Pilot Valves Type 3964

for controlling of Booster Valves Type 3756, Solenoid Valve Islands Type 3965, Diaphragm Valves Type 3994-0671 and valves according to ISO 5599/1 with CNOMO interface

General notes

The Type 3964 Pilot Valves ensure a high level of operational reliability for controlling Type 3756 Booster Valves, Type 3965 Solenoid Valve Islands, Type 3994-0671 Diaphragm Valves and valves according to ISO 5599/1 with CNOMO interface.

Intrinsically safe, low-power binary signals issued by automation or fieldbus systems can be used for controlling purposes.

Special features of the Type 3964 Pilot Valves include:

- Safety Integrity Level SIL 4 according to IEC 61508
- E/P binary converter with nozzle/baffle system
- Nominal signals of 6/12/24 V DC or 24 V AC
- Intrinsically safe versions II 2 G Ex ia IIC T6 for zone 1, II 3 G Ex nA II T6 for zone 2, CSA and FM
- Power consumption 6 to 27 mW (DC) or 0.1 VA (AC)
- Polarity reversal protection
- Manual operation function as pushbutton or pushbutton switch (optionally)
- Plug-type connector according to EN 175301-803, form C, or industrial standard
- Non-corrosive enclosure with degree of protection IP 54
- Air supply 1.4 to 2.0 or 3.0 to 3.6 bar
- Flanged end or CNOMO adapter plate
- Connection plate, twofold or fourfold, for top hat rail 35 for controlling pneumatic components with threaded connection (see "Accessories")
- Indicator for output signal (optionally)
- Diaphragm switch as amplifier (optional)
- Service life more than 20 millions cycles
- Ambient temperature -45 to +80 °C

Versions

Fig. 1
Function

The Type 3964 Pilot valves consist of an e/p binary converter (1), a manual operation function (2) (optionally) and an indicator (3) (optionally). The output signal is amplified to double air flow by a diaphragm switch (4) (optionally) [see Fig. 2).

In normal position, the baffle (2) is lifted off the outlet nozzle (3) by a return spring (5). As a result, a pressure lower than the switch-off pressure of the diaphragm switch (4) builds up in the pressure divider that consists of restriction (6) and outlet nozzle (3).

When the solenoid (4) is energized by an electrical binary signal the outlet nozzle (3) is closed by the baffle (2) against the force of return spring (5). As a result, the pressure in the pressure divider rises above the switch-on pressure of the diaphragm switch (4) thus switching it into the operating position. The output signal of the e/p binary converter (1) is indicated by indicator (3).

Symbols

<table>
<thead>
<tr>
<th>Type 3964-XXX000000XX</th>
<th>Type 3964-XXX100000XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>with flanged end</td>
<td>with CNOMO adapter plate</td>
</tr>
<tr>
<td>(without restriction)</td>
<td>(with restriction)</td>
</tr>
</tbody>
</table>

Type 3964-XXX110000XX
with CNOMO adapter plate and amplifier

Type 3964-XX100000000XX
with connection plate, twofold (with restrictors)

Type 3964-XX100000000XX
with connection plate, fourfold (with restrictors)
Technical data

General data

Construction Solenoid with nozzle/baffle system, diaphragm switch with return spring as amplifier (optionally)

Degree of protection IP 20/IP 54 (without/with cable socket installed)

Material

Enclosure Polyamide PA6-3-T, black, Polyoxymethylene, green (amplifier)

Adapter plate Aluminium, black anodized

Screws Stainless steel 1.4571

Springs Stainless steel 1.4310

Gaskets Silicone rubber, Perbunan

Diaphragms Chlorbutadiene 57 Cr 868 (amplifier, for use at \(-25 \ldots +60^\circ\)C), Silicone rubber (amplifier, for use at \(-45 \ldots +60^\circ\)C), Nitrilbutadiene rubber (indicator, for use at \(-25 \ldots +80^\circ\)C)

Ambient temperature See “Electrical data” and “Pneumatic data”

Mounting position As desired (see Mounting and Operating Instructions EB 3964 EN)

Service life

\( \geq 2 \times 10^7 \) cycles (without amplifier, for use at \(-45 \ldots +80^\circ\)C), \( \geq 2 \times 10^6 \) cycles (with amplifier, for use at \(-25 \ldots +60^\circ\)C), \( \geq 2 \times 10^6 \) cycles (with amplifier, for use at \(-45 \ldots +80^\circ\)C)

Weight approx.

50 g (with flanged end), 100 g (with CNOMO adapter plate), 150 g (with CNOMO adapter plate and amplifier)

Electrical data

Type 3964 -X1 -X2 -X3 -X8

Nominal signal

\( U_n \) 6 V DC max. 27 V \( U^1 \) 12 V DC max. 25 V \( U^1 \) 24 V DC max. 32 V \( U^1 \) 24 V AC max. 36 V \( U^1 \)

Switching points “On” \( U_{+20^\circ C} \) \( \geq 4.8 \) V \( \geq 9.6 \) V \( \geq 18 \) V 19 \( \ldots 36 \) V

\( I_{+20^\circ C} \) \( \geq 1.41 \) mA \( \geq 1.52 \) mA \( \geq 1.57 \) mA \( \geq 1.9 \) mA

\( P_{+20^\circ C} \) \( \geq 5.47 \) mW \( \geq 13.05 \) mW \( \geq 26.71 \) mW \( \geq 0.04 \) VA

“Off” \( U_{-25^\circ C} \) \( \leq 1.0 \) V \( \leq 2.4 \) V \( \leq 4.7 \) V \( \leq 4.5 \) V

Impedance \( R_{+20^\circ C} \) 2.6 k\( \Omega \) 5.5 k\( \Omega \) 10.7 k\( \Omega \) approx. 10 k\( \Omega \)

Temperature influence \( T_6 \) 0.4 %/°C \( T_5 \) 0.2 %/°C \( T_4 \) 0.1 %/°C

Type of protection EEx ia IIC 2) for use in hazardous areas (zone 1)

Type 3964 -11 -12 -13

Type 3964 -81 -82 -83

Ambient temperature in temperature class

\( T_6 \) -45 \ldots +60^\circ C

\( T_5 \) -45 \ldots +70^\circ C

\( T_4 \) -45 \ldots +80^\circ C

Correcting time \( \leq 15 \) ms

Temperature influence \( 0.4 \% / ^\circ C \) \( 0.2 \% / ^\circ C \) \( 0.12 \% / ^\circ C \) \( 0.15 \% / ^\circ C \)

Connection Plug-type connector 4) according to EN 175301-803, form C, contact clearance 8 mm, Plug-type connector 4) according to industrial standard, form C, contact clearance 9.4 mm

Electrical data

Type 3964 -X1 -X2 -X3 -X8

Nominal signal

\( U_n \) 6 V DC max. 27 V \( U^1 \) 12 V DC max. 25 V \( U^1 \) 24 V DC max. 32 V \( U^1 \) 24 V AC max. 36 V \( U^1 \)

Switching points “On” \( U_{+20^\circ C} \) \( \geq 4.8 \) V \( \geq 9.6 \) V \( \geq 18 \) V 19 \( \ldots 36 \) V

\( I_{+20^\circ C} \) \( \geq 1.41 \) mA \( \geq 1.52 \) mA \( \geq 1.57 \) mA \( \geq 1.9 \) mA

\( P_{+20^\circ C} \) \( \geq 5.47 \) mW \( \geq 13.05 \) mW \( \geq 26.71 \) mW \( \geq 0.04 \) VA

“Off” \( U_{-25^\circ C} \) \( \leq 1.0 \) V \( \leq 2.4 \) V \( \leq 4.7 \) V \( \leq 4.5 \) V

Impedance \( R_{+20^\circ C} \) 2.6 k\( \Omega \) 5.5 k\( \Omega \) 10.7 k\( \Omega \) approx. 10 k\( \Omega \)

Temperature influence 0.4 %/°C 0.2 %/°C 0.1 %/°C

Type of protection EEx ia IIC 2) for use in hazardous areas (zone 1)

Type 3964 -11 -12 -13

Type 3964 -81 -82 -83

Ambient temperature in temperature class

\( T_6 \) -45 \ldots +60^\circ C

\( T_5 \) -45 \ldots +70^\circ C

\( T_4 \) -45 \ldots +80^\circ C

Correcting time \( \leq 15 \) ms

Temperature influence 0.4 %/°C 0.2 %/°C 0.12 %/°C 0.15 %/°C

Connection Plug-type connector 4) according to EN 175301-803, form C, contact clearance 8 mm, Plug-type connector 4) according to industrial standard, form C, contact clearance 9.4 mm

1) Permissible maximum value at continuous duty. For Ex versions, the permissible maximum value \( U_i \) applies.

2) Marking II 2 G Ex ia IIC T6 (zone 1) according to EC Type Examination Certificate PTB 98 ATEX 2047

3) Marking II 3 G Ex ia II T6 (zone 2) according to Statement of Conformity PTB 01 ATEX 9193 X

4) The female connector with flat gasket is not included in the delivery (see "Accessories")

Note: A manufacturer’s declaration for use in hazardous areas (zone 22) is available on request
Pneumatic data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air supply Medium</td>
<td>Instrument air, free of corrosive particles</td>
</tr>
<tr>
<td>Pressure</td>
<td>1.4 ... 2.0 bar / 3.0 ... 3.6 bar</td>
</tr>
<tr>
<td>Output signal without amplifier</td>
<td>≥ 1.2 bar at 1.4 bar air supply,</td>
</tr>
<tr>
<td></td>
<td>≥ 1.8 bar at 2.0 bar air supply,</td>
</tr>
<tr>
<td></td>
<td>≥ 2.5 bar at 3.6 bar air supply</td>
</tr>
<tr>
<td>Output signal with amplifier</td>
<td>Air supply pressure</td>
</tr>
<tr>
<td>Air consumption</td>
<td>≤ 60 l/h at 1.4 bar air supply (normal position),</td>
</tr>
<tr>
<td></td>
<td>≤ 15 l/h at 1.4 bar air supply (operating position)</td>
</tr>
<tr>
<td>Ksv value 1)</td>
<td>0.01 (without amplifier),</td>
</tr>
<tr>
<td></td>
<td>0.02 (with amplifier)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>−45 ... +80°C,</td>
</tr>
<tr>
<td></td>
<td>−25 ... +60°C (amplifier with diaphragm made of chlorbutadiene 57 Cr 868),</td>
</tr>
<tr>
<td></td>
<td>−45 ... +60°C (amplifier with diaphragm made of silicone rubber)</td>
</tr>
<tr>
<td>Connection</td>
<td>Flanged end, optionally with CNOMO adapter plate or connection plate</td>
</tr>
</tbody>
</table>

1) Air flow with $p_1=2.4$ bar and $p_2=1.0$ bar can be calculated according to the following equation: $Q = K_{sv} \times 36.22$, expressed in m³/h

Dimensions of pilot valves with flanged end

Fig. 4 - Dimensions in mm
Dimensions of pilot valves with CNOMO adapter plate

![Diagram of pilot valve dimensions](image)

Fig. 5 - Dimensions in mm

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**Dimension of pilot valves with CNOMO adapter plate and amplifier**

![Diagram of pilot valve dimensions with amplifier](image)
Dimensions of pilot valves with connection plate, twofold

Fig. 6 - Dimensions in mm
### Versions and ordering data

<table>
<thead>
<tr>
<th>Pilot valve Type 3964</th>
<th>Order no. 3964-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of protection</strong></td>
<td></td>
</tr>
<tr>
<td>Without Ex-protection</td>
<td>0</td>
</tr>
<tr>
<td>II 2 G Ex ia IIC T6 (ATEX) (^1), zone 1</td>
<td>1</td>
</tr>
<tr>
<td>Ex ia IIC (CSA) and AE ia IIC (FM)</td>
<td>3</td>
</tr>
<tr>
<td>II 3 G Ex nA II T6 (ATEX) (^2), zone 2</td>
<td>8</td>
</tr>
<tr>
<td><strong>Nominal signal</strong></td>
<td></td>
</tr>
<tr>
<td>6 V DC, power consumption 5.47 mW</td>
<td>1</td>
</tr>
<tr>
<td>12 V DC, power consumption 13.05 mW</td>
<td>2</td>
</tr>
<tr>
<td>24 V DC, power consumption 26.71 mW</td>
<td>3</td>
</tr>
<tr>
<td>24 V AC, power consumption 0.04 VA (without Ex-protection)</td>
<td>8</td>
</tr>
<tr>
<td><strong>Manual operation function</strong></td>
<td></td>
</tr>
<tr>
<td>Without manual operation function SIL 4</td>
<td>0</td>
</tr>
<tr>
<td>Pushbutton</td>
<td>1</td>
</tr>
<tr>
<td>Pushbutton switch</td>
<td>2</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td></td>
</tr>
<tr>
<td>Flanged end</td>
<td>0</td>
</tr>
<tr>
<td>CNOMO adapter plate, 30 mm SIL 4</td>
<td>1</td>
</tr>
<tr>
<td>Flanged end for Solenoid Valve Island Type 3965 with connecting cable</td>
<td>3</td>
</tr>
<tr>
<td>Flanged end for Solenoid Valve Island Type 3965 with single plug-type connector</td>
<td>4</td>
</tr>
<tr>
<td><strong>K(\omega) value(^3)</strong></td>
<td></td>
</tr>
<tr>
<td>0.01 without amplifier SIL 4</td>
<td>0</td>
</tr>
<tr>
<td>0.02 with amplifier</td>
<td>1</td>
</tr>
<tr>
<td><strong>Pressure reducer</strong></td>
<td></td>
</tr>
<tr>
<td>Without pressure reducer</td>
<td>0</td>
</tr>
<tr>
<td><strong>Electrical connection</strong></td>
<td></td>
</tr>
<tr>
<td>Plug-type connector (^4) according to EN 175301-803, form C, contact clearance 8 mm</td>
<td>0</td>
</tr>
<tr>
<td>Plug-type connector (^4) according to industrial standard, form C, contact clearance 9.4 mm</td>
<td>1</td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td></td>
</tr>
<tr>
<td>IP 54</td>
<td>0</td>
</tr>
<tr>
<td>IP 20</td>
<td>2</td>
</tr>
<tr>
<td><strong>Air supply</strong></td>
<td></td>
</tr>
<tr>
<td>1.4 ... 2.0 bar</td>
<td>0</td>
</tr>
<tr>
<td>3.0 ... 3.6 bar</td>
<td>1</td>
</tr>
<tr>
<td><strong>Indicator</strong></td>
<td></td>
</tr>
<tr>
<td>Without indicator</td>
<td>0</td>
</tr>
<tr>
<td>With indicator (−25 ... +60°C)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td></td>
</tr>
<tr>
<td>−25 ... +60°C</td>
<td>0</td>
</tr>
<tr>
<td>−45 ... +80°C</td>
<td>2</td>
</tr>
<tr>
<td>−45 ... +60°C</td>
<td>3</td>
</tr>
<tr>
<td><strong>Safety function</strong></td>
<td></td>
</tr>
<tr>
<td>Without safety function</td>
<td>0</td>
</tr>
<tr>
<td>SIL 4 (^5)</td>
<td>1</td>
</tr>
</tbody>
</table>

\(^1\) According to EC-Type Examination Certificate PTB 98 ATEX 2047

\(^2\) According to Statement of Conformity PTB 01 ATEX 2193 X

\(^3\) Air flow at \(p_1 = 2.4\) bar and \(p_2 = 1.0\) bar can be calculated according to the following equation: \(Q = K\omega \times 36.22\), expressed in \(\text{m}^3/\text{h}\)

\(^4\) The female connector with flat gasket is not included in the delivery (see “Accessories”)

\(^5\) Safety Integrity Level SIL 4 according to IEC 61508 (Report No. V 60 2004 T1)
Accessories

Female connector according to industrial standard made of polyamide, black, form C, contact clearance 9.4 mm, cable gland Pg 7
(for cable Ø 3.5 to 6 mm)
Order no. 8831-0533

Female connector according to EN 175301-803 made of polyamide, black, form C, contact clearance 8 mm, cable gland Pg 7
(for cable Ø 3.5 to 6 mm)
Order no. 8831-0535

Flat gasket made of epichlorhydrine rubber, silicone-free
(for cable socket according to industrial standard)
Order no. 8831-0545

Flat gasket made of epichlorhydrine rubber, silicone-free
(for cable socket according to EN 175301-803)
Order no. 8831-0546

Connection plate, twofold, made of aluminium, black anodized, connections M 5, without indicator, including 2 holding devices with hexagon socket head screw ISO 4762 – M 2.5 × 8
Order no. 1890-5789

Connection plate, fourfold, made of aluminium, black anodized, connections M 5, without indicator, including 4 holding devices with hexagon socket head screw ISO 4762 – M 2.5 × 8
Order no. 1890-5790

Connection plate, twofold, made of aluminium, black anodized, connections M 5, with 2 indicators, including 2 holding devices with hexagon socket head screw ISO 4762 – M 2.5 × 8
Order no. 1890-5791

Connection plate, fourfold, made of aluminium, black anodized, connections M 5, with 4 indicators, including 4 holding devices with hexagon socket head screw ISO 4762 – M 2.5 × 8
Order no. 1890-5792

Mounting base for top hat rail 35 according to EN 50022 with filister head screw ISO 1207 – M 3 × 8
(2 pieces are necessary for connection plate, fourfold)
Order no. 1400-5931

Blind plate with threaded plug ISO 1207 – M 5 × 6 and gasket M 5
(for covering unused device locations)
Order no. 1400-7588

Piping accessories see Data Sheet Z 900-1 EN

Spare parts

Diaphragm element as amplifier (for use at −25 to +60°C)
Order no. 3975-0001

Diaphragm element as amplifier (for use at −40 to +80°C)
Order no. 3975-0020

Holding device with hexagon socket head screw ISO 4762 – M 2.5 × 8
(for mounting of one pilot valve on the connection plate)
Order no. 1400-7587

O-ring 2.9 × 1.78 made of nitrilebutadiene rubber
(for CNOMO interface)
Order no. 8421-0044

Restrictor
Order no. 1690-9995

O-ring 2 × 1 made of silicone rubber
(for restrictor)
Order no. 8421-0012

(Specifications subject to change without notice.)

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