range	0 to 20 (See table G15.5)
Units	NO
Default Value	0
Function	It selects fault no4 for the auto reset mode.

G16 PUMP CONTROL 1

G16.1 IRRIGATION TIME SETTING

Screen	**1 SET IT=000Hrs**
Description	Irrigation time adjustment.
Range	0 to 60 Hours/INF.
Unit	Hours.
Default	INF
Function	Sets the time for the system to be irrigating.
Adjust	V5 irrigation timer can be reset (G16.2 back to 0Hrs.) by decreasing G16.1 to the same value than G16.2.

G16.2 IRRIGATION TIME DISPLAY

Screen	**2 I TIME=000Hrs**
Description	Irrigation time display.
Range	0 to 60 Hours/INF.
Unit	Hours
Function	Displays the time the system has been irrigating.
Note:	**Read only screen.**

G16.3 START MODE SELECTION

Screen	**3 START MODE = 0**
Description	Start mode selection.
Range	0,1
Default	0
Function	Selects the start mode of the system.
Adjust	**0.** Display unit – Enables the display unit for start stop control of the V5. This is the only way in which the V5 can be started or stopped. Digital inputs are preconfigured as follows: D INPUT 1. High Pressure switch connection (normally closed). D INPUT 2. Low Pressure switch connection (normally closed). D INPUT 3 Flow switch connection (normally closed). D INPUT 4 Deep well probe connection (normally closed). D INPUT 5 Trip (normally closed). **1.** 2 Wire – (Face Plate stop button is Reset only). Remaining digital inputs are preconfigured as follows: D INPUT 1 High Pressure switch connection (normally closed). D INPUT 2 Low pressure switch connection (normally closed). D INPUT 3 Flow switch connection (normally closed). D INPUT 4 Deep well probe connection (normally closed). D INPUT 5 is configured for remote two wire start/stop. This input acts as a reset command on closing edge.

G16.4 HIGH PRESSURE TIMEOUT

Screen	**4 HI PR DEL=00s**
Description	High pressure timeout.
Range	0 to 60 seconds.
Unit	Seconds.
Default	0
Function	This is the time delay before the V5 trips once the high pressure switch connection opens (D INPUT 1).
Note:	**V5 ramps down to stop.**

G16.5 LOW PRESSURE TIMEOUT

Screen	**5 L PR DEL=0000s**
Description	Low pressure timeout.
Range	0 to 3600 seconds.
Unit	Seconds.
Default	20
Function	This is the time delay before the V5 trips once the low pressure switch connection opens (D INPUT 2).
***Note*:**	**V5 ramps down to stop.**

G16.6 LOW PRESSURE BYPASS TIME

Screen	**6 L PR BYP=0000s**
Description	Low pressure start bypass time.
Range	1 to 1800 seconds (30 minutes).
Uni.t	Seconds
Default	10s
Function	Sets the start bypass time, during which the V5 starter ignores the Low Pressure input (D INPUT 2).

G16.7 NO FLOW BYPASS TIME

Screen	**7 FLO BYP=0000s**
Description	No Flow Start Bypass time.
Range	0 to 1800 seconds.
Unit	Seconds.
Default	10s
Function	Sets the time period for which the flow switch input is ignored following a start command (D INPUT 3).

G16.8 NO FLOW DEBOUNCE TIME

Screen	**8 FLO DEB=00s**
Description	No Flow Debounce Delay.
Range	0 to 60 seconds.
Unit	Seconds.
Default	10s
Function	Sets the delay period before the starter responds to a no flow signal when in normal run operation. (D INPUT 3)
***Note*:**	**V5 ramps down to stop.**

G16.9 DEEP WELL PROBE BYPASS TIMER

Screen	**9 LO WTR DEL=00s**
Description	Deep Well Probe Delay.
Range	0 to 60 seconds.
Unit	Seconds.
Default	10s
Function	Sets the delay period before the starter stops after receiving a valid deep well probe signal. (D INPUT 4).
Note:	**V5 ramps freewheel stops.**

ENGLISH

12. V5 SPARE PARTS

V5 230V- 500 COMMON PARTS

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
E001	V5 230-500V CONTROL AND POWER PCB	**1**	**1**
E003	V5 DISPLAY PCB	**1**	**1**
E004	V5 SERIAL COMMUNICATIONS PCB	**1**	**1**
E005	V5 VOLTAGE TRANSFORMER PCB	**1**	**1**
E0141	V5 VOLTAGE TRANSFORMER PCB FUSE 1A 20mm	**1**	**2**
V002	V5 DISPLAY KEYPAD	**1**	**1**

V50009

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P007	THYRISTOR V50009	**3**	**1**
L002	CURRENT TRANSFORMER V50009	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**

V50017

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P007	THYRISTOR V50017	**3**	**1**
L003	CURRENT TRANSFORMER V50017	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**

V50030

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P007	THYRISTOR V50030	**3**	**1**
L004	CURRENT TRANSFORMER V50030	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**

V50045

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P008	THYRISTOR V50045	**3**	**1**
L005	CURRENT TRANSFORMER V50045	**2**	**1**
L046	80 MM FAN	**1**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50060

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P009	THYRISTOR V50060	**3**	**1**
L006	CURRENT TRANSFORMER V50060	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50075

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P010	THYRISTOR V50075	**3**	**1**
L007	CURRENT TRANSFORMER V50075	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50090

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P010	THYRISTOR V50090	**3**	**1**
L008	CURRENT TRANSFORMER V50090	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50110

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P011	THYRISTOR V50110	**3**	**1**
L009	CURRENT TRANSFORMER V50110	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50145

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P012	THYRISTOR V50145	**3**	**1**
L010	CURRENT TRANSFORMER V50145	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50170

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P013	THYRISTOR V50170	**3**	**1**
L011	CURRENT TRANSFORMER V50170	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50210

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P013	THYRISTOR V50210	**3**	**1**
L012	CURRENT TRANSFORMER V50210	**2**	**1**
L050	24VDC 80X80X38MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E043	DC FAN POWER SUPPLY PCB	**1**	**1**

V50275

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P014	THYRISTOR V50275	**6**	**2**
L013	CURRENT TRANSFORMER V50275	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50330

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P015	THYRISTOR V50330	**6**	**2**
L014	CURRENT TRANSFORMER V5030	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50370

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P015	THYRISTOR V50370	**6**	**2**
L015	CURRENT TRANSFORMER V50370	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**

V50460

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P016	THYRISTOR V50460	**6**	**2**
L016	CURRENT TRANSFORMER V50460	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E011	460A 230-500V SNUBBER PCB	**3**	**1**

V50580

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P017	THYRISTOR V50580	**6**	**2**
L017	CURRENT TRANSFORMER V50580	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E008	580-900A / 230-500V SNUBBER PCB	**3**	**1**

V50650

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P017	THYRISTOR V50650	**6**	**2**
L018	CURRENT TRANSFORMER V50650	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E008	580-900A / 230-500V SNUBBER PCB	**3**	**1**

V50800

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P017	THYRISTOR V50800	**6**	**2**
L019	CURRENT TRANSFORMER V50800	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E011	580A 230-500V SNUBBER PCB	**3**	**1**

V50900

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P019	THYRISTOR V50900	**6**	**2**
L020	CURRENT TRANSFORMER V50900	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E008	580A 230-500V SNUBBER PCB	**6**	**1**

Table 14. Common parts for 230-500V .

V5 690 COMMON PARTS

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
E002	V5 230-500V CONTROL AND POWER PCB	**1**	**1**
E003	V5 DISPLAY PCB	**1**	**1**
E004	V5 SERIEL COMMUNICATIONS	**1**	**1**
E005	V5 VOLTAGE TRANSFORMER PCB	**1**	**1**
E0141	V5 VOLTAGE TRANSFORMER PCB FUSE 1A 20mm	**1**	**2**
V002	V5 DISPLAY KEYPAD	**1**	**1**

V50009.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P020	THYRISTOR V50009.6	**3**	**1**
L002	CURRENT TRANSFORMER V50009.6	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50017.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P020	THYRISTOR V50017.6	**3**	**1**
L003	CURRENT TRANSFORMER V50017.6	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50030.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P020	THYRISTOR V50030.6	**3**	**1**
L004	CURRENT TRANSFORMER V50030.6	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50045.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P021	THYRISTOR V50045.6	**3**	**1**
L005	CURRENT TRANSFORMER V50045.6	**2**	**1**
L046	80 MM FAN	**1**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50060.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P022	THYRISTOR V50060.6	**3**	**1**
L006	CURRENT TRANSFORMER V50060.6	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50075.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P023	THYRISTOR V50075.6	**3**	**1**
L007	CURRENT TRANSFORMER V50075.6	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50090.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P023	THYRISTOR V50090.6	**3**	**1**
L008	CURRENT TRANSFORMER V50090.6	**2**	**1**
L046	80 MM FAN	**2**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50110.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P024	THYRISTOR V50110.6	**3**	**1**
L009	CURRENT TRANSFORMER V50110.6	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50145.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P030	THYRISTOR V50145.6	**3**	**1**
L010	CURRENT TRANSFORMER V50145.6	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50170.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P031	THYRISTOR V50170.6	**3**	**1**
L011	CURRENT TRANSFORMER V50170.6	**2**	**1**
L046	80 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50210.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P031	THYRISTOR V50210.6	**3**	**1**
L012	CURRENT TRANSFORMER V50210.6	**2**	**1**
L050	24VDC 80X80X34MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**1**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E013	DC FAN POWER SUPPLY PCB	**1**	**1**
E009	9-210A / 690V SNUBBER PCB	**1**	**1**

V50275.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P032	THYRISTOR V50275.6	**6**	**2**
L013	CURRENT TRANSFORMER V50275.6	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E010	270-460A / 690V SNUBBER PCB	**3**	**1**

V50330.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P033	THYRISTOR V50330.6	**6**	**2**
L014	CURRENT TRANSFORMER V50330.6	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E010	270-460A / 690V SNUBBER PCB	**3**	**1**

V50370.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P033	THYRISTOR V50370.6	**6**	**2**
L015	CURRENT TRANSFORMER V50370.6	**2**	**1**
L047	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E010	270-460A / 690V SNUBBER PCB	**3**	**1**

V50460.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P034	THYRISTOR V50460.6	**6**	**2**
L016	CURRENT TRANSFORMER V50460.6	**2**	**1**
L048	120 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E010	270-460A / 690V SNUBBER PCB	**3**	**1**

V50580.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P035	THYRISTOR V50580.6	**6**	**2**
L018	CURRENT TRANSFORMER V50580.6	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E012	580-900A / 690V SNUBBER PCB	**3**	**1**

V50650.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P032	THYRISTOR V50650.6	**6**	**2**
L013	CURRENT TRANSFORMER V50650.6	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E012	580-900A / 690V SNUBBER PCB	**3**	**1**

V50800.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P035	THYRISTOR V50800.6	**6**	**2**
L019	CURRENT TRANSFORMER V50800.6	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E012	580-900A / 690V SNUBBER PCB	**3**	**1**

V50900.6

REFERENCE	DESCRIPTION	QTY.	RECOMMEN.
P037	THYRISTOR V50900.6	**6**	**2**
L020	CURRENT TRANSFORMER V50900.6	**2**	**1**
L048	170 MM FAN	**3**	**1**
L044	THERMAL PROTECTOR 85ºC	**3**	**1**
L045	THERMAL PROTECTOR 50ºC	**1**	**1**
E012	580-900A / 690V SNUBBER PCB	**6**	**1**

Table 15. Common parts for 690V .

13. ACCESORIES

CODE	DESCRIPTION
E004	Serial comms module RS232 /485. Modbus.
A001	Profibus Interface.
A002	Devicenet Interface.
A003	Johnson Controls Interface.
L001	V50009 - V50045 ByPass terminal set.
L01	Kit of Bypass terminals for the V50060 - V50090.
L02	Kit of Bypass terminals for the V50110 - V50210.
V01	Remote display (max. 2 meters) unit.

Table 16. Options Serial V5.

14. COMMISIONING CONFIGURATION RECORD

DIGITAL SOFT STARTER: **V5**
SERIAL Nº: MODEL:
APPLICATION :
DATE:
CUSTOMER :

SCREENS	DEFAULT	RECORD 1	RECORD 2
G1 MENU OPTIONS			
1 LOCK PARAM=	N0		
2 PASSWORD=	0		
3 WRONG P/W=	XXXX		
4 LANGUE=	ENGLISH		
5 INITIALISE=	NO		
6 COMMISSION=	YES		
G2 NAMEPLATE			
1 ISTARTER=	_ _ _A*		
2 I MOTOR=	_ _ _A *		
3 V MOTOR=	2*		
4 P MOTOR=	_ _ _KW		
5 COS PHI M=	85%		
6 FREQ=	50Hz		
G3 PROTECTIONS			
1 PHASE SEQUEN=	2*		
2 OV LOAD=	1 x I		
3 OV/LOAD T=	5		
4 OVL FAC=	100%		
5 MOTOR PTC=	N		
6 UNLOAD=	0.0A		
7 UNLOAD T=	OFF		
8 SHRPIN=	OFF		
9 ASYM I ENB=	YES		
10 UNDER V=	320V		
11 U/V DELAY=	5s		
12 OVERVOLT=	440V		
13 O/V DELAY=	5s		
14 START LIMIT=	3		
15 STR/ INT=	15Min		
G4 ACCELERATION			
1 STR DELAY=	0s		
2 PULS TORQ=	50%		
3 PULS TQ T=	OFF		
4 INIT TORQ=	35%		
5 INIT TQ T=	1s		
6 ACEL TIME=	6s		
7 I LIMIT=	2800A		

* See Figure 23 V5 parameters.

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SCREENS	DEFAULT	RECORD 1	RECORD 2
G5 DECELERATION			
1 FREWEL STP=	YES		
2 DECL TIME=	12s		
3 DEC MD SEL=	1*		
4 HAMR FACT=	75%		
5 MINI TORQ=	1%		
G6 INPUTS			
1 OPER MODE=	1*		
2 LOCAL RESET=	Y		
3 DINPUT1 SEL=	4*		
4 DINPUT2 SEL=	0*		
5 DINPUT3 SEL=	0*		
6 DINPUT4 SEL=	0*		
7 DINPUT5 SEL=	0*		
8 ANI1 FORMAT=	1		
9 AI1 RANGE=	0-10		
10 AI1 UNITS=	OFF		
11 ANI2 FORMAT=	1		
12 AI2RANGE=	0-10		
13 AI2 UNITS=	OFF		
G7 OUTPUTS			
1 REL1 SEL ON=	14*		
2 REL2 SEL ON=	15*		
3 REL3 SEL ON=	9*		
4 ANLOG1 SEL=	0*		
5 AO1 FORMAT=	0*		
6 AO1 LOW=	0%		
7 AO1 HIGH=	100%		
G8 DUAL SETTING			
1 DUALSETING=	NO		
2 PLS TORQ2=	50%		
3 PLS TQ T2=	OFF		
4 INIT TRQ2=	30%		
5 INIT TQ T2=	1s		
6 ACC TIME2=	12s		
7 I LIMIT2=	2800A		
8 FREWEL STP2=	N		
9 DEC TIME2=	12s		
10 DEC MD SEL2=	1		
11 HAMR FAC2=	75		
12 MINI TRQ2=	1%		
13 PHASE SEQ2=	2s		
14 OV LOAD2=	800A		
15 OV/LOAD T2=	5		
16 OVL FAC2=	100%		
17 MTR PTC2=	N		
18 UNLOAD2=	0.0A		

SCREENS	DEFAULT	RECORD 1	RECORD 2
19 UNLOAD T2=	OFF		
20 SHRPIN2=	OFF		
21 ASYM I ENB2=	N		
22 I MTR2=	30A		
23 V MTR2=	2		
24 P MTR2=	4.0Kw		
25 COS PHI 2=	85%		
26 FREQ 2=	50Hz		
G9 COMPARATORS			
1 COMPR1 SEL=	1*		
2 COMP1 ON=	100%		
3 COMP1 OFF=	80%		
4 T COMP1 ON=	5s		
5 T COMP1 OFF=	5s		
6 COMPR2 SEL=	1*		
7 COMP2 ON=	100%		
8 COMP2 OFF =	80%		
9 T COMP2 ON=	5s		
10 TCMP2 OFF=	5s		
11 CMPR3 SEL=	1*		
12 CMP3 ON=	100%		
13 CMP3 OFF=	80%		
14 T CMP3 ON=	5s		
15 TCMP3 OFF=	5s		
G10 FAULT HISTOR			
1 LAST FAULT	F0		
2 FOURTH FAULT	F0		
3 THIRD FAULT	F0		
4 SECOND FAULT	F0		
5 FIRST FAULT	F0		
6 DELET FAULTS=	N		
G11 STATIST INFO			
1 STARTS1=	00000		
2 STARTS2=	00000		
3 DEL STARTS2=	NO		
4 H1=	00000h:00m		
5 H2 =	00000h:00m		
6 DEL HOURS2=	NO		
7 TOTAL FLT=	00		
8 FAULT2=	0		
9 DEL FAULT2=	NO		
10 KWH =	000000		

ENGLISH

SCREENS	DEFAULT	RECORD 1	RECORD 2
G12 SLOW SPEED			
1 L/S ACC-DEC =	N		
2 L SPD TORQ =	30%		
3 L.S MAX T =	0s		
4 L.S ACL T=	0s		
5 L.S DEC T=	0s		
G13 DC BRAKE			
1 DCBRAK SEL=	NO		
2 DC BRAK I=	50%		
3 DC BRAKE T=	0s		
4 EXTERNAL B=	NO		
G14 SERIAL COMM			
1 COM TIME O=	OFF		
2 COM ADRESS=	0		
3 BAUD COM=	OFF		
4 EVEN PARITY=	NO		
G15 AUTO RESET			
1 AUTO RESET=	NO		
2 ATTEMP NUMBR=	5		
3 R STR DEL=	5s		
4 RS COUNT=	15Min		
5 F1 AUTO RST =	0		
6 F2 AUTO RST =	0		
7 F3 AUTO RST =	0		
8 F4 AUTO RST =	0		
G16 PUMP CONTROL 1			
1 SET IT =	000Hrs		
2 I TIME =	000Hrs		
3 START MODE =	0		
4 HI PR DEL =	00s		
5 L PR DEL=	0000s		
6 L PR BYP =	0000s		
7 FLO BYP =	0000s		
8 FLO DEB =	00s		
9 LO WTR DEL =	00s		

NOTE: Please, return this commisioning sheet to Power Electronics, it will be stored and help you in case of a need for service or support.
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