Short product description
Digital positioner for the positioning of pneumatically controlled actuators.

Device firmware version: 05.00.00

Further information
Additional documentation on TZIDC is available to download free of charge at www.abb.com/positioners.

Alternatively simply scan this code:

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ABB Automation Products GmbH
Process Automation
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32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

Customer service center
Tel: +49 180 5 222 580
Mail: automation.service@de.abb.com
1 Safety

1.1 General information and instructions
These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions. Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

1.2 Warnings
The warnings in these instructions are structured as follows:

⚠️ DANGER
The signal word “DANGER” indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠️ WARNING
The signal word “WARNING” indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠️ CAUTION
The signal word “CAUTION” indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

ℹ️ NOTE
The signal word “NOTE” indicates useful or important information about the product.
The signal word “NOTE” is not a signal word indicating a danger to personnel. The signal word “NOTE” can also refer to material damage.

1.3 Intended use
Positioning of pneumatically controlled actuators; designed for mounting on linear and part-turn actuators.
The device is designed for use exclusively within the stated values on the name plate and in the data sheet.
— The maximum operating temperature must not be exceeded.
— The permissible ambient temperature must not be exceeded.
— The housing protection type must be observed.

1.4 Improper use
The following are considered to be instances of improper use of the device:
— For use as a climbing aid, e.g. for mounting purposes
— For use as a support for external loads, e.g. as a support for piping, etc.
— Material application, e.g. by painting over the name plate or welding/soldering on parts.
— Material removal, e.g. by spot drilling the housing.

1.5 Warranty provisions
Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer’s warranty null and void.
2  Use in potentially explosive atmospheres

2.1  General requirements
— The ABB positioner has only been approved for its appropriate and intended use in standard industrial atmospheres. Any breach of this rule leads to a cancellation of warranty and manufacturer’s responsibility!
— It has to be ensured that only such equipment is installed that complies with the types of protection relevant to the applicable zones and categories!
— All electrical equipment has to be suitable for the respective intended use.

2.2  Commissioning, installation
The ABB positioner has to be mounted in a major system. Depending on the degrees of IP-protection, an interval for cleaning the equipment (dust settlement) has to be defined. Strict care has to be taken that only such equipment is installed that complies with the types of protection relevant to the applicable zones and categories. When installing the equipment, the locally applicable rules on erection, e.g. EN 60079-14, have to be observed. Other important facts to be observed:
— In all zones, the circuits of the positioner have to be put into service by a person qualified according to TRBS 1203. The details on the type label are mandatory for doing this.
— The equipment is constructed for IP 65 (optional IP 66) and has to be protected accordingly in adverse ambient conditions.
— The EC-Type Examination Certificates have to be taken into account including any special conditions defined therein.
— The equipment shall only be used as intended.
— The equipment is only to be connected when de-energized.
— The potential equalization of the system has to be established according to the regulations of erection applicable in the respective country of use (VDE 0100, part 540; IEC 364-5-54).
— Circulating currents shall not be led via the enclosures!
— It has to be ensured that the enclosure is properly installed and that its IP protection is not impaired.
— Inside the potentially explosive atmospheres’ assembly shall only be performed taking the locally applicable rules of erection into account. The following conditions have to be observed (incomplete):
  — Assembly and maintenance to be done only if atmosphere is Ex-free and a permit for hot works is in place.
  — The TZIDC is only to be operated in a fully mounted and intact enclosure.

2.3  Notes for operation
— The positioner shall be included in the local equipotential bonding system
— Either only intrinsically or non-intrinsically safe circuits shall be connected. A combination is not permitted.
— When the Positioner is operated with non-intrinsically safe circuits, the subsequent use for type of protection Intrinsic Safety is not permitted.

2.4  Use, operation
The TZIDC is only approved for intended and appropriate use. In case of non-compliance, the warranty and manufacturer’s liability do no longer apply!
— In explosive atmospheres only such auxiliary components shall be used that meet all requirements of the European and the national standards.
— The ambient conditions specified in the instruction manual have to be adhered to strictly.
— The TZIDC has only been approved for its appropriate and intended use in standard industrial atmospheres. Where aggressive substances are present in the air, the manufacturer has to be consulted.
### 2.5 Maintenance, repair

**Definition of terms according to IEC 60079-17:**

**Maintenance**
Defines a combination of any actions carried out to retain an item in, or restore it to, conditions in which it is able to meet the requirements of the relevant specification and perform its required functions.

**Inspection**
Defines any action comprising careful scrutiny of an item carried out either without dismantling, or with the addition of partial dismantling as required, supplemented by means such as measurement, in order to arrive at reliable conclusion as to the condition of an item.

**Visual inspection**
Defines an inspection which identifies, without the use of access equipment and tools, those defects, such as missing bolts, which will be apparent to the eye.

**Close inspection**
Defines an inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps, where necessary, and tools.

**Detailed inspection**
Defines an inspection which encompasses those aspects covered by a close inspection and, in addition, identifies those defects, such as loose terminations, which will only be apparent by opening the enclosure, and/or using, where necessary, tools and test equipment.

### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Visual inspection (every 3 months)</th>
<th>Close inspection (every 6 months)</th>
<th>Detailed inspection (every 12 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection of positioner for intactness, removal of dust settlements.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check of electrical system for intactness and functionality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check of entire system</td>
<td>User’s responsibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.6 Product identification
Depending on the type of explosion protection, Ex-marking is attached to the positioner on the right, next to the main name plate. This indicates the level of explosion protection and the device’s relevant Ex certificate.

2.6.1 Marking (type label)

Fig. 1

NOTE
It is essential, that the equipment is provided with a legible marking of the type of protection required for the intended field of application – before it is put into operation for the first time.

2.7 Preconditions for safe operation of the positioner

DANGER
Risk of explosion due to hot parts
Hot parts inside the housing may pose a risk of explosion. Never open the device immediately after switch-off. Always wait at least four minutes before opening the unit.

When using in hazardous areas, observe the following points:
— Observe the specifications applicable to the device and special conditions in accordance with the relevant certificate.
— Manipulation of the device by the user is not permitted. Only the manufacturer or an explosion protection specialist may modify the device.
— The splash guard cap must be screwed in place to achieve the IP 65 / NEMA 4x IP rating. Operating the unit without splash guard cap is prohibited.
— The device may only be operated with instrument air that is free of oil, water, and dust. The use of flammable gas, oxygen, or oxygen-enriched gas is not permitted.

2.7.1 Cable gland
Limited temperature range of the M20 x 1.5 plastic cable gland for explosion protection variants. The permissible ambient temperature range of the cable gland is -20 ... 80 °C (-4 ... 176 °F). When using the cable gland, make sure that the ambient temperature is within this range. The cable gland must be installed in the housing with a tightening torque of 3.8 Nm. When installing the connection of the cable gland and cable, check for tightness to ensure that the required IP rating is met.
### 2.8 ATEX / EAC TR-CU-012

(limited functionality with EAC TR-CU-012)

#### 2.8.1 ATEX Ex i

<table>
<thead>
<tr>
<th>Ex-marking</th>
<th>Labeling</th>
<th>Type examination certificate</th>
<th>Type</th>
<th>Device class</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II 2 G Ex ia IIC T6 resp. T4 Gb</td>
<td>TÜV 04 ATEX 2702 X</td>
<td>Intrinsically safe equipment</td>
<td>II 2 G</td>
<td>EN 60079-0:2012, EN 60079-11:2012</td>
</tr>
</tbody>
</table>

#### Temperature Data

<table>
<thead>
<tr>
<th>Device group II 2 G</th>
<th>Ambient temperature Ta</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4</td>
<td>-40 ... 85 °C</td>
</tr>
<tr>
<td>T5</td>
<td>-40 ... 50 °C</td>
</tr>
<tr>
<td>T6(^1)</td>
<td>-40 ... 40 °C(^1)</td>
</tr>
</tbody>
</table>

\(^1\) When using the plug-in module “Limit Monitor” in Temperature Class T6, the maximum permissible ambient temperature range is -40 ... 35 °C.

#### Electrical data

In intrinsically safe explosion protection types Ex ib IIC / Ex ia IIC or Ex ia IIIIC, only for connection to a certified intrinsically safe circuit.

<table>
<thead>
<tr>
<th>Current circuit (terminal)</th>
<th>Electrical data (maximum values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal circuit (+11 / -12)</td>
<td>(U_i = 30 \text{ V}) (I_i = 320 \text{ mA}) (P_i = 1.1 \text{ W})</td>
</tr>
<tr>
<td>Contact input (+81 / -82)</td>
<td>(U_i = 30 \text{ V}) (I_i = 320 \text{ mA}) (P_i = 1.1 \text{ W})</td>
</tr>
<tr>
<td>Switch output (+83 / -84)</td>
<td>(U_i = 30 \text{ V}) (I_i = 320 \text{ mA}) (P_i = 500 \text{ mW})</td>
</tr>
<tr>
<td>Mechanical limit monitor, (Pepperl &amp; Fuchs SJ2-SN)</td>
<td>(U_i = 20 \text{ V}) (C_i = \leq 30 \text{ nF}) (I_i = \leq 100 \mu \text{H})</td>
</tr>
<tr>
<td>Plug-in module for limit monitor (+51 / -52) (Limit1: +41 / -42)</td>
<td>(U_i = 30 \text{ V}) (I_i = 320 \text{ mA}) (P_i = 500 \text{ mW})</td>
</tr>
<tr>
<td>Plug-in module for analog position feedback (+31 / -32)</td>
<td>(U_i = 30 \text{ V}) (I_i = 320 \text{ mA}) (P_i = 1.1 \text{ W})</td>
</tr>
<tr>
<td>Interface with the TZIDC Remote Sensor (X2-2: +Uref, X3-2: GND, X3-1: signal)</td>
<td>(U_0 = 5.4 \text{ V}) (I_0 = 74 \text{ mA}) (P_0 = 100 \text{ mW}) (C_0 = \text{negligibly small}) (L_0 = 5 \text{ mH}) (C_0 = 2 \mu \text{F}) (L_0 = \leq 100 \mu \text{H}) (C_0 = 10 \mu \text{F})</td>
</tr>
<tr>
<td>Local communication interface (LCI)</td>
<td>Only for connection to a programming device using an ABB LCI adapter ((U_m \leq 30 \text{ V DC})) outside the hazardous area.</td>
</tr>
</tbody>
</table>

#### Special conditions

- Prevent electrostatic charging due to propagating brush discharge when the equipment is used for applications involving combustible dust.
2.9 IECEx Ex i

Ex-marking
Labeling
Ex ia IIC T6 resp. T4 Gb
Ex ib IIC T6 resp. T4 Gb
Type examination certificate
IECEx TUN 04.0015X
Type
Intrinsic safety "i"
Standards
IEC 60079-0:2011
IEC 60079-11:2011

Temperature Data

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Ambient temperature Ta</th>
</tr>
</thead>
<tbody>
<tr>
<td>TZIDC Ex ia IIC</td>
<td>T4 -40 ... 85 °C</td>
</tr>
<tr>
<td>TZIDC Ex ib IIC</td>
<td>T6 -40 ... 40 °C</td>
</tr>
</tbody>
</table>

1) When using the plug-in module "Limit Monitor" in Temperature Class T6, the maximum permissible ambient temperature range is -40 ... 35 °C.

Electrical data

In intrinsically safe explosion protection types Ex ib IIC / Ex ia IIC, only for connection to a certified intrinsically safe circuit.

<table>
<thead>
<tr>
<th>Current circuit (terminal)</th>
<th>Electrical information (maximum values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal circuit (+11 / -12)</td>
<td>( U_i = 30 ) V ( I_i = 320 ) mA ( P_i = 1.1 ) W ( C_i = 6.6 ) nF ( L_i = ) negligibly small</td>
</tr>
<tr>
<td>Contact input (+81 / -82)</td>
<td>( U_i = 30 ) V ( I_i = 320 ) mA ( P_i = 1.1 ) W ( C_i = 4.2 ) nF ( L_i = ) negligibly small</td>
</tr>
<tr>
<td>Switch output (+83 / -84)</td>
<td>( U_i = 30 ) V ( I_i = 320 ) mA ( P_i = 500 ) mW ( C_i = 4.2 ) nF ( L_i = ) negligibly small</td>
</tr>
<tr>
<td>Local communication interface (LCI)</td>
<td>Only for connection to a programming device using an ABB LCI adapter (( U_m \leq 30 ) V DC) outside the hazardous area.</td>
</tr>
</tbody>
</table>

The following modules may be operated as an option:

<table>
<thead>
<tr>
<th>Current circuit (terminal)</th>
<th>Electrical information (maximum values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug-in module for limit monitor (+51 / -52)</td>
<td>( U_i = 30 ) V ( I_i = 320 ) mA ( P_i = 500 ) mW ( C_i = 3.7 ) nF ( L_i = ) negligibly small</td>
</tr>
<tr>
<td>Plug-in module for analog position feedback (+31 / -32)</td>
<td>( U_i = 30 ) V ( I_i = 320 ) mA ( P_i = 1.1 ) W ( C_i = 6.6 ) nF ( L_i = ) negligibly small</td>
</tr>
</tbody>
</table>

Special Requirements

— For the "Limit monitor with proximity switches" circuit, external measures must be implemented to prevent the rated voltage from being exceeded by more than 40 % in the event of transient disturbances.
— It is only permissible to connect, disconnect, and switch live circuits during installation or maintenance, or for the purpose of carrying out repairs. Note: It is considered very unlikely that a potentially explosive atmosphere would be present in zone 2 at the same time that installation or maintenance/repair work was being carried out.
— Only non-flammable gases may be used for the pneumatic power supply.
— Only use suitable cable entries that meet the requirements of EN 60079-15.
2.10 FM / CSA
(limited functionality)

2.10.1 CSA International

<table>
<thead>
<tr>
<th>Certificate</th>
<th>1052414</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2258 02</td>
<td>PROCESS CONTROL EQUIPMENT – For Hazardous Locations</td>
</tr>
<tr>
<td>Class 2258 04</td>
<td>PROCESS CONTROL EQUIPMENT – Intrinsically Safe, Entity – For Hazardous Locations</td>
</tr>
</tbody>
</table>

Electrical data

Model TZIDC, P/N V18345-x0x2x2xx0x Intelligent Positioner

| For use in | Class I, Div 2, Groups A, B, C and D; Class II, Div 2, Groups E, F, and G; Class III, Enclosure Type 4X |
| Input rated | 30 V DC; max. 4 ... 20 mA |
| Max output pressure | 90 psi |
| Max. ambient temperature | 85 °C |

Model TZIDC, P/N V18345-x0x2x2xx0x Intelligent Positioner

Intrinsically safe with entity parameters of:

| For use in | Class I, Div 1, Groups A, B, C and D; Class II, Div 1, Groups E, F and G; Class III, Enclosure Type 4X |
| Terminals 11 / 12 | V max = 30 V, \( I_{\text{max}} = 104 \text{ mA} \), \( C_i = 6.6 \text{ nF} \), \( L_i = 0 \mu\text{H} \) |
| Terminals 81 / 82 | V max = 30 V, \( I_{\text{max}} = 110 \text{ mA} \), \( C_i = 4.2 \text{ nF} \), \( L_i = 0 \mu\text{H} \) |
| Terminals 83 / 84 | V max = 30 V, \( I_{\text{max}} = 90 \text{ mA} \), \( C_i = 4.2 \text{ nF} \), \( L_i = 0 \mu\text{H} \) |
| Terminals 31 / 32 | V max = 30 V, \( I_{\text{max}} = 110 \text{ mA} \), \( C_i = 6.6 \text{ nF} \), \( L_i = 0 \mu\text{H} \) |
| Terminals 41 / 42 and 51 / 52 | V max = 30 V, \( I_{\text{max}} = 96 \text{ mA} \), \( C_i = 3.7 \text{ nF} \), \( L_i = 0 \mu\text{H} \) |
| Terminals Limit 2 41 / 42 and Limit 1 51 / 52 | V max = 155 V, \( I_{\text{max}} = 52 \text{ mA} \), \( C_i = 20 \text{ nF} \), \( L_i = 30 \mu\text{H} \) |

Note
— The “x” in P/N denotes minor mechanical variations or optional features.
— Local communication interface (LCI) shall not be used in hazardous location.
— Each pair of conductors of each intrinsic safety circuit shall be shielded.
— See FM installation drawing No. 901064 for Details.
2.10.2 CSA Certification Record

<table>
<thead>
<tr>
<th>Certificate</th>
<th>1649904 (LR 20312)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2258 04</td>
<td>PROCESS CONTROL EQUIPMENT – Intronically Safe, Entity – For Hazardous Locations</td>
</tr>
</tbody>
</table>

Electrical data

**Model TZIDC, P/N V18345-x0x2x2xx0x Intelligent Positioner**

For use in

- Class I, Div 1, Groups A, B, C and D;
- Class II, Div 1, Groups E, F, and G;
- Class III, Div 1, Enclosure Type 4X

<table>
<thead>
<tr>
<th>Input rated</th>
<th>30 V DC; max. 4 ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output pressure</td>
<td>Max. 90 psi</td>
</tr>
</tbody>
</table>

Intrinsically safe with entity parameters of:

- Terminals 11 / 12: V max = 30 V, I max = 104 mA, C_i = 6.6 nF, L_i = 0 μH, P_i = 1 W
- Terminals 81 / 82: V max = 30 V, I max = 110 mA, C_i = 3.7 nF, L_i = 0 μH, P_i = 1 W
- Terminals 83 / 84: V max = 30 V, I max = 90 mA, C_i = 3.7 nF, L_i = 0 μH, P_i = 1 W
- Terminals 31 / 32: V max = 30 V, I max = 110 mA, C_i = 6.6 nF, L_i = 0 μH, P_i = 1 W
- Terminals 41 / 42 and 51 / 52: V max = 30 V, I max = 96 mA, C_i = 3.7 nF, L_i = 0 μH, P_i = 1 W
- Terminals Limit 2 41 / 42 and Limit 1 51 / 52: V max = 155 V, I max = 52 mA, C_i = 20 nF, L_i = 30 μH, P_i = 1 W

When installed per installation Drawing No 901064:

<table>
<thead>
<tr>
<th>Temperature Code</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Ambient temperature</td>
<td>85 °C</td>
</tr>
</tbody>
</table>

Note

- The “x” in P/N denotes minor mechanical variations or optional features.
- Local communication interface LCI shall not be used in hazardous location.
- Each pair of conductors of each intrinsic safety circuit shall be shielded.
- See FM installation drawing No. 901064 for Details.

2.10.3 FM Approvals

TZIDC Positioner, Model V18345-a0b2c2de0f

- IS/I,II,III/1/ABCDEFG/T4 Ta = 85 °C – 901064/7/4; Entity;
- S/II,III/2/FG/T4 Ta = 85 °C; Type 4X

Max Entity Parameters: Per Control Drawings

- Case/mounting – 1, 2, 3, 4 or 9
- Input/communication port – 1 or 2
- Output/safe protection – 1, 2, 4 or 5
- Option modules for analog or digital position feedback – 0, 1, 3 or 5
- Mechanical kit (proximity switches) for digital position feedback (option) – 0, 1 or 3
- Design (varnish/coding) – 1 or 2

See FM installation drawing No. 901064 for Details.
3 Function and System Design

3.1 Schematic diagram

![Diagram of the positioner with labels](image)

**Fig. 2: Schematic diagram of the positioner**

1. LCI connector  
2. Setpoint signal 4 ... 20 mA  
3. Binary input  
4. Binary output  
5. Supply air: 1.4 ... 6 bar (20 ... 90 psi)  
6. Exhaust air  
7. I/P module with 3/3-way valve  
8. Position sensor  
9. Plug-in module analog feedback (4 ... 20 mA)  
10. Plug-in module digital feedback  
11. Installation kit for mechanical position indication  
12. Limit monitor with proximity switches  
13. Limit monitor with 24 V microswitches

**NOTE**

With optional upgrades, either the "Limit monitor with proximity switches" (12) or the "Limit monitor with 24 V microswitches" (13) can be used. In both cases, the "mechanical position indicator" (11) must be installed.

3.2 Functionality

The TZIDC is an electronically configurable positioner with communication capabilities designed for mounting on pneumatic linear or part-turn actuators.

Fully automatic determination of the control parameters and adaptation to the positioner allow for considerable time savings as well as optimum control behavior.
4 Product identification

4.1 Name plate

![Name plate diagram](image)

**Fig. 3: Name plate (example)**

- **1** Full type designation
- **2** Master number
- **3** Hardware rev.
- **4** Software rev.
- **5** Serial number
- **6** Code for customer-specific version
- **7** Year of manufacture
- **8** Supply air pressure
- **9** Input: analog 4 - 20 mA
- **10** Mode of action of pneumatics
- **11** Response to failure of power supply
- **12** Ex-version
- **13** Additional options

5 Transport and storage

5.1 Inspection
Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents. All claims for damages must be submitted to the shipper without delay and before installation.

5.2 Transporting the device
Observe the following instructions:
- Do not expose the device to moisture during transport. Pack the device accordingly.
- Pack the device so that it is protected against vibrations during transport, e.g., by using air-cushioned packaging.

5.3 Storing the device
Bears the following points in mind when storing devices:
- Store the device in its original packaging in a dry and dust-free location. The device is also protected by a desiccant in the packaging.
- The storage temperature should be between -40 ... 85 °C (-40 ... 185 °F).
- Avoid storing the device in direct sunlight.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

5.3.1 Ambient conditions
The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device. Adhere to the device data sheet!

5.4 Returning devices
For the return of devices, follow the instructions in the chapter "Repair" on page 39.
6 Installation

6.1 Safety instructions

⚠ CAUTION
Risk of injury due to incorrect parameter values!
Incorrect parameter values can cause the valve to move unexpectedly. This can lead to process failures and result in injuries.
— Before recommissioning a positioner that was previously in use at another location, always reset the device to its factory settings.
— Never start Auto Adjust before restoring the factory settings.

⚠ NOTE
Before installation, check whether the positioner meets the control and safety requirements for the installation location (actuator or valve).
See the “Specifications” section on the data sheet.

Only qualified specialists who have been trained for these tasks are authorized to mount and adjust the unit, and to make the electrical connection.

When carrying out any work on the device, always observe the local accident prevention regulations and the regulations concerning the construction of technical installations.

6.2 External position sensors

A TZIDC Control Unit with TZIDC Remote Sensor
In this version, the components are supplied in two housings, which together form one harmonized unit.
The following points should be observed during installation:
— Housing 1 (TZIDC Control Unit) contains the electronics and pneumatics and is mounted separately from the actuator.
— Housing 2 (TZIDC Remote Sensor) contains the position sensor and is mounted on the linear and part-turn actuator. Mechanical mounting is described in chapter "Mechanical mounting" on page 15.
— Electrical connections are described in chapter "Connection on device - TZIDC Control Unit with TZIDC Remote Sensor" on page 24.

B TZIDC Control Unit for remote position sensor
In this version the positioner is supplied without a position sensor.
The following points should be observed during installation:
— Housing 1 (TZIDC Control Unit) contains the electronics and pneumatics and is mounted separately from the actuator.
— The remote position sensor is mounted on the linear and part-turn actuator. Follow the operating instructions for the remote position sensor for mechanical mounting!
— Electrical connections are described in chapter "Connection on device - TZIDC Control Unit for remote position sensor" on page 25.
6.3 Mechanical mounting

6.3.1 General information

6.3.2 Mounting on linear actuators

For mounting on a linear actuator in accordance with DIN / IEC 534 (lateral mounting as per NAMUR), the following mounting kit is available:

- **Fig. 7**
  - 1 Screw
  - 2 Washer
  - 3 Mount bracket
  - 4 Lever with follower pin (for stroke adjustment 10 ... 35 mm (0.39 ... 1.38 inch) or 20 ... 100 mm (0.79 ... 3.94 inch)
  - 5 Washers
  - 6 Screws
  - 7 U-bolts
  - 8 Washers
  - 9 Nuts
  - 10 Screws
  - 11 Spring washers
  - 12 Clamp plates
  - 13 Follower guide

Operating range for linear actuators:
The operating range for linear actuators is ±45° symmetrically to the longitudinal axis. The usable span within the operating range is at least 25° (recommended figure 40°). The usable span does not necessarily need to run symmetrically to the longitudinal axis.

Operating range of rotary actuators:
The usable span is 90°, which must be entirely within the measuring range, but does not necessarily need to run symmetrically to the longitudinal axis.

**NOTE**
During installation make sure that the actuator travel or rotation angle for position feedback is implemented correctly.
Fig. 8: Attaching a follower guide to the actuator
1. Tighten the screws so that they are hand-tight.
2. Attach the follower guide 1 and clamp plates 2 with screws 4 and spring washers 3 to the actuator stem.

Fig. 9: Mounting lever and bracket on positioner
1. Attach the lever 6 to the feedback shaft 5 of the positioner (can only be mounted in one position due to the cut shape of the feedback shaft).
2. Using the arrow marks 4, check whether the lever moves within the operating range (between the arrows).
3. Hand-tighten the screw 7 on the lever.
4. Hold the prepared positioner (with the mount bracket 1 still loose) on the actuator so that the follower pin for the lever enters the follower guide to determine which tap holes on the positioner must be used for the mount bracket.
5. Secure the mount bracket 1 with screws 2 and washers 3 using the relevant tap holes on the positioner housing.
Tighten the screws as evenly as possible to ensure subsequent linearity. Align the mount bracket in the oblong hole to ensure that the operating range is symmetrical (lever moves between the arrow marks 4).

Fig. 10: Mounting on a cast iron yoke
1. Attach the mount bracket 2 with screw 4 and washer 3 to the cast iron yoke 1.

or

Fig. 11: Mounting on a columnar yoke
1. Hold the mount bracket 3 in the proper position on the columnar yoke 2.
2. Insert the U-bolts 1 from the inside of the columnar yoke 2 through the holes of the mount bracket.
3. Add the washers 4 and nuts 5.
4. Tighten the nuts so that they are hand-tight.

NOTE
Adjust the height of the positioner on the cast iron yoke or columnar yoke until the lever is horizontal (based on a visual check) at half stroke of the valve.
Fig. 12: Positioner linkage
1 Increasing linkage 2 Reducing linkage

The scale on the lever indicates the link points for the various stroke ranges of the valve.
Move the bolt with the follower pin in the oblong hole of the lever to adjust the stroke range of the valve to the working range for the position sensor.
Moving the link point inwards increases the rotation angle of the sensor. Moving the link point outwards reduces the rotation angle of the sensor.
Adjust the actuator stroke to make use of as large an angle of rotation as possible (symmetrical around the center position) on the position sensor.

Recommended range for linear actuators: -28 ... 28°
Minimum angle: 25°

NOTE
After mounting, check whether the positioner is operating within the measuring range.

Position of actuator bolt
The actuator bolt for moving the potentiometer lever can be mounted permanently on the lever itself or on the valve stem. Depending on the mounting method, when the valve moves the actuator bolt performs either a circular or a linear movement with reference to the center of rotation of the potentiometer lever. Select the chosen bolt position in the HMI menu in order to ensure optimum linearization. The default setting is actuator bolt on lever.
6.3.3 Mounting on part-turn actuators
For mounting on part-turn actuators in accordance with VDI / VDE 3845, the following attachment kit is available:

Fig. 15: Components of attachment kit
- Adapter 1 with spring 5
- Four screws M6 4, four spring washers 3, and four washers 2 for attaching the mounting bracket 6 to the positioner
- Four screws M5 7, four spring washers 8, and four washers 9 for attaching the mounting bracket to the actuator

Required tools:
- Wrench, size 8 / 10
- Allen key, size 3

Fig. 16: Mounting the adapter on the positioner
1. Determine the mounting position (parallel to actuator or at 90° angle)
2. Calculate the rotational direction of the actuator (right or left).
3. Move the rotary actuator into the home position.
4. Pre-adjust feedback shaft.
   To ensure the positioner will operate within the operating range (see chapter “General information” on page 15), the mounting position as well as the home position and direction of rotation of the actuator must be taken into account when determining the adapter position on the feedback shaft 1. For this purpose, the feedback shaft can be adjusted manually so that the adapter 3 can be attached in the correct position.
5. Place the adapter in the proper position on the feedback shaft and fasten with threaded pins 2. One of the threaded pins must be locked in place on the flat side of the feedback shaft.
Fig. 17: Screwing the mounting bracket onto the positioner

Mounting bracket

Fig. 18: Screwing the positioner onto the actuator

NOTE
After mounting, check whether the operating range for the actuator matches the measuring range for the positioner, see chapter "General information" on page 15.
6.4 Electrical connections

**DANGER**
Risk of explosion for devices with local communication interface (LCI)
A local communication interface (LCI) may not be operated in hazardous areas. Never use the local communication interface (LCI) on the main board in a hazardous area.

**WARNING**
Risk of injury due to live parts!
When the housing is open, contact protection is not provided and EMC protection is limited. Before opening the housing, switch off the power supply.

6.4.1 Connection diagram for positioner / TZIDC Control Unit

The electrical connection may only be established by authorized specialist personnel. The electrical connection information in this manual must be observed; otherwise, the IP rating may be adversely affected. Safe isolation of electrical circuits which are dangerous if touched is only ensured if the connected devices satisfy the requirements of DIN EN 61140 (VDE 0140 Part 1) (basic requirements for safe isolation). To ensure safe isolation, install supply lines so that they are separate from electrical circuits which are dangerous if touched, or implement additional isolation measures for them.

![Connection diagram](image.jpg)

**Connections for inputs and outputs**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function / comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>+11 / -12</td>
<td>Analog input</td>
</tr>
<tr>
<td>+81 / -82</td>
<td>Binary input DI</td>
</tr>
<tr>
<td>+83 / -84</td>
<td>Binary output DO2</td>
</tr>
<tr>
<td>+51 / -52</td>
<td>Digital feedback SW1 (Option module)</td>
</tr>
<tr>
<td>+41 / -42</td>
<td>Digital feedback SW2 (Option module)</td>
</tr>
<tr>
<td>+31 / -32</td>
<td>Analog feedback AO (Option module)</td>
</tr>
<tr>
<td>1 / 2 / 3</td>
<td>TZIDC remote sensor (Only for options TZIDC Remote Sensor or TZIDC for remote position sensor)</td>
</tr>
</tbody>
</table>

**Terminal** | **Function / comments** |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+51 / -52</td>
<td>Limit switch Limit 1 with proximity switch (optional)</td>
</tr>
<tr>
<td>+41 / -42</td>
<td>Limit switch Limit 2 with proximity switch (optional)</td>
</tr>
<tr>
<td>41 / 42 / 43</td>
<td>Limit switch Limit 1 with microswitch (optional)</td>
</tr>
<tr>
<td>51 / 52 / 53</td>
<td>Limit switch Limit 2 with microswitch (optional)</td>
</tr>
</tbody>
</table>

**NOTE**
The TZIDC can be fitted either with proximity switches or microswitches as limit switches. It is not possible to combine both variants. For the version TZIDC Control Unit with TZIDC Remote Sensor, the limit switches are located in the TZIDC Remote Sensor.
6.4.2 Connection diagram for TZIDC Remote Sensor

![TZIDC Remote Sensor connection diagram]

Fig. 20: TZIDC Remote Sensor connection diagram
A Basic device  B Options
1 Position sensor  2 Limit monitor with proximity switches (option)  3 Limit monitor with microswitches (option)

Connections for inputs and outputs

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function / comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 / 2 / 3</td>
<td>TZIDC control unit</td>
</tr>
<tr>
<td>+51 / -52</td>
<td>Proximity switches Limit 1 (Option)</td>
</tr>
<tr>
<td>+41 / -42</td>
<td>Proximity switches Limit 2 (Option)</td>
</tr>
<tr>
<td>41 / 42 / 43</td>
<td>Microswitches Limit 1 (Option)</td>
</tr>
<tr>
<td>51 / 52 / 53</td>
<td>Microswitches Limit 2 (Option)</td>
</tr>
</tbody>
</table>

NOTE
The TZIDC Remote Sensor can be fitted either with proximity switches or microswitches as limit switches. It is not possible to combine both variants.

6.4.3 Electrical data for inputs and outputs

NOTE
When using the device in hazardous areas, note the additional connection data in the chapter titled "Use in potentially explosive atmospheres" on page 5!

Analog input

Setpoint signal analog (two-wire technology)

<table>
<thead>
<tr>
<th>Terminals</th>
<th>+11 / -12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal range</td>
<td>4 ... 20 mA</td>
</tr>
<tr>
<td>Split range configuration between</td>
<td>20 ... 100 % of the nominal operating range is configurable</td>
</tr>
<tr>
<td>Maximum</td>
<td>50 mA</td>
</tr>
<tr>
<td>Minimum</td>
<td>3.6 mA</td>
</tr>
<tr>
<td>Starting at</td>
<td>3.8 mA</td>
</tr>
<tr>
<td>Load voltage</td>
<td>9.7 V at 20 mA</td>
</tr>
<tr>
<td>Impedance at 20 mA</td>
<td>485 Ω</td>
</tr>
</tbody>
</table>

Digital input

Input for the following functions:
- no function
- move to 0 %
- move to 100 %
- hold previous position
- block local configuration
- block local configuration and operation
- block any access (local or via PC)

Binary input DI

<table>
<thead>
<tr>
<th>Terminals</th>
<th>+81 / -82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 V DC (12 ... 30 V DC)</td>
</tr>
<tr>
<td>Input &quot;logical 0&quot;</td>
<td>0 ... 5 V DC</td>
</tr>
<tr>
<td>Input &quot;logical 1&quot;</td>
<td>11...30 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Maximum 4 mA</td>
</tr>
</tbody>
</table>
**Binary output**

Output configurable as alarm output by software.

<table>
<thead>
<tr>
<th>Binary output DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminals</td>
</tr>
<tr>
<td>Supply voltage</td>
</tr>
<tr>
<td>(Control circuit to DIN 19234/NAMUR)</td>
</tr>
<tr>
<td>Output &quot;logical 0&quot;</td>
</tr>
<tr>
<td>Output &quot;logical 1&quot;</td>
</tr>
<tr>
<td>Effective direction</td>
</tr>
<tr>
<td>&quot;logical 0&quot; or &quot;logical 1&quot;</td>
</tr>
</tbody>
</table>

**Option modules**

**Module for analog feedback AO**

Without a signal from the positioner (e.g. "no power" or "initializing") the module sets the output to > 20 mA (alarm level).

| Terminals | +31 / -32 |
| Signal range | 4 ... 20 mA (configurable split ranges) |
| — in the event of an error | > 20 mA (alarm level) |
| Supply voltage, two-wire technology | 24 V DC (11 ... 30 V DC) |
| Characteristic curve | rising or falling (configurable) |
| Characteristic curve deviation | < 1 % |

**Module for digital feedback SW1, SW2**

| Terminals | +41 / -42, +51 / -52 |
| Supply voltage | 5 ... 11 V DC |
| (Control circuit to DIN 19234/NAMUR) |
| Output "logical 0" | < 1.2 mA |
| Output "logical 1" | > 2.1 mA |
| Effective direction | Configurable |
| "logical 0" or "logical 1" |
| Description | Two software switches for binary position feedback (position adjustable within the range of 0 ... 100 %, ranges cannot overlap) |

**Assembly kits for limit monitor**

Two proximity switches or microswitches for independent position signaling, switching points adjustable between 0 ... 100%.

| Limit monitor with proximity switches Limit 1, Limit 2 |
| Terminals | +41 / -42, +51 / -52 |
| Supply voltage | 5 ... 11 V DC |
| (Control circuit to DIN 19234/NAMUR) |
| Effective direction | Slot sensor in proximity switch |
| Slot sensor outside proximity switch |
| Type SJ2-SN (NC; log 1) | < 1.2 mA | > 2.1 mA |

**Limit monitor with 24 V microswitches Limit 1, Limit 2**

| Terminals | +41 / -42, +51 / -52 |
| Supply voltage | maximum 24 V AC/DC |
| Load rating | Maximum 2 A |
| Contact surface | 10 μm Gold (AU) |

**Mechanical position indicator**

Indicator disk in enclosure cover linked with device feedback shaft.

These options are also available for retrofitting by Service.

---

1) The module for analog position feedback and the module for digital position feedback plug in separate slots and can be used together.
6.4.4 Connection on the device

For the cable entry in the housing, there are two tap holes 1/2 - 14 NPT or M20 x 1.5 on the left-hand side of the housing. One of these holes has a cable gland and the other has a blind plug.

NOTE
The connecting terminals are delivered closed and must be unscrewed before inserting the wire.

1. Strip the wires to approximately 6 mm (0.24 inch).
2. Connect the wires to the connecting terminals in line with the connection diagram.

Wire cross-sectional areas
Basic device

<table>
<thead>
<tr>
<th>Electrical connections</th>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ... 20 mA input</td>
<td>Rigid / flexible wires 0.14 ... 2.5 mm$^2$ (AWG 26 ... AWG 14)</td>
</tr>
<tr>
<td>Options</td>
<td>Flexible with wire end sleeve 0.25 ... 2.5 mm$^2$ (AWG 23 ... AWG 14)</td>
</tr>
<tr>
<td></td>
<td>Flexible with wire end sleeve no plastic sleeve 0.25 ... 1.5 mm$^2$ (AWG 23 ... AWG 17)</td>
</tr>
<tr>
<td></td>
<td>Flexible with wire end sleeve with plastic sleeve 0.14 ... 0.75 mm$^2$ (AWG 26 ... AWG 20)</td>
</tr>
</tbody>
</table>

Multi-wire connection capacity (two wire with the same cross-section)

<table>
<thead>
<tr>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid / flexible wires</td>
</tr>
<tr>
<td>Flexible with wire end sleeve no plastic sleeve</td>
</tr>
<tr>
<td>Flexible with wire end sleeve with plastic sleeve</td>
</tr>
</tbody>
</table>

Option modules

<table>
<thead>
<tr>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid / flexible wires</td>
</tr>
<tr>
<td>Flexible with wire end sleeve no plastic sleeve</td>
</tr>
<tr>
<td>Flexible with wire end sleeve with plastic sleeve</td>
</tr>
</tbody>
</table>

Multi-wire connection capacity (two wire with the same cross-section)

<table>
<thead>
<tr>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid / flexible wires</td>
</tr>
<tr>
<td>Flexible with wire end sleeve no plastic sleeve</td>
</tr>
<tr>
<td>Flexible with wire end sleeve with plastic sleeve</td>
</tr>
</tbody>
</table>

Limit switch with proximity switches or 24 V microswitches

<table>
<thead>
<tr>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid wire</td>
</tr>
<tr>
<td>Flexible wire</td>
</tr>
<tr>
<td>Flexible with wire end sleeve no plastic sleeve</td>
</tr>
<tr>
<td>Flexible with wire end sleeve with plastic sleeve</td>
</tr>
</tbody>
</table>
6.4.5 Connection on device - TZIDC Control Unit with TZIDC Remote Sensor

In the case of the "TZIDC Control Unit with TZIDC Remote Sensor" design, the components are supplied in two housings, which together form one harmonized unit.

Housing 1 (TZIDC Control Unit) contains the electronics and pneumatics along with the following options (where applicable):
- Analog position feedback
- Digital position feedback

Housing 2 (TZIDC Remote Sensor) contains the position sensor and is suitable for mounting on linear or part-turn actuators.

The following options can be installed if required:
- Optical position indication
- Mechanical feedback contacts designed as proximity switches or microswitches.

Connect the positioner (TZIDC Control Unit, housing 1) and remote position sensor (TZIDC Remote Sensor, housing 2) while following the instructions below:
- The sensor and the electronics have been carefully matched. Ensure that only devices with the same serial number are connected.
- A shielded three-wire cable with a maximum length of 10 m (33 ft) must be used for connection purposes.
- Route the cable into the terminal compartment through the EMC cable glands. Ensure that the shielding is secured correctly in the EMC cable glands.
- Connect the cables in line with the connection diagrams and tighten the screws of the connecting terminals so that they are hand-tight.
- The electrical connections of the TZIDC Control Unit and the optional modules are described in chapter "Connection diagram for positioner / TZIDC Control Unit" on page 20.
- If the TZIDC Control Unit is attached so that it is non-conductive, the housing must be grounded (TZIDC Control Unit and TZIDC Remote Sensor housing with the same electrical potential); otherwise control deviations could occur with regard to analog position feedback.
- Use wire end ferrules when connecting.
6.4.6 Connection on device - TZIDC Control Unit for remote position sensor

With the TZIDC designed for remote position sensors, the positioner is supplied without a position sensor.

The TZIDC Control Unit contains the electronics and pneumatics along with the following options (where applicable):
- Analog position feedback
- Digital position feedback

Any position sensor (4 ... 30 kΩ, with open circuit detection 4 ... 18 kΩ) may be connected.

Connect the positioner (TZIDC Control Unit) and remote position sensor while observing the following instructions:
- A shielded three-wire cable with a maximum length of 10 m (33 ft) must be used for connection purposes.
- Route the cable into the terminal compartment through the EMC cable glands. Ensure that the shielding is secured correctly in the EMC cable glands.
- Connect the cables in line with the connection diagrams and tighten the screws of the connecting terminals so that they are hand-tight.
- The electrical connections of the TZIDC Control Unit and the optional modules are described in chapter "Connection diagram for positioner / TZIDC Control Unit" on page 20.
- If the TZIDC Control Unit is attached so that it is it non-conductive, the housing must be grounded (TZIDC Control Unit and remote position sensor housing with the same electrical potential); otherwise control deviations could occur with regard to analog position feedback.
- Use wire end ferrules when connecting.
6.5 Pneumatic connections

### NOTE
The positioner must only be supplied with instrument air that is free of oil, water, and dust (in gas configuration with dried natural gas).
The purity and oil content must meet the requirements of Class 3 according to DIN/ISO 8573-1.

### NOTE
Damage to components!
Contamination on the air pipe and positioner can damage components.
Dust, splinters, and any other particles of dirt must be blown off the pipe before it is connected.

### NOTE
Damage to components!
Pressure above 6 bar (90 psi) can damage the positioner or actuator.
Provisions must be made (e.g. use of a pressure regulator) to ensure that the pressure does not rise above 6 bar (90 psi), even in the event of a fault.

#### 6.5.1 Information on double-acting actuators with spring-return mechanism

On double-acting actuators with spring-return mechanism, a pressure that significantly exceeds the supply pressure value can be generated during operation by the springs in the chamber opposite the springs. This may damage the positioner or adversely affect control of the actuator.

To eliminate the possibility of this occurring, it is recommended to install a pressure compensation valve between the springless chamber and the supply air for these types of applications. It enables the increased pressure to be transferred back to the air inlet line.

The opening pressure of the check valve should be < 250 mbar (< 3.6 psi).

#### 6.5.2 Connection on the device

![Diagram of Pneumatic Connections](M10905)

**Fig. 24: Pneumatic connections**

1. OUT 2
2. OUT 1
3. IN

**Labeling** | **Pipe connection**
---|---
IN | Air supply, pressure 1.4 ... 6 bar (20 ... 90 psi)
OUT1 | Actuating pressure for actuator
OUT2 | Actuating pressure for actuator

(2. Connection with double-acting actuator)

Join the pipe connections according to the designation, observing the following points:

- All pneumatic piping connections are located on the right-hand side of the positioner. G1/4 or 1/4 18 NPT tap holes are provided for the pneumatic connections. The positioner is labeled according to the tap holes available.
- We recommend that you use a line with dimensions of 12 x 1.75 mm.
- The level of supply air pressure required to apply the actuating force must be adjusted in line with the output pressure in the actuator. The working range for the positioner is between 1.4 ... 6 bar (20 ... 90 psi).

#### 6.5.3 Air supply

**Instrument air**(1):

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purity</td>
<td>Maximum particle size: 5 μm</td>
</tr>
<tr>
<td></td>
<td>Maximum particle density: 5 mg/m³</td>
</tr>
<tr>
<td>Oil content</td>
<td>Maximum concentration 1 mg/m³</td>
</tr>
<tr>
<td>Pressure dew point</td>
<td>10 K below operating temperature</td>
</tr>
<tr>
<td>Supply pressure(2)</td>
<td>1.4 ... 6 bar (20 ... 90 psi)</td>
</tr>
<tr>
<td>Air consumption(3)</td>
<td>&lt; 0.03 kg/h / 0.015 scfm</td>
</tr>
</tbody>
</table>

1) Free of oil, water and dust in accordance with DIN / ISO 8573-1. Pollution and oil content according to Class 3
2) Do not exceed the maximum output pressure of the actuator
3) Independent of supply pressure
7 Commissioning

NOTE
The electrical power supply and supply air pressure data indicated on the name plate must be complied with during commissioning.

CAUTION
Risk of injury due to incorrect parameter values!
Incorrect parameter values can cause the valve to move unexpectedly. This can lead to process failures and result in injuries.

— Before recommissioning a positioner that was previously in use at another location, always reset the device to its factory settings.
— Never start Auto Adjust before restoring the factory settings.

NOTE
Please observe the information in chapter “Operation” on page 30 when operating the device.

Commissioning the positioner:
1. Open the pneumatic power supply.
2. Switch on the electrical power supply and feed in the setpoint signal 4 ... 20 mA.
3. Checking mechanical mounting:
   — Press and hold MODE, and press ↑ or ↓ until operating mode 1.3 (manual adjustment within the measuring range) is displayed. Release MODE.
   — Press ↑ or ↓ to move the actuator into the mechanical end position; check the end positions; rotation angle is displayed in degrees; for high-speed mode, press ↑ or ↓ simultaneously.

Recommended rotational angle range
| Linear actuators | -28 ... 28° |
| Part-turn actuators | -57 ... 57° |
| Minimum angle | 25° |


Commissioning of the positioner is now complete, and the device is ready for operation.

7.1 Operating modes
Selection from the operating level:
1. Press and hold down MODE.
2. Also press and release ↑ rapidly as often as required. The selected operating mode is displayed.
3. Release MODE.
The position is displayed in % or as a rotation angle.

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Mode indicator</th>
<th>Position indicator</th>
</tr>
</thead>
</table>
| 1.0 Control mode\(^1\) with adaptation of the control parameters | ![CTRL_Adj]
M10000s | ![POSITION]
M10000f |
| 1.1 Control mode\(^1\) without adaptation of the control parameters | ![CTRL_FIX]
M10000b | ![POSITION]
M10000g |
| 1.2 Manual adjustment\(^2\) in the operating range. | ![MANUAL]
M10000c | ![POSITION]
M10000h |
| Adjust with ↑ or ↓ \(^3\) |  |
| 1.3 Manual adjustment\(^2\) in the measuring range. | ![MAN_SENS]
M10000d | ![SENS_POS]
M10000n |
| Adjust with ↑ or ↓ \(^3\) |  |

1) Since self-optimization in operating mode 1.0 is subject to several factors during control operation with adaptation, incorrect adjustments could be made over an extended period.
2) Positioning not active.
3) For high-speed mode, press ↑ and ↓ simultaneously.
7.2 Standard Auto Adjust

**NOTE**

Standard Auto Adjust does not always result in optimum control conditions.

7.2.1 Standard Auto Adjust for linear actuators

1. Press and hold down **MODE** until **ADJ_LIN** is displayed.
2. Press **MODE** and hold down until the countdown ends.
3. Release **MODE**; this starts Autoadjust.

7.2.2 Standard Auto Adjust for part-turn actuators

1. Press and hold down **ENTER** until **ADJ_ROT** is displayed.
2. Press **ENTER** and hold down until the countdown ends.
3. Release **ENTER**; this starts Autoadjust.

If Autoadjust is successful, the parameters will be stored automatically and the positioner will revert to operating mode 1.1.

If an error occurs during Autoadjust, the process will be terminated with an error message.

Perform the following steps if an error occurs:

1. Press and hold down operating button ↑ or ↓ for approximately three seconds.
   The unit will switch to the operating level, mode 1.3 (manual adjustment within the measuring range).
2. Check mechanical mounting in accordance with chapter “Mechanical mounting” on page 15 and repeat Standard Auto Adjust.

1) The zero position is determined automatically and saved during Standard Auto Adjust (counter-clockwise (CTCLOCKW) for linear actuators and clockwise (CLOCKW) for rotary actuators).

7.3 Sample parameters

"Change the zero position of the LCD display from clockwise (CLOCKW) to counter-clockwise limit stop (CTCLOCKW)"

Initial situation: the positioner is in bus operation on the operating level.

1. Switching to the configuration level:
   — Press and hold down ↑ and ↓ simultaneously,
   — also press and release **ENTER**,
   — Wait for the countdown to go from 3 to 0,
   — Release ↑ and ↓.
   The following is now shown in the display:

   ![Display Image]

2. Switching to parameter group 3._:
   — Press and hold down **MODE** and **ENTER** simultaneously,
   — Also press and release ↑ twice,
   The following is now shown in the display:

   ![Display Image 2]

   — Release **MODE** and **ENTER**.
   The following is now shown in the display:

   ![Display Image 3]

3. Selecting parameter 3.2:
   — Press and hold down **MODE**,
   — Also press and release ↑ twice,
   The following is now shown in the display:

   ![Display Image 4]

   — Release **MODE**.

4. Changing parameter settings:
   — Press and release ↑ to select **CTCLOCKW**.
5. Switching to parameter 3.3 (Return to operating level) and saving the new settings:
   — Press and hold down MODE,
   — Also press and release ⧼ twice,
   The following is now shown in the display:
   
   — Release MODE,
   — Press and release ⧼ to select NV_SAVE,
   — Press and hold down ENTER until the countdown goes from 3 to 0.
   The new parameter setting is saved and the positioner automatically returns to the operating level. It continues in the operating mode that was active prior to the configuration level being called up.

7.4 Setting the option modules

7.4.1 Setting the mechanical position indicator
1. Loosen the screws for the housing cover and remove it.
2. Rotate the position indicator on the shaft to the desired position.
3. Attach the housing cover and screw it onto the housing. Tighten the screws so that they are hand-tight.
4. Attach the symbol label to mark the minimum and maximum valve positions on the housing cover.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The labels are located on the inside of the housing cover.</td>
</tr>
</tbody>
</table>

7.4.2 Setting the mechanical binary feedback with proximity switches
1. Loosen the screws for the housing cover and remove it.

⚠️ CAUTION ⚠️
Risk of injury!
The device includes slot sensors with sharp edges. Only adjust the slot sensors using a screwdriver.

2. Set the upper and lower switching points for binary feedback as follows:
   — Select "Manual Adjustment" mode and move the valve by hand into the lower switching position.
   — Use a screwdriver to adjust the slot sensor for proximity switch 1 (lower contact) on the feedback shaft until it closes the contact (i.e. until shortly before entering the proximity switch). The slot sensor enters proximity switch 1 when the feedback shaft is rotated clockwise (as viewed from the front).
   — Move the valve by hand into the upper switching position.
   — Use a screwdriver to adjust the slot sensor for proximity switch 2 (upper contact) on the feedback shaft until it closes the contact (i.e. until shortly before entering the proximity switch). The slot sensor enters proximity switch 2 when the feedback shaft is rotated counter-clockwise (as viewed from the front).
3. Attach the housing cover and screw it onto the housing.
4. Tighten the screws so that they are hand-tight.

7.4.3 Setting the mechanical binary feedback with 24 V microswitches
1. Loosen the screws for the housing cover and remove it.
2. Select "Manual Adjustment" operating mode and move the valve by hand into the desired switching position for contact 1.
3. Set maximum contact (1, lower washer). Fasten the upper washer with the special adjustment retainer and rotate the lower washer manually.
4. Select "Manual Adjustment" operating mode and move the valve by hand into the desired switching position for contact 2.
5. Set minimum contact (2, upper washer); Fasten the lower washer with the special adjustment retainer and rotate the upper washer manually.
6. Connect the microswitch.
7. Attach the housing cover and screw it onto the housing.
8. Tighten the screws so that they are hand-tight.
8 Operation

8.1 Safety instructions

⚠️ CAUTION
Risk of injury due to incorrect parameter values!
Incorrect parameter values can cause the valve to move unexpectedly. This can lead to process failures and result in injuries.
- Before recommissioning a positioner that was previously in use at another location, always reset the device to its factory settings.
- Never start Auto Adjust before restoring the factory settings.

If there is a chance that safe operation is no longer possible, take the device out of operation and secure it against unintended startup.

8.2 Parameterization of the device
The LCD display features operating buttons which enable the device to be operated with the housing cover open.

8.2.1 Menu navigation

### Value display with unit
This 7-segment display with four digits indicates parameter values or parameter reference numbers. For values, the physical unit (°C, %, mA) is also displayed.

### Designator display
This 14-segment display with eight digits indicates the designators of the parameters with their status, of the parameter groups, and of the operating modes.
### 8.3 Menu levels

The positioner has two operating levels:

| Operating level | On the operating level the positioner operates in one of four possible operating modes (two for automatic control and two for manual mode). Parameters cannot be changed or saved on this level. |
| Configuration level | On this level most of the parameters of the positioner can be changed locally. The PC is required to change the limit values for the movement counter, the travel counter, and the user-defined characteristic curve. On the configuration level the active operating mode is deactivated. The I/P module is in neutral position. The control operation is inactive. |

---

**NOTE**

**Property damage**

During external configuration via a PC, the positioner no longer responds to the setpoint current. This may lead to process failures. Prior to external configuration, always move the actuator to the safety position and activate manual adjustment.
8.4 HART parameter overview

- Parameter "EXIT" (NV_SAVE)
  - ENTER
  - MODE
  - (3 ... 0)

Configuration level
- P1_ STANDARD
  - P1.0
  - P1.1
  - P1.2
  - P1.3
  - P1.4
  - P1.5

- P2_ SETPOINT
  - P2.0
  - P2.1
  - P2.2
  - P2.3
  - P2.4
  - P2.5
  - P2.6
  - P2.7
  - P2.8

- P3_ ACTUATOR
  - P3.0
  - P3.1
  - P3.2
  - P3.3

- P4_ MES
  - P4.0
  - P4.1
  - P4.2
  - P4.3
  - P4.4
  - P4.5

- P5_ ALARMS
  - P5.0
  - P5.1
  - P5.2
  - P5.3
  - P5.4
  - P5.5
  - P5.6
  - P5.7

- P6_ MAN_ADJ
  - P6.0
  - P6.1
  - P6.2
  - P6.3
  - P6.4
  - P6.5
  - P6.6
  - P6.7

- P7_ CTRL_PAR
  - P7.0
  - P7.1
  - P7.2
  - P7.3
  - P7.4
  - P7.5
  - P7.6
  - P7.7
  - P7.8
  - P7.9
  - P7.10
  - P7.11
  - P7.12
  - P7.13

- P8_ ANLG_OUT
  - P8.0
  - P8.1
  - P8.2
  - P8.3
  - P8.4
  - P8.5
  - P8.6
  - P8.7
  - P8.8

- P9_ DIG_OUT
  - P9.0
  - P9.1
  - P9.2
  - P9.3
  - P9.4

- P10_ DIG_IN
  - P10.0
  - P10.1

- P11_ FS/IP
  - P11.0
  - P11.1
  - P11.2
  - P11.3
  - P11.4
  - P11.5

Fig. 26
# 8.5 HART parameter description

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<tr>
<th>Parameter</th>
<th>Display</th>
<th>Function</th>
<th>Possible parameter setting</th>
<th>Unit</th>
<th>Factory setting</th>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>P1.0</strong></td>
<td>ACTUATOR</td>
<td>Actuator type</td>
<td>Actuator type</td>
<td>LINEAR, ROTARY</td>
<td>---</td>
</tr>
<tr>
<td><strong>P1.1</strong></td>
<td>AUTO_ADJ</td>
<td>Auto adjust</td>
<td>Autoadjust</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td><strong>P1.2</strong></td>
<td>ADJ_MODE</td>
<td>Auto adjust mode</td>
<td>Automatic adjustment mode</td>
<td>FULL, STROKE, CTRL_PAR, ZERO_POS, LOCKED</td>
<td>---</td>
</tr>
<tr>
<td><strong>P1.3</strong></td>
<td>TEST</td>
<td>Test</td>
<td>Test</td>
<td>Function</td>
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</tr>
<tr>
<td><strong>P1.4</strong></td>
<td>FIND_DEV</td>
<td>Find device</td>
<td>Find device</td>
<td>DISABLE, ONE_TIME, CONTINUOUS</td>
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</tr>
<tr>
<td><strong>P1.5</strong></td>
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<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
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</tr>
<tr>
<td><strong>P2._</strong></td>
<td>SETPOINT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>P2.0</strong></td>
<td>MIN_RGE</td>
<td>Min setpoint range</td>
<td>Min. setpoint range</td>
<td>4.0 … 18.4 mA</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>P2.1</strong></td>
<td>MAX_RGE</td>
<td>Max setpoint range</td>
<td>Max. setpoint range</td>
<td>20.0 … 5.6 mA</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>P2.2</strong></td>
<td>CHARACT</td>
<td>Characteristic curve</td>
<td>Characteristic curve</td>
<td>LINEAR, 1:25, 1:50, 25:1, 50:1, USERD</td>
<td>---</td>
</tr>
<tr>
<td><strong>P2.3</strong></td>
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<td>Valve action</td>
<td>Effective direction</td>
<td>DIRECT, REVERSE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P2.4</strong></td>
<td>SHUT_CLS</td>
<td>Shut-off value 0%</td>
<td>Shut-off value 0%</td>
<td>OFF, 0.1 … 45.0 %</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>P2.5</strong></td>
<td>SHUT_OPN</td>
<td>Shut-off value 100%</td>
<td>Shut-off value 100%</td>
<td>55.0 … 100.0, OFF</td>
<td>%</td>
</tr>
<tr>
<td><strong>P2.6</strong></td>
<td>RAMP_UP</td>
<td>Setpoint ramp, up</td>
<td>Setpoint ramp (up)</td>
<td>OFF, 0 … 200</td>
<td>---</td>
</tr>
<tr>
<td><strong>P2.7</strong></td>
<td>RAMP_DN</td>
<td>Setpoint ramp, down</td>
<td>Setpoint ramp (down)</td>
<td>OFF, 0 … 200</td>
<td>---</td>
</tr>
<tr>
<td><strong>P2.8</strong></td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td><strong>P3._</strong></td>
<td>ACTUATOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>P3.0</strong></td>
<td>MIN_RGE</td>
<td>Max. of stroke range</td>
<td>Operating range, min.</td>
<td>0.0 … 90.0 %</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>P3.1</strong></td>
<td>MAX_RGE</td>
<td>Max. of stroke range</td>
<td>Operating range, max.</td>
<td>100.0 … 10.0 %</td>
<td>100</td>
</tr>
<tr>
<td><strong>P3.2</strong></td>
<td>ZERO_POS</td>
<td>Zero position</td>
<td>Zero position</td>
<td>CLOCKWISE, CTCLOCKWISE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P3.3</strong></td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td><strong>P4._</strong></td>
<td>MESSAGES</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>P4.0</strong></td>
<td>TIME_OUT</td>
<td>Control time out</td>
<td>Dead band time limit</td>
<td>OFF, … 200</td>
<td>---</td>
</tr>
<tr>
<td><strong>P4.1</strong></td>
<td>POS_SW1</td>
<td>Position switch 1</td>
<td>Switching point SW1</td>
<td>0.0 … 100.0</td>
<td>%</td>
</tr>
<tr>
<td><strong>P4.2</strong></td>
<td>POS_SW2</td>
<td>Position switch 2</td>
<td>Switching point SW2</td>
<td>0.0 … 100.0</td>
<td>%</td>
</tr>
<tr>
<td><strong>P4.3</strong></td>
<td>SW1_ACTV</td>
<td>Switchpoint 1 enable</td>
<td>Active direction SW1</td>
<td>FALL_BEL, EXCEED</td>
<td>---</td>
</tr>
<tr>
<td><strong>P4.4</strong></td>
<td>SW2_ACTV</td>
<td>Switchpoint 2 enable</td>
<td>Active direction SW2</td>
<td>FALL_BEL, EXCEED</td>
<td>---</td>
</tr>
<tr>
<td><strong>P4.5</strong></td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5._</strong></td>
<td>ALARMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>P5.0</strong></td>
<td>LEAKAGE</td>
<td>Leakage detection</td>
<td>Leakage to actuator</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.1</strong></td>
<td>SP_RGE</td>
<td>Setpoint range monitor</td>
<td>Outside the setpoint range</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.2</strong></td>
<td>SENS_RGE</td>
<td>Sens. range monitor</td>
<td>Operating range exceeded</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.3</strong></td>
<td>CTRL_RGE</td>
<td>Controller monitor</td>
<td>Controller inactive</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.4</strong></td>
<td>TIME_OUT</td>
<td>Control time out</td>
<td>Dead band time limit</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.5</strong></td>
<td>STRK_CTR</td>
<td>Stroke counter</td>
<td>Movement counter</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.6</strong></td>
<td>TRAVEL</td>
<td>Travel counter</td>
<td>Travel counter</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P5.7</strong></td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td><strong>P6._</strong></td>
<td>MAN_ADJ</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>P6.0</strong></td>
<td>MIN_VR</td>
<td>Min. valve range</td>
<td>Operating range, min.</td>
<td>0.0 … 100.0 %</td>
<td>0.0</td>
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<tr>
<td><strong>P6.1</strong></td>
<td>MAX_VR</td>
<td>Max. valve range</td>
<td>Operating range, max.</td>
<td>0.0 … 100.0 %</td>
<td>100</td>
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<tr>
<td><strong>P6.2</strong></td>
<td>ACTUATOR</td>
<td>Actuator type</td>
<td>Actuator type</td>
<td>LINEAR, ROTARY</td>
<td>---</td>
</tr>
<tr>
<td><strong>P6.3</strong></td>
<td>SPRING_Y2</td>
<td>Spring action (Y2)</td>
<td>Spring action (Y2)</td>
<td>CLOCKWISE, CTCLOCKWISE</td>
<td>---</td>
</tr>
<tr>
<td><strong>P6.4</strong></td>
<td>DANG_DN</td>
<td>Dead angle close</td>
<td>Dead angle 0 %</td>
<td>0.0 … 45.0 %</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>P6.5</strong></td>
<td>DANG_UP</td>
<td>Dead angle open</td>
<td>Dead angle 100 %</td>
<td>55.0 … 100.0 %</td>
<td>100</td>
</tr>
<tr>
<td><strong>P6.6</strong></td>
<td>BOLT_POS</td>
<td>Bolt position</td>
<td>Actuator position</td>
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</tr>
<tr>
<td><strong>P6.7</strong></td>
<td>EXIT</td>
<td>Return</td>
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<td>Function</td>
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<td>Parameter</td>
<td>Display</td>
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<td>P7.0</td>
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<td>KP value (up)</td>
<td>0.1 ... 120.0</td>
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<td>KP value (down)</td>
<td>0.1 ... 120.0</td>
<td>---</td>
</tr>
<tr>
<td>P7.2</td>
<td>TV_UP</td>
<td>TV value, up</td>
<td>TV value (up)</td>
<td>10 ... 450</td>
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</tr>
<tr>
<td>P7.3</td>
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<td>TV value, down</td>
<td>TV value (down)</td>
<td>10 ... 450</td>
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</tr>
<tr>
<td>P7.4</td>
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<td>Y offset (up)</td>
<td>0.0 ... 100.0</td>
<td>%</td>
</tr>
<tr>
<td>P7.5</td>
<td>Y-OFS_DN</td>
<td>Y offset, down</td>
<td>Y offset (down)</td>
<td>0.0 ... 100.0</td>
<td>%</td>
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<tr>
<td>P7.6</td>
<td>TOL_BAND</td>
<td>Tolerance band (zone)</td>
<td>Tolerance band (zone)</td>
<td>0.3 ... 10.0</td>
<td>%</td>
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<tr>
<td>P7.7</td>
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<td>Deadband</td>
<td>Dead band</td>
<td>0.10 ... 10.00</td>
<td>%</td>
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<td>Min. current range</td>
<td>4.0 ... 18.4</td>
<td>mA</td>
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<tr>
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<td>Max. current range</td>
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<td>Test</td>
<td>Test</td>
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<td>NONE</td>
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<tr>
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<td>Alarm via analog output</td>
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<td>Extension of signal output to 3.8 ... 20.5 mA</td>
<td>4.0 ... 20.0; 3.8 ... 20.5 mA</td>
<td>mA</td>
</tr>
<tr>
<td>P8.8</td>
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<td>Function</td>
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<td>ALRM_LOG</td>
<td>Alarm logic</td>
<td>Alarm output logic</td>
<td>ACTIVE_HI, ACTIVE_LO</td>
<td>---</td>
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<tr>
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<td>SW1_LOG</td>
<td>Switchpoint 1 logic</td>
<td>Logic SW1</td>
<td>ACTIVE_HI, ACTIVE_LO</td>
<td>---</td>
</tr>
<tr>
<td>P9.2</td>
<td>SW2_LOG</td>
<td>Switchpoint 2 logic</td>
<td>Logic SW2</td>
<td>ACTIVE_HI, ACTIVE_LO</td>
<td>---</td>
</tr>
<tr>
<td>P9.3</td>
<td>TEST</td>
<td>Test</td>
<td>Test</td>
<td>---</td>
<td>NONE</td>
</tr>
<tr>
<td>P9.4</td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td>P10._</td>
<td>DIG_IN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P10.0</td>
<td>FUNCTION</td>
<td>Function select</td>
<td>Function selection</td>
<td>NONE, POS_0 %, POS_100 %, POS_HOLD</td>
<td>---</td>
</tr>
<tr>
<td>P10.1</td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td>P11._</td>
<td>FS / IP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P11.0</td>
<td>FAIL_POS</td>
<td>Save position</td>
<td>Safe position</td>
<td>ACTIVE, INACTIVE</td>
<td>---</td>
</tr>
<tr>
<td>P11.1</td>
<td>FACT_SET</td>
<td>Factory setting</td>
<td>Factory Setting</td>
<td>Function</td>
<td>---</td>
</tr>
<tr>
<td>P11.2</td>
<td>IP-TYP</td>
<td>I/P module type</td>
<td>Type of I/P module</td>
<td>NO_F_POS,F_SAFE_1,F_SAFE_2, F_FREEZE1, F_FREEZE2</td>
<td>---</td>
</tr>
<tr>
<td>P11.31)</td>
<td>IP_COMP</td>
<td>IP compensation</td>
<td>IP compensation</td>
<td>ON, OFF</td>
<td>---</td>
</tr>
<tr>
<td>P11.4</td>
<td>HART_REV</td>
<td>HART revision</td>
<td>HART Revision</td>
<td>5; 7</td>
<td>---</td>
</tr>
<tr>
<td>P11.5</td>
<td>EXIT</td>
<td>Return</td>
<td>Return to operating level</td>
<td>Function</td>
<td>---</td>
</tr>
</tbody>
</table>

1) Activation only by ABB Service

**NOTE**

For detailed information on the parameterization of the device, consult the associated configuration and parameterization instructions.
## Diagnosis / error messages

### 9.1 Error codes

<table>
<thead>
<tr>
<th>Error code</th>
<th>Possible cause</th>
<th>Impact</th>
<th>Troubleshooting the Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ERROR 10</strong></td>
<td>The supply voltage was interrupted for at least 20 ms. (This error is displayed after resetting the device to indicate the reason for the reset.)</td>
<td>-</td>
<td>Check the power source and the wiring.</td>
</tr>
<tr>
<td><strong>ERROR 11</strong></td>
<td>The supply voltage has fallen below the minimum voltage.</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset and starts up again with the message <strong>ERROR 10</strong>. If a local communication interface (LCI) is plugged in, the device will enter the operating mode LCI supply.</td>
<td>Check the power source and the wiring.</td>
</tr>
<tr>
<td><strong>ERROR 12</strong></td>
<td>The position is outside the measuring range. Possible reason is a malfunction in the position sensor.</td>
<td><strong>In control mode:</strong> The actuator is moved to the safe position. <strong>On the configuration level:</strong> The output is set to neutral until a button is pressed. After approx. 5 seconds, the positioner is automatically reset in control mode and on the configuration level.</td>
<td>Check the mounting.</td>
</tr>
<tr>
<td><strong>ERROR 13</strong></td>
<td>Invalid input current. This display indicates when the setpoint signal is overridden. The actuator is moved to the safe position.</td>
<td>-</td>
<td>Check the power source and the wiring.</td>
</tr>
<tr>
<td><strong>ERROR 20</strong></td>
<td>No access possible to the data in the EEPROM.</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset. Attempts are made to restore the data. This compensates for intermittent errors in the communication environment with the EEPROM.</td>
<td>If there is still no access to the EEPROM data after resetting the device, load the factory settings. If the error still persists, the device must be returned for repair to the manufacturer.</td>
</tr>
<tr>
<td>Error code</td>
<td>Possible cause</td>
<td>Impact</td>
<td>Troubleshooting the Instrument</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>--------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>ERROR 21</td>
<td>Error while processing the measured values, pointing to an error in the working data (RAM).</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset and the RAM is reinitialized.</td>
<td>If the error persists even after the positioner has been reset, the device will need to be returned to the manufacturer for repair.</td>
</tr>
<tr>
<td>ERROR 22</td>
<td>Error during the table processing, pointing to an error in the working data (RAM).</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset and the RAM is reinitialized.</td>
<td>If the error persists even after the positioner has been reset, the device will need to be returned to the manufacturer for repair.</td>
</tr>
<tr>
<td>ERROR 23</td>
<td>Error when verifying the checksum of the configuration data (RAM).</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset and the RAM is reinitialized.</td>
<td>If the error persists even after the positioner has been reset, the device will need to be returned to the manufacturer for repair.</td>
</tr>
<tr>
<td>ERROR 24</td>
<td>Error in the processor function registers (RAM).</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset and the RAM is reinitialized.</td>
<td>If the error persists even after the positioner has been reset, the device will need to be returned to the manufacturer for repair.</td>
</tr>
<tr>
<td>ERROR 50</td>
<td>Internal error.</td>
<td>The actuator is moved to the safe position. After approx. 5 seconds, the positioner is automatically reset.</td>
<td>If the error can be reproduced and occurs in the same position after resetting, the device must be returned for repair to the manufacturer.</td>
</tr>
</tbody>
</table>
## 9.2 Alarm codes

<table>
<thead>
<tr>
<th>Alarm code</th>
<th>Possible cause</th>
<th>Impact</th>
<th>Troubleshooting the Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM 1</td>
<td>Leakage between positioner and actuator</td>
<td>Depending on how well the leakage can be compensated, small control actions are required at regular intervals.</td>
<td>Check the piping.</td>
</tr>
<tr>
<td>ALARM 2</td>
<td>The setpoint current is outside the permissible range, i.e. it is &lt; 3.8 mA or &gt; 20.5 mA.</td>
<td>-</td>
<td>Check the power source.</td>
</tr>
<tr>
<td>ALARM 3</td>
<td>Alarm of the zero monitor. The zero position has shifted by more than 4%</td>
<td>-</td>
<td>Correct the mounting.</td>
</tr>
<tr>
<td>ALARM 4</td>
<td>Controlling is inactive, because the device does not operate in control mode or the binary input is active.</td>
<td>The controller does not follow the setpoint.</td>
<td>Switch to control mode or switch off the binary input.</td>
</tr>
<tr>
<td>ALARM 5</td>
<td>Positioning timed out. The settling time needed exceeds the configured stroke time.</td>
<td>None, or adaptive control is performed (in adaptive mode).</td>
<td>Ensure that</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>— the actuator is not blocked.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>— the supply air pressure is adequate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>— the given time limit is higher than 1.5 times the longest stroke time of the actuator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If adaption cannot run uninterruptedly for an actuator, adaption should be switched on until the alarm does not occur anymore during controlling actions.</td>
</tr>
<tr>
<td>ALARM 6</td>
<td>The defined limit value for the stroke counter has been exceeded.</td>
<td>-</td>
<td>Reset the counter (only possible via a connected PC with suitable software).</td>
</tr>
<tr>
<td>ALARM 7</td>
<td>The specified limit value for the travel counter has been exceeded.</td>
<td>-</td>
<td>Reset the counter (only possible via a connected PC with suitable software).</td>
</tr>
</tbody>
</table>
### 9.3 Message codes

<table>
<thead>
<tr>
<th>Message codes</th>
<th>Message description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREAK</td>
<td>Action stopped by operator.</td>
</tr>
<tr>
<td>CALC_ERR</td>
<td>Error during plausibility check.</td>
</tr>
<tr>
<td>COMPLETE</td>
<td>Action completed, acknowledgment required.</td>
</tr>
<tr>
<td>EEPROM_ERR</td>
<td>Memory error, data could not be saved.</td>
</tr>
<tr>
<td>FAIL_POS</td>
<td>Safe position is active, action cannot be executed.</td>
</tr>
<tr>
<td>NO_F_POS</td>
<td>Safe position required, but not active.</td>
</tr>
<tr>
<td>NO_SCALE</td>
<td>Valve range limits have not yet been determined; therefore, partial Autoadjust cannot be run.</td>
</tr>
<tr>
<td>NV_SAVE</td>
<td>Data is saved in the non-volatile memory.</td>
</tr>
<tr>
<td>OUT_FANG</td>
<td>Measuring range is exceeded, Auto Adjust was automatically stopped.</td>
</tr>
<tr>
<td>LOAD</td>
<td>Data (factory settings) are being loaded.</td>
</tr>
<tr>
<td>RNG_ERR</td>
<td>Less than 10 % of the measuring range is used.</td>
</tr>
<tr>
<td>RUN</td>
<td>Action running.</td>
</tr>
<tr>
<td>SIMUL</td>
<td>Simulation has been started externally from a PC via HART, Protocol; switching outputs, alarm output and analog position feedback are no longer influenced by the process.</td>
</tr>
<tr>
<td>SPR_ERR</td>
<td>Actual spring action is different from the adjusted one.</td>
</tr>
<tr>
<td>TIMEOUT</td>
<td>Time-out; parameter could not be determined within two minutes; Autoadjust was automatically stopped.</td>
</tr>
</tbody>
</table>
10 Maintenance

The positioner does not require any maintenance if it is used as intended under normal operating conditions.

**NOTE**
Manipulation by users shall immediately render the warranty for the device invalid.
To ensure fault-free operation, it is essential that the device is supplied with instrument air that is free of oil, water, and dust.

11 Repair

Repair and maintenance activities may only be performed by authorized customer service personnel.
When replacing or repairing individual components, use original spare parts.

11.1 Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes. Fill out the return form (see the Appendix) and include this with the device.
According to the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Please contact Customer Center Service acc. to page 2 for nearest service location.
12 Recycling and disposal

12.1 Disposal

NOTE

Products that are marked with this symbol may not be disposed of through municipal garbage collection points.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:

— This product is not subject to WEEE Directive 2002/96/EC or relevant national laws (e.g. ElektroG in Germany).
— The product must be surrendered to a specialist recycling company. Do not use municipal garbage collection points. According to WEEE Directive 2002/96/EC, only products used in private applications may be disposed of at municipal garbage collection points.
— If it is not possible to dispose of old equipment properly, ABB Service can take receipt of and dispose of returns for a fee.

12.2 Information on ROHS Directive 2011/65/EC

The products provided by ABB Automation Products GmbH do not fall within the current scope of regulations on hazardous substances with restricted uses or the directive on waste electrical and electronic equipment according to ElektroG.

If the necessary components are available on the market at the right time, in the future these substances will no longer be used in new product development.

13 Spare parts, consumables and accessories

Repair and maintenance activities may only be performed by authorized customer service personnel. When replacing or repairing individual components, use original spare parts.

14 Specifications

NOTE

The detailed device data sheet is available in the download area at www.abb.com/positioners.

Trademarks

® HART is a registered trademark of FieldComm Group, Austin, Texas, USA
15 Appendix

15.1 Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted. Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:
Address:
Contact person: Telephone:
Fax: E-Mail:

Device details:

Typ: Serial no.:
Reason for the return/description of the defect:

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items)?

- Biological ☐ Corrosive / irritating ☐ Combustible (highly / extremely combustible) ☐
- Toxic ☐ Explosiv ☐ Other toxic substances ☐
- Radioactive ☐

Which substances have come into contact with the device?
1.
2.
3.

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date Signature and company stamp

15.2 Declarations of conformity

NOTE

All documentation, declarations of conformity, and certificates are available in ABB’s download area.
www.abb.com/positioners
CONTROL DOCUMENT NO 901064

Hazardous area

Class I, Div. I, Groups A, B, C, D
Class II, Div. I, Groups E, F, G
Class III, Div. I
(Nota 2)

TZIDC
V18345-X0X2XX0X

Associated Apparatus

Control Equipment

Input Parameters:

Vmax = 30 Vdc
Imax = 104 mA

C1 = 6.6 nF
Li = 0 pH
Pi = 10 W

Notes:

1. Vdc or Vr <= Vmax, Iac or Ii <= Imax, Ca > C1, Lc > Li, Ucable; Pa <= Pi
2. Dust-tight conduit seal must be used when installed in Class I and Class II environments.
3. Control equipment connected to barrier must not use or generate more than 250 Vrms or 60 Vdc
4. Installation should be in accordance with ANSI/ISA RP12.6 "Installation of Intrinsically Safe System for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70).
5. The configuration of associated apparatus must be FMRC Approved/CSA Approved as required.
6. Associated apparatus manufacturers installation drawing must be followed when installing this equipment.
7. When connecting conduit to the enclosure use conduit hubs that have the same environmental rating as the enclosure.
8. No revision to drawing without prior FMRC Approval/CSA Approval.
9. OUTPUT CURRENT MUST BE LIMITED BY A RESISTOR SUCH THAT THE OUTPUT VOLTAGE CURRENT PLOT IS A STRAIGHT LINE DRAWN BETWEEN OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT.
10. Tampering and replacement with non-factory components may adversely affect the safe use of the system. Substitution of components may impair suitability for hazardous locations.
11. FOR FM DIV. 2 USE: Do not connect or disconnect unless the power is switched off or the area is known to be non-hazardous.
12. FOR Div 2 Models: WARNING - EXPLOSION HAZARD - Substitution of components may impair suitability for Class I, Division 2.
13. FOR Div 2 Models: WARNING - EXPLOSION HAZARD - Do not connect while circuit is live unless area is known to be nonhazardous.
14. Local communication interface LKS shall not be used in hazardous locations.
15. To maintain intrinsic safety, wiring associated with each channel must be run in separate cable shields connected to intrinsically safe (associated apparatus) ground.
CONTROL DOCUMENT NO 901064

Hazardous area

Class I, Div. 1, Groups A, B, C, D
Class II, Div. 1, Groups E, F, G
Class III, Div. 1
(Note 2)

TZIDC
V18345-X0X2X2XXX0X

+81
Terminals
-82
(Switching Input)

Entity Parameters:
Vmax = 30 Vdc  Imax = 110 mA
C1 = 4.2 nF  L1 = 0 pH
P1 = 1 W

Associated Apparatus

(Note 9)
(Note 5)
(Note 6)

Control Equipment

Int. Safe Gnd

Entity Parameters:
Vmax = 30 Vdc  Imax = 110 mA
C1 = 4.2 nF  L1 = 0 pH
P1 = 1 W

Nonhazardous area

+83
Terminals
-84
(Switching Output)

Int. Safe Gnd

(Note 3)

(Note 9)
(Note 5)
(Note 6)
(Note 3)
Hazardous area

Associated Apparatus

Control Equipment

(TZIDC V18345-X0X2X21X0X)

+31
Terminals
-32

(Entity Parameters:

Vmax = 30 Vdc
Imax = 110 mA
C1 = 6.6 nF
L1 = 0 pH
Pi = 1 W

(TZIDC V18345-X0X2X23X0X)

+51
Terminals
-52

+41
Terminals
-42

(Entity Parameters:

Vmax = 30 Vdc
Imax = 96 mA
C1 = 3.7 nF
L1 = 0 pH
Pi = 1 W

(Int. Safe Gnd)

(Note 9)

(Note 5)

(Note 3)

(Note 9)

(Note 5)

(Note 6)

(Note 3)

(Note 3)

(Note 9)

(Note 5)

(Note 6)

(Note 3)
CONTROL DOCUMENT NO 901064

Hazardous area

Class I, Div. 1, Groups A, B, C, D
Class II, Div. 1, Groups E, F, G
Class III, Div. 1
(Note 2)

TZIDC
V18345-X0X2X2X10X
or V18345-X0X2X2X30X

Associated
Apparatus

Control
Equipment

+51
Terminals
Limit 1

-52

(Note 5)
(Note 6)

+41
Terminals
Limit 2

-42

(Note 5)
(Note 6)

Int. Safe Gnd

Int. Safe Gnd

(Mechanical Digital Feedback)

Entity Parameters:
Vmax = 15.5 V
Imax = 52 mA
Ci = 20 nF
Li = 30 μH
Pi = 1 W
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www.abb.com/positioners

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3KXE341201R4201
Original instruction