EVDRIVE06

Electronic expansion valves drivers

ENGLISH

USER MANUAL ver. 1.0

CODE 144EPD6E104

Important

Important

Read this document carefully before installing and using the device and follow all the additional information; keep this document close to the device for future consultations.

The following symbols support the reading of the document:

- it indicates a suggestion
- ⚠ it indicates an additional information.

The device must be disposed according to the local legislation about the collection for electrical and electronic equipment.

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1 INTRODUCTION

1.1 Introduction

The drivers of the EVDRIVE06 series are devices studied for the management of bipolar stepper electronic expansion valves.
They are available in built-in and blind version (according to the model).
The user interface of the built-in versions consists of a LCD graphic display, of six buttons and guarantees an index of protection IP40.
The blind versions must be used with a remote user interface.
They can be powered both in alternating and in direct current (24 VAC/DC).
The drivers can work with the most common temperature probes (NTC and Pt 1000) and with the most common pressure transducers (0-20 mA, 4-20 mA, 0-5 V ratiometric and 0-10 V).
They have configurable digital inputs (enable the operation, change parameters set, backup module status, etc.) and a 5 res. A @ 250 VAC digital output (electromechanical relay) configurable as alarm output, solenoid valve or resynchronization valve.
Through the USB port it is possible to make the upload and the download of the configuration parameters (using a common USB flash drive); through this port (or the RS-485 one), it is also possible to connect the devices to the set-up software system Parameters Manager (through a serial interface).
Through the CAN communication port (or the RS-485 one) it is possible to connect the devices to a controller or to a remote user interface instead.
Through the backup module EPS4B it is finally possible to close the valve in case of lack of power supply of the drivers.
Installation is on DIN rail.
Among the several functions one highlights the possibility to work both in stand alone mode and under the supervision of a controller, the management both of generic electronic expansion valves and of the most common valves Sporlan, Alco, Danfoss, Sanhua, Castel and the management of the backup probes.

1.2 Summarizing table of the main features and available models

The following table shows the main features of the devices and the available models.
The character " / " means the feature can be set through a configuration parameter.

Version (according to the model)				
built-in LCD				•
blind	•	•	•	
User interface				
71.0 x 128.0 mm (2.795 x 5.039 in; L x H), 4 DIN modules	•	•	•	•
128 x 64 pixel single colour (black with rearlighting through white LEDs) LCD graphic display				•
number of buttons				6
index of protection	IP20 IP40 the front	IP20 IP40 the front	IP20 IP40 the front	IP20 IP40 the front
Main connections				
extractable screw terminal blocks	•	•	•	•
Power supply				
24 VAC or 24... 37 VDC	•	•	•	•
Analog inputs				
analog input 1 (suction temperature backup probe / suction pressure backup probe)	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V
analog input 2 (suction temperature backup probe / suction pressure backup probe)	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V	NTC / Pt 1000 / 0-20 mA / 4-20 mA / 0-5 V
analog input 3 (suction temperature probe)	NTC / Pt 1000	NTC / Pt 1000	NTC / Pt 1000	NTC / Pt 1000

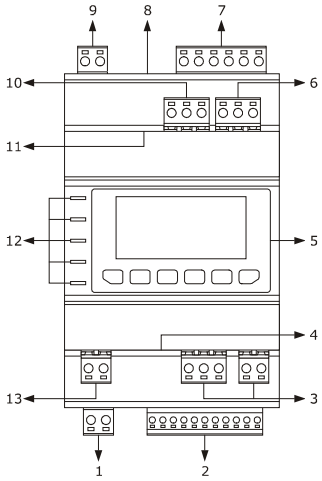
analog input 4 (suction pressure probe)	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V
Free of voltage digital inputs				
digital input 1 (enable the operation / change parameters set / resynchronization command / backup module status)	•	•	•	•
digital input 2 (enable the operation / change parameters set / resynchronization command / backup module status)	•	•	•	•
High voltage digital inputs				
on-off switching (enable the operation / change parameters set / resynchronization command / backup module status)		•	•	•
Digital outputs (electromechanical relays; res. A @ 250 VAC)				
digital output 1 (alarm output / solenoid valve / resynchronization valve)	5 A	5 A	5 A	5 A
Communication ports				
CAN port with CANBUS communication protocol		•	•	•
RS-485 port with MODBUS communication protocol			•	•
USB port	•	•	•	•
Codes				
codes	EPD4BX6	EPD4BC6	EPD4BF6	EPD4DF6

For further information look at chapter 11 “TECHNICAL DATA”; for further models please contact the EVCO sales network.

2 DESCRIPTION

2.1 Description

The following drawing shows the aspect of EVDRIVE06.



The following table shows the meaning of the parts of EVDRIVE06.

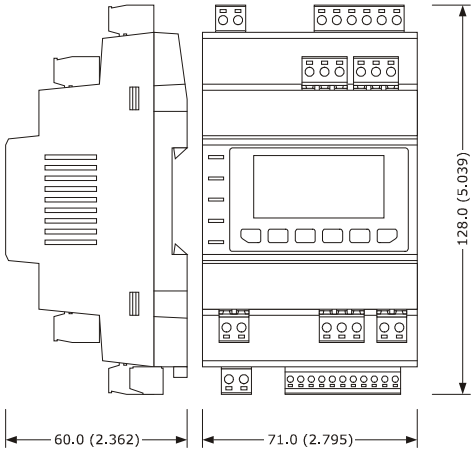
Part	Meaning
1	digital output
2	analog inputs and free of voltage digital inputs
3	CAN port (not available in model EPD4BX6)
4	CAN port line termination (not available in model EPD4BX6)
5	display and keyboard (not available in models EPD4BX6, EPD4BC4 and EPD4BF6)
6	reserved
7	bipolar stepper motor output
8	USB port
9	power supply
10	RS-485 port (not available in models EPD4BX6 and EPD4BC4)
11	RS-485 port line termination (not available in models EPD4BX6 and EPD4BC4)
12	signalling LEDs
13	high voltage digital input (not available in model EPD4BX6)

For further information look at the following chapters.

3 SIZE AND INSTALLATION

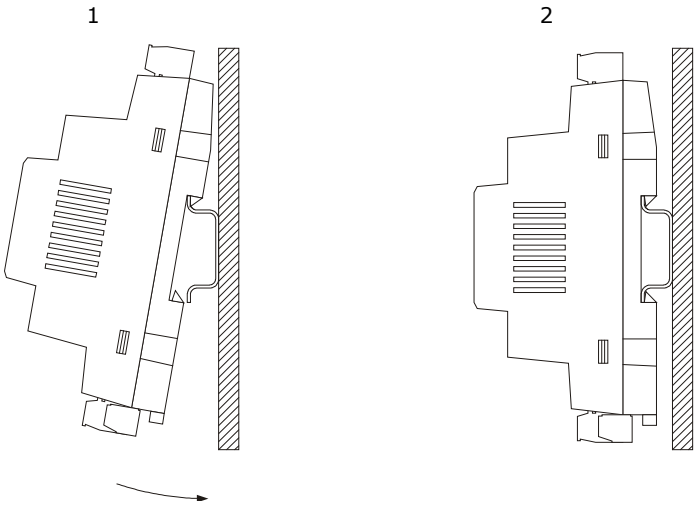
3.1 Size

The following drawing shows the size of EVDRIVE06 (4 DIN modules); size in mm (in).

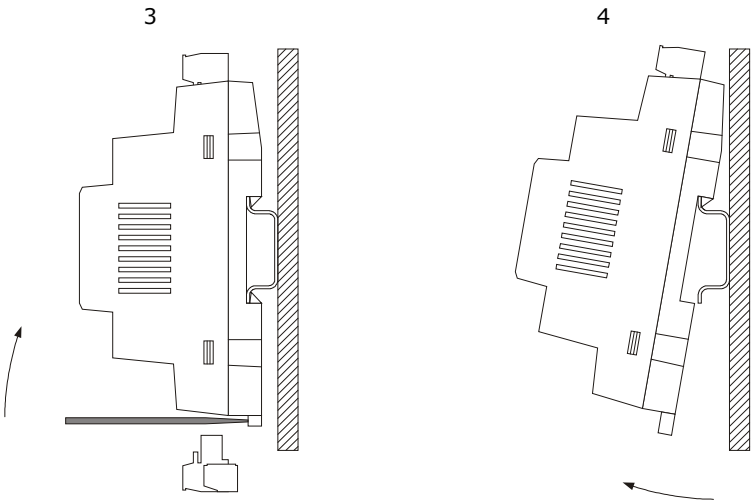


3.2 Installation

On DIN rail 35.0 x 7.5 mm (1.377 x 0.295 in) or 35.0 x 15.0 mm (1.377 x 0.590 in).
To install the device operate as shown in the following drawing.



To remove the device remove possible extractable screw terminal blocks plugged at the bottom first, then operate on the DIN rail clips with a screwdriver as shown in the following drawing.



To install the device again press the DIN rail clips to the end first.

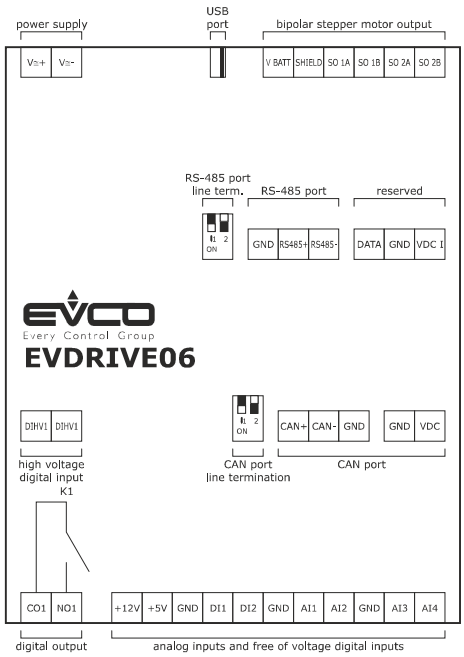
3.3 Additional information for the installation

- make sure the working conditions of the device (operating temperature, operating humidity, etc.) are in the limits indicated; look at chapter 11 "TECHNICAL DATA"
- do not install the device close to heating sources (heaters, hot air ducts, etc.), devices having big magnetos (big speakers, etc.), locations subject to direct sunlight, rain, humidity, dust, mechanical vibrations or bumps
- according to the safety legislation, the protection against possible contacts with the electrical parts must be ensured by a correct installation of the device; all the parts which ensure the protection must be fixed so that you can not remove them if not by using a tool.

4 ELECTRICAL CONNECTION

4.1 Meaning of the connectors

The following drawing shows the connectors of EVDRIVE06.



The following tables show the meaning of the connectors; for further information look at chapter 11 "TECHNICAL DATA".

Digital output

Electromechanical relay.

Terminal	Meaning
CO1	common digital output
NO1	normally open contact digital output

Analog inputs and free of voltage digital inputs

Part	Meaning
+12V	power supply 0-20 mA/4-20 mA/0-10 V transducers (12 VDC ±10%, 60 mA max.)
+5V	power supply 0-5 V ratiometric transducers (5 VDC ±5%, 40 mA max.)
GND	ground analog inputs and free of voltage digital inputs
DI1	digital input 1 (non optoisolated free of voltage contact; 5 V when not loaded, 3.3 mA when loaded)
DI2	digital input 2 (non optoisolated free of voltage contact; 5 V when not loaded, 3.3 mA when loaded)

GND	common analog inputs and free of voltage digital inputs
AI1	analog input 1 (which can be set via configuration parameter for NTC/Pt 1000 probes and for 0-20 mA/4-20 mA/0-5 V ratiometric transducers)
AI2	analog input 2 (which can be set via configuration parameter for NTC/Pt 1000 probes and for 0-20 mA/4-20 mA/0-5 V ratiometric transducers)
GND	common analog inputs and free of voltage digital inputs
AI3	analog input 3 (which can be set via configuration parameter for NTC/Pt 1000 probes)
AI4	analog input 4 (which can be set via configuration parameter for 0-20 mA/4-20 mA/0-5 V ratiometric/0-10 V transducers)

CAN port (not available in model EPD4BX6)

Non optoisolated CAN port, with CANBUS communication protocol.

Terminal	Meaning
CAN+	signal +
CAN-	signal -
GND	ground

- the maximum number of devices that can make a CAN network (32) depends on the bus load; the bus load depends on the baud rate of the CANBUS communication and on the kind of device in the network (for example: a CAN network can be made of a programmable controller, of four I / O expansions and of four user interfaces with baud rate 500,000 baud)

⚠
- connect the CAN port using a twisted pair
- do not connect more than four I / O expansions.

For the settings about the CAN port look at chapter 7 "CONFIGURATION".

Terminal	Meaning
GND	ground
VDC	power supply remote user interface (22... 35 VDC, 100 mA max.)

CAN port line termination (not available in model EPD4BX6)

Position microswitch 2 on position on (120 Ω, 0.25 W) to plug in the CAN port line termination (plug in the termination of the first and of the last element of the network).

Reserved

Reserved.

Bipolar stepper motor output

Terminal	Meaning
V BATT	backup power supply input
SHIELD	common bipolar stepper motor shielded cable
SO 1A	bipolar stepper motor coil 1
SO 1B	bipolar stepper motor coil 1
SO 2A	bipolar stepper motor coil 2
SO 2B	bipolar stepper motor coil 2

With reference to the previous table, the following one shows how to connect to EVDRIVE06 the most common electronic expansion valves Sporlan and Alco.

Terminal	Wire (color)			
	Sporlan SER, SEI, SEH and ESX	**Alco EXM/EXL-246**	**Alco EX4, EX5, EX6, EX7 and EX8**	**Danfoss ETS**
SO 1A	green wire	blue wire	blue wire	green wire
SO 1B	red wire	yellow wire	brown wire	red wire
SO 2A	black wire	white wire	white wire	white wire
SO 2B	white wire	orange wire	black wire	black wire

USB port

USB port.

Power supply

Terminal	Meaning
V≅+	power supply device (not isolated; 24 VAC +10% -15%, 50/60 Hz ±3 Hz, 40 VA max. or 24... 37 VDC, 22 W max.)
V≅-	power supply device (not isolated; 24 VAC +10% -15%, 50/60 Hz ±3 Hz, 40 VA max. or 24... 37 VDC, 22 W max.)

⚠ - protect the power supply with a fuse rated 2 A-T 250 V
- if the device is powered in direct current, it is necessary to respect the polarity of the power supply voltage.

RS-485 port (not available in models EPD4BX6 and EPD4BC4)

Non optoisolated RS-485 port, with MODBUS communication protocol.

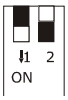
Terminal	Meaning
GND	ground
RS485+	D1 = A = + (terminal 1 of the transceiver)
RS485-	D0 = B = - (terminal 0 of the transceiver)

⚠ - connect the RS-485 MODBUS port using a twisted pair.

For the settings about the RS-485 MODBUS port look at chapter 7 "CONFIGURATION".

RS-485 port line termination (not available in models EPD4BX6 and EPD4BC4)

Position microswitch 1 on position on (120 W, 0.25 W) to plug in the RS-485 port line termination (plug in the termination of the first and of the last element of the network).



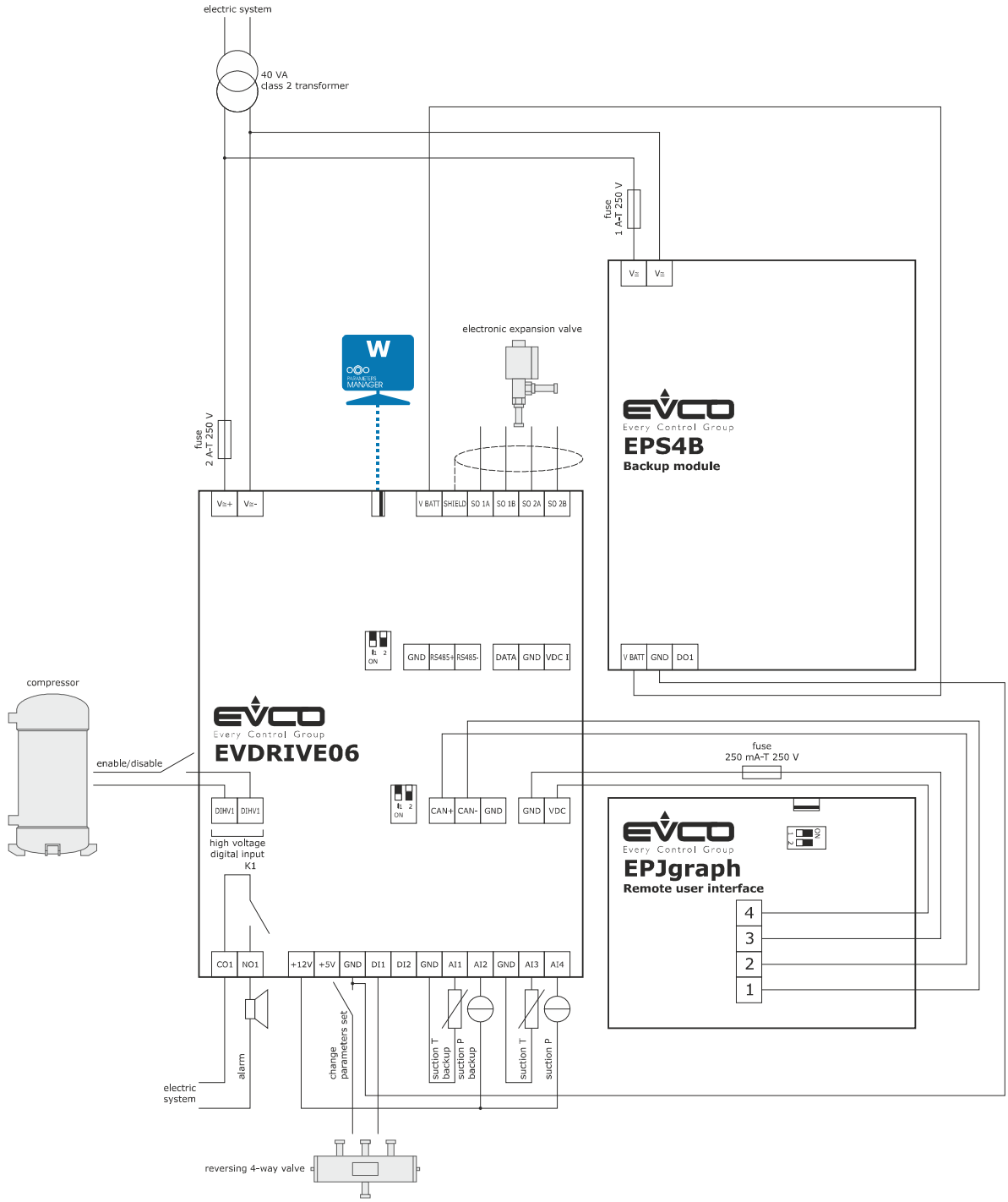
High voltage digital input

High voltage digital input (if present).

Part	Meaning
DIHV1	high voltage digital input (optoisolated contact; 115 VAC -10%... 230 VAC +10%)
DIHV1	high voltage digital input (optoisolated contact; 115 VAC -10%... 230 VAC +10%)

4.2 Example of electrical connection

The following drawing shows an example of electrical connection of EVDRIVE06.



Please note the power supply of EVDRIVE06 and that of EPS4B are not isolated one another: it is important to wire correctly the devices as indicated in the drawing.

4.3 Additional information for electrical connection

- do not operate on the terminal blocks of the device using electrical or pneumatic screwers
- if the device has been moved from a cold location to a warm one, the humidity could condense on the inside; wait about an hour before supplying it
- make sure the power supply voltage, the electrical frequency and the electrical power of the device correspond to those of the local power supply; look at chapter 11 “TECHNICAL DATA”
- disconnect the power supply of the device before servicing it
- do not use the device as safety device
- for the repairs and for information about the device please contact the EVCO sales network.

5 USER INTERFACE

5.1 Preliminary information

EVDRIVE06 is available in built-in and blind version (according to the model).
The built-in versions can be programmed through the user interface, the blind ones must be used with a remote user interface (for example EPJgraph): both the versions can be programmed through the set-up software system Parameters Manager; look at chapter 7 "CONFIGURATION".
Using a common USB flash key it is also possible to make the upload and the download of the configuration parameters.

5.2 Keyboard (not available in the blind versions)

The following table shows the meaning of the keyboard.

Button	Preset function
ESC	cancel, hereinafter also called "button ESC"
◁	move to left, hereinafter also called "button LEFT"
△	increase, hereinafter also called "button UP"
▽	decrease, hereinafter also called "button DOWN"
▷	move to right, hereinafter also called "button RIGHT"
↵	confirmation, hereinafter also called "button ENTER"

5.3 Signalling LEDs

The following table shows the meaning of the LEDs at the front of the device.

LED	Meaning
ON	LED power supply if it is lit, the device will be powered if it is out, the device will not be powered
STEP 1	LED stepper output 1 if it is lit, the valve will be stopped and completely closed if it flashes slowly, the valve will be stopped and completely open if it flashes quickly, the valve will be moving if it is out, the valve will be stopped and open in an intermediary position

STEP 2	LED auxiliary if parameter Ph80 = 0, LED status if it is lit, the device will be working in superheating algorithm modality if it flashes slowly, the device will be working in manual or in debugger modality if it flashes quickly, the device will be working in analog positioner modality if it is Off, the device will be in a different status if parameter Ph80 = 1, LED MOP/LOP alarm if it flashes quickly, the MOP alarm will be running if it flashes slowly, the LOP alarm will be running if it is out, no MOP/LOP alarm will be running if parameter Ph80 = 2, LED high superheating/low superheating alarm if it flashes quickly, the high superheating alarm will be running if it flashes slowly, the low superheating alarm will be running if it is out, no high superheating/low superheating alarm will be running
⚠	LED alarm if it is On, an alarm will be running if it flashes slowly, it is necessary to disable the device so that the modification of the configuration parameters has effect if it flashes quickly, it is necessary to switch off/on the power supply of the device so that the modification of the configuration parameters has effect if it is Off, no alarm will be running
COM	LED communication if it is ON, a device-controller communication alarm will be running and the valve is halted or if there is activity on the USB port if it flashes slowly, the device-controller communication will be in the warning status if it flashes quickly, a device-controller communication alarm will be running and the device will be working in stand alone modality if it is OFF, the device will be working in stand alone modality or no device-controller communication alarm will be running

6 OPERATION

6.1 Switch on and resynchronization

At switch-on and after a resynchronization, the fundamental parameters for moving the motor are acquired.
The parameters of pressure and temperature units of measure are loaded at switch-on, and, if necessary, is performed the conversion of all the parameters of pressure and temperature.
The parameters that are loaded only during the initialization phase, and therefore require a reset to be loaded, are referred to as manufacturer parameters (Manufacturer menu) and can be modified only in the stand-by state.

6.1.1 Refrigerant selection

Parameter *Type of refrigerant* (Pi00) allow to select the proper gas for the application.

Pi00	Gas	Min. pressure [BarA]	Min. temperature [°C]	Max. pressure [BarA]	Max. temperature [°C]
0	R22	0.00	-75.9	49.88	96.1
1	R134A	0.00	-98.0	40.57	101.0
2	R402A	0.00	-80.8	40.66	74.1
3	R404A	0.00	-79.4	36.81	71.4
4	R407A	0.00	-72.0	43.59	81.1
5	R407C	0.00	70.4	45.30	85.5
6	R410A	0.00	-70.5	48.91	71.2
7	R417A	0.00	-68.5	37.91	84.4
8	R422A	0.00	-77.3	31.15	63.5
9	9R422D	0.00	-72.0	37.23	77.6
10	R507A	0.00	-80.8	36.88	70.4
11	R744	0.00	-56.5	73.75	30.9
12	R438A	0.00	-70.1	40.43	82.8
13	R401B	0.00	-64.9	46.01	105.0
14	R290	0.50	-56.9	42.00	96.0
15	R717	1.00	-33.5	112.77	131.9
16	R1270	0.00	-121.8	46.50	92.2
17	R32	0.00	-119.9	57.50	77.8
18	R407F	1.00	-39.7	32.00	65.5
19	R1234ZE	0.27	-45.6	17.57	73.9
20	R1234YF	0.32	-52.8	33.82	94.6
21	R723	0.10	-73.8	39.99	76.9
22	R452A	0.22	-70.0	35.40	70.0
23	R513A	0.20	-60.0	33.04	90.0
24	R454B	1.00	-50.2	42.63	68.3
25	R448A	0.17	-70.0	32.52	70.0
26	R449A	0.16	-70.0	31.59	70.0
27	R23	1.14	-80.0	46.99	25.0

6.1.2 Valve selection

To select the desired valve, it is necessary to set the correct value in Valve selection (parameter Pi07).

Setting this parameter to a value of 0 (generic valve) means setting the parameters Pr50 to Pr55 is required, with which it is possible to specify the value of each valve parameter.

With function "Copy selected to generic valve" it is possible to copy the default values of the selected valve into the ones of the generic valve, in order to use them as reference for possible modifications.

If a predefined valve is selected (parameter Pi07 > 0), all relevant parameters specific to that valve are loaded automatically from the flash memory, according to the table below:

Pi07	Valve name	Minimum regulation steps [step]	Maximum regulation steps [step]	Overdriving steps [step]	Stepping rate [step/s]	Operating phase current [mA]	Holding phase current [mA]	Recommended Step Mode
0	Generic valve	0	0	0	0	0	0	Full step 2ph
1	Sporlan CO2	0	2500	3125	400	275	0	Full step 2ph
2	Sporlan SER AA Sporlan SER A Sporlan SER B Sporlan SER C Sporlan SER D	0	2500	3500	400	120	0	Full step 2ph
3	Sporlan SERI F Sporlan SERI G Sporlan SERI J Sporlan SERI K Sporlan SERI L	0	2500	3500	400	120	0	Full step 2ph
4	Sporlan SER 1.5 to 20	0	1596	3500	400	160	0	Full step 2ph
5	Sporlan SEI 0.5 to11	0	1596	3500	400	160	0	Full step 2ph
6	Sporlan SEI 30	0	3193	6500	400	160	0	Full step 2ph
7	Sporlan SEI 50	0	6386	7500	400	160	0	Full step 2ph
8	Sporlan SEH 100	0	6386	7500	400	160	0	Full step 2ph
9	Sporlan SEHI 175 Sporlan SEHI 400	0	6386	6500	400	160	0	Full step 2ph
10	Sporlan SDR-3	0	3193	3512	200	160	0	Full step 2ph
11	Sporlan SDR-4	0	6386	7025	200	160	0	Full step 2ph
12	Sporlan ESX unipolar	24	224	300	40	260	0	Full step 2ph
13	Sporlan EDEV B unipolar Sporlan EDEV C unipolar	0	800	1250	200	120	0	Half step
20	Castel 261	0	415	515	35	200	0	Full step 2ph
21	Castel 262 Castel 263	0	195	255	25	200	50	Full step 2ph
22	Castel 264	0	985	1135	70	560	50	Full step 2ph
30	Alco EXM unipolar Alco EXL unipolar	16	250	350	45	130	0	Half step
31	Alco EX4 Alco EX5 Alco EX6	0	750	1000	500	500	100	Full step 2ph
32	Alco EX7	0	1600	2000	500	750	250	Full step 2ph
33	Alco EX8	0	2600	3250	500	800	500	Full step 2ph
40	Danfoss ETS 12C Danfoss ETS 24C Danfoss ETS 25C Danfoss ETS 50C Danfoss ETS 100C	30	600	628	240	800	160	Full step 2ph
41	Danfoss ETS 12.5 Danfoss ETS 25 Danfoss ETS 50	0	2625	3150	300	100	75	Full step 2ph
42	Danfoss ETS 100	0	3530	4250	300	100	75	Full step 2ph
43	Danfoss ETS 250 Danfoss ETS 400	0	3810	4550	300	100	75	Full step 2ph
44	Danfoss ETS 6 unipolar	0	240	260	25	260	0	Half step
50	Sanhua VPF 12.5 Sanhua VPF 25 Sanhua VPF 50	0	2600	3000	300	140	0	Full step 2ph
51	Sanhua VPF 100	0	3500	4400	300	140	0	Full step 2ph
52	Sanhua VPF 150 Sanhua VPF 250 Sanhua VPF 400	0	3800	4400	300	140	0	Full step 2ph
55	Carel ExV	50	480	500	50	450	100	Full step 2ph

The driving mode can be selected through parameter Driving mode selection (Pi01). If value 0 is selected (Pi01=0) the driving mode is automatically calculated to ensure the maximum speed according to the step rate of the selected valve.

It means if the nominal step rate of the valve is higher than 625 steps/s, 8 microsteps/s will be used; while if the nominal step rate is lower than 625 steps/s, 16 microsteps/s will be used.
It is recommended to use the driving type according to the valve features.
The Valve duty cycle (parameter Pr45) represent the limit of continuous operating of the valve: limiting the continuous activity of the valve reduces the heating of same.
For example: setting Pr45 = 70% means for every 70 ms in which operational current is used, there will be 30 ms in which maintenance current will be applied on the valve.
If the parameter is set to 100%, this algorithm is deactivated.
Furthermore, this procedure applies only to the normal operation of the valve: all forced movements (for example synchronisation closure, positioning caused by probe errors or communication errors) are continuous until the target position is reached.

6.1.3 Operation

During the re-synchronization phase (**Synchro wait** (1)) the valve is completely closed. When the instrument is switched on, to ensure complete closure, the valve is closed by *Overdrive steps* steps. Instead, during normal operation, to ensure complete closure, the valve is closed at 0 steps and then is closed another 10%**Maximum regulation steps* steps.
The valve is automatically resynchronized at every switch-on.
During normal operation of the valve, it assumes the 0% position corresponds to the physical position defined by Minimum regulation steps, and that the 100% position corresponds to the physical position defined by Maximum regulation steps.
A resynchronization request can be signalled using various methods:

- rising edge on digital input DI2 (if DI2 is configured as "resynchronization command" and Enabling mode (parameter Pr06) is configured as "standalone"
- rising edge on Resynchro request (ResR) if Enabling mode (parameter Pr06) is configured as "network"
- internal request from the algorithm
- upon reaching the maximum limit of operational hours (Working hours, parameter Pr40), Resynchronization interval (parameter Pr41), if configured.

A resynchronization request is performed only when it is safe to do, so when the state is Stand-by: this means that a resynchronization request made when the valve is enabled is performed automatically only when it is disabled.
It is not currently possible to cancel a request.
The valve moves with a maximum velocity defined by the Stepping rate parameter.
The positioning speed depends on the operation mode:

- during resynchronization is used the maximum speed, but towards the end of the positioning is made a deceleration ramp
- in debug mode is used the speed of the Debug step rate (parameter Prd0)
- in manual mode and for all other positioning is used the maximum speed.

Using Limit valve opening (parameter Pr30) it is possible to adapt the valve to the application.
For example, for a valve with a maximum rating of 10 kW fitted to a machine with 7.5 kW, Pr30 would be set to 75%. So, if the request position target is 90%, the final real position of the valve may be 67.5% = 90 x 75% of the Maximum regulation steps.
The displayable variables for the current position and set-point in % are all referenced to the actual range of use of the valve (0 - Pr30%), while the position in steps is the real position.
If an invalid selection (Max steps = 0) is performed a Configuration error 23 is displayed.

6.2 Operating mode

6.2.1 Preliminary information

EVDRIVE06 implements a stepper motor control according to the state machine presented in the table here below (hereinafter the document will make reference to these status).

The state in which the algorithm is in may be readable in the FSM status (Finite State Machine, parameter Stat).

FSM	Meaning	
0	initialization	- Valve parameters acquisition - Request valve synchronization
1	synchronization wait	- Awaiting completion of synchronization - Request positioning to 0%
2	positioning wait	- Awaiting end of positioning - Positioning to Pr20
3	probe alarm	- Awaiting resolution of probe alarm - Positioning to Pr05
4	grid alarm	- Awaiting resolution of power supply alarm - Safe shutdown requested if backup battery is operative
5	communication alarm	- Awaiting positioning to communication alarm - Positioning to Pr48
10	stand-by off	- Evaluating resynchronization request flag - Acquisition of relevant parameters - Verifying consistency of parameters
11	stand-by on	- Evaluating Pr01 parameter to start the right valve control
30	analog positioner	- Analog positioner control in according to Pr01 selection
40	stabilization	- Positioning at stabilization position - Wait stabilization delay
41	start-up	- Positioning at start-up position - Wait start-up delay
42	algorithm selection	- Control algorithm selection - Set PID initializing request
50	manual	- Valve controlled in manual mode
51	debugger	- Debugging function active
61	SH or HGB algorithm	- Valve parameters acquisition - Request valve synchronization

6.3 Stand-by and operation mode selection

At the end of the resynchronization operations the machine will enter the stand-by state, during which the installer parameters are loaded and configurations are checked.
In this status can be modified the installer parameters, that take effect immediatly, and also the manufacturer parameters, that require a reset.
If there are no configuration errors, represented in the Alarm status (parameter AlSt) and Configuration warning (parameter CoWa), the valve can be enabled.
The operation mode is set using Main control type (Pr01), and when the valve is enabled:

if PR01 = 0	the system remains held in the Stand-by on (11)
if PR01 = 6 or 8	start SH or HGB algorithm or manual mode, according to functioning mode (Pr02)
else	analog positioner (30) operation mode begins

Please note regardless of the state of the enabled valve, disabling it will cause a positioning procedure using the value specified in stand-by position (parameter Pr20), after which the state is changed to Stand-by off (10).

6.4 Enabling EVDRIVE06

Excluding the automatic movements, it is necessary to enable the valve module EVDRIVE06 before moving it.
Enabling mode (parameter Pr06) configures the enabled features to be accepted.
When the valve module is to be used in standalone mode, an enable from digital input mode must be chosen (parameter Pr06 = 0 or Pr06 =1).
The selection must be made based on the type of input to be used.
A typical application of the DIHV (parameter Pr06 = 1) mode is to connect it in parallel to the compressor, such that the valve is enabled along with it.
To enable the valve using digital inputs, it is necessary for these to be configured correctly, otherwise a configuration alarm will be generated.
In particular:

If Pr06 = 0:	the DI1 or D12 input must be configured as enable	> Ph11 = 1 or Ph21 = 1
If Pr06 = 1:	the DIHV input must be configured as enable	> Ph31 = 1

Selecting the values from 2 to 9 the valve can be enabled via serial port using MODBUS or CAN communication protocols: this selection must be made if a controller manages the EVDRIVE06.
Selecting values from 6 to 9, it is possible to operate the EVDRIVE06 in standalone mode if a communications fault occurs, in this case the DI1 or DI2 inputs must be configured as enable (parameter Ph11 = 1 or Ph21 = 1).
The enabling of the valve using a communication network requires system which ensures the EVDRIVE06 can determine whether the controller is still online: specifically, the module expects the controller updates the variable Enable valve command (parameter EnaV) periodically. See the paragraph “Communication error”
The Enable valve command (parameter EnaV) has different addresses according to the communication system chosen:

- CAN (Pr06 = 2 or Pr06 = 6)
- MODBUS RS-485 (Pr06 = 4 or Pr06 = 8): EnaV address = 1281

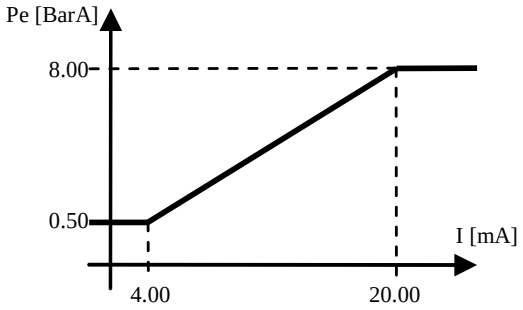
6.5 Analog inputs

The configuration of each analog inputs is achieved by setting the related parameter: *Aix probe type* (Pia*x*) determines the kind of probe connected to the analog input and *Aix probe usage* (Piu*x*) determines the use of the analog input, where "*x*" is the input number.

The analog inputs AI3 and AI4 are dedicated to the measurement of the suction temperature Ts and evaporator pressure Pe. The inputs AI1 and AI2 can be used as backup probe, or left free.

During the **Stand-by off** (10) is performed the verify to correctness and consistency of these parameters: a configuration error will prevent exiting this state. In this case an alarm is generated (bit 1 of *Alarm status* (AlSt)), and an error code in *Configuration warning* (CoWa) is readable.
The input type is set using parameter *Aix probe type* (Pia*x*). The analog inputs must be configured according to the probe connected.
Therefore, the temperature probe measuring the suction temperature (Ts), necessary for calculating the Superheat, must be connected to one of the three analog inputs AI1, AI2 or AI3, while the pressure probe for measuring the evaporation pressure may be connected to any of the four analog inputs. If the analog input is used for measuring pressure, this parameter also defines the conversion range.
The *Aix probe usage* (Piu*x*) parameter defines the use of the analog input: primary or backup probe for measuring temperature or pressure.

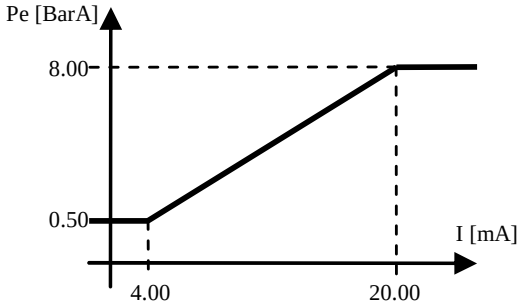
For example:
if Pia4 = 11 the input will be configured as 4÷20 mA the pressure reading will be transformed into 0.5÷8 Barg



Each of the analog inputs may be configured as "scaling" (Piax = 30), this means its settings will be determined by parameters:
PxXty: type of input (0÷20 mA, 4÷20 mA for AI1, AI2 and AI3, 0÷20mA, 4÷20 mA, 0÷5V or 0÷10V for AI4)
PxYty: type of output (BarA or Barg)
PxXM: maximum input value (e.g. 15 mA, 20 mA, 5V, 10V, …)
PxXm: minimum input value (e.g. 0 mA, …, 10mA, 0V, 3V, …)
PxYM: maximum output conversion value
PxXm: minimum output conversion value

PxYM and PxXm parameters are expressed in the units of the chosen measurement. E.g., if the input is configured as a pressure probe and the measurement unit is in Bar, these parameters should contain the minimum and maximum values hundredths of BarA or Barg according to PxYty.

In this example, the following values have been applied to the AI4 probe:
PH60 = 0 (pressure measurement unit = Bar)
P4Xty = 1 (0÷20 mA)
PxYty = 1 (BarA)
P4XM = 2000 (expressed in hundredths)
P4Xm = 400 (expressed in hundredths)
P4YM = 2500 (expressed in hundredths)
P4Ym = 1000 (expressed in hundredths)

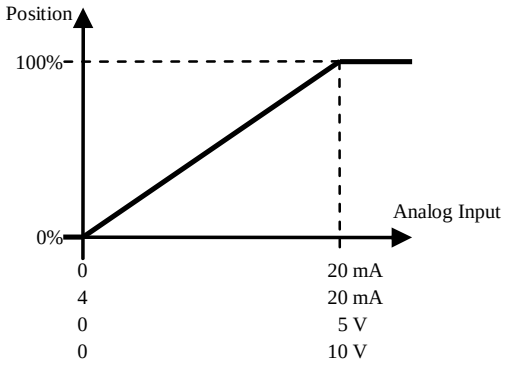


6.6 Analog positioner control

The analog positioner mode permit to move the valve position linearly respect to the value applied to the active analog input.
To enter analog positioner mode, from the **Stand-by off** (10), set the *Main control type* (parameter Pr01) to the desired and enable the valve; if all the configuration is correct enter in **Stand-by on** (11), and then in the **Analog positioner** (30). To exit the analog positioner mode, it is necessary to disable the valve, which will cause a positioning movement to the value specified in *Stand-by position* (parameter Pr20), before entering the **Stand-by off** (10).

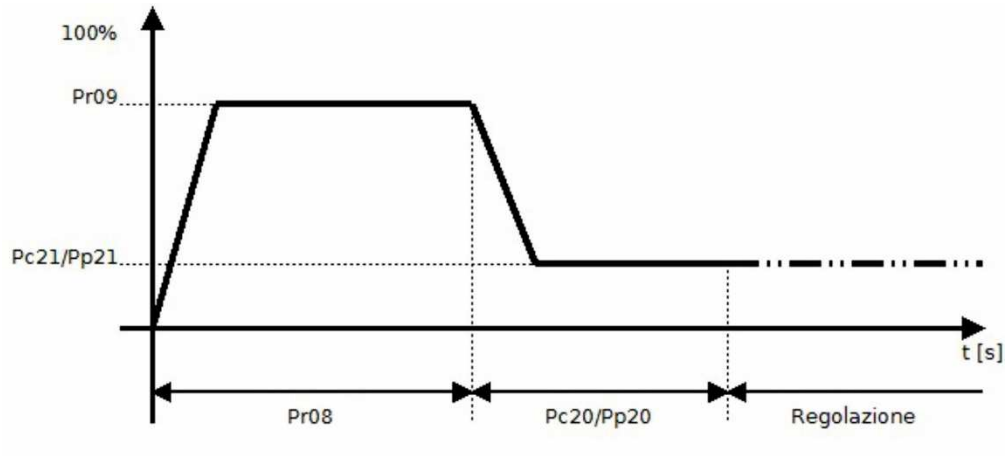
Pr01 = 01 -> analog positioner on AI1 (0÷20mA)
Pr01 = 02 -> analog positioner on AI2 (0÷5V)
Pr01 = 03 -> analog positioner on AI3 (4÷20mA)
Pr01 = 04 -> analog positioner on AI4 (0÷10V)
Pr01 = 05 -> analog positioner on AI4 (using parameter Pia4 to select probe type)
Pr01 = 07 -> analog positioner on AI3 (4÷20 mA) and AI4 (0÷10V): the positioning is calculated using the maximum of the two. Resincronization request is performed only if the resulting positioning is <=1

The unused analog input are configured according to their respective Ai probe usage (parameter Pia).



6.7 Algorithm start-up

To enter algorithm mode, from the **Stand-by off** (10), set the *Main control type parameter* Pr01 = 6 to perform Superheat (SH) control or Pr01 = 8 to perform hot gas bypass control. If all the configuration is correct enter in **Stand-by on** (11) and then in the **Stabilization** (40), in which is performed a positioning to Stabilization position (parameter Pr09) and await Stabilization delay (parameter Pr08).
Then enter in **Start-up** (41), in which is performed a positioning to Start-up position (parameters Pc21 or Pp21) and await Start-up delay (parameters Pc20 or Pp20).
Finally enter in the Algorithm selection (42) in which evaluates Main control type (parameter Pr01) and Functioning mode (parameter Pr02).



This state also enables manual mode, debugger mode, or one of the available SH-algorithm.

The *Functioning mode* (Pr02) defines the algorithm's operation mode, while *Main control type* (Pr01) defines which algorithm can be used.
Specifically:

- Pr02 = 0: enables control SH-algorithm defined by *Main control type* (Pr01)
- Pr02 = 1: enables manual algorithm, which permits movement of the valve to the position specified by *Manual set-point position* (Pr03)
- Pr02 = 2: actives a specific algorithm that moves the valve linearly up and down, at the desired step rate, between two specified positions

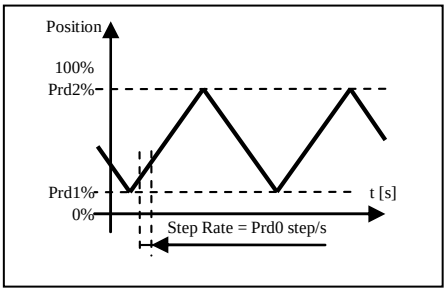
Loading of *Functioning mode* (Pr02) occurs every main cycle, and thus switching between the three algorithm operation modes occurs without forced intermediate positioning moves.
Note that Functioning mode (parameter Pr02) and Manual set-point position (parameter Pr03) are not saved into memory, this means that from reset the valve starts always in automatic mode with Functioning mode Pr02 = 0 and Manual set-point position Pr03 = 0.

6.8 Manual mode

In manual mode (parameter Pr02 = 1), this permits movement of the valve and bringing it to the percentage value stored in Manual set-point position (parameter Pr03) using the maximum step rate.

6.9 Debugging mode

The debugger feature is enabled when Pr02 = 2: the valve will move from a Debug minimum position (parameter Prd1) to a Debug maximum position (parameter Prd2) with the step rate defined by Debug step rate (parameter Prd0). Internally, the actuated step rate value is clamped to the maximum step rate of the selected valve.



6.10 Control algorithm

Setting the *Main control type* (parameter Pr01) selects the algorithm to enable:

- Pr01 = 6: Superheat (SH) control algorithm
- Pr01 = 8: Hot gas bypass control algorithm

6.10.1 Superheat control algorithm

The purpose of this control is to maintain the Superheat (SH) at its set-point value, in order to maximise the efficiency of the system and ensure that the compressor is protected by entrance of liquid.
The SH is usually controlled by a PID.

After selecting the control algorithm, it is necessary to set the various regulation parameters:

- *SH set-point* (Pc01, Pp01)
- *LoSH set-point* (Pc02, Pp02)
- *HiSH set-point* (Pc03, Pp03)
- *LOP temperature* (Pc04, Pp04)
- *MOP temperature* (Pc05, Pp05)
- PID proportional band (Pc13, Pp13)
- PID integral time (Pc14, Pp14)
- PID derivative time (Pc15, Pp15)
- Start-up delay (Pc20, Pp20)
- Start-up position (Pc21, Pp21)
- Fast action (Pr12)
- Neutral zone high threshold (Pr10)
- Smart band zone threshold (Pr11)
- SH filter time constant (Pr14)
- Fast action threshold (Pr13)

SH parameters set selection (SetP) supports selection of one of two different sets of regulation parameters. Each set includes SH set-point, PID parameters, and LoSH, HiSH, MOP and LOP alarm set points, start up position and delay. Example uses are: using set1 parameters for a chiller, set2 for a heat pump.

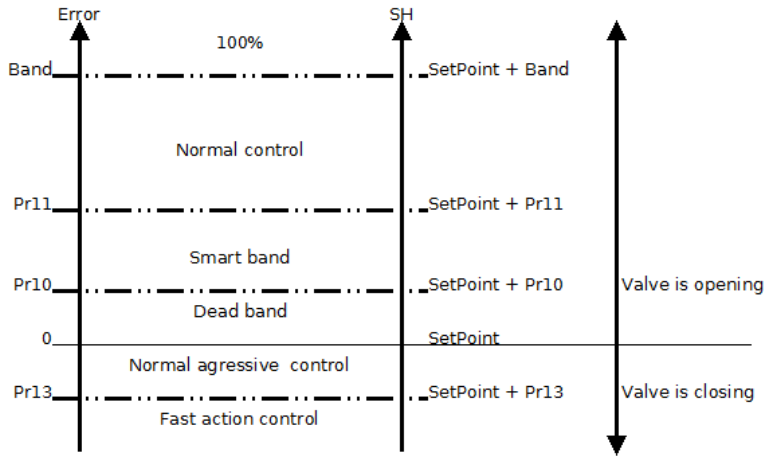
SH parameters set selection (SetP) supports switching from one control parameter set to another simply and quickly. It is possible to change the regulation parameter sets directly by modifying *SH parameters set selection* (Pr04), if a serial interface is present, or via correctly configured digital inputs on the standalone version. If one of the digital inputs (DI1 or DI2 or DIHV) is configured as "Change SetP" (*DI1 function* (Ph11) or *DI2 function* (Ph21) or *DIHV function* (Ph31) setting to 2), the parameter sets for the PID control are determined by the digital input status: set 1 is selected if the input is low, set 2 is selected if the input is high. If no DI is configured for parameter set modification, the data is taken directly from *SH parameters set selection* (Pr04).

With the operation mode selected, the regulator uses the related SH set-point parameter. This is a fundamental parameter for the proper functioning of the control algorithm. A low set-point ensures a higher evaporator performance, lower temperatures, and minimum variations, but has the disadvantage that liquid may reach the compressor.

The algorithm uses different regulation parameters, depending on the working area:

- if the measured error is lower than 0 an aggressive normal control is performed.
- else if the measured error is in the dead band (error lower than Dead band threshold (parameter Pr10)) there is no changing in valve opening.
- else if the measured error is in the smart band (error lower than Smart band threshold (parameter Pr11)) a smart algorithm is used.
- else a normal PID control is performed

If the measured error is lower than *Fast action threshold* (parameter Pr13) at the above operation the "Fast Action" algorithm is added which further strengthens the algorithm response



All the input parameters, with the exception of the *Main control type* (Pr01), are acquired at every main cycle.

6.10.2 Hot gas bypass algorithm

The purpose of this control is to maintain the temperature at its set-point value.

After selecting the control algorithm, it is necessary to set the various regulation parameters:

- Temperature set-point (Pc06, Pp06)
- PID proportional band (Pc13, Pp13)
- PID integral time (Pc14, Pp14)
- PID derivative time (Pc15, Pp15)
- Start-up delay (Pc20, Pp20)
- Start-up position (Pc21, Pp21)
- Neutral zone high threshold (Pr10)
- Smart band zone threshold (Pr11)

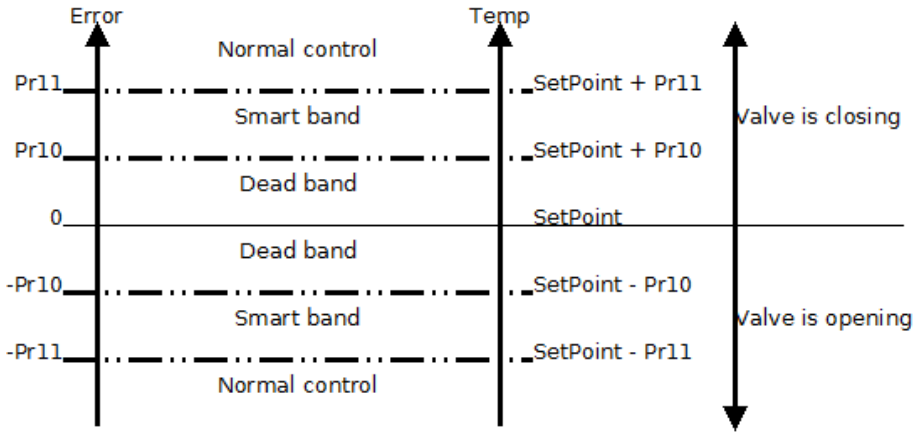
SH parameters set selection (Pr04) work in the same way as in SH control algorithm.

The algorithm use different regulation parameters, depending on the working area:

If the measured error is in the *Dead band* no regulation is performed

If the measured error is in the *Smart band threshold* a smart algorithm is used.

Out of this bands the normal algorithm is performed



Band = Pc13 or Pp13
SetPoint = Pc06 or Pp06
Error = T - SetPoint

6.11 Alarm relay

The alarm relay is managed directly by the application. It is possible to set the *Relay function* (parameter Ph01) and *Relay logic* (parameter Ph02).

The alarm relay can be operate if there is an alarm situation depending of the choose (Ph01 = 1÷5): any alarm, only probe alarm, only LoSH alarm, only for MOP alarm, only for valve alarm.

If Ph01 = 6, the relay is used to control a solenoid valve which intervenes to block the flow of refrigerant in case of a power failure, or a disabled valve. The behavior is as follows: the relay remains in the excited state (solenoid valve open) while the valve is enabled, and is unexcited (solenoid valve closed) if the valve is disabled, or a power failure is detected.

The Ph01 = 7 combine the configuration 1 and 6.

If Ph01 = 8, the relay will be activated if the resynchronization is requested. To perform a resynchronization operation, the valve must be disabled.

If Ph01 = 0, the relay is not used by internal application and may be operated by a controller.

The relay remains in the OFF state, as defined by the value in parameter *Relay logic* (parameter Ph02), until it is changed by the condition defined in parameter *Relay function* (parameter Ph01). E.g: if Ph02 = 0 (normally not excited), and Ph01 = 1, the relay will be excited when any alarm is set.

7 CONFIGURATION

7.1 Unit of measurements

Units of measurement used in the internal algorithm are Celsius (ºC) and Kelvin (K) degrees in tenths for temperatures, and barG in hundreds for pressure.

For the convenience of the user, it is possible to set temperature and pressure parameters in the preferred unit of measurement, specifying the unit in parameters Pressure unit of measurement (parameter Ph60) and Temperature unit of measurement (parameter Ph61).

These parameters are acquired only during **Initialization** (0) phase at the reset , thus any changes to these parameters will take effect only after a reset.

Setting of the Ph60 and Ph61 parameters affects:

- the limits of certain parameters
- the measurement read from state variables
- the temperature and pressure parameters

The modify of the parameters of measurement unit will trigger automatic conversion of existing temperature and pressure parameters: the automatic conversion of all the pressure and temperature parameters is performed in the Initialization (0) at the start-up, and then the board reset is needed after unit of measure parameters change.

The correct procedure should be performed in this order:

- disable the valve
- change parameters Ph60 and/or Ph61
- reset the board
- check Parameters alarm bit in the Alarm status (AlSt)
  - if parameters alarm is active, check and correct all the parameters of temperature and pressure, cancel the alarm leading to 1 bit 0 of the variable Command (Cmd), and then reset the EVDRIVE06
  - if parameters alarm is cleared check ParS variable and if necessary, reset the board again.

It is recommended not to abuse the automatic conversion of the parameters: is a delicate function as its disruption can lead to the invalidation of all the memory parameters.

In addition, repetitive conversions lead to a subsequent loss of precision in the values.

The Internal unit of measure (parameter UdM) indicates which units of measurements are actually used, since the parameters Ph60 and Ph61 may have been changed. After the reset and the automatic conversion the Internal unit of measure (parameter UdM) mirrors the parameters.

Given that, as stated earlier, the internal algorithm work in Kelvin, Celsius and BarA, if the units of measurement chosen match these, no conversions are performed. If the user's units of measurements are in Fahrenheit and / or Psi, the following conversions are applied:

Param. in °F/R/Psi → val. in °C/K/Bar → algorithm → val. out °C/K/Bar → var. out °F/R/Psi

7.2 Configuring a built-in version

To modify a parameter operate as follows:

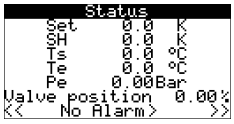
1. Press and release button UP or button DOWN to select a submenu.
2. Press and release button ENTER.
3. Press and release button UP or button DOWN to select the parameter.
4. Press and release button ENTER.
5. Press and release button UP or button DOWN to modify the value.
6. Press and release button ENTER to confirm the value.
7. Press and release button ESC over and over again to go back to the previous pages.

7.2.1 User menu

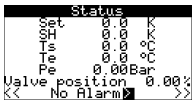
Make sure the power supply is switched on.

Move among the pages using the buttons as shown in the example here below, using the buttons ◁ or ▷ to scroll through the menu pages:

Page User.1

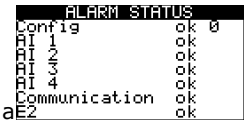


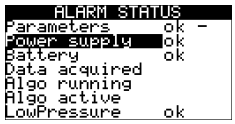
△ or ▽ to select

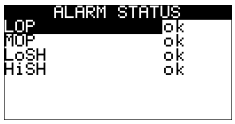


and ↵ to enter ALARM STATUS page:

Page User.1.a

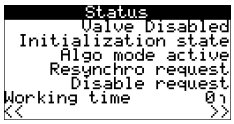




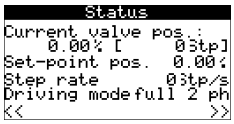


△ or ▽ to scroll the page ESC to return to Page 1

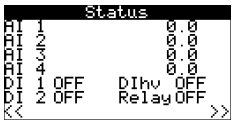
Page User.2



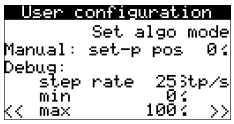
Page User.3



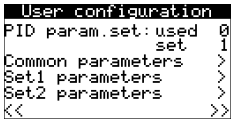
Page User.4



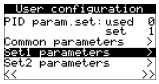
Page User.5



Page User.6

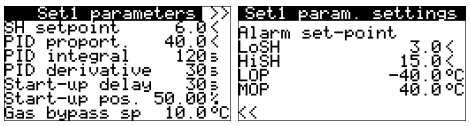


△ or ▽ to select

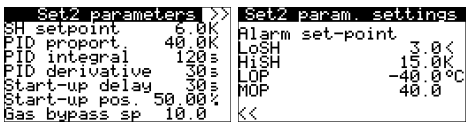


and ↵ to enter Set1 or Set 2 parameters page:

Page User.6.a



Page User.6.b



◁ or ▷ to scroll through the user menu Set1/2 parameters pages

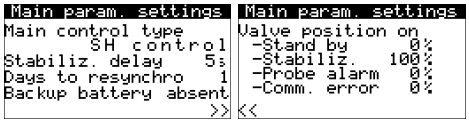
The first pages are dedicated to the end user and permit display of major features of the EVDRIVE06, any alarm messages, or whether it is necessary to resynchronise or reset the machine after changing parameters. In the PageUser2 , the fourth line is visible and blinking only if there is a request for resynchronization; the last line signalizes a request to disable (blinking "disable request") or a request to reset the board (negative blinking "reset request").
In the "User configuration" pages, some manual and debug mode functions are also available, including the direct setting of SH set-point to pass to the algorithm.
In the "Alarm Status" page all the warnings and alarms are displayed.

7.2.2 Installer menu

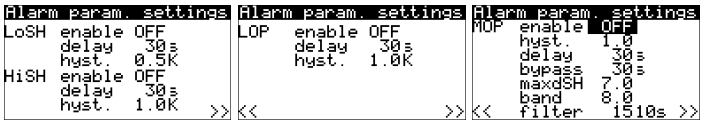
Enter the Installer menu pressing ◁ in Page User 1 or pressing ▷ in Page User.6
The default level 1 password is "10".

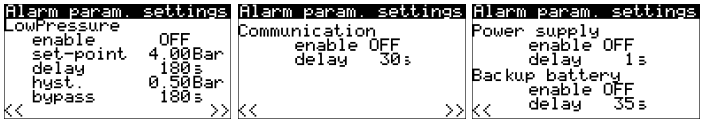
Page Installer.1

Page Installer.1.a

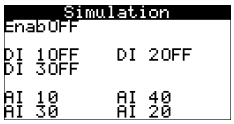


Page Installer.1.b





Page Installer.1.c

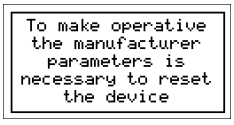


These menus permit modification of most driver parameters.
In the "Main param. settings" the user can change the control type (analog positioner or SH algorithm), the algorithm sample time, the algorithm parameters set to be used and the parameters for each set, valve start-up position, valve position in case of probe or communication error, valve stand-by position, etc.
The "Alarm param. settings" permit to enable or disable each alarm and settings the parameters.

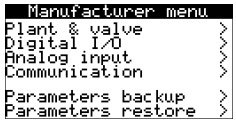
7.2.3 Manufacturer menu

Enter the Manufacturer menu selecting "Manufacturer Menu" using △ or ▽ and ↵ to enter;
The default level 2 password is "20".

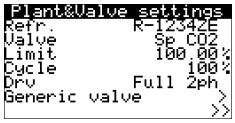
Page Manufacturer 0

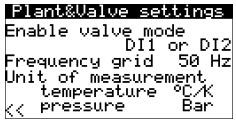


Page Manufacturer 1

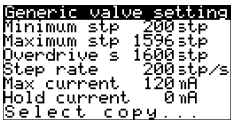


Page Manufacturer 1.a

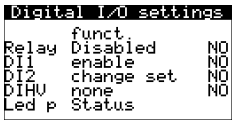




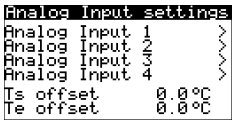
Page Manufacturer 1.a.1

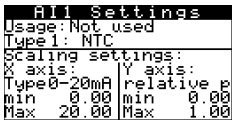


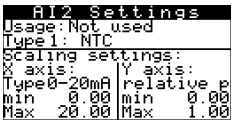
Page Manufacturer 1.c

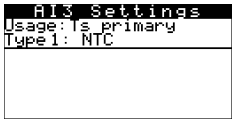


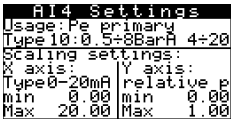
Page Manufacturer 1.d



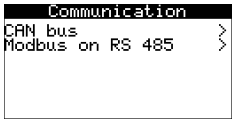


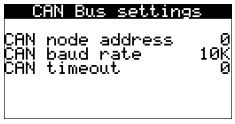


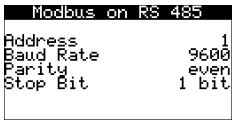




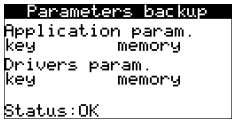
Page Manufacturer 1.e



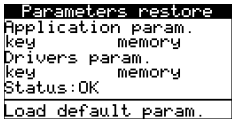




Page Manufacturer 1.f



Page Manufacturer 1.f



The backup and restore functionalities are active only in **Stand-by off** (10). They are protected by the Level 5 password and permit to download a copy of the EVDRIVE06 application's parameters and/or the driver's parameters (communication settings, etc.) in the memory or in the parameters key.

The user can restore the parameters with the copy in the memory or in the parameters key.

7.3 Configuring a blind version

The following procedures show an example of configuration of a blind version through an user interface (in the example EPJgraph) and through its user interface.
For further information please consult the hardware manual of the user interface.

Operate as follows:

1. Switch off the power supply of the device and of the interface.
2. Connect the device to the interface through the CAN port; look at chapter 4 "ELECTRICAL CONNECTION".
3. Switch on the power supply of the device and of the interface.
4. Keep pressed 2 s buttons OK and LEFT.
5. When the display of the interface will show the following menu release buttons OK and LEFT.

EPJgraph
Parameters
Contrast
CAN Network
Modbus
Info
Real date and time

6. Press and release button UP or button DOWN to select "**CAN Network**".
7. Press and release button ENTER.
8. Press and release button ENTER again to set the password value.
9. Press and release button DOWN over and over again to set "**-19**".
10. Press and release button ENTER again.
11. Set parameter *NW Node* using button UP or button DOWN to select the parameter and using button ENTER to modify and to confirm the value.

According to the factory setting the address of the CAN node of an electronic expansion valve driver has value *11* (therefore operate on the interface to set parameter *NW Node* to *[1] 11*).

12. Switch off the power supply of the interface.
13. Switch on the power supply of the interface.

7.4 Main menu

The following procedures show how to gain access to the main menu.

The main menu provides information on the project, on the status of the inputs, allows to set the level's passwords, etc.

To gain access to the procedure operate as follows:

1. Make sure the power supply is switched on
2. If you are using a built-in version, keep pressed 2 s buttons UP and DOWN: the display will show the menu. If you are using a blind version through a remote user interface (per esempio EPJgraph), keep pressed 2 s buttons ESC and RIGHT: the display will show the internal menu.

⚠ The access to some submenus is protected by password.

To gain access to a not protected submenu operate as follows:

3. Press and release button UP or button DOWN to select the submenu.
4. Press and release button ENTER.

To gain access a protected submenu operate as follows:

5. From step 2, press and release button UP or button DOWN to select the submenu.
6. Press and release button ENTER.
7. Press and release button ENTER again to set the password value.
8. Press and release button DOWN over and over again to set "**-19**".
9. Press and release button ENTER again.

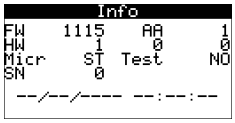
To modify a parameter operate as follows:

10. From step 4 or step 9, press and release button UP or button DOWN to select the parameter.
11. Press and release button ENTER.
12. Press and release button UP or button DOWN to modify the value.
13. Press and release button ENTER to confirm the value.
14. Press and release button ESC over and over again to go back to the previous pages.

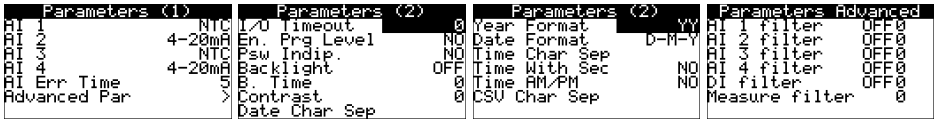
To quit the procedure operate as follows:

15. Press and release button ESC over and over again: possible modifications will not be saved.

Version information page

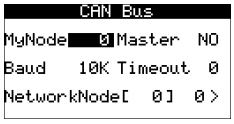


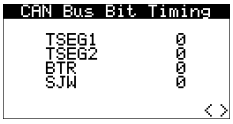
Common parameters and Advenced parameters pages

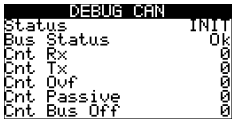


Networks pages

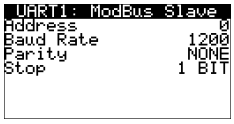
CAN network configuration and status pages





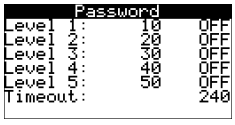


Modbus on RS485 configuration page



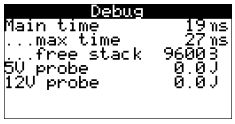
USB status page

Password setting page

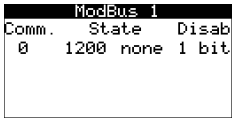


Diagnostic page

Internal status



RS485 status



7.5 Connecting the device through the set-up software system Parameters Manager

The following procedure shows how to connect the device to the set-up software system Parameters Manager.
For further information please consult the application manual of Parameters Manager.

Operate as follows:

1. To connect the device to the set-up software system Parameters Manager through the USB port, make sure to have an USB cable; to connect the device to the set-up software system Parameters Manager through the RS-485 port, make sure to have the non optoisolated RS-485/USB serial interface EVIF20SUXI.
2. Switch off the power supply of the device.
3. Connect the kit (or the interface) to the Personal Computer.

4. Switch on the power supply of the device.
5. Operate as related in the User manual of Parameters Manager.

7.6 Backup and restore

If the EVDRIVE06 driver version is displayed (using the built-in display or another display connected via the CAN port) you can view the backup / restore pages which permit to save a copy of the memory areas of the parameters. The copy can be done in another area of the memory or in an external memory (parameters key) connected to the communication programming port.
It is possible to save both the application parameters (EVDRIVE06 parameters) and the driver parameters (calibration network settings, ...).
It is possible to restore the parameters from copies in the memory (restore application or driver parameters) or load the default parameters (load default configuration from flash memory).
The backup and restore functionalities are active only in Stand-by off (10).

7.6.1 Configuring the device through an USB flash drive

The following procedures show how to make the upload and the download of the configuration parameters through an USB flash drive.

To copy the parameters from the device to the USB flash drive operate as follows:

1. Make sure the power supply is switched on.
2. Connect the flash drive to the device.
3. With reference to step 28 of the paragraph 7.2 "Configuring a built-in version", from page 37 press button UP or button DOWN to select "**key**" to copy the parameters in the flash drive or "**memory**" to copy the parameters in the internal memory of the device, belonging to the field "**Application param.**" to copy the application software parameters or belonging to the field "**Drivers param**". to copy the configuration parameters.
4. Press and release button ENTER: the parameters will be copied (this operation usually takes a few seconds; the last line of the page provides information on the status of the process).
5. Disconnect the flash drive.

To copy the parameters from the USB flash drive to the device operate as follows:

6. Make sure the power supply is switched on.
7. Connect the flash drive to the device.
8. With reference to step 28 of the paragraph 7.2 "Configuring a built-in version", from page 38 press button UP or button DOWN to select "**key**" to copy the parameters from the flash drive or "**memory**" to copy the parameters from the internal memory of the device, belonging to the field "**Application param.**" to copy the application software parameters or belonging to the field "**Drivers param**". to copy the configuration parameters.
9. Press and release button ENTER: the parameters will be copied (this operation usually takes a few seconds; the last line of the page provides information on the status of the process).
10. Disconnect the programming flash drive.

⚠ **The copy of the parameters from the flash drive to the device is allowed on condition that the firmware of the devices coincides.**

To quit the procedure operate as follows:

11. Press and release button ESC over and over again: possible modifications will not be saved.

7.7 Reprogramming

It is possible to reprogram the device using a USB flash drive in which the work.ucjb and work.ucje files have been copied. Once the USB flash drive is inserted, the files are copied in the device, which restarts: if the downloaded program is suitable, the device is reprogrammed with the new version.

You can reprogram the Device using the Download Manager program, connecting the PC to the device using the USB port.

7.8 Simulation mode

EVDRIVE06 can be used in input simulation mode by setting the following parameters.

The value of *Probe 1/2/3/4 Simulation value* (Si5/6/7/8) is in accordance with its configuration:

- tenths of a degree if configured as a temperature probe
- hundredths of mA if configured as a current probe
- hundredths of V if configured as a live probe

			Min	Max				Simulation
Ps01	1700	RW	0	1	-	0	U	Enable simulation mode 0: normal mode 1: simulation mode
Ps02	1704	RW	0	1	-	0	U	DI 1 Simulation value
Ps03	1705	RW	0	1	-	0	U	DI 2 Simulation value
Ps04	1706	RW	0	1	-	0	U	DI HV Simulation value
Ps05	1706	RW	-32768	32767	-	0	U	Probe 1 Simulation value
Ps06	1706	RW	-32768	32767	-	0	U	Probe 2 Simulation value
Ps07	1706	RW	-32768	32767	-	0	U	Probe 3 Simulation value
Ps08	1706	RW	-32768	32767	-	0	U	Probe 4 Simulation value

7.9 List of configuration parameters

The following is a complete list of parameters managed by the application, each with a short code, the ModBus address (Adr), brief description, default values and limits, measurement units (U), the menu in which they are accessed (M) and the notes.

The menus are split into levels: U (User), I (Installer, protected by first-level password), M (Manufacturer, protected by the second level password.

All the parameters in the User menu are freely modifiable and their modification is immediately applied. The Installer parameters are usually loaded by the application only when the machine is in the **Stand-by off** (10), and can be changed only in this state.

The variable *Parameters status* (ParS) indicates that the modified parameters have been acquired but are not currently in use. To finalize the acquisition, it is necessary to reset or disable the valve. If the variable is set to 0, it means that the new parameters are already active.

The correct procedure for changing Installer and Manufacturer parameters is:

- disable the valve
- modify the parameters
- verify the *Parameters status* (ParS) value
- reset the board if requested by *Parameters status* (ParS)

Par.	Add.	Acc.	Min.	Mas.	Unità	Default	Menu	Common parameters
Pr01	1537	RW	0	8	-	6	Installer	Main control type 0: none 1: analog positioner on AI1 (0÷20 mA) 2: analog positioner on AI2 (0÷5V ratiometric) 3: analog positioner on AI3 (4÷20 mA) 4: analog positioner on AI4 (0÷10V) 5: analog positioner on AI4 6: Superheat control 7: analog positioner on AI3 (4÷20 mA) and AI4 (0÷10V) 8: hot gas bypass
Pr04	1537	RW	1	2	-	1	User	SH parameters set selection 1: parameters Set 1 2: parameters Set 2
Pr05	1598	RW	0.00	100.00	%	0.00	Installer	Probe alarm position If Pr05 = 0% the valve is closed to 0 steps instead Minimum regulation step
Pr06	1599	RW	0	9	-	0	Installer	Enabling mode 0 = from digital input DI1 or DI2 (stand-alone) 1 = from digital input DIHV (stand-alone)

								2 = from CAN bus 3 = reserved 4 = from serial Modbus RS-485 5 = from serial Modbus USB 6 = from CAN bus + DI1/2 in communication error 7 = reserved 8 = from serial Modbus RS-485 + DI1/2 in comm. error 9 = from serial Modbus USB + DI1/2 in comm. error
Pr08	1631	RW	0	255	s	5	Installer	Stabilization delay
Pr09	1632	RW	0.00	100.00	%	100.00	Installer	Stabilization position
Pr10	1638	RW	0.0	25.0	K	1.0	User	Dead band threshold
Pr11	1640	RW	Pr10	25.0	K	3.0	User	Smart band threshold
Pr12	1637	RW	1	100	-	70	User	Fast action level
Pr13	1642	RW	-10.0	10.0	K	-1.0	User	Fast action threshold
Pr14	1641	RW	0	255	100ms	10	User	SH filter time constant
Pr20	1604	RW	0.00	100.00	%	0.00	Installer	Stand by position If Pr20 = 0% the valve closed to 0 steps instead Minimum regulation step
Pr30	1605	RW	50.00	100.00	%	100.00	Manufact.	Limit valve opening
Pr40	1606	RO	0	9999	h	0	User	Working hour
Pr41	1607	RW	0	365	day	1	Installer	Resynchronization interval 0: disabled
Pr45	1608	RW	30	100	%	100	Manufact.	Valve duty cycle
Pr48	1609	RW	0.00	100.00	%	0.00	Installer	Communication error position If Pr48 = 0% the valve closed to 0 steps instead Minimum regulation step
Pr50	1610	RW	0	Pr51	step	200	Manufact.	Minimum regulation step
Pr51	1611	RW	Pr50	9999	step	1596	Manufact.	Maximum regulation steps
Pr52	1612	RW	Pr51	9999	step	1600	Manufact.	Overdrive steps
Pr53	1613	RW	25	1000	step/s	200	Manufact.	Stepping rate
Pr54	1614	RW	0	1000	mA	120	Manufact.	Operating phase current
Pr55	1615	RW	0	1000	mA	0	Manufact.	Holding phase current

Par.	Add.	Acc.	Min.	Mas.	Unità	Default	Menu	Valve and driver: debug
Prd0	1616	RW	25	1000	step/s	25	User	debug step rate
Prd1	1617	RW	0.00	Prd2	%	0.00	User	debug minimum position
Prd2	1618	RW	Prd1	100.00	%	100.00	User	debug maximum position
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Valve and driver: backup battery**
Pb01	1619	RW	0	1	- - - -	0	Installer	backup battery 1 = present
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Parameters set n. 1**
Pc01	1539	RW	3.0	25.0	K	6.0	User	SH setpoint
Pc02	1540	RW	1.0	3.0	K	2.0	User	LoSH setpoint
Pc03	1541	RW	10.0	40.0	K	15.0	User	HiSH setpoint
Pc04	1542	RW	-200.0	40.0	°C	40.0	User	Set1 LOP temperature
Pc05	1543	RW	-40.0	40.0	°C	40.0	User	MOP temperature
Pc06	1544	RW	-30.0	40.0	°C	10.0	User	Set1 Bypass temperature set-point
Pc13	1681	RW	1.0	100.0	K	40.0	User	PID proportional band
Pc14	1682	RW	0	999	s	120	User	PID integral time
Pc15	1687	RW	0	999	s	30	User	PID derivative time
Pc20	1690	RW	1	255	s	5	Installer	start-up delay
Pc21	1693	RW	0.00	100.00	%	50.00	Installer	start-uo position
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Parameters set n. 2**
Pp01	1547	RW	3.0	25.0	K	6.0	User	SH setpoint
Pp02	1548	RW	1.0	3.0	K	2.0	User	LoSH setpoint
Pp03	1549	RW	10.0	40.0	K	15.0	User	HiSH setpoint
Pp04	1550	RW	-200.0	40.0	°C	-40.0	User	Set2 LOP temperature
Pp05	1551	RW	-40.0	40.0	°C	40.0	User	MOP temperature
Pp06	1552	RW	-30.0	40.0	°C	10.0	User	Set2 Bypass temperature set-point
Pp13	1685	RW	1.0	100.0	K	40.0	User	PID proportional band
Pp14	1686	RW	0	999	s	120	User	PID integral time
Pp15	1689	RW	0	999	s	30	User	PID derivative time
Pp20	1692	RW	1	255	s	5	Installer	start-up delay
Pp21	1695	RW	0.00	100.00	%	50.00	Installer	start-uo position
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Protections and alarms**
Pa01	1570	RW	0	1	- - - -	0	Installer	enable communication alarm 1 = yes

Pa02	1571	RW	5	120	s	30	Installer	communication alarm delay
Pa10	1572	RW	0	1	- - - -	0	Installer	enable LoSH alarm 1 = yes
Pa11	1573	RW	0.0	25.0	K	0.5	Installer	LoSH alarm hysteresis
Pa12	1574	RW	0	250	min	3	Installer	LoSH alarm delay
Pa20	1575	RW	0	1	- - - -	0	Installer	enable HiSH alarm 1 = yes
Pa21	1576	RW	0.0	25.0	K	1.0	Installer	HiSH alarm hysteresis
Pa22	1577	RW	0	250	min	3	Installer	HiSH alarm delay
Pa30	1578	RW	0	1	- - - -	0	Installer	enable low pressure alarm 1 = yes
Pa31	1579	RW	0.00	45.00	barG	0.00	Installer	low pressure setpoint alarm
Pa32	1580	RW	0.20	1.00	barG	0.30	Installer	low pressure alarm hysteresis
Pa33	1581	RW	0	250	min	3	Installer	low pressure alarm delay
Pa34	1588	RW	0	250	s	180	Installer	low pressure alarm bypass
Pa40	1582	RW	0	1	- - - -	0	Installer	enable LOP alarm 1 = yes
Pa41	1583	RW	0.0	10.0	K	1.0	Installer	LOP alarm hysteresis
Pa42	1584	RW	0	250	min	3	Installer	LOP alarm delay
Pa50	1585	RW	0	1	- - - -	0	Installer	enable MOP alarm 1 = yes
Pa51	1586	RW	0.0	10.0	K	1.0	Installer	MOP alarm hysteresis
Pa52	1587	RW	0	250	min	3	Installer	MOP alarm delay
Pa53	1633	RW	0.0	25.0	K	7.0	Installer	MOP maximum dSH applicable
Pa54	1634	RW	0.0	25.0	K	8.0	Installer	MOP band
Pa55	1635	RW	0	255	10 s	15	Installer	MOP filter time constant
Pa56	1636	RW	0	255	min	10	Installer	MOP bypass delay
Pa57	1696	RW	0	100	%	0	Installer	MOP forced delta
Pa58	1697	RW	0	255	s	0	Installer	MOP forced time
Pa70	1590	RW	0	1	- - - -	0	Installer	enable main power supply alarm 1 = yes
Pa71	1591	RW	0	60	s	1	Installer	main power supply alarm delay
Pa75	1592	RW	0	1	- - - -	0	Installer	enable backup battery alarm 1 = yes
Pa76	1593	RW	0	60	s	35	Installer	backup battery alarm delay

Par.	Add.	Acc.	Min.	Mas.	Unità	Default	Menu	Valve and driver: refrigerant equipment
Pi00	1594	RW	0	23	- - - -	6	Manufact.	type of refrigerant 0 = R-22 1 = R-134A 2 = R-402A 3 = R-404A 4 = R-407A 5 = R-407C 6 = R-410A 7 = R-417A 8 = R-422A 9 = R-422D 10 = R-507A 11 = R-744 12 = R-438A 13 = R-401B 14 = R-290 15 = R-717 16 = R-1270 17 = R-32 18 = R-407F 19 = R-1234ZE 20 = R-1234YF 21 = R-723 22 = R-452A 23 = R-513A 24 = R-454B 25 = R-448A 26 = R-449A 27 = R-23
Pi01	1596	RW	0	6	- - - -	1	Manufact.	driving mode selection 0 = automicrostepping 1 = full step 2 ph on 2 = full step 1 ph on 3 = half step 4 = microstepping 4 5 = microstepping 8 6 = microstepping 16
Pi07	1595	RW	0	59	- - - -	2	Manufact.	valve selection (values of parameter Pi07 not related here below are reserved) 0 = generic valve 1 = Sporlan CO2 2 = Sporlan SER AA-D 3 = Sporlan SERI F-L

								4 = Sporlan SER 1.5-20 5 = Sporlan SEI 0.5-11 6 = Sporlan SEI 30 7 = Sporlan SEI 50 8 = Sporlan SEH 100 9 = Sporlan SEHI 175/400 10 = Sporlan SDR-3 11 = Sporlan SDR-4 12 = Sporlan ESX UNI 13 = Sporlan EDEV B/C UNI 20 = Castel 261 21 = Castel 262/263 22 = Castel 264 30 = Alco EXM/L UNI 31 = Alco EX4-6 32 = Alco EX7 33 = Alco EX8 40 = Danfoss ETS 12-100C 41 = Danfoss ETS 12.5-50 42 = Danfoss ETS 100 43 = Danfoss ETS 250/400 44 = Danfoss ETS 6 UNI 50 = Sanhua VPF 12.5-50 51 = Sanhua VPF 100 52 = Sanhua VPF 150-400 55 = Carel ExV
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Valve and driver: digital I/O settings and various**
Ph01	1620	RW	0	8	- - - -	0	Manufact.	digital output DO1 function 0 = disabled 1 = any alarm 2 = probe errors 3 = following low SH alarms 4 = following MOP alarms 5 = following valve alarm 6 = used for solenoid valve 7 = alarms + used for solenoid valve 8 = valve resyncchronization signal is necessary
Ph02	1621	RW	0	1	- - - -	0	Manufact.	relay logic 0 = normally unexcited 1 = normally excited
Ph10	1622	RW	0	1	- - - -	0	Manufact.	free of voltage digital input DI1 logic 0 = normally open 1 = normally closed

Ph11	1623	RW	0	4	- - - -	1	Manufact.	free of voltage digital input DI1 function 0 = none 1 = enable/disable valve 2 = change parameters set 3 = resynchronization request 4 = backup battery status
Ph20	1624	RW	0	1	- - - -	0	Manufact.	free of voltage digital input DI2 logic 0 = normally open 1 = normally closed
Ph21	1625	RW	0	4	- - - -	2	Manufact.	free of voltage digital input DI2 function 0 = none 1 = enable/disable valve 2 = change parameters set 3 = resynchronization request 4 = backup battery status
Ph30	1626	RW	0	1	- - - -	0	Manufact.	high voltage digital input logic 0 = normally open 1 = normally closed
Ph31	1627	RW	0	4	- - - -	0	Manufact.	high voltage digital input DIHW function 0 = none 1 = enable/disable valve 2 = change parameters set 3 = resynchronization request 4 = backup battery status
Ph60	1628	RW	0	1	- - - -	0	Manufact.	pressure unit of measurements 0 = barG 1 = psiG
Ph61	1629	RW	0	1	- - - -	0	Manufact.	temperature unit of measurements 0 = °C / K 1 = °F / R
Ph70	1630	RW	0	1	- - - -	0	Manufact.	frequency grid 0 = 50 Hz 1 = 60 Hz
Ph80	1680	RW	0	2	- - - -	0	Manufact.	LED "STEP 2" function 0 = status 1 = LOP alarms + MOP alarms 2 = Lo SH alarms + Hi SH alarms
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI1**
Piu1	1646	RW	0	4	- - - -	1	Manufact.	analog input AI1 function 0 = not used 1 = suction temperature backup

								probe 2 = suction pressure backup probe
Pia1	1647	RW	1	30	- - - -	1	Installer	analog input AI1 probe type (used if Piu1 = 1 or 2) 1 = NTC probe 6 = Pt 1000 probe 10 = 4÷20 mA transducer (0÷10 Barg) 11 = 4÷20 mA transducer (0÷16 Barg) 12 = 4÷20 mA transducer (0÷30 Barg) 13 = 4÷20 mA transducer (0÷50 Barg) 20 = 0÷5 V ratiometric transducer (0÷7 Barg) 21 = 0÷5 V ratiometric transducer (0÷25 Barg) 22 = 0÷5 V ratiometric transducer (0÷60 Barg) 30 = scaling
AI1T	517	RW	2	7	- - - -	???	User	AI1 type (used if Piu1 = 0) 2 = NTC 3 = 0-20 mA 4 = 4-20 mA 5 = 0-5 V 6 = reserved 7 = Pt 1000
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI1 scaling**
P1Xty	1648	RW	0	2	- - - -	0	Manufact.	X type 0 = 0-20 mA 1 = 4-20 mA 2 = 0-5 V raziometrico
P1XM	1649	RW	P1Xm	0:20.00 1:20.00 2:5.00	- - - -	20.00	Manufact.	X max value
P1Xm	1650	RW	0:0.00 1:4.00 2:0.00	P1XM	- - - -	0.00	Manufact.	X min value
P1Tty	1651	RW	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA

P1YM	1652	RW	P1Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P1Ym	1653	RW	-300.00	P1YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI2**
Piu2	1654	RW	0	2	- - - -	0	Manufact.	analog input AI2 function 0 = not used 1 = suction temperature backup probe 2 = suction pressure backup probe
Pia2	1655	RW	1	30	- - - -	20	Installer	analog input AI2 probe type (used if Piu2 = 1 or 2) 1 = NTC probe 6 = Pt 1000 probe 10 = 4÷20 mA transducer (0÷10 Barg) 11 = 4÷20 mA transducer (0÷16 Barg) 12 = 4÷20 mA transducer (0÷30 Barg) 13 = 4÷20 mA transducer (0÷50 Barg) 20 = 0÷5 V ratiometric transducer (0÷7 Barg) 21 = 0÷5 V ratiometric transducer (0÷25 Barg) 22 = 0÷5 V ratiometric transducer (0÷60 Barg) 30 = scaling
AI2T	518	RW	2	7	**- - - -**	5	User	AI1 type (used if Piu2 = 0) 2 = NTC 3 = 0-20 mA 4 = 4-20 mA 5 = 0-5 V 6 = reserved 7 = Pt 1000
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI2 scaling**
P2Xty	1656	RW	0	2	- - - -	0	Manufact.	X type 0 = 0-20 mA 1 = 4-20 mA 2 = 0-5 V
P2XM	1657	RW	P2Xm	0:20.00	- - - -	20.00	Manufact.	X max value

				1:20.00 2:5.00				
P2Xm	1658	RW	0:0.00 1:4.00 2:0.00	P2XM	- - - -	0.00	Manufact.	X min value
P2Yty	1659	RW	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA
P2YM	1660	RW	P2Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P2Ym	1661	RW	- 300.00	P2YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI3**
Piu3	1662	RW	3	3	- - - -	3	Manufact.	analog input AI3 function 3 = suction temperature probe
Pia3	1663	RW	1	6	- - - -	1	Manufact.	analog input AI3 probe type 1 = NTC probe 6 = Pt 1000 probe
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI4**
Piu4	1670	RW	4	4	- - - -	4	Manufact.	analog input AI4 function 4 = suction pressure probe
Pia4	1671	RW	10	30	- - - -	20	Installer	analog input AI4 probe type 10 = 4÷20 mA transducer (0÷10 Barg) 11 = 4÷20 mA transducer (0÷16 Barg) 12 = 4÷20 mA transducer (0÷30 Barg) 13 = 4÷20 mA transducer (0÷50 Barg) 20 = 0÷5 V ratiometric transducer (0÷7 Barg) 21 = 0÷5 V ratiometric transducer (0÷25 Barg) 22 = 0÷5 V ratiometric transducer (0÷60 Barg) 30 = scaling
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: analog input AI4 scaling**
P4Xty	1672	RW	0	3	- - - -	2	Manufact.	X type 0 = 0-20 mA

								1 = 4-20 mA 2 = 0-5 V 3 = 0-10 V
P4XM	1673	RW	P4Xm	0:20.00 1:20.00 2:5.00 3:10.00	- - - -	5.00	Manufact.	X max value
P4Xm	1674	RW	0:0.00 1:4.00 2:0.00 3:0.00	P4XM	- - - -	0.00	Manufact.	X min value
P4Yty	1675	RW	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA
P4YM	1676	RW	P4Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P4Ym	1677	RW	-300.00	P4YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Probe settings: offset**
OfsTs	1678	RW	-10.0	10.0	K	0.0	User	suction temperature offset
OfsTe	1679	RW	-10.0	10.0	K	0.0	User	suction pressure (converted into temperature) offset
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Communication settings**
Mb0a	1729	RW	1	247	- - - -	1	Manufact.	MODBUS RS-485 port address
Mb0p	1730	RW	0	2	- - - -	2	Manufact.	MODBUS RS-485 port parity 0 = none 1 = odd 2 = even
Mb0b	1731	RW	0	4	- - - -	4	Manufact.	MODBUS RS-485 port baud rate 0 = 1,200 1 = 2,400 2 = 4,800 3 = 9,600 4 = 19,200
Mb0s	1733	RW	0	1	- - - -	0	Manufact.	MODBUS RS-485 port stop bit 0 = 1 bit 1 = 2 bit
CANn	1739	RW	1	127	- - - -	11	Manufact.	CAN node address
CANb	1744	RW	0	4	- - - -	1	User	CAN baud rate 0 = 10K 1 = 20K

								2 = 50K 3 = 125K 4 = 500K
CANt	1741	RW	1	60	s	5	User	CAN timeout
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Simulation**
Ps01	1700	RW	0	1	-	0	User	Enable simulation mode 0: normal mode 1: simulation mode
Ps02	1704	RW	0	1	-	0	User	DI 1 Simulation value
Ps03	1705	RW	0	1	-	0	User	DI 2 Simulation value
Ps04	1706	RW	0	1	-	0	User	DI HV Simulation value
Ps05	1706	RW	-32768	32767	-	0	User	Probe 1 Simulation value tenths of a degree if configured as a temperature probe hundredths of mA if configured as a current probe
Ps06	1706	RW	-32768	32767	-	0	User	Probe 2 Simulation value tenths of a degree if configured as a temperature probe hundredths of mA if configured as a current probe
Ps07	1706	RW	-32768	32767	-	0	User	Probe 3 Simulation value tenths of a degree if configured as a temperature probe hundredths of mA if configured as a current probe
Ps08	1706	RW	-32768	32767	-	0	User	Probe 4 Simulation value hundredths of mA if configured as a current probe hundredths of V if configured as a voltage probe
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menù**	**Comandi**
Pr02	1596	RW	0	2	-	0	Utente	Functioning mode 0: SH-algorithm 1: manual mode 2: debug functionality
Pr03	1597	RW	0.00	100.00	%	0.00	Utente	Manual set-point position used if valve in manual mode (Pr02=1)
ResR	1281	RW	0	1	-	0	Utente	Resynch request 0 → 1 resynch request
EnaV	1282	RW	0	1	-	0	Utente	Enable valve command

	1285							1282: Modbus RS-485 1285: Modbus USB 0 = disable valve 1 = enable valve
Cmd	1286	RW	0	65535	-	0	Utente	Command b0: 0 → 1 reset parameter alarm Cmd: x → 0xBx reset application (Init phase) Cmd: x → 0x5x reset board
Cpy	1812	WO	0	255	-	0	Utente	Copy selected to generic valve 1 to Pi07 max: copy the selected valve parameters to generic valve parameter
Par.	**Add.**	**Acc.**	**Min.**	**Mas.**	**Unità**	**Default**	**Menu**	**Status**
UdM	1645	RO	- - - -	- - - -	- - - -	- - - -	User	internal unit of measure b0: 0: pressure in bar 1: pressure in psi b1: 0: temperature in °C/K 1: temperature in °F/R b2: 0: conversion ok 1: conversion in progress or halted
DrvM	1792	RO	0	5	- - - -	- - - -	User	driving mode 0 = full step 2 ph on 1 = full step 1 ph on 2 = half step 3 = microstepping 4 4 = microstepping 8 5 = microstepping 16
Stat	1793	RO	0	61	- - - -	- - - -	User	FSM status 0 = initialization 1 = synchronization wait 2 = positioning wait 3 = probe alarm 4 = grid alarm 5 = communication alarm 10 = stand-by off 11 = stand-by on 30 = analog positioner 40 = stabilization 41 = start-up 42 = algorithm selection 50 = manual 51 = debugger 60 = reserved 61 = SH algorithm

AlSt	1794	RO	- - - -	- - - -	- - - -	- - - -	User	alarm status b0: EEPROM alarm b1: configuration alarm b2-3: communication status b4-7: probe alarm b8: power fail b9: backup battery alarm b10: algorithm alarm b11: reserved b12: parameters conversion failed
AlgS	1795	RO	- - - -	- - - -	- - - -	- - - -	User	SH algorithm status b0: measure not acquired b1: algorithm halted b2: bypass algorithm (manual) b3: LoSH algorithm is running b4: LoSH alarm b5: HiSH algorithm is running b6: HiSH alarm b7: LOP algorithm is running b8: LOP alarm b9: MOP algorithm is running b10: MOP alarm b11: LP b12: LP alarm
CoWA	1796	RO	0	21	- - - -	- - - -	User	configuration warnin 0 = correct configuration 1 = incorrect config. for start-up 2 = invalid value for parameter Pia1 3 = invalid value for parameter Pia2 4 = invalid value for parameter Pia3 5 = invalid value for parameter Pia4 6 = Piu1 configuration matches other Piux 7 = Piu2 configuration matches other Piux 8 = Piu3 configuration matches other Piux 9 = incorrect configuration Piu4 10 = mismatch between Pia1 and Piu1 11 = mismatch between Pia2 and Piu2 12 = mismatch between Pia3 and Piu3 13 = mismatch between Pia4 and Piu4 14 = awaiting configuration AI1 15 = awaiting configuration AI2 16 = awaiting configuration AI3 17 = awaiting configuration AI4 18 = awaiting analog configurations

								19 = error writing Xmax probe 4 scaling 20 = error writing Xmax probe 4 scaling 21 = no primary temperature or pressure probe configured 22 = copy valve parameters error 23 = valve selection error
PAtt	1797	RO	0.00	100.00	%	- - - -	User	actual valve position
PAtP	1798	RO	- - - -	- - - -	step	- - - -	User	actual valve position step
Psp	1799	RO	0.00	100.00	%	- - - -	User	target position
EnaS	1800	RO	0	1	- - - -	- - - -	User	enable valve status 0 = valve not enabled 1 = valve enabled
ResS	1801	RO	0	1	- - - -	- - - -	User	resynchronization request status 0 = no request 1 = request reserved
IhoS	1802	RO	0	1	- - - -	- - - -	User	holding current status 0 = operating phase current 1 = holding phase current
Te	1803	RO	- - - -	- - - -	°C	- - - -	User	Te (evaporation temperature)
Pe	1804	RO	- - - -	- - - -	barG	- - - -	User	Pe (evaporation pressure)
Ts	1805	RO	- - - -	- - - -	°C	- - - -	User	Ts (suction temperature)
SH	1806	RO	- - - -	- - - -	K	- - - -	User	SH
SpSH	1807	RO	- - - -	- - - -	K	- - - -	User	SH setpoint
SetS	1808	RO	1	2	- - - -	- - - -	User	selected SH parameters set
PidP	1809	RO	- - - -	- - - -	%	- - - -	User	PID setpoint position output
ParS	1810	RO	0	2	- - - -	- - - -	User	parameters status bit0: disable the valve to accept new parameters bit1: reset the board to accept new parameters
SRat	1811	RO	- - - -	- - - -	step/s	- - - -	User	actual value step rate
SetM	1813	RO	- - - -	- - - -	K	- - - -	User	SH setpoint SH with MOP correction
Upr	1814	RO	- - - -	- - - -	- - - -	- - - -	User	used probes b 0: AI1 b 0: AI2

								b 0: AI3 b 0: AI4
TsPr	1815	RO	- - - -	- - - -	- - - -	- - - -	User	Ts prymary probe 0: AI1 0: AI2 0: AI3 0: AI4
PePr	1816	RO	- - - -	- - - -	- - - -	- - - -	User	Pe prymary probe 0: AI1 0: AI2 0: AI3 0: AI4
TsPrB	1817	RO	- - - -	- - - -	- - - -	- - - -	User	Ts backup probe 0: AI1 0: AI2 0: AI3 0: AI4 255 = no probe
PePrB	1818	RO	- - - -	- - - -	- - - -	- - - -	User	Pe backup probe 0: AI1 0: AI2 0: AI3 0: AI4 255 = no probe
PoF	1790	RW	- - - -	- - - -	- - - -	- - - -	User	power failure counter
PoFc	1791	RW	- - - -	- - - -	- - - -	- - - -	User	power failure complete closure counter
DI1	257	RO	- - - -	- - - -	- - - -	- - - -	User	DI1 status 0: OFF 1: ON
DI2	258	RO	- - - -	- - - -	- - - -	- - - -	User	DI2 status 0: OFF 1: ON
DI1HV	259	RO	- - - -	- - - -	- - - -	- - - -	User	DI1 HV status 0: OFF 1: ON
DO	265	RO	- - - -	- - - -	- - - -	- - - -	User	relay status 0: OFF 1: ON
AI1	513	RO	- - - -	- - - -	- - - -	- - - -	User	AI1 value
AI2	514	RO	- - - -	- - - -	- - - -	- - - -	User	AI2 value
AI3	515	RO	- - - -	- - - -	- - - -	- - - -	User	AI3 value
AI4	516	RO	- - - -	- - - -	- - - -	- - - -	User	AI4 value

Pnum	65329	RO	- - - -	- - - -	- - - -	- - - -	User	project number
Pvar	65342	RO	- - - -	- - - -	- - - -	- - - -	User	project variation 0 = AA 1 = AB 2 = AC etc.
Pver	65330	RO	- - - -	- - - -	- - - -	- - - -	User	project version
Prev	65331	RO	- - - -	- - - -	- - - -	- - - -	User	project revision
FoLo	1822	RO	- - - -	- - - -	- - - -	- - - -	User	compilation date (Lo); (seconds to 2000)
FoHi	1822	RO	- - - -	- - - -	- - - -	- - - -	User	compilation date (Lo); (seconds to 2000)

8 SERIAL COMMUNICATION

8.1 Preliminary information

It is possible to control the EVDRIVE06 driver by connecting it to a controller.
The controller sends information to the driver necessary for its correct functioning, and the driver responds with its internal states, such as (for example) the pressure and temperature measurements, alarms, certain parameters, etc.
The connection methods available on the EVDRIVE06 are CANBUS, MODBUS RS-485 and MODBUS USB, according to the model.
The protocol to be used for communication with the controller must be selected via parameter Enabling mode (Pr06).
See the "Enable EVDRIVE06" section.

The EVDRIVE06 behaves as an expansion to read the analog inputs AI1 and AI2, read digital inputs and write the relay. (Note that driving the relay by the controller completely bypasses its function set by parameter.)

8.2 CANBUS serial communication

The EVCO controllers primarily use a protocol based on CANbus for communication with controllable systems.

8.2.1 CAN Master tool

The exchange of data is based on a list of variables or parameters that the controller may send to the driver, and a list of variables the driver sends to the controller to provide its state data, using the CAN Master tool.

The variables and parameters to be monitored should be selected from lists proposed by SW development according to their own needs.
The protocol performs one send request every second and one receive request every second, which does not occur simultaneously. Each send/receive request is done on a different node, thru the nodes on the network.
You can give a different timing of the individual entities. The levels selected are:

- Level INIT: the value is written (or read) only once when the controller detects a new node in the network. If the node is disconnected and then reconnected the initialization is done again.
- Level LO: every 10 seconds is written (or read) one of the entities with this priority.
- Level HI: each 1 second is written (or read) one of the entities with this priority.

When you connect a device to the network, the controller read and write all entities without differentiating the priorities. Once this step is completed for each node, entities with priority INIT will no longer be requested.
The refresh time of the single entity depends, therefore, both on its level and on the number of entities of the same level and type (read / write).

8.2.1.1 Status variables

AI1 type (AI1T used if Piu1 = 0)
AI2 type (AI2T used if Piu1 = 0)
Ai error timeout
FSM status (Stat)
Used SH control parameters set (SetS)
Measured SH (SH)
Used SH set-point (SpSH)
Measured aspiration temperature (Ts)
Measured evaporator pressure (Pe)
Calculated evaporator temperature (Te)
Unit uf measure in use (UdM)
Working hour (Pr40)
Control algorithm status (AlgS)
Alarm status (AlSt)
Configuration warning (CoWa)
Enable valve status (EnaS)
Request a reset status (ParS)
Resynchro request status (ResS)

Target position (Psp)
Current valve position % (PAtt)
Communication alarm enable status(Pa01)
Communication alarm delay (Pa02)
FW project
FW variation
FW version
FW revision

8.2.1.2 Control variables

AI1 type (AI1T used if Piu1 = 0)
AI2 type (AI2T used if Piu1 = 0)
Ai error timeout
Enable valve command (EnaV)
Command (Cmd)
Resynchronization request (ResR)
Functioning mode (Pr02)
Manual valve position set-point (Pr03)
Debug valve step rate (Prd0)
Debug minimum opening (Prd1)
Debug maximum opening (Prd2)
Stabilization delay (Pr08)
Stabilization position (Pr09)
Main control type (Pr01)
SH control parameters selection (SEtP)
set 1: SH set-point (Pc01)
set 2: SH set-point (Pp01)
set 1: LoSH set-point (Pc02)
set 2: LoSH set-point (Pp02)
set 1: HiSH set-point (Pc03)
set 2: HiSH set-point (Pp03)
set 1: LOP set-point (Pc04)
set 2: LOP set-point (Pp04)
set 1: MOP set-point (Pc05)
set 2: MOP set-point (Pp05)
set 1: PID proportional band (Pc13)
set 2: PID proportional band (Pp13)
set 1: PID integral time (Pc14)*set 2: PID integral time* (Pp14)
set 1: PID derivative time (Pc15)
set 2: PID derivative time (Pp15)
set 1: start-up delay (Pc20)
set 2: start-up delay (Pp20)
set 1: start-up position (Pc21)
set 2: start-up position (Pp21)
Fast action start threshold (FaTh)
Fast action (Fast)
PID neutral zone high threshold (PNHi)
PID neutral zone low threshold (PNLO)
PID proportional constant threshold (Pcz)
PID SH filter time constant (SHFi)
Relay fuction selection (Ph01)
Relay polarity (Ph02)
DI1 function selection (Ph11)
DI1polarity (Ph10)
DI2 function selection (Ph21)
DI2polarity (Ph20)
DI1HV function selection (Ph31)
DI1HVpolarity (Ph30)
AI1 probe usage (PIu1)
AI2 probe usage (PIu2)
AI1 probe type (PIA1)
AI2 probe type (PIA2)
AI3 probe type (PIA3)
AI4 probe type (PIA4)
AI1 scaling X type (P1Xt)
AI2 scaling X type (P2Xt)
AI4 scaling X type (P4Xt)
AI1 scaling X max (P1XM)
AI2 scaling X max (P2XM)
AI4 scaling X max (P4XM)
AI1 scaling X min (P1Xm)*AI2 scaling X min* (P2Xm)
AI4 scaling X min (P4Xm)
AI1 scaling Y type (P1Yt)
AI2 scaling Y type (P2Yt)
AI4 scaling Y type (P4Yt)
AI1 scaling Y max (P1YM)
AI2 scaling Y max (P2YM)
AI4 scaling Y max (P4YM)
AI1 scaling Y min (P1Ym)
AI2 scaling Y min (P2Ym)
AI4 scaling Y min (P4Ym)
Ts temperature offset (OfsTs)
Te temperature offset (OfsTe)
Type of refrigerant (Pi00)
Enabling mode (Pr06)

8.2.2 Commands

For the variables that need an immediate refresh, commands are implemented.

The CommandOut allows to write commands on the device. The device performs the new values as soon as possible.

The CommanIn allows to read variables from device. The device send a CommandIn every 5 seconds and on event (see table).

Code	UNIPRO/SoHVAC Name		Sent variables	Event
38	Send EVCM command	Controller to EVDrive	bit 0: *Enable valve command* bit 1: *Resynchronization request* bit 2: *Functioning mode* 0 = algo 1 = manual bit 3: *SH control parameters selection* 0 = set 1 1 = set2 bit 4-7: reserved bit 8-15: bit 0-7 mask	
39	Send EVCM Manual Pos	Controller to EVDrive	*Manual valve position set-point*	
40	Receive EVCM Current Pos	EVDrive to Controller	*Current valve position %*	Current position < 5%
41	Receive EVCM Status	EVDrive to Controller	bit 0-7: *FSM status* bit 8: *Enable valve status* bit 9: *Resynchro request status* bit 10: *Used SH control parameters set* 0 = set 1 1 = set2	Every change
42	Receive EVCM Status	EVDrive to Controller	*Alarm status*	Every change

8.3 MODBUS serial communication

Serial communication via the RS-485 port may use the ModBus protocol. The accessible variables and parameters are those shown in the tables in the section "Configuration". These same tables also include ModBus addresses (base 1).

The same rules covered earlier for the communication alarm management also apply to the valve *Enable valve command* (EnaV) (see "Communication error").

The port configuration can be performed using dedicated configuration pages on EPJgraph or LCD display.

The default setting for ModBus communication via RS485 port is 9600 bps, even parity, 1 stop bit.

9 ALARMS AND ERRORS

9.1 Alarms and errors

The system supports a series of alarms related to both the system (memory, probes, communication, configuration, etc.), and the regulation algorithm (LoSH, HiSH, LOP, MOP, Low Pressure).
All the alarms, except the parameters alarm (EPar), are automatic, this means that they will be cancelled automatically once the cause of the alarm is removed.
The presence of an alarm status is signalled using the LED interface and using relays, if suitably configured.
The alarm status is always available in the Alarm status (AlSt), Configuration warning (CoWA) and Algorithm status (AlgS).

Alarm Status	Short Code	Alarm description	Parameters
Bit 0	EHd1	Memory error	--
Bit 1	EHd2	Configuration error	
Bit 2,3	Ecom	Communication error	Pa01, Pa02, Pr48
Bit 4	EPr1	Probe Ai1 error	Pr05
Bit 5	EPr2	Probe Ai2 error	Pr05
Bit 6	EPr3	Probe Ai3 error	Pr05
Bit 7	EPr4	Probe Ai4 error	Pr05
Bit 8	PSer	Power failure	Pa70, Pa71, Pb01
Bit 9	Ebat	Backup battery error	Pa75, Pa76 , Pb01, Ph21, Ph20
Bit 10	Ealg	Algorithm status	Pa11, Pa12, Pa20, Pa21, Pa22, Pa30, Pa31, Pa32, Pa33, Pa40, Pa41, Pa42, Pa50, Pa51, Pa52
Bit 12	Epar	Parameters error	--

9.2 Memory error

A memory error occurs when it is not possible to access data stored in the EEPROM memory: it is not therefore possible to access the parameter values stored on it, so they will assume default values from flash memory. Is also not possible to store new parameter values.
This alarm can be occurred if the automatic conversion procedure of the temperature and/or pressure parameters is halted. In this case also the parameters alarm is set and is necessary to reload the default parameters from the flash memory to clear the memory alarm.

9.3 Configuration error

In the Stand-by off state is checked the correctness and the congruence of the parameters. If the configuration is not correct, an alarm is generated, signalled by bit 1 of Alarm status (AlSt). To determine the significance of this single bit Configuration warning (CoWA) contains the error code generated during the parameter verification process.

Code	Reason	What to do
0	Correct configuration (no error)	-
1	Pr06 value invalid, or if Pr06 = 0, Ph11 not set to enable valve, or, if Pr06 = 1, Ph31 not set to enable valve.	Check parameters Pr06, Ph11, Ph31
2	Invalid value for parameter PIA1	Set parameter to a valid value
3	Invalid value for parameter PIA2	

4	Invalid value for parameter PIA3	
5	Invalid value for parameter PIA4	
6	PIu1 configured as another Piux	Parameters Piu1, Piu2, Piu3 and Piu4 must each
7	PIu2 configured as another PIux	have different values, or null.
8	PIu3 configured as another PIux	Checked only if Pr01 ≥ 6
9	PIu4 configured as another Piux	
10	Contradiction between analog input type (Pia1) and its utilization (Piu1)	Check parameters Piax and Piux.
11	Contradiction between analog input type (Pia2) and its utilization (Piu2)	Temperature is measured using probes of type NTC, pt1000, or scaling; pressure
12	Contradiction between analog input type (Pia3) and its utilization (Piu3)	is measured using current, tension or scaling probes.
13	Contradiction between analog input type (Pia4) and its utilization (Piu4)	Checked only if Pr01 ≥ 6
14	Awaiting AI1 configuration	Wait
15	Awaiting AI2 configuration	Wait
16	Awaiting AI3 configuration	Wait
17	Awaiting AI4 configuration	Wait
18	Awaiting analog inputs configurations	Wait
19	Limit error Xmax probe scaling	
20	Limit error Xmax probe scaling	
21	No AI configured for primary temperature	Check PIu1, PIu2, PIu3 and PIu4 parameters or pressure probe input and ensure one is dedicated to the primary temperature probe, and another to the primary pressure probe. Checked only if Pr01 ≥ 6
22	Error when copying the selected valve parameters to the generic valve	Try copyng again
23	A valve with incorrect parameters was selected	Set the valve parameters correctly and restart the instrument
24	A probe is not properly configured	Check PIAx prameters

9.4 Communication error

A communication error is signalled only if a suitable communication mode is selected (Pr06 ≥ 2), and the communication alarm is active (Pa01 = 1). Under these conditions, the driver expects the controller to periodically refresh the Enable valve command (EnaV).

If the refresh does not happen for more than half the time set in Communication alarm delay (Pa02), a warning is given. If the refresh does not happen for more than the time set in Communication alarm delay (Pa02), the communication is considered lost and communication alarm is set.

Management of this alarm depends on the mode selected. If Pr06 = 2÷5, a communication alarm state will cause the valve to be forced to the position determined by Communication error position (Pr48), and will then enter the Communication alarm (5) until the positioning process has completed and the communication start again. If Pr06 = 6÷9, a communication alarm status will place the valve into standalone mode, and DI1 enable the valve.

When the communication alarm is cleared, the valve will automatically return to the online mode.

The significance of bit 3 and 2 of Alarm status (AlSt) are shown in the following table:

bit3	bit2	Significance
0	0	No communication alarm
0	1	Warning
1	0	Communication alarm in standalone mode
1	1	Communication alarm

9.5 Probe error

The probe alarm state is monitored every main cycle and is shown in bits 4÷7 of Alarm status (AlSt) and also signalled by the relay, if configured.

Each bit is associated with a single analog input:

- bit 4: error state for probe connected to analog input AI1
- bit 5: error state for probe connected to analog input AI2
- bit 6: error state for probe connected to analog input AI3
- bit 7: error state for probe connected to analog input AI4

A probe error state is signalled and, if necessary, managed, only when the respective probe is in use.

Be aware that the measurements are valid only in operation modes in which the valve is enabled (FSM status ≥ 30); in other states, the analog inputs might not be configured correctly.

When the state machine enter the Stand-by off, after the parameters check, it is possible to determine which probes will be used: for example, if an analog positioner is set using setting Pr01 = 1, only an error on probe 1 will generate an alarm. If, on the other hand, an algorithm (Pr01 ≥ 6) is selected, both the selected primary probes (and, eventually, those chosen as secondary probes) will be able to set an alarm. The signalling of the alarms is thus active after the first entry into the Stand-by off.

In states where it is really necessary that the values from analog inputs are reliable, i.e. in analog positioner and SH-algorithm mode, a more complete probe error management system is activated.

When the analog positioner function is selected (Analog positioner (30)), a probe error on a probe currently in use will trigger a positioning move to the value Probe alarm position (Pr05), and the system is changed to Probe alarm (3), where it will then wait for the clearing of the alarm from the relevant probe.

If a SH-algorithm is active, the probe errors monitored are those related to pressure and temperature measures. Any probe error will be handled as follows:

if the alarm relates to the primary probe (temperature or pressure), and another analog input has been configured as a backup probe (for temperature or pressure respectively), the measurement is automatically read from the backup probe; the corresponding Alarm status (AlSt) bit is set to signal a malfunction on the primary probe. Once the primary probe's alarm state has been cleared, the readings are taken from the primary probe once more.

if no backup probe is defined, or if also the backup probe goes in alarm, the algorithm is disabled; the valve is positioned at Probe alarm position (Pr05), and the FSM enters the Probe alarm (3), where it awaits the clearing of the alarm state.

In each case, positioner or SH-algorithm, when the probe alarm is cleared, the state is automatically changed to Stand-by off.

If the valve is disabled while is in Probe alarm (3), there is a positioning to Stand-by position (Pr20) and then it enter Stand-by off.

9.6 Power failure and backup battery error

The EVDRIVE06 supports connection to a backup battery in order to allow a complete closure of the valve in the case of power supply failure.
There are two alarms: one for the power supply failure (bit 8), the other for a malfunction of the backup battery (bit 9).
Clearly, both these alarms make sense only if a backup battery is present (parameter Backup battery (Pb01 = 1).
The backup battery alarm also requires the configuration of DI2 (DI2 logic (PH20) and DI2 function (PH21)).
Note that the backup battery alarm only signalize the malfunction of the battery.
However, if the power fail alarm occurs, in addition to reporting, a valve safety shutdown procedure is started.
Once the alarm is cleared, the system is reset.
An alternative to the backup battery, a solenoid valve connected to the relay may be used to block the flow of the refrigerant.

9.7 Algorithm status

Bit 10 of Alarm status (AlSt) is raised if the measures needed by the algorithm are not valid or for SuperHeat algorithm alarms and warmings (LOP, MOP, LoSH, HiSH, LowPressure).
This monitoring is in effect only while the system is working in SH-algorithm and in manual mode.
The Algorithm status (AlgS) variable holds the specific state that generated the alarm, according to this table:

Algorithm status	Description	
	Value 0	Value 1
bit 0	Measures acquired	Data not read (Alarm status.b10 0→1)
bit 1	algorithm is running	control algorithm halted
bit 2	algorithm is active	algorithm is skipped (manual mode is active)
bit 3	No LoSH algorithm is running	LoSH algorithm is running
bit 4	No LoSH alarm	LoSH alarm (Alarm status.b10 0 > 1)
bit 5	No HiSH algorithm is running	HiSH algorithm is running
bit 6	No HiSH alarm	HiSH alarm (Alarm status.b10 0 > 1)
bit 7	No LOP algorithm is running	LOP algorithm is running
bit 8	No LOP alarm	LOP alarm (Alarm status.b10 0 > 1)
bit 9	No MOP algorithm is running	MOP algorithm is running
bit 10	No MOP alarm	MOP alarm (Alarm status.b10 0 > 1)
bit 11	No LowPressure	LowPressure (warning signal only)
bit 12	No LowPressure alarm	LowPressure alarm (Alarm status.b10 0 > 1)

Note that if the manual mode is active, a read error of the measurement data due to incorrect probe configuration only generates a warning. While, if the control algorithm is running, the inability to read the measurements makes it impossible for the algorithm to continue, so this triggers a probe alarm.
Bits 0, 1 and 2 of Algorithm status (AlgS) are always calculated, while the other bits, given their dependencies on the active control algorithm, are only valid while SH-algorithm is running.

9.8 Superheat algorithm protection functions

9.8.1 LoSH

When enabled (Pa10), this alarm is triggered when the SH drops below the low heating threshold (Pc02, Pp02, Pd02). The condition is signalled in the Algorithm status (AlgS) and, when the timeout (Pa12) expires, an alarm is set.
The alarm and signal are cleared automatically when the SH returns above the threshold (hysteresis defined in Pa11).

9.8.2 HiSH

When enabled (PA20), this alarm is triggered when the SH rises above the high heating threshold (Pc03, Pp03, Pd03), a bit is set in Algorithm status (AlgS) and, after the timeout (Pa22) expires, an alarm is set. The alarm and signal are cleared automatically when the SH returns below the threshold (hysteresis defined in Pa21).

9.8.3 LOP

When enabled (parameter Pa40), this alarm is triggered when the evaporation temperature (Te) drop below the LOP threshold (parameters Pc04, Pp04) and in the **Start-Up** (41) status activates a specific algorithm for managing the LOP, forcing the valve to open 100%, and in case of alarm re-entry stopping it at the current opening.
The condition is signalled in the *Algorithm status* (AlgS) and, when the timeout (Pa42) expires, an alarm is set.
This protection is most useful during start-up of the machine, when the evaporation temperature is effectively low.
It is possible to optimise this phase by setting a correct value in the valve opening on start-up parameter (parameters Pc21, Pp21). When the Te temperature returns within its limits (parameter Pa41 defines the hysteresis), the alarm and signalling are cleared and the normal regulation algorithm resumes.

9.8.4 MOP

When enabled (parameter Pa50), once the *Delay Bypass MOP* (parameter PA56) has elapsed since the activation of the regulation algorithm, this alarm is triggered when the evaporation temperature (Te) rise above the MOP threshold (parameters Pc05, Pp05) and activates a specific algorithm for managing the MOP, that increasing the superheat setpoint (parameters PA53, PA54, Pa55).
The MOP correction algorithm can force the opening of the valve, closing it of *MOP forced delta* (parameter Pa57) each *MOP forced time* (parameter Pa58) seconds. This function is disabled if *MOP forced delta* (Pa57 parameter) is null.
The condition is signalled in the *Algorithm status* (AlgS) and, when the timeout (parameter Pa52) expires, an alarm is set. When the Te temperature returns within its limits (parameter Pa51 defines the hysteresis), the alarm and its signal are cleared and the normal regulation algorithm resumes.

9.8.5 LowPressure

When enabled (Pa30), and the evaporation pressure (Pe) falls below the low pressure threshold (Pa31), an warning is signalled. After the timeout (Pa33) expires, the LP alarm is set. The alarm and its signal are cleared automatically when the pressure returns above the threshold. (Pa32 defines the hysteresis).

9.9 Parameters error

Bit 12 of Alarm status (AlSt) indicates that there was a problem during the automatic conversion of the parameters of temperature and/or pressure and it is possible that not all parameters have been successfully converted.
The automatic conversion of the parameters is performed only at the reset after a change in parameters Ph60 and/or Ph61.
If this alarm occurs, the user should check and correct all the parameters of temperature and pressure, cancel the alarm leading to 1 bit 0 of the variable Command (Cmd), and then reset the EVDRIVE06.

10 ACCESSORIES

10.1 Non optoisolated RS-485/USB serial interface EVIF20SUXI

10.1.1 Introduction

EVIF20SUXI is a non optoisolated RS-485/USB serial interface.

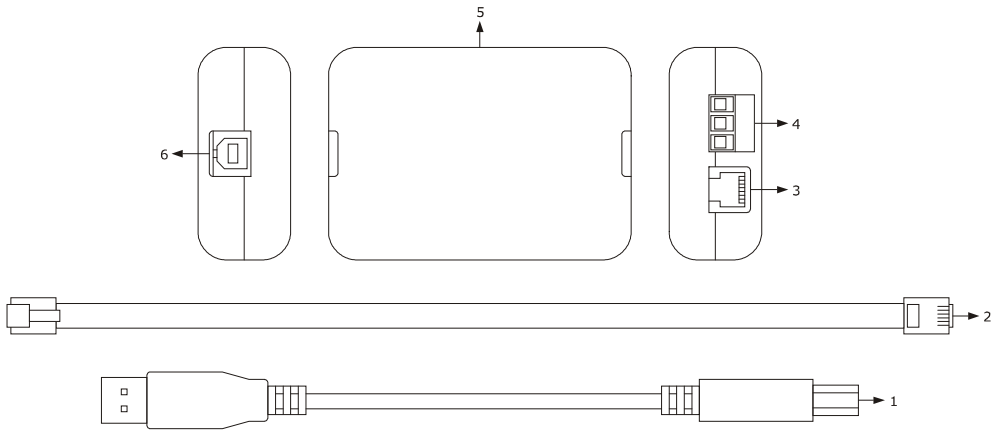
Through the interface it is possible to connect the driver to the set-up software system Parameters Manager.

The interface is made of:

- RS-485 / USB non optoisolated serial interface
- USB cable (to connect the serial interface to the Personal Computer)
- RS-485 cable (this cable is not necessary because the connection serial interface-driver uses a three wires connection).

10.1.2 Description

The following drawing shows the aspect of the interface EVIF20SUXI.

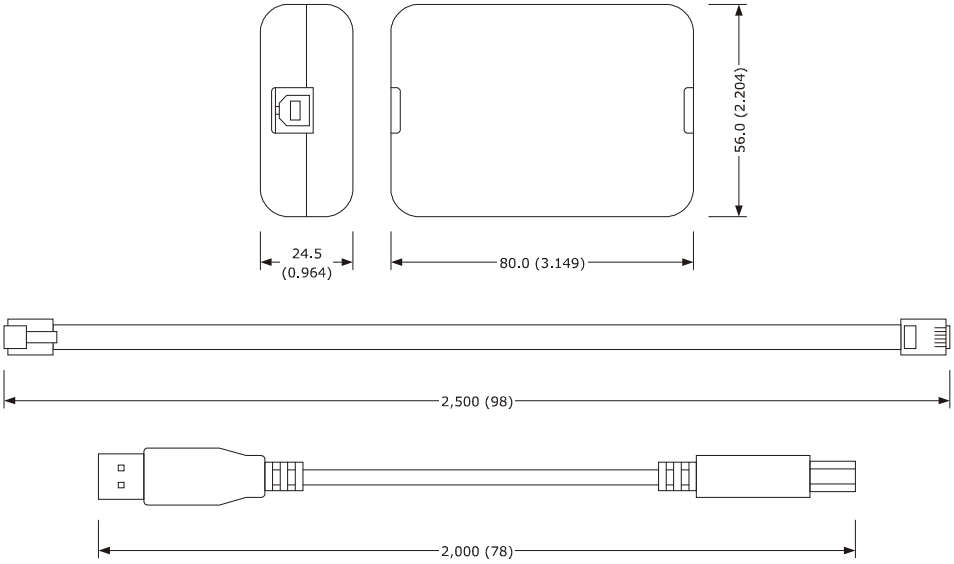


The following table shows the meaning of the parts of the kit.

Part	Meaning
1	USB cable 2 m (6 ft) long
2	RS-485 cable 2.5 m (8 ft) long
3	RS-485 port on telephone connector
4	RS-485 port on screw terminal block
5	RS-485 / USB non optoisolated serial interface
6	USB port

10.1.3 Size

Size is in mm (in).



10.1.4 Connection to the Personal Computer

Operate as follows:

1. Connect the RS-485 port on screw terminal block of the interface to the RS-485 port of the device using three wires and operating as follows:
   - terminal 1 of the interface must be connected to terminal RS485+ of the device
   - terminal 2 of the interface must be connected to terminal RS485- of the device
   - terminal 3 of the interface must be connected to terminal GND of the device.
2. Plug in and end of the USB cable into the USB port of the serial interface.
3. Plug in the other end of the USB cable into an USB port of the Personal Computer.

For further information consult the User manual of Parameters Manager.

10.2 Backup module EPS4B

10.2.1 Introduction

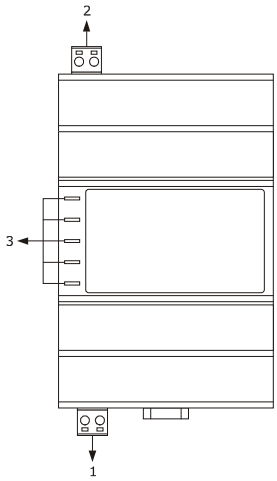
EPS4B is a backup module.

Through the module it is possible to close the valve in case of lack of power supply of the driver.

For further information consult the data sheet of EPS4B.

10.2.2 Description

The following drawing shows the aspect of the module EPS4B.

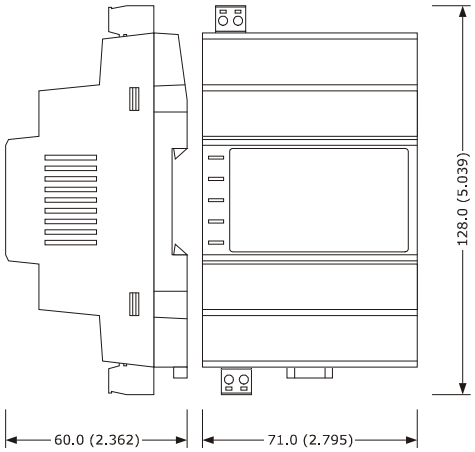


The following table shows the meaning of the parts of the module.

Part	Meaning
1	backup power supply output
2	power supply
3	signal LEDs

10.2.3 Size

Size is in mm (in).



10.2.4 Connection to the device

Look at chapter 4 "ELECTRICAL CONNECTION"Operate as follows:

Please note the power supply of EVDRIVE06 and that of EPS4B are not isolated: it is important to wire correctly the devices as indicated in chapter 4.

11 TECHNICAL DATA

11.1 Technical data

<table>
<tr><td>Purpose of the device:</td><td colspan="4">electronic expansion valves driver.</td></tr>
<tr><td>Box:</td><td colspan="4">self-extinguishing grey.</td></tr>
<tr><td rowspan="2">Size:</td><td colspan="4">71.0 x 128.0 x 60.0 mm (2.795 x 5.039 x 2.362 in; W x H x D); 4 DIN modules.</td></tr>
<tr><td colspan="4">Size refers to the device with the extractable screw terminal blocks properly plugged.</td></tr>
<tr><td>Installation:</td><td colspan="4">on DIN rail 35.0 x 7.5 mm (1.377 x 0.295 in) or 35.0 x 15.0 mm (1.377 x 0.590 in).</td></tr>
<tr><td>Index of protection:</td><td colspan="4">IP20; IP40 the front.</td></tr>
<tr><td rowspan="2">Connections:</td><td>EPD4BX6</td><td>EPD4BC4</td><td>EPD4BF6</td><td>EPD4DF6</td></tr>
<tr><td>male extractable screw terminal blocks with pitch 5.0 mm (0.196 in; power supply and outputs; with pitch 3.5 mm for analog inputs and free of voltage digital inputs) for conductors up to 2.5 mm² (0.0038 in²), type-A USB connector.</td><td>male extractable screw terminal blocks with pitch 5.0 mm (0.196 in; power supply, high voltage digital inputs, outputs, CAN port; with pitch 3.5 mm for analog inputs and free of voltage digital inputs) for conductors up to 2.5 mm² (0.0038 in²), type-A USB connector.</td><td colspan="2">male extractable screw terminal blocks with pitch 5.0 mm (0.196 in; power supply, high voltage digital inputs, outputs, CAN port and RS-485 port; with pitch 3.5 mm for analog inputs and free of voltage digital inputs) for conductors up to 2.5 mm² (0.0038 in²), type-A USB connector.</td></tr>
</table>

	The maximum lengths of the connecting cables are the following:
	- power supply device: 30 m (98 ft)
	- analog inputs: 100 m (328 ft)
	- power supply 0-20 mA/4-20 mA/0-5 V ratiometric/0-10 V transducers: 100 m (328 ft)
	- free of voltage digital inputs: 100 m (328 ft)
	- high voltage digital input: 100 m (328 ft)
	- digital output: 100 m (328 ft)
	- bipolar stepper motor output: 5 m (16 ft; 10 m (32 ft) with shielded cable)
	- CAN port:
	  - 1,000 m (3,280 ft) with baud rate 20,000 baud
	  - 500 m (1,640 ft) with baud rate 50,000 baud
	  - 250 m (820 ft) with baud rate 125,000 baud
	  - 50 m (164 ft) with baud rate 500,000 baud
	- power supply remote user interface: 30 m (98 ft)
	- RS-485 port: 1,000 m (3,280 ft); also look at the *MODBUS specifications and implementation guides* manual.
	One suggests using the connecting kit CJAV17 (female extractable screw terminal blocks pitch 5.0 mm (0.196 in), to order separately).

Operating temperature:	from -10 to 60 °C (from 14 to 140 °F).
Storage temperature:	from -20 to 70 °C (from -4 to 158 °F).
Operating humidity:	from 10 to 90% of relative humidity not condensing.
Pollution situation:	2.
Power supply:	24 VAC +10% -15%, 50/60 Hz ±3 Hz, 40 VA max. not isolated or 24... 37 VDC, 22 W max. not isolated, supplied by a class 2 circuit. If the device is powered in direct current, it is necessary to respect the polarity of the power supply voltage. Protect the power supply with a fuse rated 2 A-T 250 V.
Overvoltage category:	III.

Analog inputs:

4 inputs of which 2 inputs (non optoisolated, which can be set via configuration parameter for NTC/Pt 1000 probes and for 0-20 mA/4-20 mA/0-5 V ratiometric transducers) which can be set via configuration parameter for suction temperature backup probe/suction pressure backup probe, 1 input (non optoisolated, which can be set via configuration parameter for NTC/Pt 1000 probes) as suction temperature probe and 1 input (non optoisolated, which can be set via configuration parameter for 0-20 mA/4-20 mA/0-5 V ratiometric/0-10 V transducers) as suction pressure probe.

NTC analog inputs (10K Ω @ 25 °C, 77 °F)

Kind of sensor:	ß3435.
Working range:	from -40 to 110 °C (from -40 to 230 °F) for standard NTC probes from -50 to 150 °C (from -58 to 302 °F) for high temperature NTC probes from -50 to 110 °C (from -58 to 230 °F) for fast NTC probes.
Accuracy:	±0.6% of the full scale for standard and fast NTC probes ±0.5% of the full scale for high temperature NTC probes.
Resolution:	0.1 °C (1 °F).
Conversion time:	100 ms.
Protection:	none.

Pt 1000 analog inputs (1K Ω @ 0 °C, 32 °F)

Working range:	from -100 to 400 °C (from -148 to 752 °F).
Accuracy:	±0.5% of the full scale.
Resolution:	0.5 °C (1 °F).
Conversion time:	100 ms.
Protection:	none.

0-20 mA/4-20 mA analog inputs

Input resistance:	≤ to 200 Ω.
Accuracy:	±1% of the full scale.
Resolution:	0.01 mA.
Conversion time:	100 ms.
Protection:	none; the maximum current allowed on each input is 25 mA.

	0-5 V ratiometric analog inputs Input resistance: ≥ to 10K Ω. Accuracy: ±1% of the full scale. Resolution: 0.01 V. Conversion time: 100 ms. Protection: against the reversal of polarity.
	0-10 V analog inputs Input resistance: ≥ to 10K Ω. Accuracy: ±1% of the full scale. Resolution: 0.01 V. Conversion time: 100 ms. Protection: against the reversal of polarity.
	Power supply 0-20 mA/4-20 mA/0-10 V transducers: 12 VDC ±10%, 60 mA max. Power supply 0-5 V ratiometric transducers: 5 VDC ±5%, 40 mA max. The device incorporate a restorable thermal protection of the power supplies against the short circuit and the overload.
Digital inputs:	3 inputs of which 2 inputs (non optoisolated free of voltage contacts, which can be set via configuration parameter as normally open/normally closed contact) which can be set via configuration parameter as enable the operation/change parameters set/resynchronization command/backup module status and 1 input (optoisolated high voltage contact, which can be set via configuration parameter as normally open/normally closed contact) which can be set via configuration parameter as enable the operation/change parameters set/resynchronization command/backup module status (not available in model EPD4BX6).
	Non optoisolated free of voltage contacts Power supply: none (5 V when not loaded, 3.3 mA when loaded). Protection: none.
	Optoisolated high voltage contact Power supply: 115 VAC -10%... 230 VAC +10%. Protection: none. The device ensure a reinforced isolation among each terminal of the high voltage contact and the remaining parts of the device.

Displays:	EPD4BX6	EPD4BC4	EPD4BF6	EPD4DF6

	signalling LEDs.			128 x 64 pixel single colour (black with rearlighting through white LEDs) LCD graphic display, signalling LEDs.
Digital outputs:	1 SPST 5 res. A @ 250 VAC (5 res. A @ 30 VDC) output (electromechanical relay) which can be set via configuration parameter as alarm output/solenoid valve/resynchronization valve.			
	<u>Electromechanical relay</u> Maximum switching power: 1,250 VA (150 W). Mechanical life: > to 5,000,000 operations. Electrical life: > to 100,000 operations. Protection: none. The device ensure a reinforced isolation among each terminal of the digital output and the remaining parts of the device.			
Bipolar stepper motor output:	4 wires bipolar stepper motor output.			
	<u>Bipolar stepper motor output</u> Input voltage: 21 VDC ±10%. Output voltage: 27... 36 VDC (18... 24 VDC if supplied by the backup module). Maximum output current (winding): 1 A. Driver type: chopper (constant current). Protection: none.			
Type of actions and additional features:	1C.			
Communication ports:	EPD4BX6	EPD4BC4	EPD4BF6	EPD4DF6

	1 USB port.	1 non optoisolated CAN port with CANBUS communication protocol and 1 USB port.	1 non optoisolated CAN port with CANBUS communication protocol, 1 non optoisolated RS-485 port with MODBUS communication protocol and 1 USB port.
	Power supply remote user interface: 22... 35 VDC, 100 mA max.		

EVDRIVE06
Electronic expansion valves drivers
User manual ver. 1.0
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Code 144EPD6E104

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