PSD04

Electronic expansion valves drivers

ENGLISH

USER MANUAL ver. 3.6

CODE 144PSDE364

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.

Index

1 INTRODUCTION

1.1 Introduction

The drivers of the PSD04 series are devices studied for the management of bipolar stepper electronic expansion valves. They are available with built-in keyboard display and blind version (according to the model).

The user interface of the built-in keyboard display 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/24... 37 VDC).

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 resynchronisation valve.

Through the programming port it is possible to make the upload and the download of the configuration parameters (using the programming key PSKEY10); 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 PSS4B 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 many selectable functions one highlights the possibility to work both in stand alone mode and under the supervision of a controller, the management of Sporlan range of EEV valves and the backup probes.

1.2 Summarising 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 display				•
blind (no display)	•	•	•	
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 back lighting 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

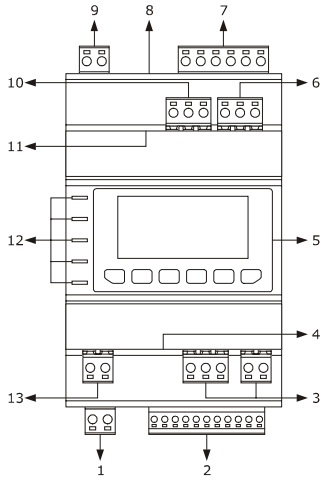
analog input 4 (suction pressure probe)	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V	0-20 mA / 4-20 mA / 0-5 V / 0-10 V
Voltage free digital inputs				
digital input 1 (enable the operation / change parameters set / resynchronisation command / backup module status)	•	•	•	•
digital input 2 (enable the operation / change parameters set / resynchronisation command / backup module status)	•	•	•	•
High voltage digital inputs				
on-off switching (enable the operation / change parameters set / resynchronisation command / backup module status)		•	•	•
Digital outputs (electromechanical relays; res. A @ 250 VAC)				
digital output 1 (alarm output / solenoid valve / resynchronisation valve)	5 A	5 A	5 A	5 A
Communication ports				
CAN port with CANBUS communication protocol			•	•
RS-485 port with MODBUS communication protocol		•	•	•
programming port with MODBUS communication protocol	•	•	•	•
Codes				
codes	PSD4BX3	PSD4BM3	PSD4BF3	PSD4DF3

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

2 DESCRIPTION

2.1 Description

The following drawing shows the aspect of PSD04.



The following table shows the meaning of the parts of PSD04.

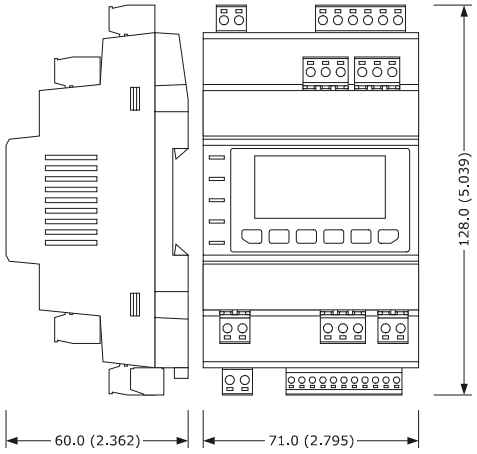
Part	Meaning
1	digital output
2	analog inputs and free of voltage digital inputs
3	CAN port (not available in models PSD4BX3 and PSD4BM3)
4	CAN port line termination (not available in models PSD4BX3 and PSD4BM3)
5	display and keyboard (not available in models PSD4BX3, PSD4BM3 and PSD4BF3)
6	reserved
7	bipolar stepper motor output
8	programming port
9	power supply
10	RS-485 port (not available in model PSD4BX3)
11	RS-485 port line termination (not available in model PSD4BX3)
12	signalling LEDs
13	high voltage digital input (not available in model PSD4BX3)

For further information look at the following chapters.

3 SIZE AND INSTALLATION

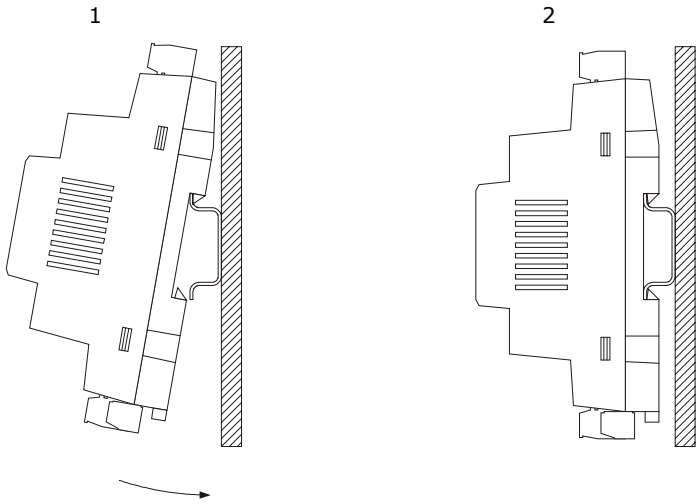
3.1 Size

The following drawing shows the size of PSD04 (4 DIN modules); size in mm (in).

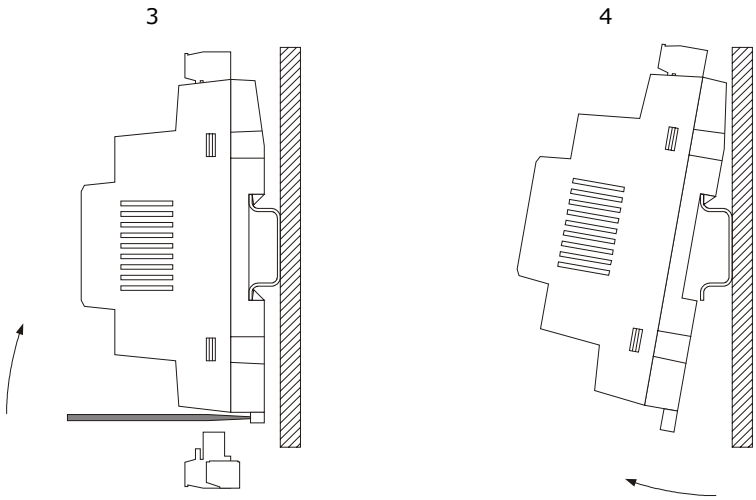


3.2 Installation

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.

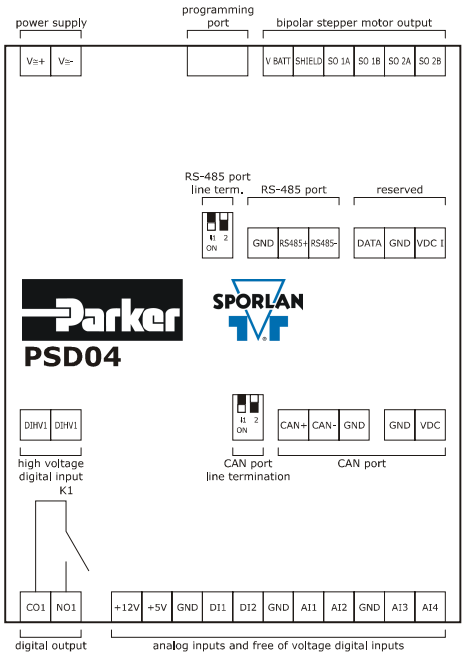
3.3 Additional information for the installation

- 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 (loud speakers, etc.), locations subject to direct sunlight, rain, humidity, dust and mechanical vibration
- according to the local safety legislation, protection against possible contacts with other electrical parts must be ensured by the correct installation of the device; all the parts which ensure protection of the device must be fixed so that you cannot be removed without using a special tool.

4 ELECTRICAL CONNECTION

4.1 Meaning of the connectors

The following drawing shows the connectors of PSD04.



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 models PSD4BX3 and PSD4BM3)

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

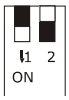
- do not connect more than four I / O expansions.

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 models PSD4BX3 and PSD4BM3)

Position microswitch 1 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 PSD04 the Sporlan range of EEV valves.

Terminal	Wire (color)
	Sporlan SER, SERI and SEHI
SO 1A	green wire
SO 1B	red wire
SO 2A	black wire
SO 2B	white wire

When a PSD04 superheat controller is used with a Sporlan Unipolar Valve, the customer must use a Bipolar cable, and when they do this, the inputs connections from the valve to the controller are the same.

Programming port

Non optoisolated programming port, with MODBUS communication protocol.

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 model PSD4BX3)

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

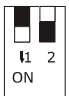
Terminal	Meaning
GND	ground
RS485+	D1 = A = + (terminal 1 of the transceiver)
RS485-	D0 = B = - (terminal 0 of the transceiver)

⚠ - 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 model PSD4BX3)

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).



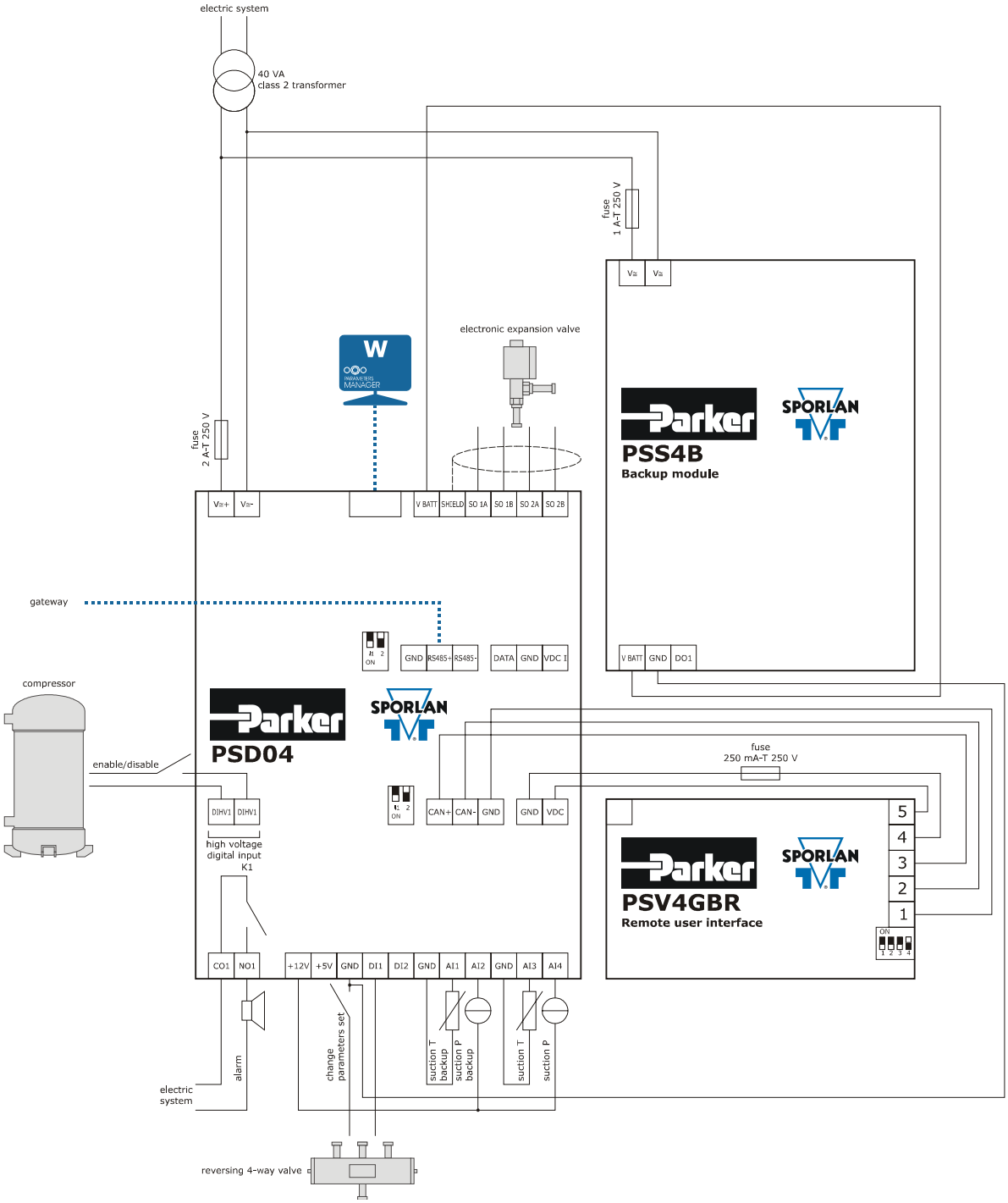
High voltage digital input

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 PSD04.



Please note the power supply of PSD04 and that of PSS4B are not isolated one from the another: it is important to wire the devices correctly 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 Parker RAC Europe sales network.

5 USER INTERFACE

5.1 Preliminary information

PSD04 is available with built-in LCD display keyboard and blind version (according to the model).
The built-in versions can be programmed through the keyboard interface, blind ones can be programmed by using a remote user interface (for example PSV4GBR if the version has a CANBus card fitted): both versions with display or without display can be programmed through the set-up software system Parameters Manager.
Using the programming key PSKEY10 it is also possible to upload and download 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 if it flashes slowly, the device-controller communication will not be completely correct 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 initialisation 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.
To select the desired valve, it is necessary to set the correct value in Valve selection (parameter Pi07).
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	CABLAGGIO			
									SO1A	SO1B	SO2A	SO2B
0*	Generic valve	Pr50	Pr51	Pr52	Pr53	Pr54	Pr55					
1	Sporlan SER AA	0	2500	3500	400	120	0	FullStep	green	red	black	white
2	Sporlan SER A	0	2500	3500	400	120	0	FullStep	green	red	black	white
3	Sporlan SER B	0	2500	3500	400	120	0	FullStep	green	red	black	white
4	Sporlan SER C	0	2500	3500	400	120	0	FullStep	green	red	black	white
5	Sporlan SER D	0	2500	3500	400	120	0	FullStep	green	red	black	white
6	Sporlan SERI F	0	2500	3500	400	120	0	FullStep	green	red	black	white
7	Sporlan SERI G	0	2500	3500	400	120	0	FullStep	green	red	black	white
8	Sporlan SERI J	0	2500	3500	400	120	0	FullStep	green	red	black	white
9	Sporlan SERI K	0	2500	3500	400	120	0	FullStep	green	red	black	white
10	Sporlan SERI L	0	2500	3500	400	120	0	FullStep	green	red	black	white
11	Sporlan SEHI 175	0	6386	6500	400	160	0	FullStep	green	red	black	white
12	Sporlan SEHI 400	0	6386	6500	400	160	0	FullStep	green	red	black	white
13	Sporlan ESX	24	224	300	40	460	0	FullStep	green	red	black	white
14	Sporlan EDEV B/C (U)	0	800	1250	200	120	0	FullStep	??	??	??	??
15	Sporlan reserved	--	--	--	--	--	--	--	--	--	--	--
16	Sporlan reserved	--	--	--	--	--	--	--	--	--	--	--
17*	Sporlan SER 1.5 to 20	0	1596	3500	400	160	0	FullStep	green	red	black	white
18*	Sporlan SEI 30	0	3193	6500	400	160	0	FullStep	green	red	black	white
19*	Sporlan SEI 50	0	6386	7500	400	160	0	FullStep	green	red	black	white
20*	Sporlan SEH 100	0	6386	7500	400	160	0	FullStep	green	red	black	white
21*	Sporlan SEI 0.5 to 11	0	1596	3500	400	160	0	FullStep	green	red	black	white
22*	Alco EXM/EXL-246	16	250	350	45	130	0	HalfStep	blue	yellow	white	orange
23*	Alco EX4 TO 6	0	750	1000	500	500	100	FullStep	blue	brown	white	black
24*	Alco EX7	0	1600	2000	500	750	250	FullStep	blue	brown	white	black
25*	Alco EX8	0	2600	3250	500	800	500	FullStep	blue	brown	white	black
26*	Danfoss ETS 12.5-25-50	0	2625	3150	300	100	75	FullStep	green	red	white	black
27*	Danfoss ETS 100 -250	0	3530	4250	300	100	75	FullStep	green	red	white	black
28*	Danfoss ETS 400	0	3810	4550	300	100	75	FullStep	green	red	white	black
39*** *	Sprlan CO2 valve	0	2500	2750 / 3125	400	275	0	FullStep	green	red	white	black

The Driver type (parameter DrTy) used depends on the hardware, while the Stepper type (parameter StTy) depends on the motor to be controlled; currently, the PSD04 can only be used with Parker Sporlan bipolar stepper motors.
The driving mode can be selected through parameter Driving mode selection (Pi01).
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.
The valve is automatically resynchronized at every switch on.
During the resynchronization the valve is completely closed; the resynchronization is necessary to realign the physical position of the complete closure with the 0 step position.
In debug mode the speed follows the debug step rate; in manual mode the speed follows the maximum speed.
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 phase the maximum speed is applied, but at the end of the positioning the speed follows 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.

6.2 Operating mode

6.2.1 Preliminary information

PSD04 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
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

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 the installer parameters can be modified, any changes made take effect immediatly, and also the manufacturer parameters, that require a reset.
If there are no configuration errors, in the Alarm status (parameter AlSt) and Configuration warning (parameter CoWa), the valve can be enabled.

The operation mode is set by using Main control type (Pcty), and when the valve is enabled:

if Pcty = 0 the system remains held in the Stand-by on (11)

if Pcty = 1... 5 or 7 the analog positioner (30) operation mode begins

if Pcty ≥ 6 start SH-algorithm or manual mode.

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 PSD04

Excluding the automatic movements, it is necessary to enable the valve module PSD04 before moving it.

Enabling mode (parameter Pr06) configures the enabled features to be accepted.

When the valve is to be used in standalone mode, the enable digital input function mode must be chosen (parameter Pr06 = 0 or Pr06 =1).

The selection must be made based on the type of input to be used.

In a typical application the DIHV (parameter Pr06 = 1) would be connect it in parallel to the compressor, so that the valve is enabled at the same time as the compressor.

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 a value from 2 to 9 allows the valve to be enabled via a serial port, using MODBUS or CAN communication protocols: this selection must be made if an external controller manages the PSD04.

Selecting a value from 6 to 9, it is possible to operate the PSD04 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 PSD04 can determine whether the controller is still online: the PSD04 expects the controller to update the variable Enable valve command (parameter EnaV) periodically.

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 positioner control

The analog positioner mode permits the valve position to be moved linearly respect to the value applied to the active analog input.

Pcty = 01 > analog positioner on AI1 (0÷20mA)

Pcty = 02 > analog positioner on AI2 (4÷20mA)

Pcty = 03 > analog positioner on AI3 (0÷5V)

Pcty = 04 > analog positioner on AI4 (0÷10V)

Pcty = 05 > analog positioner on AI4 (Pia4).

To enter analog positioner mode, for Stand-by, set the Main control type (parameter Pcty) with a value between 1 and 5, and enable the valve; if all the configuration are correct enter in Stand-by on (11), and then in the Analog positioner (30).

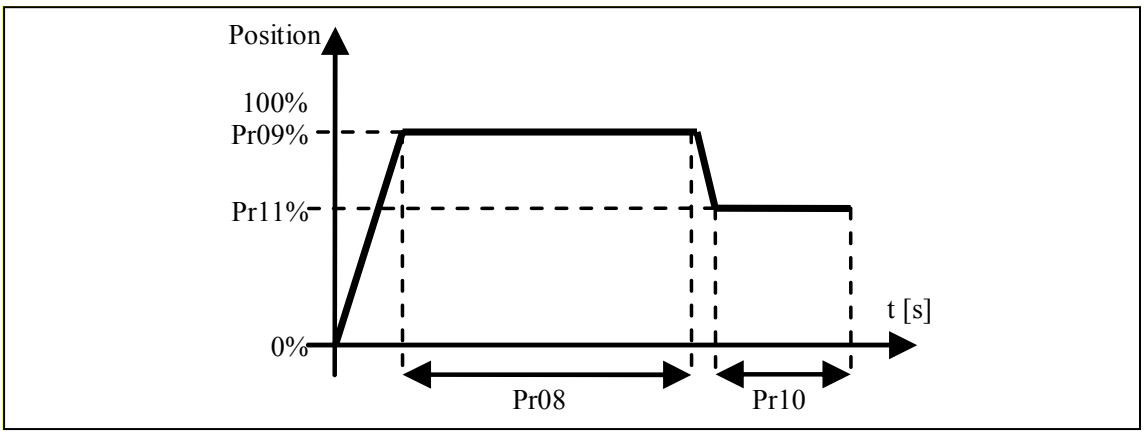
To exit the analog positioner mode, it is necessary to disable the valve, this will cause the valve to move to the positioning value specified in Stand-by position (parameter Pr20), before entering the Stand-by off (10).

The setting of Main control type (parameter Pcty) with a value between 1 and 4 selects the type of probe that connects to the indicated AI if the parameter Pcty = 5 connect the probe Ai4 to AI4 and change the parameter Pia4 to select the probe type.

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

6.6 Algorithm start-up

To enter algorithm mode, from the Stand-by off (10), set the Main control type (parameter Pcty) with a value greater or equal to 6, and enable the valve. If all the configuration are correct enter in Stand-by on (11) and then in the Stabilization (40), this allows the valve to move to its stabilization position (parameter Pr09) and await for the expiration of Stabilization delay to time out (parameter Pr08).
Then enter in Start-up (41), which performs the Start-up position sequence (parameter Pc21 or Pp21), await for the Start-up delay to be completed (parameter Pc20 or Pp20) and finally enter in the Algorithm selection (42) in which evaluates Main control type (parameter Pcty) and mode Function (parameter Pr02).



This also enables manual mode, debugger mode, or one of the available SH-algorithm.
The Functioning mode (parameter Pr02) defines the algorithm's operation mode, while Main control type (parameter Pcty) defines which algorithm can be used.
Specifically:
Pr02 = 0: enables control SH-algorithm defined by Main control type (parameter Pcty)
Pr02 = 1: enables manual algorithm, which permits movement of the valve to the position specified by Manual set-point position (parameter 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 (parameter Pr02) occurs every mains cycle, which allows switching between the three algorithm operation modes to be carried out without forced intermediate positioning moves.
Note that Functioning mode (parameter Pr02) and Manual set-point position (parameter Pr03) are not saved into Eeprom, this means that from reset the valve always starts in automatic mode with Functioning mode Pr02 = 0 and Manual set-point position Pr03 = 0.

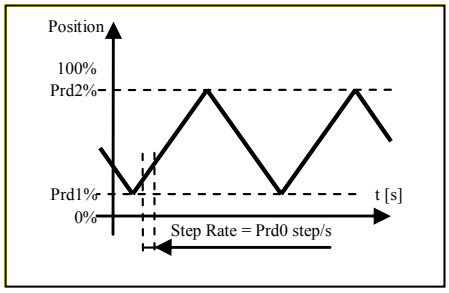
6.7 Manual mode

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.

6.8 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.



6.9 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.

Setting the *Main control type* (Pcty) selects the SH-algorithm to enable:

- Pcty = 6 : EVCO algorithm

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)
- *EVCO algorithm:*
  - 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 (Fast)
  - Neutral zone high threshold (PNHi)
  - Smart band zone threshold (Pcz)
  - SH filter time constant (SHFi)
  - Fast action threshold (FaTh)

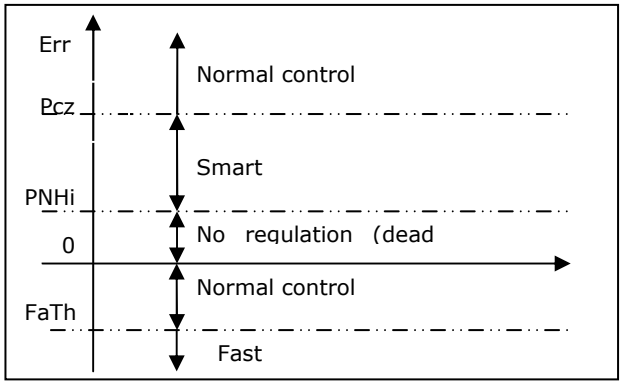
SH parameters set selection (SetP) supports selection of one of two different sets of regulation parameters. Each set includes SH set-point, PID parameters, and LoSH, HiSH, MOP and LOP alarm set points, start up opening position and delay. Example uses are: using set1 parameters for a chiller, set2 for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

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 use different regulation parameters, depending on the working area:

- if the measured error is lower than *Fast action threshold* (Fath), a more aggressive algorithm is used (*Fast action* (Fast))
- if the measured error is between *Neutral zone high threshold* (PNHi) and *Smart band zone threshold* (Pcz) a smart algorithm is used.
- if the measured error is between 0 and *Neutral zone high threshold* (PNHi) no regulation is performed



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

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 to be measured, specify the unit value in the parameter Pressure unit of measurement (Ph60) and Temperature unit of measurement (Ph61) sets the value.

These parameters are acquired only during Initialization (0) phase at the reset , which means that any changes to these parameters will take effect 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 modification of any of the measurement units will trigger the 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 start-up, and then a board reset is needed, after unit of measure has been changed.

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 PSD04
  - if parameter 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 sensitive 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 (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 (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 display version

<u>To gain access to the user menu:</u>

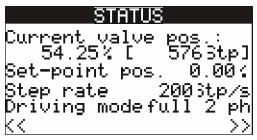
1. Make sure the power supply is switched on.
2. Move through the pages using the buttons as shown in the example here below:

to the installer menu ◁ page 1

◁ or ▷ △ or ▽ to select "**Alarm status**" and ↵

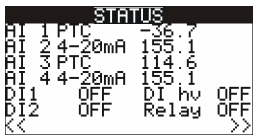
page 3

◁ or ▷



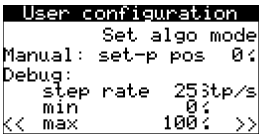
page 4

◁ or ▷



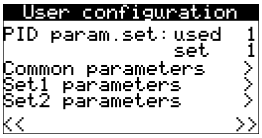
page 5

◁ or ▷



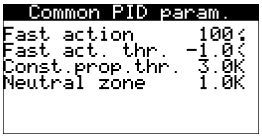
page 6

◁ or ▷

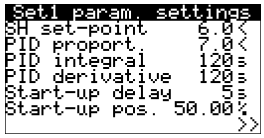


page 7 ▷ to the installer menu

△ or ▽ and ↵

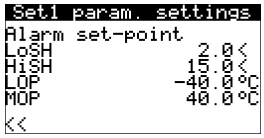


page 8



page 9/11

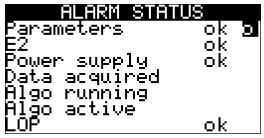
△ or ▽



page 10/12

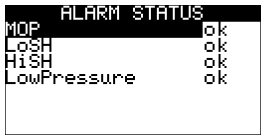
page 2a

△ or ▽



page 2b

△ or ▽



page 3b

The first five pages are dedicated to the end user and permit display of major features of the PSD04, any alarm messages, or whether it is necessary to resynchronise or reset the machine after changing parameters. In the third page, 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.

All warnings and alarms are displayed in the "Alarm Status" page.

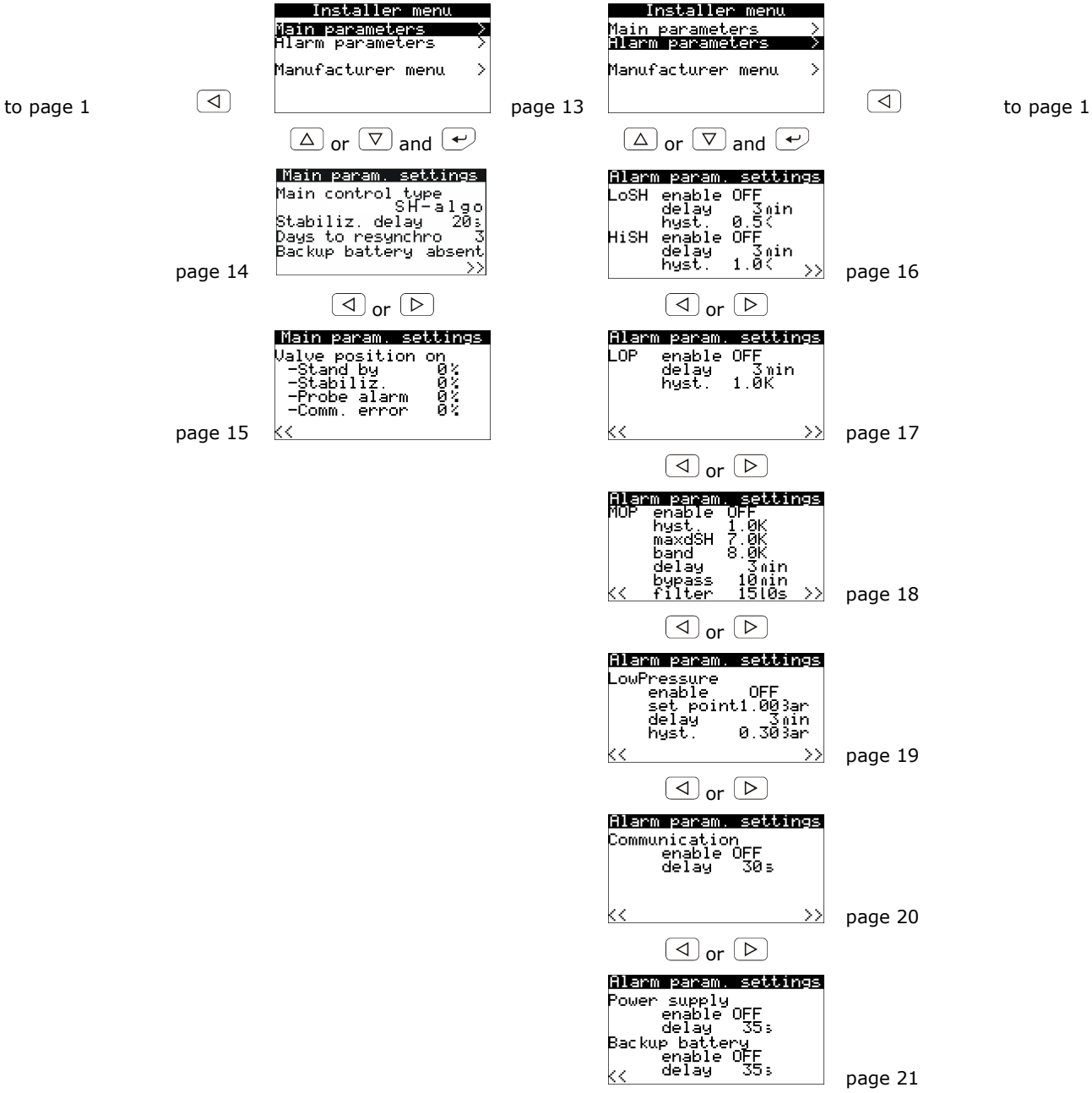
<u>To modify a parameter operate as follows:</u>

3. Make sure to have selected an "**User configuration**" page.
4. Press and release button UP or button DOWN to select a submenu.
5. Press and release button ENTER.
6. Press and release button UP or button DOWN to select the parameter.

7. Press and release button ENTER.
8. Press and release button UP or button DOWN to modify the value.
9. Press and release button ENTER to confirm the value.
10. Press and release button ESC over and over again to go back to the previous pages.

<u>To gain access to the installer menu:</u>

11. With reference to step 2, from page 1 press button LEFT (or from page 7 press button RIGHT).
12. Press and release button ENTER.
13. Press and release button UP or button DOWN over and over again to set level 1 password (according to the factory settings "**10**"; to change this value look at paragraph 7.6 "Main menu".
14. Press and release button ENTER again.
15. Move among the pages using the buttons as shown in the example here below:



These menus permit modification of most driver parameters.

In the "Main control parameters" 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 parameters" permit to enable or disable each alarm and settings the parameters.

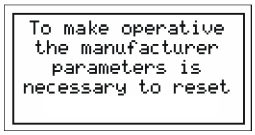
To modify a parameter operate as follows:

16. Press and release button UP or button DOWN to select possible submenus.
17. Press and release button ENTER.
18. Press and release button UP or button DOWN to select the parameter.
19. Press and release button ENTER.
20. Press and release button UP or button DOWN to modify the value.
21. Press and release button ENTER to confirm the value.
22. Press and release button ESC over and over again to go back to the previous pages.

To gain access to the manufacturer menu:

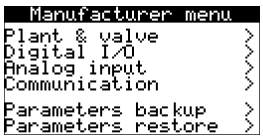
23. With reference to step 15, from page 13 press button DOWN to select "**Manufacturer menu**".
24. Press and release button ENTER.
25. Press and release button ENTER again to set the password value.
26. Press and release button UP or button DOWN over and over again to set level 2 password (according to the factory settings "**20**"; to change this value look at paragraph 7.6 "Main menu".
27. Press and release button ENTER again.
28. Move among the pages using the buttons as shown in the example here below:

page 22



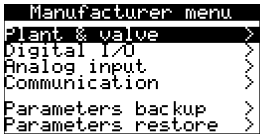
◁ or ▷

page 23



△ or ▽

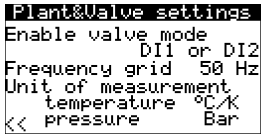
page 23



↵

page 24

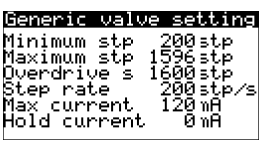
◁ or ▷



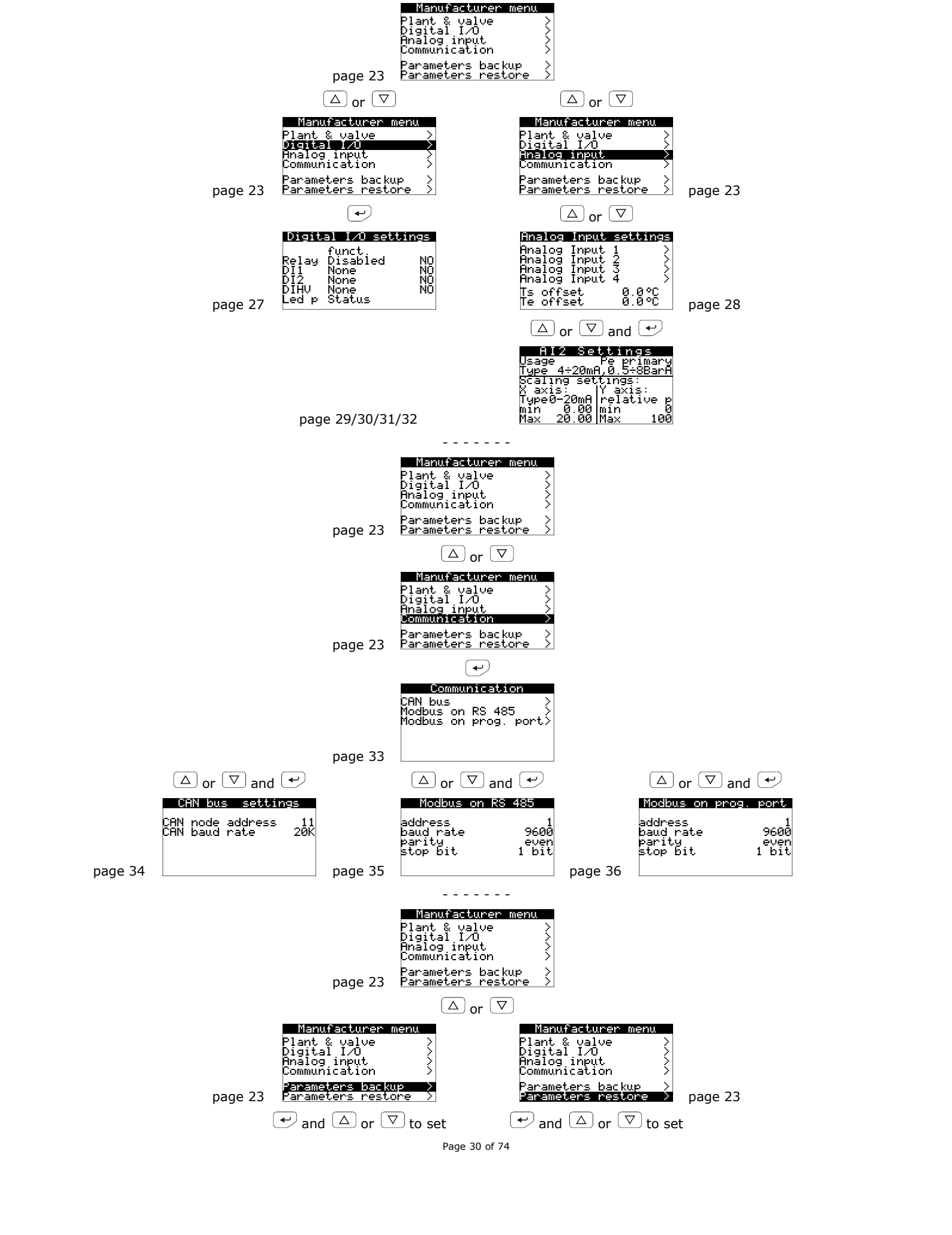
page 25

△ or ▽ and ↵

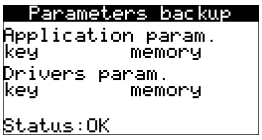
page 26



- - - - - - - -

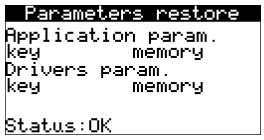

Manufacturer menu
Plant & valve >
Digital I/O >
Analog input >
Communication >
Parameters backup >
Parameters restore >
page 23
or
Digital I/O settings
funct
Relay Disabled NO
DI1 None NO
DI2 None NO
DIHV None NO
Led p Status
page 27
Analog Input settings
Analog Input 1 >
Analog Input 2 >
Analog Input 3 >
Analog Input 4 >
Ts offset 0.0°C
Te offset 0.0°C
page 28
and
AI2 Settings
Usage Pe primary
Type 4÷20mA,0.5÷8BarA
Scaling settings:
X axis: Y axis:
Type0-20mA relative p
min 0.00 min 0
Max 20.00 Max 100
page 29/30/31/32
- - - - - - -
Communication
CAN bus >
Modbus on RS 485 >
Modbus on prog. port >
page 33
CAN bus settings
CAN node address 11
CAN baud rate 20K
page 34
Modbus on RS 485
address 1
baud rate 9600
parity even
stop bit 1 bit
page 35
Modbus on prog. port
address 1
baud rate 9600
parity even
stop bit 1 bit
page 36
- - - - - - -
Parameters backup >
Parameters restore >
and or to set

level 5 password



page 37

level 5 password



page 38

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 PSD04 application's parameters and/or the driver's parameter (communication settings, etc.) in the memory or in the parameters key.

The user can restore a copy of the parameters from the memory or from the parameters stored in the PSKEY10.

To modify a parameter operate as follows:

29. Press and release button UP or button DOWN to select possible submenus.
30. Press and release button ENTER.
31. Press and release button UP or button DOWN to select the parameter.
32. Press and release button ENTER.
33. Press and release button UP or button DOWN to modify the value.
34. Press and release button ENTER to confirm the value.
35. Press and release button ESC over and over again to go back to the previous pages.

7.3 Configuring a blind version

The following procedures show an example of how to configure a blind version using an interface (in the example PSV4GBR).

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. Keep pressed 2 s buttons ESC and RIGHT.
4. Switch on the power supply of the device and of the interface.
5. When the display of the interface will show the following menu release buttons ESC and RIGHT.

PSV4GBR
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.
14. Keep pressed 2 s buttons LEFT and ENTER: the display will show the following menu.

Network Status			
Loc	99	OK	> >
1	11	OK	> >
2	0	-	> >
3	0	-	> >
4	0	-	> >
5	0	-	> >

15. Press and release button UP or button DOWN to select the device.
16. Press and release button ENTER: the display will show page 1 of the device.
17. Operate as shown in paragraph 7.2 "Configuring a built-in version".

7.4 Configuring the device through the programming key PSKEY10

The following procedures shows how to upload and download the configuration parameters by using the programming key PSKEY10.

<u>To copy the parameters from the device to the programming key PSKEY10 operate as follows:</u>

1. Make sure the power supply is switched on.
2. Connect the key to the device; look at paragraph 10.1.4 "Connection 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 PSKEY10 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 programming key.

<u>To copy the parameters from the programming key PSKEY10 to the device operate as follows:</u>

6. Make sure the power supply is switched on.
7. Connect the key to the device; look at paragraph 10.1.4 "Connection 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 PSKEY10 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 key.

⚠ **The copy of the parameters from the programming key PSKEY10 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.

7.5 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 programming port, make sure to have the programming kit PSIF20TUXI; 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 PSIF20SUXI.
2. Switch off the power supply of the device.
3. Connect the kit (or the interface) to the Personal Computer; look at paragraph 10.2.4 (or 10.3.4) "Connection 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 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.

2.1 If you are using a built-in version, keep pressed 2 s buttons UP and DOWN: the display will show the following menu.

2.2 If you are using a blind version through a remote user interface (for example PSV4GBR), keep pressed 2 s buttons ESC and RIGHT: the display will show the following menu.

PSD04
Info
Parameters
Networks
...
Diagnostic
Set Password
Debug variables

⚠ 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 2.1 or step 2.2, 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.

7.7 Backup and restore

If the version of the driver EVdrive03 is appropriate, it is possible to connect a keyboard V-graph that displays the pages backup / restore which permit to save a copy of the memory areas of the parameters. The copy can be done in another area of the EEPROM or in an external memory (parameters key) connected to the communication programming port.

It is possible to save both the application parameters (EVDrive03 parameters), both 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).

7.8 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 Manufacturer parameters are the most low-level and are usually loaded by the application only at the start-up, can be modified only in the **Stand-by off** (10) and requires a reset to load the new value.

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.	Min.	Max.	Units	Default	Menu	Control mode choice
Pcty	0	7	- - - -	7	I	main control type 0 = none 1 = analog positioner on AI1 (0-20 mA) 2 = analog positioner on AI2 (4-20 mA) 3 = analog positioner on AI3 (0-5 V) 4 = analog positioner on AI4 (0-10 V) 5 = analog positioner on AI4 6 = SH control
SetP	1	2	- - - -	1	U	SH parameters set selection 1 = parameters set n. 1 2 = parameters set n. 2
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Parameters set n. 1**
Pc01	3.0	25.0	K	6.0	User	SH setpoint
Pc02	1.0	3.0	K	2.0	User	LoSH setpoint
Pc03	10.0	40.0	K	15.0	User	HiSH setpoint
Pc04	-200.0	40.0	°C	40.0	User	Set1 LOP temperature
Pc05	-40.0	40.0	°C	40.0	User	MOP temperature

Pc13	1.0	100.0	K	40.0	User	PID proportional band
Pc14	0	999	s	120	User	PID integral time
Pc15	0	999	s	30	User	PID derivative time
Pc20	1	255	s	5	Installer	start-up delay
Pc21	0.00	100.00	%	50.00	Installer	start-up position
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Parameters set n. 2**
Pp01	3.0	25.0	K	6.0	User	SH setpoint
Pp02	1.0	3.0	K	2.0	User	LoSH setpoint
Pp03	10.0	40.0	K	15.0	User	HiSH setpoint
Pp04	-200.0	40.0	°C	-40.0	User	Set2 LOP temperature
Pp05	-40.0	40.0	°C	40.0	User	MOP temperature
Pp13	1.0	100.0	K	40.0	User	PID proportional band
Pp14	0	999	s	120	User	PID integral time
Pp15	0	999	s	30	User	PID derivative time
Pp20	1	255	s	5	Installer	start-up delay
Pp21	0.00	100.00	%	50.00	Installer	start-uo position
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Common SH algorithm**
Fast	1	100	- - - -	100	User	fast action
PNHi	0.0	25.0	K	1.0	User	neutral high threshold
Pcz	PNHi	25.0	K	3.0	User	constant proportional threshold
SHFi	0	255	100 ms	10	User	SH filter time constant
FaTh	-10.0	10.0	K	-1.0	User	fast action threshold
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Protections and alarms**
Pa01	0	1	- - - -	0	Installer	enable communication alarm 1 = yes

Pa02	5	120	s	30	Installer	communication alarm delay
Pa10	0	1	- - - -	0	Installer	enable LoSH alarm 1 = yes
Pa11	0.0	25.0	K	0.5	Installer	LoSH alarm hysteresis
Pa12	0	250	min	3	Installer	LoSH alarm delay
Pa20	0	1	- - - -	0	Installer	enable HiSH alarm 1 = yes
Pa21	0.0	25.0	K	1.0	Installer	HiSH alarm hysteresis
Pa22	0	250	min	3	Installer	HiSH alarm delay
Pa30	0	1	- - - -	0	Installer	enable low pressure alarm 1 = yes
Pa31	0.00	45.00	barG	0.00	Installer	low pressure setpoint alarm
Pa32	0.20	1.00	barG	0.30	Installer	low pressure alarm hysteresis
Pa33	0	250	min	3	Installer	low pressure alarm delay
Pa40	0	1	- - - -	0	Installer	enable LOP alarm 1 = yes
Pa41	0.0	10.0	K	1.0	Installer	LOP alarm hysteresis
Pa42	0	250	min	3	Installer	LOP alarm delay
Pa50	0	1	- - - -	0	Installer	enable MOP alarm 1 = yes
Pa51	0.0	10.0	K	1.0	Installer	MOP alarm hysteresis
Pa52	0	250	min	3	Installer	MOP alarm delay
Pa53	0.0	25.0	K	7.0	Installer	MOP maximum dSH applicable
Pa54	0.0	25.0	K	8.0	Installer	MOP band
Pa55	0	255	10 s	15	Installer	MOP filter time constant
Pa56	0	255	min	10	Installer	MOP bypass delay

Pa70	0	1	- - - -	1	Installer	enable main power supply alarm 1 = yes
Pa71	0	60	s	1	Installer	main power supply alarm delay
Pa75	0	1	- - - -	0	Installer	enable backup battery alarm 1 = yes
Pa76	0	60	s	35	Installer	backup battery alarm delay
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Valve and driver: refrigerant equipment**
Pi00	0	21	- - - -	19	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
Pi01	1	2	- - - -	1	Manufact.	driving mode selection 1 = full step 2 ph on 2 = full step 1 ph on

Pi07	1	16	- - - -	1	Manufact.	valve selection 1 = Sporlan SER AA 2 = Sporlan SER A 3 = Sporlan SER B 4 = Sporlan SER C 5 = Sporlan SER D 6 = Sporlan SERI F 7 = Sporlan SERI G 8 = Sporlan SERI J 9 = Sporlan SERI K 10 = Sporlan SERI L 11 = Sporlan SEHI 175 12 = Sporlan SEHI 400 13 = Reserved 14 = Sporlan EDEV B/C (unipolar) 15 = Reserved 16 = Reserved
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Valve and driver: driver settings**
Pr05	0.00	100.00	%	0.00	Installer	probe alarm position
Pr06	0	9	- - - -	0	Manufact.	enabling mode 0 = from digital input DI1 or DI2 (stand alone) 1 = from digital input DIHV (stand alone) 2 = from CANBUS 3 = reserved 4 = from serial MS RS-485 5 = reserved 6 = from CANBUS + DI1 or DI2 as consequence of communication error 7 = reserved 8 = from serial MS RS-485 + DI1 or DI2 as consequence of communication error 9 = reserved
Pr08	0	255	s	1	Installer	stabilization delay
Pr09	0.00	100.00	%	50.00	Installer	stabilization position
Pr20	0.00	100.00	%	0.00	Installer	stand-by position
Pr30	50.00	100.00	%	100.00	Manufact.	limit valve opening
Pr40	0	9999	h	0	User	working hour (read only parameter)

Pr41	0	365	day	1	Installer	resynchronization interval 0 = disabled
Pr45	30	100	%	100	Manufact.	reserved
Pr48	0.00	100.00	%	0.00	Installer	communication error position
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Valve and driver: debug**
Prd0	25	1000	step/s	25	User	debug step rate
Prd1	0.00	Prd2	%	0.00	User	debug minimum position
Prd2	Prd1	100.00	%	100.00	User	debug maximum position
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Valve and driver: backup battery**
Pb01	0	1	- - - -	0	Installer	backup battery 1 = present
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Valve and driver: digital I/O settings and various**
Ph01	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	0	1	- - - -	0	Manufact.	relay logic 0 = normally unexcited 1 = normally excited
Ph10	0	1	- - - -	0	Manufact.	free of voltage digital input DI1 logic 0 = normally open 1 = normally closed

Ph11	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	0	1	- - - -	0	Manufact.	free of voltage digital input DI2 logic 0 = normally open 1 = normally closed
Ph21	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	0	1	- - - -	0	Manufact.	high voltage digital input logic 0 = normally open 1 = normally closed
Ph31	0	4	- - - -	0	Manufact.	high voltage digital input DIHV function 0 = none 1 = enable/disable valve 2 = change parameters set 3 = resynchronization request 4 = backup battery status
Ph60	0	1	- - - -	0	Manufact.	pressure unit of measurements 0 = barG 1 = psiG
Ph61	0	1	- - - -	0	Manufact.	temperature unit of measurements 0 = °C / K 1 = °F / R
Ph70	0	1	- - - -	0	Manufact.	frequency grid 0 = 50 Hz 1 = 60 Hz
Ph80	0	2	- - - -	0	Manufact.	LED "STEP 2" function 0 = status 1 = LOP alarms + MOP alarms 2 = Lo SH alarms + Hi SH alarms
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI1**

Piu1	0	4	- - - -	1	Manufact.	analog input AI1 function 0 = not used 1 = suction temperature backup probe 2 = suction pressure backup probe
Pia1	1	30	- - - -	1	Manufact.	analog input AI1 probe type 1 = NTC probe 6 = Pt 1000 probe 10 = 4-20 mA transducer (0.5 - 8 barA) 11 = 4-20 mA transducer (0 - 30 barA) 12 = 4-20 mA transducer (-1 - 8 barG) 13 = 4-20 mA transducer (-1 - 15 barG) 14 = 4-20 mA transducer (0 - 30 barG) 20 = 0-5 V (0 - 7 barG) 21 = 0-5 V (0 - 25 barG) 22 = 0-5 V (0 - 60 barG) 30 = scaling
AI1T	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.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI1 scaling**
P1Xty	0	2	- - - -	0	Manufact.	X type 0 = 0-20 mA 1 = 4-20 mA 2 = 0-5 V
P1XM	P1Xm	0:20.00 1:20.00 2:5.00	- - - -	20.00	Manufact.	X max value
P1Xm	0:0.00 1:4.00 2:0.00	P1XM	- - - -	0.00	Manufact.	X min value

P1Tty	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA
P1YM	P1Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P1Ym	-300.00	P1YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI2**
Piu2	0	2	- - - -	0	Manufact.	analog input AI2 function 0 = not used 1 = suction temperature backup probe 2 = suction pressure backup probe
Pia2	1	30	- - - -	1	Manufact.	analog input AI2 probe type 1 = NTC probe 6 = Pt 1000 probe 10 = 4-20 mA transducer (0.5 - 8 barA) 11 = 4-20 mA transducer (0 - 30 barA) 12 = 4-20 mA transducer (-1 - 8 barG) 13 = 4-20 mA transducer (-1 - 15 barG) 14 = 4-20 mA transducer (0 - 30 barG) 20 = 0-5 V (0 - 7 barG) 21 = 0-5 V (0 - 25 barG) 22 = 0-5 V (0 - 60 barG) 30 = scaling
AI2T	2	7	**- - - -**	???	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.	Min.	Max.	Units	Default	Menu	Probe settings: analog input AI2 scaling
P2Xty	0	2	- - - -	0	Manufact.	X type 0 = 0-20 mA 1 = 4-20 mA 2 = 0-5 V
P2XM	P2Xm	0:20.00 1:20.00 2:5.00	- - - -	20.00	Manufact.	X max value
P2Xm	0:0.00 1:4.00 2:0.00	P2XM	- - - -	0.00	Manufact.	X min value
P2Yty	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA
P2YM	P2Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P2Ym	-300.00	P2YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI3**
Piu3	3	3	- - - -	3	Manufact.	analog input AI3 function 3 = suction temperature probe
Pia3	1	6	- - - -	1	Manufact.	analog input AI3 probe type 1 = NTC probe 6 = Pt 1000 probe
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI4**
Piu4	4	4	- - - -	4	Manufact.	analog input AI4 function 4 = suction pressure probe

Pia4	10	30	- - - -	10	Manufact.	analog input AI4 probe type 10 = 4-20 mA transducer (0.5 - 8 barA) 11 = 4-20 mA transducer (0 - 30 barA) 12 = 4-20 mA transducer (-1 - 8 barG) 13 = 4-20 mA transducer (-1 - 15 barG) 14 = 4-20 mA transducer (0 - 30 barG) 20 = 0-5 V (0 - 7 barG) 21 = 0-5 V (0 - 25 barG) 22 = 0-5 V (0 - 60 barG) 30 = scaling
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: analog input AI4 scaling**
P4Xty	0	3	- - - -	0	Manufact.	X type 0 = 0-20 mA 1 = 4-20 mA 2 = 0-5 V 3 = 0-10 V
P4XM	P4Xm	0:20.00 1:20.00 2:5.00 3:10.00	- - - -	20.00	Manufact.	X max value
P4Xm	0:0.00 1:4.00 2:0.00 3:0.00	P4XM	- - - -	0.00	Manufact.	X min value
P4Yty	0	1	- - - -	0	Manufact.	Y type 0 = barG 1 = barA
P4YM	P4Ym	300.00	barG/barA	1.00	Manufact.	Y max value
P4Ym	-300.00	P4YM	barG/barA	0.00	Manufact.	Y min value
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Probe settings: offset**
OfsTs	-10.0	10.0	K	0.0	User	suction temperature offset

OfsTe	-10.0	10.0	K	0.0	User	suction pressure (converted into temperature) offset
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Communication settings**
Mb0a	1	247	- - - -	1	Manufact.	MODBUS RS-485 port address
Mb0p	0	2	- - - -	2	Manufact.	MODBUS RS-485 port parity 0 = none 1 = odd 2 = even
Mb0b	0	4	- - - -	3	Manufact.	MODBUS RS-485 port baud rate 0 = 1,200 1 = 2,400 2 = 4,800 3 = 9,600 4 = 19,200
Mb0s	0	1	- - - -	0	Manufact.	MODBUS RS-485 port stop bit 0 = 1 bit 1 = 2 bit
Mb1a	1	1	- - - -	1	Manufact.	MODBUS prog port address
Mb1p	2	2	- - - -	2	Manufact.	MODBUS prog port parity 0 = none 1 = odd 2 = even
Mb1b	4	4	- - - -	4	Manufact.	MODBUS prog port baud rate 0 = 1,200 1 = 2,400 2 = 4,800 3 = 9,600 4 = 19,200
Mb1s	0	0	- - - -	0	Manufact.	MODBUS prog port stop bit 0 = 1 bit 1 = 2 bit
CANn	1	127	- - - -	11	Manufact.	CAN node address

CANb	0	4	- - - -	1	Manufact.	CAN baud rate 0 = 10K 1 = 20K 2 = 50K 3 = 125K 4 = 500K
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Command**
Pr02	0	2	- - - -	0	User	functioning mode 0 = SH-ALGORITHM 1 = manual mode 2 = debug functionality
Pr03	0.00	100.00	%	0.00	User	manual setpoint position (only if Pr02 = 1)
ResR	0	1	- - - -	0	User	resynchronization request
EnaV	0	1	- - - -	0	User	enable valve command (RS-485 or external MODBUS) 0 = disable valve 1 = enable valve
Cmd	0	65535	- - - -	0	User	command (b0: 0 -> 1 reset parameter alarm; Cmd: x -> 0zBx reset application; Cmd: x -> 0x5x reset board)
Par.	**Min.**	**Max.**	**Units**	**Default**	**Menu**	**Status**
UdM	- - - -	- - - -	- - - -	- - - -	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	0	5	- - - -	- - - -	User	driving mode 0 = full step 2 ph on 1 = full step 1 ph on 2 = reserved 3 = reserved 4 = reserved 5 = reserved

Stat	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	- - - -	- - - -	- - - -	- - - -	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	- - - -	- - - -	- - - -	- - - -	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	0	21	- - - -	- - - -	User	configuration warning 0 = correct configuration 1 = incorrect configuration 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
PAtt	0.00	100.00	%	- - - -	User	actual valve position
PAtP	- - - -	- - - -	step	- - - -	User	actual valve position step
Psp	0.00	100.00	%	- - - -	User	target position

EnaS	0	1	- - - -	- - - -	User	enable valve status 0 = valve not enabled 1 = valve enabled
ResS	0	1	- - - -	- - - -	User	resynchronization request status 0 = no request 1 = request reserved
IhoS	0	1	- - - -	- - - -	User	holding current status 0 = operating phase current 1 = holding phase current
Te	- - - -	- - - -	°C	- - - -	User	Te (evaporation temperature)
Pe	- - - -	- - - -	barG	- - - -	User	Pe (evaporation pressure)
Ts	- - - -	- - - -	°C	- - - -	User	Ts (suction temperature)
SH	- - - -	- - - -	K	- - - -	User	SH
SpSH	- - - -	- - - -	K	- - - -	User	SH setpoint
SetS	1	2	- - - -	- - - -	User	selected SH parameters set
PidP	- - - -	- - - -	%	- - - -	User	PID setpoint position output
ParS	0	2	- - - -	- - - -	User	parameters status bit0: disable the valve to accept new parameters bit1: reset the board to accept new parameters
SRat	- - - -	- - - -	step/s	- - - -	User	actual value step rate
SetM	- - - -	- - - -	K	- - - -	User	SH setpoint SH with MOP correction
Upr	- - - -	- - - -	- - - -	- - - -	User	used probes b 0: AI1 b 0: AI2 b 0: AI3 b 0: AI4
TsPr	- - - -	- - - -	- - - -	- - - -	User	Ts prymary probe 0: AI1 0: AI2 0: AI3 0: AI4

PePr	- - - -	- - - -	- - - -	- - - -	User	Pe prymary probe 0: AI1 0: AI2 0: AI3 0: AI4
TsPrB	- - - -	- - - -	- - - -	- - - -	User	Ts backup probe 0: AI1 0: AI2 0: AI3 0: AI4 255 = no probe
PePrB	- - - -	- - - -	- - - -	- - - -	User	Pe backup probe 0: AI1 0: AI2 0: AI3 0: AI4 255 = no probe
PoF	- - - -	- - - -	- - - -	- - - -	User	power failure counter
PoFc	- - - -	- - - -	- - - -	- - - -	User	power failure complete closure counter
DI1	- - - -	- - - -	- - - -	- - - -	User	DI1 status 0: OFF 1: ON
DI2	- - - -	- - - -	- - - -	- - - -	User	DI2 status 0: OFF 1: ON
DI1HV	- - - -	- - - -	- - - -	- - - -	User	DI1 HV status 0: OFF 1: ON
DO	- - - -	- - - -	- - - -	- - - -	User	relay status 0: OFF 1: ON
AI1	- - - -	- - - -	- - - -	- - - -	User	AI1 value
AI2	- - - -	- - - -	- - - -	- - - -	User	AI2 value
AI3	- - - -	- - - -	- - - -	- - - -	User	AI3 value
AI4	- - - -	- - - -	- - - -	- - - -	User	AI4 value

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

8 SERIAL COMMUNICATION

8.1 Preliminary information

It is possible to control the PSD04 driver by connecting it to a controller.
The controller sends information to the driver necessary for it to correctly control its functions, and the driver responds, communicating internal information, such as the pressure and temperature measurements, alarms, etc.
The connection methods available on the PSD04 are CANBUS, MODBUS RS-485, and MODBUS on the setting and programming port, according to the model.
The protocol to be used for communication with the controller must be selected via the parameter in the Enabling mode (Pr06).

8.2 CANBUS serial communication

The PSD04 controller primarily uses a protocol based on CANBUS for communication with controllable systems.
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.
The PSD04 status variables are:

AI1 type
AI2 type
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

The control variables are:

AI1 type
AI2 type
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 (PCty)
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)

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	SoHVAC Name		Variabili inviate	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 "Parameters". 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 "**Errore. L'origine riferimento non è stata trovata.**").
The port configuration can be performed using dedicated configuration pages on V-graph 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, LowPressure).
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 the device configuration is checked for correctness of the parameters settings. 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 Pcty ≥ 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 Pcty ≥ 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 Pcty ≥ 6

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 mains 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 controller is in stand-by off, and after the parameters have been checked, it is possible to determine which probes will be used: for example, if an analog positioner is set using setting Pcty = 1, only an error on probe 1 will generate an alarm. If, on the other hand, an algorithm (Pcty ≥ 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 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 PSD04 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 signals the malfunction of the battery.

However, if the power fail alarm occurs, in addition to reporting the alarm, a valve safety shutdown procedure is started.

Once the alarm is cleared, the system is reset.

An alternative to the backup battery, is a solenoid valve connected to the digital relay output which can be used to close the solenoid blocking the flow of the refrigerant, when the power supply is lost.

9.7 Algorithm status

Bit 10 of Alarm status (AlSt) is raised for LOP, MOP, LoSH, HiSH, LowPressure or if the measures needed by the algorithm are not valid.
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 and 1 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 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 (Pa40), this alarm is triggered when the evaporation temperature (Te) drop below the LOP threshold (Pc04, Pp04, Pd04). 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 (parameter Pc21 or Pp21). When the Te temperature returns within its limits (Pa41 defines the hysteresis), the alarm and signalling are cleared and the normal regulation algorithm resumes.

9.8.4 MOP

When enabled (Pa50), this alarm is triggered when the evaporation temperature (Te) rise above the MOP threshold (Pc05, Pp05, Pd05) and activates a specific algorithm for managing the MOP. The condition is signalled in the Algorithm status (AlgS) and, when the timeout (Pa52) expires, an alarm is set. When the Te temperature returns within its limits (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 PSD04.

10 ACCESSORIES

10.1 Programming key PSKEY10

10.1.1 Introduction

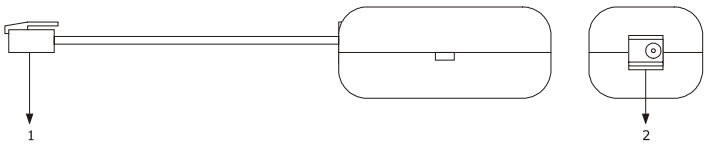
PSKEY10 is a programming key.

Through the key it is possible to make the upload and the download of the application software parameters and / or of the configuration ones.

The key can be used on condition that the devices are powered.

10.1.2 Description

The following drawing shows the aspect of the programming key PSKEY10.

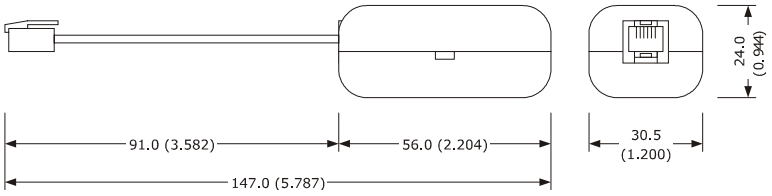


The following table shows the meaning of the parts of the key.

Part	Meaning
1	telephone connector
2	reserved

10.1.3 Size

Size is in mm (in).



10.1.4 Connection to the device

Operate as follows:

1. Plug in the telephone connector of the key into the programming port of the device.

To copy the parameters from the device to the key and vice-versa look at chapter 7 “CONFIGURATION”.

10.2 Programming kit PSIF20TUXI

10.2.1 Introduction

PSIF20TUXI is a programming kit.

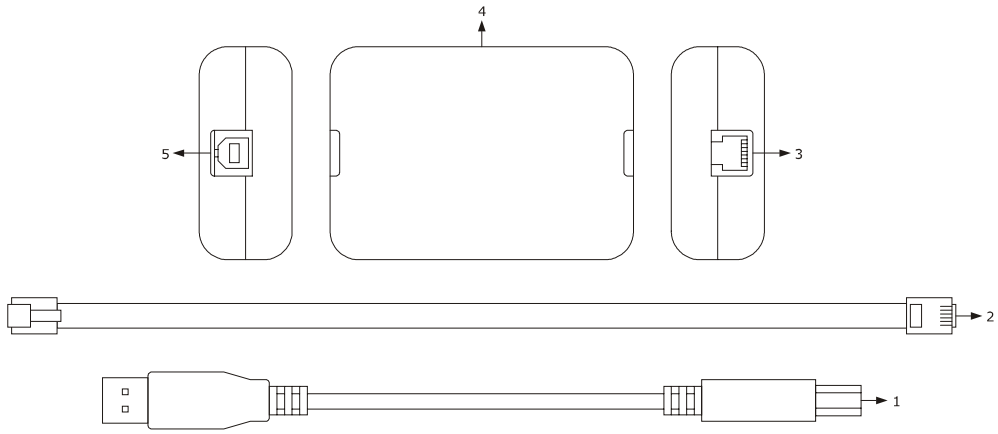
Through the kit it is possible to connect the driver to the set-up software system Parameters Manager (using the programming port).

The kit is made of:

- TTL / USB non optoisolated serial interface
- USB cable (to connect the serial interface to the Personal Computer)
- TTL cable (to connect the serial interface to the driver).

10.2.2 Description

The following drawing shows the aspect of the programming kit PSIF20TUXI.

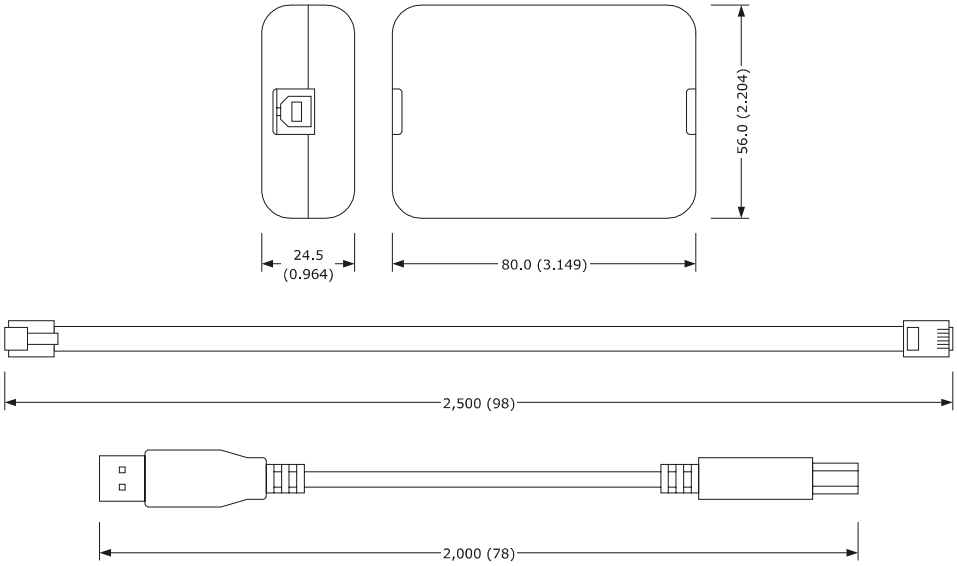


The following table shows the meaning of the parts of the kit.

Part	Meaning
1	USB cable 2 m (6 ft) long
2	TTL cable 2.5 m (8 ft) long
3	TTL port
4	TTL / USB non optoisolated serial interface
5	USB port

10.2.3 Size

Size is in mm (in).



10.2.4 Connection to the Personal Computer

Operate as follows:

1. Plug in an end of the TTL cable into the TTL port of the serial interface.
2. Plug in the other end of the TTL cable into the programming port of the device.
3. Plug in and end of the USB cable into the USB port of the serial interface.
4. Plug in the other end of the USB cable into an USB port of the Personal Computer.

For further information consult the User manual if Parameters Manager.

10.3 Non optoisolated RS-485/USB serial interface PSIF20SUXI

10.3.1 Introduction

PSIF20SUXI is a non optoisolated RS-485/USB serial interface.

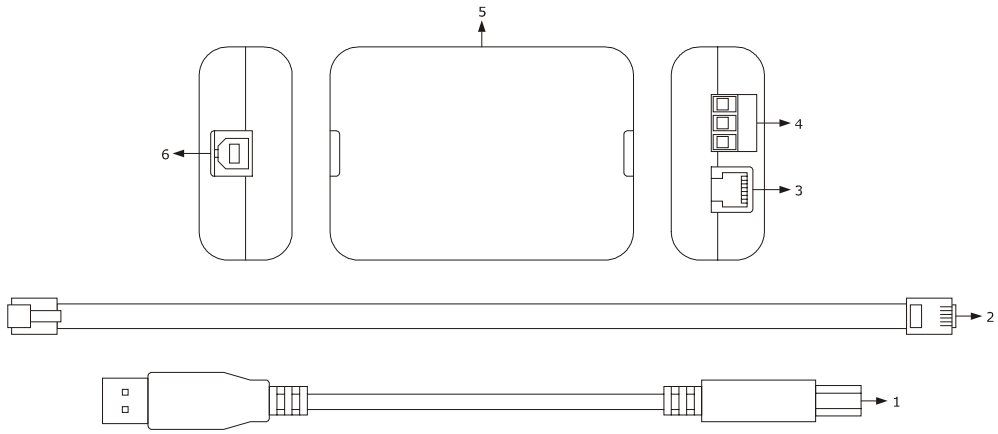
Through the interface it is possible to connect the driver to the set-up software system Parameters Manager (using the RS-485 port).

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).

10.3.2 Description

The following drawing shows the aspect of the interface PSIF20SUXI.

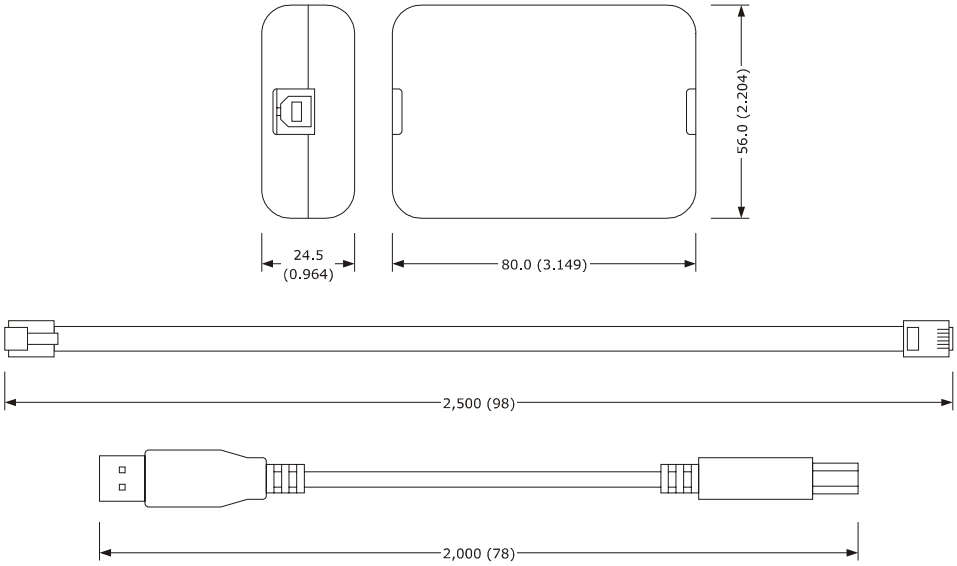


The following table shows the meaning of the parts of the kit.

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

10.3.3 Size

Size is in mm (in).



10.3.4 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.

10.4 Backup module PSS4B

10.4.1 Introduction

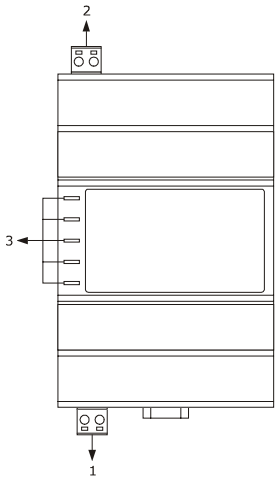
PSS4B is a backup module.

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 PSS4B.

10.4.2 Description

The following drawing shows the aspect of the module PSS4B.

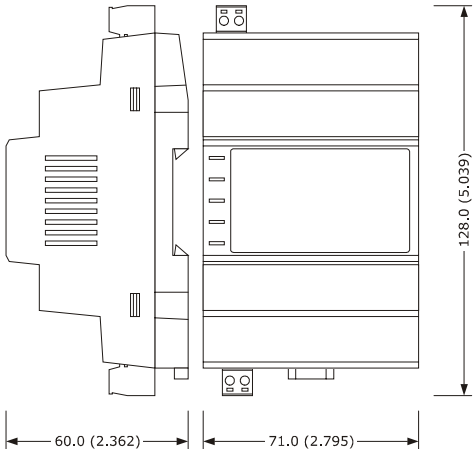


The following table shows the meaning of the parts of the module.

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

10.4.3 Size

Size is in mm (in).



10.4.4 Connection to the device

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

Please note the power supply of PSD04 and that of PSS4B 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>PSD4BX3</td><td>PSD4BM3</td><td>PSD4BF3</td><td>PSD4DF3</td></tr>
<tr><td>male + female 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), 6 poles female RJ11 telephone connector (setting and programming port).</td><td>male + female extractable screw terminal blocks with pitch 5.0 mm (0.196 in; power supply, high voltage digital inputs, outputs, 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), 6 poles female RJ11 telephone connector (setting and programming port).</td><td colspan="2">male + female 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), 6 poles female RJ11 telephone connector (setting and programming port).</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.

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.

<table>
<tr><td></td><td>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.</td></tr>
<tr><td rowspan="3">Digital inputs:</td><td>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 PSD4BX3).</td></tr>
<tr><td><u>Non optoisolated free of voltage contacts</u>
Power supply: none (5 V when not loaded, 3.3 mA when loaded).
Protection: none.</td></tr>
<tr><td><u>Optoisolated high voltage contact</u>
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.</td></tr>
<tr><td rowspan="2">Displays:</td><td>PSD4BX3 | PSD4BM3 | PSD4BF3 | PSD4DF3</td></tr>
<tr><td>signalling LEDs. | signalling LEDs. | signalling LEDs. | 128 x 64 pixel single colour (black with rearlighting through white LEDs) LCD graphic display, signalling LEDs.</td></tr>
<tr><td>Digital outputs:</td><td>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.</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">Electromechanical relay
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.</td></tr>
<tr><td rowspan="2">Bipolar stepper motor output:</td><td colspan="4">4 wires bipolar stepper motor output.</td></tr>
<tr><td colspan="4">Bipolar stepper motor output
Input voltage: 21 VDC ±10%.
Output voltage: 27... 36 VDC (18... 24 VDC if supplied by the backup module).
Maximum output current: 1 A.
Driver type: chopper (constant current).
Protection: none.</td></tr>
<tr><td>Type of actions and additional features:</td><td colspan="4">1C.</td></tr>
<tr><td rowspan="3">Communication ports:</td><td>PSD4BX3</td><td>PSD4BM3</td><td>PSD4BF3</td><td>PSD4DF3</td></tr>
<tr><td>1 non optoisolated programming port with MODBUS communication protocol.</td><td>2 non optoisolated ports of which 1 RS-485 port with MODBUS communication protocol and 1 programming port with MODBUS communication protocol.</td><td colspan="2">3 non optoisolated ports of which 1 CAN port with CANBUS communication protocol, 1 RS-485 port with MODBUS communication protocol and 1 programming port with MODBUS communication protocol.</td></tr>
<tr><td colspan="4">Power supply remote user interface: 22... 35 VDC, 100 mA max.</td></tr>
</table>

PSD04
Electronic expansion valves drivers
User manual ver. 3.6
PT - 03 / 16
Code 144PSDE364

User Safety Responsibility Statement for All Parker Products

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Parker Hannifin Ltd - RAC Europe
Brampton S73 OUF
phone +44 (0) 1226 273400
fax +44 (0) 1226 273401