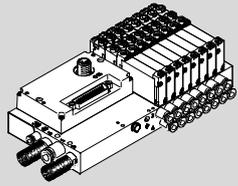


# VTUG-PT-L



## FESTO

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Brief description

8031867  
1402NH  
[8031869]

Original: de

### Valve terminal type VTUG-PT-L

#### 1 Range of application and certifications

The VTUG valve terminal with interlock (type VTUG-PT-L) is used exclusively for control of pneumatic actuators within the limits of the technical data and is intended for installation in machines and automation systems.

The VTUG-PT-L is intended for use in an industrial environment.

The target group of this description consists of trained specialists in control and automation technology who have experience with the installation of valve terminals.



#### Warning

Danger of injury through uncontrolled movements of connected equipment. Make sure that electrical and pneumatic equipment are in a de-energised and pressureless status.

Before working on the pneumatics:

- Switch off the compressed air supply
- Vent the valve terminal

Before working on the electrical components, e.g. before installation or maintenance work:

- Switch off the power supply

In this way, you can avoid:

- uncontrolled movements of loose tubing
- accidental and uncontrolled movements of the connected actuators
- undefined switching states of the electronics
- functional damage.



#### Note

Installation and commissioning should only be carried out by qualified personnel in accordance with this brief description. Commission a valve terminal only if it has been completely mounted and wired! Employ the valve terminal VTUG-PT-L only in conformity with protection class IP40.



#### Note

IO-Link® and TORX® are registered trademarks of the respective trademark owners in certain countries.



#### Note

Certain configurations of the product have been certified by Underwriters Laboratories Inc. (UL) for the USA and Canada (→ Title).

If the UL requirements are to be complied with in your application, please observe the regulations of the separate UL-specific special documentation. The relevant technical data listed there also apply here.

#### 2 Pilot air supply for pilot control

The VTUG valve terminal is configured for operation with internal or external pilot air depending on your order.

##### Internal pilot air supply

The pilot pressure is branched from duct 1 for internal pilot air supply. If your VTUG valve terminal is configured for internal pilot air supply, the ports 14 in the manifold rail are sealed with blanking plugs.

##### External pilot air supply

The pilot pressure is supplied via port 14 for external pilot air supply. If your VTUG valve terminal is configured for external pilot air supply, a special blanking screw is fitted in the manifold rail (→ Fig. 1). Conversion of the pilot air variant is described in the assembly instructions VABM-L1-...GR.

#### 3 Pressure zones

Using separators, the valve terminal VTUG-... can be divided into pressure zones. Mounting of these separators is described in the assembly instructions VABD-... B.

#### 4 H-rail mounting

The VTUG-PT-L valve terminal is designed for mounting on an H-rail.



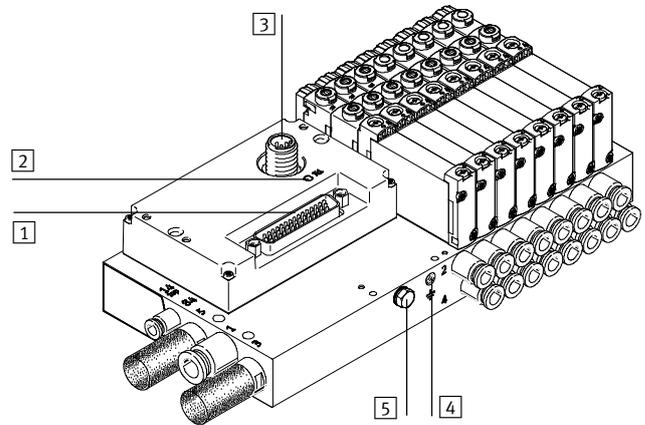
#### Note

If the VTUG-PT-L is subjected to vibration or shock loads, H-rail mounting is not permissible.

H-rail mounting is described in the assembly instructions VAME-T-M4.

#### 5 Display and connecting elements of the electronics

The following electrical connection and display components can be found on the VTUG-PT-L:



- 1 Interlock Sub-D plug connector
- 2 Status-LED X1, I-port communication
- 3 I-port/IO-Link connection (plug, 5-pin, M12, A-coded)

- 4 Thread for earthing screw for connection to functional earth (→ chap. 7)
- 5 Special blanking screw for external pilot air supply

Fig. 1

#### 5.1 LED display X1

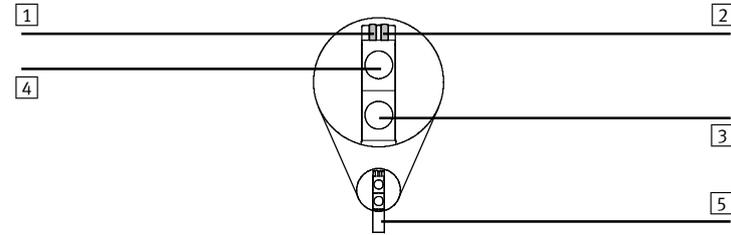
The subsequent table shows the statuses and significance for the LED X1:

| LED display | Status and significance  |
|-------------|--|
|             | LED illuminated green:<br>– normal operating status  |
|             | LED flashing green:<br>– data communication is not satisfactory  |
|             | LED flashing alternately green/red:<br>– 24 V load voltage supply not satisfactory (no voltage, undervoltage or short circuit)                 |
|             | LED flashing red:<br>– device errors   |
|             | LED illuminated red:<br>– no data communication and<br>– 24 V load voltage supply not satisfactory (no voltage, undervoltage or short circuit) |
|             | LED dark:<br>– no operating voltage  |

Fig. 2

## 6 Display and connecting elements of the valves

The subsequent figure shows the assignment of the LEDs to the solenoid coils of the valves:



- 1 LED for solenoid coil 12
- 2 LED for solenoid coil 14
- 3 Manual override (MO) non-detenting/detenting, solenoid coil 14
- 4 Manual override (MO) non-detenting/detenting, solenoid coil 12
- 5 Valve

Fig. 3

## 7 Earth terminal

Connect the VTUG-PT-L to the functional earth via the earth terminal (→ 4 in Fig. 1). In this way, you will avoid malfunctions from electromagnetic interference.

## 8 Voltage supply



### Note

- Use for the electrical power supply only PELV circuits in accordance with IEC/EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Observe also the general requirements for PELV circuits in accordance with IEC/EN 60204-1.
- Use only voltage sources that ensure a reliable electric separation of operating voltage in accordance with IEC/EN 60204-1
- Always connect both circuits for operating and load voltage supply.

Through the use of PELV circuits, protection against electric shock (protection against direct and indirect contact) is ensured in accordance with IEC/EN 60204-1.

## 9 I-port connection

The VTUG-PT-L can be connected as follows via the I-port connection:

- directly to the fieldbus by mounting a CTEU bus node on the VTUG-PT-L
- decentralised to an external I-port-compatible device through a connecting cable.
- to a CPX terminal through a connecting cable and a CTEL master module (→ CTEL system description).

### 9.1 Pin allocation of the I-port/IO-Link cable

| Connection <sup>1)</sup> | Pin | Allocation                   | Function                       |
|--------------------------|-----|------------------------------|--------------------------------|
|                          | 1   | 24 V <sub>EL/SEN</sub> (PS)  | Operating voltage supply       |
|                          | 2   | 24 V <sub>VAL/OUT</sub> (PL) | Load voltage supply            |
|                          | 3   | 0 V <sub>EL/SEN</sub> (PS)   | Operating voltage supply       |
|                          | 4   | C/Q                          | Data communication             |
|                          | 5   | 0 V <sub>VAL/OUT</sub> (PL)  | Load voltage supply            |
|                          |     | Housing, FE                  | Functional earth <sup>2)</sup> |

1) 5-pin M12x1 plug, A-coded

2) The connection to the functional earth must also be ensured via the earthing screw 1 of the valve terminal (see chap. ).

Fig. 4

## 10 IO-Link mode

The VTUG-PT-L can also be operated as an IO-Link device. You can download the IODD configuration file required for this at → [www.festo.com](http://www.festo.com).



### Note

If an IO-Link Master is used, the load voltage must normally be made available through a T-plug.

## 11 Inscription labels

The valves of the VTUG-... can be equipped with an inscription label holder (→ assembly instructions ASCF-H-L1) or with identification plate holders (→ assembly instructions ASLR-D). The I-port sub-base can be equipped with the identification plate ASLR-C-E4.

## 12 Manual override (MO)

Actuation of the MO under the holders of the inscription label holder ASCF-H-L1 or under the identification plate holders ASLR-D, is only possible in a non-detenting manner.

The MO VAMC-L1-CD is not permissible in combination with the inscription label holder ASCF-H-L1.



### Note

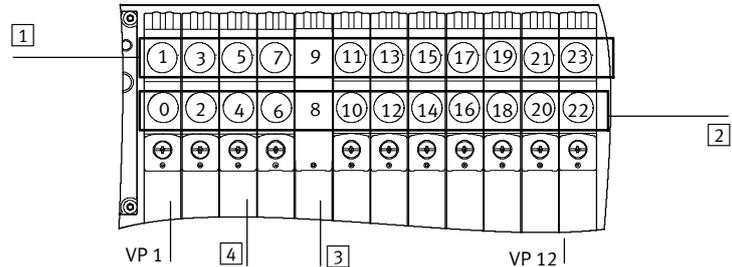
Destruction of the MO

- Observe the permissible actuating force of max. 20 N.

## 13 Address assignment

With the VTUG-PT-L you can actuate up to 48 solenoid coils. The subsequent figure shows as an example the address allocation of the VTUG-PT-L with 12 valve positions (VP):

- 1 assigned addresses of the solenoid coils 12
- 2 assigned addresses of the solenoid coils 14
- The address assignment is independent of whether blanking plates 3 or valves 4 are used.
- Address assignment is in ascending order without gaps, from left to right.
- A valve position always occupies two addresses. The following assignment applies in this case:  
low-order valve position (address) for solenoid coil 14  
high-order valve position (address) for solenoid coil 12.



- 1 assigned addresses of the solenoid coils 12
- 2 assigned addresses of the solenoid coils 14
- 3 Blanking plate
- 4 Valves

Fig. 5

## 14 Assignment of the outputs and inputs

The subsequent table shows assignment of the outputs and inputs.

| Byte                | Bit                |            |          |       |       |       |       |       |  |
|---------------------|--------------------|------------|----------|-------|-------|-------|-------|-------|--|
|                     | 0                  | 1          | 2        | 3     | 4     | 5     | 6     | 7     |  |
| <b>Outputs:</b>     |                    |            |          |       |       |       |       |       |  |
| 0                   | Sp 1 <sup>1)</sup> | Sp 2       | Sp 3     | Sp 4  | Sp 5  | Sp 6  | Sp 7  | Sp 8  |  |
| 1                   | Sp 9               | Sp 10      | Sp 11    | Sp 12 | Sp 13 | Sp 14 | Sp 15 | Sp 16 |  |
| 2                   | Sp 17              | Sp 18      | Sp 19    | Sp 20 | Sp 21 | Sp 22 | Sp 23 | Sp 24 |  |
| 3                   | Sp 25              | Sp 26      | Sp 27    | Sp 28 | Sp 29 | Sp 30 | Sp 31 | Sp 32 |  |
| 4                   | Sp 33              | Sp 34      | Sp 35    | Sp 36 | Sp 37 | Sp 38 | Sp 39 | Sp 40 |  |
| 5                   | Sp 41              | Sp 42      | Sp 43    | Sp 44 | Sp 45 | Sp 46 | Sp 47 | Sp 48 |  |
| <b>Inputs (V+):</b> |                    |            |          |       |       |       |       |       |  |
| 0                   | Sp 1               | Sp 2       | Sp 3     | Sp 4  | Sp 5  | Sp 6  | Sp 7  | Sp 8  |  |
| 1                   | Sp 9               | Sp 10      | Sp 11    | Sp 12 | Sp 13 | Sp 14 | Sp 15 | Sp 16 |  |
| 2                   | Sp 17...32         | Sp 33...48 | not used |       |       |       |       |       |  |
| 3                   | not used           |            |          |       |       |       |       |       |  |

1) Sp = solenoid coil

Fig. 6

## 15 Malfunction and error handling

Malfunctions and statuses from connected I-port devices are transmitted in the form of event codes through the bus node to the Fieldbus Master and output there and stored, if necessary. In the diagnostics case, a 2-byte-long event code is transferred to the I-port or IO-Link master.

| Event code | Malfunction and error handling |  | Type    |
|------------|--------------------------------|--|---------|
|            | MSB                            | LSB  |         |
| 50 h       | 00h                            | Device errors. Switch device off and back on. If the error is still present, the device is defective and needs to be replaced. | Error   |
| 51 h       | 12 h                           | Error in the load voltage supply<br>• Check the load voltage supply  | Warning |

Fig. 7

## 16 Technical data

| VTUG-PT-L  |   |
|--|---|
| Assembly position<br>– wall mounting<br>– H-rail mounting  | any<br>horizontal   |
| Ambient temperature<br>Storage temperature   | – 5 ... + 50 °C<br>– 20 ... + 60 °C   |
| Operating and pilot medium   | Compressed air to ISO 8573-1:2010 [7:4:4]; operation with lubricated medium possible (required during subsequent operation) |
| Relative air humidity  | 93 % at 40 °C, non-condensing   |
| Number of valve positions  | 4 ... 24  |
| Operation with external pilot air (IC = ident. code):<br>Operating pressure:<br>– 5/3-; 5/2-; 2x 3/2-; 3/2-way valves (IC: B, E, G; J, A, M, P; VH, VK, VN, VX, VW)<br>– 2x 3/2-way valve (pneumatic spring) (IC: H, K, N)<br>Pilot pressure <sup>1) 2)</sup> :<br>– 5/3-, 5/2-way valves (IC: B, E, G, A)<br>– 5/2-way valve (impulse) (IC: J)<br>– 5/2-; 3/2-way valve (IC: M, P, VX, VW)<br>– 2x 3/2-way valve (IC: VH, VK, VN)<br>– 2x 3/2-way valve with pneumatic spring (IC: H, K, N) | –0.9 ... 10 bar<br>1.5 ... 10 bar<br>3 ... 8 bar<br>1.5 ... 8 bar<br>2.5 ... 8 bar<br>2 ... 8 bar<br>1.5 ... 8 bar          |
| Operation with internal pilot air:<br>Operating and pilot pressure <sup>2)</sup> :<br>– 5/3-, 5/2-way valves (IC: B, E, G, A)<br>– 5/2-way valves (impulse) (IC: J)<br>– 5/2-; 3/2-way valves (IC: M, P, VX, VW)<br>– 2x 3/2-way valve (IC: VH, VK, VN)<br>– 2x 3/2-way valve with pneumatic spring (IC: H, K, D)  | 3 ... 8 bar<br>1.5 ... 8 bar<br>2.5 ... 8 bar<br>3.5 ... 8 bar<br>1.5 ... 8 bar   |
| Tightening torque:<br>– CTEU.. on electrical interface VAEM-L1-S-...-PTK<br>– electrical interface<br>– valve on manifold rail<br>– blanking screw, blanking plug for pilot air supply<br>– earthing screw   | 1.0 Nm (± 10 %)<br>0.3 Nm (± 20 %)<br>0.3 Nm (+ 50 %)<br>1.5 Nm (-20 %)<br>1 Nm (± 20 %)                                    |
| Power supply <sup>3)</sup> :<br>– load voltage (valves)<br>– load voltage interlock (valves)<br>– operating voltage (electronics)  | reverse polarity protected<br>24 V DC (± 10 %)<br>24 V DC (± 10 %)<br>24 V DC (± 25 %)                                      |
| Power consumption (load)<br>– per solenoid coil at nominal voltage   | 1.0 W 30 ms, then 0.4 W   |
| Max. current consumption through I-port:<br>– valves / electronics   | 2.5 A / 0.5 A   |
| Intrinsic current consumption through I-port:<br>– valves / electronics  | 40 mA / 30 mA   |
| Current consumption per solenoid coil<br>– pull current (duration 30 ms)<br>– holding current  | 48 mA<br>16 mA  |
| Mains buffering time (only operating voltage)  | 10 ms   |
| Test pulse bypass time   | ≤ 1 ms (valve supply V <sub>n+</sub> )  |
| I-port/IO-Link connecting cable<br>– wire cross section (length 0.1 ... 5 m)<br>– wire cross section (length 5 ... 20 m)<br>– max. length  | min. 0.25 mm <sup>2</sup><br>min. 1 mm <sup>2</sup><br>20 m (unshielded)  |
| IO-Link properties<br>– operating Mode<br>– revision<br>– data Out<br>– data In  | COM 3 (230.4 kBit)<br>COM 2 (38.4 kBit)<br>1.0<br>6 bytes<br>4 bytes  |
| Protection class through housing in accordance with IEC/EN 60529, bus node mounted completely, plug connector inserted or equipped with protective cap   | IP40 with corresponding connecting cable from the Festo range of accessories  |
| Protection against electric shock (protection against direct and indirect contact in accordance with IEC/EN 60204-1)   | through the use of PELV circuits  |
| Electromagnetic compatibility <sup>4)</sup><br>– resistance to interference and emitted interference   | ➔ Declaration of conformity (www.festo.com)   |
| Materials  | AL, PA, POM, NBR, PU, PC  |

- 1) If the VTUG... is operated with external pilot air, the pressure of the pilot air must be at least 50 % of the operating pressure
- 2) Reduce your pilot pressure to max. 6 bar if there are more than 12 simultaneously switched valves.
- 3) The operating voltage supply is provided via the CTEU bus node or IO-Link Master. The load voltage supply is provided via the CTEU bus node or, for IO-Link, via a separate feed. Separate fuses are required for operating and load voltage.
- 4) The VTUG... valve terminal is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken

Fig. 8

## 17 Interlock

The first 16 solenoid coils can be supplied individually through the interlock Sub-D plug connector. This permits the external release of these valves.



### Note

Only mount or remove the interlock Sub-D socket when the power is switched off.

The interlock can be switched on as follows:

- single-pin through external contacts
- double-pin through safe output terminals. In this case, check the compatibility of the safe output terminals with the VTUG-PT-L.

All valves of the VTUG-PT-L are supplied with load voltage via the interlock Sub-D plug connector, even if they are actuated via the bus node. The solenoid coils 17 ... 32 and 33 ... 48 cannot be supplied individually through the interlock Sub-D plug connector (➔ table in section 17.3 and 17.4).

### 17.1 Sub-D socket

Festo recommends one of the following connecting cables (with sub-D socket) from Festo for connecting the interlock.

| Type                       | Length of the cable |
|----------------------------|---------------------|
| NEBV-S1G44-K-2.5-N-LE44-S6 | 2.5 m               |
| NEBV-S1G44-K-5-N-LE44-S6   | 5 m                 |
| NEBV-S1G44-K-10-N-LE44-S6  | 10 m                |

Fig. 9



### Note

Please observe the following when using a sub-D socket from another manufacturer:

- the sub-D socket must not exceed a max. width of 16.5 mm
- connect the cable screening to the plug housing

### 17.2 Pin allocation of the interlock plug connector (sub-D 44 pin)

The subsequent figure shows the position of the pins in the interlock plug connector on the VTUG-PT-L.

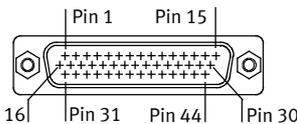


Fig. 10

For controlling the valves, each solenoid coil (referred to as coil or SP in the tables) is assigned to two specific pins of the interlock Sub-D plug connector:

| Pin <sup>1)</sup> | Coil      | Signal <sup>2)</sup>               |
|-------------------|-----------|------------------------------------|
| 1 ... 3           | –         | 24 V <sub>VAL/OUT</sub>            |
| 4 ... 6           | 1 ... 48  | 0 V <sub>VAL/OUT</sub>             |
| 7                 | 1         | V <sub>1+</sub>                    |
| 8                 | 1         | V <sub>1-</sub>                    |
| 9                 | 2         | V <sub>2+</sub>                    |
| 10                | 2         | V <sub>2-</sub>                    |
| 11                | 3         | V <sub>3+</sub>                    |
| 12                | 3         | V <sub>3-</sub>                    |
| 13 ... 36         | ...       | V <sub>n+</sub><br>V <sub>n-</sub> |
| 37                | 16        | V <sub>16+</sub>                   |
| 38                | 16        | V <sub>16-</sub>                   |
| 39                | 17 ... 32 | V <sub>17...32+</sub>              |
| 40                | 33 ... 48 | V <sub>33...48+</sub>              |
| 41 ... 43         | 1 ... 48  | 0 V <sub>VAL/OUT</sub>             |
| 44                | –         | not connected                      |
| Housing           | FE        | FE                                 |

- 1) Pins 7 ... 38 provide individual control of the solenoid coils 1 ... 16 of the interlock
- 2) Do not use V<sub>1...16-</sub> and V<sub>n-</sub> with single-pin interlock interface

Fig. 11

### 17.3 Single-pin interlock interface

Observe the following with single-pin interlock interface:

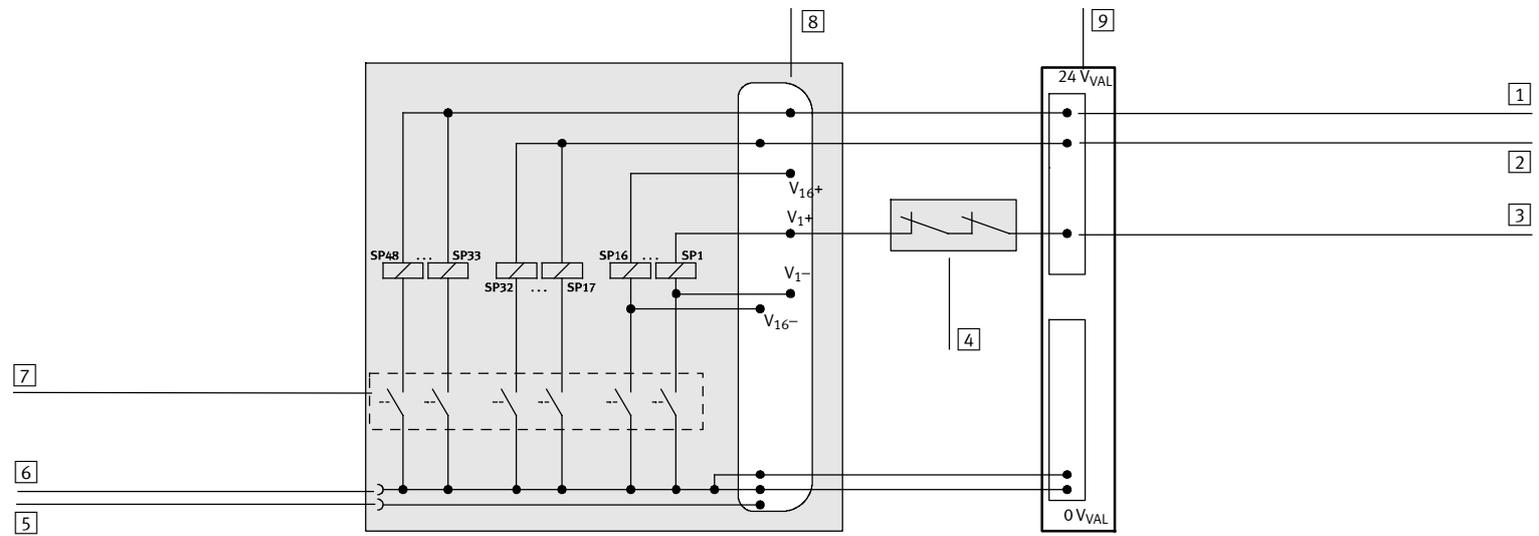
- The interlock interface is made through external plus switching contacts or single-pin switching safety terminals.
- The 24 V supply of all solenoid coils must be on the same potential.
- 16 solenoid coils can be actuated through the interlock ( $V_{n+}$ ).
- The solenoid coils that do not require an interlock interface can be supplied directly with 24 V from pin 1 ... 3.
- Creation of the respective input voltage is reported as an image table through the fieldbus.



**Note**

The interlock contacts  $V_{1-}$  ...  $V_{16-}$  must not be used with the single-pin interlock interface.

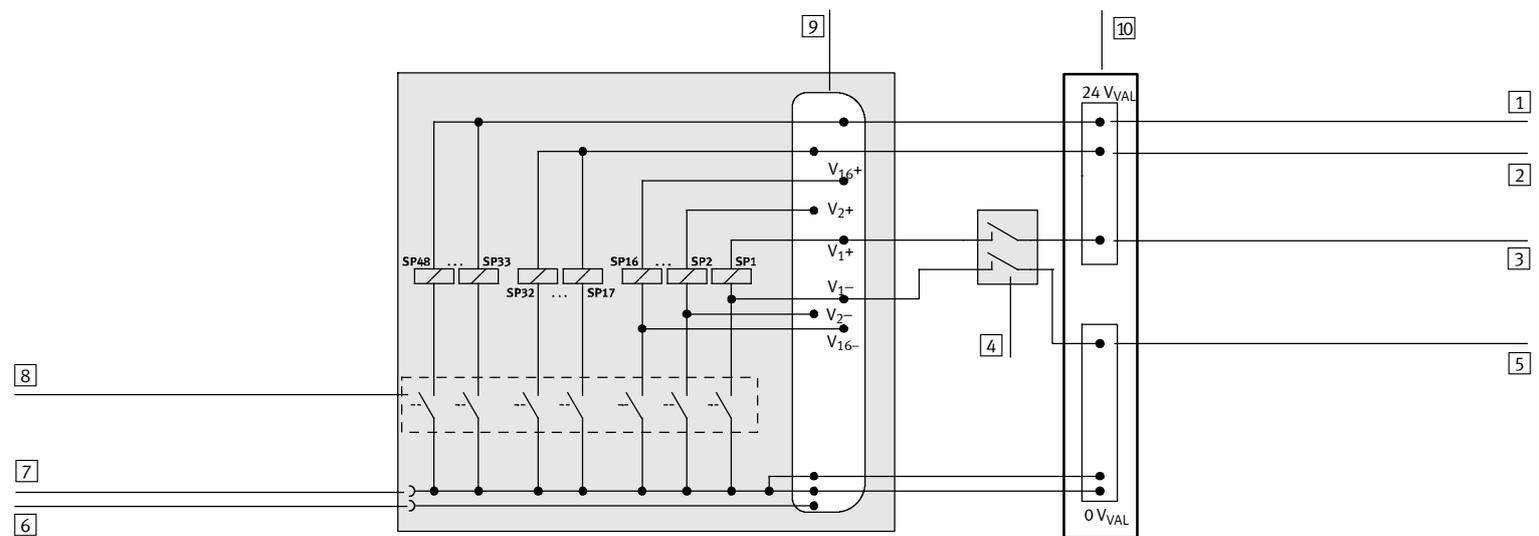
For an example of a circuit diagram for a single-pin interlock interface → Fig. 12.



- 1 Power supply  $V_+$ ; solenoid coil 33 ... 48, (no interlock)
- 2 Power supply  $V_+$ ; solenoid coil 17 ... 32, (no interlock)
- 3 Control  $V_{n+}$  (via interlock)
- 4 Interlock contacts of the output terminal
- 5 I-port connection pin 2,  $24 V_{VAL/OUT}$  (PL), load voltage supply

- 6 I-port connection pin 5,  $0 V_{VAL/OUT}$  (PL),
- 7 Driver, controlled via fieldbus/I-port
- 8 Interlock Sub-D plug connector
- 9 Power supply (interlock)

Fig. 12



- 1 Direct control  $V_+$ ; solenoid coil 33 ... 48, (no interlock)
- 2 Direct control  $V_+$ ; solenoid coil 17 ... 32, (no interlock)
- 3 Control  $V_{n+}$  (via interlock)
- 4 Interlock contacts of the output terminal
- 5 Control  $V_{n-}$  (via interlock)

- 6 I-port connection pin 2,  $24 V_{VAL/OUT}$  (PL), load voltage supply
- 7 I-port connection pin 5,  $0 V_{VAL/OUT}$  (PL), load voltage supply
- 8 Driver, controlled via fieldbus/I-port
- 9 Interlock Sub-D plug connector
- 10 Power supply (interlock)

Fig. 13

### 17.4 Double-pin interlock interface

Observe the following with the double-pin interlock interface:

- The interlock interface is made through external plus-minus switching safety terminals.



**Note**

Internal activation of valves 1 ... 16 via the fieldbus must not be used. Inadvertent actuation of the internal drivers of the VTUG-PT-L via the fieldbus can be detected by most safe terminals. Only use terminals that detect inadvertent actuation via the fieldbus.

- The solenoid coils of the interlock valves are controlled via the corresponding pin in the Sub-D plug connector (pins 7 ... 38).
- The solenoid coils that do not require an interlock interface can be supplied directly with 24 V (e.g. from pin 1 ... 3).
- A difference in potential between  $V_{n-}$  and  $0 V_{VAL/OUT}$  is permissible only below 5 V.
- The test impulses ( $\leq 1$  ms) used for error detection by safe output terminals are suppressed by a special filter switch.
- The current consumption for each valve is below 20 mA on the VTUG-PT-L. Some safe terminals detect a wire break if current consumption is below 20 mA. In these cases, the wire break detection must be switched off.

For an example of a circuit diagram for a single-pin interlock interface → Fig. 13