Electropneumatic Positioner and Pneumatic Positioner Type 3760

Application

Single-acting electropneumatic and pneumatic positioners for operation of pneumatic control valves. Standardized electric signals (mA or V) or pneumatic (psi or bar) input signals.
Electric input signals from **4 to 20 mA** or **0(2) to 10 V**.
Pneumatic signals from **3 to 15 psi (0.2 to 1 bar)**
Output range from **0 to 90 psi (0 to 6 bar)**
Rated valve stem travels from **0.2" to 0.6" (5 to 15 mm)**

Positioners consisting of a pneumatic proportional controller and optional i/p converter. For integral attachment to Type 3277 and Type 2780-2 Pneumatic Actuators with maximum 0.6" (15 mm) stroke.

The positioners provide accurate valve stem positioning ensuring a pre-selected relationship between the valve stem position (controlled variable x) and the electric or pneumatic input signal supplied by the controller (reference variable w.) They compare the input signal received from the control device to the stem position of the control valve and produce a corresponding pneumatic output signal pressure p_{st} (output variable y) to the actuator.

Features

- Extremely corrosion-resistant polyamide enclosure
- Compact design requiring very little maintenance
- Very insensitive to mechanical vibrations
- Field reversible operating action
- Excellent dynamic response
- Suitable for normal or split-range operation
- Low air consumption
- Rugged stainless steel tube fitting connections
- Internal linkages, protected from damage or corrosion
- Feedback lever directly attached to actuator stem
- Pre-calibration of actuator and positioner possible
- Optional inductive limit switch or output pressure limiter
- Output range: 0 to 90 psi (0 to 6 bar)
- Air supply: 20 to 90 psi (1.4 to 6 bar)

Fig. 1 · Type 3760 Positioner

Versions

Type 3760 · Electropneumatic positioner

- Input signal: 4(0) to 20 mA, 1 to 5 mA, 2(0) to 10 V
- Certified Intrinsically safe for hazardous locations

Type	Authority	Hazardous locations information
3760-3	CSA	Class I, II, III, Division 1, Groups A, B, C, D Class I, Division 2, Groups A, B, C, D
	FM	Class I, II, III, Div.1, Groups A, B, C, D, E, F, G Class I, Division 2, Groups A, B, C, D Class II, Division 2, Groups F and G Class III, Division 2
3760-1	PTB	EEx ia IIC T6 according to CENELEC
3760-0	–	For non-hazardous locations

Type 3760 · Pneumatic Positioner

- Input range: 3 to 15 psi (0.2 to 1.0 bar)

Accessories

- Pressure gauges for input and output signal pressures
- Retrofit kits for subsequent conversion from a pneumatic positioner to an electropneumatic positioner and vice versa
- Vent port filter valve for protection against high intensity sprays and foreign matter

Principle of operation (Fig. 2)

The only difference between the Type 3760 Pneumatic Positioner and the Type 3760 Electropneumatic Positioner is that an electropneumatic (I/P) converter (2) has been added to the latter in order to convert the electric signal received from a controller into a proportional pneumatic signal.

As mentioned on the previous page, both positioners ensure a pre-selected relationship between the valve stem position (controlled variable x) and the electric or pneumatic input signal supplied by the controller (reference variable w). With the electropneumatic version, the electric reference input signal supplied to the electropneumatic positioner comprises either a DC current signal (I) or a DC voltage signal (U). With the pneumatic version, the pneumatic reference input signal p_e supplied to the pneumatic positioner comprises a pressure (bar or psi). The pneumatic output signal pressure p_{st} produced by both positioners (output variable y) is introduced as loading pressure to the actuator.

Both positioner types are designed for direct attachment to the Type 3277 Pneumatic Actuators.

These positioners can be used for both normal (full) and split-range operation.

Split range operation

In split-range operation, the output signal from the controller is divided among two control valves so that each actuator passes through its entire travel at half the input span; e.g., at a span between 3 and 15 psi (0.2 and 1 bar), the first valve is adjusted to the first half from 3 to 9 psi (0.2 to 0.6 bar), the second is adjusted to the second half from 9 to 15 psi (0.6 to 1 bar.).

The adjustment screws for ZERO (5) and SPAN (8) determine the lower and upper-range values for the input signal. The measuring spring (7) must be chosen to match both the rated travel of the control valve and the nominal input span.

Operating action

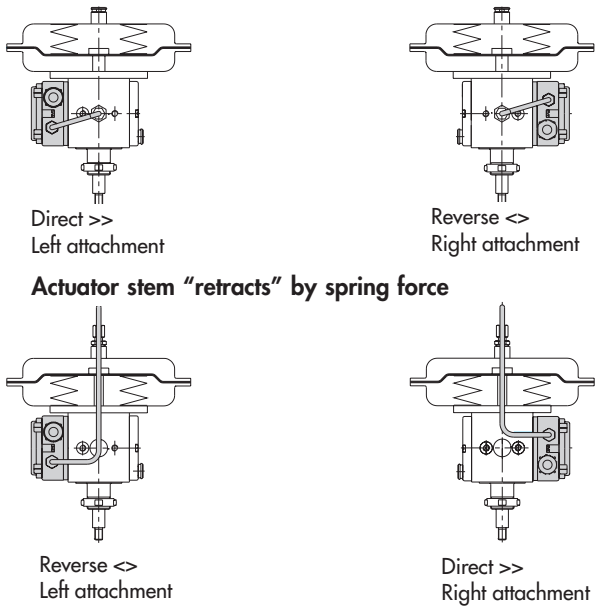
When the input signal (p_e) increases, the pneumatic output signal pressure p_{st} can be selected to be increasing (direct action >>) or decreasing (reverse action <>). The operating action depends on the reversing block installation. The symbol (>> or <>) indicates the respective operating action. Reversal of action or fail-safe is possible in the field taking care to note the required positioner orientation according to Fig. 2.

Attaching the positioner to the actuator (Fig. 2)

The positioners are designed for direct attachment to Type 3277 Pneumatic Actuators with effective areas up to 350 cm^2. They are secured directly to the actuator yoke by two screws.

No external tubing is necessary for actuators with effective areas of 120 cm^2. The pneumatic output signal pressure p_{st} from the positioner is ported to the desired diaphragm chamber of the actuator via a switch-over plate and internal air passages.

Fig. 3 schematically illustrates the following relationships: The arrangement of the actuator; the mounting position of the positioner; the input signal; and the operating action.



Note: "Left" and "Right" attachment defined when viewing the air connection side of the actuator

Fig. 2 · Positioner and actuator combinations

Fail-safe action

The Type 3277 Pneumatic Actuator features the following fail-safe actions which move the valve stem in the pre-determined position whenever the signal pressure decreases or the air supply fails:

- **Actuator stem "extends"**

Whenever the pressure acting on the surface of the diaphragm decreases or the air supply fails, the force of the compression springs installed in the actuator "extends" the actuator stem in the lower position.

- **Actuator stem "retracts"**

Whenever the pressure acting on the surface of the diaphragm decreases or the air supply fails, the force of the compression springs installed in the actuator "retracts" the actuator stem in the upper position.

Further details can be found in the Technical Data Sheet T 8311.

Fig. 2 illustrates the various ways in which the positioner can be attached to the actuator. The specifications "Left attachment" or "Right attachment" apply when looking onto the switch-over plate and the loading pressure connection of the actuator.

Table 1 · Technical data

Travel range		0.2" to 0.6" (5 to 15 mm) (see also measuring springs, Table 2)	
Input signal w	Pneumatic psi (bar)	3 to 15 psi (0.2 to 1 bar)	
(for split range operation, input span 0 to 50 % or 50 to 100 %)	Electric mA R_i at 70 °F (20 °C)	4 to 20 mA 200 Ω	1 to 5 mA 850 Ω
	Electric V with 24 V DC power supply	0(2) to 10 V Internal resistance at 70 °F (20 °C), approximately 20 kΩ	
Air supply requirement		20 to 90 psi (1.4 to 6 bar)	
Pneumatic output signal pressure p_{st}		Maximum 0 to 90 psi (0 to 6 bar)	
Characteristic		Linear	
Deviation from terminal-based conformity		≤ 1.5 %	
Operating action		Reversible (direct >> or reverse <>)	
Hysteresis		≤ 0.5 %	
Sensitivity		> 0.1 %	
Air consumption in the steady state		At 9 psi (0.6 bar) input signal and supply up to 90 psi (6 bar) ≤ 3.5 scfh (100 l_n/h)	
Air output capacity		At 20 psi (1.4 bar), 56.5 scfh (1600 ln/h); at 90 psi (6 bar), 175 scfh (5000 l_n/h)	
Transit times (speeds of response) for SAMSON Actuator, 0.6" (15 mm) travel 3 to 15 psi (0.2 to 1 bar) signal pressure	Effective area	120 cm^2 = ≤ 2 s 240 cm^2 = ≤ 2 s 350 cm^2 = ≤ 8 s	
Permissible ambient temperature		–5 to +160 °F (–20 to +70 °C), special version up to –50 °F (–45 °C) on request	
For Intrinsically safe version see:		Certificate of Conformity	
Influence	Temp. zero point	≤ 0.03 %/°C	
	Span	≤ 0.03 %/°C	
	Vibrations	Between 5 to 120 Hz and 2G ≤ 0.5 %	
	Air supply	≤ 1 % between 21 and 90 psi (1.4 and 6 bar)	
Variable position when turned 180 °		< 3.5 %	
Enclosure protection class		CSA Enclosure 3, NEMA 3R, IP 54 (IP 65 special version)	
Weight		1.3 lb (0.6 kg)	
Accessories			
Inductive limit switch (proximity switch)		Type SJ2–SN	
Control circuit		Values corresponding to the connected transistor relay	
Switching differential at rated travel		≤ 1 %	
Output pressure limiter		On request	

Table 2 · Materials

Housing	Polyamide	
External parts	Stainless steel AISI 316 and AISI 430 F	Stainless steel WN 1.4571 and WN 1.4104
Measuring diaphragm	Fluorosilicone rubber	

Table 3 · Entity parameters for certified Intrinsically Safe circuits

Limit switch	**i/p positioner**
V_{max} ≤ 15.5 V	Vmax ≤ 28 V
Imax ≤ 52 mA	Imax ≤ 100 mA
Pmax ≤ 169 mW	Rmin ≥ 280 V
	Ci; Li: negligible

Table 4 · Measuring spring selection

Measuring spring	Reference variable (%)	Travel	
		inches	mm
1	0 to 100% Split-range 0 to 50% or 50 to 100%	0.6 0.3	15 7.5
2	0 to 100%	0.3	7.5
3	Split-range 0 to 50%	0.6	15
4	Split-range 50 to 100%	0.6	15
5	0 to 100%	0.33 and 0.4	5 and 6
6	0 to 100%	0.8	20
7	0 to 100%	0.4 and 0.5	10.5 and 12
8	Split-range 0 to 50%	0.4 and 0.5	10.5 and 12
9	Split-range 50 to 100%	0.4 and 0.5	10.5 and 12

Ordering information

Product number	Type 3760-					
Intrinsically safe protection						
Without	0					
EEx ia IIC T6	1					
CSA/FM	3					
Accessories						
Without		0				
Inductive limit switch (proximity switch)		1				
Output pressure limiter		2				
Both options listed above		3				
Pneumatic connections						
G ⅛			1			
NPT ⅛			2			
Electrical connections						
Without				0		
PG 13.5 blue cable gland				1		
PG 13.5 black cable gland				2		
Connector DIN 43 650-AF3 PG 11				3		
Input signal						
3 to 15 psi / 0.2 to 1 bar					0	0
4 to 20 mA					1	1
0 to 20 mA					2	2
1 to 5 mA					2	3
2 to 10 V (requires 24 V DC power supply)[1]					1	4
0 to 10 V (requires 24 V DC power supply)[1]					1	5

[1] Only for Type 3760-00 without limit switch

Additional specifications

Measuring spring 1/ 2 / 3
Without / with pressure gauge
Gauge housing: CrNiMo steel,
connection optionally nickel plated/CrNiMo steel

Specifications subject to change without notice.

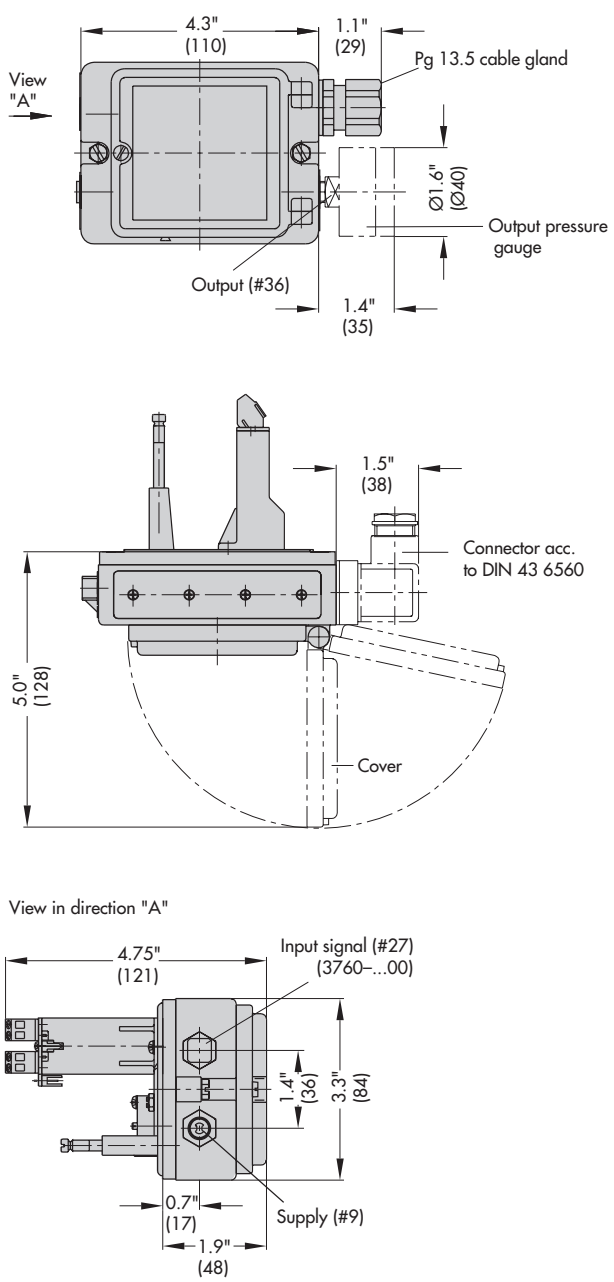
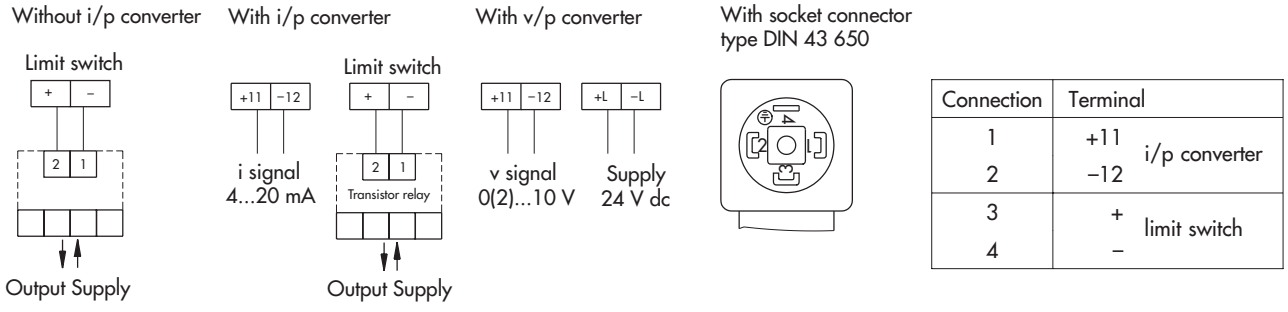


Fig. 3 · Dimensions in inches; dimensions in parentheses () in mm



Connection	Terminal	
1	+11	i/p converter
2	–12	
3	+	limit switch
4	–	

Fig. 4 · Electrical connections

SAMSON CONTROLS INC.
1-105 Riviera Drive
Markham · Ontario · Canada · L3R 5J7
Tel. (905) 474-0354 · Telefax (905) 474-0998

SAMSON CONTROLS INC.
4111 Cedar Boulevard
Baytown · Texas · USA · 77520
Tel. (281) 383-3677 · Telefax (281) 383-3690