

Mounting and Operating Instructions  
Solenoid Valve Island Type 3965



Fig. 1

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## General notes



The devices may only be mounted, started up, and operated by experienced personnel familiar with this product. Proper shipping and appropriate storage of the device are assumed.

In these mounting and operating instructions, the term “experienced personnel” refers to persons, who are able to evaluate the responsibilities assigned to them as well as recognize potential hazards due to their specialized training, knowledge, and experience as well as their special knowledge of the relevant standards.

Staff handling/operating of explosion-protected devices in hazardous areas staff must be specially trained or instructed, i.e. staff must be authorized to handle/operate explosion-protected devices.

For technical data, ordering data, accessories and spare parts see Data Sheet T 3965 EN.

## Mounting



**Before mounting, all relevant parts of the plant must be depressurized.**

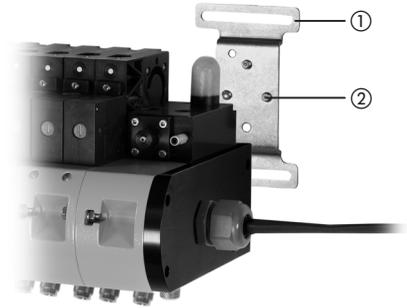
The devices can be mounted with two mounting brackets, preferably in horizontal position (see Fig. 2).

When the devices are to be used in hazardous areas of zone 21 according to EN 50281-1-1: 1998, the equipment shall be mounted in an additional enclosure made of steel or stainless steel or of plastic. The enclosure including its connection parts and bushings shall be proven to comply with degree of protection IP 65 according to IEC 60529:1989. When the devices are to be mounted in a plastic enclosure, the enclosure made by Rittal and certified under PTB 03 ATEX 1011 U shall be used.

On mounting, it is important that a clearance of minimum 150 mm above the devices and a clearance of minimum 100 mm (for common cable) or 200 mm (for multipole connector) at the right end plate be observed.

When the devices are to be mounted in an enclosure, a distance of minimum 100 mm between devices and a distance of minimum 200 mm between the lowest device and the en-

## Mounting



Accessories	Order no.
Low mounting bracket set	1400-9321
High mounting bracket set	1400-9322
① 2 × Mounting bracket	
② 6 × Hexagon socket head screw ISO 4762 – M 5 × 6	

Fig. 2

closure bottom must be observed.

## Air connection



The air supply pipes and screw joints may only be laid and mounted by experienced personnel. They must be regularly checked for leaks and damage, and if necessary, repaired. Before starting any repair work, all supply pipes which are to be opened must be depressurized.

The air connections are G (NPT)  $\frac{1}{8}$  and G (NPT)  $\frac{1}{4}$  tapped holes (see table).

Air supply pipes		
Connection	Air supply 8	Operating medium 9
	Outputs 3, 2, 4	Exhaust air 5
Thread	G (NPT) $\frac{1}{8}$	G (NPT) $\frac{1}{4}$
Pipe	$\geq 6 \times 1$ mm	$\geq 12 \times 1$ mm
Hose	$\geq 4 \times 1$ mm	$\geq 9 \times 3$ mm



The air supply must not exceed the maximum permissible pressure.

## Air supply

### With external air supply via connection 8 (without pressure reducer):

Instrument air, free of corrosive particles, or nitrogen, pressure 2.2 bar  $\pm$  10 %.

### With internal air supply via connection 9 (with pressure reducer):

Instrument air, free of corrosive particles, or nitrogen, pressure 2.2 to 6.0 bar.

## Operating medium

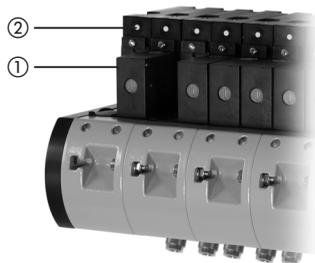
### With external air supply via connection 8 (without pressure reducer):

Instrument air, free of corrosive particles, oil containing air or noncorrosive gases, pressure max. 6.0 bar.

### With internal air supply via connection 9 (with pressure reducer):

Instrument air, free of corrosive particles, or nitrogen, pressure 2.2 to 6.0 bar.

## Pneumatic status indicators



- ① Pilot valve
- ② Pneumatic indicator (optional)

Fig. 3

## Quality of compressed air according to ISO 8573-1

Particle size and density	Oil contents	Pressure dew point
Class 4	Class 3	Class 3
$\leq 5 \mu\text{m}$ and $1\,000/\text{m}^3$	$\leq 1 \text{ mg}/\text{m}^3$	$-20^\circ\text{C}$ or at least 10 K below the lowest ambient temperature to be expected

## Pneumatic status indicators

The pneumatic switching status of the pilot valves ① is indicated by pneumatic indicators ② (optional, see Fig. 3).

## Connections for air supply and operating medium

In the pneumatic connection module, connection 8 (external air supply without pressure reducer) and connection 9 (operating medium) are protected against dirt particles with a sieve, mesh size 100 µm.

The sieve must be cleaned or replaced when contaminated as follows (see Fig. 4):

- 1 Screw out male connector ① with seal ring ② from the connection.
- 2 Screw sieve ③ out of the connection using a screw driver (screw driver blade 7 to 9 mm).
- 3 Clean or replace sieve ③ and screw into the connection.
- 4 Screw male connector ① with seal ring ② into the connection.

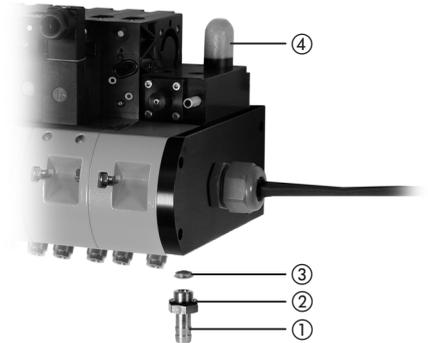
### Exhaust air connection

In the pneumatic connection module, exhaust air connection 5 must be protected against water and dust by a filter ④, when the exhaust air is not be vented via a central pipe, or when the devices are not be mounted in an enclosure (see Fig. 4).

When the devices are to be mounted in an enclosure, the enclosure must be provided with a filter according to the required degree of protection.

The connection size of the filter must be chosen according to the number of switching functions (e. g. minimum 1/2" for 16 switching functions).

## Supply air and exhaust air connections



Accessories and spare parts	Order no.
① Male connector G 1/4 for hose 9 × 3 mm	8582-1684
② Seal ring 13.5 × 17 × 1.5	8414-0140
③ Sieve G 1/4	0550-0213
④ Filter G 1/4	8504-0066

Fig. 4

## Electrical connection



As far as the electrical installation of the device is concerned, the relevant electrotechnical regulations and the accident prevention regulations of the country in which the device is used must be observed. In Germany these are the VDE regulations and the accident prevention regulations of the employers' liability insurance association.

For mounting in hazardous areas, the respective national regulations of the country in which the device is used applies. In Germany these are VDE 0165/EN 60079.

For connection to certified intrinsically safe electric circuits, the EC Type Examination Certificate PTB 05 ATEX 2044 X for zone 1 or 21 and Certificate of Conformity PTB 06 ATEX 2003 X for zone 2 or 22 applies (see pages 15 and 16).

**When connected to DC voltage signals, correct polarity must be ensured.**

The power supply is connected either with single plug-type connectors, a common cable with cable gland M 20 × 1.5 or with a multipole connector (see pages 7 to 11).

### Degree of protection

The devices are provided with an exhaust air plug ① at the left end plate (see Fig. 5).

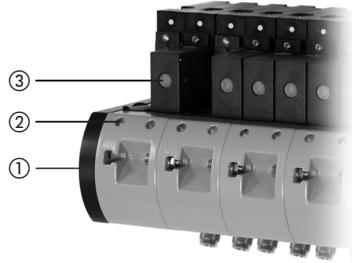


**The required degree of protection IP 40 according to IEC 60529:1989 can be only guaranteed with installed exhaust air plug and proper installation of the connections.**

### Electric status indicators

The electric control signals for the pilot valves are indicated by light-emitting diodes ② (optional for common cable or multipole connector, see Fig. 5).

### Electric status indicator and manual override



- ① Exhaust air plug G 1/4
- ② Light-emitting diode, yellow (optional)
- ③ Manual override (optional)
  - Press pushbutton
  - Press pushbutton switch and turn by 90° clockwise. To unlock, turn in opposite direction.

Fig. 5

### Manual override

The pilot valves are provided with a manual override ③ (optional, see Fig. 5).

When an electric nominal signal is not available, the pilot valve can be operated by a pushbutton or a pushbutton switch using a screw driver (screw driver blade 4.5 mm).



**For safety circuits, only pilot valves without manual override are to be used.**

## Electrical connection with single plug-type connectors

The power supply is connected with single plug-type connectors ① at the pilot valves (see Fig. 6 and 7).

It is recommended that connecting cables with a conductor cross-section of 0.5 mm<sup>2</sup> and an external diameter of 4 to 8 mm are used.



The requested degree of protection IP 40 according to IEC 60529:1989 can be only guaranteed with proper installation of the female connector with a flat gasket placed underneath.

## Electrical connection with single plug-type connectors



① Single plug-type connector according to EN 175301-803

Fig. 6

## Connection diagram for single plug-type connectors

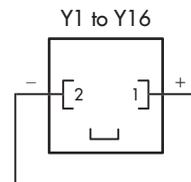


Fig. 7

## Electrical connection with common cable

The power supply is connected to a common cable ①, coming out through a cable gland ② at the right end plate of the devices (see Fig. 8).

For the 2/2 and 3/2-way functions four pairs of conductors (Y1 – Y4 to Y13 – Y16) are combined with a marked cable tie (see Fig. 9).

For the 5/2-way functions two pairs of conductors (Y1 – Y2 to Y15 – Y16) are combined with a marked cable tie (see Fig. 10).

## Electrical connection with common cable



- ① Common cable  
(conductor cross-section 0.25 mm<sup>2</sup>, length 1.5 m)
- ② Cable gland M 20 x 1.5

Fig. 8

**Connection diagram for common cable  
(2/2 and 3/2-way functions)**

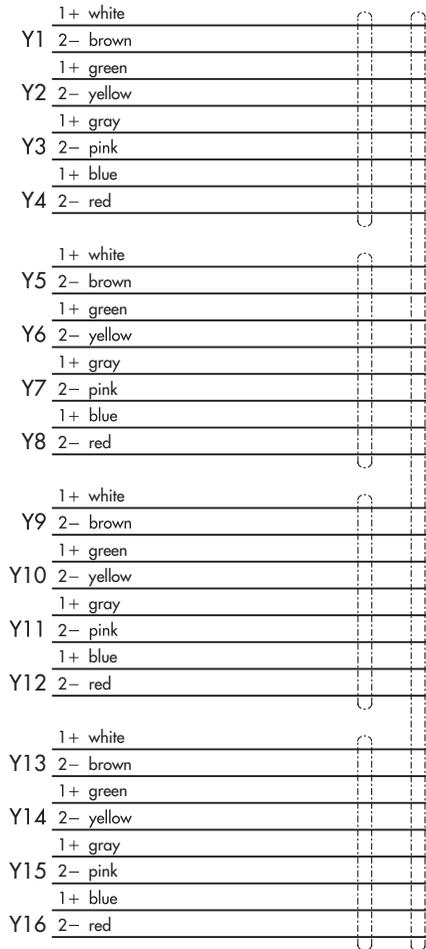


Fig. 9

**Connection diagram for common cable  
(5/2-way functions)**

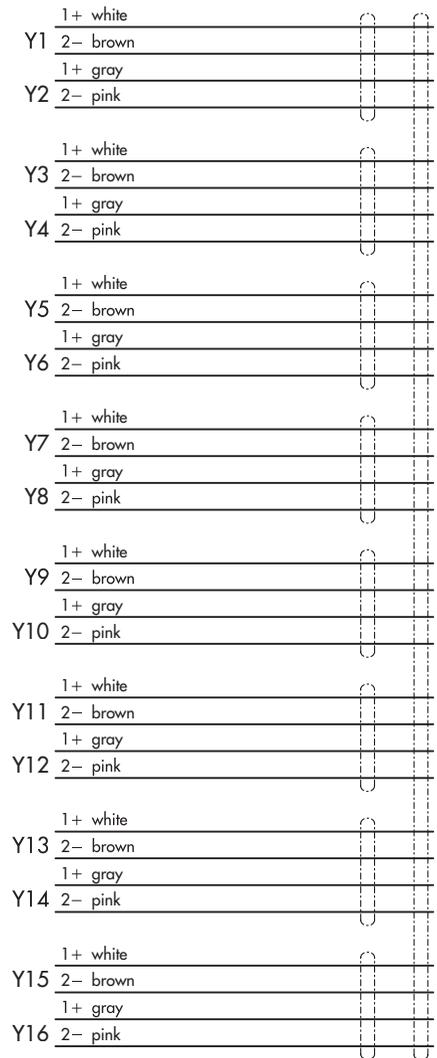


Fig. 10

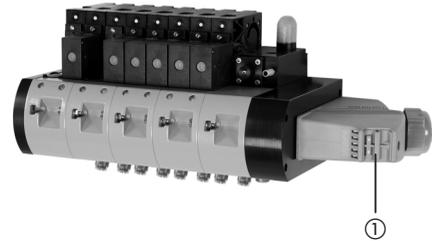
## Electrical connection with multipole connector

The power supply is connected to a multipole connector ① at the right end plate of the devices (see Fig. 11).

For the 2/2 and 3/2-way functions four pairs of conductors (Y1 – Y4 to Y13 – Y16) are combined inside the devices (see Fig. 12).

For the 5/2-way functions two pairs of conductors (Y1 – Y2 to Y15 – Y16) are combined inside the devices (see Fig. 13).

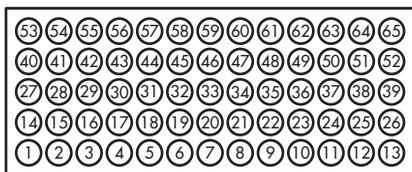
## Electrical connection with multipole connector



① Multipole connector

Fig. 11

**Connection diagram for multipole connector  
(2/2 and 3/2-way functions)**



Assignment of pin housing (cable side)

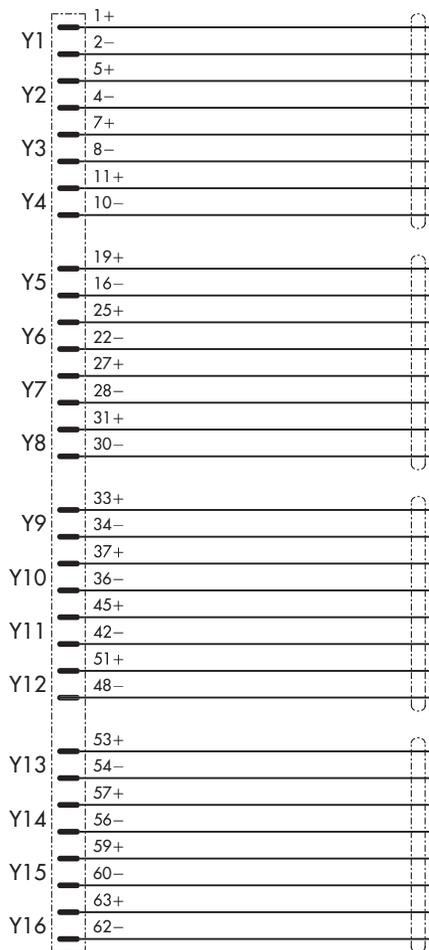
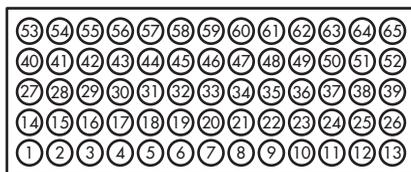


Fig. 12

**Connection diagram for multipole connector  
(5/2-way functions)**



Assignment of pin housing (cable side)

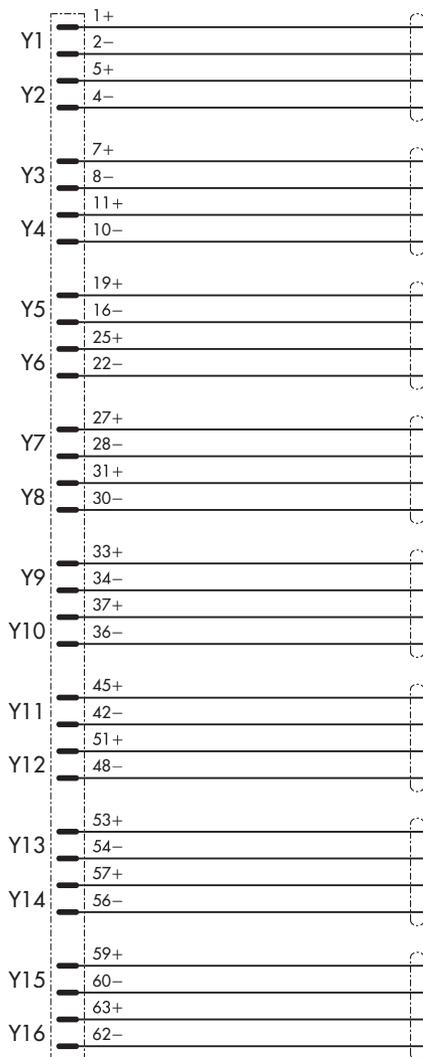


Fig. 13

## Troubleshooting

Fault	Recommended action															
<b>Complete solenoid valve island without function</b>	<b>► Test the air supply pressure at the pneumatic connection module</b>															
	▷ Pneumatic connection module without pressure reducer															
	Connect pressure gauge with a male connector M 5 for hose 4 × 1 mm (order no. 0790-6123) and test male connector (order no. 3999-0004) to the test diode. The output pressure of the pressure reducer must be 1.8 to 2.0 bar (air supply pressure 2.2 to 6.0 bar).															
	▷ Pneumatic connection module with pressure reducer															
<b>Single solenoid valve without function</b>	Connect pressure gauge with a T-piece to air supply connection 8. The air supply pressure must be 2.2 bar ± 10 % bar.															
	<b>► Test the electric nominal signal at the pilot valve</b>															
	▷ Pilot valves with electric status indicator															
	The light-emitting diode is lit, when the electrical nominal signal is available and the circuit is not interrupted.															
	▷ Pilot valves without electric status indicator															
	Measure the nominal signal $U_N$ with a voltmeter either at the contacts of the connector (single plug-type connector or multipole connector) or at the connecting terminals (common cable). The required nominal signal $U_N$ for switching on/off the pilot valve is shown in the following table:															
	<table border="1" data-bbox="248 703 997 807"> <thead> <tr> <th data-bbox="248 703 549 738">Nominal signal <math>U_N</math></th> <th data-bbox="549 703 661 738">6 V DC</th> <th data-bbox="661 703 773 738">12 V DC</th> <th data-bbox="773 703 885 738">24 V DC</th> <th data-bbox="885 703 997 738">24 V AC</th> </tr> </thead> <tbody> <tr> <td data-bbox="248 738 549 774">Switching point "On" <math>U_{+80^\circ\text{C}}</math></td> <td data-bbox="549 738 661 774">≥ 4.8 V</td> <td data-bbox="661 738 773 774">≥ 9.6 V</td> <td data-bbox="773 738 885 774">≥ 18.0 V</td> <td data-bbox="885 738 997 774">≥ 19.0 V</td> </tr> <tr> <td data-bbox="248 774 549 807">"Off" <math>U_{-25^\circ\text{C}}</math></td> <td data-bbox="549 774 661 807">≤ 1.0 V</td> <td data-bbox="661 774 773 807">≤ 2.4 V</td> <td data-bbox="773 774 885 807">≤ 4.7 V</td> <td data-bbox="885 774 997 807">≤ 4.5 V</td> </tr> </tbody> </table>	Nominal signal $U_N$	6 V DC	12 V DC	24 V DC	24 V AC	Switching point "On" $U_{+80^\circ\text{C}}$	≥ 4.8 V	≥ 9.6 V	≥ 18.0 V	≥ 19.0 V	"Off" $U_{-25^\circ\text{C}}$	≤ 1.0 V	≤ 2.4 V	≤ 4.7 V	≤ 4.5 V
	Nominal signal $U_N$	6 V DC	12 V DC	24 V DC	24 V AC											
Switching point "On" $U_{+80^\circ\text{C}}$	≥ 4.8 V	≥ 9.6 V	≥ 18.0 V	≥ 19.0 V												
"Off" $U_{-25^\circ\text{C}}$	≤ 1.0 V	≤ 2.4 V	≤ 4.7 V	≤ 4.5 V												
<b>► Test the pneumatic output signal at the pilot valve</b>																
▷ Pilot valve with pneumatic status indicator																
The pneumatic output signal is indicated by the pneumatic indicator.																
▷ Pilot valve without pneumatic status indicator																
Remove the pilot valve (see "Changing the pilot valves", pages 13 and 14).																

## Changing the pilot valves

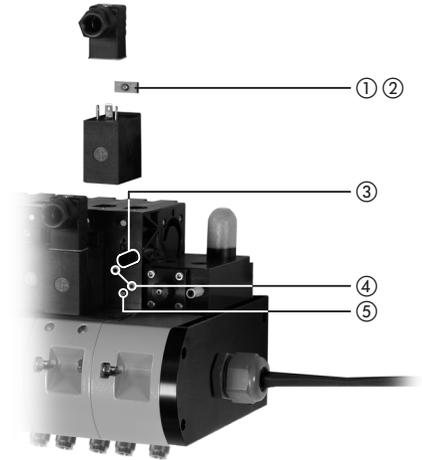
In the event of failure, the pilot valves can be changed. The seal hose with restrictor has to be changed at the same time because the function of the restrictor cannot be tested on site.

### Changing the pilot valves with single plug-type connector

Pilot valves with single plug-type connector can be changed as follows (see Fig. 12):

- 1 Switch off the air supply.
- 2 Pull off the female connector from the contact pins at the pilot valve after unscrewing the fixing screw.
- 3 Remove the damaged pilot valve from the booster valve after unscrewing the self-tapping screw ② and removing the clamp ①.
- Note:** For the self-tapping screw, a Torx TX 9 screw driver is required.
- 4 Pull out the seal hose with restrictor ⑤ from the flange of the booster valve using a needle and replace it.
- 5 Attach the new pilot valve using clamp ① and self-tapping screw ② at the booster valve.
- Note:** Before attaching make sure that the O-rings ③ ④ and the seal hose with restrictor ⑤ are positioned correctly at the flange of the booster valve.
- 6 Place the female connector on the contact pins at the pilot valve and attach with the fixing screw.
- Note:** Before attaching, make sure that the flat gasket is positioned correctly at the pilot valve.
- 7 Switch on the air supply.
- 8 The pneumatic function of the pilot valve is indicated with by a pneumatic indicator (optional).

### Pilot valves with single plug-type connector



Spare parts	Order no.
① 1 × Clamp	0320-2501
② 1 × Self-tapping screw 2.5 × 10	8336-1101
③ 1 × O-ring 8 × 1,5	8421-0279
④ 2 × O-ring 2 × 1	8421-0012
⑤ 1 × Seal hose with restrictor	1690-4844

Fig. 12

## Changing the pilot valves with common cable or multipole connector

Pilot valves with common cable or multipole connector can be changed as follows (see Fig. 13):

- 1 Switch off the air supply.
- 2 Pull off the damaged pilot valve from the contact pins in the basic module after unscrewing the self-tapping screw ② and removing the clamp ①.

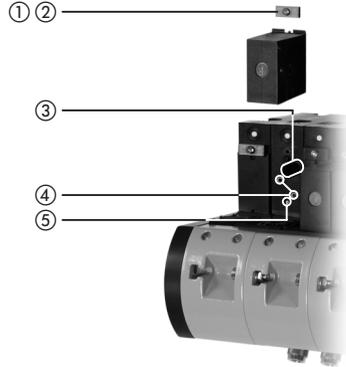
**Note:** For the self-tapping screw a Torx TX 9 screw driver is required.

- 3 Pull out the seal hose with restrictor ⑤ from the flange of the booster valve using a needle and replace it.
- 4 Place the new pilot valve to the contact pins in the basic module and attach using clamp ① and self-tapping screw ② at the booster valve.

**Note:** Before attaching, make sure that the O-rings ③ ④ and the seal hose with restrictor ⑤ are positioned correctly at the flange of the booster valve.

- 5 Switch on the air supply.
- 6 The function of the pilot valve is indicated by a light-emitting diode and a pneumatic indicator (optional).

### Pilot valves with common cable or multipole connector



Spare parts	Order no.
① 1 × Clamp	0320-2501
② 1 × Self-tapping screw Torx 2.5 × 10	8336-1101
③ 1 × O-ring 8 × 1,5	8421-0279
④ 2 × O-ring 2 × 1	8421-0012
⑤ 1 × Seal hose with restrictor	1690-4844

Fig. 13

## Certifications

EC Type Examination Certificate PTB 05 ATEX 2044 X  
for Type 3965-1 Solenoid Valve Island (extract)



II 2 G EEx ia IIC T6 and II 2 D IP 65 T 80 °C

for use in hazardous areas (zone 1 or 21)

The correlation between version, temperature class, permissible ambient temperature and maximum permissible power dissipation is shown in the following table:

Type		3965-11XX1	3965-11XX2	3965-11XX3
Nominal signal	$U_N$	6 V DC	12 V DC	24 V DC
Ambient temperature in temperature class	T6	-45 to +60 °C		
	T5	-45 to +70 °C		
	T4	-45 to +80 °C		
Power dissipation	$P_i$	250 mW	No limitation	
Internal inductance	$L_i$	≈ 0		
Internal capacitance	$C_i$	≈ 0		

For connection to a certified intrinsically safe circuit the permissible maximum values are shown in the following table:

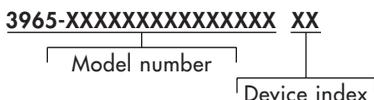
Output voltage	$U_i$	25 V	27 V	28 V	30 V	32 V
Output current	$I_i$	150 mA	125 mA	115 mA	100 mA	85 mA

### Special conditions

1. When the solenoid valve island is to be used in hazardous areas of zone 21 according to EN 50281-1-1:1998, the equipment shall be mounted in an additional enclosure made of steel or stainless steel or of plastic. The enclosure including its connection parts and bushings shall be proven to comply with degree of protection IP 65 according to IEC 60529:1989.
2. When the solenoid valve island is to be mounted in a plastic enclosure, the enclosure made by Rittal and certified under PTB 03 ATEX 1011 U shall be used.

### Model number and device index

The model number and the device index are shown on the nameplate:



**Statement of Conformity PTB 06 ATEX 2003 X  
for Type 3965-8 Solenoid Valve Island (extract)**



**II 3 G EEx nA II T6 or II 3 G EEx nL IIC T6 and  
II 3 D IP 54 T 80 °C or II 3 D IP 65 T 80 °C**

**for use in hazardous areas (zone 2 or 22)**

The correlation between version, temperature class, permissible ambient temperature and maximum permissible power dissipation is shown in the following table:

Type		3965-81XX1	3965-81XX2	3965-81XX3
Nominal signal	$U_N$	6 V DC	12 V DC	24 V DC
Ambient temperature in temperature class	T6	-45 to +60 °C		
	T5	-45 to +70 °C		
	T4	-45 to +80 °C		
Power dissipation	$P_i$	250 mW	No limitation	
Internal inductance	$L_i$	≈ 0		
Internal capacitance	$C_i$	≈ 0		

For connection to a certified intrinsically safe circuit the permissible maximum values are shown in the following table:

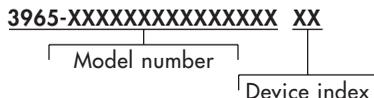
Output voltage	$U_i$	32 V
Output current	$I_i$	132 mA

### Special conditions

1. Under normal operating conditions the input circuits provided with type of protection EEx nA II are permitted to be connected, disconnected or switched on/off while live only during installation, maintenance and repair work.
2. The input circuits provided with type of protection EEx nL IIC are permitted to be switched on/off in normal operation.
3. When the solenoid valve island is to be used in hazardous areas where conductive dusts according to EN 50281-1-1:1998 are present, it shall be mounted in an additional enclosure made of steel or stainless steel or of plastic. The enclosure including its connection parts and bushings shall be proven to comply with degree of protection IP 65 according to IEC 60529:1989.
4. When the solenoid valve island is to be mounted in a plastic enclosure, the enclosure made by Rittal and certified under PTB 03 ATEX 1011 U shall be used.

### Model number and device index

The model number and the device index are shown on the nameplate:



(Specifications subject to change without notice.)

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