

SRI986 Electro-Pneumatic Positioner



The SRI986 Positioner is for operation of pneumatic valve actuators from control systems and electrical controllers with electric control signals. It is used to reduce the adverse effects of valve friction, for higher thrust and shorter positioning time.

FEATURES

- Independent adjustment of stroke range and zero
- Adjustable amplification and damping
- Split range up to 3-fold possible
- Input signal 0/4 to 20 mA, 0/2 to 10 V
- Supply pressure up to 6 bar (90 psig)
- Low vibration effect in all directions
- Mounting according to IEC 534, part 6 (NAMUR)
- Rotation adapter for angles up to 120
- Explosion protection:
II 2 G EEx ia IIC T6 according to ATEX or
intrinsic safe acc. to FM, CSA, CU TR, INMETRO
- EMC in accordance with the international standards and laws
- Modular system of additional equipment
 - Limit switches
 - Position transmitter
 - Booster
 - Connection manifold

TECHNICAL DATA

Input

Signal range 4 to 20 mA or
 0 to 20 mA or
 2 to 10 V (On request) or
 0 to 10 V (On request)
 Input resistance < 200 Ohms at 20 °C
 Stroke range 8 to 100 mm (0.3 to 4 in)
 Angular range
 linear 30 ° to 120 °
 equal percentage 90 °; from 70 ° linear

Output

Output to actuator 0 to 100 % supply air pressure

Supply

Supply air pressure 1.4 to 6 bar (20 to 90 psig)
 Air supply according to ISO 8573-1
 - Solid particle size and density class 2
 - Oil rate class 3
 - Pressure dew point 10 K under ambient temperature
 The use of filter regulator for air supply of positioner is strongly recommended. It reduces the air pressure to actuator's maximum pressure and keeps it constant.

Ambient conditions

Ambient temperature ¹⁾ -40 to 80°C (-40 to 176°F)
 Relative humidity up to 100 %
 Operating conditions
 according to IEC 654-1 The device can be operated at a class D2 location
 Transport and storage temperature -50 to 80°C (-58 to 176°F)
 Storage conditions
 acc. to IEC 60 721-3-1 1K5, 1B1, 1C2, 1S3, 1M2
 Protection class IP 54; IP65 as an option
 IP65 protection class can be selected from model code option -F or can be retrofit on existing device by ordering the kit EW 411 406 301.

Electromagnetic compatibility EMC

Operating conditions industrial environment
 Immunity according to
 - EN 61326, EN 61000-6-2 . . fulfilled
 Emission according to
 - EN 61326, Class A,
 - EN 61000-6-3 fulfilled
 NAMUR recommendation . . fulfilled

CE marking

Electromagnetic compatibility 2004/108/EC
 Low-voltage regulation not applicable

Response characteristic ²⁾

Amplification adjustable
 Sensitivity < 0.1 % F.S.
 Non-linearity (terminal based adjustment) < 1.0 % F.S.
 Hysteresis < 0.3 % F.S.
 Supply air dependency. < 0.3 % / 0.1 bar (1.5 psi)
 Temperature effect. < 0.5 % / 10 K

Air consumption

Air consumption single acting
 Supply air 1.4 bar (20 psig) 200 l_n/h (7.1 scfh)
 Supply air 3.0 bar (45 psig) 400 l_n/h (12.4 scfh)
 Supply air 6.0 bar (90 psig) 600 l_n/h (21.2 scfh)
 Air consumption double acting
 Supply air 1.4 bar (20 psig) 350 l_n/h (10.6 scfh)
 Supply air 3.0 bar (45 psig) 550 l_n/h (17.7 scfh)
 Supply air 6.0 bar (90 psig) 750 l_n/h (33.5 scfh)

Air output

Load effect ³⁾ -3 % for delivery flow
 2350 l_n/h (83 scfh)
 +3 % for exhausted flow
 1900 l_n/h (67 scfh)

Capacity at max. deviation

Supply air pressure bar (psig)	1.4 (20)	2 (30)	4 (60)	6 (90)
without booster l _n /h (scfh)	2 700 (95)	3 500 (124)	5 500 (194)	7 500 (265)
with booster VKXG-FN/GN l _n /h (scfh)	18 000 (636)	24 000 (847)	40 000 (1 492)	55 000 (1 942)
with booster VKXG-HN l _n /h (scfh)	36 000 (1 271)	48 000 (1 695)	80 000 (2 825)	110 000 (3 884)

- 1) Note the section "Explosion protection" on pages 6 and 7 with respect to explosion-protected equipment
- 2) Data based on the following parameters:
stroke 30 mm (1.28 in), range spring FES 628/1,
feedback lever 117.5 mm (4.63 in), max. amplification,
supply air pressure 3 bar (45 psig)
- 3) Measured at air supply 1.4 bar (20 psig) and 50 % of the signal range

Materials

Housing Aluminum (Alloy No. 230)
finished with DD-varnish
grey blue

All moving parts of
feedback system WNr. 1.4305 / 1.4571
Mounting bracket Aluminum (Alloy No. 230)

Weight

single acting approx. 1.5 kg (3.3 lbs)
double acting approx. 1.8 kg (3.9 lbs)
Attachment kit
for diaphragm actuators. . . approx. 0.3 kg (0.6 lbs)
for rotary actuators approx. 0.5 kg (1.1 lbs)

Connection

Pneumatic Female threads
G 1/8 acc. to ISO 228

Electric
Line entry 1 or 2 cable glands
M20 x 1.5 or 1/2-14 NPT
(others with Adapter AD-...)
Cable diameter 6 -12 mm (0.24 - 0.47 in)
Screw terminals Screw terminals for wires
up to 2.5 mm² (AWG 14)

Mounting

Type of mounting for attaching to diaphragm
actuators acc. to IEC 534-6
(NAMUR) and to rotary
actuators
Mounting orientation. any

ADDITIONAL EQUIPMENT

Additional equipment is installed by the manufacturer, but some types can also be put in later on. Therefore special part sets are available.

Inductive Limit Switch, two-wire system Code P, Q, T, U

Input Stroke / angle from actuator
via positioner feedback lever

Output 2 inductive proximity sensors
acc. to DIN 19 234 resp.
NAMUR for connection to
a switching amplifier with
an intrinsically safe control
circuit ^{1) 2) 3)}

Current consumption

Vane clear. > 3 mA
Vane interposed < 1 mA
for control circuit with the following electrical values
Supply voltage DC 8 V, R_i approx. 1 kOhms
Residual ripple < 5 %
Permissible
line resistance < 100 Ohms

Response characteristic ⁶⁾

Gain continuously adjustable
from 1:1 to approx. 7:1

Switching differential < 1 %

Switching point
repeatability. < 0.2 %

EMC acc. to EN 60 947-5-2

Part set for later installation

Code P, Q. not available
Code T EW 419 510 343
Code U EW 419 510 361

Inductive Limit Switch, three-wire system Code R

Input Stroke / angle from actuator
via positioner feedback lever

Output 2 inductive proximity sensors,
three-wire system,
LED indication,
contact, pnp ^{2) 4)}

Supply voltage U_s DC 10 to 30 V
Residual ripple ± 10 %, U_s = 30 V
Switching frequency 2 kHz
Constant current 100 mA

Response characteristic ⁶⁾

Gain continuously adjustable
from 1:1 to approx. 7:1

Switching differential < 1 %

Switching point
repeatability. < 0.2 %

Part set for later installation . EW 419 510 307

Limit Switch Assembly with Micro-switches Code V

Input Stroke / angle from actuator
via positioner feedback lever

Output 2 micro switches ^{2) 5)}

Connected load, alternating current

Switching capacity. max. 250 VA
Switching voltage max. 250 V
Switching current with
ohmic resistance max. 5 A
inductive resistance max. 2 A
Bulb, metal filament max. 0.5 A

Connected load, direct current

Switching voltage, max. V	Ohmic load A	Inductive load A
30	5	3
50	1	1
75	0.75	0.75
125	0.5	0.03
250	0.25	0.03

Reponse characteristic ⁶⁾

Gain continuously adjustable
from 1:1 to approx. 7:1

Switching differential < 2.5 %

Switching point
repeatability. < 0.2 %

Part set for later installation EW 420 421 026

Connection Manifold with Gauges Code JN, MN, RN, SN

Indicating range 0 to 10 bar (0 to 150 psig)

Error limit class 1.6

Pneum. connections. Female threads
Q1/4-18 NPT
acc. to DIN 45 141

- 1) For the standard version Code P, T one switching amplifier is required. For the security version Code Q, U a fail-safe amplifier for each inductive proximity sensor is required.
- 2) Operating mode min. (=low) / max. (=high) selectable by adjustment of switch vanes
- 3) Operating mode normally closed circuit / normally open circuit selectable at switch amplifier output
- 4) Contact closed within the positive range
- 5) Contact open within the positive range
- 6) For feedback lever effective length 117.5 mm (4.63 in), stroke 30 mm (1.28 in) and maximum gain

Electrical Position Transmitter**Code F**

Sensor	resistive precision conductive plastic element
Input	Stroke / angle from actuator via positioner feedback lever
Stroke range	8 to 100 mm (0.3 to 4 in)
Angular range	60 to 120 °
Output	two-wire system
Signal range	4 to 20 mA
Permitted load	$R_{Bmax} = \frac{U_S - 12V}{0.02A}$ (U_S = Supply voltage)

Power supply

Supply voltage	DC 12 to 36 V
Permitted ripple	< 10 % p.p.
Supply voltage dependency	< 0.2 %

Response characteristic ¹⁾

Non-linearity with terminal based setting	< 1.0 % F.S.
Hysteresis	< 0.5 % F.S.
External resistance dependency	< 0.2 % / ΔR_{Bmax}
Temperature effect	< 0.3 % / 10 K

Part set for later installation

Code F	EW 420 661 124
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Common data ²⁾**Ambient conditions**

Ambient temperature ^{3) 4)}	-25 to 80 °C (-13 to 176 °F) -40 to 80 °C (-40 to 176 °F)
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Relative humidity up to 100 %

Operating conditions

according to IEC 654-1 The device can be operated
at a class D2 location

Transport and

storage temperature	-40 to 80 °C (-40 to 176 °F)
Protection class	IP 54, IP65

Mounting attachment to positioner

Electrical connections

Line entry	1 or 2 cable glands M20 x 1.5 or 1/2-14 NPT (others with Adapter AD-...)
Cable diameter	6 -12 mm (0.24 - 0.47 in)
Screw terminals	Screw terminals for wires up to 2.5 mm ² (AWG 14)
Optionally	Screwed gland made of stainless steel WNr. 1.4305

Materials

Base plate	galvanized steel
Control vane	Aluminum
Setting mechanism	Fibre-glass reinforced polyamid

- 1) For feedback lever with effective length 117.5 mm (4.63 in) and stroke 30 mm (1.28 in)
- 2) Except manifold with gauges
- 3) Note the section "Explosion protection" on pages 6 and 7 with respect to explosion-protected equipment.
- 4) -40 to 80 °C (-40 to 176 °F) for the fail-safe version of inductive limit switch Code Q, U

SAFETY REQUIREMENTS

Safety

acc. to EN 61 010-1
(resp. IEC 1010-1) safety class III,
pollution degree 2,
overvoltage category I

Limit Switch Code V
(additional equipment) safety class II,
pollution degree 2,
overvoltage category II

Explosion protection type EEx ia/ib ¹⁾

Basic device Type AI 633
Type of protection II 2 G EEx ib/ia IIB/IIC T4/T6
Certificate of conformity . . . PTB 02 ATEX 2153
For operation in certified intrinsically safe circuits with the
following maximum values of input circuit:
U_i 30 V
I_i 150 mA
P_i refer to following table:

P _i [W]	T ₆ [°C]	T ₄ [°C]
2	40	90
1.5	50	90
1	57.5	90

Internal inductance negligible
Internal capacitance negligible

The control circuit is galvanically separate from earth and all other electric circuits.

Limit Switch Code T, U (additional equipment)
Type of protection Intrinsic safety EEx ib/ia IIB/IIC
with the following maximum values:
U_i 16 V
I_i 25 mA
P_i 64 mW
Internal inductance 100 μH
Internal capacitance 30 nF

The signal circuits are galvanically separate from earth, from each other and from all other electric circuits.

Position Transmitter Code F (additional equipment)
Type of protection Intrinsic safety EEx ib/ia IIB/IIC
with the following maximum values:
for temperature class T4 and a maximally permissible
outside ambient temperature of 80 °C:
U_i 30 V
I_i 130 mA
P_i 0.9 W

for temperature class T4 and a maximally permissible
outside ambient temperature of 60 °C:
U_i 22 V
I_i 66 mA
P_i 0.5 W

The effective internal inductance L_i left amounts to 9 μH, the effective capacity C_i against earth amounts to 10 nF and/or differential 6 nF.

The supply- and signal circuits are galvanically separate from earth and from all other electric circuits.

1) National installation regulations must be observed
The national regulations must be strictly observed when retrofitting the electrical position transmitter type AI 633 in the electro-pneumatic positioner of type AI 633 or the inductive limit switch type AI 633 K in the electro-pneumatic positioner of type AI 633 (SRI986-BIDS2EBB and SRI986-CIDS2EBB).
The following regulations apply to the Federal Republic of Germany:
The installation must be carried out by the manufacturer, or the product must be tested by a qualified inspector as a special version in accordance with ElexV.

Explosion protection Zone 2 ¹⁾

It is recommended that the instrument version for protection type EEx ia is used.

In the Federal Republic of Germany these instruments may be operated in Zone 2 with non-intrinsically safe circuits if the operating values do not exceed the maximum reference values.

Explosion protection according to FM and CSA ¹⁾

Electro-pneumatic positioner type BIM 633

Intrinsically safe, Class I, Division 1,

Groups A, B, C, D, hazardous locations

Explosion protection according to INMETRO

see certificate

Explosion protection according to CU TR

EAC marking see certificate

1) National installation regulations must be observed

MODEL CODES SRI986

Electro-Pneumatic Positioner	SRI986									070715
Version										
Single Acting		-B								
Double Acting		-C								
Input										
Signal Range 4 - 20 mA		-I								
Mode of Action										
Direct Version: Increasing Input increases Output				D						
Reverse Version: Increasing Input decreases Output				R						
Built-In Limit Switch/Position Transmitter										
Without								S		
Inductive Limit Switch Three-Wire Technique, Without Explosion Protection . (a)								R		
Inductive Limit Switch (Standard Version) (a)								T		
Inductive Limit Switch (Security Version) (a)								U		
Two Micro Switches, Without Explosion Protection. (a)								V		
Position Transmitter 4 - 20 mA. (a)								F		
Cable Entry										
1/2"-14 NPT (with Adapter(s) M20x1.5 to 1/2"-14 NPT)								6		
M20 x 1.5 With One Plastic Cable Gland, Color Gray								7		
Electrical Certification: (Only Standard Device)										
II 2 G EEx ia IIC T6 according to ATEX (d)									EAA	
FM Approved For Intrinsic Safety Cl. I, Div. 1, Groups A,B,C,D Hazardous Locations Indoors									FAA	
CSA Approved For Intrinsic Safety Cl. I, Div. 1, Groups A,B,C,D Hazardous Locations Indoors									CAA	
GOST Approved For Intrinsic Safety									GAA	
EAC Approved For Intrinsic Safety									EAC	
INMETRO approved for Intrinsic Safety									BAA	
Without									ZZZ	
Attachment Kit										
Order as Auxiliary										N
Manifold										
Order as Auxiliary										A
Options										
Amplifier Free Of Nonferrous Metals (a)										-C
Protection Class IP65 made with non return valve exhaust										-FA
Designed For Auxiliary Energy Oxygen Max 6 Bar (With BAM Certificate)										-S
LLoyd's Register of Shipping										-X
Certificate EN 10204-2.1 - Certificate of compliance with the order										-1
Tag No. Labeling										
Stamped With Weather Resistant Color										-G
Stainless Steel Label Fixed With Wire										-L

Example: SRI986 -B I D S 7 ZZZ N A -CG

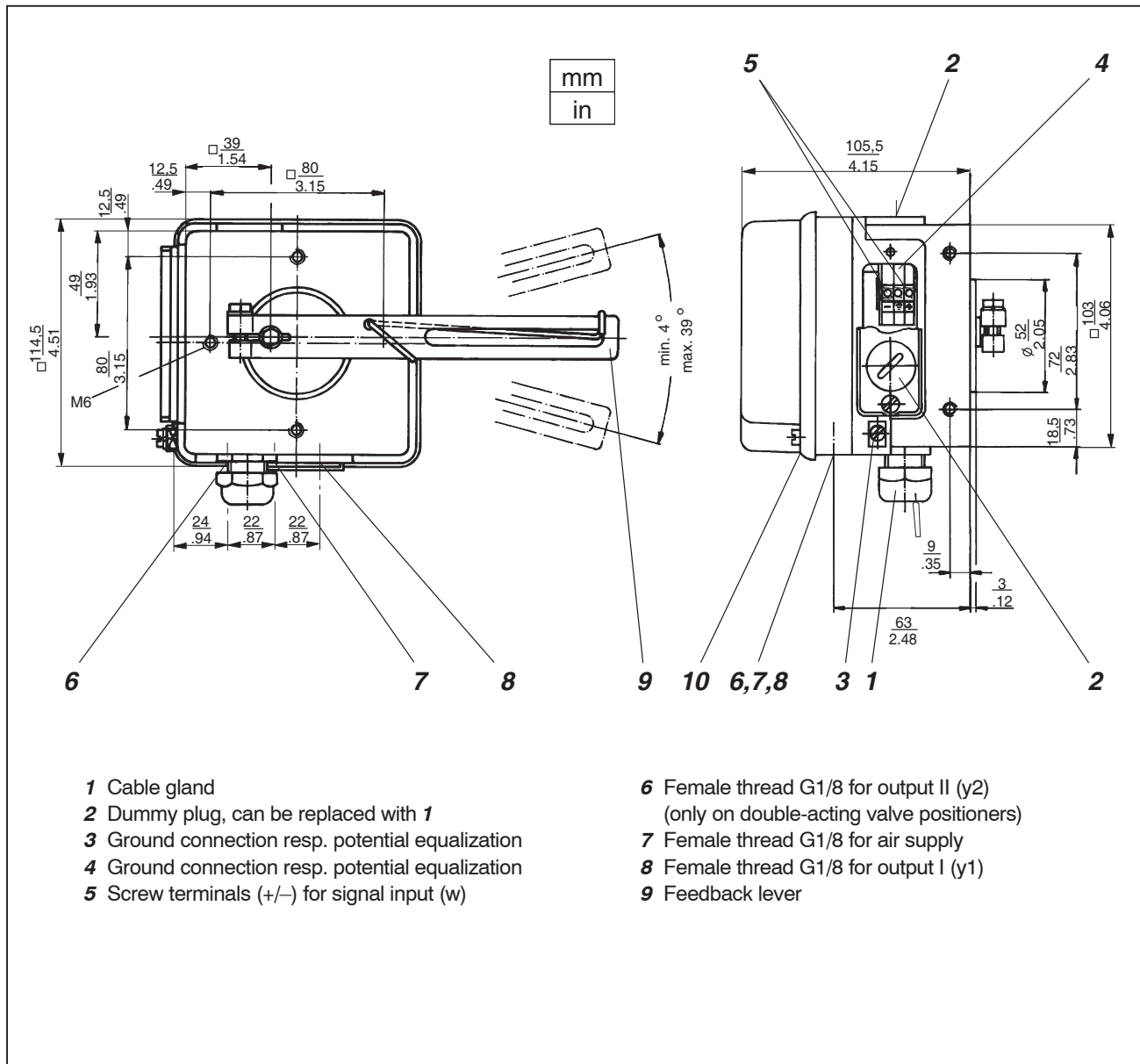
Footnotes

- a) Not available with FAA & CAA
- d) Not available with Limit Switch Codes R, V

MODEL CODES Accessories

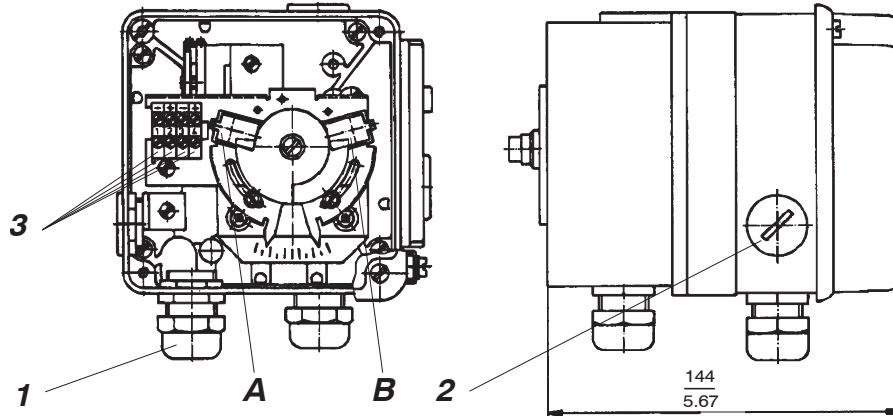
Attachment kit		EBZG
for diaphragm actuators with casting yoke acc. to NAMUR (incl. standard Couple lever) (for SRI986)		-HN
for diaphragm actuators with pillar yoke acc. to NAMUR (incl. standard Couple lever) (for SRI986)		-KN
for rotary actuators, without flange, 3 drill holes 6.5 mm (for SRP981, SRI983, SRI986, SMP981, SMI983, SGE985)		-PN
for rotary actuators, without flange, 4 threads M6 (for SRP981, SRI983, SRI986, SMP981, SMI983, SGE985)		-NN
for rotary actuators, with flange (for SRP981, SRI983, SRI986, SMP981, SMI983, SGE985)		-JN
for rotary actuators, with shaft (for SRP981, SRI983, SRI986, SMP981, SMI983, SGE985)		-ZN
for Masonellan type Camflex II (for SRP981, SRI983, SRI986, SMP981, SMI983, SGE985)		-RN
<i>Further Attachment kits on request. See also http://www.foxboro-eckardt.eu/products/positioners_en/Attachment_Kits</i>		
Couple lever / cam		
standard (a = 72 mm)		-AN
extended (a = 91 mm)		-BN
inverse equal percentage cam for rotary actuators		-CN
Spring set		FESG
range-springs (4pc.)		-FN
Manifold (Connection 1/4-18NPT)		LEXG
staggered connections (for SRP981, SRI986)		-BN
connections same level (for SRP981, SRI986)		-CN
with gauges for supply air, y, for version single acting (for SRP981, SRI986)		-JN
with gauges for supply air, y1, y2, for version double acting (for SRP981, SRI986)		-MN
gauge manifold without gauge, for version single acting (for SRP981, SRI986)		-RN
gauge manifold without gauge, for supply air, y1, y2, for version double acting (for SRP981, SRI986)		-SN
Booster (Connection 1/4-18NPT)		VKXG
for Version single acting (for SRP981, SRI986)		-FN
for Version double acting (for SRP981, SRI986)		-GN
for Version single acting with doubled output capacity (for SRP981, SRI986)		-HN
Adapter (Material SS)		AD
Adapter 1/2" NPT to 3/4" NPT		-A3
Adapter (stainless steel) M20x1.5 to 1/2"-14NPT (internal thread)		-A6
Adapter (stainless steel) M20x1.5 to PG 13.5 (internal thread)		-A7
Adapter (stainless steel) M20x1.5 to G 1/2" (internal thread)		-A8
Adapter (plastic) M20x1.5 to PG 13.5 (internal thread)		-A9
Cable gland		BUSG
PG 13.5 Plug-connector for Fieldbus (ss/ threaded connection 7/8 - UN)		-F1
M20x1.5 Plug-connector for Fieldbus (ss/ threaded connection 7/8 - UN)		-F2
PG 13.5 plastics, color gray		-K1
PG 13.5 plastics, color blue		-K2
PG 13.5 plastics, color white		-K4
M20x1.5 plastics, color gray		-K6
M20x1.5 plastics, color blue		-K7
M20x1.5 plastics, color black		-K8
M20x1.5 plastics, color white		-K9
PG 13.5 Plug-connector for Fieldbus (ss/ threaded connection M12)		-P1
PG 13.5 HF-cable gland for Fieldbus (ss)		-P2
M20x1.5 Plug-connector for Fieldbus (ss/ threaded connection M12)		-P3
M20x1.5 HF-cable gland for Fieldbus (ss)		-P4
PG 13.5 stainless steel		-S1
M20x1.5 stainless steel		-S6

DIMENSIONS SRI986

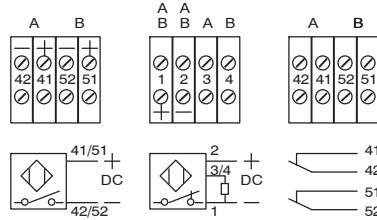


DIMENSIONS Additional Equipment

Built-in Limit Switch Code P, Q, R, T, U, V

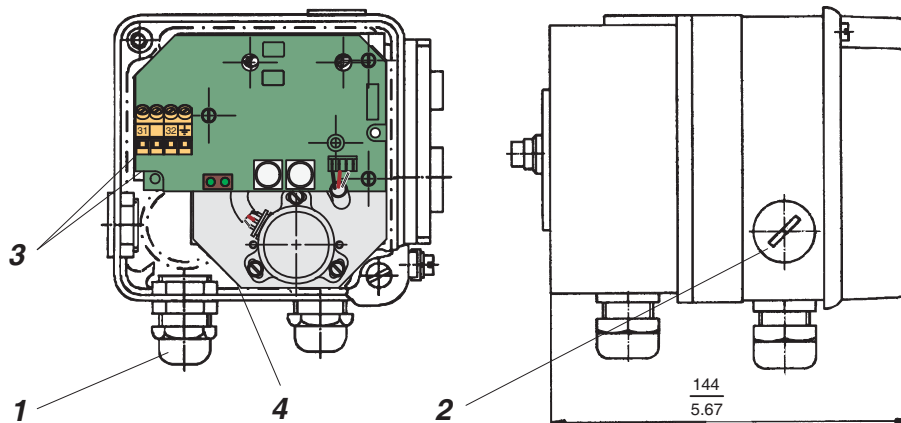


**Built-in Limit Switch Code
P, Q, T, U R V**



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in

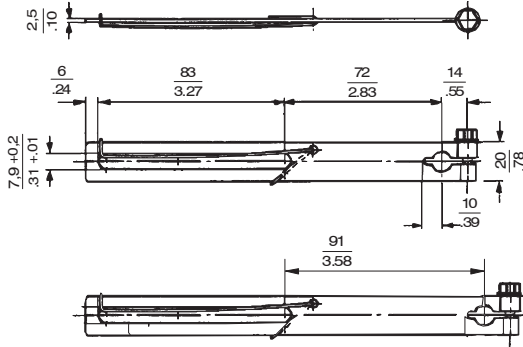
Built-in Position Transmitter Code F



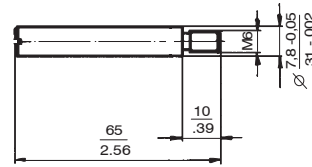
- 1 Cable gland
- 2 Dummy plug, can be replaced with 1
- 3 Connection terminals (+/-)
- 4 Ground connection
- A Limit switch
- B Limit switch

DIMENSIONS Attachment Kit for Diaphragm Actuators

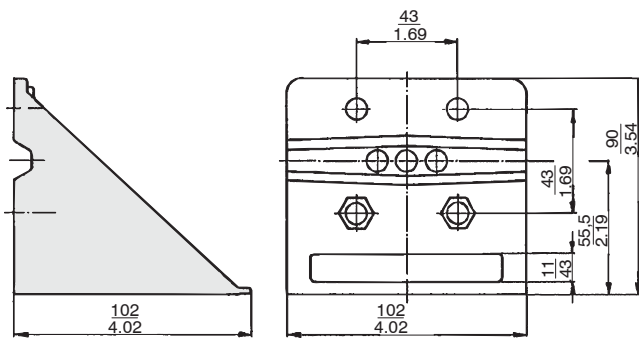
Feedback lever
Code EBZG - HN, - KN, - AN



Carrier bolt for attachment to valve stem

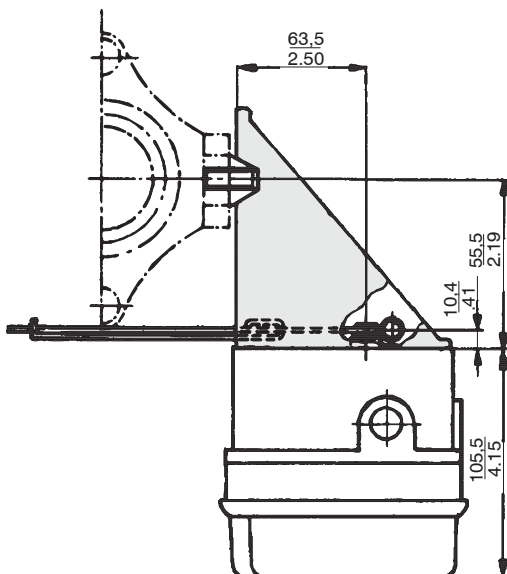


Dimensions of Mounting bracket acc. to IEC 534-6 (NAMUR) for Code EBZG - HN, - KN

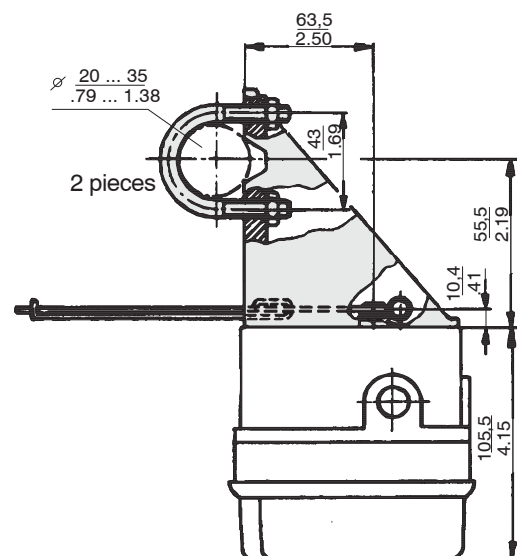


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Attachment to casting yoke acc. to IEC 534-6 (NAMUR) Code EBZG - HN

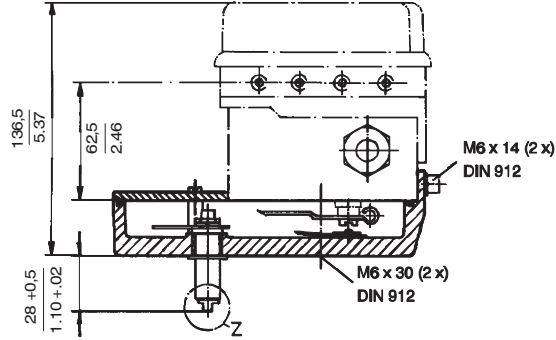


Attachment to pillar yoke acc. to IEC 534-6 (NAMUR) Code EBZG - KN

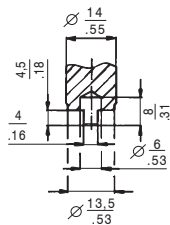


DIMENSIONS Attachment Kit for Rotary Actuators

**with shaft (acc. to VDI/VDE 3845)
Code EBZG - ZN**

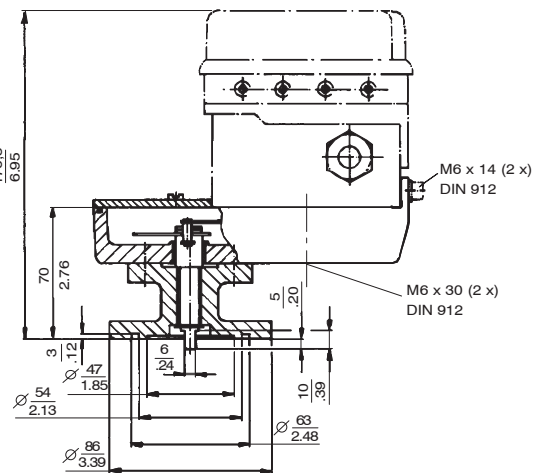
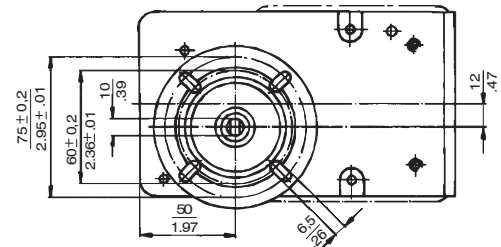


Detail Z



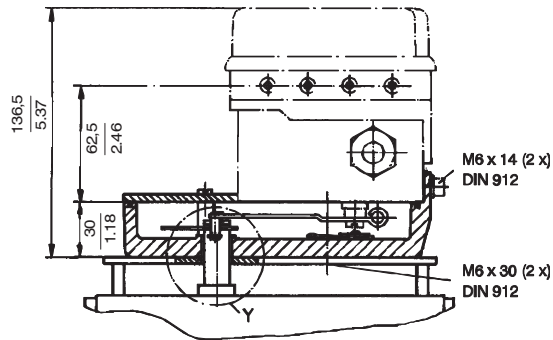
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**with flange
Code EBZG - JN**

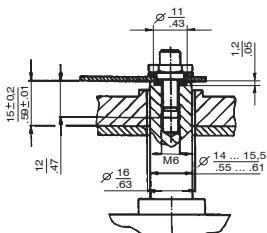


Rotation angle max. 120°; torque requirement 0.14 Nm

**without flange
Code EBZG - NN, -PN**

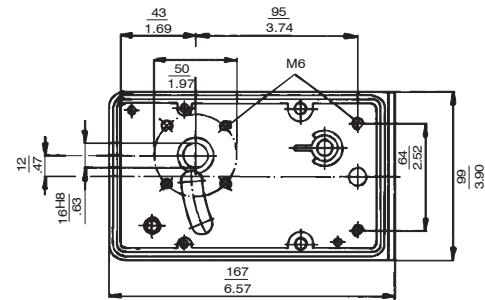


Detail Y

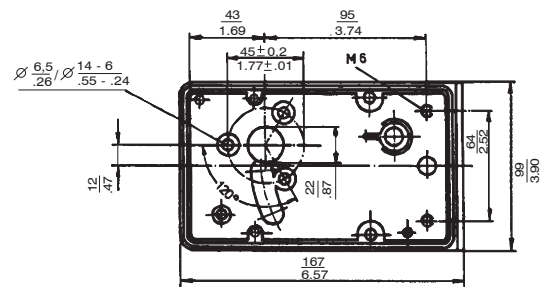


Adaptation of the actuator drive shaft end and correct axial location by client!

**Housing dimensions
attachment kit with shaft -ZN resp. without flange -NN**

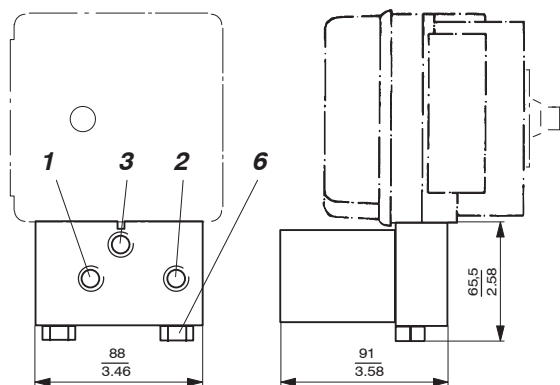


**Housing dimensions
attachment kit without flange -PN**

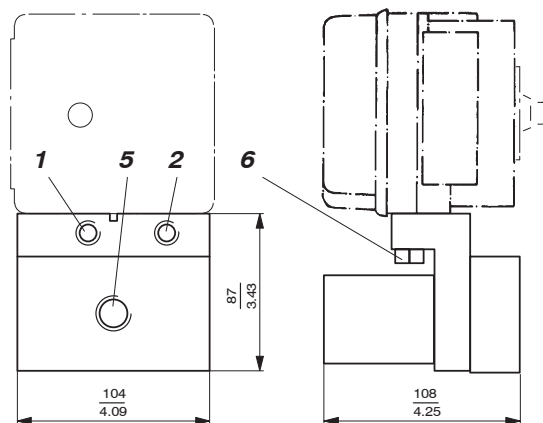


DIMENSIONS Booster

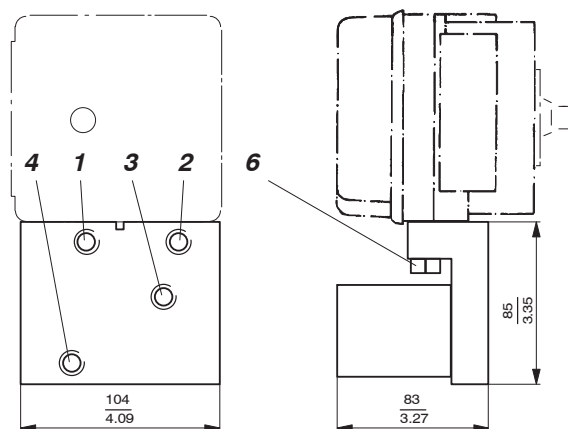
**Booster single acting
Code VKXG - FN**



**Booster single acting with double capacity
Code VKXG - HN**



**Booster double acting
Code VKXG - GN**

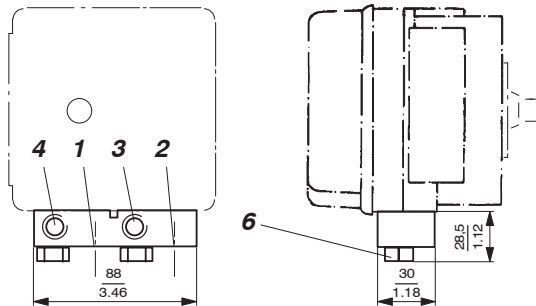


mm
in

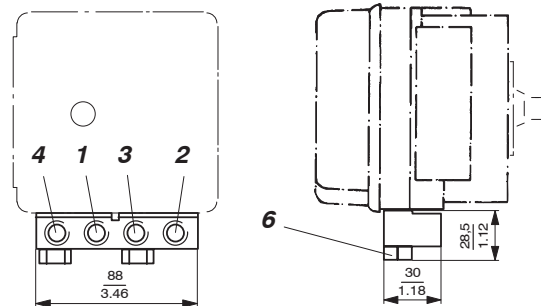
- 1** Female thread 1/4-18 NPT for supply air
- 2** Female thread 1/4-18 NPT not used
- 3** Female thread 1/4-18 NPT for output I (y1)
- 4** Female thread 1/4-18 NPT for output II (y2)
- 5** Female thread 1/2-14 NPT for output I (y1)
- 6** Fixing screws 17 mm A/F

DIMENSIONS Connection Manifold

**Connection Manifold
Code LEXG - BN**



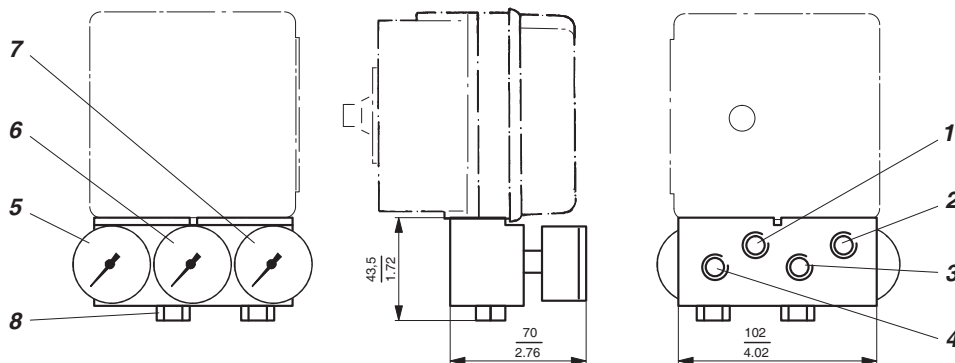
**Connection Manifold
Code LEXG - CN**



mm
in

- 1 Female thread 1/4-18 NPT for supply air
- 2 Female thread 1/4-18 NPT not used
- 3 Female thread 1/4-18 NPT for output I (y1)
- 4 Female thread 1/4-18 NPT for output II (y2)
- 6 Fixing screws 17 mm A/F

**Connection Manifold with Gauges
Code LEXG - JN, - MN**



Conne- tion Manifold Code	5 Gauge for Supply air	6 Gauge for Output I (y / y1)	7 Gauge for Output II (y2)	single acting	double acting
JN	Supply air	Output (y)	without	yes	-
MN	Supply air	Output I (y1)	Output II (y2)	-	yes
RN	without	without	without	yes	-
SN	Supply air	Output I (y1)	Output II (y2)	-	yes

- 1 Female thread 1/4-18 NPT for supply air
- 2 Female thread 1/4-18 NPT not used
- 3 Female thread 1/4-18 NPT for output I (y1)
- 4 Female thread 1/4-18 NPT for output II (y2)
(not for Connection Manifold LEXG - JN)
- 8 Fixing screws 17 mm A/F

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 EVE0102 A](#) Extract of Master Instruction for an easily to use, easy understandable and fast start-up.
This document highlights the most important aspects.

Master Instructions:

[MI EVE0102 A](#) SRI986

Additional Documentation for other products

Specifications website

[PSS EVE0101](#) SRP981 Pneumatic Positioner

[PSS EVE0102](#) SRI986 Electro-Pneumatic Positioner

[PSS EVE0103](#) SRI983 Electro-Pneumatic Positioner- explosion proof or EEx d version

[PSS EVE0105](#) SRD991 Intelligent Positioner

[PSS EVE0107](#) SRI990 Analog Positioner

[PSS EVE0109](#) SRD960 Universal Positioner

PSS EMO0100 Accessories for devices with HART Protocol