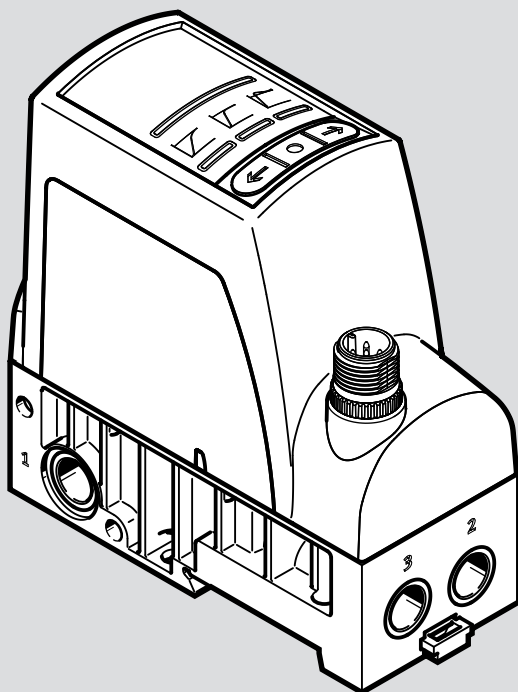


VPPI-...-S1BT

Proportional-pressure regulator

FESTO

Manual



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2021-11

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Translation of the original instructions

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Table of contents

1	About this document	4
1.1	Applicable documents	4
1.2	Product labelling	4
2	Safety	4
2.1	Safety instructions	4
2.2	Intended use	4
3	Additional information	5
4	Product overview	5
4.1	Function	5
4.2	Product design	5
5	Transport and Storage	6
6	Assembly	6
6.1	Assembly	6
6.1.1	Linkage of valves	6
6.1.2	Creating pressure zones	7
6.2	Mounting	8
6.2.1	Mounting via bottom of valve	8
6.2.2	Mounting via valve side surface	8
6.2.3	Mounting on H-rail	8
6.3	Mechanical installation	8
7	Installation	9
7.1	Pneumatic installation	9
7.2	Electrical installation	9
8	Commissioning	10
8.1	Commissioning without using the Bluetooth interface	10
8.2	Commissioning using the Bluetooth interface	10
8.2.1	Installing Festo Automation Suite	11
8.2.2	Start screen	11
8.2.3	Installing or updating plug-in	12
8.2.4	Using the plug-in	14
8.2.5	'Configuration' parameter group	15
8.2.6	'Pressure range' parameter group	17
8.2.7	'Set point' parameter group	18
8.2.8	'Actual value' parameter group	19
8.2.9	'Parameter set' parameter group	20
8.2.10	'Parameter set' 'Custom'	20
8.2.11	Execution of homing	22
8.2.12	'Delay function' parameter group	23
9	Malfunctions	23
9.1	Diagnostics	23
9.2	Fault clearance	25
10	Disassembly	25
11	Technical data	25

1 About this document

1.1 Applicable documents

Document	Product	Contents
Operating instructions	Proportional-pressure regulator VPPI-...-S1/-S1BT	Assembly, Installation, Commissioning
Test report ¹⁾	Proportional-pressure regulator VPPI-...-T	Accuracies determined by the manufacturer

1) Available only if the test report was selected in the configurator when ordering the product. Accessible on the Festo website by entering the product key.

Tab. 1: Applicable documents



All available documents for the product → www.festo.com/sp.

1.2 Product labelling

- Observe the specifications on the product.

Warning symbol

The following warning symbol is on the product VPPI-...-S1BT:

Symbol	Meaning
	Mechanical overload can cause the valve to malfunction. Under certain circumstances, this malfunction will cause permanent energisation of the coils resulting in a hot surface.

Tab. 2: Warning symbol

2 Safety

2.1 Safety instructions

- Only use the product in its original condition without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Take into account the ambient conditions at the location of use.
- Before working on the product, switch off the power supply and secure it against being switched on again.
- The product variants VPPI-...-S1BT have a Bluetooth interface that is permanently active. Fuse protection is therefore required.

2.2 Intended use

The proportional-pressure regulator is intended to regulate a pressure proportional to a specified setpoint value.

The product may generate high frequency interference, which may require interference suppression measures in residential areas.

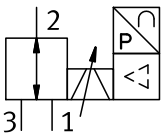
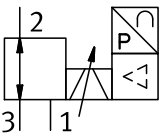
3 Additional information

- Contact the regional Festo contact if you have technical problems → www.festo.com.
- Accessories and spare parts → www.festo.com/catalogue.

4 Product overview

4.1 Function

A built-in pressure sensor records the pressure at the working port and compares this value with the setpoint value. In the event of deviations between the setpoint value and actual value, the valve regulates until the outlet pressure has reached the setpoint value.

VPPI -...- 3 -... (normally closed)	VPPI -...- 4 -... (normally open)
	

Tab. 3: Pneumatic Circuit Symbol

4.2 Product design

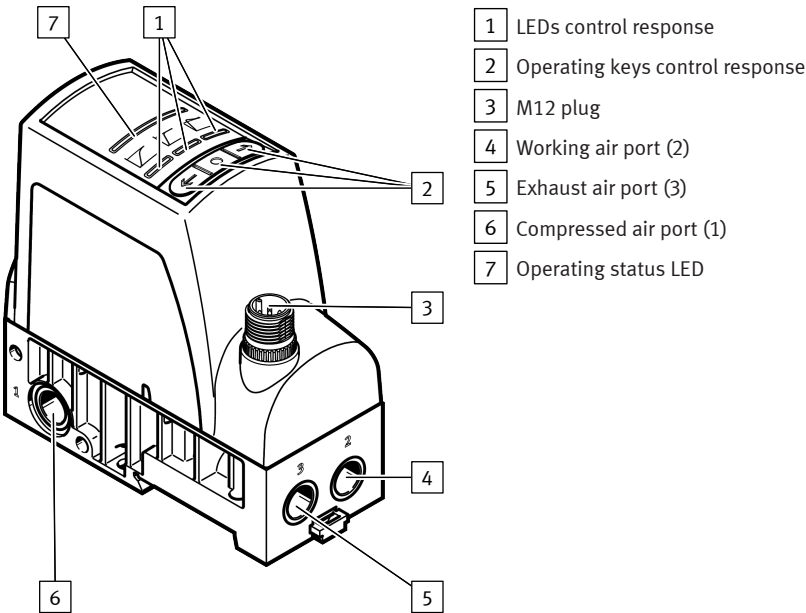


Fig. 1: Product design (example VPPI)

5 Transport and Storage

- Store the product in a dry, UV- and corrosion-protected environment.
- Ensure short storage times.

6 Assembly

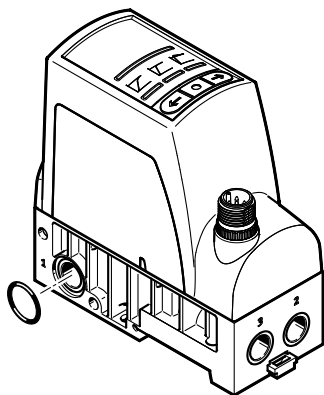
6.1 Assembly

6.1.1 Linkage of valves

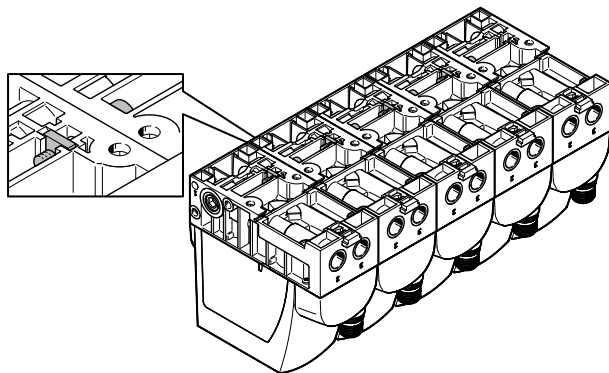
Up to 5 valves can be pneumatically linked. The connecting kit VAME-P18-K-P5 is required for the linkage → www.festo.com/catalogue.

The connecting kit consists of 2 square nuts, 2 socket head screws and an O-ring.

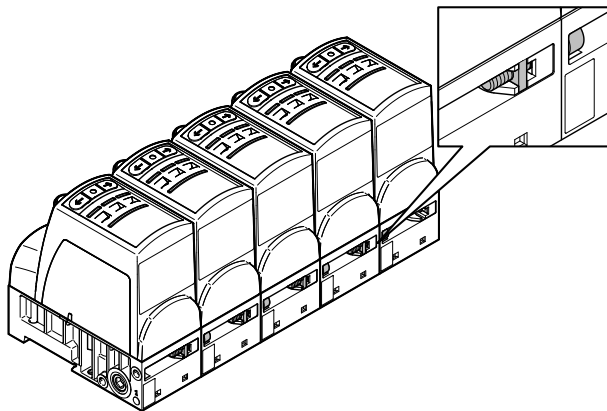
1. Remove the plug screw and sealing material from the duct (1).
2. Insert the O-ring into the duct (1) between 2 valves.



3. Connect the valves on the bottom using socket head screws and square nuts. Tightening torque:
 $1.2 \pm 0.2 \text{ Nm}$



4. Connect the valves at the rear using socket head screws and square nuts. Tightening torque:
 $1.2 \pm 0.2 \text{ Nm}$



6.1.2 Creating pressure zones



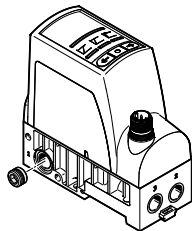
For separating pressure zones, connect the compressed air supply to both ends of the valve manifold.

The plug screw can be left in the duct (1) of the valve for pressure zone separation.

Plug screws VAME-P18-BP-G18-P5 for the duct (1) can also be ordered as accessories

→ www.festo.com/catalogue.

- Screw the plug screw into the duct (1) of the selected valve. Screw in the plug screw until it is flush with the surrounding surface.



6.2 Mounting

6.2.1 Mounting via bottom of valve

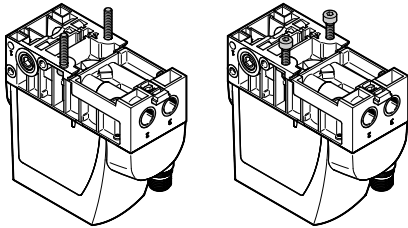


Fig. 2: Mounting via bottom of valve with M4 screws/M4 screws and square nuts

6.2.2 Mounting via valve side surface

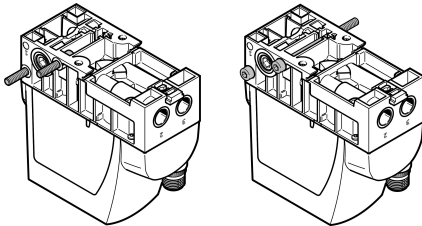


Fig. 3: Mounting via side with internal M4 screws/M4 through screws

6.2.3 Mounting on H-rail

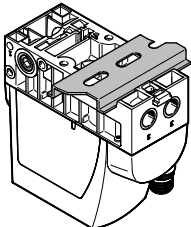


Fig. 4: Individual valve

6.3 Mechanical installation

1. Make sure there is sufficient space for the connecting cable and tubing connections.
 - ✎ This will prevent kinks from forming in the connecting cables and the tubing.
2. Place the valve as close to the consumer as possible.
 - ✎ This improves control precision and reduces response times.

7 Installation

7.1 Pneumatic installation

Valves for standard operation (overpressure)

1. Attach the tubing to the connections:
 - Compressed air (1)
 - Working air (2)
2. Fit a silencer at the exhaust air connection (3) or provide for ducted exhaust air.

Valves for vacuum operation or combined vacuum and overpressure operation (VPPI-...-1V...H-...)

1. Attach the tubing to the connections:
 - Vacuum (3)
 - Working air (2)
2. Connect a compressed air supply to port (1) or mount a silencer to protect the valve from coarse dirt particles.

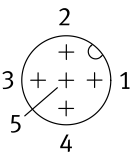
7.2 Electrical installation

⚠ WARNING

Risk of Injury due to Electric Shock.

- For the electric power supply, use only PELV circuits that ensure a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.
- The unit must be powered by a power source that fulfils the requirements of an energy-limited circuit in accordance with IEC 61010-1/EN 61010-1.

1. If a screened cable is used: earth the shield at the cable end away from the valve.
2. Install electrical connecting cable without squeezing, kinking or stretching.
3. Tighten the electrical connecting cable onto plug M12. Tightening torque: maximum 0.3 Nm

Connection	Pin	Allocation		Wire colour ¹⁾ NEBU-M12...
		Analogue	Alternative (digital input)	
	1	+ 24 V DC	+ 24 V DC	BN
	2	Setpoint value (-)	DI1	WH
	3	GND	GND	BU
	4	Setpoint value (+)/PWM	DI0	BK
	5	Actual value output – based on pin 2 "set-point value (-)" for type VPPI-...-V1-... – based on pin 3 "GND" for VPPI-...-A4-...	DI2	GY

1) Colour code in accordance with IEC 60757:1983-01

Tab. 4: Pin allocation for plug M12, 5-pin, A-coded

8 Commissioning

Requirements:

- The valve is mounted.
 - The pneumatic and electrical installation must be complete and tested.
1. Check operating conditions and critical limits → 11 Technical data.
 2. Switch on the power supply.
 3. Switch on the compressed air supply.
 4. If necessary, adjust the control response of the valve.

8.1 Commissioning without using the Bluetooth interface

Control response

The control response of the valve can be set using the operating buttons on the top of the valve → Fig.

1. The symbols above the operating buttons represent the control response of the valve.

Setting the control response

1. Hold middle button for 3 s.
2. Select the control response with the arrow keys.
 - ↳ The LED under the symbol of the selected control response lights.
3. Confirm the control response with the middle key.

Symbol	Application recommendation
	Designed for flow rate applications.
	Standard preset for all applications. Optimised for closed volumes from 100 ml to approx. 750 ml.
	Optimised for closed volumes of ≥ 750 ml. Less suitable for volumes < 500 ml.

Tab. 5: Control response

8.2 Commissioning using the Bluetooth interface

The product variants VPPI-...-S1BT have a Bluetooth interface for parameterisation. The parameters are set with the Festo Automation Suite plug-in.



The Bluetooth interface is permanently active. The Bluetooth connection must therefore be secured against unauthorised access.

- Protect the Bluetooth connection with a password → 8.2.5 'Configuration' parameter group.
-

8.2.1 Installing Festo Automation Suite



Administrator rights and a connection to the Internet are required for this action.
The requirement for the VPPI plug-in is WINDOWS 10, version 1909 or newer.

1. Download the Festo Automation Suite installation file from the Support Portal
→ www.festo.com/sp.
2. Start installation by double-clicking on the installation file.
3. Follow instructions in the installation program.
 The Festo Automation Suite is installed. The program starts automatically with the start screen after successful installation depending on the selected option.

8.2.2 Start screen

Projects can be opened and functions that are frequently required at the start can be executed on the start screen. The start screen is displayed by default when the Festo Automation Suite is started for the first time.

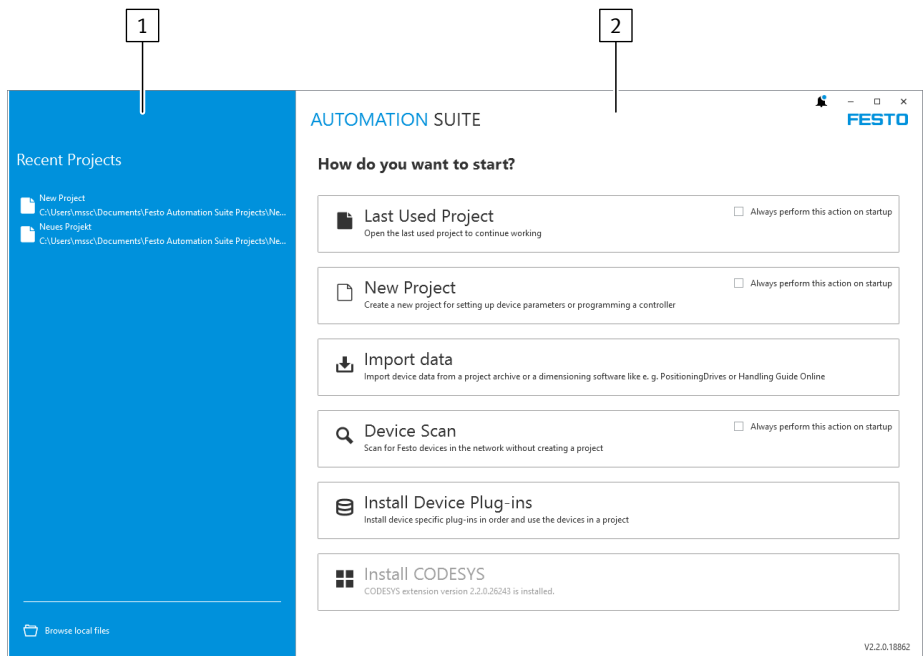


Fig. 5: Start screen, example (version V2.2)

- | | |
|---|--|
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div> List of recently used projects | <div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div> Start options and installations |
|---|--|

The list of recently used projects provides quick access to recently used projects. The 'Browse local files' button can be used to open a locally saved project from a directory in the file system.

The Festo Automation Suite start options can be configured on the right:

- ‘Last Used Project’ to open the last used project
- ‘New Project’ to create and open a new project
- ‘Device Scan’ to search all available Festo devices in the network

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If one of the ‘Always perform this action on startup’ checkboxes is marked, the selected start option will be executed automatically at the next start. The start screen is then no longer displayed when the software is started.

This setting can be reset or changed → Festo Automation Suite Online Help.

Plug-ins can be installed directly from the start screen:

- ‘Install Device Plug-ins’ for installing device-specific plug-ins → 8.2.3 Installing or updating plug-in

8.2.3 Installing or updating plug-in

The Festo Automation Suite automatically searches for updates of the plug-ins when it is started. The automatic check for updates can be deactivated → Festo Automation Suite Online Help.

Plug-ins can be installed or updated as follows:

- Installation from the Internet
- Installation of a locally available plug-in
- Installation of a missing plug-in when adding a device

Installation from the Internet

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Administrator rights and an Internet connection are required for this action.

Symbol	Meaning
	Backstage section
	‘Repositories’ menu option
	‘Search for updates’ button

Tab. 6: Symbols for the action steps

Search for a plug-in or the updates of a plug-in:

1. Open backstage section.
2. Open ‘Repositories’ menu option.
 - ↳ The ‘Plug-ins’ entry is displayed.

- 3. Click on the ‘Search for updates’ symbol.
 - ↗ New plug-ins and updates to existing plug-ins are searched for.
If the server is not found in the search:
 - Check proxy settings and select the correct network (backstage section → menu option ‘Options’ → section ‘Network proxy’).
 - Repeat the process.

To display the release notes:

- 1. Select plug-in.
- 2. Click on the ‘Release Notes’ link.
 - ↗ The Release Notes are displayed.

To install a plug-in or update a plug-in:

- 1. Select plug-in.
- 2. Press ‘Install plug-in’ or ‘Update plug-in’ button.
 - ↗ The plug-in is downloaded and installed or updated.
If the requested installation data are not immediately available, the installation data are prepared by the server. As soon as they are available, a notification will be displayed in the Notification Center.

Installation of a plug-in from a locally available file

i Administrator rights are required for this action.	
Symbol	Meaning
	Backstage section
	‘Repositories’ menu option
	‘Install local file’ button

Tab. 7: Symbols for the action steps

- 1. Open backstage section.
- 2. Open ‘Repositories’ menu option.
 - ↗ The ‘Plug-ins’ entry is displayed.
- 3. Click on the ‘Install local file’ symbol.
- 4. Select and open plug-in (*.fsi) in the file system.
 - ↗ The plug-in is installed or updated.

Installation of a missing plug-in when adding a device

i Administrator rights and an Internet connection are required for this action.

Commissioning

- 1. Add device.
 - ↳ The software searches for a relevant plug-in locally first and then on the server in the Internet.
- 2. Confirm installation with 'Ok' button.
 - ↳ The plug-in is installed.
 - If the server is not found in the search:
 - Check proxy settings (backstage section → menu option 'Options' → section 'Network proxy').
 - Repeat the process.

8.2.4 Using the plug-in

The user interface of the VPPI plug-in can be divided into 4 sections.

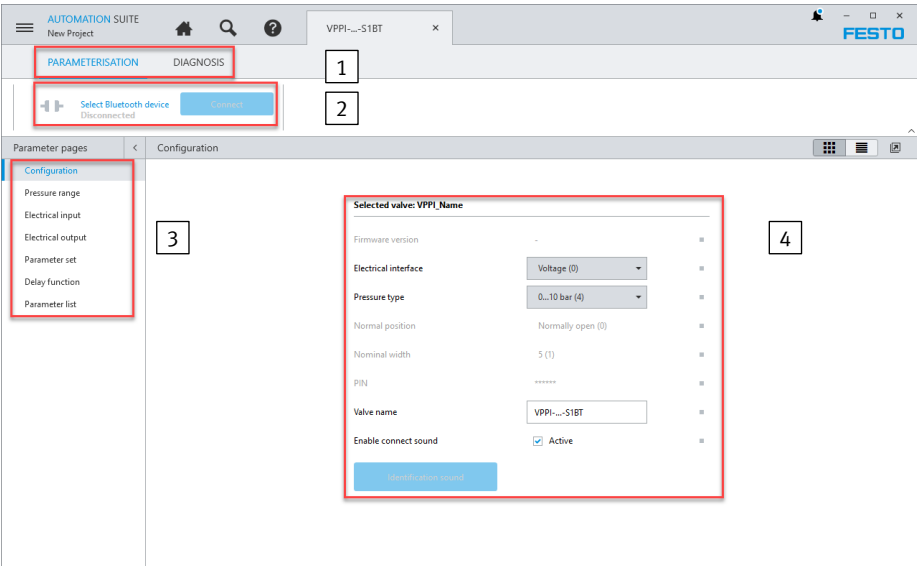


Fig. 6: Overview of plug-in (example)

- 1 Context sections
- 2 Connection control
- 3 Parameter panels
- 4 Working section (here parameters of the selected parameter panel)

Context sections

Navigation between different sections.

- 'Parameterisation':
Parameter settings of the valve can be read out and changed here.
- 'Diagnosis':
Diagnostic values such as temperature and switching cycle counter can be read out here.

Connection control

Establish a connection to a VPPI with a Bluetooth interface.

The connection to a VPPI with Bluetooth interface can be established via ‘Select Bluetooth device’ and ‘Connect’. When the connection is established, all parameters are compared with the valve and then either the values from the offline settings in the plug-in or those from the valve are imported. As long as the connection exists, valid parameter changes are effective immediately in the valve.

Parameter panels

Navigation between different parameter groups.

The parameters of the VPPI are divided into groups. There is a tab in which the parameters can be set for every group.

Operating range

If the ‘Parameterisation’ context section is selected, parameters and their current settings are displayed in the working section. The appearance of the working section differs slightly for different parameter groups.

If the ‘Diagnosis’ context section is selected, the corresponding diagnostic values are displayed in the work area.

8.2.5 ‘Configuration’ parameter group

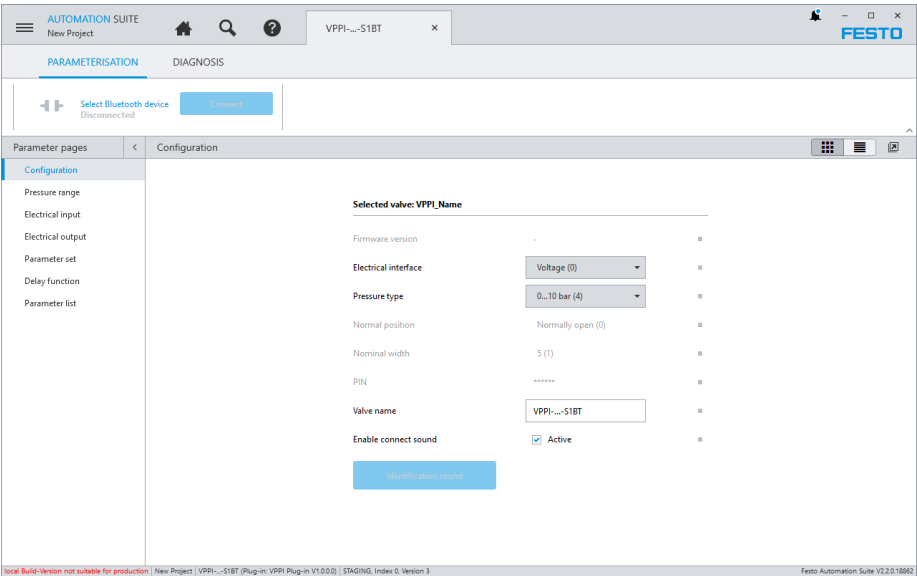


Fig. 7: ‘Configuration’ parameter group (example)

Parameter	Contents	Description
'Firmware version'	e.g. V4.4.0	The firmware version of the connected valve
'Electrical interface'	'Voltage'/'Current'	Indicates whether the analogue interfaces of the valve communicate via voltage (0 ... 10 V DC) or current (0 ... 20 mA). This parameter can be set for offline configuration. This parameter cannot be changed when a valve is connected.
'Pressure type'	e.g. 0 ... 10 bar	The pressure range of the connected valve. This parameter can be set for offline configuration. This parameter cannot be changed when a valve is connected.
'Normal position'	'Normally open'/'Normally closed'	Normal position of the connected valve. This setting is hardware-specific and cannot be changed.
'Nominal width'	e.g. 5	Nominal width of the connected valve. This setting is hardware-specific and cannot be changed.
'PIN'	e.g. 327891	6-digit PIN with which the valve can be protected. This PIN is requested when connecting to the valve. The plug-in cannot connect to the valve without the correct PIN. There is no PIN query with setting 000000. The PIN can be reset using a "clip grip". This requires pressing the two outer control buttons for control response simultaneously for 1 s → Fig. 1.
'Valve name'	e.g. VPPI-...-S1BT	Bluetooth name of the valve. The valve uses the name "VPPI_[set name]" to establish the Bluetooth connection.
'Enable connect sound'	–	Setting for whether a sound should be generated when establishing or disconnecting the Bluetooth connection.
'Identification sound'	–	The connected valve will beep and the LEDs will flash.

Tab. 8: 'Configuration'

8.2.6 'Pressure range' parameter group

Parameter	Contents	Description
'Pressure unit'	bar/MPa/psi	Pressure unit in which all pressures are displayed.
'Minimum pressure'	e.g. 1 bar	Lower limit of the pressure regulation range.
'Maximum pressure'	e.g. 5 bar	Upper limit of the pressure regulation range.

Tab. 9: 'Pressure range'

8.2.7 'Set point' parameter group

Parameter	Contents	Description
'Input type'	'Analog'/'Digital'	– 'Analog': the setpoint pressure is specified as an analogue voltage/current value via the set value input. – 'Digital': a digital 24 V signal is entered via the setpoint input.
'Maximum analog setpoint'	e.g. 5 V	Upper limit of the analogue setpoint value range. The 'Minimum analog setpoint' > 'Maximum analog setpoint' setting is not recommended.
'Minimum analog setpoint'	e.g. 0 V	Lower limit of the analogue setpoint value range. The 'Minimum analog setpoint' > 'Maximum analog setpoint' setting is not recommended.
'Pressure value 001'	e.g. 1.00 bar	Setpoint value, if value of the digital inputs = 001
'Pressure value 010'	e.g. 2.00 bar	Setpoint value, if value of the digital inputs = 010
'Pressure value 011'	e.g. 4.00 bar	Setpoint value, if value of the digital inputs = 011
'Pressure value 100'	e.g. 5.00 bar	Setpoint value, if value of the digital inputs = 100
'Pressure value 101'	e.g. 7.00 bar	Setpoint value, if value of the digital inputs = 101
'Pressure value 110'	e.g. 8.00 bar	Setpoint value, if value of the digital inputs = 110
'Pressure value 111'	e.g. 10.00 bar	Setpoint value, if value of the digital inputs = 111

Tab. 10: Input values



If the 'Digital' input is selected, one of 8 setpoint values is specified via three 24 V inputs. For this, the three inputs are interpreted as a binary number with 3 bits.

The assignment is as follows:

- Setpoint value (+): DI0 or least significant bit
- Setpoint value (-): DI1
- Actual value output: DI2 or most significant bit

The value 000 means 0 bar, the remaining 7 values can be set in 'Set point' → Tab. 4 Pin allocation for plug M12, 5-pin, A-coded.

8.2.8 'Actual value' parameter group

Parameter	Contents	Description
'Output type'	'Analog'/'Digital'	Digital can only be selected for voltage variants. 'Output type' = 'Analog' is for current variants. – 'Analog': the current actual pressure is output as an analogue voltage/current value via the actual value output. – 'Digital': a digital 24 V signal is output via the actual value output, which switches as soon as the actual value is within the parameterised limits.
'Minimum analog output'	e.g. 0 V	Lower limit of the electrical actual value output in analogue mode. The 'Minimum analog output' > "Maximum analog output" setting is not recommended.
'Maximum analog output'	e.g. 5 V	Upper limit of the electrical actual value output in analogue mode. The 'Minimum analog output' > 'Maximum analog output' setting is not recommended.
'Digital output hysteresis'	e.g. 0.200 bar	Setting of the limits for the digital output. The set value corresponds to the maximum deviation from the setpoint value, which is evaluated as OK for the digital output.
'Digital output delay'	e.g. 100 ms	Delayed output of edge changes at the actual value output in order to filter short status changes (e.g. with setpoint value jumps). Shorter pulses than defined in 'Digital output delay' are not output.
'Digital output logic'	'High'/'Low'	Switchover of the meaning of high or low signal at the digital output: – 'High': 'High' is output if the actual value lies within the parameterised limits. – 'Low': 'Low' is output if the actual value is within the parameterised limits.

Tab. 11: Baseline values

8.2.9 'Parameter set' parameter group

Parameter	Contents	Condition
'Parameter set'	'Small volume'/ 'Flow'/ 'Large volume'/ 'Custom'	Setting of the control response – 'Small volume': default set for all applications. Optimised for closed volumes of 100 ml to approx. 750 ml. For larger volumes, 'Small volume' results in a softer control response than 'Large volume'. For applications with flow rate 'Small volume' is only suitable to a limited extent (< 100 l/min) – 'Large volume': optimised for closed volumes (≥ 750 ml on 1 m tubing, $\varnothing 8$ mm). Faster adjustment of pressure jumps. – 'Flow': designed for flow rate applications. Softer control response due to greater hysteresis. Can also be used for closed volumes. – 'Custom': individual adaptation to higher volumes or applications with longer/thinner tubing or constrictions within the application.
'Tuning parameter pressure increasing'	e.g. 5200	'Tuning parameter pressure increasing' appears only if 'Parameter set' = 'Custom'. Setting of the tuning parameter for pressure jumps upwards.
'Tuning parameter pressure decreasing'	e.g. 5600	'Tuning parameter pressure decreasing' appears only if 'Parameter set' = 'Custom'. Setting of the tuning parameter for pressure jumps downwards.
'Perform reference run' button	–	Appears only if 'Parameter set' = 'Custom' → 8.2.11 Execution of homing.

Tab. 12: 'Parameter set'

8.2.10 'Parameter set' 'Custom'



If the 'Parameter set' 'Custom' is selected, short-term pressure rises to the input pressure at the working port are possible. This is independent of any set limit values ('Minimum pressure'/'Maximum pressure'). The complete input pressure or the vacuum present at the exhaust port can be present at the working port during the regulation process and during homing.

If the application and the tuning parameters do not match, an uncontrolled response is possible (continuous oscillation, continuous maximum or minimum pressure at the working port). If the application is changed, the tuning parameters must be adjusted.

The 'Parameter set' 'Custom' enables individual adjustment/optimisation of the control response for an application. This adjustment enables greater pressure dynamics in the face of a constriction compared to a standard controller. This considerably reduces settling times for pressure jumps. The two required model parameters ('Tuning parameter pressure increasing'/'Tuning parameter pressure decreasing') can be determined automatically via homing. The determined model parameters can also be manually adjusted later. Free input of the two model parameters without homing is also possible.

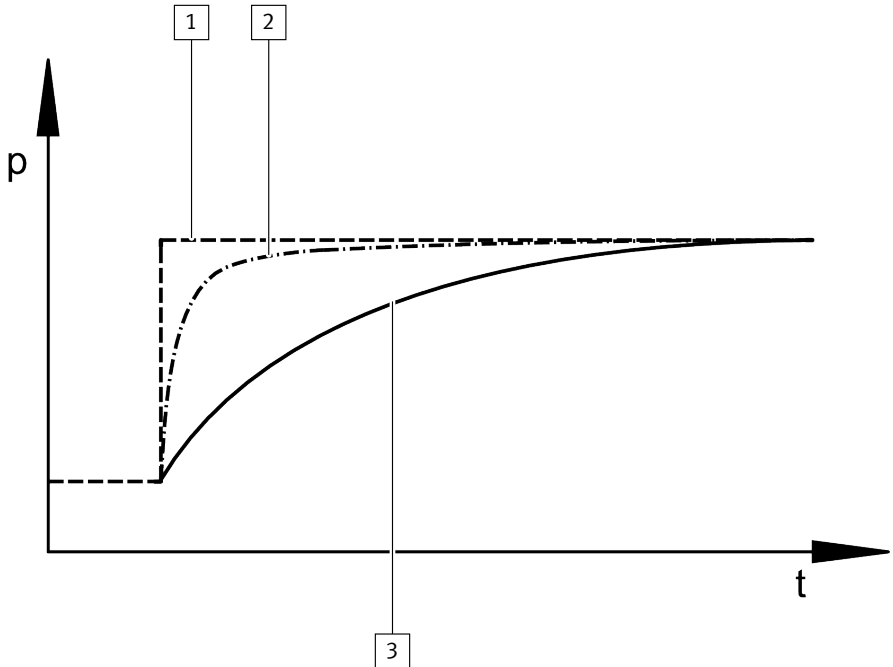


Fig. 8: Pressure jump in standard regulator (basic representation)

- | | |
|--|--|
| <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">1</div> Target pressure | <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">3</div> Pressure in the working volume |
| <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">2</div> Valve pressure at the working port | |

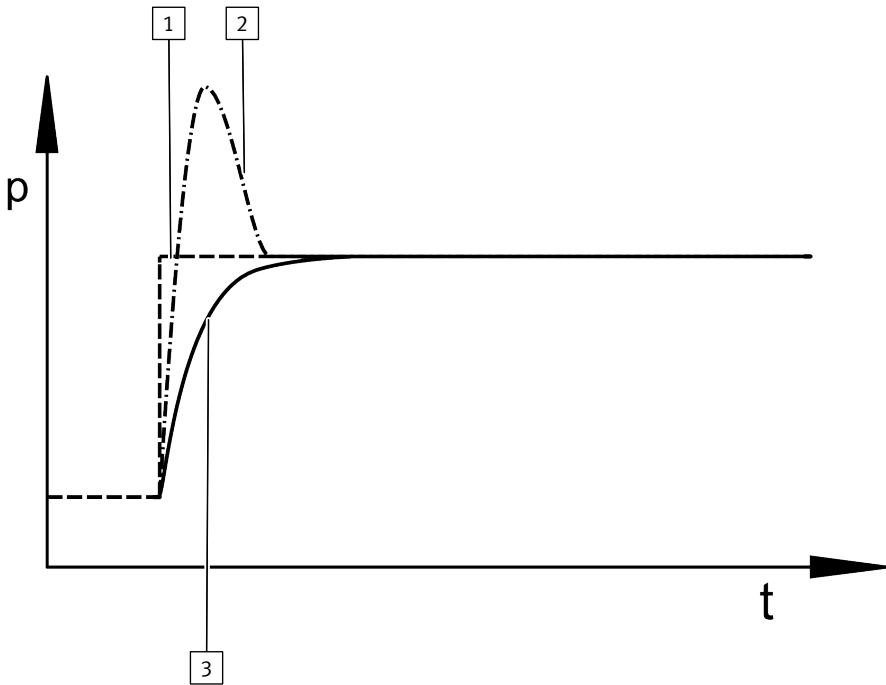


Fig. 9: Pressure jump 'Parameter set' 'Custom'

- | | |
|--|---|
| <p>1 Target pressure</p> <p>2 Valve pressure at the working port</p> | <p>3 Pressure in the working volume</p> |
|--|---|

8.2.11 Execution of homing

1. Connect application (connected volumes, tubing, air consumption and supply pressure must correspond to the working conditions).
2. Activate 'Parameter set' 'Custom'.
3. Select the 'Perform reference run' button.
 - ↳ A warning appears.
4. Read the warning and make sure that no damage can be caused by the homing.
5. Start homing with "OK".
 - ↳ Homing is started.
6. Wait for a success message or an error message to appear.

Homing typically takes 30 ... 40 s.

 - ↳ In the event of a success message, the homing automatically determined tuning parameters that were accepted immediately. In the event of an error message, the homing has failed. New tuning parameters are not set.

Possible causes of a failed homing:

- Lack of supply pressure (working pressure does not reach 'Maximum pressure'.)
- application too fast (no bottleneck)
- extremely slow application (very large volume, very long tubing)

In these cases the 'Parameter set' 'Custom' can be used via the manual input of the 'Tuning parameter pressure increasing'/'Tuning parameter pressure decreasing' parameters.

i

Manual adjustment/free entry of the tuning parameters:

The physical meaning of 'Tuning parameter pressure increasing'/'Tuning parameter pressure decreasing' corresponds to that of a master value for the pressurisation or exhaust process. If the tuning parameter is increased, the control response becomes gentler. If the tuning parameter is reduced, the control response becomes more aggressive.

8.2.12 'Delay function' parameter group

Parameter	Contents	Description
'Delay pressure increasing'	e.g. 1000 ms	Setpoint jumps upwards are filtered with a low-pass filter. The set value is the time constant (tau) in milliseconds.
'Delay pressure decreasing'	e.g. 0 ms	Setpoint jumps downwards are filtered with a low-pass filter. The set value is the time constant (tau) in milliseconds. Exception: with variants VPPI-...-...L...H-... exhausting to 0 bar is always run as quickly as possible. If deceleration is desired, the pressure must first be exhausted to a pressure of $\geq 1\%$ FS.
'Activate delay function'	–	Activates the delay function

Tab. 13: Delay function

9 Malfunctions**9.1 Diagnostics**

The following table describes the diagnostics with the LED operating status → Fig. 1, [7].

LED	Status and meaning
	LED lights green: – The operating voltage is present and within the permissible range. – Setpoint signal lies within the permissible range (0 ... 10.8 V or 2.5 ... 20.5 mA).
	LED lights red: – Working temperature is too high. – Valve is in temperature shut-off.

LED	Status and meaning
	LED flashes red: - Supply voltage is too high
	LED flashes alternately red and green in the ratio 1:1: - Analogue setpoint value is too high. - Cable break setpoint input
	LED flashes alternately red and green in the ratio 1:5: - Temperature is critical - Power reduction active
	LED is off: - No operating voltage. - The operating voltage is below the permissible range (< 20.4 V).
	LED flashes green at the ratio 1:1: - Bluetooth connected

Tab. 14: Operating status LED

9.2 Fault clearance

Error description	Cause	Remedy
Valve does not respond.	Operating voltage not applied.	Check the operating voltage connection.
	No setpoint voltage.	Check the controller and connection.
	Working temperature is too high. Valve is in temperature shut-off.	Switch off the valve, let it cool down and restart. Reduce ambient temperature and / or temperature of medium.
Valve normally open: The working pressure at (2) falls to the level at (3) (ambient pressure or vacuum).	Cable break setpoint input	Check connection to setpoint generator. Replace supply cable.
Valve normally closed: The working pressure at (2) deviates upwards or downwards from the setpoint value (working pressure is neither pressurised nor exhausted).	Cable break setpoint input	Check connection to setpoint generator. Replace supply cable.
Setpoint value not reached.	Input pressure at (1) is too low.	Increase input pressure at (1). Maintain permissible maximum operating pressure → 11 Technical data.

Tab. 15: Fault Clearance

10 Disassembly

1. Specify setpoint value 0 bar (0 MPa).
2. Switch off compressed air supply.
3. Switch off operating voltage.
4. Remove electrical connecting cables.
5. Remove compressed air lines.
6. Dismantle the product.

11 Technical data

General technical data	
Valve function	3-way proportional-pressure regulator
Mounting position	any
Product weight [g]	370

General technical data	
Approvals	RCM
	KC
Materials	
Seals	HNBR
Housing	Reinforced PA

Tab. 16: General technical data

Operating and environmental conditions	
Ambient temperature [°C]	0 ... 50
Storage temperature [°C]	−20 ... +70
Temperature of medium [°C]	0 ... 50
Degree of protection	IP65
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4]
	Inert gas
Information on the operating medium	Lubricated operation not possible
Climate class in accordance with EN 60721	3k3
Nominal operating altitude	< 3000 m above MSL
Vibration resistance/shock resistance (in accordance with IEC 60068)	
Note	Explanation of the severity levels (SL) → Tab. 18 Type of severity level (SL)
Vibration (part 2-6)	Individual valve fastened with screws: SL2
	Individual valve on H-rail: SL1
	Linkage of max. 3 valves with lateral screw mounting: SL2
	Linkage of max. 5 valves with lateral screw mounting: SL1
Shock (part 2 – 27)	Individual valve fastened with screws: SL2
	Individual valve on H-rail: SL1
	Linkage of max. 3 valves with lateral screw mounting: SL2
	Linkage of max. 5 valves with lateral screw mounting: SL1

Tab. 17: Operating and environmental conditions

Type of severity level (SL)					
Vibration load					
Frequency range [Hz]		Acceleration [m/s ²]		Deflection [mm]	
SL1	SL2	SL1	SG2	SL1	SL2
2 ... 8	2 ... 8	–	–	±3.5	±3.5
8 ... 27	8 ... 27	10	10	–	–
27 ... 58	27 ... 60	–	–	±0.15	±0.35
58 ... 160	60 ... 160	20	50	–	–
160 ... 200	160 ... 200	10	10	–	–
Shock load					
Acceleration [m/s ²]		Duration [ms]		Shocks per direction	
SL1	SL2	SL1	SL2	SL1	SL2
±150	±300	11	11	5	5
Continuous shock load					
Acceleration [m/s ²]		Duration [ms]		Shocks per direction	
±150		6		1000	

Tab. 18: Type of severity level (SL)

Characteristic pneumatic values				
Product type	Input pressure at (1) ¹⁾		Operating pressure at (1) ²⁾	
	[MPa]	[bar]	[MPa]	[bar]
VPPI-...-1V0H-...	0 ... 0.6	0 ... 6	0 ... 0.2	0 ... 2
VPPI-...-1V1H-...	0 ... 0.6	0 ... 6	0.1 ... 0.2	1 ... 2
VPPI-...-0L2H-...	0 ... 0.6	0 ... 6	0.2 ... 0.4	2 ... 4
VPPI-...-0L6H-...	0 ... 1.3	0 ... 13	0.6 ... 0.8	6 ... 8
VPPI-...-0L10H-...	0 ... 1.3	0 ... 13	1.0 ... 1.2	10 ... 12
VPPI-...-0L12H-...	0 ... 1.3	0 ... 13	1.2 ... 1.3	12 ... 13
Product type	Input pressure at (3) (vacuum)		Operating pressure at (3)	
	[MPa]	[bar]	[MPa]	[bar]
VPPI-...-1V0H-...	–0.1 ... 0	–1 ... 0	–0.1 ... 0	–1 ... 0
VPPI-...-1V1H-...	–0.1 ... 0	–1 ... 0	–0.1 ... 0	–1 ... 0

Characteristic pneumatic values		
Product type	Pressure regulation range at (2) ³⁾	
	[MPa]	[bar]
VPPI-...-1V0H-... ⁴⁾	0 ... -0.1	0 ... -1
VPPI-...-1V1H-...	-0.1 ... +0.1	-1 ... +1
VPPI-...-0L2H-...	0 ... 0.2	0 ... 2
VPPI-...-0L6H-...	0 ... 0.6	0 ... 6
VPPI-...-0L10H-...	0 ... 1.0	0 ... 10
VPPI-...-0L12H-...	0 ... 1.2	0 ... 12

- 1) The valve can be operated at an input pressure within the specified range. It must be noted here that the specified control quality is only fulfilled with a permanent supply within the operating pressure range and that the control pressure can reach the maximum available input pressure.
- 2) The specified control quality is only achieved if there is a permanent operating pressure supply at the valve within the specified range.
- 3) Active regulation is only from a setpoint value of 1% FS, below which the valve is at zero point suppression.
- 4) For variants VPPI-...-1V0H-... 0% of the setpoint value corresponds to 0 bar and 100% of the setpoint value corresponds to -1 bar.

Tab. 19: Characteristic pneumatic values

Normal position	
Valve variant	Normal position (de-energised state)
VPPI-...-3-...	Working pressure (2) blocked.
VPPI-...-4-...	Working pressure (2) is exhausted to the pressure at the exhaust air port (3).

Tab. 20: Normal position

Cable break detection		
Valve variant	'Minimum analog set-point' parameter setting	Cable break detection
VPPI-...-A4-...	< 2 mA	Cable break detection inactive.
	≥ 2 mA	Cable break detection active. At analogue input values below 2 mA the 'Cable break' error is displayed and the valve moves to the normal position.

Cable break detection		
VPPI-...-V1-...	< 500 mV	Cable break detection inactive.
	≥ 500 mV	Cable break detection active. At analogue input values below 500 mV the 'Cable break' error is displayed and the valve moves to the normal position.

Tab. 21: Cable break detection

Zero point suppression		
Valve variant	'Minimum pressure' parameter setting	Response with setpoint value < 0.7% Full scale
VPPI-...-...L...H-...	0 MPa	Exhaust to 0 bar and keep the exhaust open.
	> 0 MPa	Active control on 'Minimum pressure'.
VPPI-...-1V1H-...	-0.1 MPa	Valve moves to normal position.
	> -0.1 MPa	Active control on 'Minimum pressure'.
VPPI-...-1V0H-...	-	Active control on 'Maximum pressure'.

Tab. 22: Zero point suppression

Setpoint values < 0.7% Full scale above the minimum input value ('Minimum analog setpoint') are interpreted as the lowest input value in order to suppress noise at the input signal → Fig. 10. Depending on the valve variant and the minimum input pressure, there may be a special response in this area → Tab. 22 Zero point suppression.

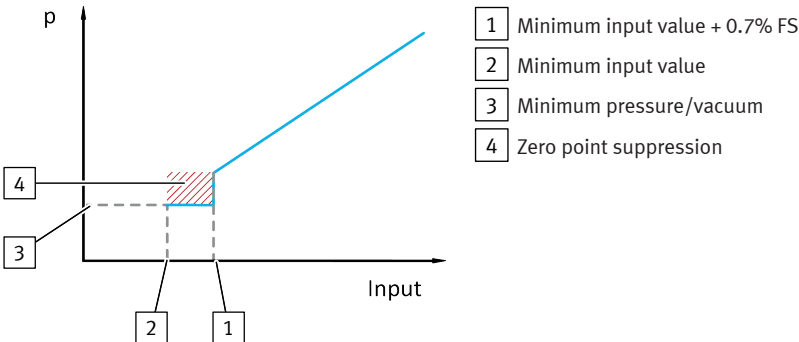


Fig. 10: Zero point suppression

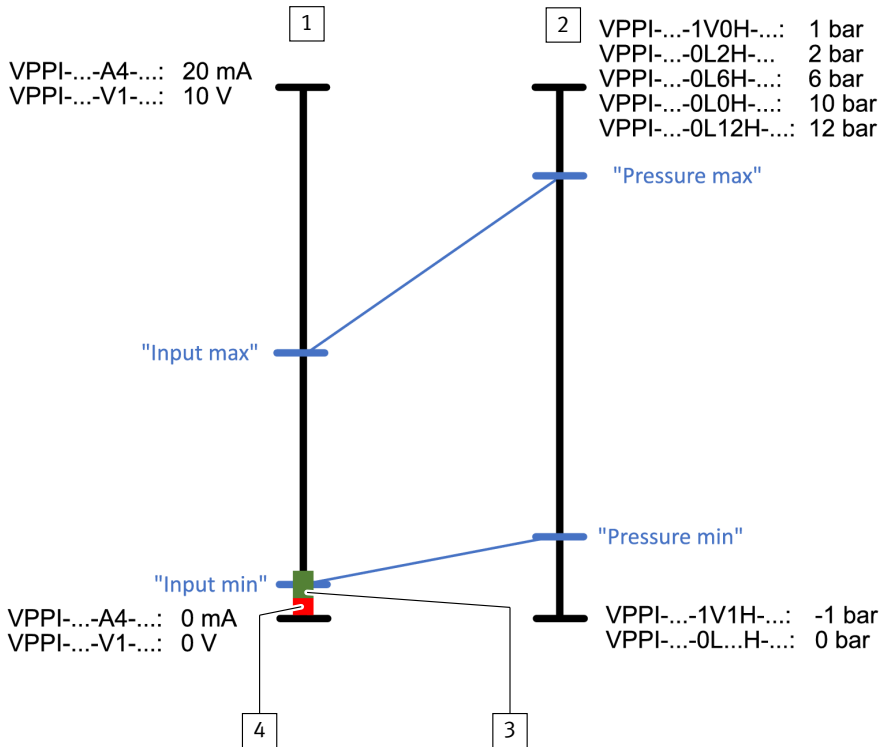


Fig. 11: Valve variants for excess pressure and vacuum / excess pressure

- | | | | |
|---|-------------------------|---|---------------|
| 1 | Analogue setpoint value | 3 | Zero shutdown |
| 2 | Target pressure | 4 | Cable break |

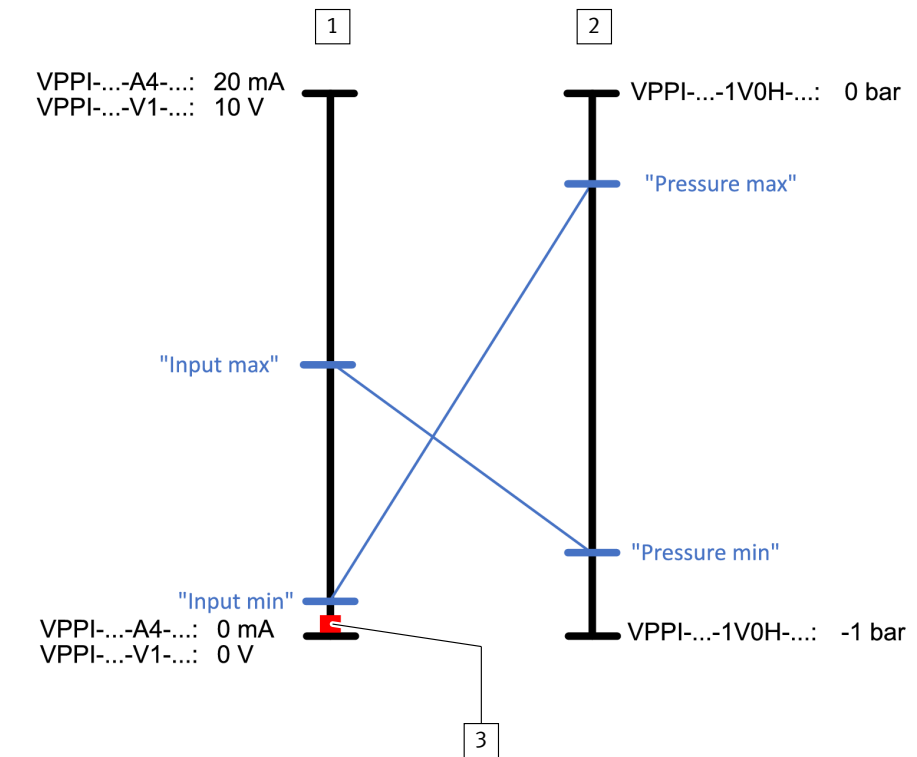


Fig. 12: Valve variants for vacuum

- 1 Analogue setpoint value
- 2 Target pressure
- 3 Cable break

Characteristic electrical values		
Nominal operating voltage	[V DC]	24
Operating voltage range	[V DC]	21.6 ... 27.6
Nominal current	[mA]	150
Max. current consumption	[mA]	≤ 525
Permissible signal line length	[m]	≤ 30

Characteristic electrical values		
Setpoint input		
Setpoint value input		
VPPI-...-V1-...	[V DC]	0 ... 10
VPPI-...-A4-...	[mA]	4 ... 20
Input voltage PWM/digital inputs		
VPPI-...-V1-...	24 V DC (type 1 in accordance with DIN EN 61131)	
Pulse-width modulation frequency		
VPPI-...-V1-...	[Hz]	200 ... 800
PWM duty cycle		
VPPI-...-V1-...	[%]	20 ... 100
Input resistance		
VPPI-...-V1-...	[kΩ]	100
VPPI-...-A4-...	[kΩ]	0.3
Actual value output		
Output current	[mA]	≤ 25
Analogue output		
VPPI-...-V1-...	[V DC]	0 ... 10
VPPI-...-A4-...	[mA]	4 ... 20

Tab. 23: Characteristic electrical values

Control characteristics ¹⁾	
Linearity	0.9% FS (full scale)
Hysteresis	0.4% FS
Reproducibility	0.4% FS
Total accuracy	1.1% FS
Temperature coefficient	0.02/K

¹⁾ Maximum deviation, characteristic values determined at room temperature in accordance with ISO 10094. Linearity refers to the ideal characteristic curve.

Tab. 24: Control characteristics

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