

## ELECTRO-PNEUMATIC POSITIONERS PE986

### DESCRIPTION

The ADCATrol PE986 is an electro-pneumatic positioner used for direct operation of pneumatic linear or rotary actuators by means of electrical controllers or control systems with a 4 to 20 mA, 2 to 10 V or split ranges output.

The positioner features a compact design and a modular construction which allows easy attachment of options such as limit switches, analog feedback modules, manifolds, volume boosters, amongst others.

### MAIN FEATURES

- Compact and flexible design.
- Mounting onto any linear or rotary actuator.
- Single or double acting.
- Supply pressure up to 6 bar.
- Adjustable amplification and damping.
- Independent adjustment of stroke range and zero position.
- Resistant to vibration effect in all directions.
- ATEX approval (Ex ia).

### OPTIONS AND ACCESSORIES

- Module for analog position feedback.
- Digital position feedback with inductive switches (two or three-wire system).
- Digital position feedback with microswitches.
- Attachment kit for linear actuators acc. to IEC 534/NAMUR.
- Attachment kit with rotary adaptor for rotary actuators acc. to VID/VDE 3845.
- Connection manifold with gauges.
- ATEX approval (Ex d): Version PE983.
- Volume boosters.



## TECHNICAL DATA

GENERAL	
<b>Material</b>	Housing: Aluminium finished with DD-varnish black Mounting bracket: Aluminium Moving parts of feedback system: AISI 303 /1.4305 or AISI 316Ti / 1.4571
<b>IP rating</b>	Protection class IP 54 (IP 65 on request)
<b>Pneumatic connections</b>	Female threaded ISO 228 G 1/8"
<b>Electrical connections</b>	M20 x 1,5 Cable glands Screw terminals: max. 2.5 mm <sup>2</sup>
<b>Weight</b>	Single acting: approx. 1,5 kg Double acting: approx. 1,8 kg Attachment kit: For diaphragm actuators: approx. 0,3 kg For rotary actuators: approx. 0,5 kg

AMBIENT CONDITIONS	
<b>Ambient temperature</b>	-40 °C to 80 °C
<b>Relative humidity</b>	Up to 100%
<b>Operating conditions</b>	According to IEC 654-1; The device can be operated at a class D2 location
<b>Transport and storage temperature</b>	-50 °C to 80 °C
<b>Storage conditions</b>	According to IEC 60 721-3-1: 1K5, 1B1, 1C2, 1S3, 1M2

ELECTROMAGNETIC COMPATIBILITY (EMC)	
<b>Operating conditions</b>	Industrial environment
<b>Immunity</b>	According to EN 61326 and EN 61000-6-2
<b>Emission</b>	According to EN 61326, Class A and EN 61000-6-3

Remark: NAMUR recommendation fulfilled

CE MARKING	
<b>Electromagnetic compatibility</b>	89/336/EWG
<b>Low-voltage regulation</b>	73/23/EWG not applicable

CAPACITY AT MAXIMUM DEVIATION (NI/h)				
AIR PRESSURE SUPPLY	1,4 bar	2 bar	4 bar	6 bar
<b>Without booster</b>	2700	3500	5500	7500
<b>With booster LEXG-FN/GN</b>	18000	24000	40000	55000
<b>With booster LEXG-HN</b>	38000	48000	80000	110000

INPUT SIGNAL	
<b>Signal range</b>	4 to 20 mA or 2 to 10 V
<b>Input resistance</b>	< 200 Ω at 20 °C
<b>Stroke range</b>	20 to 100% of the nominal operating range
<b>Angular range</b>	Linear: 30 ° to 120 ° Equal percentage: 90 °; from 70 ° linear

OUTPUT SIGNAL	
<b>Output to actuator</b>	0 to 100 % supply air pressure

AIR SUPPLY *	
<b>Air supply pressure</b>	1,4 to 6 bar (20 to 90 psig)
<b>Solid particle size and density</b>	Class 2
<b>Oil rate</b>	Class 3
<b>Pressure dew point</b>	10K below ambient temperature

\* According to ISO 8573-1.

Remark: For air supply, we recommend the ADCA P10 filter regulator.

AIR CONSUMPTION	
<b>Single acting</b>	Air supply 1.4 bar (20 psig) 200 NI/h ( 7,1 scfh)
	Air supply 3.0 bar (45 psig) 400 NI/h (12,4 scfh)
	Air supply 6.0 bar (90 psig) 600 NI/h (21,2 scfh)
<b>Double acting</b>	Air supply 1.4 bar (20 psig) 350 NI/h (10,6 scfh)
	Air supply 3.0 bar (45 psig) 550 NI/h (17,7 scfh)
	Air supply 6.0 bar (90 psig) 750 NI/h (33,5 scfh)

AIR OUTPUT	
Load effect *	
-3 % for delivery flow 2350 NI/h (83 scfh)	
+3 % for exhausted flow 1900 NI/h (67 scfh)	

\* Measured with air supply 1,4 bar and 50% of the signal range.

RESPONSE CHARACTERISTIC *	
<b>Amplification</b>	Adjustable
<b>Sensitivity</b>	< 0,1% F.S.
<b>Non-linearity (terminal based adjustment)</b>	< 1,0 % F.S.
<b>Hysteresis</b>	< 0,3 % F.S.
<b>Supply air dependency</b>	< 0,3 % / 0,1 bar
<b>Temperature effect</b>	< 0,5 % / 10 K

\* Data based on the following parameters: stroke 30 mm, feedback lever 117,5 mm, max. amplification, air supply pressure 3 bar.

## OPTIONS AND ACCESSORIES

### INDUCTIVE LIMIT SWITCH (TWO-WIRE SYSTEM)

<b>Input</b>	Stroke / angle from actuator via positioner feedback lever
<b>Output</b>	2 inductive proximity sensors acc. to DIN 19 234 resp. NAMUR for connection to a switching amplifier with an intrinsically safe control circuit <b>a)</b>
<b>Current consumption</b>	Vane clear: > 3 mA Vane interposed: < 1 mA
<b>Supply voltage</b>	DC 8 V, Ri approx. 1 kΩ
<b>Residual ripple</b>	< 5 %
<b>Permissible line resistance</b>	< 100 Ω
<b>Response characteristic b)</b>	Gain: continuously adjustable from 1:1 to approx. 7:1 Switching differential: < 1 % Switching point repeatability: < 0,2 % EMC: according to EN 60 947-5-2

**a)** For the standard version one switching amplifier is required. For the security version fail-safe amplifier for each inductive proximity sensor is required; Operating mode minimum (= low) / maximum (= high) selectable by adjustment of switch vanes; Operating mode normally closed circuit / normally open circuit selectable at switch amplifier output.

**b)** For feedback lever effective length 117,5 mm (4,63 in), stroke 30 mm (1,28 in) and maximum gain.

### LIMIT SWITCH ASSEMBLY WITH MICROSWITCHES

<b>Input</b>	Stroke / angle from actuator via positioner feedback lever
<b>Output</b>	2 micro switches <b>d)</b>
<b>Connected load, alternating current</b>	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
<b>Connected load, direct current (refer to the following table)</b>	

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

<b>Response characteristic d)</b>	Gain: continuously adjustable from 1:1 to approx. 7:1 Switching differential: < 2,5 % Switching point repeatability: < 0,2 %
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**d)** For feedback lever effective length 117,5 mm (4,63 in), stroke 30 mm (1,28 in) and maximum gain.

### INDUCTIVE LIMIT SWITCH (THREE-WIRE SYSTEM)

<b>Input</b>	Stroke / angle from actuator via positioner feedback lever
<b>Output</b>	2 inductive proximity sensors, three-wire system, LED indication, contact, pnp <b>b)</b>
<b>Supply voltage US</b>	DC 10 to 30 V
<b>Residual ripple</b>	± 10 %, US = 30 V
<b>Switching frequency</b>	2 kHz
<b>Constant current</b>	100 mA
<b>Response characteristic c)</b>	Gain: continuously adjustable from 1:1 to approx. 7:1 Switching differential: < 1 % Switching point repeatability: < 0.2 %

**b)** Operating mode minimum (= low) / maximum (= high) selectable by adjustment of switch vanes; Contact closed within the positive range.

**c)** For feedback lever effective length 117,5 mm (4,63 in), stroke 30 mm (1,28 in) and maximum gain.

### CONNECTION MANIFOLD WITH GAUGES

<b>Indicating range</b>	Stroke / angle from actuator via positioner feedback lever
<b>Error limit</b>	class 1.6
<b>Pneumatic connections</b>	Female threads Q1/4-18 NPT according to DIN 45 141

### ANALOG POSITION FEEDBACK

<b>Sensor</b>	Resistive precision conductive plastic element
<b>Input</b>	Stroke/angle from actuator via position feedback lever; Stroke range: 8 to 100 mm (0,3 to 4 in) Angular range: 60 ° to 120 °
<b>Output</b>	Two-wire system Signal range: 4 to 20 mA
<b>Permitted load</b>	$R_{Bmax} = (U_S - 12 V) / 0,02A$ ( $U_S$ = Supply voltage)
<b>Power supply</b>	Supply voltage: DC 12 to 36 V Permitted ripple: < 10 % p.p. Supply voltage dependency: < 0,2 %
<b>Response characteristic e)</b>	Non-linearity with terminal based setting: < 1,0 % F.S Hysteresis: < 0,5 % F.S. External resistance dependency: < 0,2 % / $R_{Bmax}$ Temperature effect: < 0,3 % / 10 K

**e)** For feedback lever effective length 117,5 mm (4,63 in), stroke 30 mm (1,28 in) and maximum gain.

**COMMON DATA FOR OPTIONS AND ACCESSORIES**

GENERAL	
<b>IP rating</b>	Protection class IP 54; IP 65 on request
<b>Mounting</b>	Attachment to positioner
<b>Electrical connections</b>	Line entry: 1 or 2 cable glands M20 x 1,5 or 1/2"-14 NPT (others with Adapter AD-...) Cable diameter: 6 to 12 mm (0,24 to 0,47 in) Screw terminals: max. 2.5 mm <sup>2</sup> (AWG14) Optionally: Threaded gland made of AISI 303 (1.4305)
<b>Materials</b>	Base plate: galvanized steel Control vane: aluminium Setting mechanism: fibre glass-reinforced polyamide

AMBIENT CONDITIONS	
<b>Ambient temperature f)</b>	-25 to 80 °C
<b>Relative humidity</b>	Up to 100%
<b>Operating conditions</b>	According to IEC 654-1; The device can be operated at a class D2 location
<b>Transport and storage temperature</b>	-40 °C to 80 °C

f) Refer to the section "Explosion protection", in page 5, with respect to explosion-protected equipment; -40 °C to 80 °C for the fail-safe version of inductive limit switch.

**SAFETY REQUIREMENTS**

SAFETY	
<b>Acc. to EN 61 010-1 (resp. IEC 1010-1)</b>	safety class III, pollution degree 2, overvoltage category I
<b>Limit Switch (accessory equipment)</b>	safety class II, pollution degree 2, overvoltage category II

EXPLOSION PROTECTION TYPE Ex ia/ib	
<b>Basic device type</b>	AI 633
<b>Type of protection</b>	II 2 G Ex ib/ia IIB/IIC T4/T6
<b>Certificate of conformity</b>	PTB 02 ATEX 2153
<b>For operation in certified intrinsically safe circuits with the following maximum values of input circuit:</b> U <sub>i</sub> : 30 V I <sub>i</sub> : 150 mA P <sub>i</sub> : refer to the following table:	

P <sub>i</sub> (W)	T6 (°C)	T4 (°C)
2	40	90
1,5	50	90
1	57,5	90

<b>Internal inductance</b>	Negligible
<b>Internal capacitance</b>	Negligible

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

EXPLOSION PROTECTION ZONE 2 *
It is recommended that the instrument version for protection type Ex 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 *
Electro-pneumatic positioner type BIM 633 Intrinsically safe, Class I, Division 1, Groups A, B, C, D, hazardous locations.

\* National installation regulations must be observed.

LIMIT SWITCH
Type of protection intrinsic safety Ex ib/ia IIB/IIC with the following maximum values:  U <sub>i</sub> : 16 V I <sub>i</sub> : 25 mA P <sub>i</sub> : 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
Type of protection intrinsic safety Ex ib/ia IIB/IIC with the following maximum values:  For temperature class T4 and a maximally permissible outside ambient temperature of 80 °C: U <sub>i</sub> : 30 V I <sub>i</sub> : 130 mA P <sub>i</sub> : 0,9 W
For temperature class T4 and a maximally permissible outside ambient temperature of 60 °C: U <sub>i</sub> : 22 V I <sub>i</sub> : 66 mA P <sub>i</sub> : 0,5 W
The effective internal inductance L <sub>i</sub> left amounts to 9 µH, the effective capacity C <sub>i</sub> 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.