SRD960 Universal Positioner – All versions -

The Universal Positioner SRD960 is designed to operate pneumatic valve actuators and is available in the version Ex d / explosionproof (flameproof) or Ex ia / intrinsic safety. It can be operated from control systems (e.g. the Foxboro I/A Series System), controllers, or PC-based configuration- and operation tools such FDT/DTM. The positioner is available with different communication protocols. This includes versions with analog setpoint (4 to 20 mA) without communication or with superimposed HART signal; or fieldbus communication according to PROFIBUS-PA and FOUNDATION Fieldbus H1 based on IEC 1158-2 MBP acc. to FISCO. The multi-lingual full text graphic LCD in connection with the external 4 push buttons allows a comfortable and easy local configuration and operation as well as the display of valve specific data, and status- and diagnostic messages.

DEVICE FEATURES

Intelligent

- Auto-start with self-calibration
- Self diagnostics, status- and diagnostic messages
- Easy operation with three keys
- Multi-Lingual full text graphical LCD

With communication

- HART, FOUNDATION Fieldbus H1, PROFIBUS-PA
- Configuration by means of local keys, hand held terminal (HART), PC with FDT-DTM or I/A Series system

COMMON FEATURES

- Stroke 8 to 120 mm / 260 mm (0.3 to 14.7 in / 10.2 in)
- Angle range up to 95°
- Supply air pressure up to 6 bar (90 psig), with spool valve up to 7 bar (105 psig)
- Single or double-acting
- Mounting on linear actuators according to NAMUR – IEC 50534-6-1   – VDI/VDE 3847
- Mounting on rotary actuators acc. to VDI/VDE 3845
- Protection class IP 66, NEMA 4X
- Approved for SIL applications
- Explosion protection: Flameproof according to ATEX - Ex d; Explosion proof according to FM
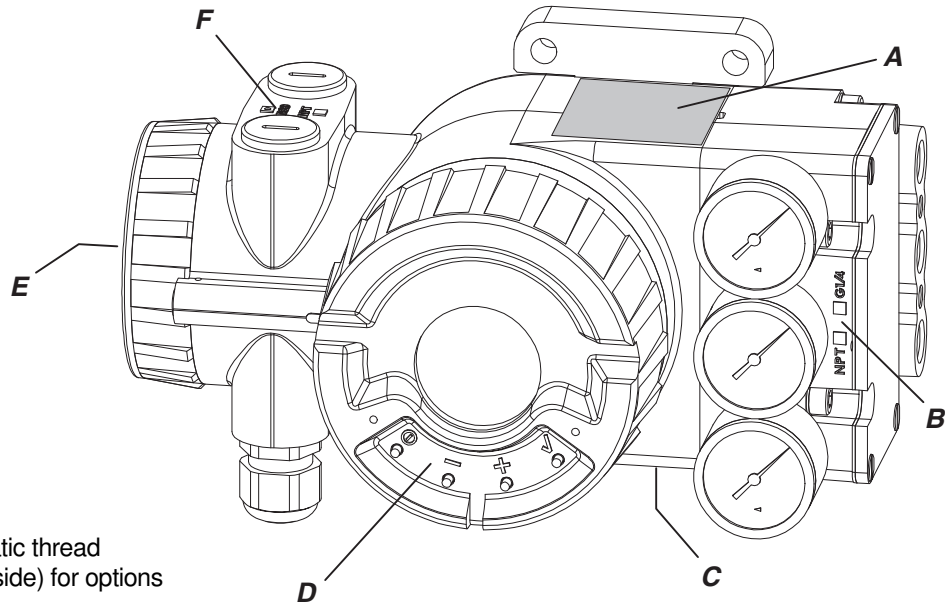
Labels

A Nameplate
B Designation of pneumatic thread
C Additional label (underside) for options
D Designation of keys
E Warning label on the screw cover
F Designation of electrical connection threads

Nameplate A (Example)
Without Ex protection

SRD960- [Device specification, Model Code]

Additional label C Options (Example)

Nameplate A (Example)
With Ex protection acc. ATEX
Type of protection Ex d

Measurement point label (Example)
Directly fixed or attached

XXX 09/16

Additional manufacturing data are stored in the software and are read via communication interface.

TABLE OF CONTENTS

Installation and start-up of instrument to be carried out only by qualified personnel, familiar with installation and start-up procedures and operation of this product!

Accident prevention
The connected instrument contains mechanical moving parts, e.g. feedback lever, which could cause injuries. The operators have to be instructed accordingly.

Electrical safety
This instrument satisfies the conditions for safety class III, overvoltage category I according to EN 61010-1 or IEC1010-1.
Any work on electrical parts must be done by qualified personnel if any supply is connected to the instrument. The instrument must be used for its designated purpose

and connected in accordance with its connection diagram (see page 61).
Locally applicable installation regulations for electrical equipment must be observed, e.g. in the Federal Republic of Germany DIN VDE 0100 resp. DIN VDE 0800.
The instrument must be operated with safety extra low voltage SELV or SELV-E.
Safety precautions taken in the instrument may be rendered ineffectual if the instrument is not operated in accordance with the Master Instructions.
Limitation of power supplies for fire protection must be observed due to EN 61010-1, appendix F or IEC 1010-1.

Summary – HART Communication

Start-up according to following logical steps:

Mounting to Actuator (Valve)
The SRD960 can be mounted to stroke or rotary actuators.
More see page 12.

Connection and Start-up
Carry out the pneumatic tubing. More see page 21.
Upon connection of supply air and a voltage source of e.g.
DC 12 V to the input terminals (pay attention to polarity, see
page 22) an initial start-up can be carried out without any
further equipment.
With the local push buttons, basic parameters can be chan-
ged such as type of actuator, side of installation, valve
opens/closes with increasing setpoint value, and charac-
teristics curve of the valve (values set ex-factory: stroke
actuator, mounting side: left, valve opens with increasing
setpoint value, linear characteristics curve).
Thereafter an AUTOSTART can be performed; during
which the SRD960 determines independently the geometric
data of the actuator as well as control parameter, to ensure
an optimized operation with the attached valve.
More see page 25.

HART version:
The positioner can be operated either locally or via
hand-held terminal or PC (via modem).

System configuration

HART version: When using 'Communication' (an AC signal
which modulates on the 4-20 mA signal), it must be ensured
that the connected outputs, buffer amplifier and barriers are
compatible with the frequency ranges used. In addition to
the load, the AC impedance requirements must be met.
Therefore, it is recommended that only the specified amplifier,
barrier and configuration device be used.
More see page 61.

To prevent crosstalk between lines and reduce disturban-
ces through electromagnetic influences, it is recommended
that twisted-pair shielded lines be used, with a diameter of
0.3 to 2.5 mm^2 (AWG 22 - 14) and a max. capacity of 100
pF/m.

The line capacities and connected devices may not exceed
the maximum values listed for a particular HART protocol.

All components which are connected to the SRD in an ex-
plosion hazardous area, require an Ex-Approval. The there-
in applicable limit values must not be exceeded in any event.
These limit values also have to be adhered to when
connecting additional capacitances, inductances, voltage or
current sources.

Configuration and
Operating software
e.g. PC20 / PC50 (FDT)

PCS
I/A Series System
with FBM215 / 218
with IFDC-Software

FSK
Modem

Hand held Terminal
HHT991

non-hazardous locations

IS: EEx i barrier
(TV228)

IS   IS   IS

EEx d Flameproof
hazardous
location
SRD960

Intr.Safe EEx i
hazardous
location

SRD991

SRD991 / SRD960

144LD
244LD
144LVD

144
LVD

144LD
244LD
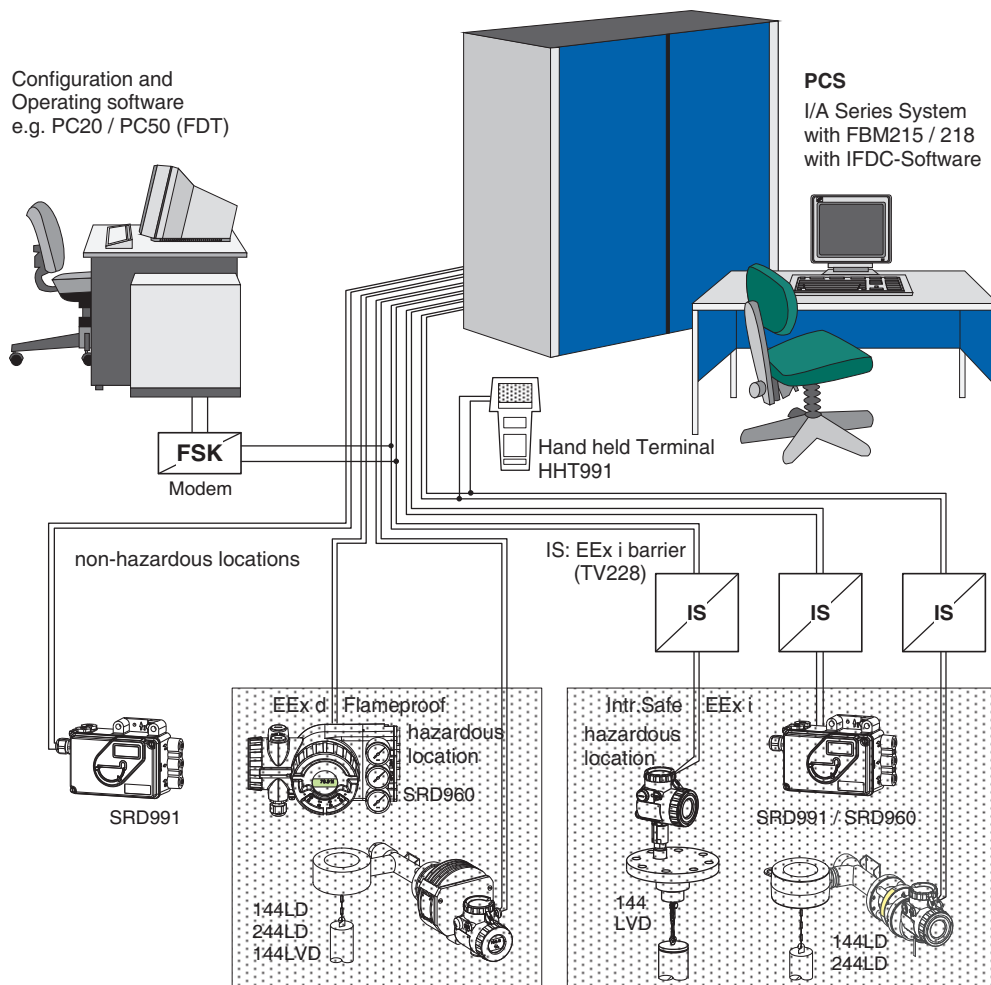
Summary – FOUNDATION Fieldbus

Start-up according to following logical steps:

Mounting to Actuator (Valve)
The SRD960 can be mounted to linear or rotary actuators. More see page 12.

Connection and Start-up
Carry out the pneumatic tubing. More see page 21. Upon connection of supply air and a voltage source of e.g. DC 24 V to the input terminals (polarity is random, see page 22) an initial start-up can be carried out without any further equipment.

With the local push buttons, basic parameters can be changed such as type of actuator, side of installation, valve opens/closes with increasing setpoint value, and characteristics curve of the valve (values set ex-factory: stroke actuator, mounting side: left, valve opens with increasing setpoint value, linear characteristics curve).

Thereafter an AUTOSTART can be performed; during which the SRD960 determines independently the geometric data of the actuator as well as control parameter, to ensure an optimized operation with the attached valve.
More see page 25.

Bus Connection
The SRD960 in the version FOUNDATION Fieldbus is bus compatible, which means that to a 2-core lead, the instruments have to be attached in parallel according to IEC 1158-2. The lead serves as voltage feeder as well as for digital communication.

A FOUNDATION Fieldbus can consist of one or several segments, each with an individual length of up to 1900 m. An Ex barrier should not have a further distance than 100 m from a bus terminal. To a segment up to 32 instruments can be attached. A maximum of up to 240 instruments can be addressed (including repeater = connector of segments). To activate each instrument individually, an individual address has to be entered.

From the factory, the address 29h (41) is always stored. This address can be changed automatically with the NI-Configurator.

System Integration
With the NI-Configurator changes in the configuration of the SRD960 can be carried out. The required files (*.FFO, *.SYM, *.CFF) can be downloaded from our website.

There a further document is made available, which explains the communication data and parameters in detail.

More informations about FOUNDATION Fieldbus see www.fieldbus.org
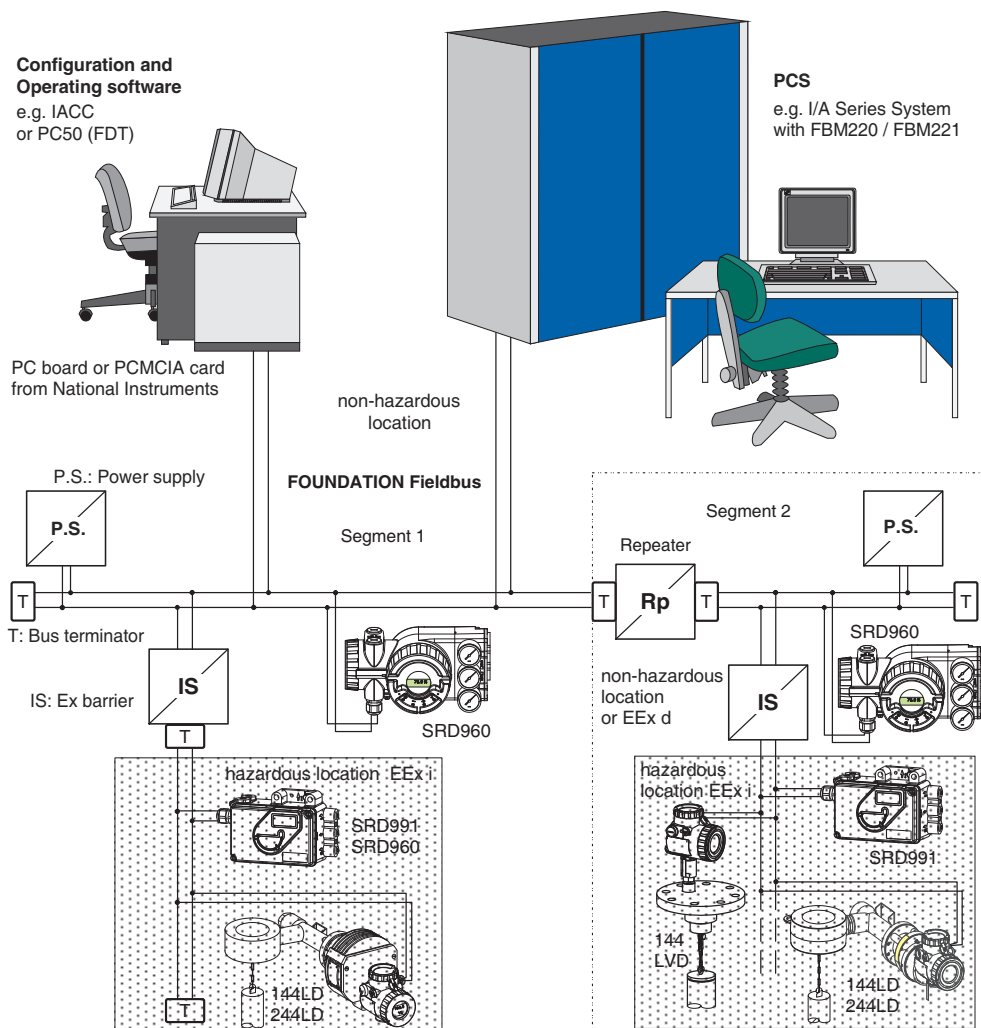
Summary – PROFIBUS-PA

Start-up according to following logical steps:

Mounting to Actuator (Valve)
The SRD960 can be mounted to stroke or rotary actuators. More see page 12.

Connection and Start-up
Carry out the pneumatic tubing. More see page 21. Upon connection of supply air and a voltage source of e.g. DC 24 V to the input terminals (polarity is random, see page 22) an initial start-up can be carried out without any further equipment.

With the local push buttons, basic parameters can be changed such as type of actuator, side of installation, valve opens/closes with increasing setpoint value, and characteristics curve of the valve (values set ex-factory: stroke actuator, mounting side: left, valve opens with increasing setpoint value, linear characteristics curve).

Thereafter an AUTOSTART can be performed; during which the SRD960 determines independently the geometric data of the actuator as well as control parameters, to ensure an optimized operation with the attached valve. More see page 25.

Bus Connection
The SRD960 in the version PROFIBUS-PA is bus compatible, which means that to a 2-core lead the instruments have to be attached in parallel according to IEC 1158-2. The lead serves as voltage feeder as well as for digital communication. To activate each instrument individually, an individual address has to be entered. From the factory the address 126 is always stored [1]; since this address cannot be used during operation, a new address has to be entered in every instrument. This can be done via the local keys, with the FDT/DTM- software or a commercial configurator.

To a PROFIBUS-PA-segment with a length of up to 1900 m, up to 32 instruments can be attached. A maximum of up to 126 instruments can be addressed at the PROFIBUS.

System Integration
During operation the SRD960 will communicate with a PROFIBUS master class 1. The required GSD file ("instrument-specific dates") can be downloaded from our website.

There a further document is made available, which explains the communication data and parameters in detail.

More informations about PROFIBUS see www.profibus.com
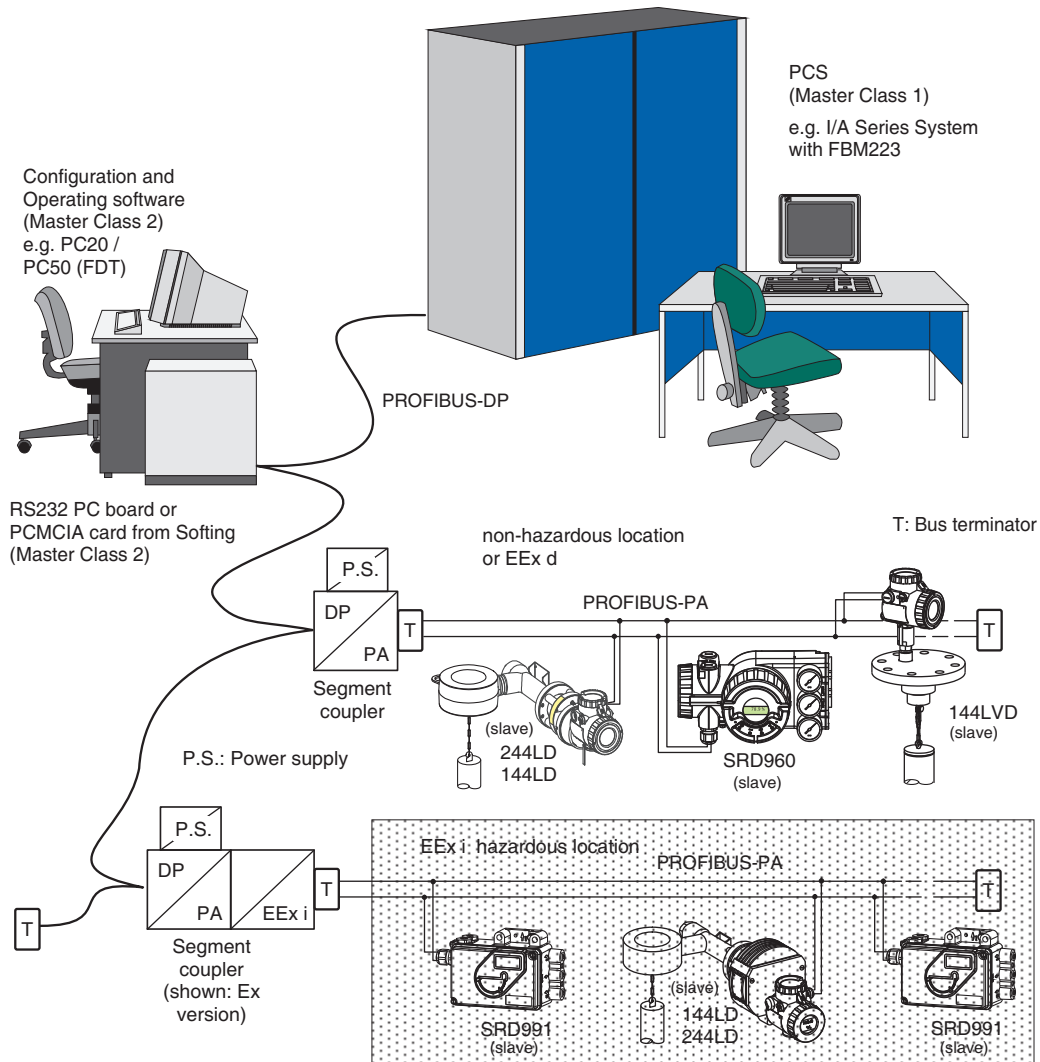
1 METHOD OF OPERATION

1.1 General

The intelligent positioner SRD960 *1* and the pneumatic actuator *2* form a control loop with the setpoint value w (from master controller or control system), the output pressure y and the position x of the actuator on valve *3*.
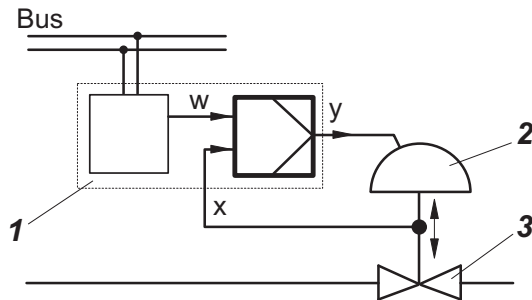
Fig.: Fieldbus version

For the supply air, we recommend the FRSxx filter regulator.

The positioner can be attached to both linear and rotary actuators.
Actuators with spring force are controlled by a single acting positioner. Actuators without spring force are controlled by a double acting positioner.

HART version
The positioner can be operated locally by means of local keys, Hand Held Terminal, remotely via PC-based configuration or a corresponding control system, e.g. I/A Series System.

PROFIBUS-PA or FOUNDATION Fieldbus version:
The positioner can be operated locally by means of local keys, remotely via a corresponding control system, or can be operated via PC-based configuration and operating tools e.g. FDT/DTM.

1.2 Block diagram
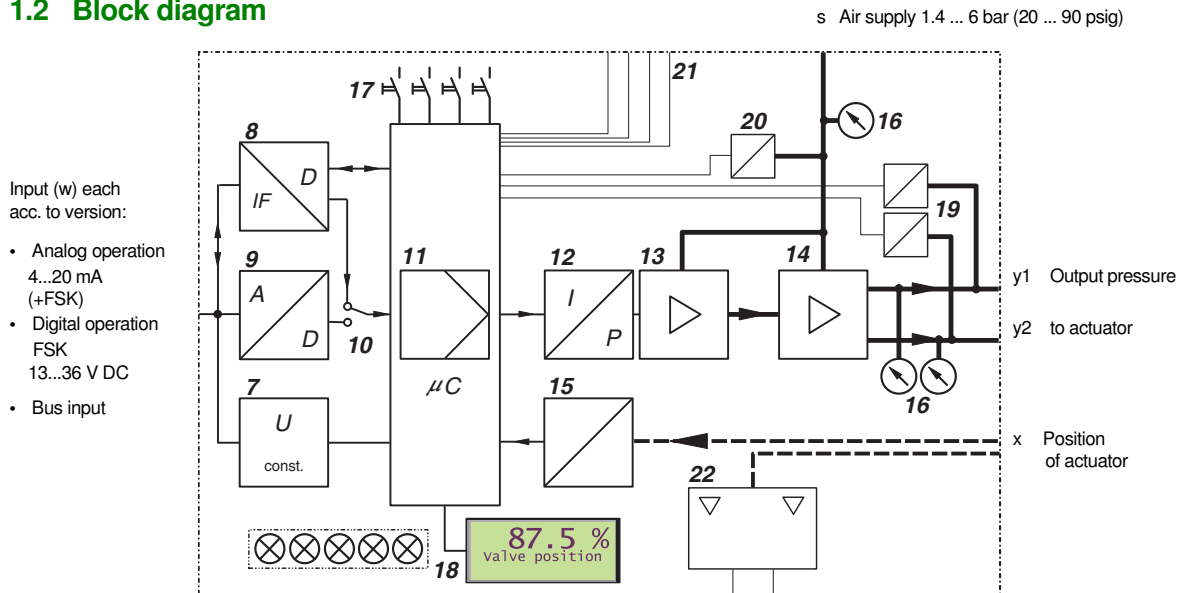
1.3 Functional description

With the intelligent positioner with input signal 4-20 mA or superimposed HART signal, the supply takes place via the power signal adjacent to the input.
By means of voltage converter *7*, derivation of the internal supply of the electronics takes place. The power value is measured, in A/D transformer *9* converted, and directed via switch *10* to digital controller *11*.

With PROFIBUS-PA or FOUNDATION Fieldbus, the SRD is powered by means of the bus cable. The positioner is operated from a control system by sending a setpoint (setpoint value) to the positioner. The digital signal is directed via the interface component *8* to the digital controller *11*. By means of the voltage converter *7* the internal supply of the electronics is established, fed via the bus lead.

The output of controller *11* drives the electro-pneumatic converter (IP-module) *12*, controlling a pre-amplifier *13*, the single acting (or double acting) pneumatic power amplifier *14*. The output of the amplifier *14* is the output pressure y to the actuator.

The pneumatic amplifiers are supplied with supply air s 1.4 to 6 bar (20 to 90 psig).
The position x of the actuator is sent to the control unit *11* by the position sensor (conductive plastic potentiometer) *15*.

Optional gauges *16*, pressure sensors *19*, *20*, inputs / outputs *21* (two binary outputs; a 4-20 mA output and alarm; control inputs for 'Open/Close' and 'Hold last value') enable additional diagnostic indications and possible intervention. The mechanical limit switch *22* (optional) enables independent alarm signals.

Adjusting, start-up of the positioner as well as the demand for internal information can be made using the local keys *17* with indication given by LCD *18*.

2 OPERATING MODES

Operation of the positioner is divided into individual 'operating modes'. Operating modes may change depending on, for example, key commands or internal calculations.
The different operating modes are described in abbreviated form below.

INITIALIZE:

Upon power-up or Reset (pressing of keys (❶) (–) (+) simultaneously), several self-tests are conducted. Individual steps in the self-test process are indicated by the LCD.

If no error occurs the device moves to OUT OF SERVICE, if it is still in a delivery condition; AUTOSTART has to be performed. If AUTOSTART was done already, the device will go to IN OPERATION.

If faults are detected, the code of the faulty self-test will remain (see page 54). If error reoccurs after reset, please contact customer service.

DEVICE FAULT:

In the event that the LCD shows a message a device fault is signaled. These faults are detected during cyclical self-test.
The device can no longer be operated. This could be caused a.o. by a jammed menu key, defective program memory, etc. (see chapter "Trouble-shooting").
This condition disappears through new resetting until the same error is detected again. If a device error occurs repeatedly, please contact customer service.

IN OPERATION:

After performing an AUTOSTART, the device moves to IN OPERATION and will always, even after restarting or resetting, move back to the safety position (de-energized valve position) or FAILSAFE. If setpoint values are fed via communication, the SRD will go to IN OPERATION.

FAILSAFE:

Positioner carries out actions as configured in menu "failure handling". Additionally, the cyclical self-diagnosis takes place.
If the instrument is IN OPERATION, but no setpoint values arrive via communication, the SRD will go to FAILSAFE mode, after a defined time period; either
– holding last value or
– pressureless output, or
– moves to a predetermined position.
As soon as setpoint values arrive via communication again, the instrument is immediately back IN OPERATION.

OUT OF SERVICE:

The SRD960 in delivered condition is configured in such a way that it will remain OUT OF SERVICE after power-up until moving to IN OPERATION via the manually initiated function AUTOSTART.
In the device state OUT OF SERVICE, the menu entering mode remains active at all times. If a device has been IN OPERATION already and is removed from an actuator and mounted to another, it is recommended to take the device out of operation via RESET CONFIG (Menu 9.1) prior to disconnecting the device from the first actuator.
This enables the next actuator to be started in the delivery condition (see chapter 8).

CALIBRATE:

During an AUTOSTART function the device is in condition CALIBRATION. The actuator is moved up- and downwards several times, and the device could be busy for a longer time. Subsequently, the device moves to IN OPERATION.

MESSAGE:

The SRD960 continuously supervises important device functions. If limit values are exceeded or operational problems occur, messages are signaled via the LCD.
The message with the highest priority will be indicated first. With key (–) additional messages can be called up, with key (+) the measuring values can be retrieved. It is possible at any time to reach the menu by pressing the menu keys to possibly eliminate the problem by performing suitable menu functions. Further references may be found in chapter "Trouble-shooting".

SIMULATE (FOUNDATION FIELDBUS version only)

During function IN OPERATION, the valve position queried via the communication, can be simulated with a value that has been entered via communication into the instrument during position SIMULATION. Thereby the positioner continues with normal operation and regulates to the "accurate" set value.
For the SRD, this function has to be additionally released or blocked via menu 10.

LCD description and possible operator interventions are described in the chapter START-UP.

3 FUNCTIONAL DESIGNATIONS

1 Cable gland [1]
2 Plug [1], interchangeable by Pos.1
3 Screw terminals [2] (11 + 12 -) for input (w) or
   (11 / 12) for Bus connection acc. IEC 1158-2[)]
3a Screw terminals [2] for additional inputs / outputs
4 Ground connection
5 Female thread G 1/4 or 1/4 -18 NPT [3] for output I (y1)
6 Female thread G 1/4 or 1/4 -18 NPT for air supply (s)
7 Female thread G 1/4 or 1/4 -18 NPT for output II (y2)
8 Direct connection for output I (y1-d)
9 Feedback shaft
10 Connection manifold for attachment to stroke actuators
    (see page 11)
11 Connection base for attachment to rotary actuators
12 Cover with window and external push buttons
12a Push button protection cover (option –X) (not shown)

13a Key ❶ MENUE
13b Key – DOWN
13c Key + UP
13d Key ✓ ENTER / STORE
15 Pneumatic unit with amplifier and connection
16 4 screws for connection of pneumatic unit
18 built in pressure gauges for air supply, output
    Y1 and output Y2
19 Cover for electronic connection compartment
20 Protection screw for electronic connection and
    electronic compartment
21 Air vent, dust and water protected
    (IP65 and NEMA 4X)
22 Data label
22a Label for Options
25 Tip jacks, 2 mm dia (integrated in Terminals)
26 Arrow is perpendicular to shaft 9 at angle 0 degree

---

1) Cable glands BUSG.
    The device is supplied with dust protection covers.
2) Optional Cage clamps (WAGO)
3) Type of thread is marked at housing

3.1 Pneumatic Accessories

When mounting, check the proper seating of the O-rings and bolt on the accessories with the two M8 bolts. Unused outputs are closed by means of plastic plugs.

3x
1/4-18 NPT
y
(y1)
s
(y2)

H
L
B

L x B x H =
83 x 20 x 25 mm

y (y1)
s
3x
G1/4
(y2)

Code LEXG -K
Connection manifold
with G 1/4 threads

3x
1/4-18 NPT
y1
s
y2

Code LEXG -G (-G1 for G 1/4)
Booster for double
acting positioner

L x B x H =
102 x 70 x 102 mm
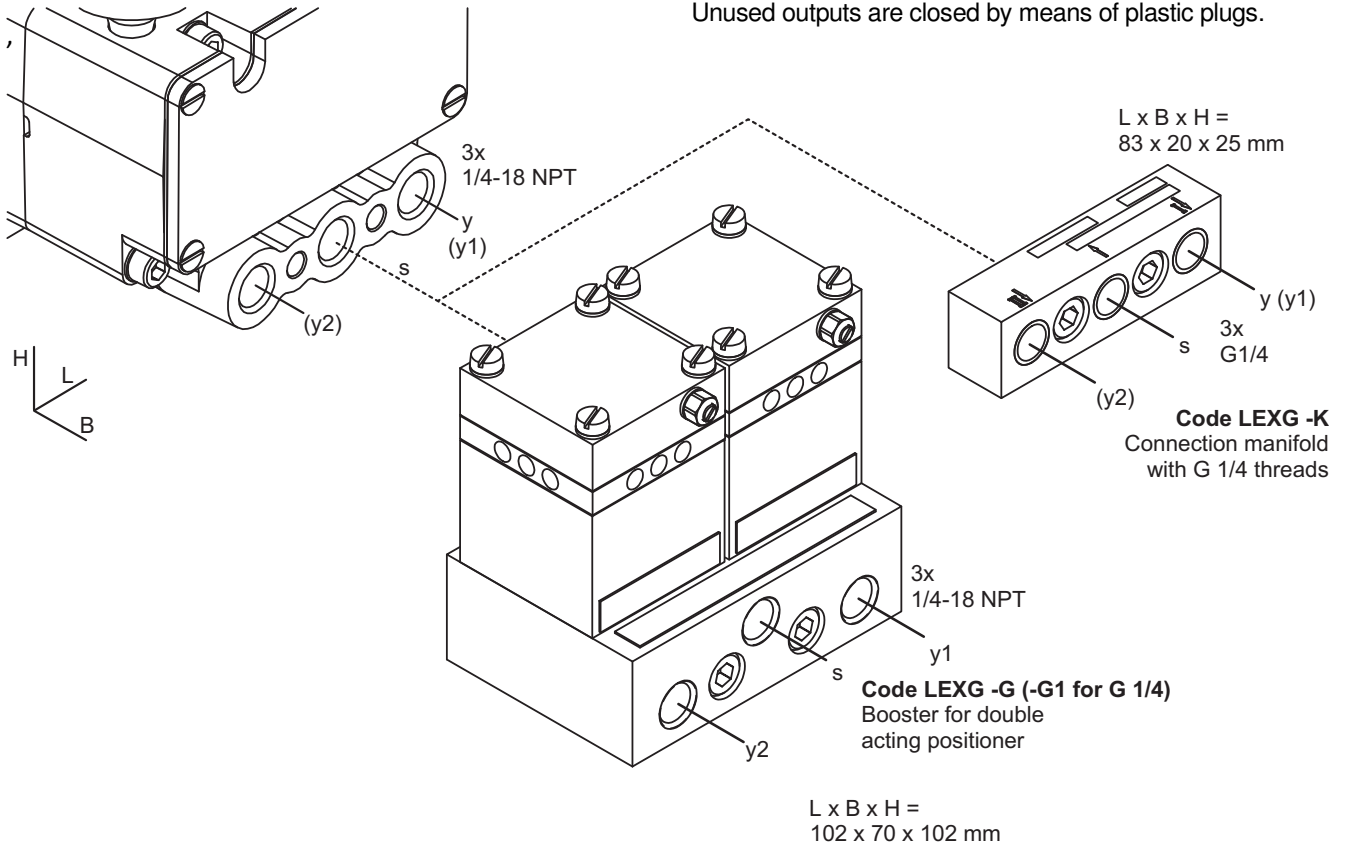
Types with G-threads instead of standard NPT threads:
LEXG-F1: As LEXG-F, however with thread G 1/4
LEXG-G1: As LEXG-G, however with thread G 1/4
LEXG-H1: As LEXG-H, however with thread G 1/2

Alternative:
Amplifier, independent of positioner:
(Connection from positioner to amplifier with tubes)
LEXG-X1: As LEXG-F1, however externally mounted
LEXG-Y1: As LEXG-G1, however externally mounted
LEXG-Z1: As LEXG-H1, however externally mounted

LEXG-Y1

LEXG-X1
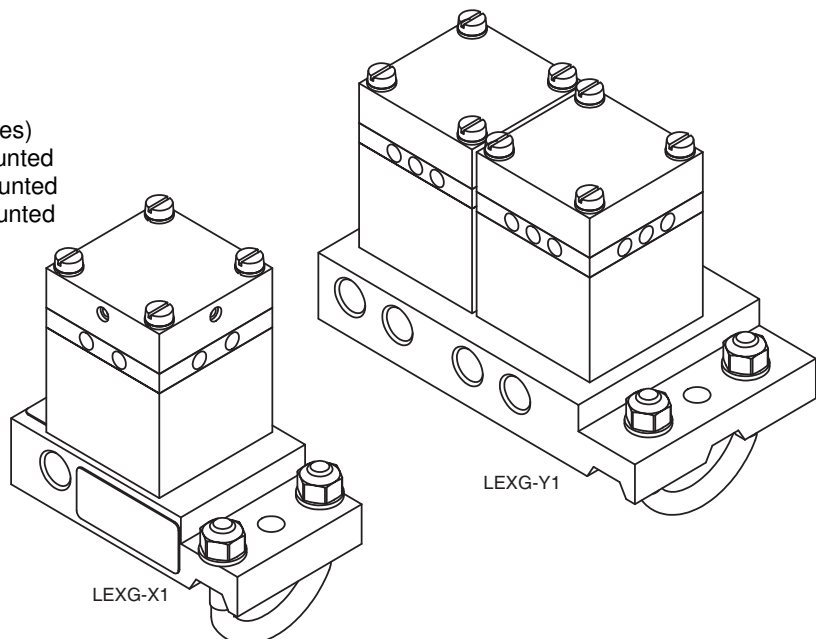
MOUNTING PREPARATION

The Universal Positioner needs a linking piece for attachment to the different brands of actuators.

The standard Mounting Adapter is marked with Option N.

Mounting adapters
Be sure to have the right mounting adapter.

Option N for:
- NAMUR mounting, according to IEC 534-6
- Direct mounting to FlowPak- and FlowTop actuators
- Rotary actuators, according to VDI/VDE 3845

-N
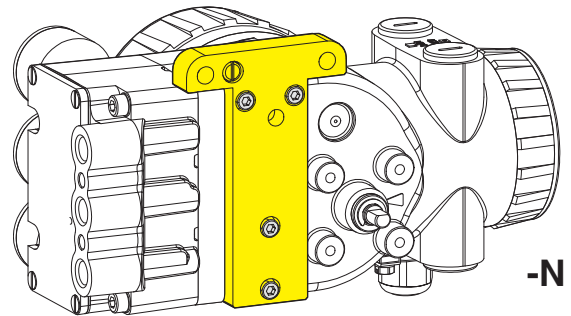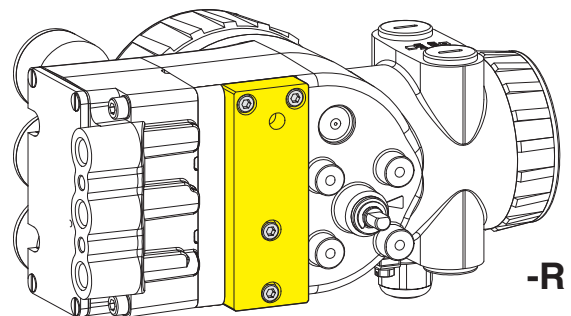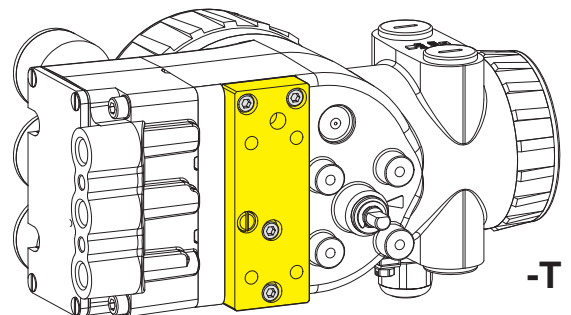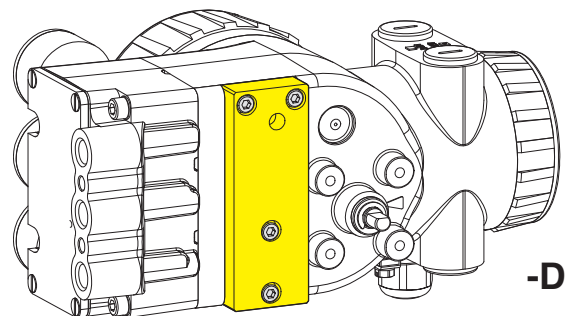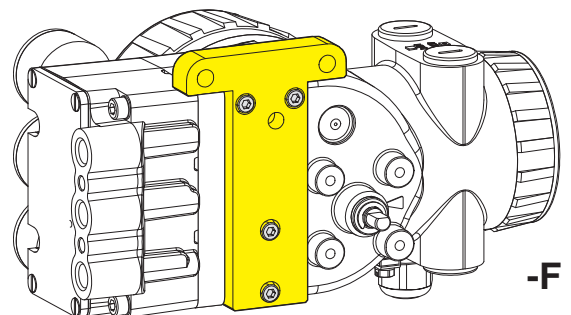
Option R for:
- Rotary actuators, according to VDI/VDE 3845

-R

Option T for:
- Integrated mounting with air connections on rear
- Direct mounting to e.g. Kämmer valves / actuators
- Rotary actuators, according to VDI/VDE 3845

-T

Option D for:
- NAMUR mounting, according to VDI/VDE 3847 (see PSS)
- Rotary actuators, according to VDI/VDE 3845

-D

Option F for:
- NAMUR mounting, according to IEC 534-6
- Rotary actuators, according to VDI/VDE 3845

-F

On following pages, different ways of mounting are shown:

NAMUR mounting - left hand -
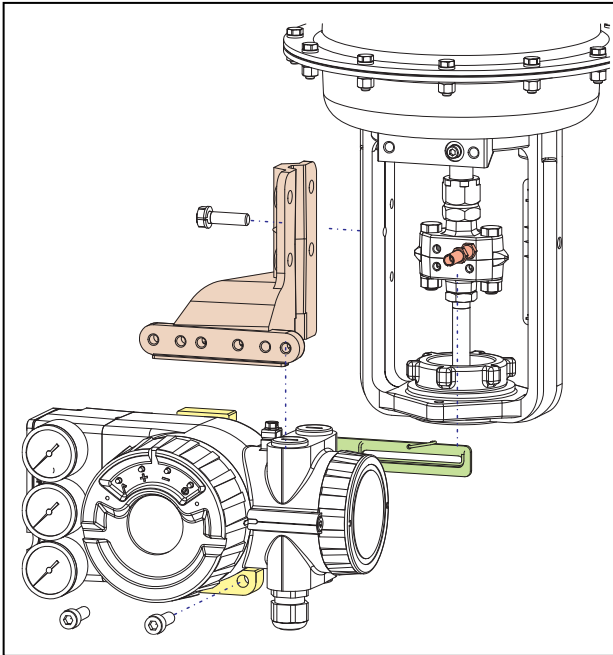
NAMUR mounting - right hand -
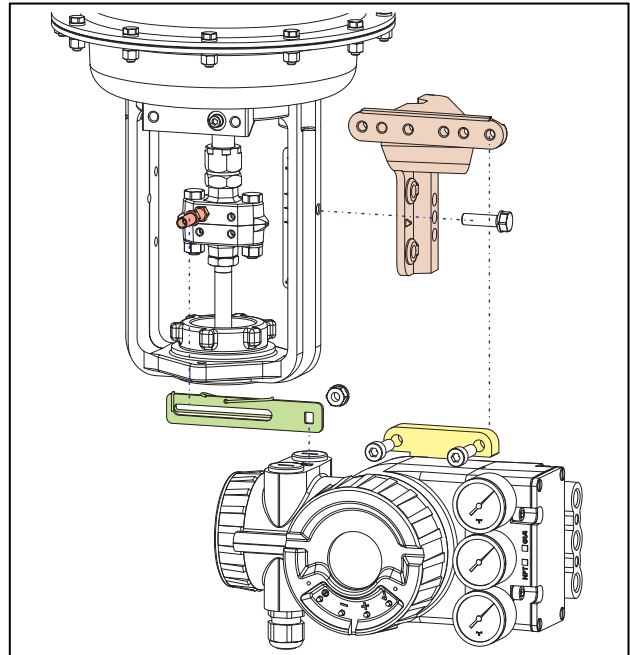
Direct mounting

Mounting to rotary actuators
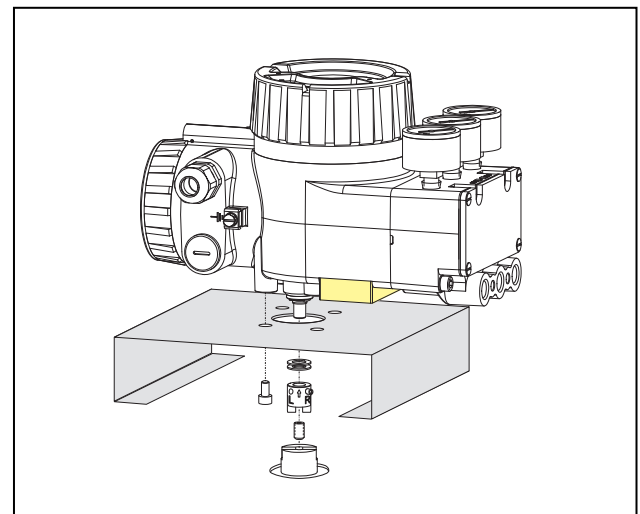
Feedback lever for linear actuators

The carrier bolt *B* is in the slot of the feedback lever *A*
and the compensating spring *F* touches the carrier bolt.
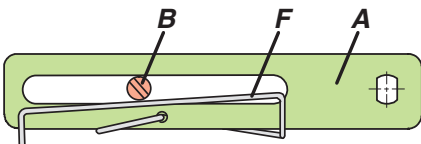
Carrier bolt *B*:
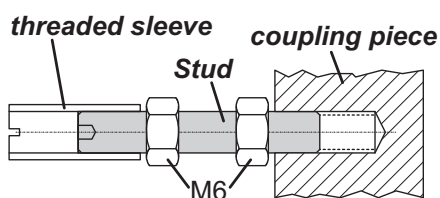
4 MOUNTING TO LINEAR ACTUATORS

4.1 NAMUR Mounting - left hand

Applicable to actuators with cast yoke or pillar yoke acc. to NAMUR (DIN IEC 534-6).

Mounting the positioner with pneumatic connections on the left side and electrical connections on the lower side.
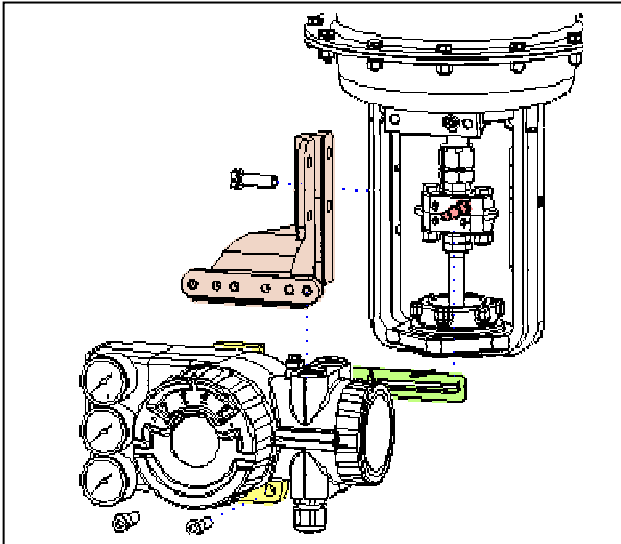
Attachment of the positioner to the actuator is made to the left using the mounting bracket and feedback lever for a NAMUR mount. Use:

attachment kit EBZG -H for a cast yoke, or
attachment kit EBZG -K for a pillar yoke.

The side outputs I (or I and II, see page 21) are used. The rear output I is closed by means of a lock screw 522 588 013.

Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRD. Use only Loctite® #243 for sealant [1].

Screw-type glands for electrical connections are positioned on the lower or right side. Any unused threaded holes are closed by plugs.

4.1.1 Preparation of the positioner

Rotate the shaft **9** so that the flat on the shaft stub is perpendicular to the arrow **26** on the housing (detail see page 18). Fasten the feedback lever **A** to the shaft by means of spring washer and nut M8.
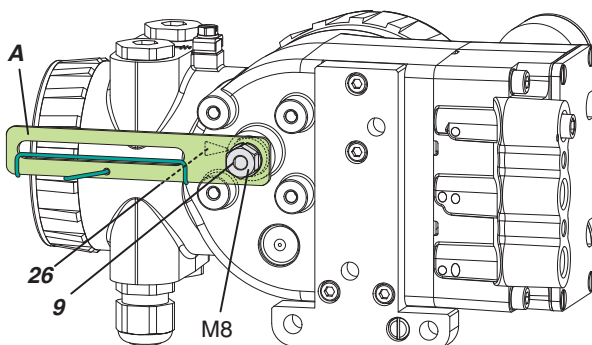
4.1.2 Preparation of the actuator

Screw the carrier bolt to the stem connector (see Fig.) and lock it by means of a counter nut.

A carrier bolt with an adjustable length is used to be able to screw on various coupling pieces.
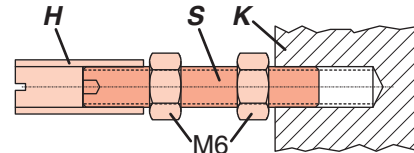
It consists of a stud **S**, which is screwed into the coupling piece **K** (with 3 mm Allen key) and locked with a lock nut M6. The threaded sleeve **H** is screwed onto it and locked with a lock nut M6. Make sure that the bolt is adjusted to the right length!

Fasten the mounting bracket to the left side of the yoke.
For a cast yoke use a screw M8 x 30,
for a pillar yoke use two U-bolts and two nuts.

4.1.3 Mounting of the positioner

Fasten the positioner to the mounting bracket using two spring washers and two screws M8 x 80.

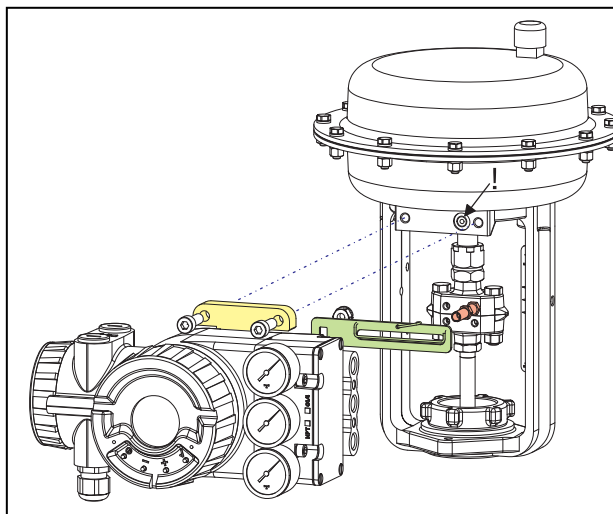Note, the carrier bolt **B** is in the slot of the feedback lever **A** and the compensating spring **F** touches the carrier bolt.

Fig.: Feedback lever

For optimum utilization of the positioner operating range, it is recommended that the arrangement is adjusted according to the following procedure before fixing. At an actuator position in the middle of travel range, the feedback lever position should be perpendicular to the actuator stem and the angle range should be between −10° to +10° and −45° to +45°.

Fasten the positioner to the mounting bracket so that a suitable angle range is selected.

It is recommended that the pneumatic and electrical connections are made after adjusting the position.

---

1)   Apply only to male thread

4.1.4 NAMUR Mounting Dimensions – left hand –

LCD Orientation can be changed by means of local push buttons under Menu 9.9.2 to "flipped" to ensure a correct orientation of the display.

mm
in

Attachment to casting yoke
(with attachment kit Code EBZG-H)

35 ... 90
1.38 ... 3.54

67
2.64

Mounting bracket

4x Ø 9 / .35

43
1.69

3x Ø 9 / .35

38,5
1.52

43
1.69

6x M8

13,5
.53

12,5
.49

73,5
2.89

62
2.44

20
.79

15
.59

32
1.26

67,5
2.66
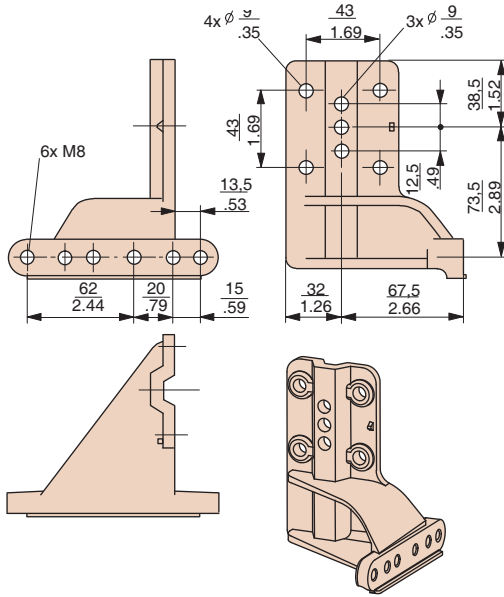
Attachment to pillar yoke
(with attachment kit Code EBZG-K)

35 ... 90
1.38 ... 3.54

Ø 20 ... 35
.79 ... 1.38

67
2.64

2 pieces

Feedback lever   Code EBZG-A for 8..70 mm travel

32
1.26

67
2.64

8
.32
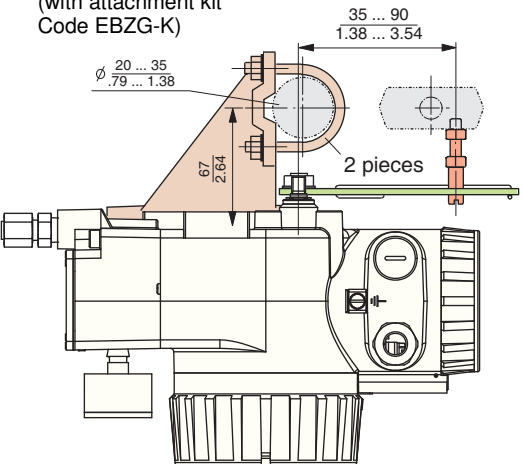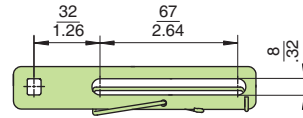
Feedback lever   Code EBZG-B for 60..120 mm travel

83
3.27

67
2.64

8
.32

Carrier bolt   for connection to valve stem

18 ... 30
.71 ... 1.18

19
.75

7,8
.31
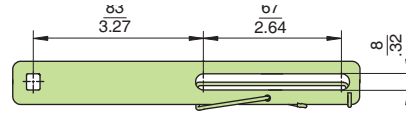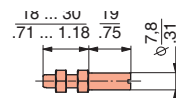
4.2 NAMUR Mounting, right hand

Right-hand mounting is done if for instance left-hand moun-ting is not possible for structural reasons.

Applicable to actuators with cast yoke or pillar yoke acc. to NAMUR (DIN IEC 534-6).

Mounting the positioner with pneumatic connections on the right side and electrical connections on the left side.
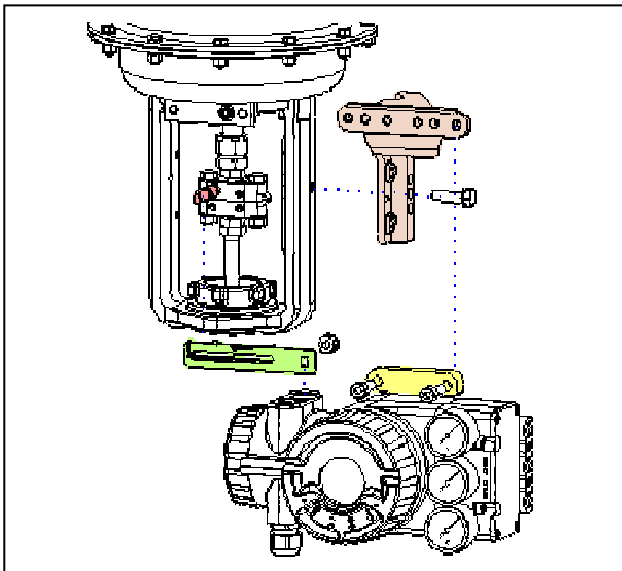
Attachment of the positioner to the actuator is made to the right using the mounting bracket and feedback lever for a NAMUR mount. Use:
attachment kit EBZG -H for a cast yoke, or
attachment kit EBZG -K for a pillar yoke.

The side outputs I (or I and II, see page 21) are used.
The rear output I is closed by means of a lock screw 522 588 013.

Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRD. Use only Loctite® #243 for sealant[1].

Screw-type glands for electrical connections are positioned on the left side. Any unused threaded holes are closed by plugs.

If housing cover has an air vent, this air vent must face-down when mounted.

4.2.1 Preparation of the positioner

Rotate the shaft stub of shaft *9* so that the flat on the shaft stub is perpendicular to the arrow *26* on the housing (detail see page 18). Fasten the feedback lever *A* to the shaft by means of spring washer and nut M8.

M8   *9*   *26*   *A*

1)   Apply only to male thread
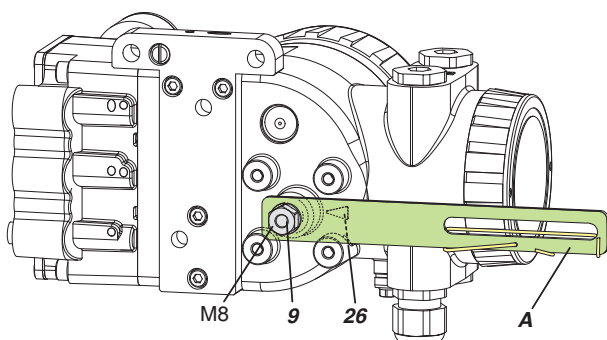
4.2.2 Preparation of the actuator

Screw the carrier bolt to the stem connector (see Fig.) and lock it by means of a counter nut.
A carrier bolt with an adjustable length is used to be able to screw on various coupling pieces.

H   *S*   *K*

M6

It consists of a stud *S*, which is screwed into the coupling piece *K* (with 3 mm Allen key) and locked with a lock nut M6. The threaded sleeve *H* is screwed onto it and locked with a lock nut M6. Make sure that the bolt is adjusted to the right length!
Fasten the mounting bracket to the left side of the yoke.
For a cast yoke use a screw M8 x 30,
for a pillar yoke use two U-bolts and four nuts.

4.2.3 Mounting of the positioner

Fasten the positioner to the mounting bracket using two spring washers and two screws M8 x 80.
Note, the carrier bolt *B* is in the slot of the feedback lever *A* and the compensating spring *F* touches the carrier bolt.
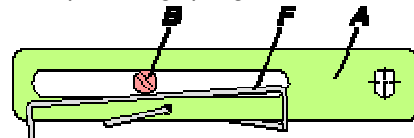

A   *B*

F
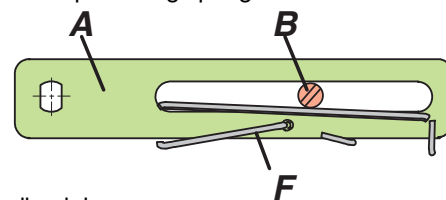
Fig.: Feedback lever

For optimum utilization of the positioner operating range, it is recommended the arrangement be adjusted according to the following procedure before fixing. At an actuator positi-on in the middle of travel range, the feedback lever position should be perpendicular to the actuator stem and the angle range should be between −10° to +10° and −45° to +45°.
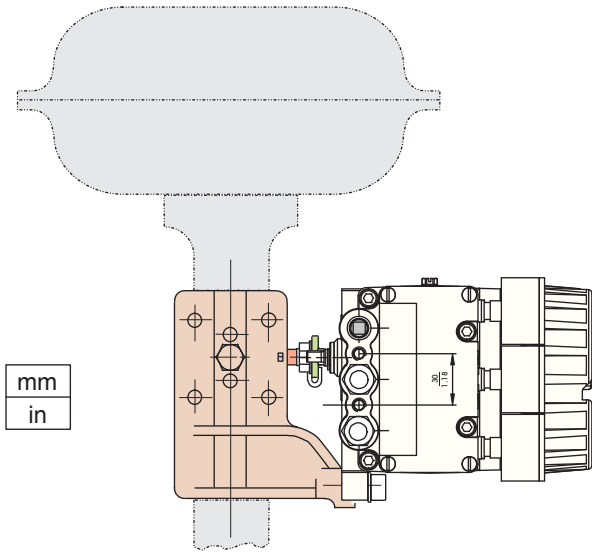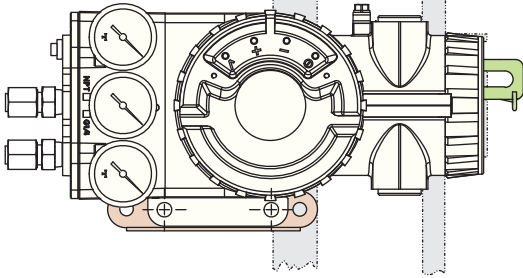
Fasten the positioner to the mounting bracket so that a suitable angle range is selected.

It is recommended that the pneumatic and electrical con-nections are made after adjusting the position.

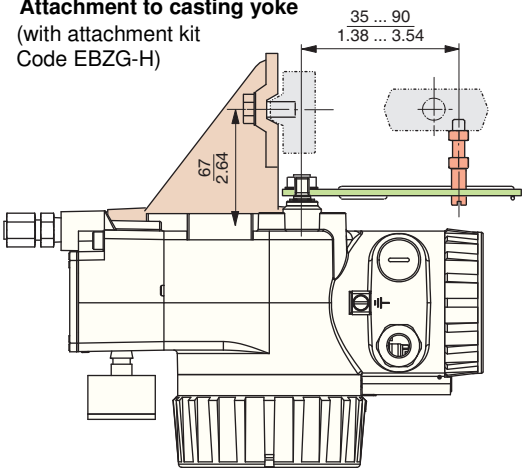### 4.2.4 NAMUR Mounting Dimensions – right hand –

mm
in
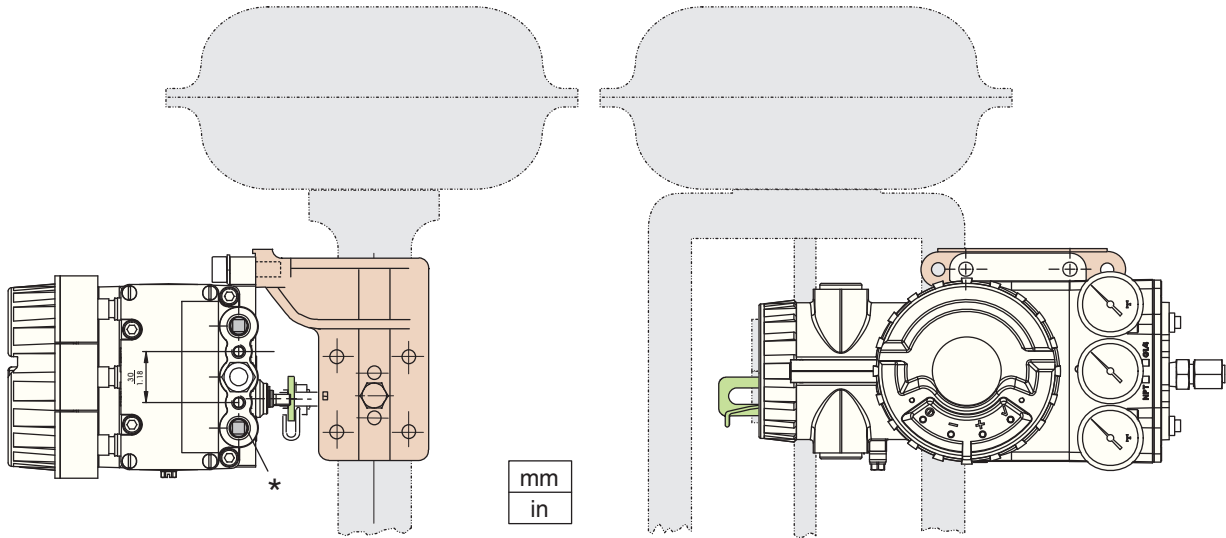
Attachment to casting joke
(with attachment kit EBZG-H)

35 ... 90
1.38 ... 3.54

67
2.64
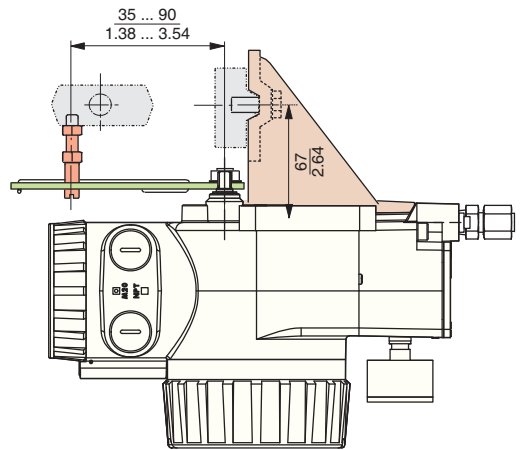
Mounting bracket, feedback lever and
carrier bolt see page 14

Attachment to pillar joke
(with attachment kit EBZG-K)

35 ... 90
1.38 ... 3.54

⌀ 20 ... 35
.79 ... 1.38

67
2.64

2 pieces
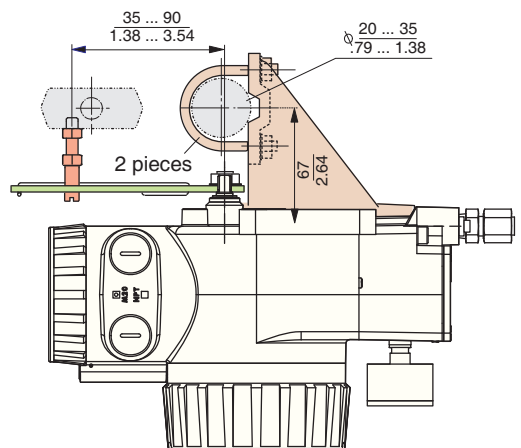
4.3 Linear actuator, direct mounting

Actuators with appropriately prepared yoke (PA200, PA350) enable mounting of the SRD direcly to the actuator yoke.

The attachment of the positioner is accomplished by bolting it directly to the actuator yoke using the feedback lever for a direct mount (with attachment kit EBZG -E).

The rear output I and the side outputs I and II are used as follows (see page 21):

• Actuator single acting, spring force closes:
  The rear output I is used (remove lock screw in hole **D**).
  The side output I is closed by means of a lock screw.

• Actuator single acting, spring force opens:
  The side output I is used.
  The rear output I is closed by means of a lock screw.

• Actuator double acting:
  The rear output I and the side output II is used.
  The side output I is closed by means of a lock screw.

Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRD. Use only Loctite® #243 for sealant[1].

Screw-type glands for electrical connections are positioned on the lower side. Any idle female threads are closed by means of plugs.

4.3.1 Preparation of the positioner

Rotate the shaft stub of shaft **9** so that the flat on the shaft stub is perpendicular to the arrow **26** on the housing (detail see page 18). Fasten the feedback lever **A** to the shaft by means of spring washer and nut M8.
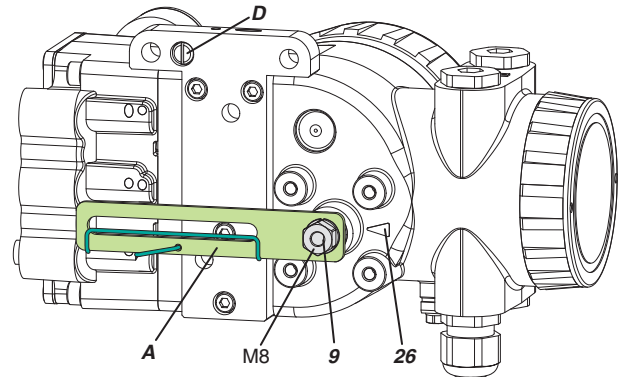
4.3.2 Preparation of the actuator

Screw in the carrier bolt **B** on the coupling piece **K** on the drive spindle **S** at the lower left and lock it by means of a nut M6.
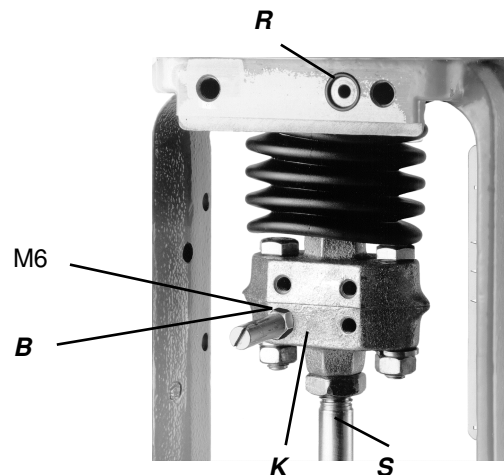
4.3.3 Mounting of the positioner

Fasten the positioner to the upper part of the yoke using 2 spring washers and 2 screws M8 x 80, as shown above. The rear output I of positioner has contact to the air duct **R** in the yoke.
Attention: Note the correct position of the O-ring on the yoke for the rear connection I!

Note, the carrier bolt **B** is in the slot of the feedback lever **A** and the compensating spring **F** touches the carrier bolt.
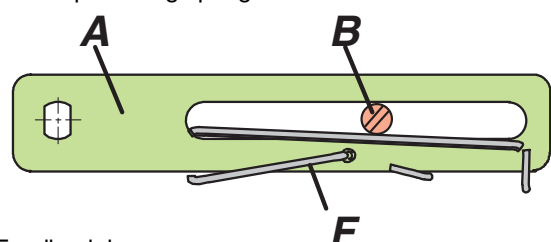
Fig.: Feedback lever

---
1)   Apply only to male thread.

4.3.4 Mounting dimensions – direct mounting –

$\geq \frac{11}{.43}$

$\frac{10}{.39}$

$\frac{30}{1.18}$

$\geq \frac{35}{1.38}$

$\boxed{\begin{array}{c} mm \\ \hline in \end{array}}$

Feedback lever   Code EBZG-A for 8..70 mm travel

$\frac{32}{1.26}$ $\frac{67}{2.64}$ $\frac{8}{.32}$

Feedback lever   FoxPak/FoxTop in Code EBZG-E

$\frac{23}{0.91}$ $\frac{45}{1.77}$ $\frac{8}{.32}$

Carrier bolt   for connection to valve stem

$\frac{19}{.75}$ $\frac{28}{1.1}$ $\phi \frac{7,8}{.31}$

M6

Detail: shaft stub **9** is perpendicular
to the arrow **26** on the housing

26

9

$\frac{35 ... 90}{1.38 ... 3.54}$

Connection to yoke using the direct
connection hole for rear output I (y/y1)

2x M8

$\frac{62}{2.44}$

$\frac{14}{.55}$

O-Ring
10 x 2

$\frac{0 ... 50}{... 1.97}$

4.4 Mounting to rotary actuators

Applicable to rotary actuators that meet the VDI/VDE 3845 standard for mounting. Installation position of positioner: Mount the positioner so that the pneumatic connections are in the same direction as the longitudinal drive axis of the actuator as shown in the illustration below.
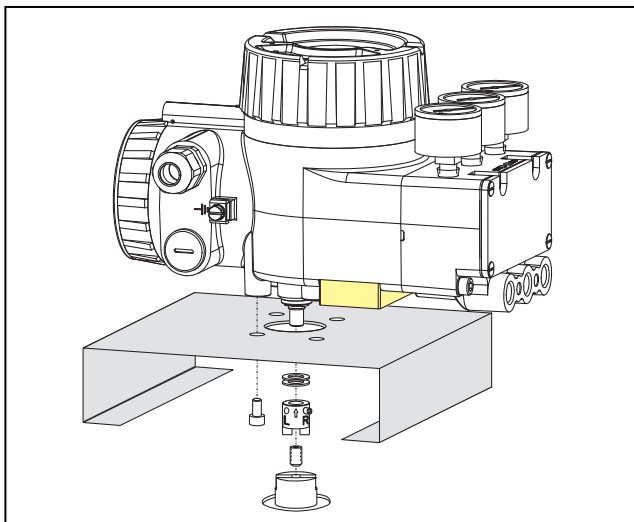
Attention: The feedback shaft *9* of the SRD has no mechanical stop, therefore may spin round. The permissible rotation angle range is between +50 and –50 degrees around the arrow at the housing concerning the flat area of the feedback shaft (also see detail page 18, bottom). Since a rotary actuator has a rotary angle of about 90 degrees the mounting as described in the following must be carried out very precise.

Attachment of the positioner to the actuator is made by using the rotary adaptor kit EBZG -R.

Either the side outputs I (or I and II) are used and the rear output I is closed by means of the lock screw 522 588 013.

Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRD. Use only Loctite® #243 for sealant [1].

Screw-type glands for electrical connections are used as needed. Any unused threaded holes are closed by plugs.

Caution! Prevent accumulation of water in the instrument in this mounting position by sealing cable entry against water. Provide a continuous supply of dry instrument air.

4.4.1 Preparation of positioner

Valve must be in failsafe position and the direction of rotation of the actuator drive shaft must be known. These items are extremely important for proper functioning. These items can be checked as follows in case they are not clear:

In the single-acting actuator the force of the installed spring closes. The pressure-less actuator is in failsafe position. Through manually feeding compressed air it can be seen whether the actuator drive shaft rotates to the left or to the right. In the powerless SRD is y1 pressureless.

In the double-acting actuator without spring reset both air chambers are basically equal. Failsafe position can be either "open" or "close". Therefore, indication of the failsafe position has to be determined by engineering. Then the direction of rotation may be determined by manual feeding of compressed air. In the powerless SRD is y1 pressureless and y2 under pressure.

Bolt *2* is screwed into actuator drive shaft *1* for subsequent centering of the rotary adaptor *3*. The attachment console is mounted to the stroke actuator (see Fig. below).

Attachment diagram for bracket
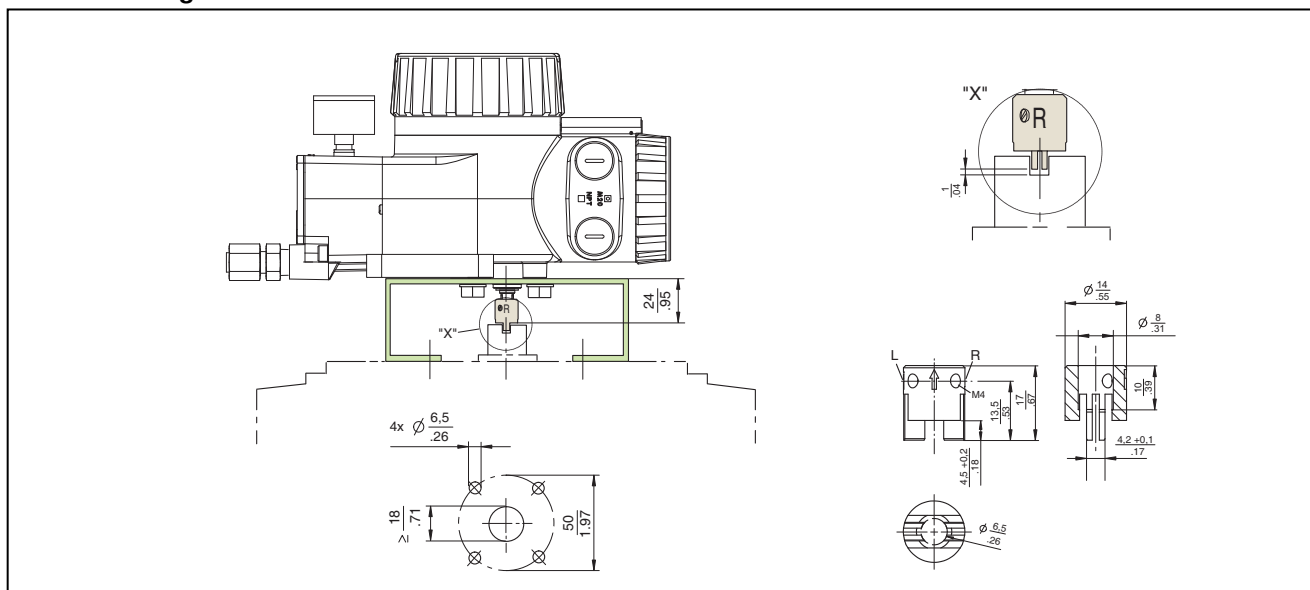
1) Apply only to male thread

4.4.2 Preparation of the actuator

First the rotary adaptor is being prepared:

For attachment to a counter-clockwise or <u>left</u> turning actuator secure the stud screw *4* in the threaded hole "**L**" of the rotary adaptor; hole "R" remains open. See Fig. 27.

For attachment to a clockwise or <u>right</u> turning actuator secure the stud screw *4* in the threaded hole "**R**" of the rotary adaptor; hole "L" remains open. See Fig. 28.

Now place the rotary adaptor *3* with two washers *5* on the feedback shaft *9* of the positioner against the stop.
Note:
When the product temperature rise, the drive shaft *1* becomes longer. Therefore, the rotary adaptor *3* must be mounted so that approx. 1 mm (0.04 in.) of clearance results between the drive shaft *1* and the rotary adaptor *3*. This is achieved by placing an appropriate number of washers *5* on the feedback shaft stub *9* before attaching the rotary adaptor. Two washers should result in a clearance of 1 mm.

Now screw and tighten the bolt in the coupling against the flat part of the feedback shaft (do not screw against the thread!).

Finally turn the feedback shaft in such a way that the arrow of the coupling points to the arrow of the SRD housing. Beginning and end positions of the actuator drive shaft *1* and feedback shaft *9* are marked in figure 27 (counter clockwise rotating actuator) and in figure 28 (clockwise rotating actuator) by arrows for the respective direction of rotation.
The feedback shaft is now in the normal position corresponding to the failsafe position of the actuator.

4.4.3 Mounting of positioner

SRD and actuator are in failsafe position.
Turn set screw *2* into shaft *1*.
Attach the SRD on the console in such a way that the catch of coupling *3* is guided into the groove of shaft *1*.
Be careful not to shift shafts *1* and *9* and that both shafts are exactly flush. The set screw *2* can assist in alignment.
Fasten the positioner to the bracket by means of 4 lock washers and 4 screws M6 x 12.

Figure 27: Mounting if actuator is left-rotating
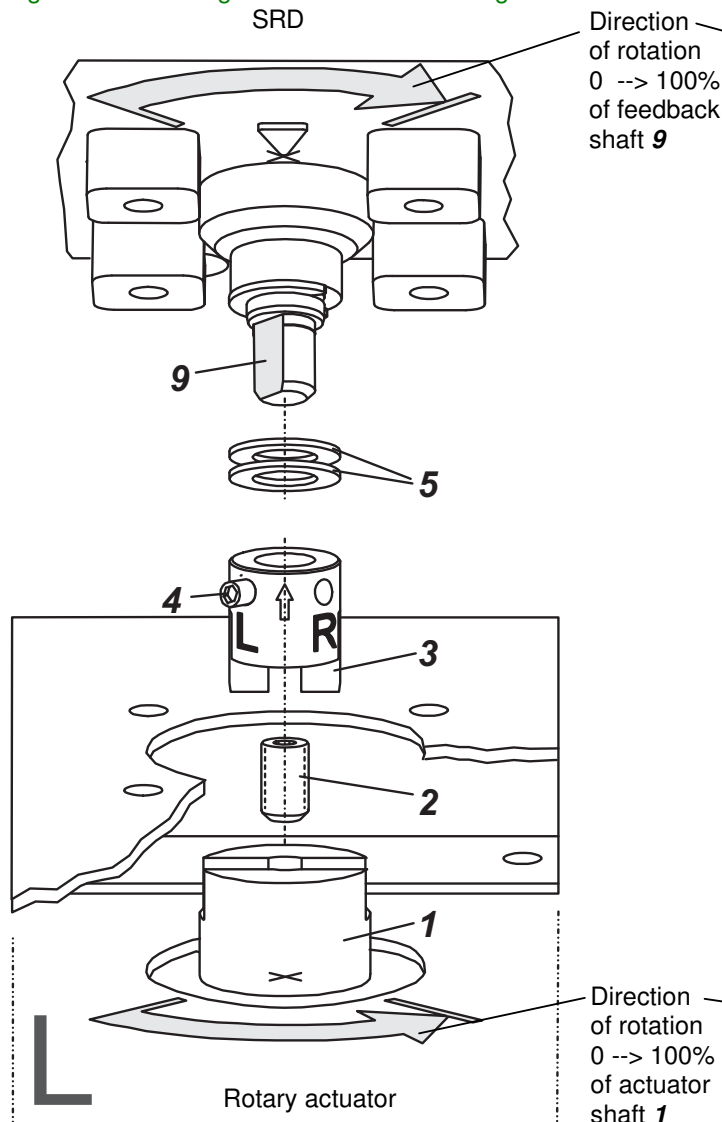
Figure 28: Mounting if actuator is right-rotating

Direction of rotation 0 --> 100% of feedback shaft *9*

Direction of rotation 0 --> 100% of actuator shaft *1*

Rotary actuator

.
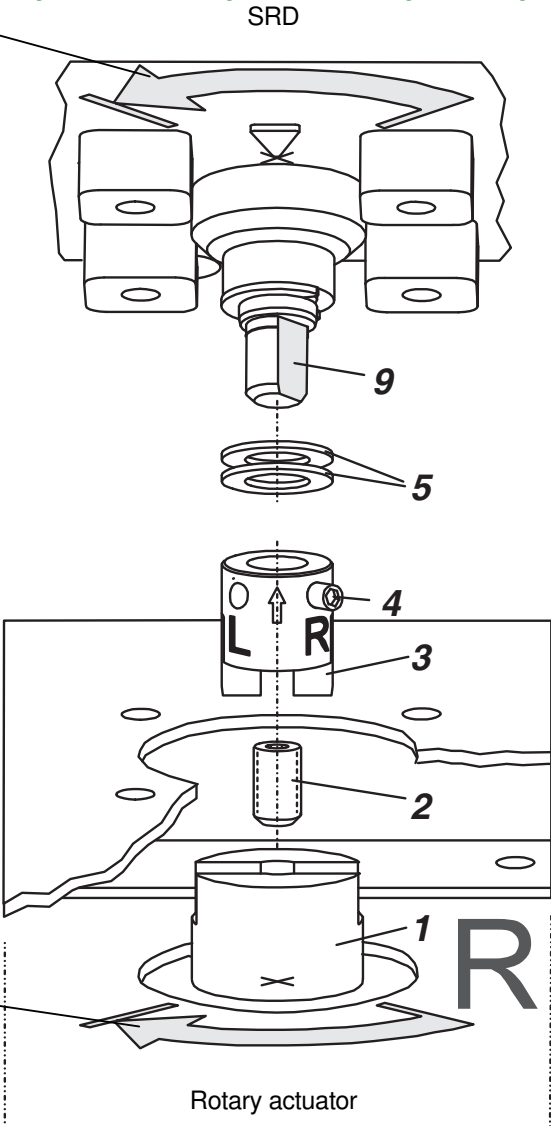
5   PNEUMATIC CONNECTIONS

Following alignment and mounting of the positioner to the valve, pneumatic tubing has to be provided.

Check before mounting fittings and cable glands if threads are matching, otherwise housing can be damaged.
Type of thread is marked at housing.
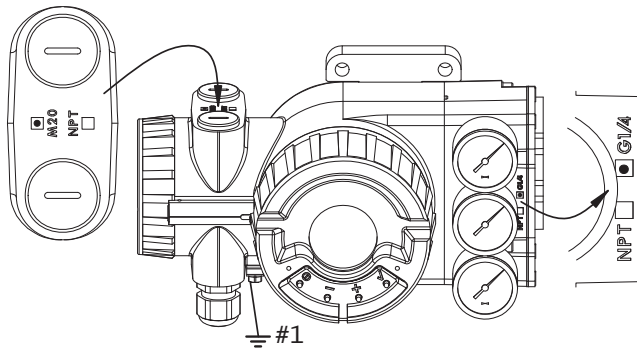
The connection illustrations depend on the respective version.

s   Supply air

y1-d Output 1 for direct mounting, depressurized at powerless electronics. When using this output **y1** has to be closed by means of hex. screw.

y1   Output 1, depressurized at powerless electronics. When using this output, **y1-d** has to be closed by means of sealing screw and O-ring.

y2   Output 2 for double-acting actuator. Full pressure at powerless electronics. Closed at single-acting actuator.

n1   Hex. screw with NPT thread
Part No. 522 588 013 (stainless steel)
Part No. 556 446 016 (plastic)

n2   Sealing screw with O-ring

Direct Mounting (Single Acting)
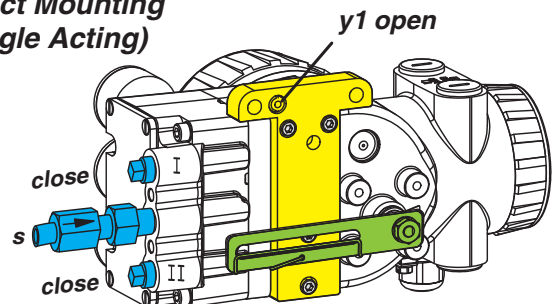
Single Acting
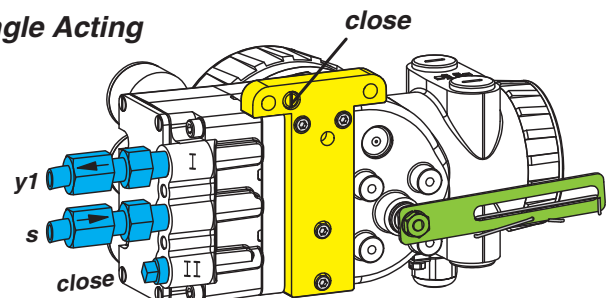
Double Acting
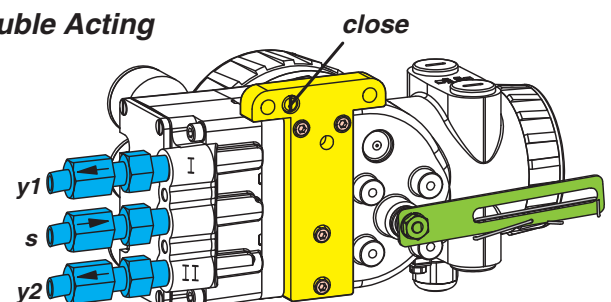
Unused pneumatic connections must be closed off.

6   ELECTRICAL CONNECTION

The safety requirements on page 59 must be observed! Different threads can be supplied with cable gland – please verify marking at housing! (See drawing at previous page)

Unused cable entries must be closed with blanking plugs with the appropriate explosion-proof certification (the plastic plugs are only to aviod damage on shipping).

Feed in the bus cable through the gland *1*. The gland is suitable for cable diameters of 6 to 12 mm (0.24 to 0.47 in). Observe the tightness of the cable entry.

Make the electrical connection of the input line at the screw terminals *3*, whereby with Fieldbus devices no polarity has to be observed. The terminals are suitable for wire cross- sections of 0.3 to 2.5 mm^2 (22 -14 AWG).

For devices with communication: The shield of the bus connection is
– with conductive cable glands (recommended) directly connected with the housing
– with non-conductive cable glands to be placed onto the inner screw terminal *4*.

Note: When connecting shielded cable connect the cable shield on both sides!
(at the positioner as well as on the system side).
For selection of cable, see recommendation for cable types acc. to IEC 1158-2.
For connection to a local ground the internal and external ground terminal *4* can be used.

2

*! — Loosen protection screw first, to open the cover and access the electrical connection compartment.

This screw also unlocks the cover for the electronic compartment.

#2 — Earth connection in electrical connection compartment

Additional i/o

11 12
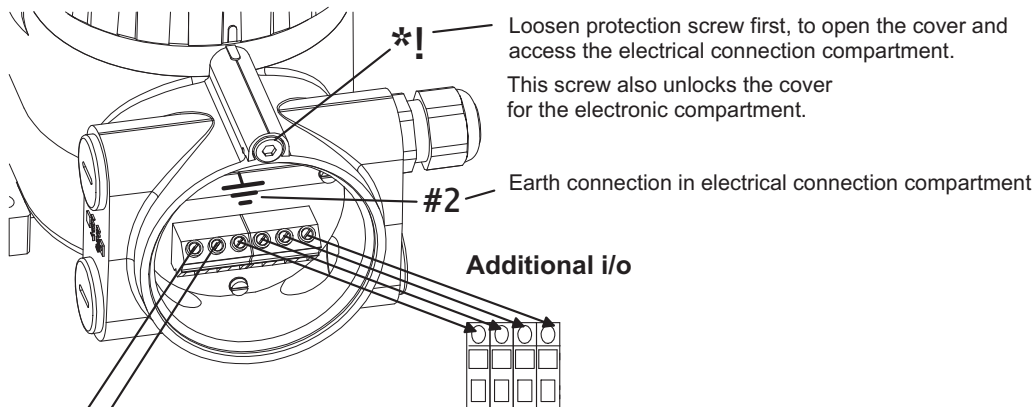
Setpoint

For SRD960-xH (HART),
SRD960-xD (intelligent w/o comm.),
SRD960-xA (Analog)

11 12
+ –
+ / \ –
Input 4 to 20 mA

For SRD960-xF (FoxCom digital)

11 12
+ –
+ / \ –
Supply voltage ... DC 13 to 36 V [1]

For SRD960-xP (PROFIBUS-PA)
and SRD960-xQ (FOUNDATION F. H1)

11 12
/ \
Bus connection acc. to IEC 1158-2
Supply voltage DC 9 to 32 V [1]

Mech. Limit Switch (SRD960-xxV)

41 42 51 52
R_L
Two micro switches, AC/DC, external supply and external fuses

Two binary outputs (SRD960-xxP)

81 82 83 84
+ – + –
Two-wire system, acc. to DIN 19234
Supply voltage: DC 8 to 36 V [1]

switching amplifier*   switching amplifier*
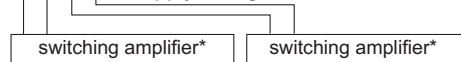
Two binary inputs (SRD960-xxB)

13 14 15 16
+ – + –
Binary inputs with internal supply for connection of sensors or switches
(switch **closed** for a normal operation!)

Two binary in- / outputs (SRD960-xxE)

81 82 83 84
+ – + –
switching amplifier*
Each channel configurable as binary input or binary output, to be supplied externally

Inp. Outp. (Example for configuration)

Position feedback 4 to 20 mA and 1 Alarm (SRD960-xxQ)

81 82 31 32
+ – + –

switching amplifier with intrinsically safe control circuit   Analog output 4 to 20 mA Two-wire system, supply voltage DC 8 to 48 V [1]
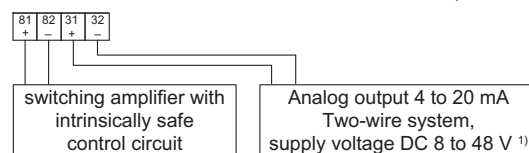
Inductive Limit Switch (SRD960-xxT or -xxU)

Two-wire proximity sensors acc. to DIN 19234 or NAMUR
Supply voltage: DC 8 V

41 42 51 52
+ – + –

switching amplifier*   switching amplifier*
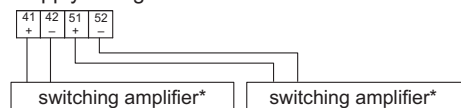
Three-wire proximity sensors **(SRD960-xxR)**

41 43 42 52
R_L
+   – supply

1) For intrinsically safe circuits please refer to certificate or data plate for max. operating voltages etc.
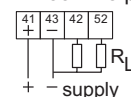
* with intrinsically safe control circuit

7 OPTIONS

7.1 "Limit switch"   item **2**

Rebuild to this option resp. exchange see page 52.

Switch functions
Feedback lever, feedback shaft and the control vanes
are all connected to each other, without an interme-
diate transmission. The control vanes are therefore
moving simultaneously with the same angle rate as
the feedback lever. The length of the control vane
corresponds with the swing angle of 120°.
Both control vanes are located on different planes.
Each control vane can be seen independently from
the other, because each has its own sensor (or micro-
switch).
By adjusting the screws **1** and **2**, the control vanes
can be adjusted relatively to the angle rate, so that
e.g. one vane dives into and another comes out of the
sensor.

Testing of switch behaviour
Voltage measuring above the terminals (see page 22):
vane inserted: approx. 4 V
vane free: approx. 7 V
(if Ri of external supply is approx. 1 kOhm)
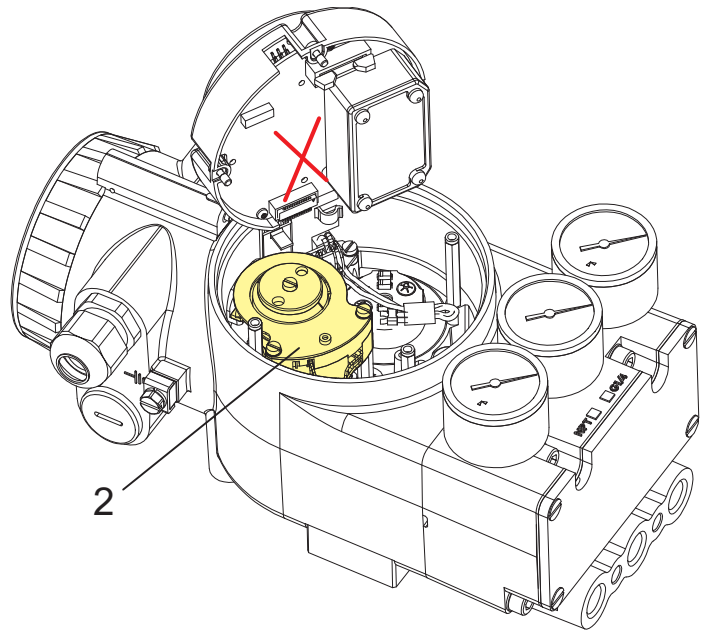
Setting limit switch trigger points
First loosen screw **S** until disc **D** is no longer blocked by
bolt **B**. Then turn disc by 90°, until set screws **1** and **2** are
accessible.
Set trigger point switch GW1:
     Turn screw **1** at mark (•), until desired switch behavior
     is reached.
Set trigger point switch GW2:
     Turn screw **2** at mark (• •), until desired switch
     behavior is reached.

To fix switch points, turn disc again by 90° until the bolt
catches, then fasten tight the center screw **S**.

> Do not touch control vanes during operation,
> danger of injuries!
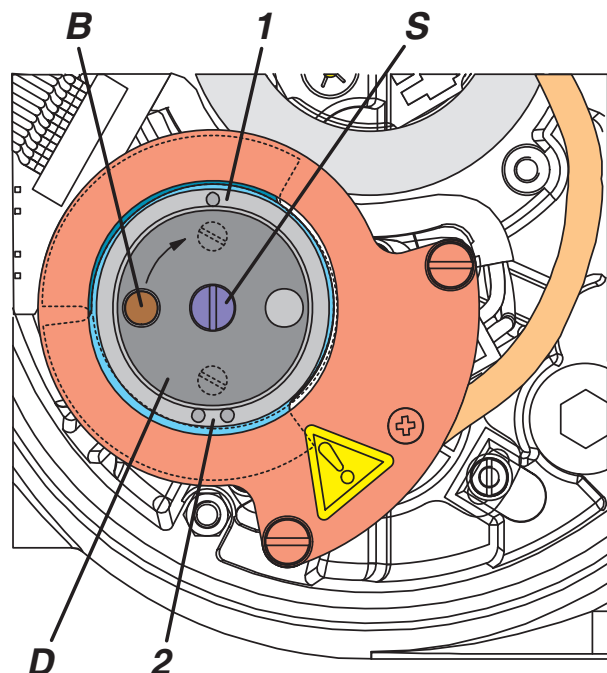
7.2 "Additional Inputs / Outputs"

All SRD versions are prepared for a subsequent conversion to this option, if not already installed at the factory. Installation of options, see from page 49 forward.

Code Q "Position feedback and alarm"   item 1

The **analog** output for **position feedback** indicates the valve position 0 to 100 % as current signal 4 to 20 mA [1]. Signal range 3.8 to 20.5 mA, at fault approx. 0.5 mA.

The **binary** output for **Alarm** will be activated in the following cases (see Messages, page 55):

• Calibration error
  (for example, due to break-up of calibration) Message 3
• Output outside of limits determined during Autostart
   (Check mounting of feedback lever) Message 5
• Circuit to potentiometer is disturbed
   (cable plugged?) Message 5
• Circuit to IP module is disturbed
   cable plugged?) Message 6
• No actuator movement; Message 7
• Remaining control deviation (packing is too tight?)
   Message 11

Signal range: 1 mA resp. 4 to 6 mA, at fault < 50 A.

During disturbance of the electronics of the SRD the Watchdog circuit is activated. The binary output for alarm signalizes this as "cable failure". Installation see page 51.

Code P "Two binary outputs"   item 1

Both binary outputs AB1 resp. AB2 switch to high current as soon as the valve position is below resp. exceeds the associated limit value. If the binary outputs AB1 resp. AB2 are to be inverted (higher current no alarm, lower current alarm), the association upper/ lower alarm has to be exchanged, see DTM.
Signal range 1 mA resp. 5 to 6 mA, at fault < 50 µA.
Installation see page 51.

Code B "Binary inputs"   item 1

The binary inputs EB1 and EB2 for two external switches resp. sensors initiate the following actions: [2]

EB1	EB2	Action [2]
closed	closed	IN SERVICE
open	closed	Position to be operated full power to 0%
closed	open	Position to be operated full power to 100 %
open	open	Hold last value

An input not used is to be short-circuited (wire bridge between + and –).

Attention: Even if opening limit or closing limit are set: these actions are superimposed, and the actuator moves to 0% resp. 100 %.
Installation see page 51.

By DTM, the two input channels are configured also so that, for example, they can trigger a PST Start or can set a status bit for communication purposes.
See also instructions on the DTM screen.

Code E "Binary In- / Outputs"   item 1

By DTM, each of both channels can be individually configured as input or output for binary signals.
Configured as input, applies the same behavior as described above in "Code B ".
    Configured as output, there can be selected:
•   Signal Level (NAMUR or binary 0 / 40 mA)
•   logic active high or active low current
•   Enable the output due to events
•   (PST result, alarms, etc.; extensive selection list
     see DTM screen.)
Installation see page 51.

7.3   Option "Premium Diagnostic"   item 3

With pressure sensors for monitoring of supply air, Y1 and Y2 via communication, also for PST.
Installation see page 50.

---

1)   The direction of action of the position response message is set:
     valve position 0% = 4 mA; valve position 100% = 20 mA
2)   Factory setting. Via communication actions may be turned off or used
     otherwise. EB1 and EB2 can thus also be used as diagnostics inputs.
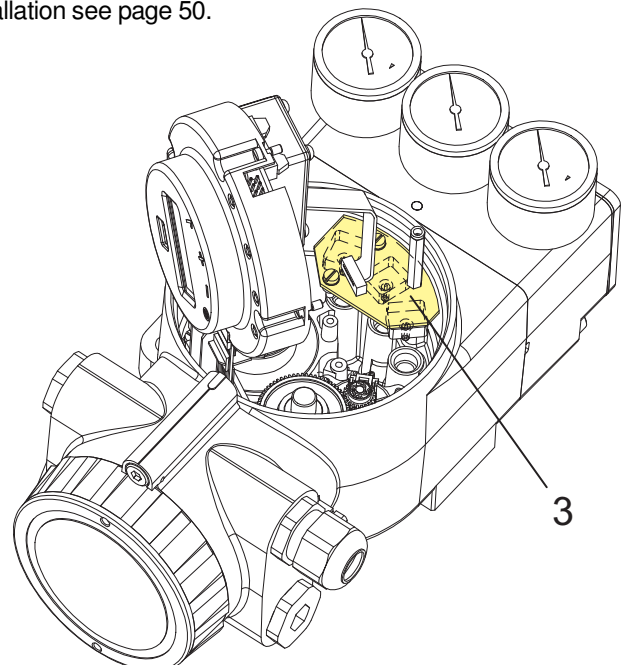
8 START-UP

8.1 General

First of all, the nameplate should be checked, especially with respect to indications referring to Ex / non- Ex, input signal, communication, output signal, single / double acting, additional inputs / outputs.

Before starting the positioner the SRD has to be mounted to the actuator; a corresponding input signal must be adjacent and air supply must be connected. The supply air connection must have sufficient capacity and pressure of 1.4 to 6 bar (20 to 90 psig) and should not exceed the maximum operating pressure of the actuator.
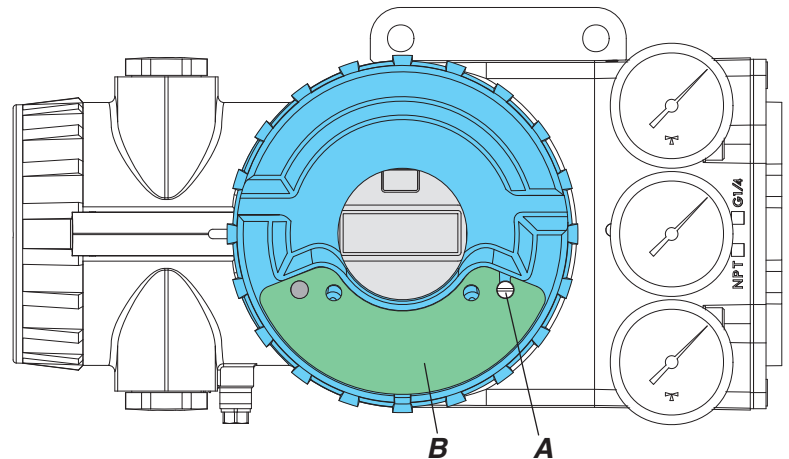
> **Attention:** Configuration using local keys or the communication interface may interfere with operation of the actual process! During configuration it is recommended that there is no flow through the valve.

For **first start-up** see next page.

Key Cover (optional)
After loosening of screw **A**, the cover **B** can be turned aside and the 4 local keys are accessible.

MENU   DOWN   UP   ENTER
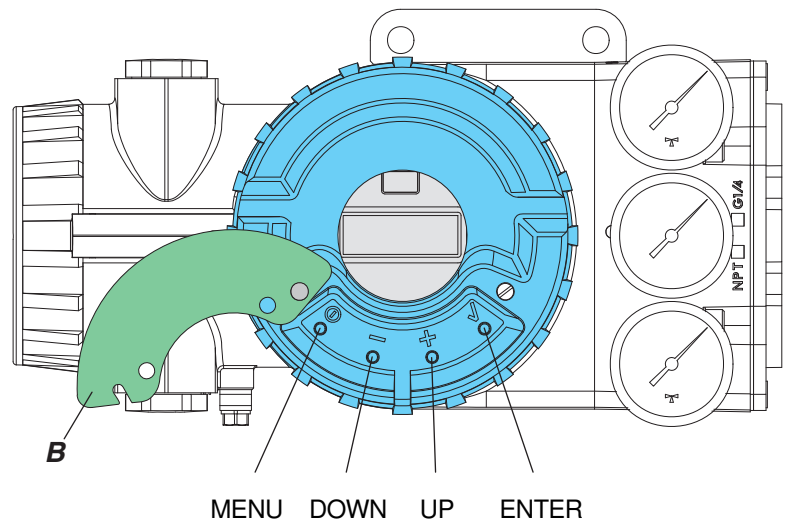
Setting by means of local keys
The SRD960 can be adjusted by means of local keys (accessible from the outside). The keys have the following function:
- (◖)   start menu / end menu
- (–)   counting down of menu or parameter numbers
- (+)   counting up of menu or parameter numbers
- (✓)   confirm at start, or
          when entering, storing, or verifying
- **(◖) (–) (+) simultaneously**:
          Reset = new start of SRD, thereafter initialization

Indication with LCD
In true text:

```
SRD Main Menue
1  Mounting
2  Autostart
3  Valve Action
```

> If there is no response using the local key pad (message 1 appears, see page 55) make sure that the Write Protection is not set! Remove the write protection using the FDT/DTM configuration software.

> **Attention:** Do not touch behind the positioner housing while operating the keys!
> DANGER OF INJURIES!

8.2 OPERATION

After Power ON

INIT: After power on of the input signal, or after reset, the SRD initializes, and the various components of the electronics are checked and started. (The stored data of the positioner is of course not affected, and remains unchanged)..
The current status is stated on the LCD in clear text (see page 54).
Initialization after positioner start-up takes approx. 3 s, then the SRD goes
• into operation (Autostart has already been done) or
• to configuration, Menu 1 (with LCD the text language is selected before (changing e.g. to other language) ...

```
9.9 Menu Lang
9.9.1 English
9.9.2 Deutsch
9.9.3 (Francais)
```

Select with keys
(+) or (–)
and confirm with (✓)

… and the display orientation is selected …

```
9.10 LCD Orient
9.10.1 Normal
9.10.2 Flipped
```

... then automatically continued to configuration:

```
SRD Main Menue
1  Mounting
2  Autostart
3  Valve Action
```

Configuration

MENU: The various specifications for configuration are arranged in menus:

1	Actuator system, mounting side
2	Autostart, Short Autostart
3	Valve function
4	Characteristic of setpoint
5	Limits and Alarms
6	Parameter for position controller
7	Manual setting of pneumatic output
8	Manual setting of valve position
9	Calibration functions for workshop
10	PROFIBUS-PA: Bus Address FOUNDATION F.: Simulate

Details of Menus and Parameters see following pages.

In Operation

After accomplished autostart, the SRD goes automatically IN OPERATION. (Additional parameters can of course be configured through pressing of menu key (❶).

On the LCD display the process variable is indicated.

```
87.5 %
Valve Position
```

Through pressing of keys (+) or (–), additional information can be retrieved from the SRD:

```
Travel position
 Input current
Digital setpoint
 Stem setpoint
 Input pressure
Output pressure1
Output pressure2
 Input pressure
  Temperature
   Travel sum
  Valve cycles
   SRD Version
```
(Certain data is available only with the corresponding options.)

Manual Operation
Through twice pressing of key (✓), the SRD goes into manual operation mode, where the valve position can be set manually. Exit menu by pressing twice key (❶).

Diagnostics during Operation
If the diagnostics determines an occurrence, this is indicated in the bottom line:

```
87.5 %
Valve position
Ctrl diff error
```

MESSAGE: The SRD recognises an occurrence which the user must eliminate by taking suitable steps in order to continue with operation. This can be e.g. a wrong configuration or missing supply air. With key (+) additional information can be retrieved.

ERROR: During self-test, the SRD recognised an error and is no longer operable, see page 54.

Operation with local keys
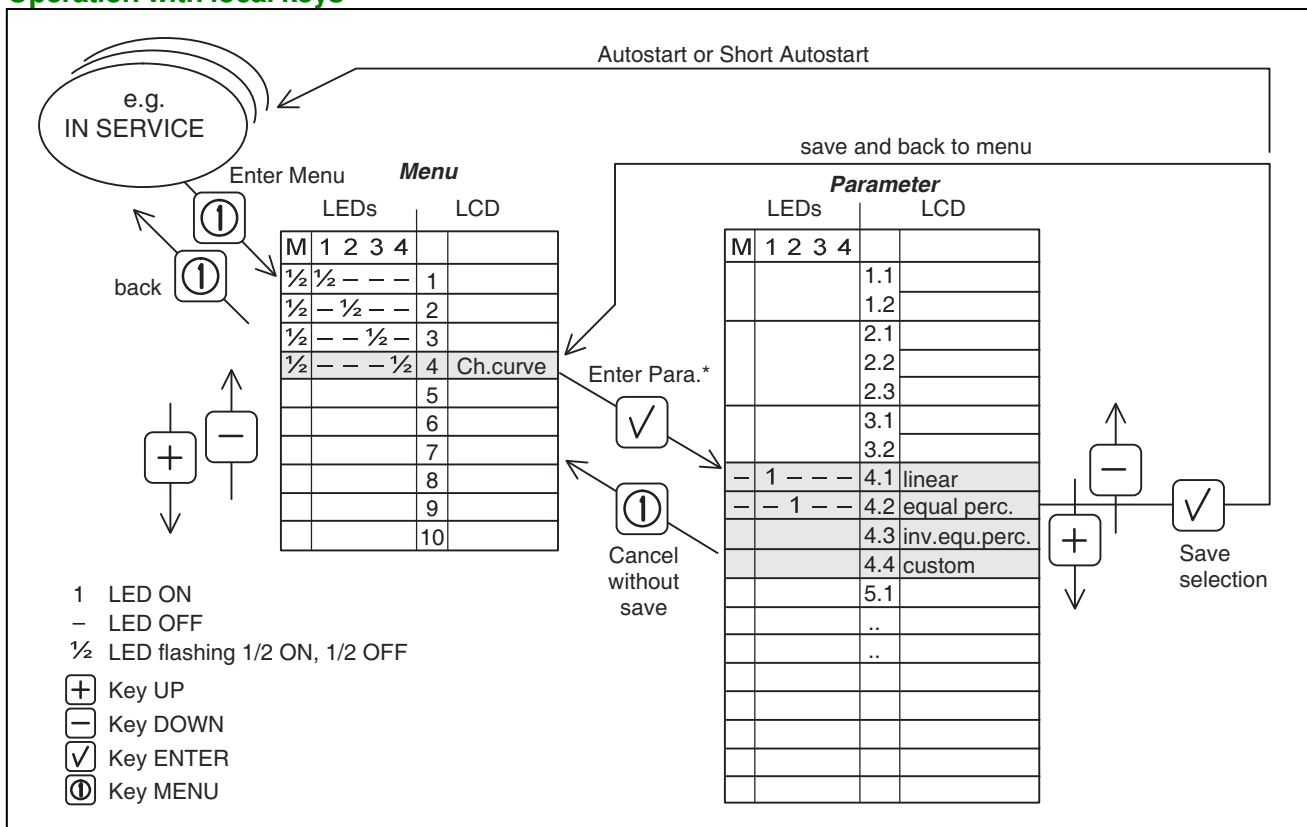
- Enter the **Menu** mode by pressing the (❶) key, and Menu 1 appears (see also page 28).
- Select the desired Menu item by pressing (+) or (–) key, see table. Each press of the key moves one menu item forward (or back).
- Pressing the (✓) key confirms the selected menu item and enters the **Parameter** change mode for the selected menu item.
  To set a parameter see table **Parameter** on next page.
- Leave **Menu** mode by pressing (❶) key again.
  If device remains in menu mode it still is OUT OF SERVICE and AUTOSTART has to be initiated.
  If the instrument is IN OPERATION, the display with the valve position appears.
  If a menu was selected and no further keys are pressed thereafter, the SRD switches automatically back to operation after some minutes.

MENU STRUCTURE FOR SRD991 / SRD960

SRD Main Menu

Menu	Factory configuration	Description
		06.17
1 Mounting		
1.1 Stroke left	✓	Linear actuator, left-hand or direct mounting
1.2 Stroke right		Linear actuator, right-hand mounting
1.3 Rot cclockw		Rotary actuator, opening counter-clockwise
1.4 Rot clockw		Rotary actuator, opening clockwise
1.5 Linear Pot.		For Top Mounting (only for SRD991)
2 Autostart		
2.1 Endpoints		Adaptation of the mechanical stops only
2.2 Standard		Autostart recommended for standard application
2.3 Enhanced		Enh. Autostart. Optimized control behaviour compared to Standard Autostart
2.4 Smooth Resp.		Enh. Autostart. Damped control behaviour for e.g. smaller actuators
2.5 Fast Resp.		Enh. Autostart. Undamped control behaviour for e.g. larger actuators
3 Valve Action		
3.1 SRD		Action of Positioner:
3.1.1 Direct	✓	Valve opens with increasing setpoint value
3.1.2 Reverse		Valve closes with increasing setpoint value
3.2 Feedback		Action of Feedback Unit:
3.2.1 Direct	✓	Increasing Current with increasing valve position
3.2.2 Reverse		Decreasing Current with increasing valve position
3.3 Accessories		
3.3.1 None		No accessories mounted
3.3.2 Booster		Booster mounted
4 Character		
4.1 Linear	✓	Linear characteristic
4.2 Eq Perc 1:50		Equal percentage characteristic 1:50
4.3 Quick open		Inverse equal percentage characteristic 1:50 (quick opening)
4.4 Customer		Custom characteristic (Configuration via DTM)
5 Limits/alarms		*(Not locally available with LED versions of communication FF and Profibus)*
5.1 Lower limit	0 %	Closing limit is set to input value
5.2 Cutoff low	1 %	0%-tight sealing point is set to input value
5.3 Cutoff high	100 %	100%-tight sealing point is set to input value
5.4 Upper limit	100 %	Opening limit is set to input value
5.5 Splitr 0 %	4 mA	Split range 0 %: input value corresponds to 0 %
5.6 Splitr 100 %	20 mA	Split range 100 %: input value corresponds to 100 %
5.7 Lower Alarm	-10 %	Lower position alarm on output 1 is set to input value
5.8 Upper Alarm	110 %	Upper position alarm on output 2 is set to input value
5.9 Valve 0 %	4 mA	Configuration of rated-stroke of 0 % at 4 mA
5.10 Valve 100 %	20 mA	Configuration of rated-stroke of 100 % at 20 mA
5.11 Valve corr.		Tuning of position for mounting adaption
5.12 Stroke	x° / 20 mm	Configuration of nominal travel
5.13 Units	SI	Configuration of temperature and pressure unit SI or Anglo US
6 Parameters		
6.1 Gain closing	15	P: Proportional gain for 'close valve'
6.2 Gain opening	2	P: Proportional gain for 'open valve'
6.3 Res time cl	7.5	I : Integration time for 'close valve'
6.4 Res time op	2.7	I : Integration time for 'open valve'
6.5 Rate time cl	0.0	D: Derivative time for 'close valve'
6.6 Rate time op	0.0	D: Derivative time for 'open valve'
6.7 Trav time cl	0.35	Positioning time for 'close valve'
6.8 Trav time op	0.35	Positioning time for 'open valve'
6.9 Control gap	0.1	Permitted dead band for control difference
6.10 Fine tuning		Fine tuning of control for booster applications

7 Output		Manual setting of IP Module for testing of pneumatic output
8 Setpoint		*Manual setting of valve position*
8.1 12.5 % Steps		Setpoint changes of 12.5 % steps by using push buttons Up or Down
8.2 1 % Steps		Setpoint changes of 1 % steps by using push buttons Up or Down
8.3 0.1 % Steps		Setpoint changes of 0.1 % steps by using push buttons Up or Down
8.4 Do PST		Start the Partial Stroke Test
9 Workbench		
9.1 Reset Config		Resetting of configuration to setting "ex factory"
9.2 Calib. 4 mA		Calibrate input current to 4 mA
9.3 Calib. 20 mA		Calibrate input current to 20 mA
9.4 Calib. –45°		Calibrate position measuring value to –45°
9.5 Calib. +45°		Calibrate position measuring value to +45°
9.6 Reset all 1		Resetting of configuration and Calibration (!) to "ex factory" setting for **single-acting** output
9.7 Reset all 2		Resetting of configuration and Calibration (!) to "ex factory" setting for **double-acting** output
9.8 Go Online		Setting position into mode Online (Service function only)
9.9 Menu Lang		Language on LCD:
9.9.1 English	✓	Standard English
9.9.2 Deutsch		Standard German
9.9.3 Français		Preselected / freely definable
9.10 LCD orient		LCD Orientation:
9.10.1 Normal	✓	Normal orientation of writing on LCD
9.10.2 Flipped		Reverse orientation of writing on LCD
10 Profibus PA - Bus Address		*Profibus only.*
10.1 Address LSB		Ratio from Dec. 0 / Hex 00 to Dec. 15 / Hex 0F
10.2 Address MSB		Ration from Dec. 0 / Hex 00 to Dec. 112 / Hex 70
10.3 Address	126	Display of Bus Address from Dec. 1 to 127 (Hex 00 to 7F)
10 FOUNDATION Fieldbus H1		*FF only.*
10.1 Simulate		
Disabled	✓	Simulate disabled
Enabled		Simulate enabled
10.2 Profile		
Link Master		Link Master active
Basic field dev	✓	Link Master de-activated
10.3 Address	248	Bus Address, change by using push buttons Up or Down

Additional Parameters

The following parameters are accessible via communication only:

Parameter	ex factory
Control difference limit value	5 %
Control difference response time	1 min
Sealing hysteresis	0.5 %
Failsafe-Aktion	OFF
Power-up action	IN SERVICE
Parameter write protection	OFF
Alarm limit for total strokes	90 Mio.
Alarm limit for total cycles	90 Mio.
Dead band for valve cycles	1 %
Set value source: Model Code xFxx	digital
Set value source: all others	analog
Upper pre-alarm	100 %
Lower pre-alarm	0 %
Hysteresis for position alarms	0.5 %

Complete parameter list see FDT/DTM Software.

8.3 Configuration of 0 and 100%

Valid for single and double acting
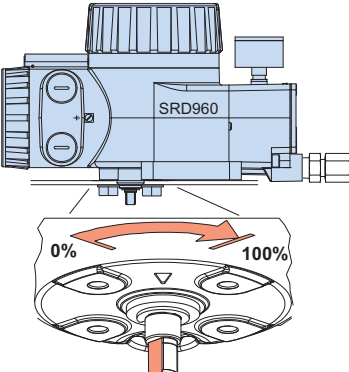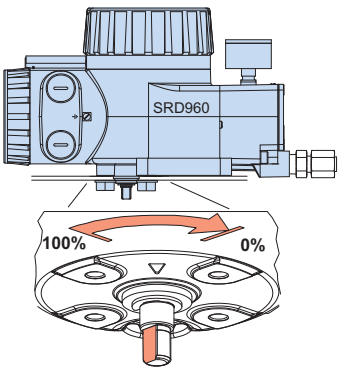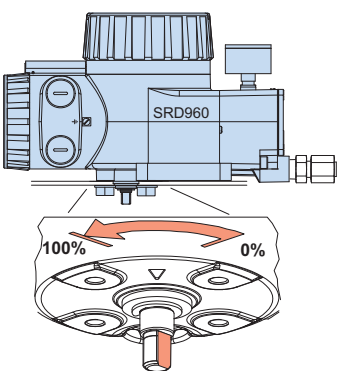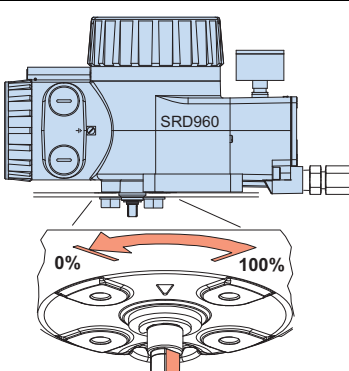
Configuration requested						
	MENU 1: "Mounting"				MENU 3: "Valve Action"	
	1.1	1.2	1.3	1.4	3.1	3.2

Configuration of 0 % and 100 %	Input Signal	Linear Left	Linear Right	Rot cclockw	Rot clockwise	Direct	Reverse
	4 mA = 0% 20 mA = 100%	✔				✔	
	4 mA = 100% 20 mA = 0%	✔					✔
	4 mA = 0% 20 mA = 100%		✔			✔	
	4 mA = 100% 20 mA = 0%		✔				✔
	4 mA = 0% 20 mA = 100%		✔			✔	
	4 mA = 100% 20 mA = 0%		✔				✔
	4 mA = 0% 20 mA = 100%	✔				✔	
	4 mA = 100% 20 mA = 0%	✔					✔

Configuration of 0 and 100%   (continued)

Valid for single and double acting

Configuration of 0 % and 100 %	Input signal	Linear Left	Linear Right	Rot cclockw	Rot clockwise	Direct	Reverse
		MENU 1: "Mounting"				**MENU 3: "Valve Action"**	
		1.1	1.2	1.3	1.4	3.1	3.2
	4 mA= 0% 20 mA = 100%			✓		✓	
	4 mA = 100% 20 mA = 0%			✓			✓
	4 mA= 0% 20 mA = 100%				✓	✓	
	4 mA = 100% 20 mA = 0%				✓		✓
	4 mA= 0% 20 mA = 100%				✓	✓	
	4 mA = 100% 20 mA = 0%				✓		✓
	4 mA= 0% 20 mA = 100%			✓		✓	
	4 mA = 100% 20 mA = 0%			✓			✓

8.4 Description of menus

Because of optimised local operation, for configuration neither PC nor control system is required.

> In case operation via local keys is not possible check if write protection is set.
> Change via FDT/DTM software.

Menu 1: Actuator system, Mounting side

⚠ **WARNING**

To avoid any personal injury or property damage from sudden or fast movement, during configuration:
Do not put your finger or other part at any time inside the valve or in any moving part of the actuator. Do not put your finger or other part at any time in the feedback lever mechanism. Do not touch the rear part of the positioner at any time.

```
SRD Main Menue
1  Mounting
2  Autostart
3  Valve Action
```

Confirm with key (✓)

For an optimal actuator adaptation, the SRD has to be configured whether it is a rotary or a linear actuator.

The positioner of the **rotary** actuator can work directly with the linear position sensor value. In case of a **stroke** actuator an error tan( ) arises due to the angle of the resulting in 1% non-linearity at travel of 30°. The SRD corrects the travel via the tan function and thus avoid bigger linearity errors.

The rotation direction of the adapter shaft for the tap changes depending on the mounting side of the stroke actuator. "Valve closed" in one case means "Valve open" in another one.

There are rotary actuator types opening in the counter clockwise direction and others opening in the clockwise direction. This also has to be signaled to the SRD so that 0% "Valve closed" and 100% "Valve open" are correctly assigned.

```
1  Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw
```

(Further with (+) key:)

For stroke actuators mounted <u>left</u> of the spindle resp. directly mounted.

```
1  Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw
```

For stroke actuators mounted <u>right</u> of the spindle.

```
1  Mounting
1.1 Lin left
1.2 Lin right
1.3 Rot cclockw
```

For rotary actuators opening the valve during counter clockwise (left) rotation.

```
1  Mounting
1.2 Lin right
1.3 Rot cclockw
1.4 Rot clockw
```

For rotary actuators opening the valve during clockwise (right) rotation.

Menu 2: Autostart

```
SRD Main Menue
1  Mounting
2  Autostart
3  Valve Action
```

Selection between different Autostart modes
(change with key (+) or (–)):
Autostart:
To automatically adapt the positioner to the valve. Geometric data of the actuator is determined and optimally assigned to control parameters. If the "Standard" Autostart does not result in stable regulation, another Autostart mode - depending upon actuator - should be selected. At **initial start-up**, an Autostart should always be performed.

Attention: Autostart overwrites previous control parameters!

```
2  Autostart
2.1 Endpoints
2.2 Standard
2.3 Enhanced
```
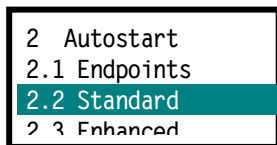
2.1 Ready for "**End points**" Autostart
Serves for automatic adjustment of the SRD to the mechanical end points.
With key (+) or (–) to other Autostart modes

2.2 Ready for "**Standard**" Autostart:

2.3 Ready for **"Enhanced"** Autostart
To the optimization of the controller parameters in relation to standard mode.

```
2  Autostart
2.3 Enhanced
2.4 Smooth resp
2.5 Fast resp
```

2.4 Ready for **"Smooth response"** Autostart:
Extended, damped controller parameters for e.g. smaller drives

2.5 Ready for **"Fast response"** Autostart:
Extended, undamped controller parameters for e.g. larger drives

```
2   Autostart
SRD960 Vers.xx

Get end points
```
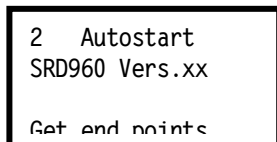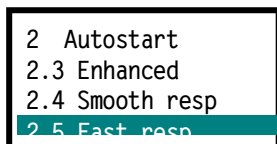
After selection and <u>start</u> (by pressing the (✔) key) the function
taking several minutes can be followed at LCD indicator.
Duration on a valve position can take some time depending on actuator volume, air supply, pressure, etc.

```
2   Autostart
SRD960 Vers.xx

Get motor gain
```
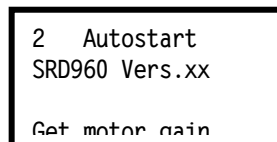
Moving direction, mechanical starting and ending positions are determined by one or several passages of valve position range.
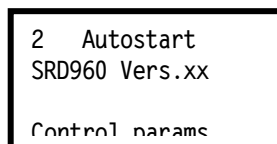
Ramps are entered and control system parameter is determined (ratio position/valve size).

```
2   Autostart
SRD960 Vers.xx

Control params
```
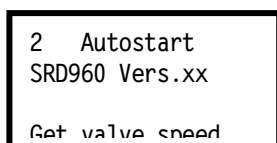
Jumps are entered for determination of control parameters.

Determination of positioning speeds.

```
2   Autostart
SRD960 Vers.xx

Get valve speed
```

Determined values are saved; previous values are superscribed. The SRD is IN SERVICE again with the detected new parameters.

Menu 3: Mode of Action of SRD (and additional Position Feedback)

```
SRD Main Menue
1  Mounting
2  Autostart
3  Valve Action
```
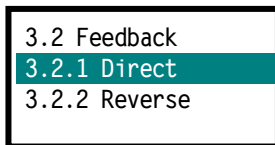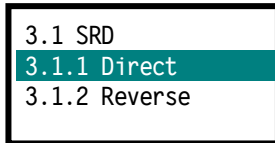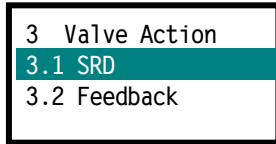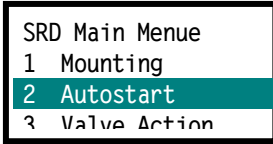
Function of the positioner is set:
It will set the mode of action of the positioner and the optionally present feedback. Without the card "position feedback", the menu item "Feedback" is not displayed.

```
3  Valve Action
3.1 SRD
3.2 Feedback
```

3.1 Select "SRD":

```
3.1 SRD
3.1.1 Direct
3.1.2 Reverse
```

3.1.1 "Normal" if increasing input signal is to initiate increasing output signal.
3.1.2 "Reverse" if increasing input signal is to initiate decreasing output signal.

```
3  Valve Action
3.1 SRD
3.2 Feedback
```

3.2 Select "Feedback": (if present)

```
3.2 Feedback
3.2.1 Direct
3.2.2 Reverse
```

3.2.1 "Normal" for increasing current with increasing valve position.
3.2.2 "Reverse" for decreasing current with increasing valve position.

Menu 4: Characteristic of setpoint

```
SRD Main Menue
2  Autostart
3  Valve Action
4  Character
```
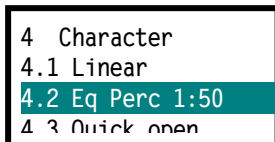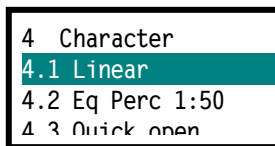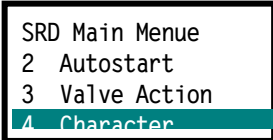
A relationship between the input signal and valve position is set.

```
4  Character
4.1 Linear
4.2 Eq Perc 1:50
4.3 Quick open
```

4.1 "Linear". See Fig. 4.1

4.2 "Equal percentage": Results in an equal percentage characteristic line with a position ratio of 1:50 for a valve of linear characteristic. See Fig. 4.2

```
4  Character
4.1 Linear
4.2 Eq Perc 1:50
4.3 Quick open
```

4.3 "Quick open" (Inverse equal percentage)": Results in an inversely equal percentage characteristic line with a position ratio of 50:1 for a valve of linear characteristic. See Fig. 4.3
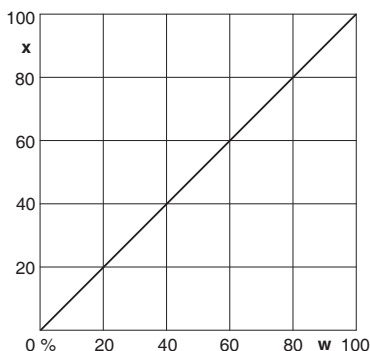
Fig. 4.1
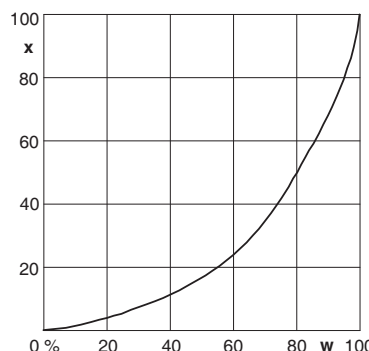
Fig. 4.2
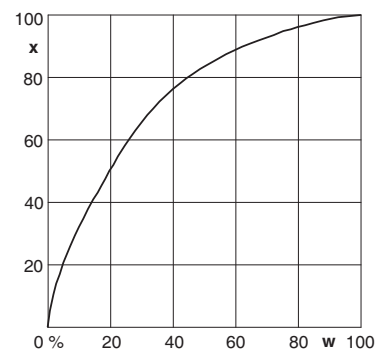
Fig. 4.3

```
4  Valve Char.
4.2 Eq Perc 1:50
4.3 Quick open
4.4 Customer
```

"User defined characteristic".
A characteristic line entered via communication (not via local keys) with 2 to 22 supporting points is activated. A linear characteristic is factory set.
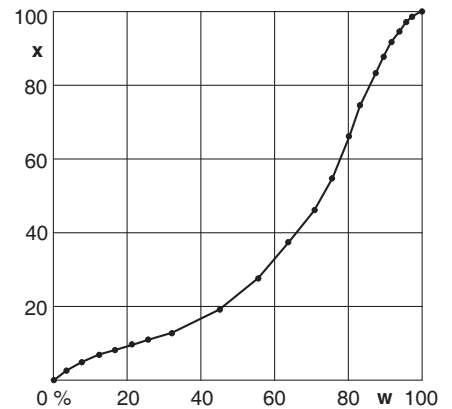
Menu 5: Limit and Alarms of valve

```
SRD Main Menue
3 Valve Action
4 Valve Char.
5 Limits/Alarms
```

Note:
The values can be adjusted stepwise locally in "clear text" with keys (+) and (–).
With versions with HART or "without communication", the corresponding current of the valve is rated via analog output and entered with key (✔).
With versions fieldbus, the values can be entered only via communication. With versions with communication, the values can be configured also with corresponding software.
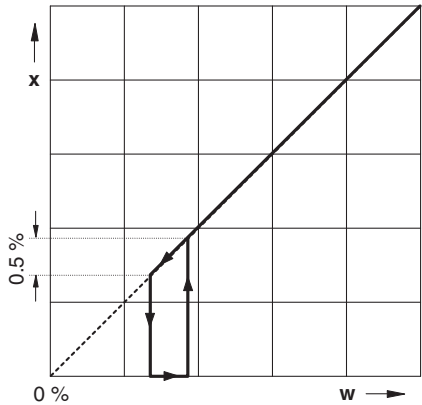
Sealing tightly, linear characteristic line
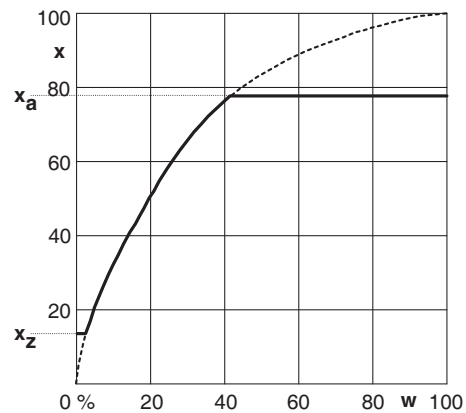
Sealing tightly, inversely equal percentage
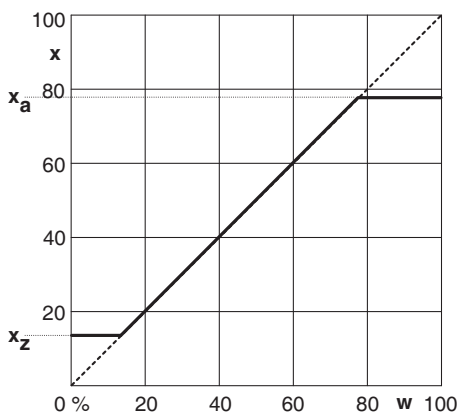
Opening limit x_a, Closing limit x_z,
linear characteristic
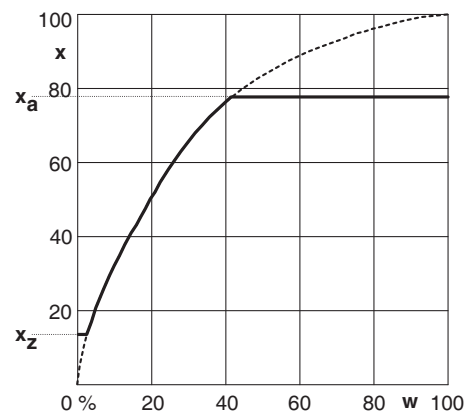
Opening limit x_a, Closing limit x_z,
inversely equal percentage characteristic

```
5  Limits/Alarms
5.1 Lower limit
5.2 Cutoff low
5.3 Cutoff high
```

```
5.1 Lower Limit

     2.0 %
```

5.1 Setting Lower limit ("closing limit")

The positioner provides that IN SERVICE the valve position does not close any further than defined by the closing limit. If the setpoint value is lower than this limit, message 12 (see page 55) is produced.

By pressing of keys (+) or (–), the value is adjusted and with key (✓) confirmed.
The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.

Example: Lower limit is set to 2 %.

```
5  Limits/Alarms
5.1 Lower limit
5.2 Cutoff low
5.3 Cutoff high
```

```
5.2 Cutoff low

     3.0 %
```

5.2 Setting Cutoff low ("0 % seal-tight point")

If a 0% seal-tight point is given, in case the setpoint is deviated lower (e.g. 3 %), the SRD provides the pneumatic output to press the valve into its seat with full force in order to tightly seal valve.
As soon as the command value is 0.5%* higher than this seal-tight value, the position again follows the command value.

* This ist the "Seal-tight hysteresis" factory set at 0.5%. The value may be changed via communication.

```
5  Limits/Alarms
5.1 Lower limit
5.2 Cutoff low
5.3 Cutoff high
```

```
5.3 Cutoff high

     97.0 %
```

5.3 Setting Cutoff high ("100 % seal-tight point")

If a 100% seal-tight point is pre-set and in case a certain set value is exceeded (e.g. 97 %), the SRD provides that the pneumatic output presses the valve 100 % into its seat with full force.
This function makes sense for 3-way valves.
Also both seal-tight points can be used in order to tightly close the respective shut-off path during partial operation.

By pressing of keys (+) or (–), the value is adjusted and with key (✓) confirmed.
The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.
Example: Cutoff high is set to 97 %.

```
5  Limits/Alarms
5.2 Cutoff low
5.3 Cutoff high
5.4 Upper limit
```

5.4 Setting Upper limit ("opening limit")

The SRD provides that IN SERVICE the valve position does not open any further than defined by the opening limit. If the set value is exceeded, message 13 (see page 56) is produced.

Definitions

Stroke, stroke range of the membrane actuator is defined for rotary actuator as **angle, angle rang**e.

0 % position	is the mechanical impact at actually closed valve (caution if using handwheel and mechanically adjustable stroke limitation!)
100 % position	is the mechanical impact at actually open valve.
Closing limit	is a lower limit set via software. In normal operation the valve will not close more than set here. Attention: In the event of failure of the auxiliary energy no controlling is possible, therefore the springs in the actuator will move the valve into safety position (for single-acting actuator).
Opening limit	is a upper limit set via software. In normal operation the valve will not close more than set here. Attention: In the event of failure of the auxiliary energy no controlling is possible, therefore the springs in the actuator will move the valve into safety position (for single-acting actuator).
Normal operation	(= IN SERVICE) means that the position is controlled to the 4–20 mA input signal.

Split Range
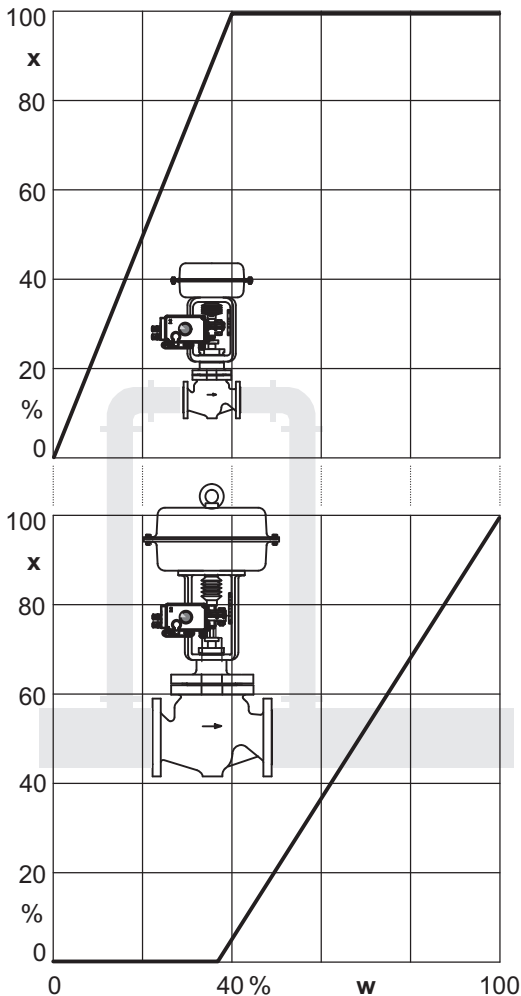
Split-Range, PV_Scale Splitting

Split Range is useful if an additional control range is demanded which cannot be covered by one valve only. A valve of smaller nominal size can be applied overtaking the smallest quantities; a parallel mounted valve of bigger nominal size takes on the larger quantities.

With conventional positioners, this function is realized through serial connection of the instruments and allocation of individual regulating ranges (see drawing). With SRD with analoge setpoint value (version HART or "without communication"), this can be adjusted with menus 5.5 and 5.6.

The other versions of the SRD receive the set value via digital means; the input data signal cannot be splited. The function can be realized either in the primary control system, in which setpoint values are calculated for each valve, or via the variables PV_SCALE. With PV_Scale the digital input setpoint value can be assigned to the valve span.

Example: At low current, only the smaller valve positions; from approx. 40 % the large valve is added

**SRD960 with HART or
        "Without Communication"**

(With the other versions of the SRD, these menus cannot be selected.)

```
5  Limits/Alarms
5.4 Upper limit
5.5 Splitr  0 %
5.6 Splitr 100 %
```
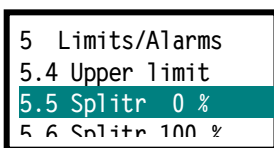
5.5 Split Range 0 %
By pressing of keys (+) or (–) the value is adjusted and confirmed with key (✔).

```
5  Limits/Alarms
5.4 Upper limit
5.5 Splitr  0 %
5.6 Splitr 100 %
```
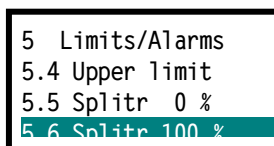
5.6 Split Range 100 %
By pressing of keys (+) or (–) the value is adjusted and confirmed with key (✔).

The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.

```
5.6 Splitr 100 %

     10.4 mA
```
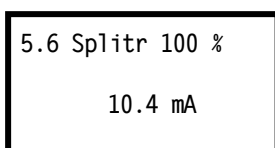
Example: An input current of 10.4 mA has to correspond to a valve position of 100 %.

```
5  Limits/Alarms
5.6 Splitr 100 %
5.7 Lower Alarm
5 8 Unner Alarm
```

```
5  Limits/Alarms
5.6 Splitr 100 %
5.7 Lower Alarm
5 8 Unner Alarm
```

```
5.8 Upper Alarm

     91.3 %
```

5.7 Setting Lower Alarm
When falling below the set value underneath the entered alarm limit, an alarm is activated. Message 12 is generated.
To switch off the alarm setting, enter the value –10%.

5.8 Setting Upper Alarm
When surpassing the set value above the entered alarm limit, an alarm is activated. Message 13 is generated.
To switch off the alarm setting, enter the value +110%.

By pressing of keys (+) or (–), the value is adjusted and with key (✓) confirmed.
The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.

Example: Upper Alarm set to 91.3 %.

5.9 Valve Limits (Not with versions FF/PB).
At Autostart the SRD determines the real limits of the actuator (which generally are a little larger then specified on the specification sheet). An actuator with 30 mm stroke, could display a real stroke of 33 mm. In order to produce a precise relationship between the input signal and the stroke, the tolerances of the actuator can be compensated with menus 5.9 and 5.10. At unchanged 0 %, the actuator could be moved until exactly 30 mm are reached. Through execution of function 5.10, the current position can be declared as 100 % and at a setpoint value of 50 %, the actuator will run exactly to 15 mm.
For new configuration of the strokes at 0% or 100%, the valve must be run in the corresponding position and then must be confirmed.

```
5  Limits/Alarms
5.9 Valve 0 %
5.10 Valve 100 %
5 11 Stroke
```

5.9 Setting Valve 0 %
The actual position of the actuator is declared as 0 %.

```
5  Limits/Alarms
5.9 Valve 0 %
5.10 Valve 100 %
5 11 Stroke
```

5.10 Setting Valve 100 %
The actual position of the actuator is declared as 100 %.

By pressing of keys (+) or (–), the value is adjusted and confirmed with key (✓).
The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.

Example: The actual valve position 98.4 % is to be counted as 100 %.

```
5.10 Valve 100 %

     98.4 %
     Confirm
```

```
5  Limits/Alarms
5.11 Valve corr.
5.12 Stroke
5.13 Units
```

5.11 Valve correction

Because of inaccuracies at mounting, it may be possible that at input value 50 % (= 12 mA) the stroke valve is not exactly at half of stroke, regarding scale at valve. To correct this, apply 12 mA and select this function. Move valve position to half of stroke by pressing of (+) or (–) keys, and confirm. End points of stroke and tan( ) values are automatically adapted and makes positioning even more precisely.

```
5  Limits/Alarms
5.11 Valve corr.
5.12 Stroke
5.13 Units
```

```
5.12 Stroke

       30.0 mm
   1 in = 25.4 mm
```

5.12 Setting Stroke with stroke actuators

The SRD measures with its feedback lever always only an angle and by means of its tangent function, a linear stroke of 0 to 100 % is calculated therefrom. In order to indicate a real stroke in mm, the full stroke at 100 % can be entered in this menu. The LCD will then indicate the actual position in mm (or inch).

By pressing of keys (+) or (–), the value is adjusted and confirmed with key (✓).
The keys have Autorepeat: By pressing and holding of a key (+) or (–), the value is counted upward, after some time in larger steps.

Example: Stroke range of valve is to be 30 mm.

```
5  Limits/Alarms
5.11 Valve corr.
5.12 Stroke
5.13 Units
```

5.13 Indication of Units

Selection of indication as SI units, or Anglo US (°C / °F) (mm / inch)

Menu 6: Parameter for Position controller

Along with the determination of the actuator geometry and control parameters the suitable setting parameters for the position controller are determined via function AUTOSTART in Menu 2. Assessment of a control behavior generally is very subjective. Partially a quick response is requested without consideration of the overshoot width, partially a very smooth swinging is requested with minor overshoot.

We basically recommend to first perform the execution of the automatic setting via AUTOSTART in Menu 2 in order to achieve a stable control behavior. Corrections may then be made from the determined values. In rare cases AUTOSTART cannot find the optimal setting for the respective application. See "Remarks for controller tuning" on next page.

```
SRD Main Menu
4   Valve Char.
5   Limits/Alarms
6   Parameters
```

Several control parameters are combined in Menu 6 each availing of a sub-menu. The values may be adjusted with (+) or (–) keys in each of these and by pressing of (✔) key be entered in the position controller as constant. Controller type is a PID controller.

```
6   Parameters
6.1 Gain closing
6.2 Gain opening
6.3 Res time cl
6.4 Res time op
6.5 Rate time cl
6.6 Rate time op
6.7 Trav time cl
6.8 Trav time op
6.9 Control gap
```

Parameter-Designation	Valve is opening	Valve is closing	Unit
Proportionate amplification Kp	Kp	Kp	-
Integration time constant	Tn	Tn	sec
Derivate time constant	Tv	Tv	sec
Positioning time	T63	T63	sec
Dead band for control diff.	GAP	GAP	% of span

6.9 The dead band prevents (at the expense of accuracy) that the valve in the controlled condition constantly moves around the setpoint. This reduces harm to the mechanical parts of the actuator and, in particular, the valve packing.

6.10 With boosters: If unsatisfactory behavior occurs with small setpoint jumps, the value can be increased successively from 0.0 to 0.1 or 0.2.

Remarks to Controller Tuning

If AUTOSTART does not find the optimum setting the following may be the result:

A) Slow response to setpoint, long positioning time or long neutral time

B) Continuous oscillation following setpoint jump

C) Wide and high overshoot

For the assessment of the control 12.5 % jumps in both directions may be performed in Menu 8. The valve dynamics may be observed at LCD or the mechanical indicator.

Prior to changing parameters for valve dynamics, a number of items are to be checked, see below. The pneumatic output can be operated directly without controller via Menu 7 and the valve movement may be assessed.

In case of behavior A) check:

1. Is the Proportionate gain P↑ (Menu 6.1) or P↓ (Menu 6.2) too small

   Remedy: Increase parameters.

2. Is the air pressure high enough to possibly overcome the actuator spring force and friction? Remedy: Increase air pressure.

3. Is the actuator volume high, possibly requiring an increased air capacity for fast valve movement? Remedy: Attach booster, see accessories, or spool valve option.

4. Was AUTOSTART performed in Menu 2 and did messages 8 resp. 9 occur (messages, see table page 56)? Remedy: "AUTOSTART" in Menu 2.

5. Has the parameter for the positioning time been set at a value too high? Remedy: decrease both parameters "T63" in Menu 6.7 and 6.8 .

6. Is valve packing too tight resulting in a very high friction?

7. Is the supply air filter blocked? Remedy - see page 48.

8. Has the supply air been contaminated by small oil drops, particulate or are pneumatic parts possibly blocked? Remedy: exchange pneumatic parts; possibly use a suitable air supply station.

Behaviors B) and C) check:

1. Is the air capacity possibly too high, e.g. through spool valve or booster? Remedy: Work, if necessary, without booster or use version without spool valve.

2. Has the air supply pressure been set too high? Remedy: reduce pressure, install pressure reducer.

Changing valve dynamics during behavior A):
If valve has a high friction (for example, often the case in small rotary actuators due to low air supply pressure or due to a valve seat packing which is too tight) then the valve position gets stuck after a setpoint jump and possibly is recontrolled via the resetting time Tn, possibly after quite some time has elapsed.

Basically, the following is possible:

a) to accept a remaining deviation

b) to accept some response procedures (such as remaining in over-response for a short time, and remaining below setpoint and trailing).

When deciding a), "Tn" should become ineffective, table value (15). Compensating "P(kp)" should be increased until the setpoint jumps reach the setpoint within a short period of time and without significant over-response (adapt to both movement directions).

When deciding b) start as in a) above. Thereafter "Tn" is reswitched and decreased until the setpoint deviation has been re-controlled within a short period of time and without long after-response (adapt in both movement directions).
It is recommended to maintain the Tn's for both directions about the same.
If a post oscillation occurs after a setpoint jump, "Tn" is selected too small, possibly "P(kp)" was selected too large.

The positioning time "T63", also called valve damping, does not have an effect during AUTOSTART in Menu 2, however, setpoint jumps in Menu 8 reach the position controller in a damped condition which then is not easily stimulated to oscillation. This behavior is also true for the setpoint input.
This enables setting the controller to higher "P(kp)" values without producing oscillations in the process. On one side this helps the position control to level disturbances due to friction, changes in load or air supply pressure changes faster. On the other hand it helps the superimposed valve control circuit that neutral times in the valve control route do no have such a big effect (stability in valve control circuit).

Changing valve dynamics during behavior B):
Increase "Tn" for both movement directions, possibly turn off and proceed as described in behavior A) alternative b).

Menu 7: Pneumatic output (for trouble-shooting)

```
SRD Main Menu
5  Limits/Alarms
6  Parameters
7  Output
```

```
7   Output

□□□ _____]
```
etc.
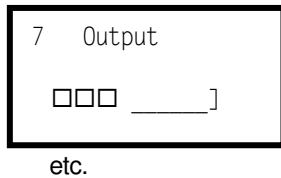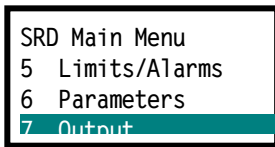
Serves to check the pneumatic parts of the positioner and the right valve piping by directly applying current to the IP module with the (+) or (–) keys (no control; software limit values such as "stroke limits" or "tight closing" are ignored).

The current of the IP module is increased by about 3 % in 32 steps. By measuring the output pressure in general the following characteristic line of the IP module is achieved. The ramp also may be more steep or flat depending on the air supply pressure.
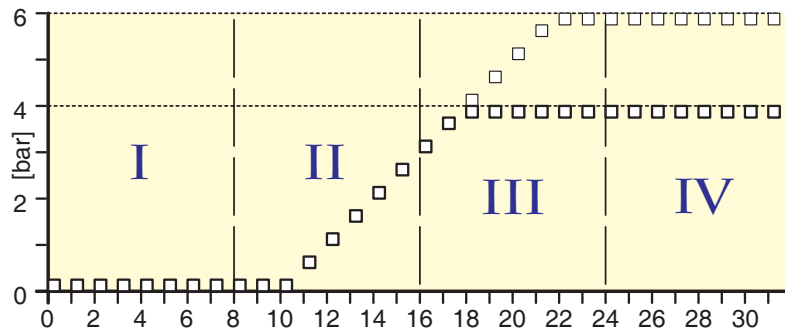
The pneumatic works precisely, if the actuator begins movement in section II and runs latest in section IV into the end position.

If no reaction is shown, check:
- does air supply exist?   - is plug connected to IP module?
If these items are okay, possibly the electronics or a pneumatic part is defective. See also page 48.
After leaving this menu by pressing the (❶) or (✓) key the actual setpoint is automatically restarted.

Menu 8: Manual setting of valve position

```
SRD Main Menu
6   Parameters
7   Output
8   Setpoint
```

```
8   Setpoint
8.1  12.5% Steps
8.2.  1% Steps
8.3  0.1 % Steps
```

```
8   Setpoint

□ _____] 12.5 %
      Pos. 12.5 %
```
etc.

```
8  Setpoint
8.2. 1% Steps
8.3  0.1 % Steps
8.4  Do PST
```
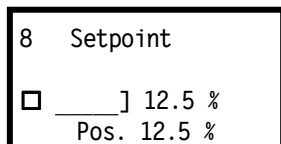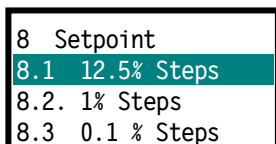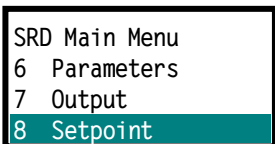
For the purpose of checking the control reaction of the actuator to a setpoint jump can be observed via the indicator. As far as the device is IN SERVICE the (+) (–) keys can initiate jumps of 12.5 % (or 1 %, or 0.1 %) each.
The starting value for Menu 8 is always the current setpoint value.

If the control behavior is to be improved, this can be reached by performing a complete Autostart (see Menu 2) or through manual tuning (see Menu 6).
After leaving this menu the existing setpoint value at the input is automatically restarted.
This menu point can also be called up under normal operating conditions, by twice pressing of key (❶).
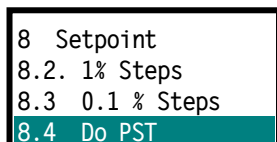
8.4 Do PST
With this function, the Partial Stroke Test is started, with the given parameters by DTM. After the test is passed, SRD goes back to the menu.
If the PST is not passed, the error message "PST error" appears on LCD.

Menu 9: Calibration functions (for workshop)

```
SRD Main Menu
7  Outoput
8  Setpoint
9  Workbench
```

Factory calibrations are carried out with sufficient accuracy and remain unchanged during life time. However, an alignment may become necessary in some cases after servicing hardware components.

```
9  Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA
```

9.1 Reset Configuration to "ex factory" settings
It is possible to restore the configuration existing at time of delivery via this function. This may become necessary if it is not clear what had been changed per menu or in the case that a positioner was taken from one actuator and mounted to another actuator.
Following this function, the device is turned to condition OUT OF SERVICE. This has to be followed by Autostart for the purpose of adapting the calibration to the actuator and to start IN SERVICE.
The parameters of the factory setting are listed in table Menu Structure (page 28).

The following calibration functions must only be performed by trained personnel.

The calibration of the input current or position sensor makes sense, if after exchange of the electronics, the valve position is inaccurately displayed.

SRD960 with HART

Calibration of input current (Only with SRD with analog setpoint; does not apply to fieldbus instruments.)
Serves to equalize possible inaccuracies in the complete current loop.

```
9  Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA
```

9.2 Calibration of input current to 4 mA
The present input current value is taken over as "4 mA" when pressing (✔) key.

```
9  Workbench
9.1 Reset Config
9.2 Calib 4 mA
9.3 Calib 20 mA
```

9.3 Calibration of input current to 20 mA
The present input current value is taken over as "20 mA" when pressing (✔) key.

Calibration of position sensor (angle calibration)
The angle pertaining to the vertical tap position (arrow mark) is factory calibrated for the position tap. If the position sensor or the electronics board is exchanged the mechanical and electric tolerances have to be aligned through recalibration. See Service Instruction manual.

```
9  Workbench
9.4 Calib -45°
9.5 Calib +45°
9.6 Reset all 1
```

9.4 Calibration of position sensor value to –45°
The present position value is taken over as angle –45° when pressing (✔) key.

```
9  Workbench
9.4 Calib -45°
9.5 Calib +45°
9.6 Reset all 1
```

9.5 Calibration of position sensor value to +45°
The present position value is taken over as angle +45° when pressing (✔) key.
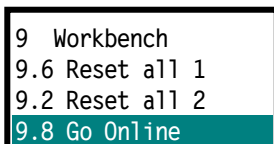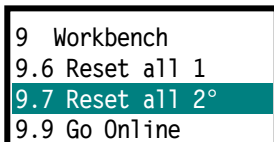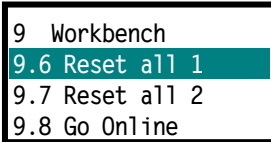
9.6 Resetting of Configuration and Calibration to "ex factory" settings

For the exchange of the electronics the device must be configured whether the pneumatic output is single-acting or double-acting so that the controller shows the correct behavior during the next start-up.

Caution: The current calibration for inputs and outputs, the angle calibration and all other calibrations are reset to their factory defined condition!

```
9  Workbench
9.6 Reset all 1
9.7 Reset all 2
9.8 Go Online
```

9.6 Resetting of Configuration and Calibration to "ex factory" settings – for single acting pneumatic output

The factory calibration for single-acting pneumatic output is restored when pressing (✔) key.

```
9  Workbench
9.6 Reset all 1
9.7 Reset all 2°
9.9 Go Online
```

9.7 Resetting of Configuration and Calibration to "ex factory" settings – for double acting output

The factory calibration for double-acting pneumatic output is restored when pressing (✔) key.

```
9  Workbench
9.6 Reset all 1
9.2 Reset all 2
9.8 Go Online
```

9.8 Go Online without Autostart

In principle, the first startup runs an Autostart in which the SRD is optimally adapted to the actuator, then the SRD goes online and begins to regulate. This service function sets the SRD directly online, without an Autostart. Only for test purposes. Not recommended for regular use.

Configuration functions for all versions

```
9  Workbench
9.7 Reset all 2
9.8 Go Online
9.9 Menu Lang
```
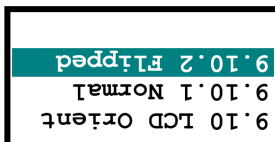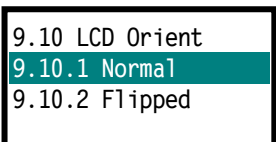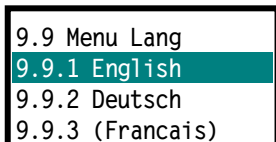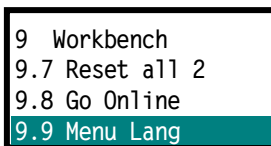
9.9 Selection of menu language [1]

One of three of the programmed languages can be selected.

Ex-factory the active language is always English. Changing to one of the other two languages, can also take place during operation.

```
9.9 Menu Lang
9.9.1 English
9.9.2 Deutsch
9.9.3 (Francais)
```

The third menu language can be selected and was already programmed in the factory according to customer order. If a different third menu language is desired, then the language file can be downloaded from our website.

Thereafter download the file from the PC via FDT/DTM-Software onto the SRD. See also references on the internet page.

```
9  Workbench
9.8 Go Online
9.9 Menu Lang
9.10 LCD Orient
```

9.10 LCD Orientation [1]

Display normal or turned by 180°

```
9.10 LCD Orient
9.10.1 Normal
9.10.2 Flipped
```

```
9.10 LCD Orient
9.10.1 Normal
9.10.2 Flipped
```

---

1)   The menus 9.8 and 9.9 appear automatically at initial start-up, i.e. if the SRD is connected the first time to the electrical supply.

SRD960 with PROFIBUS PA:
Menu 10: Bus Address

```
SRD Main Menu
8  Setpoint
9  Workbench
10 Bus address
```

```
     Address
Dec:126  Hex: 7E
```
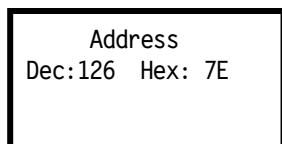
Here the bus address of the SRD is indicated and can be changed.

The current address is displayed in decimal and hexadecimal number system.
By pressing and holding of a key (+) or (−) the value is counted up or downward, after some time in larger steps.

Note: Addresses 0 and 127 should not be used. Address 126 (delivery condition) is not permitted for cyclical operation.
For further information see TI EVE0105 P.

SRD960 with FOUNDATION Fieldbus:
Menu 10: FF Configuration

```
SRD Main Menu
 8  Setpoint
 9  Workbench
10 FF Config
```

Special settings for Foundation Fieldbus device.

```
10 FF Config
10.1 Simulate
10.2 Profile
```

10.1 Simulate enable / disable
The SRD960 sends during normal operation its actual Position-Actual-Value[1] back to the control system.
If, however, "Simulate" is released in the SRD and in addition via communication Simulate is activated, then a simulation value coming from the control system is sent back as an actual value to the control system. In this way within the control system, e.g. the reaction to specific valve adjustments can be tested without having to adjust the valve – the SRD regulates toward the "accurate" setpoint value.
For further information about the Simulate see TI EVE0105 Q.

```
10.1 Simulate
10.1.1 Disabled
10.1.2 Enabled
```

10.1.1 Simulate Disabled
Disable simulate. The real valve position will be indicated.

10.1.2 Simulate Enabled
Release simulate.

```
10 FF Config
10.1 Simulate
10.2 Profile
```

10.2 Foundation Fieldbus Profile: Activate Link Master

```
10.2 Profile
10.2.1 Link Mast
10.1.2 Basic Dev
```

10.2.1 Link Master active
This SRD becomes the Link Master if Control System is down.

10.2.2 Basic device
This SRD becomes not the Link Master if Control System is down.

By using the (+) or (–) keys the desired condition can be selected and entered through pressing the (✔) key.

---

1) With the option "Position Feedback", the position-actual-value will be displayed, as before, as analog value 4 to 20 mA.

9 DECOMMISSIONING

Before decommissioning the unit, disconnect the supply air and the electrical input signal.

After disconnecting the electrical input signal the last confirmed configuration of the positioner is preserved in the memory.

Exchange of device
If a temporary decommissioning of the SRD and a later mounting to another actuator has to be carried out, before disconnecting, we recommend to reset Configuration in Menu 9.1. So the default settings "Ex-Factory" are re-activated. This facilitates a later recommissioning.

10   MAINTENANCE

General

The SRD960 requires no periodical maintenance. When replacing components during repair work, the safety requirements on page 59 must be observed!

10.1 Service plug and IrCom

All basic instruments of the SRD960 are equipped with a service plug *A*. There via RS232 a PC with FDT/DTM Software can be connected via modem EDC82 (galv. separated, not Ex).

This universal interface, together with the PC software, allows the configuration of <u>all</u> SRD versions independent of the protocol – thus versions HART, FOUNDATION Fieldbus, PROFIBUS PA and also the version "without communication" can be configured from the PC, without having to acquire expensive modems. For details see TI to EDC82.

The service plug (IDC connector) is accessible from the side after unscrewing the cover to electronic compartment. The 6-pole connector links EDC82 modem with SRD, and from EDC82 a 9-pole subD cable links to RS232 interface of PC.

A
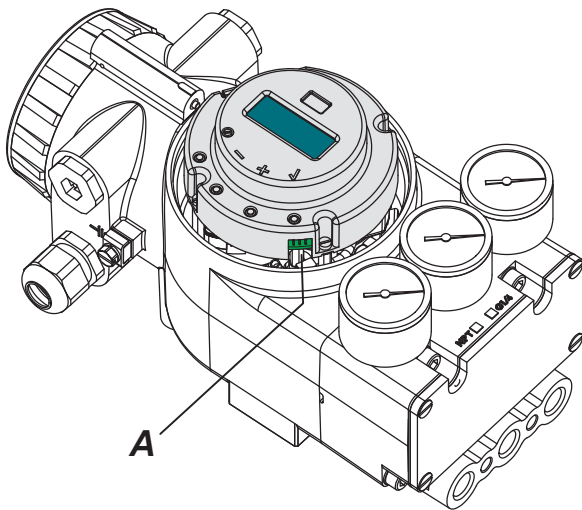
10.2 Supply filter replacement

An obstructed supply filter can be replaced. Unscrew the air supply fitting, remove the filter and exchange the filter with a new one.

10.3 Pneumatic Amplifier

Upon unscrewing of lateral cover, the pneumatic compartment is accessible.

Fig.; Single acting amplifier

J   *K*
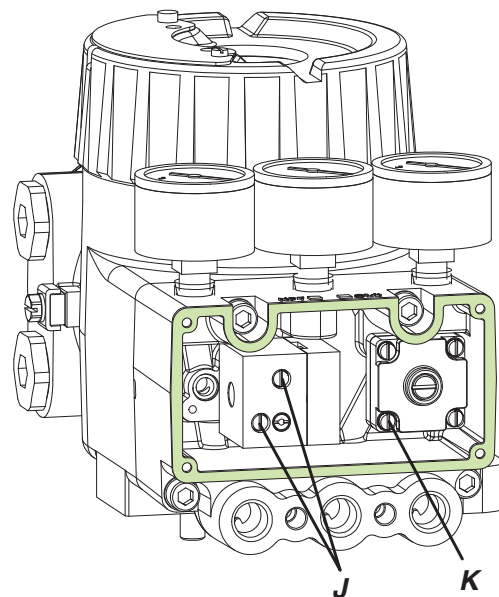
Pre-Amplifier: Unscrew 4 screws *K*.
Amplifier: Unscrew 2 screws *J*.

When remounting, verify the correct seating of sealing.

10.4 Replacement of mechanical and pneumatic units

See following pages.
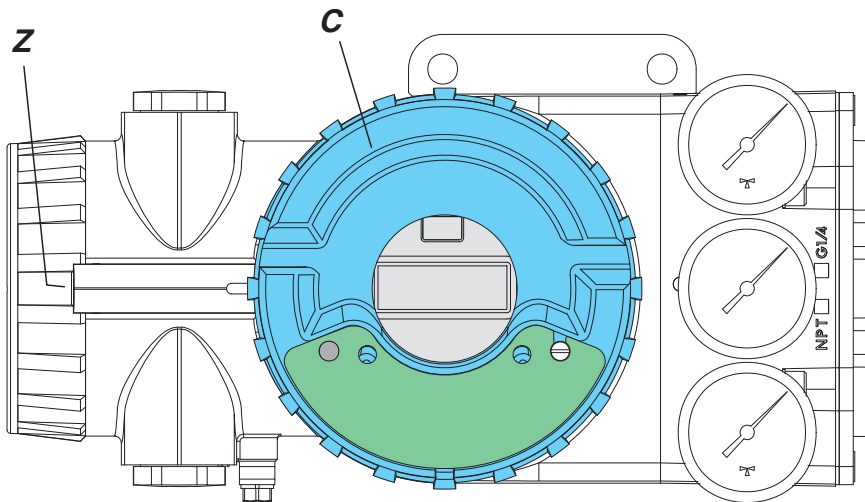
Open Housing

Unscrew cover safety lock **Z** until cover **C** is completely free.

Then unscrew cover **C** .
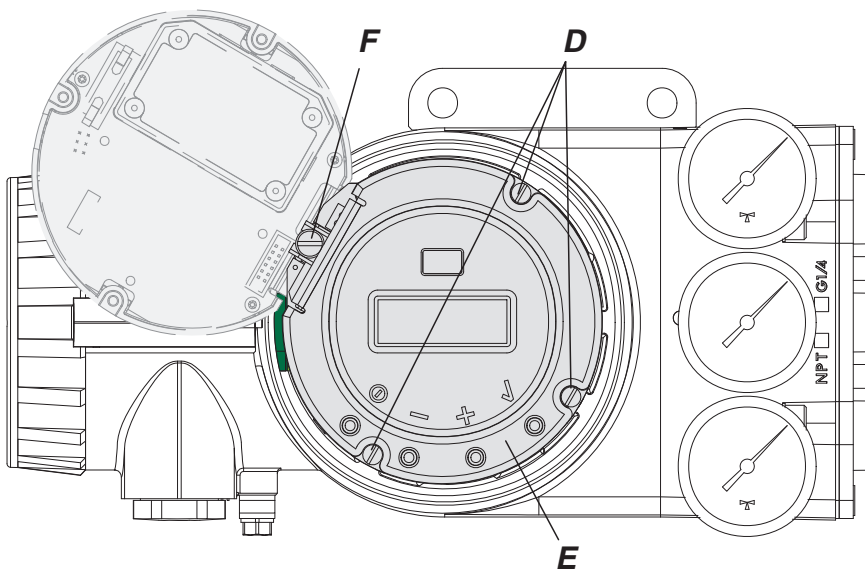
Tilt Electronic forward

Unscrew the 3 screws **D** , and the round electronic **E** can be tilted forward.

Should the electronic have to be removed completely, unscrew also screw **F** , and pull out plug **U** from the electronic.
When removing (and when re-inserting), the correct position of the flat cables must be observed.
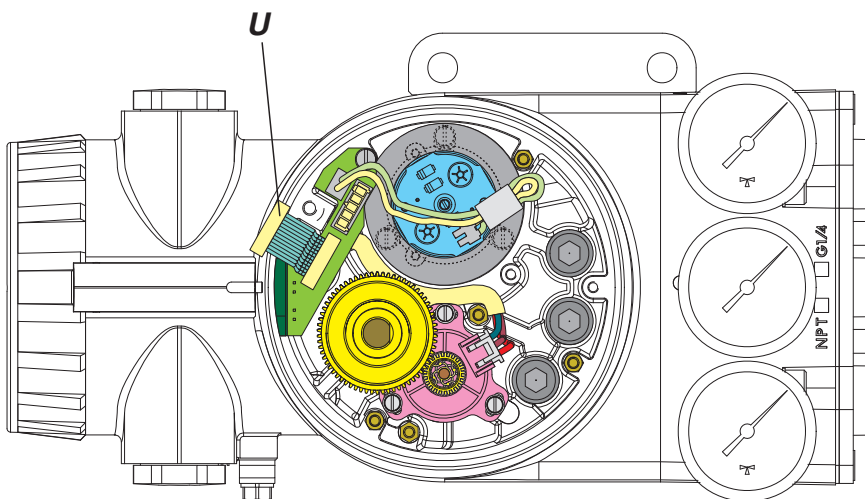
Electronic **E** detached.

Upon <u>exchange</u> of the electronic **E**, the angle calibration (page 53) and an Autostart must be performed!
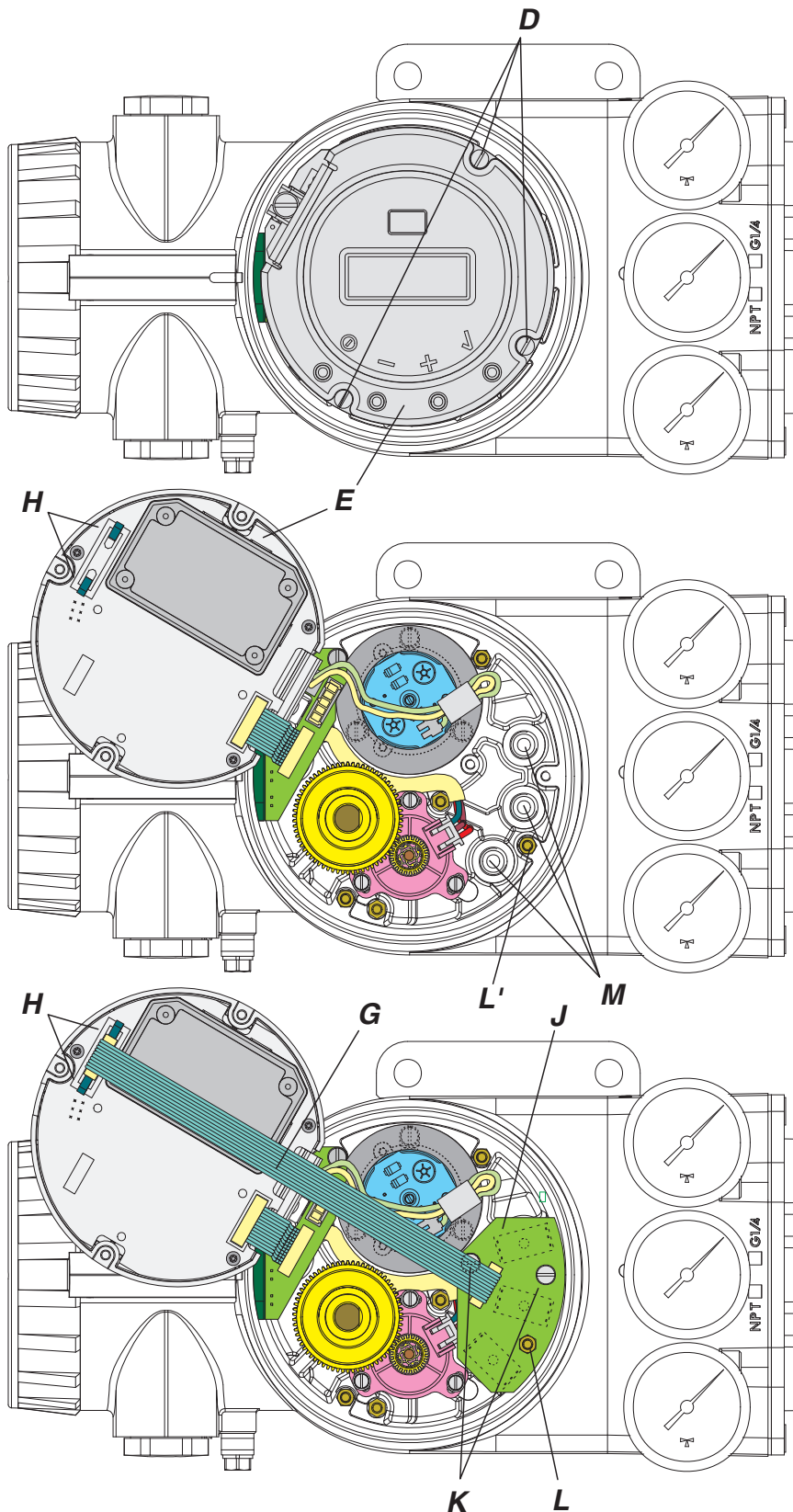
Option "Pressure Sensors"

Upon unscrewing of the 3 screws **D**, tilt carefully forward the round electronic **E** – if pressure sensors are already built-in, the flat cable **G** must be removed first.
For this, unlock the two retaining clips **H** and remove plug.

Secure the "Pressure Sensors" assembly **J** with the two screws **K** and bolt **L**.

When retrofitting to this option, the sealing screws in the measuring holes **M** must be removed, and the (existing) bolt **L** must be exchanged for the (a little shorter) bolt **L** (1.6 mm level difference through the circuit board).

During mounting, it must be observed that the conical nipples of the reducing bushings are correctly fitted and the 3 measuring holes **M** are free.

Place flat cable **G** and lock connector with retaining clips **H**.

Option boards
"Additional Inputs / Outputs"

Open as described before.
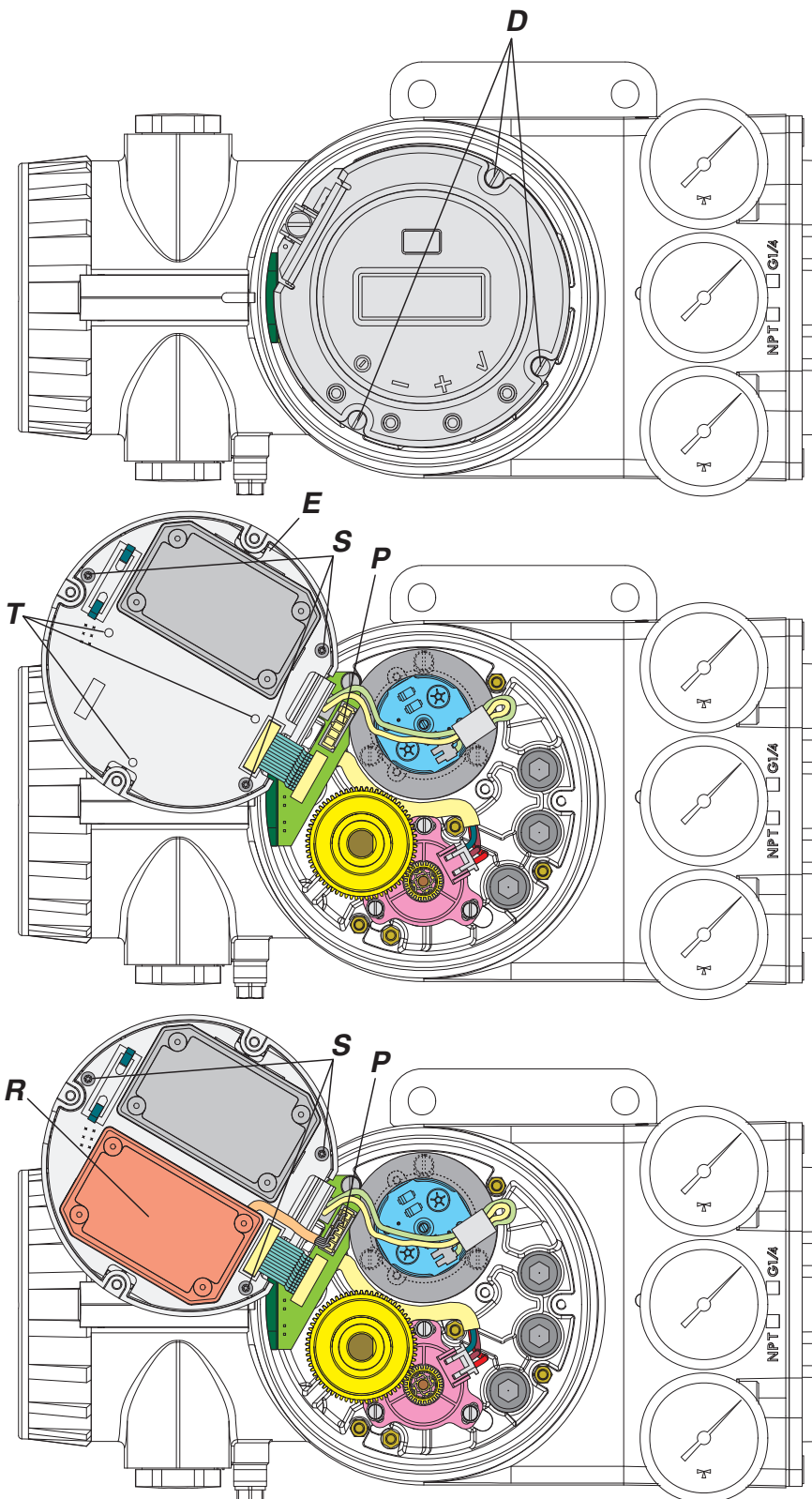
Such an additional module R is at-
tached from the "User Side" of the
electronic *E* with 3 screws *T*.
For removal (or insertion), the round
electronic *E* must be taken out of
the plastic shell.
Unscrew the 3 screws *S* to do this.

Insert the new module onto the
round electronic, from the user side
screw in the 3 screws *T*, place the
round electronic *E* into the plastic
shell and secure with 3 screws *S*.

Clip-in the cable of the additional
module into the retaining clamps,
and attach plug *P*.

Option "Limit Switch"

Open as described before

(Q)
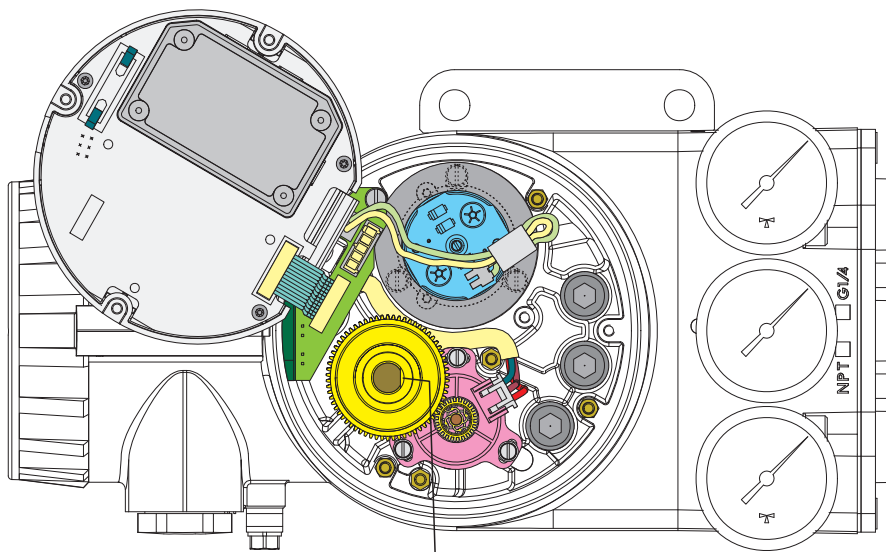
Sensor Part:
During mounting it must be observed that the set screw **Q** is screwed onto the flat part of the shaft.

Q
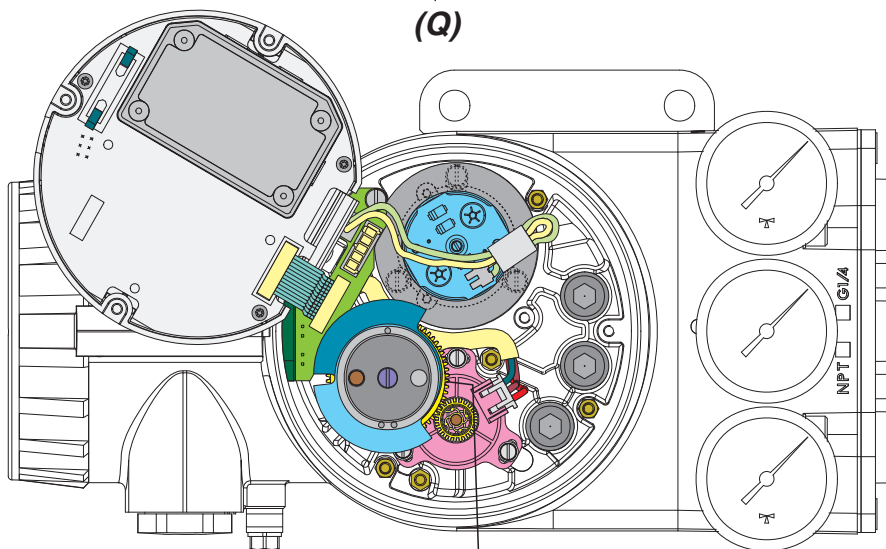
Set in place the Sensor part with the switch vanes onto the steering shaft (with the big cog wheel) and secure with a sidewise set screw **Q** (Hexagon socket screw 2 mm).

The set screw is accessible from the right side, if the 1 marking is above (and the 2 marking is below).

P

Q

N

O
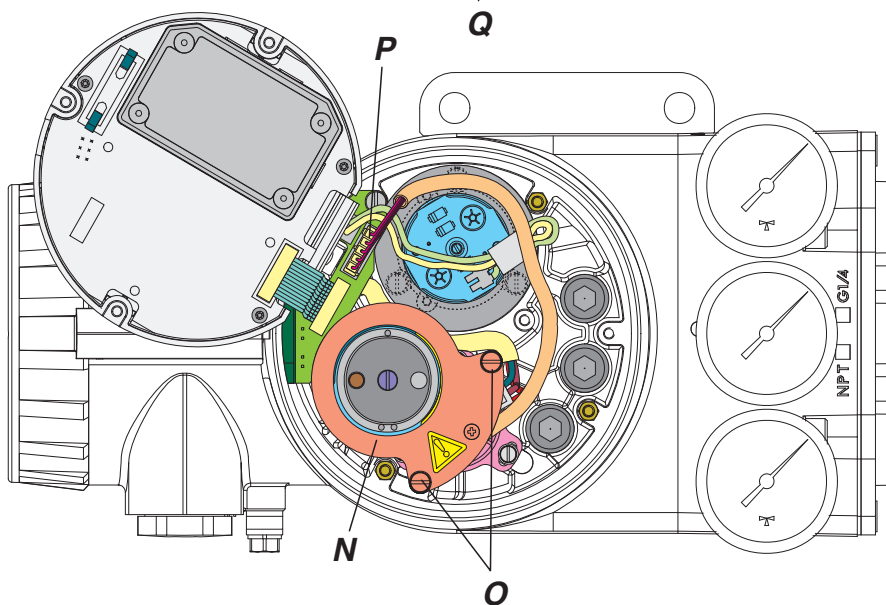
Set in place the contact assembly and the cover **N** and secure with both screws **O**.
With inductive sensors, the switching vanes must not touch the sensors. Insert the cable at plug **P**.

10.5 Angle calibration

When the electronic unit or the position feedback unit is re-placed, the position sensor requires calibration. To accomplish the calibration, an angle calibration tool 'ACT' (WKX 425 014 038) is required.

Fig.: Angle calibration tool ('ACT')
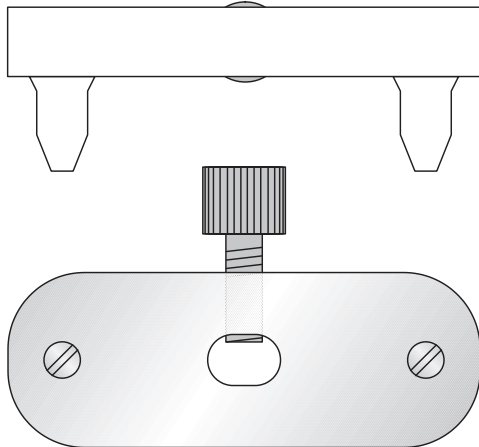
Rotate the feedback shaft **9** so that the flat side on the shaft is perpendicular to the arrow **26** on the housing. Attach the ACT to the top of the feedback shaft. Rotate the feedback shaft counter-clockwise until the two pins line up with the mounting holes **AA** on the back of the positioner, as shown below.

Fig.: Position "–45"
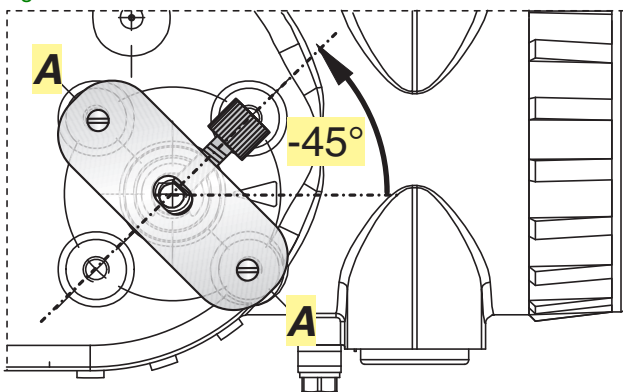
Push down the ACT until the pins are centered in the mounting holes **AA** and fasten screws to secure the ACT to the feedback shaft. The position is now locked at "–45°". Now the measurement value of the position sensor must be stored in the SRD. This can be done locally or via software. For operation with local keys, the menu item 9.4 "Calibrate position measuring value to –45°" is used. Confirm with pressing the (✔) key.

For calibration with software via FDT/DTM-Software follow the directions in the appropriate workshop function. Enter value "–45" and confirm.

Now loosen the ACT and turn it with feedback shaft clockwise 90 degrees to the second set of mounting holes **BB** . See Figure.

Fig.: Position "+45"
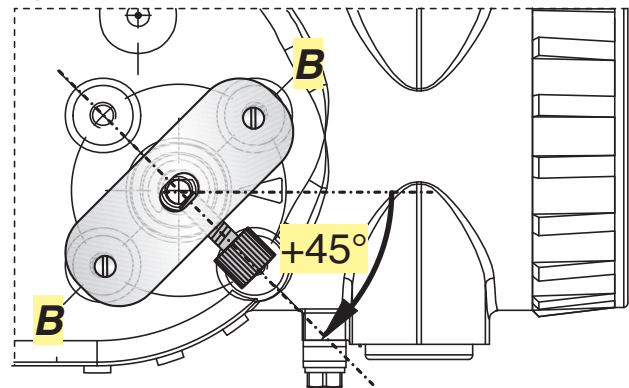
Push down the ACT until the pins are centered in the mounting holes **BB** and screws on to secure the ACT to the feedback shaft. The position is now locked at "+45°".

Now the measurement value of the position sensor must be stored in the SRD. This can be done locally or via software. For operation with local keys, the menu item 9.5 "Calibrate position measuring value to +45°" is used. Confirm with pressing the (✔) key.

For calibration with software via FDT/DTM-Software, follow the directions in the appropriate work-shop function. Enter value "+45" and confirm.

Remove angle calibrator.
Re-connect SRD at actuator and carry out AUTOSTART, if necessary perform configuration.

11 TROUBLE-SHOOTING GUIDE

The components of the positioner are under constant surveillance by the installed micro controller. Errors detected are displayed in LCD.

Certain conditions (such as "Stroke limitation active") are displayed in LCD as message.

11.1 Errors detected during initialization

After start-up or reset several initialization phases are passed through which are shown in LCD. If this phase stops, an error was detected.
If after renewed reset [1] the indicator stops at error code the device is probably defective; please contact customer service. Stating the error code will be of help to the Repair and Service Dept.

LCD Error Codes (on LCD in true text)

Description
Micro controller functional test
Micro controller RAM test
Micro controller ROM test
initialize operating system
initialize monitor
initialize interfaces
initialize timer
initialize EEPROM
initialize data
initialize ADC
initialize communication
initialize local operation
start background process
check options and start
start operating system

11.2 Errors detected during self-test
During cyclical self test certain components of the SRD are under constant surveillance. At trouble detection in the electronics, output y1 becomes pressureless ('fail safe position').
If after reset [1] the display shows the error again the device is probably defective; please contact customer service.

---

1) Execute reset by simultaneous pressing (❶) (–) (+) keys,
     or by turn-off and restart of input signal

11.3 Messages

Message	Description of message / LCD text	Remedy

	Write protected	
Message 1: write protection	Parameter and functions are write-protected	Can be changed via Configurator, FDT/DTM Soft - ware or Profile 3.0 (PROFIBUS)

	Bad config CRC	
Message 2: Parameter	Invalid, undefined parameter values	Reset of configuration to factory setting in Menu 9.1

	Calib invalid	
Message 3: Calibration	Incomplete calibration or entering value resp. calibration value outside of permissible tolerance range	Repeat calibrations in Menus 9.2 to 9.5

	Ill loop current	
Message 4: Input current outside of operating range	Check nameplate (INPUT) for correct version Message appears at: Analog or HART: input current under approx. 3.8 mA or above approx. 22 mA Fieldbus: input current under approx. 9 mA or above approx. 12 mA	check supply voltage (Analog) or check Bus voltage (Fieldbus), exchange SRD if necessary

	Pot problem	
Message 5: Position sensor Positioner already calibrated, dismounted and supplied. If you supply (4-20 mA or with a fieldbus) a not mounted positioner and bring the potentiometer out of range, the message will apear and remain till the potentiometer goes again in range and the error is validated with push button.	Position sensor input recognizes error	check 3-pole plug at electronic board
		check cable to sensor
		check sensor (Potentiometer: 5k +20% –0%)
	Position not within permissible rotation angle range. Lower deviation of the original 0% and exceeding of the original 100%, which have been determined by Autostart.	Check feedback lever mounting (flat area points to arrow on housing)
	During Autostart a change of the direction of movement was found	Acknowledge via key ($\checkmark$), then o.k.
		Check further possible reasons: valve seat worn-out; spindle lock out-of-line; carrier unit on spindle lock is damaged (for determination of valve position).

	IP motor problem	
Message 6: I/P-converter output	Connection I/P converter to electronic board faulty	check 2-pole plug at electronic board
		check cable to the I/P converter
		check I/P converter to detect short circuit or interruption

	No supply press	
Message 7: Air supply / pneumatic error	Detection: spring closes: w > 2 %, but position < 1 % spring opens: w < 98 %, but position > 99 % without spring: no actuator changes in direction of position signal	check air supply pressure
		lead cable separated
		possibly poor control parameters are set
		pneumatic parts blocked

Message	Description of message / LCD text	Remedy

	Autostart err 1	
Message 8: AUTOSTART defective	Air supply too low	Check air supply
	Feedback lever (linear actuator) or Coupling (rotary actuator) incorrectly linked. Potentiometer moves out of operating range of ± 47 % of 0° position	Check mounting. Flat area points to arrow on housing
	Coupling (rotary actuator) incorrectly linked (R and L interchanged)	Check mounting
	Pneumatic output to actuator closed or untight/ When direct mounting onto FlowTop or FlowPak, the screw plug y1-d is not removed.	Check pneumatic connections
	Mechanical stops are not determinable	Check spring movement of actuator / check air supply / Check mounting
	When using a booster or spool valve, no control parameters can be determined, since air capacity is too high.	Device version is not suitable for this actuator; select version with smaller air capacity or remove booster.
	Control parameter too high since air capacity is too high (in general, oscillation in valve movement)	Use a booster or the version with spool valve. Reduce control parameter prop.-gain (Menu 6.1 and 6.2).
	Possibly incomprehensible configuration data	Reset configuration, see Menu 9.1

	Autostart err 2	
Message 9: AUTOSTART defective	Configuration to single-acting instead of double-acting actuator	Initialize factory calibration for double-acting in Menu 9.7

	Optionboard err	
Message 10: Disturbances at Option board	Configured status of the SRD deviates from existing version (e.g. Option board has been inserted subsequently.	Check if correct option board has been connected Confirm message and thereby new instrument version.
	Bad contact	Connections to terminals interchanged
		Check connections
		Tighten electronics
	Defective	Exchange option board

	Ctrl diff error	
Message 11: Remaining control deviation	Actuator problems (high friction or blocked)	Check actuator
	Insufficient air supply	Check air supply / air filter
	Insufficient parameters for position controls, for example, amplification too small	Check control parameter, check pneumatic components
	IP module or pneumatic amplifier defect	Check in Menu 7; replace if necessary

	Lower stroke lim	
Message 12: configured closing limit has been reached	If this is desired, the message may be ignored, of course.	If not, the setting has to be checked in Menu 5.1 or via communication

	Upper stroke lim	
Message 13: configured opening limit has been reached	If this is desired, the message may be ignored, of course.	If not, the setting has to be checked in Menu 5.4 or via communication

Message	Description of message / LCD text	Remedy

	Maintainance	
Message 14: Maintenance required	Operating point of controller is outside of permissible tolerance	Pneumatic components have to be checked and if necessary readjusted. Filters are possibly blocked and have to be replaced

	Unforeseen	
Message 15:	Not defined	

11.4 Diagnosis without LCD information

Fault	Possible cause	Solution
Positioner not operational using key pads	No input signal at 11, 12	Connect input signal
	Local operation blocked (write protection)	Remove blockage via communication
	No automatic power up (Reset)	Reset SRD with keys
	A key got jammed	Release cover screws, check menu functions, retighten cover
	Failure in the positioner	Contact customer service
Autostart not completed (> 45 min)	Actuator volume too large	stop Autostart and carry out extended Autostart, see chapter 8.4, Menu 2 or apply booster
	Failure in the positioner, otherwise Message 8, 9	carry out Autostart again, see chapter. 8.1 and 8.4, Menu 2 carry out Reset configuration
		send device to manufacturer
	Autostart remains stagnant for a longer time (>10 min) in step 1 or 2, otherwise message 8	Feedback lever (at stroke actuator) incorrectly mounted. Verify installation of feedback lever, see chapt. 4; flat part points to arrow on housing
		Coupling piece (at rotary actuator) incorrectly turned (R and L mixed up): Verify direction of rotation, see chapt. 4; flat part points to arrow on housing
	Autostart remains stagnant for a longer time (>10 min) in step 3 (LCD: shows "Control params")	At large volume actuators the Autostart can possibly remain stagnant for a longer time (>10 min) in step 3, prior to continuing in step 4
Actuator does not react to a change in the input signal	No Autostart performed.	Perform Autostart.
	Positioner is not IN OPERATION	Switch positioner IN OPERATION, see chap. 8.2 resp. Autostart or via Configurator
	Setpoint source is configured wrong	Correct configuration via configurator
Actuator does not attain the closed or opened position	Autostart not carried out	carry out Autostart
	Supply pressure too low	check supply air pressure
	Travel limit is set Message 12, 13	check settings, see chapter 8.4, Menu 5
	Angle position linearization, positioner action or characteristic curve is set incorrectly (e.g. 'Custom', but values are missing)	check settings, see chapter 8.4, Menus 1, 3, 4
Unstable behavior, position control circuit oscillates	Autostart incomplete, therefore, control parameters not suitable	carry out complete Autostart, see chapter 8.4,
	Small actuator volume but high air capacity	increase damping at pneumatic output, see chapter 8.4, Menu 6 reduce gain (P parameters)
	Friction on valve packing too great	loosen packing gland slightly or replace
	IP module or Pneumatic amplifier	change module, pneumatic amp
Actuator leakage		Check the actuator and repoint
Actuator reacts too sluggishly	Air capacity insufficient	attach booster
	Gain set too low	increase damping at pneumatic output, see chapter 8.4, Menu 6
	Positioning time T63 set too high	reduce positioning time, see chapter 8.4 Menu6
No communication possible	Input voltage too low	Eliminate voltage drop
	Faulty protocol, communicator and device type do not match	Check configuration of devices
	Wrong electronics unit	change device

For tuning controller parameters see remarks on page 40.

12 SAFETY REQUIREMENTS

12.1 EMC and CE

For notes regarding Electromagnetic compatibility EMC and CE labels see Product Specifications Sheet PSS EVE0105 A.

In order to ensure EMC protection, the screwed electronics housing must be locked.

12.2 Explosion protection

(Only if ordered)

Technical data for explosion protection see Product Specifications Sheet PSS EVE0105 A or Certificates of Conformity EX EVE0105 A.

For installations located in explosive atmospheres, all relevant national regulations and installation conditions must be observed, e.g. in the Federal Republic of Germany ElexV and DIN VDE 0165.

Attention:
When repairing explosion-protected equipment, observe the national regulations.

Repairs involving parts must be manufacturer's original parts.

The following applies to the Federal Republic of Germany: Repairs involving parts required for explosion protection must either be carried out by the manufacturer or by authorized personnel and confirmed by certificate.

13 SYSTEM CONFIGURATION

The safety requirements must be observed!

13.1 HART Communication

When using the 'communication' (an alternating current signal, which is modulated onto the 4-20 mA signal), it must be observed that the connected outputs are suitable for the used frequency ranges. Apart from the load, also the alternating current impedances have to be observed.
It is recommended therefore, to use only suitable instruments.

To eliminate crosstalk between leads and to reduce disturbances through electromagnetic influences, it is recommended to use twisted paired shielded leads
(0.3 to 2.5 mm^2, max. 100 pF/m).

The capacities of the leads and the connected instruments must not exceed the maximum values for HART.

All components which are connected to the SRD in an explosion hazardous area require an Ex-Approval. The therein applicable limit values must not be exceeded in any case. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages, and currents.

Measuring HART Communication Signal
If a reliable communication signal can't be received, it is advisable to check the level with an oscilloscope. The first data block always comes from the configurator and the second block is the reply from the SRD.

HART	measured at configurator:	measured at SRD:
Configurator transmits	at least 350 mVpp	at least 120 mVpp
SRD960 transmits	at least 120 mVpp	at least 400 mVpp

13.2 With Communication PROFIBUS-PA

The operation of the positioner takes place digital, as per PROFIBUS-PA Profile Class B acc. to EN 50170 and DIN 19245 part 4. Data transmission via bit synchronous current modulation with a speed of 31250 bits via twisted and shielded two wire connections acc. to IEC 1158-2, with cable shields on both sides and bus terminators according to recommendation IEC 1158-2.

The positioner has to be connected to a segment coupler, which has to be conforming to IEC 1158-2. For operation in explosion hazardous areas, a segment coupler in explosion proof version has to be used. Supply as well as communication takes place via the bus.

All components which are connected to the SRD in an explosion hazardous area, require an Ex Approval. The applicable limit values must not be exceeded in any event. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages and currents. The FISCO model is thereby used as a basis.

Further information for observance:
"Technical Guide for PROFIBUS-Connection Technique" PROFIBUS-User Organisation, Order no. 2.141

13.3 With Communication FOUNDATION Fieldbus

The operation of the positioner takes place digital, as per FOUNDATION Fieldbus Specification Rev. 1.4. Data transmission via bit synchronous current modulation with a speed of 31250 bits of via twisted and shielded two wire connections acc. to IEC 1158-2, with cable shields on both sides and bus terminators according to recommendation IEC 1158-2.

The positioner has to be connected to components which are conforming to IEC 1158-2. For operation in explosion hazardous areas, an Ex-separator has to be used. Supply as well as communication takes place via the bus.

All components which are connected to the SRD in an explosion hazardous area, require an Ex Approval. The applicable limit values must not be exceeded in any event. These limit values also have to be adhered to when connecting additional capacitances, inductances, voltages and currents. The FISCO model is thereby used as a basis.

Further information for observance:
"Wiring and Installation 31.25 kBit/s, Voltage Mode, Wire Medium Application Guide" by FOUNDATION Fieldbus

13.4 System configuration

Electrical connection

Type of protection ATEX "EExd-Flameproof"

I 2 G EEx d IIC Temperature classes T4...T6
(Design AD 639)

EC Approval Document No. PTB 02 ATEX 1084 X
Ambient temperature ranges:

Temperature class T4	−30 ℃ to +80 ℃	
	(−22 ℉ to 176 ℉)	
Temperature class T4 (on request)	−40 ℃ to +80 ℃	
	(−40 ℉ to 176 ℉)	
Temperature class T6	−30 ℃ to +75 ℃	
	(−22 ℉ to 167 ℉)	
Temperature class T6 (on request)	−40 ℃ to +75 ℃	
	(−40 ℉ to 167 ℉)	

Type of protection FM "explosion proof"

Class I Division 1, Groups B, C, D

hazardous locations, indoor and outdoor, NEMA 4X

For connections in explosion protected hazardous areas according to directive 94/9/EG appendix II, with the following maximum values.

Electrical connection
Connection compartment see page 22

Electrical connection for SRD960 in non-intrinsic safe and flameproof (Ex d) version
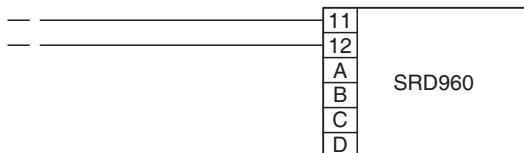
Terminals:

	Input		Options			
	11	12	A	B	C	D
Input signal / Setpoint value						
HART 4-20mA	11+	12−				
Fieldbus acc. to IEC 1158-2	11**	12**				
Options / Additonal In-/Outputs						
Position feedback			81+	82−	31+	32−
Binary output			81+	82−	83+	84−
Binary input			13+	14−	15+	16−
Limit signal switch			41+	42−	51+	52−
Potentiometer						
Sensor						

Connection values

HART / 4-20 mA

Terminals .... 11+ / 12−
Signal range .... 4 to 20 mA
Input voltage .... DC 12 to 36 V (without load)

FOUNDATION Fieldbus

Terminals........................... 11 / 12
Bus connection .... Fieldbus interface acc. to
                           IEC 1158-2
Supply voltage .... DC 9 to 32 V [2]
max. Supply voltage .... DC 36 V
Operating current .... 10.5 mA ± 0.5 mA

PROFIBUS-PA

Terminals .... 11 / 12
Bus connection .... Fieldbus interface acc. to
                           IEC 1158-2
Supply voltage .... DC 9 to 32 V [2]
max. Supply voltage .... DC 36 V
Operating current .... 10.5 mA ± 0.5 mA

** any Polarity

[2] When in use in Ex-hazardous areas, the max. supply voltages, etc. on nameplate resp. certificate of conformity, have to be observed!

Connection values "Additional In-/Outputs"

Position feedback 4 to 20 mA

Terminals for AI1:	31+ / 32-
supply voltage:	DC 8 to 36 V
signal range	3.8 to 21.5 mA

0 % and 100 % configurable

device fault	< 1mA
Terminals for AB1:	81+ / 82–

1 Binary output alarm, galvanically separated, two-wire system, according to DIN 19234, for external supply

supply voltage	DC 8 to 36 V
Logic: no alarm	< 1 mA
alarm	> 2.2 mA
device fault	< 50 µA

Binary Input

Terminals for EB1:	13+ / 14–
Terminals for EB2:	15+ / 16–

A connected switch is loaded with 3 V, 150 µA.

Switch 1	Switch 2	Actuator control function
close	close	normal operation
open	close	go to stop at 0 %
close	open	go to stop at 100 %
open	open	hold last position

Requirements for connected switches:

Capacitance in parallel	< 100 nF
Resistivity for ON	< 2 kOhm
Resistivity for OFF	>10 kOhm
Hysteresis	2 to 5 kOhm

Binary outputs

Terminals for AB1:	81+ / 82–
Terminals for AB2:	83+ / 84–

two-wire system, according to DIN 19234, for external supply

supply voltage	DC 8 to 36 V

Logic:

limit value not exceeded	< 1 mA
limit value exceeded	> 2.2 mA (typ. 6 mA)
device fault	< 50 A

configurable as switch output:

limit value not exceeded	< 50 µA
limit value exceeded	> 20 mA / 20 V
	> 40 mA / 10 V

Potentiometer (in preparation)

Sensor (in preparation)

Built-in Limit Switch

Terminals for GW1:	41+ / 42–
Terminals for GW2:	51+ / 52–

in two-wire-technique acc. to DIN 19234 with external power supply for connection to switching amplifier, or in three-wire-technique

Current consumption

vane clear	> 2.2 mA
vane interposed	< 1 mA

for control circuit with the following electrical values

supply voltage	DC8 V, Ri ca. 1 kOhm
supply voltage range	DC 5 to 25 V
residual ripple	< 10 % p.p.
permissible line resistance	< 100 Ohm

Response characteristic [1] [2]

switching differential	1%
switching point repeatability	0.2 %

Non-intrinsic safe and Ex d - Input circuit

Max. electrical Power Pmax = 2,5 W
Terminals and cable glands Umax = 60 V
Self-heating-up of housing surface 1.3 K/W

Additional In-/Outputs Ex d (will follow)

Ex i - Input circuit

Input circuit max. values
HART / 4-20 mA:
   U_i= 30 V, I_i= 130 mA, P_i= 0.9 W, C_i= 1.3 nF, L_i= 5 µH
FOUNDATION Fieldbus / PROFIBUS:
   U_i= 24 V, I_i= 380 mA, P_i= 5.2 W, C_i= 1.3 nF, L_i= 5 µH

Additional In-/Outputs Ex i

Option:

Position feedback
   U_i= 16 V, I_i= 80 mA, P_i= 250 mW, C_i= 26 nF, L_i= 5 µH

Binary Input
   U_o= 7.88 V, I_o= 11.4 mA, P_o= 23 mW

IIC		IIB	
Lo [mH]	Co [F]	Lo [mH]	Co [µF]
100	0.72	100	3.9
10	1.1	10	5.5
1	1.6	1	8.7
0.1	2.7	0.1	15
0.01	4.7	0.01	27

(Li and Ci integrated)

Binary Output
   U_i= 16 V, I_i= 80 mA, P_i= 250 mW, C_i= 26 nF, L_i= 5 µH

Potentiometer
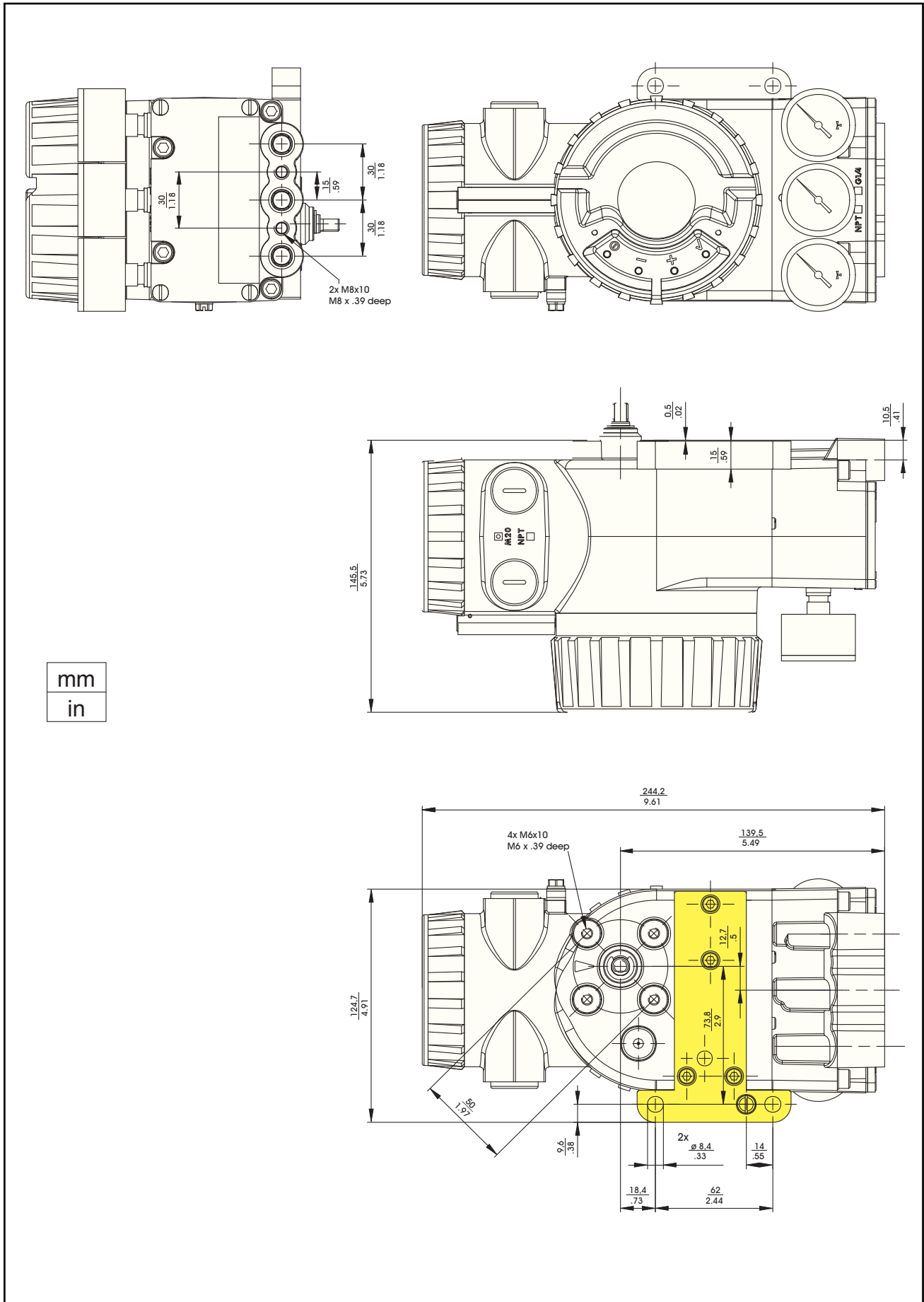   (will follow)

Sensor
   (will follow)

Limit switches
   U_i= 16 V, I_i= 25 mA, P_i= 64 mW, C_i= 30 nF, L_i= 100 µH

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1)   With appropriate order only
2)   National requirements must be observed

14 DIMENSIONS

Additional Documentation for this product:

Technical Information of Attachment Kits for Positioners

TI EVE0011 A   Overview of Attachment Kits of all positioners on actuators/valves of different manufacturers

Quick Guide

QG EVE0109 A   Extract of Master Instruction for an easy to use, easy understandable and fast start-up.
This document highlights the most important.

Master Instructions:

MI EVE0109 A   SRD960 -All Versions –

Technical Information for Fieldbus-Communication: TI

EVE0109 P   SRD991/960 -PROFIBUS-PA
TI EVE0109 Q   SRD991/960 -FOUNDATION Fieldbus H1

Master Instruction for HART-Communication:

MI EVE0109 B   HART with Hand-Held Terminal

**Master Instruction for configuration- and operation-software PC20 and
integration into Foxboro I/A Series System:**

MI 020-495   HART / PROFIBUS-PA and IRCOM with PC by means of PC20/ IFDC
B 0193 VH   I/A Series System

DOKT 533 495 144 FW18
FD-MI-PO-001-EN   0518