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Process Instrumentation

Field Instruments for Process Automation
July 2019 Supplement

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Introduction

The Process Instrumentation Business Segment of Siemens Industry, Inc. is a leader in providing innovative solutions to process instrumentation and control challenges. It is the operational center for Siemens' process instrumentation and control business in North America. The Process Instrumentation business provides a complete line of reliable measurement and control products, including: transmitters for level, pressure, temperature, and flow; loop controllers; valve instrumentation products, regulators and relays; process protection instruments; weigh feeders and belt scales. Siemens Process Instrumentation solutions help increase productivity and plant safety, reduce time-to-market and improve product quality across the process industries, such as chemical, pharmaceutical, bio-pharmaceutical, oil & gas, water and wastewater treatment, mining, pulp & paper and refining.

This catalog supplement includes only those items manufactured in Harleysville, sold here in the US, and not covered in the Siemens Field Instruments FI 01 catalog. If you do not find the product you are looking for in this supplement, please contact our factory for more information. We will be happy to connect you with a sales representative in your area that covers the products and services that you need.

Siemens Industry Inc.
Process Instrumentation
2060 Detwiler Road
Suite 111
Harleysville, PA, 19438
1-(800)-365-8766

Table of Contents

Introduction

Features & Benefits

- Universal design and choice of interchangeable NAMUR IEC 534-6 rectilinear VDI/VDE 3845 rotary mountings provide wide application flexibility
- Double-acting or single-acting service and split ranging afford application versatility in a single unit
- Non-interaction of the zero and span adjustments and CAMLOC (TM) cam locking mechanism significantly reduce calibration and setup time
- Modular design reduces inventory because it allows interchangeable spare parts
- Comes standard with 3 cams, linear, quick opening and equal % for application versatility

Description

The Series 760 Valve Positioners provide a cost effective universal approach to your valve control. Their modular concept allows all models to be built on the base pneumatic unit (Model 760P). The electro-pneumatic model (Model 760E) is created by adding an I/P transducer to the base pneumatic unit, and a wide range of accessories easily installs inside the unit.

The 760 base pneumatic unit provides cam characterization, split ranging, direct or reverse action, and single or double acting without requiring additional parts. Key design features include non-interaction of the zero and span adjustments.

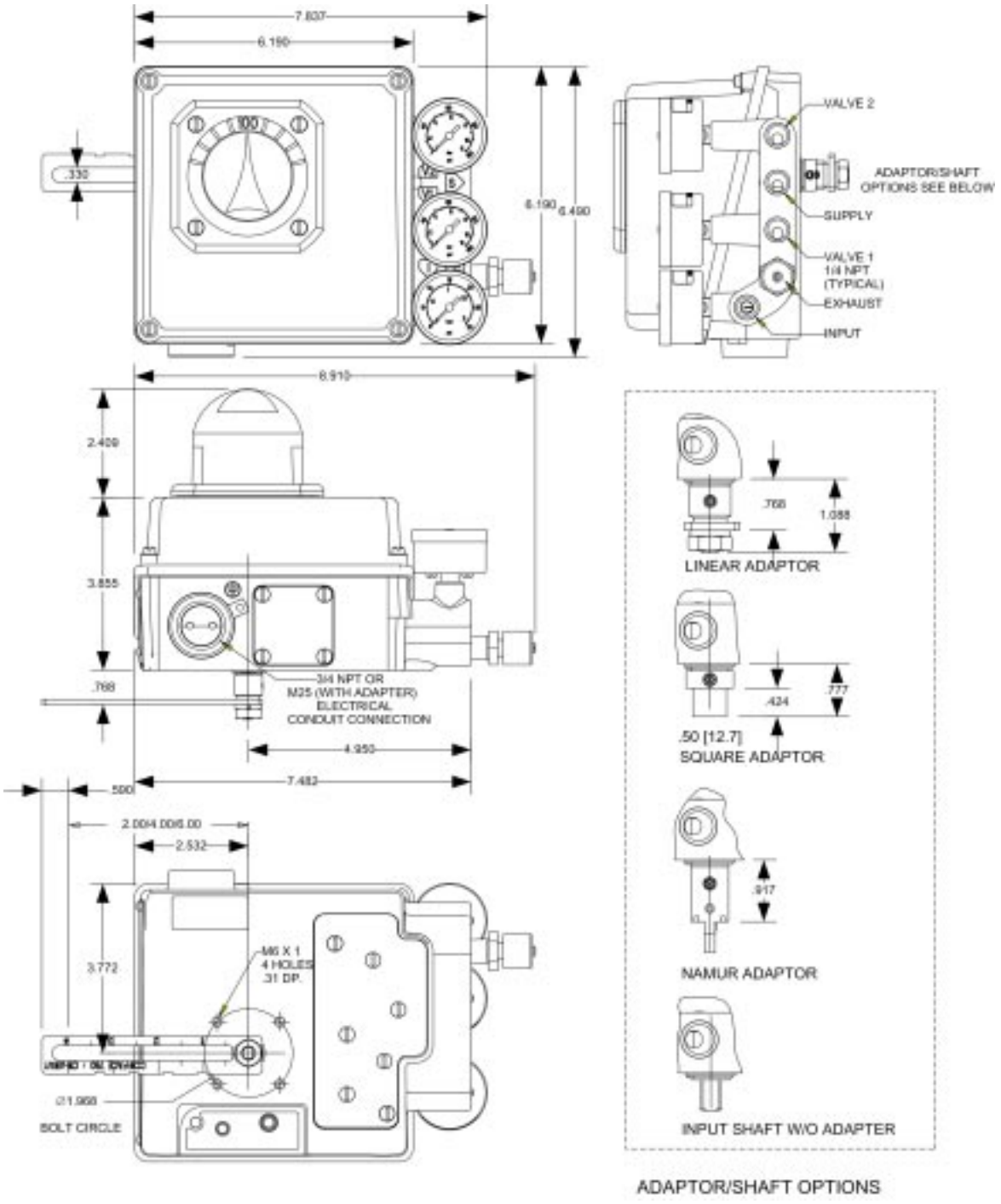
Series 760 Valve Positioners include provisions for internal limit switch mounting and position feedback devices without requiring additional housings. Thus, the need to stack housings that impede access to the main enclosure are eliminated.

A spool valve is used to load the actuator for positioning in response to an input signal. A characterized cam provides mechanical feedback. There are linear, equal percentage and quick opening operation cam profiles, and a blank profile cam is available for custom applications. Rectilinear action length can range from 1/2 inch to 6 inches.

The feedback shaft and characterized cam can be replaced in the field to configure the positioner for use with either a rectilinear or rotary actuator. No additional parts are necessary to change between single or double acting actuators or direct or reverse action.

Technical data

Mounting Dimensions



Specifications

Functional Specifications

Temperature Range

760P: –40 to 185°F (–40 to 85°C)
–4 to 185°F (–20 to 85°C)
High temp. option available to 300°F (148°C)
760E: –40 to 167°F (–40 to 75°C)
–4 to 167°F (–20 to 75°C)
with optional Viton® dynamic elastomers

Ingress

NEMA 4X, IP 65

Connections

Pneumatic – 1/4" NPT
Gauge – 1/8" NPT
Electrical – 3/4" NPT, 25mm
Exhaust – 1/4" NPT

Finish

Epoxy/Polyester Powder Coat

Output Configuration

Single or Double Acting

Action

Direct or Reverse

Supply Pressure

150 psig max.

Air Consumption

Standard Spool: 0.5 scfm typical
Low Gain Spool = 0.5 scfm
High Flow Capacity Spool: 1.0 scfm (typical)

Flow Capacity (at 60 psi with 25% drop)

9.0 scfm (Cv = 0.3) Standard
18.0 scfm (Cv = 0.6) Optional

Input Signal

760P: 3-15 psig, 3-27 psig, 50% split range
760E: 4-20 mA, 50% split range

Mechanical Feedback

90°, rotary std.
1/2" to 6" linear optional (longer lengths available on request)

Characterization

Equal %; Quick Opening; Linear

Pressure Gain

160:1@ 60 psig standard

Span

Adjustable –60% to +25% of normal span

Zero

Adjustable –10% to +60% of normal span

®Viton is a registered trade name of DuPont Performance Elastomers

Performance Specifications

Linearity (Independent)

760P: 0.5% of normal span (typical)
760E: 0.75% of normal span (typical)

Hysteresis

760P: 0.75% of normal span (typical)
760E: 1.0% of normal span (typical)

Deadband

Less than or equal to 0.25% of span

Repeatability

Within 0.5% of span

Supply Pressure Effect

Less than 0.2% of span for a 5 psi change in supply pressure

Hazardous Area Class Approval

Series 760 Approvals & Certifications
FM Approvals:
Intrinsically Safe:
Class I, Division 1, Groups A, B, C, D
Class II, Division 1, Groups E, F and G
Class III, Division 1
When installed in accordance with Siemens drawing 15032-7602 rev.5
Non-incendive:
Class I, Division 2, Groups A, B, C, D
Suitable for:
Class II, Division 2, Groups F and G
Class III, Division 2

CSA Certification
Intrinsically Safe:
Class I, Division 1, Groups A, B, C, D
Class II, Division 1, Groups E, F, G
Class III, Division 1
When installed in accordance with Siemens drawing 15032-7620
Suitable for:
Class I, Division 2, Groups A, B, C, D
Class II, Division 2, Groups E, F, G
Class III, Division 2

CE
EN50081-1 and EN50081-2 Emission
EN61000-6-1 and EN60000-6-2 Immunity

ATEX Certified:
II 2G EEx ia IIC T4/T5/T6
II 3G EEx nL IIC T5
See ATEX Certificates for Service Restrictions
SIRA 03 ATEX 2577X
SIRA 03 ATEX 4578
Enclosure:
Type 4X, in accordance with NEMA Std. 250
Type IP65, in accordance with IEC Std. 529

Valve Positioners

Series 760P/E Valve Positioners

Ordering data

Model Number

Series 760 Valve Controller/Positioner

Basic Model Code No.

• 760 Valve Controller (Positioner)

Order No.

760 ■■■ ■ ■■■■■■ (cont. on page 3.5)

Input signal	
• 4 to 20 mAdc (not available with High Temp. Option)	**E1**
• 3 to 15 psig	**P1**
• 3-27/6-30 psig	**P2**
• 20 to 100 kPa	**P4**
• 0.2 to 1.0 Bar	**P5**
• 0.2 to 1.0 kg/cm^2	**P6**
Action (Rising Stem/Linear or Rotary)	
• 1/2 to 4 inch stroke lever with set of (3) 60° cams	**1**
• 2 to 6 inch stroke lever with set of (3) 60° cams	**2**
• 1/4 turn - 1/2 inch square shaft with set of (3) 90° cams	**3**
• 1/2 to 2 inch stroke lever with set of (3) 60° cams	**4**
• 1/4 turn NAMUR style shaft end with set of (3) 90° cams	**5**
• 1/4 turn - 1/2 inch square shaft with set of (3) 60° cams	**7**
• 1/2 to 4 inch stroke lever with (1) 90° linear cam	**E**
• 2 to 6 inch stroke lever with (1) 90° linear cam	**F**
• 1/4 turn NAMUR shaft with set of (3) 60° cams	**S**
Enclosure Type 4X/IP65 (with 3/4 inch NPT Conduit Connection)	
• Standard	**A**
• With 90° Beacon Indicator (not available with High Temp. Option)	**B**
• With 60° Flat Indicator (not available with High Temp. Option)	**J**
• With 90° Flat Indicator (not available with High Temp. Option)	**K**
Enclosure Type 4X/IP65 (with M25 Conduit Connection)*	
• Standard	**E**
• With 90° Beacon Indicator (not available with High Temp. Option)	**F**
• With 60° Flat Indicator (not available with High Temp. Option)	**N**
• With 90° Flat Indicator (not available with High Temp. Option)	**P**
Flow Capacity	
• Standard Capacity Spool Valve Assembly (Cv = 0.3)	**A**
• High Flow Capacity Spool Valve Assembly (Cv = 0.6)	**B**
• Low Flow Gain Spool Valve Assembly	**C**

NOTES:

1. Fix feedback pin in lever to hold non-linearity error to 3% max. Consult factory for more details.
2. The Low Flow Gain Spool Valve Assembly option can provide more stable operation when the positioner is installed on small volume actuators, i.e. piston diameters less than 4"" (10mm). Consult factory for more details.

*760 with M25 metric enclosure no longer avaialable. For M25 thread requirements, use adapter TGX:16300-1439

Ordering data

Model Number

Order No.

Series 760 Valve Controller/Positioner (cont'd)

Environmental Construction Options
- Standard Temperature (-40°F to +185°F) (-40°C to +85°C)
- High Temp. (-20°F to +300°F)(-29°C to +149°C) avail. on 760P w/ no elec. options or approvals
- Ozone Resistant with Viton® dynamic elastomers and iso-elastomeric spring

Gauges (Not available with Hi Temp. Environmental Construction "C"
- Not Required
- Gauges (set of three gauges)

Limit Switches (Not avail. with Hi Temp Environmental Construction "C"
- Not Required
- Mechanical Switches, (2) SPDT
- Proximity Switches (2) NAMUR type

Feedback Devices (Not avail. with Hi Temp Environmental Construction "C")
- Not Required
- Potentiometer - 1K
- 4 to 20 mAdc Feedback
- Potentiometer - 1K w/SS feedback gear
- 4 to 20 mAdc Feedback w/SS feedback gear

Design Level
- Revision

Electrical Approval
- None
- FM / CSA / ATEX / CE

760 (see page 3.4) A C E N G N 1 2 N 1 2 3 4 D N 6

Series 760 Approvals & Certifications

FM (Factory Mutual) Approvals:
- Intrinsically Safe:
  - Class I, Division 1, Groups A, B, C, D;
  - Class II, Division 1, Groups E, F, G;
  - Class III, Division 1;
- Non-Incendive:
  - Class I, Division 2, Groups A, B, C, D
- Suitable for:
  - Class II, Division 2, Groups E, F, G
  - Class III, Division 2

CSA (Canadian Standards Association) Certification
- Intrinsically Safe:
  - Class I, Division 1, Groups A, B, C, D;
  - Class II, Division 1, Groups E, F, G;
  - Class III, Division 1;
- Suitable for:
  - Class I, Division 2, Groups A, B, C, D;
  - Class II, Division 2, Groups E, F, G
  - Class III, Division 2

NOTES:
1. Fix feedback pin in lever to hold non-linearity error to 3% max. Consult factory for more details.
2. The Low Flow Gain Spool Valve Assembly option can provide more stable operation when the positioner is installed on small volume actuators, i.e. piston diameters less than 4"(10mm). Consult factory for more details.

Ordering data

760 Series Valve Controller/Positioner (cont'd)	Order No.
Conversions	
• Add I/P Module Kit (Converts 760P to 760E)	**16300-1355**
• 3-15 PSI Input Spring (Std. Temp.)	**16300-331**
• (3) Pressure Gauge Kit	**16300-442**
• Add 90° Beacon Indicator Kit (for 1/4 Turn Actuators)	**16300-488**
• Add 60° Flat Indicator Kit (for Lever Action Actuators)	**16300-486**
• Add 90° Flat Indicator Kit (for 1/4 Turn Actuators)	**16300-487**
• 3-15 PSI Conversion Kit (Hi Temp)	**16300-640**
• 3-27/6-30 psi Conversion Kit (Std. Temp)	**16300-771**
• Hi-temps 3/27 PSI	**16300-772**
Options	
• Add Mechanical Limit Switches Kit (2) SPDT	**16300-500**
• Add Proximity Limit Switches Kit (2) NAMUR type	**16300-501**
• Add 1K Feedback Potentiometer Kit	**16300-503**
• Add 4 to 20 mAdc Feedback Kit	**16300-502**
• Add Mechanical Limit Switches & 1K Feedback Potentiometer Kit	**16300-505**
• Add Mechanical Limit Switches & 4 to 20 mAdc Feedback Kit	**16300-504**
• Add Proximity Limit Switches & 1K Feedback Potentiometer Kit	**16300-507**
• Add Proximity Limit Switches & 4 to 20 mAdc Feedback Kit	**16300-506**
• Add 1K Feedback Potentiometer Kit w/SS feedback gear	**16300-580**
• Add 4 to 20 mAdc Feedback Kit w/SS feedback gear	**16300-577**
• Add Mechanical Limit Switches & 1K Feedback Potentiometer Kit w/SS feedback gear	**16300-581**
• Add Mechanical Limit Switches & 4 to 20 mAdc Feedback Kit w/SS feedback gear	**16300-578**
• Add Proximity Limit Switches & 1K Feedback Potentiometer Kit w/SS feedback gear	**16300-582**
• Add Proximity Limit Switches & 4 to 20 mAdc Feedback Kit w/SS feedback gear	**16300-579**
Note: Above listed options are limited to standard upper temperature limit of +185° F.	
• Standard Flow Spool Valve Kit	**16300-468**
• High Flow Spool Valve Kit	**16300-469**
• Low Gain Spool Valve Kit	**16300-470**
• Sealing Plate Kit (converts 760E to 760P)	**16300-641**
Cams	
• 760 P/E Cam Kit, rotary 90° Action (3 cams: Linear, QO, =%)	**16300-783**
• 760 P/E Cam Kit, linear 60° Action (3 cams: Linear, QO, =%)	**16300-784**
• 75° Rectilinear-Linear	**16300-805**
• Cam, 180° - CW, Rotary -Linear	**16300-807**
• Cam, 30° - Rectelinear - Linea	**16300-816**
• Blank Cam Kit	**16300-267**
• Cam, 180° - CCW, Rotary-Linear	**A6X30005613**
Spare Parts Kits	
• Spare Parts Kit includes all recommended rebuild parts as shown in SD760, Issue 7	**16300-686**
Accessories	
• Manual	**SD760**
• User Manual CD (included with each instrument)	

Introduction

Features & Benefits

- Single-axis, force-balance principle of operation, ensures accurate and stable positioning
- Feedback circuits direct the actuator's position, ensuring adherence to the control instrument signal
- Range spring capability accommodates a wide variety of valve strokes and instrument spans

Description

The Series 73 Built-in Valve Positioners use the full force of their air supply to drive and maintain the piston or diaphragm in a pneumatic actuator to position a valve to what is required by a control instrument, regardless of the presence of forces that change valve position.

This line of compact instruments incorporates a single-axis, force-balance principle of operation to ensure accurate and stable control valve positioning. In all cases, including bottom-loading applications, a Model 73 Built-In Valve Positioner is mounted directly on the topwork of the valve, with no external levers or other exposed mechanisms.

Each positioner receives a signal from a control instrument, and using an air supply as high as 100 psig, the positioner strokes the valve actuator to the required position.

Like all valve positioners, the Model 73 Built-In Valve Positioners have feedback circuits designed to measure the position of the actuator's piston or diaphragm. The positioner then supplies or exhausts air to bring the actuator within the required range for its corresponding control instrument.

The position of the piston or diaphragm in the valve actuator is sensed by the amount of compressive force exerted by a range spring on the valve positioner's diaphragm assembly. By selecting the appropriate range spring from the wide selection available almost any combination of valve stroke (from 1/4" to 4") and instrument span (from 2 to 24 psi) can be obtained.

Specifications

Functional Specifications

Input Range

3-15, 3-9, 9-15, 6-30, 3-27 psig

Valve Travel

Minimum: 1/4"
Maximum: 4"

Supply Pressure

Minimum: 3 psi above required actuator pressure
Maximum: 100 psig

Air Consumption

(In balance condition with 20 psig supply and 9 psig dead-ended output)

- 73N_F: 0.25 scfm
- 73N_B: 0.6 scfm

Overrange Limit

150 psig to any connection

Response Level

(output sensitivity to input pressure changes)

- 73N_F: 0.1% of input span
- 73N_B: 0.25% of input span

Functional Mechanical

Materials of Construction

Aluminum, brass, stainless steel, Neoprene®, and/or Buna-N

Model Selection

Model	Type of Application
73N12F	Top-loading, direct-acting, input spans of 2 to 12 psi
73N24F	Top-loading, direct-acting, input spans over 12 to 24 psi
73N-FR	Top-loading, reverse-acting
73N-B	Bottom-loading, direct-acting, with top air-cushion loading
73N-B1	Bottom-loading actuators w/actuator range spring

Valve Positioners

Series 73 Built-In Valve Positioner

Technical data

Spring Table

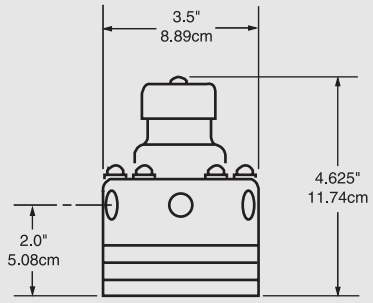
Instrument Input Pressure Span (PSI)									
	4	5	6	8	10	12	16	20	24
Valve Stroke Inches	**- Item No. of Range Spring Series 12395 Series ±5% Stroke Range Tolerance Example: 12395-1212**								
1/4	1212	1012	812	612	512	412			
5/16	1612	1212	1012	712	612	512			
3/8	1812	1412	1212	1012	712	612			
7/16	2012	1812	1412	1012	812	712			
1/2	2412	2012	1612	1212	1012	812			
9/16	2812	2012	1812	1412	1012	1012			
5/8	3212	2412	2012	1612	1212	1012			
3/4	3612	2812	2412	1812	1412	1212			
7/8	4412	3612	2812	2012	1812	1412			
1	4812	4012	3212	2412	2012	1612			
1-1/8	5612	4412	3612	2812	2012	1812			
1-1/4	6412	4812	4012	3212	2412	2012			
1-1/2		6412*	4812	3612	2812	2412			
1-5/8		6412*	4812	4012	3212	2612			
1-3/4		6412*	5612	4412	3612	2812			
2			6412*	4812	4012	3212			
2-1/4				5612	4412	3612			
2-1/2				6412*	4812	4012			
2-3/4				6412*	4812	4412			
3					6412*	4812			
3-1/2						5612	***Consult Factory***		
4						6412*			

1) The maximum zero pressure for Model 73N12F is 9 psig when the 12395 series range spring is used.

2) The maximum zero pressure for Model 73N24F is 15 psig for instrument pressure spans of 16 psi or greater, and 28 psig when used for spans of 12 psi or less.

3) The maximum instrument pressure for Model 73N-FR is 15 psig for instrument pressure spans of 12 psi or less, and 27 psi for spans of 16 psi or greater.

Mounting Dimensions



The topworks of the valve must have six, 1/4-20 x 9/16 deep (min.) blind tapped, equally spaced holes for mounting positioner

Spring Selection

1. Find the valve stroke nearest the desired valve stroke.
2. Find the instrument input pressure span nearest the desired instrument input pressure span.
3. Select the proper range spring at the intersection of the valve stroke and the instrument input pressure span columns.

Introduction

Features & Benefits

- Double-acting or single-acting service accommodates installation in a variety of environments
- Field reversibility reduces downtime and simplifies maintenance
- Choice of continuously adjustable standard stroke ranging from 1/4" to 48" and continuous span and zero adjustability within range spring limits provide application versatility
- Extra high capacity pilots ensure maximum frequency response and optimum stroking speeds for all actuator sizes
- Negative feedback pilot circuit allows the positioner to operate with a push-pull gain of more than 900:1 (using 100 psig supply) with no sacrifice in stability

Description

The Model Series 74 Valve Positioners are universal positioners that provide versatility, dynamic performance, and high positioning accuracy. They use the piston or diaphragm in a pneumatic actuator to position a valve to what is required by a control instrument and hold that position, regardless of the presence of forces that change valve position. As such, supply pressure variations have little or no effect on the positioner output, which eliminates the need for a supply pressure regulator.

These valve positioners are two-stage, pilot-operated instruments. The pilot circuit activates dual-output boosters, which perform opposite actions (when one booster is supplying air, the other is exhausting air.) This “push-pull” action applies to a full differential (supply pressure to atmosphere) across the actuator to drive the valve to the position required by the control instrument signal.

Model 74 Valve Positioners can also be used for single-acting service on a spring-loaded actuator. In this case, one of the pilot-booster connections is plugged. See below for rotary-type actuators.

Specifications

Input Ranges

3-15, 3-9, 3-27, 0-15, and 0-30 psig including split ranges within these basic ranges

Valve-Stroke Ranges[1]

1/4" minimum
48" maximum

Supply Pressure

3 psig above full actuator pressure minimum
150 psig maximum

Air Consumption

0.2 scfm (inbalanced condition with 20 psig supply)

Overload Protection

150 psig at any connection

Response Level

Output is sensitive to control signal changes as small as 0.1% of full range

Ambient Temperature Range

-40 to 180°F (-40 to 82°C)

Materials of Construction

Aluminum, brass, stainless steel, and Buna-N

Rotary Actuators Kit

The Series 74 Rotary Actuator Kits allows for compact installation of a complete assembly (positioner and mounting) to fit inside a 5"x 5"x2-2/3" envelope. The kit’s direct connected feedback spring eliminates error-prone connections and levers, while its spiral feedback spring provides inherent reliability.

Response Level

0.1% F.S.

Linearity

±1.5% F.S.

Input Range

3-9, 9-15[2], 3-15 psig

Actuator Motion

90° Rotation

1) See next page for additional performance data, design specifications, and a range spring selection chart.
2) 9-15 psig range requires a suppression spring.

Valve Positioners

Series 74 Valve Positioners

Ordering data

Model Number — Order No.

Valve Positioner

Sensitivity

Standard Pilot & Standard Gain

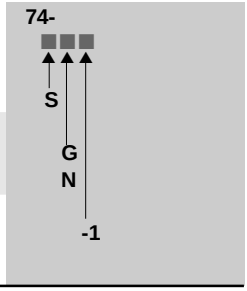
- Stabilizing Pilot & Reduced Gain

Gauge Option

- With 3 Gauges
- Without Gauges

Intermediate Sensitivity

- Standard Pilot & Reduced Gain (74S only)



Accessories

- Rectilinear Range Spring Kits - Rectilinear range spring kits include a range spring, zero screw, (2) range spring seats, and instructions. All kits include the (2) range spring seats, P/N 12372-384 (not listed below).
- Rotary Range Spring Kits - The table below lists the kit numbers, spring assembly numbers, and their color codes.
- Zero Suppression Spring Kits - Zero suppression spring kits include a suppression spring and a spring seat. All kits include the P/N 12372-254 spring seat (not listed below).

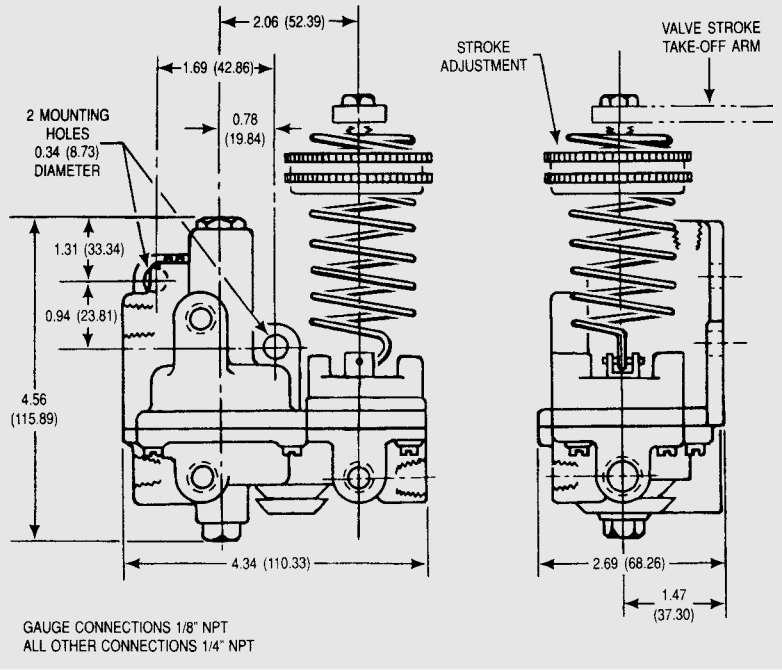
Range Spring Kit Table

Acutator Stroke - Inches -	Kit and Parts	Instrument Input Pressure Range - psig				
		3-15	3-9	3-27	0-30	0-15
1/4 to 1-1/2	Kit No. Spring No. Color Code Screw No.	14995-101 14996-1 Black 12372-274				
1-1/2 to 2-3/4	Kit No. Spring No. Color Code Screw No.	14995-102 14996-2 White 12372-273		***Consult Factory***		
2-3/4 to 4	Kit No. Spring No. Color Code Screw No.	14995-103 14996-3 Blue 12372-273				
4 to 6	Kit No. Spring No. Color Code Screw No.	14995-119 14996-102 Brown 12372-292		N/A		
6 to 9	Kit No. Spring No. Color Code Screw No.	14995-117 14996-104 Green 12372-292			N/A	
9 to 12	Kit No. Spring No. Color Code Screw No.	14995-120 14996-106 Red 12372-3034	***Consult Factory***		N/A	
12 to 19	Kit No. Spring No. Color Code Screw No.	14995-118 14996-110 Orange 12372-303		N/A		
48	Kit No. Spring No. Color Code Screw No.	14995-121 14996-111 None 12372-296		N/A		

Rotary Range Spring Kit

	Rotation of Actuator Shaft	Clockwise		Counterclockwise	
	Instrument Input Range -psig-	3-9	3-15	3-9	3-15
Kit Supplied Without Mounting Plate	Kit No. Spring No. Color Code	Consult Factory	14923-154 14923-70 White	Consult Factory	14923-104 14923-71 Red
Kit Supplied With Mounting Plate	Kit No. Spring No. Color Code	Consult Factory	14923-154 14923-70 White	Consult Factory	14923-103 14923-71 Red

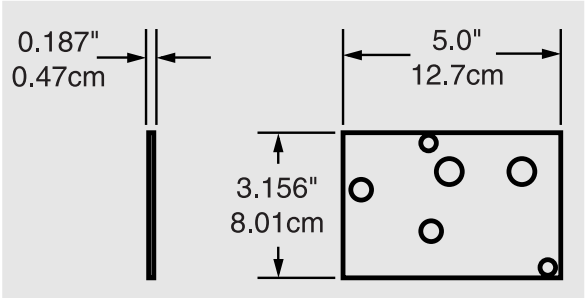
Mounting Dimensions



Mounting Dimensions, Rotary Kit

The actuator extension shaft must be 0.3125" ±0.0010" and capable of withstanding 100 inch-pounds of torque (pinned assembly recommended).

Installer to drill and mount the base plate so that the appropriate feedback hole (clockwise or counter-clockwise rotation) is concentric with actuator extension shaft.



Transducers

Models 77 and 771 Current-to-Pneumatic Transducers

Introduction

Features & Benefits

- High signal sensitivity for demanding applications
- Simplified design ensures simplified operation
- Rugged, NEMA construction, with insensitivity to shock, vibration, and supply pressure variations accommodate operation in harsh industrial environments
- Choice of output capacities provides application versatility

Description

The Models 77 and 771 convert a DC millampere input signal to a pneumatic output signal directly proportional to the input. Their rugged design and ability to withstand shock and vibration allow them to be installed in even the harshest industrial environments.

Model 77 Current-to-Pneumatic Transducer

The Model 77 Current-to-Pneumatic Transducer, which was designed specifically for measuring circuits, converts the output of an electronic measuring device to a pneumatic signal for indication, recording, computation, or control. It can also be used to convert an electronic controller's signal to operate a final control element, such as a control valve circuit that requires a high degree of accuracy.

The Model 77 is typically used to signal a valve positioner. If it is used for direct-loading of valve actuators or other large volumes, a volume booster relay is required to minimize time lags and the effects of leakage.

Model 771 Current-to-Pneumatic Transducers

The Model 771 Current-to-Pneumatic Transducers were designed as a cost-effective valve service current-to-pneumatic transducer.

The Model 771 receives the output signal of an electronic device, such as a PID control function, and drives a control valve via the transducer until the control function is satisfied. For measuring circuits, or for control circuits requiring a higher degree of transducing accuracy, the Model 77 should be used.

Because it's boosted output capacity minimizes time lags and the effects of leakage, the Model 771B should be used for direct-loading of valve actuators or other large volumes. If the valve actuator includes a valve positioner, a Model 771S should be used.

Specifications – Model 77

Functional Specifications

Supply Pressure

20 psig, ±2 psig for 3-15 psig output
30 psig, ±2 psig for 3-27 psig output

Input/Output Data

See Model Selection

Model 77

For general purpose and non-incendive applications

Model 77F

For intrinsically-safe applications

Zero Offset Adjustment

+40% and -20% of span

Pneumatic Connections

1/4" NPT

Output Capacity

0.16 scfm

Supply Pressure Effect

Less than 1% of span (change of output for supply change from 18 to 22 psig)

Temperature Range

-40 to 180°F (-40 to 82°C)

Electrical Connections

Enclosed terminal block, 1/2" threaded

Surface Mounting

Two 1/4 x 20 x 5/16" deep blind tapped holes

Enclosure

NEMA 3R
NEMA 4 via conduit vent

Electrical Classification

FM Approved
Model 77
Non-incendive for Class I, Div. 2, Groups A, B, C, D. Dust-ignition proof for Class II, Div. 1, Groups E, F, G. Suitable for Class III, Div. 1 hazardous locations and NEMA 4.

Model 77XXF
Intrinsically safe for Class I/II/III, Div. 1, Groups A, B, C, D, E, F, G and NEMA 4 when used with approved barriers and converters listed on Siemens drawing #15032-7704/7705.

Performance Specifications

Calibration Accuracy

±0.25% of span

Reproducibility

0.2% of span

Response Level

0.025% of span

Model Number

Order No.

Current-to-Pneumatic Transducer

77- ■■■■ - ■

Exhaust
- Atmospheric
- Tapped Exhaust

Input/Output

Input Range[1] (mA dc)	Output Range (psig)	Input Impedence (Ohms)
1 to 5	3 to 15	2450
0 to 4	3 to 15	2450
4 to 20	3 to 27	610
4 to 20	3 to 15	185
10 to 50	3 to 15	30

Intrinsically-Safe Designation
- Intrinsically Safe (omit for other classifications)

Accessories
- Reverse Acting Output

- E
- 3
- 3A
- 8
- 16
- 40
- F
- R

Specifications – Series 771

Functional Specifications

Supply Pressure

20 psig (35 psig for 771-8_ _ _)

Input/Output Data

See Model Selection

Zero Offset Adjustment

+40% and –20% of span

Output Capacity

Standard: 0.16 scfm
Boosted: 2.0 scfm

Supply Pressure Effect

Less than 2% of span (change of output for supply change from 18 to 22 psig)

Temperature Range

-40 to 180°F (-40 to 82°C)

Electrical Connections

Enclosed terminal block, 1/2" threaded

Enclosed

NEMA 3R
NEMA 4 via conduit vent

Electrical Classification

FM Approved
Series 771_ _ _ F1: Intrinsically safe for Class I/II/III, Div. I, Groups A, B, C, D, E, F, G when used with approved barriers and converters listed on Siemens drawing #15032-7704/7705.

Series 771_ _ _ F2: Non-incendive for Class I, Div. 2, Groups, A, B, C, D. Dust-ignition proof for Class II, Div. 1, Groups E, F and G. Suitable for Class III, Div. 1 hazardous locations.

Performance Specifications

Calibration Accuracy

±1/2% of span standard unit
±1% of span boosted unit

Reproducibility

0.2% of span

Response Level

0.025% of span

1) Other input ranges available; 0 - 3 mA to 0-60 mA, consult factory.

Transducers

Models 77 and 771 Current-to-Pneumatic Transducers

Ordering data

Model Number

Current-to-Pneumatic Transducer

Order No. **771-** ■■■■

Input/Output

Input Range[1] (mA dc)	Output Range (psig)	Input Impedence (Ohms)	
1 to 5	3 to 15	2450	**3**
4 to 20	3 to 27	610	**8**
4 to 20	3 to 15	185	**16**
10 to 50	3 to 15	30	**40**

Output Capacity

- Boosted — **B**
- Standard — **S**

Terminal Strip — **T**

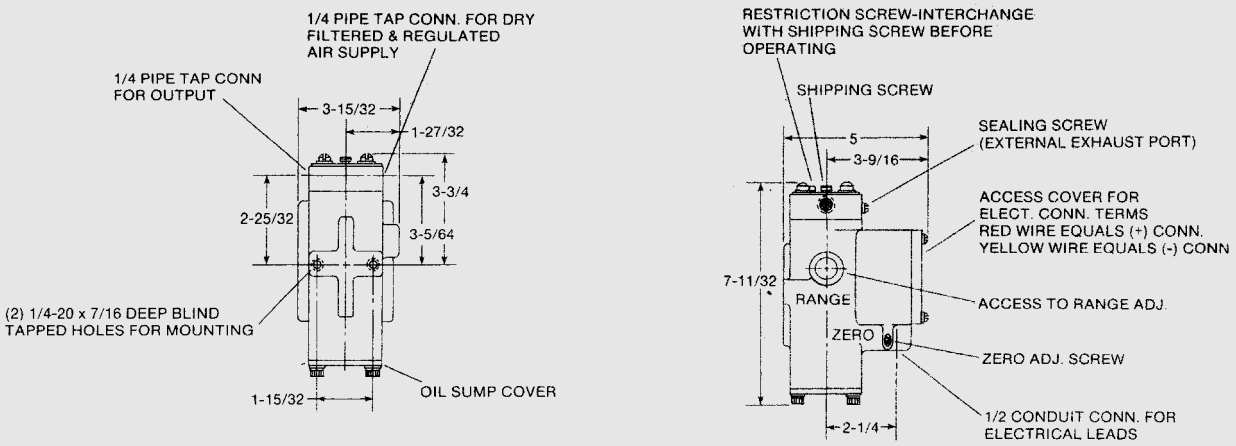
Electrical Approval

- None Required — **N**
- Intrinsically Safe — **F1**
- Non-incendive — **F2**

Accessories

- P/N 12330-100 - Wall Mount Bracket
- P/N 12334-130 - Pipe Mounting Bracket
- Reverse Acting (not available on the Model 771-8) Increase input; decrease output. Add "R" to model number.

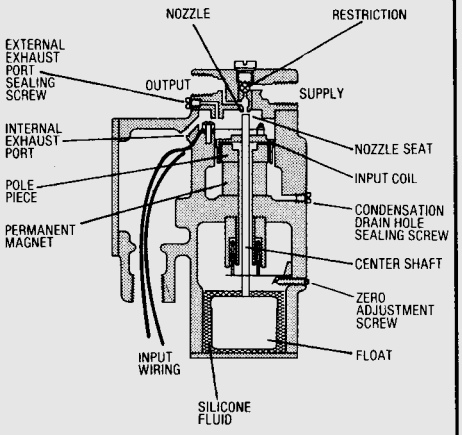
Mounting Dimensions – Model 77



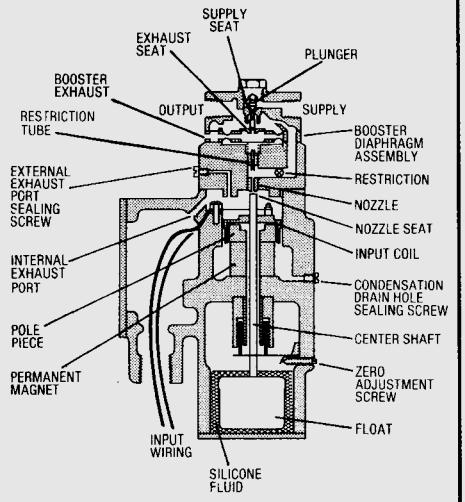
NOTES:

1. ALL CONNECTIONS ARE 1/4 NPT EXCEPT AS SHOWN.
2. MUST BE MOUNTED VERTICALLY (±10°) AS SHOWN.
3. FLAT ADAPTER PLATE (P/N 12330-100) AVAILABLE TO MOUNT TRANSDUCER ON A BLIND WALL.

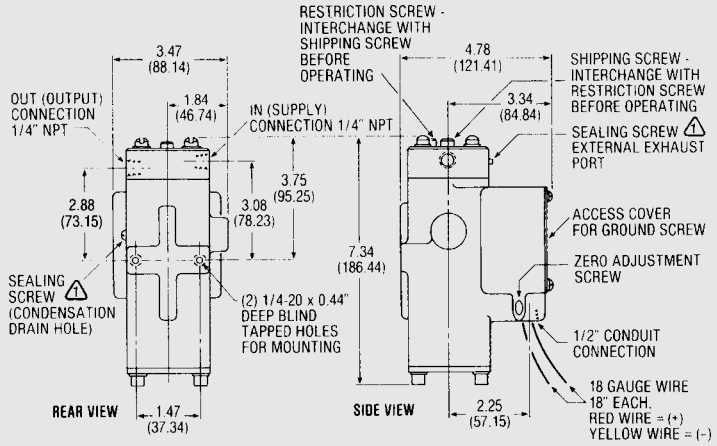
Mounting Dimensions – Model 771 S/B



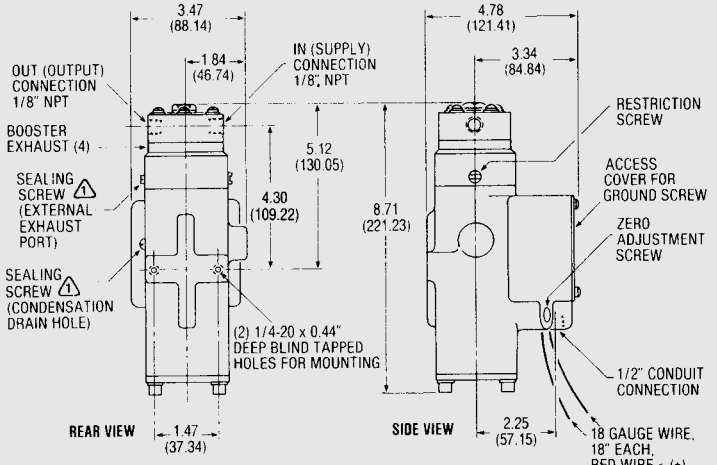
MODEL SERIES 771S
Standard Output Capacity



MODEL SERIES 771B
Boosted Output Capacity



MODEL SERIES 771S
Standard Output Capacity



MODEL SERIES 771B
Boosted Output Capacity

NOTES:

⚠1 Sealing screw must not be removed in a Class II hazardous location or under any NEMA 4 condition.

2. Dimensions are shown in inches and (millimeters).
3. Clearance of at least 5" (127MM) must be left above the top when mounting the transducer to permit removal of shipping and restriction screws and top cap (standard capacity models) and retaining nut (boosted models).
4. Transducer must be installed so that water cannot enter booster exhaust under NEMA 4 conditions (boosted models).
5. Transducer must be installed within 10° of vertical.

Models 40, 41, and 42 Precision Pressure Regulators

Introduction

Features & Benefits

- Multi-stage, low-droop precision regulators maintain constant output over wide changes in flow and supply pressure
- Epoxy powder coat paint delivers improved corrosion resistance
- Wide selection of regulated pressures [1" to 450 psi] affords application versatility
- Patented Nullmatic pressure regulation system provides reliable maintenance-free operation

Description

The Models 40, 41, and 42 Precision Pressure Regulators control air pressures in applications where precise and dependable regulation is required, such as pneumatic instrument circuits, test stands, product on checking fixtures, and industrial air gages As such, they are suitable for dead-end service, and flows up to a maximum of 110 scfm.

A unique, two-stage piloted design provides outstanding accuracy. Rugged construction—with no links, levers, pivots, or other friction-producing members—ensures reliable, maintenance-free operation. These features allow a regulator to maintain constant output pressure, regardless of even the w dest changes In flow or supply pressures. In fact, a regulator using a Model 40, 41, or 42 is practically a self-contained pressure controller operating its supply-plunger valve via a built-in, high gain pneumatic amplifier.

A fine-turn, precision screw is used to manually load the range spr ng, which sets the regulated pressure. When the adjusting knob is turned clockwise, the increased spring force is exerted on the top diaphragm assembly, decreasing the nozzle clearance and increas ng the pilot pressure. Because the source for pilot pressure is supply air flowing to the pilot pressure chamber through the restriction screw, the increased pilot pressure forces the exhaust diaphragm assembly downward. This act on closes the exhaust port, and contacts and moves the valve plunger, which opens the supply port. This increases the regulated output, which a so feeds back to the top diaphragm assembly. The regulator locks-up or throttles at the new output value when the feedback force of the top diaphragm assembly equals the range spring force.

A safety release valve is incorporated in the top diaphragm assembly of several models It operates if the regulated pressure increases 3 psig more than the set pressure and exhausts air through the atmospheric vent in the top housing. Overpressure causes the diaphragm to move upward, which opens the safety release valve

Specifications

Resolution Adjustment

Better than 0.03% of regulated output

Supply Pressure

Maximum & recommended pressures are listed on page 4.5
Minimum: 5 ps g above regulated output

Supply Pressure Effect

Nominal ratio of change in regulated pressure for a change in supply
1:150 for Model 40 and 42
1: 100 for Model 41

Ambient Temperature Limits

-40 to 180°F (-40 to 80½C)

Ambient Temperature Effect

Approximately 1% of set pressure with standard range spring; for 50°F (27½C) temperature change

Knob Adjustment

Model 40 & 42: Nominal 10% of full range for one complete turn
Model 41: Nominal 15% of full range for one complete turn

Droop Effect

See Graph 1

Maximum Air Flow

See Graph 2

Regulators

Models 40, 41, and 42 Precision Pressure Regulators

Technical data

Air Consumption

See Graph 3

Drift Effect

See Graph 4

Exhaust-Flow Rate (at 25-psig setting)

Pressure rise of 0.25 psig will result from flow of:
Model 40: 1.5 scfm
Model 41: 2.4 scfm
Model 42: 1.7 scfm

Maximum Flow Capacity

See Graph on page 4.4

Standard Mounting

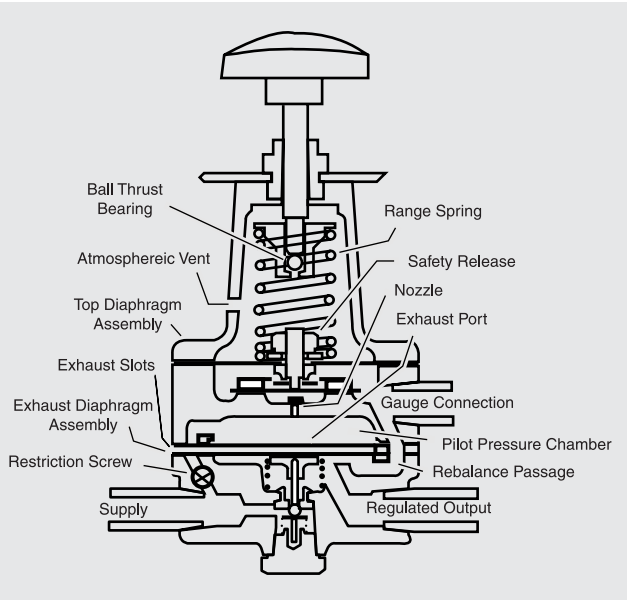
In-line pipe or flush panel up to 1/4" thick (bushing for 3/4" thick panel is optional)
Connections: (supply and outlet)
Model 40: 1/4" NPT
Model 41: 1/8" NPT
Model 42: 1/2" NPT

Materials of Construction (materials in contact with regulated media)

Brass, stainless steel, Neoprene, aluminum, and zinc

Accessories

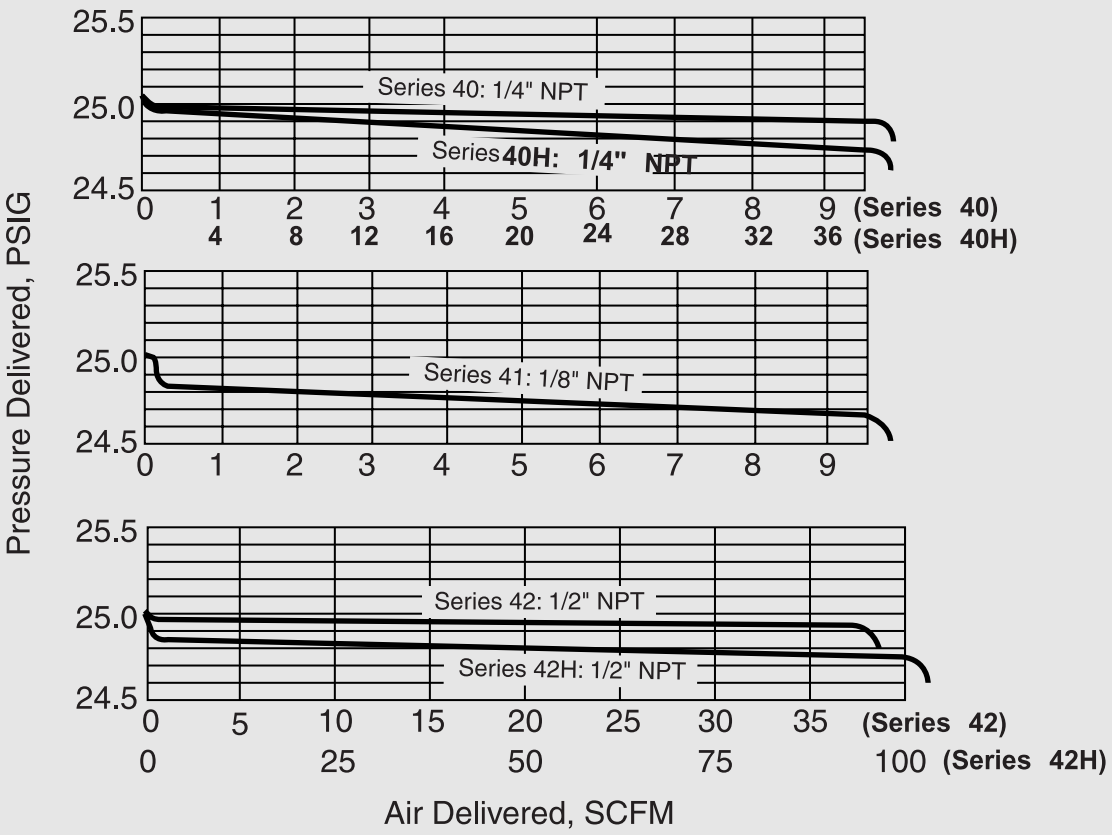
- P/N 2932-19 - Mounting Bracket for surface mounting (Model 40 and Model 42)
- P/N 10963-73 - Mounting Bracket for surface mounting (Model 41)
- P/N 3603-22 - Locknut



Options

- **Air Loading**
  Provision for supplementary air loading (100 psig max) in addition to spring loading
  Model 42: 1/4" NPT
  Model 41: 1/8" NPT
  Model 40-2: Not available
  Add [A] into the model number.
  Example: 40A15
- **Tapped Exhaust**
  Provision for piping exhaust flow away from the regulator
  Model 42: 1/8" NPT
  Model 40 & 41: Not available
  Add [E] into the model number.
  Example: 42E15
- **Deletion of Safety release Valve (SRV)**
  The SRV increases exhaust flow capacity when the regulator must exhaust large flows. Deletion of the SRV will improve drift characteristics (see Graph 4). The SRV is not available with the Seimens 41. It is standard with:
  Model 40: 2, 7, 15, 30, 50 & H50 pressure ranges
  Model 42: 15, 30, 50, H30, & H50 pressure ranges
  To delete the SRV, add an [X] into the model number.
  Example: 40X15

Graph 1 Droop Effect



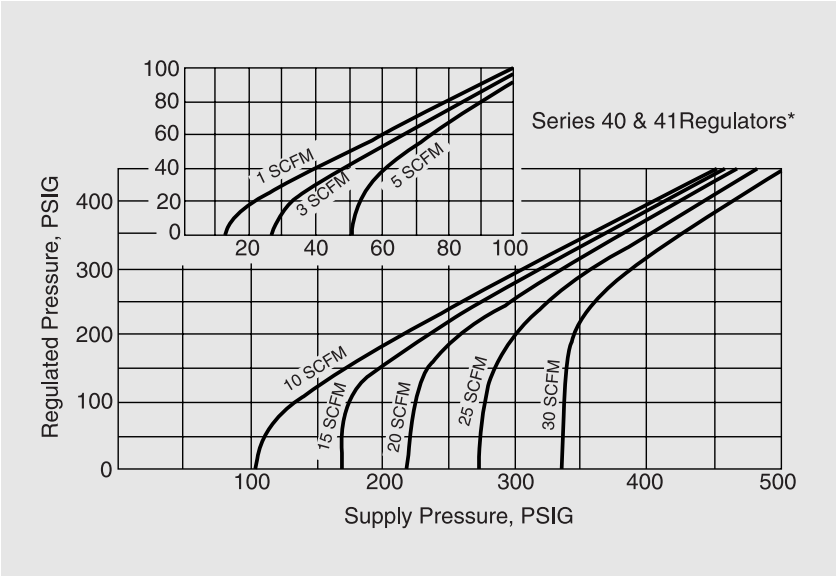
Test Procedure: Each 30-psig-range regulator was adjusted to 25 psig with 100 psig supply and no flow. Flow was increased to maximum capacity. All regulated pressure readings were taken at gauge connection in the body of the regulator.

Regulators

Models 40, 41, and 42 Precision Pressure Regulators

Technical data

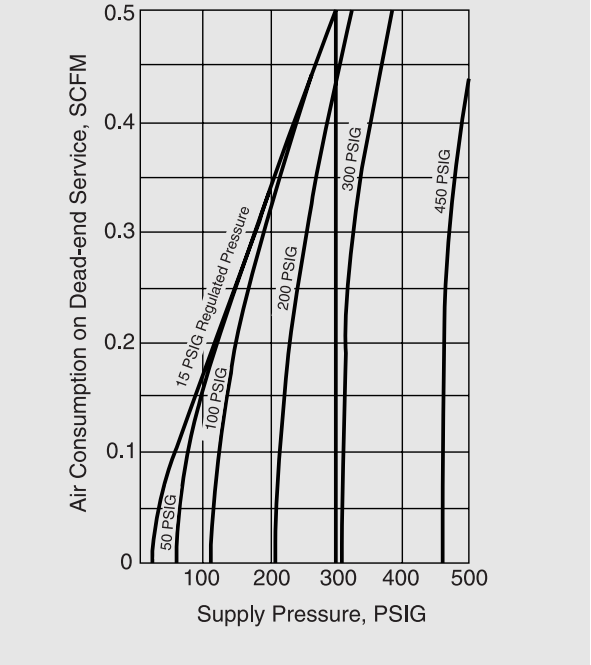
Graph 2 Maximum Air Flow, SCFM Delivered



** Supply pressure for other models will be determined by multiplying the pressure(s) above by the flow values shown below:*

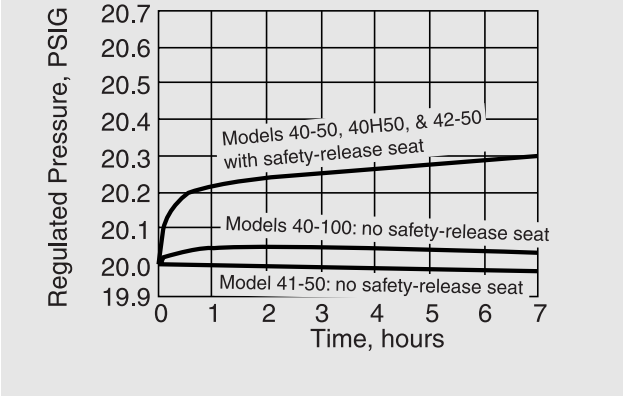
Model	Value
Model 40H	4.5
Model 42	4
Model 42H	14

Graph 3 Air Consumption



The Nullmatic regulator bleeds only the amount of air that passes through the pilot nozzle when there is no demand for output flow. The exhaust port starts to close as soon as the flow of regulated air is increased to the output, and it closes completely before the pilot-plunger valve opens. Full pilot flow is then delivered to the output.

Graph 4 Drift Effect



Test Procedure: Regulators were set at 20 psig output with 100 psig air supply. Supply was turned off for one week, after which supply was turned on at time 0.

Model Selection

		Supply Pressure psig				
Model No.	**Range psig[3]**	**Recommended**	**Maximum**			**Standard Modifications**
40-2[1]	(1-50"H_2O)	5-10	25			X
40-7	(6-200"H_2O)	50	100			A & X
40-15	0.5-15	75	150			A & X
40-30	1-30	120	150			A & X
40-50	1-50	120	150			H, A & X
40-100	1.5-100	150	500			H & A
40-200	3-200	250	500			A
40-300	7-300	350	500			A
40-450	15-450	500	500			A
41-15	0.5-15	75	150			A
41N15[2]	0.5-15	75	150			
41-30	1-30	120	150			A
41-50	1-50	120	150			A
41-100	1.5-100	150	250			A
41-2550	25-50	120	150			
42-15	0.5-15	75	150			A, E & X
42-30	1-30	120	150			H, A, E & X
42-50	1-50	120	150			H, A, E & X
42-100	1.5-100	150	500			H, A & E
42-200	3-200	250	500			A & E

Standard Modifications
H - High flow capacity.
A - With pressure-tight top housing, containing 1/4" NPT connection for supplementary air loading.
E - With 1/8" NPT connection to collect exhaust
X - Without safety release.

1) Includes locknut on adjusting stem (optional for all other models).
2) For use with Model 65 Square-Root Extractor to maintain minimum 3 psig output.
3) At recommended supply pressure.

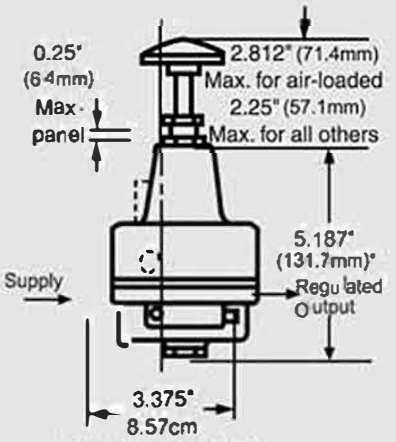
Regulators

Models 40, 41, and 42 Precision Pressure Regulators

Dimensional drawings

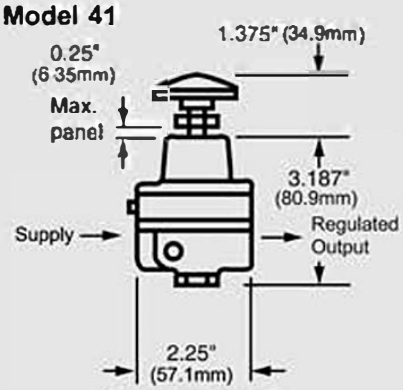
Mounting Dimensions

Model 40



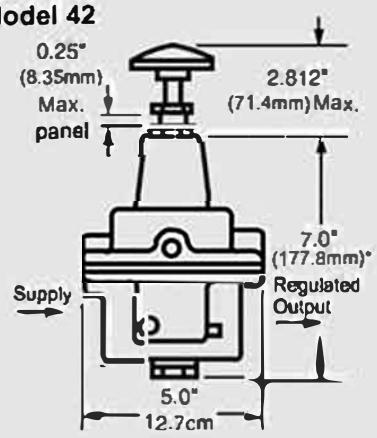
Connections = 1/8" NPT

Model 41



(Connections = 1/8")

Model 42



*Add 0.125" 0.31cm
for 200 psig Models
(Connections = 1/2" NPT)

Model 91-HF Filter-Regulator

Introduction

Features & Benefits

- Stable output and repeatability - provides constant control under variable flowrates and supply pressures.
- Corrosion-resistant construction - aluminum die-castings are finished with Iridite and baked epoxy paint.
- Depth filter -unit comes equipped with high capacity 3 micron filter housed in drip-well
- Self-Relieving
- Low droop at high flow levels - aspirator design helps maintain set pressure at higher flow levels

Tight shut-off - a soft, rubberized valve provides a positive shut-off and compensates for dirt and other foreign matter

Description

The Model 91-HF FilterRegulator is designed to provide clean, accurate air pressure to valve positioners, and other pneumatic control equipment. The filter regulator has been proven to provide long lasting corrosion resistance in harsh industrial environments. The model 91-HF filter regulator is a quality unit that is ideal as an economical alternative for control of process applications.

The Model 91-HF is used extensively to supply air to pneumatic controllers, transmitters, transducers, valve positioners, air cylinders, and a wide range of pneumatic control systems.

Specifications

Performance Specifications

Output Range

0-120 psig (0-800 kPa)

Maximum Supply Pressure

150 psig (1034 kPa)

Flow Capacity

22 SCFM (37.0 m³/hr) at 100 psig (700 kPa)

Exhaust Capacity

0.1 SCFM (0.17 m³/hr) with downstream pressure 5 psig (35 kPa) above set point

Sensitivity

1" (2.5 cm) of water

Air Consumption

Less than 5 SCFM (0.17 m³/hr)

Effect of Supply Pressure Variation

Less than 0.2 psig (1.4 kPa) for 25 psi (170 kPa) change

Ambient Temperature Limits

0 to 160°F (-18 to 71°C)

Mechanical Specifications

Mounting

Pipe or through body

Weight

1.6 lb (725 g)

Port Size

(In, Out, and Gauge) 1/4" NPT

Materials of Construction

Body: Die-cast aluminum alloy, Iridite and baked Epoxy finish

Filter: 3 micron Phenolic impregnated Cellulose

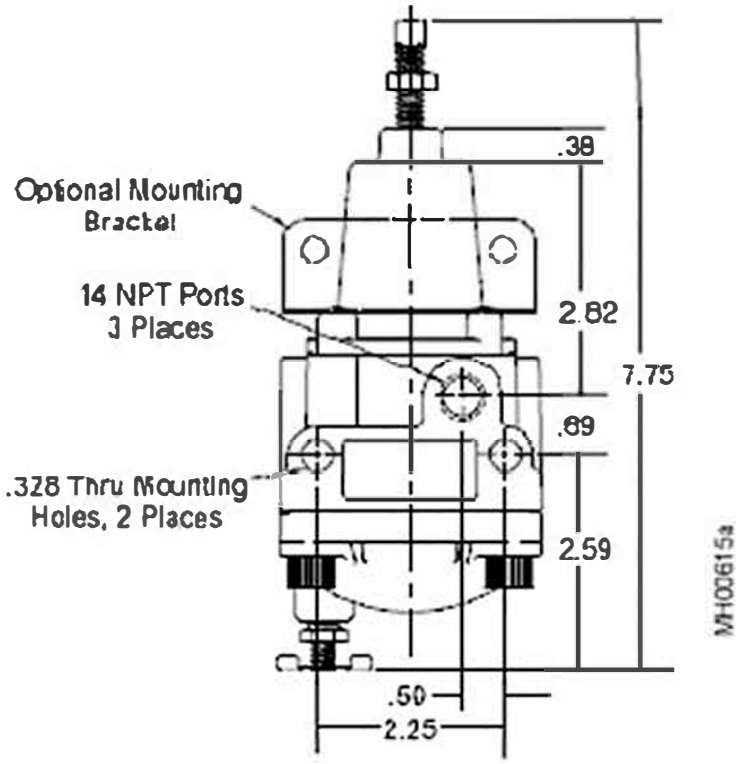
Diaphragm: Nitrile Elastomer and Nylon fabric

Valve Seat Plug: Nitrile Elastomer

Additional Materials: Brass, Zinc plated steel, Acetal

Introduction

Mounting Dimensions



Model 2306 Instrument Air Filter

Introduction

Features & Benefits

- Solid brass construction delivers exceptional durability
- Natural wool filter medium provides unsurpassed coalescing action

Description

The Model 2306 instrument air filter is used to remove dirt, oil, water, and other impurities from an instrument-air supply. This highly efficient instrument-air filter uses the principle of coalescence to trap fine particles in a dripwell.

Air enters the filter through the inlet connected to a cylindrical filter cartridge. After the air is filtered as it passes through the cartridge, it flows up between the cartridge and the outer housing.

As the air flows downward through the lamb's wool filtering medium, oil and water particles coalesce. The steady blow down action of the incoming air maintains high filtering efficiency by cleaning the filter cartridge continuously, while the natural force of gravity forces the coalesced materials to collect at the bottom of the dripwell.

A simple petcock permits the filter to be blown down periodically.

If accumulated dirt and scale make it necessary to replace the filter cartridge, the replacement may be effected without disturbing inlet and outlet connections by turning the housing out of the cap.

Specifications

Functional Specifications

Recommended Flow for Optimum Efficiency[1]

0.5 scfm at 75 psig (14 dm^3/m at 520 kPa)

Maximum Supply Pressure

1000 psig (69 bar)

Performance Specifications

Pressure Droop Through Filter with 75 psig Supply

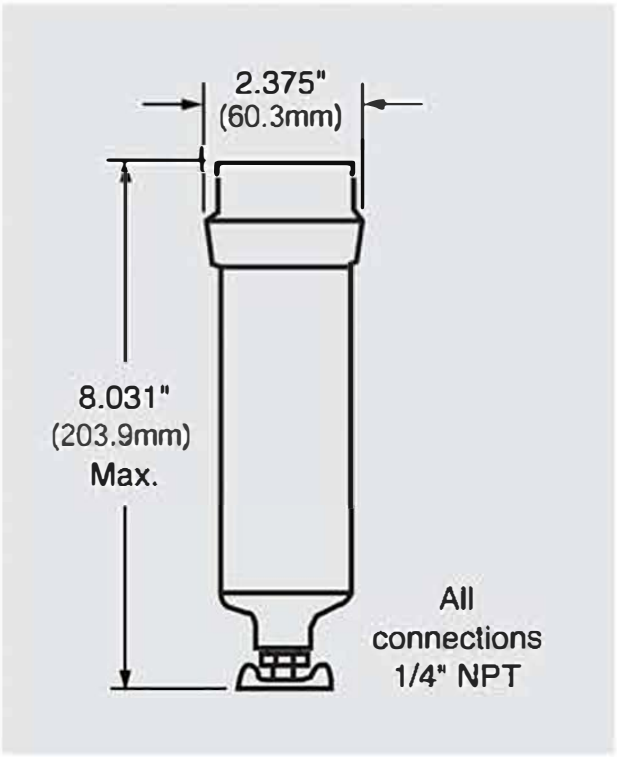
Pressure and 0.5 scfm flow approximately 1/4 psi (2 kPa)

Mechanical Specifications

Materials of Construction

Brass, aluminum, lamb's wool, and neoprene.

Mounting Dimensions



1) Flow capacities at higher or lower supply pressures will vary in direct proportion to the absolute pressure.

Relays
Series 61 Booster Relays

Introduction

Features & Benefits

- Force-balance principle produces a proportional output for pneumatic circuit flexibility
- Built-in stability needle valve on the 61H and 61VH minimizes piping needs
- Improved valve stroking speed for better process control
- Epoxy powder coating provides improved corrosion resistance
- Accurate 1:1 signal relay provides pneumatic circuit design flexibility

Description

The Series 61 Booster Relays reproduce pneumatic signals in a 1:1 ratio for applications where input isolation or increased flow capacity are required. Various models are available to meet a wide range of requirements.

Valve Service

Model 61H High-Capacity Booster Relay

The Model 61H High-Capacity Booster Relay was designed to improve the stroking speed of large diaphragm valves. As such, it incorporates a stabilizing bypass needle valve between the input and output, eliminating the need for an external y piped bypass.

Model 61VH High-Capacity Booster Relay

The Model 61VH High-Capacity Booster Relay was designed for use on control valve actuators that require very fast strok ng speeds. As such, it incorporates a stabilizing bypass needle valve between the input and output, eliminating the need for an externally piped bypass.

Pneumatic Control

Model 61L Moderate Accuracy Booster Re ay

The Model 61L Moderate Accuracy Booster Relay combines moderate accuracy with a moderate capacity (approximately 4.5 scfm output at 9 psi). Like the Model 61H relay, this instrument is used primarily in straight forward valve-booster applications.

Model 61F High Accuracy Booster Relay

The Model 61F High Accuracy Booster Relay via the sensitive preformed diaphragms in this relay provides greater accuracy in 1:1 transmission. Its output capacity is about 1/4 that of the Model 61L. As such, it is suitable for use in measuring c rcuits.

Model 61H is shown

Model 61FE Booster Relay

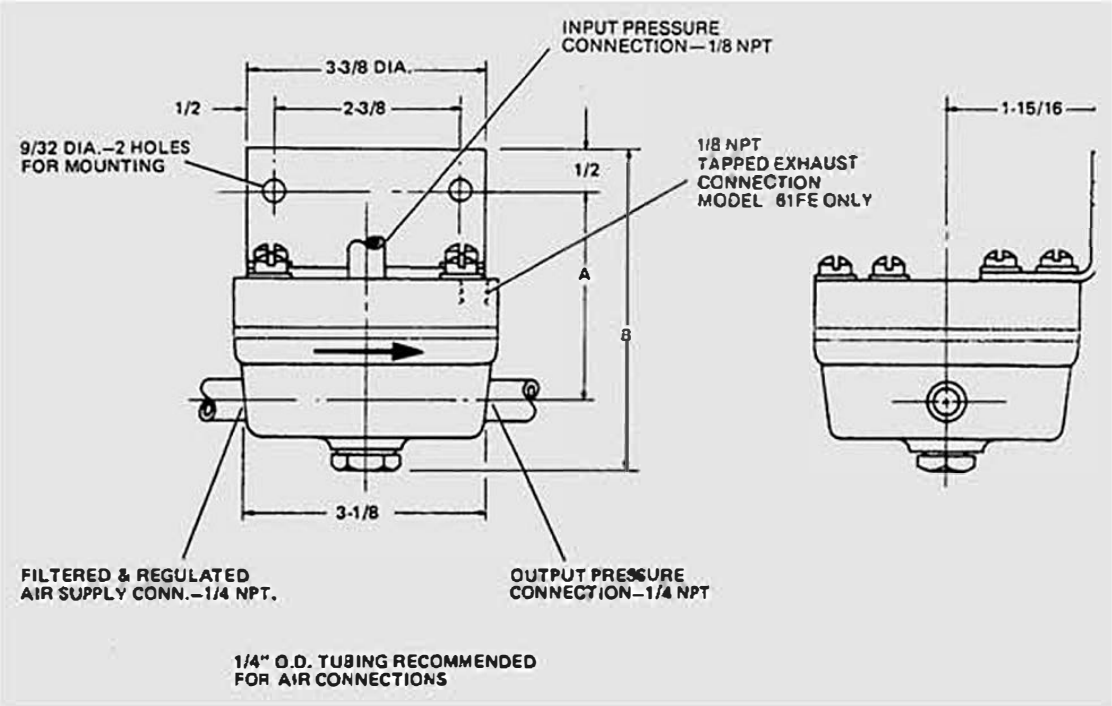
The Model 61FE Booster Relay is similar to the Model 61F; however, it also includes a 1/8" NPT connection for those appl cations where a tapped exhaust is required.

Operation

Input pressure, acting upon the effective area of the upper diaphragm, produces a force that is opposed by the output pressure exerted upon the effective area of the lower diaphragm. The opposing forces are in a direct 1:1 ratio. As such, any increase in the input pressure will depress the diaphragm assembly and open the pilot valve to admit a sufficient supply of air to the output. This re-balances the input pressure. A decrease in input pressure will cause the diaphragm assembly to lift off the exhaust port, which reduces the output and re-balances the input.

Specifications

Model	61H	61L	61F & 61FE
Normal Input & Output Pressure	3-15	3-15	3-15
Maximum Input Pressure	100 psi	100 psi	50 psi
Maximum Supply Pressure	100 psi	100 psi	50 psi
Overload Protection to any Connection	100 psi	100 psi	100 psi
Accuracy of 1:1 Ratio	5%	2%	0.5%
Zero Error	-----	3%	1%
Reproducibility[1]	0.1%	0.1%	0.02%
Linearity[1]	0.4%	0.4%	0.1%
Ambient Temperature Limits		-40 to 180°F	
Flow Capacity[2]	10.5 scfm	4.5 scfm	2.4 scfm

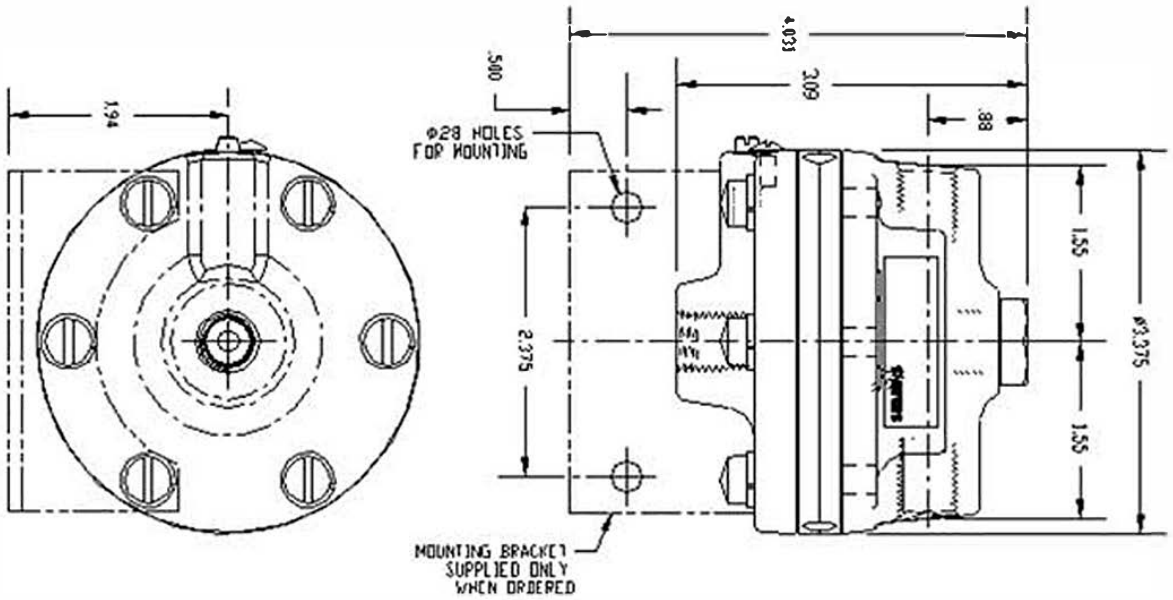


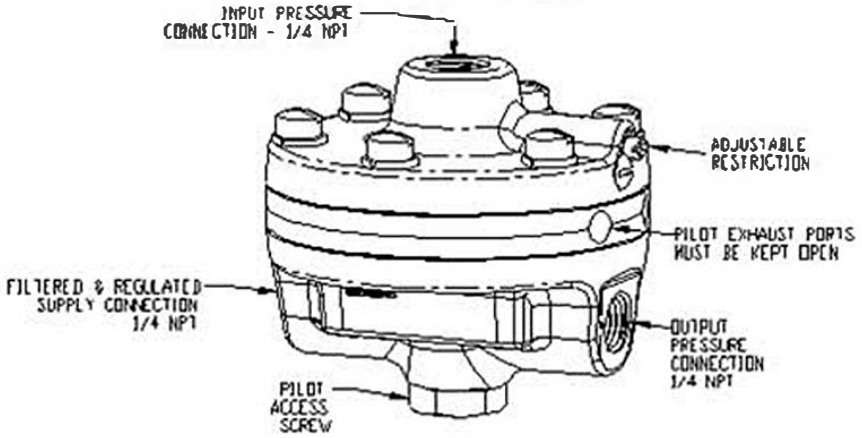
Model	A	B
61F, 61FE	2-13/16	4-3/16
61L	2-5/8	4

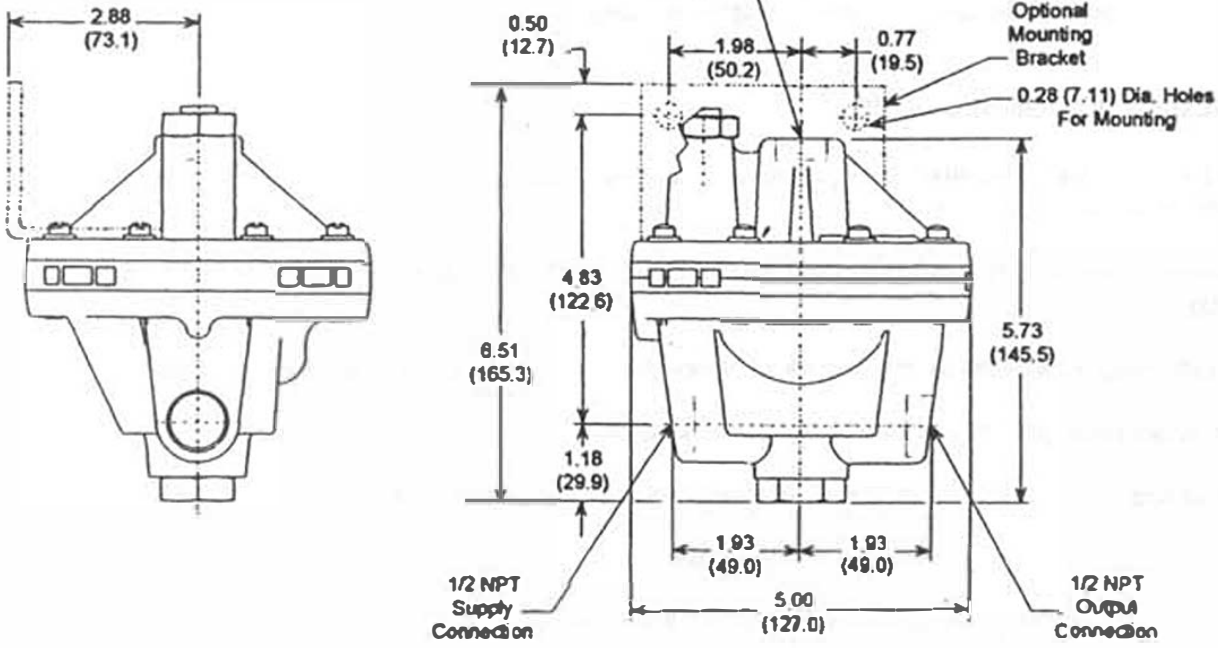
1) These performance figures are based on a 3-15 psi input.
2) Flow causes output pressure to droop 1 psi at 9 psi output with 20 psi supply.

Model 61H Booster Relays

Technical data






2.88
(73.1)
1/4 NPT
Input
Connection
0.50
(12.7)
1.98
(50.2)
0.77
(19.5)
Optional
Mounting
Bracket
0.28 (7.11) Dia. Holes
For Mounting
4.83
(122.6)
6.51
(165.3)
5.73
(145.5)
1.18
(29.9)
1.93
(49.0)
1.93
(49.0)
1/2 NPT
Supply
Connection
5.00
(127.0)
1/2 NPT
Output
Connection

Relays

Series 62 Constant-Differential Relays

Introduction

Features & Benefits

- The ability to maintain constant-differential pressure drop across a built-in needle valve ensures a constant volumetric flow rate
- Maintains constant bubbling rate in liquid level applications, eliminating the problems of typical conventional bubbling systems
- The ability to produce reasonable purge rates eliminates the need for a supply regulator
- Epoxy powder coating provides improved corrosion resistance

Description

serve as air-flow controllers maintaining a constant air purge for each setting of an integral needle valve.

By maintaining a constant-differential pressure drop across a built-in needle valve (for any flow setting up to 2.1 cu. ft. of air per hour), Series 62 Relays ensure a constant volumetric rate of flow, regardless of variations in process or supply pressure.

The constant-differential pressure across the built-in needle valve is regulated by a spring-loaded diaphragm. This diaphragm controls the action of the supply-port plunger, which automatically admits supply air to the needle valve at the required rate. Excess purge air bleeds to the atmosphere

Siemens constant-differential relays eliminate most of the problems encountered in conventional bubbling systems, because:

- Each relay holds the bubbling rate constant, thereby maintaining high measurement accuracy
- The differential pressure maintained across the needle valve is approximately 1-1/2 psi, which allows wider needle valve openings that are less subject to clogging
- Full supply pressure (up to 150 psig) is connected to the purge system for a greater margin of safety
- Ordinary air-fine impurities have no effect

In addition to the preceding advantages, the Series 62 Constant-Differential Relays ensure reasonable purge rates at all times, because they eliminate the need for a supply regulator. Another safety feature is the automatic exhaust, which bleeds off any excess air caused by the presence of foreign particles on the pilot seat of the supply-port plunger.

Specifications

Supply Pressure

Maximum: 150 psig
Minimum: 5 psi above highest output pressure required

Rotometer Pressure

Maximum: 200 psig (1380 kPa)

Supply Pressure Effect

0.18 scfh (max.) flow change for 25 psi increase of supply

Ambient Temperature Limits

-40 to 180°F (-40 to 82°C)
-40 to 160°F (-40 to 71°C) with Rotometer

Materials of Construction

Relay: Aluminum, brass, stainless steel, Neoprene, Buna-N
Rotometer: Aluminum, Stainless steel, Borosilicate glass, Buna-N (O-rings), ruby saphire (float), and brass (fittings)

Ordering data

Model Number

Order No. 62· ■■

Constant-Differential Relay

Purge Rate

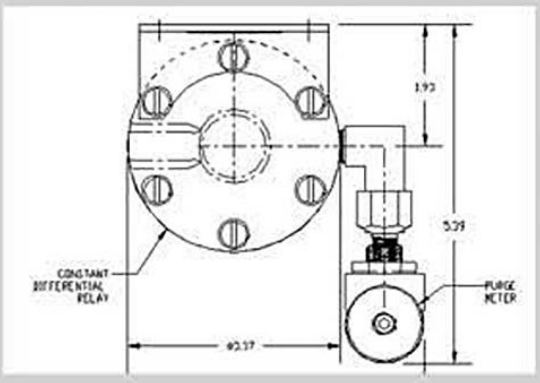
- 0.09 to 2.1 scfh[1] — Built-in needle valve has internal bypass to prevent tight shut-off of purge flow — **V**
- 0.06 to 1.8 scfh[1] — Built-in needle valve provides tight shut-off of purge flow — **VN**

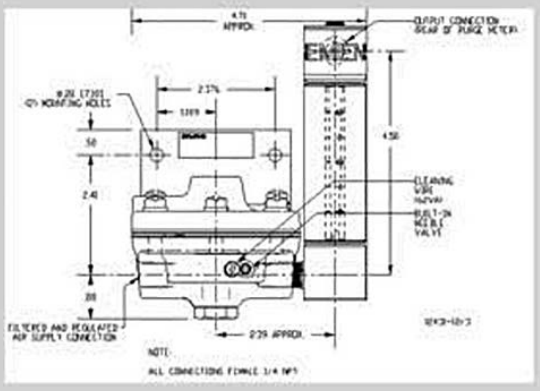
Flow Indicator[2]

- Indicating Rotometer 0.25 to 2.5 scfh scale range — **A**

Letter omitted - Less Rotometer

Mounting Dimensions





1) With a relay or rotometer outlet at atmospheric pressure.
2) A flow indicator is recommended for use with the Model 62VN.

Relays

Series 63 Constant Differential Flow Controllers

Introduction

Features & Benefits

- Versatile and design accommodates liquids or gases and wide range of OEM needs
- Powder coating provides improved corrosion resistance

Description

The Series 63 Constant-Differential Relays are used in conjunction with an external needle valve to provide constant volume flow rates of liquids or gases over a continuously adjustable range.

For gas flow applications, compressibility must be considered if a constant mass flow is desired. Therefore, models are available for constant upstream or downstream reference pressure.

For liquids, which are not compressible, the constant volume flow will also be a constant mass flow, regardless of upstream or downstream pressures. As such, mass flow is independent of pressure changes.

The relay's needle valve determines rangeability and capacity. Four models are available.

Specifications

Range Limits

@20 psig supply
Model 63BU & Model 63SU
Maximum: 1.1 sclm
Minimum: 001 sclm

Model 63BUL & Model 63SUL
Maximum: 2800 sccm
Minimum: 13 sccm

Supply Pressure

Minimum: At least 5 psi greater than the maximum downstream pressure of the needle valve-controller combination

Maximum Needle Valve		
Model	**Closed**	**Open**
63BU	50 psi	250 psig
63BUL	50 psig	250 psig
63SU	100 psig	500 psig
63SUL	50 psig	500 psig

Ambient Temperature Limits

Model 63BU & Model 63BUL: -40 to 180°F (-40 to 82°C)
Model 63SU & Model 63SUL: -40 to 250°F (-40 to 121°C)

Supply Pressure

Minimum: At least 5 psig greater than the maximum downstream pressure of the needle valve-controller combination

Maximum Needle Valve		
Model	**Open**	**Closed**
63BD	250 psig	100 psig
63BDL	250 psig	100 psig
63SD	500 psig	100 psig
63SDL	500 psig	100 psig

Ambient Temperature Limits

Model 63BD & BDL: -40 to 180°F (-40 to 82°C)
Model 63SD & SDL: -40 to 250°F (-40 to 121°C)

Controlled Differential

3.1 ±.5 psig (others optional)

Materials

	Brass Units	316 SS Units
Body	Brass	316 SS
Diaphragm	Neoprene	KYNAR
Differential Spring	18-8 SS	316 SS
Valve Plunger & Seat	303 SS	316 SS
Plunger Spring (used in "D" 63BD models only) 63BD-L	316 SS Phos. Br.	316 SS 316 SS

Ratings

Ambient Temperature

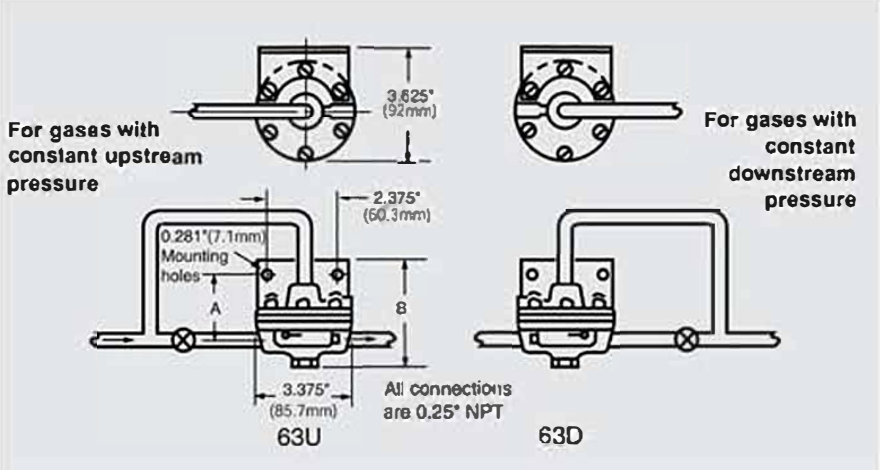
-40 to 180°F (-40 to 82°C)

Flow Capacity Formula

	Higher Range Models 63BD and 63SD; 63BU and 63SU	Low Flow Models 63BD-L and 63SD-L; 63BU-L and 63SU-L
GAS FLOW-CAPACITY		
Maximum at less than critical flow[1]	$SCCM = 4000 \sqrt{\frac{\Delta P \times Pd \times 530}{SG \quad T}}$	$SCCM = 400 \sqrt{\frac{\Delta P \times Pd \times 530}{SG \quad T}}$
Maximum at critical flow[1]	$SCCM = 2000\ Pu \sqrt{\frac{1 \times 530}{SG \quad T}}$	$SCCM = 200\ Pu \sqrt{\frac{1 \times 530}{SG \quad T}}$
Minimum controllable flow	Approximately 1/200 of maximum	$SCCM = 8 \frac{\Delta P\ (Pu + Pd)}{Rv\ T}$
LIQUID FLOW-CAPACITY		
Maximum	$CCM = 470 \sqrt{\frac{\Delta P}{SG}}$	$CCM = 47 \sqrt{\frac{\Delta P}{SG}}$
Minimum	Approximately 1/200 of maximum	$CCM = .06 \frac{\Delta P}{Rv}$
NEEDLE VALVE SIZING (With 3 psi drop across valve)		
For any liquid	$Kn = \frac{CCM}{\sqrt{6550 \frac{1}{SG}}}$	
For any gas	$Kn = \frac{SCCM}{\sqrt{49000 \frac{1 \times Pn \times 530}{SG \quad T}}}$	

Mounting Dimensions

Model	DIM. A	DIM. B
63BU	2 1/8"	3 1/4"
63BUL	2 1/8"	3 1/4"
63SU	2 3/8"	3 1/2"
63SUL	2 3/8"	3 1/2"
63BD	2 1/8"	3 1/2"
63BDL	2 1/8"	3 1/2"
63SD	2 3/8"	3 3/4"
63SDL	2 3/8"	3 3/4"



Note: Dimensions for 63D are mirrored from 63U

1) Critical flow exists when the ratio of upstream pressure (Pu) to downstream pressure (Pd) is equal to or less than approximately 0.53

Model 66 Amplifying and Reducing Relays

Introdction

Features & Benefits

- Pneumatic signal conditioning provides control circuit design flexibility
- Powder coating provides improved corrosion resistance

Description

The Model 66 Amplifying and Reducing Relays are used to increase or decrease control-circuit pressure signals.

Its input pressure, acting upon the effective area of the top diaphragm, produces a force that is balanced by the force produced by the output pressure applied over the effective area of the lower diaphragm. Any imbalance in these opposing forces will operate the plunger, increasing or decreasing air supply to the output chamber. (The amplifying or reducing ratio is fixed by the ratio of input-to-output diaphragm areas.)

An increase in input opens the pilot valve to admit supply air directly to the output. A decrease in input opens the exhaust port to exhaust air from the output.

Specifications

Function Specifications

Supply Pressure

Normal: 20 psig (140 kPa)
Maximum: 80 psig (550 kPa)
Minimum: 1 psi (7 kPa) above maximum required output

Range Limits

80 psig max. for input or output - whichever limits

Overrange Limits

100 psig (690 kPa) at any connection

Maximum Output Pressure

Within 0.1 psi (0.7 kPa) of supply

Minimum Output Pressure

Less than 0.4 psig (3 kPa) with zero output

Ratio Accuracy

Within 1% of nornal ratio

Linearity

±1% of output span

Reproducibility

Within 0.02 psi (0.15 kPa)

Operating Temperature

-40 to 180°F (-40 to 82°C)

Performance Specifications

Response Level

0.2" H_2O (5 mm H_2O)

Zero Error

66BA6: ±0.36 psi (2.5 kPa)
All Others: ±0.24 (1.5 kPa)

Flow Capacity

2.2 scfm minimum

Air Consumption

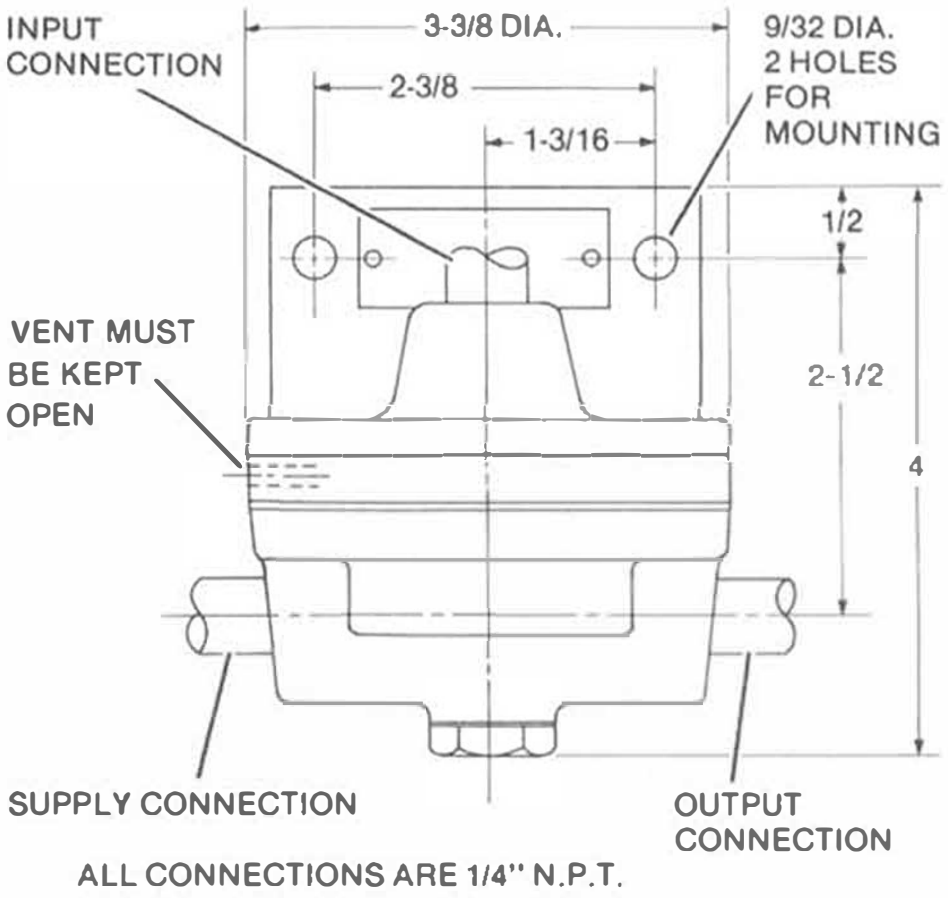
0.12 scfm maximum

Mechanical Specifications

Materials of Construction

Brass, aluminum, stainless steel, and Neoprene

Values based on 20 psig supply unless otherwise noted.


INPUT CONNECTION
3-3/8 DIA.
9/32 DIA. 2 HOLES FOR MOUNTING
2-3/8
1-3/16
1/2
VENT MUST BE KEPT OPEN
2-1/2
4
SUPPLY CONNECTION
OUTPUT CONNECTION
ALL CONNECTIONS ARE 1/4" N.P.T.

Model 661 Amplifying Relays with Bias

Introduction

Features & Benefits

- Fixed-gain force and bias adjustment mechanisms amplify pneumatic instrument signals to provide control circuit design flexibility

Description

Series 661 Amplifying Relays are lixed-gain force-balance instruments, which incorporate bias adjustment that amplify pneumatic instrument s gnals For example, a 3-15 psi signal can be amplilied to operate a 3-27 psi control valve.

The input pressure signal, acting upon the effect ve area of the upper diaphragm, produces a force opposed by the force produced by the output pressure applied over the effective area of the lower diaphragm and by a manually-set (constant) spring force. Any inbalance in the opposing forces will operate the p'lot valve to throttle supply air to change the output until rebalance is achieved.

Plus or minus biasing of the input signal is accomplished by changing the setting of the upper bias'ng spr ng, wh ch alters the net spring force on the diaphragm assembly.

Specifications

Supply Pressure

Normal: 20 psig (140 kPa)
Maximum: 80 psig (550 kPa)
Minimum: 1 psi (7 kPa) above maximum required output

Range Limits

80 psig max. for input or output (whichever limits)

Overrange Limits

100 psig (690 kPa) at any connection

Minimum Output Pressure

Less than 0.1 psi (0.7 kPa)

Ratio Accuracy

Within 1% of norma ratio

Linearity

±1% of output span

Reproducibility

Within 0.1% of output span

Response Level

0 2' H_2O (5 mm H_2O)

Bias Range

Direct Acting: +30 psi to -15 psi (210 to -100 kPa)

Flow Capacity

2.2 scfm minimum (62.3 SDM^3/M)

Air Consumption

0.15 scfm maximum (4.25 SDM^3/M)

Ambient Teperature Limits

-40 to 180° F (-40 to 82° C)

Materials of Construction

Brass. a uminum. sta nless steel. and Neoprene

Model 661 Amplifying Relays with Bias

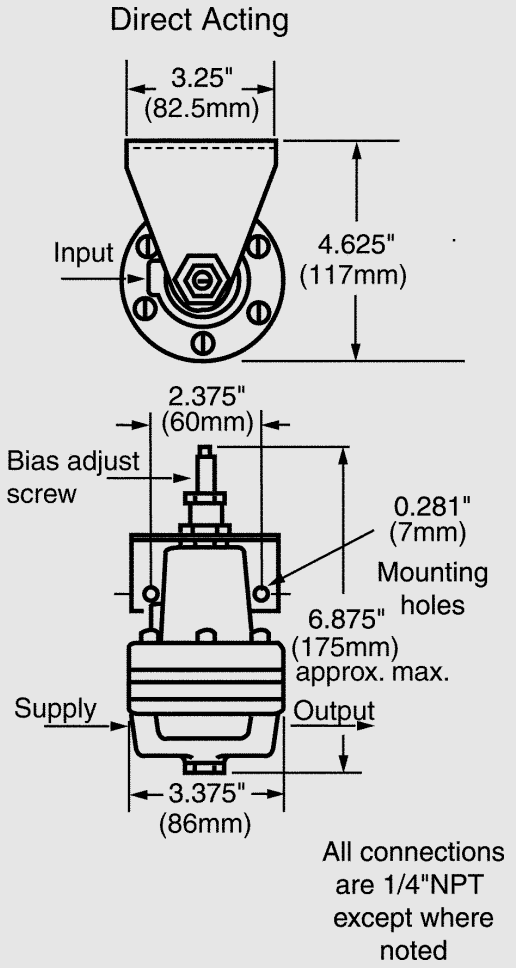
Technical data

Model Selection

Direct Action	
Model No.	**Gain**
661A2	2
661A3	3
661A4	4
661A6	6
Function Equation: $P_{out} = G (P_{in} \pm K)$	

Where P_{in} = input pressure
p_{out} = output pressure

Mounting Dimensions



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