Series 3730
Type 3730-5 Electropneumatic Positioner
With FOUNDATION™ fieldbus communication
FF device rev. 3

Mounting and Operating Instructions

EB 8384-5 EN
Firmware version 1.62
Edition December 2017
**Note on these mounting and operating instructions**

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

- For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- If you have any questions about these instructions, contact SAMSON’s After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at [www.samson.de > Service & Support > Downloads > Documentation](http://www.samson.de).

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**Definition of signal words**

| **DANGER** | Hazardous situations which, if not avoided, will result in death or serious injury |
| **WARNING** | Hazardous situations which, if not avoided, could result in death or serious injury |
| **NOTICE** | Property damage message or malfunction |
| **Note** | Additional information |
| **Tip** | Recommended action |
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Note

− Configuration and operation over FOUNDATION™ fieldbus are described in the Configuration Manual ▶ KH 8384-5. KH 8384-5 is included on the enclosed CD-ROM and is available on our website.
− The functions of the EXPERTplus Valve Diagnostics are described in the Operating Instructions ▶ EB 8389. EB 8389 is included on the enclosed CD-ROM and is available on our website.
## Firmware revisions (Control R)

### R 1.44 to 1.46

**Internal revisions**

### R 1.52

- **Diagnostics**: all EXPERTplus diagnostic functions are available without having to activate them in the positioner (▶ EB 8389 on EXPERTplus Valve Diagnostics).
- Additional function blocks: 2x DO (Discrete Output), 1x IS (Input Selector), 1x MAI (Multiple Analog Input), 1x MAO (Multiple Analog Output). See Configuration Manual ▶ KH 8384-5
- **New functions**: new functions are implemented in the DO Function Block (Discrete Output). See Configuration Manual ▶ KH 8384-5
- **Action on fault detection**: If the AO Transducer Block is in O/S mode and the condensed state changes to "Maintenance alarm", the following actions can be started:
  - Hold last value
  - Move valve to fail-safe position
  - Move to a predefined fault state value
  
  Configuration Manual ▶ KH 8384-5

### R 1.54 to 1.56

**Code 48 extended**: The following subitems have been added to Code 48 (▶ EB 8389):

- h0: Activation/deactivation reference test
- h1: Reference test completed (YES/No)
- h3: Automatic reset of diagnosis after this time
- h4: Remaining time until diagnosis reset

### R 1.57

**Data logging**: Data logging has been extended to document errors in internal device communication.

### R 1.62

The positioner changes to closed-loop control more quickly due to an improved start-up performance.
**Firmware revisions (Communication K)**

Further details can be found in KH 8384-5. KH 8384-5 is included on the enclosed CD-ROM and is available on our website.

**K 1.21**

- **"Device not initialized" diagnostic alarm**: the diagnostic alarm “Device not initialized” is generated when the positioner is not initialized and the condensed state is set to “Maintenance alarm”.

- **Leakage sensor at binary input 2**: The connection of a leakage sensor at binary input 2 (by selecting LEAKAGE SENSOR in CONFIG_BINARY_INPUT2 parameter of the AO Transducer Block) causes:
  - Information specified in XD_ERROR_EXT parameter in the AO Transducer Block and the generation of a diagnostic alarm which is logged
  - The state of the binary input is reported in BINARY_INPUT2 parameter in the AO Transducer Block

The connection of a leakage sensor at binary input 2 (by selecting LEAKAGE SENSOR in CONFIG_BINARY_INPUT2 parameter of the AO Transducer Block) causes:

- Information specified in XD_ERROR_EXT parameter in the AO Transducer Block and the generation of a diagnostic alarm which is logged
- The state of the binary input is reported in BINARY_INPUT2 parameter in the AO Transducer Block

- **Display of the operating range FINAL_VALUE_RANGE**: the correction of the operating range FINAL_VALUE_RANGE over on-site operation of the positioner (Code 8/9) is also transferred over fieldbus in firmware version K 1.21 and higher.

- **De-energized internal solenoid valve**: a masking allows to set whether a de-energized internal solenoid valve generates an AO block error, resulting in a block alarm.

- **SOLENOID_SELECT parameter**: the SOLENOID_SELECT parameter in firmware K 1.21 and higher allows to set whether a "Maintenance now" block error of the AO Transducer Block results in an output error in the AO Block.

- **TOT_VALVE_TRAV_LIM parameter**: new range: 1000 to 990 000 000

**K 1.22**

- **Operating range FINAL_VALUE_RANGE**: the operating range FINAL_VALUE_RANGE of the AO Transducer Block is compared on entering it with TRANSM_PIN_POS. If the TRANSM_PIN_POS parameter is changed, the positioner checks whether the setting and unit match the current operating range FINAL_VALUE_RANGE. If this is not the case, the FINAL_VALUE_RANGE parameter is set to 0 to 100 %.

- **VALVE_TYPE parameter**: the parameter of the AO Transducer Block is set depending on the selected PIN_POS. The last setting is kept when VALVE_TYPE is set to OFF.

- **FINAL_VALUE parameter**: the output value is scaled with FINAL_VALUE_RANGE in firmware K 1.22 and higher and not as previously with XD_SCALE.

- **Display of O/S mode in AO Transducer Block**: if the AO Transducer Block is set to O/S mode, this is indicated in the positioner display by MAN/AUTO.
### Firmware revisions (Communication K)
Further details can be found in KH 8384-5. KH 8384-5 is included on the enclosed CD-ROM and is available on our website.

#### K 1.23
Internal revisions

#### K 1.24
- **BUS_ADDRESS parameter**: the bus address has the default setting of 248.
- **Device type**: in the delivered state, the device is configured as a basic device.

#### K 1.25
Internal revisions

#### K 2.01
- **Additional function blocks**: 2x DO (Discrete Output), 1x IS (Input Selector), 1x MAI (Multiple Analog Input), 1x MAO (Multiple Analog Output).
- **New functions**: the following new functions are implemented in the DO Function Block (Discrete Output):
  - Discrete analysis of on/off valves
  - Start partial stroke test (PST)
  - Start and reset the data logger
  - Resetting the diagnosis
  - Stop diagnosis
  - Move to fail-safe position
  - Lock on-site operation
- **Action on fault detection**: If the AO Transducer Block is in O/S mode and the condensed state changes to "Maintenance alarm", the following actions can be started:
  - Hold last value
  - Move valve to fail-safe position
  - Move to a predefined fault state value

#### K 2.02
**Partial stroke test (PST)**: configuration of the partial stroke test (PST) over the FF parameters is no longer possible. Configuration over the TROVIS-VIEW software is still possible.

#### K 2.03
**Partial stroke test (PST)**: configuration of the partial stroke test (PST) over the FF parameters and TROVIS-VIEW software is possible. The partial stroke test can be started by the binary input BI2.

#### K 2.04
Internal revisions

#### K 2.05
Internal revisions

#### K 2.06
**Process control system**: new firmware compatible with Honeywell Experion® control system. Communication: improved communication of valve positions smaller than –0.9 %.
### Firmware revisions (Communication K)
Further details can be found in KH 8384-5. KH 8384-5 is included on the enclosed CD-ROM and is available on our website.

| K 2.07 | Testing device functioning: monitoring of internal device communication has been added to the cyclic testing of the device functions. |
| K 3.01 | - Certified according to ITK 6.2.0  
- Diagnostics specification according to FF-912  
- Function block added: AI (Analog Input)  
- Function blocks removed: MAI (Multiple Analog Input), MAO (Multiple Analog Output), IS (Input Selector) |
1 Important safety instructions

For your own safety, follow these instructions concerning the mounting, start-up and operation of the positioner:

- The positioner is to be mounted, started up or operated only by trained and experienced personnel familiar with the product. According to these mounting and operating instructions, trained personnel is referred to as individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

- Explosion-protected versions of this positioner are to be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas. Refer to section 11.

- Any hazards that could be caused in the valve by the process medium, the signal pressure or by moving parts are to be prevented by taking appropriate precautions.

- If inadmissible motions or forces are produced in the pneumatic actuator as a result of the supply pressure level, it must be restricted using a suitable supply pressure reducing station.

To avoid damage to any equipment, the following also applies:

- Do not operate the positioner with the back of the positioner/vent opening facing upwards. The vent opening must not be sealed or restricted when the positioner is installed on site.

- Proper shipping and storage are assumed.

- Do not ground electric welding equipment near to the positioner.

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**Note**

The device with a CE marking fulfills the requirements of the Directives 2014/30/EU and 2011/65/EU, and depending on the version, the requirements of the Directive 2014/34/EU. The EU declarations of conformity are included at the back of these instructions.
## 2 Article code

<table>
<thead>
<tr>
<th>Positioner</th>
<th>Type 3730-5</th>
<th>x x x 0 x x x 0 x 0 x 0 x x</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>With LCD and autotune, FOUNDATION™ fieldbus</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Explosion protection</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Without</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ATEX</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CSA</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>FM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATEX</td>
<td></td>
<td>5</td>
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<tr>
<td>ATEX</td>
<td></td>
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<table>
<thead>
<tr>
<th>Additional equipment</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Inductive limit contact</td>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>SJ2-SN (NC contact)</td>
<td>1</td>
</tr>
<tr>
<td>Solenoid valve</td>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>With, 24 V DC</td>
<td>4</td>
</tr>
<tr>
<td>External position sensor</td>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>With</td>
<td>1 0 0 0</td>
</tr>
<tr>
<td>Leakage sensor</td>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>With</td>
<td>1</td>
</tr>
<tr>
<td>Binary input</td>
<td>Without</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Floating contact</td>
<td>0 1</td>
</tr>
</tbody>
</table>

| Diagnostics | EXPERTplus | 4 |

<table>
<thead>
<tr>
<th>Housing material</th>
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<tbody>
<tr>
<td>Aluminum (standard)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Stainless steel 1.4581</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Special application</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Without</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Version compatible with paint</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Exhaust air port with ¼-18 NPT thread, back of positioner sealed</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Attachment according to VDI/VDE 3847 including interface</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Attachment according to VDI/VDE 3847 prepared for interface</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>
### Positioner Type 3730-5

<table>
<thead>
<tr>
<th>Special version</th>
<th>0 0 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>With LCD and autotune, FOUNDATION™ fieldbus</td>
<td></td>
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</table>

**Without**

<table>
<thead>
<tr>
<th>NEPSI</th>
<th>0 0 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEPSI nA II T6, Ex nL IIC T6</td>
<td>0 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IECEx</th>
<th>0 1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>IECEx ia IIC T6-T4 Gb, Ex ia IIC T80°C Db</td>
<td>0 3 4</td>
</tr>
<tr>
<td>IECEx ia IIC T6-T4 Gc, Ex te IIC T80°C Dc</td>
<td>0 1 5</td>
</tr>
<tr>
<td>EAC Ex 1Ex ia IIC T6; Ex tb IIC T80°C Db X, IP66</td>
<td>0 1 4</td>
</tr>
<tr>
<td><strong>EAC Ex</strong> 2Ex nA ic IIC T6/T5/T4 Gc X, Ex te IIC T80°C Db X, IP66</td>
<td>0 2 0</td>
</tr>
</tbody>
</table>
3 Design and principle of operation

The positioner is mounted on pneumatic control valves and is used to assign the valve position (controlled variable $x$) to the control signal (set point $w$). The positioner compares the control signal of a control system to the travel or rotational angle of the control valve and issues a signal pressure (output variable $y$) for the pneumatic actuator.

The positioner mainly consists of an electric travel sensor system, an analog i/p converter with a downstream air capacity booster and the electronics with the microcontroller.

When a system deviation occurs, the actuator is either vented or filled with air. If necessary, the signal pressure change can be slowed down by a volume restriction. The signal pressure supplied to the actuator can be limited by software or on site to 1.4, 2.4 or 3.7 bar.

The fixed flow regulator ensures a constant air flow to the atmosphere, which is used to flush the inside of the positioner housing and to optimize the air capacity booster. The i/p converter is supplied with a constant upstream pressure by the pressure regulator to compensate for any fluctuations in the supply pressure.

---

**Fig. 1:** Functional diagram
The positioner communicates and is powered using IEC 61158-2 transmission technology conforming to FOUNDATION™ fieldbus specification.

As a standard feature, the positioner comes with a binary input used to signalize process information over the FOUNDATION™ fieldbus network.

The extended EXPERTplus diagnostics are integrated into the positioner. They provide information on the positioner and generate diagnostic and status messages, which allow faults to be pinpointed quickly.

The positioner is suitable for the following types of attachment using the corresponding accessories:

- Direct attachment to SAMSON Type 3277 Actuator: section 4.1
- Attachment to actuators according to IEC 60534-6 (NAMUR): section 4.2
- Attachment according to VDI/VDE 3847: section 4.3
- Attachment to Type 3510 Micro-flow Valve: section 4.4
- Attachment to rotary actuators acc. to VDI/VDE 3845: section 4.5

### 3.1 Additional equipment

#### Solenoid valve

If the operating voltage for the solenoid valve (12) fails, the supply pressure for the i/p converter is vented to the atmosphere. The positioner can no longer operate and the control valve moves to the fail-safe position determined by the actuator, regardless of the set point.

---

**NOTICE**

The manual set point is also reset to 0 % after the solenoid valve is activated!
A different manual set point must be entered again (Code 1).

#### Inductive limit contact

In this version, the rotary shaft of the positioner carries an adjustable tag which actuates the built-in proximity switch.

#### External position sensor

In this version, only the sensor is mounted to the control valve. The positioner is located separately from the valve. The connection of x and y signals to the valve is established by cable and piping for air (only without inductive limit contact).

#### Leakage sensor

By upgrading the positioner with a leakage sensor, it is possible to detect seat leakage when the valve is in the closed position.

#### Binary input BI1 (14)

As a standard feature, the positioner comes with a binary input used to signalize process information over the FOUNDATION™ fieldbus network.

#### Binary input BI2 (15)

This binary input BI2 is optional. It is an active input which is powered by the positioner to connect a floating contact. The switching state of the floating contact can be indicated over the FOUNDATION™ fieldbus network.
Design and principle of operation

---

**Note**
The binary inputs are configured in the DI Function Blocks. Refer to Configuration Manual ▶ KH 8384-5.

---

### 3.2 Communication

The positioner is controlled completely by digital signal transmission according to FOUNDATION™ fieldbus specification.

Data are transmitted over the bus using digital, bit-synchronous Manchester coding at a baud rate of 31.25 kbit/s over twisted-pair wires according to IEC 61158-2.

**Note**
If complex functions are started in the positioner, which require a long calculation time or lead to a large quantity of data being saved in the volatile memory of the positioner, the alert 'busy' is issued over the DD. This alert is *not an error message* and can be simply confirmed.

---

Configuration and operation of the positioner over FOUNDATION™ fieldbus are described in the Configuration Manual ▶ KH 8384-5.

---

#### 3.2.1 Configuration using the TROVIS-VIEW software

The positioner can be configured with SAMSON’s TROVIS-VIEW Configuration and Operator Interface.

The positioner has for this purpose a *serial interface* to allow the RS-232 or USB port of a computer to be connected to it over an adapter cable.

The TROVIS-VIEW software enables the user to easily configure the positioner as well as view process parameters online.

**Note**
TROVIS-VIEW provides a uniform user interface that allows users to configure and parameterize various SAMSON devices using device-specific database modules. The 3730-5 device module can be downloaded free of charge from our website (www.samson.de) at Services > Software > TROVIS-VIEW. Further information on TROVIS-VIEW (e.g. system requirements) is available on our website and in the Data Sheet ▶ T 6661.
### 3.3 Technical data

**Type 3730-5 Positioner:** the technical data for the explosion-protected devices may be restricted by the limits specified in the test certificates.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated travel, adjustable</strong></td>
<td>Direct attachment to Type 3277 Actuator: 3.6 to 30 mm</td>
</tr>
<tr>
<td></td>
<td>Attachment according to IEC 60534-6 (NAMUR): 3.6 to 300 mm</td>
</tr>
<tr>
<td></td>
<td>Attachment according to VDI/VDE 3847: 3.6 to 300 mm</td>
</tr>
<tr>
<td></td>
<td>Attachment to rotary actuators (VDI/VDE 3845): 24 to 100° opening angle</td>
</tr>
<tr>
<td><strong>Travel range, adjustable</strong></td>
<td>Within the initialized travel/angle of rotation; travel can be restricted to 1/5 at the maximum</td>
</tr>
<tr>
<td><strong>Bus connection</strong></td>
<td>Fieldbus interface according to IEC 61158-2, bus-powered</td>
</tr>
<tr>
<td></td>
<td>Physical Layer Class 113 (without expl. protection) and 111 (expl.-protected version)</td>
</tr>
<tr>
<td></td>
<td>Field device according to FM 3610 entity, FISCO and FNICO</td>
</tr>
<tr>
<td><strong>Fieldbus</strong></td>
<td>Data transmission conforming to FOUNDATION™ fieldbus specification</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Communication Profile Class: 31 PS, 32 L</td>
</tr>
<tr>
<td><strong>Execution time</strong></td>
<td>Interoperability tested according to Interoperability Test Kit (ITK) 6.2.0</td>
</tr>
<tr>
<td><strong>AO FB:</strong></td>
<td>30 ms</td>
</tr>
<tr>
<td><strong>DI FB:</strong></td>
<td>20 ms</td>
</tr>
<tr>
<td><strong>PID FB:</strong></td>
<td>40 ms</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td>SAMSON SSP interface and serial interface adapter</td>
</tr>
<tr>
<td><strong>Permissible operating voltage</strong></td>
<td>9 to 32 V DC · Powered over bus line</td>
</tr>
<tr>
<td></td>
<td>Observe the limits in the test certificate for explosion-protected versions.</td>
</tr>
<tr>
<td><strong>Maximum operating current</strong></td>
<td>15 mA</td>
</tr>
<tr>
<td><strong>Add. current in case of error</strong></td>
<td>0 mA</td>
</tr>
<tr>
<td><strong>Supply air</strong></td>
<td>1.4 to 7 bar (20 to 105 psi)</td>
</tr>
<tr>
<td><strong>Air quality acc. to ISO 8573-1</strong></td>
<td>Max. particle size and density: Class 4 · Oil content: Class 3</td>
</tr>
<tr>
<td></td>
<td>Moisture and water: Class 3 · Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected</td>
</tr>
<tr>
<td><strong>Signal pressure (output)</strong></td>
<td>0 bar up to the capacity of the supply pressure · Can be limited to 1.4/2.4/3.7 bar ±0.2 bar over software</td>
</tr>
<tr>
<td><strong>Characteristic</strong></td>
<td>Linear/equal percentage/reverse equal percentage</td>
</tr>
<tr>
<td></td>
<td>User-defined (over operating software and communication)</td>
</tr>
<tr>
<td></td>
<td>Butterfly valve, rotary plug valve or segmented ball valve: Linear/equal percentage</td>
</tr>
<tr>
<td></td>
<td>Deviation from characteristic ≤ 1 %</td>
</tr>
<tr>
<td><strong>Hysteresis</strong></td>
<td>≤0.3 %</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>≤0.1 %</td>
</tr>
<tr>
<td><strong>Direction of action</strong></td>
<td>Reversible</td>
</tr>
<tr>
<td><strong>Air consumption</strong></td>
<td>Independent of supply air &lt; 110 l/h</td>
</tr>
<tr>
<td><strong>Air output capacity filled with air</strong></td>
<td>At Δp = 6 bar: 8.5 m₃/h · At Δp = 1.4 bar: 3.0 m₃/h · Kᵥmax(20 °C) = 0.09</td>
</tr>
<tr>
<td><strong>Air output capacity vented</strong></td>
<td>At Δp = 6 bar: 14.0 m₃/h · At Δp = 1.4 bar: 4.5 m₃/h · Kᵥmax(20 °C) = 0.15</td>
</tr>
</tbody>
</table>
# Design and principle of operation

**Type 3730-5 Positioner:** the technical data for the explosion-protected devices may be restricted by the limits specified in the test certificates.

<table>
<thead>
<tr>
<th>Perm. ambient temperature</th>
<th>All versions</th>
<th>With metal cable gland</th>
<th>Special version for low temperatures with metal cable gland (Type 3730-5xxxxxxxxxx0x0xx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>–20 to +80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–45 to +80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–55 to +80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The temperature limits for the explosion-protected devices may be further restricted by the limits specified in the test certificates.

<table>
<thead>
<tr>
<th>Influences</th>
<th>Temperature</th>
<th>≤0.15 %/10 K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply air</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Effect of vibration</td>
<td>≤0.25 % up to 2000 Hz and 4 g according to IEC 770</td>
</tr>
</tbody>
</table>

**EMC**

Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21

**Explosion protection**

See Summary of explosion protection approvals

**Electrical connections**

One M20 x 1.5 cable gland for 6 to 12 mm clamping range · Second M20 x 1.5 threaded connection additionally exists · Screw terminals for 0.2 to 2.5 mm² wire cross-sections

**Degree of protection**

IP 66/NEMA 4X

**Use in safety-instrumented systems (SIL)**

Observing the requirements of IEC 61508, the systematic capability of the pilot valve for emergency venting as a component in safety-instrumented systems is given.

Use is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1).

**Binary input BI1**

Input

0 to 30 V DC · Reverse polarity protection · Static destruction limit 40 V · Current consumption 3.5 mA at 24 V, galvanic isolation

Signal

Signal ‘1’ at Ue > 5 V · Signal ‘0’ at Ue < 3 V

**Materials**

<table>
<thead>
<tr>
<th>Housing</th>
<th>Die-cast aluminum EN AC-AlSi12(Fe) (EN AC-44300) acc. to DIN EN 1706 chromated and powder paint coated · Special version: stainless steel 1.4581</th>
</tr>
</thead>
<tbody>
<tr>
<td>External parts</td>
<td>Stainless steel 1.4404/316L</td>
</tr>
<tr>
<td>Cable gland</td>
<td>M20x1.5, black polyamide</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 1.0 kg · Special version in stainless steel: 2.2 kg</td>
</tr>
</tbody>
</table>

**Compliance**

[CE Mark]
### Options for Type 3730-5

<table>
<thead>
<tr>
<th><strong>Binary input BI2</strong> for floating contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching input</strong></td>
</tr>
<tr>
<td><strong>Galvanic isolation</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Solenoid valve</strong> · Approval according to IEC 61508/SIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
</tr>
<tr>
<td><strong>Current consumption</strong> ( I = \frac{U - 5.7 , V}{3840 , \Omega} ) (corresponding to 4.8 mA at ( 24 , V/114 , mW ))</td>
</tr>
<tr>
<td><strong>Signal '0' (no response)</strong></td>
</tr>
<tr>
<td><strong>Signal '1' (response)</strong></td>
</tr>
<tr>
<td><strong>Service life</strong></td>
</tr>
<tr>
<td><strong>( K_v ) coefficient</strong></td>
</tr>
</tbody>
</table>

| **Pepperl+Fuchs inductive limit contact** For connection to switching amplifier acc. to EN 60947-5-6 |

| **SJ2-SN proximity switch** | Measuring plate not detected: \( \geq 3 \, mA \) · Measuring plate detected: \( \leq 1 \, mA \) |

<table>
<thead>
<tr>
<th><strong>External position sensor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel</strong></td>
</tr>
<tr>
<td><strong>Cable</strong></td>
</tr>
</tbody>
</table>

| **Permissible ambient temperature** | \( -60 \) to +105 °C with fixed connection between the positioner and position sensor |

| **Immunity to vibration** | Up to 10 g in the range of 10 to 2000 Hz |
| **Degree of protection** | IP 67 |

<table>
<thead>
<tr>
<th><strong>Leakage sensor</strong> · Suitable for operation in hazardous areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong></td>
</tr>
<tr>
<td><strong>Tightening torque</strong></td>
</tr>
</tbody>
</table>
### Summary of explosion protection approvals

<table>
<thead>
<tr>
<th>Type</th>
<th>Certification</th>
<th>Type of protection/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5CCE</td>
<td>Number A P HQ MH 104 1343</td>
<td>Ex ia IIC T6</td>
</tr>
<tr>
<td></td>
<td>Date 2013-04-19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid until 2018-04-18</td>
<td></td>
</tr>
<tr>
<td>STCC</td>
<td>On request</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number PTB 04 ATEX 2109</td>
<td>II 2G Ex ia IIC T6 Gb; II 2D Ex ia III T80°C Db</td>
</tr>
<tr>
<td></td>
<td>Date 2017-05-11</td>
<td></td>
</tr>
<tr>
<td>EAC Ex</td>
<td>Number RU-C-DE. 08.B.00697</td>
<td>1Ex ia IIC T6; Ex tb III T80°C Db X, IP66</td>
</tr>
<tr>
<td></td>
<td>Datum 2014-12-15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid until 2019-12-14</td>
<td></td>
</tr>
<tr>
<td>IECEx</td>
<td>Number IECEx PTB 06.0054</td>
<td>Ex ia IIC T6...T4 Gb; Ex ia IIC T80°C Db</td>
</tr>
<tr>
<td></td>
<td>Date 2017-07-17</td>
<td></td>
</tr>
<tr>
<td>KCS</td>
<td>Number 11-KB4BO-0225</td>
<td>Ex ia IIC T6/T5/T4</td>
</tr>
<tr>
<td></td>
<td>Date 2011-11-10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid until 2018-11-10</td>
<td></td>
</tr>
<tr>
<td>NEPSI</td>
<td>Number GYJ16.1081</td>
<td>Ex ia IIC T6</td>
</tr>
<tr>
<td></td>
<td>Date 2016-01-24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid until 2023-01-23</td>
<td></td>
</tr>
<tr>
<td>CSA</td>
<td>Number 1675804</td>
<td>Ex ia IIC T6; Class I,II, Div.1, Groups A, B, C, D, E, F, G; Ex nA II T6; Ex nL IIC T6; Class I, II, Div.2, Groups A, B, C, D, E, F, G; Class II, Div.1, Groups E, F, G; Class III Type 4 Enclosure</td>
</tr>
<tr>
<td></td>
<td>Date 2017-05-23</td>
<td></td>
</tr>
<tr>
<td>FM</td>
<td>Number 3023605</td>
<td>Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A–G; Class I, Div.2, Groups A–D; Class II, Div.2, Groups F, G</td>
</tr>
<tr>
<td></td>
<td>Date 2006-03-15</td>
<td></td>
</tr>
</tbody>
</table>
### Design and principle of operation

<table>
<thead>
<tr>
<th>Type</th>
<th>Certification</th>
<th>Type of protection/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3730-55</td>
<td><strong>IECEEx</strong>&lt;sup&gt;1&lt;/sup&gt; [Number PTB 04 ATEX 2109]&lt;br&gt;Date 2017-05-11</td>
<td>II 2D Ex tb IIIc T80°C Db</td>
</tr>
<tr>
<td>3730-58</td>
<td><strong>IECEEx</strong>&lt;sup&gt;2&lt;/sup&gt; [Number PTB 05 ATEX 2010 X]&lt;br&gt;Date 2017-06-22</td>
<td>II 3G Ex nA IIC T6 Gc,&lt;br&gt;II 3D Ex tc IIIc T80°C Dc</td>
</tr>
<tr>
<td>3730-58</td>
<td><strong>EAC</strong>&lt;sup&gt;Ex&lt;/sup&gt; [Number RU-C-DE. 08.B.00697]&lt;br&gt;Date 2014-12-15&lt;br&gt;Valid until 2019-12-14</td>
<td>2Ex nA ic IIC T6/T5/T4 Gc X;&lt;br&gt;Ex tc IIIc T80°C Db X, IP66</td>
</tr>
<tr>
<td>3730-58</td>
<td><strong>IECEEx</strong>&lt;sup&gt;Ex&lt;/sup&gt; Number IECEx PTB 06.0054&lt;br&gt;Date 2017-07-17</td>
<td>Ex nA IIC T6...T4 Gc;&lt;br&gt;Ex tc IIIc T80°C Dc</td>
</tr>
<tr>
<td>3730-58</td>
<td><strong>NEPSI</strong> Number GYJ16.1082&lt;br&gt;Date 2016-01-24&lt;br&gt;Valid until 2021-01-23</td>
<td>Ex nA II T6; Ex nL IIC T6</td>
</tr>
</tbody>
</table>

<sup>1</sup> EC type examination certificate

<sup>2</sup> Statement of conformity
4 Attachment to the control valve – Mounting parts and accessories

**NOTICE**
Risk of malfunction due to incorrect sequence of mounting, installation, and start-up. Keep the following sequence.
1. Remove the protective film from the pneumatic connections.
2. Mount the positioner on the control valve.
3. Connect the supply air.
4. Connect the electrical power.
5. Perform the start-up settings.

The positioner is suitable for the following types of attachment:
- Direct attachment to SAMSON Type 3277 Actuator
- Attachment to actuators according to IEC 60534-6 (NAMUR)
- Attachment according to VDI/VDE 3847
- Attachment to Type 3510 Micro-flow Valve
- Attachment to rotary actuators

**NOTICE**
Risk of malfunction due to incorrect mounting parts/accessories or incorrect assignment of lever and pin position. Attach the positioner to the control valve only using the mounting parts and accessories as specified in Table 1 to Table 6. Observe the type of attachment.

Observe the assignment between lever and pin position (see travel tables on page 23).

### Lever and pin position
The positioner is adapted to the actuator and to the rated travel by the lever on the back of the positioner and the pin inserted into the lever.

The travel tables on page 23 show the maximum adjustment range at the positioner. The travel that can be implemented at the valve is additionally restricted by the selected fail-safe position and the required compression of the actuator springs.

The positioner is equipped with the M lever (pin position 35) as standard.

![M lever with pin position 35](image)

**NOTICE**
Risk of malfunction because the newly mounted lever has not been adapted to the internal measuring lever. Move the newly mounted lever (1) once all the way as far as it will go in both directions.
Travel tables

**Note**
The M lever is included in the scope of delivery. S, L, XL levers for attachment according to IEC 60534-6 (NAMUR) are available as accessories (see Table 3). The XXL lever is available on request.

### Direct attachment to Type 3277-5 and Type 3277 Actuators

<table>
<thead>
<tr>
<th>Actuator size [cm²]</th>
<th>Rated travel [mm]</th>
<th>Adjustment range at positioner ¹) Travel [mm]</th>
<th>Required lever</th>
<th>Assigned pin position</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>7.5</td>
<td>5.0 to 25.0</td>
<td>M</td>
<td>25</td>
</tr>
<tr>
<td>120/175/240/350</td>
<td>15</td>
<td>7.0 to 35.0</td>
<td>M</td>
<td>35</td>
</tr>
<tr>
<td>355/700/750</td>
<td>30</td>
<td>10.0 to 50.0</td>
<td>M</td>
<td>50</td>
</tr>
</tbody>
</table>

### Attachment according to IEC 60534-6 (NAMUR)

<table>
<thead>
<tr>
<th>SAMSON valves with Type 3271 Actuator</th>
<th>Adjustment range at positioner ¹) Other control valves</th>
<th>Required lever</th>
<th>Assigned pin position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator size [cm²]</td>
<td>Rated travel [mm]</td>
<td>Min. travel [mm]</td>
<td>Max. travel [mm]</td>
</tr>
<tr>
<td>60 and 120 with Type 3510 Valve</td>
<td>7.5</td>
<td>3.6</td>
<td>18.0</td>
</tr>
<tr>
<td>120</td>
<td>7.5</td>
<td>5.0</td>
<td>25.0</td>
</tr>
<tr>
<td>120/175/240/350</td>
<td>15</td>
<td>7.0</td>
<td>35.0</td>
</tr>
<tr>
<td>355/700/750</td>
<td>7.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>355/700/750</td>
<td>15 and 30</td>
<td>10.0</td>
<td>50.0</td>
</tr>
<tr>
<td>1000/1400/2800</td>
<td>30</td>
<td>14.0</td>
<td>70.0</td>
</tr>
<tr>
<td>1400/2800</td>
<td>60</td>
<td>20.0</td>
<td>100.0</td>
</tr>
<tr>
<td>See manufacturer’s specifications</td>
<td>200</td>
<td>See manufacturer’s specifications</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rotary actuators</th>
<th>Required lever</th>
<th>Assigned pin position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening angle</td>
<td>24 to 100°</td>
<td>M 90°</td>
</tr>
</tbody>
</table>
4.1 Direct attachment

4.1.1 Type 3277-5 Actuator

- Required mounting parts and accessories: Table 1 on page 52
- Observe the travel table on page 23.

Actuator with 120 cm² (see Fig. 3)

Depending on the type of positioner attachment, the signal pressure is routed either left or right of the yoke through a hole to the actuator diaphragm. Depending on the fail-safe action of the actuator "actuator stem extends" or "actuator stem retracts" (valve closes or opens upon supply air failure), the switchover plate (9) must first be attached to the actuator yoke. Align the switchover plate with the corresponding symbol for left or right attachment according to the marking (view looking onto the switchover plate).

1. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly.

2. Remove screw plug (4) on the back of the positioner and seal the signal pressure output (38) on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.

3. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

4. Mount cover plate (10) with narrow side of the cut-out (Fig. 3, on the left) pointing towards the signal pressure connection.

Make sure that the gasket (14) points towards the actuator yoke.

5. 15 mm travel: Keep the follower pin (2) on the M lever (1) on the back of the positioner in the pin position 35 (delivered state).

7.5 mm travel: Remove the follower pin (2) from the pin position 35, reposition it in the hole for pin position 25 and screw tight.

6. Insert formed seal (15) into the groove of the positioner housing and insert the seal (10.1) on the back of the housing.

7. Place positioner on the cover plate (10) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or rotary pushbutton. The lever (1) must rest on the follower clamp with spring force. Mount the positioner on the cover plate (10) using the two fixing screws.

---

i Note

The following applies to all types of attachment except for direct attachment to Type 3277-5:
The signal pressure output at the back must be sealed by the screw plug (4, order no. 0180-1254) and the associated O-ring (order no. 0520-0412).

8. Mount cover (11) on the other side.

Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off.
Attachment to the control valve – Mounting parts and accessories

4.1 Direct attachment

4.1.1 Type 3277-5 Actuator

- Required mounting parts and accessories: Table 1 on page 52
- Observe the travel table on page 23.
- Actuator with 120 cm² (see Fig. 3)

Depending on the type of positioner attachment, the signal pressure is routed either left or right of the yoke through a hole to the actuator diaphragm. Depending on the fail-safe action of the actuator “actuator stem extends” or “actuator stem retracts” (valve closes or opens upon supply air failure), the switchover plate (9) must first be attached to the actuator yoke. Align the switchover plate with the corresponding symbol for left or right attachment according to the marking (view looking onto the switchover plate).

1. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly.

2. Remove screw plug (4) on the back of the positioner and seal the signal pressure output (38) on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.

3. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

4. Mount cover plate (10) with narrow side of the cut-out (Fig. 3, on the left) pointing towards the signal pressure connection.

Fig. 3: Direct attachment – Signal pressure connection for Type 3277-5 Actuator with 120 cm²

NOTICE

Only use the connecting plate (6) included in the accessories to connect supply and output!

Never screw threaded parts directly into housing!
4.1.2 Type 3277 Actuator
– Required mounting parts and accessories: Table 2 on page 53
– Observe the travel table on page 23.

Actuators with 175 to 750 cm² effective areas (see Fig. 4)

Mount the positioner on the yoke. The signal pressure is routed to the actuator over the connection block (12), for actuators with fail-safe action "actuator stem extends" internally through a hole in the valve yoke and for "actuator stem retracts" through an external pipe.

1. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

2. Mount cover plate (10) with narrow side of the cut-out (Fig. 4, on the left) pointing towards the signal pressure connection. Make sure that the gasket (14) points towards the actuator yoke.

3. For actuators with 355, 700 or 750 cm², remove the follower pin (2) on the M lever (1) on the back of the positioner from pin position 35, reposition it in the hole for pin position 50 and screw tight. For actuators 175, 240 and 350 cm² with 15 mm travel, keep the follower pin (2) in pin position 35.

4. Insert formed seal (15) into the groove of the positioner housing.

5. Place positioner on the cover plate in such a manner that the follower pin (2) rests on the top of the follower clamp (3).

6. Make sure that the tip of the gasket (16) projecting from the side of the connection block is positioned to match the actuator symbol for the actuator’s fail-safe action "actuator stem extends" or "actuator stem retracts". If this is not the case, unscrew the three fastening screws and lift off the cover. Turn the gasket (16) by 180° and re-insert it.

7. Place the connection block (12) with the associated seals against the positioner and the actuator yoke and fasten using the screw (12.1). For actuators with failsafe action "actuator stem retracts", additionally remove the stopper (12.2) and mount the external signal pressure pipe.

8. Mount cover (11) on the other side. Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off.

Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or rotary pushbutton. The lever (1) must rest on the follower clamp with spring force. Mount the positioner on the cover plate (10) using the two fixing screws.
4.1.2 Type 3277 Actuator

- Required mounting parts and accessories: Table 2 on page 53
- Observe the travel table on page 23.
- Actuators with 175 to 750 cm² effective areas (see Fig. 4)
- Mount the positioner on the yoke. The signal pressure is routed to the actuator over the connection block (12), for actuators with fail-safe action "actuator stem extends" internally through a hole in the valve yoke and for "actuator stem retracts" through an external pipe.

1. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.
2. Mount cover plate (10) with narrow side of the cut-out (Fig. 4, on the left) pointing towards the signal pressure connection. Make sure that the gasket (14) points towards the actuator yoke.
3. For actuators with 355, 700 or 750 cm², remove the follower pin (2) on the M lever (1) on the back of the positioner from pin position 35, reposition it in the hole for pin position 50 and screw tight.
4. For actuators 175, 240 and 350 cm² with 15 mm travel, keep the follower pin (2) in pin position 35.
5. Insert formed seal (15) into the groove of the positioner housing.
6. Place positioner on the cover plate in such a manner that the follower pin (2) rests on the top of the follower clamp (3).

Fig. 4: Direct attachment – Signal pressure connection for Type 3277 Actuator with 175 to 750 cm²
4.2 Attachment according to IEC 60534-6

- Required mounting parts and accessories: Table 3 on page 54
- Observe the travel table on page 23.

Fig. 5
The positioner is attached to the control valve using a NAMUR bracket (10).

1. Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) for fastening.

Actuator sizes 2800 cm² and 1400 cm² with 120 mm travel:
- For a travel of 60 mm or smaller, screw the longer follower plate (3.1) directly to the stem connector (9).
- For a travel exceeding 60 mm, mount the bracket (16) first and then the follower plate (3) to the bracket together with the bolts (14) and screws (14.1).

2. Mount NAMUR bracket (10) to the control valve as follows:
- For attachment to the NAMUR rib, use an M8 screw (11) and toothed lock washer directly in the yoke hole.
- For attachment to valves with rod-type yokes, use two U-bolts (15) around the yoke. Align the NAMUR bracket (10) according to the embossed scale so that the follower plate (3) is shifted by half the angle range to the NAMUR bracket (the slot of the follower plate is centrally aligned with the NAMUR bracket at mid valve travel).

3. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly.

4. Select required lever size (1) M, L or XL and pin position according to the actuator size and valve travel listed in the travel table on page 23.

Should a pin position other than position 35 with the standard M lever be required, or an L or XL lever size be required, proceed as follows:

5. Screw the follower pin (2) in the assigned lever hole (pin position as specified in the travel table). Only use the longer follower pin (2) included in the mounting kit.

6. Place the lever (1) on the shaft of the positioner and fasten it tight using the disk spring (1.2) and nut (1.1). Move lever once all the way as far as it will go in both directions.

7. Place positioner on the NAMUR bracket in such a manner that the follower pin (2) rests in the slot of the follower plate (3, 3.1). Adjust the lever (1) correspondingly.

Screw the positioner to the NAMUR bracket using both its mounting screws.
Attachment to the control valve – Mounting parts and accessories

4.2 Attachment according to IEC 60534-6

- Required mounting parts and accessories: Table 3 on page 54
- Observe the travel table on page 23.

Fig. 5: Attachment according to IEC 60534-6 (NAMUR)

1. Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) for fastening.

Actuator sizes 2800 cm² and 1400 cm² with 120 mm travel:
- For a travel of 60 mm or smaller, screw the longer follower plate (3.1) directly to the stem connector (9).
- For a travel exceeding 60 mm, mount the bracket (16) first and then the follower plate (3) to the bracket together with the bolts (14) and screws (14.1).

2. Mount NAMUR bracket (10) to the control valve as follows:
- For attachment to the NAMUR rib, use an M8 screw (11) and toothed lock washer directly in the yoke hole.
- For attachment to valves with rod-type yokes, use two U-bolts (15) around the yoke. Align the NAMUR bracket (10) according to the bossed scale so that the follower plate (3) is shifted by half the angle range to the NAMUR bracket (the slot of the follower plate is centrally

NOTICE

Only use the connecting plate (6) included in the accessories to connect supply and output!
Never screw threaded parts directly into housing!
4.3 Attachment according to VDI/VDE 3847

Type 3730-5xxx0xxxx0x0060xx and Type 3730-5xxx0xxxx0x0070xx Positioners with air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

Type 3730-5xxx0xxxx0x0000xx Positioner without air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

This type of attachment allows the positioner to be replaced quickly while the process is running by blocking the air in the actuator. The signal pressure can be blocked in the actuator by unscrewing the red retaining screw (20) and turning the air blocker (19) on the bottom of the adapter block.

Attachment to Type 3277 Actuator (see Fig. 6)

− Required mounting parts and accessories: Table 4 on page 54

Mount the positioner on the yoke as shown in Fig. 6. The signal pressure is routed to the actuator over the connecting plate (12), for actuators with fail-safe action "actuator stem extends" internally through a bore in the valve yoke and for "actuator stem retracts" through external piping.

Only the Y1 port is required for positioner attachment. The Y2 port can be used for air purging of the spring chamber.

1. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

2. Place the adapter bracket (6) on the positioner and mount using the screws (6.1). Make sure that the seals are correctly seated. For positioners with air purging, remove the stopper (5) before mounting the positioner. For positioners without air purging, replace the screw plug (4) with a vent plug.

3. For actuators with 355, 700 or 750 cm², remove the follower pin (2) on the M lever (1) on the back of the positioner from pin position 35, reposition it in the hole for pin position 50 and screw tight. For actuators 175, 240 and 350 cm² with 15 mm travel, keep the follower pin (2) in pin position 35.

4. Insert the formed seal (6.2) in the groove of the adapter bracket (6).

5. Insert the formed seal (17.1) into the turnboard (17) and mount the turnboard to the adapter block (13) using the screws (17.2).

6. Mount the blank plate (18) to the turnboard (17) using the screws (18.1). Make sure that the seals are correctly seated.

Note

A solenoid valve can also be mounted in place of the blank plate (18). The orientation of the turnboard (17) determines the mounting position of the solenoid valve. Alternatively, a restrictor plate can be mounted (AB 11).
4.3 Attachment according to VDI/VDE 3847

Type 3730-5xxx0xxxx0x0060xx and Type 3730-5xxx0xxxx0x0070xx Positioners with air purging of the actuator’s spring chamber can be attached according to VDI/VDE 3847.

Type 3730-5xxx0xxxx0x0000xx Positioner without air purging of the actuator’s spring chamber can be attached according to VDI/VDE 3847.

This type of attachment allows the positioner to be replaced quickly while the process is running by blocking the air in the actuator.

The signal pressure can be blocked in the actuator by unscrewing the red retaining screw (20) and turning the air blocker (19) on the bottom of the adapter block.

Attachment to Type 3277 Actuator (see Fig. 6)

− Required mounting parts and accessories: Table 4 on page 54

Mount the positioner on the yoke as shown in Fig. 6. The signal pressure is routed to the actuator over the connecting plate (12), for actuators with fail-safe action “actuator stem extends” internally through a bore in the valve yoke and for “actuator stem retracts” through external piping.

Only the Y1 port is required for positioner attachment. The Y2 port can be used for air purging of the spring chamber.

1. Place follower clamp (3) on the actuator stem, align it and screw tight so that the

Fig. 6: Attachment according to VDI/VDE 3847 onto Type 3277 Actuator
7. Insert the screws (13.1) through the middle holes of the adapter block (13).

8. Place the connecting plate (12) together with the seal (12.1) onto the screws (13.1) corresponding to the fail-safe action "actuator stem extends" or "actuator stem retracts". The fail-safe action that applies is determined by aligning the groove of the adapter block (13) with the groove of the connecting plate (12) (Fig. 7).

Place positioner on the adapter block (13) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or rotary pushbutton. The lever (1) must rest on the follower clamp with spring force. Fasten the positioner to the adapter block (13) using the two fastening screws (6.3). Make sure the formed seal (6.2) is properly seated.

12. Mount cover (11) on the other side to the yoke. Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off.

9. Mount the adapter block (13) together with the connecting plate (12) to the actuator using the screws (13.1).

10. Insert the vent plug (11.1) into the Exh. connection.

11. For fail-safe action "actuator stem extends", seal the Y1 port with a blanking plug.
   For fail-safe action "actuator stem retracts", connect the Y1 port to the signal pressure connection of the actuator.

Fig. 7: Fail-safe action
Attachment to NAMUR rib (see Fig. 10)

- Required mounting parts and accessories: Table 4 on page 54
- Observe the travel table on page 23.

1. **Series 240 Valves, actuator size up to 1400-60 cm²**: Screw the two bolts (14) to the bracket of the stem connector or directly to the stem connector (depending on the version), place the follower plate (3) on top and use the screws (14.1) to fasten it.

   **Type 3251 Valve, 350 to 2800 cm²**: Screw the longer follower plate (3.1) to the bracket of the stem connector or directly to the stem connector (depending on the version).

   **Type 3254 Valve, 1400-120 to 2800 cm²**: Screw the two bolts (14) to the bracket (16). Fasten the bracket (16) onto the stem connector, place the follower plate (3) on top and use the screws (14.1) to fasten it.

Mount the positioner on the NAMUR rib as shown in Fig. 8.

2. For attachment to the NAMUR rib, fasten the NAMUR connection block (10) directly into the existing yoke bore using the screw and toothed lock washer (11). Align the marking on the NAMUR valve connection (on the side marked '1') to 50 % travel.

   For attachment to valves with rod-type yokes using the formed plate (15), which is placed around the yoke: screw the four studs into the NAMUR connection block (10). Place the NAMUR connection block on the rod and position the formed plate (15) on the opposite side. Use the nuts and toothed lock washers to fasten the formed plate onto the studs. Align the marking on the NAMUR valve connection (on the side marked '1') to 50 % travel.

3. Place the adapter bracket (6) on the positioner and mount using the screws (6.1). Make sure that the seals are correctly seated. For positioners **with air purging**, remove the stopper (5) before mounting the positioner. For positioners **without air purging**, replace the screw plug (4) with a vent plug.

4. Select required lever size (1) M, L or XL and pin position according to the actuator size and valve travel listed in the travel table on page 23. Should a pin position other than position 35 with the standard M lever be required, or an L or XL lever size be required, proceed as follows:
   - Screw the follower pin (2) in the assigned lever hole (pin position as specified in the travel table). Only use the longer follower pin (2) included in the mounting kit.
   - Place the lever (1) on the shaft of the positioner and fasten it tight using the disk spring (1.2) and nut (1.1).
   - Move lever once all the way as far as it will go in both directions.

5. Insert the formed seal (6.2) in the groove of the adapter bracket.
6. Insert the formed seal (17.1) into the turnboard (17) and mount the turnboard to the adapter block (13) using the screws (17.2).

7. Mount the blank plate (18) to the turnboard using the screws (18.1). Make sure that the seals are correctly seated.

---

**Note**

A solenoid valve can also be mounted in place of the blank plate (18). The orientation of the turnboard (17) determines the mounting position of the solenoid valve. Alternatively, a restrictor plate can be mounted (› AB 11).

---

8. Fasten the adapter block (13) to the NAMUR connection block using the screws (13.1).

9. Insert the vent plug into the Exh. connection.

10. Place the positioner on the adapter block (13) in such a manner that the follower pin (2) rests on the top of the follower plate (3, 3.1). Adjust the lever (1) correspondingly.

    Fasten the positioner to the adapter block (13) using the two fastening screws (6.3). Make sure the formed seal (6.2) is properly seated.

11. For **single-acting actuators without air purging**, connect the Y1 port of the adapter block to the signal pressure connection of the actuator. Seal the Y2 port with a blanking plug.

For **double-acting actuators and actuators with air purging**, connect the Y2 port of the adapter block to the signal pressure connection of the second actuator chamber or spring chamber of the actuator.
Attachment to the control valve – Mounting parts and accessories

For double-acting actuators and actuators with air purging, connect the Y2 port of the adapter block to the signal pressure connection of the second actuator chamber or spring chamber of the actuator.

Fig. 8: Attachment according to VDI/VDE 3847 to a NAMUR rib
4.4 Attachment to Type 3510 Micro-flow Valve

Fig. 9
- Required mounting parts and accessories: Table 3 on page 54
- Observe the travel table on page 23.

The positioner is attached to the valve yoke using a bracket.

1. Fasten the bracket (9.1) to the stem connector.
2. Screw the two pins (9.2) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (9.3) for fastening.
3. Mount the travel indication scale (accessories) to the outer side of the yoke using the hex screws (12.1), ensuring that the scale is aligned with the stem connector.
4. Fasten the hex bar (11) onto the outer side of yoke by screwing the M8 screws (11.1) directly into the holes on the yoke.
5. Fasten the bracket (10) to the hex bar using the hex screw (10.1), washer, and tooth lock washer.
6. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals are seated properly.
7. Unscrew the standard M lever (1) including follower pin (2) from the positioner shaft.
8. Take the S lever (1) and screw the follower pin (2) in the hole for pin position 17.
9. Place the S lever on the positioner shaft and screw tight using the disk spring (1.2) and nut (1.1).
   Move lever once all the way as far as it will go in both directions.
10. Place positioner on the bracket (10) in such a manner that the follower pin slides into the groove of the follower pin (3). Adjust the lever (1) correspondingly. Screw the positioner to the bracket (10) using both its screws.

4.5 Attachment to rotary actuators

Fig. 11
- Required mounting parts and accessories: Table 5 on page 55
- Observe the travel table on page 23.

The positioner is mounted to the rotary actuator using two pairs of brackets.

Prior to attaching the positioner to the SAMSON Type 3278 Rotary Actuator, mount the associated adapter (5) to the free end of the rotary actuator shaft.

---

Note

On attaching the positioner as described below, it is imperative that the actuator’s direction of rotation is observed.

1. Place follower clamp (3) on the slotted actuator shaft or adapter (5).
Fig. 9: Attachment to Type 3510 Micro-flow Valve
2. Place coupling wheel (4) with flat side facing the actuator on the follower clamp (3). Refer to Fig. 11 to align slot so that it matches the direction of rotation when the valve is in its closed position.

3. Fasten the coupling wheel (4) and follower clamp (3) tightly onto the actuator shaft using screw (4.1) and disk spring (4.2).

4. Fasten the bottom pair of brackets (10.1) with the bends pointing either facing to the inside or to the outside (depending on the actuator size) onto the actuator housing. Position the top pair of brackets (10) and fasten.

5. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals are seated properly. Double-acting springless rotary actuators require the use of a reversing amplifier on the connection side of the positioner housing (see section 4.6).

6. Unscrew the standard follower pin (2) from the positioner's M lever (1). Use the metal follower pin (Ø 5 mm) included in the mounting kit and screw tight into the hole for pin position 90°.

7. Place positioner on the top bracket (10) and fasten tight. Taking the actuator's direction of rotation into account, adjust lever (1) so that it engages in the slot of the coupling wheel (4) with its follower pin (Fig. 11). It must be guaranteed that the lever (1) is parallel to the long side of the positioner when the actuator is at half its angle of rotation.

8. Stick the scale plate (4.3) on the coupling wheel so that the arrow tip indicates the closed position and it can be easily read when the valve is installed.

4.5.1 Heavy-duty version

Fig. 13

- Required mounting parts and accessories: Table 5 on page 55

Both mounting kits contain all the necessary mounting parts. The parts for the actuator size used must be selected from the mounting kit.

Prepare actuator and mount possibly required adapter supplied by the actuator manufacturer.

1. Mount the housing (10) onto the rotary actuator. In case of VDI/VDE attachment,
2. Place coupling wheel (4) with flat side facing the actuator on the follower clamp (3). Refer to Fig. 11 to align slot so that it matches the direction of rotation when the valve is in its closed position.

3. Fasten the coupling wheel (4) and follower clamp (3) tightly onto the actuator shaft using screw (4.1) and disk spring (4.2).

4. Fasten the bottom pair of brackets (10.1) with the bends pointing either facing to the inside or to the outside (depending on the actuator size) onto the actuator housing. Position the top pair of brackets (10) and fasten.

5. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals are seated properly.

Double-acting springless rotary actuators require the use of a reversing amplifier on the connection.

---

**NOTICE**

Only use the connecting plate (6) included in the accessories to connect supply and output! Never screw threaded parts directly into housing!

---

**Legend for Fig. 10 and Fig. 11**

1. Lever  
1.1 Nut  
1.2 Disk spring  
2. Follower pin  
3. Follower clamp (Fig. 10)  
4. Coupling wheel  
4.1 Screw  
4.2 Disk spring  
4.3 Scale plate  
5. Actuator shaft Adapter for Type 3278  
6. Connecting plate  
6.1 Seals  
7. Pressure gauge bracket  
8. Pressure gauge mounting kit  
10. Top pair of brackets  
10.1 Bottom pair of brackets

---

**Fig. 11: Attachment to rotary actuators**
place spacers (11) underneath, if necessary.

2. For SAMSON Type 3278 and VETEC S160 Rotary Actuators, screw the adapter (5) onto the free end of the shaft or place adapter (5.1) onto the shaft of the VETEC R Actuator. Place adapter (3) onto Type 3278, VETEC S160 and VETEC R Actuators. For VDI/VDE version, this step depends on the actuator size.

3. Stick adhesive label (4.3) onto the coupling in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the enclosure, if required.

4. Fasten coupling wheel (4) on the slotted actuator shaft or adapter (3) using screw (4.1) and disk spring (4.2).

5. Unscrew the standard follower pin (2) from the positioner’s M lever (1). Attach the follower pin (Ø5 mm) included in the mounting kit to pin position 90°.

6. Mount connecting plate (6) for required G ¼ connecting thread or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly. Double-acting springless rotary actuators require the use of a reversing amplifier on the connection side of the positioner housing (refer to section 4.6).

7. For actuators with a volume of less than 300 cm³, fit the restriction (order no. 1400-6964) into the signal pressure output of the positioner (or the output of the pressure gauge bracket or connecting plate).

8. Place positioner on housing (10) and screw it tight. Taking the actuator’s direction of rotation into account, adjust lever (1) so that it engages in the correct slot with its follower pin (Fig. 12).

**4.6 Reversing amplifier for double-acting actuators**

For the use with double-acting actuators, the positioner must be fitted with a reversing amplifier, e.g. the SAMSON Type 3710 Reversing Amplifier (see Mounting and Operating Instructions EB 8392).
Attachment to the control valve – Mounting parts and accessories

2. For SAMSON Type 3278 and VETEC S160 Rotary Actuators, screw the adapter (5) onto the free end of the shaft or place adapter (5.1) onto the shaft of the VETEC R Actuator. Place adapter (3) onto Type 3278, VETEC S160 and VETEC R Actuators. For VDI/VDE version, this step depends on the actuator size.

3. Stick adhesive label (4.3) onto the coupling in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the enclosure, if required.

Fig. 13: Attachment to rotary actuators (heavy-duty version)
If a different reversing amplifier (item no. 1079-1118 or 1079-1119) is used, follow the mounting instructions described in section 4.6.1.

The following applies to all reversing amplifiers:

The signal pressure of the positioner is supplied at the output 1 of the reversing amplifier. An opposing pressure, which equals the required supply pressure (Z) when added to the pressure at output 1, is applied at output 2.

The following relationship applies:
\[ \text{output 1 + output 2 = Supply pressure (Z)} \]

Connect output 1 to the signal pressure connection on the actuator that causes the valve to open when the pressure rises.

Connect output 2 to the signal pressure connection on the actuator that causes the valve to close when the pressure rises.

➔ Set slide switch on positioner to AIR TO OPEN.

### Note
How the outputs are marked depends on the reversing amplifier used:
- **Type 3710:** Output 1/2 = Y₁/Y₂
- **1079-1118 and 1079-1119:**
  - Output 1/2 = A₁/A₂

### 4.6.1 Reversing amplifier (1079-1118 or 1079-1119)

**Fig. 14**

1. Mount the connecting plate (6) from the accessories in Table 5 to the positioner. Make sure that both O-rings (6.1) are seated correctly.

2. Thread the special nuts (1.3) from the accessories of the reversing amplifier into the boreholes of the connecting plate.

3. Insert the gasket (1.2) into the recess of the reversing amplifier and slide both the hollowed special screws (1.1) into the connecting boreholes \( A₁ \) and \( Z \).

4. Place the reversing amplifier onto the connecting plate (6) and screw tight using both the special screws (1.1).

5. Use a screwdriver (8 mm wide) to screw the enclosed filters (1.6) into the connection boreholes \( A₁ \) and \( Z \).

### Notice
Air can escape uncontrolled from the signal pressure connection.
Do not unscrew the sealing plug (1.5) out of the reversing amplifier.

### Note
The rubber seal (1.4) is not required and can be removed when the sealing plug is used.

6. After initialization, set Code 16 (Pressure limit) to No.
Attachment to the control valve – Mounting parts and accessories

4.6.1 Reversing amplifier (1079-1118 or 1079-1119)

1. Mount the connecting plate (6) from the accessories in Table 5 to the positioner. Make sure that both O-rings (6.1) are seated correctly.

2. Thread the special nuts (1.3) from the accessories of the reversing amplifier into the boreholes of the connecting plate.

3. Insert the gasket (1.2) into the recess of the reversing amplifier and slide both the hollowed special screws (1.1) into the connecting boreholes A1 and Z.

4. Place the reversing amplifier onto the connecting plate (6) and screw tight using both the special screws (1.1).

5. Use a screwdriver (8 mm wide) to screw the enclosed filters (1.6) into the connection boreholes A1 and Z.

Air can escape uncontrolled from the signal pressure connection. Do not unscrew the sealing plug (1.5) out of the reversing amplifier.

The rubber seal (1.4) is not required and can be removed when the sealing plug is used.

6. After initialization, set Code 16 (Pressure limit) to No. 1.

Fig. 14: Mounting a reversing amplifier (1079-1118 or 1079-1119)
Pressure gauge attachment
The mounting sequence shown in Fig. 14 remains unchanged. Screw a pressure gauge bracket onto the connections $A_1$ and $Z$.

Pressure gauge bracket $\frac{G}{4}$ 1400-7106 $\frac{1}{4}$ NPT 1400-7107

Pressure gauges for supply air $Z$ and output $A_1$ as listed in Table 1 to Table 7.

4.7 Attachment of external position sensor

Positioner unit with sensor mounted on a micro-flow valve

- Required mounting parts and accessories:
  Table 7 on page 56

In the positioner version with an external position sensor, the sensor located in a separate housing is attached over a plate or bracket to the control valve. The travel pick-off corresponds to that of a standard device. The positioner can be mounted as required to a wall or a pipe.

For the pneumatic connection either a connecting plate (6) or a pressure gauge bracket (7) must be fixed to the housing, depending on the accessory chosen. Make sure the seals (6.1) are correctly inserted (see Fig. 5, bottom right).

**For the electrical connection** a 10 meter connecting lead with M12x1 connectors is included in the scope of delivery.

<table>
<thead>
<tr>
<th>Note</th>
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<tr>
<td>In addition, the instructions in sections 5.1 and 5.2 apply for the pneumatic and electrical connection. Operation and setting are described in sections 7 and 8. Since 2009, the back of the position sensor (20) is fitted with two pins acting as mechanical stops for the lever (1). If this position sensor is mounted using old mounting parts, two corresponding $\varnothing$ 8 mm holes must be drilled into the mounting plate/bracket (21). A template is available for this purpose. See Table 7.</td>
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4.7.1 Mounting the position sensor with direct attachment

Type 3277-5 Actuator with 120 cm² (Fig. 15)
The signal pressure from the positioner is routed over the signal pressure connection of the connecting plate (9, Fig. 15 left) to the actuator diaphragm chamber. To proceed, first screw the connecting plate (9) included in the accessories onto the actuator yoke.

- Turn the connecting plate (9) so that the correct symbol for the fail-safe action "actuator stem extends" or "actuator stem retracts" is aligned with the marking (Fig. 15, below).
- Make absolutely sure that the gasket for the connecting plate (9) is correctly inserted.
- The connecting plate has threaded holes with NPT and G threads. Seal the threaded connection that is not used with the rubber seal and square plug.

Type 3277 Actuator with 175 to 750 cm²:
The signal pressure is routed to the connection at the side of the actuator yoke for the version with fail-safe action "actuator stem

Fig. 15: Mounting for Type 3277-5 Actuator (left) and Type 3277 Actuator (right)
extends". For the fail-safe action "actuator stem retracts" the connection on the top diaphragm case is used. The connection at the side of the yoke must be fitted with a venting plug (accessories).

**Mounting the position sensor**

1. Place the lever (1) on the sensor in mid-position and hold it in place. Un-thread the nut (1.1) and remove the lever together with the disk spring (1.2) from the sensor shaft.

2. Screw the position sensor (20) onto the mounting plate (21).

3. Depending on the actuator size and rated valve travel, determine which lever and position of the follower pin (2) is to be used from the travel table on page 23. The positioner is delivered with the M lever in pin position 35 on the sensor. If necessary, remove the follower pin (2) from its pin position and move it to the hole for the recommended pin position and screw tight.

4. Place the lever (1) and disk spring (1.2) on the sensor shaft. Place the lever in mid-position and hold it in place. Screw on the nut (1.1).

5. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

6. Place the mounting plate together with the sensor onto the actuator yoke so that the follower pin (2) rests on the top of the follower clamp (3). It must rest on it with spring force. Fasten the mounting plate (21) onto the actuator yoke using both fixing screws.

7. Mount cover (11) on the other side. Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off.
4.7.2 Mounting the position sensor with attachment according to IEC 60534-6

- Required mounting parts and accessories: Table 7 on page 56

Fig. 16

1. Place the lever (1) on the position sensor in mid-position and hold it in place. Un-thread the nut (1.1) and remove the lever together with the disk spring (1.2) from the sensor shaft.

2. Screw the position sensor (20) onto the bracket (21).

The standard attached M lever with the follower pin (2) at position 35 is designed for 120 to 350 cm² actuators with 15 mm rated travel. For other actuator sizes or travels, select the lever and pin position from the travel table on page 23. L and XL levers are included in the mounting kit.

3. Place the lever (1) and disk spring (1.2) on the sensor shaft. Place the lever in mid-position and hold it in place. Screw on the nut (1.1).

4. Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) for fastening.

5. Place the bracket with the sensor at the NAMUR rib in such a manner that the follower pin (2) rests in the slot of the follower plate (3), then screw the bracket using its fixing screws onto the valve.

Fig. 16: Mounting according to IEC 60534-6 (NAMUR)
4.7.3 Mounting the position sensor to Type 3510 Micro-flow Valve

- Required mounting parts and accessories: Table 7 on page 56

Fig. 17

1. Place the lever (1) on the position sensor in mid-position and hold it in place. Unscrew the nut (1.1) and remove the standard attached M lever (1) together with the disk spring (1.2) from the sensor shaft.

2. Screw the position sensor (20) onto the bracket (21).

3. Select the S lever (1) from the accessories and screw the follower pin (2) into the hole for pin position 17. Place the lever (1) and disk spring (1.2) on the sensor shaft. Place the lever in mid-position and hold it in place. Screw on the nut (1.1).

4. Place follower clamp (3) on the valve stem connector, align at a right angle and screw tight.

5. Position the bracket (21) with the position sensor on the valve yoke and screw tight, making sure the follower pin (2) slides into the groove of the follower clamp (3).

---

Fig. 17: Mounting on a micro-flow valve

1. Lever
2. Follower pin
3. Follower clamp
20. Position sensor
21. Bracket
4.7.4 Mounting on rotary actuators

- Required mounting parts and accessories: Table 7 on page 56

Fig. 18

1. Place the lever (1) on the position sensor in mid-position and hold it in place. Unthread the nut (1.1) and remove the lever together with the disk spring (1.2) from the sensor shaft.

2. Screw the position sensor (20) onto the mounting plate (21).

3. Replace the follower pin (2) normally attached to the lever (1) with the metal follower pin (Ø 5 mm) from the accessories and screw it into the hole for pin position 90°.

4. Place the lever (1) and disk spring (1.2) on the sensor shaft. Place the lever in mid-position and hold it in place. Screw on the nut (1.1).

Follow the instructions describing attachment to the standard positioner in section 4.5. Instead of the positioner, attach the position sensor (20) with its mounting plate (21).

Fig. 18: Mounting on rotary actuators
4.8 Mounting the leakage sensor

Fig. 19
Normally, the control valve is delivered with positioner and leakage sensor already mounted. If the leakage sensor is mounted after the valve has been installed or it is mounted onto another control valve, proceed as described in the following.

⚠️ NOTICE
Risk of malfunction due to incorrect fastening.
Fasten the leakage sensor using a torque of 20 ±5 Nm.

The M8 threaded connection on the NAMUR rib should preferably be used to mount the sensor (Fig. 19).

☀️ Tip
If the positioner was mounted directly onto the actuator (integral attachment), the NAMUR interfaces on either side of the valve yoke can be used to mount the leakage sensor.

The start-up of the leakage sensor is described in detail in the Operating Instructions for EXPERTplus Valve Diagnostics.

Fig. 19: Mounting the leakage sensor
4.9 Attaching positioners with stainless steel housings

Positioners with stainless steel housings require mounting parts that are completely made of stainless steel or free of aluminum.

**Note**

The pneumatic connecting plate and pressure gauge bracket are available in stainless steel (order numbers listed below). The Type 3710 Pneumatic Reversing Amplifier is also available in stainless steel.

<table>
<thead>
<tr>
<th>Connecting plate (stainless steel)</th>
<th>G ¼</th>
<th>1400-7476</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>¼ NPT</td>
<td>1400-7477</td>
</tr>
<tr>
<td>Pressure gauge bracket (stainless steel)</td>
<td>G ¼</td>
<td>1402-0265</td>
</tr>
<tr>
<td></td>
<td>¼ NPT</td>
<td>1400-7108</td>
</tr>
</tbody>
</table>

Table 1 to Table 6 apply for attaching positioners with stainless steel housings with the following restrictions:

**Direct attachment**

All mounting kits from Table 1 and Table 2 can be used. The connection block is not required. The stainless steel version of the pneumatic connecting plate routes the air internally to the actuator.

**Attachment according to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes)**

All mounting kits from Table 3 can be used. Connecting plate in stainless steel.

**Attachment to rotary actuators**

All mounting kits from Table 5 can be used except for the heavy-duty version. Connecting plate in stainless steel.

4.10 Air purging function for single-acting actuators

The instrument air leaving from the positioner is diverted to the actuator spring chamber to provide corrosion protection inside the actuator. The following must be observed:

**Direct attachment to Type 3277-5 (stem extends FA/stem retracts FE)**

The air purging function is automatically provided.

**Direct attachment to Type 3277, 175 to 750 cm²**

FA: Remove the stopper (12.2, Fig. 4) at the black connection block and make a pneumatic connection to the spring chamber on the vented side.

**NOTICE**

Mounting possibly incorrect when old powder-paint-coated aluminum connection blocks are used.

Mount old powder-paint-coated aluminum connection blocks as described in sections on Attachment according to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes) and Attachment to rotary actuators.

FE: The air purging function is automatically provided.
Attachment according to IEC 60534-6
(NAMUR rib or attachment to rod-type yokes) and to rotary actuators
The positioner requires an additional port for the exhaust air that can be connected over piping. An adapter available as an accessory is used for this purpose:

Threaded bushing  G ¼  0310-2619
(M20x1.5)   ¼ NPT  0310-2550

**Note**
The adapter uses one of the M20x1.5 connections in the housing which means only one cable gland can be installed.

### 4.11 Required mounting parts and accessories

<table>
<thead>
<tr>
<th>Table 1: Direct attachment to Type 3277-5 Actuator (Fig. 3)</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mounting parts</strong></td>
<td></td>
</tr>
<tr>
<td>Standard version for actuators 120 cm² or smaller</td>
<td>1400-7452</td>
</tr>
<tr>
<td>Version compatible with paint for actuators 120 cm² or smaller</td>
<td>1402-0940</td>
</tr>
<tr>
<td><strong>Accessories for actuator</strong></td>
<td></td>
</tr>
<tr>
<td>Old switchover plate for Type 3277-5xxxxxx.00 Actuator (old)</td>
<td>1400-6819</td>
</tr>
<tr>
<td>New switchover plate for Type 3277-5xxxxxx.01 Actuator (new)</td>
<td>1400-6822</td>
</tr>
<tr>
<td>New connecting plate for Type 3277-5xxxxxx.01 Actuator (new)</td>
<td>1400-6823</td>
</tr>
<tr>
<td>Old connecting plate for Type 3277-5xxxxxx.00 Actuator (old): G ¼ and ½ NPT</td>
<td>1400-6820</td>
</tr>
<tr>
<td>Old connecting plate for Type 3277-5xxxxxx.00 (old): ½ NPT</td>
<td>1400-6821</td>
</tr>
<tr>
<td><strong>Accessories for positioner</strong></td>
<td></td>
</tr>
<tr>
<td>Connecting plate (6)</td>
<td>G ¼</td>
</tr>
<tr>
<td></td>
<td>¼ NPT</td>
</tr>
<tr>
<td></td>
<td>1400-7461</td>
</tr>
<tr>
<td></td>
<td>1400-7462</td>
</tr>
<tr>
<td>Pressure gauge bracket (7)</td>
<td>G ¼</td>
</tr>
<tr>
<td></td>
<td>¼ NPT</td>
</tr>
<tr>
<td></td>
<td>1400-7458</td>
</tr>
<tr>
<td></td>
<td>1400-7459</td>
</tr>
<tr>
<td>Pressure gauge mounting kit (8) up to max. 6 bar (output/ supply)</td>
<td>Stainless steel/ brass</td>
</tr>
<tr>
<td></td>
<td>Stainless steel/ stainless steel</td>
</tr>
</tbody>
</table>

1) Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are not interchangeable.

Should other valve accessories be used which vent the actuator (e.g. solenoid valve, volume booster, quick exhaust valve), this exhaust air must also be included in the purging function. The connection over the adapter at the positioner must be protected with a check valve (e.g. check valve G ¼, order no. 8502-0597) mounted in the piping. Otherwise the pressure in the positioner housing would rise above the ambient pressure and damage the positioner when the exhausting components respond suddenly.
## Table 2: Direct attachment to Type 3277 Actuator (Fig. 4)

<table>
<thead>
<tr>
<th>Mounting parts</th>
<th>Standard version for actuators 175, 240, 350, 355, 700, 750 cm²</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Version compatible with paint for actuators 175, 240, 350, 355, 700, 750 cm²</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Piping with screw fittings</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>– for fail-safe action &quot;actuator stem retracts&quot;</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>– with air purging of the top diaphragm chamber</td>
<td>-----------</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Mounting parts</th>
<th>G ¼/ G ¾</th>
</tr>
</thead>
<tbody>
<tr>
<td>175 cm²</td>
<td>¼ NPT/¾ NPT 1402-0970</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1402-0971</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0978</td>
</tr>
<tr>
<td>240 cm²</td>
<td>Steel G ¼/ G ¾ 1400-6444</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0911</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1400-6445</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0912</td>
</tr>
<tr>
<td>350 cm²</td>
<td>Steel G ¼/ G ¾ 1400-6446</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1400-6447</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1400-6447</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0913</td>
</tr>
<tr>
<td>355 cm²</td>
<td>Steel G ¼/ G ¾ 1402-0972</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0979</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1402-0973</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0980</td>
</tr>
<tr>
<td>700 cm²</td>
<td>Steel G ¼/ G ¾ 1400-6448</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0915</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1400-6449</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0916</td>
</tr>
<tr>
<td>750 cm²</td>
<td>Steel G ¼/ G ¾ 1402-0974</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0981</td>
</tr>
<tr>
<td></td>
<td>Stainless steel G ¼/ G ¾ 1402-0975</td>
</tr>
<tr>
<td></td>
<td>¼ NPT/¾ NPT 1402-0982</td>
</tr>
<tr>
<td>Connection block with seals and screw</td>
<td>G ¼</td>
</tr>
<tr>
<td></td>
<td>¼ NPT 1400-8819 1402-0901</td>
</tr>
<tr>
<td>Pressure gauge mounting kit up to max. 6 bar (output/supply)</td>
<td>Stainless steel/brass 1402-0938</td>
</tr>
<tr>
<td></td>
<td>Stainless steel/stainless steel 1402-0939</td>
</tr>
</tbody>
</table>
Attachment to the control valve – Mounting parts and accessories

Table 3: Attachment to NAMUR ribs or control valves with rod-type yokes (20 to 35 mm rod diameter) according to IEC 60534-6 (Fig. 5 and Fig. 9)

<table>
<thead>
<tr>
<th>Travel in mm</th>
<th>Lever</th>
<th>For actuator</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>S</td>
<td>Type 3271-5 with 60/120 cm² on Type 3510 Micro-flow Valve (Fig. 9)</td>
<td>1402-0478</td>
</tr>
<tr>
<td>5 to 50</td>
<td>M 1)</td>
<td>Actuators from other manufacturers and Type 3271 with 120 to 750 cm² effective areas</td>
<td>1400-7454</td>
</tr>
<tr>
<td>14 to 100</td>
<td>L</td>
<td>Actuators from other manufacturers and Type 3271 with 1000 and 1400-60 cm²</td>
<td>1400-7455</td>
</tr>
<tr>
<td>40 to 200</td>
<td>XL</td>
<td>Actuators from other manufacturers and Type 3271 with 1400-120 and 2800 cm² and with 120 mm travel</td>
<td>1400-7456</td>
</tr>
<tr>
<td>30 or 60</td>
<td>L</td>
<td>Type 3271 with 1400-120 and 2800 cm² with 30/60 mm travel 2)</td>
<td>1400-7466</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mounting brackets for Emerson and Masoneilan linear actuators (in addition, a mounting kit according to IEC 60534-6 is required depending on the travel). See rows above.</td>
<td>1400-6771</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Valtek Type 25/50</td>
<td>1400-9554</td>
</tr>
</tbody>
</table>

Accessories

| Connecting plate (6) | G ¼ | 1400-7461 |
|                      | ¼ NPT | 1400-7462 |
| Pressure gauge bracket (7) | G ¼ | 1400-7458 |
|                      | ¼ NPT | 1400-7459 |
| Pressure gauge mounting kit up to max. 6 bar (output/supply) | Stainless steel/brass | 1402-0938 |
|                      | Stainless steel/stainless steel | 1402-0939 |

2) M lever is mounted on basic device (included in the scope of delivery)

3) In conjunction with Type 3273 Side-mounted Handwheel with 120 mm rated travel, additionally one bracket (0300-1162) and two countersunk screws (8330-0919) are required.

Table 4: Attachment according to VDI/VDE 3847 (Fig. 6 and Fig. 8)
Electropneumatic positioners with VDI/VDE 3847 interface (Type 3730-5xxxx0xxxx0x0070xx)

<table>
<thead>
<tr>
<th>Mounting parts</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface adapter</td>
<td>1402-0257</td>
</tr>
<tr>
<td>Mounting kit for attachment to SAMSON Type 3277 Actuator with 175 to 750 cm²</td>
<td>1402-0868</td>
</tr>
<tr>
<td>Mounting kit for attachment to SAMSON Type 3271 Actuator or non-SAMSON actuators</td>
<td>1402-0869</td>
</tr>
<tr>
<td>Connecting plate, including connection for air purging of actuator spring chamber</td>
<td>1402-0268</td>
</tr>
<tr>
<td>Aluminum</td>
<td>ISO 228/1-G ¼</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>ISO 228/1-G ¼</td>
</tr>
<tr>
<td>Travel pick-off for valve travel up to 100 mm</td>
<td>1402-0177</td>
</tr>
<tr>
<td>Travel pick-off for 100 to 200 mm valve travel (SAMSON Type 3271 Actuator only)</td>
<td>1402-0178</td>
</tr>
</tbody>
</table>
### Table 5: Attachment to rotary actuators (Fig. 10 and Fig. 11)

<table>
<thead>
<tr>
<th>Mounting parts</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment acc. to VDI/VDE 3845 (September 2010), see section 15.1 for details</td>
<td></td>
</tr>
<tr>
<td>Actuator surface corresponds to fixing level 1</td>
<td></td>
</tr>
<tr>
<td>Size AA1 to AA4, version with CrNiMo steel bracket</td>
<td>1400-7448</td>
</tr>
<tr>
<td>Size AA1 to AA4, heavy-duty version</td>
<td>1400-9244</td>
</tr>
<tr>
<td>Size AA5, heavy-duty version (e.g. Air Torque 10 000)</td>
<td>1400-9542</td>
</tr>
<tr>
<td>Bracket surface corresponds to fixing level 2, heavy-duty version</td>
<td>1400-9526</td>
</tr>
<tr>
<td>Attachment for rotary actuators with max. 180° opening angle, fixing level 2</td>
<td>1400-8815 and 1400-9837</td>
</tr>
<tr>
<td>Attachment to SAMSON Type 3278 with 160/320 cm², CrNiMo steel bracket</td>
<td>1400-7614</td>
</tr>
<tr>
<td>Attachment to SAMSON Type 3278 with 160 cm² and to VETEC Type S160, Type R and Type M, heavy-duty version</td>
<td>1400-9245</td>
</tr>
<tr>
<td>Attachment to SAMSON Type 3278 with 320 cm² and to VETEC Type S320, heavy-duty version</td>
<td>1400-5891 and 1400-9526</td>
</tr>
<tr>
<td>Attachment to Camflex II</td>
<td>1400-9120</td>
</tr>
<tr>
<td>Connecting plate (6)</td>
<td>1400-7461</td>
</tr>
<tr>
<td>¼ NPT</td>
<td>1400-7462</td>
</tr>
<tr>
<td>Pressure gauge bracket (7)</td>
<td>1400-7458</td>
</tr>
<tr>
<td>¼ NPT</td>
<td>1400-7459</td>
</tr>
<tr>
<td>Pressure gauge mounting kit up to max. 6 bar (output/supply)</td>
<td>1402-0938</td>
</tr>
<tr>
<td>Stainless steel/stainless steel</td>
<td>1402-0939</td>
</tr>
</tbody>
</table>

### Table 6: General accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversing amplifier for double-acting actuators</td>
<td>Type 3710</td>
</tr>
<tr>
<td>Cable gland M20x1.5</td>
<td></td>
</tr>
<tr>
<td>Black plastic (6 to 12 mm clamping range)</td>
<td>8808-1011</td>
</tr>
<tr>
<td>Blue plastic (6 to 12 mm clamping range)</td>
<td>8808-1012</td>
</tr>
<tr>
<td>Nickel-plated brass (6 to 12 mm clamping range)</td>
<td>1890-4875</td>
</tr>
<tr>
<td>Nickel-plated brass (10 to 14 mm clamping range)</td>
<td>1922-8395</td>
</tr>
<tr>
<td>Stainless steel 1.4305 (8 to 14.5 mm clamping range)</td>
<td>8808-0160</td>
</tr>
<tr>
<td>Adapter M20x1.5 to ½ NPT</td>
<td></td>
</tr>
<tr>
<td>Powder-coated aluminum</td>
<td>0310-2149</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>1400-7114</td>
</tr>
<tr>
<td>Retrofit kit for inductive limit contact 1 x SJ2-SN</td>
<td>1402-1770</td>
</tr>
<tr>
<td>Cover plate with list of parameters and operating instructions</td>
<td></td>
</tr>
<tr>
<td>DE/EN (delivered state)</td>
<td>1990-0761</td>
</tr>
<tr>
<td>EN/ES</td>
<td>1990-3100</td>
</tr>
<tr>
<td>EN/FR</td>
<td>1990-3142</td>
</tr>
</tbody>
</table>
# Attachment to the control valve – Mounting parts and accessories

## Table 6: General accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TROVIS-VIEW 6661 with Type 3730-5 device module</td>
<td></td>
</tr>
<tr>
<td>Serial interface adapter (SAMSON SSP interface to RS-232 port on a computer)</td>
<td>1400-7700</td>
</tr>
<tr>
<td>Isolated USB interface adapter (SAMSON SSP interface to USB port on a computer) including TROVIS-VIEW CD-ROM</td>
<td>1400-9740</td>
</tr>
</tbody>
</table>

## Table 7: Attachment of external position sensor

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template for mounting position sensor on older mounting parts. See note on page 44</td>
<td>1060-0784</td>
</tr>
<tr>
<td>Direct attachment</td>
<td></td>
</tr>
<tr>
<td>Mounting parts for actuators with 120 cm². See Fig. 15 (left).</td>
<td>1400-7472</td>
</tr>
<tr>
<td>Connecting plate (9, old) with Type 3277-5xxxxxx.00 Actuator G ½&quot;</td>
<td>1400-6820</td>
</tr>
<tr>
<td>Connecting plate (new) with Type 3277-5xxxxxx.01 Actuator (new) 1)</td>
<td>1400-6823</td>
</tr>
<tr>
<td>Mounting parts for actuators with 175, 240, 350, 355 and 700 cm². See Fig. 15 (right).</td>
<td>1400-7471</td>
</tr>
<tr>
<td>NAMUR attachment</td>
<td></td>
</tr>
<tr>
<td>Mounting parts for attachment to NAMUR rib using L or XL lever. See Fig. 16.</td>
<td>1400-7468</td>
</tr>
<tr>
<td>Attachment to Type 3510 Micro-flow Valve</td>
<td></td>
</tr>
<tr>
<td>Mounting parts for Type 3271 Actuator with 60 cm². See Fig. 17.</td>
<td>1400-7469</td>
</tr>
<tr>
<td>VDI/VDE 3845 (September 2010), see section 15.1 for details.</td>
<td></td>
</tr>
<tr>
<td>Actuator surface corresponds to fixing level 1</td>
<td></td>
</tr>
<tr>
<td>Size AA1 to AA4 with follower clamp and coupling wheel, version with CrNiMo steel bracket. See Fig. 18.</td>
<td></td>
</tr>
<tr>
<td>Size AA1 to AA4, heavy-duty version</td>
<td>1400-9384</td>
</tr>
<tr>
<td>Size AA5, heavy-duty version (e.g. Air Torque 10 000)</td>
<td>1400-9992</td>
</tr>
<tr>
<td>Bracket surface corresponds to fixing level 2, heavy-duty version</td>
<td>1400-9974</td>
</tr>
<tr>
<td>SAMSON Type 3278 with 160 cm² and VETEC Type S160 and Type R, heavy-duty version</td>
<td>1400-9385</td>
</tr>
<tr>
<td>SAMSON Type 3278 with 320 cm² and VETEC Type S320, heavy-duty version</td>
<td>1400-5891  and 1400-9974</td>
</tr>
<tr>
<td>Accessories for positioner</td>
<td></td>
</tr>
<tr>
<td>Connecting plate (6) G ¼&quot;</td>
<td>1400-7461</td>
</tr>
<tr>
<td>Pressure gauge bracket (7) G ¼&quot;</td>
<td>1400-7458</td>
</tr>
<tr>
<td>Pressure gauge mounting kit up to max. 6 bar (output/supply) Stainless steel/brass</td>
<td>1402-0938</td>
</tr>
<tr>
<td>Stainless steel/stainless steel</td>
<td>1402-0939</td>
</tr>
<tr>
<td>Bracket to mount the positioner on a wall (Note: The other fastening parts are to be provided at the site of installation as wall foundations vary from site to site).</td>
<td>0309-0184</td>
</tr>
</tbody>
</table>

1) Only new connecting plates can be used with new actuators (Index 01). Old and new plates are not interchangeable.
5 Connections

WARNING
Risk of injury due to the actuator stem extending or retracting.
Do not touch or block the actuator stem.

NOTICE
Risk of malfunction due to incorrect sequence of mounting, installation and start-up.
Keep the following sequence.
- 1. Remove the protective film from the pneumatic connections.
- 2. Mount the positioner on the control valve.
- 3. Connect the supply air.
- 4. Connect the electrical power.
- 5. Perform the start-up settings.

5.1 Pneumatic connections

NOTICE
Risk of malfunction due to incorrect connection of the supply air.
Do not connect the compressed air directly to the threaded connections in the positioner housing. Screw the screw fittings into the connecting plate, pressure gauge mounting block or connection block from the accessories.

The pneumatic connections in the connecting plate, pressure gauge mounting block and connection block are optionally designed as a bore with ¼ NPT or G ¼ thread. Custom-fittings for metal or copper tubing or plastic hoses can be used.

NOTICE
Risk of malfunction due to failure to comply with required air quality.
Only use supply air that is dry and free of oil and dust.
Read the maintenance instructions for upstream pressure reducing stations.
Blow through all air pipes and hoses thoroughly before connecting them.

If the positioner is attached directly to the Type 3277 Actuator, the connection of the positioner’s output pressure to the actuator is fixed. For attachment according to IEC 60534-6 (NAMUR), the signal pressure can be routed to either the top or bottom diaphragm chamber of the actuator, depending on the actuator’s fail-safe action "actuator stem extends" or "actuator stem retracts".

For rotary actuators, the manufacturer’s specifications for connection apply.

5.1.1 Signal pressure gauges

To monitor the supply air (supply) and signal pressure (output), we recommend mounting pressure gauges (see accessories in Table 1 to Table 6).

5.1.2 Supply pressure

The required supply air pressure depends on the bench range and the actuator’s operating direction (fail-safe action).
The bench range is written on the nameplate either as the spring range or signal pressure range depending on the actuator. The direction of action is marked FA or FE, or by a symbol.

**Actuator stem extends FA (AIR TO OPEN)**
Fail-close (for globe and angle valves):
Required supply pressure = Upper bench range value + 0.2 bar, at least 1.4 bar.

**Actuator stem retracts FE (AIR TO CLOSE)**
Fail-open (for globe and angle valves):
For tight-closing valves, the maximum signal pressure $p_{st\text{max}}$ is roughly estimated as follows:

$$p_{st\text{max}} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \text{ [bar]}$$

$d = $ Seat diameter [cm]
$\Delta p = $ Differential pressure across the valve [bar]
$A = $ Actuator diaphragm area [cm²]
$F = $ Upper bench range value of the actuator [bar]

If there are no specifications, calculate as follows:
Required supply pressure = Upper bench range value + 1 bar

### 5.2 Electrical connections

**DANGER**
Risk of electric shock and/or the formation of an explosive atmosphere.
For electrical installation, observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use. In Germany, these are the VDE regulations and the accident prevention regulations of the employers’ liability insurance.

**WARNING**
Incorrect electrical connection will render the explosion protection unsafe.
Adhere to the terminal assignment.
Do not undo the enameled screws in or on the housing.
Do not exceed the maximum permissible values specified in the EC type examination certificates when interconnecting intrinsically safe electrical equipment ($U_i$, $U_{0i}$, $I_i$, $I_{0i}$, $P_i$, or $P_{0i}$, $C_i$, or $C_{0i}$ and $L_i$, or $L_{0i}$).

### 5.1.3 Signal pressure (output)
The signal pressure at the output (38) of the positioner can be restricted to 1.4 bar, 2.4 bar or 3.7 bar in Code 16.
The limitation is not activated [No] by default.

### Selecting cables and wires
Observe clause 12 of EN 60079-14: 2008 (VDE 0165, Part 1) for installation of the intrinsically safe circuits.
Clause 12.2.2.7 applies when running multi-core cables and wires with more than one intrinsically safe circuit.

The radial thickness of the insulation of a conductor for common insulating materials (e.g. polyethylene) must not be smaller than 0.2 mm. The diameter of an individual wire in a fine-stranded conductor must not be smaller than 0.1 mm. Protect the conductor ends against splicing, e.g. by using wire-end ferrules. When two separate cables or wires are used for connection, an additional cable gland can be installed. Seal cable entries left unused with plugs. Fit equipment used in ambient temperatures below –20 °C with metal cable entries.

**Equipment for use in zone 2/zone 22**

In equipment operated according to type of protection Ex nA II (non-sparking equipment) according to EN 60079-15: 2003, circuits may be connected, interrupted or switched while energized only during installation, maintenance or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15: 2003 may be switched under normal operating conditions.

The maximum permissible values specified in the statement of conformity and its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

**Cable entry**

Cable entry with M20 x 1.5 cable gland. See section on Accessories for clamping range.

There is a second M20 x 1.5 threaded hole in the housing that can be used for additional connection, when required.

The screw terminals are designed for wire cross-sections of 0.2 to 2.5 mm². Tighten screws by 0.5 to 0.6 Nm.

---

**Fig. 20: Electrical connections**

Forced venting function with solenoid valve (optional)

Bus line

Binary contacts

Switching amplifier EN 60947-5-6

Inductive limit contact (optional)
Connections

**NOTICE**
The power supply for the positioner can be supplied either over the connection to the fieldbus segment or over a DC voltage source (9 to 32 V) connected to the bus terminals in the positioner.

**Observe the relevant regulations for installation in hazardous areas.**

---

### Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cable glands M20 x 1.5</strong></td>
<td></td>
</tr>
<tr>
<td>Black plastic (6 to 12 mm clamping range)</td>
<td>8808-1011</td>
</tr>
<tr>
<td>Blue plastic (6 to 12 mm clamping range)</td>
<td>8808-1012</td>
</tr>
<tr>
<td>Nickel-plated brass (6 to 12 mm clamping range)</td>
<td>1890-4875</td>
</tr>
<tr>
<td>Nickel-plated brass (10 to 14 mm clamping range)</td>
<td>1922-8395</td>
</tr>
<tr>
<td>Stainless steel (8 to 14.5 mm clamping range)</td>
<td>8808-0160</td>
</tr>
<tr>
<td><strong>EMC cable gland M20 x 1.5:</strong></td>
<td></td>
</tr>
<tr>
<td>Nickel-plated brass (7 to 12 mm clamping range)</td>
<td>8808-0143</td>
</tr>
<tr>
<td><strong>Adapter M20x1.5 to ½ NPT</strong></td>
<td></td>
</tr>
<tr>
<td>Powder-coated aluminum</td>
<td>0310-2149</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>1400-7114</td>
</tr>
</tbody>
</table>

### Bus line

Route the two-wire bus line to the screw terminals marked "IEC 1158-2", whereby no polarity needs to be observed.

To connect the limit contact, binary inputs, and forced venting, an additional cable gland that needs to be fitted in place of the existing blanking plug is necessary.

---

**NOTICE**

Degree of protection may be impaired. Do not use the positioner with open cable glands.

Seal cable glands left unused with blanking plugs.

---

### Limit contact

The operation of the limit contact requires a switching amplifier to be connected in the output circuit. Its function is to control the limit values of the control circuit according to EN 60947-5-6, thus ensuring operational reliability of the positioner.

Observe the relevant regulations for installation in hazardous areas.

#### Binary input BI1

An active contact can be operated at binary input 1. The positioner can report the switching state over the bus protocol.

#### Binary input BI2

A passive, floating contact can be operated at binary input 2. The positioner can report the switching state over the bus protocol.

#### Solenoid valve (forced venting function)

For positioners fitted with the optional solenoid valve for the forced venting function, a voltage of 24 V DC must be connected to the relevant terminals +81 and –82.

If there is no voltage connected for the solenoid valve at terminals +81 and –82 or when the voltage signal is interrupted, the positioner vents the actuator.
Fig. 21: Connection acc. to FOUNDATION™ fieldbus, for safe areas (top) and for hazardous areas (bottom)
Connections

![NOTICE]
The actuator does not respond to the set point when the voltage is too low. Observe the switching thresholds specified in the technical data.

5.2.1 Establishing communication

The communication structure between the controller, logic solvers (PLC) or automation system, or between a PC or workstation and the positioner(s) is implemented to conform with IEC 61158-2.

![Note]
The action of the positioner upon failure of the FOUNDATION™ fieldbus communication can be determined over the bus parameters or over the SAMSON TROVIS-VIEW software:
- The valve remains in its last position.
- The valve moves to the fail-safe position.
- The valve moves to a defined fault state value.

**Bus parameters:**
- FEATURES_SEL (RES) > FAULTSTATE
- XD_FSTATE_OPT (AO TRD): Action on fault detection
- XD_FSTATE_VAL (AO FB): Fault state value

**TROVIS-VIEW:**
The parameters can be found in the folder [Settings > Positioner (AO, TRD) > Fail-safe action].
The action selected only takes effect if the positioner is powered. Should a power failure occur at the same time, the actuator is vented and the valve moves to the fail-safe position.
7 Start-up and settings

**NOTICE**
Risk of malfunction due to incorrect sequence of mounting, installation and start-up. Keep the following sequence.
1. Remove the protective film from the pneumatic connections.
2. Mount the positioner on the control valve.
3. Connect the supply air.
4. Connect the electrical power.
5. Perform the start-up settings.

Reading after connecting the electrical power supply:
`TestinG` runs across the display and then the fault alarm icon appears and blinks on the display when the **positioner has not been initialized**. The reading indicates the lever position in degrees in relation to the mid-axis.

Code 0 appears on the display when a **positioner has been initialized**. The positioner is in the last active operating mode.

**WARNING**
Risk of injury due to the actuator stem extending or retracting. Do not touch or block the actuator stem.

---

**Note**
The positioner performs a test in the start-up phase while following its automation task at the same time.
During the start-up phase, operation on site is unrestricted, yet write access is limited.

Perform the start-up settings in the same sequence as described (section 7.1 to section 7.6).

7.1 Defining the fail-safe position

Define the fail-safe position (0 %) taking the valve type and the actuator’s direction of action into account. Position the AIR TO OPEN/AIR TO CLOSE slide switch accordingly:

- **AIR TO OPEN** setting
  Signal pressure opens the valve e.g. for a fail-close valve
  The AIR TO OPEN (AtO) setting always applies to double-acting actuators.

- **AIR TO CLOSE** setting
  Signal pressure closes the valve e.g. for a fail-open valve

For checking purposes: After successfully completing initialization, the positioner display must read 0 % when the valve is in the fail-safe position and 100 % when the valve is open. If this is not the case, change the slide switch position and re-initialize the positioner.
Start-up and settings

**Note**
The switch position is prompted prior to an initialization. After an initialization has been completed, changing the switch position does not have any effect on the operation of the positioner.

### 7.2 Adjusting the volume restriction Q

The volume restriction Q serves to adapt the air output capacity to the size of the actuator:

- Actuators with a transit time < 1 s, e.g. linear actuators with an effective area smaller than 240 cm², require a restricted air flow rate (MIN).
- Actuators with a transit time ≥ 1 s do not require the air flow rate to be restricted (MAX).

The position of volume restriction Q also depends on how the signal pressure is routed at the actuator in **SAMSON actuators**:

- The SIDE position applies for actuators with a loading pressure connection at the side, e.g. Type 3271-5.
- The BACK position applies for actuators with a loading pressure connection at the back, e.g. Type 3277-5.
- The SIDE restriction position always applies for actuators from other manufacturers.

#### Overview · Position of the volume restriction Q*

<table>
<thead>
<tr>
<th>Signal pressure</th>
<th>Transit time</th>
<th>&lt;1 s</th>
<th>≥1 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection at the side</td>
<td>MIN SIDE</td>
<td>MAX SIDE</td>
<td></td>
</tr>
<tr>
<td>Connection at the back</td>
<td>MIN BACK</td>
<td>MAX BACK</td>
<td></td>
</tr>
</tbody>
</table>

* Intermediate settings are not permitted.

---

**NOTICE**

Malfunction due to changed start-up settings. Initialize an initialized positioner again after the position of the volume restriction has been changed.

### 7.3 Adapting the display direction

To adapt the reading on the display to the mounting situation of the actuator, the display contents can be turned by 180°.

Reading direction for right attachment of pneumatic connections
If the displayed data appear upside down, proceed as follows:

Turn \( \rightarrow \) Code 2
Press \( \rightarrow \), Code 2 blinks.
Turn \( \rightarrow \) Required reading direction
Press \( \rightarrow \) to confirm reading direction.

7.4 Limiting the signal pressure

If the maximum actuator force may cause damage to the valve, the signal pressure must be limited.

Enable configuration at the positioner before limiting the signal pressure:

| Note |
---|---|
If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

Limit the signal pressure:

| Pressure limit | Default: No |
---|---|

Turn \( \rightarrow \) Code 16
Press \( \rightarrow \), Code 16 blinks.
Turn \( \rightarrow \) until the required pressure limit (1.4/2.4/3.7 bar) appears.
Press \( \rightarrow \) to confirm the pressure limit setting.

7.5 Checking the operating range of the positioner

To check the mechanical attachment and the proper functioning, the valve should be moved through the operating range of the positioner in the \( \rightarrow \) manual mode with the manual set point.

Select \( \rightarrow \) manual mode:

| Operating mode | Default MAN |
---|---|

Turn \( \rightarrow \) Code 0
Press \( \rightarrow \), Code 0 blinks.
Turn \( \rightarrow \) \( \rightarrow \) \( \rightarrow \) \( \rightarrow \) \( \rightarrow \)
Press \( \rightarrow \). The positioner changes to the manual mode (\( \rightarrow \)).
### Check the operating range:

**Manual set point w** (current angle of rotation is indicated)

Turn \( \equiv \) Code 1

Press \( \equiv \), Code 1 and \( \equiv \) blink.

Turn \( \equiv \) until the pressure in the positioner builds up, and the control valve moves to its final positions so that the travel/angle can be checked.

The angle of rotation of the lever on the back of the positioner is indicated. A horizontal lever (mid position) is equal to 0°.

**To ensure the positioner is working properly**, the outer bar elements must not blink while the valve is moving through the operating range.

Exit Code 1 by pressing the rotary pushbutton (\( \equiv \)).

**The permissible range has been exceeded** when the displayed angle is more than 30° and the outer right or left bar element blinks. The positioner goes to the fail-safe position (SAFE).

After canceling the fail-safe position (SAFE) (see section 8.2.2) it is absolutely essential that you check the lever and pin position as described in section 4.

---

**WARNING**

Risk of injury due to the actuator stem extending or retracting.

---

### 7.6 Initialization

**NOTICE**

The process is disturbed by the movement of the actuator stem.

Do not initialize the positioner while the process is running; only perform an initialization during start-up with the shut-off valves closed.

A signal pressure above the maximum permissible limit will damage the valve. Check the maximum permissible signal pressure of the control valve before starting initialization. If necessary, limit the signal pressure by connecting an upstream pressure reducing valve.

Malfunction due to changed mounting or installation circumstances.

Reset the positioner to its default settings and re-initialize it after the positioner has been mounted on to another actuator or its mounting location has been changed.

During initialization the positioner adapts itself optimally to the friction conditions and the signal pressure required by the control valve. The type and extent of auto tuning depends on the initialization mode selected:

- **Maximum range (MAX)** (standard range)
  
  Initialization mode for simple start-up of valves with two clearly defined mechani-
Start-up and settings

cal end positions, e.g. three-way valves (see section 7.6.1)

- Nominal range (NOM)
  Initialization mode for all globe valves (see section 7.6.2)

- Manually selected range (MAN)
  Initialization mode for globe valves with an unknown nominal range (see section 7.6.3)

- Substitute calibration (SUB)
  This mode allows a positioner to be replaced while the plant is running, with the least amount of disruption to the plant (see section 7.6.4).

**Note**

For normal operation, simply start initialization by pressing the INIT key after mounting the positioner on the valve and defining the fail-safe position and setting the volume restriction. The positioner only needs to work with its default settings. If necessary, perform a reset (see section 7.8).

![Initialization in progress](image)

Alternating readings
Initialization in progress
Icon depending on initialization mode selected

![Bar graph display indicating the progress of the initialization](image)

The time required for the initialization procedure depends on the actuator transit time and can take a few minutes.

After a successful initialization, the positioner runs in closed-loop operation indicated by the closed-loop operation icon.

A malfunctioning leads to the process being canceled. The initialization error appears on the display according to how it has been classified by the condensed state. Refer to section 8.3.

**Note**

When Code 48 - h0 = YES, the diagnostics automatically start to plot the reference graphs (drive signal steady-state d1 and hysteresis d2) after initialization has been completed. This is indicated by tES and d1 or d2 appearing on the display in alternating sequence.

An error during the plotting of the reference graphs is indicated on the display over Code 48 - h1 and Code 81.

The reference graphs do not have any effect on closed-loop operation.

Fail-safe position AIR TO CLOSE

If the slide switch is set to AIR TO CLOSE, the positioner automatically switches to the direction of action increasing/decreasing (↗↘) after initialization has been completed. This
Start-up and settings

results in the following assignment between set point and valve position:

<table>
<thead>
<tr>
<th>Fail-safe position</th>
<th>Direction of action</th>
<th>Set point Valve</th>
<th>Direction of action</th>
<th>Set point Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator stem extends (FA)</td>
<td>AIR TO OPEN</td>
<td>CLOSED at</td>
<td>OPEN at</td>
<td>0 %</td>
</tr>
<tr>
<td>Actuator stem retracts (FE)</td>
<td>AIR TO CLOSE</td>
<td>100 %</td>
<td>0 %</td>
<td></td>
</tr>
</tbody>
</table>

The tight-closing function has been activated.

Set Code 15 (final position w>) to 99 % for three-way valves.

Canceling an initialization process

An initialization procedure in progress can be canceled by pressing the rotary pushbutton (STOP). STOP appears for three seconds on the display and the positioner then changes to the fail-safe position.

Exit the fail-safe position again over Code 0 (see section 8.2.2).

7.6.1 MAX – Initialization based on maximum range

The positioner determines travel/angle of rotation of the closing member from the CLOSED position to the opposite travel stop and adopts this travel/angle of rotation as the operating range from 0 to 100 %.

Enable configuration:

**Note**

If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

**Enable configuration:**

**Default:** No

Turn  → Code 3, display: No
Press , Code 3 blinks.
Turn  → YES
Press , display:

Select the initialization mode:

**Default MAX**

Turn  → Code 6
Press .
Turn  → MAX
Press  to confirm the MAX as the initialization mode.

Start initialization:

Press INIT key.

The nominal travel/angle of rotation is indicated in % after initialization. Code 5 (nominal range) remains locked. The parameters for travel/angle range start (Code 8) and
travel/angle range end (Code 9) can also only be displayed and modified in %.
For a reading in mm/°, enter the pin position (Code 4).

**Enter the pin position:**

![Pin position display]

- Turn \(\bigcirc\) → Code 4
- Press \(\bigcirc\), Code 4 blinks.
- Turn \(\bigcirc\) → Pin position on lever (see relevant section on attachment)
- Press \(\bigcirc\).
- The reading of the nominal range appears in mm/°.

### 7.6.2 NOM – Initialization based on nominal range

The calibrated sensor allows the effective valve travel to be set very accurately. During initialization, the positioner checks whether the control valve can move through the indicated nominal range (travel or angle) without collision. If this is the case, the indicated nominal range is adopted with the limits of travel/angle range start (Code 8) and travel/angle range end (Code 9) as the operating range.

**Enable configuration:**

**Note**

If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

**Enter the pin position and nominal range:**

![Nominal range display]

- Turn \(\bigcirc\) → Code 4
- Press \(\bigcirc\), Code 4 blinks.

**Note**

The maximum possible travel must always be greater than the nominal travel entered. If this is not the case, initialization is automatically canceled (error message Code 52) because the nominal travel could not be achieved.
Turn \(\textcircled{1}\) → Pin position on lever (see relevant section on attachment)
Press \(\textcircled{1}\).
Turn \(\textcircled{2}\) → Code 5
Press \(\textcircled{2}\), Code 5 blinks.
Turn \(\textcircled{2}\) → Nominal travel of the valve
Press \(\textcircled{2}\).

Select the initialization mode:

![Initialization Mode Selection](image)

Turn \(\textcircled{3}\) → Code 6
Press \(\textcircled{3}\), Code 6 blinks.
Turn \(\textcircled{3}\) → NOM
Press \(\textcircled{3}\) to confirm the NOM as the initialization mode.

Start initialization:

- Press INIT key.
- After initialization, check the direction of action (Code 7) and, if necessary, change it.

7.6.3 MAN – Initialization based on a manually selected range

Before starting initialization, move the control valve manually to the OPEN position. Turn the rotary pushbutton (\(\textcircled{4}\)) clockwise in small steps. The valve must be moved with a monotonically increasing signal pressure.

The positioner calculates the differential travel/angle from the OPEN and CLOSED positions and adopts it as the operating range with limits of lower travel/angle range value (Code 8) and upper travel/angle range value (Code 9).

Enable configuration:

![Configuration Enable](image)

If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.
Start-up and settings

Select the initialization mode:

Select the initialization mode:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>0</td>
</tr>
<tr>
<td>MAX</td>
<td>6</td>
</tr>
</tbody>
</table>

Turn \( \odot \) \( \rightarrow \) Code 6
Press \( \odot \), Code 6 blinks.

Turn \( \odot \) \( \rightarrow \) MAN
Press \( \odot \) to confirm the MAN as the initialization mode.

Enter OPEN position:

<table>
<thead>
<tr>
<th>Manual set point</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 ( \pm )</td>
<td>1</td>
</tr>
</tbody>
</table>

Turn \( \odot \) \( \rightarrow \) Code 0
Press \( \odot \), Code 0 blinks.

Turn \( \odot \) \( \rightarrow \) MAN
Press \( \odot \).

Turn \( \odot \) \( \rightarrow \) Code 1
Press \( \odot \), Code 1 blinks.

Turn \( \odot \) until the valve reaches its OPEN position.
Press \( \odot \) to confirm the OPEN position.

Start initialization:

\( \Rightarrow \) Press INIT key.

### 7.6.4 Sub – Substitute calibration

A complete initialization procedure takes several minutes and requires the valve to move through its entire travel range several times. This initialization mode, however, is an emergency mode, in which the control parameters are estimated and not determined by an initialization procedure. As a result, a high level of accuracy cannot be expected. You should always select a different initialization mode if the plant allows it.

The substitute calibration is used to replace a positioner while the process is running. For this purpose, the control valve is usually fixed mechanically in a certain position, or pneumatically by means of a pressure signal which is routed to the actuator externally. The blocking position ensures that the plant continues to operate with this valve position. By entering the blocking position (Code 35), closing direction (Code 34), pin position (Code 4), nominal range (Code 5) and direction of action (Code 7), the positioner can calculate the positioner configuration.

> **NOTICE**

Perform a reset before re-initializing the positioner if the substitute positioner has already been initialized. Refer to section 7.8.
Enable configuration:

If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

Enable configuration
Default: No

Turn \( \rightarrow \) Code 3, display: No
Press \( \), Code 3 blinks.
Turn \( \rightarrow \) YES
Press \( \), display: 

Enter the pin position and nominal range:

Pin position
Default: No

Nominal range (locked when Code 4 = No)

Turn \( \rightarrow \) Code 4
Press \( \), Code 4 blinks.
Turn \( \rightarrow \) Pin position on lever (see relevant section on attachment)
Press \( \).
Turn \( \rightarrow \) Code 5
Press \( \), Code 5 blinks.

Turn \( \rightarrow \) Nominal travel of the valve
Press \( \).

Select the initialization mode:

Init mode
Default: MAX

Turn \( \rightarrow \) Code 6
Press \( \).
Turn \( \rightarrow \) SUB
Press \( \) to confirm the SUB as the initialization mode.

Enter the direction of action:

Direction of action
Default: 

Turn \( \rightarrow \) Code 7
Press \( \), Code 7 blinks.
Turn \( \rightarrow \) Direction of action (\( \rightarrow \)/\( \rightarrow \))
Press \( \).

Deactivate travel limit:

Travel limit
Default: No

Turn \( \rightarrow \) Code 11
Press \( \), Code 11 blinks.
Turn \( \rightarrow \) No
Press \(\bullet\).

Change pressure limit and control parameters:

**Note**
Do not change the pressure limit \((\text{Code 16})\). Only change the control parameters \(K_p\) \((\text{Code 17})\) and \(T_v\) \((\text{Code 18})\) if the settings of the replaced positioner are known.

Enter closing direction and blocking position:

![Closing direction](image)
Closing direction (direction of rotation causing the valve to move to the CLOSED position (view onto positioner display))
Default: CCL (counterclockwise)

![Blocking position](image)
Blocking position
Default 0

Turn \(\bullet\) \(\rightarrow\) Code 34
Press \(\bullet\), Code 34 blinks.

Turn \(\bullet\) \(\rightarrow\) Closing direction (CCL = counterclockwise/CL = clockwise)
Press \(\bullet\).

Turn \(\bullet\) \(\rightarrow\) Code 35
Press \(\bullet\), Code 35 blinks.

Turn \(\bullet\) \(\rightarrow\) Blocking position, e.g., 5 mm (read off at travel indicator scale of the blocked valve or measure with a ruler).

Set the fail-safe position:

- Set switch for fail-safe position AIR TO OPEN or AIR TO CLOSE according to section 7.1.

- Set volume restriction as described in section 7.2.

Start initialization:

- Press INIT key.
  The positioner switches to **MAN** mode.
  The blocking position is indicated.
Start-up and settings

**Note**
Since initialization has not been completed, the error code 76 (no emergency mode) and possibly also error code 57 (control loop) may appear on the display. These alarms do not influence the positioner’s readiness for operation.

Cancel the blocking position and change to automatic mode (AUTO):

For the positioner to follow its set point again, the blocking position must be canceled and the positioner must be set to automatic mode as follows:

1. Turn \( 
\) Code 1
2. Press \( 
\), Code 1 and \( 
\) blink.
3. Turn \( 
\) in order to move the valve slightly past the blocking position.
4. Press \( 
\) to cancel mechanical blocking.
5. Turn \( 
\) \( 
\) Code 0
6. Press \( 
\), Code 0 blinks.
7. Turn \( 
\) \( 
\) AUTO
8. Press \( 
\).

The positioner switches to automatic mode. The current valve position is indicated in %.

**Note**
If the positioner shows a tendency to oscillate in automatic mode, the parameters \( K_p \) and \( T_V \) must be slightly corrected. Proceed as follows:

- Set \( T_V \) (Code 18) to 4.
- If the positioner still oscillates, the gain \( K_p \) (Code 17) must be decreased until the positioner shows a stable behavior.

### Zero point calibration

Finally, if process operations allow it, the zero point must be calibrated according to section 7.7.

#### 7.7 Zero calibration

In case of inconsistencies in the closed position of the valve, e.g. with soft-seated plugs, it might be necessary to recalibrate zero.

**NOTICE**

The process is disturbed by the movement of the actuator stem.

Do not perform zero calibration while the process is running. First isolate the plant by closing the shut-off valves.

**Note**

The positioner must be connected to the supply air to perform the zero calibration.

#### Enable configuration:

1. Turn \( 
\) \( 
\) Code 3, display: \( 
\)
2. Press \( 
\), Code 3 blinks.
3. Turn \( 
\) \( 
\) YES
4. Press \( 
\), display: \( 
\)

#### Perform zero calibration:

1. Turn \( 
\) \( 
\) Code 6
2. Press \( 
\), Code 6 blinks.
Turn $\circlearrowleft \rightarrow \mathit{ZP}$

- Press INIT key.
  Zero calibration starts. The positioner moves the valve to the CLOSED position and recalibrates the internal electrical zero point.

### 7.8 Reset to default settings

This function resets all start-up parameters as well as the diagnosis to the factory default settings (see code list in section 14).

**Enable configuration:**

Turn $\circlearrowleft \rightarrow \text{Code 3}$, display: **No**
Press $\circlearrowleft$, Code 3 blinks.
Turn $\circlearrowleft \rightarrow \text{YES}$
Press $\circlearrowleft$, display: $\Rightarrow$

**Reset start-up parameters:**

![Reset start-up parameters](image)

Turn $\circlearrowleft \rightarrow \text{Code 36}$, display: $\bullet \bullet \bullet \bullet$
Press $\circlearrowleft$, Code 36 blinks.
Turn $\circlearrowleft \rightarrow \text{Std}$
Press $\circlearrowleft$.
All start-up parameters as well as the diagnosis are reset to their default values.

---

**Note**

Code 36 - diAG allows just the diagnosis data (EXPERTplus) to be reset. Refer to the Operating Instructions for EXPERTplus valve diagnostics $\Rightarrow \text{EB 8389.}$
6 Operating controls and readings

**Rotary pushbutton**

The rotary pushbutton is located underneath the front protective cover. The positioner is operated on site using the rotary pushbutton:

- **Turn**: Select codes and values
- **Press**: Confirm setting

**AIR TO OPEN/AIR TO CLOSE slide switch**

- **AIR TO OPEN** applies to a valve opening as the signal pressure increases.
- **AIR TO CLOSE** applies to a valve closing as the signal pressure increases.

The signal pressure is the pneumatic pressure at the output of the positioner applied to the actuator.

AIR TO OPEN always applies to positioners with a mounted reversing amplifier for double-acting rotary actuators (connections according to section 4.6).

**Volume restriction Q**

The volume restriction serves to adapt the air output capacity to the size of the actuator. Depending on the air passage at the actuator, two fixed settings are available.

- For actuators smaller than 240 cm² and with a loading pressure connection at the side (Type 3271-5), set restriction to MIN SIDE.
- For a connection at the back (Type 3277-5), set restriction to MIN BACK.
- For actuators 240 cm² and larger, set to MAX SIDE for a side connection and to MAX BACK for a connection at the back.

---

**Initialization key Cap and rotary switch Metal tag of proximity switch**

SSP interface

Switch for AIR TO OPEN/AIR TO CLOSE

Volume restriction

Rotary pushbutton

**Fig. 22: Operating elements**
Readings
Icons assigned to certain codes, parameters and functions are indicated on the display.

Operating modes:
- Manual mode (see section 8.2.1)
  The positioner follows the manual set point (Code 1) instead of the set point of the Analog Output Block.
  \(\n\) blinks: The positioner is not initialized. Operation only possible over manual set point (Code 1).
- Automatic mode (see section 8.2.1)
  The positioner is in closed-loop operation and follows the set point of the Analog Output Block.
- SAFE (see section 8.2.2)
  The positioner vents the output. The valve moves to the mechanical fail-safe position.

Bar graph:
In manual \(\n\) and automatic \(\circ\) modes, the bars indicate the set point deviation that depends on the sign (+/−) and the value. One bar element appears per 1 % set point deviation.

If the positioner has not been initialized, \(\n\) blinks on the display, the bar graph indicates the lever position in degrees in relation to the mid-axis. One bar element corresponds to approximately a 5° angle of rotation. The fifth bar element blinks (reading >30°) if the permissible angle of rotation has been exceeded. Lever and pin position must be checked.

Status messages
- Maintenance alarm
- Maintenance demanded/
  Maintenance required
- \(\n\) blinks: Out of specification

These icons indicate that an error has occurred. A classified status can be assigned to each error. Classifications include “No message”, “Maintenance required”, “Maintenance demanded” and “Maintenance alarm” (see section 8.3).

Enable configuration
This indicates that the codes marked with an asterisk (*) in the code list (section 14) are enabled for configuration (see section 8.1).
### Operating controls and readings

#### Display

![Display Diagram]

- **Malfunction/fault**
- **Manual mode**
- **Closed-loop operation**
- **Code**
- **Bar graph for set point deviation or lever position**
- **Units**
- **Fail-safe position active**
- **Enable Configuration**
- **Maintenance demanded**
- **Maintenance required**

#### Glossary

- AUTO: Automatic
- CL: Clockwise
- CCL: Counterclockwise
- Err: Error
- ESC: Cancel
- LOW: w too low
- MAN: Manual setting
- MAX: Maximum range
- No: Not available/not active
- NOM: Rated travel
- RES: Reset
- RUN: Start
- SAFE: Fail-safe position
- Sub: Substitute calibration
- TunE: Initialization in progress
- YES: Available/active
- ZP: Zero calibration
- tEStinG: Test function active

- Blinking icon: out of specification

- ✕: Increasing/increasing
- ✖: Increasing/decreasing

- 🌡: Blinking: positioner not initialized

- ☮: Blinking: Valve in mechanical fail-safe position
  (see SET_FAIL_SAFE_POS parameter in the AO Transducer Block (AO TRD)
  ➤ KH 8384-5)

- 🌡 and 🌡 together: AO Transducer Block is in the MAN mode ➤ KH 8384-5

- 🌡 and ☮ both blinking: The positioner is manual mode while the mechanical fail-safe position (SET_FAIL_SAFE_POS) has been demanded over the fieldbus. After exiting the manual position, the valve moves to the fail-safe position.

- ☮ blinking: emergency mode (see error code 62 on page 97)
8 Operation

**WARNING**
Risk of injury due to the actuator stem extending or retracting.
Do not touch or block the actuator stem.

8.1 Enabling and selecting parameters

All codes and their meaning and default settings are listed in the code list in section 14. Codes which are marked with an asterisk must be enabled with Code 3 before the associated parameters can be configured as described below.

<table>
<thead>
<tr>
<th>Code</th>
<th>Configuration status</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Configuration not enabled</td>
</tr>
<tr>
<td>YES</td>
<td>Configuration enabled</td>
</tr>
</tbody>
</table>

Turn \(\bigcirc\) to select the required code.
Press \(\bigcirc\) to activate the selected code. The code number starts to blink.
Turn \(\bigcirc\) to select the setting.
Press \(\bigcirc\) to confirm the selected setting.

**Note**
If no settings are entered within 120 seconds, the enabled configuration function becomes invalid and the display returns to Code 0.

Cancel the setting:

To cancel a value before it is confirmed (by pressing \(\bigcirc\)) proceed as follows:

1. Turn \(\bigcirc\) to ESC
2. Press \(\bigcirc\).

The entered value is not adopted.

8.2 Operating modes

8.2.1 Automatic and manual modes

After initialization has been completed successfully, the positioner is in automatic mode (AUTO).
Operation

Switching to manual mode (MAN)

Turn \( \rightarrow \) Code 0
Press \( \), display: AUTO, Code 0 blinks.

Turn \( \rightarrow \) MAN
Press \( \). The positioner changes to the manual mode (\( \)).

The manual mode starts using the last set point of the automatic mode, ensuring a bumpless changeover. The current position is displayed in \( \% \).

Adjust the manual set point

Turn \( \rightarrow \) Code 1
Press \( \), Code 1 blinks.

Turn \( \) until sufficient pressure has been built up in the positioner and the control valve moves to the required position.

i Note
The positioner automatically returns to Code 0 if no settings are made within 120 seconds, but remains in the manual mode.

Switch to automatic mode

Turn \( \rightarrow \) Code 0
Press \( \), Code 0 blinks.

Turn \( \rightarrow \) AUTO
Press \( \). The positioner switches to automatic mode.

8.2.2 Fail-safe position (SAFE)

If you want to move the valve to the fail-safe position determined during start-up (see section 7.1), proceed as follows:

Turn \( \rightarrow \) Code 0
Press \( \), display: current operating mode (AUTO or MAN), Code 0 blinks.

Turn \( \rightarrow \) SAFE
Press \( \), display: \( S \)
The valve moves to the fail-safe position.

If the positioner has been initialized, the current valve position in \( \% \) is indicated on the display.
Exit the fail-safe position
Turn → Code 0
Press , Code 0 blinks.
Turn and select the required operating mode (AUTO or MAN).
Press .
The positioner switches to the operating mode selected.

8.3 Fault/malfunction
A status classification is assigned to all status and fault alarms in the positioner. The default settings of the status classification are listed in the code list.

The assignment of the status classification can be changed in TROVIS-VIEW and over the FOUNDATION™ fieldbus parameters. Refer to the Operating Instructions on the valve diagnostics ▶ EB 8389 and the Configuration Manual ▶ KH 8384-5 on the enclosed CD-ROM for more details.

To provide a better overview, the classified messages are summarized in a condensed state for the positioner according to the NAMUR Recommendation NE 107. The status messages are divided into the following categories:

- **Maintenance alarm**
  The positioner cannot perform its control task due to a functional fault in the positioner itself or in one of its peripherals or an initialization has not yet been successfully completed.

- **Maintenance required**
  The positioner still performs its control task (with restrictions). A maintenance demand or above average wear has been determined. The wear tolerance will soon be exhausted or is reducing at a faster rate than expected. Maintenance is necessary in the medium term.

- **Maintenance demanded**
  The positioner still performs its control task (with restrictions). A maintenance demand or above average wear has been determined. The wear tolerance will soon be exhausted or is reducing at a faster rate than expected. Maintenance is necessary in the short term.

- **Out of specification**
  The positioner is running outside the specified operating conditions.

- **Function check**
  Test or calibration procedures are performed in the positioner. The positioner is temporarily unable to perform its control task as long as the procedure is taking place.

**Note**
If an event is classified as “No message”, this event does not have any affect on the condensed state.

The condensed state appears on the display represented by the following icons:
Operation

<table>
<thead>
<tr>
<th>Condensed state</th>
<th>Positioner display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance alarm</td>
<td><img src="icon" alt="Maintenance icon" /></td>
</tr>
<tr>
<td>Function check</td>
<td>Text e.g. tEsting, TunE or tEst</td>
</tr>
<tr>
<td>Maintenance required/maintenance demand</td>
<td><img src="icon" alt="Maintenance icon" /></td>
</tr>
<tr>
<td>Out of specification</td>
<td><img src="icon" alt="Out of specification icon" /> blinking</td>
</tr>
</tbody>
</table>

If the positioner has not been initialized, the maintenance alarm icon ( ![Maintenance icon](icon) ) appears on the display as the positioner cannot follow its set point.

If fault alarms exist, the possible source of error is displayed in Code 49 onwards. In this case, Err appears on the display.

Refer to the code list (section 14) for possible causes and the recommended action.

### 8.3.1 Confirming error messages

Enable configuration:

**Note**

If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

Turn 🔄 → Code 3, display: No

Press 🔄, Code 3 blinks.
9 Adjusting the limit contact

The positioner version with an inductive limit contact has an adjustable tag (1) mounted on the axis of rotation, which operates the proximity switch (3).

For operation of the inductive limit contact, the corresponding switching amplifier (see section 5.2.1) must be connected to the output circuit.

When the tag (1) is located in the inductive field of the switch, the switch assumes a high resistance. When it moves outside the field, the switch assumes a low resistance.

Normally, the limit contact is adjusted in such a way that it will provide a signal in both end positions of the valve. The switch, however, can also be adjusted to indicate intermediate valve positions.

Fig. 25: Adjusting the limit contact
Adjusting the limit contact

The required switching function, i.e. whether the output relay is to be picked up or released when the tag enters the field, must be selected at the switching amplifier, if required.

Adjusting the switching point:

**Note**

During adjustment or testing, the switching point must always be approached from mid-position (50%).

To guarantee the switching under all ambient conditions, adjust the switching point approx. 5% before the mechanical stop (OPEN – CLOSED).

For CLOSED position:
1. Initialize the positioner.
2. Move the valve to 5% in the MAN mode (see display).
3. Adjust the tag at the yellow adjustment screw (2) until the tag enters or leaves the field and the switching amplifier responds.
   You can measure the switching voltage as an indicator.

Contact function:
- Tag leaving the field > contact is closed.
- Tag entering the field > contact is opened.

For OPEN position:
1. Initialize the positioner.
2. Move the valve to 95% in the MAN mode (see display).
3. Adjust the tag (1) at the yellow adjustment screw (2) until the tag enters or leaves the field of the proximity switch (3).
   You can measure the switching voltage as an indicator.

Contact function:
- Tag leaving the field > contact is closed.
- Tag entering the field > contact is opened.

9.1 Retrofitting an inductive limit contact

Required retrofit kit:
Limit contact          Order no. 1400-7460

**Note**
The same requirements apply to retrofitting an inductive limit contact as to servicing the positioner. For explosion-protected positioners, the requirements in section 11 (Servicing explosion-protected devices) need to be kept. Check the "Limit switch, inductive" box on the nameplate after installing the limit contact.

1. Take off the rotary pushbutton (3) and cap (1), unthread the five fastening screws (2) and lift off the plastic cover (9) together with the display, taking care not to damage the ribbon cable (between PCB and display).
2. Use a knife to cut an opening at the marked location (4).
3. Push the connector (11) with cable through the opening and secure the proximity switch (7) on the cover with a dot of glue.

4. Insert the cable connector (11) at the socket X7.

5. Guide the cable in such a manner that the plastic cover can be placed back onto the positioner. Insert the fixing screws (2) and screw tight. Attach the clamping plate (8) onto the proximity switch.

6. Attach the rotary switch (5). Make sure the flattened side of the positioner shaft is turned so that the rotary switch (5) can be attached with the metal tag next to the proximity switch.

7. On start-up of the positioner, set the option inductive alarm under Code 38 from **No** to **YES**.

Fig. 26: Retrofitting an inductive limit contact
10 Maintenance

The positioner does not require any maintenance.

Housing cover

It may occasionally be necessary to clean the window in the cover.

⚠️ NOTICE

Incorrect cleaning will damage the window. The window is made of Makrolon® (new design) and will be damaged when cleaned with abrasive cleaning agents or agents containing solvents.
- Do not rub the window dry.
- Do not use any cleaning agents containing chlorine or alcohol or abrasive cleaning agents.
- Use a non-abrasive, soft cloth for cleaning.

Filters

There are filters with a 100 µm mesh size in the pneumatic connections for supply and output which can be removed and cleaned, if required.

Supply air pressure reducing stations

The maintenance instructions of any upstream supply air pressure reducing stations must be observed.

11 Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate or given the device a mark of conformity. Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device before putting it back into operation. Document the passing of the routine test by attaching a mark of conformity to the device. Replace explosion-protected components only with original, routine-tested components from the manufacturer.

Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being operated inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

Read section 13 for maintenance, calibration and adjustment work inside and outside hazardous areas.
12 Firmware update (serial interface)

Firmware updates on positioners currently in operation can be performed as follows:
When updates are performed by a service employee appointed by SAMSON, the update is confirmed on the device by the test mark assigned by SAMSON’s Quality Assurance.
In all other cases, only plant operator personnel with written approval may perform updates. Updates are to be confirmed by approved personnel on the device.
Laptops and PCs connected to the power supply must not be used without an additional protective circuit.
This does not apply to laptops in battery operation. In this case, it is assumed that a battery-powered laptop runs briefly for software programming or testing purposes.

a) Updates outside the hazardous area:
Remove the positioners from the plant. Update them outside the hazardous area.

b) Updates on site:
Updates on site are only permitted after the plant operator presented a signed hot work permit.

After updating has been completed, add the current firmware to the nameplate; this can be done using labels.

13 Maintenance, calibration and work on equipment

Interconnection with intrinsically safe circuits to check or calibrate the equipment inside or outside hazardous areas is to be performed only with intrinsically safe current/voltage calibrators and measuring instruments to rule out any damage to components relevant to explosion protection.
Observe the maximum permissible values specified in the certificates for intrinsically safe circuits.
### 14 Code list

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Operating mode</td>
<td>Switchover from automatic to manual mode is bumpless. In fail-safe position, the S icon appears on the display. In MAN and AUtO mode, the system deviation is represented by the bar graph elements. The reading indicates the valve position or angle of rotation in % when the positioner is initialized. If the positioner is not initialized, the position of the lever in relation to the longitudinal axis is displayed in degrees (°).</td>
</tr>
<tr>
<td>1</td>
<td>Manual w [0] to 100 % of the nominal range</td>
<td>Adjust the manual set point with the rotary pushbutton. The current travel/angle is displayed in % when the positioner is initialized. If the positioner is not initialized, the position of the lever in relation to the longitudinal axis is indicated in degrees (°). <strong>Note:</strong> It can only be selected when Code 0 = MAN</td>
</tr>
<tr>
<td>2</td>
<td>Reading direction 1234, 1234, ESC</td>
<td>The reading direction of the display is turned by 180°.</td>
</tr>
<tr>
<td>3</td>
<td>Enable configuration [No], YES, ESC</td>
<td>Enables changing of data (automatically deactivated when the rotary pushbutton has not been operated for 120 s). FF blinks on the display when the on-site operation is locked. Codes marked with an asterisk (*) can only be read and not overwritten. Similarly, codes can only read over the SSP interface.</td>
</tr>
</tbody>
</table>

**Note:** Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.
# Code list

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4*</td>
<td>Pin position</td>
<td>Follower pin must be mounted in the proper position depending on the valve travel/opening angle. Pin position must be entered for nominal (NOM) or substitute (SUb) initialization.</td>
</tr>
<tr>
<td></td>
<td>[No], 17, 25, 35, 50, 70, 100, 200 mm, 90° with rotary actuators, ESC Note: If you select a pin position in Code 4 that is too small, the positioner switches to SAFE mode for reasons of safety.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pin position Standard Adjustment range</td>
<td>Pin position Standard Adjustment range</td>
</tr>
<tr>
<td></td>
<td>17 7.5 3.6 to 17.7</td>
<td>17 7.5 3.6 to 17.7</td>
</tr>
<tr>
<td></td>
<td>25 7.5 5.0 to 25.0</td>
<td>25 7.5 5.0 to 25.0</td>
</tr>
<tr>
<td></td>
<td>35 15.0 7.0 to 35.4</td>
<td>35 15.0 7.0 to 35.4</td>
</tr>
<tr>
<td></td>
<td>50 30.0 10.0 to 50.0</td>
<td>50 30.0 10.0 to 50.0</td>
</tr>
<tr>
<td></td>
<td>70 40.0 14.0 to 70.7</td>
<td>70 40.0 14.0 to 70.7</td>
</tr>
<tr>
<td></td>
<td>100 60.0 20.0 to 100.0</td>
<td>100 60.0 20.0 to 100.0</td>
</tr>
<tr>
<td></td>
<td>200 120.0 40.0 to 200.0</td>
<td>200 120.0 40.0 to 200.0</td>
</tr>
<tr>
<td></td>
<td>90° 24.0 to 100.0</td>
<td>90° 24.0 to 100.0</td>
</tr>
<tr>
<td>5*</td>
<td>Nominal range</td>
<td>Nominal valve travel or opening angle must be entered for nominal (NOM) or substitute (SUb) initialization. The possible adjustment range depends on the pin position from the table for Code 4. Code 5 is generally locked until Code 4 is set to No, i.e. after a pin position has been entered, Code 5 can be configured. Indicates maximum travel/angle reached during initialization after initialization has been successfully completed.</td>
</tr>
<tr>
<td></td>
<td>mm or angle °, ESC</td>
<td>mm or angle °, ESC</td>
</tr>
<tr>
<td>6*</td>
<td>Init mode</td>
<td>Select the initialization mode</td>
</tr>
<tr>
<td></td>
<td>[MAX] Maximum range</td>
<td>MAX: Travel/angle of the closure member from the CLOSED position to the opposite stop in the actuator.</td>
</tr>
<tr>
<td></td>
<td>NOM Nominal range</td>
<td>NOM: Travel/angle of the closure member measured from the CLOSED position to the indicated OPEN position.</td>
</tr>
<tr>
<td></td>
<td>MAN Manual setting</td>
<td>MAN: Manually selected range</td>
</tr>
<tr>
<td></td>
<td>SUb Emergency mode</td>
<td>SUb: Substitute calibration (without initialization)</td>
</tr>
<tr>
<td></td>
<td>ZP Zero calibration</td>
<td>ZP Zero calibration</td>
</tr>
<tr>
<td></td>
<td>ESC Cancel</td>
<td>ESC Cancel</td>
</tr>
</tbody>
</table>

---
### Code list

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7*</td>
<td><strong>w/x</strong>&lt;br&gt;[ Increasing/increasing&lt;br&gt; Increasing/decreasing&lt;br&gt; ESC]</td>
<td>Direction of action of the set point w in relation to the travel/angle x&lt;br&gt;<strong>Automatic adaptation:</strong>&lt;br&gt;- AIR TO: On completing initialization, the direction of action remains increasing/increasing (Increasing/increasing). A globe valve opens as the set point increases.&lt;br&gt;- OPEN: On completing initialization, the direction of action changes to increasing/decreasing (Increasing/decreasing). A globe valve closes as the set point increases.</td>
</tr>
<tr>
<td>8*</td>
<td><strong>Travel/angle range start</strong>&lt;br&gt;(lower x-range value)&lt;br&gt;[0.0] to 80.0 % of the nominal range, ESC</td>
<td>Lower range value for travel/angle in nominal or operating range&lt;br&gt;The <strong>operating range</strong> is the actual travel/angle of the valve and is limited by the lower travel/angle range value (Code 8) and the upper travel/angle range value (Code 9). Usually, the operating range and the nominal range are identical. The nominal range can be limited to the operating range by the lower and upper x-range values. The value is displayed or must be entered.&lt;br&gt;The characteristic is adapted. See also the example in Code 9.</td>
</tr>
<tr>
<td>9*</td>
<td><strong>Travel/angle range end</strong>&lt;br&gt;(upper x-range value)&lt;br&gt;20.0 to [100.0 %] of the nominal range, ESC</td>
<td>Upper range value for travel/angle in nominal or operating range&lt;br&gt;The value is displayed or must be entered.&lt;br&gt;The characteristic is adapted.&lt;br&gt;<strong>Example:</strong> The operating range is modified, for example, to limit the range of a control valve which has been sized too large. For this function, the entire resolution range of the set point is converted to the new limits.&lt;br&gt;0 % on the display corresponds to the adjusted lower limit and 100 % to the adjusted upper limit.</td>
</tr>
<tr>
<td>10*</td>
<td><strong>Travel/angle lower limit</strong>&lt;br&gt;(lower x-limit)&lt;br&gt;0.0 to 49.9 % of the operating range, [No], ESC</td>
<td>Limits travel/opening angle to the entered value (lower limit). The characteristic is not adapted.&lt;br&gt;The characteristic is not adapted to the reduced range. See also example in Code 11.</td>
</tr>
<tr>
<td>Code no.</td>
<td>Parameter – Readings/values [default setting]</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 11*      | Travel/angle upper limit (upper x-limit)     | Limits travel/angle to the entered value (upper limit). The characteristic is not adapted.  
**Example:** In some applications, it is better to limit the valve travel, e.g. if a certain minimum medium flow is required or a maximum flow must not be reached.  
The lower limit must be adjusted with Code 10 and the upper limit with Code 11.  
If a tight-closing function has been set up, it has priority over the travel limitation.  
When set to No, the valve can be opened past the nominal travel with a set point outside of the 0 to 100 % range. |
| 14*      | Reference variable range start (w-start)    | If the set point w reaches up to the entered percentage at the final value that causes the valve to close, the actuator is immediately completely vented (with AIR TO OPEN) or filled with air (with AIR TO CLOSE). This action always lead to maximum tight-closing of the valve.  
Codes 14/15 have priority over Codes 8/9/10/11.  
Codes 21/22 have priority over Codes 14/15. |
| 15*      | Reference variable range end (w-end)        | If the set point w reaches up to the entered percentage at the final value that causes the valve to open, the actuator is immediately filled with air (with AIR TO OPEN) or completely vented (with AIR TO CLOSE). This action always lead to the valve being completely opened. The signal pressure can be limited in Code 16.  
Codes 14/15 have priority over Codes 8/9/10/11.  
Codes 21/22 have priority over Codes 14/15.  
**Example:** Set the end position w > to 99 % for three-way valves. |
| 16*      | Pressure limit                              | The signal pressure to the actuator can be limited in stages.  
After changing a pressure limit already set, the actuator must be vented once (e.g. by selecting the fail-safe position (SAFE) over Code 0).  

**NOTICE**  
Do not activate pressure limitation for double-acting actuators (with fail-safe position AIR TO OPEN). |
### Code list

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
</table>
| 17*      | Proportional-action coefficient $K_p$ (level) 0 to 17, [7], ESC | Read or change $K_p$  
**Note:**  
**Changing the $K_p$ and $T_v$ levels:** During positioner initialization, the values for $K_P$ and $T_V$ are optimally set. If the positioner tends to overshoot impermissibly due to other disturbances, the $K_p$ and $T_v$ levels can be adapted accordingly after initialization. Increment $T_v$ level until desired behavior is reached or when the maximum value of 4 is reached, the $K_p$ level can be decreased in increments. $K_p$ level changes affect the set point deviation. |
| 18*      | Derivative-action time $T_v$ (level) 1, [2], 3, 4, No, ESC | Read or change $T_v$ (see $K_p$ level)  
A change of the $T_v$ level has no effect on the system deviation. |
| 19*      | Tolerance band 0.1 to 10.0 %, [5.0 %] of the operating range, ESC | Used for error monitoring. Determination of the tolerance band in relation to the operating range.  
Associated lag time (30 s) is a reset criterion. If a transit time is determined during initialization which is six times longer than 30 s, the six-fold transit time is accepted as the lag time. |
| 20*      | Characteristic [0] to 9, ESC | Select characteristic  
0 Linear  
1 Equal percentage  
2 Reverse equal percentage  
3 SAMSON butterfly valve, linear  
4 SAMSON butterfly valve, equal percentage  
5 VETEC rotary plug valve, linear  
6 VETEC rotary plug valve, equal percentage  
7 Segmented ball valve, linear  
8 Segmented ball valve, equal percentage  
9 User-defined (defined over operator software)  
**Note:**  
The various characteristics are listed in the Appendix (section 16). |

---

**Note:**  
**Changing the $K_p$ and $T_v$ levels:** During positioner initialization, the values for $K_P$ and $T_V$ are optimally set. If the positioner tends to overshoot impermissibly due to other disturbances, the $K_p$ and $T_v$ levels can be adapted accordingly after initialization. Increment $T_v$ level until desired behavior is reached or when the maximum value of 4 is reached, the $K_p$ level can be decreased in increments. $K_p$ level changes affect the set point deviation.
<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
</table>
| 21*     | **Required transit time OPEN** (w ramp open) | Time required to move through the operating range when the valve opens.  
Limitation of the transit time (Code 21 and 22):  
For some applications it is recommendable to limit the transit time of the actuator to prevent it from engaging too fast in the running process.  
Code 21 has priority over Code 15.  

**NOTICE**  
The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power. |
| 22*     | **Required transit time CLOSED** (w ramp closed) | Time required to move through the operating range when the valve closes.  
Code 22 has priority over Code 14.  

**NOTICE**  
The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power. |
| 23*     | **Total valve travel**  
[0] to 99 \( \cdot 10^7 \), YES, ESC  
Exponential reading from 9999 travel cycles onwards | Totaled full valve travel cycle  
Can be reset to 0 by selecting ESC.  

**Note**  
The total valve travel is saved in a non-volatile memory after every 1000 full valve travel cycle. |
| 24*     | **LV total valve travel**  
1000 to 99 \( \cdot 10^7 \)  
[1.000000], ESC  
Exponential reading from 9999 travel cycles onwards | Limit value of total valve travel. If the limit is exceeded, the error message and the icon corresponding to the condensed state appear. |
| 34*     | **Closing direction**  
CL, [CCL], ESC | CL: Clockwise  
CCL: Counterclockwise  
Direction of rotation to reach the valve’s CLOSED position (view onto rotary switch with positioner cover open).  
Needs only be entered in SUb initialization mode (Code 6). |
<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
</table>
| 35*     | Blocking position [0.0] mm/° /%, ESC           | Enter the blocking position (distance to CLOSED position)  
Only necessary with SUb initialization mode. |
| 36*     | Reset [---], Std, diAG, ESC                    | Std: Resets all parameters and diagnosis data to their default settings. After a reset, the positioner must be re-initialized.  
diAG: Resets diagnosis data only. Plotted reference graphs and logs remain saved.  
The positioner does not need to be re-initialized. |
| 38*     | Inductive alarm [No], YES, ESC                 | Indicates whether the inductive limit contact option is installed or not. |
| 39      | Set point deviation e info –99.9 to 99.9 %     | Read only  
Indicates the deviation from the target position. |
| 40      | Transit time Open info [0] to 240 s            | Read only  
Minimum opening time determined during initialization. |
| 41      | Transit time Closed info [0] to 240 s          | Read only  
Minimum closing time determined during initialization. |
| 42      | Auto-w/manual-w info 0.0 to 100.0 % of the span | Read only  
Auto mode: Indicates the applied automatic set point.  
Man mode: Indicates the applied manual set point. |
| 43      | Firmware info control                          | Read only  
Indicates the positioner type and current firmware version in alternating sequence. |
<table>
<thead>
<tr>
<th>Code no.</th>
<th>Parameter – Readings/values [default setting]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>y info [0] to 100 %, 0P, MAX, – – –</td>
<td>Read only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indicates the control signal y in % in relation to the travel range determined during initialization.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAX: The positioner builds up its maximum output pressure, see description in Code 14 and 15.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0P: The positioner vents completely, see description in Code 14 and 15.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– – –: The positioner is not initialized.</td>
</tr>
<tr>
<td>45</td>
<td>Solenoid valve info YES, HIGH/LOW, No</td>
<td>Read only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indicates whether a solenoid valve is installed or not.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If a voltage supply is connected at the terminals of the installed solenoid valve, YES and HIGH appear on the display in alternating sequence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If a voltage supply is not connected (actuator vented, fail-safe position indicated on the display by the S icon), YES and LOW appear on the display in alternating sequence.</td>
</tr>
<tr>
<td>46*</td>
<td>Bus address 16 to 251, ESC</td>
<td>Bus address</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 to 247: Positioners with fixed bus address</td>
</tr>
<tr>
<td></td>
<td></td>
<td>248 to 251: Positioners without fixed bus address (new or decommissioned positioners)</td>
</tr>
<tr>
<td>47*</td>
<td>Write protection FF YES, [No], ESC</td>
<td>When write protection is active, device data can be read using FF communication but not overwritten.</td>
</tr>
<tr>
<td>48*</td>
<td>Diagnostic parameters ➤ EB 8389</td>
<td></td>
</tr>
<tr>
<td>49*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
The error codes listed in following appear in the display corresponding to their status classification set over the condensed state (Maintenance required/Maintenance demanded: ☢, Out of specification: ☢ blinking, Maintenance alarm: ⚠). If “No message” is assigned to the error code as the status classification, the error is not included in the condensed state.

A status classification is assigned to every error code in the default setting. The status classification of error codes can also be changed as required using an operator software (e.g. TROVIS-VIEW).
## Initialization errors

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <em>Err</em> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 x &gt; permissible range</td>
<td>Value of measuring signal too high or too low; the lever operates near its mechanical stops.</td>
</tr>
<tr>
<td></td>
<td>• Pin not mounted properly</td>
</tr>
<tr>
<td></td>
<td>• Bracket slipped in case of NAMUR attachment or positioner is off center. Follower plate not mounted properly.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Check attachment and pin position, set operating mode from SAFE to MAN and re-initialize the positioner.</td>
</tr>
<tr>
<td>51 Δx &lt; permissible range</td>
<td>Insufficient measuring span of the lever.</td>
</tr>
<tr>
<td></td>
<td>• Pin not mounted properly</td>
</tr>
<tr>
<td></td>
<td>• Wrong lever</td>
</tr>
<tr>
<td></td>
<td>An angle of rotation smaller than 16° at the positioner shaft only generates an alarm. An angle below 9° leads to the initialization being canceled.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Check attachment and re-initialize the positioner.</td>
</tr>
<tr>
<td>52 Attachment</td>
<td>• Invalid positioner attachment.</td>
</tr>
<tr>
<td></td>
<td>• Nominal travel/angle (Code 5) could not be achieved during NOM initialization (no tolerance downwards permissible).</td>
</tr>
<tr>
<td></td>
<td>• Mechanical or pneumatic fault, e.g. wrong lever selected or supply pressure too low to move to the required position.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Check attachment and supply pressure. Re-initialize the positioner. Under certain circumstances, it may be possible to check the maximum travel/angle by entering the actual pin position and then performing a MAX initialization. After initialization has been completed, the Code 5 indicates the maximum achieved travel or angle.</td>
</tr>
<tr>
<td>Error codes – Recommended action</td>
<td>Condensed state message active. When prompted, Err appears. When fault alarms exist, they are displayed here.</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 53 Initialization time exceeded (Init time >) | Initialization takes too long. The positioner returns to the previous operating mode.  
• No pressure in supply line or pneumatic leakage  
• Supply air failure during initialization |
| Status classification | [Maintenance required] |
| Recommended action | Check attachment and supply air line. Re-initialize the positioner. |
| 54 Initialization – solenoid valve | 1) A solenoid valve is installed (Code 45 = YES) and has not been connected or not properly. As a result, actuator pressure cannot build up. The alarm is generated when you attempt to initialize the positioner.  
2) If you attempt to initialize the positioner from the fail-safe position (SAFE). |
| Status classification | [Maintenance required] |
| Recommended action | 1) Check connection and supply voltage of the solenoid valve (Code 45 High/Low).  
2) Set the MAN mode in Code 0. Then initialize the positioner. |
| 55 Transit time too short (transit time <) | Actuator transit times detected during initialization are so short that optimal positioner tuning is impossible. |
| Status classification | [Maintenance required] |
| Recommended action | Check the volume restriction setting as described in section 7.2. Re-initialize the positioner. |
| 56 Pin position | Initialization canceled because selected NOM and SUB initialization modes require the pin position to be entered. |
| Status classification | [Maintenance required] |
| Recommended action | Enter pin position over Code 4 and nominal travel/angle over Code 5. Re-initialize the positioner. |
## Code list

### Operational error

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <em>Err</em> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>57</strong> Control loop</td>
<td>Control loop error, the valve no longer follows the controlled variable within tolerable times (tolerance band alarm Code 19).</td>
</tr>
</tbody>
</table>
|                                 | • Actuator blocked  
|                                 | • Positioner attachment shifted subsequently  
|                                 | • Supply pressure no longer suffices.  |
| Status classification           | [Maintenance required]  |
| Recommended action              | Check attachment.  |
| **58** Zero                     | Zero point incorrect  
|                                 | Error can occur when the positioner’s attachment position is shifted or when the valve trim is worn, particularly with soft-sealed plugs.  |
| Status classification           | [Maintenance required]  |
| Recommended action              | Check valve and attachment of the positioner. If OK, perform a zero calibration over Code 6 (see section 7.7). We recommend to re-initialize the positioner if zero deviates by more than 5 %.  |
| **59** Auto-correction          | Errors in the positioner’s data section are detected detected by automatic monitoring and corrected automatically.  |
| Status classification           | [No message]  |
| Recommended action              | Automatic  |
| **60** Fatal error              | Error in safety-relevant data that cannot be corrected automatically. Possible cause: EMC disturbances.  
|                                 | The valve is moved to fail-safe position.  |
| Status classification           | Maintenance alarm (cannot be classified)  |
| Recommended action              | Reset over Code 36. Re-initialize the positioner.  |
## Hardware error

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <strong>Err</strong> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>62</strong> x signal</td>
<td>Actuator’s measured value recording failed. The conductive plastic element is defective. The device continues functioning in emergency mode but it must be replaced as quickly as possible. The emergency mode on the display is indicated by a blinking closed-loop operation icon and 4 dashes instead of the position reading. <strong>Note on the open-loop operation:</strong> If the measuring system has failed, the positioner is still in a reliable state. The positioner switches to emergency mode where the position cannot be accurately controlled anymore. However, the positioner continues operation according to its set point so that the process remains in a safe state.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance demanded]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Return positioner to SAMSON AG for repair.</td>
</tr>
<tr>
<td><strong>64</strong> i/p converter (y)</td>
<td>Current circuit of i/p converter interrupted.</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance alarm (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Cannot be remedied. Return positioner to SAMSON AG for repair.</td>
</tr>
</tbody>
</table>
## Error appendix

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <strong>Err</strong> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>65</strong> Hardware</td>
<td>Initialization key jammed (firmware version R 1.51 and higher) A hardware error has occurred. The positioner changes to the fail-safe position (SAFE).</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance alarm (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error and return to automatic mode, or perform a reset and re-initialize the positioner. If this is not successful, return positioner to SAMSON AG for repair.</td>
</tr>
<tr>
<td><strong>66</strong> Data memory</td>
<td>No more data can be written to the memory, e.g. because written data deviate from read data. The valve moves to the fail-safe position.</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance alarm (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Return positioner to SAMSON AG for repair.</td>
</tr>
<tr>
<td><strong>67</strong> Check calculation</td>
<td>Hardware controller monitored by test calculation.</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance alarm (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error. If this is not possible, return positioner to SAMSON AG for repair.</td>
</tr>
</tbody>
</table>

## Data error

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <strong>Err</strong> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>68</strong> Control parameters</td>
<td>Error in control parameters.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error, perform a reset and re-initialize the positioner.</td>
</tr>
<tr>
<td><strong>69</strong> Potentiometer parameters</td>
<td>Error in digital potentiometer parameters</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error, perform a reset and re-initialize the positioner.</td>
</tr>
<tr>
<td>Error codes – Recommended action</td>
<td>Condensed state message active. When prompted, Err appears. When fault alarms exist, they are displayed here.</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>70 Calibration</td>
<td>Error in data from production calibration. The positioner continues operation with cold start values.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Return positioner to SAMSON AG for repair.</td>
</tr>
<tr>
<td>71 General parameters</td>
<td>Error in parameters not critical to control operation.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error. Check and, if necessary, change the settings of the require parameters.</td>
</tr>
<tr>
<td>73 Internal device error 1</td>
<td>Internal device error</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Return positioner to SAMSON AG for repair.</td>
</tr>
<tr>
<td>74 FF parameters</td>
<td>Error in parameters not critical to control operation.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error and perform a reset.</td>
</tr>
<tr>
<td>76 No emergency mode</td>
<td>The travel measuring system of the positioner has a self-monitoring function (see Code 62).</td>
</tr>
<tr>
<td></td>
<td>An emergency mode (open-loop control) is not available for certain actuators, such as double-acting actuators.</td>
</tr>
<tr>
<td></td>
<td>In case of a travel sensing error, the positioner vents the output (Output 38) or A1 in double-acting actuators.</td>
</tr>
<tr>
<td></td>
<td>During the initialization, the positioner automatically checks whether the actuator has such a function or not.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[No message]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Merely information, confirm, if necessary. No further action required.</td>
</tr>
</tbody>
</table>
**Code list**

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <strong>Err</strong> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>77</th>
<th>Software loading error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>When the positioner starts operation for the first time after the FF signal has been applied, it carries out a self-test (<strong>tESTinG</strong> runs across the display). If the positioner loads the wrong software, the valve moves to the fail-safe position. It is not possible to make the valve leave this fail-safe position again.</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance alarm (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Interrupt fieldbus signal and restart the positioner. If not successful, return positioner to SAMSON AG for repair.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>78</th>
<th>Option parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Error in option parameters.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[Maintenance required]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Return positioner to SAMSON AG for repair.</td>
</tr>
</tbody>
</table>

**Diagnosis errors**

<table>
<thead>
<tr>
<th>Error codes – Recommended action</th>
<th>Condensed state message active. When prompted, <strong>Err</strong> appears. When fault alarms exist, they are displayed here.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>79</th>
<th>Diagnostic messages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Messages generated by the extended diagnostics</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance required (cannot be classified)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>80</th>
<th>Diagnostic parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Error in parameters not critical to control operation.</td>
</tr>
<tr>
<td>Status classification</td>
<td>Maintenance required (cannot be classified)</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Confirm error. Check and, if necessary, perform a new reference test.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>81</th>
<th>Reference graphs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Error occurred during plotting the reference graphs for drive signal y steady-state or drive signal y hysteresis. • Reference test canceled • Reference line for drive signal y steady-state or drive signal y hysteresis was not adopted.</td>
</tr>
<tr>
<td>Status classification</td>
<td>[No message]</td>
</tr>
<tr>
<td>Recommended action</td>
<td>Check and, if necessary, perform a new reference test.</td>
</tr>
</tbody>
</table>
14.1 Decimal values of the modes in the FOUNDATION™ fieldbus blocks (Code 48)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Decimal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO</td>
<td>8</td>
</tr>
<tr>
<td>AUTO/CAS</td>
<td>12</td>
</tr>
<tr>
<td>AUTO/RCAS</td>
<td>134</td>
</tr>
<tr>
<td>O/S</td>
<td>128</td>
</tr>
<tr>
<td>MAN</td>
<td>16</td>
</tr>
</tbody>
</table>

14.2 Decimal values of the states in the FOUNDATION™ fieldbus blocks (Code 48)

<table>
<thead>
<tr>
<th>Status</th>
<th>Decimal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good (NC) – Non-specific</td>
<td>128</td>
</tr>
<tr>
<td>Good (NC) – Active block alarm</td>
<td>132</td>
</tr>
<tr>
<td>Good (NC) – Active advisory alarm</td>
<td>136</td>
</tr>
<tr>
<td>Good (NC) – Active critical alarm</td>
<td>140</td>
</tr>
<tr>
<td>Good (NC) – Unack block alarm</td>
<td>144</td>
</tr>
<tr>
<td>Good (NC) – Unack advisory alarm</td>
<td>148</td>
</tr>
<tr>
<td>Good (NC) – Unack critical alarm</td>
<td>152</td>
</tr>
<tr>
<td>Uncertain – Non-specific</td>
<td>64</td>
</tr>
<tr>
<td>Uncertain – Last usable value</td>
<td>68</td>
</tr>
<tr>
<td>Uncertain – Substitute/manual entry</td>
<td>72</td>
</tr>
<tr>
<td>Uncertain – Initial value</td>
<td>76</td>
</tr>
<tr>
<td>Uncertain – Sensor conversion not accurate</td>
<td>80</td>
</tr>
<tr>
<td>Uncertain – Engineering unit range violation</td>
<td>84</td>
</tr>
<tr>
<td>Uncertain – Sub-normal</td>
<td>88</td>
</tr>
<tr>
<td>Good (C) – Non-specific</td>
<td>192</td>
</tr>
<tr>
<td>Good (C) – Initialization acknowledge</td>
<td>196</td>
</tr>
<tr>
<td>Good (C) – Initialization request</td>
<td>200</td>
</tr>
<tr>
<td>Good (C) – Not invited</td>
<td>204</td>
</tr>
</tbody>
</table>
### Code list

<table>
<thead>
<tr>
<th>Status</th>
<th>Decimal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good (C) – Not selected</td>
<td>208</td>
</tr>
<tr>
<td>Good (C) – Local override</td>
<td>216</td>
</tr>
<tr>
<td>Good (C) – Fault state active</td>
<td>220</td>
</tr>
<tr>
<td>Bad – Non-specific</td>
<td>0</td>
</tr>
<tr>
<td>Bad – Configuration error</td>
<td>4</td>
</tr>
<tr>
<td>Bad – Not connected</td>
<td>8</td>
</tr>
<tr>
<td>Bad – Device failure</td>
<td>12</td>
</tr>
<tr>
<td>Bad – Sensor failure</td>
<td>16</td>
</tr>
<tr>
<td>Bad – No comm., with last usable value</td>
<td>20</td>
</tr>
<tr>
<td>Bad – No comm., no last usable value</td>
<td>24</td>
</tr>
<tr>
<td>Bad – Out of service</td>
<td>28</td>
</tr>
</tbody>
</table>
15 Dimensions in mm

Fig. 27: NAMUR and direct attachment
Attachment according to VDI/VDE 3847 to Type 3277

Lever mm

\[ \begin{align*}
M &= 50 \\
L &= 100 \\
XL &= 200
\end{align*} \]

Attachment according to VDI/VDE 3847 to a NAMUR rib

Fig. 28: Attachment according to VDI/VDE 3847
Fig. 29: Attachment to rotary actuators acc. to VDI/VDE 3845 (Sept. 2010), fixing level 1, AA1 to AA4 size

- *Reversing amplifier
  - Type 3710 (see drawing of heavy-duty version for dimensions)
  - 1079-1118/1079-1119, no longer available (see drawing of light version for dimensions)
**Dimensions in mm**

<table>
<thead>
<tr>
<th>Lever</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>17 mm</td>
<td>25 mm</td>
<td>33 mm</td>
</tr>
<tr>
<td>M</td>
<td>25 mm</td>
<td>50 mm</td>
<td>66 mm</td>
</tr>
<tr>
<td>L</td>
<td>70 mm</td>
<td>100 mm</td>
<td>116 mm</td>
</tr>
<tr>
<td>XL</td>
<td>100 mm</td>
<td>200 mm</td>
<td>216 mm</td>
</tr>
</tbody>
</table>

**Fig. 30: Lever**

15.1 Fixing levels according to VDI/VDE 3845 (September 2010)

**Dimensions in mm**

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Ød</th>
<th>( M_{\text{min}} )</th>
<th>D*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA0</td>
<td>50</td>
<td>25</td>
<td>15</td>
<td>5.5 for M5</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td>AA1</td>
<td>80</td>
<td>30</td>
<td>20</td>
<td>5.5 for M5</td>
<td>96</td>
<td>50</td>
</tr>
<tr>
<td>AA2</td>
<td>80</td>
<td>30</td>
<td>30</td>
<td>5.5 for M5</td>
<td>96</td>
<td>50</td>
</tr>
<tr>
<td>AA3</td>
<td>130</td>
<td>30</td>
<td>30</td>
<td>5.5 for M5</td>
<td>146</td>
<td>50</td>
</tr>
<tr>
<td>AA4</td>
<td>130</td>
<td>30</td>
<td>50</td>
<td>5.5 for M5</td>
<td>146</td>
<td>50</td>
</tr>
<tr>
<td>AA5</td>
<td>200</td>
<td>50</td>
<td>80</td>
<td>6.5 for M6</td>
<td>220</td>
<td>50</td>
</tr>
</tbody>
</table>

* Flange type F05 according to DIN EN ISO 5211
16 Valve characteristic selection

The characteristics that can be selected in Code 20 are shown in following in graph form.

**Note**

A characteristic can only be defined (user-defined characteristic) using a workstation/operating software (e.g. TROVIS-VIEW).

**Linear** (select characteristic: 0)

![Graph showing linear characteristic]

**Equal percentage** (select characteristic: 1)

![Graph showing equal percentage characteristic]

**Reverse equal percentage** (select characteristic: 2)

![Graph showing reverse equal percentage characteristic]
TRANSLATION

VDE
VDE, Prüf und Zertifizierungsinstitut

EB 834-5 EN

Translation

Offenbach, 2005-11-21

Year of
P. Opt
1031
Year of
2005-14-03
Order
d 87096-9010-006/15355
BG 230/1/bob-2/whk

Center
H. Biehl
Tel. (069) 83068-240
Fax (069) 8306-716
giebel@biede.de

Test report for information of the Applicant

Testing of the Degree of Protection on enclosures of Type 3730 and Type 3731 Positioners

This test report contains the results of a single investigation carried out on the product submitted. A sample of
this product was tested to confirm the adherence with the then applicable standards resp. parts of standards.

The test report does not enable to use a VDE Certification mark and the "GS - gesichert nach Sicherheitsstandard" (test safety) and does not refer to all VDE specifications applicable to the tested product.

This report may only be passed to a third party in its complete wording including this preamble and the date of
issue.

Any publication or reproduction requires the prior written approval of the VDE Testing and Certification Institute.

1 Assignment

The samples described in 2 below were tested for compliance with the IP 66 degree of protection.

2 Samples

2.1 Type 3730 Positioner

2.2 Type 3731 Positioner

3 Basis of assessment

DIN EN 60 529/ND 2070 Part 1/2000-09
Degree of protection provided by enclosures (IP Code)
German version EN 60 529-1:1999-12:2001

4 Execution of the tests

The dust test has already been carried out on the Type 3730 Positioner under the reference number
479990-9010-006/15355 and on the Type 3731 Positioner under the reference number
479990-9010-006/15358 with suction in class category 1 of the contacting enclosures of the positioners and bonnet valves.

The inner pressure was 2 kPa and the test lasted 8 hours.

5 Test results

The testing of the samples described in 2 above yielded the following results:

- Protecting against ingress of solid foreign objects according to DIN EN 60 529/VD E 2070 Part 1:2000-09
  - IP6X satisfied
- Protecting against ingress of water according to DIN EN 60 529/VD E 2070 Part 1:2000-09
  - IPX5 satisfied

The positioner enclosures in the versions submitted meet the requirements of IP 66 degree of protection.

There was no ingress of either dust or water.

VDE-Pruf- und Zertifizierungsinstitut

(Seal)

Gerhard Biehl

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK-UNTERNEHMENSTECHNIK, e.V.

Testing and Certification Institute

Hundsruckerstr. 24
D-65848 Offenbach

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK-UNTERNEHMENSTECHNIK, e.V.

Testing and Certification Institute

Hundsruckerstr. 24
D-65848 Offenbach

PHoto by VDE e.V. 45480 P-Schwelm, Germany; E-mail: info@vde.com
IECEx Certificate of Conformity

Certificate No.: IECEx PE06/03654

Date of Issue: 2006-11-02

Manufacturer: SIEMENS ALIAS-UNI-AC EXPO 500-01

Quality Assurance Report:

Quality Assurance Report

October 11, 2006

IECEx Certificate of Conformity

Certificate No.: IECEx PE06/03654

Date of Issue: 2006-11-02

Manufacturer: SIEMENS ALIAS-UNI-AC EXPO 500-01

Quality Assurance Report:

Quality Assurance Report

October 11, 2006
IECEx Certificate of Conformity

Certificate No.: IECEx PTB 08/0054
Date of Issue: 2008-11-02
Issue No.: 0

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The model 3712-41 and 3713-51 up-Positrons are hermetically sealed devices with communication capability and serve to adjust the valve stem position.

In compliance with a central signal, they are actuated for attachment to either:

- Serial or parallel actuators
- Remote control units
- Local control devices
- Programmable logic control systems (PLCs)
- Distributed control systems (DCSs) or similar equipment

(Mount 3712-41 ..) or in accordance with the "EUROCAT.DE" Factory

Specifications Typ 3712-51 ...

For further information see annex.

CONDITIONS OF CERTIFICATION NO
Annex to Certificate of Conformity IECEx PTB 080054

Equipment: 3720-41 Profinet PA Process Automation Fieldbus Foundation Fieldbus

Submitted by: BÄRKKÖN ENG SpA, Regione Emilia
Wassermäkerstrasse 5, 4514 Feldkirch

Manufactured by: BÄRKKÖN ENG Mass. und Regeltechnik
Wassermäkerstrasse 5, 4514 Feldkirch

Groups: IIC

Type of Protection: 15

Temperature Classification: T4a

Degree of Ingress Protection: IP 66

Conditions of Manufacture:

The conditions of manufacture are as follows:

- The equipment is manufactured to comply with the relevant directives and standards:
  - The equipment is designed and manufactured to meet the requirements of the IECEx Certification Scheme.
  - The equipment is tested according to the IECEx tests and procedures.
  - The equipment is marked with the IECEx marking.

The equipment is suitable for use in Zone 1 and Zone 21 environments.

Table: Summary of Results

<table>
<thead>
<tr>
<th></th>
<th>FOUNDATION Fieldbus</th>
<th>SISCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>IIC</td>
<td>IIC</td>
</tr>
<tr>
<td>U (V)</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>I (mA)</td>
<td>174 (214)</td>
<td>210</td>
</tr>
<tr>
<td>P (W)</td>
<td>2.08 (2.12)</td>
<td>2.12</td>
</tr>
</tbody>
</table>

- **U** = maximum voltage for intrinsically safe field circuits according to EN 50020
- **I** = maximum current for intrinsically safe field circuits according to EN 50020
- **P** = maximum power in the intrinsically safe field circuit upon matching

Model 3720-41 and 3720-51 IP66 Positioners - Permissible maximum values for intrinsic safety according to EC Type Examination Certificate PTB 04 ATEX 2109

- The Model 3720-41 and 3720-51 IP66 Positioners are intrinsically safe devices with communication capability and serve for adjusting the valve state: position, temperature, or a control signal. They are intended for attachment to either linear or rotational actuators.

- The Model 3720-41 and 3720-51 IP66 Positioners are passive two-terminal devices which may be connected to all certified intrinsically safe circuits, provided the permissible maximum values of **U**, **I**, and **P** are not exceeded.
Annex to Certificate of Conformity IECEx PTB 00.0054

For instrument air non-combustible media are used.

The equipment is intended for use in hazardous locations.

The correlation between temperature classification and the permissible ambient temperature ranges is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-40°C ... 60°C</td>
</tr>
<tr>
<td>T5</td>
<td>-40°C ... 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>-30°C ... 80°C</td>
</tr>
</tbody>
</table>

Electrical data

Bus connection signal circuit
(terminals 11/12)

Type of protection: Intrinsic safety Ex ia IIC
Only for connection to an intrinsically safe circuit

The correlation between the type of protection and the electrical data is shown in the tables below:

Maximum values: Model 2730-4.

<table>
<thead>
<tr>
<th>Protection PA</th>
<th>Ex ia IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_in = 24 V DC</td>
<td>U_in = 24 V DC</td>
</tr>
<tr>
<td>I_in = 380 mA</td>
<td>I_in = 380 mA</td>
</tr>
<tr>
<td>P_i = 5.32 W</td>
<td>P_i = 2.58 W</td>
</tr>
</tbody>
</table>

Maximum values: Model 2730-5.

<table>
<thead>
<tr>
<th>Protection PA</th>
<th>Ex ia IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_in = 24 V DC</td>
<td>U_in = 24 V DC</td>
</tr>
<tr>
<td>I_in = 380 mA</td>
<td>I_in = 280 mA</td>
</tr>
<tr>
<td>P_i = 5.32 W</td>
<td>P_i = 2.58 W</td>
</tr>
</tbody>
</table>

CI = 5 μF; LI = 10 μF

Limit switch, inductive
(terminals 41/42)

Type of protection: Intrinsic safety Ex ia IIC,
Only for connection to an intrinsically safe circuit

Maximum values:

U_1 = 16 V, I_1 = 52 mA;
P_I = 250 mW

LI = 100 μH, CI = 30 nF

or

U_1 = 16 V, I_1 = 25 mA;
P_I = 64 mA

The correlation between the type of protection and the permissible ambient temperature ranges, maximum short-circuit currents and maximum power of the analyzers is shown in the table below:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature ranges</th>
<th>I_s / P_s</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>+5°C to 45°C</td>
<td>52 mA / 16 mW</td>
</tr>
<tr>
<td>T5</td>
<td>-40°C to 60°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T4</td>
<td>+25°C to +75°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T6</td>
<td>+60°C to 90°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T5</td>
<td>-60°C to +90°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T4</td>
<td>+30°C to +60°C</td>
<td>25 mA / 64 mW</td>
</tr>
</tbody>
</table>

Forced venting function
(terminals 87/88)

Type of protection: Intrinsically safe Ex ia IIC
Only for connection to an intrinsically safe circuit

Maximum values:

U_1 = 28 V, I_1 = 115 mA
P_I = 500 mW
LI = negligible
CI = 5.2 μF

Binary input 1
(terminals 87/88)

Type of protection: Intrinsically safe Ex ia IIC
Only for connection to an intrinsically safe circuit

Maximum values:

U_1 = 28 V, I_1 = 100 mA
P_I = 500 mW
LI = 6.2 μF
CI = 3.2 μF

Binary input 2
(terminals 87/88)

Type of protection: Intrinsically safe Ex ia IIC
Only for connection to an intrinsically safe circuit

Maximum values:

U_1 = 28 V, I_1 = 100 mA
P_I = 500 mW
LI = 6.2 μF
CI = 3.2 μF

The correlation between the type of protection and the permissible external capacitances and inductances is shown in the table below:

<table>
<thead>
<tr>
<th>Protection PA</th>
<th>Ex ia IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_I = 7 μF</td>
<td>C_I = 1 μF</td>
</tr>
<tr>
<td>L_s = 10 μH</td>
<td>L_s = 3 μH</td>
</tr>
</tbody>
</table>

LI and CI negligible

Serial interface BU

Type of protection: Intrinsically safe Ex ia IIC

Maximum values:

LI = 100 μH
CI = 30 nF

LI = 10 mH
CI = 30 nF

4 of 5
Annex to Certificate of Conformity IECEx PTB 06.0064

The correlation between the type of protection and the permissible external capacitances and inductances is shown in the table below:

<table>
<thead>
<tr>
<th>Ex in H2</th>
<th>Pb in T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C = 0.61 µF</td>
<td>C = 4 µF</td>
</tr>
<tr>
<td>L = 9 mH</td>
<td>L = 9 mH</td>
</tr>
</tbody>
</table>

Only for connection to a certified intrinsically safe circuit.

Maximum values:

U2 = 16 V, I2 = 25 mA
P2 = 54 mW

In case of interconnection the rules for interconnecting intrinsically safe circuits shall be complied with.

External position sensor
(catalog 2eb, 2id, ph.p1, p.11)

Type of protection: Intrinsically safe Ex in H2

External position sensor
(catalog 2eb, 2id, ph.p10, p.7)

The correlation between the type of protection and the permissible external capacitances and inductances is shown in the table below:

<table>
<thead>
<tr>
<th>Ex in H2</th>
<th>Pb in T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C = 0.61 µF</td>
<td>C = 4 µF</td>
</tr>
<tr>
<td>L = 9 mH</td>
<td>L = 9 mH</td>
</tr>
<tr>
<td>L1 = 370 µH, C1 = 730 nF</td>
<td></td>
</tr>
</tbody>
</table>

Maximum values:

U2 = 8.61 V, I2 = 55 mA
P2 = 250 mW
EU-TYPE-EXAMINATION CERTIFICATE
(Translation)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 2014/34/EU

(3) EU-Type Examination Certificate Number:

PTB 04 ATEX 2109

(4) Product: Postionier, type 3730-41, 3730-51, 3730-45, 3730-55

(5) Manufacturer: GAMSON AG Mess- und Regeltechnik

(6) Address: Wernerkirchstraβe 3, 80314, Frankfurt, Germany

(7) This product and any acceptable variation thereof is specified in the schedule to the certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 3102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been tested to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in the confidential Test Report PTB 04 ATEX 2109.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50079-3:2012/A11:2013 EN 50079-11:2012 EN 50079-31:2014

(10) If the sign "Z" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 2 G Ex ia IIC T6...T4 Gb and II 2 D Ex ia IIC T80 °C Db or II 2 D Ex tb IIC T80 °C Db

Konformitätssicherungsstelle: Sektor Explosionsschutz Braunschweig, May 11, 2017

On behalf of PTB

Dr. Ing. F. Leibinger
Regierungsdirektor

EUT-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Exports or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt - Bundesallee 100 • 38116 Braunschweig • GERMANY
### SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
<th>$i_0/P_a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-65°C ... -45°C</td>
<td>52 mA / 169 mW</td>
</tr>
<tr>
<td>T5</td>
<td>-55°C ... -35°C</td>
<td>52 mA / 169 mW</td>
</tr>
<tr>
<td>T4</td>
<td>-55°C ... -75°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T6</td>
<td>-55°C ... -30°C</td>
<td>25 mA / 64 mW</td>
</tr>
<tr>
<td>T4</td>
<td>-55°C ... -60°C</td>
<td>25 mA / 64 mW</td>
</tr>
</tbody>
</table>

**BUS-connection signal circuit**
- type of protection Intrinsic Safety Ex ia IIC / IIB / IIC
- only for connection to a certified intrinsically safe circuit

For relationship between type of protection and electrical data, reference is made to the following table:

**Maximum values:**

<table>
<thead>
<tr>
<th>FISCO power supply</th>
<th>FIELDBUG power supply general</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex ia IIC / IIB / IIC</td>
<td>Ex ia IIC / IIC</td>
</tr>
<tr>
<td>$U_i = 17.5$ V DC</td>
<td>$U_i = 24$ V DC</td>
</tr>
<tr>
<td>$I_i = 360$ mA</td>
<td>$I_i = 360$ mA</td>
</tr>
<tr>
<td>$P_i = 6.32$ W</td>
<td>$P_i = 1.04$ W</td>
</tr>
</tbody>
</table>

$C_i = 5$ nF
$L_i = 10$ µH

**Limit contact, inductive**
- type of protection Intrinsic Safety Ex ia IIC / IIC
- only for connection to a certified intrinsically safe circuit

**Maximum values:**

| $U_i = 10$ V |
| $I_i = 62$ mA |
| $P_i = 160$ mW |
| $C_i = 60$ nF |
| $L_i = 100$ µH |

**For relationship between explosion group and permissible external capacitances and inductances, reference is made to the following table:**

<table>
<thead>
<tr>
<th>Ex ia IIC / IIC</th>
<th>Ex ia IIB / IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_i = 2$ µF</td>
<td>$C_i = 16$ µF</td>
</tr>
<tr>
<td>$L_i = 10$ nH</td>
<td>$L_i = 1$ H</td>
</tr>
</tbody>
</table>

---

EU-Type Examination Certificate without signature and official stamp shall not be valid. The certificate may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.

In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt · Bundesallee 100 · 38116 Braunschweig · GERMANY
SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

C: negligibly low
L: negligibly low

Serial interface type of protection Intrinsically Safe Ex ia IIC / IIB / IIC
(programming socket BU)

Maximum values:
- U = 8.81 V
- I = 55 mA
- P = 250 mW

For relationship between type of protection and permissible external capacitances and inductances, reference is made to the following table:

<table>
<thead>
<tr>
<th>Ex ia IIC / IIC</th>
<th>Ex ia IIB / IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 = 0.61 µF</td>
<td>C2 = 4 µF</td>
</tr>
<tr>
<td>L1 = 8 mH</td>
<td>L2 = 9 mH</td>
</tr>
</tbody>
</table>

resp.
only for connection to a certified intrinsically safe circuit

Maximum values:
- U = 10 V
- I = 25 mA
- P = 64 mW

C: negligibly low
L: negligibly low

External position sensor type of protection Intrinsically Safe Ex ia IIC / IIC
(analog circuit board, pins p0, p10, p11)

Maximum values:
- U = 8.81 V
- I = 55 mA
- P = 250 mW

For relationship between type of protection and permissible external capacitances and inductances, reference is made to the following table:

10. Test Report PTB Ext 17-25136

11. Specific conditions of use
none
SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 04 ATEX 2109, Issue: 1

(18) Essential health and safety requirements

Not by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konsortenbewertungsstelle, Sektion Explosionschutz

Braunschweig, May 11, 2017

On behalf of PTB:

Dr.-Ing. F. Lammel
Regierungsdirektor
CONFORMITY STATEMENT
(Translation)


(2) Test Certificate Number:

PTB 05 ATEX 2010 X

(3) Issue: 1

(4) Product:
AEX-FT and AEX-G

(5) Manufacturer:
SAGVON AG Mess- und Regeltechnik

(6) Address:
Warenstraße 3, 80334 München, Germany

(7) This product and any acceptable variation thereof are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directives 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II of the Directive.

The examination and test results are recorded in the confidential test report PTB Ex 17-235/40.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2012/EN 60079-15:2010 EN 60079-31:2014.

(10) If the sign "K" is placed after the certificate number, it indicates that the product is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This Conformity Statement relates only to the design and construction of the specified product in accordance with Directive 2014/34/EU. Further requirements of this Directive apply to the manufacturer and supplier of this product.

(12) The marking of the product shall include the following:

II 3 G Ex nA IIIC T8 Gr. N
Conformity statement: Ex II 3D Ex nA IIIC T80 °C Dc
Physical Technische Bundesanstalt, Braunschweig, June 22, 2017

Sheet 1/3

(13) SCHEDULE

(14) CONFORMITY STATEMENT PTB 05 ATEX 2010 X, Ausgabe: 1

(15) Description of the product:
The positioners of type 3730-48... and 3730-68... are communication-capable, bus-powered field devices which are used to assign a valve position to a control signal.

They are mounted onto actuators and are used as pneumatic auxiliary power. The equipment is intended for the application inside the hazardous area.

Thermal and electrical maximum values:
The permissible ambient temperature range for dust group IIC is between -55 °C ... 80 °C.

For the relationship between temperature class and permissible ranges of the ambient temperature for gas group IIC reference is made to the following table:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-55 °C ... 60 °C</td>
</tr>
<tr>
<td>T5</td>
<td>-55 °C ... 70 °C</td>
</tr>
<tr>
<td>T4</td>
<td>-55 °C ... 80 °C</td>
</tr>
</tbody>
</table>

BLG connection signal circuit....Nominal signal: 24 V DC
(Terminals 11/12) Rated voltage: 20 V

Binary input 1....Nominal signal: 6 ... 30 V DC
(Terminals 37/68) Rated voltage: 30 V

Binary input 2....Only for connection to a passive floating
(Terminals 35/05) contact circuit

Limit contact, inductive....Nominal signal: 8 V DC, 8 mA
(Terminals 41/42) Rated voltage: 16 V

Forced generation....Nominal signal: 6 ... 24 V DC
(Terminals 51/62) Rated voltage: 28 V

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Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

Sheet 2/3
SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 05 ATEX 20/16 X Issue: 1

Changes against previous issue:

The changes concern the update of the applied standards, the electrical data, the cancelation of type of protection "II", the cancelation of dust ignition protection by enclosure, the application of alternative gasket material of the enclosure and alternative construction of the enclosure.

16. Test report PTE Ex 17-35139

17. Specific conditions of use

The program interface intended for connection to the positioners of types 3730-48... and 3730-58... shall be installed outside of the hazardous area.

For type of protection "II" applies:

If the program interface adapter is connected to a circuit of type of protection "II" a fuse according to IEC 60127-28, 250 V F or according to IEC 60127-2-M, 250 V T with a nominal fuse current of max. 40 mA shall be connected in series to the I/O-circuit. The fuse shall be arranged outside of the hazardous area.

18. Essential health and safety requirements

Met by compliance with the aforementioned harmonized standards.

According to Article 41 of Directive 2014/34/EU, Conformity Statements which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such Conformity Statements and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbeurteilung
Sektor Explosionschutz
Braunschweig, June 22, 2017

Dr. Ing. F. Lampe
Regierungspräsident

On behalf of PTB

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Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY
Communication is optionally either according to the FOUNDATION Fieldbus Specification or according to PROFIBUS PA in compliance FISCO concept.

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (V) is less than or equal to 250 V and the power (P) is less than or equal to 250 VA. Where both conditions are satisfied, the apparatus is considered intrinsically safe. The maximum voltage (V) permitted at any point of the system is 250 V. The power (P) permitted at any point of the system is 250 VA.

In a segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system. The allowed voltage (V) of the associated apparatus is limited to the range of 250 V. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except to a leakage current of 5 mA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices needs to have the parameters in the following range:
- Loop resistance R: 15 - 150 Ohm/km
- Inductance per unit length L: 0.4 - 1 mH/km
- Capacitance per unit length C: 60 - 200 nF/m
- C = C + L = 0.5 C + L
- If both lines are floating, or, C = C + L = 0.5 C + L
- Length of your cable ≤ 30 m
- Length of trunk cable ≤ 1 km

At the end of the trunk cable an approved in-line filter is required to comply with the following parameters:
- R = 90 - 100 Ω
- C = 0.2 - 2.2 μF

One of the allowed terminations might already be integrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to CSA. However, if the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:
1. Approved associated apparatus must be installed in accordance with manufacturer instructions.
2. Approved associated apparatus must meet the following requirements:
   - V ≤ 42V rms, 100V max, 60V max
   - The maximum non-hazardous area voltage must not exceed 250V.
   - The installation must be in accordance with the Canadian Electrical code Part 1.
   - Each set of wires must be protected with ground shield. The shield must extend as close to the terminal(s) as possible and must be grounded shield at 3. Barrier ground.
   - Caution: Use only supply wires suitable for 5°C above surrounding.
   - Warning: Substitution of components may impair intrinsic safety. PE = 1.5. Ground.
   - The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
3. FISCO concept applies to fieldbus / circuit only.
4. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions:
   - Co ≥ C, L ≥ Li ≥ Lcable
Table 1: Intrinsic Safety Parameters

| Fieldbus | Limit-switches | Forced venting function | Binary-input | Serial Interface |
|----------|----------------|-------------------------|--------------|----------------
| Foundation | Profibus | Inductive | 1 | 2 | Active | Passive |
| Circuit No. | | | | | |
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 6 |
| Terminal No. | 11 / 12 (IEC 1148-2) | 11 / 12 (IEC 1148-2) | 41 / 42 | 81 / 82 | 87 / 87 | 85 / 86 | plug |
| Groups | IIC | IIB | IIC | IIB | #/# | #/# | #/# | #/# | #/# |
| V_max [V] | 24 | 17.5 | 16 | 28 | 30 | 28 | 30 | #/# | #/# | #/# |
| U_m or V_m | #/# #/# | 5.88 V | 8.61 V | #/# |
| I_max [mA] | 360 | 380 | 380 | 25 | 52 | 115 | 100 | #/# | #/# | 25 |
| I_or I_sc | #/# #/# | 1 mA | 55 mA | #/# |
| P_max [W] | 1.04 | 2.58 | 5.32 | 664 mW 169 mW | #/# | #/# | 7.2 mW | 250 mW | 64 mW |
| C (nF) | 2 | 60 | 5.3 | 0 | #/# | #/# | 0 |
| C or C_a | #/# #/# | 2 µF | 0.61 µF | #/# |
| L (µH) | 10 | 100 | 0 | 0 | #/# | #/# | 0 |
| L_or L_a | #/# #/# | 10 mH | 9 mH | #/# |

Binary-input 1: For connection of an active signal circuit
Binary-input 2: For connection of an active contact circuit directly on the control valve, e.g. passive pressure switch for leakage monitoring.

Notes:
1. Entity parameters must meet the following requirements:
   - V_oc ≤ V_max, I SC ≤ I max, P o ≤ P_max
   - C_a or C or C_a ≥ C and L or L_a ≥ L + L_a
2. Install in accordance with the Canadian Electrical Code Part I
3. Cable entry M 20 x 1.5 or metal conduit anc. to dwg. No. 1050-0540

* Circuit 3 can be connected to a CSA Certified zener barrier that is rated as follows:
  - Supply channel (connect to Terminal 87): V oc ≤ 28V max and R min ≥ 245 Ω
  - Return channel (connect to Terminal 87): ≤ 28 V max with diodes Return (zero current)

** Circuit 4 can be connected to a CSA Certified zener barrier that is rated as follows:
  - Supply channel (connect to Terminal 87): V oc ≤ 30V max and R min ≥ 300 Ω
  - Return channel (connect to Terminal 87): V oc ≤ 30 V max with diodes Return (zero current)

Table 2: CSA – certified barrier parameters of circuit 4

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Supply barrier</th>
<th>Evaluation barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit 3</td>
<td>≤28V</td>
<td>≥245Ω</td>
</tr>
<tr>
<td>Circuit 4</td>
<td>≤30V</td>
<td>≥300Ω</td>
</tr>
</tbody>
</table>

The correlation between temperature classification and permissible ambient temperature ranges is shown in the table 3 below.

Table 3:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Permissible ambient temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-60°C</td>
</tr>
<tr>
<td>T5</td>
<td>-40°C ≤ T ≤ 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>+80°C</td>
</tr>
</tbody>
</table>

Table 4: Energy-Limited (Non-I Incendive) Parameters

<table>
<thead>
<tr>
<th>Terminal</th>
<th>11 / 12 (IEC 1148-2)</th>
<th>#/#</th>
<th>#/#</th>
<th>#/#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>A, B and IIC</td>
<td>C, D and IIB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U or V_max [V DC]</td>
<td>20V</td>
<td>24V</td>
<td>30V</td>
<td>32V</td>
</tr>
<tr>
<td>I or I_max [mA]</td>
<td>464</td>
<td>261</td>
<td>152</td>
<td>130</td>
</tr>
<tr>
<td>P or P_max [W]</td>
<td>2.32</td>
<td>1.56</td>
<td>1.34</td>
<td>1.14</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>5.3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>10 µF</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Communication is optionally either according to the FOUNDATION Fieldbus Specification or according to PROFINET PA in compliance FISCO-C concept.

The FISCO Concept allows interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (V<sub>in</sub>) the current (I<sub>in</sub>) and the power (P<sub>in</sub>) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (V<sub>in</sub>) the current (I<sub>in</sub>) and the power (P<sub>in</sub>) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C<sub>u</sub>) and inductance (L<sub>u</sub>) of each apparatus (other than the terminator) connected to the Fieldbus must be less than or equal to 5 nF and 10 µH respectively.

In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system. The allowed voltage (V<sub>in</sub>) of the associated apparatus is limited to the range of 14V DC, 24V DC. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except a leakage current of 50mA for each connected device. Separately powered equipment needs a galvanic isolation to assure that the intrinsically safe fieldbus circuit remains passive.

The cable used to interconnect the devices need to have the parameters in the following range:

- Loop resistance (R): 15 ... 150 Ohm/km
- Inductance per unit length (L): 0.4 ... 1 mH/km
- Capacitance per unit length C<sub>i</sub>:
  - 60 ... 200 nF/km
  - C<sub>i</sub> = C<sub>i</sub> + C<sub>line</sub> + C<sub>screen</sub>, if both lines are floating on, C<sub>i</sub> = C<sub>i</sub> + C<sub>line</sub>, if the screen is connected to one line
- Length of spur cable: ≤ 30 m
- Length of trunk cable: ≤ 1 km

At the end of the trunk cable an approved inflatable line termination with the following parameters is suitable:

- R = 90 ... 100 Ohm
- C = 0 ... 2.2 µF

One of the allowed terminations might already be integrated in the associated apparatus.

The number of passive devices connected to the bus segment is not limited due to S. 9. 5, reasons. If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

Notes:

1. Approved associated apparatus must be installed in accordance with manufacturer instructions.
2. Approved associated apparatus must meet the following requirements:
   - Use or V<sub>in</sub> < V<sub>max</sub>, I<sub>in</sub> < I<sub>max</sub>, P<sub>in</sub> < P<sub>max</sub>
3. The maximum non-hazardous area voltage must not exceed 350 V.
4. The installation must be in accordance with the National Electrical Code ANSI/NFA 70 and ANSI/ASAP 12.06.01.
5. Each set of wires must be provided with grounded shield. The shield must extend as close to the terminal(s) as possible and must be grounded shield at all S. Barrier ground.
6. Caution: Use only supply wires suitable for 5°C above surrounding.
8. The polarity for connecting 11 and 12 is of no importance due to an internal rectifier.
9. FISCO concept applies to fieldbus / circuit only.
10. Entity parameters apply to circuit 2, 3 and 4 and further required to meet the following conditions:
    - C<sub>u</sub> = 0.4, C<sub>l</sub> = 0.2 µF
**Addendum Page 9**

Table 1: Maximum values

<table>
<thead>
<tr>
<th>Circuit No.</th>
<th>Terminal No.</th>
<th>Fieldbus</th>
<th>Limit-switches Inductive</th>
<th>Forced venting- function</th>
<th>Binary-input</th>
<th>Serial-Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11/12</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Groups

<table>
<thead>
<tr>
<th>U or V max [V]</th>
<th>1 or l max [mA]</th>
<th>P or P max [W]</th>
<th>C [nF]</th>
<th>L [µH]</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>16</td>
<td>28</td>
<td>30</td>
<td>Vac</td>
</tr>
</tbody>
</table>

Notes:

1. Binary-input 1: For connection of an active signal circuit
2. Binary-input 2: For connection of an passive contact circuit directly on the control valve, e.g. passive pressure switch for leakage monitoring

**Addendum Page 10**

Table 2: FM - approved barrier parameters of circuit 4

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<tr>
<th>Barrier</th>
<th>Supply barrier</th>
<th>Evaluation barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vac</td>
<td>R min</td>
<td>I sc</td>
</tr>
<tr>
<td>circuit 3</td>
<td>≤28V</td>
<td>≥245Ω</td>
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<tr>
<td>T5</td>
<td>-40°C ≤ T ≤ 70°C</td>
</tr>
<tr>
<td>T4</td>
<td>+80°C</td>
</tr>
</tbody>
</table>

Table 4:

<table>
<thead>
<tr>
<th>Terminal</th>
<th>11/12</th>
<th>41/42</th>
<th>81/82</th>
<th>87/88</th>
</tr>
</thead>
</table>

Groups

<table>
<thead>
<tr>
<th>U or V max [VDC]</th>
<th>I or l max [mA]</th>
<th>P or P max [W]</th>
<th>C [nF]</th>
<th>L [µH]</th>
</tr>
</thead>
<tbody>
<tr>
<td>20V</td>
<td>24V</td>
<td>30V</td>
<td>32V</td>
<td>24V</td>
</tr>
<tr>
<td>464</td>
<td>261</td>
<td>152</td>
<td>130</td>
<td>1,117</td>
</tr>
<tr>
<td>2,32</td>
<td>1,56</td>
<td>1,14</td>
<td>1,14</td>
<td>8,88</td>
</tr>
</tbody>
</table>

Notes:

1. Entity parameters must meet the following requirements:
   
   U0 ≤ U or V max, I0 ≤ I or l max, P0 ≤ P or P max
   
   Co or C0 ≥ Ci + C max, and L0 or L0 ≥ Li + L max

2. The installation must be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01

3. Cable entry M 20 x 1,5 or metal conduit acc. to dwg. No. 1050-0540

Maximum values for supply and barrier input 2

Revisions Control No. 1: March 2006 Addendum to E8384-5 EN
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Elektropneumatischer Stellungsregler mit FOUNDATION FIELD BUS Kommunikation / Electropneumatic Positioner with FOUNDATION FIELD BUS communication / Positionneur électropneumatique avec communication FOUNDATION FIELD BUS

Typ/ Type/ Type 3730-5...

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- EMC 2014/30/EU
- EN 61000-6-2:2005, EN 61000-6-3:2007
- RoHS 2011/65/EU
- EN 50581:2012

Hersteller / Manufacturer / Fabricant:

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Frankfurt / Francfort, 2017-07-29
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Hanno Zager
Leiter Qualitätssicherung / Head of Quality Management
Responsable de l'assurance de la qualité

Dirk Hoffmann
Zentralabteilungsleiter / Head of Department / Chef du département
Entwicklungsorganisation / Development Organization

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Typ / Type / Type 3730-51...

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D-38116 Braunschweig
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RoHS 2011/65/EU EN 50581:2012

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Zentralabteilungsleiter/Head of Department/Chef du département
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Revision 07

130  EB 8384-5 EN
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Electropneumatic Positioner with FOUNDATION FIELDBUS communication /
Positionneur électropneumatique avec communication FOUNDATION FIELDBUS
Typ/ Type/Type 3730-55..

entsprechend der EU-Baumusterprüfbescheinigung PTB 04 ATEX 2109 ausgestellt von der/
according to the EU Type Examination PTB 04 ATEX 2109 issued by/
établi selon le certificat CE d'essais sur échantillons PTB 04 ATEX 2109 émis par:

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the conformity with the relevant Union harmonisation legislation is declared with/
est conforme à la législation d'harmonisation de l'Union applicable selon les normes:

EMC 2014/30/EU EN 61000-6-2:2005, EN 61000-6-3:2007
Explosion Protection 94/9/EC (bis/to 2016-04-19) EN 60079-0:2012/A1:2013,
RoHS 2011/65/EU EN 50581:2012

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Typ/ Type/ Type 3730-58..

entsprechend der EU-Baumusterprüfbescheinigung PTB 05 ATEX 2010 X ausgestellt von der / according to the EU Type Examination PTB 05 ATEX 2010 X issued by / établi selon le certificat CE d’essais sur échantillons PTB 05 ATEX 2010 X émis par:

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D-60314 Frankfurt am Main
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Frankfurt / Francfort, 2017-07-29
Im Namen des Herstellers/ On behalf of the Manufacturer / Au nom du fabricant.

Hanno Zager
Leiter Qualitätssicherung / Head of Quality Management / Responsable de l'assurance de la qualité

Dirk Hoffmann
Zentralabteilungsleiter / Head of Department / Chef du département
Entwicklungsorganisation / Development Organization / Organisation du département d'ingénierie