Fine Controls have been supplying process controls & instrumentation equipment since 1994, & now serves an ever expanding customer base, both in the UK & globally.

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**Level:** Level Transmitters & Switches

**Pressure:** Pressure Gauges & Transmitters, Precision & High Pressure Regulators & I-P Converters, Volume Boosters.

**Precision Pneumatics:** Pressure Regulators, I-P Converters, Volume Boosters, Vacuum Regulators

**Valves:** Solenoid & Pneumatic Valves, Control Valves & Positioners, Actuated Ball, Globe or Diaphragm Valves & Isolation Valves

**Services:** Repair, Calibration, Panel Build, System Design & Commissioning

Fine Controls (UK) LTD, Bassendale Road, Croft Business Park, Bromborough, Wirral, CH62 3QL UK
Tel: 0151 343 9966
Email: sales@finecontrols.com
Operating Instructions

Bedienungsanleitung
Instructions de Service

Type 8635
SIDE Control Positioner
Operating Instructions for
SIDE Control Positioner Type 8635
(S/HART, PROFIBUS PA,
HART-Hand Terminal)

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GENERAL NOTES

Symbols

The following symbols are used in these operating instructions:

→ marks a work step that you must carry out.

⚠️ ATTENTION!
marks notes on whose non-observance your health or the functioning of the device will be endangered.

💡 NOTE
marks important additional information, tips and recommendations.

(S/HART) (PROFIBUS PA) (HART)
indicate chapters or sections of the text which are valid only for certain versions of the SIDE Control.

General safety notes

Please observe the notes in these operating instructions together with the conditions of use and permitted data that are specified in the data sheets of the electropneumatic positioner, in order that the device will function perfectly and remain operable for a long time:

• This device left the manufacturer's factory in a faultless condition with regard to technical safety and was tested. Proper transport, storage and installation are the prerequisites for continued correct functioning.

• Keep to standard engineering rules in planning the use of and operating the device!

• Installation and intervention for maintenance work are only allowed by qualified personnel using suitable tools!

• Observe the current regulations on accident prevention and safety for electrical devices during operation and maintenance of the device!

• Take suitable precautions to prevent inadvertent operation or damage by unauthorized action!

• On non-observance of these notes and unauthorized interference with the device, we will refuse all liability and the warranty on device and accessories will become void!
Protection from damage by electrostatic charging

This device contains electronic components that are sensitive to electrostatic discharge (ESD). Contact to electrostatically charged persons or objects will endanger these components. In the worst case, they will be immediately destroyed or will fail after commissioning.

Observe the requirements of EN 100015-1 (IEC 61340-5-1) in order to minimize the possibility of, or avoid, damage from instantaneous electrostatic discharge. Also take care not to touch components that are under supply voltage.

Device-related notes

- For installation and operation in potentially hazardous (explosive) locations, observe the regulations. These are to be found in EN 60079-14 (IEC 60079-14).
- On electrical connection of the inherently safe circuits, observe the data in the relevant certificate of conformity.
- Take suitable precautions to prevent electrostatic charging of plastic parts of the housing (see EN 100015-1 / IEC 61340-5-1).
- No components shall be connected to the inputs and outputs of the boards whose electrical data lie outside the limits determined for inherently safe operation and stated on the data sheet for the positioner.
- In potentially explosive locations, only inherently safe devices (of EN 50020 / IEC 60079-11) shall be connected to the serial interface.
- The plastic covering shall be removed only by the manufacturer!
- Interventions in the device with the housing open shall not be carried out in very humid or aggressive atmospheres. Take precautions to prevent inadvertent mechanical damage to the boards or their components. Limit the duration of opening of the housing to that which is absolutely necessary.

Scope of delivery

Immediately after receipt of a shipment, make sure that the contents are undamaged and match the scope of delivery stated on the packing slip. In general this consists of:

- SIDE Control
- Operating Instructions for the SIDE Control

Add-on kits for linear and part-turn actuators may be obtained as accessories.

If there are discrepancies, please contact immediately our customer service:

Bürkert Fluid Control Systems / Service Department
Chr.-Bürkert-Str. 13-17
D-76453 Ingelfingen
Tel.: (+49 7940) 10-111 Fax: (+49 7940) 10-448
E-Mail: info@de.buerkert.com
GENERAL NOTES

Warranty conditions

This document contains no promise of guarantee. Please refer to our general terms of sales and delivery. The warranty is only valid if the device is used as authorized in accordance with the specified application conditions.

ATTENTION!

The warranty covers only faultless condition of the SIDE Control. No liability will be accepted for consequential damage of any kind that may arise from failure or malfunctioning of the device.

Master code (S/HART)

Operation of the SIDE Control (S/HART) can be blocked with a freely selectable user code. Independent of this, there exists an unchangeable master code with which you can execute all operative actions on the device. This 4-digit master code is to be found in the Appendix of these operating instructions in the Chapter Master code (S/HART).

If required, cut out this code and keep it separate from these operating instructions.
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Technical data (S/HART) ........................................................................................ 24
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Construction of SIDE Control (S/HART)

The SIDE Control (S/HART) is a digital positioner for pneumatically operated continuous valves with single-acting linear or part-turn actuators.

The SIDE Control (S/HART) can be operated via a keypad with display. An optional extra is communication to the HART protocol.

Illustration

Display with 3 operating keys
Screw terminals
Bushings M20x1.5
Throttle screw
Earthing (grounding) screw
Features

- **Position sensor**
  Very high resolution conductive plastic potentiometer

- **Microprocessor controlled electronics**
  for signal processing, control and driving the piezoelectric positioning system; setpoint entry and power supply are via a 4 ... 20 mA standard signal.

- **Operating elements**
  The device can be set (configuration and parametrization) locally via three inside keys. An inside, 8-digit, 16-segment LC display is provided, which can also show the setpoint or actual value.

- **Positioning system**
  A piezoelectric positioning system serves to drive the valve actuator.

- **Position repeater (option)**
  via 2 inductive proximity switches (initiators)

- **Electrical interfaces**
  Cable bushing (M20x1.5) with screw terminals

- **Pneumatic interfaces**
  G1/4” interior thread

- **Housing**
  Aluminium housing (hard anodized and plastic-coated) with swing-up cover and captive screws.

- **Attachment**
  to linear actuators to NAMUR recommendation (DIN IEC 534 T6) or to part-turn actuators to VDI/VDE 3845.
  Option: integral attachment to Bürkert continuous valves
Functional diagram of the SIDE Control (S/HART) connected to a control valve with single-acting diaphragm actuator

NOTE

In the case of integral attachment of the SIDE Control (S/HART) to a Bürkert continuous valve, the position sensor is situated outside the SIDE Control (S/HART) on the actuator and is connected to the latter with a cable.
Operation as a positioner (S/HART)

The SIDE Control (S/HART) controls the position of the pneumatic actuator, whereby the position sensor measures the actual position (POS) of the actuator. The controller compares this actual value of the position with the setpoint (CMD), which is presented as a standard signal. If a control difference (Xd1) exists, a pulse-width modulated voltage signal is sent to the positioning system as the correcting variable. If the difference is positive, the pressurizing piezoelectric valve is driven via output B1; if it is negative, the exhausting piezoelectric valve is driven via output E1. In this way, the position of the actuator is altered until the control difference is 0. Z1 represents a disturbance.
Characteristics of the positioner software

<table>
<thead>
<tr>
<th>Supplementary function</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positioner with supplementary functions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>AUTOTUNE</strong></td>
<td>Automatic adaptation of positioner to the control valve in use.</td>
</tr>
<tr>
<td>Tight-closing function</td>
<td>Valve closes tight outside the control range. A value is specified (in %) from which the actuator is completely exhausted (at 0%) or pressurized (at 100%).</td>
</tr>
<tr>
<td>Stroke limitation</td>
<td>Mech. valve piston movement only within a defined stroke range.</td>
</tr>
<tr>
<td>Limitation of correcting speed</td>
<td>Actuator takes a preset time to move from OPEN to CLOSED or from CLOSED to OPEN.</td>
</tr>
<tr>
<td>Signal range splitting</td>
<td>Splitting of the standard signal range over 2 or more SIDE Controls.</td>
</tr>
<tr>
<td>Correction characteristic for adaptation to the operating curve</td>
<td>Linearization of the process curve can be carried out.</td>
</tr>
<tr>
<td>Insensitivity range</td>
<td>The positioner responds only above a control difference to be specified.</td>
</tr>
<tr>
<td>Direction of action of the controller setpoint</td>
<td>Reserve of direction of action of the setpoint.</td>
</tr>
<tr>
<td>Direction of action of the actuator</td>
<td>Reserve of direction of action of the actuator.</td>
</tr>
<tr>
<td>Safety position</td>
<td>Valve moves to a defined safety position.</td>
</tr>
<tr>
<td>Code protection</td>
<td>Blocking of the keypad or menu</td>
</tr>
<tr>
<td>Factory reset</td>
<td>Reset to factory settings</td>
</tr>
<tr>
<td><strong>Repeater (option)</strong></td>
<td></td>
</tr>
<tr>
<td>Analog feedback of position</td>
<td>Feedback of the values POS and CMD</td>
</tr>
<tr>
<td>Binary outputs</td>
<td>Feedback of various controller conditions (e.g. sensor breakage or controller in safety position).</td>
</tr>
</tbody>
</table>

Hierarchic operating concept for simple operation with the following levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process operation</td>
<td>In this level, you switch between Automatic and Manual operation.</td>
</tr>
<tr>
<td>Configuration</td>
<td>In this level, you specify on commissioning certain basic functions and configure supplementary functions as required.</td>
</tr>
</tbody>
</table>

Communication via HART protocol (option)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HART Hand Terminal</td>
<td>Operation of the SIDE Control via a HART Hand Terminal.</td>
</tr>
</tbody>
</table>
Schematic illustration of position control

- POS
- CMD
- INP
- X.LIMIT
- DIR.ACT
- X.TIME
- X.TIME
- X.CTRL
- SPLTRNG
- CHARACT
- CUTOFF
- DIR.CMD
- DBDX
- X.LIMIT
- 4...20 mA
Operation as a process controller (S/HART, option)

If the SIDE Control (S/HART) is operated as a process controller, the abovementioned position control becomes a lower-ranking auxiliary control loop. The overall result is a cascade control system.

The process controller (as a main control loop) is implemented in the SIDE Control (S/HART as a PID controller. In this case the process setpoint (SP) is preset and compared with the actual value (PV) of the process variable to be controlled, which is supplied by a sensor. Formation of the correcting variable is done according to the description of the positioner. Z2 represents a disturbance acting on the process.

Characteristic of the process controller software (option)

<table>
<thead>
<tr>
<th>Supplementary function</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioner with supplementary functions</td>
<td></td>
</tr>
<tr>
<td>AUTOTUNE</td>
<td>Automatic adaptation of positioner to the control valve in use.</td>
</tr>
<tr>
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<td>Valve closes tight outside the control range. A value is specified (in %) from which the actuator is completely exhausted (at 0 %) or pressurized (at 100 %).</td>
</tr>
<tr>
<td>Stroke limitation</td>
<td>Mech. valve piston movement only within a defined stroke range.</td>
</tr>
<tr>
<td>Limitation of correction speed</td>
<td>Actuator takes a preset time to move from OPEN to CLOSED or from CLOSED to OPEN.</td>
</tr>
<tr>
<td>Correction characteristic for adaptation to the operating curve</td>
<td>Linearization of the process curve can be carried out.</td>
</tr>
<tr>
<td>Insensitivity range</td>
<td>The positioner responds only above a control difference to be specified.</td>
</tr>
<tr>
<td>Direction of action of the controller setpoint</td>
<td>Reverse of direction of action of the setpoint.</td>
</tr>
<tr>
<td>Direction of action of the actuator</td>
<td>Reverse of direction of action of the actuator.</td>
</tr>
<tr>
<td>Safety position</td>
<td>Valve moves to a defined safety position</td>
</tr>
<tr>
<td>Code protection</td>
<td>Blocking of the keypad or menu</td>
</tr>
<tr>
<td>Factory reset</td>
<td>Reset to factory settings</td>
</tr>
</tbody>
</table>
Supplementary function | Effect
--- | ---
Connectable process controller with the following characteristics (option) | 
Control structure | PID
Parameters which can be set | Proportional action factor, reset time, rate time and operating point
Scalable inputs | Position of decimal points, lower and upper scale values of process value and setpoint
Selection of setpoint specification | Setpoint specified either via standard signal input or via keys

Hierarchic operating concept for simple operation with the following levels

| Process operation | In this level, you switch between Automatic and Manual operation.
| Configuration | In this level, you specify on commissioning certain basic functions and configure supplementary functions as required. |
Schematic illustration of process control
**Interfaces (S/HART)**

- Binary input
- Process value input 4...20 mA (with process controller only)
- Setpoint (4...20 mA) optionally with HART communication

The SIDE Control (S/HART) is a 2-conductor device, i.e. the voltage supply is provided via the 4...20 mA signal.

**NOTE**

Optional inputs and outputs are enclosed by dotted lines.

---

**NOTE**

The SIDE Control (S/HART) is a 2-conductor device, i.e. the voltage supply is provided via the 4...20 mA signal.
**Technical data of the SIDE Control (S/HART)**

**Technical data (S/HART)**

**OPERATING CONDITIONS**
- Permissible ambient temperature: -25 ... +65 °C (with non-Ex devices or T4/T5)
- System of protection: IP 65 to EN 60529
  (only with correctly connected cable)

**MECHANICAL DATA**
- Housing dimensions, outside (WxHxD): 174 x 88 x 93 mm
- Housing material: Aluminium
  hard anodized and plastic-coated
- Seal material: NBR / Neoprene
- Other exterior parts: stainless steel (V4A)
- Mass: approx. 1.5 kg

**ELECTRICAL DATA**
- Connections: 2 M20x1.5 bushings
  with screw terminals 0.14 ... 1.5 mm²
- Power supply: via setpoint input 4-20 mA
- Burden voltage: < 12 V DC
- Burden resistance: 590 Ω at 20 mA and 11.8 V DC
- Process value input (option): 4-20 mA
- Burden voltage: 200 mV at 20 mA
- Burden resistance: 10 Ω
- Binary input: mechanical make/break contact
- Inductive proximity switch (optional): to DIN EN 60947-5-6 (NAMUR)
  Structural shape: SJ3.5-G-N
  Manufacturer: Pepperl+Fuchs
- Output signal for switching amplifier: to DIN EN 50227 (NAMUR)
- Rated voltage $U_o$: 8 V
- Current (sensor uncoated): ≥ 2.1 mA
- Current (sensor coated): ≤ 1.2 mA
**SYSTEM DESCRIPTION (S/HART)**

**Analog repeat (optional)**
- Supply voltage: $U_{\text{supply}} = 12 \ldots 30 \text{ V DC}$
- Burden: $U_{\text{supply}} \geq 12 \text{ V} + RB \cdot 20 \text{ mA}$

**Binary outputs (optional)**
- Supply voltage: 5 \ldots 11 \text{ V DC}
- Current in switching status OPEN: < 1.2 mA
- Current in switch. status CLOSE: > 2.1 mA
- Sense of action: NO (normally open) or NC (normally closed) (may be parametrized)
- max. permissible values: see Declaration of Conformity

**PNEUMATIC DATA**
- Control medium: Quality classes to DIN ISO 8573-1
  - Dust content: Class 5:
    - max. 40 µm particle size
    - max. 10 mg/m³ particle density
  - Water content: Class 3:
    - max. pressure dew point
      - - 20 °C or at least 10 degrees below lowest operating temperature
  - Oil content: Class 3: max. 1 mg/m³
  - Temperature range of compressed air:
    - - 25 \ldots + 65 °C (with non-Ex devices or T4/T5)
    - - 25 \ldots + 60 °C (with T6)
- Pressure range: 1.4 \ldots 6.0 \text{ bar}
- Supply pressure variation: max. ± 10 % during operation
- Air flow capacity of control valve:
  - at 1.4 bar pressure drop over valve: ca. 55 L/min STP for pressurizing and exhausting
  - at 6 bar pressure drop over valve: ca. 170 L/min STP for pressurizing and exhausting
- Self-consumption of air in balanced state: 0.0 L/min STP
- Throttle screw: adjustment ratio ca. 10:1
- Connections: G1/4” internal thread
## Factory settings (S/HART)

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHARACT</td>
<td>CHA LIN</td>
<td>X.CONTRL</td>
<td></td>
</tr>
<tr>
<td>CUTOFF</td>
<td>( CUT_0 = 0 %; ) ( CUT^\tau = 100 % )</td>
<td>( X.CO DBND )</td>
<td>1 %</td>
</tr>
<tr>
<td>DIR.CMD</td>
<td>DIR.CRISE</td>
<td>( X.CO PARA )</td>
<td></td>
</tr>
<tr>
<td>DIR.ACT</td>
<td>DIR.ARISE</td>
<td>( KX^\tau )</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>SPLTRNG</td>
<td>( SR_1 = 0 %); ( SR^\tau = 100 % )</td>
<td>( KX )</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>X.LIMIT</td>
<td>( LIM_1 = 0 %; ) ( LIM^\tau = 100 % )</td>
<td>After execution of SETFACT: 1 s</td>
<td></td>
</tr>
<tr>
<td>X.TIME</td>
<td></td>
<td>P.CONTRL</td>
<td></td>
</tr>
<tr>
<td>T.OPN</td>
<td>Values determined by AUTOTUNE</td>
<td>( P.CO DBND )</td>
<td>1 %</td>
</tr>
<tr>
<td>T.CLS</td>
<td>Values determined by AUTOTUNE</td>
<td>( P.CO PARA )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After execution of SETFACT: 1 s</td>
<td>( KP )</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( TN )</td>
<td>999.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( TV )</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( X0 )</td>
<td>0</td>
</tr>
<tr>
<td>OUTPUT</td>
<td></td>
<td>P.CO SETP</td>
<td>( SETP ) INT</td>
</tr>
<tr>
<td>OUT ANL:</td>
<td></td>
<td>P.CO FILT</td>
<td>0</td>
</tr>
<tr>
<td>OUT POS</td>
<td>( OUT ) 420 A</td>
<td>P.CO SCAL</td>
<td>( PV_0 ) 000.0, ( PV^\tau ) 100.0</td>
</tr>
<tr>
<td>OUT BIN:</td>
<td></td>
<td>P.CO TUNE</td>
<td>( D'ACT )</td>
</tr>
<tr>
<td>OUT DEV</td>
<td>( DEV ) 5.0 NORM OPN</td>
<td>CODE</td>
<td>CODE 0000</td>
</tr>
<tr>
<td>SAFEPOS</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIN-IN</td>
<td>B.IN SPOS / NORM OPN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NOTE
The functions and factory settings shown in grey are optionally valid with analog repeat (OUTPUT) or with process controller (P.CONTROL).
SYSTEM DESCRIPTION
(PROFIBUS PA)

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Technical data (PROFIBUS PA) ...................................................................................... 35
Factory settings (PROFIBUS PA) .................................................................................. 36
**Construction of SIDE Control (PROFIBUS PA)**

The SIDE Control (PROFIBUS PA) is a digital positioner for pneumatically operated continuous valves with single-acting linear or part-turn actuators.

The SIDE Control (PROFIBUS PA) can be controlled via PROFIBUS PA from a central automation system (e.g., process control system). The momentary valve position is reported via the bus.

For detailed information on commissioning a PROFIBUS PA branch, we recommend the *PROFIBUS Commissioning Guidelines* by the PROFIBUS Users Organization (PUO).

**Illustration**

![Diagram of SIDE Control (PROFIBUS PA)](image)
Features

• **Position sensor**
  Very high resolution conductive plastic potentiometer

• **Microprocessor controlled electronics**
  for signal processing, control and driving the piezoelectric positioning system

• **Operating elements**
  The device can be set (configuration and parametrization) locally via three inside keys. An inside, 8-digit, 16-segment LC display is provided, which can also show the set point or actual value.

• **Positioning system**
  A piezoelectric positioning system serves to drive the valve actuator.

• **Electrical interfaces**
  M20 bushings with screw terminals

• **Pneumatic interfaces**
  G1/4” interior thread

• **Housing**
  Aluminium housing (hard anodized and plastic-coated) with swing-up cover and captive screws.

• **Attachment**
  to linear actuators to NAMUR recommendation (DIN 534 T6) or to part-turn actuators to VDI/VDE 3845

Options

• Position feedback via 2 inductive proximity switches (initiators).

• Integral attachment to Bürkert continuous valves.
System Description (PROFIBUS PA)

Functional diagram of the SIDe Control (PROFIBUS PA) connected to a control valve with single-acting diaphragm actuator

NOTE

In the case of integral attachment of the SIDe Control (PROFIBUS PA) to a Bürkert continuous valve, the position sensor is situated outside the SIDe Control (PROFIBUS PA) on the actuator and is connected to the latter with a cable.
Operation as a positioner *(PROFIBUS PA)*

The SIDE Control *(PROFIBUS PA)* controls the position of the pneumatic actuator, whereby the position sensor measures the actual position (POS) of the actuator. The controller compares this actual value of the position with the setpoint (CMD), which may be set via the PROFIBUS PA. If a control difference (Xd1) exists, a pulse-width modulated voltage signal is sent to the positioning system as the correcting variable. If the difference is positive, the pressurizing piezoelectric valve is driven via output B1; if it is negative, the exhausting piezoelectric valve is driven via output E1. In this way, the position of the actuator is altered until the control difference is 0. Z1 represents a disturbance.
## Characteristics of the positioner software

<table>
<thead>
<tr>
<th>Supplementary function</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positioner with supplementary functions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>AUTOTUNE</strong></td>
<td>Automatic adaptation of positioner to the control valve in use.</td>
</tr>
<tr>
<td>Tight-closing function</td>
<td>Valve closes tight outside the control range. A value is specified (in %) from which the actuator is completely exhausted (at 0 %) or pressurized (at 100 %).</td>
</tr>
<tr>
<td>Stroke limitation</td>
<td>Mech. valve piston movement only within a defined stroke range.</td>
</tr>
<tr>
<td>Limitation of correction speed</td>
<td>Actuator takes a preset time to move from OPEN to CLOSED or from CLOSED to OPEN.</td>
</tr>
<tr>
<td><strong>Correction characteristic for adaptation to the operating curve (via PROFIBUS PA)</strong></td>
<td>Linearization of the process curve can be carried out.</td>
</tr>
<tr>
<td>Insensitivity range</td>
<td>The positioner responds only above a control difference to be specified.</td>
</tr>
<tr>
<td>Direction of action of the controller setpoint</td>
<td>Reverse of direction of action of the setpoint</td>
</tr>
<tr>
<td>Direction of action of the actuator</td>
<td>Reverse of direction of action of the actuator</td>
</tr>
<tr>
<td>Safety position</td>
<td>Valve moves to a defined safety position</td>
</tr>
<tr>
<td>Factory reset</td>
<td>Reset to factory settings</td>
</tr>
</tbody>
</table>

**Communication via PROFIBUS PA protocol**
Schematic illustration of position control
The SIDE Control (PROFIBUS PA) is a 2-conductor device, i.e. the voltage supply is provided via the PROFIBUS PA signal.
Technical data of the SIDE Control (PROFIBUS PA)

Technical data (PROFIBUS PA)

OPERATING CONDITIONS
Permissible ambient - 25 ... + 65 °C (with non-Ex devices or T4/T5)
temperature - 25 ... + 60 °C (with T6)
System of protection IP 65 to EN 60529
  (only with correctly connected cable)

CONFORMITY TO THE FOLLOWING STANDARDS
CE symbol Conformity wrt. EMC Guideline 89/336/EEC
Low Voltage Guidline 73/23/EEC
Explosion protection (optional) EEX ia IIC T4/T5/T6

MECHANICAL DATA
Housing dimensions, outside (W x H x D) 174 x 88 x 93 mm
Housing material Aluminium
  hard anodized and plastic-coated
Seal material NBR / Neoprene
Other exterior parts stainless steel (V4A)
Mass approx. 1.5 kg

ELECTRICAL DATA
Connections 2 M20 x 1.5
  bushings with screw terminals 0.14 ... 1.5 mm²
Power supply via PROFIBUS PA signal
  to Ex segment coupler 9 ... 15 V DC (Ex)
  to segment coupler 9 ... 24 V DC (NonEx)
Operating current from bus 12 mA ± 7 % without FDE
Fault current protection 5 mA ± 10 % FDE
Binary input mechanical make/break contact
Inductive proximity switch (optional) to DIN EN 60947-5-6 (NAMUR)
  Structural shape SJ3,5-G-N
  Manufacturer Pepperl+Fuchs
Output signal for switching amplifier to DIN EN 50227 (NAMUR)
  Rated voltage $U_0$ 8 V
  Current (sensor uncoated) $\geq 2.1$ mA
  Current (sensor coated) $\leq 1.2$ mA
PNEUMATIC DATA

Control medium Quality classes to DIN ISO 8573-1
Dust content Class 5:
max. 40 µm particle size
max. 10 mg/m³ particle density
Water content Class 3:
max. pressure dew point
- 20 °C or at least 10 degrees below lowest operating temperature
Oil content Class 3: max. 1 mg/m³
Temperature range of compressed air - 25 ... + 65 °C (with non-Ex devices or T4/T5)
Pressure range 1.4 ... 6.0 bar
Supply pressure variation ± 10 % during operation
Air flow capacity of control valve at 1.4 bar pressure drop over valve ca. 55 l/min STP for pressurizing and exhausting
at 6 bar pressure drop over valve ca. 170 l/min STP for pressurizing and exhausting
Self-consumption of air in balanced state 0.0 l/min
Throttle screw adjustment ratio ca. 10:1
Connections G1/4" internal thread

Factory settings (PROFIBUS PA)

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUTOFF</td>
<td>CUT₁ = 0 %; CUT₉ = 100 %</td>
</tr>
<tr>
<td>DIR.CMD</td>
<td>DIR.CRISE</td>
</tr>
<tr>
<td>DIR.ACT</td>
<td>DIR.ARISE</td>
</tr>
<tr>
<td>X.LIMIT</td>
<td>LIM₁ = 0 %, LIM₉ = 100 %</td>
</tr>
<tr>
<td>X.TIME</td>
<td></td>
</tr>
<tr>
<td>T.OPN</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>T.CLS</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td></td>
<td>After execution of SETFACT: 1 s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFEPOS</td>
<td>0</td>
</tr>
<tr>
<td>BIN-IN</td>
<td>B.IN SPOS / NORM OPN</td>
</tr>
<tr>
<td>X.CONTRL</td>
<td></td>
</tr>
<tr>
<td>X.CO DBND</td>
<td>1 %</td>
</tr>
<tr>
<td>X.CO PARA</td>
<td></td>
</tr>
<tr>
<td>KX τ</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>KX ⊥</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td></td>
<td>After execution of SETFACT: 1</td>
</tr>
</tbody>
</table>
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  Attachment to a continuous valve with linear actuator acc. to NAMUR ................................................. 39
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Electrical connection (PROFIBUS PA) .................................................... 46
Attachment and assembly

The SIDE Control may be attached to different continuous valves. The valves which may be used are continuous valves with a linear activator to NAMUR recommendation (DIN IEC 534 T6) and such with a part-turn actuator to VDI/VDE 3845. Furthermore, the SIDE Control is available completely preassembled on a Bürkert continuous valve from series 27xx.

Complete system with Bürkert continuous valve from series 27xx

The SIDE Control is available in combination with Bürkert continuous valves from the series 27xx as a completely preassembled and tested system.

ATTENTION!

The connecting line from the SIDE Control to the external positioning sensor shall not be lengthened. Only the positioning sensor supplied shall be connected to the SIDE Control.
If manipulations are carried out, the EX approval will become void!
Attachment to a continuous valve with linear actuator acc. to NAMUR

Transmission of the valve position to the position sensor built into the SIDE Control is via a lever (to NAMUR).

Add-on kit to linear activator (Id no. 787 215)

(obtainable from Bürkert as an accessory)

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Quantity</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>NAMUR attachment bracket IEC 534</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>U-piece</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Clamping piece</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Driving pin</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Conical roller</td>
</tr>
<tr>
<td>6a</td>
<td>1</td>
<td>NAMUR lever for stroke range 3 - 35 mm</td>
</tr>
<tr>
<td>6b</td>
<td>1</td>
<td>NAMUR lever for stroke range 35 - 130 mm</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>U-bolt</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>Hex screw DIN 933 M8 x 20</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Hex screw DIN 933 M8 x 16</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>Lock washer DIN 127 A8</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>Washer DIN 125 B 8.4</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>Washer DIN 125 B 6.4</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Spring VD-115E 0.70 x 11.3 x 32.7 x 3.5</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Spring washer DIN 137 A6</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Retaining washer DIN 6799 - 3,2</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>Lock washer DIN 127 A6</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
<td>Hex screw DIN 933 M6 x 25</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>Hex nut DIN 934 M6</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Square nut DIN 557 M6</td>
</tr>
<tr>
<td>21</td>
<td>4</td>
<td>Hex nut DIN 934 M8</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>Guide bushing 6.2 x 9.9 x 15 x 3.5</td>
</tr>
</tbody>
</table>
Assembly

→ Mount U-piece (2) using clamping pieces (3), hex screws (17) and lock washers (16) on actuator spindle.

→ Select the short lever (Table Add-on kit to linear actuator, Serial no. 6a) or long lever (Table Add-on kit to linear actuator, Serial no. 6b), depending on the actuator stroke.

→ Assemble the lever (if not preassembled).

The distance of the driving pin from the axle should be equal to the actuator stroke. This results in a swing angle of the lever of 60°. This assures that the position sensor works with good resolution. The scale printed on the lever is irrelevant.

→ Push the lever onto the axle of the SIDE Control and screw it tight.

→ Fix attachment bracket (1) with hex screws (9), lock washers (10) and washers (11) to the rear side of the SIDE Control.

NOTE

Which M8 thread on the SIDE Control is chosen depends on the size of the actuator.

→ To determine the correct position, hold the SIDE Control with bracket against the actuator. The conical roller (5) on the lever of the position sensor must be able to move freely in U-piece (2) on the actuator over the entire stroke. At 50% stroke, the lever position should be roughly horizontal (see under Alignment of the lever mechanism).
Actuator with cast frame

→ Fix the SIDE Control with bracket by means of one or more hex screws (8), washers (11) and lock washers (10) to the cast frame.

Actuator with post yoke

→ Fix the SIDE Control with bracket with U-bolts (7), washers (11), lock washers (10) and hex nuts (21) to the post yoke.

Alignment of the lever mechanism

The lever mechanism can only be aligned properly when the device has been connected electrically and pneumatically.

→ In the manual mode, move the actuator to half stroke (corresponding to scale on actuator).
→ Move the device vertically until the lever is horizontal.
→ Fix the device finally to the actuator.
**Attachment to a continuous valve with part-turn actuator**

The axle of the position sensor built into the SIDE Control is coupled directly to the axle of the part-turn actuator.

**Add-on kit to part-turn activator (id no. 651 741)**

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Quantity</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Adapter</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Setscrew DIN 913 M4 x 4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Cap screw DIN 933 M6 x 12</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Lock washer B6</td>
</tr>
</tbody>
</table>

(obtainable from Bürkert as an accessory)

**Other accessories required**

Attachment bracket with fixing screws (acc. to VDI/VDE 3845) - available from the manufacturer of the part-turn actuator.

**Assembly**

1. Determine the orientation of attachment of the SIDE Control (parallel to the actuator or rotated by 90°).
2. Determine the basic position and direction of rotation of the actuator.
3. Push adapter (1) onto the axle of the SIDE Control and fix it with 2 setscrews (2). One of the setscrews should press onto the flat on the axle (to prevent slip!). It must be assured that the axle of the SIDE Control can move only in one of the ranges shown below in the drawings observe the flat on the axle!
→ Place the SIDE Control on the bracket and fix it with 4 cap screws (3) and lock washers (4).

→ Place the SIDE Control with the bracket on the part-turn actuator and fix it.

**NOTE**

If after starting the function *X.TUNE* the message *X.ERR 5* appears in the LC display, the alignment of the axle of the SIDE Control to the axle of the actuator is incorrect.

→ In this case, check the alignment as described above.

→ Then repeat the function *X.TUNE*.
Fluidic connection

The locations of the fluidic connections are shown in the following drawing:

→ Connect supply pressure to connection 1.
→ Connect the service connection 2 to the chamber of the single-acting actuator.
→ If possible, connect a silencer or the like to connection 3. If the connection is left open, there is a risk of water splashes entering the SIDE Control.
Electrical connection (S/HART)

→ To make electrical connections, open the cover of the SIDE Control (S/HART) by unscrewing the 2 screws.

<table>
<thead>
<tr>
<th>Terminal designation</th>
<th>Allocation</th>
<th>External connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 +</td>
<td>Setpoint +</td>
<td>4 ... 20 mA signal</td>
</tr>
<tr>
<td>12 -</td>
<td>Setpoint -</td>
<td>GND</td>
</tr>
<tr>
<td>13 +</td>
<td>Process value + (option)</td>
<td>4 ... 20 mA signal</td>
</tr>
<tr>
<td>14 -</td>
<td>Process value - (option)</td>
<td>GND</td>
</tr>
<tr>
<td>31</td>
<td>Actual value output + (option)</td>
<td>31 — 12 ... 30 V</td>
</tr>
<tr>
<td>32</td>
<td>Actual value output - (option)</td>
<td>32 — 12 ... 30 V</td>
</tr>
<tr>
<td>41 +</td>
<td>Initiator 1+ (option)</td>
<td>Switching amplifier to EN 50227</td>
</tr>
<tr>
<td>42 -</td>
<td>Initiator 1- (option)</td>
<td>Switching amplifier to EN 50227</td>
</tr>
<tr>
<td>51+</td>
<td>Initiator 2+ (option)</td>
<td>Switch (make contact or break contact)</td>
</tr>
<tr>
<td>52 -</td>
<td>Initiator 2- (option)</td>
<td>Switch (make contact or break contact)</td>
</tr>
<tr>
<td>81</td>
<td>Binary input +</td>
<td>83 + 5 ... 11 V</td>
</tr>
<tr>
<td>82</td>
<td>Binary input -</td>
<td>84 — 5 ... 11 V</td>
</tr>
<tr>
<td>83</td>
<td>Binary output 1+ (option)</td>
<td>83 + 5 ... 11 V</td>
</tr>
<tr>
<td>84</td>
<td>Binary output 1- (option)</td>
<td>84 — 5 ... 11 V</td>
</tr>
<tr>
<td>85</td>
<td>Binary output 2+ (option)</td>
<td>85 + 5 ... 11 V</td>
</tr>
<tr>
<td>86</td>
<td>Binary output 2- (option)</td>
<td>86 — 5 ... 11 V</td>
</tr>
</tbody>
</table>

1) Burden resistance RB: see Chapter Technical Data

ATTENTION!
During the electrical connection of the inherently safe circuits, always observe the data in the attached Certificate of Conformity!

HINWEIS
Connection of a potential equalization conductor (PE) to the electronics is unnecessary.
Electrical connection *(PROFIBUS PA)*

→ To make electrical connections, open the cover of the SIDE Control *(PROFIBUS PA)* by unscrewing the 2 screws.

**Configuration of the terminals**

<table>
<thead>
<tr>
<th>Terminal designation</th>
<th>Allocation</th>
<th>External connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS (+)</td>
<td>PROFIBUS-PA (IN)</td>
<td>to IEC 1158-2 (either polarity between input terminals)</td>
</tr>
<tr>
<td>BUS (-)</td>
<td>PROFIBUS-PA (IN)</td>
<td></td>
</tr>
<tr>
<td>BUS (+)</td>
<td>PROFIBUS-PA (OUT)</td>
<td>to IEC 1158-2 (either polarity between output terminals)</td>
</tr>
<tr>
<td>BUS (-)</td>
<td>PROFIBUS-PA (OUT)</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Binary input</td>
<td>connected via switch (make contact) to terminal 82</td>
</tr>
<tr>
<td>82</td>
<td>Binary input</td>
<td></td>
</tr>
<tr>
<td>N.C.</td>
<td>not connected</td>
<td></td>
</tr>
<tr>
<td>N.C.</td>
<td>not connected</td>
<td></td>
</tr>
<tr>
<td>41 (+)</td>
<td>Initiator 1 + (option)</td>
<td></td>
</tr>
<tr>
<td>42 (-)</td>
<td>Initiator 1 - (option)</td>
<td></td>
</tr>
<tr>
<td>51 (+)</td>
<td>Initiator 2 + (option)</td>
<td></td>
</tr>
<tr>
<td>52 (-)</td>
<td>Initiator 2 - (option)</td>
<td></td>
</tr>
</tbody>
</table>

Use screened cable for connecting the bus and the binary input in order to assure reliability and EC conformity. The cable screens can be attached using the clamping screw (on the post between the M20 bushings). The cable screens must be attached at both ends. On the outside of the housing there is a further screw for further connection to a suitable earthing (grounding) point.

**ATTENTION!**

During the electrical connection of the inherently safe circuits, always observe the data in the attached Certificate of Conformity!
INDUCTIVE PROXIMITY SWITCHES (S/HART, PROFIBUS PA, OPTION)

Description of the inductive proximity switches ................................................. 48

Configuration of the adjusting wheels (option) .................................................. 48

Settings ............................................................................................................... 49
  Setting with one inductive proximity switch ..................................................... 49
  Setting with two inductive proximity switches .................................................. 49

Definition of the end positions with part-turn actuators ................................... 49
Description of the inductive proximity switches

Any actuator position can be registered with an inductive proximity switch. Depending on the version of the device, one or two inductive proximity switches are installed. The output signals can be processed with switching amplifiers to „NAMUR“ to EN 50227 or VDE 0660 T 212.

As soon as the control flags installed in the SIDE Control enter the fork-shaped inductive proximity switch, the current changes.

Proximity switch operated: current \( \leq 1.2 \) mA
Proximity switch not operated: current \( \geq 2.1 \) mA

The control flags are designed such that the signal is then maintained until the end position is reached.

Configuration of the adjusting wheels (option)

Even when the device is equipped with only one proximity switch, both adjusting wheels are installed. In this case only SR1 is active.
Settings

NOTE First put the device into operation, as described in the chapter Operation and Control Functions. The function AUTOTUNE must have been executed, so that the actuator stroke is displayed correctly.

Setting with one inductive proximity switch

The upper end position is to be set (Position 1 with part-turn actuators)

→ Move the actuator in the manual mode to the position in which initiation is to take place. Turn adjusting wheel SR1 to the right until the current jumps from ≥ 2.1 mA to ≤ 1.2 mA.

The lower end position is to be set (Position 2 with part-turn actuators)

→ Move the actuator in the manual mode to the position in which initiation is to take place. Turn adjusting wheel SR1 to the left until the current jumps from ≥ 2.1 mA to ≤ 1.2 mA.

Setting with two inductive proximity switches

The upper end position is to be set (Position 1 with part-turn actuators)

→ Move the actuator in the manual mode to the position in which initiation is to take place. Turn adjusting wheel SR2 to the right until the current jumps from ≥ 2.1 mA to ≤ 1.2 mA.

On turning the adjusting wheel, take care that the other adjusting wheel is not turned.

The lower end position is to be set (Position 2 with part-turn actuators)

→ Move the actuator in the manual mode to the position in which initiation is to take place. Turn adjusting wheel SR2 to the left until the current jumps from ≥ 2.1 mA to ≤ 1.2 mA.

On turning the adjusting wheel, take care that the other adjusting wheel is not turned.

Definition of the end positions with part-turn actuators
Operating and display elements .................................................. 52
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Operating mode MANUAL .......................................................... 88
  Meaning of the keys in the operating mode MANUAL .............. 88
  Displays in the operating mode MANUAL ............................... 88
Operating and display elements

The SIDE Control is equipped with a 3-key operating and display element with an LC display. The functions of the keys are described in the following sections.

- **Arrow key**
  - up
  - down

- **MANUAL / AUTOMATIC key**

- **LED (without function)**

Operating levels

Operation of the SIDE Control is done via two operating levels:

- **Process operating level**
  
  After the device is switched on, the process operating level is active. In this level, you can switch between the operating modes AUTOMATIC and MANUAL.

  In the AUTOMATIC mode, position or process control run (process control only with the option process controller). In the MANUAL mode, the valve can be manually opened and closed.

- **Configuration level**
  
  In the configuration level, you can specify the first commissioning of the basic functions and configure supplementary functions if needed.
Commissioning and set-up as a positioner

➔ Before commissioning, execute the fluidic and electrical installations.

Procedure for specifying the basic settings

➔ On first commissioning of the SIDE Control, make the following basic settings:
  • Enter the control function of the actuator used.
  • Start the automatic adaptation of the controller to the current operating conditions (AUTOTUNE).

Configuration of the keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
<th>Switch between main and sub-menu items, e.g. ADDFUNCT - CHARACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MANUAL/AUTOMATIC key</td>
<td></td>
</tr>
<tr>
<td>▲ ▼</td>
<td>Arrow keys</td>
<td>Switch between equal-ranking menu items, e.g. ADDFUNCT - X.TUNE</td>
</tr>
</tbody>
</table>

Factory settings of the controller (S/HART)

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHARACT</td>
<td>CHA LIN</td>
<td>X.CONTROL</td>
<td></td>
</tr>
<tr>
<td>CUTOFF</td>
<td>CUT₁ = 0 %; CUT₂ = 100 %</td>
<td>X.CO DBND</td>
<td>1 %</td>
</tr>
<tr>
<td>DIR.CMD</td>
<td>DIR.CRISE</td>
<td>X.CO PARA</td>
<td></td>
</tr>
<tr>
<td>DIR.ACT</td>
<td>DIR.ARISE</td>
<td>KX ℏ</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>SPLTRNG</td>
<td>SR₁ = 0 (%); SR₂ = 100 (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X.LIMIT</td>
<td>LIM₁ = 0 %, LIM₂ = 100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.OPN</td>
<td>Values determined by AUTOTUNE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.CLS</td>
<td>Values determined by AUTOTUNE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>After execution of SETFACT: 1 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTPUT</td>
<td></td>
<td>P.CONTROL</td>
<td></td>
</tr>
<tr>
<td>OUT ANL:</td>
<td></td>
<td>P.CO DBND</td>
<td>1 %</td>
</tr>
<tr>
<td>OUT POS</td>
<td>OUT 4 20 A</td>
<td>P.CO PARA</td>
<td></td>
</tr>
<tr>
<td>OUT BIN</td>
<td>:</td>
<td>KP</td>
<td>1.00</td>
</tr>
<tr>
<td>OUT DEV</td>
<td>DEV 5.0 NORM OPN</td>
<td>TN</td>
<td>999.9</td>
</tr>
<tr>
<td>SAFEPOS</td>
<td>0</td>
<td>TV</td>
<td>0.0</td>
</tr>
<tr>
<td>BIN-IN</td>
<td>B.IN SPOS / NORM OPN</td>
<td>X₀</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.CO SETP</td>
<td>SETP INT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.CO FILT</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.CO SCAL</td>
<td>PV₁ = 000.0, PV₂ = 100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.CO TUNE</td>
<td>D’ACT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CODE</td>
<td>CODE 0000</td>
</tr>
</tbody>
</table>

NOTE: The functions and factory settings shown in grey are optionally valid with analog repeat (OUTPUT) or with process controller (P.CONTROL).
## Operating and Controller Functions

### Factory settings of the controller (PROFIBUS PA)

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUTOFF</td>
<td>$CUT_{\perp} = 0%; \quad CUTC = 100%$</td>
<td>SAFEPOS</td>
<td>0</td>
</tr>
<tr>
<td>DIR.CMD</td>
<td>DIR.CRISE</td>
<td>BIN-IN</td>
<td>B.IN SPOS / NORM OPN</td>
</tr>
<tr>
<td>DIR.ACT</td>
<td>DIR.ARISE</td>
<td>X.CONTRL</td>
<td></td>
</tr>
<tr>
<td>X.LIMIT</td>
<td>$LIM_{\perp} = 0%; \quad LIMC = 100%$</td>
<td>X.CO DBND</td>
<td>1%</td>
</tr>
<tr>
<td>X.TIME</td>
<td></td>
<td>X.CO PARA</td>
<td></td>
</tr>
<tr>
<td>T.OPN</td>
<td>Values determined by AUTOTUNE</td>
<td>KX</td>
<td>Values determined by AUTOTUNE</td>
</tr>
<tr>
<td>T.CLS</td>
<td>Values determined by AUTOTUNE</td>
<td>KX $\perp$</td>
<td>Values determined by AUTOTUNE</td>
</tr>
</tbody>
</table>

After execution of **SETFACT**: 1 s
Main menu for settings on commissioning

Description of procedure

1 ADDFUNCT
   see section Configuring the supplementary functions.
   → Jump over this menu item on first commissioning.

2 X.TUNE - AUTOTUNE for positioners

Start the automatic adaptation of the positioner to the current operating conditions (X.TUNE)

The following functions are initiated automatically:

- Adaptation of the sensor signal to the (physical) stroke of the valve used.
- Determination of parameters for driving the integral piezoelectric positioning system
- Setting of the controller parameters of the positioner.
  Optimization is done according to the criteria: as short a correcting time as possible and freedom from overshoot.
On commissioning the SIDE Control, execution of **X.TUNE** is **absolutely** necessary. The positioner determines the optimum settings for the valve used and the current operating conditions (supply pressure).

If the supplementary function **X.CONTRL** is present in the main menu during execution of **X.TUNE**, automatic determination of the positioner dead band **X.CO.DBND** occurs additionally as a function of the frictional behaviour of the actuator (see section **X.CONTRL**).

The function **X.TUNE** should be executed with the valve unpressurized or shut off, since otherwise pressure variations in the valve may cause faulty adaptation of the controller. The supply pressure (pneumatic auxiliary energy) should be set to the value that will exist in later operation!

**NOTE**

<table>
<thead>
<tr>
<th>Display message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TUNE 5</strong></td>
<td>Countdown from 5 to 0 to start</td>
</tr>
<tr>
<td><strong>TUNE 4</strong></td>
<td><strong>AUTOTUNE</strong></td>
</tr>
<tr>
<td><strong>TUNE 0</strong></td>
<td>Display of the <strong>AUTOTUNE</strong> phase in progress at the moment (progress is indicated by a rotating bar to the left of the display)</td>
</tr>
<tr>
<td><strong>X.T INIT</strong></td>
<td><strong>X.T TCLS</strong></td>
</tr>
<tr>
<td><strong>X.T A1-P</strong></td>
<td><strong>X.T TCLS</strong></td>
</tr>
<tr>
<td><strong>X.T TOPN</strong></td>
<td><strong>X.T TCLS</strong></td>
</tr>
<tr>
<td><strong>X.TUNE END</strong></td>
<td>Flashing display → end of <strong>AUTOTUNE</strong></td>
</tr>
<tr>
<td><strong>X.ERR X</strong></td>
<td>Message on occurrence of an error (to right of display: error number, see chapter <em>Maintenance and Error Elimination on the Controller</em>)</td>
</tr>
</tbody>
</table>

**ATTENTION!**

During execution of the **AUTOTUNE** function, the valve moves autonomously from its momentary position. For this reason, never execute AUTOTUNE when a process is running!
MANUAL TUNE FUNCTIONS

Access to the manual TUNE functions can be obtained by the selecting of X.TUNE in the main menu and briefly pressing the MANUAL/AUTOMATIC key or aborting the countdown by releasing the MANUAL/AUTOMATIC key.

The following parameters, which are determined automatically during X.TUNE, may be preset or changed afterwards manually.

1. **TUNE-END** - Return to main menu
2. **TUNE-POS** - Preset end positions

The AUTOTUNE function determines the end positions of the control armature automatically on the basis of the physical stops. Certain armatures (e.g. continuously turning butterfly valves) possess no physical end stop, so that the end positions must be manually preset by means of TUNE-POS. An immediately following AUTOTUNE takes over the manual end position settings and continues with setting the positioning system and optimization of the positioner.

**NOTE**

If a manual preset of the end positions with TUNE-POS is necessary, it must be done before execution of AUTOTUNE.
OPERATING AND CONTROLLER FUNCTIONS

3. **TUNE-PWM** - Readjustment of minimum PWM pulse-duty factor for driving the piezoelectric valves integrated in the SIDE Control

The AUTOTUNE function determines automatically the required PWM-PDF for driving the piezoelectric valves integrated in the SIDE Control. These values may deviate from the optimum because of unfavourable frictional behaviour of the actuator. With TUNE-PWM, you can reajust it such that the lowest possible speed results for both directions of movement.

**NOTE**

The function TUNE-PWM must be executed after AUTOTUNE!

4. **TUNE-AIR** - Adaptation of the opening and closing times of the process valve

The required maximum air flow capacity of the internal positioning system depends on the volume of the actuator. Ideal control behaviour of the positioner is obtained with an air flow capacity that leads to an opening or closing time of the armature of 1 ... 2 s. For this reason, the SIDE Control is equipped with a throttle screw to vary the maximum air flow capacity of the internal positioning system. The position of the throttle screw is to be seen in the chapter System Description / Structure of the SIDE Control. The adjustment of this throttle screw is made by means of TUNE-AIR, whereby the corresponding times are determined by cyclic opening and closing of the valve and displayed.

**NOTE**

The function TUNE-AIR must be executed after AUTOTUNE!

**ATTENTION!**

To avoid cause faulty adaptation of the controller, be sure to execute X.TUNE at the supply pressure (= pneumatic auxiliary energy) that will exist in later operation.

The function X.TUNE should be executed preferably without operating medium pressure to exclude disturbances from forces resulting from flow.

5. **END** - Quitting the main menu

➔ To quit the main menu, select the menu item END with the arrow keys ▲ ▼ .

On the right of the display, the software version is shown (END XX). After pressing the MANUAL/AUTOMATIC key, the message EEPROM appears on the display for ca. 3 ... 5 s while the changes are being stored. Afterwards, the device is back in the mode in which it was before switching over to the main menu (MANUAL or AUTOMATIC).
Configuring the supplementary functions

NOTE

The operating concept for the SIDE Control is based on a strict separation between the basic and supplementary functions. In the delivered state, only the basic functions ADDFUNCT, X.TUNE and END are activated. These suffice for normal operation.

For more demanding control applications, you can select and specify supplementary functions in the configuration level.

Keys in the configuration level

<table>
<thead>
<tr>
<th>Press key</th>
<th>in menu</th>
<th>in a selected and confirmed menu item</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲</td>
<td>Scroll up (select)</td>
<td>Increment (increase) numeric value</td>
</tr>
<tr>
<td>▼</td>
<td>Scroll down (select)</td>
<td>Decrement (decrease) numeric value</td>
</tr>
<tr>
<td>⏫</td>
<td>Confirm selected menu item</td>
<td>Confirm selected menu item of supplementary menu to add it to the main menu. The menu item is marked with an asterisk (*) in the supplementary menu. The menu item appears in the main menu and can be selected and edited there. Confirm the menu item selected and marked with an asterisk in the supplementary menu for deletion from the main menu.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Press key</th>
<th>in menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>⏫</td>
<td>Confirm values set</td>
</tr>
</tbody>
</table>

Configuration menu

Switching between the process operating level and the configuration level

[Diagram showing the process and configuration levels with manual and automatic options, and theADDFUNCT function to switch between levels.]
To activate the configuration menu, press (in the process operating level) the MANUAL / AUTOMATIC key for 5 seconds.

The configuration menu consists of a main and a supplementary menu. The main menu contains initially the basic functions which are absolutely necessary for first commissioning. The supplementary menu comprises supplementary functions which may be selected. It may be reached via the menu item ADDFUNCT of the main menu. Specification of device functions and parameters is possible within the main menu. If needed, the main menu may be extended by functions from the supplementary menu, which can then also be specified.

Addition of supplementary functions to the main menu

Select in the main menu the item ADDFUNCT.
By pressing the MANUAL / AUTOMATIC key, you enter the supplementary menu.
With the arrow keys, select the desired supplementary function.
By pressing the MANUAL / AUTOMATIC key, you confirm addition of the supplementary function to the main menu. The function is automatically marked with an asterisk (*).
All marked functions are added to the main menu after confirmation of ENDFUNCT.
In the main menu, enter the parameters for the supplementary functions.

Deletion of supplementary functions from the main menu

By deletion of a function from the main menu, the settings previously made under this function will become invalid.

Select in the main menu the item ADDFUNCT.
By pressing the MANUAL / AUTOMATIC key, you enter the supplementary menu.
With the arrow keys, select a supplementary function marked with (*).
By pressing the MANUAL / AUTOMATIC key, you confirm deletion of the supplementary function (the asterisk (*) marking is deleted).
After confirmation of ENDFUNCT, the supplementary function is deactivated and deleted from the main menu.

Setting of numeric values

Numeric values are set in the menu items provided by pressing the keys \( \Delta \) (increment value) or \( \nabla \) (decrement value) one or more times. In the case of 4-digit numbers, only the flashing digit can be set with the arrow keys. By pressing the MANUAL / AUTOMATIC key, you can switch to the next digit.
Principle of adding supplementary functions to the main menu

Main menu

Select menu item ADDFUNCT

ADDFUNCT
X.TUNE
END

Confirm selected menu item

Supplementary functions

CHARACT
*CUTOFF
DIR.CMD
DIR.ACT
SPLTRNG
X.LIMIT
X.TIME
*X.CONTRL
P.CONTRL
CODE
SAFEPOS
SIG-ERR
BIN-IN
OUTPUT
CAL USER
SETFACT
ENDFUNCT

Augmented main menu

CUTOFF
X.CONTRL
ADDFUNCT
X.TUNE
END

Confirm selected supplementary function and add to main menu

Return to augmented main menu
Supplementary functions

**ADDFUNCT**

- **CHARACT**
  - Select the transfer characteristic between input signal and stroke (correction characteristic)
- **CUTOFF**
  - Tight-closing function for positioner or for active process controller (S/HART only)
- **DIR.CMD**
  - Sense of action between input signal and setpoint position
- **DIR.ACT**
  - Allocation of state of pressurization of actuator chamber (Port 2,) to actual position
- **SPLTRNG**
  - Splitting of signal range; input signal in % for which the valve runs through the entire stroke range.
- **X.LIMIT**
  - Limitation of mechanical stroke range
- **X.TIME**
  - Limitation of correcting speed
- **X.CONTRL**
  - Parametrization of positioner
- **P.CONTRL**
  - (Parametrization of PID process controller)
  - In version as positioner: no function!
- **CODE**
  - Code protection for settings
- **SAFEPOS**
  - Enter safe position
- **SIG-ERR**
  - Configure error recognition, signal level
- **BIN-IN**
  - Activation of binary input
- **OUTPUT**
  - [Configuration of the outputs (only with supplementary board for analog repeat or binary outputs)]
- **CAL USER**
  - Calibration
- **SETFACT**
  - Reset for factory settings
- **ENDFUNCT**

**NOTE**

The supplementary functions marked with **S/H** are available only in the S/HART version of the SIDE Control.
**CHARACT**

**Selection of the transfer characteristic between input signal (position setpoint) and stroke (correction curve) (S/HART)**

Customized characteristic (Characteristic)

Factory setting: **CHA LIN**

With this supplementary function, you can select a transfer characteristic with respect to setpoint (position setpoint CMD) and valve stroke (POS) to correct the flow or operating characteristic.

The flow characteristic $k_v = f(s)$ describes the flow through a valve, expressed by the $k_v$ value, as a function of the stroke $s$ of the actuator spindle. It is determined by the shape of the valve seat and the seat seal. In general, two types of flow characteristic are realized: the linear and the equipercentile.

With linear characteristics, equal changes in stroke $ds$ are allocated to equal changes in $k_v$ value $dk_v$

$$dk_v = n_{lin} \times ds.$$

With an equipercentile characteristic, a change in stroke $ds$ corresponds to an equipercentile change in $k_v$ value

$$\frac{dk_v}{k_v} = n_{eqprer} \times ds.$$

The operating characteristic $Q = f(s)$ represents the relationship between the volumetric flow $Q$ passing through a valve installed in a system and the stroke $s$. This characteristic contains the properties of the piping, pumps and consumers. It hence has a different shape from the flow characteristic.
For positioning applications of controllers, special requirements are usually made on the shape of the characteristic, e.g. linearity. For this reason it is sometimes necessary to correct its shape in a suitable manner. For this purpose, a transfer member is provided in the SIDE Control S/HART which realizes different characteristics. These are used to correct the operation characteristic.

The equipercentile characteristics 1:25, 1:33, 25:1, 33:1 and 50:1 and a linear characteristic may be set. Furthermore, it is possible to freely program a characteristic via fixed points or have it calibrated automatically.

**Entering the freely programmable characteristic**

The characteristic is defined via 21 fixed points distributed evenly over the 0...100 % range of the position setpoint. They are separated by 5 %. Each fixed point may be allocated to a freely selectable stroke (setting range 0...100 %). The difference between two adjacent values of stroke may not exceed 20 %.

To enter the point on the characteristic (values of the function), first select the menu item **CHA FREE**. After pressing the MANUAL/AUTOMATIC key, the first fixed point is displayed (0 %). Next to it is the value of the function (initially 0 %).

With the arrow keys, set a value of the function between 0 and 100 %. After confirmation by pressing the MANUAL/AUTOMATIC key, the next fixed point is displayed, etc. Finally, press the MANUAL/AUTOMATIC key to confirm the value of the function belonging to the last fixed point (100 %). The display returns to the menu item CHARACT.
Example of a programmed characteristic

Valve stroke [%] (POS)

Standard signal [%] (CMD)

4.20 mA
0.20 mA
0.10 V
0.5 V

Entering the fixed points:

NOTE
The fixed points that were entered should be noted in the table in the Appendix.
**CUTOFF**

Tight-closing function for positioners

Factory setting: \( \text{CUT}_{\downarrow} = 0 \% \); \( \text{CUT}_{\uparrow} = 100 \% \)

This function causes the valve to close tight outside the control range. Enter here the limits in \% for the position setpoint (CMD) or for the process setpoint (SP) with activated PID controller (S/HART only), outside which the actuator is to be completely pressurized or exhausted, respectively. Opening or resumption of control occurs with a hysteresis of 1 \%.

When the process valve is in the tight-closing region, a flashing MIN or MAX symbol appears on the display.

Tight-closing threshold exhaust (0 = inactive); setting range: 0 ... 25 \%

Tight-closing threshold pressurize (100 = inactive); setting range: 75 ... 100 \%
**DIR.CMD**

Sense of action (direction) of the positioner setpoint

Factory setting: *DIR.CRISE*

With this supplementary function, you can set the sense of action between the input signal (INP) and the position setpoint (CMD) of the actuator.

- **Direct sense of action**
  - (e.g. 4 mA or 0 V → 0 %, 20 mA or 5/10 V → 100%)

- **Inverse sense of action**
  - (e.g. 4 mA or 0 V → 100%, 20 mA or 5/10 V → 0%)
**DIR.ACT**

Sense of action (direction) of the actuator

Factory setting: *DIR.ARISE*

With this supplementary function, you can set the sense of action between the state of pressurization of the actuator and the actual position (POS).

- **Direct sense of action**
  - (vented ➔ 0 %; pressurized ➔ 100 %)

- **Inverse sense of action**
  - (vented ➔ 100 %; pressurized ➔ 0 %)

![Diagram showing the sense of action and state of pressurization](image-url)
**SPLTRNG**

Splitting of signal range (Split range) *(S/HART)*

Max. and min. values of the input signal in % for which the valve runs through the entire stroke range.

Factory setting: $SR_L = 0 \%; \ SR_T = 100 \%$

**NOTE**

This function is active only in operation as a positioner

With this supplementary function you can limit the position setpoint range of the SIDE Control *(S/HART)* by specifying a minimum and a maximum value. In this way it is possible to split the standard signal range (4..20 mA) over several SIDE Control S/HARTs (with or without overlap). In this way, several valves may be used **alternately** or, with overlapping setpoint ranges, **simultaneously** as servo components.

![Diagram of SPLTRNG function](image)

Entering the minimum value of the input signal in % (0 ... 75 (%) of the standard signal range)

Entering the maximum value of the input signal in % (25 ... 100 (%) of the standard signal range)

**Splitting a standard signal range into two setpoint ranges**

![Graph showing valve stroke and setpoint range](image)
**X.LIMIT**

**Limitation of the mechanical stroke range**

Factory setting: \( LIM_\downarrow = 0\% \), \( LIM_\uparrow = 100\% \)

This supplementary function limits the (physical) stroke to preset % values (minimum and maximum). The range of the limited stroke is thereby set to 100 %. If the limited stroke range is left during operation, negative or positive POS values or POS values greater than 100 % are displayed.

Entering the start value of the stroke range in %, 0..50% of the overall stroke

Entering the end value of the stroke range in %, 50..100% of the overall stroke

The minimum separation between \( LIM_\downarrow \) and \( LIM_\uparrow \) is 50 %.
**X.TIME**

Limitation of the correcting speed

Factory setting: 1 s

**NOTE**

On execution of the function X.TUNE, the minimum opening and closing times are entered automatically for T.OPN and T.CLS for the entire stroke. In this way, the maximum speed can be run.

If the correcting speed is to be limited, values can be entered for T.OPN and T.CLS that lie between the minimum values determined by X.TUNE and 60 s.

**Effect of limitation of the opening speed after a step in the setpoint**

![Diagram showing the effect of limitation of the opening speed after a step in the setpoint.]

**NOTE**

If AUTOTUNE determines correction times < 1s, X.TIME will be copied automatically into the main menu and the corresponding value set to 1 s.
**OPERATING AND CONTROLLER FUNCTIONS**

**X.CONTRL**

Parametrization of the positioner

1. **Insensitivity range (dead band) of the positioner**
   
   Entry of the dead band in %, referred to the scaled stroke range; i.e. $LIM_L$ minus $LIM_U$ (see function X.LIMIT). This function assures that the positioner cuts in only above a certain control difference. The function reduces wear on the piezoelectric valves in the SIDE Control and the pneumatic actuator.

   **NOTE**
   
   If the supplementary function X.CONTRL is present in the main menu during execution of X.TUNE (AUTOTUNE of the positioner), automatic determination of the positioner dead band X.CO.DBND occurs additionally as a function of the frictional behaviour of the actuator. The value determined in this way is a standard value and can be readjusted manually.

2. **Parameters of the positioner**
   
   - $KX_L XXXX$ Amplification factor of positioner (to close the valve)
   - $KX^T XXXX$ Amplification factor of positioner (to open the valve)

3. **End** of parametrization of positioner. Jump back to X.CONTRL
**CODE**

**Code protection for the settings** *(S/HART)*

Factory setting: CODE 0000

- **CODE**
- **CODE KEY**
- **CODEMENU**
- **CODEXXXX**

Locking of all manipulations that would change the operating mode of the device. (The messages on the display can be switched over.)

Locking of entry into the configuration level.

Entry of the 4-digit code.

If the code protection is activated, entry of the code will be demanded on every protected operative manipulation:

- **CODEXXXX**
  - Changing the flashing digit
  - Confirming the digit and switch to next digit
SAFEPOS

Entering the safety positioning

Factory setting: 0 %

* When the safety position is 0 % or 100 %, the actuator will be fully vented or pressurized as soon as the safety position is activated in the supplementary function SIG-ERR or BIN-IN.

NOTE

The safety position set is only moved to when a corresponding signal is present at the binary input (for configuration see BIN-IN), or on occurrence of a signal error (for configuration see SIG-ERR).

This function is executed only in the AUTOMATIC mode.

With the fast pressurize / fast vent variant, two valves are driven in each case to obtain faster pressurizing and venting.
**SIG-ERR**

Configuration of error recognition signal level  *(S/HART)*

**NOTE**

Error recognition can be selected only with 4 ... 20 mA signal of the process value. Error is recognized with an input signal ≤ 3.5 mA (±0.5 % of end value, hysteresis 0.5 % of end value).

With signal error recognition activated: PV FAULT Δ signal error of process controller value.

With the process controller deactivated, NOT.AVAIL appears in the selection menu.

**Safety position SPOS ON**

If SPOS ON is set, the following configurations may occur:

Activated menu item SAFEPOS

On error recognition the actuator moves to the position set under SAFEPOS.

Deactivated menu item SAFEPOS

On error recognition the actuator moves to the end position which it would assume in the zero-voltage state.
**BIN-IN**

Activating the binary input

Safety position *B.IN SPOS*

Moving to a safety position.

Activated menu item *SAFPOS*
The actuator moves to the position set under *SAFPOS*.

Deactivated menu item *SAFPOS*
The actuator moves to the end position which it would assume in the zero-voltage state.

Operating mode changeover *B.IN M/A*

Changeover of operating mode between MANUAL and AUTOMATIC.
OUTPUT (Option)
Configuratin of the outputs (S/HART)

1. Configure the analog output
2. Configure binary output 1
3. Configure binary output 2
4. End of configuration of the outputs

OUT ANL - Standard signal for the analog position output

Selection of the desired output

Selection of the desired standard signal

NOTE
The signal types shown in grey can be selected only if the process controller is activated.
OUT BIN1 - Configuration of binary output 1

1. BIN1DEV.X → DEV.X xxx → NORM OPN
2. BIN1LIM.X → LIM.X xxx → NORM OPN
3. BIN1POS → NORM OPN
4. BIN1SIG.P → NORM OPN
5. BIN1RMOT → NORM OPN

Permissible actuating signal

Limit position
1. **BIN1 DEV.X**
Selection: alarm output for too great an actuating signal from the positioner

* The permissible actuating signal DEV.X XXX shall not be smaller than dead band.

2. **BIN1 LIM.X**
Selection: binary position output
   
   LIM.X XXX - limit position

<table>
<thead>
<tr>
<th>OUT BIN1</th>
<th>NORM OPN</th>
<th>NORM CLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS &gt; LIM</td>
<td>&lt;1.2 mA</td>
<td>&gt;2.1 mA</td>
</tr>
<tr>
<td>POS &lt; LIM</td>
<td>&gt;2.1 mA</td>
<td>&lt;1.2 mA</td>
</tr>
</tbody>
</table>

3. **BIN1 SPOS**
Selection: actuator in safety position

4. **BIN1 SIG.P**
Selection: error message in process value signal

5. **BIN1 RMOT**
Selection: operating mode *Automatic* and *External Setpoint* activated

**NOTE**

NORM CLS (NO) "Normally Closed" - output, in switched state low (<1.2 mA)

NORM OPN (NO) "Normally Open" - output, in switched state high (>2.1 mA)
OUT BIN2 - Configuring binary output 2

1. Configuring binary output 2
2. Limit position
3. Permissible actuating signal *
4. Configuring binary output 2
5. Configuring binary output 2

BIN2DEV.X → DEV.X xxx → NORM OPN

BIN2LIM.X → LIM.X xxx → NORM OPN

BIN2SPOS → NORM OPN

BIN2SIG.P → NORM OPN

BIN2RMOT → NORM OPN
**OPERATING AND CONTROLLER FUNCTIONS**

**NOTE**

- **NORM CLS (NC) "Normally Closed"**
  - output, in switched state **low (<1.2 mA)**
- **NORM OPN (NO) "Normally Open"**
  - output, in switched state **high (>2.1 mA)**

1. **BIN2 DEV.X**
   - Selection: alarm output for too great an actuating signal from the positioner
   - * The permissible actuating signal **DEV.X XXX** shall not be smaller than dead band.

2. **BIN2 LIM.X**
   - Selection: binary position output
   - **LIM.X XXX** - limit position

<table>
<thead>
<tr>
<th>OUT BIN2</th>
<th>NORM OPN</th>
<th>NORM CLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS &gt; LIM</td>
<td>&lt;1.2 mA</td>
<td>&gt;2.1 mA</td>
</tr>
<tr>
<td>POS &lt; LIM</td>
<td>&gt;2.1 mA</td>
<td>&lt;1.2 mA</td>
</tr>
</tbody>
</table>

3. **BIN2 SPOS**
   - Selection: actuator in safety position

4. **BIN2 SIG.P**
   - Selection: error message in process value signal

5. **BIN2 RMOT**
   - Selection: operating mode **Automatic** and **External Setpoint** activated
**CAL.USER**

Calibration of the actual value display and the inputs for the position setpoint, process setpoint and process value *(S/HART)*

1. **CAL POS** → **POS MIN**
   - **POS MAX**

2. **CAL INP** → **INP 4MA**
   - **INP 20MA**
   - **SP 4MA**
   - **SP 20MA**

3. **CAL PV** → **PV 4MA**
   - **PV 20MA**

4. **CAL FACT** → **......**

5. **End of calibration**
   - **CAL END**

**NOTE**

The signal types shown in grey can only be selected if the process controller is activated.

The signal enclosed by a dotted line can only be selected if the process controller is deactivated.
OPERATING AND CONTROLLER FUNCTIONS

➀ CAL.POS
Calibration of the position display (0 - 100 %)

Storage of the minimum position:
Move to minimum position of the valve via arrow keys and confirm by pressing the MANUAL / AUTOMATIC key.

Storage of the maximum position:
Move to the maximum position of the valve via arrow keys and confirm this value by pressing the MANUAL / AUTOMATIC key.

➁ CAL.INP
Calibration of the position setpoint (4 ... 20 mA)

CAL SP
Calibration of the process setpoint (4 ... 20 mA)

This menu item does not appear with internal setpoint!

Storage of the minimum input signal (4 mA):
Apply the minimum value of the standard signal to the input and confirm it by pressing the MANUAL / AUTOMATIC key.

Storage of the maximum input signal (20 mA):
Apply the maximum value of the standard signal to the input and confirm it by pressing the MANUAL / AUTOMATIC key.

➂ CAL.PV
Calibration of the process setpoint (4 ... 20 mA)

This menu item does not appear on selection of frequency setpoint!

Storage of the minimum input signal (4 mA):
Apply the minimum value of the process value signal to the input and confirm the value by pressing the MANUAL/AUTOMATIC key.

Storage of the maximum input signal (20 mA):
Apply the maximum value of the process value signal to the input and confirm the value by pressing the MANUAL/AUTOMATIC key.

Select Pt-100:
Alter the value displayed using the arrow keys until the display on the SIDE Control S/HART agrees with that on the reference measuring instrument. Then confirm the value by pressing the MANUAL/ AUTOMATIC key.

➃ CAL.FACT
Reset of the settings under CAL.USER to the factory settings:

Hold down the MANUAL / AUTOMATIC key until the countdown has finished.
SETFACT
Resetting to the factory settings

With this function, all the settings made by the user can be reset to the status on delivery. All EEPROM parameters with the exception of the calibration values are reset to the default values. Then a hardware reset is executed.

To initiate the function, hold down the MANUAL/AUTOMATIC key for ca. 5 s until the countdown has finished.
Operating the process

Each time after switching on the voltage supply, the SIDE Control is automatically in the process operating level. To change to the process operating level from the configuration level, confirm the menu item *END* by pressing the MANUAL/AUTOMATIC key.

In the process operating level, the normal controlled operation is executed and monitored (in the *AUTOMATIC* mode), and the valve opened or closed by hand (*MANUAL* mode).

Changing between the operating modes:

- Operate the MANUAL/AUTOMATIC key to switch between the *MANUAL* and *AUTOMATIC* modes.

- Both in the *MANUAL* and the *AUTOMATIC* modes, you can change to the configuration level by pressing the MANUAL/AUTOMATIC key for longer than 5 seconds. On switching back to the process operating level, the operating mode is resumed that was set before switching over.

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>AUTOMATIC</em></td>
<td>An apostrophe (’) runs continuously from left to right.</td>
</tr>
<tr>
<td><em>HAND</em></td>
<td>-</td>
</tr>
</tbody>
</table>
Operating mode AUTOMATIC (S/HART)

In the AUTOMATIC mode, the normal controlled operation is executed and monitored.

Meaning of the keys in the operating mode AUTOMATIC

- switch over the display
- change the setpoint value:
  - with supplementary function P.CONTROL / P.CO SETP / SETP INT configured and display SP set

Displays in the operating mode AUTOMATIC

With reference to the controller, the following displays are possible:

- Actual position of valve actuator
  - POS__XXX (0 ... 100 %)

- Position setpoint of valve actuator (perhaps rescaled by an activated split-range function or correction characteristic)
  - CMD__XXX (0 ... 100 %)

- Input signal for position setpoint
  - INP__XXX (4 ... 20 mA)

By pressing the arrow keys, you can switch between these 3 display options.

NOTE

If the device is in the safety position (for the relevant configuration, see menu item BIN-IN), the message SAFE XXX appears on the display.

If the menu item CUTOFF is activated and the process valve is in the tight-closing range, a flashing MIN or MAX symbol appears on the display.
Operating mode AUTOMATIC (PROFIBUS PA)

In the AUTOMATIC mode, the normal controlled operation is executed and monitored. The setpoint is specified via the PROFIBUS PA signal.

Meaning of the keys in the operating mode AUTOMATIC

Switch over the display

Displays in the operating mode AUTOMATIC

With respect to the controller, the following displays are possible:

- Actual position of valve actuator $POS_{XXX}$ (0 ... 100 %)
- Setpoint position of valve actuator after or correction characteristic: $CMD_{XXX}$ (0 ... 100 %)

By pressing the arrow keys, you can switch between these 2 display options.

NOTE

If the device in the safety position (for the relevant configuration, see menu item BIN-IN), the message SAFE XXX appears on the display.
Operating mode MANUAL

In the MANUAL mode, the valve can be opened and closed by hand.

Meaning of the keys in the operating mode MANUAL

- Press the ▲ key in the MANUAL mode: actuator pressurized (SFA*: valve opens, SFB*: valve closes)
- Press the ▼ key in the MANUAL mode: actuator vented (SFA*: valve opens, SFB*: valve closes)
- Hold down the ▲ key and simultaneously press the ▼ key: fast pressurization of actuator (SFA*: valve opens, SFB*: valve closes)
- Hold down the ▼ key and simultaneously press the ▲ key: fast venting of actuator (SFA*: valve closes, SFB*: valve opens)

*SFA: actuator closes by spring force
*SFB: actuator opens by spring force

Displays in the operating mode MANUAL

The last display set in the AUTOMATIC mode is shown. By selecting POS_XXX, the actual value of the valve actuator can be checked.
OPERATING THE PROCESS CONTROLLER (S/HART)

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Factory settings of the process controller

<table>
<thead>
<tr>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.CONTRL</td>
<td></td>
</tr>
<tr>
<td>PCO DBND</td>
<td>1 %</td>
</tr>
<tr>
<td>PCO PARA</td>
<td></td>
</tr>
<tr>
<td>KP</td>
<td>1.00</td>
</tr>
<tr>
<td>TN</td>
<td>999.9</td>
</tr>
<tr>
<td>TV</td>
<td>0.0</td>
</tr>
<tr>
<td>X0</td>
<td>0</td>
</tr>
<tr>
<td>PCO SETP</td>
<td>SETP INT</td>
</tr>
<tr>
<td>PCO FILT</td>
<td>0</td>
</tr>
<tr>
<td>PCO SCAL</td>
<td>PV.L 000.0, PV.R 100.0</td>
</tr>
<tr>
<td>PCO TUNE</td>
<td>D’ACT</td>
</tr>
</tbody>
</table>

Setting up a process control system

In order to be able to operate the SIDE Control (S/HART) as a process controller, you must execute the following steps:

A  ➔ In all cases, first execute the self-parametrization for positioners (X.TUNE).

B  ➔ Add the supplementary function P.CONTRL to the main menu via the configuration menu.

   The function P.Q’LIN is also added to the main menu with the function P.CONTRL.

C  ➔ Call up the basic settings for the process controller under P.CONTRL.

D  Linearization of the process characteristic:
   If you are dealing with a flow control system, the process characteristic can be linearized automatically:
   ➔ Initiate the function P.Q’LIN.

E  ➔ Activate the function PCO TUNE and initiate the self-optimization of the PID parameters of the process controller.

![ATTENTION!](image)

In all cases, keep to the following sequence: X.TUNE ➔ P.Q’LIN ➔ P.CO TUNE
Self-parametrization for positioners - X.TUNE

The description of self-parametrization for positioners is to be found in the chapter Operating and Controller Functions / Commissioning and set-up as a positioner / Main menu for settings on commissioning / X.TUNE.

Supplementary function P.CONTRL

(see also the section Operating and Controller Functions - Configuring the Supplementary Functions)
OPERATING THE PROCESS CONTROLLER (S/HART)

Basic settings of the function \textit{P.CONTRL}

Parametrization of the process controller

- Insensitivity range (dead band) of the PID process controller
- Parameters of the PID process controller
- Type of setpoint setting
- Filtering of the process value input
- Scaling of the process controller
- Process tune of the process controller
- Storage of the new parameters
- End of the parametrization of the process controller
**P.CO - DBND**

Insensitivity range (dead band) of the process controller

Factory setting: 1% (relative to the range width of the process value scaled by \( SCAL_{PV} \) and \( PV_T \))

This function assures that the process controller cuts in only above a certain control difference. The function reduces wear on the piezoelectric valves in the SIDE Control (S/HART) and the pneumatic actuator.

![Diagram](image)

**Insensitivity range with process control**

Process setpoint (SP) → Control difference \( Xd_2 \) → Process value (PV) → Dead band → to controller \( Xd_2' \)
OPERATING THE PROCESS CONTROLLER (S/HART)

**P.CO - PARA**
Parameters of the PID process controller

- **Amplification factor of the process controller**
  0 ... 99.99 (factory setting 1.00)

- **Reset time**
  0.5 s ... 999.9 s (factory setting 999.9 s)

- **Rate time**
  0 s ... 999.9 s (factory setting 0 s)

- **Operating point**
  0.0 ... 100 % (factory setting 0 %)

**NOTE**
The parameters that were entered should be noted in the table in Appendix Tables for process controller. For definition of the parameters of a PID controller, see Appendix General Rules. For self-parametrization of the PID parameters, see step 3.

**P.CO - SETP**
Type of setpoint setting (internal / external)

- **Setpoint setting internally via the keys on the SIDE Control (S/HART).**

- **Setpoint setting externally via the standard signal input.**
**P.CO - FILT**
Filtering of the process value input

Factory setting: 0
Filter has low-pass behaviour (PT1).
Range: 0 ... 9

Setting in 10 steps:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Corresponds to limiting frequency (Hz)</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>minimum filter effect</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.03</td>
<td>maximum filter effect</td>
</tr>
</tbody>
</table>
**P.CO SCAL**

Scaling the process controller

- **Position of the decimal point for process value and setpoint (setting range: 0 … 3)**

- **Lower scaling value for process value; the value is assigned to 4 mA. (*)**

- **Upper scaling value for process value; the value is assigned to 20 mA. (*)**

- **Lower scaling value for process setpoint; the value is assigned to 4 mA. (**)**

- **Upper scaling value for process setpoint; the value is assigned to 20 mA. (**)**

(*) This setting specifies the reference range for the deadband of the process controller and for the analog repeat of the process value (option).

(**) This setting is active only when P.CO SETP / SETP EXT has been selected.
Example of scaling for the 4 ... 20 mA input

Process value from transmitter: 4 ... 20 mA corresponds to 0 ... 10 l/min
Process setpoint of SPS: 4 ... 20 mA corresponds to 0 ... 8 l/min

<table>
<thead>
<tr>
<th>Variant 1</th>
<th>Variant 2</th>
<th>Variant 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV (\perp)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PV (\tau)</td>
<td>1.0</td>
<td>10.0</td>
</tr>
<tr>
<td>SP (\perp)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SP (\tau)</td>
<td>0.8</td>
<td>8.0</td>
</tr>
</tbody>
</table>

**NOTE**

On entering small scaling values, decimal places are automatically added to increase the precision of display, such that the maximum possible digit range is given between the lower and upper scaling values in each case. The amplification factor \(KP\) of the process controller refers to the scaling values set.

With \(PCO\) \(SETP / SETP\) \(INT\) (setpoint entry via the arrow keys), scaling of the setpoint via \(SP\) \(\perp\) und \(SP\) \(\tau\) is not possible. The setpoint may be entered directly corresponding to the scaled process variable \((PV\) \(\perp\), \(PV\) \(\tau\)).
**P.CO TUNE**
Activating self-optimization of the process controller (process tune)

Activate process tune

Select controlled member

- Controlled member unknown
- Flow rate control
- Temperature control
- Pressure control
- Filling level control

**NOTE**
Process tune is started in the operating mode **AUTOMATIC**.
Starting the routine for linearization of the process characteristic

This function makes sense only when flow control is to be carried out.

You start the routine for linearization of the process characteristic by calling up the menu item P.Q'LIN in the main menu and pressing the MANUAL/AUTOMATIC key for 5 seconds.

With the activation of the function PCONTRL, the function P.Q'LIN, which is required for process control, is copied into the main menu.

Via this function, the program is started for autonomous determination of the fixed points for a correction characteristic.

The program increases in 20 steps the valve stroke from 0 to 100 % and measures the associated process variable. The pairs of values of the correction characteristic are stored as a freely programmable characteristic under the menu item CHARACT/CHAFREE and may be viewed under this menu item.

If the menu item CHARACT was not transferred under the menu item ADDFUNC to the main menu, this is done automatically on execution of the function P.Q'LIN. At the same time, the menu item CHARACT/CHAFREE is activated.

Displays during calling up and execution of the routine

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Q'LIN 5</td>
<td>Countdown from 5 to 0 for starting the routine</td>
</tr>
<tr>
<td>P.Q'LIN 4</td>
<td></td>
</tr>
<tr>
<td>P.Q'LIN 0</td>
<td></td>
</tr>
<tr>
<td>P.Q'LIN 0</td>
<td>Display of the fixed point that is being approached at the moment</td>
</tr>
<tr>
<td></td>
<td>(progress is indicated by rotating bars to the left of the display)</td>
</tr>
<tr>
<td>P.Q'LIN 1</td>
<td></td>
</tr>
<tr>
<td>P.Q'LIN 2</td>
<td></td>
</tr>
<tr>
<td>P.Q'LIN 3</td>
<td></td>
</tr>
<tr>
<td>P.Q'LIN.END</td>
<td>(flashing) End of routine</td>
</tr>
<tr>
<td>Q.ERR X.X</td>
<td>Message on occurrence of an error</td>
</tr>
<tr>
<td></td>
<td>(to right of display: error number - see section Maintenance of the</td>
</tr>
<tr>
<td></td>
<td>process controller)</td>
</tr>
</tbody>
</table>
P.C.O TUNE

Self-optimization of the process controller (process tune)

The control system SIDE Control is equipped with a positioner which if required can be supplemented by a superimposed process controller (see chapter Operation as a Process Controller).

The positioner controls the position of the process valve to the desired setpoint and is automatically parametrized and optimized by the X.TUNE function.

The superimposed process controller, which together with a sensor forms a process control loop, controls any process variable. It has a PID structure whose components may be combined in various ways (P, PI, PD, PID), and freely parametrized (KP, TN, TV).

In order to obtain good control behaviour, the structure of the controller must be adapted to the characteristics of the process (controlled member). The parameters must be chosen to obtain a short setting time, a small overshoot width and good damping.

Parametrization demands experience in control technique, measuring equipment and is time consuming. For this reason, SIDE Control has a self-optimization function PTUNE. This function provides an unique, direct determination of the parameters. The results may be read out as needed and modified in any way desired.

METHOD OF OPERATION

During commissioning of the control system, the process is excited by a step in the setpoint in a closed control loop. This step is carried out within the future working range of the process control system and serves to determine characteristic variables of the process. Calculation of the PID controller parameters is carried out on the basis of these characteristic variables by use of a modified Ziegler-Nichols procedure.

SETPOINT MODULATOR

In addition to optimization of the PID parameters, a setpoint modulator (filter) is calculated for the reduction of unwanted non-linear effects. Such effects may arise because of physical limitation of the correcting variables and the floating time of the control valve.

The setpoint modulator further improves the control behaviour. It is activated as long as the PTUNE function is activated in the operating menu of the SIDE Control (P.TUN ACT). When the function PTUNE is deactivated in the operating menu (P.TUN D’ACT) after completion of self-optimization, the process is controlled with the optimized PID parameters and the setpoint modulator is deactivated.

ATTENTION!

Be sure to comply with the sequence A ... E on setting up the process control system!
Operation

To carry out self-optimization (process tune) on the process controller, proceed as follows with the steps described.

**NOTE**

All operating steps for the execution of process tune are performed on the spot using the operating elements (keypad and display) of the SIDE Control.

**Step 1 - Activate process tune**

You are in the menu item \textit{P\textbackslash{}CONTROL} in the configuration level of SIDE Control. Activate process tune on the process controller \textit{P\textbackslash{}TUN ACT} and select the process type corresponding to your control job.

If the process is unknown, enter \textit{P\textbackslash{}TYP N\textbackslash{}DEF} (not defined).

Change to the \textit{process operating level} by quitting the configuration level via the menu item \textit{END X.XX} and switching the device to the operating mode \textit{AUTOMATIC}.
Step 2 - Process tune ready to start

You are in the **process operating level** in the **AUTOMATIC** mode.

Make ready process tune by the following operating procedure:

The next setpoint step entered via the keypad (see Step 3) is now used for parameter optimization. The setpoint \( SP \) is set equal to the actual sensor value \( PV \) and is the starting value for the optimization step.

Adaptation / modification of this starting value is described in Step 3.

Readiness of process tune is symbolized in the display by three horizontal bars behind the flashing setpoint symbol \( SP \).

Step 3 - Adaptation of the starting value for the optimization step (optional)

If required you can carry out an adaptation of the starting value for the optimization step. Switch the device to the **MANUAL** mode. By pressing the arrow keys, open or close the process valve, which causes a corresponding change in the process value \( PV \). As soon as the desired starting value is set, switch the device back to the **AUTOMATIC** mode.

Step 4 - Initiate process tune

You are in the **process operating level** in the **AUTOMATIC** mode.

Process tune is now initiated by entering via the keypad a setpoint step. This step should take place in the future working range of the process control system.

The procedure is as follows:

\[ \text{with the display } SP \text{(setpoint) set, press one of the arrow keys for longer than 3 seconds to activate the mode for changing the process setpoint. After release of the key, the first digit of the process setpoint flashes.} \]

\[ \text{Set the value of the flashing digit of the process setpoint } SP. \]

\[ \text{Confirm the value set and move to the next digit. After confirmation of the fourth digit, the process setpoint set is stored as the end value of the process setpoint step.} \]
The setpoint step for parameter optimization must always be entered via the operating keypad. This also applies when, on configuration, the function \texttt{P\texttt{CONTRL / P\texttt{CO SETP / SETP EXT}} (setpoint setting via analog input) was specified. In this case, the external setpoint setting is reactivated only after completion of process tune.

Self-optimization of the process controller now runs automatically. The display shows a rotating bar and the message \texttt{P\texttt{TUNE}. After completion of process tune, the device is in the \texttt{AUTOMATIC} mode. The process controller works from this point on with the optimized PID parameters and controls to the current, internal or external setpoint \texttt{SP}.

To execute a new optimization cycle, repeat \textbf{Steps 2 ... 9}.

Process tune in the operating menu of the SIDE Control remains activated, so that process control is carried out with the setpoint modulator (filter) in order to reduce unwanted, non-linear effects. If control is to be carried out without the setpoint modulator, process tune in the operating menu must be deactivated: \texttt{P\texttt{CONTRL / P\texttt{CO TUNE / P\texttt{TUN D\texttt{ACT}}.}}
Operating the process

Each time after switching on the voltage supply, the SIDE Control (S/HART) is automatically in the process operating level. To change to the process operating level from the configuration level, confirm the menu item END by pressing the MANUAL/AUTOMATIC key.

In the process operating level, normal controlled operation is executed and monitored (in the AUTOMATIC mode), and the valve opened or closed by hand (MANUAL mode).

Changing between the operating modes

Operate the MANUAL/AUTOMATIC key to switch between the MANUAL and AUTOMATIC modes.

Both in the MANUAL and the AUTOMATIC modes, you can change to the configuration level by pressing the MANUAL/AUTOMATIC key for longer than 5 seconds. On switching back to the process operating level, the operating mode is resumed that was set before switching over.

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOMATIC</td>
<td>An apostrophe (’) runs continuously from left to right.</td>
</tr>
<tr>
<td>MANUAL</td>
<td>-</td>
</tr>
</tbody>
</table>
Operating mode AUTOMATIC

In the AUTOMATIC mode, normal controlled operation is executed and monitored.

Meaning of the keys in the AUTOMATIC mode

- Switch over the display
- Change the process setpoint:
  - With configured supplementary functions P.CO TUNE, P.CO SETP, P.CO INT
  - Make P.TUNE (process tune) ready for start:
    - With PID self-optimization activated, P.CO TUNE, P.CO SETP, P.CO INT

Displays in operating mode AUTOMATIC

With the process controller activated, the following parameters can be displayed:

- Actual value of process variable (process value) $PV_{---}$ (-999 ... 9999)
- Setpoint of process variable (process setpoint) $SP_{---}$ (-999 ... 9999)
- Actual position of valve actuator $POS_{--- XX}$ (0 ... 100 %)
- Setpoint position of valve actuator after rescaling or correction curve $CMD_{--- XX}$ (0 ... 100 %)

By pressing the arrow keys, you can switch between these display options.

NOTE

- If the device is in the safety position (for the relevant configuration, see menu item SIG-ERR or BIN-IN), the message SAFE XXX appears on the display.
- If the menu item CUTOFF is activated and the process valve is in the tight-closing range, a flashing MIN or MAX symbol appears on the display.
- If the process value (PV) is outside the range of measurement (above or below), a flashing bar appears on the display.
Manual changing of the process setpoint

If the supplementary function P.CONTROL / P.CO SETP / SETP INT (setting of the setpoint via keys) was specified on configuration, then with the display SP set (setpoint) and on pressing one of the arrow keys for longer than 3 seconds, the mode for changing the process setpoint can be activated. After release of the key, the first digit of the process setpoint flashes.

The first digit of the process setpoint can be set.

After confirmation with the MANUAL / AUTOMATIC key, the set value is stored.

In the same manner, the other digits are set. After confirmation of the fourth digit, the display returns to the previous mode.
Operating mode MANUAL

In the MANUAL mode, the valve can be opened and closed by hand.

Meaning of the keys in operating mode MANUAL

- Press the ▲ key in the MANUAL mode: actuator pressurized (SFA*: valve opens, SFB*: valve closes)
- Press the ▼ key in the MANUAL mode: actuator vented (SFA*: valve closes, SFB*: valve opens)
- Hold down the ▲ key and simultaneously press the ▼ key: fast pressurization of actuator (SFA*: valve opens, SFB*: valve closes)
- Hold down the ▼ key and simultaneously press the ▲ key: fast venting of actuator (SFA*: valve closes, SFB*: valve opens)

*SFA: actuator closes by spring force
*SFB: actuator opens by spring force

Displays in operating mode MANUAL

The last display set in the AUTOMATIC mode is shown. By selecting POS_XXX, the actual position of the valve actuator can be checked. To display the actual position of the valve actuator during MANUAL operation, first change to the display POS_XXX in the AUTOMATIC mode.
GSD file

************************ COMPANY INFORMATION ************************

Bürkert

************************ DEVICE and FILE INFORMATION ************************

FILE NAME: Buer9710.gsd Profil GSD
DEVICE TYPE: PROFIBUS_PA
DEVICE INFORMATION: 8635 Sidecontrol
PROFILE COMPATIBILITY: PROFILE 3.0
DPV1 IMPLEMENTATION: yes

************************* GSD REVISION INFORMATION *************************

$Revision:: 1.0 $
$Date:: 5 April 2000 15:00 $

DATE | NAME | VERSION | COMMENT
18.02.2000 | Ht | 1.0 | Release 3.0
04.03.2000 ht 1.1 Bitmaps inserted
04.03.2000 ht 1.2 bug fix, typ, text, len, Semikolon
04.03.2000 ht 1.3 name Bitmaps
11.03.02 ht user param data len = 3
08.10.02 ht 1.5 extend max diag len to 20 according to diagnostics

************************ General DP Keywords ************************

#Profibus_DP
GSD_Revision = 2
Vendor_Name = "Buerkert"
Model_Name = "8635"
Revision = "Profile 3.0"
Ident_Number = 0x0569
Protocol_Ident = 0
Station_Type = 0
FMS_supp = 0
Hardware_Release = "all"
Software_Release = "3.00"
31.25_supp = 1
45.45_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp = 1
6M_supp = 1
12M_supp = 1
MaxTsdr_31.25 = 100
MaxTsdr_45.45 = 250
MaxTsdr_93.75 = 1000
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
CONFIGURATION FOR BUS COMMUNICATION (PROFIBUS PA)

Implementation_Type = "SPC4/ITEC"
Bitmap_Device = "bue0569n"
Bitmap_Diag = "bue0569d"
;Bitmap_SF = ""

;********** Additional Keywords For Different Physical Interfaces **********
;********** DP Master (Class 1) Related Keywords **********
;********** Additional Master Related Keywords For DP Extensions **********

;********** Basic DP_Slave Related Keywords **********
Freeze_Mode_supp = 0
Sync_Mode_supp = 0
Auto_Baud_supp = 0
Set_Slave_Add_supp = 1
Min_Slave_Intervall = 250
Modular_Station = 1
Max_Module = 1
Max_Input_Len = 15
Max_Output_Len = 10
Max_Data_Len = 25
Max_Diag_Data_Len = 20
Max_user_Prm_Data_Len = 3
Ext_User_Prm_Data_Const(0) = 0x00, 0x00, 0x00

Unit_Diag_Bit(16) = "Error appears"
Unit_Diag_Bit(17) = "Error disappears"
Unit_Diag_Bit(24) = "Hardware failure electronics"
Unit_Diag_Bit(25) = "Hardware failure mechanics"
Unit_Diag_Bit(26) = "Motor temperature too high"
Unit_Diag_Bit(27) = "Electronic temperature too high"
Unit_Diag_Bit(28) = "Memory error"
Unit_Diag_Bit(29) = "Measurement failure"
Unit_Diag_Bit(30) = "Device not initialized"
Unit_Diag_Bit(31) = "Device initialization failed"
Unit_Diag_Bit(32) = "Zero point error"
Unit_Diag_Bit(33) = "Power supply failed"
Unit_Diag_Bit(34) = "Configuration invalid"
Unit_Diag_Bit(35) = "Restart"
Unit_Diag_Bit(36) = "Coldstart"
Unit_Diag_Bit(37) = "Maintenance required"
Unit_Diag_Bit(38) = "Characteristics invalid"
Unit_Diag_Bit(39) = "Ident_Number violation"
Unit_Diag_Bit(55) = "Extension Available"

; Modules for Analog Output
; RB = READBACK, CB = CHECKBACK, RC_OUT = RCAS_OUT, RC_IN = RCAS_IN

(1.) Module = "Setpoint SP_D" 0x82,0x84,0x08,0x05
EndModule

(2.) Module = "SP+READBACK+POS_D" 0xC6,0x84,0x86,0x08,0x05,0x05,0x05,0x05
EndModule

(3.) Module = "SP+CHECKBACK" 0xC3,0x84,0x82,0x08,0x05,0x0A
EndModule
CONFIGURATION FOR BUS COMMUNICATION (PROFIBUS PA)

(4.) Module = "SP+READBACK+POS_D+CHECKBACK"  
0xC7,0x84,0x89,0x08,0x05,0x08,0x05,0x05,0x05,0x0A
EndModule

(5.) Module = "RCAS_IN+RCAS_OUT"   0xC4,0x84,0x84,0x08,0x05,0x08,0x05
EndModule

(6.) Module = "RCAS_IN+RCAS_OUT+CHECKBACK"   0xC5,0x84,0x87,0x08,0x05,0x08,0x05,0x0A
EndModule

(7.) Module = "SP+RB+RIN+ROUT+POS_D+CB"  
0xCB,0x89,0x8E,0x08,0x05,0x08,0x05,0x08,0x05,0x08,0x05,0x05,0x05,0x0A
EndModule

Slave_Family = 12

;************** Additional Keywords For Modul Assignment **************
;************** Slave Related Keywords For DP Extensions **************
;************** Slave Related Keywords For ProfiSafe Profile **************

END OF GSD FILE

One option is to be selected from the options for cyclic data exchange.  
Under (1.) is to be found the simplest possibility, which corresponds only to the setpoint.  
If one wishes to work with this manufacturer-specific file, the ident number selector must be set to  
"Manufacturer-Specific" (1).
Setting the device address

Configuration and parametrization of the SIDE Control (PROFIBUS PA) are done locally via menu functions or via the bus. The valve can also be opened and closed locally by hand. The setpoint can be specified via the bus.

With DIP switch 8, one sets whether the device address is to be set on the device or via the bus.

<table>
<thead>
<tr>
<th>DIP switch 8</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Enter the device address with the DIP switch</td>
</tr>
<tr>
<td>ON</td>
<td>Enter the device address via the bus</td>
</tr>
</tbody>
</table>

With DIP switch 8 in the OFF position, the device address can be set via DIP switches 1 to 7. The permissible range for the address is 3 to 124.

<table>
<thead>
<tr>
<th>DIP-1</th>
<th>DIP-2</th>
<th>DIP-3</th>
<th>DIP-4</th>
<th>DIP-5</th>
<th>DIP-6</th>
<th>DIP-7</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>2^6</td>
<td>2^5</td>
<td>2^4</td>
<td>2^3</td>
<td>2^2</td>
<td>2^1</td>
<td>2^0</td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>3</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>124</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>125</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>126</td>
</tr>
</tbody>
</table>

NOTE: The DIP switch settings are read in only on switching on the device.

Cyclic parameters

SP  Setpoint of valve position

These parameters are of type DS-33 (value and status - floating point structure). The structure of this type of parameter is shown in the following table:

<table>
<thead>
<tr>
<th>Element no.</th>
<th>Name of element</th>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Value</td>
<td>Float - (8)</td>
<td>4 byte</td>
</tr>
<tr>
<td>2</td>
<td>Status</td>
<td>Unsigned 8 - (5)</td>
<td>1 byte</td>
</tr>
</tbody>
</table>

The „good“ status is 0 x 80. The configuration SP is supported.
## Configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Slot index</th>
<th>Index absolute</th>
<th>Read</th>
<th>Write</th>
<th>Type</th>
<th>Size byte</th>
<th>Memory class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Device management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directory_object_header</td>
<td>1</td>
<td>0</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>12</td>
<td>C</td>
</tr>
<tr>
<td>Composite_directory_entrie</td>
<td>1</td>
<td>1</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>24</td>
<td>C</td>
</tr>
<tr>
<td><strong>Physical Block</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block object</td>
<td>0</td>
<td>16</td>
<td>X</td>
<td></td>
<td>DS-32</td>
<td>20</td>
<td>C</td>
</tr>
<tr>
<td>ST_REV</td>
<td>0</td>
<td>17</td>
<td>X</td>
<td></td>
<td>UNSIGNED16</td>
<td>2</td>
<td>N</td>
</tr>
<tr>
<td>TAG_DESC</td>
<td>0</td>
<td>18</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>32</td>
<td>S</td>
</tr>
<tr>
<td>STRATEGY</td>
<td>0</td>
<td>19</td>
<td>X</td>
<td></td>
<td>UNSIGNED16</td>
<td>2</td>
<td>S</td>
</tr>
<tr>
<td>ALERT_KEY</td>
<td>0</td>
<td>20</td>
<td>X</td>
<td></td>
<td>UNSIGNED8</td>
<td>1</td>
<td>S</td>
</tr>
<tr>
<td>TARGET_MODE</td>
<td>0</td>
<td>21</td>
<td>X</td>
<td></td>
<td>UNSIGNED8</td>
<td>1</td>
<td>S</td>
</tr>
<tr>
<td>MODE_BLK</td>
<td>0</td>
<td>22</td>
<td>X</td>
<td></td>
<td>DS-37</td>
<td>3</td>
<td>D</td>
</tr>
<tr>
<td>ALARM_SUM</td>
<td>0</td>
<td>23</td>
<td>X</td>
<td></td>
<td>DS-42</td>
<td>8</td>
<td>D</td>
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<tr>
<td>SOFTWARE_REVISION</td>
<td>0</td>
<td>24</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>16</td>
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</tr>
<tr>
<td>HARDWARE_REVISION</td>
<td>0</td>
<td>25</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>16</td>
<td>C</td>
</tr>
<tr>
<td>DEVICE_MAN_ID</td>
<td>0</td>
<td>26</td>
<td>X</td>
<td></td>
<td>UNSIGNED16</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td>DEVICE_ID</td>
<td>0</td>
<td>27</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>16</td>
<td>C</td>
</tr>
<tr>
<td>SERIALNUMBER</td>
<td>0</td>
<td>28</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>16</td>
<td>C</td>
</tr>
<tr>
<td>DIAGNOSIS</td>
<td>0</td>
<td>29</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td>DIAGNOSIS_EXTENSION</td>
<td>0</td>
<td>30</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>6</td>
<td>D</td>
</tr>
<tr>
<td>DIAGNOSIS_MASK</td>
<td>0</td>
<td>31</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>4</td>
<td>C</td>
</tr>
<tr>
<td>DIAGNOSIS_MASK_EXTENSION</td>
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<td>32</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
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<td>C</td>
</tr>
<tr>
<td>FACTORY_RESET</td>
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</tr>
<tr>
<td>DESCRIPTOR</td>
<td>0</td>
<td>36</td>
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<td></td>
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<td>S</td>
</tr>
<tr>
<td>DEVICE_MESSAGE</td>
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<td></td>
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<td>S</td>
</tr>
<tr>
<td>DEVICE_INSTALL_DATE</td>
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<td>38</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>16</td>
<td>S</td>
</tr>
<tr>
<td>LOCAL_OP_ENA</td>
<td>0</td>
<td>39</td>
<td>X</td>
<td></td>
<td>UNSIGNED8</td>
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<td>N</td>
</tr>
<tr>
<td>IDENT_NUMBER</td>
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<td>40</td>
<td>X</td>
<td></td>
<td>UNSIGNED8</td>
<td>1</td>
<td>S</td>
</tr>
<tr>
<td>View_1 (diagnosis)</td>
<td>0</td>
<td>52</td>
<td>X</td>
<td></td>
<td>OSTRING</td>
<td>17</td>
<td>D</td>
</tr>
</tbody>
</table>

N: Non-volatile parameter
S: Static revision counter parameter
D: Dynamic parameter
C: Constant parameter
### Configuration for Bus Communication (PROFIBUS PA)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Slot index</th>
<th>Index absolute</th>
<th>Read</th>
<th>Write</th>
<th>Type</th>
<th>Size byte</th>
<th>Memory class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function Block (Analog Output)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block object</td>
<td>1</td>
<td>16</td>
<td>X</td>
<td></td>
<td>DS-32</td>
<td>20</td>
<td>C</td>
</tr>
<tr>
<td>ST_REV</td>
<td>1</td>
<td>17</td>
<td>X</td>
<td></td>
<td>UNSIGNED16</td>
<td>2</td>
<td>N</td>
</tr>
<tr>
<td>TAG_DESC</td>
<td>1</td>
<td>18</td>
<td>X</td>
<td>X</td>
<td>OSTRING</td>
<td>32</td>
<td>S</td>
</tr>
<tr>
<td>STRATEGY</td>
<td>1</td>
<td>19</td>
<td>X</td>
<td>X</td>
<td>UNSIGNED16</td>
<td>2</td>
<td>S</td>
</tr>
<tr>
<td>ALERT_KEY</td>
<td>1</td>
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N: Non-volatile parameter  
S: Static revision counter parameter  
D: Dynamic parameter  
C: Constant parameter

---

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### Configuration for Bus Communication (PROFIBUS PA)

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### Configuration for Bus Communication (PROFIBUS PA)

#### Transducer Block (Analog Output)

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* not available via PDM or Commuwin
N: Non-volatile parameter
S: Static revision counter parameter
D: Dynamic parameter
C: Constant parameter

**SETP_DEVIATION_LIMIT**
0: function switched off,
otherwise limit value (7) of setpoint. On exceeding, 0x02 is outputted in the 1st byte of the diagnosis extension and a diagnosis message generated.

**TIME_OUT_MONITOR**
A time (100 ms basis) is started when the setpoint leaves the dead band. If this time exceeds the limit, 0x01 is outputted in the 1st byte of the diagnosis extension and a diagnosis message generated.

The bit remains in place for 10 s.
OPERATING VIA THE HART HAND TERMINAL (HART)

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General

The SIDE Control Type 8635 may be configured, in the version with HART interface, by means of a HART-compatible hand terminal.

Program the hand terminal with the device description belonging to the SIDE Control Type 8635 (Device Description = DD).

These DDs are administrated and released by the HART Communication Foundation (HCF: www.hartcomm.org). The DDs may be programmed by companies (programming sites) authorized by the HCF and who are provided with all DDs. A complete list of all authorized companies may be obtained from www.hartcomm.org.

A hand terminal may contain several DDs. On purchase of a hand terminal or on updating of the DDs, the HART user must choose which DDs the hand terminal should contain.

The following operating instructions refer to the HART Communicator Rosemount Model 275 for the DD revision 2 (HCF DD library listing: 78/EF/02/02).

You can see a listing of all DDs presently available in the HART Communicator in the sub-menu Utility Simulation. This can be reached with the key via the online menu.

General information on the SIDE Control Type 8635, e.g. on the Autotune function, a description of all available functions, factory settings etc. are to be found in the chapters Operating and Controller Functions or Operating the Process Controller. The chapter Operating via the HART Hand Terminal is merely a supplement.

Data is transferred with the HART protocol in the form of a superimposed frequency: a digital signal (2200 Hz = 0, 1200 Hz = 1) is modulated onto the setpoint standard signal 4 ... 20 mA by the FSK procedure (Frequency Shift Keying).

The SIDE Control Type 8635 works with the HART Protocol Revision 5.7.

NOTE

The handling of the HART-compatible hand terminal (HART Communicator) should be taken from the operating instructions enclosed with the device.

ATTENTION!

Note that operation of the SIDE Control by the hand terminal may lead to malfunctions in the running process, e.g. in the Autotune function or on changing some parameters (on scaling of process value / external setpoint or on changing the decimal point, since an update in the SIDE Control takes place only after quitting the function).

Only if these malfunctions cannot cause damage to the installation, may the controller be configured in the running process via the HART hand terminal!
**System description**

**Illustration of the system**

![Diagram of the system](image)

**Menu description and key assignment**

A maximum of five menus are displayed in numbered display lines. Further menu items may be reached by pressing the operating key. 

An inversely displayed menu item with an ➔ behind the line number may be selected with the operating key. You either arrive at data entry or are branched to a sub-menu. It is also possible to directly select a menu item with an ➔ behind the line number by entering the line number [1] to [9] on the alphanumeric keypad. 

Since only single-digit line numbers are available, menu items over 9 are shown without line numbers: they may only be accessed via the operating key. 

In the first line or the first two lines, the menu selected at the moment is shown. If an ➔ is shown to the right of the menu name, you can reach the higher-ranking menu with the key. 

In the display fields shown inversely directly above the function keys F1 to F4, the software commands valid for the current menu, such as HELP, NEXT or HOME, appear. The selected command can be confirmed with the underlying function key F1 to F4. 

In this way, for example, a help text may be called up in all menu levels in which the HELP button appears, using the function key F1. 

Lengthy text which cannot be shown in the display is made legible by confirming the commands PGUP or PGDN. 

The help text is quitted with EXIT.
OPERATING VIA THE HART HAND TERMINAL (HART)

Data entry

Fields for data entry are shown inverse and the respective digit flashes. Using the keys 2 and 6, you can select the fields and delete with the command DEL via the corresponding function key.

Data is entered via the alphanumeric keys 1 ... 9.

With the function key for ESC you quit the entry field. The data just entered are not stored.

With ENTER you store the entry, quit the entry field and send the changed value to SIDE Control.

With EXIT you quit the current entry or display field and with 6 you return to the last selected menu.

By pressing the function key for HOME you reach the on-line menu.

All important keys and display elements are shown in the following illustrations.
Commissioning

Preparation

► Before commissioning, execute the fluidic and electrical installations.
► Connect the HART hand terminal via the 2-pole communication line to the SIDE Control. Attach the communication lines parallel to the setpoint standard signal. Correct polarity must not be observed.
► Supply the SIDE Control with pneumatic auxiliary energy (inlet air) and apply a setpoint ≥ 4 mA.
► Switch on the hand terminal with the I/O key: the display shows for a few seconds a self-test message. If the hand terminal was connected for the first time to the field device, a warm start is executed which is completed with the function key F3 - NEXT. In the display appears the basic menu for the SIDE Control Type 8635 in the on-line mode.
► On first commissioning, execution of the Autotune function is absolutely necessary. SIDE Control automatically determines the optimum settings for the current operating conditions (see also the chapter Operating and Controller Functions).
► The menu item AUTOTUNE is to be found in the Main menu under item 2.

AUTOTUNE procedure (required on first commissioning)

► Select the menu item AUTOTUNE in the Main menu via the operating keys □ or □ and then start the function via the operating key □. The following message appears.

![Message after start of AUTOTUNE function.](image)

► With F3 - ABORT you can quit the AUTOTUNE function without starting.
With F4 - OK you confirm the start.
After pressing the F4 key, a warning message appears that the AUTOTUNE function may cause malfunctions in the running process.

![Warning before start of AUTOTUNE function.](image)
During run-off of AUTOTUNE, messages appear with display of the currently running AUTOTUNE phase:

- Running AUTOTUNE: 1
- Running AUTOTUNE: 2
- Running AUTOTUNE: 3

Running of the AUTOTUNE function is completed with an OK message.

If the message AUTOTUNE error X appears on the display, an error is shown. X stands for the error number. In the chapter Maintenance and Error Elimination on the Controller, you will find an explanation of this error number.

⇒ On pressing F4 - OK, you return to the main menu.
Operating the positioner via the HART hand terminal

Configuration

A prerequisite for configuration of the HART hand terminal is that the AUTOTUNE function has been executed before first commissioning.

⇒ First define the device-specific parameters such as instrument code, description, date, message or factory number in the Main menu under HART parameters - device setup.

⇒ To configure the supplementary functions, enter the Main menu / submenu Configuration (Item 1).

As to be seen in the chapter Operating and Controller Functions, all supplementary functions which you want to use must be released.

⇒ For this purpose, enter the submenu Configuration / Add Function (Item 2). With the operating key select the corresponding function.

⇒ With the function key F2 - ON, release the function if it was locked. You can equally lock a released function again with the function key F2 - OFF.

⇒ From item 3 of the submenu Configuration on, you can alter the released supplementary functions.

ATTENTION!

All parameters not altered by AUTOTUNE are only stored in the RAM memory of the SIDE Control and hence will no longer be present after a cold start. If you want to permanently store the altered parameters, they must be saved via the menu item EEPROM Control in the Main menu or in the menu Configuration - Save to EEPROM.

Display of the process variables

A display of the following process variables may be obtained via the menu Main / Dynamic variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS</td>
<td>Actual position</td>
<td>%</td>
</tr>
<tr>
<td>POScurrent</td>
<td>Actual position</td>
<td>mA</td>
</tr>
<tr>
<td>INPcurrent</td>
<td>Input signal for setpoint position</td>
<td>mA</td>
</tr>
<tr>
<td>PV</td>
<td>Process value (irrelevant for positioner)</td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>Process setpoint (irrelevant for positioner)</td>
<td></td>
</tr>
</tbody>
</table>
Changing the process variables

Via the menu item *Digital control* in the *Main* menu, you can specify the 4 ... 20 mA input signal *INP* digitally via the HART interface (0% = 4 mA; 100% = 20 mA).

**Procedure**

→ Select the menu item *Digital control* in the *Main* menu via the operating key ♦ or ◆.

→ Start the function via the operating key ◆. The following message appears.

![Message after starting Digital control](image)

→ Confirm with *F4 - OK*. The entry mask shown appears.

![Entry mask for the digital input value](image)

→ Specify a digital input value between 0 % and 100 %.

→ Using *F4 - ENTER*, transmit the value entered to the SIDE Control.

→ Using *F3 - ABORT*, quit the entry mask. A message appears as shown below.

→ By conforming with *F4 - OK* you return to the *Main* menu.

![Message after quitting Digital control](image)
Operating the process controller via the HART hand terminal

This chapter serves as a supplement to the chapter Operating the positioner via the HART hand terminal and contains only the information required for the process controller.

General information on the process controller, e.g. setting up a process control system or factory settings, are to be found in the chapter Operating the process controller.

Configuration
For process control you need the supplementary function P-CONTROL.

→ Release the function by switching the function P-CONTROL to ON with the function key F2 in the submenu Configuration under Item 1 - Add Function.

→ Configure P-CONTROL after release in the submenu Configuration - P-CONTROL.

! ATTENTION!
All altered parameters are only stored in the RAM memory of the SIDE Control and hence will no longer be present after a cold start. If you want to permanently store the altered parameters, they must be saved via the menu item EEPROM Control in the Main menu or in the menu Configuration - Save to EEPROM.

As soon as P-CONTROL has been activated via Add Function, two additional functions may be selected: P.Q’LIN and PTUNE.

P.Q’LIN
P.Q’LIN serves to linearize the process characteristic and may be started under Configuration or under Main - PQLIN.

Procedure

→ Select PQLIN via the operating key or and then start the function via the operating key . The following message appears:

Start of function PQLIN

→ You can either the function P.Q’LIN with F3 - ABORT or start the function P.Q’LIN via the key F4 - OK. As long as P.Q’LIN is running, the following message appears:

Running PQLIN

Running of the function P.Q’LIN is ended by an OK message.
If the message *PQLIN error X* appears on the display, this indicates an error. 
X stands for the error number. In the chapter *Maintenance and Error Elimination on the Process Controller*, you will find an explanation of this error number.

→ On pressing *F4 - OK*, you return to the main menu.

**PTUNE**

*PTUNE* serves to determine the optimal control parameters *KP*, *TN*, *TV* and may be started under *Main - PTUNE*, provided that the menu item *PCO TUNE* has been previously set to *active* in the menu *Configuration under P-CONTROL*.

**Procedure**

The function PTUNE can be aborted at any time with the function key *F3 – ABORT*.

→ Select PTUNE via the operating key ⑨ or ⑩ and then start the function via the operating key ⑥.

The following message appears:

**SET PTUNE ON**

→ Confirm with the key *F4 - OK*.

PTUNE is ready to start. The following message appears:

This message serves to explain the method of functioning of PTUNE:

The current process value *PV* is used as a starting value for the optimization step. It is important here that the actual value has reached equilibrium. By specification of a setpoint step, parameter optimization can be started.
Contrary to the execution of PTUNE via the SIDE Control, the process value PV, and hence the starting value for the optimization step, cannot be changed by switching over to the MANUAL mode and opening and closing the valve.

- After confirmation with F4 - OK, the process value PV is read in for 10 s. You thus have the possibility of checking whether the actual value is constant and you can decide whether the PTUNE function should be initiated (enter Yes) or whether the process value PV should be read in again for a further 10 s (enter No).

- After entry of Yes, you now have the possibility of initiating control parameter optimization by specifying a setpoint step.

  Start PTUNE by choosing a new setpoint SP

- Confirm the message with F4 - OK.

  On the HART hand terminal, the entry mask for the setpoint appears.

- Enter the new value and confirm with F4 - ENTER.

  Self-optimization of the process controller runs autonomously. On the HART hand terminal, the following message appears:

    Running PTUNE

  Running of the function PTUNE is ended by an OK message.

  OK message after completion of the function PTUNE.
If the message *PTUNE error X* appears on the display, an error is shown. X stands for the error number. In the chapter *Maintenance and Error Elimination on the Controller*, you will find an explanation of this error number.

→ On pressing F4 - OK, you return to the main menu.

**Display of the process variables**

A display of the following process variables is obtained via the *Main menu / Dynamic variables*.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS</td>
<td>Actual position</td>
<td>%</td>
</tr>
<tr>
<td>POScurrent</td>
<td>Actual position</td>
<td>mA</td>
</tr>
<tr>
<td>INPcurrent</td>
<td>Input signal for setpoint position (irrelevant for process controller)</td>
<td>mA</td>
</tr>
<tr>
<td>PV</td>
<td>Process value</td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>Process setpoint</td>
<td></td>
</tr>
</tbody>
</table>

**Changing the process variables**

Via the menu item *Digital control* in the *Main menu*, you can specify process setpoint *SP* via the HART interface.

→ Select the menu item *Digital control* in the *Main menu* via the operating key 4 or 5.

→ Start the function via the operating key 5. The following message appears.

![Message after starting Digital control](image)

→ Confirm with F4 - OK. The entry mask shown appears.

![Entry mask for the process setpoint.](image)
Specify a process setpoint between \( PV_{\text{min}} \) (scaled minimum process value) and \( PV_{\text{max}} \) (scaled maximum process value).

While the setpoint is being specified via the HART interface, SIDE Control is switched to internal setpoint setting.

- Using **F4 - ENTER**, transmit the value entered to the SIDE Control.
- Using **F3 - ABORT**, quit the entry mask. A message appears as shown below.

![Message after quitting Digital control](image)

- By confirming with **F4 - OK** you return to the Main menu.
If the setpoint was specified externally before starting Digital control, this mode is restored after confirmation with **F4 - OK**.
Memory organization

SIDE Control has a volatile RAM memory and a non-volatile EEPROM memory.

All parameters altered via the HART hand terminal are only written in the RAM memory of the SIDE Control (excepting with the AUTOTUNE function) and hence will no longer be present after a cold start. If you want to permanently store the altered parameters, they must be saved via the menu item EEPROM Control in the Main menu or in the menu Configuration - Save to EEPROM.

If the parameters altered via the HART hand terminal are to be removed from the RAM, the original status of the EEPROM can be restored via the menu item EEPROM Control in the Main menu or in the menu Configuration - Load from EEPROM.
MAINTENANCE AND ERROR ELIMINATION ON THE POSITIONER

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Maintenance

When operated according to these Operating Instructions, the SIDE Control is maintenance free.

Error messages and malfunctions

Error messages on the LC display

General error messages

<table>
<thead>
<tr>
<th>Display</th>
<th>Causes of error</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT.ERROR</td>
<td>Internal error</td>
<td>None, device faulty</td>
</tr>
</tbody>
</table>

Error messages on execution of the function X.TUNE

<table>
<thead>
<tr>
<th>Display</th>
<th>Causes of error</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>X.ERR 1</td>
<td>No compressed air connected</td>
<td>Connect compressed air</td>
</tr>
<tr>
<td>X.ERR 2</td>
<td>Air pressure failure during AUTOTUNE</td>
<td>Check compressed air supply</td>
</tr>
<tr>
<td>X.ERR 3</td>
<td>Actuator system or actuator system leaky on exhaust side</td>
<td>None, device faulty</td>
</tr>
<tr>
<td>X.ERR 4</td>
<td>Actuator system leaky on pressurized side</td>
<td>None, device faulty</td>
</tr>
<tr>
<td>X.ERR 5</td>
<td>The dead band of the internal position sensor system is exceeded</td>
<td>Check alignment of the axle of the SIDE Control and correct (see chapter Installation)</td>
</tr>
<tr>
<td>X.ERR 6</td>
<td>The end positions for POS-MIN and POS-MAX are too near together.</td>
<td>Check whether the allocation of the end positions to POS-MIN and POS-MAX via the function TUNE-POS is correct. If incorrect: execute TUNE-POS again. If correct: TUNE-POS with this arrangement of the end positions is not possible since they are too close together.</td>
</tr>
<tr>
<td>X.ERR 7</td>
<td>False allocation of POS-MIN and POS-MAX</td>
<td>To determine POS-MIN and POS-MAX, move the actuator in each case in the direction shown on the display.</td>
</tr>
</tbody>
</table>
## Other malfunctions

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible causes</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS = 0 (with CMD &gt; 0 %) or POS = 100 %, (with CMD &lt; 100 %)</td>
<td>Tight-closing function (CUTOFF) has been inadvertently activated.</td>
<td>Deactivate tight-closing function</td>
</tr>
</tbody>
</table>
MAINTENANCE AND ERROR ELIMINATION ON THE PROCESS CONTROLLER (S/HART)

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Maintenance

When operated according to these Operating Instructions, the SIDE Control (S/HART) is maintenance free.

Error messages and malfunctions

Error messages on the LC display

General error messages

<table>
<thead>
<tr>
<th>Display</th>
<th>Causes of error</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT.ERROR</td>
<td>Internal error</td>
<td>None, device faulty</td>
</tr>
<tr>
<td>PV FAULT</td>
<td>Signal error, actual value, process controller</td>
<td>Check signal</td>
</tr>
</tbody>
</table>

Error messages on execution of the function X.TUNE

<table>
<thead>
<tr>
<th>Display</th>
<th>Causes of error</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>X.ERR 1</td>
<td>No compressed air connected</td>
<td>Connect compressed air</td>
</tr>
<tr>
<td>X.ERR 2</td>
<td>Air pressure failure during AUTOTUNE</td>
<td>Check compressed air supply</td>
</tr>
<tr>
<td>X.ERR 3</td>
<td>Actuator or actuator system leaky on exhaust side</td>
<td>None, device faulty</td>
</tr>
<tr>
<td>X.ERR 4</td>
<td>Actuator system leaky on pressurized side</td>
<td>None, device faulty</td>
</tr>
<tr>
<td>X.ERR 5</td>
<td>The dead band of the internal position sensor system is exceeded</td>
<td>Check alignment of the axle of the SIDE Control (S/HART) and correct (see chapter Installation)</td>
</tr>
<tr>
<td>X.ERR 6</td>
<td>The end positions for POS-MIN and POS-MAX are too near together.</td>
<td>Check whether the allocation of the end positions to POS-MIN and POS-MAX via the function TUNE-POS is correct. If incorrect: execute TUNE-POS again. If correct: TUNE-POS with this arrangement of the end positions is not possible since they are too close together.</td>
</tr>
<tr>
<td>X.ERR 7</td>
<td>False allocation of POS-MIN and POS-MAX</td>
<td>To determine POS-MIN and POS-MAX, move the actuator in each case in the direction shown on the display.</td>
</tr>
</tbody>
</table>
Error messages on execution of the function *P.Q’LIN*

<table>
<thead>
<tr>
<th>Display</th>
<th>Causes of error</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Q.ERR 1 | No compressed air connected  
No change of process variable | Connect compressed air  
Check process; if necessary, switch on pump or open shut-off valve |
| Q.ERR 2 | Current fixed point of the valve stroke was not reached since  
• air supply failure during *P.Q’LIN*  
• no AUTOTUNE has been executed | • Check compressed air supply  
• Execute AUTOTUNE |

Other malfunctions

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible causes</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| *POS = 0 (with CMD > 0 %) or POS = 100 %, (with CMD < 100%)  
*PV = 0 (with SP > 0 ) or  
*PV = PV₂ (with SP > SP₂)* | Tight-closing function (*CUTOFF*) has been inadvertently activated | Deactivate tight-closing function |
| *Only with device with process controller:*  
Device does not work as a positioner despite correctly executed settings. | Menu item *P.CONTROL* stands in main menu. The device thus works as a process controller and expects a process value at the corresponding input. | Remove the menu item *P.CONTROL* from the main menu. |
GENERAL RULES

(APPENDIX)

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  Setting rules after Chien, Hrones and Reswick (output step method) .......... 150
Selection criteria for continuous valves

The following criteria are of decisive importance for optimal control behaviour and attainment of the maximum flow rate through the valve:

- Correct choice of flow coefficient, which is defined essential by the size of the valve;
- Good matching of the valve size to the pressure conditions, taking into consideration the other flow resistances in the system.

Dimensioning guidelines can be given on the basis of the flow coefficient ($k_v$).

The $k_v$ value refers to the standardized conditions with respect to pressure, temperature and media properties.

The $k_v$ value is defined as the flow rate in m³/h of water through a component at a pressure difference $\Delta p$ of 1 bar and a temperature of 20 °C.

With continuous valves the "$k_{vs}$ value" is additionally used. This specifies the $k_v$ value when the continuous valve is fully open.

Depending on the specified data, the following cases must be distinguished on selection of a valve:

a) The pressures before and after the valve $p_1$ and $p_2$ are known at which the desired maximum flow rate $Q_{\text{max}}$ is to be attained:

The required $k_{vs}$ value is obtained from:

$$ k_{vs} = Q_{\text{max}} \cdot \sqrt[3]{\frac{\Delta p_0}{\Delta p}} \cdot \sqrt[3]{\frac{\rho}{\rho_0}} \quad (1) $$

where:

- $k_{vs}$ is the flow coefficient of the continuous valve when fully open [m³/h]
- $Q_{\text{max}}$ is the maximum volumetric flow rate [m³/h]
- $\Delta p_0$ is 1 bar; the pressure drop over the valve as in the definition of $k_v$
- $r_0$ is 1000 kg/m³; the density of water as in the definition of $k_v$
- $\rho$ is the pressure drop over the valve [bar] and
- $r$ is the density of the medium [kg/m³]

b) The pressures at the inlet and outlet of the overall system ($p_1$ and $p_2$) are known at which the desired maximum flow rate $Q_{\text{max}}$ is to be attained:

Step 1: Calculate the flow coefficient of the overall system $k_{v,\text{ges}}$ from equation (1).

Step 2: Measure the flow rate through the system without the continuous valve (e.g. by short-circuiting the piping where the valve is installed).

Step 3: Calculate the flow coefficient of the system without the continuous valve ($k_{vs}$) from equation (1).

Step 4: Calculate the required $k_{vs}$ value of the continuous valve ($k_{vs}$) from equation (2):

$$ k_{vs} = \sqrt[3]{\frac{1}{k_{v,\text{ges}}^2}} \cdot \frac{1}{k_{vs}^2} \quad (2) $$
The \( k_{vb} \) of the continuous valve should have at least the value calculated from the equation (1 or 2) relevant to the application, but under no circumstances be very much greater.

The rule of thumb often used with switching valves, "somewhat larger never hurts", can be strongly detrimental to the control behaviour of continuous valves!

Determinition in practice of the upper limit to the \( k_{vb} \) value of the continuous valve is possible by means of the so-called "valve authority" \( \Psi \):

\[
\Psi = \frac{(\Delta p)_{vo}}{(\Delta p)_{o}} = \frac{k_{va}^2}{k_{va}^2 + k_{VS}^2}
\]

\((\Delta p)_{vo}\) is the pressure drop over the fully opened valve and

\((\Delta p)_{o}\) is the pressure drop over the entire system

NOTE With a valve authority \( \Psi < 0.3 \) the continuous valve is overdimensioned.

With the valve fully open, in this case the flow resistance is significantly smaller than that of the other fluidic components in the system. This means that only in the lower opening range is the valve position dominant in the operating characteristic. For this reason, the operating characteristic is strongly deformed.

By selection of a progressive (equiprocentile) characteristic between position setpoint and valve stroke, this can be partially compensated and the operating characteristic linearized within certain limits. However, the valve authority \( \Psi \) should be > 0.1, even when using a corrected characteristic.

The control behaviour (control performance, settling time) when using a corrected characteristic is strongly dependent on the operating point.
A PID controller has a proportional, an integral and a differential component (P, I and D components).

**P component**

Function: \( Y = K_p \cdot X_d \)

Where \( K_p \) is the proportional action factor (amplification factor). It is given by the ratio of the correcting range \( \Delta Y \) to the proportional range \( \Delta X_d \).

**Characteristic and step response of the P component of a PID controller**

**Characteristics**

A pure P controller works theoretically undamped, i.e. it is fast and dynamically favourable. It has a residual control difference, i.e. it does not completely eliminate the effects of disturbances and is thus relatively unfavourable from a static viewpoint.
I component

Function: \( Y = \frac{1}{T_i} \int Xd \, dt \)

\( T_i \) is the integration or floating time. It is the time that expires until the controller output has run through the entire correcting range.

**Characteristic and step response of the I component of a PID controller**

**Characteristics:**
A purely I controller completely eliminates the effects of disturbances. It thus has a favourable static behaviour. Because of its finite correcting speed, it works more slowly than a P controller and tends to oscillation. It is hence dynamically relatively unfavourable.
D component

Function: \( Y = K_d \cdot \frac{dX_d}{dt} \)

Kd is the differential action factor. The greater Kd, the stronger the D influence.

Characteristic and step response of the D component of a PID controller

Characteristic

A controller with a D component reacts to changes in the controlled variable and can thus reduce more quickly any control differences that occur.
Superimposing the P, I and D components

Function: \[ Y = K_p \cdot X_d + \frac{1}{T_i} \int X_d \, dt + d \frac{dX_d}{dt} \]

Substituting \( K_p \cdot T_i = T_n \) and \( K_d/K_p = T_v \), we obtain for the function of the PID controller:

\[ Y = K_p \left( X_d + \frac{1}{T_n} \int X_d \, dt + T_v \frac{dX_d}{dt} \right) \]

- \( K_p \) is the proportional action factor / amplification factor
- \( T_n \) is the reset time
  (the time required to obtain the same change in correcting variable by the I component as was caused by the P component)
- \( T_v \) is the rate time
  (the time by which a certain change in correcting variable is obtained earlier with the D component than if would have been with a pure P controller)

Step response and rise response of the PID controller

---

**Step response of the PID controller**

**Rise response of the PID controller**
Actual PID controller

D component with delay

In the process controller of the positioner, the D component is realized with a delay $T$.

Function: $T \frac{dY}{dt} + Y = K_d \frac{dx_d}{dt}$

Superimposing the P, I and DT components

Function of the real PID controller

$T \frac{dY}{dt} + Y = K_p (X_d + \frac{1}{T_n} \int X_d \, dt + T_v \frac{dx_d}{dt})$

Step response of the real PID controller
Rules for adjusting PID controllers

The literature on control technology contains a number of rules by which a favourable setting of the controller parameters can be determined experimentally. In order to avoid incorrect settings, the conditions under which the rules were set up in each case must be kept in mind. Apart from the characteristics of the controlled member and the controller itself, it makes a difference whether a change in disturbance or a command variable is to be compensated.

Adjustment rules of Ziegler and Nichols (oscillation method)

With this method, the controller parameters are set on the basis of the behaviour of the control loop at the limit of stability. These parameters are initially set such that the control loop begins to oscillate. Critical characteristic values occurring allow one to deduce a favourable setting of the control parameters. A prerequisite for using this method is naturally that the control loop is permitted to oscillate.

Procedure:

• Set the controller to P control (i.e. $T_n = 999, T_v = 0$), $K_p$ initially small.
• Set the desired set point.
• Increase $K_p$ until the controlled variable executes continuous, undamped oscillation).

The proportional action factor (amplification factor) set at the limit of stability is designated $K_{crit}$. The resulting oscillation period is designated $T_{crit}$.

Curve of controller output at the limit of stability

![Diagram of controller output at the limit of stability]

From $K_{crit}$ and $T_{crit}$, the controller parameters can then be calculated using the following table.

Parameter setting according to Ziegler and Nichols:

<table>
<thead>
<tr>
<th>Controller type</th>
<th>Parameter setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>$K_p = 0.5 K_{crit}$</td>
</tr>
<tr>
<td>PI</td>
<td>$K_p = 0.45 K_{crit}$</td>
</tr>
<tr>
<td>PID</td>
<td>$K_p = 0.6 K_{crit}$</td>
</tr>
</tbody>
</table>

The adjustment rules of Ziegler and Nichols have been determined for P members with first order time increase and dead time. However, they apply only for controllers with disturbance behaviour and not for those with command behaviour.
Adjustment rules of Chien, Hrones and Reswick (controller output step method)

With this method the controller parameters are set on the basis of the transient behaviour of the controlled member. A step in the controller output of 100% is delivered. The times \( T_u \) and \( T_g \) are derived from the curve of the actual value of the controlled variable.

Curve of the controlled variable after a step in controller output \( \Delta Y \)

![Diagram of controlled variable curve](image)

**Procedure**

- Switch controller to MANUAL
- Deliver a step in controller output and register the controlled variable with a chart recorder
- With critical runs (e.g. on risk of overheating), switch off in good time.

**NOTE**  
It should be observed that with thermally sluggish systems, the actual value of the controlled variable may continue to rise after switching off.

In the following table, the setting values are given for the controller parameters as a function of \( T_u \), \( T_g \) and \( K_s \) for command and disturbance behaviour, as well as for an aperiodic control event and a control event with 20% overswing. They apply for members with P behaviour, with dead time and with first-order delay.
The proportional action factor $K_s$ of the controlled member is obtained from:

$$K_s = \frac{\Delta X}{\Delta Y}$$

### Parameter setting according to Chien, Hrones and Reswick

<table>
<thead>
<tr>
<th>Controller type</th>
<th>Parameter setting</th>
<th>Parameter setting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with aperiodic control event (0 % overswing)</td>
<td>with control event with 20 % overswing</td>
</tr>
<tr>
<td>Command</td>
<td>Disturbance</td>
<td>Command</td>
</tr>
<tr>
<td>P</td>
<td>$K_p = 0.3 \frac{T_g}{T_u}K_s$</td>
<td>$K_p = 0.3 \frac{T_g}{T_u}K_s$</td>
</tr>
<tr>
<td>PI</td>
<td>$K_p = 0.35 \frac{T_g}{T_u}K_s$ $T_n = 1.2 T_g$</td>
<td>$K_p = 0.6 \frac{T_g}{T_u}K_s$ $T_n = 4 \cdot T_u$</td>
</tr>
<tr>
<td>PID</td>
<td>$K_p = 0.6 \frac{T_g}{T_u}K_s$ $T_n = T_g$ $T_v = 0.5 \cdot T_u$</td>
<td>$K_p = 0.95 \frac{T_g}{T_u}K_s$ $T_n = 2.4 \cdot T_u$ $T_v = 0.42 \cdot T_u$</td>
</tr>
</tbody>
</table>
OPERATING STRUCTURE (APPENDIX)

Operating structure of the SIDE Control (S/HART) ................................................................. 154

Operating structure of the SIDE Control (PROFIBUS PA) ..................................................... 159

Operating structure of the HART hand terminal (HART) ....................................................... 160
Operating structure of the SIDE Control (S/HART)
SP xxx

PCO PARA

PCO SETP

PCO FILT

PCO SCAL

PCO TUNE

PCO END

*PCONTRL

PCO DBND

DBND xx.x

KP xx.xx

TN xxx.x

TV xxx.x

X0 xxx

SETP MW

SETP EXT

FILT xxx

Pv, xxx.xx

PV, xxx.xx

SF, xxx.xx

SP, xxx.xx

DP x

PTUN D’ACT

STYPN.DEV

STYPFLOW

PTYPEMP

PTYPEMPRES

PTYPLEVEL
**OPERATING STRUCTURE (APPENDIX)**

```
*CODE
  | CODE KEY
  | CODEMENU

*SAFEPOS
  | SPOS XXX
  | If SAFEPOS deactivated, then SPOS = 000

*SIG ERR
  | ERR P INP
  | P INP OFF
  | P INP ON
  | SPOS OFF
  | SPOS ON
  | ERR END

*BIN-IN
  | B IN SPOS
  | NORM OPN
  | NORM CLS
  | B IN M/A
  | NORM OPN
  | NORM CLS

*OUTPUT
  | OUT ANL
  | ANL POS
  | ANL 4/20A
  | ANL CMD
  | ANL PV
  | ANL SP
```

If SAFEPOS deactivated, then SPOS = 000

If SAFEPOS deactivated, then SPOS = 000
Operating structure of the SIDE Control *(PROFIBUS PA)*

If SAFEPOS deactivated, then SPOS = 000

If SAFEPOS deactivated, then SPOS = 000
**Operating structure of the HART hand terminal (HART)**

Input / selection options:

F3 – [ESC] Quit the entry mask or selection menu without storing the changes
F4 – [ENTER] Quit the entry mask or selection menu with storage of the changes

For each menu item applies:
F2: menu item = ON when it is currently at OFF
menu item = OFF when it is currently at ON

### MAIN menu (on-line menu)

1. **1 Configuration**
   - 1 EEPROM control
     - see item 5 of the main menu
   - 2 Load from EEPROM
   - 2 Save to EEPROM
2. **2 Add Function**
   - Charact. Curve ON/OFF
   - Cutoff ON/OFF
   - Direction command ON/OFF
   - Direction actuator ON/OFF
   - Split range ON/OFF
   - X-Limit ON/OFF
   - X-Time ON/OFF
   - X-Control ON/OFF
   - P-Control ON/OFF
   - Code ON/OFF
   - Safe Pos. ON/OFF
   - Signal Error ON/OFF
   - Binary input ON/OFF
   - Output ON/OFF
   - Set Factory ON/OFF
3. **3 Charact. Curve**
   - 1 CHARACT free
   - 2 0 % 0.0 %
   - 3 5 % 5.0 %
   - 4 10 % 10.0 %
   - 5 15 % 15.0 %
   - 6 20 % 20.0 %
   - 7 25 % 25.0 %
OPERATING STRUCTURE (APPENDIX)

1. **CUTOFF min** entry mask, value between 0 % and 25 %
2. **CUTOFF max** entry mask, value between 75 % and 100 %

1. **DIR. CMD** selection menu, rise / fall
2. **DIR. ACT** selection menu, rise / fall

1. **SR min** entry mask, value between 0 % and 75 %
2. **SR max** entry mask, value between 25 % and 100 %

1. **LIM min** entry mask, value between 0 % and 50 %
2. **LIM max** entry mask, value between 50 % and 100 %

1. **X-Time.Open** entry mask, value between 1 s and 60 s
2. **X-Time.Close** entry mask, value between 1 s and 60 s

1. **X-Co.DBD x** entry mask, value between 0.0 % and 5.0 %
2. **X-Co.Kx.Close** entry mask, value between 1 and 9999
3. **X-Co.Kx.Open** entry mask, value between 1 and 9999

1. **DBD** entry mask, value between 0.0 and 5.0
2. **KP** entry mask, value between 0.00 and 99.99
3. **TN** entry mask, value between 0.5 s and 999.9 s
4. **TV** entry mask, value between 0.0 s and 999.9 s
5. **X0** entry mask, value between 0 % and 100 %

6. **Setpoint** selection menu, internal / external
7. **Filter** entry mask, value between 0 and 9
8. **DP** entry mask, value between 0 and 3
9. **PV min, PV max, SP min, SP max** entry mask, range of values depending on decimal point DP, between -999.9 / -99.99 / -9.99 / -0.999 and 9999 / 999.9 / 99.99 / 9.99

1. **PCO TUNE** selection menu, deactivated / activated
2. **PTUNE type** selection menu, not def. / flow / temp / press / level
**OPERATING STRUCTURE (APPENDIX)**

1. **Function**
   - Key
   - Selection menu

2. **Code**
   - Value between 0000 and 9999

3. **Safe Pos.**
   - Value between 0 and 100

4. **Signal Error**
   - Value between 0.5 and 5.0

5. **Binary Input**
   - Selection menu

6. **Output**
   - Selection menu

7. **Set Factory**
   - Execution of function Factory reset

8. **PQlin**
   - Execution of function PQlin

9. **Autotune**
   - Execution of function Autotune

10. **PTUNE**
    - Execution of function PTUNE

11. **EEPROM Control**
    - Load from EEPROM
    - Save to EEPROM

12. **Digital Control**
    - Execution of function Digital Control

13. **Dynamic Variables**
    - POS
    - POSCurrent
    - INPCurrent
    - PV
    - SP
### Operating Structure (Appendix)

For each message applies:

- **F1** – [HELP]: call up a Help text to explain the current HART parameter
- **F2** – [PREV]: scroll backward
- **F3** – [NEXT]: scroll forward
- **F4** – [EXIT]: quit menu

<table>
<thead>
<tr>
<th>8 HART parameters</th>
<th>1 Device information</th>
<th>2 Device setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>8635</td>
<td></td>
</tr>
<tr>
<td>Distributor</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Bürkert ...</td>
<td></td>
</tr>
<tr>
<td>Dev. Id.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TAG</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Descriptor</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>01/01/02</td>
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</tr>
<tr>
<td>Final assembly num.</td>
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<tr>
<td>Universal rev.</td>
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<td>Field dev. rev.</td>
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<tr>
<td>Software rev.</td>
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<td></td>
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<tr>
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</tr>
<tr>
<td>Num req. Preams</td>
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<td></td>
</tr>
</tbody>
</table>

1 Day → entry mask
8 alphanumeric characters

2 Descriptor → entry mask
16 alphanumeric characters

3 Date → entry mask for date

4 Message → entry mask,
32 alphanumeric characters

5 Final assembly num. →
entry mask value between 0 and 99999999

---

1. Only with version with process controller.
2. Only with version with APR (Analog Position Repeat)
3. Only with CHARACT = free
4. Menu item only present when \(\text{SETPOINT} = \text{external}\) has been set in menu item \(P-\text{CONTROL}\).
5. Menu item only present when \(P.CO TUNE = \text{activated}\) has been set in menu item \(P-\text{CONTROL}\).
6. Menu item only present when \(P.INP = \text{ON}\) has been set in menu item \(\text{SIGNAL ERROR}\).
7. Menu item only present when Binary Out 1 = \(\text{DEV} \times \text{X or LIM} \times \text{X}\) has been set in menu item \(\text{OUTPUT}\).
8. Menu item only present when Binary Out 2 = \(\text{DEV} \times \text{X or LIM} \times \text{X}\) has been set in menu item \(\text{OUTPUT}\).
9. Menu item only present when \(P-\text{CONTROL} = \text{ON}\) has been set in menu item \(\text{ADD FUNCTION}\).
TABLE FOR POSITIONER (APPENDIX)
Table for your settings on the positioner

Settings of the freely programmable characteristic

<table>
<thead>
<tr>
<th>Fixed point (position set point in %)</th>
<th>Valve stroke [%]</th>
<th>Date:</th>
<th>Date:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>5</td>
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</table>
## Tables for your settings on the process controller

### Settings of the freely programmable characteristic

<table>
<thead>
<tr>
<th>Fixed point (position set point in %)</th>
<th>Valve stroke [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Date:</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5</td>
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### Parameters set on the process controller

<table>
<thead>
<tr>
<th>Date:</th>
<th>Date:</th>
<th>Date:</th>
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<tbody>
<tr>
<td>KP</td>
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<td></td>
</tr>
<tr>
<td>TN</td>
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<td></td>
</tr>
<tr>
<td>TV</td>
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<tr>
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<tr>
<td>DBND</td>
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</table>
MASTER CODE S/HART (APPENDIX)
MASTER CODE S/HART (APPENDIX)

MASTER CODE

7175
APPROVALS S/HART (APPENDIX)

Declaration of Conformity for Positioner Type 8635 SIDE Control S/HART ................................. 174

EC Design Inspection Certificate for Positioner Type 8635 SIDE Control S/HART .................. 175
EC Declaration of Conformity

Bürkert Werke GmbH & Co. KG hereby declares as the manufacturer that these products comply with the requirements listed in the Guidelines of the Council for Harmonization of the Regulations of the Member States

· in respect of electrical equipment with rated voltages of 50-1000 V/AC or 75-1500 V/DC (Low Voltage Guideline 73/23/EEC),
· in respect of electromagnetic compatibility (89/336/EEC)
· and are stipulated for devices and protective systems for use in potentially explosive zones (ATEX, 94/9/EC),

For the assessment of the products in respect of compliance with the Low Voltage Guideline, the following standards were applied:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 50178: 04/98</td>
<td>Equipment of heavy current installations with electronic equipment</td>
</tr>
<tr>
<td>EN 60730-1: 01/96</td>
<td>Automatic electrical control devices</td>
</tr>
<tr>
<td>DIN VDE 0110-1: 04/97</td>
<td>Insulation co-ordinates for electrical equipment in low voltage installations</td>
</tr>
<tr>
<td>EN 60529: 11/92</td>
<td>Types of protection provided by the housing (IP code)</td>
</tr>
<tr>
<td>DIN VDE 60204-1: 06/93</td>
<td>Safety of machines</td>
</tr>
<tr>
<td>VDE 0580: 10/94</td>
<td>Electromagnetic devices, general regulations</td>
</tr>
</tbody>
</table>

For the assessment of the products in respect of electromagnetic compatibility, the following standards were applied:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 61000-6-4: 08/02</td>
<td>Basic engineering standard for interference emission; Part 2: Industrial domain</td>
</tr>
<tr>
<td>EN 61000-6-2: 03/00</td>
<td>Basic engineering standard for interference resistance; Part 2: Industrial domain</td>
</tr>
</tbody>
</table>

For the assessment of the products in respect of ATEX, the following standards were applied:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 50014: 02/00</td>
<td>Electrical equipment for potentially explosive zones, general regulations</td>
</tr>
<tr>
<td>EN 50020: 1994</td>
<td>Electrical equipment for potentially explosive zones, inherently safe „i“</td>
</tr>
</tbody>
</table>

The production was audited (CE0102) by the

Physikalischen Technischen Bundesanstalt
Bundesallee 100
D-38116 Braunschweig.

Ingelfingen, 27.09.2004
Otto Walch
place and date Certifications Manager
(1) **EC-TYPE-EXAMINATION CERTIFICATE**  
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC

(3) EC-type-examination Certificate Number: **PTB 04 ATEX 2027**

(4) Equipment: Positioner, type 8635 SideControl S/HART
(5) Manufacturer: Bürkert Werke GmbH & Co.
(6) Address: Christian-Bürkert-Str. 13-17, 74653 Ingelfingen, Germany

(7) This equipment and any acceptable variation thereto 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 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 04-23524.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:  
EN 50014:1997 + A1 + A2  
EN 50020:2002

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

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

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

\[
\text{II (1) 2 G EEx ia IIC T6}
\]

Zertifizierungsstelle Explosionsenschutz  
By order:  
Dr.-Ing. U. Gerber  
Braunschweig, March 29, 2004

---

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates 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  
D-38116 Braunschweig  

---

8635 - 175
SCHEDULE

EC-TYPE-EXAMINATION CERTIFICATE PTB 04 ATEX 2027

Description of equipment
The positioner, type 8635 SideControl S/HART is intended for mounting onto several drives. The positioner is installed in the hazardous area.
For relationship between the temperature class and the permissible range of the ambient temperature reference is made to the following table.

<table>
<thead>
<tr>
<th>temperature class</th>
<th>permissible range of the ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-25 °C ... 60 °C</td>
</tr>
<tr>
<td>T5</td>
<td>-25 °C ... 65 °C</td>
</tr>
<tr>
<td>T4</td>
<td>-25 °C ... 65 °C</td>
</tr>
</tbody>
</table>

Electrical data
Current input (terminals 11, 12)
- type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit
- Maximum values:
  - \( U_i = 30 \) V
  - \( I_i = 100 \) mA
  - \( P_i = 1 \) W
  - \( C_i \) negligibly low
  - \( L_i \) negligibly low

Process control input (terminals 13, 14)
- type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit
- Maximum values:
  - \( U_i = 30 \) V
  - \( I_i = 100 \) mA
  - \( P_i = 1 \) W
  - \( C_i = 11 \) nF
  - \( L_i \) negligibly low
### Binary input
(terminals 81, 82)

- **Type of protection:** Intrinsic Safety EEx ia IIC
- **Maximum values:**
  - $U_0 = 8.8\,\text{V}$
  - $I_0 = 0.2\,\text{mA}$
  - $C_0 = 5.5\,\mu\text{F}$
  - $L_0 = 1000\,\text{mH}$

### Interface RS 232
(terminals X4 1...3)

- **Type of protection:** Intrinsic Safety EEx ia IIC
- **Maximum values:**
  - $U_i = 8.8\,\text{V}$
  - $I_i = 100\,\text{mA}$
  - $P_i = 880\,\text{mW}$
  - $C_i$ negligibly low
  - $L_i$ negligibly low

  **Options**

### Actual-value output
(terminals 31, 32)

- **Type of protection:** Intrinsic Safety EEx ia IIC
- **Maximum values:**
  - $U_i = 30\,\text{V}$
  - $I_i = 100\,\text{mA}$
  - $P_i = 1\,\text{W}$
  - $C_i$ negligibly low
  - $L_i$ negligibly low

### Initiators
(terminals 41, 42 and 51, 52)

- **Type of protection:** Intrinsic Safety EEx ia IIC
- **Maximum values:**
  - for connection to a certified intrinsically safe circuit

---

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates 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.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 04 ATEX 2027

Maximum values:
\[ U_i = 15.5 \text{ V} \]
\[ I_i = 52 \text{ mA} \]
\[ P_i = 150 \text{ mW} \]
\[ C_i = 200 \text{ nF} \]
\[ L_i = 0.2 \text{ mH} \]

Binary outputs ............................................................... type of protection Intrinsic Safety EEx ia IIC
(terminals 83, 84 and 85, 86) only for connection to a certified intrinsically
safe circuit

Maximum values:
\[ U_i = 30 \text{ V} \]
\[ I_i = 100 \text{ mA} \]
\[ P_i = 1 \text{ W} \]
\[ C_i \text{ negligibly low} \]
\[ L_i \text{ negligibly low} \]

The connections for piezo valves, position measuring system, HART-, indicating- and pressure
sensor-board are internal intrinsically safe circuits.

(16) Test report PTB Ex 04-23524

(17) Special conditions for safe use
none

(18) Essential health and safety requirements
met by compliance with the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Geisler

Braunschweig, March 29, 2004
Declaration of Conformity for Positioner Type 8635 SIDE Control PA .................................................. 180

EC Design Inspection Certificate for Positioner Type 8635 SIDE Control PA ........................................ 182

1st Supplement ............................................................................................................................................. 184
EC Declaration of Conformity

Bürkert Werke GmbH & Co. KG hereby declares as the manufacturer that these products comply with the requirements listed in the Guidelines of the Council for Harmonization of the Regulations of the Member States.

- in respect of electrical equipment with rated voltages of 50-1000 V/AC or 75-1500 V/DC (Low Voltage Guideline 73/23/EEC),
- in respect of electromagnetic compatibility (89/336/EEC)
- and are stipulated for devices and protective systems for use in potentially explosive zones (ATEX, 94/9EC),

For the assessment of the products in respect of compliance with the Low Voltage Guideline, the following standards were applied:

EN 50178: 04/98  Equipment of heavy current installations with electronic equipment
EN 60730-1: 01/96  Automatic electrical control devices
DIN VDE 0110-1: 04/97  Insulation co-ordinates for electrical equipment in low voltage installations
EN 60529: 11/92  Types of protection provided by the housing (IP code)
DIN VDE 60204-1: 06/93  Safety of machines
VDE 0580: 10/94  Electromagnetic devices, general regulations

For the assessment of the products in respect of electromagnetic compatibility, the following standards were applied:

EN 61000-6-4: 08/02  Basic engineering standard for interference emission; Part 2: Industrial domain
EN 61000-6-2: 03/00  Basic engineering standard for interference resistance; Part 2: Industrial domain

For the assessment of the products in respect of ATEX, the following standards were applied:

EN 50014: 02/00  Electrical equipment for potentially explosive zones, general regulations
EN 50020: 1994  Electrical equipment for potentially explosive zones, inherently safe „i“

The production was audited (CE0102) by the

Physikalischen Technischen Bundesanstalt
Bundesallee 100
D-38116 Braunschweig.

Ingelfingen, 27.09.2004  Otto Walch
place and date  Certifications Manager
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

(1) EC-TYPE-EXAMINATION CERTIFICATE
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC

(3) EC-type-examination Certificate Number:

PTB 03 ATEX 2038

(4) Equipment: Positioner, type 8635 SideControl PA
(5) Manufacturer: Bürkert Werke GmbH & Co. KG
(6) Address: Christian-Bürkert-Str. 13-17, 74653 Ingelfingen, Germany

(7) This equipment and any acceptable variation thereto 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 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 03-23109.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

| EN 50014:1997 + A1 + A2 | EN 50020:2002 |

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

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

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

\[\text{Ex II (1) 2 G EEx ia IIC T6}\]

Zertifizierungsstelle Explosionsschutz
Braunschweig, September 02, 2003

By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates 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.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

S C H E D U L E

EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 2038

Description of equipment
The positioner, type 8635 SideControl PA is intended for mounting onto various drives. The positioner is installed inside hazardous areas.
For relationship of the temperature class and the permissible range of the ambient temperature reference is made to the table below:

<table>
<thead>
<tr>
<th>temperature class</th>
<th>permissible range of the ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>-25 °C ... 60 °C</td>
</tr>
<tr>
<td>T5</td>
<td>-25 °C ... 65 °C</td>
</tr>
<tr>
<td>T4</td>
<td>-25 °C ... 65 °C</td>
</tr>
</tbody>
</table>

Electrical data
Field bus terminal ..................................................... type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit in accordance with the FISCO-model
(BUS (+), BUS (-)
available in duplicate)

Maximum values:

\[
\begin{align*}
U_1 &= 15 \text{ V} \\
I_1 &= 215 \text{ mA} \\
P_1 &= 1.95 \text{ W} \\
C_i &= \text{negligibly low} \\
L_i &= \text{negligibly low}
\end{align*}
\]

Process control input .................................................. type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit (terminals 11, 12)

Maximum values:

\[
\begin{align*}
U_1 &= 30 \text{ V} \\
I_1 &= 100 \text{ mA} \\
P_1 &= 1 \text{ W} \\
C_i &= 22 \text{ nF} \\
L_i &= \text{negligibly low}
\end{align*}
\]
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 2038

Initiators .......................................................... type of protection Intrinsically Safe EEx ia IIC
(terminals 41, 42 and 51, 52)

(type of protection Intrinsically Safe EEx ib IIC
only for connection to a certified intrinsically
safe circuit in accordance with the FISCO-
model

Maximum values:

\[ U_l = 15.5 \text{ V} \]
\[ I_l = 52 \text{ mA} \]
\[ P_l = 150 \text{ mW} \]
\[ C_i = 200 \text{ nF} \]
\[ L_i = 0.2 \text{ mH} \]

Binary input .......................................................... type of protection Intrinsically Safe EEx ia IIC
(terminals 81, 82)

only for connection to a mechanical switch

Maximum values:

\[ U_o = 6 \text{ V} \]
\[ I_o = 0.14 \text{ mA} \]
\[ C_o = 40 \mu\text{F} \]
\[ L_o = 1000 \text{ mH} \]

Programming interface ........................................ for connection to the adaptor Flasher/M16C
outside of the hazardous area

Interface RS 232 ..................................................... for connection to a RS 232-interface

\[ U_m = 250 \text{ V} \]

(16) Test report PTB Ex 03-23109

(17) Special conditions for safe use

none

(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, September 02, 2003

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates 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 • D-38116 Braunschweig
1. SUPPLEMENT
according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 03 ATEX 2038

(Translation)

Equipment: Positioner, type 8635 SideControl PA

Marking: Ex II (1) 2 G EEx ia IIC T6

Manufacturer: Bürkert Werke GmbH & Co.

Address: Christian-Bürkert-Str. 13-17
74653 Ingelfingen, Germany

Description of supplements and modifications
In future the positioner, type 8635 SideControl PA may also be manufactured according to the test documents listed in the test report.
The electrical data of field bus terminal change as follows:

Electrical data
Field bus terminal BUS (+), BUS (-)

- type of protection Intrinsic Safety EEx ia IIC
- only for connection to a certified intrinsically safe circuit

Maximum values:
U_i = 17.5 V
I_i = 360 mA
P_i = 2.52 W
C_i negligibly low
L_i negligibly low

All further specifications are valid without changes for this 1. supplement too.

Test report: PTB Ex 04-23526

Braunschweig, May 17, 2004

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor
APPROVALS
S/HART, PROFIBUS PA
(APPENDIX)

EC Design Inspection Certificate (ATEX) for slot initiators Types SJ and SC .......................... 186
Inductive proximity switch NAMUR .................................................................................................. 189
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

(1) EG-Baumusterprüfbescheinigung

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigungsnummer

PTB 99 ATEX 2219 X

(4) Gerät: Schutzinitiatoren Typen SJ... und SC...

(5) Hersteller: Pepperl + Fuchs GmbH

(6) Anschrift: D-68307 Mannheim

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfungbescheinigung festgelegt.


Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht PTB Ex 99-29175 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitssanforderungen werden erfüllt durch Übereinstimmung mit


(10) Falls das Zeichen „X“ hinter der Bescheinigungsnnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfungbescheinigung bezieht sich nur auf Konzeption und Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(12) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:

Ex II 2 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz
Im Auftrag

Dr.-Ing. U. Johannesmeyer
Regierungsdirektor

Braunschweig, 22. Dezember 1999


Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Seite 1/3
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

Anlage

EG-Baumusterprüfbescheinigung PTB 99 ATEX 2219 X

Beschreibung des Gerätes

Die Schaltinitiatoren Typen SJ... und SC... dienen zur Umformung von Wegänderungen in elektrische Signale.


Elektrische Daten

Auswerte- und Versorgungsstromkreis............. in Zündschutzart Eigensicherheit EEx ia IIC/IIB bzw. EX ib IIIC/IIB

nur zum Anschluß an bescheinigte eigensichere Stromkreise

Höchstwerte:

<table>
<thead>
<tr>
<th>Typ 1</th>
<th>Typ 2</th>
<th>Typ 3</th>
<th>Typ 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>U = 16 V</td>
<td>U = 16 V</td>
<td>U = 16 V</td>
<td>U = 16 V</td>
</tr>
<tr>
<td>I = 25 mA</td>
<td>I = 25 mA</td>
<td>I = 52 mA</td>
<td>I = 76 mA</td>
</tr>
<tr>
<td>P = 34 mW</td>
<td>P = 64 mW</td>
<td>P = 169 mW</td>
<td>P = 242 mW</td>
</tr>
</tbody>
</table>

Der Zusammenhang zwischen dem Typ des angeschlossenen Stromkreises, der höchstzulässigen Umgebungstemperatur und der Temperaturklasse sowie den wirksamen inneren Reaktanzen für die einzelnen Typen der Schaltinitiatoren ist der Tabelle zu entnehmen:
### Physikalisch-Technische Bundesanstalt

**Braunschweig und Berlin**

**Anlage zur EG-Baumusterprüfbescheinigung PTB 99 ATEX 2219 X**

<table>
<thead>
<tr>
<th>Typen</th>
<th>C₁ [nF]</th>
<th>L₁ [μH]</th>
<th>Typ 1</th>
<th>Typ 2</th>
<th>Typ 3</th>
<th>Typ 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC2-N0...</td>
<td>150</td>
<td>150</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>65</td>
</tr>
<tr>
<td>SC3,5-N0-Y...</td>
<td>150</td>
<td>150</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>65</td>
</tr>
<tr>
<td>SC3,5...N0...</td>
<td>150</td>
<td>150</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ1,8-N-Y...</td>
<td>30</td>
<td>100</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>SJ2,2-N...</td>
<td>30</td>
<td>100</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>SJ1-N...</td>
<td>30</td>
<td>100</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>SJ3,5....N...</td>
<td>50</td>
<td>250</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ3,5-H...</td>
<td>50</td>
<td>250</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ5....N...</td>
<td>50</td>
<td>550</td>
<td>73</td>
<td>88</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ5-K</td>
<td>50</td>
<td>550</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ10-N...</td>
<td>50</td>
<td>1000</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ15-N...</td>
<td>150</td>
<td>1200</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>66</td>
</tr>
<tr>
<td>SJ30-N...</td>
<td>150</td>
<td>1250</td>
<td>72</td>
<td>87</td>
<td>100</td>
<td>66</td>
</tr>
</tbody>
</table>

(16) **Prüfbericht PTB Ex 99-29175**

(17) **Besondere Bedingungen**

1. Beim Einsatz der Schutzinitiatoren Typen SJ... und SC... im Temperaturbereich von -60°C bis -20°C sind diese durch Einbau in ein zusätzliches Gehäuse vor Schlagewirkung zu schützen.


3. Der Zusammenhang zwischen dem Typ des angeschlossenen Stromkreises, der höchstzulässigen Umgebungstemperatur und der Temperaturklasse sowie den wirksamen inneren Reaktanzen für die einzelnen Typen der Schutzinitiatoren ist der Tabelle unter Punkt (15) dieser EG-Baumusterprüfbescheinigung zu entnehmen.


(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Durch vorgenannte Normen abgedeckt.
Inductive proximity switches

SJ3,5-G-N

3.5 mm slot width

Switching element function: NAMUR NC

Slot width: 3.5 mm

Depth of Immersion (radial): 5...7 typ. 9 mm

Nominal voltage U_N: 8 V

Operating voltage U_OK: 5...20 V

Switching frequency f: 0...5000 Hz

Current consumption:
- Measuring plate not detected: 5 mA
- Measuring plate detected: 1 mA

Ambient temperature:
- 25...100 °C (80...373 K)

EMC in accordance with:
- EN 60947-5-1

Standard conformity:
- DIN EN 60947-5-1 (NAMUR)

Connection type:
- 0.5 m Leads L+Y

Housing material:
- PBT

Protection degree:
- IP67

PEN

Switching characteristics:

Standard conformity:
- EN 50014:1997
- EN 50020:1994

EC Declaration of conformity:
- PTB 60 ATEX 2219 X

Appropriate type:
- G3

Marking:
- Ex II 2 G Ex ia IIC T6

Effective internal inductivity C_i: ≤ 50 μF

Effective internal inductance L_i: ≤ 250 μH

Operating instructions for use in hazardous areas:

1) Warning: when using in hazardous areas, reduced values must be heeded!

2) For use outside circles, a cable with a length of 10 m is allowed for.

The temperature ranges, depending on the temperature class, are to be taken from the type test certificate.

Additional information can be found in the type test certificate.

Installation, startup

This product was developed and approved for use in hazardous areas in the protection category intrinsic safety according to EN 50014 and EN

50020.

The intrinsic safety is only guaranteed in interconnection with an appropriate operating resource and in accordance with the verification of
intrinsic safety.

The type test certificate and the applicable laws/guidelines for the use or planned purpose must be adhered.

Device must be protected from strong electromagnetic fields and mechanical damage.

Maintenance, repair

No changes may be made to operating resources which are operating in hazardous areas.

Repairs to these operating resources are not possible.
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Fax: +41 (0)41-785 66 33
E-mail: info.ch@buerkert.com

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