ALTER ELETTRONICA s.r.l
15033 Casale Monferrato (AL) – ITALY

D Series

SCR Digital converter for d.c. motors

Instructions book: 91/120 - Revision: 2.0 - Data: 10/09/2018
Compatible with Firmware V2.*

1 General index

1 Safety Information

Read this manual carefully before using the drives D Series.

Keep the manual carefully and in an easily accessible place for later reference in case of need.

Make sure this manual is delivered to the end user.

The safety symbols used in this manual are described below:

	**DANGER:** This symbol indicates the possibility of even serious injuries to people due to electrical or mechanical shocks.
	**CAUTION:** This symbol indicates the possibility of damage to property or to the drive itself.
	**WARNINGS**: Additional information useful for correct use of the drive

1.1 Danger

- Never power the drive without the cover and never remove the cover while power is present.
- Do not handle the drive with wet hands. There is a danger of electric shock.
- Maintain a sufficient safety distance from the engine and the machine when the grid is activated and never touch the rotating parts of the engine when it is running. There is a danger of injury.
- When the alarms are reset, make sure that the run signal is disabled to avoid unexpected motor starts. Set up a separate emergency stop device. There is a danger of injury.
- Before starting the wiring, make sure that there is no power supply and that the motor is stopped.
- All power sources must be disconnected before performing any maintenance.
- Before starting the inspection wait at least 2 minutes after disconnecting the voltage, make sure that the leds and the LCD display are off
- Maintenance, inspection and replacement must be performed by a designated person. Remove all metal accessories such as watches, wristbands etc before starting work.
- Make sure that the supply voltage of the drive matches the nameplate data.

1.2 Caution

- To comply with the electrical safety regulations, make the ground connections according to the standards of the country where the drive is installed.
- Installation must be performed by qualified technical personnel.
- Always secure the drive before wiring.
- Install a protection circuit (fuse or magnetic switch) on the drive power supply.
- Do not connect an energy source to terminals A, B, F0, F1.
- Make sure that the supply voltage of the drive matches the nameplate data.
- Fasten the terminal screws with an adequate tightening torque.
- Connect the wires A, B, F0, F1 correctly. The engine may not start or turn abnormally and damage the machine.
- If the drive power supply is not present, do not connect the motor cable if it is rotating. There is a danger of damaging the machine.
- Do not block the ventilation slots on the drive.
- Make sure that the motor functions as a single unit before connecting it mechanically to the machine and checking that the maximum engine speeds are tolerated by the machine. There is a danger of injury and damage to the machine.

- Never modify the drive.
- Clean the drive with a vacuum cleaner. Do not use organic solvents. There is a danger of damaging the drive.
- It is essential for your safety that a possible revision of the drive is performed by our company.
- In case of disposal, the drive is to be considered an industrial waste, therefore respect the rules imposed by the laws in force in the country in which it is installed.

1.3 Warnings

- Maintenance must be performed by qualified technical personnel.
- The ground connection and the installation of the drive must be carried out in compliance with the safety regulations imposed by the laws in force in the country in which the drive is installed.
- Operators and machine operators must be given adequate preparation.
- The drive may cause radio frequency interference if it does not have the appropriate mains filter.
- Follow the drive specifications and follow the instructions in this manual.
- Ensure that adequate ventilation and drive cleaning is maintained.
- Avoid the penetration of water or other fluids inside the drive.
- For wiring, use suitable cables, preferably shielded.

1.4 Directives, brands and standards

The drive D Series complies with the following industry standards:

Standard/Marking	Description
CEI EN 60204-1	Low voltage safety directive, 73/23/CEE.
CEI EN 61800-3	Product standard referred to the directive EMC 89/336/CEE.
CEI EN 60529	Degree of protection IP20.
CE	Marking CE.

2 Product identification

2.1 CE marking and identification plate

The CE marking certifies the conformity of the appliance with the essential health and safety requirements established by the European Directives indicated in the EC declaration of conformity. It consists of an adhesive label in silver polyester with a black print, of the following dimensions: L= 95 mm - H= 50 mm (Figure 1).

It is applied externally in the lower part (considering a vertical panel mounting).

The following data are indicated legibly and indelibly on the plate (some of these data may be intentionally missing or partially reported):

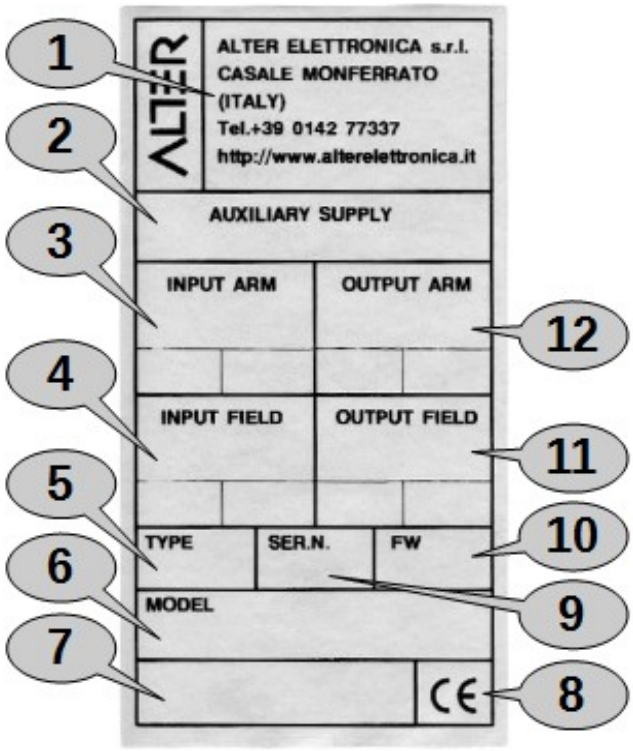


Figure 1: ID plate

(1) Manufacturer's name, address, contacts.
(2) Supply voltage for auxiliary services.
(3) Characteristics of the three-phase power supply connected to terminals L1, L2, L3 (Maximum voltage, maximum current, frequency), which supplies the armature bridge.
(4) Characteristics of the single-phase power supply connected to terminals FL1, FL2 (Maximum voltage, maximum current, frequency), which supplies the field bridge.
(5) "TYPE" code identifying the ALTER product.
(6) Code “MODEL” of the product (see Table 1 and Table 2 on page 8).
(7) Bar-code containing TYPE + MODEL.
(8) The CE marking certifying the conformity of the appliance with the essential health and safety requirements provided for by the European Directives.
(9) Unique serial number for each TYPE.
(10) Firmware version installed in the product.
(11) Voltage and rated current c.c. on terminals F0, F1 for supplying the field to the motor.
(12) Voltage and rated current c.c. on terminals A, B for powering the armature in the motor.

2.2 Declaration of conformity

The *ALTER Elettronica S.r.l.* declares that under the conditions specified in this document the converters (CDM) model “D Series“, they are in conformity with the EU EMC directives, including the latest modifications, with the relative Italian transposing legislation and the Low Voltage Community directives, including the latest modifications, with the relative Italian legislation of transposition.

Therefore the CE marking, affixed on the converters (CDM) model “D Series“, certifies compliance with both the EMC directive and the Low Voltage directive.

2.3 Manufacturer's declaration

The *ALTER Elettronica S.r.l.* for the purposes of the requirements of the Machinery Directive (DM) 89/392 and subsequent amendments, with the relative Italian legislation implementing the law D.P.R. 459 of 1996-07-24, declares that the model converters “D Series“ they must be installed according to the instructions contained in this manual and must not be put into operation until the machines in which they are incorporated have been declared compliant with the DM directive mentioned here.

2.4 Model coding

The following tables show the coding method for ordering a drive model D Series:

MODEL		ARMATURE VOLTAGE NOMINAL		ARMATURE CURRENT NOMINAL		FIELD	
XXXXX	**-**	**XXX**	**-**	**XXX**	**-**	**X**	
						1 = Field supply expected (MAX 20 A).	
				000 = Control unit for external armature bridge **015** = 0.75 A ÷ 15 A **030** = 1.5 A ÷ 30 A **060** = 3 A ÷ 60 A **090** = 4.5 A ÷ 90 A **120** = 6 A ÷ 120 A **180** = 9 A ÷ 180 A **240** = 12 A ÷ 240 A **300** = 15 A ÷ 300 A **400** = 20 A ÷ 400 A **500** = 25 A ÷ 500 A		
		400 = 400 V **480** = 480 V		Voltages available for 12IRD			
		440 = 440V **530** = 530V		Voltages available for 6ID			
6ID = SCR unidirectional converter for d.c. motors **12IRD** = SCR bidirectional converter for d.c. motors							

Table 1: coding of the models 12IRD, 6ID

MODEL		ARMATURE VOLTAGE NOMINAL		ARMATURE CURRENT NOMINAL		FIELD	
6AXD	**-**	**XXX**	**-**	**XXX**	**-**	**X**	
						0 = Field supply not provided. **1** = Field supply expected (MAX 20 A).	
				015 = 0.75 A ÷ 15 A **030** = 1.5 A ÷ 30 A **060** = 3 A ÷ 60 A **090** = 4.5 A ÷ 90 A		
		220 = 220 V **280** = 280 V					
6AXD = SCR bidirectional converter with circulation current for DC motors							

Table 2: coding of the models 6AXD

> ***NOTE:*** *if the motor have to operate in the "constant power" zone (defluxed motor), the drive must have the power supply of the field inside the drive ("FIELD" option in the Table 1 and Table 2).*

2.5 Current ratings and accessories

The following tables show various data to be used for ordering accessories, for protection circuits, and for dimensioning power cables.

ARMATURE CURRENT (1)		SIZE	POWER DISSIP. MAXIM.	INPUT CURRENT		FUSES ON L1/L2/L3		GRID FILTER (2)	GRID INDUCT.	MAXIMUM CABLE SECTION [mm^2]		
NOMIN.	PEAK			L1 L2 L3	FL1 FL2	CURR.	I^2t / 10ms	TYPE	TYPE	L1 L2 L3 A B	FL1 FL2	F0 F1
15 A	20 A	1	45 W	12,5 A	22 A	32 A	1100 A^2s	23/020	17/001	4	4	6
30 A	40 A	1	90 W	25 A	22 A	50 A	1100 A^2s	23/003	17/001	10	4	6
60 A	80 A	1	180 W	50 A	22 A	100 A	3500 A^2s	23/003	17/003	16	4	6
90 A	120 A	1	270 W	75 A	22 A	160 A	15000 A^2s	23/004	17/004	35	4	6
120 A	160 A	1	360 W	97 A	22 A	200 A	18000 A^2s	23/005	17/005	70	4	6
180 A	240 A	2	540 W	150 A	22 A	250 A	18000 A^2s	23/007	17/007	BARS	4	6
240 A	320 A	2	720 W	200 A	22 A	400 A	125000 A^2s	23/008	17/008	BARS	4	6
300 A	400 A	3	900 W	250 A	22 A	500 A	125000 A^2s	23/010	17/009	BARS	4	6
400 A	530 A	3	1200 W	330 A	22 A	630 A	320000 A^2s	23/010	17/010	BARS	4	6
500 A	660 A	3	1500 W	420 A	22 A	700 A	320000 A^2s	23/010	-	BARS	4	6

Table 3: data for the dimensioning of the converters type 12IRD, 6ID

ARMATURE CURRENT (1)		SIZE	POWER DISSIP. MAXIM.	INPUT CURRENT		FUSES ON L1/L2/L3		GRID FILTER (2)	GRID INDUCT.	MAXIMUM CABLE SECTION [mm^2]			
NOMIN.	PEAK			L1 L2 L3	FL1 FL2	CURR.	I^2t / 10ms	TYPE	TYPE	L1 L2 L3 Z0 Z1 Z2	00 A B	FL1 FL2	F0 F1
15 A	20 A	1	23 W	9 A	22 A	32 A	1100 A^2s	23/001	18/001	2,5	4	4	6
30 A	40 A	1	45 W	18 A	22 A	50 A	1100 A^2s	23/002	18/002	6	10	4	6
60 A	80 A	1	90 W	35 A	22 A	100 A	3500 A^2s	23/003	18/004	10	16	4	6
90 A	120 A	1	135 W	53 A	22 A	160 A	15000 A^2s	23/004	18/012	16	35	4	6

Table 4: data for the dimensioning of the converters type 6AXD

NOTE:

(1): With temperature inside the electrical cabinet in which the converter is mounted from 0 to 40 °C (104 °F). Nominal current reduction of 4% for every °C over 40 °C (104 °F).

(2): The filter must be mounted when the model converters D Series they are used in the First Environment to meet the EMC compatibility requirements.

3 Installation

3.1 Mechanical installation

The drives D Series they must be mounted in a vertical position on a metal panel contained in an electrical cabinet. The IP20 degree of protection requires that the device be protected from water, dust and the penetration of any type of conductive or corrosive substance.

The fixing is done with 4 M6 screws in the special slots on the base of the drive (see Figure 2).

Use the table 3 or the table 4 (on page 9) to identify the "SIZE" of the converter to be installed, then read the dimensions in the table opposite, with reference to the letters indicated in the Figure 2.

SIZE	A (mm)	B (mm)	C (mm)	D (mm)	MASS (kg)
1	197	390	157	372	11,5
2	288	430	228	412	16,5
3	288	587	228	412	19,5

Table 5: Dimensions and mass for each size

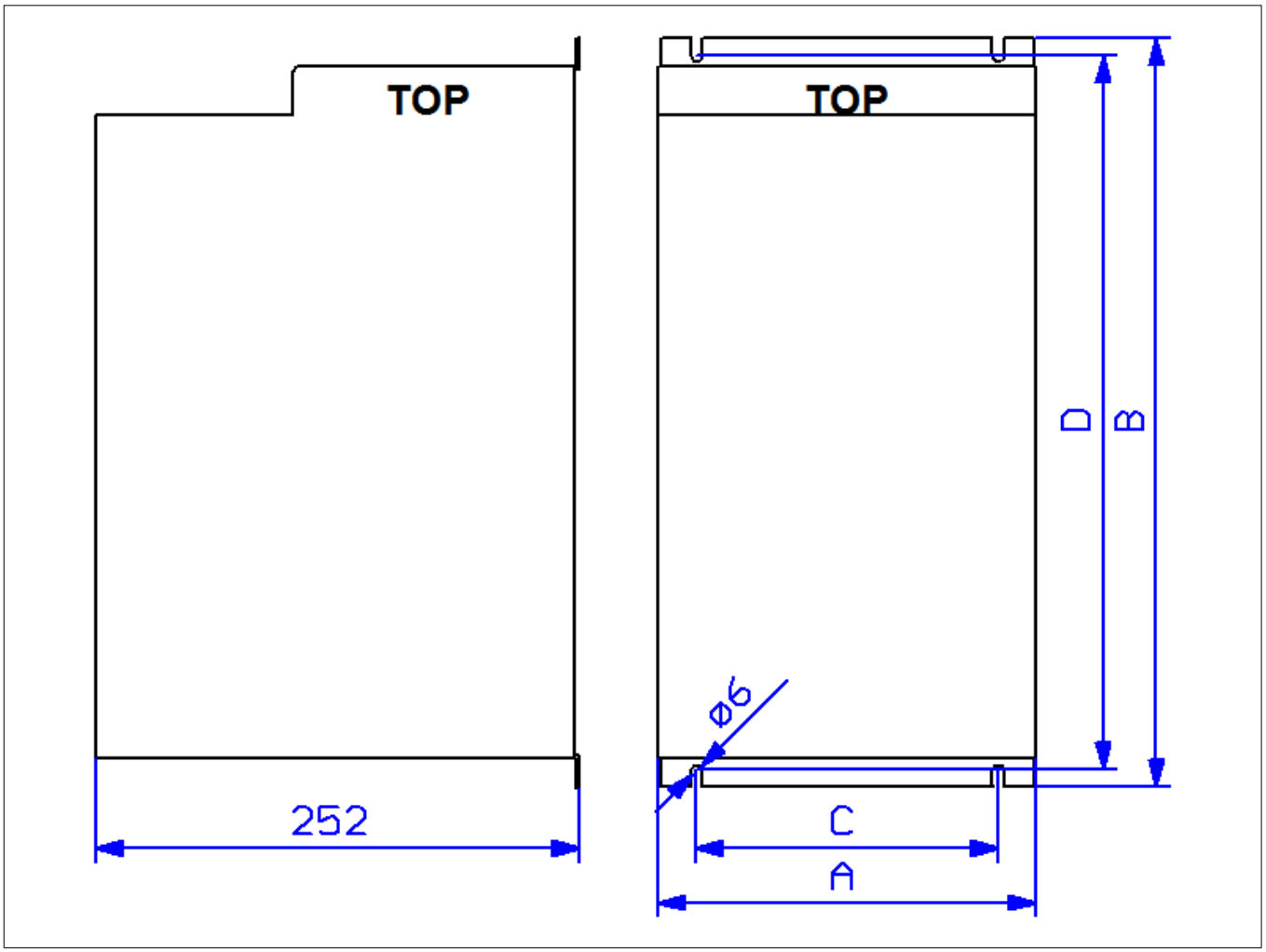


Figure 2: Mechanical dimensions (measures in mm)

3.2 Electrical installation

The electrical connections are made in two drive zones:

- **Upper short side:** at this point there are terminals or copper rods to connect the three-phase and single-phase power cables, the cables that feed the motor (armature and field), the power of the auxiliary services.
- **Front:** at this point there are the removable connectors of analog and digital low voltage signals, the input for the motor speed transducer.

3.2.1 Power and motor connection

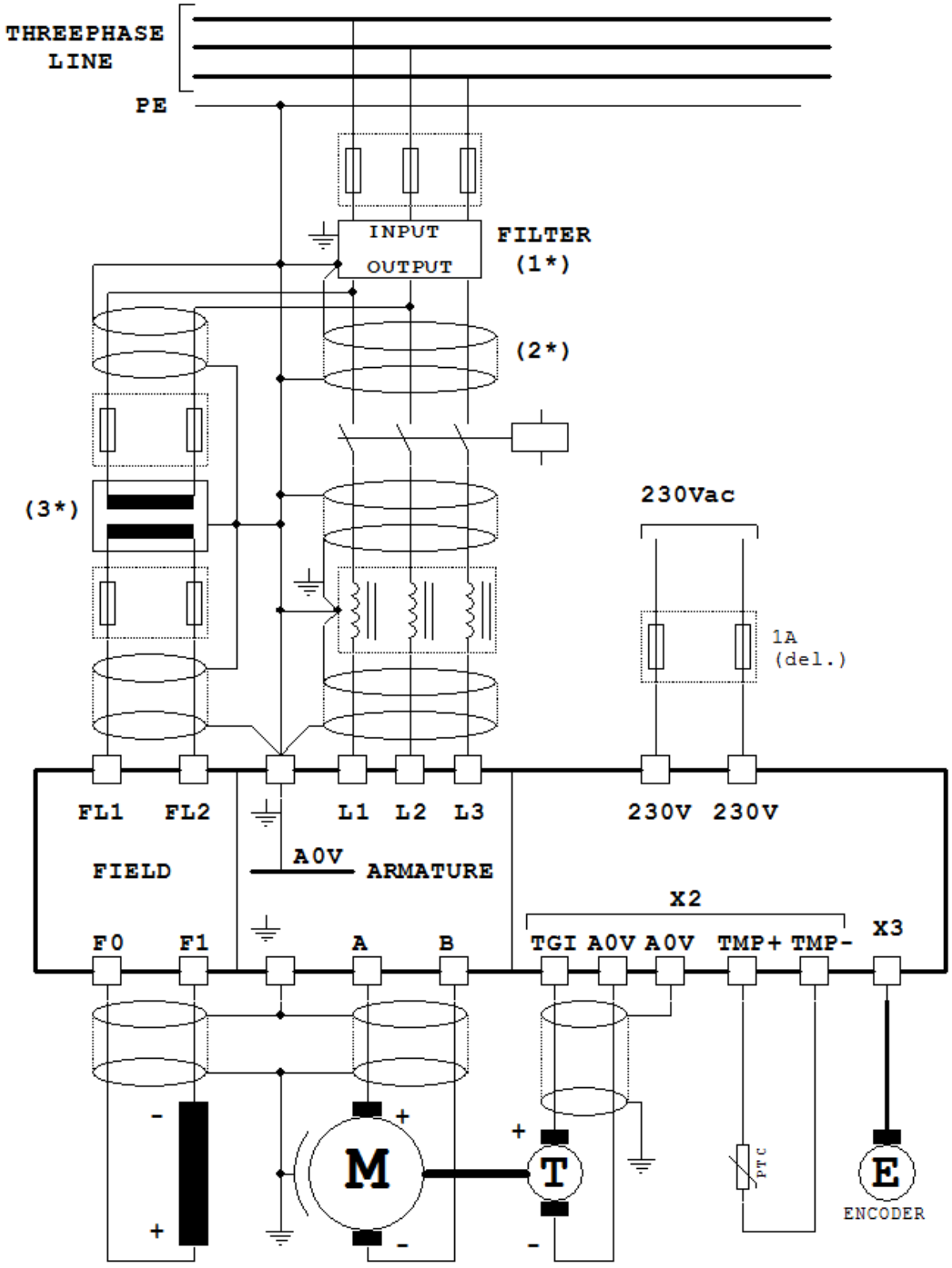


Figure 3: Power Connections for drive 12IRD, 6ID

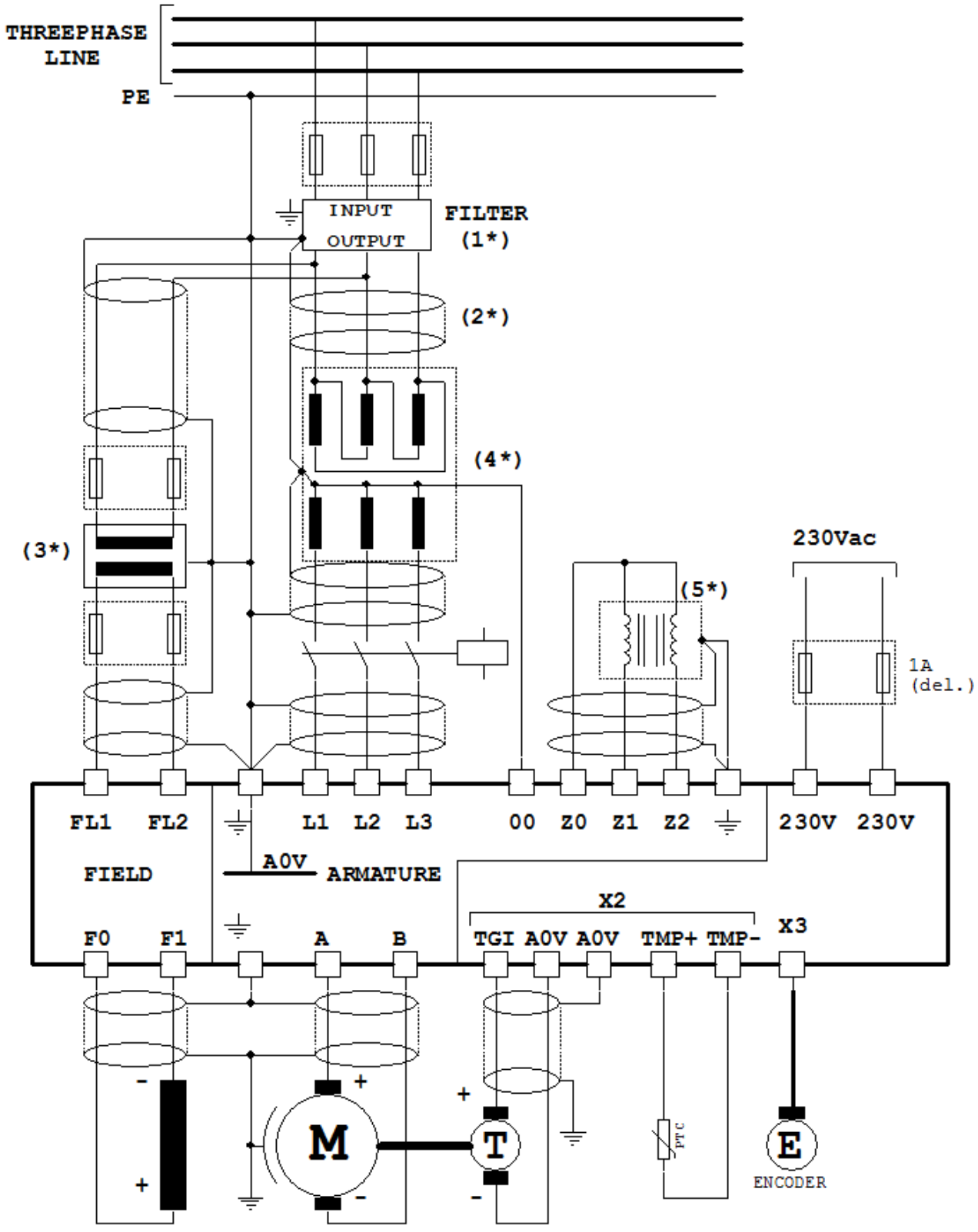


Figure 4: Power Connections for drive 6AXD

NOTE:

With positive speed reference on the inputs AI1+ or AI2+ the polarity of the armature voltage, field and tachogenerator are those indicated in the Figure 3 e Figure 4.

1: The three-phase filter is essential to comply with the EMC and BT directives.*

2: The use of shielded cables in the power unit is essential to comply with the EMC and BT directives.*

3: The single-phase transformer to supply the field (terminals FL1 / FL2) is necessary when the mains voltage (for example on terminals L1, L2, L3) must be adapted to the required voltage on terminals FL1 / FL2 calculated with the formula:* $V_{FL} = 1{,}2 \times V_F$ *with* V_F *= field voltage shown on the motor nameplate.*

4: Only for the model 6AXD the use of a three-phase Triangle / star transformer with an accessible star center connected to earth is essential. The transformer secondary must be connected as in Figure 4. A single transformer can be used to supply several drives connected in parallel: in this case it is necessary to provide a set of fuses for each drive with the current size compatible with the data indicated in the Table 4 (page 9), connected to the corresponding terminals L1, L2, L3.*

5: Only for the model 6AXD it is essential to the use of a double d.c. inductance single-phase (or two single-phase inductances) connected to terminals Z0, Z1, Z2 as drawn in Figure 4.*

- Auxiliary services: single-phase voltage 230Vac ± 10% - 50Hz (for different voltages contact our technical office), connected to the "230V" terminals. Protect the conductors with two 1A (delayed) fuses.
- Armature rectifier bridge: the power supply must be supplied by a three-phase network with grounded neutral having a maximum connected voltage of: 480 / 400Vc.a. 50 / 60Hz. (depending on the model). Insert a three-phase inductance of at least 100 uH between the three-phase network and the converter, sized for the rated current absorbed by the converter and having a saturation current equal to at least twice the nominal one. Use a transformer with Triangle / star connections and ground star center or an auto-transformer (star / star) to adapt the mains voltage. Protect the power supply with N° 3 ULTRAFAST fuses as indicated in Table 3 o in Table 4.
- Field rectifier bridge: the single-phase supply voltage of the V_{FL} field (terminals FL1-FL2) is calculated using the following formula: $V_{FL} = 1{,}2 \times V_F$. Supply Voltage Tolerance: 0 to + 20%. **Power supply voltage range: 60VAC. to 440Vc.a.** The maximum current absorbed by the I_{FL} converter (terminals FL1-FL2) is calculated with the following formula: I_{FL} = 1,2 x Maximum field current of the motor. Use a transformer or an auto-transformer to adapt the supply voltage to the network. The minimum P_{FL} sizing power of the transformer / auto-transformer is calculated using the following formula: $P_{FL} = 1{,}2 \times V_{FL} \times I_{FL}$.
- Motor armature: the maximum armature voltage (terminals A and B) depends on the voltage on the rectifier bridge (L1, L2, L3) and on the drive model: use the table 1 and the table 2 at page 8 to know the maximum armature voltage that can be obtained from your model. If the voltage between terminals L1, L2, L3 (data V_L) is lower than the nominal one, the maximum armature voltage (V_{AB} data) that can be obtained with:
  - Model 6ID: $V_{AB} = 1{,}1 \times V_L$
  - Model 6AXD: $V_{AB} = 0{,}55 \times V_L$
  - Model 12IRD: $V_{AB} = V_L$
- Motor field: the maximum field voltage (terminals F0 and F1) depends on the voltage on the rectifier bridge (FL1, FL2), but can not exceed 480Vdc. The maximum current is 20A.
- Tachogenerator: the maximum voltage at the maximum motor speed is 385Vdc, connected to the TGI and A0V terminals (on connector X2, paragraph 3.2.3). The tachometer dynamo voltage can be predicted at maximum speed with the formula: $V_{DT} = \frac{SPEED_{MAX} \times K_{DT}}{1000}$ Replace the maximum speed in rpm with the parameter $SPEED_{MAX}$ and the conversion constant of the tachometer dynamo (written on its nameplate expressed in Volt / 1000 rpm) to the K_{DT} parameter and then obtain the maximum voltage V_{DT}.
- Temperature probe: the connection of a temperature probe is OPTIONAL. If a temperature probe is available in the motor, it can be connected to the TMP + and TMP- terminals, provided it is one of the following models: PTC or On / Off contact, NTC 10K probe, KTY84 probe. Selection will be made during commissioning.
- TTL encoder: as an alternative to the tachometer dynamo it is possible to use a TTL encoder with 5Vcc supply voltage, with signals A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$. The encoder resolution can be between 100 PPR and 65000 PPR.

3.2.2 Analog I/O connector (X1)

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
1	**+10V**	Output +10Vdc ±5% - 5mA max.	
2	**-10V**	Output -10Vdc ±5% - 5mA max.	
3	**AI1+**	Hot pole of analogue input 1.	Main speed reference. (10V = 100% *Motor Speed max*)
4	**AI1-**	Cold pole of analogue input 1.	
5	**A0V**	Analog 0V connected to ground.	

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
6	**AI2+**	Hot pole of the analogue input 2.	External current limit (if activated with DI6). (10V = 100% *Motor Iarm nom*)
7	**AI2-**	Cold pole of the analogue input 2.	
8	**A0V**	Analog 0V connected to ground.	
9	**AO1**	Analog output 1.	Signal proportional to the load on the motor. (100% load = 10V)
10	**A0V**	0V analogica collegata a massa.	
11	**AO2**	Analog output 2.	Signal proportional to the speed of the motor. (110% *Motor Speed max* = 10V)
12	**A0V**	Analog 0V connected to ground.	
13	**AO3**	Analog output 3 (High speed).	Signal proportional to the armature current (unfiltered). (200% *Motor Iarm nom* = 10V)
14	**A0V**	Analog 0V connected to ground.	

Features common to all <u>analog inputs</u>:

- Maximum voltage: ± 10V between pole + and pole - or with respect to A0V.
- Input resistance: 110kΩ.
- Resolution: 15 bit + sign.

Features common to all analog outputs:

- Maximum voltage: ± 10V (or 0 to 10V) between the output pole and A0V.
- Output resistance: 100Ω.
- Resolution: 11 bit + sign.

Always use good quality shielded cables and connect the two ends of the screen to the ground. On the front of the drive, near the connectors, the anchorages for the screens are available.

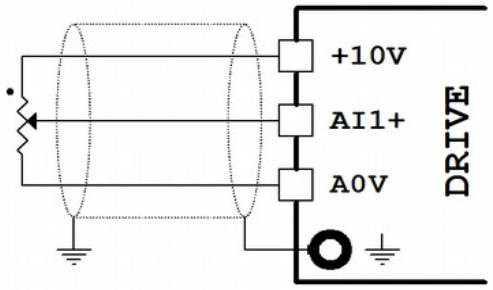


Figure 5: Connection of a potentiometer

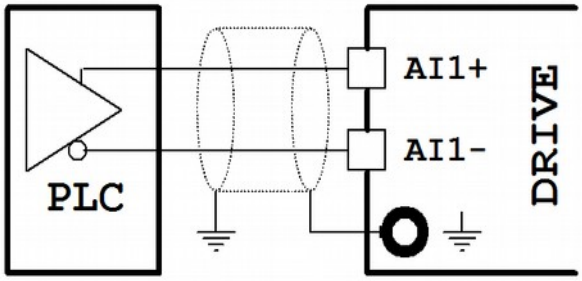


Figure 6: Connection of a PLC output

Example of connection to an analog input

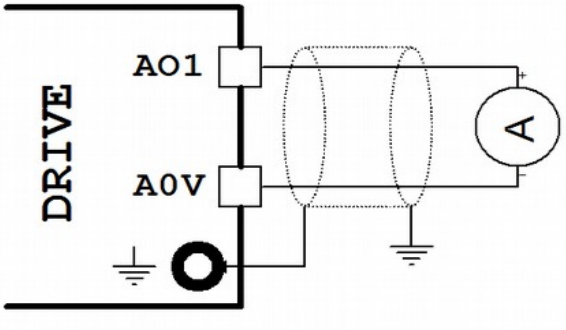


Figure 7: Connecting a viewer display

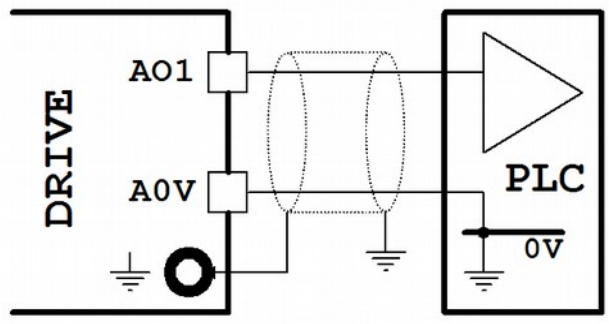


Figure 8: Connection of a PLC input

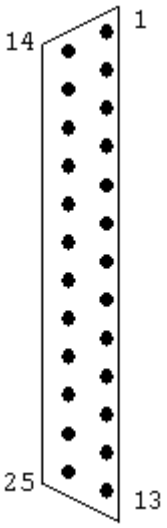
Example of connection to an analogue output

3.2.3 Tachogenerator and motor temperature connector (X2)

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
1	**TGI**	Voltage signal input from the tachogenerator (maximum ± 385Vdc compared to the A0V reference).	
2	**-**	Empty (not used).	
3	**A0V**	Reference 0V for the tachogenerator. The analog 0V is connected to the drive enclosure.	
4	**A0V**	Screen of the connection cable to the tachogenerator. The analog 0V is connected to the drive enclosure.	
5	**TMP+**	Wire + from the motor temperature sensor.	Temperature input not used
6	**TMP-**	Wire - from the motor temperature sensor.	

Always use good quality shielded cables and connect the two ends of the screen to the ground.

3.2.4 Encoder connector (X3)



DRIVE (Connector X3)		CONNECTION	MOTOR	
SIGNAL	N° PIN		N° PIN	SIGNAL
+5V (Encoder positive power supply)	1			
0V (0V encoder power supply)	2			
"A" encoder channel	3			
"$\overline{A}$" encoder channel	4			
0V (stocking screen couple A + $\overline{A}$)	5			
"B" encoder channel	6			
"$\overline{B}$" encoder channel	7			
0V (stocking screen couple B + $\overline{B}$)	8			
Motor temperature probe (signal)	13			
0V (stocking screen couple Z + $\overline{Z}$)	16			
"Z" encoder channel	17			
"$\overline{Z}$" encoder channel	18			
Motor temperature probe (ground)	25			
0V (cable shield) - Connector housing				

View of the "D" 25-pin female-type flying connector on the weld side.
Connection of the "Encoder TTL 5V Line Driver" transducer mounted in the motor. The connection cable must be shielded and the shield must be connected to ground at both ends.

> ***NOTE:*** *if the encoder does not have channels Z e $\overline{Z}$ it is mandatory to connect the two unused pins in this way: pin 17 with pin 1 and pin 18 with pin 2.*

3.2.5 Bus connector (X4)

PIN	NAME	SIGNAL	CONNECTION	DESTINATION
1	**A0V**	Internal 0V connected to ground.	SHIELD	
2	**L**	Bus (signal L)		CABLE TO OTHER REMOTE UNIT
3	**H**	Bus (signal H)		
4	**TRM**	Insertion of bus termination resistance (connect on terminal H).		

Use a shielded cable with two twisted wires to connect two drives together during anti-backlash operation (see section 5.5.1.5 on page 35).

The drives located at the ends of the fieldbus must have the terminating resistor switched on, so a jumper must be made between the "TRM" terminal and the "H" terminal.

3.2.6 Digital input connector (X5)

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
1	**+24V**	Output +24Vcc - 100mA max.	

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
2	**DEN**	Drive enable	FUNCTION NOT MODIFIABLE
3	**DI1**	Digital input 1	Enable speed ramp (REN)
4	**DI2**	Digital input 2	Alarm reset command (RST)
5	**DI3**	Digital input 3	Reverse direction of motor rotation (RSR)
6	**DI4**	Digital input 4	Enable JOG function (JOG)
7	**DI5**	Digital input 5	Speed reference selection 1 o 2 (SR1/2)
8	**DI6**	Digital input 6	Enable external current limit (MCL e BCL)
9	**DI7**	Digital input 7	Select the gain for AI1 input (GAIN)
10	**DI8**	Digital input 8	Free
11	**D0V**	0V Digital input	
12	**A0V**	Internal 0V connected to ground.	

Supply voltage from 18Vdc to 30Vdc (nominal 24Vdc). The 24Vdc power supply can be supplied by the drive (if the total current does not exceed 100mA): connect D24 with the + 24V terminal (see paragraph 3.2.7) and D0V with the A0V terminal.

If the internal power supply can not be used, an external power supply must be used.

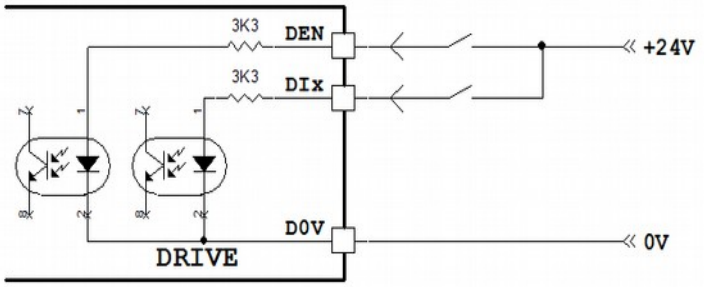


Figure 9: Connection of command contacts

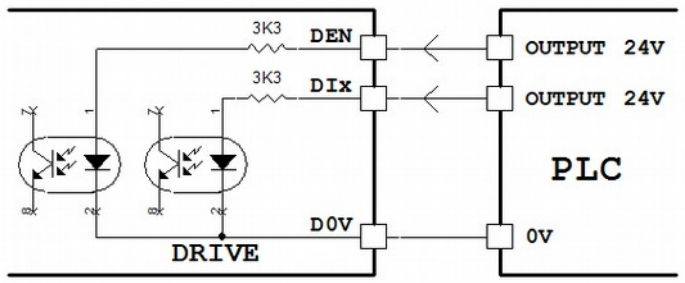


Figure 10: Connection of PLC outputs

Example of connection to digital inputs

3.2.7 Digital output connector (X6)

PIN	NAME	DESCRIPTION	Standard function (factory parameters)
1	**+24V**	Output +24Vcc - 100mA max.	
2	**D24**	Common to be connected to + 24Vdc for digital outputs.	
3	**DOK**	Drive OK output	FUNCTION NOT MODIFIABLE
4	**DO1**	Digital output 1	Line contactor command (CNT)
5	**DO2**	Digital output 2	Zero speed signal (ZES)
6	**DO3**	Digital output 3	Speed threshold 1 exceeded (SOT1)
7	**DO4**	Digital output 4	Motor load signaling > 90% (PML)
8	**DO5**	Digital output 5	Signaling reaches the set speed (STS)
9	**DO6**	Digital output 6	Armature current signal > 100% nominal drive (DOL)
10	**A0V**	Internal 0V connected to ground.	

Supply voltage from 18Vdc to 30Vdc (nominal 24Vdc). The 24Vdc power supply can be supplied by the drive (if the total current absorbed by the loads connected to the outputs does not exceed 100mA): connect D24 with the + 24V terminal and D0V with the A0V terminal (see paragraph 3.2.6). If the internal power supply can not be used, an external power supply must be used. Without service power, all outputs are OFF. Output States:

- OFF = Floating
- ON = Connected to + 24V supply (D24)

Maximum current for each output: 100 mA.

Internal voltage drop at maximum current: 2V.

In case of overload or short circuit on one or more outputs all forced in the OFF state permanently, in this case the intervention signals the anomaly both on the display and with the flashing of the red LED FLT.

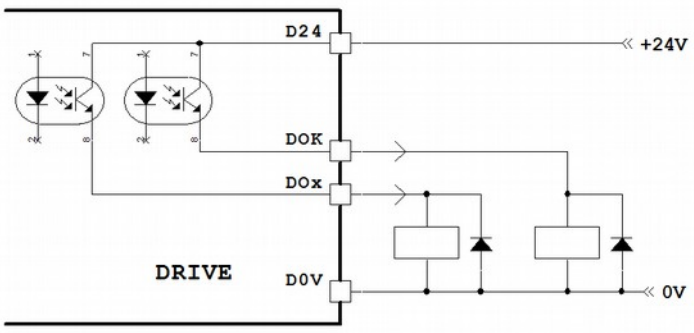


Figure 11: Connection of relay coils

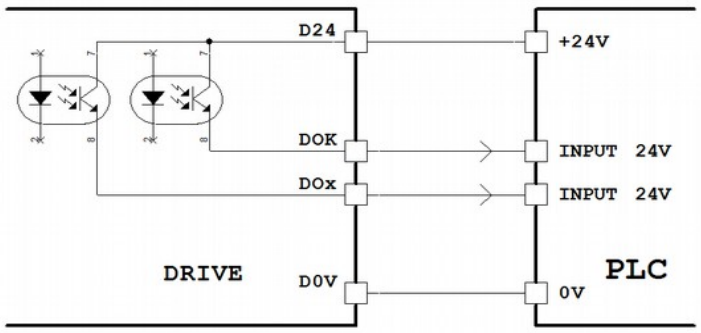


Figure 12: Connection of PLC inputs

Example of connection to digital outputs

Use of the DOK output: *this output signals when the drive has terminated the initial tests after switching on, and during operation it must always be at logic level "1", indicating that the drive is in the right operating conditions.*

The DOK output can switch to "0" level due to some anomaly or alarm (shown on the display): in this case the electrical circuit provided by the manufacturer must IMMEDIATELY de-energize the three-phase contactor coil which supplies inputs L1, L2, L3 (see figure 3 on pag.11 and figure 4 on pag.12). At the same time it must be possible to allow the engine to slow down due to inertia without causing damage to things or to people.

When the DOK output switches to "0" level, the drive is in alarm condition and no longer controls the motor.

The DOK output must also be used to signal the fault of the drive visibly to the operator, so that he can be aware of the situation.

When the DOK output is at logic level "0" THERE MUST BE NO TENSION TO THE HEADS OF THE TERMINALS L1, L2, L3. ***In case of doubt about the command of the line contactor, it is recommended to use the DO1 output*** *(if standard configuration).*

4 Commissioning

All the parameters to be set or to be read are accessible both with the display and the keyboard mounted on the front of the drive, or through a PC connected to the integrated USB port using the special software provided free of charge on request.

The drives D Series use three types of memory to store and modify parameters:

- MEM external memory: this is an external removable memory connected to the special "MEM" front connector.
- Internal memory FLASH: it is a memory inside the microprocessor that stores the parameters modified by the customer for an infinite time.
- Internal RAM memory: it is a memory inside the microprocessor that is used during the operation of the drive and contains the active parameters in use at that precise moment. When the voltage to auxiliary services fails, this memory is canceled.

4.1 Removable parameter memory (MEM)

On the front of the drive there is a connector labeled "MEM" on which the extractable memory supplied with the kit must be inserted: it is presented as a standard plastic case with a 9-pin D-type connector.

Inside this case there is a special flash memory that stores all the parameters of the drive for an infinite time, does not require batteries. This memory has the following purposes:

1. In case of replacement of the drive with another equivalent, it is possible to extract the MEM from the failed product and insert it in the new one to have the possibility to start again immediately reducing the machine stop.
2. In case of experiments on the various internal parameters, it is possible to keep a copy to restore it in case the results are not as desired.

3. Redundancy on the memorized parameters: the drive stores a copy of the MEM parameters inside it. Even if the MEM module fails, the drive can continue to operate using the copy inside it. Then you can replace the MEM with a new one and update the parameters or overwrite the previous ones.

The following table shows how the three drive memories interact with each other:

"MEM"	COMMAND	RESULT
NOT inserted	Restore parameters	FLASH → RAM
NOT inserted	Backup parameters	RAM → FLASH
NOT inserted	Auxiliary services voltage presence	FLASH → RAM
Inserted EMPTY	Restore parameters	FLASH → RAM
Inserted EMPTY	Backup parameters	RAM → FLASH → MEM
Inserted EMPTY	Auxiliary services voltage presence	FLASH → RAM
Inserted with valid parameters	Restore parameters	MEM → RAM
Inserted with valid parameters	Backup parameters	RAM → MEM → FLASH
Inserted with valid parameters	Auxiliary services voltage presence	MEM → RAM

Table 6: Drive parameter memories interaction

The external memory "MEM" can be connected/disconnected even when the drive is powered and/or enabled without causing damage, provided that a parameter backup/restore function is not active. Observing the table 6 it is understood that the external memory MEM can also be used to copy the configuration of a drive to other drives of the same type.

4.2 Use of the display and keypad on the front panel

The drives model D Series they are equipped with a character display (16 characters on 2 lines) and a 5-button keypad that allows you to act on all the parameters and to navigate in the internal menu without forcing the user to connect a PC.

The function of the 5 keys can change according to whether the parameter modification mode is active or deactivated; when a parameter digit is flashing, it means that the edit mode is ACTIVE, otherwise it is DISABLED.

Push-button	Modify mode deactivates	Edit mode active
"UP" ▲	Scrolls the menus of the same level upwards.	Increases the flashing digit in the parameter.
"DN" ▼	Scroll down the menus of the same level.	Decrements the flashing digit in the parameter.
"DX" ►	Go to the rightmost level (increment level).	Move the cursor to change digit to the right.
"SX" ◄	Go to the leftmost level (decrement level).	Move the cursor to change digit to the left.
"OK"	Switch to parameter edit mode.	Exit from the parameter edit mode.

Table 7: Function of the front keys

4.3 Structure of the internal parameters menus

Each menu contains a parameter that can be read only or read / write. When the parameter is shown on the display, it is possible to change its value by pressing the central "OK" button: if the parameter is read / write, you will see that the right-most character starts to flash, thus indicating that the "Edit mode is active".

The various parameters are grouped in menus and sub-menus in order to create homogeneous and coherent groups.

In the following pages we will highlight the various levels of the menu to be selected in order to modify a certain parameter, for example: *QUICK SETUP → MOTOR PARAMETERS → Motor Iarm nom*.

4.4 Calibration and adjustments

In this paragraph you will find all the points to follow to get the motor running quickly, using only the front display. In this case the drive is used with the standard functions configured and combined with the digital and analog I/O as the original factory parameters, whose associations are listed in the relative paragraphs from page 13 to page 16.

1. **Give power to the auxiliary services**: the LEDs are tested (turn on for 2 seconds and then go off), the background of the display lights up and the initial wording indicating the drive D Series model in use. Verify that the writing on the display indicates the same model written on the metal plate (see figure 1 on page 7).
2. **Check the logic level of the DOK output**: if everything is working properly, you must have + 24V on the output terminal and the relay controlled by it, is energized. The red LED FLT must be off; otherwise it is necessary to consult the paragraph 9 on pag.71 or the paragraph 10 on pag.76 to know the cause.
3. **Obtain the data of the motor that will be written in the following points**: it is essential to know these parameters in order to proceed with the calibration!
4. **Set the motor nominal voltage**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Varm nom`. Press the central button "OK" to activate the parameter modification, then use the "SX" button to move to the digit to be modified, you can select the units, the tens, and so on, to insert the new parameter faster. Use the UP and DN buttons to set the desired value. Once the modification is complete, press OK again to exit the parameter modification mode.
5. **Set the rated armature current of the motor**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Iarm nom`. Set the parameter with the same procedure as for the point 4.
6. **Set the maximum armature current of the motor:** reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Iarm max`. Set the parameter with the same procedure as for the point 4. If the Iarm max current is greater than the Iarm nom current, it is possible to protect the motor from excessive overload by using the MOL auxiliary function (see paragraph 5.5.1.12 on page 40).
7. **Set the rated motor field current**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Ifld nom`. Set the parameter with the same procedure as for the point 4.
   - In the standard configuration the field bridge is enabled together with the armature bridge with the DEN command: in this way, when the motor is not used, the power supply to the field is removed and the motor does not heat up unnecessarily. Changing the parameter `ADVANCED SETUP → DRIVE SETUP → COMMAND & STATUS → Field Enab Src` the following operating modes can be obtained for the field bridge:
     - Always off (with permanent magnet motors): set source to FALSE.
     - Always on (the bridge is enabled when voltage is present on terminals FL1 and FL2): set source to TRUE.
     - On with an external command: set the source on a free digital input (DI7 or DI8) to be controlled by the customer.
     - Lit together with the armature bridge (standard condition): set source to "*Cmd Drive Enable*".
8. **Set the basic speed of the motor**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Speed base`. Set the parameter with the same procedure as for the point 4. The "*base speed*" is the maximum speed expressed in RPM at which the engine can operate in CONSTANT TORQUE, ie the maximum speed that can be reached by keeping the flow constant, which corresponds to the speed of the engine when the voltage armature reaches the value set in the parameter "Motor Varm nom". This parameter can also be interpreted as that speed in which the motor starts its operation at constant power.
9. **Set the type of speed transducer in the motor**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor FBK type`. The possible selections are:

   A) "**Arm.Volt.**": The armature voltage is used when it is not mounted or it is not possible to mount the D.T. on the engine shaft. The converter, in this case, behaves like a power supply able to supply an output voltage adjustable from 0 to the maximum allowed by the power supply c.a. of the thyristor bridge; the maximum speed of the motor is therefore limited by the maximum voltage allowed by the power c.a. Controlling the armature voltage to indirectly control the speed of a motor is not recommended in most cases due to the poor accuracy in the speed value obtained especially at low revs and when using small power motors.

   In this mode it is not possible to operate the motor at constant maximum power.

   The converter, not having the motor speed signal provided by the D.T. , uses the armature voltage for all auxiliary functions related to speed. In the use of these auxiliary functions it is to be kept in mind that identifying the speed of the motor with its armature voltage leads to considerable inaccuracies, especially at low values.

   By setting this feedback mode, it must be considered that the maximum motor speed (set in the "*Motor Speed max*" parameter) can not be greater than the "*Motor Speed base*" parameter.

B) "**D.C. Tacho**": a converter which uses a tachogenerator as a motor speed feedback, adjusts the armature voltage to obtain that the speed of the motor shaft follows the speed reference. By controlling the field current it is therefore possible to obtain two modes of operation of the motor:

- A Maximum constant torque: when the field is at the maximum value and the armature voltage is proportional to the speed.
- A Maximum constant power: when the armature voltage reaches the maximum value and the field decreases inversely proportional to the speed.

A converter operating in this way provides the maximum precision of motor speed regulation and the maximum response speed possible and also allows the best use of the auxiliary functions related to speed.

Using a tachogenerator, **you must also enter these two parameters**:

- `QUICK SETUP → MOTOR PARAMETERS → Motor Tacho Kdt` : the speed conversion constant expressed in units of measurement V/1000 RPM. This value is written on the nameplate of the tachogenerator or on that of the engine. In case of problems to find this data, you can operate the motor with armature voltage feedback ("Arm.Volt."), set a constant speed that will be measured with a mechanical tachometer directly on the engine (RPM_{mis}), while at the same time the tachometer dynamo voltage (V_{mis}) is measured; at this point it is possible to calculate the constant: $Kdt = \frac{V_{mis}}{RPM_{mis}} \times 1000$ which will then be written in this parameter.
- `QUICK SETUP → MOTOR PARAMETERS → Motor FBK sign` : for the moment this parameter can remain at its normal value "**NO Inver**". If in the drive occurs an alarm called "Feedback Fault" when the motor is first enabled, then the value can be changed to try to solve the problem.

C) "**Encod.TTL**": a converter that uses a TTL encoder as a motor speed feedback, adjusts the armature voltage to get the motor shaft speed to follow the speed reference. By controlling the field current it is therefore possible to obtain two modes of operation of the motor:

- A Maximum constant torque: when the field is at the maximum value and the armature voltage is proportional to the speed.
- A Maximum constant power: when the armature voltage reaches the maximum value and the field decreases inversely proportional to the speed.

A converter operating in this way provides the maximum precision of motor speed regulation and the maximum response speed possible and also allows the best use of the auxiliary functions related to speed.

Using an encoder TTL, **you must also enter these two parameters**:

- `QUICK SETUP → MOTOR PARAMETERS → Motor Encod.PPR` : the encoder resolution expressed in "Pulse/rev" (PPR). This value is written on the encoder plate or is indicated by the manufacturer.
- `QUICK SETUP → MOTOR PARAMETERS → Motor FBK sign` : for the moment this parameter can remain at its normal value "**NO Inver**". If in the drive occurs an alarm called "Feedback Fault" when the motor is first enabled, then the value can be changed to try to solve the problem.

10. **Set the maximum speed of use of the motor**: reach the menu `QUICK SETUP → MOTOR PARAMETERS → Motor Speed max` . Set the parameter with the same procedure as for the point 4. This parameter indicates the scale factor of all speed values expressed as a percentage and therefore represents the maximum speed that the motor will reach when the input reference is at 10Vdc (input AI1, see paragraph 3.2.2 on page 13).
11. **Memorize all the parameters introduced so far**: reach the menu `MEMO PARAMETERS → Save param` . Press the OK center button to start the backup procedure. If after a few moments the word "SAVE PARAMETERS OK" appears, it means that the parameters have been memorized and in case of lack of power to the auxiliary services, they will not be lost.
12. Give the **closing command of the three-phase power contactor** so as to have the voltage on terminals L1, L2, L3, FL1, FL2. If the voltage values are in the nominal fields both as frequency and as amplitude, then the green LED RDY lights up indicating that the drive is ready to power the motor with the parameters entered.
    A) If the green RDY LED remains off, it means that there is no consent to start the engine. To find out which consent is missing, go to the next step to send the DEN command to the drive and read the alarm message on the display.
13. Provide the **enable command on the DEN input** (see paragraph 3.2.6 on page 15). The green DEN led will light up and as soon as the motor is powered up, the green RUN LED will also light up. At this point the motor is under control of the drive.
    A) If the drive goes into alarm at this point and the message "FEEDBACK FAULT" appears, see the next step.

14. Give a **positive speed reference to the AI1 input**: the motor must increase its speed little by little in one direction. Even if the direction is not the desired one, for the moment this aspect is not important.
    A) If at this point the engine accelerates quickly and then alarms the drive with the message "FEEDBACK FAULT", you must follow these points:
        - Remove the DEN enable command.
        - Reset the alarm by pressing one of the 5 front keys.
        - Reach the parameter *QUICK SETUP → MOTOR PARAMETERS → Motor FBK sign*: change the value that is currently written.
        - Repeat from the point 11.
        - If, after making this change, the problem does not resolve, then the cause may be due to a problem on the speed transducer.
    B) If at this point the drive goes into alarm and the message "FEEDBACK FAULT" appears, but the motor does not start moving, the cause can be:
        - Check the electrical connection of the armature circuit from the drive (terminals A and B) to the motor.
        - Only in case of use of TTL encoder, check the electrical connection of the wires between encoder and connector X3.
15. Set a **NULL speed reference**: the motor should remain stationary. If the motor rotates slowly, the parameter *QUICK SETUP → DRIVE PARAMETERS → AI1 Offs* must be changed up to stop the rotation of the motor.
16. Increase the **speed reference up to about 50%**. Check the motor speed with a mechanical tachometer, connected directly to the motor shaft. If you need to change the speed you should use parameter *QUICK SETUP → MOTOR PARAMETERS → Motor Speed max* . Verify that the parameter indication *DIAGNOSTIC → MOTOR STATUS → Speed fbk (RPM)* coincides with the speed measured by the tachometer.
17. Increase the **speed reference up to the maximum**. Check the actual speed and if necessary act again on the parameter *QUICK SETUP → MOTOR PARAMETERS → Motor Speed max* for regulation.
18. **Speed stability adjustment**: act on the parameter *QUICK SETUP → DRIVE PARAMETERS → Speed Lp Pgain* until a stable rotation of the motor is achieved without any pendulums or vibrations.
19. If the **direction of rotation of the motor is contrary to that desired**, the parameter must be changed *QUICK SETUP → DRIVE PARAMETERS → AI1 Sign Src* changing the value from FALSE to TRUE.
20. **Memorize any modified parameters**: reach the menu *MEMO PARAMETERS → Save param*. Press the OK center button to start the backup procedure.

At this point the motor is set to operate following the analog speed reference at input AI1, with a standard basic configuration.

For a more advanced use of the drive and for particular configurations it is advisable to consult the paragraph “Advanced configuration“ from page 52.

5 Menu of internal parameters

The menu of the parameters inside the drive is divided into levels: each contains other levels or a group of parameters that have a certain logical link between them. The structure is a tree and we move inside using the 4 front keys as explained in the table 7 at page 18.

In the following paragraphs we will also find the path in the menu and the **drawings of the functional blocks in which the names of the parameters are visible with the relative PIN number** next to each one. This PIN is used to identify the parameter when configuring function blocks to create links between them or as a reference.

5.1 Quick setup

Menu group containing the minimum parameters which must be set in order to operate the converter. It also contains the most used calibration parameters.

5.1.1 Motor Parameters

Quick setup → Motor Parameters

Menu group to set the motor parameters. Without this data the converter can not work properly and therefore must all be written following the indications on the motor plate. The parameters indicated in this group must be inserted in the order as displayed since some of them are linked to each other and one can limit the range of the other.

Name	Type	Range	Default	Unit	Description
Motor Varm nom	RWUI16	10 - 530	0	Volt	Rated armature voltage
Motor Iarm nom	RWFL	0,1 – 9999,9	0	Ampere	Rated armature current. The minimum value is 1/20 of the rated drive current.
Motor Iarm max	RWFL	Iarm nom – 9999,9	0	Ampere	Maximum armature current. The minimum value depends on the *Motor Iarm nom* setting. **NOTE**: if the armature current exceeds the rated value of the drive and lasts over time, the alarm “Drive Overload“ occurs (see pag.72).
Motor Ifld nom	RWFL	0,01 – 20,0	0	Ampere	Nominal field current (**only version with internal field supply**)
Motor Speed base	RWUI16	50 - 8000	0	RPM	Motor base speed
Motor FBK type	RWEN	Arm.Volt. / D.C. Tacho / Encod.TTL	Arm.Volt.	-	Feedback transducer type
Motor Tacho Kdt	RWFL	0,1 – 300,0	0	Volt/1000 rpm	Tachogenerator conversion constant
Motor Encod.PPR	RWUI16	100 - 65000	0	PPR	Encoder pulse/revolution resolution
Motor FBK sign	RWBL	No Inver / Inverted	No Inver	-	Reverse speed transducer sign
Motor Speed max	RWFL	50 - 8000	0	RPM	Maximum motor speed

5.1.2 Drive parameters

Quick setup → Drive parameters

Menu group to set the main parameters of the converter grouped for faster regulation. For a normal operating calibration with average performance, it is sufficient to adjust the parameters grouped here.

Name	Type	Range	Default	Unit	Description
Speed Lp Pgain	RWFL	0,1 – 999,9	60	-	Proportional gain of speed loop
Speed Lp Igain	RWFL	0,001 – 9,999	0,1	-	Integrative speed loop gain
AI1 Offs	RWF16	±100,00	0	%	Adjusting Offset analog input AI1
AI1 Sign Src	SRCSEL	TotPin	FALSE	-	Source selection to toggle sign of AI1

Name	Type	Range	Default	Unit	Description
AI1 Val	ROF16	-	-	%	Current value of analog input AI1
Ramp time 1	RWFL	0,1 – 999,9	6,0	Seconds	Speed ramp time 1

5.2 Memo parameters

Memo parameters

Menu group to store or restore the changes made to the parameters.

Remember that before removing the power supply to the services you need to memorize the modified parameters otherwise they will be lost and the next parameters will be restored.

Name	Type	Range	Default	Unit	Description
Save param	RWBL	-	-	-	Start command parameters on the backup memory
Restore param	RWBL	-	-	-	Command to start restore parameters from memory
Factory reset	RWBL	Disabled / Enabled	-	-	Factory parameter reset command

***Factory reset procedure*:**

- *Select the "Factory reset" menu.*
- *Change the parameter value to Enabled.*
- *Turn off the power to the auxiliary services for a couple of seconds and then reset it.*
- *At this point ALL the internal parameters have become the original factory ones.*
- *If this procedure has been made by mistake, it is possible to remove the power supply from the services again and restore it to return to having the parameters of the last saving.*
- *Otherwise you can proceed with a new parameterization based on the standard parameters, changing only the necessary values.*
- *At the end it is necessary to save the new parameters with the "Save param" menu: in this way the old parameters are overwritten with the new ones.*

5.3 I/O Configure

Menu group to configure and calibrate analog or digital inputs and outputs.

5.3.1 Analog inputs

Menu containing all the configuration parameters for the analog inputs.

5.3.1.1 Analog input 1

I/O Configure → Analog inputs → Analog input 1

This menu contains all the parameters to adapt the signal present in the analog input AI1.

With reference to Figure 13 we can see that the terminal with the input signal is the one shown on the left side of the drawing, then an Offset is added and then multiplied by a Gain.

The sign of the final result can be inverted by means of a switch that can be associated with any source compatible with a Boolean (False / True) signal.

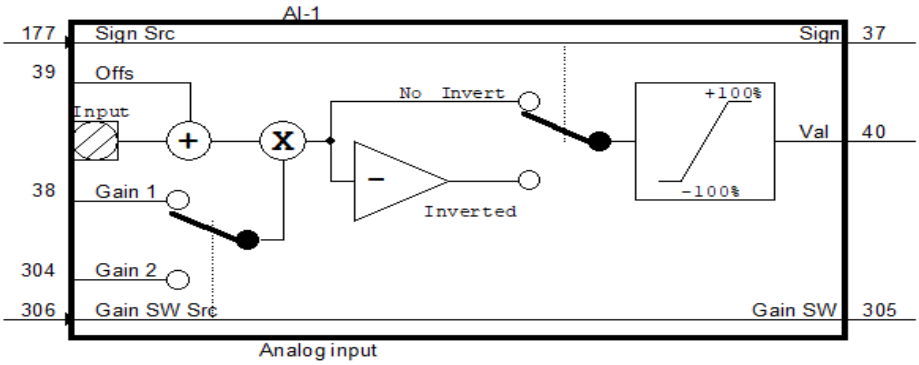


Figure 13: AI1 function block

Name	Type	Range	Default	Unit	Description
AI1 Gain SW Src	SRCSEL	TotPin	DI7 Val	-	Selecting the source to switch GAIN AI1
AI1 Gain SW	ROBL	Gain 1 / Gain 2	-	-	Gain selection status of AI1

Name	Type	Range	Default	Unit	Description
AI1 Gain 1	RWFL	±5,0000	1,0000	-	Adjustment gain 1 analog input AI1
AI1 Gain 2	RWFL	±5,0000	0,0500	-	Adjustment gain 2 analog input AI1
AI1 Offs	RWF16	±100,00	0	%	Adjusting Offset analog input AI1
AI1 Sign Src	SRCSEL	TotPin	FALSE	-	Source selection to toggle sign of AI1
AI1 Sign	ROBL	No Inver / Inverted	-	-	Reverse sign AI1 Status
AI1 Val	ROF16	-	-	%	Current value of analog input AI1

5.3.1.2 Analog input 2

I/O Configure → Analog inputs → Analog input 2

This menu contains all the parameters to adapt the signal present in the analog input AI2.

With reference to Figure 14 we can see that the terminal with the input signal is the one shown on the left side of the drawing, then an Offset is added and then multiplied by a Gain.

The sign of the final result can be inverted by means of a switch that can be associated with any source compatible with a Boolean (False / True) signal.

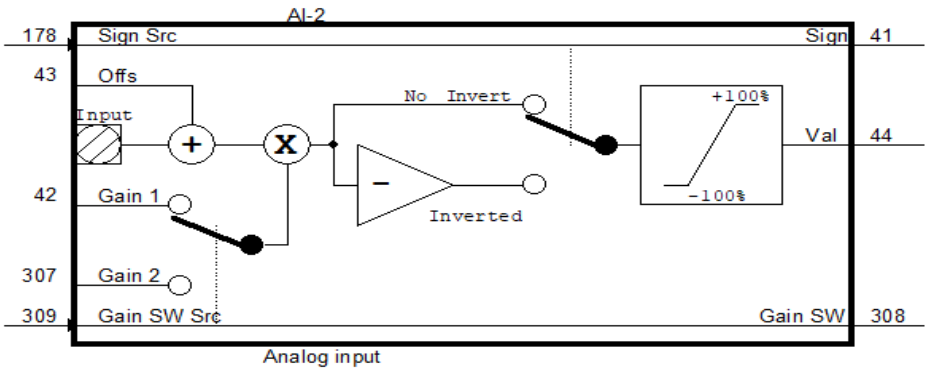


Figure 14: AI2 function block

Name	Type	Range	Default	Unit	Description
AI2 Gain SW Src	SRCSEL	TotPin	FALSE	-	Selecting the source to switch GAIN AI2
AI2 Gain SW	ROBL	Gain 1 / Gain 2	-	-	Gain selection status of AI2
AI2 Gain 1	RWFL	±5,0000	1,0000	-	Adjustment gain 1 analog input AI2
AI2 Gain 2	RWFL	±5,0000	0,0500	-	Adjustment gain 2 analog input AI2
AI2 Offs	RWF16	±100,00	0	%	Adjusting Offset analog input AI2
AI2 Sign Src	SRCSEL	TotPin	FALSE	-	Source selection to toggle sign of AI2
AI2 Sign	ROBL	No Inver / Inverted	-	-	Reverse sign AI2 Status
AI2 Val	ROF16	-	-	%	Current value of analog input AI2

5.3.2 Analog outputs

Menu containing all the configuration parameters for the analog outputs.

5.3.2.1 Analog output 1

I/O Configure → Analog outputs → Analog output 1

This menu contains all the parameters to adapt the signal to be sent to the analogue output AO1. With reference to Figure 15 we can see that the signal selected as source enters from the left side, is limited to ± 100%, passes through an adjustable L.P. filter, can be used with or without sign, is multiplied by a gain Gain and finally is added an offset that serves to com-

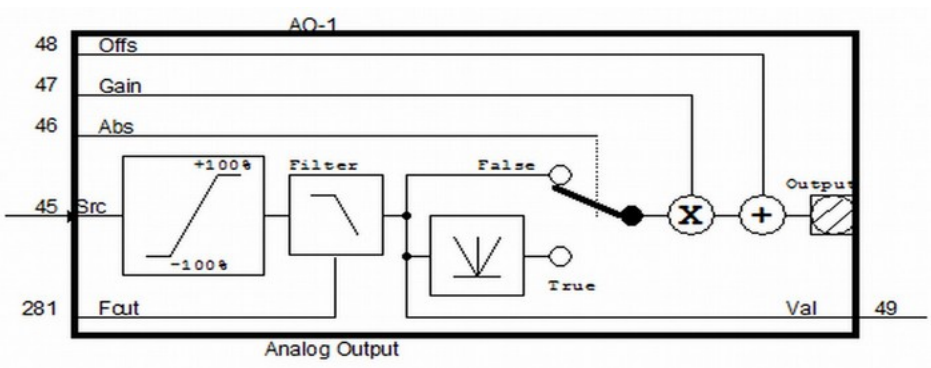


Figure 15: Function block AO1

pensate the hardware part of the analog output. The result is sent to the output on the terminal as indicated on the right side of the drawing.

The analog output AO1 must be used to display low frequency signals (Frequency <2 Hz).

Name	Type	Range	Default	Unit	Description
AO1 Src	SRCSEL	TotPin	Motor Load	-	Selection of the source value for AO1
AO1 F cut	RWUI16	1 - 1428	2	Hz	Cut-off frequency L.P. filter on output AO1
AO1 Val	ROF16	-	-	%	Current value of the source of AO1
AO1 Abs	RWBL	False / True	True	-	Absolute value activation command on AO1
AO1 Gain	RWFL	±100,0000	1,0000	-	Analog output AO1 Gain Adjustment
AO1 Offs	RWF16	±100,00	0	%	Analog output AO1 offset adjustment

5.3.2.2 Analog output 2

`I/O Configure → Analog outputs → Analog output 2`

This menu contains all the parameters to adapt the signal to be sent to the analogue output AO2. With reference to Figure 16 we can see that the signal selected as source enters from the left side, is limited to ± 100%, passes through an adjustable L.P. filter, can be used with or without sign, is multiplied by a gain Gain and finally is added an offset that serves to compensate the hardware part of the analog output. The result is sent to the output on the terminal as indicated on the right side of the drawing.

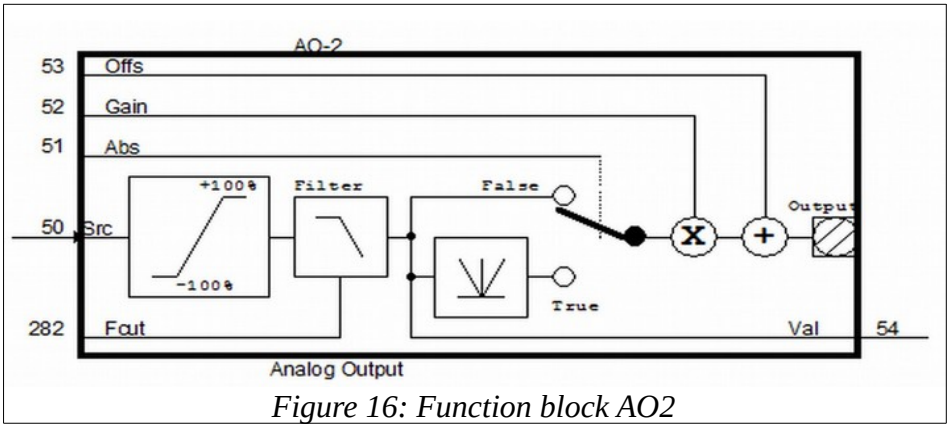


Figure 16: Function block AO2

The analog output AO2 must be used to display low frequency signals (Frequency <2 Hz).

Name	Type	Range	Default	Unit	Description
AO2 Src	SRCSEL	TotPin	Speed fbk	-	Selection of the source value for AO2
AO2 F cut	RWUI16	1 - 1428	2	Hz	Cut-off frequency L.P. filter on output AO2
AO2 Val	ROF16	-	-	%	Current value of the source of AO2
AO2 Abs	RWBL	False / True	True	-	Absolute value activation command on AO2
AO2 Gain	RWFL	±100,0000	1,0000	-	Analog output AO2 Gain Adjustment
AO2 Offs	RWF16	±100,00	0	%	Analog output AO2 offset adjustment

5.3.2.3 Analog output 3

`I/O Configure → Analog outputs → Analog output 3`

This menu contains all the parameters to adapt the signal to be sent to the analogue output AO2. With reference to Figure 17 we can see that the signal selected as source enters from the left side, is limited to ± 100%, passes through an adjustable L.P. filter, can be used with or without sign, is multiplied by a gain Gain and finally is added an offset that serves to compensate the hardware part of the analog output. The result is sent to the output on the terminal as indicated on the right side of the drawing.

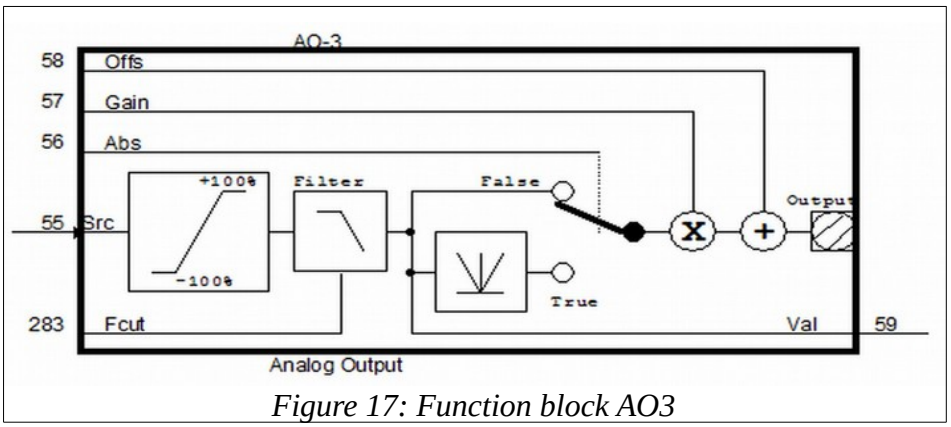


Figure 17: Function block AO3

The analogue output AO3 can also be used for high frequency signals (Frequency < 1000 Hz).

Name	Type	Range	Default	Unit	Description
AO3 Src	SRCSEL	TotPin	Iarm unfilt	-	Selection of the source value for AO3
AO3 F cut	RWUI16	1 - 1428	1400	Hz	Cut-off frequency L.P. filter on output AO3
AO3 Val	ROF16	-	-	%	Current value of the source of AO3
AO3 Abs	RWBL	False / True	True	-	Absolute value activation command on AO3
AO3 Gain	RWFL	±100,0000	1,0000	-	Analog output AO3 Gain Adjustment
AO3 Offs	RWF16	±100,00	0	%	Analog output AO3 offset adjustment

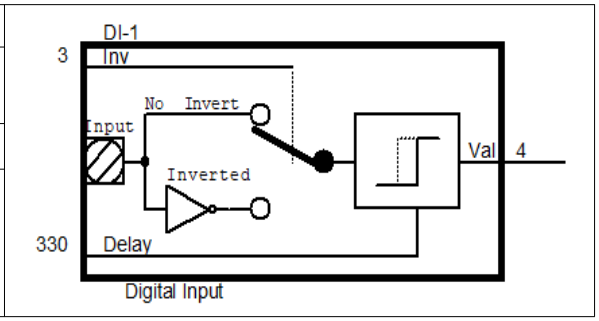
5.3.3 Digital Inputs

Menu containing all the configuration parameters for the digital inputs.

5.3.3.1 Digital input 1

I/O Configure → Digital Inputs → Digital input 1

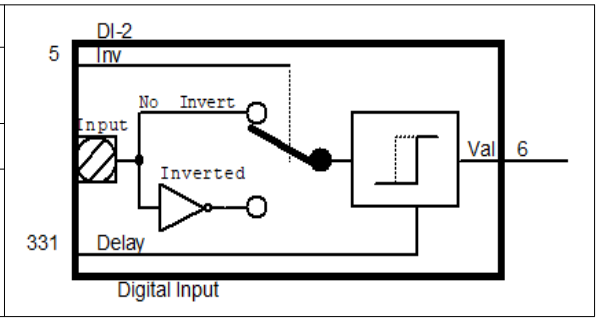
Name	Type	Range	Default	Unit	Description
DI1 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI1
DI1 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI1
DI1 Val	ROBL	False / True	-	-	Current logical state associated with DI1



5.3.3.2 Digital input 2

I/O Configure → Digital Inputs → Digital input 2

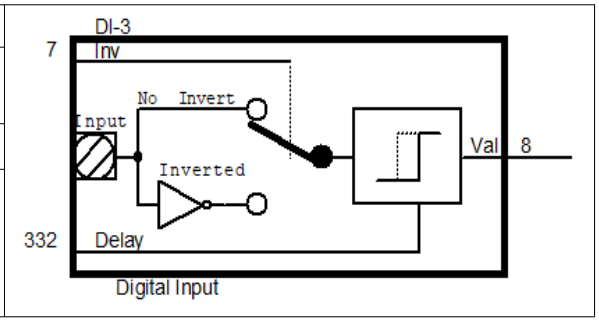
Name	Type	Range	Default	Unit	Description
DI2 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI2
DI2 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI2
DI2 Val	ROBL	False / True	-	-	Current logical state associated with DI2



5.3.3.3 Digital input 3

I/O Configure → Digital Inputs → Digital input 3

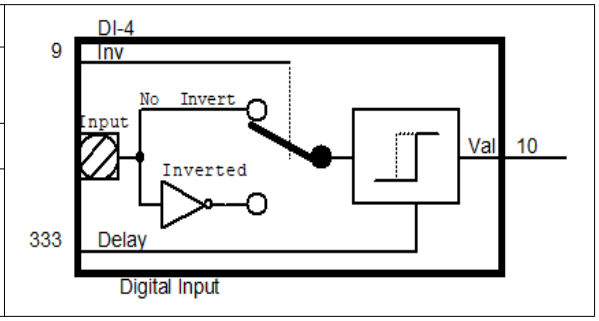
Name	Type	Range	Default	Unit	Description
DI3 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI3
DI3 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI3
DI3 Val	ROBL	False / True	-	-	Current logical state associated with DI3



5.3.3.4 Digital input 4

I/O Configure → Digital Inputs → Digital input 4

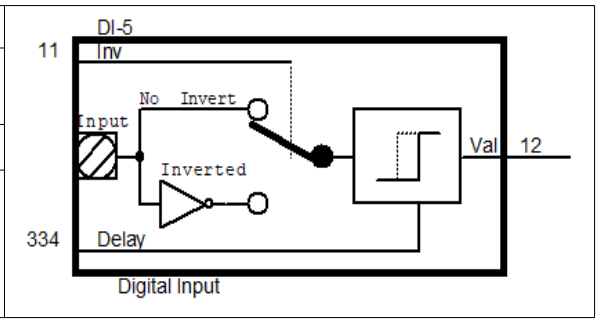
Name	Type	Range	Default	Unit	Description
DI4 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI4
DI4 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI4
DI4 Val	ROBL	False / True	-	-	Current logical state associated with DI4



5.3.3.5 Digital input 5

I/O Configure → Digital Inputs → Digital input 5

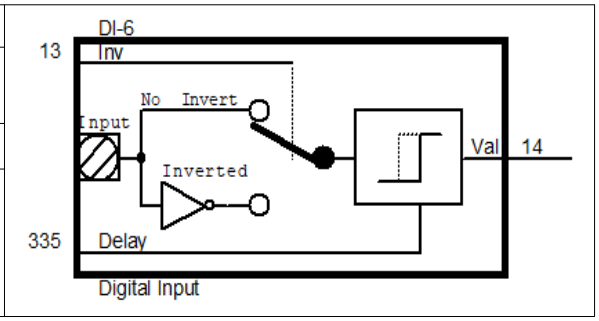
Name	Type	Range	Default	Unit	Description
DI5 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI5
DI5 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI5
DI5 Val	ROBL	False / True	-	-	Current logical state associated with DI5



5.3.3.6 Digital input 6

I/O Configure → Digital Inputs → Digital input 6

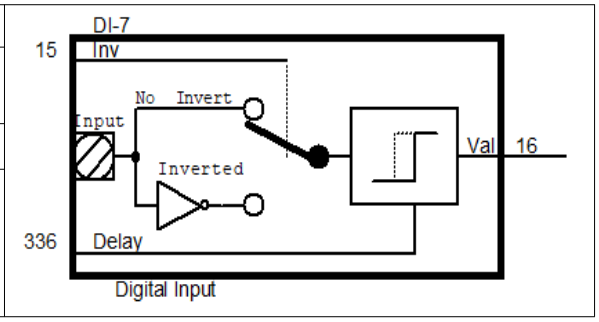
Name	Type	Range	Default	Unit	Description
DI6 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI6
DI6 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI6
DI6 Val	ROBL	False / True	-	-	Current logical state associated with DI6



5.3.3.7 Digital input 7

I/O Configure → Digital Inputs → Digital input 7

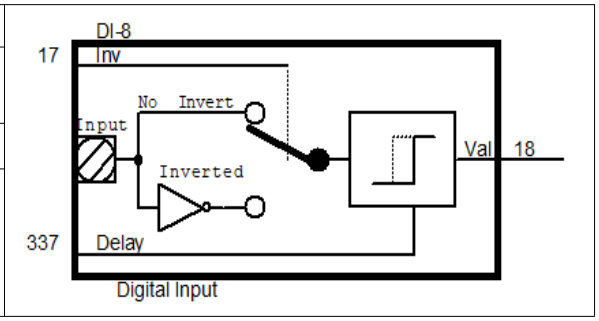
Name	Type	Range	Default	Unit	Description
DI7 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI7
DI7 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI7
DI7 Val	ROBL	False / True	-	-	Current logical state associated with DI7



5.3.3.8 Digital input 8

I/O Configure → Digital Inputs → Digital input 8

Name	Type	Range	Default	Unit	Description
DI8 Inv	RWBL	No Inver / Inverted	No Inver	-	Command Reverse logic DI8
DI8 Delay	RWUI16	0 - 9999	0	ms	Switch delay DI8
DI8 Val	ROBL	False / True	-	-	Current logical state associated with DI8



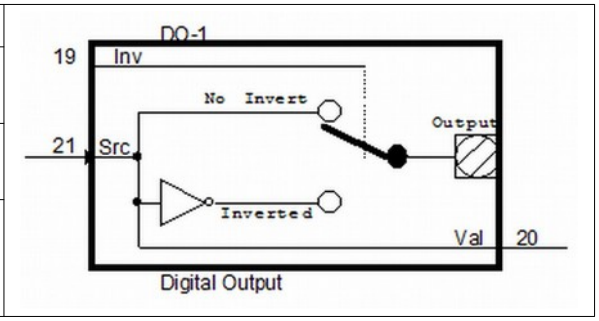
5.3.4 Digital Outputs

Menu containing all the configuration parameters for the digital outputs. Each digital output must be associated with a BOOL source PIN that will transmit its logic value to the output: it can be inverted with a sign and then sent to the output terminal. The logic status of the selected source is displayed in the "VAL" parameter.

5.3.4.1 Digital output 1

I/O Configure → Digital Outputs → Digital output 1

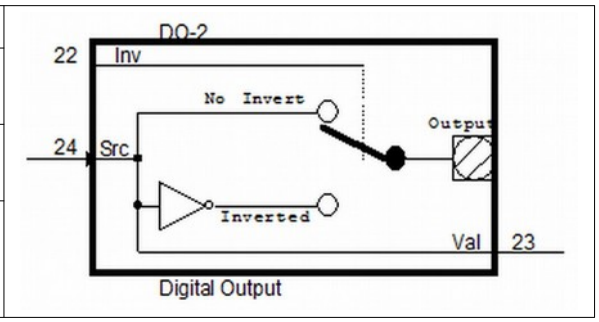
Name	Type	Range	Default	Description
DO1 Src	SRCSEL	TotPin	CNT signal	Selection of the source for DO1
DO1 Val	ROBL	False / True	-	Logical status of DO1 source
DO1 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO1



5.3.4.2 Digital output 2

I/O Configure → Digital Outputs → Digital output 2

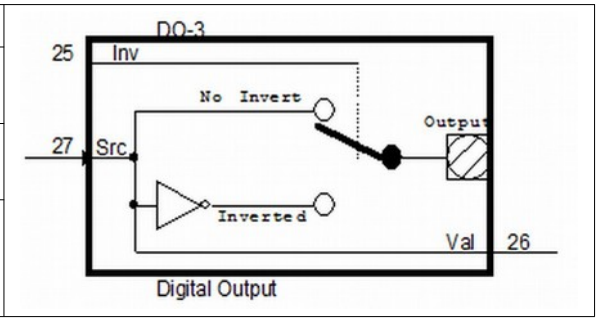
Name	Type	Range	Default	Description
DO2 Src	SRCSEL	TotPin	ZES Output	Selection of the source for DO2
DO2 Val	ROBL	False / True	-	Logical status of DO2 source
DO2 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO2



5.3.4.3 Digital output 3

I/O Configure → Digital Outputs → Digital output 3

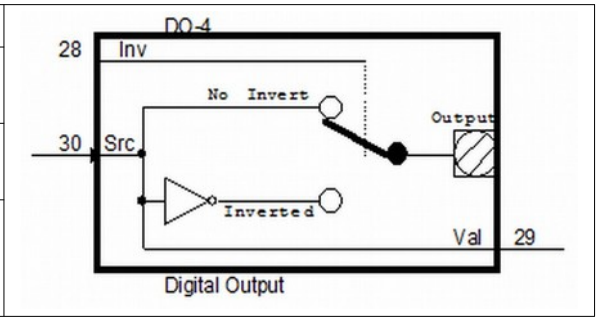
Name	Type	Range	Default	Description
DO3 Src	SRCSEL	TotPin	SOT1 Output	Selection of the source for DO3
DO3 Val	ROBL	False / True	-	Logical status of DO3 source
DO3 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO3



5.3.4.4 Digital output 4

I/O Configure → Digital Outputs → Digital output 4

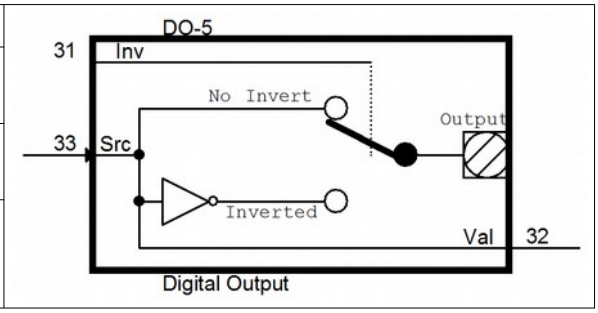
Name	Type	Range	Default	Description
DO4 Src	SRCSEL	TotPin	PML Output	Selection of the source for DO4
DO4 Val	ROBL	False / True	-	Logical status of DO4 source
DO4 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO4



5.3.4.5 Digital output 5

I/O Configure → Digital Outputs → Digital output 5

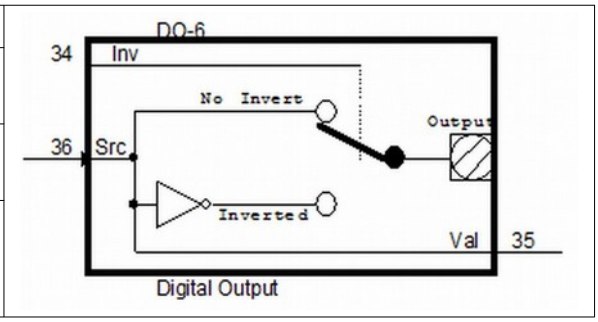
Name	Type	Range	Default	Description
DO5 Src	SRCSEL	TotPin	STS Output	Selection of the source for DO5
DO5 Val	ROBL	False / True	-	Logical status of DO5 source
DO5 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO5



5.3.4.6 Digital output 6

I/O Configure → Digital Outputs → Digital output 6

Name	Type	Range	Default	Description
DO6 Src	SRCSEL	TotPin	DOL PreAlarm	Selection of the source for DO6
DO6 Val	ROBL	False / True	-	Logical status of DO6 source
DO6 Inv	RWBL	No Inver / Inverted	No Inver	Command logic state inversion DO6



5.4 Diagnostic

Menu group with read only parameters for diagnostics, for displaying digital I / O logic states, for motor and drive status.

5.4.1 Digital Inputs

Diagnostic → Digital Inputs

With this menu it is possible to quickly check the logic status of each digital input after a possible sign inversion (if activated). See the paragraph 5.3.3 from page 26 to understand exactly where the displayed parameter is located.

Name	Type	Range	Default	Description
DI1 Val	ROBL	False / True	-	Current logical state associated with DI1
DI2 Val	ROBL	False / True	-	Current logical state associated with DI2
DI3 Val	ROBL	False / True	-	Current logical state associated with DI3
DI4 Val	ROBL	False / True	-	Current logical state associated with DI4
DI5 Val	ROBL	False / True	-	Current logical state associated with DI5
DI6 Val	ROBL	False / True	-	Current logical state associated with DI6

Name	Type	Range	Default	Description
DI7 Val	ROBL	False / True	-	Current logical state associated with DI7
DI8 Val	ROBL	False / True	-	Current logical state associated with DI8

5.4.2 Digital Outputs

Diagnostic → Digital Outputs

With this menu it is possible to quickly check the logic status of each digital output before any sign inversion (if activated). See the paragraph 5.3.4 from page 28 to understand exactly where the displayed parameter is located.

Name	Type	Range	Default	Description
DO1 Val	ROBL	False / True	-	Logical status of DO1 source
DO2 Val	ROBL	False / True	-	Logical status of DO2 source
DO3 Val	ROBL	False / True	-	Logical status of DO3 source
DO4 Val	ROBL	False / True	-	Logical status of DO4 source
DO5 Val	ROBL	False / True	-	Logical status of DO5 source
DO6 Val	ROBL	False / True	-	Logical status of DO6 source

5.4.3 Drive status

Diagnostic → Drive status

In this menu are grouped all the parameters that allow you to know the status of the drive, power supply and services, the firmware loaded, the internal temperature, cycle times, etc.

Name	Type	Range	Default	Unit	Description
Speed ref	ROF16	-	-	%	Speed reference to speed loop
Speed ref	ROF16	-	-	RPM	Speed reference to speed loop
VL freq	ROUI8	-	-	Hz	Frequency measured in VL1, VL2, VL3
VFL freq	ROUI8	-	-	Hz	Frequency measured in VFL1, VFL2 (**only version with internal field supply**)
DOL level	ROF16	-	-	%	Converter overload level
BRIDGE TEMP	ROUI8	-	-	°C	Bridge heatsink temperature
DSP TEMP	ROUI8	-	-	°C	Temperature inside the DSP
App FW vers	ROFL	-	-	-	Firmware version (MMM.mm)
BootLd vers	ROFL	-	-	-	Bootloader version (MMM.mm)
Period CTRL lp	ROUI16	-	-	uSec	Control cycle time
Time CTRL lp	ROUI16	-	-	uSec	Duration of the control cycle
Period MAIN lp	ROUI16	-	-	uSec	Cycle time main
Aux sup 24V	ROFL	-	-	V	Voltage aux services +24V
Aux sup 15V	ROFL	-	-	V	Voltage aux services +15V
Aux sup 5V	ROFL	-	-	V	Voltage aux services +5V
Aux sup -15V	ROFL	-	-	V	Voltage aux services -15V
Int.memo status	ROUI16	-	-	-	Internal memory status word (*)
Ext.memo status	ROUI16	-	-	-	External memory status word (*)
Drive nom.curr.	ROUI16	-	-	A	Indication of the drive nominal current.

(*) The meaning of the various bits of the memory status word (internal or external) is as follows:

- **0x0001**: Error erase for memory (int or ext).
- **0x0002**: Write error for memory (int or ext).
- **0x0004**: Read error for memory (int or ext).

- **0x0008**: Error full for memory (int or ext).
- **0x0010**: Buffer error for memory (int o ext).
- **0x0020**: Empty memory (int o ext).
- **0x0040**: Memory present (int o ext).
- **0x0080**: Memory safe (int o ext).
- **0x0100**: Data valid in memory (int o ext).

5.4.4 Motor status

Diagnostic → Motor status

In this menu are grouped all the parameters that allow you to know the status of the motor, voltage, current, temperature, load.

Name	Type	Range	Default	Unit	Description
Speed fbk (RPM)	ROI16	-	-	RPM	Speed in RPM (filtered)
Motor posit.	ROFL	-	-	°	Motor position
Motor Load	ROF16	-	-	%	% Load on the motor
Iarm fbk ABS	ROF16	-	-	%	Armature current % (Absolute value)
Motor Volt	ROF16	-	-	%	Armature voltage in % on Motor Varm nom (filtered and rectified)
Ifld feedback	ROF16	-	-	%	Feedback I field loop (**only version with power supply to the internal field**)
MOT Temp	ROUI8	-	-	°C	Current motor temperature

5.5 Advanced setup

Group menu containing advanced configuration parameters which allow to change the auxiliary functions, programming a custom application, modify time constants of control loops.

It is advisable to use this menu only if you have a thorough understanding of the meanings of the various parameters contained: by changing the parameters in an inappropriate way there is a risk of worsening the motor speed setting or making it unusable.

5.5.1 Aux function

Group all the functions that can be configured by the user and customized to create your application.

5.5.1.1 Analog adder (AAD)

Advanced setup → Aux function → Analog adder (AAD)

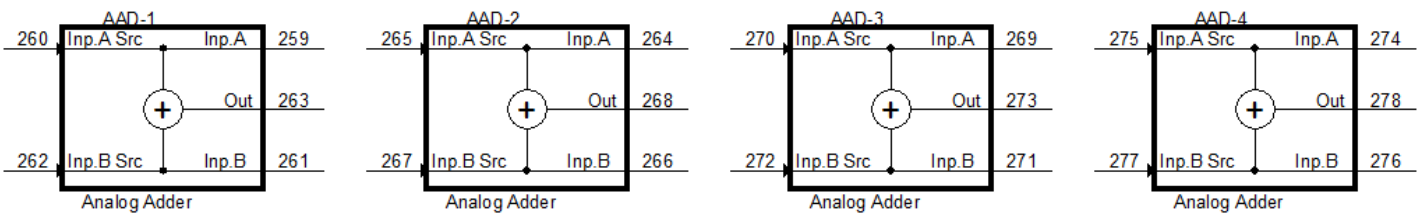


Figure 18: Functional blocks AAD

The function blocks "Analog adder" (AAD) can be used for summing the analog signals and use the result as the source in another functional block. Each of them has two analog inputs whose source can be selected (any type F16 signal), which will be added together.

By using these analog adders combined with the other auxiliary functions, it is possible to create customized applications.

Name	Type	Range	Default	Unit	Description
AAD1 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of AAD1
AAD1 Inp.A	ROF16	-	-	%	Current value of Source Input A of AAD1
AAD1 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of AAD1
AAD1 Inp.B	ROF16	-	-	%	Current value of Source Input B of AAD1

Name	Type	Range	Default	Unit	Description
AAD1 Output	ROF16	-	-	%	Signal output from the AAD1 function block
AAD2 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of AAD2
AAD2 Inp.A	ROF16	-	-	%	Current value of Source Input A of AAD2
AAD2 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of AAD2
AAD2 Inp.B	ROF16	-	-	%	Current value of Source Input B of AAD2
AAD2 Output	ROF16	-	-	%	Signal output from the AAD2 function block
AAD3 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of AAD3
AAD3 Inp.A	ROF16	-	-	%	Current value of Source Input A of AAD3
AAD3 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of AAD3
AAD3 Inp.B	ROF16	-	-	%	Current value of Source Input B of AAD3
AAD3 Output	ROF16	-	-	%	Signal output from the AAD3 function block
AAD4 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of AAD4
AAD4 Inp.A	ROF16	-	-	%	Current value of Source Input A of AAD4
AAD4 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of AAD4
AAD4 Inp.B	ROF16	-	-	%	Current value of Source Input B of AAD4
AAD4 Output	ROF16	-	-	%	Signal output from the AAD4 function block

5.5.1.2 Analog Limiter (ALM)

Advanced setup → Aux function → Analog Limiter (ALM)

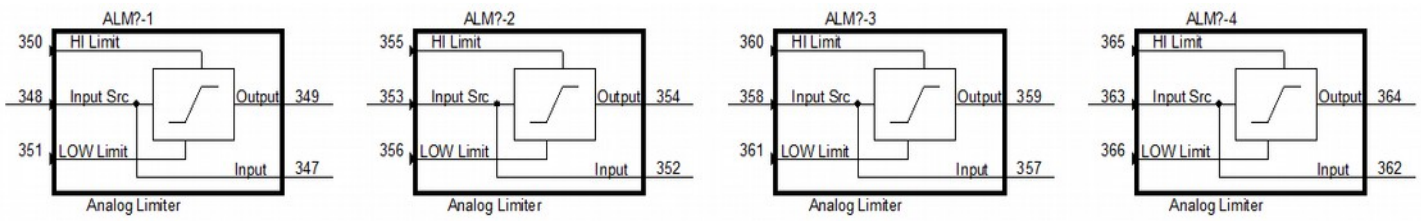


Figure 19: Functional blocks ALM

The "Analog Limiter" function blocks (ALM) can be used to limit the value of an analog signal between two settable values and use the result as a source in another functional block. Each of them has an analog input whose source can be selected (any type F16 signal), which will be limited and sent out.

Using these analogue limiters combined with the other auxiliary functions, it is possible to create customized applications.

Name	Type	Range	Default	Unit	Description
ALM1 Input Src	SRCSEL	TotPin	FALSE	-	Source selection Input of ALM1
ALM1 Input	ROF16	-	-	%	Current source value Input of ALM1
ALM1 HI Limit	RWF16	±100,00	+100,00	%	Upper limit of the ALM1 function block
ALM1 LOW Limit	RWF16	±100,00	-100,00	%	Lower limit of the ALM1 function block
ALM1 Output	ROF16	-	-	%	Signal output from the ALM1 function block
ALM2 Input Src	SRCSEL	TotPin	FALSE	-	Source selection Input of ALM2
ALM2 Input	ROF16	-	-	%	Current source value Input of ALM2
ALM2 HI Limit	RWF16	±100,00	+100,00	%	Upper limit of the ALM2 function block
ALM2 LOW Limit	RWF16	±100,00	-100,00	%	Lower limit of the ALM2 function block
ALM2 Output	ROF16	-	-	%	Signal output from the ALM2 function block
ALM3 Input Src	SRCSEL	TotPin	FALSE	-	Source selection Input of ALM3
ALM3 Input	ROF16	-	-	%	Current source value Input of ALM3

Name	Type	Range	Default	Unit	Description
ALM3 HI Limit	RWF16	±100,00	+100,00	%	Upper limit of the ALM3 function block
ALM3 LOW Limit	RWF16	±100,00	-100,00	%	Lower limit of the ALM3 function block
ALM3 Output	ROF16	-	-	%	Signal output from the ALM3 function block
ALM4 Input Src	SRCSEL	TotPin	FALSE	-	Source selection Input of ALM4
ALM4 Input	ROF16	-	-	%	Current source value Input of ALM4
ALM4 HI Limit	RWF16	±100,00	+100,00	%	Upper limit of the ALM4 function block
ALM4 LOW Limit	RWF16	±100,00	-100,00	%	Lower limit of the ALM4 function block
ALM4 Output	ROF16	-	-	%	Signal output from the ALM4 function block

5.5.1.3 Analog refer. (AR)

Advanced setup → Aux function → Analog refer. (AR)

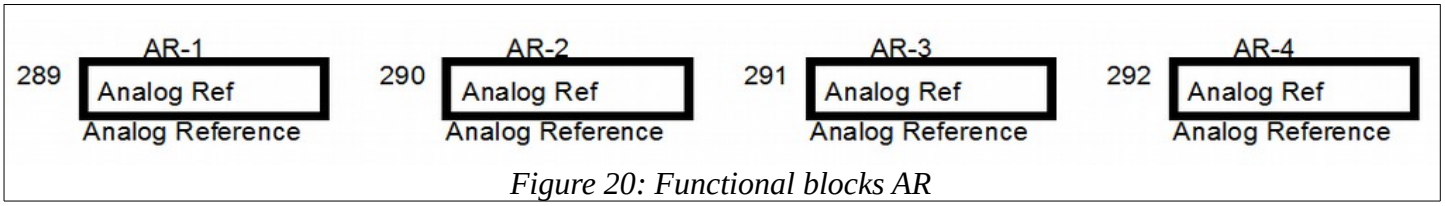


Figure 20: Functional blocks AR

Analog signal references are available (expressed in %) whose value is stored in the internal flash and in the external memory. These references can be used as a source for functions or output signals as needed. The value can be changed directly from the front panel display or on the software with the PC even real-time.

Name	Type	Range	Default	Unit	Description
Analog Ref.1	RWF16	±100,00	0	%	Analog reference 1
Analog Ref.2	RWF16	±100,00	0	%	Analog reference 2
Analog Ref.3	RWF16	±100,00	0	%	Analog reference 3
Analog Ref.4	RWF16	±100,00	0	%	Analog reference 4

5.5.1.4 Analog switch (ASW)

Advanced setup → Aux function → Analog switch (ASW)

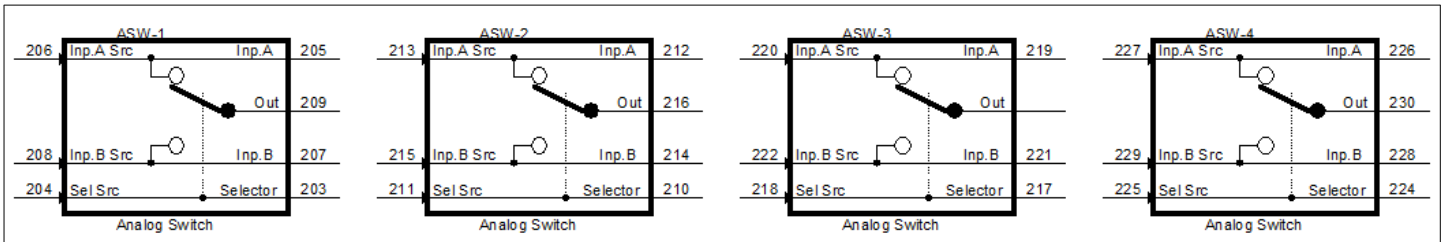


Figure 21: Functional blocks ASW

"Analog switch" (ASW) function blocks can be used to switch analog signals following the logic of a digital signal (they behave like a relay contact). Each of them has two analog inputs whose source can be selected (any type F16 signal), a digital input whose source can be selected (any type of BOOL signal) that controls the output switching.

When the logic state of the "Selector" source is on the logic level "0", the source signal of "Inp.A" is sent to the "Out" output; on the other hand, when the logic state of the "Selector" source is on the logic level "1", the source signal of "Inp.B" is sent to the "Out" output.

Using these analog selectors combined with the other auxiliary functions, it is possible to create customized applications.

Name	Type	Range	Default	Unit	Description
ASW1 Select Src	SRCSEL	TotPin	DI5 Val	-	Source selection ASW1 selector
ASW1 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the ASW1 Selector source
ASW1 Inp.A Src	SRCSEL	TotPin	AI1 Val	-	Source selection Input A of ASW1
ASW1 Inp.A	ROF16	-	-	%	Current value of input source A of ASW1

Name	Type	Range	Default	Unit	Description
ASW1 Inp.B Src	SRCSEL	TotPin	Analog Ref.1	-	Source selection Input B of ASW1
ASW1 Inp.B	ROF16	-	-	%	Current value of input source B of ASW1
ASW1 Output	ROF16	-	-	%	Signal output from the ASW1 function block
ASW2 Select Src	SRCSEL	TotPin	JOG Enable	-	Source selection ASW2 selector
ASW2 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the ASW2 Selector source
ASW2 Inp.A Src	SRCSEL	TotPin	ASW1 Output	-	Source selection Input A of ASW2
ASW2 Inp.A	ROF16	-	-	%	Current value of input source A of ASW2
ASW2 Inp.B Src	SRCSEL	TotPin	JOG Output	-	Source selection Input B of ASW2
ASW2 Inp.B	ROF16	-	-	%	Current value of input source B of ASW2
ASW2 Output	ROF16	-	-	%	Signal output from the ASW2 function block
ASW3 Select Src	SRCSEL	TotPin	FALSE	-	Source selection ASW3 selector
ASW3 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the ASW3 Selector source
ASW3 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of ASW3
ASW3 Inp.A	ROF16	-	-	%	Current value of input source A of ASW3
ASW3 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of ASW3
ASW3 Inp.B	ROF16	-	-	%	Current value of input source B of ASW3
ASW3 Output	ROF16	-	-	%	Signal output from the ASW3 function block
ASW4 Select Src	SRCSEL	TotPin	FALSE	-	Source selection ASW4 selector
ASW4 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the ASW4 Selector source
ASW4 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of ASW4
ASW4 Inp.A	ROF16	-	-	%	Current value of input source A of ASW4
ASW4 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of ASW4
ASW4 Inp.B	ROF16	-	-	%	Current value of input source B of ASW4
ASW4 Output	ROF16	-	-	%	Signal output from the ASW4 function block

5.5.1.5 Anti BackLash (ABL)

Advanced setup → Aux function → Anti BackLash (ABL)

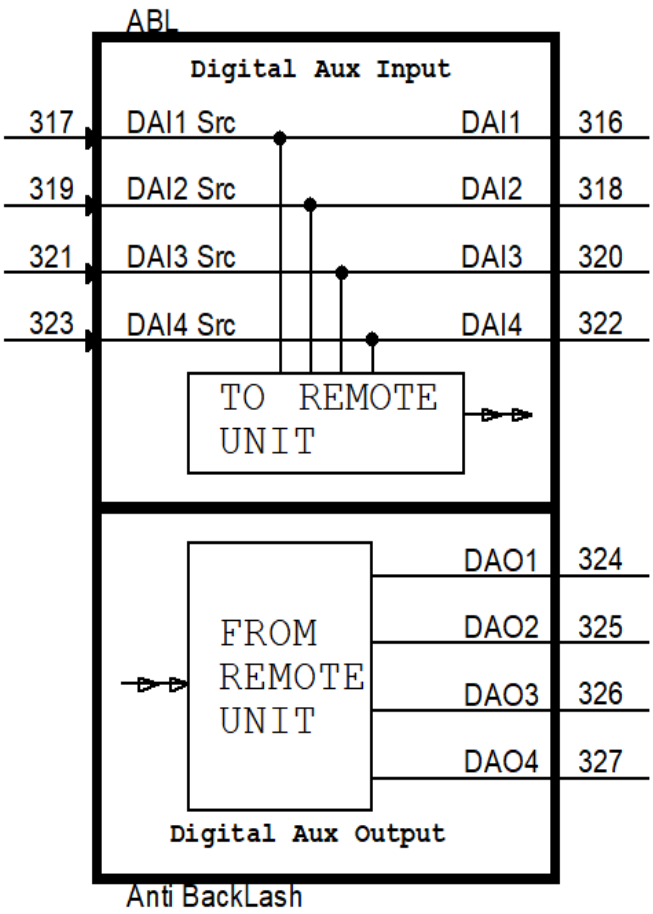


Figure 22: Auxiliary I/O on Antibacklash

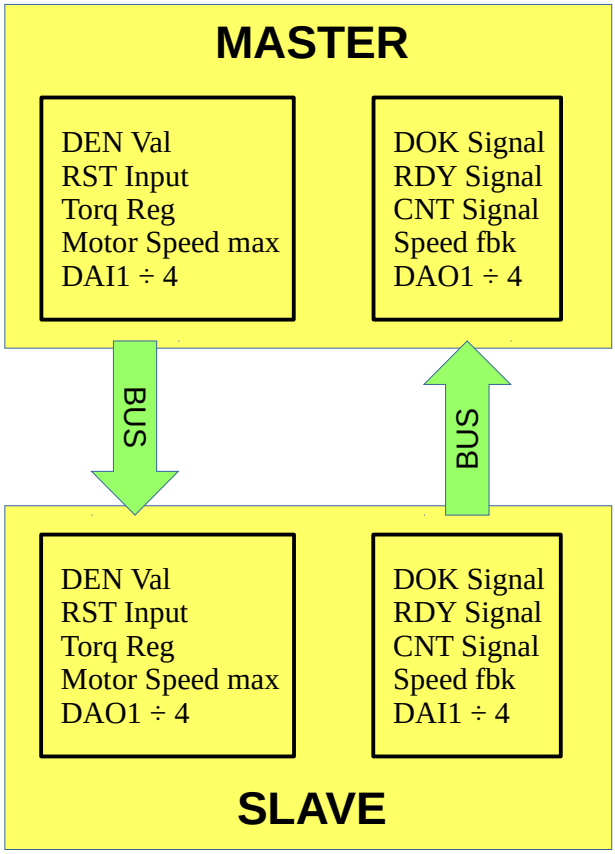


Figure 23: Data exchange between master and slave

The task of the electric anti-backlash is to eliminate the mechanical play present in the kinematic chain when they are used reducers gear and rack-pinion groups. The electric anti-backlash uses two equal units, each consisting of a converter and an electric motor. The two converters are so that the torque generated at standstill by the two motor is equal but opposite in sign. In this way the teeth of the gears are in contact and the play of the kinematic chain are canceled. When the system is in motion, the torque delivered by a motor increases while the torque of the other decreases, keeping the play of the kinematic chain always null. The anti-backlash servo uses two equal converters (same nominal current). One converter is called the *Master* and the other *Slave*. The Master converter receives all commands from the outside and controls the system while the Slave converter is driven by the Master.

Parameter table for Anti BackLash function setting:

Name	Type	Range	Default	Unit	Description
ABL mode	RWEN	Disabled / Master / Slave	Disabled	-	ABL function selection for the drive
ABL torque	RWF16	±50,00	0	%	A contrast torque between the two motors
ABL slave dir.	RWBL	No Inverted / Inverted	No Inverted	-	Reversing rotation direction of the motor slave
ABL Net Errors	RWBL	Disabled / Enabled	Enabled	-	Enables the drive to be blocked in the event of occasional communication errors on the bus due to disturbances.
ABL spd err thr	RWF16	1 - 100	10	%	Maximum speed error threshold between master and slave
ABL spd err act	ROF16	-	-	%	Current speed error between master and slave
ABL DAI 1 Src	SRCSEL	TotPin	FALSE	-	Source selection for the Digital Aux Input 1

Name	Type	Range	Default	Unit	Description
ABL DAI 1	ROBL	False / True	-	-	Logical status of Digital Aux Input 1
ABL DAI 2 Src	SRCSEL	TotPin	FALSE	-	Source selection for the Digital Aux Input 2
ABL DAI 2	ROBL	False / True	-	-	Logical status of Digital Aux Input 2
ABL DAI 3 Src	SRCSEL	TotPin	FALSE	-	Source selection for the Digital Aux Input 3
ABL DAI 3	ROBL	False / True	-	-	Logical status of Digital Aux Input 3
ABL DAI 4 Src	SRCSEL	TotPin	FALSE	-	Source selection for the Digital Aux Input 4
ABL DAI 4	ROBL	False / True	-	-	Logical status of Digital Aux Input 4
ABL DAO 1	ROBL	False / True	-	-	Logical Status of Digital Aux Output 1
ABL DAO 2	ROBL	False / True	-	-	Logical Status of Digital Aux Output 2
ABL DAO 3	ROBL	False / True	-	-	Logical Status of Digital Aux Output 3
ABL DAO 4	ROBL	False / True	-	-	Logical Status of Digital Aux Output 4

DRIVE MASTER ELECTRICAL CONNECTIONS:

- Power supplies and services as indicated in the figure 3 on page 11 or in the figure 4 on page 12.
- Analog signals, digital controls and digital outputs on the corresponding connectors X1, X5, X6.
- Shielded cable with twisted pair connected to connector X4 (see paragraph 3.2.5 a pagina 15), and at the same connector as the slave drive.

DRIVE SLAVE ELECTRICAL CONNECTIONS:

- Power supplies and services as indicated in the figure 3 on page 11 or in the figure 4 on page 12.
- The connectors X1, X5, X6 are not used.
- Shielded cable with twisted pair connected to connector X4 (see paragraph 3.2.5 a pagina 15), and at the same connector as the master drive.

CALIBRATION

1. Disconnect the two motors from the mechanics to see the direction of rotation of both.
2. Set the "ABL Mode" parameter to MASTER (to master converter) or to SLAVE (to SLAVE converter).
3. Make the settings as indicated in the paragraph 4.4 on page 18 from point 1 to point 12 both for the master and slave converters.
4. The digital commands, the speed reference and the digital outputs will be used those of the master converter, so you can use a single contactor on the three-phase line that powers the two converters.
5. The calibrations shown in the paragraph 4.4 on page 18 from point 13 to point 20 they must be done on the master converter.
6. The the slave motor rotation direction must be in the same direction as the master. If the direction is opposite, the parameter "ABL direct slave" must be changed.
7. After checking that the motors run in the same direction, you can disable the running of the drives (LED RUN off), memorize the parameters and switch off the electrical cabinet to restore the mechanical connection of the motors to the machine.
8. Reset the operating conditions of the drives and enable motor control (LED RUN on).
9. Set the "ABL torque" parameter to 10% as the initial test.
10. Check the mechanical play between the two motors by moving the axis in both directions. If greater compensation is required, the "ABL torque" parameter can be increased again.
11. At the end it is always necessary to save the parameters, before turning off the power supply to the auxiliary services.

AUXILIARY SIGNALS

They were provided for 4 digital auxiliary signals exchanged between master and slave. The use of these is optional, so the anti-play function also works without them.

These signals can be used at the discretion of the customer to send commands between the two converters; to use them you have to set the source of each of them, this signal will be transferred to the other converter via the fieldbus (see figure 22 and figure 23 on page 35) and set to its output.

Example: by connecting the "ABL DAI 1" source to an internal digital signal in the slave converter, in the master converter we will see that the "ABL DO1" signal changes the logic status following the source selected in the slave converter.

SPEED ERROR CONTROL

The master drive calculates the speed error with respect to the slave and indicates this value on the "ABL spd err act" parameter; it is compared with the parameter "ABL spd err thr", when the error exceeds the set threshold the drive goes into alarm. The purposes of this control are as follows:

1. Protect one of the two motors due to a mechanical failure from overspeed.
2. Report the fault or any faults on the connection cable to the speed transducer.

5.5.1.6 Brake curr lim (BCL)

Advanced setup → Aux function → Brake curr lim (BCL)

The "Brake Current Limit" (BCL) function allows setting an armature current limit that will be used when the motor operates as a "brake": this condition occurs during slowdowns and whenever the torque sign is different from the speed sign.

In the "BCL IntLim" parameter you set the internal current limit that will be stored in the internal FLASH and in the external memory MEM.

You can select an analog source as an external limit with the "BCL Ext Lim Src" parameter: for example an analog input (AIx) or the output of another function block or an analogue selector (ASW).

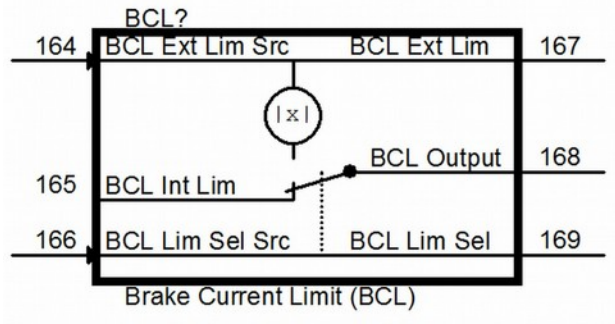


Figure 24: Functional block BCL

Finally, it is possible to select a digital source with the "BCL Lim Sel Src" parameter to switch the current limit BCL Output from the internal value (BCL Int Lim) to the external value (BCL Ext Lim), in fixed mode or associated to a digital input (DIx).

Name	Type	Range	Default	Unit	Description
BCL Ext Lim Src	SRCSEL	TotPin	AI2 Val	-	Source selection External reference BCL limit
BCL Lim Sel Src	SRCSEL	TotPin	DI6 Val	-	Source selection of BCL limit selection
BCL Int Lim	RWF16	0,00 – 100,00	100,00	%	Internal reference current limit BCL
BCL Ext Lim	ROF16	-	-	%	Current value of the source external reference BCL limit
BCL Lim Sel	ROBL	Internal / External	-	-	Current value of the source selection BCL limit selection
BCL Output	ROF16	-	-	%	Output from BCL block

***NOTE:** The output from the BCL block is internally connected to the current armature limit, so it is already active and working: it is sufficient to modify the parameters or the sources to change the current limit as a brake.*

5.5.1.7 Digital switch (DSW)

Advanced setup → Aux function → Digital switch (DSW)

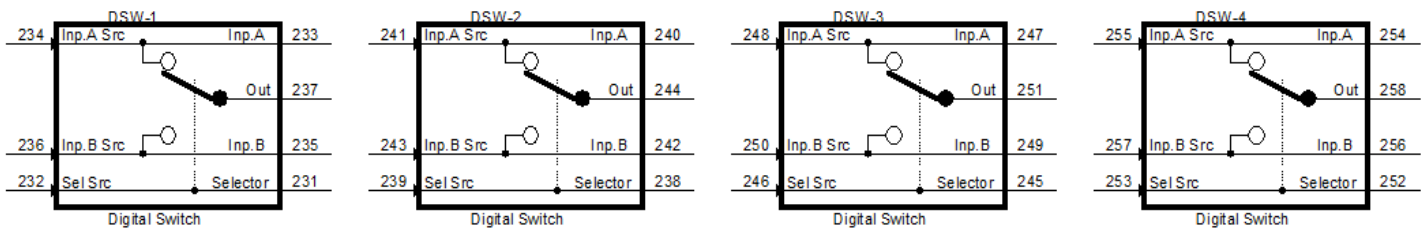


Figure 25: Functional blocks DSW

The "Digital switch" function blocks (DSW) can be used to switch digital signals following the logic state of a digital signal (they behave like a relay contact). Each of them has two digital inputs for which the source can be selected (any type of BOOL signal), a digital input whose source can be selected (any type of BOOL signal) that controls the output switching.

When the logic state of the "Selector" source is on the logic level "0", the source signal of "Inp.A" is sent to the "Out" output; on the other hand, when the logic state of the "Selector" source is on the logic level "1", the source signal of "Inp.B" is sent to the "Out" output.

By using these digital selectors combined with the other auxiliary functions, it is possible to create customized applications.

Name	Type	Range	Default	Unit	Description
DSW1 Select Src	SRCSEL	TotPin	JOG Enable	-	Source selection DSW1 selector
DSW1 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the DSW1 Selector source
DSW1 Inp.A Src	SRCSEL	TotPin	DI1 Val	-	Source selection Input A of DSW1
DSW1 Inp.A	ROBL	-	-	-	Current value of input source A of DSW1
DSW1 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of DSW1
DSW1 Inp.B	ROBL	-	-	-	Current value of input source B of DSW1
DSW1 Output	ROBL	-	-	-	Signal output from the DSW1 function block
DSW2 Select Src	SRCSEL	TotPin	FALSE	-	Source selection DSW2 selector
DSW2 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the DSW2 Selector source
DSW2 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of DSW2
DSW2 Inp.A	ROBL	-	-	-	Current value of input source A of DSW2
DSW2 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of DSW2
DSW2 Inp.B	ROBL	-	-	-	Current value of input source B of DSW2
DSW2 Output	ROBL	-	-	-	Signal output from the DSW2 function block
DSW3 Select Src	SRCSEL	TotPin	FALSE	-	Source selection DSW3 selector
DSW3 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the DSW3 Selector source
DSW3 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of DSW3
DSW3 Inp.A	ROBL	-	-	-	Current value of input source A of DSW3
DSW3 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of DSW3
DSW3 Inp.B	ROBL	-	-	-	Current value of input source B of DSW3
DSW3 Output	ROBL	-	-	-	Signal output from the DSW3 function block
DSW4 Select Src	SRCSEL	TotPin	FALSE	-	Source selection DSW4 selector
DSW4 Selector	ROBL	Inp.A / Inp.B	-	-	Current value of the DSW4 Selector source
DSW4 Inp.A Src	SRCSEL	TotPin	FALSE	-	Source selection Input A of DSW4
DSW4 Inp.A	ROBL	-	-	-	Current value of input source A of DSW4
DSW4 Inp.B Src	SRCSEL	TotPin	FALSE	-	Source selection Input B of DSW4
DSW4 Inp.B	ROBL	-	-	-	Current value of input source B of DSW4
DSW4 Output	ROBL	-	-	-	Signal output from the DSW4 function block

5.5.1.8 Drive Overload (DOL)

Advanced setup → Aux function → Drive Overload (DOL)

The "Drive Overload" function (DOL) signals the drive overload. The armature current exceeds the rated current and lasts over time. The greater the overload, the shorter the duration is. For example, a constant 33% overload can last 60 sec.

The amount of overload can be displayed with the "DOL level" parameter: when the value exceeds 90%, the pre-alarm signal occurs at the "DOL PreAlarm" output; when it reaches 100%, the inverter locks and signals the alarm condition " Drive OverLoad ".

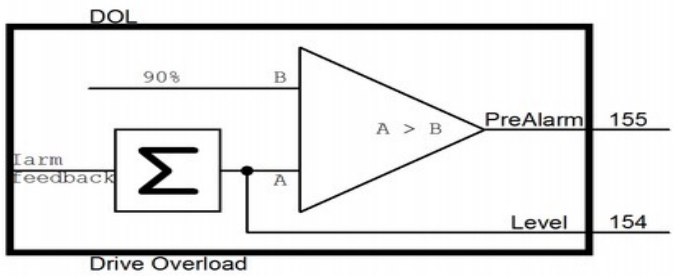


Figure 26: Functional block DOL

The output signal can be used as a source for a digital output or switch other functions at the discretion of the user.

Name	Type	Range	Default	Unit	Description
DOL level	ROF16	-	-	%	Converter overload level
DOL PreAlarm	ROBL	False / True	-	-	Alarm PRE condition with Drive Overload

5.5.1.9 Drive stop/run (DSR)

Advanced setup → Aux function → Drive stop/run (DSR)

This function is used to change the operation of the digital input "DEN" (see paragraph 3.2.6 on page 15) so that when it goes to logic level "0" the converter can disable (standard mode) or brake the motor (with or without ramp) until it stops and then it is disabled.

If the "DSR Enable" parameter is set to DISABLED, the "DEN" input is used to enable or disable the converter, so it will stop by inertia if it is not handled appropriately by the user. This is the standard mode.

On the other hand, if the "DSR Enable" parameter is set to ENABLED, the "DEN" input is used to start or stop the motor; in this case the motor will be slowed down until it stops, ie when ZES = TRUE (see paragraph 5.5.1.18 on page 44), subsequently the converter is disabled and the motor is no longer powered (so it is free to move).

If the speed ramp is active (REN = ON) the motor slows down following the time set in the "Ramp Time" parameter (see paragraph 5.5.2 on page 44).

If the speed ramp is NOT active (REN = OFF) the motor slows down with the maximum available torque (emergency stop). For safety it is possible to set a maximum time to stop the motor, after which the drive is disabled even if the motor is not stopped ("DSR Max Stop" parameter).

To restart the engine, simply reset the "DEN" command at the desired time (if RDY LED is on): the engine will accelerate to the reference speed.

Name	Type	Range	Default	Unit	Description
DSR Enable	RWBL	Disabled / Enabled	Disabled	-	Enabling Drive Stop/Run function
DSR Max Stop	RWUI8	1 - 60	4	s	Maximum time for the stop, once the ramp has been completed.

5.5.1.10 Jog reference (JOG)

Advanced setup → Aux function → Jog reference (JOG)

The JOG function is used to move the motor at a fixed or variable speed depending on a certain waveform: you can select 3 different types of Jog to adapt it to your needs. The Jog function is enabled by changing the logic state of the source associated with the "Enable" parameter: it can be a digital input or a digital signal coming from a functional block. When the function is enabled, the output signal from the function block immediately changes in value starting to follow what has been set as the "Mode" of JOG operation: this means that if the output of the function block is used as a speed reference of the engine, it will abruptly change its rotation speed.

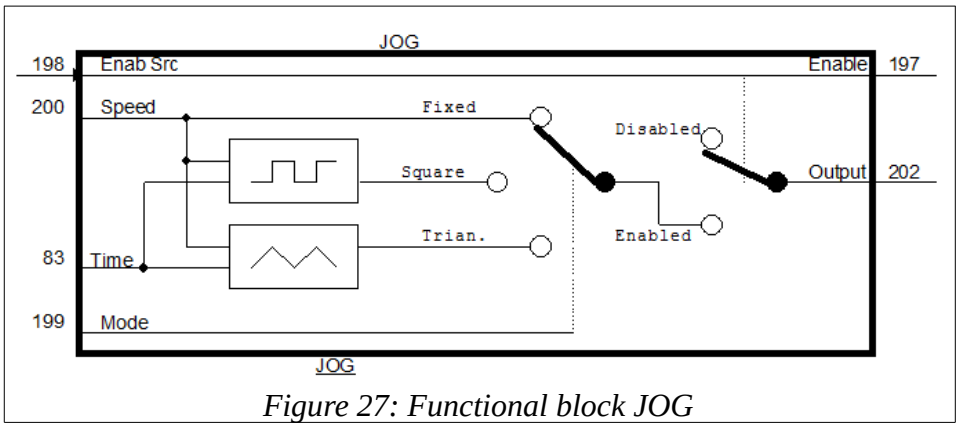


Figure 27: Functional block JOG

The JOG reference generation mode can be chosen by setting the "Mode" parameter among the following:

- FIXED REFER: When the Jog function is enabled, the "Output" signal becomes a FIXED reference. When the Jog function is disabled, the "Output" signal goes to ZERO.
- SQUARE WAVE: When the Jog function is enabled, the function generates a "Square Wave" with a period and with an adjustable amplitude, so the motor rotates at the set speed for a certain time and then reverses the direction and turns in reverse and continues in this way until the JOG command is removed.
- TRIAN. WAVE: When the Jog function is enabled, the function generates a "Triangular Wave" with a period and with an adjustable amplitude, so the motor gradually accelerates up to the set speed with the set time and then gradually slows down to reverse the direction and reach the set speed (inverted sign). Then it slows down again and continues in this way until the JOG command is removed.

Name	Type	Range	Default	Unit	Description
JOG Enab Src	SRCSEL	TotPin	DI4 Val	-	Source Selection JOG enabling
JOG Enable	ROBL	Disabled / Enabled	-	-	Current value of the JOG enable source
JOG Mode	RWEN	Fixed refer / Square wave / Trian. wave	Fixed refer	-	JOG mode
JOG Speed	RWF16	±100,00	5,00	%	JOG speed
JOG time	RWFL	0,1 – 25,0	1,0	Sec	JOG ramp time
JOG Output	ROF16	-	-	%	Output from JOG block (JOG speed reference)

5.5.1.11 Motor curr lim (MCL)

Advanced setup → Aux function → Motor curr lim (MCL)

The "Motor Current Limit" (MCL) function allows setting an armature current limit that will be used when the motor is operating as a "motor": this condition occurs during accelerations and whenever the torque sign is equal to speed sign. In the "MCL IntLim" parameter you set the internal current limit that will be stored in the internal FLASH and in the external MEM memory. You can select an analog source as an external limit with the "MCL Ext Lim Src" parameter: for example, an analog input (AIx) or the output of another function block or an analogue selector (ASW). Finally, it is possible to select a digital source with the "MCL Lim Sel Src" parameter to switch the current limit MCL Output from the internal value (MCL Int Lim) to the external value (MCL Ext Lim), in fixed mode or associated to a digital input (DIx).

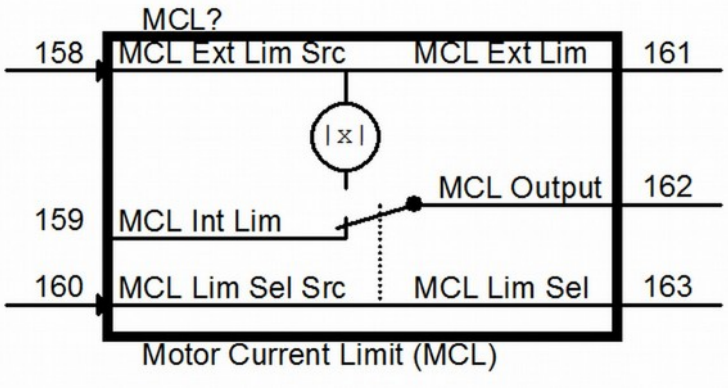


Figure 28: Functional block MCL

Name	Type	Range	Default	Unit	Description
MCL Ext Lim Src	SRCSEL	TotPin	AI2 Val	-	Source selection MCL External reference limit
MCL Lim Sel Src	SRCSEL	TotPin	DI6 Val	-	Source selection MCL selection limit
MCL Int Lim	RWF16	0,00 – 100,00	100,00	%	MCL Internal reference current limit
MCL Ext Lim	ROF16	-	-	%	Current source value of the MCL external reference limit
MCL Lim Sel	ROBL	Internal / External	-	-	Current value of the MCL limit selection source
MCL Output	ROF16	-	-	%	Output from MCL block

NOTE: *The output from the MCL block is internally connected to the current armature limit, so it is already active and working: it is sufficient to modify the parameters or the sources to change the current limit as motor.*

5.5.1.12 Motor Overload (MOL)

Advanced setup → 5.5.1 → Motor Overload (MOL)

The "Motor Overload" function (MOL) is used to protect the motor against excessive current overload. This function is only active when the "*Motor Iarm max*" parameter is greater than "*Motor Iarm nom*" (see paragraph 5.1.1 on page 22). When the current in the motor exceeds the nominal one an integrator starts to increase its value with greater speed if the current reaches the maximum one. This integrator also depends on the set overload time tolerated by the motor (*MOL Time)*. When the value of the integrator exceeds 90%, the "*Warning*" output is switched, while when it reaches 100%, the "*Alarm*" output is switched. The various digital signals output from the block can be used as

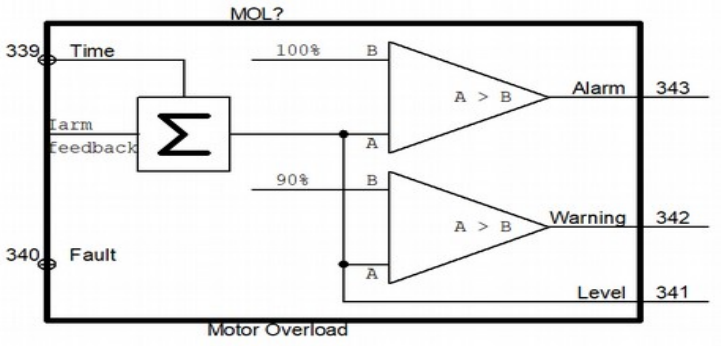


Figure 29: Functional block MOL

sources to the digital outputs or to switch signals or current limits. In this way the user can decide which measure to adopt in the event of an overload of the motor.

With the "*Fault*" parameter it is possible to enable the automatic blocking of the drive when the overload reaches 100%.

Name	Type	Range	Default	Unit	Description
MOL Time	RWUI16	0 - 1800	300	Sec	Setting overload time at IaMax
MOL Fault	RWBL	Disabled / Enabled	Disabled	-	Enable FAULT drive
MOL Warning	ROBL	False / True	-	-	Indication of motor overload condition 90%
MOL Alarm	ROBL	False / True	-	-	Indication of motor overload condition 100%
MOL level	ROF16	-	-	%	Motor overload level

5.5.1.13 Motor Over-temp (MOT)

Advanced setup → Aux function → Motor Over-temp (MOT)

The "Motor Over-temperature" (MOT) function is used to set the type of temperature sensor mounted in the motor (see Figure 3 on page 11 or Figure 4 on page 12), the threshold beyond which the drive must go into alarm condition, the automatic blocking delay of the drive after the temperature threshold has been exceeded. The various digital signals output from the block can be used as sources to the digital outputs or to switch signals or current limits. In this way the user can decide which measure to adopt in case of overtemperature of the motor. The automatic blocking of the drive always remains valid when the motor temperature remains high even after the set delay has elapsed.

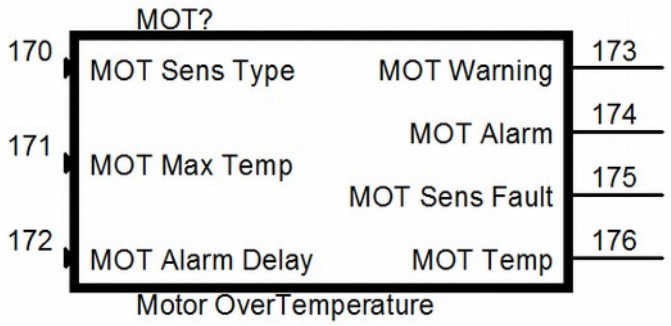


Figure 30: Functional block MOT

Name	Type	Range	Default	Unit	Description
MOT Sens Type	RWEN	Not Used / PTC / NTC 10KΩ / KTY 84	Not Used	-	Selection of temperature sensor type mounted in the motor. "Not Used" deactivates temperature control.
MOT Max Temp	RWUI8	40 - 150	120	°C	Motor temperature alarm threshold (only if MOT Sens Type ≠ PTC)
MOT Alarm Delay	RWUI8	0 - 120	10	Min	Alarm delay due to motor over-temperature
MOT Warning	ROBL	False / True	-	-	Indication of motor in over-temperature condition
MOT Alarm	ROBL	False / True	-	-	MOT alarm indication (after Alarm Delay delay)
MOT Sens Fault	ROBL	False / True	-	-	Temperature sensor fault indication. (only if MOT Sens Type ≠ PTC)
MOT Temp	ROUI8	-	-	°C	Current engine temperature (only if MOT Sens Type ≠ PTC)

5.5.1.14 Peak motor load (PML)

Advanced setup → Aux function → Peak motor load (PML)

The "Peak motor load" (PML) function is a comparator between the absolute value of the load on the motor and a fixed settable threshold stored in the drive. The adjustable threshold allows you to anticipate the signal to make the necessary decisions before the engine reaches its maximum load. The output of the function block switches from 0 to 1 when the load on the motor is HIGHER than the set threshold, so it indicates when the motor is reaching the maximum load. The output signal can be used as a source for a digital output or switch other functions at the discretion of the user.

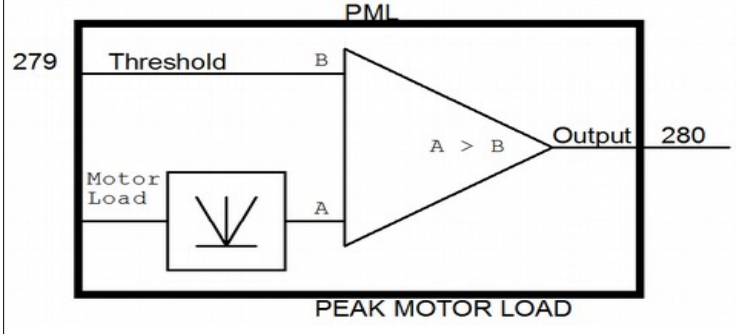


Figure 31: Functional block PML

The switching of the output from 0 to 1 is delayed by 500 ms after the comparison threshold is exceeded.

Name	Type	Range	Default	Unit	Description
PML Threshold	RWF16	10 - 99	90	%	Load threshold for switching PML output
PML Output	ROBL	False / True	-	-	Function block output, load limit signal

5.5.1.15 Speed Over Thres (SOT)

Advanced setup → Aux function → Speed Over Thres (SOT)

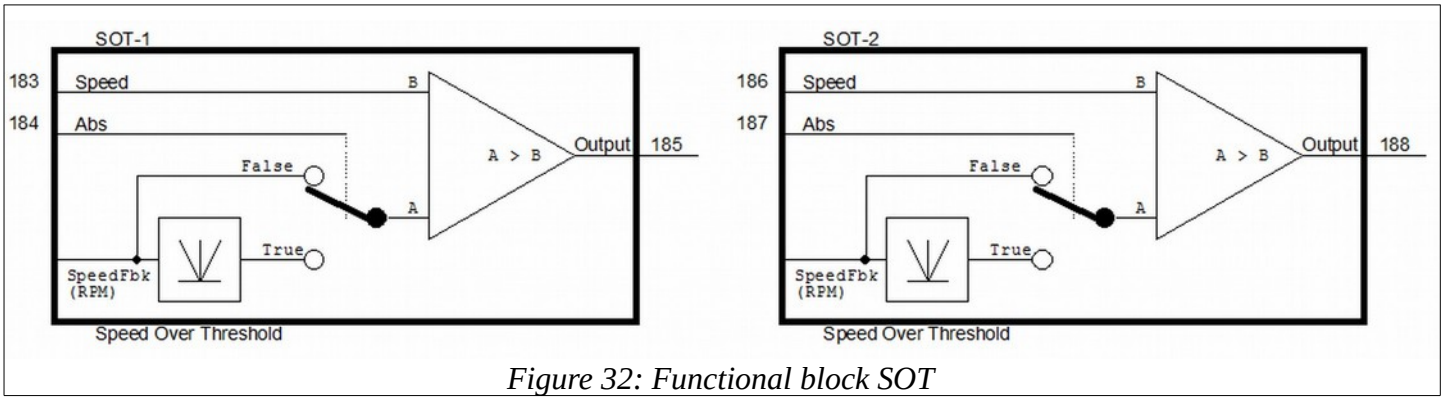


Figure 32: Functional block SOT

The "Speed Over Threshold" (SOT) function is a comparator between the current speed of the motor (which can be analyzed even without the sign) and a fixed settable threshold stored in the drive. In the drive there are 2 thresholds that can be used with different parameters.

When the motor speed exceeds the set threshold, the comparator output is switched; it can be used as a source for a digital output or to switch other functions at the discretion of the user.

By using the speed of the motor with the sign, it is possible to discriminate the direction of rotation of the motor for an eventual external signal.

The switching of the output from 0 to 1 is delayed by 500 ms after the comparison threshold is exceeded.

Name	Type	Range	Default	Unit	Description
Speed fbk (RPM)	ROI16	-	-	RPM	Current speed in RPM (filtered)
SOT1 Abs	RWBL	False / True	True	-	SOT1 command for activation of absolute value
SOT1 Speed	RWI16	±9900	50	RPM	SOT1 Speed threshold
SOT1 Output	ROBL	False / True	-	-	SOT1 Functional block output
SOT2 Abs	RWBL	False / True	True	-	SOT2 command activation of absolute value
SOT2 Speed	RWI26	±9900	100	RPM	SOT2 Speed threshold
SOT2 Output	ROBL	False / True	-	-	SOT2 Functional block output

5.5.1.16 Steady speed (STS)

Advanced setup → Aux function → Steady speed (STS)

The "Steady Speed" (STS) function is a comparator between the absolute value of the speed error (calculated as the difference between the ramp block input and the actual motor speed) and a fixed settable threshold stored in the drive.

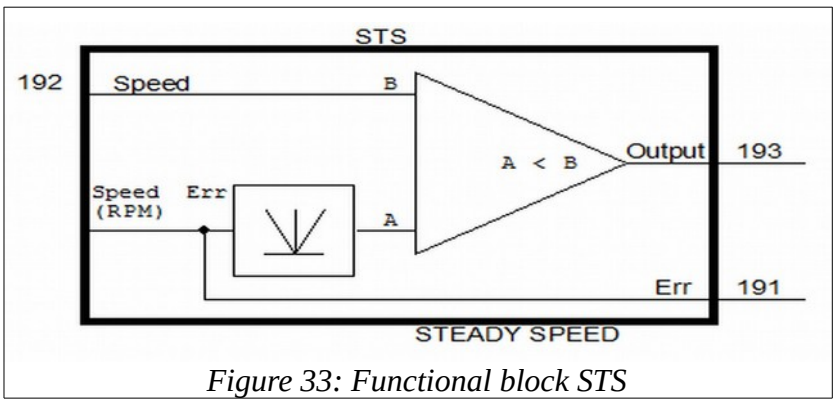


Figure 33: Functional block STS

The adjustable threshold allows to output a stable and safe signal, tolerating a small difference between the actual speed and its setpoint.

The output of the function block changes from 0 to 1 when the speed error is LOWER than the set threshold, so it indicates when the motor has reached the required speed. The output signal can be used as a source for a digital output or switch other functions at the discretion of the user.

The switching of the output from 0 to 1 is delayed by 500 ms after the comparison threshold is exceeded.

Name	Type	Range	Default	Unit	Description
STS Err (RPM)	ROI16	-	-	RPM	Current calculated speed error
STS Speed	RWI16	1 – 40	5	RPM	Error threshold for switching STS output
STS Output	ROBL	False / True	-	-	Functional block output, speed reached

5.5.1.17 Variab. curr limit (VCL)

`Advanced setup → Aux function → Variab. curr limit (VCL)`

This function is used to create a variable armature current limit depending on the speed with the parameters defined in a table. The result will be as shown in the figure 34 here on the side.

The current remains set to 100% up to the speed defined by "VCL Speed 1".

Beyond this speed a gradual reduction of the current limit occurs until reaching the value defined in "VCL Curr Lim 2" at the speed of "VCL Speed 2".

Once this last speed is exceeded, the current limit remains stable at the value set with "VCL Curr Lim 2".

The "VCL Output" output signal will be used as an external current limit input in the MCL function blocks (see section 5.5.1.11 on page 40) and/or BCL (see section 5.5.1.6 on page 37) respectively to limit the current only during operation as a motor or only as a brake or both. **The user must change the basic configuration to use this function**.

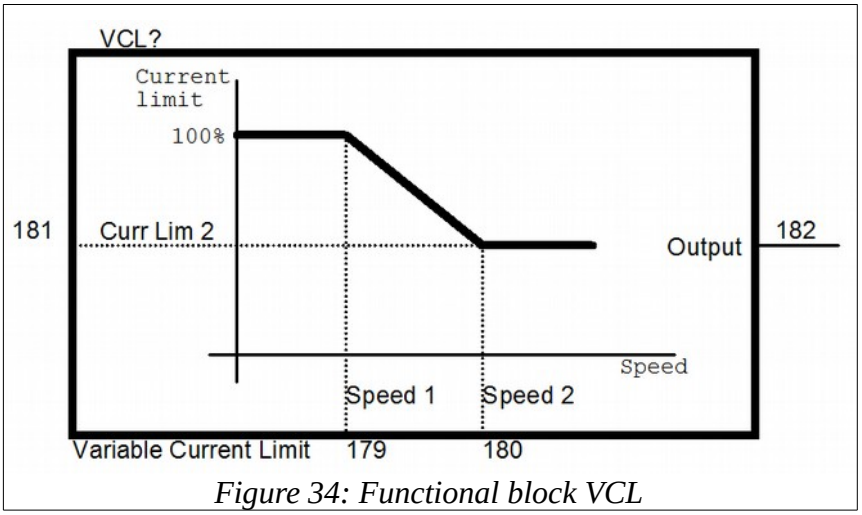


Figure 34: Functional block VCL

Name	Type	Range	Default	Unit	Description
VCL Speed 1	RWI16	10 - 9900	1000	RPM	Speed POINT 1 function VCL
VCL Speed 2	RWI16	10 - 9900	2000	RPM	Speed POINT 2 function VCL
VCL Curr Lim 2	RWF16	5 – 100	50	%	Current limit POINT 2 function VCL
Speed fbk (RPM)	ROI16	-	-	RPM	Actual speed in RPM (filtered)
VCL Output	ROF16	-	-	%	Output of VCL block (actual current limit)

CONFIGURATION EXAMPLE:

If you wish to always limit the motor current as a function of speed both when it is operating as a "motor" and when it is operating as a "brake", it is sufficient to follow these steps:

1. Reach the menu `ADVANCED SETUP → AUX FUNCTIONS → BRAKE CURR LIM`
2. Set the parameters: "*BCL Ext Lim Src*" = VCL Output (using the PC set 182), "*BCL Lim Sel Src*" = TRUE (using the PC set 1). For information on the BCL block, see the paragraph 5.5.1.6 on page 37).
3. Reach the menu `ADVANCED SETUP → AUX FUNCTIONS → MOTOR CURR LIM`
4. Set the parameters: "*MCL Ext Lim Src*" = VCL Output (using the PC set 182), "*MCL Lim Sel Src*" = TRUE (using the PC set 1). For information on the MCL block, see the paragraph 5.5.1.11 on page 40).
5. Reach the menu `ADVANCED SETUP → AUX FUNCTIONS → VARIAB. CURR LIM`
6. Set the two points "*VCL Speed 1*" and "*VCL Speed 2*" as indicated on the motor nameplate.
7. Set the high-speed motor current (exceeding the value set in *VCL Speed 2*) in the "*VCL Curr Lim 2*" parameter as a percentage of the maximum current set in the "*Motor Iarm max*" parameter (see paragraph 5.1.1 on page 22), as indicated on the motor nameplate.
8. At this point the configuration is finished. If the motor is rotated at a speed higher than the speed set in *VCL Speed 1*, the current limit will be reduced until it reaches the one set for point 2.

5.5.1.18 Zero Speed (ZES)

Advanced setup → Aux function → Zero Speed (ZES)

The "Zero Speed" (ZES) function is a comparator between the absolute value of the current motor speed and a fixed settable threshold stored in the drive.

The adjustable threshold allows to output a stable and safe signal, tolerating a small rotation of the motor due to the offsets in analog signals that may arise over time.

The output of the function block changes from 0 to 1 when the motor speed is LOWER than the set threshold, so it indicates when the motor is stopped (or almost stopped). The output signal can be used as a source for a digital output or switch other functions at the discretion of the user.

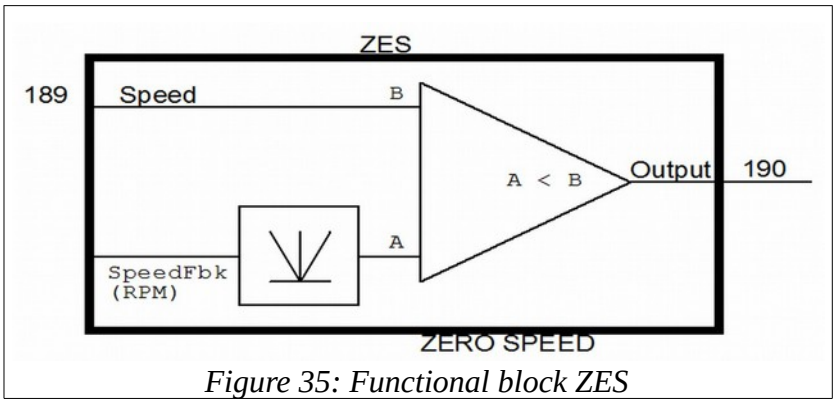


Figure 35: Functional block ZES

The switching of the output from 0 to 1 is delayed by 500 ms after the comparison threshold is exceeded.

Name	Type	Range	Default	Unit	Description
ZES Speed	RWI16	1 – 40	5	RPM	Speed threshold for switching ZES output
ZES Output	ROBL	False / True	-	-	Function block output, signal stopped motor

5.5.2 Speed Ramp

Advanced setup → Speed Ramp

It groups the parameters to customize the operation of the speed ramp integrated in the drive, which generates the speed reference to the "speed loop" regulation loop.

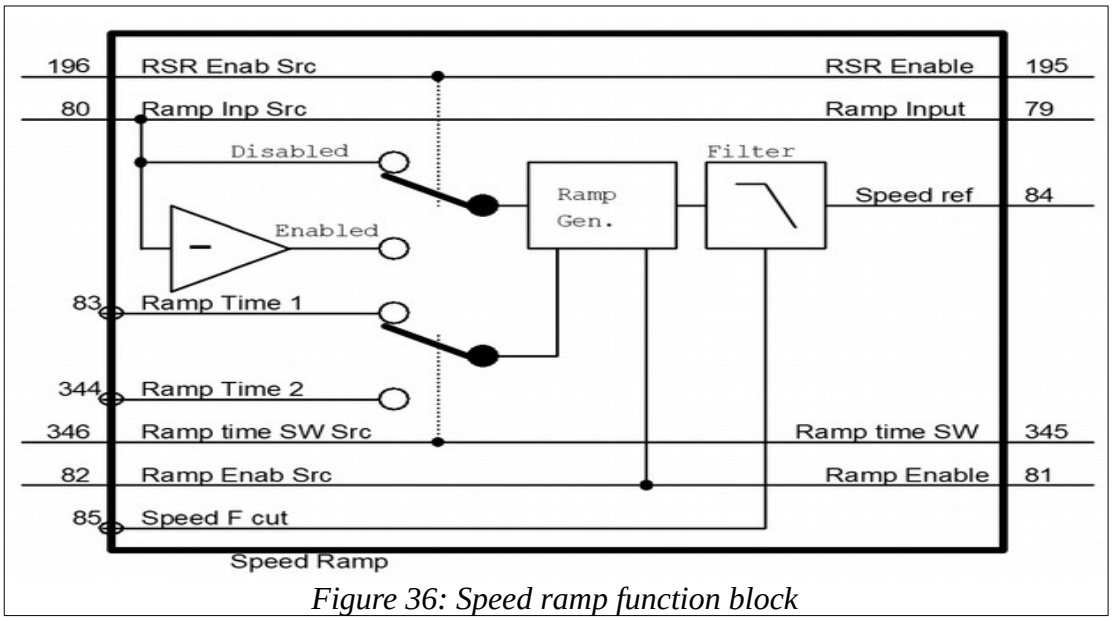


Figure 36: Speed ramp function block

Name	Type	Range	Default	Unit	Description
Ramp Inp Src	SRCSEL	TotPin	ASW2 Output	-	Ramp input source selection
Ramp Input	ROF16	-	-	%	Actual value of the ramp block input source
Ramp Enab Src	SRCSEL	TotPin	DSW1 Output	-	Ramp enable source selection
Ramp Enable	ROBL	Disabled / Enabled	-	-	Actual value of the ramp enable input source

Name	Type	Range	Default	Unit	Description
RSR Enab Src	SRCSEL	TotPin	DI3 Val	-	Source selection enable Reverse Speed Reference command
RSR Enable	ROBL	Disabled / Enabled	-	-	Actual value of the RSR enable source
Ramp time 1	RWFL	0,1 – 999,9	6,0	Sec.	Speed ramp time 1
Ramp time 2	RWFL	0,1 – 999,9	12,0	Sec.	Speed ramp time 2
Ramp time SW Src	SRCSEL	TotPin	False	-	Ramp time selection source
Ramp time SW	ROBL	Time 1 / Time 2	-	-	Ramp time selection status
Speed F cut	RWUI16	1 - 1428	300	Hz	Filter cutting frequency P.B. on Speed reference
Speed ref	ROF16	-	-	%	Speed loop speed reference

5.5.3 PI Speed loop

Advanced setup → PI Speed loop

In this menu are grouped all the parameters used to adjust the time constants of the speed loop: a "Proportional + Integrative" loop which regulates the armature current (torque) to maintain the motor speed equal to that required by the user with the speed reference signal.

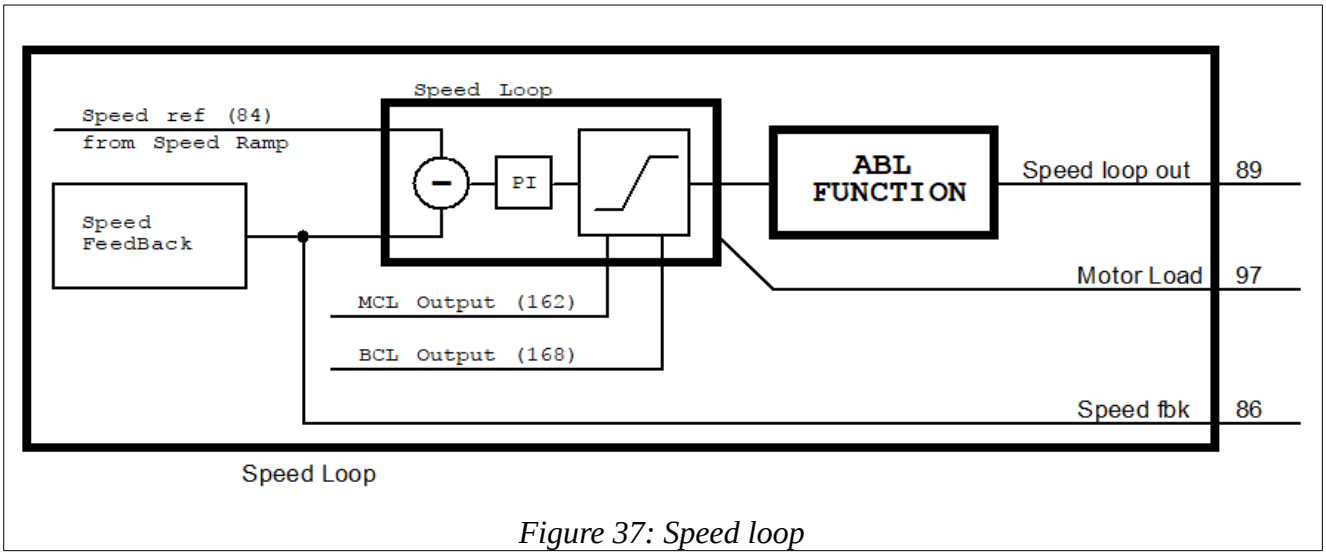


Figure 37: Speed loop

Name	Type	Range	Default	Unit	Description
Speed Lp Pgain	RWFL	0,1 – 999,9	60,0	-	Proportional gain of speed loop
Speed Lp Igain	RWFL	0,001 – 9,999	0,100	-	Speed loop Integrative Gain
Spd Lp GainScale	RWF16	10,00 – 100,00	70,00	%	Scaling gains with speed > 10%
Speed Lp SpeedUp	RWF16	0,00 – 100,00	0	%	"SpeedUp" component (advance feedback) speed loop
Speed ref	ROF16	-	-	%	Speed loop speed reference
Speed fbk	ROF16	-	-	%	Speed loop feedback signal
Speed loop out	ROF16	-	-	%	Speed loop output
Motor Load	ROF16	-	-	%	% Load on the motor

5.5.4 PI Armature loop

Advanced setup → PI Armature loop

In this menu all the parameters used to regulate the time constants of the armature current ring are grouped: a "Proportional + Integrative" loop which regulates the armature voltage to maintain the motor torque equal to that required by the speed loop.

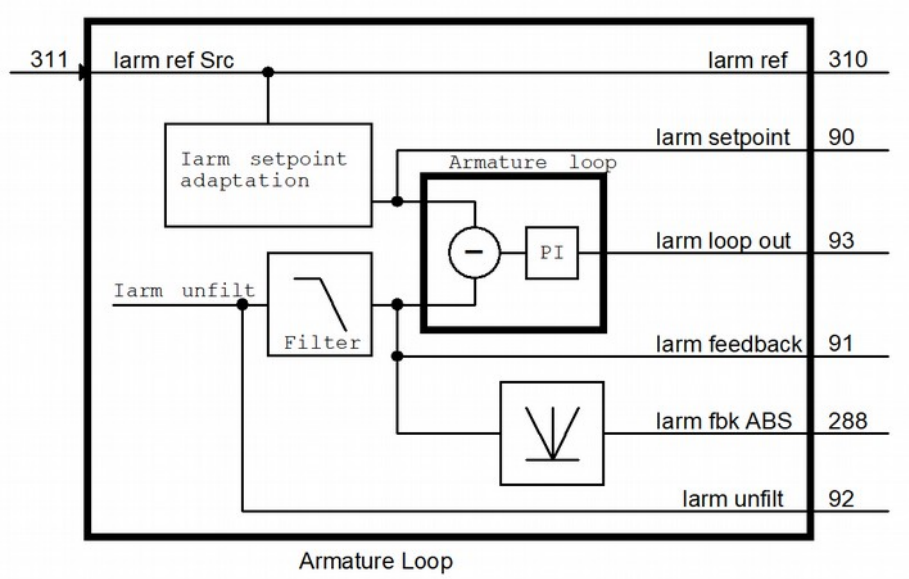


Figure 38: Armature current loop functional block

Name	Type	Range	Default	Unit	Description
Iarm ref Src	SRCSEL	TotPin	Speed loop out	-	Selection of armature current reference source
Iarm ref	ROF16	-	-	%	Actual value of the armature current reference source
Iarm Lp Pgain	RWFL	0,001 – 9,999	0,200	-	Proportional gain armature current loop
Iarm Lp Igain	RWFL	0,0001 – 0,9999	0,0030	-	Integration gain armature current loop

5.5.5 PI Deflux loop

Advanced setup → PI Deflux loop

This menu is only visible in models with control of the field inside the drive; all the parameters used to regulate the time constants of the field weakening ring are grouped together: a "Proportional + Integrative" type ring which regulates the field current to maintain the armature voltage of the motor equal to the nominal one (set from the parameter "Motor Varm nom", see paragraph 5.1.1 on page 22), when a speed greater than that set with the "Motor Base Speed" parameter is requested (see paragraph 5.1.1 on page 22).

Name	Type	Range	Default	Unit	Description
Deflux Lp Pgain	RWFL	0,01 – 99,99	1,00	-	Proportional gain of the weakening loop
Deflux Lp Igain	RWFL	0,001 – 9,999	0,020	-	Integrative gain of the weakening loop
Dflx Lp SpeedUp	RWF16	0 – 100,00	0	%	Weakening loop advance
Dflx Lp GainSc.	RWF16	1 – 100	100	%	Automatic gain scale (minimum value) weakening loop

5.5.6 PI Field loop

Advanced setup → PI Field loop

This menu is only visible in models with control of the field inside the drive; all the parameters used to regulate the time constants of the current field ring are grouped together: a "Proportional + Integrative" loop which regulates the field voltage to maintain the motor field current equal to the nominal one (set from the parameter "Motor Ifld nom", see paragraph 5.1.1 on page 22), or following the output of the weakening loop (see previous paragraph).

Name	Type	Range	Default	Unit	Description
Ifld Lp Pgain	RWFL	0,01 – 99,99	0,50	-	Proportional gain field current loop
Ifld Lp Igain	RWFL	0,001 – 99,999	0,50	-	Integrating Gain field current loop

5.5.7 Drive setup

Advanced setup → Drive setup

In this menu are grouped some general parameters to set the drive, to change the standard operation, to improve the response of the motor at zero speed, to select the sources for enabling some commands.

Name	Type	Range	Default	Unit	Description
Fbk FLT Thresh	RWF16	10 – 60	25	%	Percentage of Varm for FBK FLT activation
Bridge Rev Comp	RWF16	0 – 100	100	%	Bridge inversion compensation percentage (**12IRD only**)
Speed F cut	RWUI16	1 - 1428	300	Hz	Filter L.P. cutting frequency on Speed reference
Tacho F cut	RWUI16	1 - 1428	1400	Hz	Filter L.P. cutting frequency on tacho generator signal
Tacho offset	RWF16	±2,00	0	%	Offset adjustment tacho generator signal
Tacho signal	ROF16	-	-	%	Tacho generator signal % of the max measurable value

5.5.7.1 Command & Status

Advanced setup → Drive setup → Command & Status

This menu contains the parameters that are used to control the operation of:

- Enable field motor (Field Enable).
- External reset alarms command (RST).

Furthermore, the logical states of:

- Sources for Field Enable and RST command.
- RDY logic state: the drive is ready to power the motor.
- Drive Enable signal: a drive enable command has been sent.
- Logic status DOK: the drive has no alarms.
- CNT logic state: signal to be used to control the three-phase line contactor on L1, L2, L3.

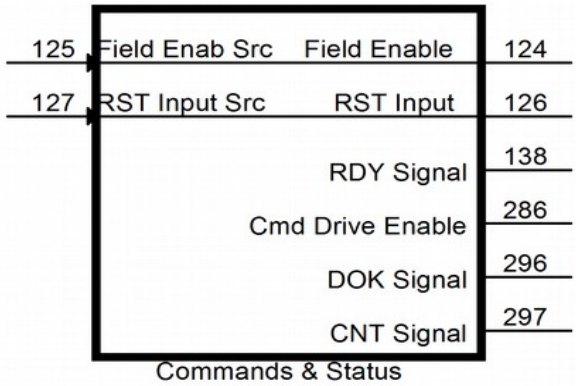


Figure 39: Block Command & Status

Name	Type	Range	Default	Unit	Description
Field Enab Src	SRCSEL	TotPin	Cmd Drive Enable	-	Source selection field enable input. The modification of this parameter is enabled only if NO voltage is present between the FL1 / FL2 terminals. (**only version with internal field power supply**)
Field Enable	ROBL	Disabled / Enabled	-	-	Actual value of the field enable input source (**only version with internal field power supply**)
RST Input Src	SRCSEL	TotPin	DI2 Val	-	Alarm reset input source selection (RST)
RST Input	ROBL	Disabled / Enabled	-	-	Actual value of the alarm reset input source (RST)
RDY signal	ROBL	False / True	-	-	Logic state signal RDY
Cmd Drive Enable	ROBL	False / True	-	-	Drive Enable command with RDY on
DOK signal	ROBL	False / True	-	-	Drive without alarms signal (DOK)
CNT signal	ROBL	False / True	-	-	Command for line contactor (CNT)

5.5.8 SRC SEL List

Advanced setup → SRC SEL List

This menu contains all the "Source selectors" available in the drive. They are used to connect functional blocks to each other, or to send certain analog or digital signals to the output. By consulting this menu you can quickly get an idea of how the blocks are connected to each other and eventually change the connections as you like. Find the explanation of each parameter in the relevant paragraph to which the associated function refers.

6 Basic configuration

The basic configuration is that which uses a part of the functional blocks to create some of the applications most used by our customers. If your needs are different, you can change these settings to create a custom application: see the paragraph Advanced configuration on page 52.

List of basic functions:

- **Enabling of the motor field bridge**: together with the enabling of the armature bridge with digital input DEN.
- **Speed ramp**: enable with digital input DI1 (REN command).
  - Set the ramp time with the "Ramp time" parameter (see paragraph 5.1.2 on page 22).
- **Alarm reset**: with digital input DI2 (RST command).
- **Reversal of rotation direction**: with external command on digital input DI3 (RSR command).
- **JOG function**: JOG enable with external command on digital input DI4 (JOG command).
  - Configure the mode, time and speed with the appropriate parameters (see paragraph 5.5.1.10 on page 39).
- **Selection of speed reference 1 / 2**: with digital input DI5 (SR1/2 command).
  - Selection is made between analogue input 1 (AI1) and analogue reference 1 (AR1). The AR1 reference can be changed from a PC to set a specific motor rotation speed.
- **External armature current limit**: with digital input DI6 (MCL & BCL control) the external reference is activated which is valid both when the motor is running as a motor and when it operates as a brake.
  - The current reference value is received on analog input AI2.
- **Percent motor load monitor**: use the analogue output AO1.
  - Scaling: 10Vcc = 100% motor load.
  - To change the scale of the output signal, use the parameter "*AO1 Gain*" (see paragraph 5.3.2.1 on page 24).
- **Motor speed monitor**: use the analogue output AO2.
  - Scaling: 10Vcc = [Motor Speed max (RPM)] x 1.1
  - To change the scale of the output signal, use the parameter "*AO2 Gain*" (see paragraph 5.3.2.2 on page 25).
- **Oscilloscope display of the armature current**: use the fast analogue output AO3.
  - Scaling: 10Vcc = [Drive nominal armature current (A)] x 10.314.
  - To change the scale of the output signal, use the parameter "AO3 Gain" (see paragraph 5.3.2.3 on page 25).
- **Line contactor command "CNT"**: on digital output DO1.
- **Motor stopped signal "ZES"**: on digital output DO2.
  - See ZES function parameters in the paragraph 5.5.1.18 on page 44.
- **Speed threshold signal "SOT1"**: on digital output DO3.
  - See SOT function parameters in the paragraph 5.5.1.15 on page 42.
- **Nominal motor load signal "PML"**: on digital output DO4.
  - See PML function parameters in the paragraph 5.5.1.14 on page 41.
- **Speed reached signal "STS"**: on digital output DO5.
  - See STS function parameters in the paragraph 5.5.1.16 on page 42.
- **Drive overload signal “DOL”**: on digital output DO6.
  - The overload level can be displayed with the "DOL Level" parameter, see section 5.5.1.8 on page 38.

The following figures show the standard connection of the functional blocks used:

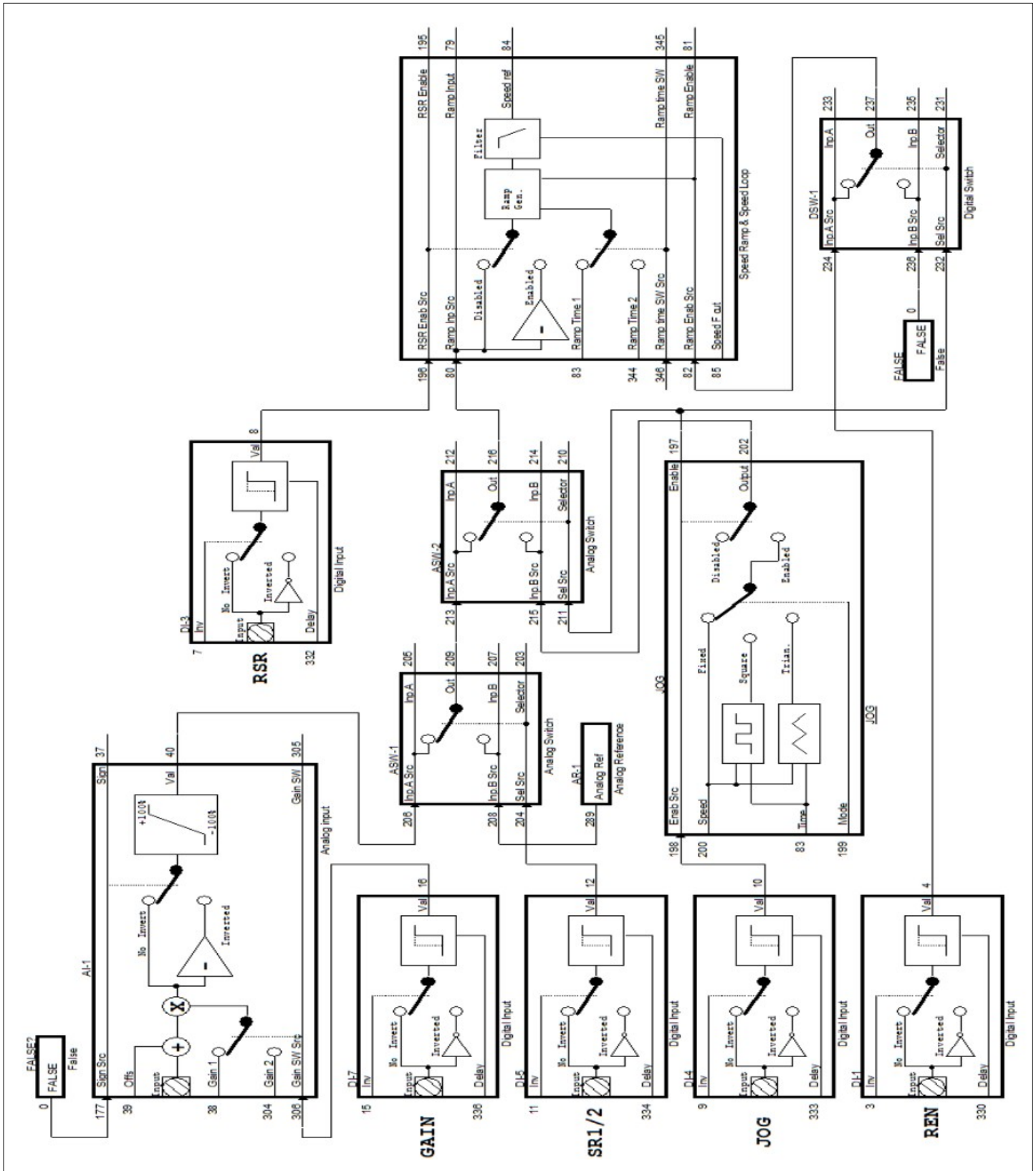


Figure 40: Basic configuration (Speed Ramp inputs)

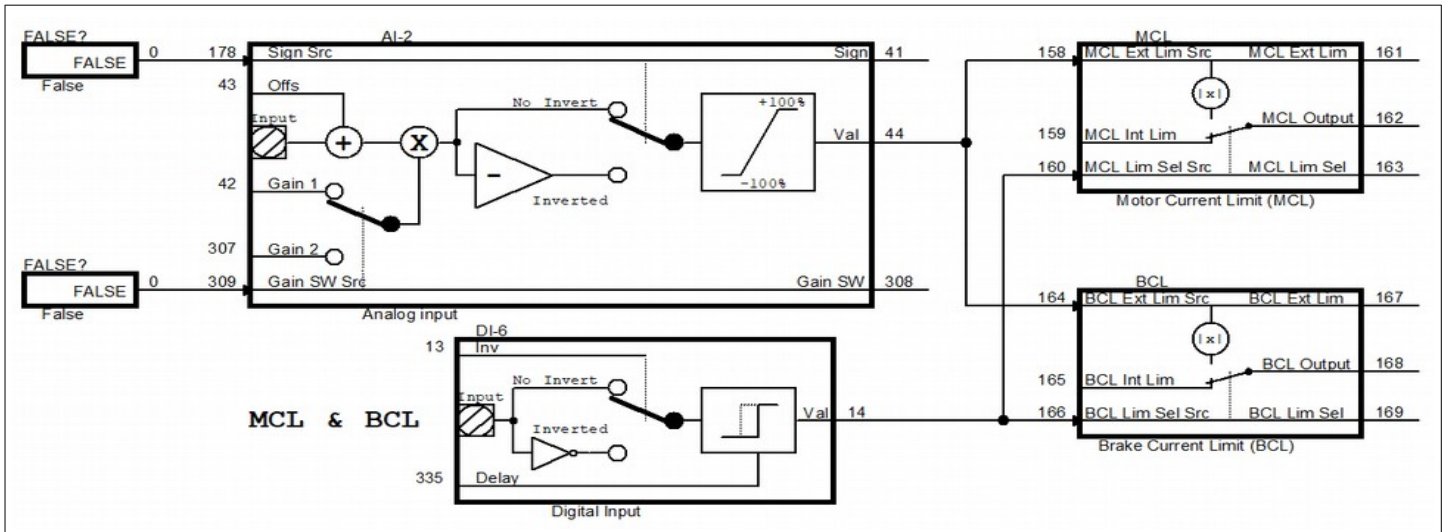


Figure 41: Basic configuration (Current limit MCL & BCL)

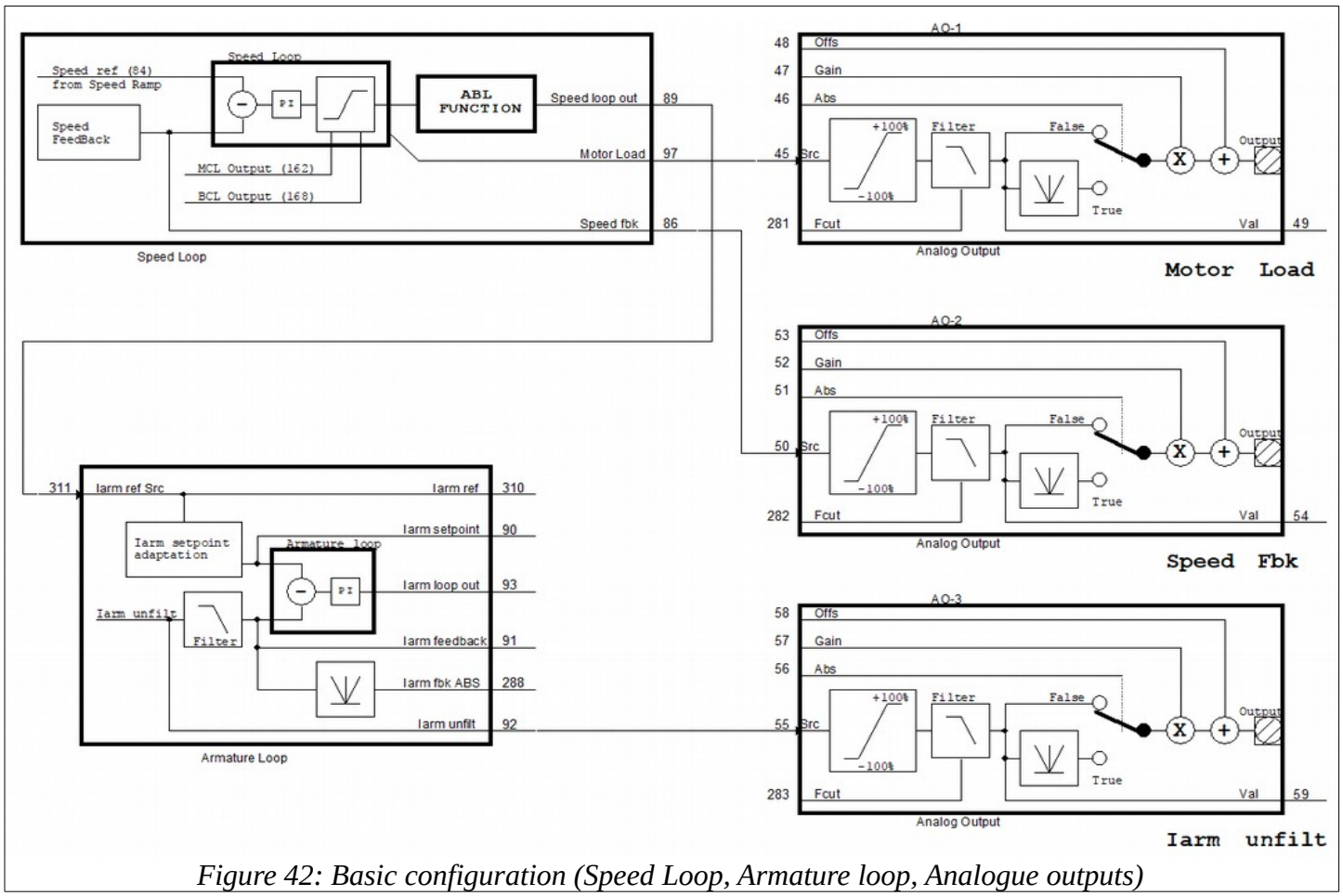


Figure 42: Basic configuration (Speed Loop, Armature loop, Analogue outputs)

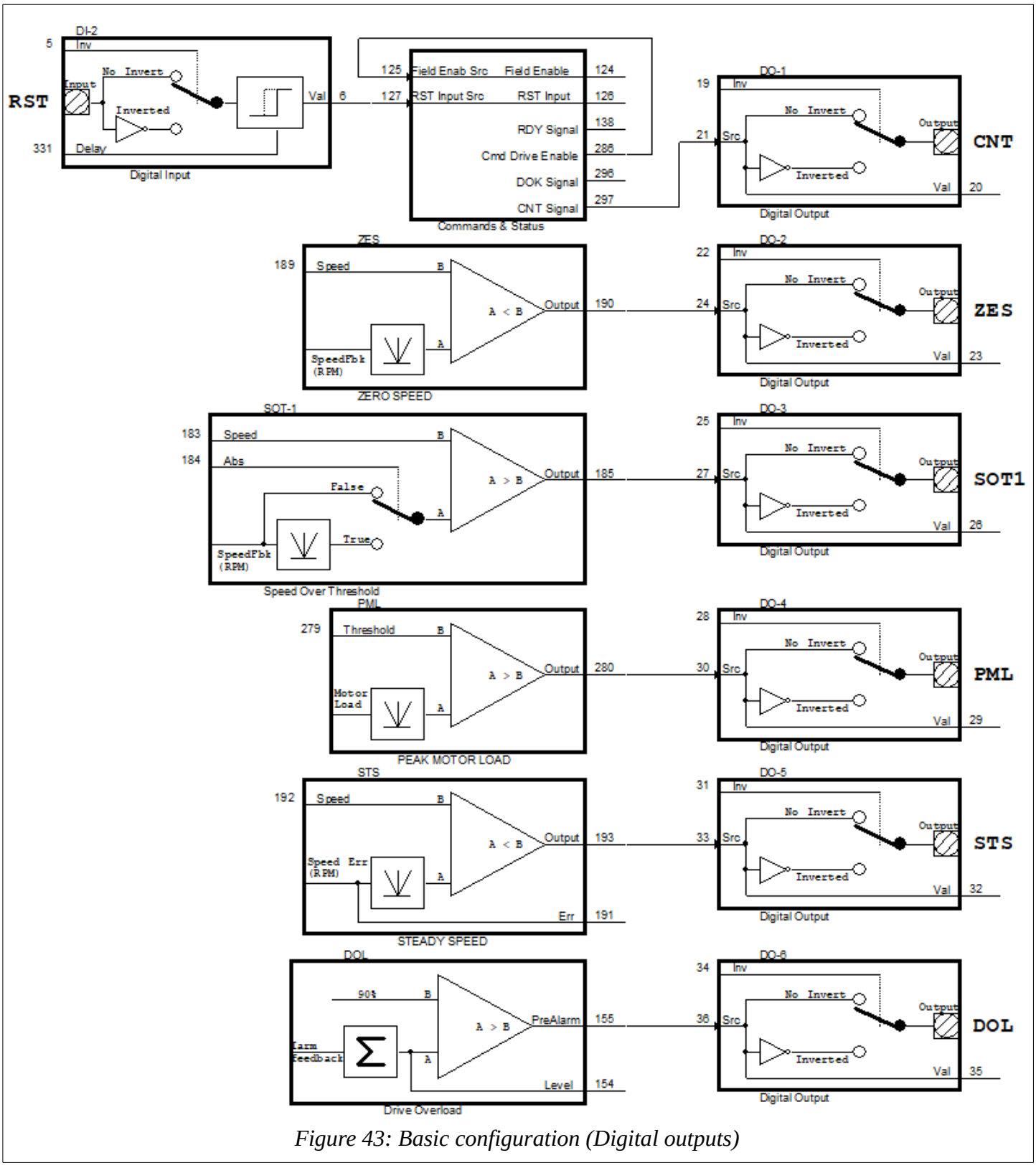


Figure 43: Basic configuration (Digital outputs)

7 Advanced configuration

The drives D Series use functional blocks which can be interconnected with each other in order to satisfy every customer application requirement. The programming of these blocks can be done directly on the drive keypad or through the software on the PC which makes the task faster.

These function blocks are already connected in a standard mode (see paragraph 6 from page 48) to meet the needs of most customers, but if you want to adapt them to your needs it is essential to fully understand the operation and logic of each block to avoid problems later.

The available function blocks are listed in the menu “Advanced setup“ (see paragraph 5.5 from page 31).

7.1 Types of parameters

There are several "types" of parameters that share certain characteristics, such as the possibility to change their value, if it is a logic value 0 or 1 or an analog value, the number of bits with which it is represented.

The parameter "type" is written in the "TYPE" column of each table in the paragraphs of “Menu of internal parameters“ (see paragraph 5 from page 22), in the PIN table from page 53, in the Parameters table from page 59.

Each "TYPE" can be divided into two blocks:

1. The first 2 characters on the left identify if the parameter can be modified and we find:
   - **RO**: the parameter is read-only and can not be changed.
   - **RW**: the parameter is read / write and can be changed from the keyboard or PC.
2. The following characters identify the resolution, whether logical or analogical, whether signed or unsigned.

Without going into details, the only important thing to observe is the 2nd block of each type: this will make us understand if a parameter can be used as a source of the value of another and thus create a link between the blocks.

7.2 Connection between blocks

The connection between the function blocks takes place between a "Source Selector" (SRCSEL) and any parameter compatible with the destination: the PIN of the source parameter must be written in the SRCSEL parameter, and the connection is thus terminated. Using the display and the keyboard on the front of the drive it is possible to scroll all the parameters compatible with that specific source selector, displaying the name of the parameter itself. Instead, using the PC it is necessary to know the PIN number that can be read in the functional block or from the tables on page 53 and page 59.

What is the SRCSEL source selector?

The SRCSEL parameter is a special type that is used to store the PIN of the parameter that must become the source of another.

What is a parameter's PIN?

Each parameter has an identification number (PIN) that is used to make it unique among the others, it is indicated in each drawing of the function block: for example, if we look at the figure 39 at page 47 we find that the "RDY Signal" parameter has PIN 138, so when a SRCSEL source selector will contain PIN 138 it means that the RDY Signal value will be used as the source of the destination parameter.

What is the destination parameter of a SRCSEL?

Generally, the destination parameter of a SRCSEL is called with a similar name to the selector itself; in the drawings of the functional blocks we find a line that unites the source selector and the destination value in order to make the signal path clearer. For example, if we look at the figure 39 at page 47 we see that the "Field Enab Src" source selector (PIN 125) is the source of the "Field Enable" value (PIN 124).

When source is compatible with destination?

When the 2nd part of the "TYPE" source is the same as the destination one (see paragraph 7.1).

EXCEPTION: PIN 0 (FALSE) can be used as a source for any destination.

What are the advantages of this connection method?

1. The same source parameter can be used for different destinations. For example, with a single digital input (DI*), you can switch multiple analog switches (ASW*) or enable other functions simultaneously.
2. There is no danger of accidentally sending two different sources to a single destination, creating a conflict of signals.
3. The value that will be transferred to the destination is clearer, because only parameters of the same type can be coupled. Therefore it is not possible to send a logical signal (BOOL) to an analogue destination (16 bit) by mistake.

7.3 PIN table

This table contains all the PINs in ascending order, from which the parameter can be derived.

PIN N°	NAME	TYPE	DESCRIPTION
000	FALSE	RO – UI32	Fixed variable to FALSE
001	TRUE	RO – BOOL	Fixed variable to TRUE
002	DEN Val	RO – BOOL	DEN current logical status
003	DI1 Inv	RW – BOOL	DI1 inversion logical status command
004	DI1 Val	RO – BOOL	DI1 current logical status (after inversion)
005	DI2 Inv	RW – BOOL	DI2 inversion logical status command
006	DI2 Val	RO – BOOL	DI2 current logical status (after inversion)
007	DI3 Inv	RW – BOOL	DI3 inversion logical status command
008	DI3 Val	RO – BOOL	DI3 current logical status (after inversion)
009	DI4 Inv	RW – BOOL	DI4 inversion logical status command
010	DI4 Val	RO – BOOL	DI4 current logical status (after inversion)
011	DI5 Inv	RW – BOOL	DI5 inversion logical status command
012	DI5 Val	RO – BOOL	DI5 current logical status (after inversion)
013	DI6 Inv	RW – BOOL	DI6 inversion logical status command
014	DI6 Val	RO – BOOL	DI6 current logical status (after inversion)
015	DI7 Inv	RW – BOOL	DI7 inversion logical status command
016	DI7 Val	RO – BOOL	DI7 current logical status (after inversion)
017	DI8 Inv	RW – BOOL	DI8 inversion logical status command
018	DI8 Val	RO – BOOL	DI8 current logical status (after inversion)
019	DO1 Inv	RW – BOOL	DO1 inversion logical status command
020	DO1 Val	RO – BOOL	DO1 logical status from source
021	DO1 Src	SRC SELECT	DO1 source value
022	DO2 Inv	RW – BOOL	DO2 inversion logical status command
023	DO2 Val	RO – BOOL	DO2 logical status from source
024	DO2 Src	SRC SELECT	DO2 source value
025	DO3 Inv	RW – BOOL	DO3 inversion logical status command
026	DO3 Val	RO – BOOL	DO3 logical status from source
027	DO3 Src	SRC SELECT	DO3 source value
028	DO4 Inv	RW – BOOL	DO4 inversion logical status command
029	DO4 Val	RO – BOOL	DO4 logical status from source
030	DO4 Src	SRC SELECT	DO4 source value
031	DO5 Inv	RW – BOOL	DO5 inversion logical status command
032	DO5 Val	RO – BOOL	DO5 logical status from source
033	DO5 Src	SRC SELECT	DO5 source value
034	DO6 Inv	RW – BOOL	DO6 inversion logical status command
035	DO6 Val	RO – BOOL	DO6 logical status from source
036	DO6 Src	SRC SELECT	DO6 source value
037	AI1 Sign	RO – BOOL	AI1 status inversion sign
038	AI1 Gain 1	RW – FLOAT	AI1 gain setting 1
039	AI1 Offs	RW – F16	AI1 offset setting
040	AI1 Val	RO – F16	AI1 value to use
041	AI2 Sign	RO – BOOL	AI2 status inversion sign
042	AI2 Gain 1	RW – FLOAT	AI2 gain setting 1
043	AI2 Offs	RW – F16	AI2 offset setting
044	AI2 Val	RO – F16	AI2 value to use
045	AO1 Src	SRC SELECT	AO1 source value
046	AO1 Abs	RW – BOOL	AO1 command to activate absolute value
047	AO1 Gain	RW – FLOAT	AO1 gain setting
048	AO1 Offs	RW – F16	AO1 offset setting
049	AO1 Val	RO – F16	AO1 source value
050	AO2 Src	SRC SELECT	AO2 source value
051	AO2 Abs	RW – BOOL	AO2 command for activation of absolute value
052	AO2 Gain	RW – FLOAT	AO2 gain setting
053	AO2 Offs	RW – F16	AO2 offset setting
054	AO2 Val	RO – F16	AO2 source value
055	AO3 Src	SRC SELECT	AO3 source value
056	AO3 Abs	RW – BOOL	AO3 command for activation of absolute value
057	AO3 Gain	RW – FLOAT	AO3 gain setting

PIN N°	NAME	TYPE	DESCRIPTION
058	AO3 Offs	RW – F16	AO3 offset setting
059	AO3 Val	RO – F16	AO3 source value
060	DSP TEMP	RO – UI8	Internal temperature at the DSP (°C)
061	BRIDGE TEMP	RO – UI8	Bridge heatsink temperature (°C)
062	ALARM 1	RO – UI16	Alarms 1st word
063	ALARM 2	RO – UI16	Alarms 2nd word
064	WARNING 1	RO – UI16	Reports 1st word
065	Motor Iarm nom	RW – FLOAT	Rated armature current
066	Motor Varm nom	RW – UI16	Nominal armature voltage
067	Motor Ifld nom	RW – FLOAT	Nominal field current
068	Motor Speed base	RW – UI16	Engine base speed
069	Motor Speed max	RW – FLOAT	Maximum motor speed
070	Motor Tacho Kv	RW – FLOAT	Tachogenerator Kv / 1000rpm
071	Speed Lp Pgain	RW – FLOAT	Speed loop P gain
072	Speed Lp Igain	RW – FLOAT	Speed loop I gain
073	Iarm Lp Pgain	RW – FLOAT	Iarm loop P gain
074	Iarm Lp Igain	RW – FLOAT	Iarm loop I gain
075	Deflux Lp Pgain	RW – FLOAT	Deflux loop P gain
076	Deflux Lp Igain	RW – FLOAT	Deflux loop I gain
077	Ifld Lp Pgain	RW – FLOAT	Ifield loop P gain
078	Ifld Lp Igain	RW – FLOAT	Ifield loop I gain
079	Ramp Input	RO – F16	Ramp block entry
080	Ramp Inp Src	SRC SELECT	Ramp input source selection
081	Ramp Enable	RO – BOOL	Ramp enable input
082	Ramp Enab Src	SRC SELECT	Ramp input source selection
083	Ramp time 1	RW – FLOAT	Speed ramp time 1 (sec)
084	Speed ref	RO – F16	Ring speed reference
085	Speed F cut	RW – UI16	Cutting frequency Speed ref
086	Speed fbk	RO – F16	Speed feedback to loop
087	Speed Rpm SCALE	RO – FLOAT	Speed scaling (RPM)
088	Speed % SCALE	RO – FLOAT	Speed scaling (%)
089	Speed loop out	RO – F16	Speed loop output
090	Iarm setpoint	RO – F16	I armature loop setpoint
091	Iarm feedback	RO – F16	I armature loop feedback
092	Iarm unfilt	RO – F16	I armature NOT filtered
093	Iarm loop out	RO – F16	I armature loop output
094	Iarm AMP SCALE	RO – FLOAT	I armature scaling (A)
095	Iarm % SCALE	RO – FLOAT	I armature scaling (%)
097	Motor Load	RO – F16	% Load on the motor
098	Motor Volt	RO – F16	Armature voltage % on Motor Varm nom (filtered and rectified)
099	Deflux setp.	RO – F16	Weakening loop set point
100	Deflux feedb.	RO – F16	Weakening loop feedback
101	Varm setpoint	RO – F16	Setpoint V armature loop
102	Varm feedback	RO – F16	Feedback V armature loop
103	Varm unfilt	RO – F16	V armature NOT filtered
104	Varm loop out	RO – F16	V armature loop output
105	Volt SCALE	RO – FLOAT	Voltage scaling (V)
106	Ifld setpoint	RO – F16	I field loop setpoint
107	Ifld feedback	RO – F16	I field loop feedback
108	Ifld loop out	RO – F16	I field loop output
109	Ifld AMP SCALE	RO – FLOAT	Current scaling field (A)
110	Ifld % SCALE	RO – FLOAT	Current scaling field (%)
111	VL12 unfilt	RO – F16	Three-phase grid voltage L1-L2 (unfiltered)
112	VL23 unfilt	RO – F16	Three-phase grid voltage L2-L3 (unfiltered)
113	VL31 unfilt	RO – F16	Three-phase grid voltage L3-L1 (unfiltered)
114	VL12 filt	RO – F16	Three-phase grid voltage L1-L2 (filtered)
115	VL23 filt	RO – F16	Three-phase grid voltage L2-L3 (filtered)
116	VL31 filt	RO – F16	Three-phase grid voltage L3-L1 (filtered)
117	VFL12 unfilt	RO – F16	Field voltage VFL1-VFL2 (unfiltered)
118	VFL12 filt	RO – F16	Field voltage VFL1-VFL2 (filtered)
119	VL freq	RO – UI8	Frequency measured in VL

PIN N°	NAME	TYPE	DESCRIPTION
120	VFL freq	RO – UI8	Frequency measured in VFL
121	Period fast lp	RO – UI16	Fast cycle time (uSec)
122	Time fast lp	RO – UI16	Fast cycle time (uSec)
123	Period slow lp	RO – UI16	Slow cycle time (uSec)
124	Field Enable	RO – BOOL	Field enable input
125	Field Enab Src	SRC SELECT	Field input source selection
126	RST Input	RO – BOOL	External alarm reset input
127	RST Input Src	SRC SELECT	RST input source selection
128	Save param	RW – BOOL	Parameter save command
129	Restore param	RW – BOOL	Parameter restore command
131	Save status	RO – UI8	Parameter saving status
132	Restore status	RO – UI8	Status restore parameters
134	Int.memo status	RO – UI16	Internal memory status word
135	Ext.memo status	RO – UI16	External memory status word
136	Factory reset	RW – BOOL	Factory data reset command
138	RDY signal	RO – BOOL	RDY current logical status
139	App FW vers	RO – FLOAT	Firmware version (MMM.mm)
144	Motor FBK type	RW – ENUM	Feedback transducer type
145	Motor FBK sign	RW – BOOL	Sign reverse speed transducer
146	Fbk FLT Thresh	RW – F16	Percentage of Varm for FBK FLT activation
147	Tacho signal	RO – F16	Tachometer signal in% on the max measurable value ADC
148	Tacho F cut	RW – UI16	Frequency cut for the d.c. tachogenerator
149	Aux sup 24V	RO – FLOAT	Voltage aux services + 24V
150	Aux sup 15V	RO – FLOAT	Voltage aux services + 15V
151	Aux sup 5V	RO – FLOAT	Auxiliary voltage + 5V
152	Aux sup -15V	RO – FLOAT	Aux service voltage -15V
153	Bridge Rev Comp	RW – F16	Bridge inversion compensation percentage
154	DOL level	RO – F16	Current armature overload level
155	DOL PreAlarm	RO – BOOL	Warning condition with Drive Overload
156	Speed Lp SpeedUp	RW – F16	Speed loop SpeedUp
157	Spd Lp GainScale	RW – F16	Speed loop gain scale with speed > 10%
158	MCL Ext Lim Src	SRC SELECT	Source selection External current limit reference
159	MCL Int Lim	RW – F16	Internal reference current limit
160	MCL Lim Sel Src	SRC SELECT	Limit selection source selection
161	MCL Ext Lim	RO – F16	Reading of external reference of current limit
162	MCL Output	RO – F16	Output from MCL block
163	MCL Lim Sel	RO – BOOL	Internal / external limit selection
164	BCL Ext Lim Src	SRC SELECT	Source selection External current limit reference
165	BCL Int Lim	RW – F16	Internal reference current limit
166	BCL Lim Sel Src	SRC SELECT	Limit selection source selection
167	BCL Ext Lim	RO – F16	Reading of external reference of current limit
168	BCL Output	RO – F16	Output from BCL block
169	BCL Lim Sel	RO – BOOL	Internal / external limit selection
170	MOT Sens Type	RW – ENUM	Motor temperature sensor type selection
171	MOT Max Temp	RW – UI8	Alarm threshold motor temperature (°C)
172	MOT Alarm Delay	RW – UI8	Alarm delay due to motor overtemperature
173	MOT Warning	RO – BOOL	Warning MOT indication
174	MOT Alarm	RO – BOOL	Alarm MOT indication
175	MOT Sens Fault	RO – BOOL	Motor temp sensor fault indication
176	MOT Temp	RO – UI8	Current motor temperature (°C)
177	AI1 Sign Src	SRC SELECT	AI1 source sign
178	AI2 Sign Src	SRC SELECT	AI2 source sign
179	VCL Speed 1	RW – I16	Speed POINT 1
180	VCL Speed 2	RW – I16	Speed POINT 2
181	VCL Curr Lim 2	RW – F16	Current limit point 2
182	VCL Output	RO – F16	Output from VCL block
183	SOT1 Speed	RW – I16	SOT1 Speed threshold
184	SOT1 Abs	RW – BOOL	SOT1 command for activation of absolute value
185	SOT1 Output	RO – BOOL	SOT1 Output
186	SOT2 Speed	RW – I16	SOT2 Speed threshold
187	SOT2 Abs	RW – BOOL	SOT2 command for activation of absolute value

PIN N°	NAME	TYPE	DESCRIPTION
188	SOT2 Output	RO – BOOL	SOT2 Output
189	ZES Speed	RW – I16	Zero speed threshold
190	ZES Output	RO – BOOL	Zero speed Output
191	STS Err (RPM)	RO – I16	STS Speed error in RPM
192	STS Speed	RW – I16	Speed threshold reached
193	STS Output	RO – BOOL	Speed reached Output
194	Speed fbk (RPM)	RO – I16	Speed in RPM (filtered)
195	RSR Enable	RO – BOOL	RSR function enabled
196	RSR Enab Src	SRC SELECT	Selection of RSR enable source
197	JOG Enable	RO – BOOL	JOG function enabled
198	JOG Enab Src	SRC SELECT	JOG enable source selection
199	JOG Mode	RW – ENUM	JOG mode
200	JOG Speed	RW – F16	Jog speed
201	JOG time	RW – FLOAT	JOG ramp time (sec)
202	JOG Output	RO – F16	Exit from the JOG block
203	ASW1 Selector	RO – BOOL	ASW1 selector
204	ASW1 Select Src	SRC SELECT	Source selection ASW1 selector
205	ASW1 Inp.A	RO – F16	ASW1 Input A
206	ASW1 Inp.A Src	SRC SELECT	ASW1 source Input A
207	ASW1 Inp.B	RO – F16	ASW1 Input B
208	ASW1 Inp.B Src	SRC SELECT	ASW1 source Input B
209	ASW1 Output	RO – F16	ASW1 Output
210	ASW2 Selector	RO – BOOL	ASW2 selector
211	ASW2 Select Src	SRC SELECT	Source selection ASW2 selector
212	ASW2 Inp.A	RO – F16	ASW2 Input A
213	ASW2 Inp.A Src	SRC SELECT	ASW2 source Input A
214	ASW2 Inp.B	RO – F16	ASW2 Input B
215	ASW2 Inp.B Src	SRC SELECT	ASW2 source Input B
216	ASW2 Output	RO – F16	ASW2 Output
217	ASW3 Selector	RO – BOOL	ASW3 selector
218	ASW3 Select Src	SRC SELECT	Source selection ASW3 selector
219	ASW3 Inp.A	RO – F16	ASW3 Input A
220	ASW3 Inp.A Src	SRC SELECT	ASW3 source Input A
221	ASW3 Inp.B	RO – F16	ASW3 Input B
222	ASW3 Inp.B Src	SRC SELECT	ASW3 source Input B
223	ASW3 Output	RO – F16	ASW3 Output
224	ASW4 Selector	RO – BOOL	ASW4 selector
225	ASW4 Select Src	SRC SELECT	Source selection ASW4 selector
226	ASW4 Inp.A	RO – F16	ASW4 Input A
227	ASW4 Inp.A Src	SRC SELECT	ASW4 source Input A
228	ASW4 Inp.B	RO – F16	ASW4 Input B
229	ASW4 Inp.B Src	SRC SELECT	ASW4 source Input B
230	ASW4 Output	RO – F16	ASW4 Exit
231	DSW1 Selector	RO – BOOL	DSW1 selector
232	DSW1 Select Src	SRC SELECT	Source selection DSW1 selector
233	DSW1 Inp.A	RO – BOOL	DSW1 Input A
234	DSW1 Inp.A Src	SRC SELECT	DSW1 source Input A
235	DSW1 Inp.B	RO – BOOL	DSW1 Input B
236	DSW1 Inp.B Src	SRC SELECT	DSW1 source Input B
237	DSW1 Output	RO – BOOL	DSW1 Output
238	DSW2 Selector	RO – BOOL	DSW2 selector
239	DSW2 Select Src	SRC SELECT	Source selection DSW2 selector
240	DSW2 Inp.A	RO – BOOL	DSW2 Input A
241	DSW2 Inp.A Src	SRC SELECT	DSW2 source Input A
242	DSW2 Inp.B	RO – BOOL	DSW2 Input B
243	DSW2 Inp.B Src	SRC SELECT	DSW2 source Input B
244	DSW2 Output	RO – BOOL	DSW2 Output
245	DSW3 Selector	RO – BOOL	DSW3 selector
246	DSW3 Select Src	SRC SELECT	Source selection DSW3 selector
247	DSW3 Inp.A	RO – BOOL	DSW3 Input A
248	DSW3 Inp.A Src	SRC SELECT	DSW3 source Input A

PIN N°	NAME	TYPE	DESCRIPTION
249	DSW3 Inp.B	RO – BOOL	DSW3 Input B
250	DSW3 Inp.B Src	SRC SELECT	DSW3 source Input B
251	DSW3 Output	RO – BOOL	DSW3 Output
252	DSW4 Selector	RO – BOOL	DSW4 selector
253	DSW4 Select Src	SRC SELECT	Source selection DSW4 selector
254	DSW4 Inp.A	RO – BOOL	DSW4 Input A
255	DSW4 Inp.A Src	SRC SELECT	DSW4 source Input A
256	DSW4 Inp.B	RO – BOOL	DSW4 Input B
257	DSW4 Inp.B Src	SRC SELECT	DSW4 source Input B
258	DSW4 Output	RO – BOOL	DSW4 Output
259	AAD1 Inp.A	RO – F16	AAD1 Input A
260	AAD1 Inp.A Src	SRC SELECT	AAD1 source Input A
261	AAD1 Inp.B	RO – F16	AAD1 Input B
262	AAD1 Inp.B Src	SRC SELECT	AAD1 source Input B
263	AAD1 Output	RO – F16	AAD1 Output
264	AAD2 Inp.A	RO – F16	AAD2 Input A
265	AAD2 Inp.A Src	SRC SELECT	AAD2 source Input A
266	AAD2 Inp.B	RO – F16	AAD2 Input B
267	AAD2 Inp.B Src	SRC SELECT	AAD2 source Input B
268	AAD2 Output	RO – F16	AAD2 Output
269	AAD3 Inp.A	RO – F16	AAD3 Input A
270	AAD3 Inp.A Src	SRC SELECT	AAD3 source Input A
271	AAD3 Inp.B	RO – F16	AAD3 Input B
272	AAD3 Inp.B Src	SRC SELECT	AAD3 source Input B
273	AAD3 Output	RO – F16	AAD3 Output
274	AAD4 Inp.A	RO – F16	AAD4 Input A
275	AAD4 Inp.A Src	SRC SELECT	AAD4 source Input A
276	AAD4 Inp.B	RO – F16	AAD4 Entry B
277	AAD4 Inp.B Src	SRC SELECT	AAD4 source Input B
278	AAD4 Output	RO – F16	AAD4 Exit
279	PML Threshold	RW – F16	PML Intervention Threshold
280	PML Output	RO – BOOL	PML Output
281	AO1 F cut	RW – UI16	Cutting frequency AO1
282	AO2 F cut	RW – UI16	Cutting frequency AO2
283	AO3 F cut	RW – UI16	Cutting frequency AO3
284	DSR Enable	RW – BOOL	DSR Enabling Drive Stop / Run function
285	DSR Max Stop	RW – UI8	DSR Maximum stop time (sec)
286	Cmd Drive Enable	RO – BOOL	Drive enable request command
287	Fix 100% SCALE	RO – FLOAT	100% fixed scaling
288	Iarm fbk ABS	RO – F16	Armature current % (Absolute value)
289	AR 1	RW – F16	Analog reference 1
290	AR 2	RW – F16	Analog reference 2
291	AR 3	RW – F16	Analog reference 3
292	AR 4	RW – F16	Analog reference 4
293	Tacho offset	RW – F16	Tachogenerator offset adjustment
295	BootLd vers	RO – FLOAT	Bootloader version (MMM.mm)
296	DOK Signal	RO – BOOL	DOK current logical status
297	CNT Signal	RO – BOOL	CNT current logical status (contactor command)
300	Drive nom.curr.	RO – UI16	Nominal drive current indicator
301	Motor Encod.PPR	RW – UI16	TTL encoder PPR resolution
302	Position fbk	RO – F32	Motor angular position (Radiant PiGreco)
303	Motor posit.	RO – FLOAT	Motor position (degrees)
304	AI1 Gain 2	RW – FLOAT	AI1 gain setting 2
305	AI1 Gain SW	RO – BOOL	AI1 gain selection status
306	AI1 Gain SW Src	SRC SELECT	AI1 gain selection source
307	AI2 Gain 2	RW – FLOAT	AI2 gain setting 2
308	AI2 Gain SW	RO – BOOL	AI2 gain selection status
309	AI2 Gain SW Src	SRC SELECT	AI2 source gain selection
310	Iarm ref	RO – F16	Armature Current reference
311	Iarm ref Src	SRC SELECT	Source selection of current armature reference
312	ABL mode	RW – ENUM	Anti-backlash mode of operation

PIN N°	NAME	TYPE	DESCRIPTION
313	ABL torque	RW – F16	Anti-backlash contrasting torque
314	ABL Net Errors	RW – BOOL	Anti-backlash enabling network errors
315	ABL slave dir.	RW – BOOL	Anti-backlash slave direction
316	ABL DAI 1	RO – BOOL	Anti-backlash Digital Aux Input 1
317	ABL DAI 1 Src	SRC SELECT	Anti-backlash source Digital Aux Input 1
318	ABL DAI 2	RO – BOOL	Anti-backlash Digital Aux Input 2
319	ABL DAI 2 Src	SRC SELECT	Anti-backlash source Digital Aux Input 2
320	ABL DAI 3	RO – BOOL	Anti-backlash Digital Aux Input 3
321	ABL DAI 3 Src	SRC SELECT	Anti-backlash source Digital Aux Input 3
322	ABL DAI 4	RO – BOOL	Anti-backlash Digital Aux Input 4
323	ABL DAI 4 Src	SRC SELECT	Anti-backlash source Digital Aux Input 4
324	ABL DAO 1	RO – BOOL	Anti-backlash Digital Aux Output 1
325	ABL DAO 2	RO – BOOL	Anti-backlash Digital Aux Output 2
326	ABL DAO 3	RO – BOOL	Anti-backlash Digital Aux Output 3
327	ABL DAO 4	RO – BOOL	Anti-backlash Digital Aux Output 4
328	ABL spd err act	RO – F16	Anti-backlash current speed error between master and slave
329	ABL spd err thr	RW - F16	Anti-backlash speed error threshold between master and slave
330	DI1 Delay	RW – UI16	DI1 switching delay
331	DI2 Delay	RW – UI16	DI2 switching delay
332	DI3 Delay	RW – UI16	DI3 switching delay
333	DI4 Delay	RW – UI16	DI4 switching delay
334	DI5 Delay	RW – UI16	DI5 switching delay
335	DI6 Delay	RW – UI16	DI6 switching delay
336	DI7 Delay	RW – UI16	DI7 switching delay
337	DI8 Delay	RW – UI16	DI8 switching delay
338	Motor Iarm max	RW – FLOAT	Maximum armature current
339	MOL Time	RW – UI16	MOL Overload time setting at Iarm max
340	MOL Fault	RW – BOOL	MOL FAULT drive enabling
341	MOL level	RO – F16	MOL overload level (%)
342	MOL Warning	RO – BOOL	MOL Warning Indication
343	MOL Alarm	RO – BOOL	MOL Alarm indication
344	Ramp time 2	RW – FLOAT	Speed ramp time 2 (sec)
345	Ramp time SW	RO – BOOL	Ramp time selection status
346	Ramp time SW Src	SRC SELECT	Ramp time selection source
347	ALM1 Input	RO – F16	ALM1 Input
348	ALM1 Input Src	SRC SELECT	ALM1 input source
349	ALM1 Output	RO – F16	ALM1 Output
350	ALM1 HI Limit	RW - F16	ALM1 high limit
351	ALM1 LOW Limit	RW - F16	ALM1 low limit
352	ALM2 Input	RO – F16	ALM2 Input
353	ALM2 Input Src	SRC SELECT	ALM2 input source
354	ALM2 Output	RO – F16	ALM2 Output
355	ALM2 HI Limit	RW - F16	ALM2 high limit
356	ALM2 LOW Limit	RW - F16	ALM2 low limit
357	ALM3 Input	RO – F16	ALM3 Input
358	ALM3 Input Src	SRC SELECT	ALM3 input source
359	ALM3 Output	RO – F16	ALM3 Output
360	ALM3 HI Limit	RW - F16	ALM3 high limit
361	ALM3 LOW Limit	RW - F16	ALM3 low limit
362	ALM4 Input	RO – F16	ALM4 Input
363	ALM4 Input Src	SRC SELECT	ALM4 input source
364	ALM4 Output	RO – F16	ALM4 Output
365	ALM4 HI Limit	RW - F16	ALM4 high limit
366	ALM3 LOW Limit	RW - F16	ALM4 low limit
367	Dflx Lp SpeedUp	RW - F16	Deflux loop SpeedUp
368	Dflx Lp GainSc.	RW - F16	Deflux loop automatic gain scale (minimum value)

Table 8: PIN list → Parameters

7.4 Parameters table

This table contains all the parameters in alphabetical order, from which the PIN can be obtained.

NAME	TYPE	DESCRIPTION	PIN N°
AAD1 Inp.A	RO – F16	AAD1 Input A	259
AAD1 Inp.A Src	SRC SELECT	AAD1 source Input A	260
AAD1 Inp.B	RO – F16	AAD1 Input B	261
AAD1 Inp.B Src	SRC SELECT	AAD1 source Input B	262
AAD1 Output	RO – F16	AAD1 Output	263
AAD2 Inp.A	RO – F16	AAD2 Input A	264
AAD2 Inp.A Src	SRC SELECT	AAD2 source Input A	265
AAD2 Inp.B	RO – F16	AAD2 Input B	266
AAD2 Inp.B Src	SRC SELECT	AAD2 source Input B	267
AAD2 Output	RO – F16	AAD2 Output	268
AAD3 Inp.A	RO – F16	AAD3 Input A	269
AAD3 Inp.A Src	SRC SELECT	AAD3 source Input A	270
AAD3 Inp.B	RO – F16	AAD3 Input B	271
AAD3 Inp.B Src	SRC SELECT	AAD3 source Input B	272
AAD3 Output	RO – F16	AAD3 Output	273
AAD4 Inp.A	RO – F16	AAD4 Input A	274
AAD4 Inp.A Src	SRC SELECT	AAD4 source Input A	275
AAD4 Inp.B	RO – F16	AAD4 Entry B	276
AAD4 Inp.B Src	SRC SELECT	AAD4 source Input B	277
AAD4 Output	RO – F16	AAD4 Exit	278
ABL DAI 1	RO – BOOL	Anti-backlash Digital Aux Input 1	316
ABL DAI 1 Src	SRC SELECT	Anti-backlash source Digital Aux Input 1	317
ABL DAI 2	RO – BOOL	Anti-backlash Digital Aux Input 2	318
ABL DAI 2 Src	SRC SELECT	Anti-backlash source Digital Aux Input 2	319
ABL DAI 3	RO – BOOL	Anti-backlash Digital Aux Input 3	320
ABL DAI 3 Src	SRC SELECT	Anti-backlash source Digital Aux Input 3	321
ABL DAI 4	RO – BOOL	Anti-backlash Digital Aux Input 4	322
ABL DAI 4 Src	SRC SELECT	Anti-backlash source Digital Aux Input 4	323
ABL DAO 1	RO – BOOL	Anti-backlash Digital Aux Output 1	324
ABL DAO 2	RO – BOOL	Anti-backlash Digital Aux Output 2	325
ABL DAO 3	RO – BOOL	Anti-backlash Digital Aux Output 3	326
ABL DAO 4	RO – BOOL	Anti-backlash Digital Aux Output 4	327
ABL mode	RW – ENUM	Anti-backlash mode of operation	312
ABL Net Errors	RW – BOOL	Anti-backlash enabling network errors	314
ABL slave dir.	RW – BOOL	Anti-backlash slave direction	315
ABL spd err act	RO – F16	Anti-backlash current speed error between master and slave	328
ABL spd err thr	RW - F16	Anti-backlash speed error threshold between master and slave	329
ABL torque	RW – F16	Anti-backlash contrasting torque	313
AI1 Gain 1	RW – FLOAT	AI1 gain setting 1	038
AI1 Gain 2	RW – FLOAT	AI1 gain setting 2	304
AI1 Gain SW	RO – BOOL	AI1 gain selection status	305
AI1 Gain SW Src	SRC SELECT	AI1 gain selection source	306
AI1 Offs	RW – F16	AI1 offset setting	039
AI1 Sign	RO – BOOL	AI1 status inversion sign	037
AI1 Sign Src	SRC SELECT	AI1 source sign	177
AI1 Val	RO – F16	AI1 value to use	040
AI2 Gain 1	RW – FLOAT	AI2 gain setting 1	042
AI2 Gain 2	RW – FLOAT	AI2 gain setting 2	307
AI2 Gain SW	RO – BOOL	AI2 gain selection status	308
AI2 Gain SW Src	SRC SELECT	AI2 source gain selection	309
AI2 Offs	RW – F16	AI2 offset setting	043
AI2 Sign	RO – BOOL	AI2 status inversion sign	041
AI2 Sign Src	SRC SELECT	AI2 source sign	178
AI2 Val	RO – F16	AI2 value to use	044
ALARM 1	RO – UI16	Alarms 1st word	062

NAME	TYPE	DESCRIPTION	PIN N°
ALARM 2	RO – UI16	Alarms 2nd word	063
ALM1 HI Limit	RW - F16	ALM1 high limit	350
ALM1 Input	RO – F16	ALM1 Input	347
ALM1 Input Src	SRC SELECT	ALM1 input source	348
ALM1 LOW Limit	RW - F16	ALM1 low limit	351
ALM1 Output	RO – F16	ALM1 Output	349
ALM2 HI Limit	RW - F16	ALM2 high limit	355
ALM2 Input	RO – F16	ALM2 Input	352
ALM2 Input Src	SRC SELECT	ALM2 input source	353
ALM2 LOW Limit	RW - F16	ALM2 low limit	356
ALM2 Output	RO – F16	ALM2 Output	354
ALM3 HI Limit	RW - F16	ALM3 high limit	360
ALM3 Input	RO – F16	ALM3 Input	357
ALM3 Input Src	SRC SELECT	ALM3 input source	358
ALM3 LOW Limit	RW - F16	ALM4 low limit	366
ALM3 LOW Limit	RW - F16	ALM3 low limit	361
ALM3 Output	RO – F16	ALM3 Output	359
ALM4 HI Limit	RW - F16	ALM4 high limit	365
ALM4 Input	RO – F16	ALM4 Input	362
ALM4 Input Src	SRC SELECT	ALM4 input source	363
ALM4 Output	RO – F16	ALM4 Output	364
AO1 Abs	RW – BOOL	AO1 command to activate absolute value	046
AO1 F cut	RW – UI16	Cutting frequency AO1	281
AO1 Gain	RW – FLOAT	AO1 gain setting	047
AO1 Offs	RW – F16	AO1 offset setting	048
AO1 Src	SRC SELECT	AO1 source value	045
AO1 Val	RO – F16	AO1 source value	049
AO2 Abs	RW – BOOL	AO2 command for activation of absolute value	051
AO2 F cut	RW – UI16	Cutting frequency AO2	282
AO2 Gain	RW – FLOAT	AO2 gain setting	052
AO2 Offs	RW – F16	AO2 offset setting	053
AO2 Src	SRC SELECT	AO2 source value	050
AO2 Val	RO – F16	AO2 source value	054
AO3 Abs	RW – BOOL	AO3 command for activation of absolute value	056
AO3 F cut	RW – UI16	Cutting frequency AO3	283
AO3 Gain	RW – FLOAT	AO3 gain setting	057
AO3 Offs	RW – F16	AO3 offset setting	058
AO3 Src	SRC SELECT	AO3 source value	055
AO3 Val	RO – F16	AO3 source value	059
App FW vers	RO – FLOAT	Firmware version (MMM.mm)	139
AR 1	RW – F16	Analog reference 1	289
AR 2	RW – F16	Analog reference 2	290
AR 3	RW – F16	Analog reference 3	291
AR 4	RW – F16	Analog reference 4	292
ASW1 Inp.A	RO – F16	ASW1 Input A	205
ASW1 Inp.A Src	SRC SELECT	ASW1 source Input A	206
ASW1 Inp.B	RO – F16	ASW1 Input B	207
ASW1 Inp.B Src	SRC SELECT	ASW1 source Input B	208
ASW1 Output	RO – F16	ASW1 Output	209
ASW1 Selector	RO – BOOL	ASW1 selector	203
ASW1 Select Src	SRC SELECT	Source selection ASW1 selector	204
ASW2 Inp.A	RO – F16	ASW2 Input A	212
ASW2 Inp.A Src	SRC SELECT	ASW2 source Input A	213
ASW2 Inp.B	RO – F16	ASW2 Input B	214
ASW2 Inp.B Src	SRC SELECT	ASW2 source Input B	215
ASW2 Output	RO – F16	ASW2 Output	216
ASW2 Selector	RO – BOOL	ASW2 selector	210
ASW2 Select Src	SRC SELECT	Source selection ASW2 selector	211

NAME	TYPE	DESCRIPTION	PIN N°
ASW3 Inp.A	RO – F16	ASW3 Input A	219
ASW3 Inp.A Src	SRC SELECT	ASW3 source Input A	220
ASW3 Inp.B	RO – F16	ASW3 Input B	221
ASW3 Inp.B Src	SRC SELECT	ASW3 source Input B	222
ASW3 Output	RO – F16	ASW3 Output	223
ASW3 Selector	RO – BOOL	ASW3 selector	217
ASW3 Select Src	SRC SELECT	Source selection ASW3 selector	218
ASW4 Inp.A	RO – F16	ASW4 Input A	226
ASW4 Inp.A Src	SRC SELECT	ASW4 source Input A	227
ASW4 Inp.B	RO – F16	ASW4 Input B	228
ASW4 Inp.B Src	SRC SELECT	ASW4 source Input B	229
ASW4 Output	RO – F16	ASW4 Exit	230
ASW4 Selector	RO – BOOL	ASW4 selector	224
ASW4 Select Src	SRC SELECT	Source selection ASW4 selector	225
Aux sup 15V	RO – FLOAT	Voltage aux services + 15V	150
Aux sup -15V	RO – FLOAT	Aux service voltage -15V	152
Aux sup 24V	RO – FLOAT	Voltage aux services + 24V	149
Aux sup 5V	RO – FLOAT	Auxiliary voltage + 5V	151
BCL Ext Lim	RO – F16	Reading of external reference of current limit	167
BCL Ext Lim Src	SRC SELECT	Source selection External current limit reference	164
BCL Int Lim	RW – F16	Internal reference current limit	165
BCL Lim Sel	RO – BOOL	Internal / external limit selection	169
BCL Lim Sel Src	SRC SELECT	Limit selection source selection	166
BCL Output	RO – F16	Output from BCL block	168
BootLd vers	RO – FLOAT	Bootloader version (MMM.mm)	295
Bridge Rev Comp	RW – F16	Bridge inversion compensation percentage	153
BRIDGE TEMP	RO – UI8	Bridge heatsink temperature (°C)	061
Cmd Drive Enable	RO – BOOL	Drive enable request command	286
CNT Signal	RO – BOOL	CNT current logical status (contactor command)	297
Deflux feedb.	RO – F16	Weakening loop feedback	100
Deflux Lp Igain	RW – FLOAT	Deflux loop I gain	076
Deflux Lp Pgain	RW – FLOAT	Deflux loop P gain	075
Deflux setp.	RO – F16	Weakening loop set point	099
DEN Val	RO – BOOL	DEN current logical status	002
Dflx Lp GainSc.	RW - F16	Deflux loop automatic gain scale (minimum value)	368
Dflx Lp SpeedUp	RW - F16	Deflux loop SpeedUp	367
DI1 Delay	RW – UI16	DI1 switching delay	330
DI1 Inv	RW – BOOL	DI1 inversion logical status command	003
DI1 Val	RO – BOOL	DI1 current logical status (after inversion)	004
DI2 Delay	RW – UI16	DI2 switching delay	331
DI2 Inv	RW – BOOL	DI2 inversion logical status command	005
DI2 Val	RO – BOOL	DI2 current logical status (after inversion)	006
DI3 Delay	RW – UI16	DI3 switching delay	332
DI3 Inv	RW – BOOL	DI3 inversion logical status command	007
DI3 Val	RO – BOOL	DI3 current logical status (after inversion)	008
DI4 Delay	RW – UI16	DI4 switching delay	333
DI4 Inv	RW – BOOL	DI4 inversion logical status command	009
DI4 Val	RO – BOOL	DI4 current logical status (after inversion)	010
DI5 Delay	RW – UI16	DI5 switching delay	334
DI5 Inv	RW – BOOL	DI5 inversion logical status command	011
DI5 Val	RO – BOOL	DI5 current logical status (after inversion)	012
DI6 Delay	RW – UI16	DI6 switching delay	335
DI6 Inv	RW – BOOL	DI6 inversion logical status command	013
DI6 Val	RO – BOOL	DI6 current logical status (after inversion)	014
DI7 Delay	RW – UI16	DI7 switching delay	336
DI7 Inv	RW – BOOL	DI7 inversion logical status command	015
DI7 Val	RO – BOOL	DI7 current logical status (after inversion)	016
DI8 Delay	RW – UI16	DI8 switching delay	337

NAME	TYPE	DESCRIPTION	PIN N°
DI8 Inv	RW – BOOL	DI8 inversion logical status command	017
DI8 Val	RO – BOOL	DI8 current logical status (after inversion)	018
DO1 Inv	RW – BOOL	DO1 inversion logical status command	019
DO1 Src	SRC SELECT	DO1 source value	021
DO1 Val	RO – BOOL	DO1 logical status from source	020
DO2 Inv	RW – BOOL	DO2 inversion logical status command	022
DO2 Src	SRC SELECT	DO2 source value	024
DO2 Val	RO – BOOL	DO2 logical status from source	023
DO3 Inv	RW – BOOL	DO3 inversion logical status command	025
DO3 Src	SRC SELECT	DO3 source value	027
DO3 Val	RO – BOOL	DO3 logical status from source	026
DO4 Inv	RW – BOOL	DO4 inversion logical status command	028
DO4 Src	SRC SELECT	DO4 source value	030
DO4 Val	RO – BOOL	DO4 logical status from source	029
DO5 Inv	RW – BOOL	DO5 inversion logical status command	031
DO5 Src	SRC SELECT	DO5 source value	033
DO5 Val	RO – BOOL	DO5 logical status from source	032
DO6 Inv	RW – BOOL	DO6 inversion logical status command	034
DO6 Src	SRC SELECT	DO6 source value	036
DO6 Val	RO – BOOL	DO6 logical status from source	035
DOK Signal	RO – BOOL	DOK current logical status	296
DOL level	RO – F16	Current armature overload level	154
DOL PreAlarm	RO – BOOL	Warning condition with Drive Overload	155
Drive nom.curr.	RO – UI16	Nominal drive current indicator	300
DSP TEMP	RO – UI8	Internal temperature at the DSP (°C)	060
DSR Enable	RW – BOOL	DSR Enabling Drive Stop / Run function	284
DSR Max Stop	RW – UI8	DSR Maximum stop time (sec)	285
DSW1 Inp.A	RO – BOOL	DSW1 Input A	233
DSW1 Inp.A Src	SRC SELECT	DSW1 source Input A	234
DSW1 Inp.B	RO – BOOL	DSW1 Input B	235
DSW1 Inp.B Src	SRC SELECT	DSW1 source Input B	236
DSW1 Output	RO – BOOL	DSW1 Output	237
DSW1 Selector	RO – BOOL	DSW1 selector	231
DSW1 Select Src	SRC SELECT	Source selection DSW1 selector	232
DSW2 Inp.A	RO – BOOL	DSW2 Input A	240
DSW2 Inp.A Src	SRC SELECT	DSW2 source Input A	241
DSW2 Inp.B	RO – BOOL	DSW2 Input B	242
DSW2 Inp.B Src	SRC SELECT	DSW2 source Input B	243
DSW2 Output	RO – BOOL	DSW2 Output	244
DSW2 Selector	RO – BOOL	DSW2 selector	238
DSW2 Select Src	SRC SELECT	Source selection DSW2 selector	239
DSW3 Inp.A	RO – BOOL	DSW3 Input A	247
DSW3 Inp.A Src	SRC SELECT	DSW3 source Input A	248
DSW3 Inp.B	RO – BOOL	DSW3 Input B	249
DSW3 Inp.B Src	SRC SELECT	DSW3 source Input B	250
DSW3 Output	RO – BOOL	DSW3 Output	251
DSW3 Selector	RO – BOOL	DSW3 selector	245
DSW3 Select Src	SRC SELECT	Source selection DSW3 selector	246
DSW4 Inp.A	RO – BOOL	DSW4 Input A	254
DSW4 Inp.A Src	SRC SELECT	DSW4 source Input A	255
DSW4 Inp.B	RO – BOOL	DSW4 Input B	256
DSW4 Inp.B Src	SRC SELECT	DSW4 source Input B	257
DSW4 Output	RO – BOOL	DSW4 Output	258
DSW4 Selector	RO – BOOL	DSW4 selector	252
DSW4 Select Src	SRC SELECT	Source selection DSW4 selector	253
Ext.memo status	RO – UI16	External memory status word	135
Factory reset	RW – BOOL	Factory data reset command	136
FALSE	RO – UI32	Fixed variable to FALSE	000

NAME	TYPE	DESCRIPTION	PIN N°
Fbk FLT Thresh	RW – F16	Percentage of Varm for FBK FLT activation	146
Field Enable	RO – BOOL	Field enable input	124
Field Enab Src	SRC SELECT	Field input source selection	125
Fix 100% SCALE	RO – FLOAT	100% fixed scaling	287
Iarm % SCALE	RO – FLOAT	I armature scaling (%)	095
Iarm AMP SCALE	RO – FLOAT	I armature scaling (A)	094
Iarm fbk ABS	RO – F16	Armature current % (Absolute value)	288
Iarm feedback	RO – F16	I armature loop feedback	091
Iarm loop out	RO – F16	I armature loop output	093
Iarm Lp Igain	RW – FLOAT	Iarm loop I gain	074
Iarm Lp Pgain	RW – FLOAT	Iarm loop P gain	073
Iarm ref	RO – F16	Armature Current reference	310
Iarm ref Src	SRC SELECT	Source selection of current armature reference	311
Iarm setpoint	RO – F16	I armature loop setpoint	090
Iarm unfilt	RO – F16	I armature NOT filtered	092
Ifld % SCALE	RO – FLOAT	Current scaling field (%)	110
Ifld AMP SCALE	RO – FLOAT	Current scaling field (A)	109
Ifld feedback	RO – F16	I field loop feedback	107
Ifld loop out	RO – F16	I field loop output	108
Ifld Lp Igain	RW – FLOAT	Ifield loop I gain	078
Ifld Lp Pgain	RW – FLOAT	Ifield loop P gain	077
Ifld setpoint	RO – F16	I field loop setpoint	106
Int.memo status	RO – UI16	Internal memory status word	134
JOG Enable	RO – BOOL	JOG function enabled	197
JOG Enab Src	SRC SELECT	JOG enable source selection	198
JOG Mode	RW – ENUM	JOG mode	199
JOG Output	RO – F16	Exit from the JOG block	202
JOG Speed	RW – F16	Jog speed	200
JOG time	RW – FLOAT	JOG ramp time (sec)	201
MCL Ext Lim	RO – F16	Reading of external reference of current limit	161
MCL Ext Lim Src	SRC SELECT	Source selection External current limit reference	158
MCL Int Lim	RW – F16	Internal reference current limit	159
MCL Lim Sel	RO – BOOL	Internal / external limit selection	163
MCL Lim Sel Src	SRC SELECT	Limit selection source selection	160
MCL Output	RO – F16	Output from MCL block	162
MOL Alarm	RO – BOOL	MOL Alarm indication	343
MOL Fault	RW – BOOL	MOL FAULT drive enabling	340
MOL level	RO – F16	MOL overload level (%)	341
MOL Time	RW – UI16	MOL Overload time setting at Iarm max	339
MOL Warning	RO – BOOL	MOL Warning Indication	342
MOT Alarm	RO – BOOL	Alarm MOT indication	174
MOT Alarm Delay	RW – UI8	Alarm delay due to motor overtemperature	172
MOT Max Temp	RW – UI8	Alarm threshold motor temperature (°C)	171
Motor Encod.PPR	RW – UI16	TTL encoder PPR resolution	301
Motor FBK sign	RW – BOOL	Sign reverse speed transducer	145
Motor FBK type	RW – ENUM	Feedback transducer type	144
Motor Iarm max	RW – FLOAT	Maximum armature current	338
Motor Iarm nom	RW – FLOAT	Rated armature current	065
Motor Ifld nom	RW – FLOAT	Nominal field current	067
Motor Load	RO – F16	% Load on the motor	097
Motor posit.	RO – FLOAT	Motor position (degrees)	303
Motor Speed base	RW – UI16	Engine base speed	068
Motor Speed max	RW – FLOAT	Maximum motor speed	069
Motor Tacho Kv	RW – FLOAT	Tachogenerator Kv / 1000rpm	070
Motor Varm nom	RW – UI16	Nominal armature voltage	066
Motor Volt	RO – F16	Armature voltage % on Motor Varm nom (filtered and rectified)	098
MOT Sens Fault	RO – BOOL	Motor temp sensor fault indication	175
MOT Sens Type	RW – ENUM	Motor temperature sensor type selection	170

NAME	TYPE	DESCRIPTION	PIN N°
MOT Temp	RO – UI8	Current motor temperature (°C)	176
MOT Warning	RO – BOOL	Warning MOT indication	173
Period fast lp	RO – UI16	Fast cycle time (uSec)	121
Period slow lp	RO – UI16	Slow cycle time (uSec)	123
PML Output	RO – BOOL	PML Output	280
PML Threshold	RW – F16	PML Intervention Threshold	279
Position fbk	RO – F32	Motor angular position (Radiant PiGreco)	302
Ramp Enable	RO – BOOL	Ramp enable input	081
Ramp Enab Src	SRC SELECT	Ramp input source selection	082
Ramp Inp Src	SRC SELECT	Ramp input source selection	080
Ramp Input	RO – F16	Ramp block entry	079
Ramp time 1	RW – FLOAT	Speed ramp time 1 (sec)	083
Ramp time 2	RW – FLOAT	Speed ramp time 2 (sec)	344
Ramp time SW	RO – BOOL	Ramp time selection status	345
Ramp time SW Src	SRC SELECT	Ramp time selection source	346
RDY signal	RO – BOOL	RDY current logical status	138
Restore param	RW – BOOL	Parameter restore command	129
Restore status	RO – UI8	Status restore parameters	132
RSR Enable	RO – BOOL	RSR function enabled	195
RSR Enab Src	SRC SELECT	Selection of RSR enable source	196
RST Input	RO – BOOL	External alarm reset input	126
RST Input Src	SRC SELECT	RST input source selection	127
Save param	RW – BOOL	Parameter save command	128
Save status	RO – UI8	Parameter saving status	131
SOT1 Abs	RW – BOOL	SOT1 command for activation of absolute value	184
SOT1 Output	RO – BOOL	SOT1 Output	185
SOT1 Speed	RW – I16	SOT1 Speed threshold	183
SOT2 Abs	RW – BOOL	SOT2 command for activation of absolute value	187
SOT2 Output	RO – BOOL	SOT2 Output	188
SOT2 Speed	RW – I16	SOT2 Speed threshold	186
Spd Lp GainScale	RW – F16	Speed loop gain scale with speed > 10%	157
Speed % SCALE	RO – FLOAT	Speed scaling (%)	088
Speed fbk	RO – F16	Speed feedback to loop	086
Speed fbk (RPM)	RO – I16	Speed in RPM (filtered)	194
Speed F cut	RW – UI16	Cutting frequency Speed ref	085
Speed loop out	RO – F16	Speed loop output	089
Speed Lp Igain	RW – FLOAT	Speed loop I gain	072
Speed Lp Pgain	RW – FLOAT	Speed loop P gain	071
Speed Lp SpeedUp	RW – F16	Speed loop SpeedUp	156
Speed ref	RO – F16	Ring speed reference	084
Speed Rpm SCALE	RO – FLOAT	Speed scaling (RPM)	087
STS Err (RPM)	RO – I16	STS Speed error in RPM	191
STS Output	RO – BOOL	Speed reached Output	193
STS Speed	RW – I16	Speed threshold reached	192
Tacho F cut	RW – UI16	Frequency cut for the d.c. tachogenerator	148
Tacho offset	RW – F16	Tachogenerator offset adjustment	293
Tacho signal	RO – F16	Tachometer signal in% on the max measurable value ADC	147
Time fast lp	RO – UI16	Fast cycle time (uSec)	122
TRUE	RO – BOOL	Fixed variable to TRUE	001
Varm feedback	RO – F16	Feedback V armature loop	102
Varm loop out	RO – F16	V armature loop output	104
Varm setpoint	RO – F16	Setpoint V armature loop	101
Varm unfilt	RO – F16	V armature NOT filtered	103
VCL Curr Lim 2	RW – F16	Current limit point 2	181
VCL Output	RO – F16	Output from VCL block	182
VCL Speed 1	RW – I16	Speed POINT 1	179
VCL Speed 2	RW – I16	Speed POINT 2	180
VFL12 filt	RO – F16	Field voltage VFL1-VFL2 (filtered)	118

NAME	TYPE	DESCRIPTION	PIN N°
VFL12 unfilt	RO – F16	Field voltage VFL1-VFL2 (unfiltered)	117
VFL freq	RO – UI8	Frequency measured in VFL	120
VL12 filt	RO – F16	Three-phase grid voltage L1-L2 (filtered)	114
VL12 unfilt	RO – F16	Three-phase grid voltage L1-L2 (unfiltered)	111
VL23 filt	RO – F16	Three-phase grid voltage L2-L3 (filtered)	115
VL23 unfilt	RO – F16	Three-phase grid voltage L2-L3 (unfiltered)	112
VL31 filt	RO – F16	Three-phase grid voltage L3-L1 (filtered)	116
VL31 unfilt	RO – F16	Three-phase grid voltage L3-L1 (unfiltered)	113
VL freq	RO – UI8	Frequency measured in VL	119
Volt SCALE	RO – FLOAT	Voltage scaling (V)	105
WARNING 1	RO – UI16	Reports 1st word	064
ZES Output	RO – BOOL	Zero speed Output	190
ZES Speed	RW – I16	Zero speed threshold	189

Table 9: Parameters list → PIN

8 Use of PC software

To configure the drive from the computer it is necessary to be provided with:

1. A PC with Windows operating system.
2. A free USB port on your PC (you can also use a Usb Hub).
3. A type B USB connection cable (like the one used for printers with a USB port).
4. The software to be loaded on the PC to interface with the module (provided by Alter upon request).
5. The driver for the USB connection (if an Internet connection is available, this is not necessary as the drive is Plug & Play and the driver is automatically downloaded).

> ***NOTE**: This manual does not cover the installation of software, drivers, or other PC-related issues that come with the customer. If necessary, you can contact the ALTER technical office. Commissioning assumes that the customer's PC is configured and ready for use.*

8.1 Predispositions

Before setting the parameters in the drive it is mandatory to follow these points:

- Supply the auxiliary power supply on the appropriate terminals (see paragraph 3.2.1 at page 11).
- All the LEDs will light up for 3 seconds (Led Test), then they will switch off.
- Make sure that the writing showing the model is shown on the drive display.
- Connect one end of the USB cable to the "USB" connector on the drive and the other end to a free USB port on the PC.
- If necessary, wait for the time necessary for the PC to install the driver for USB communication.
- Start the programming software on the PC.

8.2 Introduction to PC software

After starting the application on the PC, go to the upper menu and click "File → Open Project", select the project "SerieD-V0200_ENG.pmp". At this point you are in front of 5 zones where you can see different data:

1. At the top we find the "**Toolbar**" with various buttons to perform some functions.
2. On the left side we find the "**Project Tree**" where you can select the various menus ( ) which contain the internal parameters of the drive, the various oscilloscopes ( ) to analyze low-rate signals or recorders ( ) to analyze fast signals.
3. In the lower central part we find the "**Variable Watch**" in which the parameters will be displayed with their value updated in real time, the parameters to be modified and any commands (reset alarms, save parameters, etc.).
4. In the lower right part we find the "**Variable Stimulus**" in which some parameters are already set "Stimulator" as a function of time: for example they can be used to vary the speed signal of the motor with a predetermined temporal frequency (square wave) so that the user can analyze the behavior of the regulation rings and make some corrections. The user can also create other "Stimulators" according to their needs.
5. In the central part we find an area that can change functioning based on the context. In this part we can find:
    1. "**Control Page**": in which you can view the PIN table (identical to the Table 8 from page 58), or the Parameters table (identical to the Table 9 from page 65).
    2. "**Algorithm block description**" in which drawings or instructions appear to facilitate the calibration or to better clarify the meaning of the variables listed in the "Variable Watch" part.
    3. "**Oscilloscope**" in which you see some variables (maximum 8) displayed in graphical form with respect to a time base or with respect to another variable (X-Y chart). The updating of these variables is linked to the bit-rate of the communication between the PC and the module, therefore the variations of fast signals can not be represented.
    4. "**Recorder**" in which you see some variables (maximum 8) displayed in graphical form with respect to a time base or with respect to another variable (X-Y chart). The updating of these variables is linked to the speed of the control cycle (which can be seen in the "Diagnostic" parameter "Period CTRL lp" parameter), so it can also represent variables that change in the order of the micro seconds.

Without going into the details of all the functions of the various menus and buttons, in the next paragraphs we will explain how to use the software on the PC as an alternative to the keypad on the front, to allow a quick commissioning to the user.

8.3 Activation of the communication port

- In the upper menu select “Project → Options”.
- Set the values as in the figure 44.
- Press "OK" to save the changes.
- Press the button “SAVE” ( ) in the "Toolbar" to update the project.
- Press the red button “STOP” ( ) in the "Toolbar" so that the blue outline disappears.
- If the communication between the PC and the drive is correct, no alarm windows should appear on the PC and the message should appear on the lower right edge “*RS232 UART Communication; COMx; Speed=57600*”. The "STOP" button becomes:
- At this point you can continue with the other paragraphs.

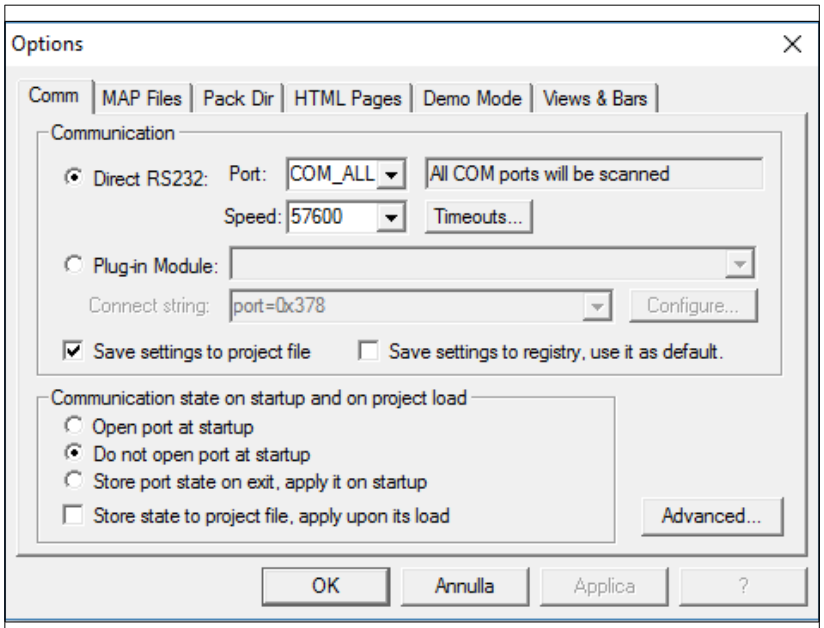


Figure 44: Window "Options"

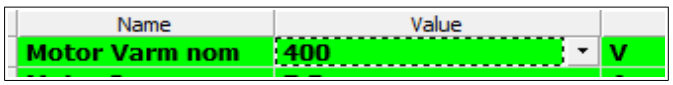
***NOTE:** if the communication takes place correctly (see previous points), but instead of the parameter values in the various menus there are "?", you need to update the parameters mapping with: "Project → Reload Symbol file". After executing this command, wait a few minutes for the transfer from the drive to the PC.*

8.4 How to change values

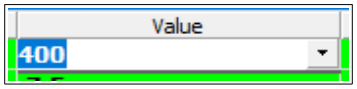
Generally the parameters that can be modified are highlighted with a certain color; instead the parameters with a white background are read-only (ReadOnly).

To change the value, proceed as follows:

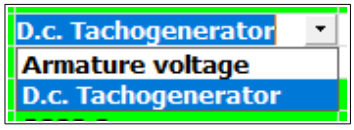
- With the Windows pointer, click once on the value to be changed.
- To the right of the value will appear a gray square with a low arrow: click once on it (see figure at the side).



- At this point two situations can occur:
  1. <u>The value to be modified is highlighted</u>: in this case, a numeric value can be written with the keyboard.



  2. <u>A small window appears with written values</u>: in this case it is mandatory to choose between the listed values.



- When the selection is complete, press ENTER.
- If the value remains written and if no alarm messages appear below left, then the parameter has been accepted and is already operational.

8.5 Navigation in the menus

In the left part called "Project Tree" there is a tree-structured menu similar to the one inside the drive from which you access with the keypad and the front display, so to know the meaning and location of the various parameters you should consult all the paragraph 5 from page 22.

To select a menu or other objects in the "Project Tree" simply click on it with the mouse pointer.

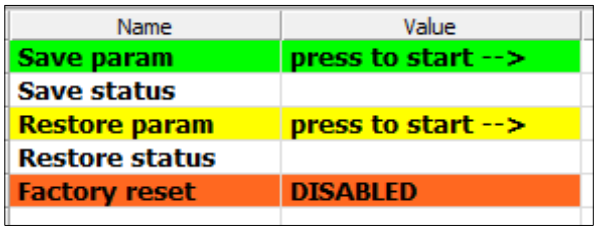
8.6 Saving / Restoring parameters

All the changes made to the parameters remain valid <u>until the power supply to the auxiliary services is lost</u>; if these changes have not been saved (stored) they will be lost and the old data will be found on the next reboot. This feature has the advantage that, in case of accidental modification of one or more parameters, it is sufficient to remove the power supply for a few seconds and then give it back to return to the situation of the last save.

Parameters can be saved / restored **using the appropriate menu on the display integrated with the drive**: see paragraph 5.2 on page 23.

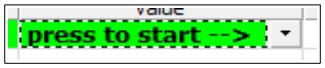
In this section we will see how to store or restore the parameters using the software on the PC.

In the "Project Tree" select the "MEMO PARAMETERS" block: in the "Variable Watch" area, the parameters will appear as shown in the figure at the side.

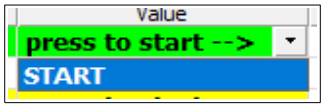


Saving parameters: in the 1st row we find the button to start the "backup" procedure, follow these steps:

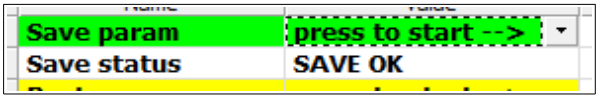
- With the mouse pointer, press the word "press to start →" once in the "Save param" line.
- A gray square will appear (see figure at the side). Press with the mouse pointer on the square.



- The word "START" will appear. Press with the mouse pointer on the writing.



- After a few seconds in the 2nd line the word "SAVE OK" will appear (see figure at the side) if the copy has been completed correctly; otherwise "SAVE ERROR" will appear: in this case, consult the "DIAGNOSTIC" menu to display the parameters "Int.memo status" and "Ext.memo status" containing the codes that can be communicated to ALTER to check the malfunction.



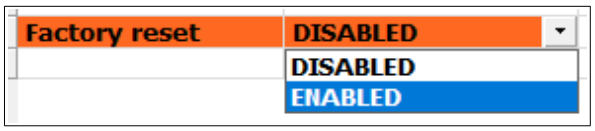
- If the copy has been completed correctly, the power supply to the auxiliary services can also be switched off without risk of losing the values introduced.

Restore parameters of the last saving: in case of accidental modification of some parameters, it is possible to restore the parameters contained in the memories of the drive in two ways:

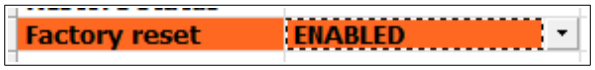
1. Removing power to auxiliary services.
2. With the "Restore param" command of this menu or using the keyboard on the drive front panel: follow the steps listed in the "Save Parameters" procedure explained above, but use the "Restore param" line. The rest of the steps are identical.

Factory reset: in case of need it is possible to restore the factory parameters. Obviously all the changes made during commissioning will be lost. To avoid accidentally a "Factory reset", the procedure to be carried out is more complex:

- With the mouse pointer, press the word "DISABLED" on the orange line once with the words "Factory reset".
- A gray square will appear. Press with the mouse pointer on the square.
- A menu with two entries will appear: DISABLED and ENABLED. Select the "ENABLED" item (see figure alongside).



- At this point a situation must be obtained as shown in the figure at the side.



- Remove the power supply for a few seconds and then reset it.
- At the end of the restart the original parameters will be loaded, but to make them final you must overwrite the previous ones, following the procedure "Saving parameters" in this paragraph.

> ***NOTE**: by obliging the user to follow this factory reset procedure, it is ensured that even in case of unwanted command the previous data will not be lost. In fact, even if the user accidentally made a reset, there is still the possibility of recovering the error: it is enough NOT to save the restored parameters, remove and restore the auxiliary power supply to find the previous parameters again.*

8.6.1 Parameter transfer from the drive to the PC

You can transfer parameters from the drive to the PC and save them on the HD for archiving or to restore them in case of replacement. With the following procedure all the parameters currently in use will be transferred (ie those displayed in the various menus) that could also be different from those stored in the memory:

1. In the programming software, click on the upper menu "Tools → S-Record Transfer". A window will appear divided into four zones with set values or buttons to be pressed.
2. Verify that everything is set up as shown in the following figure (except "address used"):

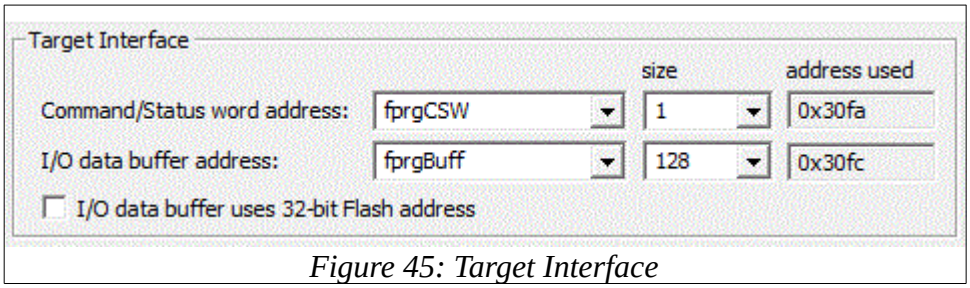


Figure 45: Target Interface

3. Verify that the bottom part is all set as shown in the following figure:

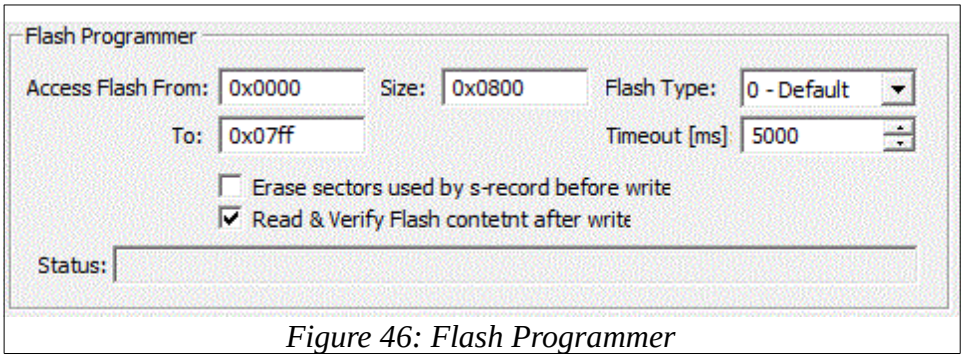


Figure 46: Flash Programmer

4. Press the "Read Flash ..." button at the bottom left. A window will open that displays the data download phase.
5. After a few moments, another window will appear asking you where to save the file.
6. We recommend that you create an "ALTER" folder in "C:" and assign a name to the data set that can then be easily identified. In this example we will call it "Prova_001.srec".
7. Press "Close & Save Settings" at the bottom right to close the window.

NOTE: the parameters downloaded and stored on the PC HD can be used only to be transferred within the same product with the procedure explained in the next paragraph. It is forbidden to edit the file or transfer the parameters of another product: the drive notices this error and blocks the transfer.

8.6.2 Parameter transfer from the PC to the drive

The parameters that have been memorized on the PC with the procedure of the previous paragraph, can be transferred to the drive with the following points:

1. In the programming software, click on the upper menu "Tools → S-Record Transfer". A window will appear divided into four zones with set values or buttons to be pressed.
2. Make sure the top is all set as in Figure 45 and in the lower part as in the figure 46.
3. In the central part "Input file" press the button on the right " ... " and select the file to transfer to the drive: for example, we transfer the data set stored in the previous paragraph. A situation similar to that of the following figure should be obtained:

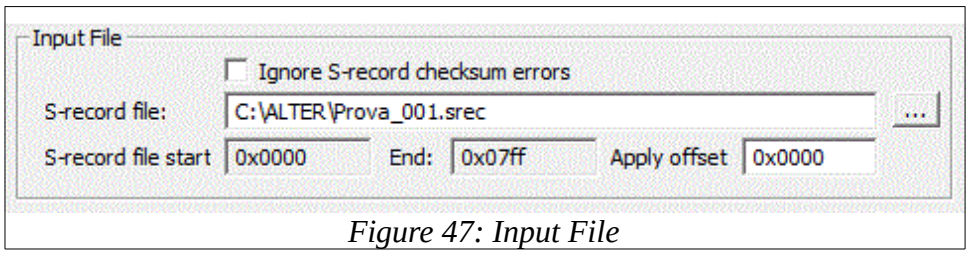


Figure 47: Input File

4. Press the "Write Flash" button at the bottom center: a window will appear showing the progress of the data transfer phase.
5. If the transfer is made without errors, you will see the writing "Flash Write operation finished successfully" in the "Status:" line.
6. Press "Close & Save Settings" at the bottom right to close the window.
7. The new parameters are already available in the drive and can be checked by selecting the various menus in the "Project Tree". To make them final you must save them in the internal memory of the module following the procedure

indicated in paragraph 8.6 on page 62, otherwise the last parameters that were stored internally will be returned the next time the drive is restarted.

NOTE: *the parameters downloaded and stored on the PC HD can be used only to be transferred within the same type of product. It is forbidden to edit the file or transfer the parameters of another product: the module notices this error and blocks the transfer.*

9 Alarm messages (Fault)

Alarm messages have the highest display priority compared to all other messages that may appear on the front display.

The presence of an alarm message is indicated by:

1. Fast flashing of the red LED FLT.
2. The digital output DOK goes to the logic level ZERO.
3. The drive removes the power supplies to the motor and it stops by inertia.

The alarm messages that can appear are the following:

9.1 Anti BackLash data error

This alarm appears only with the ABL function active (see paragraph 5.5.1.5 on page 35).

Cause:

- Disturbances on the communication bus between master and slave that prevent data exchange correctly.
- Incorrect setting of operation as a master or as a slave.
- Bus connection cable connected incorrectly.
- Bus connection cable interrupted.

Solution:

- Use a shielded cable with two twisted wires and connect the shield to the appropriate terminal.
- The drive receiving commands and signals from the CNC must be set to MASTER, the other must be set to SLAVE.
- Check the connection of the cable from both ends, it must be as indicated in the paragraph 3.2.5 on page 15).

9.2 Anti BackLash Slave fault

This alarm appears only with the ABL function active (see paragraph 5.5.1.5 on page 35).

Cause:

- The Slave drive is in an alarm condition.

Solution:

- Check the display of the slave drive for the cause of the alarm and correct it.

9.3 Anti BackLash Speed error

This alarm appears only with the ABL function active (see paragraph 5.5.1.5 on page 35).

Cause:

- The two master and slave motors are not mechanically coupled.
- The speed signal from the transducer of one of the two motors, has disturbances or electrical problems.
- The slave motor rotates in the opposite direction from the master.
- The alarm threshold set with parameter “*ABL spd err thr*” is too low.

Solution:

- Mount the two motors on the same rack to mechanically couple them.
- Check the connection cables of the transducer to the drive.
- If the slave motor rotates in the opposite direction to the master, the "*ABL slave dir.*" parameter must be used to reverse the direction (see paragraph 5.5.1.5 on page 35).
- Increase the parameter “*ABL spd err thr*” until the alarm signal is eliminated (see paragraph 5.5.1.5 on page 35).

9.4 Armature Over Current

Cause:

- Overcurrent in the motor armature.

Solution:

- Check the insulation of the connections between drive and motor armature terminals.
- Check the insulation of the armature windings inside the motor.

- If the alarm has appeared during commissioning, it may depend on a too high value of the time constants of the reinforcement ring. Gradually reduce the gains shown in the paragraph 5.5.4 on page 45.

9.5 Auxiliary Supply Fault

Cause:

- Auxiliary internal power supplies out of tolerance.
- Internal drive failure.

Solution:

- Disconnect the connectors X1, X2, X3, X4, X5, X6 and after having reset the alarm, reconnect them one by one to check which one generates the fault.
- If the alarm is always present after disconnecting all the connectors indicated in the previous point, the PC can be used (see paragraph 8 on page 66) to display the "DIAGNOSTIC" menu and check that the following parameters are in the indicated range:
  - *Aux sup 24V*: between 22V and 27V
  - *Aux sup 15V*: between 14V and 16V
  - *Aux sup 5V*: between 4.5V and 6V
  - *Aux sup -15V*: between -14V and -16V

If anomalies are found, notify ALTER technical service to arrange the repair.

9.6 Bridge over temperature

Cause:

- Over-temperature of the thyristor bridge.

Solution:

- Check the fan operation (if present): it must be in rotation when the auxiliary services are present.
- Check the cooling air inlet / outlet slots: they must not be obstructed.
- Check the ambient temperature in which the drive is located: it must be less than 40° C.
- Check the heat-sink fitted inside the drive: it must be clean, without traces of emulsified oil, dust or other foreign material.
- The "Bridge Temp" parameter can be checked on the drive display (see paragraph 5.4.3 on page 30): the indicated temperature must not exceed 85° C.

9.7 Digital Output Overload

Cause:

- Overload on one or more digital outputs (see paragraph 3.2.7 on page 16).

Solution:

- Disconnect the wires connected to the digital outputs and after having reset the alarm, reconnect one by one to check which fault is generated.
- In the case of capacitive loads driven by the digital outputs, it may be necessary to connect a 100Ω ½Watt resistor in series with the wire.

9.8 Drive Overload

Cause:

- Converter in overload condition. The armature current exceeds the rated value of the drive and lasts over time.

Solution:

- Reduce the load on the motor shaft. The drive allows a current overload in the armature bridge of + 33% for a maximum time of 60 seconds. This maximum time is proportional to the magnitude of the overload: for example with overload + 15% the maximum time becomes 132 seconds. You can check the magnitude of the current overload with the "DOL level" parameter (see paragraph 5.5.1.8 on page 38).
- Reduce the "Motor Iarm max" parameter (see paragraph 5.1.1 on page 22) at a value less than or equal to the rated armature current of the drive indicated on the nameplate (see figure 1 on page 7): remember that this parameter can not fall below "*Motor Iarm nom*" so it may be necessary to reduce this last value as well.

9.9 Fault bridge NTC sensor

Cause:

- The internally mounted thyristor bridge temperature sensor is faulty.

Solution:

- Notify the ALTER technical service to arrange the repair.

9.10 Fault internal I2c bus

Cause:

- Internal drive failure.

Solution:

- Remove all power supplies from the drive; after a few seconds restore the power supply to the auxiliary services and check if the alarm message has disappeared.
- If the message continues to persist, notify the ALTER technical service to arrange the repair.

9.11 Fault Motor temp sensor

Cause:

- The temperature sensor mounted inside the motor is faulty.
- The connection cable to the temperature sensor has been interrupted.
- Wrong setting of the temperature sensor type.

Solution:

- Check the functioning of the temperature sensor in the motor.
- The type of sensor mounted in the motor selected with the "MOT Sens Type" parameter (see paragraph 5.5.1.13 on page 41). This alarm appears only if the type: "NTC 10KΩ" or "KTY 84" is selected. In this case, check the electrical circuit connecting the motor temperature sensor to the drive: it must not be interrupted or short-circuited (see figure 3 on page 11 or figure 4 on page 12).

9.12 Feedback Fault

Cause:

- Lack or inversion of polarity of the signal from the speed transducer mounted in the motor.

Solution:

- If the motor starts spinning before displaying this alarm, check:
  - When the drive is first enabled during commissioning: reset the alarm, change the parameter "*Motor FBK sign*" (see paragraph 5.1.1 on page 22) and try again to enable the operation.
  - Polarity, continuity and isolation of the connections and the windings of the tachometer dynamo or of the encoder.
- If the motor does not start moving before displaying this alarm, check:
  - Polarity, continuity and isolation of the connections and the motor windings.
  - Motor brushes.
- If it appears occasionally or during a strong speed variation:
  - In the case of small motors with particularly high armature winding resistance, you can try to increase the value of the "Fbk FLT Thresh" parameter a little at a time (see paragraph 5.5.7 on page 47) until the alarm stops appearing.
  - Tachogenerator and motor brushes.
  - Coupling between motor and transducer.
  - Wiring of the tachogenerator or encoder: the cable must be shielded and the cable must be connected to earth on both sides.
  - Check the welding of wires in connector X3, in the case of an encoder.

9.13 Field NO Current

Cause:

- No field current in the motor or less than the one set in the "*Motor Ifld nom*" parameter.

- An attempt was made to enable the armature bridge without enabling the field bridge.
- The "*Motor Ifld nom*" parameter setting is incorrect.
- The supply voltage at terminals FL1 and FL2 is too low to obtain the required field current.

Solution:

- Check the connection of the field power cables to terminals F0 and F1. If necessary, disconnect them from the terminals and with an ohmmeter measure the continuity of the circuit between the two wires.
- Check that the field windings inside the motor are not interrupted.
- The field bridge enable command (*Field Enable*) MUST NOT arrive after the DEN enable command. Check how the field bridge is enabled with the "*Field Enab Src*" parameter (see paragraph 5.5.7.1 on page 47).
  - **NOTE:** if the field bridge is not used (permanent magnet motors or field power supply with external object), the above parameter must be set to the value FALSE.
- Check the "*Motor Ifld nom*" parameter (see paragraph 5.1.1 on page 22) which is equal to the value of the field current written on the motor nameplate.
- Check the voltage between terminals FL1 and FL2 with an AC voltmeter. The output voltage between terminals F0 and F1 must be $V_F = R_F \times I_F$ (with R_F = field winding resistance, I_F = field current motor plate). From this it is possible to calculate the minimum voltage that must be present between the FL1 and FL2 terminals: $V_{FL} = V_F \times 1{,}12$.

9.14 Field Over Current

Cause:

- Over-current in the motor field.

Solution:

- Check the insulation of the connections between the drive and the motor field terminals.
- Check the insulation of the field windings inside the motor.
- If the alarm has appeared during commissioning, it may depend on a too high value of the time constants of the field loop. Gradually reduce the gains shown in the paragraph 5.5.6 on page 46.

9.15 FL1 / FL2 fault

Cause:

- Problem with single-phase power supply on terminals FL1, FL2.
- The drive enable command (DEN input) was given before the single-phase power supply was connected to terminals FL1, FL2.

Solution:

- Check the presence of the single-phase voltage between terminals FL1, FL2: the value must be as shown on the drive nameplate (see figure 1 on page 7) and the frequency must be 50 Hz or 60 Hz.
- The DEN enable command must be sent when the single-phase voltage FL1, FL2 is present.
- If the field bridge is not used, then the FL1 and FL2 terminals are not connected, the field bridge enable command must be deactivated by setting the "*Field Enab Src*" parameter = FALSE (see paragraph 5.5.7.1 on page 47).

9.16 L1 / L2 / L3 fault

Cause:

- Problem with the three-phase power supply on terminals L1, L2, L3.
- The drive enable command (DEN input) was given before the three-phase power supply was connected to terminals L1, L2, L3.

Solution:

- Check the presence of the three-phase voltage between terminals L1, L2, L3: the value must be as shown on the drive nameplate (see figure 1 on page 7) and the frequency must be 50 Hz or 60 Hz.
- The DEN enable command must be sent when the three-phase line contactor is already closed and the three-phase voltage L1, L2, L3 is present. You can use the RDY signal to verify all this.

9.17 Motor over load

Cause:

- Motor in overload condition. The armature current exceeds the nominal one of the motor and lasts over time.

Solution:

- Reduce the load on the motor shaft. The current in the motor can exceed the nominal current for a set time, after which the drive can go into alarm (if activated). This maximum time is proportional to the magnitude of the overload. You can check the magnitude of the current overload with the "MOL level" parameter (see paragraph 5.5.1.12 on page 40).
- Reduce the "*Motor Iarm max*" parameter (see paragraph 5.1.1 on page 22) until it is equal to the nominal armature current of the motor set with the parameter "*Motor Iarm nom*".
- Increase the overload time tolerated with the "*MOL Time*" parameter (see paragraph 5.5.1.12 on page 40).

9.18 Motor over temperature

Cause:

- The motor is overheated.
- The connection cable to the temperature sensor has been interrupted.

Solution:

- Check the operation of the engine ventilation.
- Check the electrical circuit connecting the motor temperature sensor to the drive: it must not be interrupted (see figure 3 on page 11 or figure 4 on page 12).
- This alarm depends on the MOT function (see paragraph 41 on page 41): takes place simultaneously with the "*MOT Alarm*" signal switching. From this menu it is possible to disable the generation of this alarm or increase the tolerated time for overheating ("*MOT Alarm Delay*" parameter), or with some sensor types it is possible to increase the protection trip threshold ("*MOT Max Temp*" parameter).

9.19 OverRun main loop

Cause:

- The microprocessor's slow cycle time has exceeded the maximum threshold.

Solution:

- Remove power to the auxiliary services for a few seconds and then restore it.
- Check the "Period MAIN lp" parameter (see paragraph 5.4.3 on page 30): it must not exceed 50000 µS.
- If the problem persists, inform ALTER technical service to arrange the repair.

10 Warning messages (Warning)

The warning messages have the intermediate priority of display with respect to all the other writings that may appear on the front display.

The presence of a message is indicated by:

1. Fast flashing of the red LED FLT.
2. The digital output DOK does not change its logical state.
3. If the drive was enabled (DEN command present), it continues to supply the motor regularly.

The warning messages that can appear are the following:

10.1 DmaTrigger Funct error

Problem inside the drive. Contact ALTER technical assistance.

10.2 Memory Flash not protect

Cause:

- The internal memory is not protected.

Solution:

- Notify the ALTER technical service to arrange the repair.

10.3 Missing motor parameters

Cause:

- The drive has received the enable command (DEN input) but the motor parameters have not been entered.

Solution:

- Reset the message and enter ALL the parameters required for the motor. See paragraph 4.4 on page 18.

10.4 Motor over load

Cause:

- Motor in overload condition. The armature current exceeds the nominal one of the motor and lasts over time.

Solution:

- Reduce the load on the motor shaft. The current in the motor can exceed the nominal current for a set time, after which the drive can go into alarm (if activated). This maximum time is proportional to the magnitude of the overload. You can check the magnitude of the current overload with the "MOL level" parameter (see paragraph 5.5.1.12 on page 40).
- Reduce the "*Motor Iarm max*" parameter (see paragraph 5.1.1 on page 22) until it is equal to the nominal armature current of the motor set with the parameter "*Motor Iarm nom*".
- Increase the overload time tolerated with the "*MOL Time*" parameter (see paragraph 5.5.1.12 on page 40).

10.5 Motor over temperature

Cause:

- The motor is overheated: the maximum temperature threshold has just been exceeded.
- The connection cable to the temperature sensor has been interrupted.

Solution:

- Check the operation of the engine ventilation.
- Check the electrical circuit connecting the motor temperature sensor to the drive: it must not be interrupted (see figure 3 on page 11 or figure 4 on page 12).
- This message depends on the MOT function (see paragraph 5.5.1.13 on page 41): the display of this message is a "pre-alarm" and occurs simultaneously with the "*MOT Warning*" signal switching. From this menu it is possible to deactivate the generation of this signal or with some sensor types it is possible to increase the protection trip threshold ("*MOT Max Temp*" parameter).

10.6 OverRun ctrl loop

Cause:

- The microprocessor control cycle time has exceeded the maximum threshold.

Solution:

- Remove power to the auxiliary services for a few seconds and then restore it.
- Check the "*Time CTRL lp*" parameter (see paragraph 5.4.3 on page 30): it must not be greater than 100 µS.
- If the problem persists, inform ALTER technical service to arrange the repair.

10.7 Vab ADC limit (AnB6/7)

Cause:

- The output voltage at terminals A and B has reached too high a value and saturated the input of the A / D converter in the microprocessor.

Solution:

- If the message appears occasionally with the drive enabled, it may depend on a setting of the gain of the armature current ring too high (see paragraph 5.5.4 on page 45).
- If the message appears fixed even when the drive is disabled, notify the ALTER technical service to arrange the repair.

10.8 Vfl12 ADC limit (AnA4/5)

Cause:

- The supply voltage between terminals FL1 and FL2 has reached a value that is too high and has saturated the input of the A / D converter in the microprocessor.

Solution:

- Check with an oscilloscope the voltage between terminals FL1 and FL2: there must be no spikes or disturbances coming from the power supply line. In these cases it may be useful to install a single-phase filter.
- If necessary, you can also use the PC connected to the USB port of the drive (see paragraph 8 on page 66) to analyze the voltage between FL1 and FL2 with the "Diagnostic → Field 1ph Line (FL1, FL2)" menu.
- If after resetting the message it appears again, notify the ALTER technical service to arrange the repair.

10.9 Vl12 ADC limit (AnA2/3)

Cause:

- The supply voltage between terminals L1 and L2 has reached a value that is too high and has saturated the input of the A / D converter in the microprocessor.

Solution:

- Check with an oscilloscope the voltage between terminals L1 and L2: there must be no spikes or disturbances coming from the supply line. In these cases it may be useful to install a three-phase filter.
- If necessary, you can also use the PC connected to the USB port of the drive (see paragraph 8 a pag.66) to analyze the voltage between L1 and L2 with the "Diagnostic → Armature 3ph Line (L1, L2, L3)" menu.
- If after resetting the message it appears again, notify the ALTER technical service to arrange the repair.

10.10 Vl23 ADC limit (AnB4/5)

Cause:

- The supply voltage between terminals L2 and L3 has reached a value that is too high and has saturated the input of the A / D converter in the microprocessor.

Solution:

- Check with an oscilloscope the voltage between terminals L2 and L3: there must be no spikes or disturbances coming from the power supply line. In these cases it may be useful to install a three-phase filter.
- If necessary, you can also use the PC connected to the USB port of the drive (see paragraph 8 on page 66) to analyze the voltage between L2 and L3 with the "Diagnostic → Armature 3ph Line (L1, L2, L3)" menu.
- If after resetting the message it appears again, notify the ALTER technical service to arrange the repair.

11 Popup message (Popup)

Pop-up messages have the lowest display priority compared to all other text that may appear on the front display.

The presence of a message is indicated by:

1. The red LED FLT remains off.
2. The digital output DOK does not change its logical state.
3. If the drive was enabled (DEN command present), it continues to supply the motor regularly.

The popup messages that can appear are the following:

11.1 Drive Overload

Cause:

- Converter in overload condition: the drive continues to run regularly but if the load on the motor is not reduced it could go into alarm condition. The armature current exceeds the rated value of the drive and lasts over time.

Solution:

- Reduce the load on the motor shaft. The drive allows a current overload in the armature bridge of + 33% for a maximum time of 60 seconds. This maximum time is proportional to the magnitude of the overload: for example with overload + 15% the maximum time becomes 132 seconds. You can check the magnitude of the current overload with the "*DOL level*" parameter (see paragraph 5.5.1.8 on page 38).
- Reduce the "Motor Iarm nom" parameter (see paragraph 5.1.1 on page 22) at a value less than or equal to the rated armature current of the drive indicated on the nameplate (see figure 1 on page 7).

11.2 Erase memo Error

Cause:

- Error during memory deletion started from the keyboard or PC.

Solution:

- Remove the external MEM memory, resend the memory erase start command.
- View the parameters "Int.memo status" and "Ext.memo status" from the menu at paragraph 5.4.3 on page 30, notify the ALTER technical service to interpret the error codes and clarify the cause.

11.3 Erase memo OK

Cause:

- Memory deletion initiated by the keyboard or PC has been POSITIVE.

Solution:

- None: wait 2 seconds and the message will disappear.

11.4 Nothing to Restore

Cause:

- Attempt to restore parameters from an EMPTY (external or internal) memory.

Solution:

- None: wait 2 seconds and the message will disappear.

11.5 Restore parameters Error

Cause:

- Error during parameter restore started from the keyboard or PC.

Solution:

- Remove the external MEM memory, resend the command to restore parameters.
- View the parameters "Int.memo status" and "Ext.memo status" from the menu at paragraph 5.4.3 on page 30, notify the ALTER technical service to interpret the error codes and clarify the cause.

11.6 Restore parameters OK

Cause:

- Parameter restore initiated by the keyboard or PC has been POSITIVE.

Solution:

- None: wait 2 seconds and the message will disappear.

11.7 Save parameters Error

Cause:

- Error while saving the parameters started from the keyboard or from the PC.

Solution:

- Remove the external MEM memory, re-issue the parameter save start command.
- View the parameters "Int.memo status" and "Ext.memo status" from the menu at paragraph 5.4.3 on page 30, notify the ALTER technical service to interpret the error codes and clarify the cause.

11.8 Save parameters OK

Cause:

- Parameter saving started from the keyboard or PC has been POSITIVE.

Solution:

- None: wait 2 seconds and the message will disappear.

ALTER Elettronica s.r.l.

Via Ezio Tarantelli 7 (Z.I.)
15033 Casale Monferrato (AL)
ITALY

Tel. +39 0142 77337 (r.a.)

Fax. +39 0142 453960

Internet: http://www.alterelettronica.it

email: info@alterelettronica.it