

i n v e n s y s<sup>TM</sup>

Pneumatic Instruments Catalog

Foxboro®



# Ordering

## Specifying Your Instrument or Accessory

You can easily specify many instruments and accessories described in this catalog. Sections covering our most popular items include all the technical data you need to know for most applications. To specify the appropriate item, simply follow the step-by-step procedure at the end of each description. Your Foxboro representative can help also.

### For Example:

Choose the product code.  
Itemize the information needed to complete the specification.

### Ordering:

To order, contact your Foxboro representative.  
Or call, in North America: 1-866-746-6477, or International: 001-508-549-2424.  
Or visit [www.buyautomation.com/officelocator](http://www.buyautomation.com/officelocator).  
Give us the ordering information using this catalog. Then tell us where you want the order shipped and when you need it delivered. We'll do the rest.

### Need Help?

If you have questions, let us know. We're ready, and eager, to assist you. Applications are a Foxboro specialty. We can help you figure out the best instrument for your purpose.

Instrument catalog available – ask your Foxboro representative about it.

<b>1) SPECIFY MODEL NUMBER: 13</b>	
<b>Transmitter:</b>	
316 ss body.....	A
Monel body.....	A4
Hastelloy C body (supplied without process connectors).....	A5
<b>Span Limits:</b>	
5 and 62 kPa or 20 and 250 inH <sub>2</sub> O ΔP.....	M
50 and 210 kPa or 200 and 850 inH <sub>2</sub> O ΔP.....	H
<b>Body Material:</b>	
316 ss (13A only).....	S
Monel (13A4 only).....	M
Hastelloy C (13A5 only) (Process Connectors code 0 below must be specified).....	C
<b>Process Connectors:</b>	
1/4 NPT.....	1
1/2 NPT.....	2
R1/4.....	3
R1/2.....	4
Welding neck for 14 x 21 mm tube and 1/2 in Schedule 80 pipe.....	6
None, body tapped for 1/4 NPT.....	0
<b>Optional Features: (also see previous page)</b>	
Zero elevation kit.....	L
Zero suppression kit.....	R
<b>2) SPECIFY OUTPUT SIGNAL</b> _____	
<b>3) SPECIFY CALIBRATED DIFFERENTIAL PRESSURE RANGE</b> _____	
<b>4) SPECIFY ADDITIONAL OPTIONAL FEATURES</b> _____	
<b>5) SPECIFY INFORMATION FOR INSTRUMENT TAG</b> _____	

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## **Foxboro Pneumatic Transmitters are the industry standard.**

All of these instruments have been field proven through years of experience. They are precise, easy to maintain, and available in a wide range of materials.

The Foxboro line encompasses a variety of measurement types.

### **Flow Measurement**

Differential pressure transmitters.

### **Temperature Measurement**

Filled thermal systems and thermocouple/ RTD devices.

### **Pressure Measurement**

Force balance and indicating transmitters.

### **Liquid Level Measurement**

Differential pressure transmitters with or without chemical seals and buoyancy transmitters.

### **Other Applications**

Sanitary designs, relative humidity transmitters, speed transmitters, and repeaters.

Foxboro is the leading single source of pneumatic transmitters for the process industries.

No other manufacturer makes as many types for as many applications.

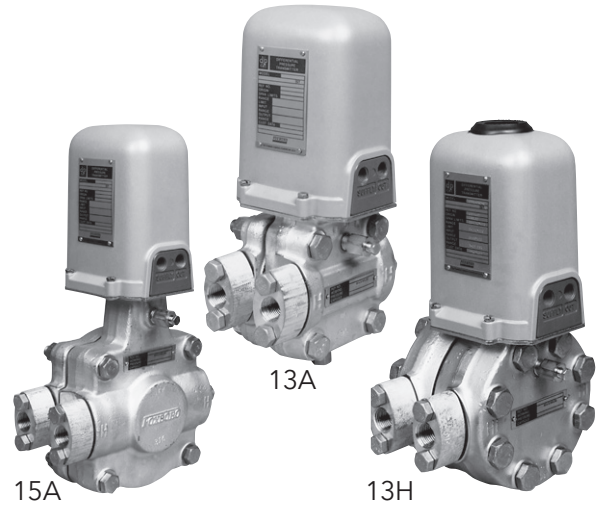
# Pneumatic Transmitters (Differential Pressure)

## 15A, 13A, 13H Series Pneumatic d/p Cell Transmitters

15A, 13A, 13H

- 15A—low range transmitter adjustable for ranges from 0-1.3 to 0-6 kPa (0-5 to 0-25 inH<sub>2</sub>O) ΔP at static pressures up to 3.5 MPa (500 psi)
- 13A—adjustable for ranges from 0-5 to 0-210 kPa (0-20 to 0-850 inH<sub>2</sub>O) ΔP at static pressures up to 14 MPa (2000 psi)
- 13H—adjustable for ranges from 0-5 to 0-210 kPa (0-20 to 0-850 inH<sub>2</sub>O) ΔP at static pressures up to 40 MPa (6000 psi)
- Low Air Consumption

For complete specifications, refer to Product Specification Sheet PSS 2B-1C1 A.



The 15A, 13A, 13H Series Pneumatic d/p Cell Transmitters measure differential pressure and transmit a proportional pneumatic output signal.

## Functional Specifications

### Static Pressure, Span, and Range Limits

Series	Static Pressure Limit	
	MPa	psi
15A	3.5	500
13A	14	2000
13H	40	6000

Series	Span Code	Span Limits	
		kPa ΔP	inH <sub>2</sub> O ΔP
15A	L	1.3 and 6	5 and 25
13A and 13H	M	5 and 62	20 and 250
	H	50 and 210	200 and 850

### Process Temperature Limits:

-40 and +120°C (-40 and +250°F) at capsule.

### Ambient Temperature Limits:

-40 and +120°C (-40 and +250°F).

Series	Span Code	Range Limits (a)	
		kPa ΔP	inH <sub>2</sub> O ΔP
15A	L	±12.5	±50
13A and 13H	M	±62	±250
	H	±210	±850

(a) Nonzero-based ranges require optional zero elevation or suppression kit. See "HOW TO ORDER." Upper and lower range values must not exceed range limits. Negative numbers indicate a higher pressure on the normal "Low Side" of the transmitter, such as may occur in closed tank application with a wet leg.

### Output Signal and Supply Pressure:

Output Signal	Supply Pressure
20 to 100 kPa	140 kPa
3 to 15 psi	20 psi

## Performance Specifications

### Accuracy:

15A Series: ±0.5% of calibrated span.

13A and 13H Series: ±0.5% of calibrated span except +0.75% of calibrated span for calibrated spans greater than 130 kPa or 525 inH<sub>2</sub>O ΔP.

### Repeatability:

0.1% of calibrated span.

### Hysteresis:

0.1% of calibrated span.

# Pneumatic Transmitters (Differential Pressure)

**15A, 13A, 13H**

## Physical Specifications

### Materials of Wetted Parts:

Wetted Part	Series		
	15A, 13A, 13HA	13A4	13A5
Body	AISI 316 ss	Monel	Hastelloy C
Capsule Diaphragm	316L ss	Monel 400 (a)	Hastelloy C276
Other Capsule Parts	316 ss	Monel	Hastelloy C
Force Bar	316 ss	Monel	Hastelloy C
Force Bar Seal	cobalt-nickel	cobalt-nickel	cobalt-nickel
Force Bar Gasket	silicone elastomer (b)	Viton-A	Viton-A
Capsule Gaskets	316 ss	Monel	ptfe
Process Connection Gaskets	ptfe (c)	ptfe	(d)

(a) Duranickel capsule diaphragm material supplied when Span Limits code H is specified.

(b) 13H Series uses Buna-N as standard.

(c) 13H Series uses glass filled ptfe as standard.

(d) Hastelloy C bodies are supplied without process connectors.

### Mounting:

Direct to process or by bracket for DN 50 or 2 in horizontal or vertical pipe. Bracket is always supplied.

### Enclosure Classification:

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

### Materials:

Body Bolts: Alloy steel per ASTM A193 Grade B7; or 17-4 with Hastelloy C bodies.

### Cover:

High impact, glass filled polycarbonate.

### Air Connections:

The supply and output connections are tapped for 1/4 NPT.

## Optional Features

### Capsule Materials:

Hastelloy C, Monel, Duranickel, and tantalum.

### HF Alkylation Service:

Maximum life with economical materials.

### Chlorine Service Preparation:

Cleaned for chlorine service.

### Hydrogen Service Preparation:

Gold-plated capsule to prevent hydrogen penetration.

### High Damping:

Medium and low range capsules only.

### NACE:

Compliance to NACE Standard MR-01-75.

### Air Supply Set:

Adjustable regulators with or without gauge.

### High Process Temperature:

Body temperature up to 190°C (375°F).

### Integral Orifice:

For low flow measurements. Refer to Page 31.

### Bypass Manifolds:

Refer to Page 27.

### Oxygen Service Preparation:

Cleaned and packaged for oxygen service.

### Lower Spans:

Provides spans as low as one-half standard.



## How to Order

### 1) SPECIFY MODEL NUMBER: 15

**Transmitter:**

316 ss body.....A

**Span Limits:**

1.3 and 6 kPa or 5 and 25 inH<sub>2</sub>O ΔP.....L

**Body Material:**

316 ss (15A only).....S

**Process Connectors:**

1/4 NPT.....1

1/2 NPT.....2

R1/4 (metric).....3

R1/2 (metric).....4

Welding neck for 14 x 21 mm tube and 1/2 in Schedule 80 pipe.....6

None, body tapped for 1/4 NPT.....0

**Optional Features: (also see previous page)**

Zero elevation kit.....L

Zero suppression kit.....R

### 1) SPECIFY MODEL NUMBER: 13

**Transmitter:**

316 ss body.....A

Monel body.....A4

Hastelloy C body (supplied without process connectors).....A5

**Span Limits:**

5 and 62 kPa or 20 and 250 inH<sub>2</sub>O ΔP.....M

50 and 210 kPa or 200 and 850 inH<sub>2</sub>O ΔP.....H

**Body Material:**

316 ss (13A only).....S

Monel (13A4 only).....M

Hastelloy C (13A5 only) (Process Connectors code 0 below must be specified).....C

**Process Connectors:**

1/4 NP.....1

1/2 NP.....2

R1/4.....3

R1/2.....4

Welding neck for 14 x 21 mm tube and 1/2 in Schedule 80 pipe.....6

None, body tapped for 1/4 NPT.....0

**Optional Features: (also see previous page)**

Zero elevation kit.....L

Zero suppression kit.....R

HOW TO ORDER Continued on Next Page.

# Pneumatic Transmitters (Differential Pressure)

**15A, 13A, 13H**

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER: 13H

#### Transmitter:

316 ss body ..... A

#### Span Limits:

5 and 62 kPa or 20 and 250 inH<sub>2</sub>O ΔP ..... M

50 and 210 kPa or 200 and 850 inH<sub>2</sub>O ΔP ..... H

#### Body Material:

316 ss (13HA only) ..... S

#### Process Connectors: (a)

1/4 NPT ..... 1

1/2 NPT ..... 2

R1/4 ..... 3

R1/2 ..... 4

None, body tapped for 9/16-18 Aminco fitting ..... 5

None, body tapped for 1/4 NPT ..... 0

#### Optional Features: (also see Page 4)

Zero elevation kit ..... L

Zero suppression kit ..... R

(a) The transmitter is normally supplied with body tapped for 1/4 NPT unless Process Connectors code 5 is specified.

2) SPECIFY OUTPUT SIGNAL \_\_\_\_\_

3) SPECIFY CALIBRATED DIFFERENTIAL PRESSURE RANGE \_\_\_\_\_

4) SPECIFY ADDITIONAL OPTIONAL FEATURES \_\_\_\_\_

5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_



## 11DM Series Pneumatic Differential Pressure Transmitters

11DM

- **Differential Pressure Measurement** – ranges adjustable from 0-0.14 to 0-14.0 MPa (0-20 to 0-2000 psi)  $\Delta P$
- **Low Air Consumption**

For complete specifications, refer to Product Specification Sheet PSS 2B-1A2 A.



The 11 DM Series Pneumatic Differential Pressure Transmitters measure differential pressure and transmit a proportional pneumatic signal.

## Functional Specifications

### Span and Range Limits:

Span Limits Code	Span Limits	
	MPa $\Delta P$	psi $\Delta P$
B	0.14 and 1.4	20 and 200
C	0.3 and 2.8	40 and 400
D	0.7 and 7.0	100 and 1000
E	1.4 and 14.0	200 and 2000

Span Limits Code	Range Limits (a), (b)	
	MPa $\Delta P$	psi $\Delta P$
B	-1.54 and +2.4	-220 and +350
C	-3.1 and +5.0	-440 and +750
D	-7.7 and +10.0	-1100 and +1500
E	-14.0 and +20.0	-2000 and +3000

(a) Negative values indicate that the higher of the two measured pressures is on the normal "low side" (body side) of the transmitter. Positive values indicate higher pressure is on the normal "high side" (connection block side). (b) Nonzero-based ranges require optional Zero Elevation or Suppression Kit.

### Maximum Static Pressure:

The lower of the two measured pressures may not exceed the following pressure limits:

Span Limits Code	MPa	psi
B	2.4	350
C	5.0	750
D	10.0	1500
E	14.0	2000

### Ambient Temperature Limits:

-40 and +120°C (-40 and +250°F).

### Output Signal and Supply Pressure:

Output Signal	Supply Pressure
20 to 100 kPa 3 to 15 psi	140 kPa 20 psi

## Performance Specifications

### Accuracy:

±0.5% of calibrated span.

### Repeatability:

0.1% of calibrated span.

### Hysteresis:

Span Limits codes B, C, and D: 0.1% of calibrated span.

Span Limits code E: 0.2% of calibrated span.

# Pneumatic Transmitters (Differential Pressure)

**11DM**

## Physical Specifications

**Materials of Wetted Parts:**

316 ss = AISI Type 316 stainless steel.

316L ss = AISI Type 316L stainless steel

Body	316 ss
Capsule Bellows	316L ss or Monel
Other Capsule Parts	316 ss or Monel
Force Bar	316 ss
Force Bar Seal	cobalt-nickel
Force Bar Gasket	silicone elastomer
Capsule Gasket	silicone elastomer

**Enclosure Classification:**

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

**Mounting:**

Bracket for DN 50 or 2 in vertical or horizontal pipe.

**Air Connections:**

The supply and output connections are tapped for 1/4 NPT.

**Body Bolts:**

Alloy steel per ASTM A193 Grade B7.

**Cover:**

High impact, glass filled polycarbonate.

## Optional Features

**Oxygen Service Preparation:**

Cleaned and packaged for oxygen service.

**NACE:**

Compliance to NACE Standard MR-01-71.

## How To Order

**1) SPECIFY MODEL NUMBER: 11DM-**

**Span Limits:**

- 0.14 and 1.4 MPa or 20 and 200 psi ..... B
- 0.3 and 2.8 MPa or 40 and 400 psi..... C
- 0.7 and 7.0 MPa or 100 and 1000 psi ..... D
- 1.4 and 14 MPa or 200 and 2000 psi ..... E

**Wetted Parts:**

- 316ss ..... S
- 316 ss except Monel bellows assembly ..... D

**Process Connection:**

- 1/4 NPT ..... 1
- 1/2 NPT ..... 2
- R1/4 (metric) ..... 3
- R 1/2 (metric) ..... 4

**Optional Features: (also see previous page)**

- Zero elevation ..... L
- Zero suppression ..... R

- 2) SPECIFY OUTPUT SIGNAL** \_\_\_\_\_
- 3) SPECIFY CALIBRATED PRESSURE RANGE** \_\_\_\_\_
- 4) SPECIFY OPTIONAL FEATURES** \_\_\_\_\_
- 5) SPECIFY INFORMATION FOR INSTRUMENT TAG** \_\_\_\_\_

## 14A Series Pneumatic Flow Integrators

14A

- **Durable**
  - Self-cleaning, self-aligning ball and thrust plate bearings
  - Gasketed cast aluminum cover
- **Versatile**
  - Field or panel mounting up to several hundred feet from point of measurement
- **Stable**
  - Force balance unit minimizes variations in air supply pressure or ambient temperature
- **Multiple Ranges**
  - Changeable counting speed can match almost any flow range
  - No recalibration required



The 14A Series Pneumatic Flow Integrator receives signal from transmitter, extracts square root, and totalizes flow on integral counter in engineering units.

For complete specifications, refer to General Specification Sheet GS 2B-5A1 A.

### Functional Specifications

#### Input Signal and Supply Pressure

Input Signal	Supply Pressure
20 to 100 kPa 3 to 15 psi	140 kPa 20 psi

**Counter:**  
6-digit, nonreset.

**Count Rates and Integrator Factors:**  
Count rate upper range values are shown in the following table. Integrated flow is displayed directly when the count rate is set equal to the maximum flow rate. Other flow rates can be accommodated using the count rate times the integrator factor. Example: Reading x 100 = Gallons.

**Available Count Rate:**  
Upper Range Values

Counts per Minute	Counts per Hour	Counts per Day
4.75 to 49.21	285 to 2953	6840 to 70870
excluding: 5.46 to 5.54, 9.11 to 9.50, and 10.93 to 11.08	excluding: 328 to 332, 547 to 570, and 656 to 665	excluding: 7870 to 7980, 13120 to 13680, and 15750 to 15960

### Performance Specifications

**Accuracy:**

±0.5% of full scale calibrated between 30 and 100% of flow.

**Input Signal:**

Input cutoff point set for approximately 7% flow.  
Input startup point set for approximately 11 % flow.

**Repeatability:**

0.2% of full scale.

### Physical Specifications

**Body:**

Cast aluminum with acrylic enamel finish.

Specification	Cover	Case
14A Series	High-impact, glass-filled polycarbonate, gasketed, weatherproof.	–

### Optional Features

**Foxboro and CSA Certified:**

For use in Class I, Groups A, B, C, and D, Division 2. For EP Series only.

**Integral Mounting to d/p Cell Transmitter:**

For 14A-F. Supply regulator included with this option.

How to Order

1) SPECIFY MODEL NUMBER: 14A-

Integral Nonreset Counter:

- Panel-Mounted ..... -
- Field-Mounted ..... F
- Field-Mounted with supply regulator ..... FR

3) SPECIFY INPUT SIGNAL \_\_\_\_\_

4) SPECIFY COUNTS PER MINUTE, HOUR, OR DAY  
(AT MAXIMUM FLOW RATE) \_\_\_\_\_

5) SPECIFY INTEGRATOR FACTOR \_\_\_\_\_

6) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

# Pneumatic Transmitters (Pressure)

## 11GM, 11GH



The 11GM, 11GH Series Pneumatic Gauge Pressure Transmitters measure gauge pressure and transmit a proportional pneumatic output signal.

## 11GM, 11GH Series Pneumatic Gauge Pressure Transmitters

- 11GM—pressure measurement ranges adjustable from 0-0.07 to 0-14 MPa (0-10 to 0-2000 psi)
- 11GH—pressure measurement ranges adjustable from 0-7.0 to 0-80 MPa (0-1000 to 0-12000 psi)
- Low Air Consumption

For complete specifications, refer to Product Specification Sheet PSS 2B-1A3 A.

## Functional Specifications

### Span, Range, and Overrange Limits:

Series	Span Limits Code	Span Limits	
		MPa	psi
11GM	A	0.07 and 0.56	10 and 80
	B	0.14 and 1.4	20 and 200
	C	0.3 and 2.8	40 and 400
	D	0.7 and 7	100 and 1000
	E	1.4 and 14	200 and 2000
11GH	K	7 and 40	1000 and 6000
	N	14 and 80	2000 and 12000

Series	Span Limits Code	Range Limits (a)	
		MPa	psi
11GM	A	-0.1 and +0.6	-15 and +90
	B	-0.1 and +2.4	-15 and +350
	C	-0.1 and +5	-15 and +750
	D	-0.1 and +10	-15 and +1500
	E	-0.1 and +20	-15 and +3000
11GH	K	-0.1 and +40	-15 and +6000
	N	-0.1 and +80	-15 and +12000

(a) Nonzero-based ranges require optional zero elevation or suppression kit. See "HOW TO ORDER."

Series	Span Limits Code	Maximum Overrange Pressure Limit (b)	
		MPa	psi
11GM	A	0.7	100
	B	3.5	500
	C	7	1000
	D	14	2000
	E	28	4000
11GH	K	62	9000
	N	124	18000

(b) Overrange limit of Span Limits code E with Wetted Parts code M on Page 13 is reduced to 21 MPa (3000 psi).

### Output Signal and Supply Pressure

Output Signal	Supply Pressure
20 to 100 kPa 3 to 15 psi	140 kPa 20 psi

### Ambient Temperature Limits:

-40 and +120°C (-40 and +250°F).

### Body Temperature Limits:

11GM Series: -40 and +190°C (-40 and +375°F).  
11GH Series: -40 and +120°C (-40 and +250°F).

## Performance Specifications

### Accuracy:

Series	Spans Between		Accuracy (% of Span)
	MPa	psi	
11GM	All Spans		±0.5
11GH-K	7 and 20	1000 and 3000	±0.5
	20 and 40	3000 and 6000	±1
11GH-N	14 and 40	2000 and 6000	±0.5
	40 and 80	6000 and 12000	±1

### Repeatability:

#### 11GM Series:

Wetted Parts code S: 0.1% of calibrated span.  
Wetted Parts code M: 0.2% of calibrated span.

#### 11GH Series:

0.15% of calibrated span.

## Physical Specifications

### Materials of Wetted Parts:

Item	Wetted Parts Code		
	S	M	C
Element	316ss	Monel	Ni-Span
Connection Block	316ss	Monel	316ss
Connection Gasket	Silicone Elastomer	Viton-A	(none)

### Materials:

Cover: High-impact, glass-filled polycarbonate.

Body Bolts: Alloy steel per ASTM A193 Grade B7.

### Enclosure Classification:

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

### Air Connections:

The supply and output connections are tapped for 1/4 NPT.

## Optional Features

### Air Supply Set:

Adjustable regulators with or without gauge.

### High Accuracy Calibration (11GM only):

Accuracy of +0.25% of calibrated span.

### Pressure Seals:

Refer to Page 34.

### NACE (11 GM only):

Compliance to NACE Standard MR-01-75.

### Oxygen Service Preparation:

Cleaned and packaged for oxygen service.

## How to Order

### 1) SPECIFY MODEL NUMBER: 11GM-

#### Span Limits:

0.07 and 0.56 MPa or 10 and 80 psi .....	A
0.14 and 1.4 MPa or 20 and 200 psi .....	B
0.3 and 2.8 MPa or 40 and 400 psi.....	C
0.7 and 7 MPa or 100 and 1000 psi .....	D
1.4 and 14 MPa or 200 and 2000 psi .....	E

#### Wetted Parts:

316ss .....	S
Monel (a) .....	M

#### Process Connection:

1/4 NPT.....	1
1/2 NPT.....	2
R1/4 (metric) .....	3
R1/2 (metric) .....	4
Machined for 9/16-18 Aminco fitting (b).....	5

#### Optional Features: (also see above)

Zero elevation.....	L
Zero suppression.....	R

(a) Not available with Span Limits code A above.

(b) Not available with Span Limits code A or Wetted Parts code M above.

HOW TO ORDER Continued on Next Page.



# Pneumatic Transmitters (Pressure)

**11GM, 11GH**

## How to Order (continued)

**1) SPECIFY MODEL NUMBER: 11GH-**

**Span Limits:**

7 and 40 MPa or 1000 and 6000 psi ..... K

14 and 80 MPa or 2000 and 12000 psi ..... N

**Wetted Parts:**

Ni-Span element with 316 ss connection ..... C

**Process Connection:**

1/2 NPT ..... 2

R 1/2 (metric) ..... 4

Machined for 9/16-18 Aminco fitting ..... 5

**Optional Features:** (also see previous page)

Zero elevation ..... L

Zero suppression ..... R

**2) SPECIFY OUTPUT SIGNAL** \_\_\_\_\_

**3) SPECIFY CALIBRATED PRESSURE RANGE** \_\_\_\_\_

**4) SPECIFY OPTIONAL FEATURES** \_\_\_\_\_

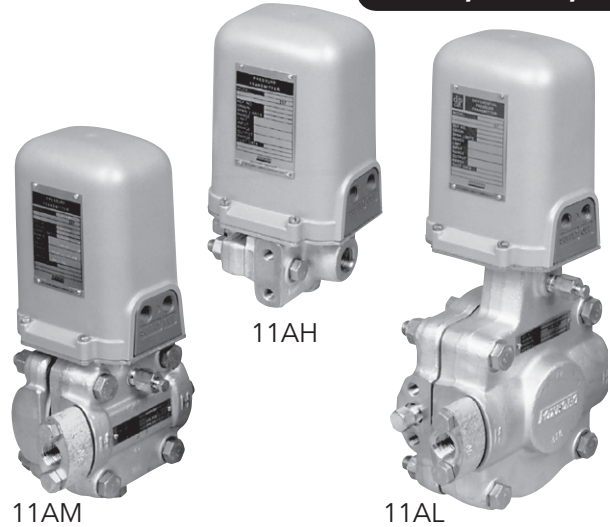
**5) SPECIFY INFORMATION FOR INSTRUMENT TAG** \_\_\_\_\_

## 11AL, 11AM, 11AH Series Pneumatic Absolute Pressure Transmitters

- 11AL—adjustable for ranges from 0-1.3 to 0-5.3 kPa (0-10 to 040 mmHg) absolute
- 11AM—adjustable for ranges from 0-5.3 to 0-200 kPa (0-40 to 01520 mmHg) absolute
- 11AH—adjustable for ranges from 0-0.7 to 0-2.7 MPa (0-10 to 0400 psi) absolute
- Low air consumption

For complete specifications, refer to Product Specification Sheet PSS 2B-1A1 A.

11AL, 11AM, 11AH



The 11AL, 11AM, 11AH Series Pneumatic Absolute Pressure Transmitters measure absolute pressure and transmit a proportional pneumatic output signal.

## Functional Specifications

Span, Range, and Overrange Limits (in absolute pressure units):

Series	Span Limits Code	Span Limits	
		kPa	mmHg
11AL	L	1.3 and 5.3 kPa	10 and 40 mmHg
		5.3 and 53 kPa	40 and 400 mmHg
11AM	M	50 and 200 kPa	375 and 1520 mmHg
		0.07 and 0.55 MPa	10 and 80 psi
11AH	B	0.14 and 1.4 MP	20 and 200 psi
	C	0.3 and 2.7 MP	40 and 400 psi

Series	Span Limits Code	Maximum Overrange Pressure Limit	
		MPa	psi
11AL	L	0.8	115
11AM	M	0.8	115
	H	1.1	165
11AH	A	0.7	100
	B	2.4	350
	C	5.2	750

Series	Span Limits Code	Range Limits (a)	
		kPa	mmHg
11AL	L	0 and 9.3 kPa	0 and 70 mmHg
		0 and 53 kPa	0 and 400 mmHg
11AM	M	0 and 200 kPa	0 and 1520 mmHg
		0 and 0.62 MPa	0 and 90 psi
11AH	B	0 and 2.4 MPa	0 and 350 psi
	C	0 and 5 MPa	0 and 750 psi

(a) Nonzero-based ranges require optional zero suppression kit (standard for 11AM). See "HOW TO ORDER."

**Maximum Process Temperature:**  
120°C (250°F) at capsule.

**Ambient Temperature Limits:**  
-40 and + 120°C (-40 and +250°F).

**Output Signal and Supply Pressure:**

Output Signal	Supply Pressure
20 to 100 kPa	140 kPa
3 to 15 psi	20 psi

## Performance Specifications

**Accuracy:**

Series	Spans Between		Accuracy (% of Span)
	kPa	mmHg	
11AL	All Spans		±1.0%
11AM-M	5.3 and 13	40 and 100	±0.5%
	13 and 53	1100 and 400	±1.0%
11 AM-H	50 and 113	375 and 850	±0.5%
	113 and 200	1850 and 1520	±1.0%
11AH	All Spans		±0.5%

**Repeatability:**

11AL Series: 0.5% of calibrated span.

11AM, 11AH Series: 0.1% of calibrated span.

**Hysteresis:**

11AL Series: 0.5% of calibrated span.

11AM Series: 0.25% of calibrated span.

11AH Series: 0.15% of calibrated span.

# Pneumatic Transmitters (Pressure)

**11AL, 11AM, 11AH**

## Physical Specifications

### Materials of Wetted Parts:

Wetted Part	Body Material	
	AISI 316 ss	Monel
Capsule Diaphragm	AISI 316L ss	Monel
Other Capsule Parts	316 ss	Monel
Force Bar	316 ss	Monel
Force Bar Seal	cobalt-nickel	cobalt-nickel
Force Bar Gasket	silicone elastomer	Viton-A
Capsule Gasket	316 ss (a)	Monel
Process Connector Gasket	ptfe (a)	ptfe

(a) 11AH Series uses single silicone elastomer gasket as capsule and connector gasket.

### Materials:

Body Bolting: Alloy steel per ASTM A193 Grade B7.

Cover: High-impact, glass-filled polycarbonate.

### Mounting:

Bracket for nominal DN 50 or 2 in pipe.

### Enclosure Classification:

Meets IEC IP53 and provides the protection of NEMA Type 3.

### Air Connections:

The supply and output connections are tapped for 1/4 NPT.

## Optional Features

### Air Supply Sets:

Adjustable regulators with or without output gauge.

### Oxygen Service Preparation:

Cleaned and packaged for oxygen service.

## How to Order

### 1) SPECIFY MODEL NUMBER: 11AL-

#### Span Limits:

1.3 and 5.3 kPa or 10 and 40 mmHg absolute ..... L

#### Body Material:

AISI Type 316 stainless steel (316 ss)..... S

#### Process Connections:

Tapped for 1/4 NPT ..... 1

Tapped for 1/2 NPT ..... 2

Tapped for R1/4 (metric)..... 3

Tapped for R1/2 (metric)..... 4

Welding neck for 14 x 21 mm tube and 1/2 in Schedule 80 pipe..... 6

Optional Zero Suppression..... R

HOW TO ORDER Continued on Next Page.

## How to Order

### 1) SPECIFY MODEL NUMBER: 11AM -

#### Span Limits:

- 5.3 and 53 kPa or 40 and 400 mmHg absolute ..... M
- 50 and 200 kPa or 375 and 1520 mmHg absolute ..... H

#### Body Material:

- 316ss ..... S
- Monel Not available with Span Limits code H above ..... M

#### Process Connections:

- Tapped for 1/4 NPT ..... 1
- Tapped for 1/2 NPT ..... 2
- Tapped for R1/4 (metric)..... 3
- Tapped for R1/2 (metric)..... 4
- Welding neck for 14 x 21 mm tube and 1/2 in Schedule 80 pipe..... 6

### 1) SPECIFY MODEL NUMBER: 11AH-

#### Span Limits:

- 0.07 and 0.55 MPa or 10 and 80 psi absolute ..... A
- 0.14 and 1.4 MPa or 20 and 200 psi absolute ..... B
- 0.3 and 2.7 MPa or 40 and 400 psi absolute ..... C

#### Body Material:

- 316 ss ..... S

#### Process Connections:

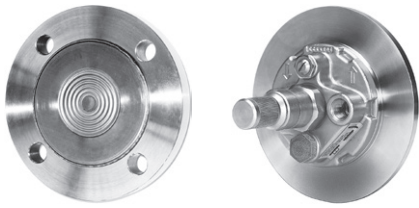
- Tapped for 1/2 NPT ..... 2
- Tapped for R1/2 (metric)..... 4

Optional Zero Suppression.....R

- 2) SPECIFY OUTPUT SIGNAL \_\_\_\_\_
- 3) SPECIFY CALIBRATED ABSOLUTE PRESSURE RANGE \_\_\_\_\_
- 4) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

# Pneumatic Transmitters (Repeater)

**139PP**



For transmitting the pressure of corrosive, hot, gaseous, or liquid media or other fluids tending to solidify or clot. The pressure exerted by the medium is converted in a 1:1 ratio into a pneumatic pressure. For the repeater with zero suppression, the output is equal input plus suppression.

For complete specification, refer to Product Specification Sheet PSS EMP0140 A-(en)

## 139PP Pneumatic Pressure Repeater

- Replacement for 17R
- Adjustable up to 10 bar
- Overrange protection up to 16 bar
- Vacuum proof
- With damping facilities
- Version with exchangeable measuring capsule, extended diaphragm
- Version with welded in measuring capsule, process side without gap, flush diaphragm
- Version for zero suppression to -0,5 bar
- Version with wetted parts in Tantalum
- PTFE diaphragm protector

### Functional Specifications

#### Input

Process pressure..... 0.01 to 10 bar  
 Repeater with  
 zero suppression ..... initial value adjustable  
 from -0.05 to -0.5 bar  
 Overload limits..... -1 bar and 16 bar  
 PTFE diaphragm  
 protector ..... 0 bar and 16 bar, not  
 suitable for vacuum service

#### Error Influence

Air supply fluctuation .....  $\leq 1\%$  / 0.1 bar  
 Ambient and process  
 temperature fluctuation:  
 Repeater without  
 zero suppression .....  $\leq 0.5$  mbar / 10 K  
 with zero suppression .....  $\leq 1$  mbar / 10 K  
 Tantalum version .....  $\leq 2$  mbar / 10 K  
 PTFE diaphragm protector...  $\leq 1$  mbar / 10 K

#### Ambient conditions

Operating temperature and application class:  
 Repeater without  
 zero suppression ..... -25 to +200 °C  
 with zero suppression -25 to +125 °C  
 Tantalum version ..... -25 to +155 °C  
 PTFE diaphragm ..... -25 to +100 °C  
 Storage temperature.. -40 to +125 °C  
 Humidity.....  $\leq 100\%$ , condensation  
 permitted  
 Protection class..... IP 54, IP 66

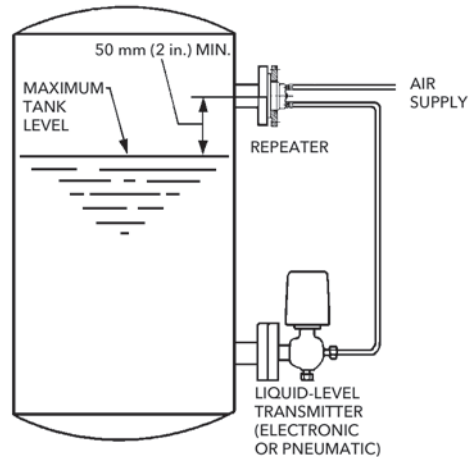
### Performance Specifications

#### Accuracy:

Output pressure up to		1 bar	2 bar	3 bar	4 bar	5 bar	
<b>Accuracy</b>	Repeater without zero suppression and Tantalum version (mbar)	$\leq 1.5$	$\leq 3$	$\leq 6$	$\leq 12$	$\leq 20$	
	Repeater with zero suppression and Repeater with PTFE diaphragm protector (mbar)	$\leq 3$	$\leq 4$	$\leq 7$	$\leq 12$	$\leq 20$	
<b>Hysteresis</b>	Repeater without zero suppression (mbar)	$< 0.1$	$< 0.2$	$< 0.3$	$< 0.5$	$< 1$	
	Repeater with zero suppression (mbar)	$< 0.2$	$< 0.3$	$< 0.4$	$< 0.6$	$< 1$	
	Tantalum version and Repeater with PTFE diaphragm protector (mbar)	$\leq 0.5$	$\leq 0.6$	$\leq 0.7$	$\leq 1$	$\leq 1.5$	
<b>Inherent Air Consumption</b>		(l/h)	120	160	210	260	360
<b>Air Supply</b>		(bar)	1.4	2.5	4.5	6.5	11

## Application

The repeater is usually used in closed-tank liquid-level applications in conjunction with a differential pressure liquid-level transmitter such as the 13F (pneumatic), or the IP10 (electronic).



## How to Order

### Model Codes

#### Pneumatic Pressure Repeater

139PP

#### Initial Value:

0.01 bar 0.15 psi.....	-A
- 0.5 bar -7.5 psi (a).....	-B

#### Wetted parts material:

1.4571 (316Ti).....	S
Tantalum.....	T

#### Version:

Extended diaphragm (capsule screwed in) (not available with Wetted Parts T).....	E
Flush diaphragm (capsule welded in) (b).....	F

#### Mounting Orientation:

horizontal, process side above .....	A
horizontal, process side below.....	B
diaphragm vertical.....	C

#### Output Pressure:

up to 1 bar.....	1
up to 2 bar.....	2
up to 4 bar.....	3
up to 6 bar.....	4
up to 10 bar .....	5

#### Optionals:

PTFE-foil with silicone oil (only for version F) (c).....	-P
Certificate EN 10204-2.1 (DIN 50 049-2.1).....	-1
Certificate EN 10204-2.3 (DIN 50 049-2.3).....	-2
Tag.No. Labeling stainless steel label fixed with wire .....	-L
Tag.No. Labeling stamped with weather-resistant color.....	-S
31A = 3 inch Class 160 ANSI 4 holes (to replace 17R from Foxboro).....	31A
33D= DN80, PN 10/40 8 holes (to replace 17R from Foxboro).....	33O

#### Notes

- (a) Output = Input + 0.5 bar (c) Not for vacuum (e) Not available with Option-P  
 (b) Suitable for food industry (d) Not available with Material T, not for Version E

# Pneumatic Transmitters (Liquid Level and Density)

**15F, 13F, 13FE**



The 15F, 13F, 13FE Series Pneumatic Liquid Level or Density Flanged d/p Cell Transmitters measure hydrostatic head of liquid and transmit a proportional pneumatic output signal.

## Pneumatic Liquid Level or Density Flanged d/p Cell Transmitters

- **15F – Low Range Flush Diaphragm Transmitter** adjustable for ranges from 0-0.13 to 0-0.63 m (0-5 to 0-25 in) head of water
- **13F – Flush Diaphragm Transmitter** adjustable for ranges from 0-0.51 to 0-21.6 m (0-20 to 0-850 in) head of water
- **13FE – Extended Diaphragm Transmitter** for measurements from 0-0.51 to 0-21.6 m (0-20 to 0-850 in) head of water
- **Low Air Consumption**

For complete specifications, refer to Product Specification Sheet PSS 2B- 1D2 A.

### Functional Specifications

#### Span Limits:

Series	Span Limits Code	Span Limits (Head of Water)	
		meters	inches
15F	L	0.13 and 0.63	5 and 25
13F, 13FE	M	0.51 and 6.3	20 and 250
	H	5.1 and 21.6	200 and 850

#### Range Limits:

Series	Span Limits Code	Range Limits (Head of Water) (a)	
		meters	inches
15F	L	±1.3	±50
13F, 13FE	M	±6.3	±250
	H	±21.6	±850

(a) Non zero-based ranges require optional zero elevation or suppression kit. Upper and lower range values must not exceed range limits. Negative numbers indicate a higher pressure on the normal "low side" of the transmitter, such as may occur in a closed tank application with a wet leg.

#### Process Temperature Limits:

ANSI Flanges: -40 and +190°C (-40 and +375°F).

#### DIN Flanges:

-40 and +120°C (-40 and +250°F).

#### Ambient Temperature Limits:

-40 and +120°C (-40 and +250°F).

#### Output Signal and Supply Pressure:

Output Signal	Supply Pressure
20 to 100 kPa 3 to 15 psi	140 kPa 20 psi

### Performance Specifications

#### Accuracy:

±0.5% of calibrated span for all models except for spans greater than 13.3 m (525 in) head of water which are ±0.75%.

#### Repeatability:

0.1% of calibrated span.

#### Hysteresis:

15F Series: 0.1 % of calibrated span or 0.25 mm (0.01 in) head of water, whichever is larger.

13F and 13FE Series: 0.1 % of calibrated span or 1.25 mm (0.05 in) head of water, whichever is larger.



## Physical Specifications

### Body and Flange Material:

Zinc cobalt-plated carbon steel or 316 ss (b), as specified.

### Materials of Wetted Parts:

High Pressure Side:

Capsule Diaphragm: 316L ss (c).

Other Capsule Parts: 316 ss.

Capsule Gaskets:

15F,13F Series: 316 ss.

13FE Series: None.

Retaining Ring (d): 316 ss.

Low Pressure Side (Partial List):

Capsule Diaphragm: 316L ss.

Force Bar: 316 ss.

Force Bar Seal: Cobalt-nickel.

Force Bar Gasket: Silicone elastomer.

Capsule Gaskets:

15F, 13F Series: 316 ss.

13FE Series: ptfe.

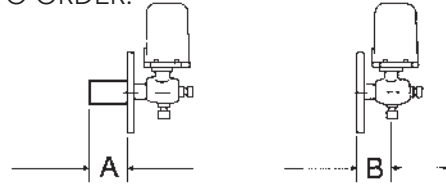
(b) AISI Type 316 stainless steel.

(c) AISI Type 316L stainless steel.

(d) Raised face portion of flange.

### Mounting:

Provided by process connection flange. See "HOW TO ORDER."



**Nominal Diaphragm Extension Length "A"**  
(13FE Series): See "HOW TO ORDER."

### Flange Extension Length "B":

15F and 13FE Series: 125 mm (5 in).

13F Series: 125 or 200 mm (5 or 8 in), as specified.

### Enclosure Classification:

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

### Cover Material:

High-impact, glass-filled polycarbonate.

## Optional Specifications

### Wetted Parts Materials:

Monel, Duranickel, Hastelloy C, tantalum, and various coatings.

### Lower Spans:

Provides spans as low as one-half standard.

### High Process Temperature:

To 315°C (600°F).

### Air Supply Sets:

Adjustable regulators with or without gauge.

## How to Order

### 1) SPECIFY MODEL NUMBER: 15F-

#### Transmitter:

316 ss body and flange ..... A

Zinc cobalt-plated carbon steel body and flange ..... A1

#### Span Limits:

0.13 and 0.63 m or 5 and 25 in head of water ..... L

#### Body and Flange Material; and Connection:

Zinc cobalt-plated carbon steel 6 in ANSI Class 150 ..... K61A

316 ss 6 in ANSI Class 150 ..... S61A

Zinc cobalt-plated carbon steel 150 mm,16 Bar, DIN, and BS ..... K61D

316 ss 150 mm,16 Bar, DIN, and BS ..... S61D

#### Flange Extension Length:

125 mm (5 in) ..... 5

#### Elevation or Suppression (Optional):

Zero elevation kit ..... L

Zero suppression kit ..... R

HOW TO ORDER Continued on Next Page.

# Pneumatic Transmitters (Liquid Level and Density)

**15F, 13F, 13FE**

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER: 13F-

#### Transmitter:

316 ss body and flange ..... A  
 Zinc cobalt-plated carbon steel body and flange ..... A1

#### Span Limits:

0.51 and 6.3 m or 20 and 250 in head of water ..... M  
 5.1 and 21.6 m or 200 and 850 in head of water ..... H

#### Body and Flange Material; and Connection:

Carbon steel 3 in ANSI Class 150 ..... K31A  
 Carbon steel 3 in ANSI Class 300 ..... K33A  
 316 ss 3 in ANSI Class 150 ..... S31A  
 316 ss 3 in ANSI Class 300 ..... S33A  
 Carbon steel 80 mm,10/40 Bar, DIN, and BS ..... K33D  
 316 ss 80 mm,10/40 Bar, DIN, and BS ..... S33D

#### Flange Extension Length:

125mm(5in)..... 5  
 200 mm (8 in)..... 8

#### Elevation or Suppression (Optional):

Zero elevation kit..... L  
 Zero suppression kit ..... R

### 1) SPECIFY MODEL NUMBER: 13FE-

#### Transmitter:

316 ss body and flange ..... A  
 Zinc cobalt-plated carbon steel body and flange ..... A1

#### Span Limits:

0.51 and 6.3 m or 20 and 250 in head of water ..... M  
 5.1 and 21.6 m or 200 and 850 in head of water ..... H

#### Body and Flange Material; and Connection:

Zinc cobalt-plated carbon steel 4 in ANSI Class 150 ..... K41A  
 Zinc cobalt-plated carbon steel 4 in ANSI Class 300 ..... K43A  
 316 ss 4 in ANSI Class 150 ..... S41A  
 316 ss 4 in ANSI Class 300 ..... S43A  
 Zinc cobalt-plated carbon steel 100 mm,16 Bar, DIN, and BS ..... K41D  
 Zinc cobalt-plated carbon steel 100 mm, 40 Bar, DIN, and BS ..... K43D  
 316 ss 100 mm,16 Bar, DIN, and BS ..... S41D  
 316 ss 100 mm, 40 Bar, DIN, and BS ..... S43D

#### Flange Extension Length:

125 mm (5 in)..... 5

#### Nominal Diaphragm Extension Length:

50 mm (2 in)..... 2  
 100 mm (4 in)..... 4  
 150 mm (6 in)..... 6

#### Elevation or Suppression (Optional):

Zero elevation kit..... L  
 Zero suppression kit ..... R

2) SPECIFY OUTPUT SIGNAL \_\_\_\_\_

3) SPECIFY CALIBRATED DIFFERENTIAL PRESSURE RANGE \_\_\_\_\_

4) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

## 13DMP, 13DEMP Series Pneumatic d/p Cell Transmitters With Matched Pressure Seals for Liquid Level Measurement

- Low Air Consumption
- 13DMP–FLUSH TYPE with 3-inch flange connections
- 13DEMP–EXTENDED TYPE with 4-inch flange connections
- Pressure Seals
  - Eliminate problems caused by repeaters and wet and dry legs
  - Make installation and adjustments easier than other approaches
  - Provide positive isolation with a minimum of process wetted parts
  - Allow higher process temperatures
- Ideal for Pressurized or Evacuated Vessels



The 13DMP, 13DEMP Series Pneumatic d/p Cell Transmitters with matched pressure seals measure differential pressure and transmit a proportional pneumatic output signal.

For complete specifications, refer to Product Specification Sheet PSS 2B-1C1 B.

### Functional Specifications

#### Span and Range Limits:

Series	Span Limits (Head of Water)	
	meters	inches
13DMP-M,13DEMP-M	0.51 and 6.4	20 and 250
13DMP-H,13DEMP-H	5.1 and 21.6	200 and 850

Series	Range Limits (Head of Water) (a)	
	meters	inches
13DMP-M,13DEMP-M	-6.4 and +6.4	-250 and +250
13DMP-H,13DEMP-H	-21.6 and +21.6	-850 and +850

(a) Negative numbers indicate a higher pressure on the normal "Low Side" of the transmitter.

**Process Temperature Limits:**  
-37 and +150°C (-35 and +300°F).

**Ambient Temperature Limits:**  
-37 and +80°C (-35 and +180°F).

#### Output Signal and Supply Pressure:

Output Signal	Supply Pressure
20 to 100 kPa 3 to 15 psi	140 kPa 20 psi

### Performance Specifications

#### Accuracy:

Spans (Head of Water) Between		Accuracy (b) % of Span
meters	inches	
0.51 and 13 13 and 21.6	20 and 525 525 and 850	±0.5 ±1.0

(b) Includes linearity, hysteresis, and repeatability.

**Repeatability:**  
0.1% of calibrated span.

**Hysteresis:**  
0.2% of calibrated span.

# Pneumatic Transmitters (Liquid Level)

**13DMP, 13DEMP**

## Physical Specifications

### Materials of Wetted Parts:

Remote Seal Diaphragms	Raised Face Backup Pads (Gasket Surface)
AISI Type 316L stainless steel (316L ss)	AISI Type 316 stainless steel (316 ss)
Hastelloy C276	Hastelloy C
Tantalum	

### Materials of Nonwetted Parts:

Description	Material
Flanges	316 ss or carbon steel
Capillary	316ss
Transmitter Body	316ss
Fill Fluid	DC 200 silicone (c)

(c) Relative density (specific gravity) is 0.90 at 25°C (77°F).

### Capillary Lengths:

See "HOW TO ORDER."

### Mounting:

Seals mount by process connection flanges. See "HOW TO ORDER." Transmitter body mounts to bracket for DN 50 or 2 in vertical or horizontal pipe.

### Enclosure Classification:

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

### Cover Material:

High-impact, glass-filled polycarbonate.

### Air Connections:

The supply and output connections are tapped for 1/4 NPT.

## Optional Specifications

### Air Supply Set:

Adjustable regulators with or without gauge.

### High Temperature Fill:

For process temperatures up to 300°C (580°F).

## How to Order

### 1) SPECIFY MODEL NUMBER: 13DMP-

#### Span Limits:

0.51 and 6.4 m or 20 and 250 in head of water ..... M  
 5.1 and 21.6 m or 200 and 850 in head of water ..... H

#### Wetted Parts Material:

316 ss with 316L ss diaphragm ..... S  
 Hastelloy C with Hastelloy C276 diaphragm ..... C  
 Tantalum ..... T

#### Capillary Length (each capillary):

1.5m( 5ft) ..... A  
 4.5m(15ft) ..... B  
 8 m (26 ft) ..... C

#### Process Connections (nonprocess wetted):

Zinc cobalt-plated carbon steel 3 in ANSI Class 150 ..... K31A  
 Zinc cobalt-plated carbon steel 3 in ANSI Class 300 ..... K33A  
 Zinc cobalt-plated carbon steel 3 in ANSI Class 600 ..... K36A  
 316 ss 3 in ANSI Class 150 ..... S31A  
 316 ss 3 in ANSI Class 300 ..... S33A  
 316 ss 3 in ANSI Class 600 ..... S36A  
 Zinc cobalt-plated carbon steel 80 mm 10/40 Bar, DIN and BS ..... K33D  
 316 ss 80 mm 10/40 Bar, DIN and BS ..... S33D

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER: 13DEMP-

#### Span Limits:

0.51 and 6.4 m or 20 and 250 in head of water ..... M  
 5.1 and 21.6 m or 200 and 850 in head of water ..... H

#### Wetted Parts Material:

316 ss with 316L ss diaphragm ..... S  
 Hastelloy C with Hastelloy C276 diaphragm ..... C

#### Capillary Length (each capillary):

1.5m (5 ft) ..... A  
 4.5m (15 ft) ..... B  
 8m (26 ft) ..... C

#### Extension Length:

50mm (2 in) ..... 2  
 100mm (4 in) ..... 4  
 150mm (6 in) ..... 6

#### Process Connections (nonprocess wetted): Carbon steel, 4 in ANSI

Class 150 ..... K41A  
 Class 300 ..... K43A  
 Class 600 ..... K46A

2) SPECIFY OUTPUT SIGNAL \_\_\_\_\_

3) SPECIFY CALIBRATED DIFFERENTIAL PRESSURE RANGE \_\_\_\_\_

4) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

Note: For liquid level applications, zero elevation kits always required due to wet leg effect of filled seal system; therefore, it is a standard part of the 13DMP and 13 DEMP Series Transmitters.

# Pneumatic Transmitter (Liquid Level and Density)

167LP



This transmitter is designed to perform measurements for liquid level, interface and density of liquids. The measurement is based on the Archimedes buoyancy principle.

For complete specification, refer to Product Specification Sheet PSS EML0110 A-(en)

## 167LP Pneumatic Buoyancy Transmitter with Torque Tube for Liquid Level, Interface and Density

- Level transmission between vessel and transmitter by torque tube
- Applicable for service temperatures from  $-196^{\circ}\text{C}$  to  $+400^{\circ}\text{C}$  and pressures up to PN 250
- The span can be set over a 1:5 ratio
- A wide selection of materials facilitates service under corrosive conditions
- Material approval certificates to EN 10204-3.1 available
- Various licences in accordance with national regulations
- Licensed for use on sea ships in the Germanische Lloyd class, or on other structures classified by Germanische Lloyd

### Functional Specifications

#### Input

Measuring span..... 3 to 15 N  
Density range.....  $100 < \rho < 1600 \text{ kg/m}^3$   
Standard lengths of  
displacers 204DE ..... 350 to 3000 mm  
14 to 120 inch  
Weight of displacer ...max. 25 N  
Output..... 0.2 to 1 bar/3 to 15 psi/20  
to 100 kPa/0.2 to 1  $\text{kp/cm}^2$   
Supply air.....  $1.4 \pm 0.1 \text{ bar}$  or  $20 \pm 1.4 \text{ psi}$

#### Transitional Behavior

Relative error ..... <1%  
Sensitivity..... <0.1%  
Ambient temperature  
influence..... <0.2%/10 K  
Process temperature  
influence..... <0.1%/10 K  
Supply air influence..... <0.2%/0.1 bar  
Air consumption ..... <200 l/h  
Air capacity ..... 1200 l/h  
Load effect  
(measured at 0.6 bar) .. +3% for 400 l/h exhausted  
flow -3% for 400 l/h  
delivered flow

#### Operating conditions

Process temperature  $-196^{\circ}\text{C}$  to  $+400^{\circ}\text{C}$   
Pressure rating  
acc. to DIN ..... PN 16, 40, 63, 100, 160, 250  
acc. to ANSI ..... Class 150, 300, 600, 900, 1500  
with heating jacket ..... wafer body  
max. PN 160/Class 900;  
heating jacket PN 25,  
heating with saturated steam  
or thermal oils  
Ambient temperature .....  $-40$  to  $+90^{\circ}\text{C}$   
Relative humidity ..... <100%  
Condensation ..... permitted  
Transportation and  
storage temperature .....  $-40$  to  $+90^{\circ}\text{C}$   
Protection class ..... IP 55 (acc. to DIN 40 050)

The device can be operated at a class D2 location in accordance with DIN IEC 654, part 1.

#### Mounting

Mounting method ..... sandwich mounted  
acc. to DIN ..... DN 80, DN 100  
acc. to ANSI ..... 3 inch, 4 inch  
Pneum. connections ..... internal thread  
DIN 45 141-Q 1/4-18 NPT

## How to Order

Specify model number 167LP

### Wafer Body with Indicator (Flange Size and Pressure Rating):

DN80 PN16-40 (available with Contact Face C).....	-20
DN80 PN16-160 (available with Contact Face U, N) .....	-21
DN80 PN16-250 (available with Contact Face E, L) .....	-22
DN100 PN16-160 (available with Contact Face U, N) .....	-23
DN100 PN16-250 (available with Contact Face E, L) .....	-24
DN100 PN16-40 (available with Contact Face C) .....	-25
3-Inch ANSI Class 150 .....	-31
3-Inch ANSI Class 300/600/900.....	-32
3-Inch ANSI Class 1500.....	-34
4-Inch ANSI Class 150 .....	-41
4-Inch ANSI Class 300/600/900.....	-42
4-Inch ANSI Class 1500.....	-44

### Wafer Body Contact Face:

Type C/C Raised Face (Rz 40 - 160) Per DIN 2526 (available with -20, -25).....	C
Type E/E Raised Face (Rz 0 - 16) Per DIN 2526 (available with -22, -24) .....	E
Type N/F (Grove) Per DIN 2512 (available with -21, -23) .....	U
Type N/N (Grove) Per DIN 2512 (available with -21, -23) .....	N
Type L/L DIN 2696 (available with -22, -24).....	L
Type RF/RF Raised Face Per ANSI B16.5 (available with -31, -32, -34, -41, -42, -44) .....	R
Type RJF/RJF Ring Joint Face Per ANSI B16.5 (available with -31, -32, -34, -41, -42, -44).....	J
Type SF/SF Smooth Finish (125 microinch) (available with -31, -32, -34, -41, -42, -44).....	S

### Wafer Body Material (Process Wetted):

Carbon Steel 1.0460 (A-105) .....	K
1.4404 (316L).....	S
Hastelloy C.....	C

### Wafer Body Mounting Direction (Transmitter on body):

Right Hand Mounted.....	R
Left Hand Mounted .....	L

### Torque Tube Material (Process Wetted):

316 (1.4571/1.4404/1.4435).....	S
Hastelloy C .....	C
Inconel 600.....	I
Monel .....	M

### Signal Range:

0.2 To 1.0 bar .....	1
3 To 15 psi .....	2
20 To 100 kPa.....	3
0.2 To 1.0 kp/cm2.....	4

### Optional Features:

Oil Damping.....	D
------------------	---

### Electrical Certificates:

ATEX – II 1/2 G c IIC (Zone 0) for media AII, AII, B <sup>(c)</sup> .....	E
ATEX – II 2 G c IIC (Zone 1) for media AII, AII, B.....	P
Overfill Protection Per WHG For Environmental Pollution Fluids <sup>(e)</sup> .....	V

### Certificates:

EN 10204-2.1.....	-1
EN 10204-2.2 Specific Test Report (Calibration).....	-2
EN 10204-3.1 Inspection Certificate of Process Wetted Metallic Material .....	-3
PED 97/23/EC additional unit verification, according to module F/G.....	-4
Comply with NACE Standard MR-01-75 (available with Wafer Body Material Code S and Torque Tube Material Code C, I or M only).....	-6

### Material Test:

X-Ray And Isotope Test For Weldings.....	-7
Dye Penetrate Test .....	-8

### Tag No. Labeling:

Stainless Steel Label Fixed With Wire.....	-L
--	----

### Notes

- (c) Available with Contact Face E, N, R & S
- (e) Not available with Wafer Body -33, -34, -43 & -44



# Pneumatic Transmitters (Temperature)

12A



The 12A Series Pneumatic Temperature Transmitters measure temperature and transmit a proportional pneumatic output signal.

## P12A Series Pneumatic Temperature Transmitters

- **Trouble-Free**
  - Force balance mechanism has no moving parts
- **Accurate**
- **Responsive**
  - Comparable to an unsheathed thermocouple
- **Simple Range Change**
  - Span can be elevated or suppressed 100%
  - Adjustment involves only three parts
- **Easy Installation**
  - A variety of mounting positions
- **Low Air Consumption**

For complete specifications, refer to Product Specification Sheet PSS 2B-1B1 A.

### Functional Specifications

Range Limits, Spans, and Maximum Overrange Temperatures (Maximum ORT):

Series	Sensor Sensitive Length "X"		Fahrenheit (F°)			
			Range Limits		Span	Maximum ORT
			Lower	Upper		
12A* and 12AS*	150	6	-100	+330	50	330
			-100	+1000	100	1000
			-100	+1000	125	1000
			-100	+1000	150	1000
			-100	+1000	200	1000
12A and 12AS	75	3	-100	+150	50	330
			-100	+650	100	1000
			-100	+850	150	1000
			-100	+1000	200	1000
			-100	+1000	250	1000
	75 or 150	3 or 6	-100	+1000	300	1000
			-100	+1000	400	1000
			-100	+1000	400	1000
			-40	+1000	500	1000
			0	+1000	600	1000
12A-C	150	6	-350	+330	50	330
			-350	+400	100	600
			-300	+600	150	600
			-250	+600	200	600
			-200	+600	250	600
	75	3	-150	+600	300	600
			-250	+600	200	600
			+600	+1400	400	1400
			+500	+1400	500	1400
			+400	+1400	600	1400
12A-H	150	6	+300	+1400	700	1400
			+200	+1400	800	1400

\*See statement under "PERFORMANCE SPECIFICATIONS."

Series	Sensor Sensitive Length "X"		Celsius (C°)			
			Range Limits		Span	Maximum ORT
			Lower	Upper		
12A* and 12AS*	150	6	-75	+125	25	125
			-75	+460	50	460
			-75	+550	75	550
			-75	+550	100	550
12A and 12AS	75	3	-75	+70	25	125
			-75	+300	50	460
			-75	+550	75	550
			-75	+550	100	550
	75 or 150	3 or 6	-75	+550	150	550
			-75	+550	200	550
12A-C	150	6	-210	+125	25	125
			-220	+200	50	320
			-170	+320	100	320
			-140	+320	150	320
			-95	+320	200	320
	75	3	-160	+320	100	320
			+350	+760	200	760
			+250	+760	300	760
			+150	+760	400	760
			12A-H	150	6	+150

**Output Signal:** 20 to 100 kPa or 3 to 15 psi.

**Ambient Temperature Limits:** -35 and +80°C (-30 and +180°F). The vinyl covered portion of the capillary tubing must be in an area between -55 and +105°C (-65 and +220°F).

**Supply Pressure:** 140 kPa or 20 psi.

## Performance Specifications

(12A and 12AS Series with range limits, spans, and sensitive lengths as noted by asterisks in Range Limits table.)

**Accuracy** (Includes linearity, hysteresis, and repeatability):  $\pm 0.5\%$  of calibrated span.

**Repeatability:**  
0.2% of calibrated span.

**Step Response Time** (Basic thermal system and agitated water bath): Maximum of 12 seconds for a 90% recovery from a step change on a bare sensor and less than 2 seconds for a 63% recovery.

## Physical Specifications

**Body:**  
Die-cast, low copper aluminum alloy with baked gray vinyl finish.

**Cover:**  
Blue, high impact, glass filled polycarbonate.

**Environmental Protection:**  
The transmitter housing is weatherproof. It is dust-protected as defined in IEC IP53 and, with its constant air purging, provides the environmental protection of NEMA Type 3.

**Thermal System:**  
SAMA (Scientific Apparatus Makers' Association) Class IIIB gas pressure system.

**Connecting Tubing:**  
Vinyl covered AISI Type 302 stainless steel (302 ss) flexible armor over 316 ss capillary. The length is 1m (3.5 ft).

**Bushings:**  
Fabricated of 316 ss and available with R1/2, R3/4, R1, G1/2B, G3/4B, G1B, 1/2 NPT, 3/4 NPT, or 1 NPT external thread and 1-18 NS internal thread. Bushing not required if temperature is well specified.

**Adjustable Union Packing:**  
ptfe: For temperatures up to 205°C (400°F).

Graphite Impregnated Inconel Mesh: For maximum temperature of 540°C (1000°F).

**Sensor:**  
Fitted with an adjustable union and bendable extension. The jam nut has an external 1-18 UNS thread. All process wetted parts are 316 ss except for the 12A-H Series, which has a sensor and bendable extension fabricated of Inconel. Also, the 12A-H Series has a fixed union.

Diameter (Y): 9.53 mm (0.375 in).

Sensitive Length (X): 75 or 150 mm (3 or 6 in).

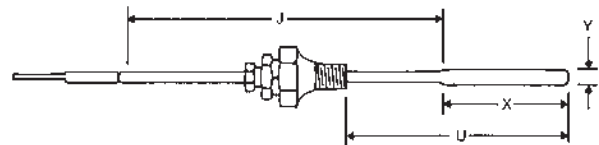
Extension Length (J): 450 mm (18 in). The J dimension for the 12A-A Series must be long enough to limit the temperature of the capillary tubing to 105°C (220°F).

Insertion Length (U): 200 to 530 mm (8 to 21 in), adjustable.

Immersion Length (R): As specified.

**Air Connections:**  
The supply and output connections are tapped for 1/4 NPT.

**Plain Bendable Sensor with Adjustable Union:**



## Optional Features

**Air Supply Sets:**  
Available as fixed or adjustable filter regulators with or without gauges. Refer to Page 27.

**Sausage Type Sensors:**  
For measurement of gas temperature in ducts or flues.

**Thermowells:**  
For mechanical or corrosive protection. Refer to Page 35.

**Derivative Unit:**  
Compensates for thermal lag in process.

**Intermediate Spans:**  
Spans different from those listed in table under "FUNCTIONAL SPECIFICATIONS."

**Optional Thermal System Configurations:**  
Other connection tubing, sensor types, and mounting are available.

## How to Order

**1) SPECIFY MODEL NUMBER:**

- Transmitter with Basic Thermal System  
and Code 3542 Sensor ..... 12A
- Cryogenic Thermal System  
and Code 3542 Sensor ..... 12A-C
- High Temperature Thermal System  
and Code 3482 Sensor ..... 12A-H
- Sanitary Thermal System  
(see additional specifications below) ..... 12AS

**ADDITIONAL SPECIFICATIONS FOR 12AS SERIES SANITARY THERMAL SYSTEMS ONLY:**

Sensor Code: ..... 3242

**Connector:**

- 16A Bevel Seat ..... S1
- 16AMP Clamp Seat ..... S2
- Type RJT ..... S3
- Type ISS ..... S4
- ISO Clamp Flange ..... S5
- DIN Seat ..... S6

**Nominal Line Size:**

- 25 mm (1 in) ..... A
- 40mm(1 1/2in) ..... B
- 50 mm (2 in) ..... C
- 65mm(2 1/2in) ..... D
- 75 mm (3 in)} ..... E
- 100 mm (4 in) ..... F

**Sensor Sensitive Length (X):**

- 75mm (3 in) ..... R
- 150 mm (6 in) ..... T

**Capillary Tubing Length:**

- 1 m (3.5 ft) ..... N
- 3 m (10 ft) ..... P

- 2) SPECIFY OUTPUT SIGNAL \_\_\_\_\_
- 3) SPECIFY RANGE LIMITS AND SPAN \_\_\_\_\_
- 4) SPECIFY CALIBRATED RANGE \_\_\_\_\_
- 5) SPECIFY SENSOR CODE \_\_\_\_\_
- 6) SPECIFY CONNECTING TUBING LENGTH \_\_\_\_\_
- 7) SPECIFY SENSOR DIMENSIONS \_\_\_\_\_
  - A. Diameter (Y) [9.53 mm (0.375 in) standard] \_\_\_\_\_
  - B. Length (X) [75 or 150 mm (3 or 6 in)—see Range Limits table] \_\_\_\_\_
  - C. Extension length (J) [450 mm (18 in) standard] \_\_\_\_\_
  - D. Insertion length (U) \_\_\_\_\_
  - E. Immersion length (R) \_\_\_\_\_
- 8) SPECIFY BUSHING EXTERNAL THREAD (if required) \_\_\_\_\_
- 9) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 10) SPECIFY INFORMATION FOR INSTRUMENT TAG AND APPLICATION \_\_\_\_\_

## FRS Filter Regulators Pressure Transmitters

FRS02 & FRS03

### FRS02 Filter Regulator

- Filter regulator for all pneumatic instruments
- Aluminum housing FRS02
- Max. input pressure 10 bar
- Control range 0 to 8 bar
- Max. air flow 18 Nm<sup>3</sup>/h
- Temperature range -20 ... +60 °C
- Gauge scale in bar / psi / kPa
- Sinter bronze filter 30 µm
- Explosion protection: ATEX II 2 GD c IIC T6
- Pneumatic Connection 1/4" NPT
- Mounting bracket as accessories



Control of instrument supply air pressure, and removal of dust particles and water content by filtration.

### FRS03 Filter Regulator Stainless Steel 316

- Filter regulator for all pneumatic instruments
- Stainless Steel Housing 316
- Max. input pressure 10 bar
- Control range 0 to 8 bar
- Max. air flow 18 Nm<sup>3</sup>/h
- Temperature range -40°C... +80°C
- Gauge scale in bar / psi / kPa
- Sinter SST filter 30 µm
- Explosion protection: ATEX II 2 GD c IIC T6
- Pneumatic Connection 1/4" NPT
- Mounting bracket as accessories



Control of instrument supply air pressure, and removal of dust particles and water content by filtration.

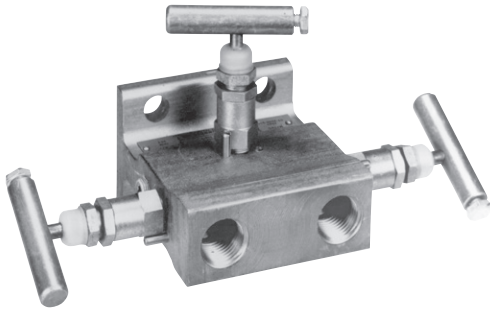
## How to Order

Aluminum version Filter Regulator .....	FRS02
Stainless Steel 316 version Filter Regulator.....	FRS03
Mounting Bracket for FRS02 or FRS03.....	EBZG-FR1
Adjustable Mounting Bracket for FRS02 or FRS03.....	EBZG-FR2

# Pneumatic Transmitters (Miscellaneous)

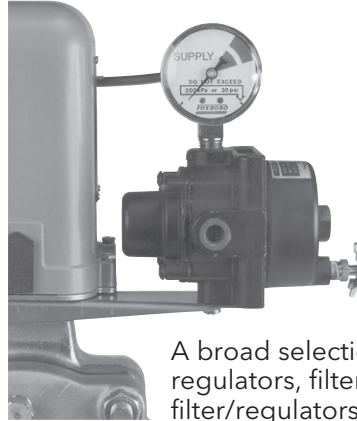
## BYPASS MANIFOLDS, AIRSETS, 17BT, 17BS, 45P

### Bypass Manifolds



A variety of 3 and 5 valve manifolds is available for fast, convenient zero checks and adjustment of transmitters, and to isolate the transmitter from the process for maintenance.

### Air Supply Pressure Regulators and Filters (Airsets)



A broad selection of air pressure regulators, filters, and combination filter/regulators is available. They are used with pneumatic instruments requiring a regulated filtered air supply.

### 17BT, 17BS Series Pneumatic Buoyancy Transmitters for Liquid Level Measurement



17BT and 17BS Series Pneumatic Buoyancy Transmitters measure and transmit liquid level interface level, or density by sensing changes in buoyant force exerted on a fixed displacer element. They can be flange-mounted to the top or side of the vessel which may be vented, pressurized, or evacuated. Displacer lengths range from 356 to 3810 mm (14 to 150 in) or longer when required.

### 45P Series Pneumatic Indicating Transmitters



45P Series Pneumatic Indicating Deflection Type Transmitters measure pressure, temperature, differential pressure, or liquid level, depending on element selection, and transmit a proportional 20 to 100 kPa or 3 to 15 psi signal.

## Primary Measurement Elements

Using primary measurement elements, you can adapt many instruments to specific applications.

Foxboro makes elements for all types of measurements – flow, pressure, temperature, moisture, and humidity.

### Orifice Plates and Flange Unions

Used with differential pressure meters to measure flow rate.

### Pressure Seals

Ideal for measuring corrosive, viscous, or hot fluids.

### Thermocouple/RTDs

Numerous configurations for use with transmitters, recorders, and controllers.

### Thermowells

Protect thermocouples and RTDs from damaging process materials.

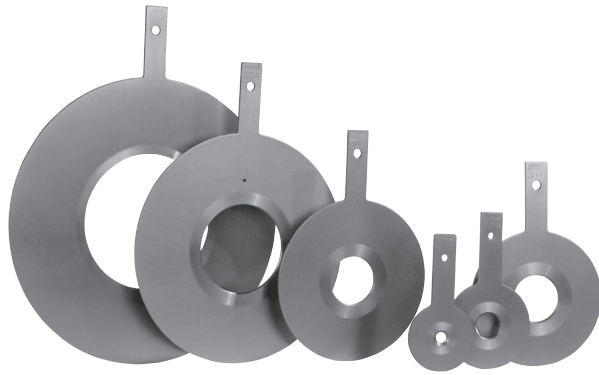
### Dewcel Elements

The most accurate, reliable way to measure moisture and humidity.

These elements are designed for use with both pneumatic and electronic devices. With them, you can count on the high performance and dependability you expect from all Foxboro instruments.

# Primary Measurement Elements (Orifice Plates, Flange Unions)

## ORIFICE PLATES, FLANGE UNIONS



Orifice Plates are used with differential pressure meters to measure flow rate.

## Orifice Plates and Flange Unions

- **Proven Performance**
  - Widely recognized as the industry standard
- **Versatile**
  - Works with either a d/p Cell Transmitter or a bellows meter
- **Broad Choice of Sizes and Materials**
  - For just about any line size or application

For complete specifications, refer to Product Specification Sheet PSS 3-5A1 A.

### Orifice Plate Specifications

**Material:**

These plates conform to National Association of Corrosion Engineer's (NACE) Standard MR-01-75.

**Flange Type Rating:**

ANSI Class 150, 300, 400, or 600, as specified.

**Bore:**

Concentric, with sharp and square inlet edge. Plate is beveled if required by conformity specifications.

**Nominal Plate Thickness:**

4 mm (0.125 in) for 25 to 200 mm (1 to 8 in) pipe sizes, 7 mm (0.250 in) for 250 to 350 mm (10 to 14 in) pipe sizes, and 10 mm (0.375 in) for 400 to 500 mm (16 to 20 in) pipe sizes.

**Legend:**

Upstream side of tab handle marked "inlet" and with bore size and flange type/rating. Downstream side marked with trademark, material, and tag.

**Conformity** (Specifications and Computations):  
Finish: Number 4 (45 microinch or better).

**Dimensions:**

Meet the intent of applicable portions of ASME "Fluid Meters" (Sixth Edition) and/or AGA Report 3 (1969), adopted as ANSI/API 2530.

**Computations:**

According to R.W. Miller's "Flow Measurement Engineering Handbook." This handbook is available from Foxboro. Refer to Part No. B0150YW.

### Orifice Flange Union Specifications

**Orifice Flange Unions are furnished in accordance with latest AGA and ASME code recommendations.**

**Construction:**

Unions include 2 flanges, 2 jackbolts with nuts, 2 composition gaskets, 4 pipe plugs, and bolting.

**Material:**

Flanges: ASTM A-105 carbon steel, ASTM A-182 F304 ss, or ASTM A-182 F316 ss, as specified.

Bolting: With steel on stainless steel flanges; ASTM A193 Grade B7 alloy steel stud bolts with ASTM A194 Grade 2H nuts.

**Pressure Tap Connections:**

2 sets per union, 180 degrees apart. Class 300 and 600 unions are threaded for 1/2-inch pipe nipples. Class 900 and 1500 unions are threaded for 3/4-inch pipe nipples. The pressure tap hole diameter is: 6.35 mm (0.25 in) for 65 mm (2 1/2 in) pipe size and smaller, 9.53 mm (0.375 in) for 80 mm (3 in), and 12.7 mm (0.50 in) for 100 mm (4 in) pipe size and larger.

### Optional Features

**Reverse Flow:**

For reverse flow applications, the plate is bored and finished equally on both faces and the bore is not beveled. The plate must be used with symmetrical taps.

**Preparation for Nuclear, Oxygen, or Chlorine Service is Available.**

**Optional Orifice Bores:**

Eccentric, segmental, or quadrant edge bore.

**Materials of Construction:**

Hastelloy C, Monel, Alloy 20, and titanium are available.



### Optional Features (continued)

#### High Temperature and High Differential

##### Pressure Operation:

The Orifice Plate may warp if the temperature of the process fluid exceeds 200°C (400°F) and the differential pressure ( $\Delta P$ ) is greater than 50 kPa (200 inH<sub>2</sub>O). Refer to Foxboro for determination of the plate thickness for these conditions.

#### Drain or Vent Hole:

Plate drilled with recommended maximum diameter hole to applicable standard.

**Other materials of construction, flange ratings, plate thickness, and line size are available.**

### How to Order

#### 1) SPECIFY ORIFICE PLATE CODE:

Plate, Foxboro Tab Type

Material: ASTM A-240 Type

304 ss.....	304
316 ss.....	316

For use with Flange Type Rating: ANSI Class

150.....	150
300.....	300
400.....	400
600.....	600

SERIES 120 -

SERIES 120

#### 2) SPECIFY NOMINAL LINE (PIPE) SIZE AND SCHEDULE NUMBER

#### 3) SPECIFY ORIFICE DIAMETER OR SUPPLY COMPLETED FLOW DATA SHEET

(Refer to Foxboro)

#### 4) SPECIFY OPTIONAL FEATURES

#### 5) SPECIFY INFORMATION FOR IDENTIFICATION TAG

#### 1) SPECIFY FLANGE UNION CODE:

##### Style:

Slip-On.....	FU-S
Threaded.....	FU-T
Welding-Neck.....	FU-W

##### Flange Facing:

Raised Face.....	RF
Ring Joint (Not available with FU-T).....	RJ

##### Material:

ASTM A-105 Carbon steel.....	CS
ASTM A-182 F304 ss.....	304
ASTM A-182 F316 ss.....	316

##### ANSI Rating:

Class 300.....	300
Class 600 (Not available with FU-T).....	600
Class 900 (Not available with FU-T).....	900
Class 1500 (Not available with FU-T).....	1500

#### 2) SPECIFY NOMINAL LINE (PIPE) SIZE

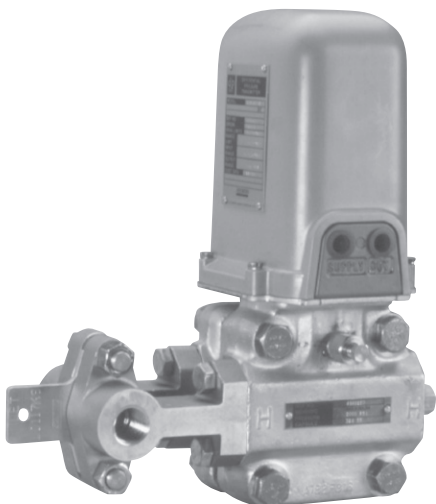
#### 3) SPECIFY PIPE SCHEDULE NUMBER OR ACTUAL INTERNAL DIAMETER FOR WELDING-NECK TYPE UNIONS

#### 4) SPECIFY OPTIONAL FEATURES

#### 5) FOR DIFFERENTIAL PRESSURE TRANSMITTER, REFER TO: Page 3.

# Primary Measurement Elements (Integral Flow Orifice Assemblies-IFOA)

## IFOA



The IFOA Series Integral Flow Orifice Assemblies adapt electronic and/or pneumatic d/p Cell Transmitters for measuring small flow rates.

## Integral Flow Orifice Assemblies (IFOA) Series

- The IFOA has very high accuracy when equipped with associated piping
- The IFOA can be used with any differential pressure transmitter having standard process connections
- Process wetted materials are available for use with both corrosive and noncorrosive fluids
- The transmitter can be either integrally coupled or remotely connected
- Process wetted material meets NACE Standard MR-01-75

For complete specifications, refer to Product Specification Sheet PSS 3-5A1 B.

## Specifications

### Assemblies with Associated Piping:

#### Body Material:

Cast AISI Type 316 ss ASTM A351 Grade CF-8M stainless steel.

#### Piping Material:

Seamless stainless alloy steel pipe to ASTM A-312 Grade TP-316, Schedule 40 for the 15 and 25 mm (1/2 and 1 in) sizes, Schedule 80 for the 40 mm (1 1/2 in) size.

#### Flange Material:

Forged 316 ss ASTM A182-F316.

### Assemblies without Associated Piping:

#### Body Material:

Cast AISI Type 316 ss ASTM A351 Grade CF-8M stainless steel or cast Hastelloy C Grade CW-2M per ASTM A494/A494M-86, as specified.

### Both Types:

#### Static Pressure Rating and Process Temperature Limits:

End Connection	Assembly Size		Static Pressure Rating and Process Temperature Limits (a)	
	mm	in	SI Units	U.S.Units
WELD ENDS	15	1/2	20 MPa from -40 to +40°C 16 MPa at 150°C	3000 psi from -40 to +100°F 2300 psi at 300°F
	25	1	14 MPa from -40 to +40°C 10.5 MPa at 150°C	2000 psi from -40 to +100°F 1550 psi at 300°F
	40	1 1/2	5 MPa from -40 to +40°C 4 MPa at 150°C	750 psi from -40 to +100°F 580 psi at 300°F
THREADED ENDS	15 & 25	1/2 & 1	10 MPa from -40 to +150°C	1500 psi from -40 to +300°F
	40	1 1/2	5 MPa from -40 to +40°C 4 MPa at 150°C	750 psi from -40 to +100°F 580 psi at 300°F
FLANGED ENDS (b)	All sizes		Static Pressure Rating of Flange Selected	

a) Process temperature limits are -40 and +150°C (-40 and +300°F). Transmitter temperature limitations must be observed when integrally mounted to IFOA assembly. For higher pressures and temperatures, t

b) Available with associated piping only.

## Specifications (continued)

**Body Bolting:**

ASTM A193 Grade B7 cadmium- or zinc-plated with yellow chromate finish alloy steel stud bolts and ASTM A194 Grade 2H nuts.

**Orifice Plate Material:**

316 ss ASTM A240, Monel ASTM B127, or Hastelloy C276 ASTM B626, as specified.

**Orifice Sealing Gasket Material:**

Glass-reinforced ptfе.

## Optional Features

Process wetted materials in compliance with NACE Standard MR-01-75.

High pressure assembly (IFO). Static pressure rating 40 MPa (6000 psi).

17-4 PH ss body bolting.

Oxygen service preparation.

3-valve manifolds.

180° U-Bend Integral Orifice Attachment.

**Orifice Kits:**

316 ss	Consisting of 7 bored diameters per standard specifications for 15 mm (1/2 in) assembly.
	Consisting of 5 bored diameters per standard specifications for 25 mm (1 in) assembly.
	Consisting of 5 bored diameters per standard specifications for 40 mm (1 1/2 in) assembly.
Monel	Consisting of 7 bored diameters per standard specifications for 15 mm (1/2 in) assembly.

## How to Order

**1) SPECIFY MODEL NUMBER: IFOA**

**Nominal Size:**

- 15 mm (1/2 in) ..... 0H
- 25 mm (1 in) ..... 01
- 40 mm (1 1/2 in) ..... 1H

**Body Material:**

- 316 ss ..... S
- Hastelloy C, Grade CW-2M (without associated piping only) ..... H

**End Connection without Associated Piping:**

- Socket Weld Body ..... 1
- Threaded Body (NPT) ..... 2
- Threaded Body (R metric) ..... 8

**End Connection with Associated Piping:**

- Pipe Ends Prepared for Welding ..... 3
- Pipe Ends Threaded (NPT) ..... 4
- Pipe Ends Threaded (R metric) ..... 9
- Pipe Ends Flanged ANSI Class 150 ..... 5
- Pipe Ends Flanged ANSI Class 300 ..... 6
- Pipe Ends Flanged ANSI Class 600, 15 and 25 mm (1/2 and 1 in) only ..... 7

**Orifice Plate Material:**

- 316 ss ..... S
- Monel ..... M
- Hastelloy C276 ..... H

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER (continued): IFOA

#### Orifice Bore Diameter: Nominal Size 15 mm (1/2 in):

0.508 mm (0.020 in).....	A
0.889 mm (0.035 in).....	B
1.524 mm (0.060 in).....	C
2.540 mm (0.100 in).....	D
4.064 mm (0.160 in).....	E
6.350 mm (0.250 in).....	F
8.890 mm (0.350 in).....	G
Jewel orifice. 316 ss base material. 0.0508 to 0.381 mm (0.002 to 0.015 in).....	U
Nonstandard within beta limits of 0.1 to 0.8.....	V

#### Orifice Bore Diameter: Nominal Size 25 mm (1 in):

6.147 mm (0.242 in).....	H
8.661 mm (0.341 in).....	J
12.14 mm (0.478 in).....	K
16.64 mm (0.655 in).....	L
21.13 mm (0.832 in).....	M
Nonstandard within beta limits of 0.1 to 0.8.....	V

#### Orifice Bore Diameter: Nominal Size 40 mm (1 1/2 in):

9.703 mm (0.382 in).....	N
13.67 mm (0.538 in).....	P
19.08 mm (0.751 in).....	R
25.86 mm (1.018 in).....	S
29.97 mm (1.180 in).....	T
Nonstandard within beta limits of 0.1 to 0.8.....	V

#### Optional Connectors: For remote mounting d/p Cell Transmitter:

316ss, 1/2NPT.....	1S
316 ss, R1/2.....	2S
Hastelloy C, 1/2 NPT.....	1H
Hastelloy C, R1/2.....	2H

### 2) SPECIFY ORIFICE BORE DIAMETER OR SUPPLY COMPLETED FLOW DATA SHEETS

(Refer to Foxboro) FOR NONSTANDARD OR JEWEL ORIFICE \_\_\_\_\_

### 3) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

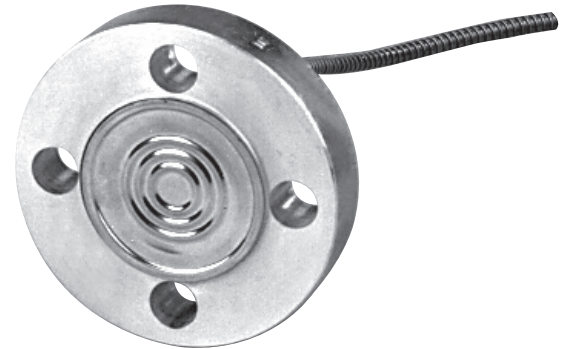
### 4) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

# Primary Measurement Elements (Diaphragm Pressure Seals)

## Diaphragm Pressure Seals

## DIAPHRAGM PRESSURE SEALS


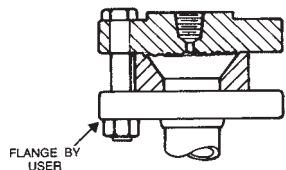
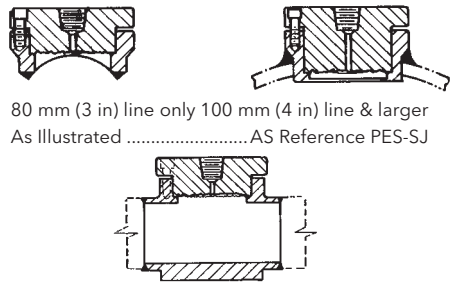
- Foxboro offers a comprehensive line of Diaphragm Pressure Seals. These seals are used to separate pressure instruments from process fluids.
- Separation is required if the process:
  - is corrosive
  - is viscous enough to clog
  - contains suspended solids
  - could freeze or solidify
  - is toxic
  - requires sanitary handling
- Diaphragm Pressure Seals are available in a wide range of designs and materials



Diaphragm Pressure Seals are for connection to pressure instruments—to isolate the process from the instrument and piping.

For complete specifications, refer to Product Specification Sheet PSS 3-2C1 A.

## Diaphragm Pressure Seals

Selection	Description	Illustrations and AS References (a)
THREAD ATTACHED	Process Connection: PES-SB: 1/4, 1/2, 3/4, 1, 1 1/4, or 1 1/2 NPT PES-SG: 1/4, 1/2, 3/4, or 1 NPT  Operating Pressure: Maximum working pressure: 0 to 17.5 MPa (0 to 2500 psi).	 <p>As Illustrated .....AS Reference PES-SB                      With 1/4-inch flushing connection.....AS Reference PES-SG</p>
FLANGE ATTACHED	Process Connection: ANSI raised face flange.  Operating Pressure: Maximum working pressure: Governed by flange rating.	 <p>As Illustrated ..... AS Reference PES-SC                      With 1/4-inch flushing connection..... AS Reference PES-SD</p>
IN-LINE FLOW-THROUGH	Process Connection: Welded to process line.  Operating Pressures: Maximum working pressure: Governed by user's weld 0 to 10.5 MPa at 38 C (0 to 1500 psi at 100°F).	 <p>80 mm (3 in) line only 100 mm (4 in) line &amp; larger                      As Illustrated .....AS Reference PES-SJ                       As Illustrated .....AS Reference PES-SM</p>

a) Other types available. Wetted parts materials available: Steel, AISI Types 304 and 316 ss, Carpenter 20, Monel, nickel, ... titanium, Hastelloy B and C, PVC, polypropylene, ptfe, and Inconel.

# Primary Measurement Elements (Thermowells and DEWCEL)

## THERMOWELLS AND DEWCEL



Foxboro Thermowells separate the temperature measuring sensitive portion of an RTD, Thermocouple, or Filled Thermal System from a potentially corrosive or damaging process media. These wells permit ready removal of the sensor without process shutdown.

## Thermowells

- **Rigid material, concentricity specifications, and individual hydrostatic testing assures maximum soundness and highest quality**
- **Connections:**
  - Flanged (ANSI and ISO): Variety of sizes and pressure ratings
  - Threaded (metric and NPT): R1/2, R3/4, and R1 (1 /2, 3/4, and 1 NPT)
- **Type:**
  - Drilled construction, welded construction, plain, with lagging, sanitary, straight, tapered, restricted tip
- **Materials:**

Brass	347 ss	316L ss
Carpenter 20 Cb-3	F11 Alloy Steel	Aluminum
C1018 Carbon Steel	F22 Alloy Steel	Copper
R-Monel 405	Hastelloy B	K-Monel
304 ss (standard)	Hastelloy C 276	309 ss
304 Low Carbon (304L) ss	Inconel 600	310 ss
316 ss (standard)	Nickel 200	410 ss
	Titanium	446 ss

## Dew Point Measurement System – DEWCEL



The DEWCEL is used with RTD, thermocouple, or filled thermal system temperature measuring equipment.

- **The DEWCEL System provides a direct reading of absolute humidity in ambient temperature between -45 and +105°C (-50 and +220°F)**

When connected to a temperature measurement device, the DEWCEL System measures absolute humidity. By means of appropriate tables, the temperature can be converted to dew point, percent water vapor, parts per million, or other units of absolute moisture. In practice, the conversion is accomplished in recorder chart layouts, characterized amplifiers, or computer programs.
- **Accuracy:**  $\pm 0.8^{\circ}\text{C}$  ( $\pm 1.5^{\circ}\text{F}$ ) at  $32^{\circ}\text{C}$  ( $90^{\circ}\text{F}$ ) dew point (not including temperature sensor tolerances)
- **Dew Point Range Limits:** -45 and  $+60^{\circ}\text{C}$  (-50 and  $+140^{\circ}\text{F}$ )
- **Relative Humidity Limits:** 12 and 100% relative humidity
- **Pressure Rating:** Zero Pa absolute to 865 kPa gauge (zero psia to 125 psig)

## Large Case Instruments

Foxboro large case instruments have been on the job for years in process plants around the world.

These versatile instruments fit a wide range of applications. There's a unit for just about every process function:

- **Recording**
- **Indicating**
- **Controlling**
- **Totalizing**
- **Transmitting**

And they are available with a selection of measurement elements:

- **Flow**
- **Pressure**
- **Humidity**
- **Temperature**
- **Servo Elements for RTDs/Thermocouples and other Electrical Inputs**

You can also choose from an extensive list of options such as electrical contacts, integrators, batch controls, pen types, control modes—and numerous other features.

Foxboro large case instruments can be field mounted on pipe stands, in panels, or on flush surfaces. And their durable housings are resistant to moisture, corrosion, and damaging environments.

Their dependability is legendary. That's why process engineers specify them time and again.



# Large Case Instruments (Controllers)

40P, 40M



The 40P, 40M Series Recording and Indicating Pneumatic Controllers receive a mechanical input from an integrally mounted measuring element, compare it to a set point, and produce a pneumatic output signal.

## 40P, 40M Series Recording and Indicating Pneumatic Controllers

- Precise Control
- Chart Records or Indication
- Weatherproof Construction (40P): NEMA Type 3
- Wide Selection of Measuring Elements
- Versatile Mounting: Surface, Panel, or Pipe Mounting

For complete specifications, refer to Product Specification Sheets PSS 3-1A1 A and 3-1A2 A, B, C, and F.

### Functional Specifications

**Control Modes:**

See "HOW TO ORDER."

**Measurement Elements:**

See "HOW TO ORDER."

**Controller Action:**

The output signal either increases or decreases with increasing measurement, as specified.

**Output Signal:**

See "HOW TO ORDER."

**Supply Pressure:**

140 kPa (20 psi, 1.4 bar or kg/cm<sup>2</sup>).

**Single Action:**

One control unit per 40P or 40M case. Dual, duplex, and auto-selector versions are also available.

**Recorder Chart Drives:**

Electrical: The standard speed is 1 revolution per 24 hours for nominal 120 or 240 V, 50 or 60 Hz, as specified.

Mechanical: The standard speed is 1 revolution per 24 hours with a 24-hour movement.

Battery Operated: 11 Speed

**Recorder Pens:**

Fiber tip disposable or box.

### Physical Specifications

**Enclosure:**

40P Series: The case and door are glass-fiber reinforced polyester moldings, compounded for superior corrosion resistance. The overall construction provides the environmental protection of IEC IP53 and NEMA Type 3.

**40M Series:**

Durable, die-cast aluminum case and door with corrosion-resistant vinyl finish.

**Mounting:**

Standard mounting is flush in a panel up to 16 mm (0.6 in) thick or on a surface. A kit of parts for vertical mounting on a DN 50 or 2 in pipe is available (40P Series only).

**Expendable Accessories:**

Charts: 100 HUMITEX nominal 300 mm (12 in) circular charts [nominal 100 mm (4 in) calibrated scale] are supplied with each instrument.

**Ink:**

1 U.S. fl oz (30 cm<sup>3</sup>) is supplied for each box type pen.



## Performance Specifications

**Accuracy:**  
See Measurement Element selected.

**Repeatability:**  
0.25% of calibrated span.

## Optional Features

**Pneumatic Set:**  
For remote set point adjustment.

**Batch:**  
For batch control.

**External Manual Set Point Knob.**

**Type 70 Contacts:**  
For electrical contact output. Refer to Page 57.

**Ratio:**  
Maintains ratio between uncontrolled and controlled variable.

**External Connection to Integral Bellows.**

## How to Order

### 1) SPECIFY MODEL NUMBER:

**40P or 40M**

**Function:**

Recording.....R  
Indicating.....N

**Action:**

Single (One control unit actuated by one measuring element. Control will apply to first listed element.).....A

**Control:**

On/Off.....1  
Full proportional 0.5 to 200% .....2  
Full proportional plus derivative 0.01 to 50 minutes...3  
Full proportional plus integral (reset) 0.01 to 50 minutes per repeat.....4  
Full proportional plus integral (reset) plus derivative...5  
Narrow band proportional 0.5 to 25% or 1.0 to 50% ..6

**Automatic/Manual Internal Transfer Switching:**

Without internal regulator, without transfer switch (a).....J  
2-position nozzle seal switch (b) .....L  
Balanceable automatic/manual unit - right (b).....N  
Balanceable automatic/manual unit - left (b) .....P

**Output Signal and Gauge:**

20 to 100 kPa signal, 150 kPa gauge .....5  
3 to 15 psi signal, 22 psi gauge .....2  
0.2 to 1.0 bar signal, 1.5 bar gauge .....6  
0.2 to 1.0 kg/cm<sup>2</sup> signal, 1.5 kg/cm<sup>2</sup> gauge.....4

**Mounting:**

Flush (c) .....F  
Pipe (c), (d).....P  
Surface (c).....S  
Yoke. 40P Series available with Type 37 Element only .....Y

(a) Available with Control code 1 only. (b) Not available with Control code 1. (c) Not available with 40P Series with Type 37 Element. (d) Not available with 40M Series.

HOW TO ORDER Continued on Next Page.

# Large Case Instruments (Controllers)

40P, 40M

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER:

40P or 40M

#### Chart Drive or Scale:

- Electrical - 24 h rotation, 120 V, 60 Hz (options available)..... E
- Mechanical - 24 h rotation and wind (options available)..... M
- Sector ..... N

#### Pens or Pointers:

- 1 pen or pointer ..... 1
- 2 pens or pointers ..... 2
- 3 pens ..... 3

#### Pen Type or Scale Type:

- Fiber tip disposable ..... F
- Box ..... B
- Single range scale ..... S
- Double range scale ..... D

#### Elements: (Refer to Pages 48-56 for Element Descriptions)

- Type 37 (a) ..... DE-A, B
- Absolute pressure bellows ..... PA-CA
- Receiver ..... PC
- Absolute pressure double spiral ..... PA-MA
- Pressure helical ..... PB-M, PB-AA
- Pressure spiral ..... PB-BA
- Pressure bellows ..... PB-CA, CC
- Diaphragm ..... PB-DF, PF
- Stainless long helical ..... PBGA
- Temperature ..... TA-1A, 2A, 2B, 3B
- Electronic servo ..... E

(a) Only one per instrument.

- 2) SPECIFY MEASUREMENT RANGE \_\_\_\_\_
- 3) SPECIFY CONTROLLER ACTION \_\_\_\_\_
- 4) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

## 43AP Series Pneumatic Indicating Controllers

43AP

- **Wide Selection of Direct Connected Measurement Elements**
- **Broad Choice of Control Modes**
  - On/off, proportional, proportional plus derivative, proportional plus integral (reset), proportional plus integral (reset) plus derivative, differential gap, and automatic shutdown
- **Internal Bumpless Auto/Manual Transfer**
  - Smooth internal switching
- **Weatherproof**
  - Glass-fiber reinforced case, gasketed door
  - NEMA Type 3 protection
- **Accuracy Unaffected by Mounting**
  - Measurement element and control unit mounted on rigid steel plate



The 43AP Series Pneumatic Indicating Controllers continuously indicate and control pressure, vacuum, temperature, or flow.

For complete specifications, refer to Product Specification Sheet PSS 3-1B3 A.

### Functional Specifications

**Control Modes:**

See "HOW TO ORDER."

**Measurement Elements:**

See "HOW TO ORDER."

**Output Gauge:**

0 to 200 kPa, 0 to 30 psi, or 0 to 2 bar or kg/cm<sup>2</sup>, as specified.

**Set Point Adjustment:**

By means of a knob mounted inside the case.

**Controller Action:**

Output signal either increases or decreases with increasing measurement, as specified; action is reversible in the field.

**Supply Pressure:**

140 kPa, 20 psi, 1.4 bar or kg/cm<sup>2</sup>.

**Output Signal:**

See "HOW TO ORDER."

**Ambient Temperature Limits:**

-40 and +80°C (-40 and +180°F).

### Performance Specifications

**Accuracy** (When used with the elements as listed under "HOW TO ORDER"):  $\pm 0.5\%$  of calibrated span.

**Repeatability:**

0.2% of calibrated span.

### Physical Specifications

**Mounting:**

Panel, surface, pipe, or yoke. Panel: Flush in a panel up to 16 mm (0.6 in) thick.

Surface: suitable for all controllers having internally mounted elements. This mounting is not available with heavy duty helical elements. (These elements extend through the back of the case.)

Pipe: a kit of parts to fit a DN 50 or 2 in vertical pipe.

Yoke: a kit of parts to fit a vertical DN 50 or 2 in pipe stub. This mounting scheme is designed specifically for controllers having rear-mounted differential pressure elements.

# Large Case Instruments (Controllers)

43AP

## Physical Specifications (continued)

### Enclosure:

The case and door are glass-fiber reinforced polyester moldings, compounded for superior corrosion resistance. The door has a shatterproof polycarbonate window, ultraviolet-resistant. The overall construction is weatherproof, meets IEC IP53, and provides the environmental protection of NEMA Type 3.

### Scale:

Black markings on a white background, sector-shaped with nominal effective length of 150 mm (6 in). Refer to Chart and Dial Catalog 600 for available ranges.

## Optional Features

### Integral Air Supply Set.

### Type 70 Contacts:

For electrical contact output. Refer to Page 57.

### Control Valve Mounting.

### External Connection to Integral (Reset) Bellows (ECRB).

### External Set Point.

### Batch:

For batch control.

### Vent Connection.

### External Phenolic Nameplate.

### Glass Window in Door.

### Stainless Steel Data Plate.

### Tamperproof Door Knob.

## How to Order

### 1) SPECIFY MODEL NUMBER: 43AP-

#### Mounting:

Field (pipe or yoke).....	F
Panel or surface.....	P

#### Control:

On/Off.....	A1
Proportional 4 to 400%.....	A2
Proportional plus derivative 0.05 to 50 minutes.....	A3
Proportional plus integral (reset) 0.01 to 50 minutes per repeat.....	A4
Proportional plus integral (reset) plus derivative.....	A5
Differential gap 1 to 100%.....	A7
Automatic shutdown.....	A8

#### Output Signal and Gauge:

20 to 100 kPa signal, 200 kPa gauge.....	5
3 to 15 psi signal, 30 psi gauge.....	2
0.2 to 1.0 bar signal, 2 bar gauge.....	6
0.2 to 1.0 kg/cm <sup>2</sup> signal, 2 kg/cm <sup>2</sup> gauge.....	4

#### Automatic/Manual Internal Transfer Switching:

None.....	N
Bumpless with 2-position switch, balance gauge, regulator.....	C
2-position nozzle seal switch for manual control.....	D

#### Optional Suffix:

Remote pneumatic set point (not available with pressure element codes PA-CA, PA-CC, PB-CA, PB-GA, PB-PF; servo element code E; Type 70 Contacts; or options ECRB and "BATCH").....	P
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HOW TO ORDER Continued on Next Page.

## How to Order (continued)

**1) SPECIFY MODEL NUMBER: 43AP-**

— — — — - — /

**Elements:** (Refer to Pages 48-56 for Element Descriptions)

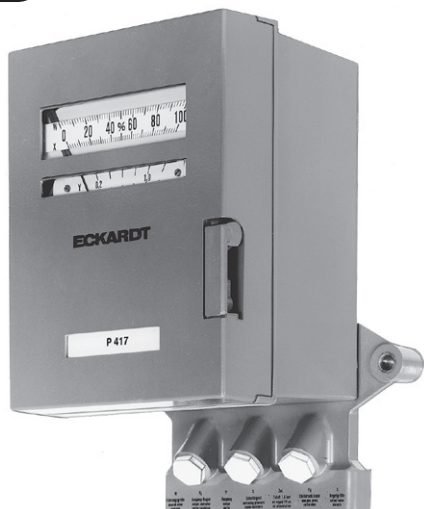
Type 37 (43AP-F only) .....	DE-A, B
Absolute pressure bellows .....	PA-CA, CC
Absolute pressure double spiral.....	PA-MA
Pressure helical.....	PB-AA
Pressure spiral .....	PB-BA
Pressure bellows .....	PB-CA, CC
Diaphragm .....	PB-DF, PF
Stainless long helical (43AP-F only).....	PB-GA
Receiver .....	PC
Temperature .....	TA-1A, 2A, 2B, 3B
Electronic servo .....	E

**2) SPECIFY CONTROLLER ACTION** \_\_\_\_\_

**3) SPECIFY OPTIONAL FEATURES** \_\_\_\_\_

**4) SPECIFY INFORMATION FOR INSTRUMENT TAG AND APPLICATION** \_\_\_\_\_

P417



## Complete instrument

P417 pneumatic controllers are complete pneumatic control stations and, in conjunction with transmitters, are suitable for all control applications in process plants, particularly for field mounting. Field controllers are also available without an indicator.

Measured value x.....	} 0.2 to 1.0 bar /
Set point w .....	
Output y.....	} 20 to 100 kPa
Supply air.....	1.4 ± 0.1 bar / 20 ± 1.4 psi /
	140 ± 10 kPa

Inherent air consumption <sup>1) 2)</sup> ..... ≤ 500 l / hr

## Housing

Front finish..... door enamelled grey to RAL 7000, with lock  
Service label..... 50 x 13mm, replaceable

## Materials

Housing, with door ..... aluminium, with DD enamel, grey RAL 7000

Connection block for wall / panel mounting ... aluminium, with DD enamel, grey RAL 7000

Measuring elements..... copper-beryllium

Other internal components..... aluminium, brass, galvanized and passivated steel

## Double indicator for x and w

Error limit..... < 1%

## Indicator for output signal

Indication range ..... 0 to 1.2 bar / 18 psi / 120 kPa

Error limit..... < 1.6%

## Signal generators for set point and output signal

Output adjustable..... 0 to 1.2 bar / 18 psi / 120 kPa

Supply air dependency. ≤ 0.25 % / 0.1 bar

Air consumption..... ≤ 100 l / hr per signal generator

## P417 Pneumatic Field Controller

- Same basic instrument for field / panel mounting
- Aluminium die-cast housing, with lock, protection class IP 54 (IP 65)
- Well-established cross-bellows control system
- Set point, measured value and output indication
- Versions for master and slave control
- Push-buttons for manual / auto transfer
- Bumpless manual / auto transfer
- Limiting of controller output
- External feedback
- Field controller changeover relay
- Mode switching
- Operating point set internally / externally
- Function altered by interchanging standard modules
- Service label

## Manual-Auto switch

Type ..... push-buttons

## Controller section

System ..... cross-bellows

Control modes..... P, PD, PI, PID

Operating point P / PD

controller..... set pneumatically, either internally or externally

Proportional band  $X_p$  ..... 5 to 400% and higher

Gain  $K_p$  ..... 20 to 0.25 and lower

Reset time  $T_n$  ..... 0.03 to 50min

Derivative time  $T_v$  ..... 0.03 to 20min

Tracking error<sup>1)</sup> ..... ≤ 0.7 %

Alignment offset<sup>1)</sup> ..... ≤ 0.7 %

Supply air dependency<sup>1)</sup> ... ≤ 0.2 % / 0.1 bar

Temperature effect<sup>1)</sup> ..... ≤ 0.2 % / 10 K

Sensitivity<sup>1)</sup> ..... ≤ 0.1 %

Startup relay ..... for bridging time function "manual"

Tracking relay..... for bumpless manual - auto transfer, even with deviation

Mode switching:

– PI-switching ..... reset bellows loading input, internal or external

– P / PI-switching ..... switching with external signal

External feedback ..... external pressure applied to feedback bellows R+

## Additional equipment

Min- /Max-limiting ..... for min. or max. limiting of "R" or "yA + R" limit value settable to 0.2 to 0.6 bar or 0.6 to 1.0 bar

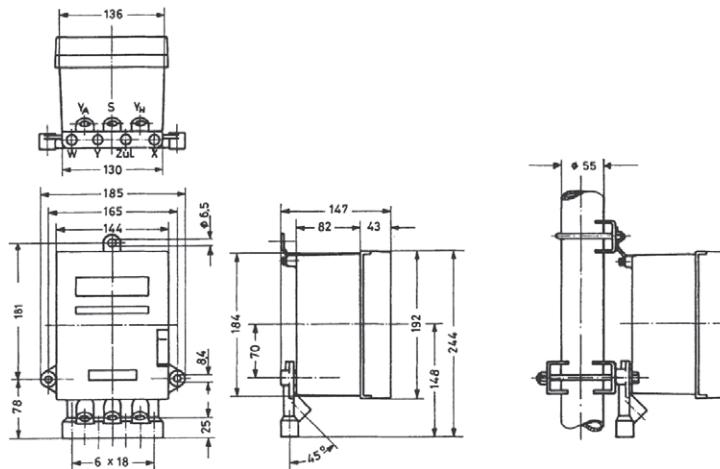
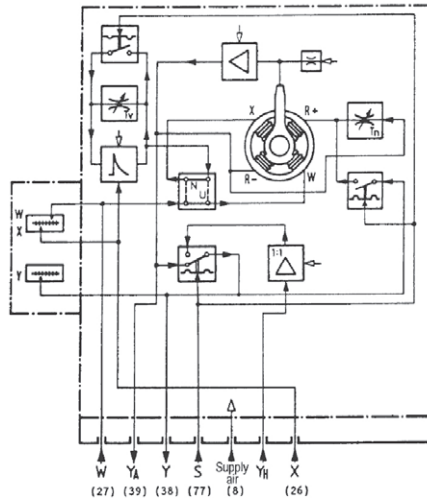
1) Measured at  $X_p = 100\%$  resp. with PI controller

2) Master version

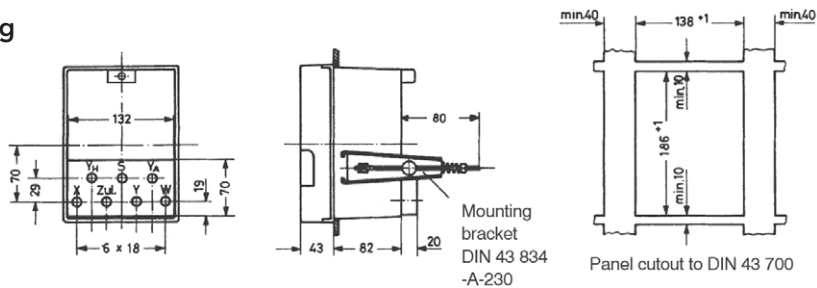
# Large Case Instruments (Controllers)

## Code P417-541

PID Controller with indicator,  $T_n$  and  $T_v$  startup relays



## Panel mounting



## How to Order

### Pneumatic Field Controller

P417

#### Version

- |   |    |
|---|----|
| Master controller with signal generator for output signal.....    | -1 |
| Slave controller with signal generator for output signal.....     | -2 |
| Master controller without signal generator for output signal..... | -3 |
| Slave controller without signal generator for output signal ..... | -4 |
| Field controller with indicator (5 pipe) .....                    | -5 |
| Field controller without indicator (5 pipe) .....                 | -6 |

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

### Control mode and equipment

P Operating point internally .....	1
P Operating point externally (a) .....	12
PD with Tv-startup relay O.P. internally (b).....	21
PD with Tv-startup relay O.P. externally (b).....	22
PI with Tn-startup relay (d).....	31
PI with Tn-startup relay and tracking relay (d) .....	32
PI with PI-switch, YF internally (a).....	3
PI with PI-switch, YF externally (b).....	34
PI with PI-switch,Tn-startup relay, YF internally (b).....	35
PI with PI-switch,Tn-startup relay, YF externally (b).....	36
PI externally feedback with Tn-startup relay (b).....	37
PI Auto-Selector-Master controller with Tn-startup relay (b).....	38
PI Auto-Selector-Slave controller with Tn-startup relay (b) .....	39
PID with Tn-, Tv-startup relay (d).....	41
PID with Tn-, Tv-startup relay and tracking relay (d) .....	42
PID with PI-switch, YF internally (b).....	43
PID with PI-switch, YF externally (b).....	44
PID with PI-switch, Tn-startup relay, YF internally (b).....	45
PID with PI-switch, Tn-, Tv-startup relay, YF externally (b).....	46
PID externally feedback with Tn-,Tv-startup relay (b).....	47
PID Auto-Selector-Master controller with Tn-, Tv-startup relay (b) .....	48
PI Auto-Selector-Slave controller with Tn-, Tv-startup relay (b) .....	49
P / PI with Tn-startup relay, O.P. internally (b).....	51
P / PI with Tn-startup relay, O.P. externally (b).....	52
P / PI with Tn-startup relay, tracking relay Operating point internally (b).....	53
P / PI with Tn-startup relay, tracking relay Operating point externally (b).....	54
P / PI with remote switching,Tn-startup relay Operating point internally (b).....	55
P / PI with remote switching,Tn-startup relay Operating point externally (b).....	56
P / PI / PID with Tn-startup relay, O.P.internally (b).....	61
P / PI / PID with Tn-,Tv-startup relay, O.P.externally (b).....	62
P / PI / PID with Tn-startup relay,tracking relay Operating point internally (b) .....	63
P / PI / PID with Tn-startup relay,tracking relay Operating point externally (b).....	64

### Indicating Range (Scale) for X and W

0 - 100% linear (h).....	A
to be specified (acc.standard list) (h) .....	B
without indicator (k).....	C

### Signal Range

0.2-1.0bar .....	1
3-15psi .....	2
20-100kPa.....	3

### Indicating Range for output signal

0-1.2bar .....	1
0-18psi .....	2
0-120kPa.....	3

### Type of mounting

Wall / Pipe mounting, pneum.conn. 1/4 -18 NPT .....	A
Wall / Pipe mounting, pneum.conn. G 1/4 .....	B
Panel mounting, pneum.conn. 1/8 -27 NPT .....	C

### Options

min. limitation of YA and R (for P-controller YA only).....	-A
min. limitation of R (b) (e).....	-B
max. limitation of YA and R (for P-controller YA only) .....	-C
max. limitation of R (b) (e).....	-D
min.- max. limitation of YA and R (for P-controller YA only) (b) (f).....	-E
Kit for pipe mounting.....	-M
Plug for test jack (O.P. for P-, PD-controller).....	-S
Protection class IP 65 (for mounting type A, B).....	-P
Tag.No. Labeling with inscription .....	-L

### Certificates

EN 10204-2.1 (DIN 50 049-2.1) .....	-1
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### NOTES

- |  |   |   |
|--|---|---|
| (a) Only available with Version -1, -2, -3, -4 | (d) Only available with Version -1,-2,-5,-6         | (g) On request                                    |
| (b) Only available with Version -1, -2         | (e) Only available with control mode 31, 32, 41, 42 | (h) Not available with Version -6                 |
| (c) Only available with Version -3, -4         | (f) Only available with control mode 31, 32, 34, 36 | (k) Not available with Version -1, -2, -3, -4, -5 |



## 40P, 40M Series Recorders and Indicators

40P, 40M

- Wide Selection of Measuring Elements
- Versatile Mounting: Surface, Panel, or Pipe Mounting
- Choice of Circular Chart Recorder or either Concentric or Sector Scale Indicator
- Weatherproof Construction (40P Series): NEMA Type 3

For complete specifications, refer to Product Specification Sheets PSS 3-1A1 A and 3-1A2 A, B, C, and E.



The 40P and 40M Series Instruments continuously record or indicate measurement of one or more process variables.

### Functional Specifications

**Measurement Elements:**  
See "HOW TO ORDER."

**Recorder Chart Drives:**  
Electrical: The standard speed is 1 revolution per 24 hours for nominal 120 or 240 V, 50 or 60 Hz, as specified.

Mechanical: The standard speed is 1 revolution per 24 hours with a 24-hour movement.

Battery Operated: 11 speed.

**Ambient Temperature Limits:**  
-30 and +60°C (-20 and +140°F).

**Recorder Pens:**  
Fiber tip disposable or box.

### Performance Specifications

See Measurement Element selected.

### Physical Specifications

**Enclosure:**  
40P Series: The case and door are glass-fiber reinforced polyester moldings, compounded for superior corrosion resistance. The door has a shatterproof glass window. The overall construction provides the environmental protection of IEC IP53 and NEMA Type 3.

40M Series: Durable, die-cast aluminum case and door with corrosion-resistant epoxy powder finish.

**Mounting:**  
Standard mounting is flush in a panel up to 16 mm (0.6 in) thick or on a wall. A kit of parts for vertical mounting on a DN 50 or 2 in pipe is available as an option (40P Series only).

**Cardboard Nameplate:**  
A cardboard nameplate is supplied for displaying the chart factor.

**Expendable Accessories:**  
Charts: 100 HUMITEX nominal 300 mm (12 in) circular charts [nominal 100 mm (4 in) calibrated scale] are supplied with each instrument.

**Ink:**  
1 U.S. fl oz (30 cm<sup>3</sup>) is supplied for each box pen.

**Indicator Pointer:**  
Sector indicators have an orange pointer and concentric indicators have a black pointer.

**Indicator Scales:**  
Black markings on white background. Refer to Chart and Dial Catalog 600 for available ranges.

**Sector:**  
The effective length is 171 mm (6.75 in).

**Concentric:**  
The effective length is 594 mm (23.4 in).

# Large Case Instruments (Recorders and Indicators)

**40P, 40M**

## Optional Features

Incandescent Type Internal Illumination.

Bakelite Nameplate.

Flush Door Lock.

Segmental Indicating Scale.

Indicating Scale Transparent Mounted in Instrument Door.

Plexiglass Circular Disc.

Portable Mounting.

## How to Order

### 1) SPECIFY MODEL NUMBER: 40P or 40M-

#### Function:

Circular Chart Recorder .....	R
Sector Scale Indicator .....	N
Concentric Scale Indicator .....	K

#### Internal Mechanism:

Recorder - standard .....	R
Indicator- sector .....	N
Indicator - concentric .....	K
With Type 70 Contacts (recorder or indicator) .....	E

#### Mounting:

Flush (a) .....	F
Pipe (a), (b) .....	P
Surface (a) .....	S
Yoke. 40P Series available with Type 37 Element only .....	Y

#### Chart Drive or Scale:

Electrical, 24 h rotation, 120 V, 60 Hz (options available) .....	E
Mechanical, 24 h rotation and wind (options available) .....	M
Sector scale .....	N
Concentric scale .....	K
Battery operated (11 speed) .....	XX

#### Pens or Pointers:

1 pen (R) or 1 pointer (N or K) .....	1
2 pens (R) or 2 pointers (N) .....	2
3 pens (R) .....	3
4 pens (R) .....	4

#### Pen Type or Scale Type:

Fiber tip disposable .....	F
Box .....	B
Single range scale .....	S
Dual range scale. For 40PN and 40MN Series only .....	D

(a) Not available with 40P Series with Type 37 Element. (b) Not available with 40M Series.

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

### 1) SPECIFY MODEL NUMBER: 40P or 40M- \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ / \_\_\_\_\_

**Elements:** (Refer to Pages 48-56 for Element Descriptions)

Type 37 (yoke mounting only) (a).....	DE-A, B
Absolute pressure bellows .....	PA-CA
Receiver .....	PC
Absolute pressure double spiral.....	PA-MA
Pressure helical.....	PB-M, PB-AA
Pressure spiral .....	PB-BA
Pressure bellows .....	PB-CA, CC
Diaphragm .....	PB-DF, PF
Stainless long helical .....	PB-GA
Temperature .....	TA-1A, 2A, 2B, 3B
Electronic servo .....	E
Relative humidity (b).....	MA-K

(a) Only one per instrument.

(b) Not available with 40P Series.

### 2) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

### 3) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

# Large Case Instruments (Recorders and Controllers)

43APG



43APG Series Controllers provide precise indication and control of flow, pressure, vacuum, and temperature.

## Oil & Gas Industry Flow Recorders and Controllers

### ■ 43APG Series Controllers:

- NACE compliant element materials available.
- Low air consumption and internal corrosion resistance means the 43APG can be operated directly from the process gas
- Wide choice of measurement elements

### ■ Glass-fiber reinforced case with gasketed door provides NEMA Type 3 protection.

For complete specifications, refer to Product Specification Sheets PSS 7-3C3 A and B.

## Functional Specifications

**Measurement Elements and Configurations:**  
See "HOW TO ORDER."

**Controller Output Signal and Supply Pressure:**

Output Signal	Supply Pressure
20 to 100 kPa (a)	140 kPa (a)
3 to 15 psi	20 psi
0.2 to 1.0 bar or kg/cm <sup>2</sup> (a)	1.4 bar or kg/cm <sup>2</sup> (a)

(a) Not applicable to the 43APG Series Controllers.

### WARNING:

EXPLOSION HAZARD CAN RESULT FROM USE OF NATURAL GAS AS SUPPLY. INSTRUMENT LOCATION MUST BE PROPERLY CLASSIFIED PER NFPA-70. TOXICITY HAZARD CAN RESULT FROM USE OF SUPPLY GAS CONTAINING HYDROGEN SULFIDE (H<sub>2</sub>S). AREA MUST BE VENTILATED OR BREATHING APPARATUS USED. REFER TO MI 011-111.

## Performance Specifications

### Recorder Accuracy:

Spans less than 12:5 kPa, 50 inH<sub>2</sub>O, 125 mbar ΔP and all compound ranges: ±0.50% of span.

### Controller (less element) Accuracy:

Repeatability: Less than 0.2% of span.

Dead Band: Less than 0.1 % of span.

Hysteresis: ±1 % of output span.

## Physical Specifications

### Door:

Hinged, glass-fiber reinforced phenylene oxide molding with blue polyurethane finish. The clear polycarbonate window is ultraviolet-resistant and shatterproof.

### Case:

Glass-fiber reinforced, gray polyester molding.

### Enclosure Classification:

Meets IEC IP53 and provides the environmental protection of NEMA Type 3.

## Optional Features

Refer to Foxboro.

## How to Order

### 1) SPECIFY MODEL NUMBER: 43APG-

#### Mounting:

Field ..... F  
 Panel or Surface ..... P

#### Control:

On-Off..... A1  
 Proportional 4 to 400% ..... A2  
 Proportional plus Derivative 0.05 to 50 minutes ..... A3  
 Proportional plus Reset (Integral) 0.01 to 50 minutes per repeat..... A4  
 Proportional plus Integral plus Derivative ..... A5  
 Differential Gap 1 to 100% ..... A7

#### Output Signal and Gauge:

3 to 15 psi signal, 30 psi gauge ..... 2

#### Automatic/Manual Internal Transfer Switching:

Bumpless with 2-position switch, balance gauge, regulator ..... C  
 2-position nozzle seal switch for manual control..... D  
 None ..... N

#### Optional Suffix:

Remote Pneumatic Set Point (not available with element code PA-CA, PA-CC, PB-PF, or PB-GA)..... P

#### Element: (Select one, refer to Pages 48-56 for Element Descriptions)

Type 37 (43APG-F only) ..... DE-A (a), B  
 Absolute pressure bellows ..... PA-CA, CC  
 Receiver ..... PC-OC  
 Absolute pressure double spiral..... PA-MA  
 Pressure helical..... PB-AA, AM (b)  
 Pressure spiral ..... PB-BA, BM (b)  
 Pressure bellows ..... PB-CA, CC  
 Diaphragm ..... PB-DF, PF  
 Stainless long helical (43APG-F only)..... PB-GA  
 Temperature (c)..... TA-1A, 2A, 2B, 3B

(a) Available in NACE compliant version.

(b) Element codes PB-AM and PB-BM comply with NACE Standard MR-01-75.

(c) Available with AISI Type 316 stainless steel tubing only.

### 2) SPECIFY SCALE FROM CHART AND DIAL CATALOG 600 OR REFER TO

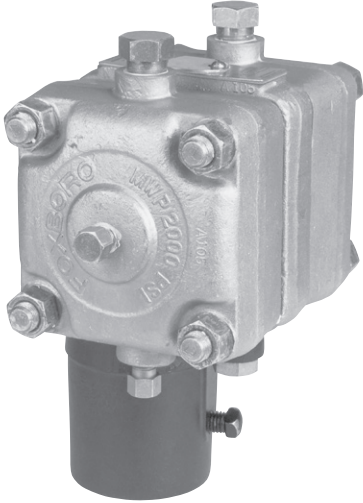
**FOXBORO** \_\_\_\_\_

### 3) SPECIFY CALIBRATED RANGE \_\_\_\_\_

### 4) SPECIFY CONTROL ACTION (FIELD REVERSIBLE) \_\_\_\_\_

### 5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

## TYPE 37



Type 37 Diaphragm Differential Pressure Elements translate differential pressure to angular shaft position.

## Type 37 Diaphragm Differential Pressure Element

- Ideal for Liquid, Gas, and Steam Flow Measurement
- No Mercury Used: Safe Operation
- Ambient Temperature Compensation
- Overage Protection
- Requires No Power for Operation

For complete specifications, refer to Product Specification Sheet PSS 3-4A2 A.

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### Functional Specifications

---

**Spans:**

Available between 5 and 50 kPa or 20 and 200 inH<sub>2</sub>O.

**Standard Differential Pressure Ranges:**

0 to 5, 0 to 12.5, 0 to 25, and 0 to 50 kPa; or 0 to 20, 0 to 50, 0 to 100, and 0 to 200 inH<sub>2</sub>O ΔP.

**Maximum Process Pressure:**

14 MPa (2000 psi).

**Ambient Temperature Limits:**

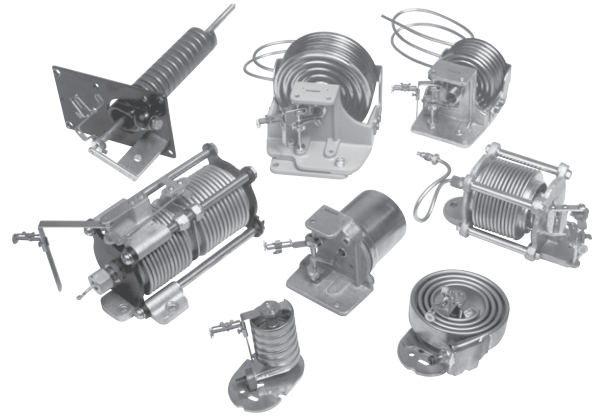
-34 and +110°C (-30 and +230°F).

## Pressure Measuring Elements

## PRESSURE MEASURING ELEMENTS

- Wide variety of element types, materials, and pressure ranges
- Durable and dependable for long service life

For complete specifications, refer to Product Specification Sheet PSS 3-2A1 A.



Pressure Measuring Elements measure gauge and absolute pressure and actuate recorders, indicators, controllers, and transmitters.

### Performance Specifications

**Accuracy:**  
Better than  $\pm 0.5\%$ .

### Physical Specifications

**Element Materials:**  
AISI Type 316 ss (316 ss).  
Bronze or Brass.

Copper-Nickel-Manganese (Cu-Ni-Mn) Alloy.  
K-Monel.

### Optional Features

**Overrange Protection, Underrange Protection:**  
Provides protection to the linkage and pointer, not the pressure element.

**Oxygen Service Preparation:**  
Available for 316 ss spirals and 316 ss helicals. Copper bearing brazing material will be in contact with process.

# Large Case Instruments (Elements)

## PRESSURE MEASURING ELEMENTS

### How to Order

#### 1) SPECIFY ELEMENT CODE:

Element		Normal Recorder Measurement Ranges (Torque Factor rating 30)		
Type	Material	kPa	psi,psia	
Receiver (Bellows)	Brass	80 kPa 100 kPa –	12 psi 15 psi 24 psi	..... PC (a)
Diaphragm 75 mm (3 in)	Cu-Ni-Sn Pfinodal	2 and 10 kPa 2 and 6 kPa vac	0.3 and 1.5 psi 0.3 and 0.9 Psi vac	..... PB-PF
Diaphragm 50 mm (2 in)	Cu-Ni-Sn Pfinodal	6 and 70 kPa 6 and 35 kPa vac	0.9 and 10 psi 0.9 and 5 Psi vac	..... PB-DF
Bellows	316 ss	35 and 200 kPa	4.5 and 29 Psi	..... PB-CA
	Brass	30 and 180 kPa 34 and 100 kPa vac	4 and 26 psi 4.9 and 15 psi vac	..... PB-CC
Spiral	316 ss	82 and 1400 kPa 82 and 100 kPa vac	12 and 200 psi 12 and 15 psi vac	..... PB-BA
	K-Monel	140 and 1400 kPa	20 and 200 psi	..... PB-BM
Helical	316 ss	1400 and 40 000 kPa	200 and 6000 psi	..... PB-AA
	K-Monel	1700 and 14 000 kPa	250 and 2000 psi	..... PB-AM
Heavy Duty Helical	316 ss	500 and 200 000 kPa	75 and 30 000 psi	..... PB-GA
Absolute Bellows	316 ss	17 and 240 kPa abs	2.5 and 35 psia	..... PA-CA
	Bronze	13 and 270 kPa abs	1.9 and 39 psia	..... PA-CC
Absolute Double Spiral	316 ss	140 and 700 kPa abs	20 and 100 psia	..... PA-MA

(a) Code PC-OC when used with the 43APG Series Controller on Page 46.

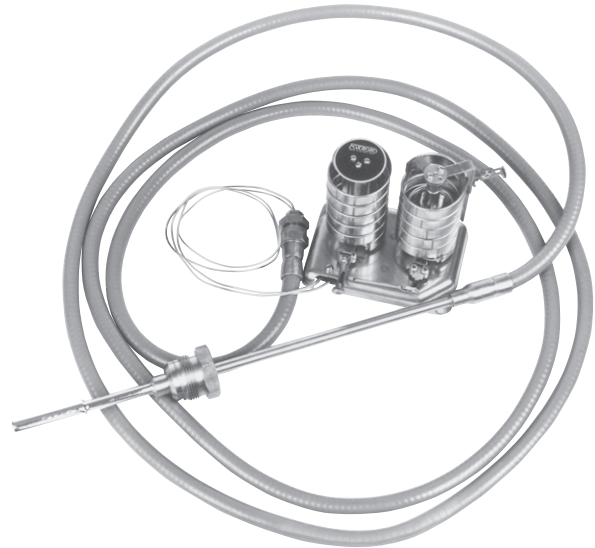
- 2) SPECIFY MEASUREMENT RANGE \_\_\_\_\_
- 3) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 4) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_



## Filled Thermal System Elements

## THERMAL ELEMENTS

- **Dependable**
  - Field-proven performance
- **Nonelectric**
  - Continuous operation, even with power failure
- **Safe**
  - Suitable for Class I, Division 1 hazardous locations



For complete specifications, refer to Product Specification Sheet PSS 3-3A1 A.

Filled Thermal System Elements consist of sensor, connection tubing, and mechanical element.

## Functional Specifications

### Thermal System Types:

#### Class IA:

A thermal system that is completely filled with an incompressible liquid under pressure. The system is fully compensated for ambient temperature variations at case and along the tubing.

#### Class IIA:

A thermal system that is evacuated and partially filled with a volatile liquid, such as methyl chloride (CL), ether (ET), butane (BU), or toluene (T).

#### Class IIIB:

A gas system that is filled under pressure with purified nitrogen.

### Standard Ranges, Standard Spans and Range Limits:

CLASS IA			CLASS IIA		CLASS IIIB			
Standard Spans	X Length		Range Limits		Standard Ranges (Fills)	Standard Spans	Range Limits	
			Minimum	Maximum			Minimum	Maximum
°C	mm	in	°C	°C	°C	°C	°C	°C
25	122	4.8	13	120	38 to 105 (BU)	100	-40	170
50	69	2.7	-15	200	105 to 150 (ET)	150	-15	400
75	53	2.1	-38	200	50 to 205 (T)	200	-15	500
100	43	1.7	-63	200	38 to 150 (ET)	250	-15	500
150	36	1.4	-73	250	50 to 250 (T)	300	-15	500
200	30	1.2	-73	260		400	-15	500
250	28	1.1	-73	260		500	-15	500
°F	mm	in	°F	°F	°F	°F	°F	°F
50	112	4.4	50	250	100 to 180 (CL)	150	-50	240
100	69	2.7	0	400	100 to 220 (BU)	200	-50	425
150	51	2.0	-50	400	100 to 250 (BU)	300	0	825
200	43	1.7	-100	400	100 to 270 (BU)	400	0	1000
250	36	1.4	-100	400	100 to 300 (ET)	500	0	1000
300	33	1.3	-100	500	100 to 350 (ET)	600	0	1000
400	28	1.1	-100	500	100 to 400 (T)	700	0	1000
500	25	1.0	-100	500	200 to 500 (T)	800	0	1000
						1000	0	1000

# Large Case Instruments (Elements)

## THERMAL ELEMENTS

### Performance Specifications

**Accuracy:**

Class IA:  
±0.5% of calibrated span for spans up to 215°C (400°F).  
±0.75% of calibrated span for spans between 215 and 330°C (400 and 600°F).

Class IIA:  
±0.5% of calibrated span over upper 2/3 of scale.

**Class IIIB:**

±0.5% of calibrated span for spans up to 330°C (600°F).  
±0.75% of upper range value for upper range value above 330°C (600°F).  
±0.75% of lower range value for lower range value below 45°C (-50°F).

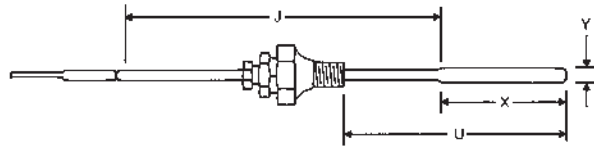
### Physical Specifications

**Sensor Type:**

Adjustable union, bendable extension.

**Sensor Dimensions:**

X = Sensitive portion length.  
U = Insertion length.  
J = Extension length.  
B = Bushing thread type and size.  
Y = Sensor diameter.

**Connecting Tubing:**

1.5, 4.5, or 7.5 m (5, 15, or 25 ft) flexible stainless steel over stainless capillary.

J = 450mm(18in).

X = 100 mm (4 in) for Class IIA and 150 mm (6 in) for Class IIIB systems. For Class IA systems, X is governed by sensor diameter and measurement span. See table under "FUNCTIONAL SPECIFICATIONS" on previous page.

U = (minimum) = X + 50 mm (2 in).

U = (maximum) = X + 380 mm (15 in).

B = 1/2, 3/4, or 1 NPT external threads as specified for Class IA or IIA systems and 1 NPT external threads for Class IIIB systems.

Y = 9.53 mm (3/8 in) for Class IA and IIA,  
22.26 mm (7/8 in) for Class IIIB.

### Optional Features

**Alternative Thermal Systems:**

- Longer capillary lengths and types.
- Other ranges and spans.
- Sanitary fittings.
- IIIB system.

**Thermowells:**

Refer to Page 35.

**Mounting Flanges.****Special Purpose Sensors:**

Preformed capillary, coated type, etc.

---

## How to Order

---

- 1) **SPECIFY BASE INSTRUMENT BY MODEL NUMBER** (Recorder, Indicator, Controller, Transmitter) \_\_\_\_\_
- 2) **SPECIFY CLASS/TUBING/SENSOR CODES**
  - IA Liquid Filled: TA-1A/D-FS-SS/4542-J18 \_\_\_\_\_
  - IIA Vapor Filled: TA-2A/S-FS-SS/2542-J18 \_\_\_\_\_
  - IIIB Gas Filled: TA-3B/S-FS-SS/3542-J18 \_\_\_\_\_
- 3) **SPECIFY CALIBRATED RANGE** (must meet requirements of table under "Functional Specifications" on Page 51) \_\_\_\_\_
- 4) **SPECIFY NORMAL WORKING TEMPERATURE** \_\_\_\_\_
- 5) **SPECIFY AMBIENT TEMPERATURE AT CASE AND ALONG TUBING** \_\_\_\_\_
- 6) **SPECIFY SENSOR DISTANCE ABOVE OR BELOW CASE (Class IIA systems only)** \_\_\_\_\_
- 7) **SPECIFY ANTICIPATED "U" DIMENSION** (insertion length) \_\_\_\_\_
- 8) **SPECIFY BUSHING THREAD SIZE "B" DIMENSION; SPECIFY 1/2, 3/4, OR 1 NPT FOR IA OR IIA SYSTEMS, 1 NPT FOR IIIB SYSTEMS** \_\_\_\_\_
- 9) **SPECIFY OPTIONAL FEATURES** \_\_\_\_\_
- 10) **SPECIFY INFORMATION FOR INSTRUMENT TAG** \_\_\_\_\_

# Large Case Instruments (Elements)

## SERVO ELEMENTS



Electronic Servo Elements are used with 40P and 40M Series Recorders, Indicators, and Controllers; 43AP and 43EP Series Indicating Controllers; and 45P Series Transmitters.

## Electronic Servo Elements

- **Sealed Conductive Plastic Slidewire**
  - Does not need frequent cleaning
  - Fast response and long life
- **RFI Protected Electronics**
  - Module may be field-mounted
- **dc Torque Motor**
  - No brushes or gears

For complete specifications, refer to Technical Information Sheet TI 27-1a.

## Functional Specifications

### Standard Ranges:

Measurement Range Code Table (see "HOW TO ORDER" for description of sensor codes):

Range Code	Range	Sensor Codes Available											
		mV	mA	°C				°F					
01	0 to 5	M											
02	0 to 10	M											
03	0 to 20	M											
04	0 to 30								Q				
05	0 to 50	M							Q				Q
06	-50 to -50								Q				Q
07	-100 to +50				J								
08	0 to 75	M							Q				
09	-20 to +80				J								
10	0 to 100	M			J				Q				Q
11	-100 to 0								Q				
12	-200 to +100				J	E				J	E		
13	-100 to +100					E							
14	50 to 100								Q				
15	-20 to +120												Q
16	-												
17	-25 to +125				T								
18	0 to 150				J				Q				Q
19	-50 to -150				J	E							
20	50 to 150												Q
21	4 to 20	A											
22	10 to 50	A											
23	0 to 200		T	J		K	Q			J			Q
24	-100 to +200					E				J	E		
25	100 to 200						Q						Q
26	0 to 250				T	J		Q	T		E		Q
27	-50 to +250		T							J			
28	50 to 250						Q			J			Q
29	0 to 300				J		K	Q	T	J			Q
30	-350 to +300								T		E		
31	100 to 300				J			Q		J			Q
32	0 to 40				J		K	Q	T	J		K	Q
33	100 to 40											K	Q
34	200 to 400				J			Q					Q
35	0 to 500				J		K	Q	T	J		K	Q
36	-150 to +500								T		E		
37	200 to 500						K						Q
38	300 to 500				J								

Range Code	Range	Sensor Codes Available												
		mV	mA	°C				°F						
39	0 to 600					K				T	J			Q
40	-													
41	200 to 600										J			
42	300 to 600					J				T				
43	0 to 700					J								Q
44	200 to 700					J					J			
45	0 to 750					J	K					K		
46	0 to 800							R			J			Q
47	100 to 800										J	K		
48	300 to 800						K				J	K		
49	0 to 900										J			Q
50	500 to 900						K				J			
51	700 to 900					K		S			J			
52	0 to 1000					K		S			J	K		
53	500 to 1000										J	K		
54	0 to 1200										J	K		
55	200 to 1200										J	K		
56	400 to 1200										J	K		
57	0 to 1300							R						
58	-													
59	800 to 1400							R						
60	900 to 1400								S					
61	0 to 1500							R			J			
62	500 to 1500										J	K		
63	0 to 1600											K		
64	1100 to 1600							S			J			
65	1200 to 1600											K		
66	500 to 1700							R				K		
67	0 to 1800										J	K		
68	0 to 2000											K		
69	1000 to 2000										J		R	
70	1200 to 2000												R	
71	0 to 2400											K		
72	1200 to 2400											K		
73	0 to 2500											K		
74	1000 to 2500											K		
75	1500 to 2500											K	R	S
76	1700 to 2500													S

### Input Impedance (mA inputs):

4 to 20 mA (Range Code 21)-6.25 ohms.  
10 to 50 mA (Range Code 22)-2.5 ohms.

### Power Required:

See "HOW TO ORDER."

## Performance Specifications

**Accuracy:**  
±0.5% of calibrated span.

**Repeatability:**  
0.25% of calibrated span.

## Optional Features

**Loop Power Supply:**  
30 V dc.

**Replacement Range Card:**  
Specify measurement type, measuring range code, range units, and thermocouple burnout (if required).

**dc Voltage Inputs:**  
0.055 to 42 V dc.

**Power Failure Detection:**  
Positions pen either to 100% of range or to zero when ac power fails.

**Nonstandard Ranges:**

Item	Range Limits		Range Limits	
	lower	upper	minimum	maximum
Millivolts, Thermocouples	-15 mV	100 mV	5 mV	100 mV
Resistance Temperature Detectors (RTDs)	18 ohms	330 ohms	8 ohms	300 ohms

# Large Case Instruments (Elements)

## SERVO ELEMENTS

### How to Order

1) SPECIFY BASE INSTRUMENT BY MODEL NUMBER: \_\_\_\_\_

2) SPECIFY SERVO ELEMENT: E \_\_\_\_\_

**Power Supply:**

- 120Vac..... S
- 220 V ac..... N
- 240 V ac..... P

**Measurement–Sensor Type:**

- EC/ISA T (Cu-CuNi) Thermocouple..... T
- DIN 43710-77 (Cu-CuNi) Thermocouple..... C
- EC/ISA J (Fe-CuNi) Thermocouple..... J
- DIN 43710-77 (Fe-CuNi) Thermocouple..... D
- EC/ISA E (NiCr-CuNi) Thermocouple..... E
- EC/ISA K (NiCr-NiAl) Thermocouple (DIN 43710-77)..... K
- EC/ISA R (Pt13Rh-Pt) Thermocouple..... R
- EC/ISA S (Pt10Rh-Pt) Thermocouple (DIN 43710-77)..... S
- EC/ISA B (Pt30Rh-Pt6Rh) Thermocouple..... B
- dc mV..... M
- dc mA..... A
- Platinum RTD, 100-ohm DIN Resistance..... Q
- Nonstandard (including Temperature Difference)..... X

**Measurement Range:**

Select 2-digit number from Measurement Range Code Table on Page 54. \_\_\_\_\_

**Range Units:**

- Degrees Celsius..... C
- Degrees Fahrenheit..... F
- Millivolts..... M
- Milliamperes..... A

**Burnout Feature (thermocouples only):**

- Upscale action (not available with RTD)..... U
- Downscale action (not available with RTD)..... D
- None..... N
- Upscale action–Reverse Range (not available with RTD)..... R
- Downscale action–Reverse Range (not available with RTD)..... S
- None–Reverse Range..... T

3) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

4) SPECIFY SENSOR (e.g., THERMOCOUPLE OR RTD) TO BE ORDERED SEPARATELY \_\_\_\_\_

5) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

## Type 70 Electronic Contacts

70, MR

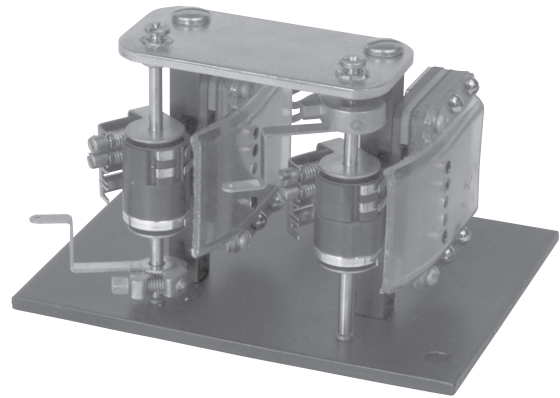
- Used in 40P and 40M Series Recorders, Indicators, and Controllers and 43AP Series Indicating Controllers

### Rotor Units:

Single or double rotor units are available, each having 3 or 5 contact segments. One segment serves as the common or collector ring contact resulting in 2, 4, or 6 segments being available for relay actuation. Contact segments are adjustable with relation to each other by micrometer adjustment screws. This relationship is not disturbed by the contact setting mechanism.

### Contact Setting Mechanism:

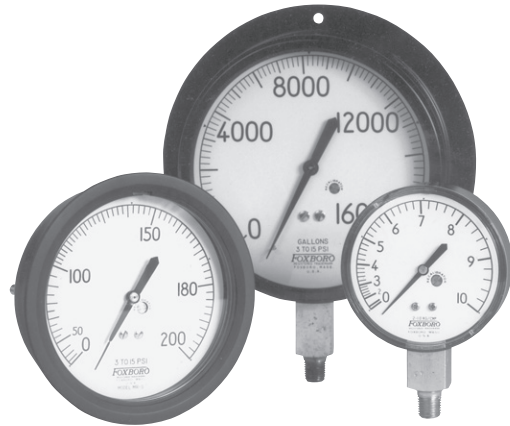
Each rotor unit is independently positioned to operate at desired values of measurement. A wide selection of setting mechanisms is available.



A Type 70 Electric Contact System is used to actuate external control or alarm circuits.

## MR Series Receiver Gauges

MR Series Receiver Gauges accept 3 to 15 psi inputs from remotely located pneumatic transmitters. A wide variety of dials and scales is available to indicate measurements in convenient engineering units.



## Panel-Mounted Pneumatic Instruments

CONSOTROL 100 is a complete family of pneumatic controllers, recorders, indicators, and auxiliary devices.

These instruments can handle the special requirements of virtually any application – from simple single control loops to interrelated multivariable systems.

Each CONSOTROL 100 unit is perfectly matched with other foxboro pneumatic instruments – including transmitters, valves, and accessories.

And they are engineered to fit into control configurations of all sizes. Together, they deliver exceptionally high system performance.

CONSOTROL 100 Instruments give you:

### **Bold, Readable Displays**

Continuous scale indication of process variables and deviation from set point.

### **Separate Automatic and Manual Functions**

Avoids forced shutdowns – control can be maintained in either mode.

### **Accurate Force Balance Control Modules**

Metallic bellows, flexure-suspended balance member for precise operation.

### **Balanceless, Bumpless Auto/Manual Transfer**

Fast, safe selection of operating mode.

### **Simple, Low Cost Mounting**

Shelves accommodate up to ten instruments. Integral air manifold reduces piping costs. Individual air shutoff valve for each instrument.

### **Easy Service**

Pneumatic circuit board has simple piping and connections. Components are highly accessible – all behind one sliding cover.



# Panel-Mounted Pneumatic Instruments (Indicating Controllers)

## 130M, 130P, 130F Series Pneumatic CONSOTROL Indicating Controllers

130M, 130P, 130F

- **130M**—manual set point adjustment
- **130P**—set point pneumatically adjusted by a remote signal
- **130F**—remote/local switch for manual or pneumatic adjustment of set point

For complete specifications, refer to Product Specification Sheet PSS 2B-4H 1 A.



130M



130P



130F

130M, 130P, and 130F Series Pneumatic CONSOTROL Indicating Controllers compare a remote transmitter signal with a set point and produce a control signal to a final actuator.

## Functional Specifications

### Supply Pressure:

140 to 150 kPa or 20 to 22 psi.

### Input/Output Signal:

20 to 100 kPa or 3 to 15 psi, as specified.

### Mode Adjustment Limits:

Proportional Band: 5 and 500%.

### Integral Action:

0.01 and 50 minutes per repeat.

### Derivative Action:

0.01 and 50 minutes.

### Ambient Temperature Limits:

-20 and +65°C (0 and 150°F).

### Control Action Reversal:

The control action is reversed by a 90 degree rotation of the reversing switch.

### Auto/Manual Transfer Unit:

A 2-position switch lever located on the front of the manual unit is used to switch directly from automatic to manual or, on controllers with integral, from manual to automatic without bumping the process.

## Performance Specifications

### Accuracy:

Measurement and Set Point Indicators:  $\pm 0.5\%$  of calibrated span.

Output Indicator:  $\pm 2\%$  of calibrated span.

### Repeatability:

Measurement and Set Point Indicators: Better than 0.25% of calibrated span.

### Alignment Error:

Automatic Control Unit: Less than 0.5% of calibrated span.

### Dead Band:

Automatic Control Unit: Less than 0.1 % of calibrated span.

Measurement and Set Point Indicators: Less than 0.1% of calibrated span.

## Physical Specifications

### Mounting:

These controllers are designed for flush mounting in vertical panels 3 to 25 mm (0.13 to 1 in) thick using 102 or 101 Series Shelves. Each controller requires 1 unit of shelf capacity. They may be calibrated for mounting in a panel inclined up to 75 degrees from vertical with the rear of the instrument lower than the front.

### Connections:

Separate electric and pneumatic connectors are located on the rear of the chassis in accordance with the standard arrangement for 102 Series Shelves.

### Nameplate:

White translucent plastic with 2.5 mm (0.1 in) high black letters. There can be a maximum of 2 lines with 17 characters or spaces per line.

# Panel-Mounted Pneumatic Instruments (Indicating Controllers)

**130M, 130P, 130F**

## Physical Specifications (continued)

**Pointers:**

Measurement: Red.

Manual Set (130M Series) and Remote Set (130P and 130F Series): Black on white.

Local Set (130F Series): Black.

Output: Red.

**Scales:**

Vertical Scale: Removable, transparent plastic with black markings; 100 divisions, scaled as specified.

Output: Black markings on a white background; 20 divisions from 0 to 100% output signal. The red pointer continuously indicates automatic or manual output. Refer to Chart and Dial Catalog 600.

## Optional Features

**“Batch” Controller:**

Prevents integral circuit saturation during shutdown or other periods of sustained set point and measurement deviation. Includes internal adjustment for preload.

**High “Batch” Unit:**

Operates when controller output pressure exceeds 100 kPa or 15 psi. Specify by substituting 130MB, 130PB, or 130FB in place of 130M, 130P, or 130F in Model Number.

**Low “Batch” Unit:**

Operates when controller output pressure falls below 20 kPa or 3 psi. Specify by substituting 130MB, 130PB, or 130FB in place of 130M, 130P, or 130F in Model Number plus AS

Reference BSL.

**External Connection to Integral Bellows:**

Permits connection of external feedback signal to prevent integral circuit saturation.

**External Set Point Connection:**

Not available for 130F Series with External Connection to Integral Bellows option. Provides access to set point signal. Maximum transmission distance is 1.5 m (5 ft) and all external connections must be leaktight due to low air delivery of aspirating relay. Use 1:1 repeating relay for greater transmission distances.

**Alarm Actuators and Alarm Lamps:**

Refer to Page 72.

## How to Order

**1) SPECIFY MODEL NUMBER:**

**Controller:**

with Manually Positioned Set Point.....	130M-N
with Pneumatically Positioned Set Point.....	130P-N
with Remote/Local Set.....	130F-N

**Control Function:**

On/off .....	1
Proportional .....	2
Proportional plus derivative .....	3
Proportional plus integral .....	4
Proportional plus integral plus derivative.....	5

- 2) SPECIFY INPUT/OUTPUT SIGNAL \_\_\_\_\_
- 3) SPECIFY SET POINT AND MEASUREMENT SCALE RANGE—REFER TO CHART AND DIAL CATALOG 600 \_\_\_\_\_
- 4) SPECIFY MOUNTING EQUIPMENT—102 OR 101 SERIES SHELVES \_\_\_\_\_
- 5) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 6) SPECIFY INFORMATION FOR NAMEPLATE AND INSTRUMENT TAG \_\_\_\_\_

# Panel-Mounted Pneumatic Instruments (Indicating Controllers)

## 130 Series Pneumatic CONSOTROL Auto Selector Control System

130 AUTO-SELECTOR



- **One Final Actuator**
  - To prevent any of several process measurements from exceeding their set points
- **Continuous Measurement**
  - Variables are measured and control is transferred to the one that is tending to exceed its limit
- **Auto/Manual Switch**
  - Smooth transfer by means of a single 2-position switch
  - Balanceless, bumpless
- **A Complete System Consists of:**
  - One 130MS (local set) or 130FS (local/remote set) controller with manual transfer unit
  - One or more 130MA (local set) or 130FA (local/remote set) controllers without manual units
  - Rack-mounted high or low selector relays
  - A rack-mounted seal valve

The 130 Series Pneumatic CONSOTROL Auto-Selector Control System controls two or more related variables within preset limits.

For complete specifications, refer to General Specification Sheet GS 2B-4H 1 D.

### Functional Specifications

**Supply Pressure:**

140 to 150 kPa or 20 to 22 psi.

**Input/Output Signal:**

20 to 100 kPa or 3 to 15 psi, as specified.

**Mode Adjustment Limits:**

Proportional Band: 5 and 500%.

**Integral Action:**

0.01 and 50 minutes per repeat.

**Derivative Action:**

0.01 and 50 minutes.

**Ambient Temperature Limits:**

-20 and +65°C (0 and 150°F).

**Control Action Reversal:**

The control action is reversed by a 90 degree rotation of the reversing switch.

**Auto/Manual Transfer Unit:**

A 2-position switch lever located on the front of the manual unit is used to switch directly from automatic to manual and from manual to automatic without bumping the process.

### Performance Specifications

**Accuracy:**

Measurement and Set Point Indicators:  $\pm 0.5\%$  of calibrated span.

Output Indicator:  $\pm 2\%$  of calibrated span.

**Repeatability:**

Measurement and Set Point Indicators: Better than 0.25% of calibrated span.

**Dead Band:**

Automatic Control Unit: Less than 0.1% of calibrated span.

Measurement and Set Point Indicators: Less than 0.1% of calibrated span.

**Alignment Error:**

Automatic Control Unit: Less than 0.5% of calibrated span.

### Physical Specifications

**Mounting:**

These controllers are designed for flush mounting in vertical panels 3 to 25 mm (0.13 to 1 in) thick using 102 or 101 Series Shelves.

Each controller requires 1 unit of shelf capacity. They may be calibrated for mounting in a panel, inclined up to 75 degrees from vertical, with the rear of the instrument lower than the front.

# Panel-Mounted Pneumatic Instruments (Indicating Controllers)

## 130 AUTO-SELECTOR

### Physical Specifications (continued)

**Connections:**

Separate electric and pneumatic connectors are located on the rear of the chassis in accordance with the standard arrangement for 101, 102 Series Shelves..

**Nameplate:**

White translucent plastic with 2.5 mm (0.1 in) high black letters. There can be a maximum of 2 lines with 17 characters or spaces per line.

**Pointers:**

Measurement: Red.

Manual Set (130M Series) and Remote Set (130F Series): Black on white.

Local Set (130F Series): Black.

Output: Red.

**Scales:**

Vertical Scale: Removable, transparent plastic with black markings; 100 divisions, scaled as specified.

**Output:**

Black markings on a white background; 20 divisions from 0 to 100% output signal. The red pointer continuously indicates automatic or manual output. Refer to Chart and Dial Catalog 600.

**Nominal Dimensions** (including manual unit):

205 mm high x 70 mm wide x 555 mm deep (8.2 in high x 2.8 in wide x 21.8 in deep).

**Selector Relays and Volume Booster:**

A low selector relay is required for each controller in a "LOW" Auto-Selector System. A "HIGH" selector system requires one less high selector relay than the number of controllers and one low selector relay used as a volume booster in the system output. Specify High Selector, Part No. B0114YL or Low Selector, Part No. B0114BZ.

**Seal Valve:**

One pneumatically actuated seal valve is required per Auto-Selector System. Specify Part No. C0138RM.

### Optional Features

**"Batch" Controller:**

High "Batch" feature available only for controllers used in "LOW" Auto-Selector Systems. Add Suffix -B to Model Number.

**Alarm Actuators and Alarm Lamps:**

Refer to Page 72.

### How to Order

**1) SPECIFY MODEL NUMBER:**

**Controller:**

with Manually Positioned Set Point..... 130M  
with Remote/Local Set Point..... 130F

**Auto-Selector:**

without Manual Transfer Unit ..... A  
with Manual Transfer Unit ..... S

**Control Function:**

Proportional plus integral ..... N4  
Proportional plus integral plus derivative..... N5

**2) SPECIFY INPUT/OUTPUT SIGNAL** \_\_\_\_\_

**3) SPECIFY SET POINT AND MEASUREMENT SCALE—REFER TO CHART AND DIAL CATALOG 600** \_\_\_\_\_

**4) SPECIFY SELECTOR RELAYS AND SEAL VALVE** \_\_\_\_\_

**5) SPECIFY MOUNTING EQUIPMENT—102 OR 101 SERIES SHELVES** \_\_\_\_\_

**6) SPECIFY OPTIONAL FEATURES** \_\_\_\_\_

**7) SPECIFY INFORMATION FOR NAMEPLATE AND INSTRUMENT TAG** \_\_\_\_\_

## 110 Series Pneumatic CONSOTROL Indicators

110

- **Simple Construction**
  - No cables, clutches, or complicated mechanisms
  - Ball and socket connectors for frictionless linkage
- **Bold, Readable Display**
  - Large, brightly colored pointers
- **Easy Calibration**
  - Indicator partially slides out of shelf
  - Adjustments made at front end of panel
- **Integral Recording**
  - Optional circular chart recording mechanism
- **Versatile Mounting**
  - Singly or with other instruments in 102 or 101 Series Shelves

For complete specifications, refer to General Specification Sheet GS 2B-3D1 A.



The 110 Series Pneumatic CONSOTROL Indicators indicate 1, 2, or 3 process measurements received as proportional pneumatic signals from remote transmitters.

### Functional Specifications

**Element:**

One brass bellows per variable.

**Damping:**

Integral and adjustable.

**Input Signal:**

20 to 100 kPa or 3 to 15 psi, as specified.

**Scale:**

Vertical. Effective length 100 mm (4 in). Black figures on clear plastic, scaled as specified.

**Pointers:**

Red, green, blue.

**Ambient Temperature Limits:**

-20 and +65°C (0 and 150°F).

### Performance Specifications

**Accuracy:**

±0.5% of calibrated span.

**Repeatability:**

0.25% of calibrated span.

**Dead Band:**

Less than 0.1 % of calibrated span.

### Physical Specifications

**Mounting:**

Flush in panels 3 to 25 mm (0.13 to 1 in) thick using 102 or 101 Series Shelves. Indicators require 1 unit width of mounting capacity.

**Connections:**

Electrical and pneumatic multiprong receptacles on rear of chassis.

**Nameplate:**

White translucent plastic with 2.5 mm (0.1 in) high black characters. Maximum of 2 lines, 17 characters or spaces per line.

**Overall Dimensions:**

165 mm high x 71 mm wide x 554 mm deep (6.5 in high x 2.8 in wide x 21.8 in deep).

## Optional Features

### Chart Record:

Single variable indicators only may be furnished with an integral recording mechanism to provide a continuous record on a nominal 125 mm (5 in) circular chart with 50 mm (2 in) wide recording area. Electrical 2-speed chart drive, 24 h/24 min/off or 7 day/2.8 h/off rotation, as specified. Supply voltage 24, 120, or 240 V ac, 50 or 60 Hz, as specified. 24 V ac must be specified when alarm option is used. Foxboro and CSA certified for ordinary and Class I, Groups C and D, Division 2 hazardous locations. CSA certified units, Source - Canada. Maximum angle mounting is 15 degrees from vertical.

**Alarm Actuators and Alarm Lamps:**  
Refer to Page 72.

## How to Order

### 1) SPECIFY MODEL NUMBER:

One Variable .....	111
Two Variables .....	112
Three Variables.....	113

2) SPECIFY INPUT SIGNAL \_\_\_\_\_

3) SPECIFY SCALE RANGES—REFER TO CHART AND DIAL CATALOG 600 \_\_\_\_\_

4) SPECIFY MOUNTING EQUIPMENT—102 OR 101 SERIES SHELVES \_\_\_\_\_

5) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

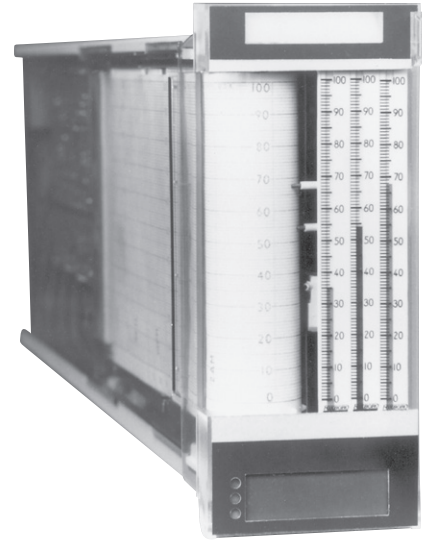
6) SPECIFY NAMEPLATE AND INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_



## 127S Series Pneumatic CONSOTROL Recorders

127S

- **Bold, Readable Displays**
  - Bright red, green, and blue ribbon indicators
  - Individual scales
- **Simple Maintenance**
  - Accessible modular components
  - Adjustments can be made while instrument is in operation
- **Easy Chart Changing and Pen Replacement**
  - Removable chart drive
  - Snap-in, fiber-tip pen cartridges
- **Precise Servo Mechanism**
  - Accurately positions pens
  - All-pneumatic
  - Guided by force balance detector



The 127S Series Pneumatic CONSOTROL Recorders record up to 3 process measurements received from remote transmitters.

For complete specifications, refer to Product Specification Sheet PSS 2B-3E2 B.

### Functional Specifications

#### Pneumatic Input Signal:

3 to 15 psi (20 to 100 kPa) (0.20 to 1.0 Kg/cm<sup>2</sup>)  
or 3 to 18 psi (20 to 120 kPa) (0.2 to 1.2 Kg/cm<sup>2</sup>).

#### Supply Pressure:

120 to 150 kPa or 18 to 22 psi.

#### Power Requirements:

24 ±4 V ac, 120 or 240 V ac, +10, -15%, 50 or 60 Hz, as specified. Required with electric chart drive only.

#### Fusing:

Required with electric chart drive only. For 24 V ac: No fuse required.

For 120 V ac: 3/8 A.

For 240 V ac: 1/4 A.

#### Ambient Temperature Limits:

5 and 50°C (40 and 120°F).

#### Pen Speed:

The elapsed time for the pen to travel from 10 to 90% of full scale is adjustable from less than 3 to greater than 20 seconds.

#### Mounting Position:

Normal mounting position is horizontal. Instrument can also be mounted up to a 15 degree angle with the rear of the instrument above the front, or down to a 75 degree angle with the rear of the instrument below the front.

#### Adjustments:

Zero and span adjustments are accessible in the service (partially withdrawn) position, and provide a minimum of ±2% adjustment after the instrument has been calibrated. Ribbon indicator has an adjustment for zeroing relative to pen. No separate ribbon span adjustment is necessary, since the ribbon travels with the pen.

#### Electrical Classification:

These instruments have been designed for use in ordinary locations.

### Performance Specifications

#### Accuracy:

±0.5% of calibrated span.

#### Repeatability:

0.15% of calibrated span.

## Physical Specifications

### Connections:

Separate electric and pneumatic connectors are located on the rear of the instrument chassis in accordance with the standard arrangement for 102 and 101 Series Shelves.

### Front Door:

Hinged at bottom to provide access to chart and pens. Lens material is transparent molded polycarbonate.

### Right Side Access Cover and Calibration Door:

Removable access cover and a hinged-down calibration door provide access to internal parts and adjustments.

### Nominal Dimensions:

69 mm wide x 165 mm high x 478 mm long (2.7 in wide x 6.5 in high x 18.8 in long).

### Pens:

1, 2, or 3, as specified.

Red Pen: Located in center position.

Green Pen: Located in inner position.

Blue Pen: Located in outer position.

Pen Separation: Approximately 12 minutes at the standard chart speed of 20 mm/h (0.8 in/h).

### Left Side Access Cover:

Sliding cover provides access to internal parts. Cover material is transparent molded polycarbonate.

### Instrument Mounting:

Up to 10 instruments can be mounted in Foxboro 102 Series Shelves (706 mm [27.8 in] deep). Up to 4 instruments can be mounted in Foxboro 101 Series Shelves (544 mm [21.4 in] deep). Shelves are designed for flush mounting in 3 to 25 mm (0.13 to 1 in) thick panels.

### Nameplate:

A gray polycarbonate nameplate is attached to the lower surface of the front door. It provides space for 3 lines which can have approximately 24 characters (including spaces) to accommodate a description of each input signal. A green, red, and blue (from top to bottom) color identification dot at the beginning of each line corresponds to the pen color and applicable input signal description.

## Optional Features

### Chart Drives:

The following chart drives are available at supply voltages of 24, 120, or 240 V, and frequencies of 50 or 60 Hz; EXCEPTION: 5 mm/h (0.2 in/h) not available with 24 V. Selectable by specifying single or dual speed, chart speed, voltage, and frequency.

Single Speed: 5, 10, 20, 40, 80, 120, 320, 720 and 2400 mm/h (0.2, 0.4, 0.8, 1.6, 3.1, 4.7, 6.4, 28.2 and 96.0 in/h).

Dual Speed: 20 mm/h and 20 mm/min (0.8 in/h and 0.8 in/min). 20 mm/h and 40 mm/min (0.8 in/h and 1.6 in/min).

Pneumatic Impulse: 20 mm/h (0.75 in/h).

### Special Pen Position for 2-Pen Recorder:

Optionally available is a 2-pen recorder with the red pen in the center position and the blue pen in the outer position. Selectable by specifying model number for 2-pen recorder and AS Reference SPP.

### Charts:

A selection of standard charts is available. Refer to Foxboro Chart and Dial Catalog 600.

### Alarm Lamps:

Refer to Page 72.



## How to Order

### 1) SPECIFY MODEL NUMBER: 127S-

#### Pen and Indicator Quantity and Color:

- 1 pen and 1 indicator (red)..... 1
- 2 pens and 2 indicators (red and green)..... 2
- 3 pens and 3 indicators (red, green, and blue)..... 3

#### Chart Drive:

- Electric, single speed, 20 mm/h (0.8 in/h)..... E
- Pneumatic impulse, 20 mm/h (0.8 in/h). Not available with code 3 above.  
Codes X and 0 below must be specified..... P

#### Voltage:

- 120 V ac..... A
- 240 V ac..... B
- 24 V ac..... C
- None. Select with Chart Drive code P..... X

#### Frequency:

- 50 Hz ..... 5
- 60 Hz ..... 6
- None. Select with Chart Drive code P..... 0

#### Optional Feature:

- 3 alarm lamps, externally operated. Available with Voltage code C above only. .... L

2) SPECIFY INPUT SIGNAL \_\_\_\_\_

3) SPECIFY SCALE RANGES AND CHART RANGES FROM CHART AND DIAL CATALOG 600 \_\_\_\_\_

4) SPECIFY MOUNTING EQUIPMENT-102 OR 101 SERIES SHELVES \_\_\_\_\_

5) SPECIFY OPTIONAL FEATURES \_\_\_\_\_

6) SPECIFY INFORMATION FOR NAMEPLATE AND INSTRUMENT TAG \_\_\_\_\_



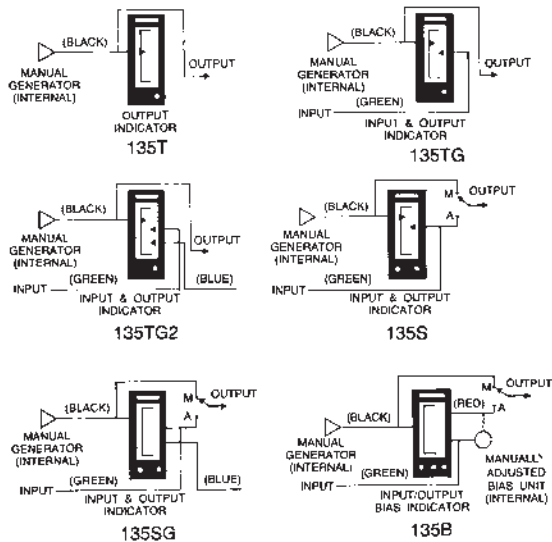
135 Series Stations are complementary auxiliary units for 100 Series Control Systems.

## 135 Series Manual Loading, Switching, and Bias Stations

- Selective Pneumatic Switching
- Remote Control Setting
- Manual Loading of Final Operators

For complete specifications, refer to General Specification Sheet GS 2B-4H2 A.

### Functional Specifications



**Model 135T:**  
Provides an accurate manually adjusted standard output signal used for remote manual control of final operators or for the remote setting of any pneumatic receiver. A manual adjusting knob regulates a stable standard output indicated on a 100 mm (4 in) vertical scale.

**Model 135TG:**  
Performs the same function as the Model 135T (above). An additional pointer is provided to display a standard input signal.

**Model 135TG2:**  
Performs the same function as the Model 135T. Two additional pointers are provided to display standard input signals.

**Model 135S:**  
Passes a standard input signal to a final operator or manually generates an accurate standard signal. It is normally used in control loops where a single master controller regulates two or more final operators. The station contains a vertical scale, indicating the input signal and the output of the manual generator. By matching the two indicators on the vertical scale and flipping the simple 2-position transfer switch, a bumpless transfer is ensured.

**Model 135SG:**  
Performs the same function as the Model 135S (above). An additional pointer is provided to display a standard input signal.

**Model 135B:**  
Performs the same functions as the Model 135S with the added feature that up to  $\pm 100\%$  bias may be manually added to the standard input signal. It is normally used where a single master controller regulates two or more final operators, or where it remotely sets two or more controllers, and where it is necessary to bias one with respect to the other. This unit has three pointers. One is used to indicate the manually generated signal and the other two indicate the input signal before and after it is biased.

**Ambient Temperature Limits:**  
-20 and +65°C (0 and 150°F).

**Input/Output Signal and Supply Pressure:**

Input/Output Signal	Supply Pressure
20 to 100 kPa	140 to 150 kPa
3 to 15 psi	20 to 22 psi

## Performance Specifications

**Receiver-Indicator:**

Accuracy:  $\pm 0.5\%$  of calibrated span.

Repeatability: 0.25% of calibrated span.

Dead Band: Less than 0.1% of calibrated span.

**Manual Output Pointer:**

Output Indicator: 0.5% of calibrated span.

Repeatability of Setting: 0.25% of calibrated span.

## Physical Specifications

**Element:**

Brass bellows.

**Scale:**

100 mm (4 in) vertical, black markings on white background.

**Pointers:**

Manual output: black.

Bias output: red.

Inputs: green and blue.

**Connections:**

Electrical and pneumatic multiprong receptacles on rear of chassis.

**Nameplate:**

White translucent plastic with 2.5 mm (0.1 in) high black letters. Maximum of 2 lines, 17 letters or spaces per line.

**Mounting:**

Flush in panels 3 to 25 mm (0.13 to 1 in) thick using 102 or 101 Series Shelves. Units require 1 unit of mounting capacity.

## Optional Features

**Alarm Actuators and Alarm Lamps:**

Refer to Page 72.

## How to Order

**1) SPECIFY MODEL NUMBER:**

Manual Loading.....	135T
Manual Loading with Variable Indicator .....	135TG
Manual Loading with Two Variable Indicators.....	135TG2
Automatic/Manual Switching.....	135S
Automatic/Manual Switching with Variable Indicator .....	135SG
Automatic/Manual Switching and Bias.....	135B

**2) SPECIFY INPUT AND OUTPUT SIGNALS** \_\_\_\_\_

**3) SPECIFY SCALE RANGES—REFER TO CHART AND DIAL CATALOG 600** \_\_\_\_\_

**4) SPECIFY MOUNTING EQUIPMENT—102 OR 101 SERIES SHELVES** \_\_\_\_\_

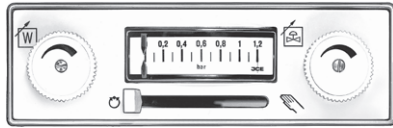
**5) SPECIFY OPTIONAL FEATURES** \_\_\_\_\_

**6) SPECIFY INFORMATION FOR NAMEPLATE AND INSTRUMENT TAG** \_\_\_\_\_

# Panel-Mounted Pneumatic Instruments (Subpanel)

PM960

PM960 Pneumatic Subpanel



Pneumatic Subpanels are used in conjunction with pneumatic Standard Controllers for generating set point, manual output, and for auto-manual transfer switching.

- Pneumatic circuitry cast into base plate
- Many versions available, including Manual Loader with process variable indicator
- Set point control knob secures to prevent accidental alteration

Version	Front View	Circuit Diagram	Pneum. Connections
Manual Loader -A			1 Zul. Supply air 5yH Manual output
For Local Set Control -F			1 Zul. Supply air 2S Switch signal 3w Setpoint 4yA Controller output 5Y Output

## Pneumatic Subpanel

Front finish..... bezel grey RAL 7037  
 ..... facia grey RAL 7035  
 Supply air..... 1.4 ± 0.1 bar / 20 ± 1.4 psi  
 Manual-Auto-switch..... flat slide valve

## Pressure Indicator (built in)

Version..... single- or double indicator  
 System..... bourdon tube  
 Indication range..... 0 to 1.2 bar / 0 to 18 psi  
 Scale length..... 44mm  
 Error limit..... ≤ 1 % f. s. d.  
 Cross-matching error .... ≤ 0.5 % f. s. d.  
 (Double indicator)

## Pneumatic Signal Generator (built in)

Output adjustable..... 0 to supply air pressure  
 Air consumption..... ≤ 100 l/h per signal gen.  
 Supply air dependency... ≤ 0.2 %/0.1 bar  
 Temperature effect..... ≤ 0.3 %/10 K

## Materials

Bourdon tube..... bronze  
 Other components ..... al, brass, zinc-plated steel

For complete specification, refer to Product Specification Sheet PSS EIC4315 A-(en)

## How to Order

### Pneumatic Subpanel

#### Version:

Manual Loader.....	-A
Manual Loader with process indicator.....	-B
Double Manual Loader.....	-C
for slave control.....	-D
for Slave control, controller with PI switch.....	-E
for local set control.....	-F

#### Indicating Range (Scale):

0-1.2bar.....	1
0-18psi.....	2
0-120kPa.....	3

#### Options:

Wall mounting plate.....	-W
Tag No. Labeling with inscription.....	-L

PM960

## 556 Series and Model 557 Pneumatic Analog Computers

- **Versatile**
  - Multiply
  - Divide
  - Square
  - Square root
- **Wide Range of Applications**
  - Flexible scaling for multiplication and division
- **Built-in Function Switch**
  - To select any of four computing functions
- **Weatherproof**
  - Plastic cover
  - Die-cast, low copper content aluminum alloy manifold
  - IEC IP53 and NEMA Type 3

For complete specifications, refer to Product Specification Sheets PSS 2B-5E1 A and B.



Units provide output proportional to mathematical function of input. Model 557 performs square root function only.

## Functional Specifications

### Functions and Related Equations:

The 556 Series performs any one of four functions and solves an equation as shown in the table. The 557 performs square root only.

Function	Equation
Multiplication	$A = fB(z+sC)$
Division	$B = \frac{A}{(f)(z + sC)}$
Square Root	$B = \sqrt{A}$
Square	$A = C^2$

A, B, and C are pneumatic signals expressed as decimal equivalents of percent of span.

f = Scaling factor (limits: 0.750 and 3.500).

s = Span factor for C signal (limits: 0.050 and 1.000).

z = Zero suppression of C signal (limits: 0.000 and 0.950).

NOTE: The sum of s and z must equal 1.000.

### Input and Output Signals:

20 to 100 kPa or 3 to 15 psi, as specified.

### Supply Pressure Limits:

130 and 150 kPa or 19 and 22 psi.

### Ambient Temperature Limits:

-40 and +80°C (-40 and + 180°F).

### Air Consumption Under Normal Operation:

<.10 m<sup>3</sup>/h (.06 scfm) at standard conditions.

### Air Connections:

All air connections are tapped for 1/4 NPT.

### Mounting:

A bracket is supplied for vertical mounting on a rack or DN 50 or 2 in pipe. The bracket is designed for either horizontal or vertical pipes or rack struts.

# Panel-Mounted Pneumatic Instruments (Computing Elements)

**556, 557**

## Performance Specifications

**Accuracy:**

Multiplication:  $\pm 0.5\%$  of output span referred to input.

Division:  $\pm 0.5\%$  of output span referred to input.

**Square Root:**

556:  $\pm 0.25\%$  of output span referred to input.

557:  $\pm 0.5\%$  of output span referred to input.

Square:  $\pm 0.5\%$  of output span.

**Repeatability:**

0.1 % of output span.

## Physical Specifications

**Materials of Construction:**

Cover: Molded plastic with textured gray finish.

Manifold: Low copper content aluminum alloy die-casting with a gray epoxy finish.

Flexures: 17-4 PH stainless steel.

A and C Bellows: Brass.

B Diaphragm: Copper alloy.

**Environmental Protection:**

The housing construction is weatherproof. It is dust-protected as defined in IEC IP53 and provides the environmental protection of NEMA Type 3.

## How to Order

**1) SPECIFY MODEL NUMBER:**

Function	Formula	
Multiplication	$A = fB(z+sC)$	.....556-8
Division	$B = A/f(z + sC)$	.....556-9
Square Root (a)	$B = \sqrt{A}$	.....556-10
Square	$a + C^2$	.....556-11
Square Root	$B = \sqrt{A}$	..... 557

(a) Refer also to Model 557, and accuracy statement in "PERFORMANCE SPECIFICATIONS."

**2) SPECIFY INPUT/OUTPUT RANGE IN PROCESS UNITS** \_\_\_\_\_

**3) SPECIFY FOR MODELS 556-8 AND 556-9:**  
 SUPPLY THE VALUE OF f, s, AND z \_\_\_\_\_

DEFINE INPUT/OUTPUT SIGNAL RANGE DESIRED, kPa OR psi \_\_\_\_\_

**4) SPECIFY INFORMATION FOR INSTRUMENT TAG** \_\_\_\_\_

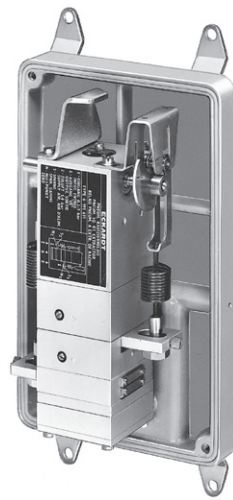
# Panel-Mounted Pneumatic Instruments (Computing Relay)

## PC191 Pneumatic Computing Relay

PC191

### ■ Pneumatic Subpanel

- Booster Relay
- Selector Relay
- Reversing Relay
- Adding Relay
- Averaging Relay
- Subtraction Relay
- Fixed Ratio Relay
- Square root extractor
- Function generator



### ■ Time Function Relays

- Delay Relay
- PI Relay
- PD Relay
- Delay element
- Trend Relay

For complete specification, refer to Product Specification Sheet PSS EIO4332 A-(en)

## How to Order

### Pneumatic Computing Relay

PC191

#### Function and Formula:

Booster Relay $A = E$ .....	-100
Min.-selector relay 2 inputs.....	-101
Max.-selector relay 2 inputs.....	-102
Reversing relay $A = K - E$ .....	-110
Booster Relay $A = E$ with calibration adjustment.....	-113
Adding relay $A = E1 + E2 - K$ .....	-121
Averaging relay $A = (E1 + E2) / 2$ .....	-130
Subtraction relay $A = E1 - E2 + K$ .....	-140
Fixed ratio relay $A = 0.5E - K$ .....	-221
Fixed ratio relay $A = 0.5E + K$ .....	-231
Fixed ratio relay $A = 2E - K$ .....	-261
Fixed ratio relay $A = 3E - K$ .....	-281
Square root extractor $A = E(xp=1/2)$ 0.2-1.0 bar.....	-611
Square root extractor $A = E(xp=1/2)$ 3-15 psi.....	-612
Function generator $A = F(E)$ 0.2-1.0 bar.....	-621
Function generator $A = F(E)$ 3-15 psi.....	-622
Delay relay symmetrical .....	-900
Delay relay signal increase .....	-901
Delay relay signal decrease .....	-902
PI-relay .....	-905
PD-relay .....	-910
Delay element (without booster) .....	-913
Trend relay $V = 2.5$ .....	-920

#### Options:

Working on cams with given function (only for -621 / -622).....	-A
---	----

# Panel-Mounted Pneumatic Instruments (Computing Relay)

**PS953**

## PS953 Pneumatic Signal Selection Relay



- **Signal selector relays**
  - Signal selector Relay with mechanical or pneumatic setpoint adjustment for pressure and pressure difference
- **Relays for control applications**
  - Lock-in relay
  - Limiting relay
  - Changeover relay
  - Push-button valve

For complete specification, refer to Product Specification Sheets PSS EIO4331 A-(en) for PS953

### How to Order

Pneumatic Signal Selection Relay	PS953	
<b>Function:</b>		
Signal selector relay, mechanical setpoint change-over if setpoint is exceeded .....	-100	
Signal selector relay, mechanical setpoint change-over if setpoint is drops .....	-101	
Three-way signal selector relay, mech. setpoint, change-over if setpoint is exceeded, reversing if setpoint is drops.....	-111	
Three-way signal selector relay, mech.setpoint (0,2-1,0 bar) with self-latch, change-over if setpoint is exceeded reversing manual (a) .....	-112	
Three-way signal selector relay, mech.setpoint (0-1,0 bar) with self-latch, change-over if setpoint is exceeded, reversing manual (a).....	-114	
Lock-in relay single-action .....	-200	
Lock-in relay double-action. ....	-210	
Limiting relay for max.pressure.....	-410	
Change-over relay pneum. conn. 1/8 - 27 NPT .....	-611	
Change-over relay pneum. conn. 1/4 - 18 NPT .....	-613	
<b>Options:</b>		
Push-button valve for venting pneum. signal lines (only for -112/114).....	-A	
Adapter Plate for PS953-210 for large pneumatic connector .....	M	
Adapter Plate for PS953-200 for NAMUR mounting instead of SOV .....	N	

**NOTES:**

- (a) With Option - A
- (b) With Option - B



# Panel-Mounted Pneumatic Instruments (Miscellaneous)

130MD, 130PD, 130FD, 138, 130M-N, 102, 101, 120

## 130MD, 130PD & 130FD Series Pneumatic CONSOTROL Control Stations



130MD, 130PD, and 130FD Series Pneumatic CONSOTROL Control Stations provide Panel-Mounted measurement, set point, and auto/manual transfer functions to operate separately mounted controllers. The stations are used with the 138 Series Controllers to minimize time lag resulting from long distances between control panels and the process.

## 138 Series Remote Mounted Pneumatic Controllers



138 Series Remote Mounted Pneumatic Controllers are used with 130MD, 130PD, and 130FD Series Control Stations. They provide the response advantage of a local controller with the convenience of a Panel-Mounted display.

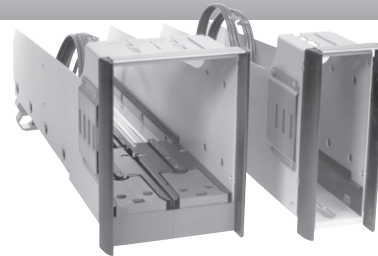
## 130M-N Series Pneumatic CONSOTROL Indicating Gap Controllers



The Model 130M-N7 Differential Gap Controller is an on/off unit with an adjustable inert zone (gap) within which the controller will not respond to changes in the measurement.

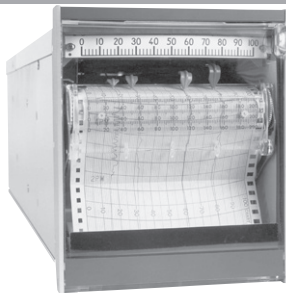
The Model 130M-N94 Gap Action Floating Controller provides standard proportional plus integral control action when the measurement exceeds the high or low gap limit.

## 102 & 101 Series Pneumatic CONSOTROL Shelves



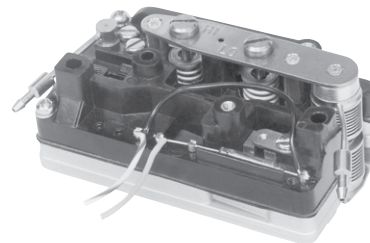
102 and 101 Series Pneumatic CONSOTROL Shelves allow flush panel mounting of pneumatic CONSOTROL instruments in panels. They are compact units, available in ten sizes for one to ten instruments. The shelves allow instruments to be wholly or partially withdrawn without interfering with the operation of others.

## 120 Series Pneumatic CONSOTROL Recorders



120 Series Pneumatic CONSOTROL Recorders record up to four process measurements received as standard pneumatic transmission signals from remote transmitters. Large, brightly colored pens clearly indicate the measurement. The recording is on a SCAN-FOLD chart.

## Alarm Actuators and Alarm Lamps



100 Series Pneumatic Alarm Actuators are available integrally mounted in CONSOTROL 100 instruments. The actuators are operated directly by the pneumatic input signals. They provide high sensitivity, accuracy, and dependability by eliminating intermediate receiver mechanisms. A wide variety of alarm configurations is available.

## Converters

Many processes require both electronic and pneumatic instrumentation. Converters allow you to integrate that combination into your control strategy.

**Foxboro makes converters for both purposes:**

### **CURRENT-TO-PNEUMATIC (I/P) E69 SERIES**

- Available with a selection of input/output signals
- Small, compact, lightweight—for easy installation
- High air delivery rate for direct valve actuation

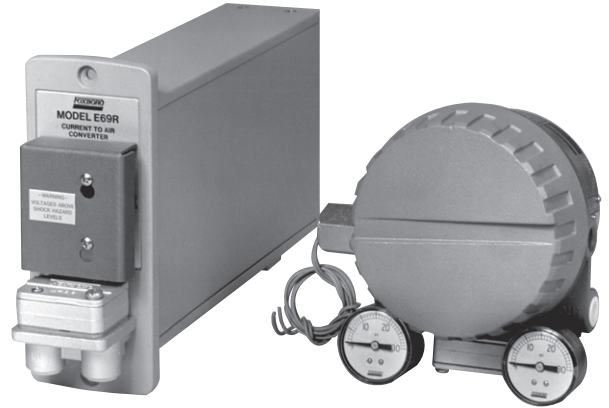
### **CURRENT-TO-PNEUMATIC (I/P) IP24 SERIES**

- Available with a large selection of input/output signals
- Designed for field service / heavy duty application
- Stainless steel version as option

## E69F and E69R Series Current-to-Pneumatic Converters

- **Light, Compact**
  - Easy to install
- **Low Air Consumption**
  - Reduced operation costs
- **High Air Capacity**
  - Eliminates need for volume boosters
- **Choice of Various Input and Output Signals**
  - Suitable for all applications
- **Sealed Air Purged Case (E69F)**
  - Long-term dependability in dirty environments
- **Precise Performance**

For complete specifications, refer to Product Specification Sheets PSS 4-8B1 A (E69F) and 2B-2A2 A (E69R).



E69F and E69R Series Current-to-Pneumatic Converters accept a dc milliamper input signal and convert to a proportional pneumatic output signal.

### Functional Specifications

**Input Signal Ranges (mA dc):**  
4 to 20, 4 to 12, 12 to 20.  
10 to 50, 10 to 30, 30 to 50.

**Output Signal Ranges:**  
20 to 100 kPa or 3 to 15 psi.  
40 to 200 kPa or 6 to 30 psi.  
3 to 27 psi.  
7 to 125 kPa or 1 to 18 psi.  
7 to 220 kPa or 1 to 32 psi.

**Input Impedance:**  
170  $\Omega$  (4 to 20 mA dc).  
27  $\Omega$  (10 to 50 mA dc).

**Supply Pressure: (a)**

Nominal	Limits
140 kPa or 20 psi	130 and 160 kPa or 19 and 23 psi
240 kPa or 35 psi	225 and 260 kPa or 33 and 38 psi

a) Not less than 20 kPa or 3 psi above maximum output.

**Electrical Classification:**

FM, CSA, and ATEX certified. Explosion proof and intrinsically safe versions available. Refer to Foxboro for complete specifications.

### Physical Specifications

**Accuracy:**

Output Signal codes 2 and 3:  $\pm 1.0\%$  of calibrated span.

Output Signal codes 7 and 8:  $\pm 2\%$  of calibrated span.

**Linearity:**

0.5% of calibrated span typical.

**Repeatability:**

0.25% of calibrated span typical.

**E69F Enclosure:**

Die-cast copper (1% maximum) aluminum alloy body and cover (ASTM 512A and 512B), with a vinyl or epoxy powder finish. Meets the

requirements of IEC IP65 and provides the environmental protection of NEMA Type 4.

**Mounting:**

Valve yoke, surface, or DN 50 or 2 in pipe. Calibrated for vertical mounting unless otherwise specified. Bracket is supplied as standard.

**Input/Output Connections:**

Electrical: Tapped 1/2 in for conduit fitting to connect to a pair of 0.5m (18 in) long 18 AWG (1.0 mm<sup>2</sup>) twisted leads.

**Pneumatic:**

1/4 NPT for air supply and output signal.

## E69F, E69R

### Physical Specifications (continued)

#### E69R

##### Enclosure:

Die-cast aluminum front and back plates with extruded top and bottom rails and steel side covers. Finish is vinyl, polyurethane, or acrylic enamel.

##### Mounting:

Up to 6 units may be mounted across in a 483 mm (19 in) rack.

##### Input/Output Connections (on front panel):

Electrical: Screw terminal with terminal cover.

Pneumatic: 1/4 NPT for air supply and out signal.

### Optional Features

#### Alternative Output Signal:

Refer to Foxboro for other than standard output signals.

Mounted integral to converter. PG 11 Cable Gland (Trumpet Connector) for non explosion-proof applications.

#### Adjustable Filter Regulator (E69F):

Provided without gauge.

#### Miniature Junction Box (E69F):

Consists of an aluminum box, 64 x 58 x 33 mm (2.5 x 2.3 x 1.3 in), and meets the IEC/ IP65 requirements and the environmental protection of NEMA Type 4. Provided with 1/2 in conduit, 20 mm threaded hole, or PG 11 or PG 13.5 Trumpet Type Cable Connectors.

#### Supply (Input) and Output Pressure Gauges (E69F):

Mounted integral to converter.

#### Explosionproof Junction Box (E69F):

Assembled to Valve Actuator by Foxboro (E69F).

### How to Order

#### 1) SPECIFY MODEL NUMBER: E69F-

##### Housing:

Bolted cover (weatherproof) ..... B  
 Threaded cover (explosionproof) ..... T

##### Input Signal (a), (b) and Impedance:

4 to 20 mA dc (170 Ω) ..... I  
 10 to 50 mA dc (27 Ω) ..... H

##### Output Signal (c):

kPa	psi	
20 to 100	3 to 15	2
40 to 200	6 to 30	3
-	3 to 27	3
7 to 125	1 to 18	7
7 to 220	1 to 32	8
Other .....		X

##### Optional Features:

Explosionproof junction box ..... J  
 Adjustable filter regulator without gauge ..... R  
 Supply/output gauges ..... S  
 Miniature junction box (1/2 in conduit connector) - front entry (d) ..... M  
 Miniature junction box (1/2 in conduit connector) - rear entry (d) ..... P

a) Converter action may be direct or reverse. (Specify.)

b) Input signal may be split-ranged (i.e., 4 to 12 mA). (Specify.)

c) When ordering valves not employing valve positioners, specify code 7 or 8 depending on the actuator spring range.

d) Cannot be used with Electrical Classification CS-E/LD-E.

This product and its components are protected by U.S. Patent 4,213,478. Corresponding patents have been issued or are pending in other countries.

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

**1) SPECIFY MODEL NUMBER: E69R-**

**Housing:**

**Input Signal (a), (b) and Impedance:**

4 to 20 mA dc (170 Ω) ..... I  
 10 to 50 mA dc (27 Ω) ..... H

**Output Signal (c):**

kPa	psi	
20 to 100	3 to 15	2
40 to 200	6 to 30	3
—	3 to 27	3
7 to 125	1 to 18	7
7 to 220	1 to 32	8
Other		X

- a) Converter action may be direct or reverse. (Specify.)
- b) Input signal may be split-ranged (i.e., 4 to 12 mA) (Specify.)
- c) When ordering valves not employing valve positioners, specify code 7 or 8 depending on the actuator spring range.

- 2) SPECIFY DIRECT OR REVERSE ACTION \_\_\_\_\_
- 3) SPECIFY OUTPUT SIGNAL \_\_\_\_\_
- 4) SPECIFY ELECTRICAL CLASSIFICATION \_\_\_\_\_
- 5) SPECIFY OPTIONAL FEATURES \_\_\_\_\_
- 6) SPECIFY INFORMATION FOR INSTRUMENT TAG \_\_\_\_\_

## IP24

## IP24 Current to Pneumatic Converter for Field & Service

### Input

Signal range ..... 4 to 20 mA/0 to 20 mA/  
0 to 10 mA/0 to 10 V

Input resistance (at 20 °C)

Normal Version & Vers.

II 2 G EEx ia IIC T6 acc.

to ATEX ..... <220 Ohms

Signal Range

0 to 10 mA / 0 to 10 V..... <1000 Ohms

### Output

Signal range normal ..... 0.2 to 1 bar, 3 to 15 psi,  
20 to 100 kPa, 0.2 to 4 bar

Signal range normal ..... 1 to 0.2 bar, 15 to 3 psi,  
100 to 20 kPa, 4 to 0.2 bar

Supply air ..... 1.4 ±0.1 bar ( 20 ±1.4 psi)

Air consumption ..... <100 l/h

Supply air ..... free of oil, dust, water  
according to ISO 8573-1

Max. particle-size and -density... Class 2

Max. oil contents ..... Class 3

### Transmission performance

Non-linearity (terminal-based).. <0.3% of final value

Hysteresis ..... <0.1%

Supply pressure dependence... <0.25 %/0,1 bar

Temperature influence

Output normal..... <0.3%/10 K

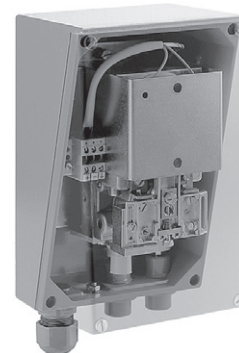
Output reverse ..... <0.5%/10 K

Sensitivity level ..... <0.02%

### Housing

Material ..... Aluminum casting, finished

Protection Class ..... IP54 or IP65



For conversion of a standard electrical signal into a standard pneumatic signal.

For complete specification, refer to Product Specification Sheet PSS EVE0401 A-(en).

- High air capacity
- Low input resistance
- Easy adaptation of the Converter to ranges 0 to 20 mA or 4 to 20 mA
- Mode of action normal or reverse
- Protection Class IP54 or IP65
- Version in II 2 G EEx ia IIC T6 acc. to ATEX
- Stainless Steel 316 as option

## How to Order

Pneumatic Signal Selection Relay

IP24

### Input:

Signal Range 0 - 20 mA..... -A

Signal Range 4 - 20 mA..... -B

Signal Range 0 - 10 mA(a) ..... -C

Signal Range 0 - 10 V(a)..... -D

### Input:

Signal Range 0. -1 bar. ....K

Signal Range 3-15 psi.....L

Signal Range 20-100 kPa .....M

Signal Range 0.2-4 bar(a).....N

Signal Range 0.2-5 bar(a).....P

Signal Range 0.2-6 bar(a).....Q

### Mode of Action:

Normal (For Version ZZZ).....D

Normal (For Version EAA according to ATEX).....E

Reverse .....R

HOW TO ORDER Continued on Next Page.

## How to Order (continued)

**Electrical Certification:**

II 2 G EEx ia IIC T6 ..... EAA  
 Without ..... ZZZ

**Options:**

Attachment Kit For Pipe Mounting ..... -A  
 Protection Class IP65 ..... -B  
 Calibration In kp/cm ..... -C  
 Assembled free of oil and Grease / Designed for Aux. Energy Oxygen. .... -S

**Tag No. Labeling:**

Stamped With Weather Resistant Color ..... -G  
 Stainless Steel Label Fixed With Wire ..... -L

**NOTES:**

(a) Only available with Mode of Action Code D

**Special Version**

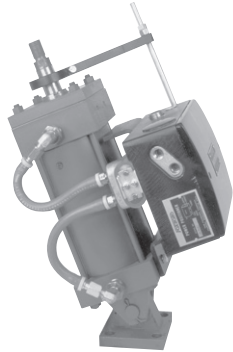
Nr EP	Specifications
EP0194	Special setting: Input 4-20 mA ≥ Output 0.2-0.6 bar
EP0210	Special setting: Input 4-20 mA ≥ Output 0.2-4 bar
EP0300	IP24 in Stainless Steel Housing 316
EP0305	Special setting: Input 4-20 mA ≥ Output 0.4-2 bar
EP0314	With 2 additional gauges (air supply, output)



# Control Valves (Actuators)

## 2A, P SERIES, 20F/P50, 30C/P110

### 2A Series Cylinder Actuator with Power Positioner



The 2A Series Cylinders are used to actuate dampers, gates, shutters, doors, and large control valves. Power positioners are required with all pneumatic cylinders for throttling action. They convert the standard 20 to 100 kPa (3 to 15 psi) controller signal to full supply pressure on the cylinder piston and assure precise, positive positioning. Cylinders are available in bore sizes 83 through 355 mm (3 1/4 through 14 in) with strokes up to 810 mm (32 in).

### E69P Series Current-To-Pneumatic Valve Positioners



The E69P Series Current-to-Pneumatic valve Positioner converts a direct current milliamperere input signal into a pneumatic output signal for positioning control valve actuators. It eliminates the need for a separate converter and a separate positioner. It is available with the following input signal ranges (mA): 4 to 20, 4 to 12, 12 to 20, 10 to 50, 10 to 30, 30 to 50 with a corresponding output signal of up to 240 or 420 dPa (35 or 60 psi, 2.4 or 4.2 bar of kg/cm<sup>2</sup>).

### Models 20F/P50 & 30C/P110 Diaphragm Lever Actuators



The Models 20F/P50 and 30C/P110 Diaphragm Lever Actuators are used to actuate dampers, gates, and butterfly valves. The topworks of the size P50 and P110 Diaphragm Actuators are made of vinylcoated, die-cast aluminum. Maximum input pressure is 420 kPa (60 psi). Bracket material is cast iron, and the carbon steel lever is predrilled. Lever strokes range from 116 to 254 mm (4.56 to 10 in).

### P Series Pneumatic Spring Diaphragm Actuators



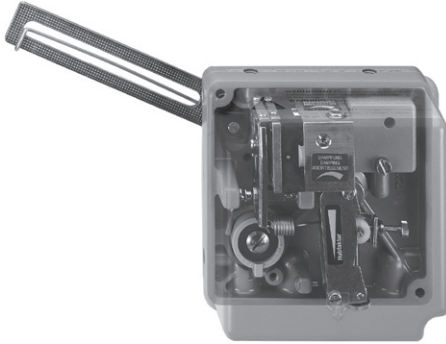
The P Series Actuators can operate a variety of control valves, dampers, louvers, and gates. They are lightweight field-reversible units with low hysteresis and fast, precise response.

Model	Maximum Stroke		Effective Area		Material Construction
	mm	in	m <sup>2</sup>	in <sup>2</sup>	
P25	19	3/4	0.016	25	aluminum
P50	38	1 1/2	0.032	50	with cast
P110	57	2 1/4	0.071	110	iron yoke

Nominal input signal: 20 to 100 or 40 to 200 kPa (3 to 15 or 6 to 30 psi).



### SRP981 Pneumatic Positioner



The SRP981 Positioner is designed to control pneumatic valve actuators with pneumatic control signals. It offers an easy adjustment by two mechanical screws.

- Split range up to 4-fold possible
- Input Signal from 0.2 ... 1 bar (3 ... 15 psig)
- Supply pressure up to 6 bar (90 psig)
- Single or double acting
- ATEX Explosion protection II 2 G EEx c (constructive safety)
- Stainless steel 316 housing as option

### SRI986 Electro-Pneumatic Positioner



The SRI986 Positioner is designed to control pneumatic valve actuators from control systems and electrical controllers with electric control signals. It offers an easy adjustment by two mechanical screws.

- Split range up to 3-fold possible
- Input Signal from 0 to 20 mA or 4 to 20 mA
- Explosion protection:
  - o II 2 G EEx i (intrinsic safety) according to ATEX
  - o Intrinsic safety according to FM and CSA
- Ambient temperature -40 to 80°C (-40 to 176°F)

### SRI983 Electro-Pneumatic Positioner

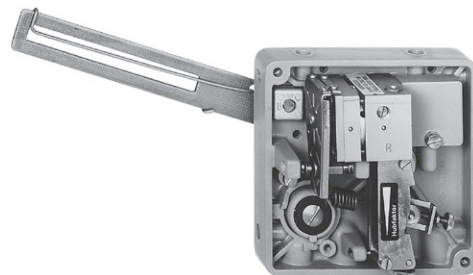


The SRI983 Positioner is designed to control pneumatic valve actuators from control systems and electrical controllers with electric control signals. It offers an easy adjustment by two mechanical screws.

- Explosion protection:
  - II 2 G EEx d (flameproof) according to ATEX explosion proof according to FM and CSA
- Ambient temperature -40 to 80°C (-40 to 176°F)

For more information, please refer to our main instrument catalog, Foxboro Measurements and Instruments Catalog (PN FX-0181).

### SMP981 Pneumatic Position Transmitter



For the conversion of linear or rotary movements actuators into a 0.2 to 1 bar pneumatic signal.

- Universal matching to all strokes by means of differing range springs.
- Simple installation and adjustment. Zero and range settings non-interactive
- ATEX Explosion protection II 2 G EEx c (constructive safety)

## Humitex Circular and Strip Charts

Foxboro recording charts complement the precision and fine craftsmanship of our wide range of recording instruments. Charts combine the essential elements of special high-quality paper with rigidly controlled printing and trimming procedures. Over 17,000 different charts can be supplied in ranges and calibrations to meet the requirements of practically any process recording application. Special charts and new ranges not listed in the Chart Catalog and Dial List (Catalog 600) may require a new electro printing plate for specific customer needs. Contact our nearest Branch Office for Catalog 600.

## Chart Purchase Agreement

Any Foxboro instrument user with an estimated yearly requirement of 500 boxes of circular and/or 500 boxes of strip charts or more may request a Chart Purchase Agreement. Under the agreement system, quantity prices are applied to the individual chart purchase order. The agreement is continuous, reviewed yearly for actual purchases, and a 30-day advance notice to changes is given. Refer to Foxboro with your annual requirements to receive a Chart Purchase Agreement.

Minimum Order Quantity—15 boxes of circular charts or 15 boxes of strip charts.

### Toll Free Number

To order charts, call 888-FOXBORO (888-369-2676).

### Types of Calibration Charts Available for Circular and Strip Charts

Uniform, Differential Pressure, Flow (Type 27), Vacuum Pressure, Square Root, Vapor Pressure, Dairy Charts, Dew Point, Thermocouple, Thermopile, Flow-Open Channel Weir and Flume, Log Function, Specific Gravity, and Balsbaugh.

## Circular Chart Specifications

Standard circular charts are printed with gray ink, 1 side only, on 0.122 mm (0.0048 in) thick paper. Circular charts with heavy paper are printed on 0.178 mm (0.0070 in) paper. Charts are packaged 100 to a box.

Instrument	Chart Size
125 mm (5 in) Side-Mounted Recorder	125 mm (5 in) (a)
12 Series Recorders	300 mm (12 in)
40/740 Series Recorders	300 mm (12 in)
39A Series Flow Recorders	300 mm (12 in) (a)
39 B Series Flow Recorders	MW Series 300mm (12in)(a)
740R Series Recorders	300 mm (12 in)

a) Always printed on heavy paper.

Foxboro also prints circular charts for American Meter, Arcco-Anubis, Bailey, Bristol, Gotham (Ametek), Honeywell (Brown), Mercury, Palmer, Ranarex (Permutit), Rockwell, Taylor, UGC Industries, Warren Controls (Tagliabue), and Weksler which are made to their specifications.

### Options for 300 mm (12 in) Circular Charts:

Description	Code (b)
Heavy Paper	-HP
Backprinting (c)	-BP
Mullins Slotting (d)	-MS-HP
Overprinting of Two-Color Charts (f)	-OP
Color of Ink on Chart:	
Green	-GRN
Scanner Blue Ink	-BLU-SBI
Black	-BLK
Aqua	-AQUA
Dark Blue	-DBLU
Shrink Wrap	-SW

b) Add as suffix to circular chart number.

c) Add Foxboro backprint number.

d) Specify drop time and/or day of the week.

e) Specify time.

f) Must be available as an existing chart; see Catalog 600.

## Strip Chart Specifications

4 in Roll, 100 mm Roll, and SCAN-FOLD charts can be supplied with or without time mark numbering. Standard time mark numbering is the hour of the day printed on the left side of the chart at 2-hour intervals (on the even hour). The standard speed for the 4 in Roll and SCAN-FOLD is 3/4 in/h which coincides with the chart drive speed. The standard speed for the 100 mm Roll is 20 mm/h.

A large selection of non-standard time mark numbering is available to match the chart speeds of your recorders. Refer to Catalog 600 for a listing.

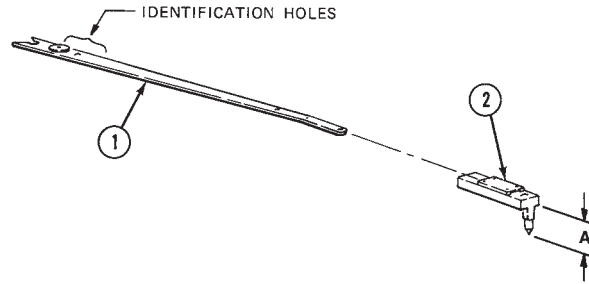
4 in Roll Chart..... One 30-day chart per box  
 100 mm Roll Chart..... One 30-day chart per box  
 SCAN-FOLD Chart..... Two 16-day charts per box

Recorders	Chart
E20S 53 54 64 120 220S	<u>4 in Roll or SCAN-FOLD</u> For 4 in Roll, specify chart number suffix -T if time numbering is required.  For SCAN-FOLD, specify chart number suffix -6TX if time numbering is required.
E27R 126S 127S 226S 227S 760R	<u>100 mm Roll only</u>  Specify chart number suffix -T if time numbering is required.
761R	L0120NP
762R	Fold - L0122RQ 50 Divisions - L0122RS 0-100 Linear Roll - L0122RR 50 Divisions - L0122RT 0-100 Linear
751R	Fold - L0122RS 0-100 Linear Roll - L0122RT 0-100 Linear

# Accessories and Supplies

## Pens and Pen Arms

- **Large, Disposable, Fiber Tip Pens for Circular Chart Recording Instruments**
- **Designed to Write 365 meters (1200 feet)**
- **Prepackaged 6 Pens per Card**



## Recording

40, 40M, 40P, and 39 Series Rectangular Case Recorders:

Pen Location	Pen Arm, Item 1		Fiber Tip Pens (Package of 6), Item 2			
	Part Number	Identification Holes	Color	Part Number	A Length	
					mm	in
1-Pen	0044897	2	Red	L0121CH	12	0.47
2-Pen inner outer	M0122AC	1	Violet	L0121CM	6	0.24
	0044897	2	Red	L0121CH	12	0.47
3-Pen inner center outer	M0122AC	1	Violet	L0121CM	6	0.24
	0044897	2	Red	L0121CH	12	0.47
	M0122AB	3	Green	L0121CU	18	0.71
4-Pen inner next to inner next to outer outer	M0122AC	1	Violet	L0121CM	6	0.24
	0044897	2	Red	L0121CH	12	0.47
	M0122AB	3	Green	L0121CU	18	0.71
	M0122AA	0	Blue	L0121DA	24	0.94

12R Series Round Case Recorders:

Pen Location	Pen Arm, Item 1		Fiber Tip Pens (Package of 6), Item 2			
	Part Number	Identification Holes	Color	Part Number	A Length	
					mm	in
1-Pen	0044899	2	Red	L0121CH	12	0.47
2-Pen outer inner	0046965	3	Violet	L0121CR	6	0.24
	0044899	2	Red	L0121C J	12	0.47

12RD (1 to 3 Pen) and 12RM (1 and 2 Pen) Series Round Case Recorders:

Pen Location	Pen Arm, Item 1		Fiber Tip Pens (Package of 6), Item 2			
	Part Number	Identification Holes	Color	Part Number	A Length	
					mm	in
1-Pen	0044899	2	Red	L0121CT	18	0.71
2-Pen inner outer	0046964	1	Violet	L0121CR	12	0.47
	0044899	2	Red	L0121CT	18	0.71
3-Pen inner center outer	M0122NE	0	Violet	L0121CR	12	0.47
	0046964	1	Red	L0121CT	18	0.71
	0044899	2	Green	L0121CZ	24	0.94

To order, call 888-FOXBORO (888-369-2676).

## Recording Controllers

### 40, 40M, and 40P Series Rectangular Case Recording Controllers:

Controller Type	Pen Location	Pen Arm/Index, Item 1		Fiber Tip Pens (Package of 6), Item 2			
		Part Number	Identification Holes or Color	Color	Part Number	A Length	
						mm	in
Single Action	1-Pen Index	0044897 0032301	2 Plain	Red	L0121CH	12	0.47
Single Action with Additional Pen	2-Pen inner outer Index	M0122AC	1	Violet	L0121CR	12	0.47
		0044897 M0122LT	2 Red	Red	L0121CT	18	0.71
Single Action with 2 Additional Pens	3-Pen inner center outer Index	M0122AC	1	Violet	L0121CR	12	0.47
		0044897	2	Red	L0121CT	18	0.71
		M0122AB	3	Green	L0121CZ	24	0.94
		M0122LT	Red				
Triple Setting	1-Pen Index inner center outer	0044897	2				
		M0122LS	Violet	Red	L0121CY	24	0.94
		M0122LT M0122MA	Red Green				
Ratio	2-Pen inner outer Index	M0122AC	1	Violet	L0121CR	12	0.47
		0044897	2	Red	L0121CT	18	0.71
		M0122LS	Violet				
Ratio with inner Additional Pen	3-Pen inner center outer Index	M0122AC	1	Violet	L0121CR	12	0.47
		0044897	2	Red	L0121CT	18	0.71
		M0122AB	3	Green	L0121CZ	24	0.94
		M0122LS	Violet				
Duplex	1-Pen Index inner outer	0044897	2				
		M0122LT	Red	Red	L0121CT	18	0.71
		M0122LS	Violet				
Auto-Selector, Dual, or Duplex with Additional Pen	2-Pen inner outer Index inner outer	M0122AC	1				
		0044897	2	Red	L0121CT	18	0.71
		M0122LT	Red	Violet	L0121DB	24	0.94
		M0122LS	Violet				

1. On multiple pen recorders, if pens L0121CR (Violet), LC 121CS (Black), L0121CP (Green), or L012 CQ (Blue) are used as arcing pens, then the red inner pen (L0121CJ) must be used. Its length is 6 mm (0.24 in)

2. Black pens may be substituted for red or violet as follows:

Use L0121CN for pen arm lengths of 6 mm (0.24 in)

Use L0121CS for pen arm lengths of 12 mm (0.47 in)

3. If replacing box pens with fiber tip pens, the color dot on the pen arm (Item 1 in drawing on preceding page) must be removed.

### Disposable Fiber Tip Pen Cartridges for 40P/40M/12 and 740 Chart Recorders:

A-Length		Red	Violet	Green	Blue	Black
mm	in					
6	0.24	L0121CJ	L0121CM	L0121CK	L0121CL	L0121CN
12	0.47	L0121CH	L0121CR	L0121CP	L0121CQ	L0121CS
18	0.71	L0121CT	L0121CW	L0121CU	L0121CV	L0121CX
24	0.94	L0121CY	L0121DB	L0121CZ	L0121DA	L0121DC

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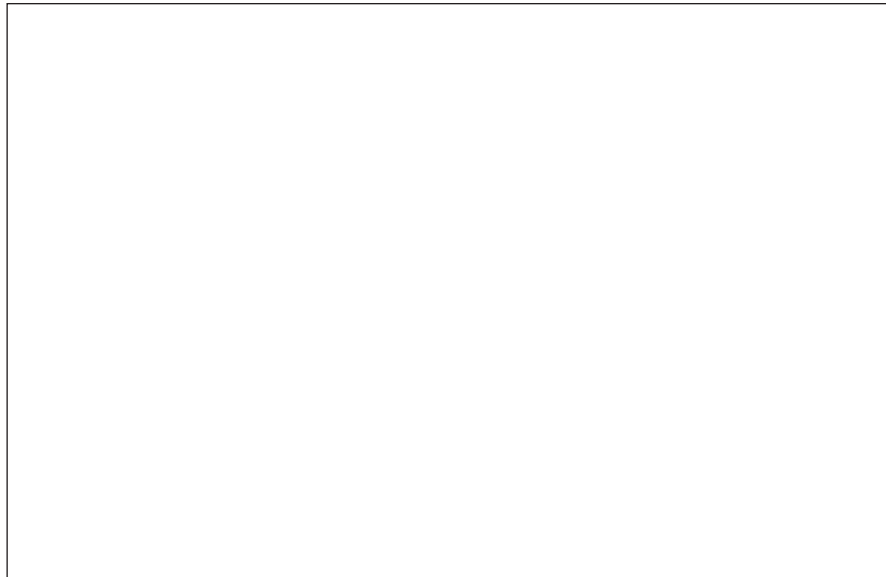






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