Process Instrumentation
Field Instruments for Process Automation
July 2019 Supplement

usa.siemens.com/pneumatics
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## 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 install 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.
Valve Positioners
Series 760P/E Valve Positioners

Technical data

Mounting Dimensions
Valve Positioners
Series 760P/E Valve Positioners

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 Ex ia IIC T4/T5/T6
II 3G Ex 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

<table>
<thead>
<tr>
<th>Model Number</th>
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<tbody>
<tr>
<td>Series 760 Valve Controller/Positioner</td>
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<table>
<thead>
<tr>
<th>Basic Model Code No.</th>
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<tbody>
<tr>
<td>• 760 Valve Controller (Positioner)</td>
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<table>
<thead>
<tr>
<th>Input signal</th>
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<tbody>
<tr>
<td>• 4 to 20 mAdc (not available with High Temp. Option)</td>
</tr>
<tr>
<td>• 3 to 15 psig</td>
</tr>
<tr>
<td>• 3-27/6-30 psig</td>
</tr>
<tr>
<td>• 20 to 100 kPa</td>
</tr>
<tr>
<td>• 0.2 to 1.0 Bar</td>
</tr>
<tr>
<td>• 0.2 to 1.0 kg/cm²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action (Rising Stem/Linear or Rotary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1/2 to 4 inch stroke lever with set of (3) 60° cams</td>
</tr>
<tr>
<td>• 2 to 6 inch stroke lever with set of (3) 60° cams</td>
</tr>
<tr>
<td>• 1/4 turn - 1/2 inch square shaft with set of (3) 90° cams</td>
</tr>
<tr>
<td>• 1/2 to 2 inch stroke lever with set of (3) 60° cams</td>
</tr>
<tr>
<td>• 1/4 turn NAMUR style shaft end with set of (3) 90° cams</td>
</tr>
<tr>
<td>• 1/4 turn - 1/2 inch square shaft with set of (3) 60° cams</td>
</tr>
<tr>
<td>• 1/2 to 4 inch stroke lever with (1) 90° linear cam</td>
</tr>
<tr>
<td>• 2 to 6 inch stroke lever with (1) 90° linear cam</td>
</tr>
<tr>
<td>• 1/4 turn NAMUR shaft with set of (3) 60° cams</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enclosure Type 4X/IP65 (with 3/4 inch NPT Conduit Connection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Standard</td>
</tr>
<tr>
<td>• With 90° Beacon Indicator (not available with High Temp. Option)</td>
</tr>
<tr>
<td>• With 60° Flat Indicator (not available with High Temp. Option)</td>
</tr>
<tr>
<td>• With 90° Flat Indicator (not available with High Temp. Option)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enclosure Type 4X/IP65 (with M25 Conduit Connection)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Standard</td>
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<tr>
<td>• With 90° Beacon Indicator (not available with High Temp. Option)</td>
</tr>
<tr>
<td>• With 60° Flat Indicator (not available with High Temp. Option)</td>
</tr>
<tr>
<td>• With 90° Flat Indicator (not available with High Temp. Option)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Standard Capacity Spool Valve Assembly (Cv = 0.3)</td>
</tr>
<tr>
<td>• High Flow Capacity Spool Valve Assembly (Cv = 0.6)</td>
</tr>
<tr>
<td>• Low Flow Gain Spool Valve Assembly</td>
</tr>
</tbody>
</table>

**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 available. For M25 thread requirements, use adapter TGX:16300-1439
### Model Number

<table>
<thead>
<tr>
<th>Series 760 Valve Controller/Positioner (cont’d)</th>
</tr>
</thead>
</table>

#### 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

### 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.
Valve Positioners
Series 760P/E Valve Positioners

Ordering data

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° - Rectilinear - 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
Valve Positioners
Series 73 Built-In Valve Positioner

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

Model Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Type of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>73N12F</td>
<td>Top-loading, direct-acting, input spans of 2 to 12 psi</td>
</tr>
<tr>
<td>73N24F</td>
<td>Top-loading, direct-acting, input spans over 12 to 24 psi</td>
</tr>
<tr>
<td>73N-12F</td>
<td>Top-loading, reverse-acting</td>
</tr>
<tr>
<td>73N-B</td>
<td>Bottom-loading, direct-acting, with top air-cushion loading</td>
</tr>
<tr>
<td>73N-B1</td>
<td>Bottom-loading actuators w/actuator range spring</td>
</tr>
</tbody>
</table>

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

Materials of Construction
Aluminum, brass, stainless steel, Neoprene®, and/or Buna-N
Valve Positioners
Series 73 Built-In Valve Positioner

Technical data

Spring Table

<table>
<thead>
<tr>
<th>Valve Stroke Inches</th>
<th>Instrument Input Pressure Span (PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>1/4</td>
<td>1212</td>
</tr>
<tr>
<td>5/16</td>
<td>1612</td>
</tr>
<tr>
<td>3/8</td>
<td>1812</td>
</tr>
<tr>
<td>7/16</td>
<td>2012</td>
</tr>
<tr>
<td>1/2</td>
<td>2412</td>
</tr>
<tr>
<td>9/16</td>
<td>2812</td>
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<tr>
<td>5/8</td>
<td>3212</td>
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<td>1-3/4</td>
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<td>3-1/2</td>
<td>5612</td>
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<tr>
<td>4</td>
<td>6412*</td>
</tr>
</tbody>
</table>

- Item No. of Range Spring Series
- 12395 Series ±5% Stroke Range Tolerance
Example: 12395-1212

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.
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
1/4" 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 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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Order No.</th>
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<td>Valve Positioner</td>
<td>74-</td>
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<table>
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<tr>
<th>Sensitivity</th>
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<tbody>
<tr>
<td>Standard Pilot &amp; Standard Gain</td>
<td></td>
</tr>
<tr>
<td>Stabilizing Pilot &amp; Reduced Gain</td>
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<table>
<thead>
<tr>
<th>Gauge Option</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Without Gauges</td>
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<table>
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<tbody>
<tr>
<td>Standard Pilot &amp; Reduced Gain</td>
<td>(74S only)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acuator Stroke - Inches -</th>
<th>Kit and Parts</th>
<th>Instrument Input Pressure Range - psig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-15</td>
<td>3-9</td>
</tr>
<tr>
<td>1/4 to 1-1/2</td>
<td>Kit No.</td>
<td>Spring No. 14996-101</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-274</td>
</tr>
<tr>
<td>1-1/2 to 2-3/4</td>
<td>Kit No.</td>
<td>Spring No. 14995-102</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-273</td>
</tr>
<tr>
<td>2-3/4 to 4</td>
<td>Kit No.</td>
<td>Spring No. 14995-103</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-273</td>
</tr>
<tr>
<td>4 to 6</td>
<td>Kit No.</td>
<td>Spring No. 14995-119</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-292</td>
</tr>
<tr>
<td>6 to 9</td>
<td>Kit No.</td>
<td>Spring No. 14995-117</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-292</td>
</tr>
<tr>
<td>9 to 12</td>
<td>Kit No.</td>
<td>Spring No. 14995-120</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-3034</td>
</tr>
<tr>
<td>12 to 19</td>
<td>Kit No.</td>
<td>Spring No. 14995-118</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>Orange</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-303</td>
</tr>
<tr>
<td>48</td>
<td>Kit No.</td>
<td>Spring No. 14995-121</td>
</tr>
<tr>
<td></td>
<td>Color Code</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Screw No.</td>
<td>12372-296</td>
</tr>
</tbody>
</table>
Valve Positioners
Series 74 Valve Positioners

Technical data

<table>
<thead>
<tr>
<th>Instrument Input Range -psig-</th>
<th>Rotation of Actuator Shaft</th>
<th>Clockwise</th>
<th>Counter-clockwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kit Supplied Without Mounting Plate</td>
<td>Kit No. Spring No. Color Code</td>
<td>Consult Factory</td>
<td>14923-154 14923-70 White</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consult Factory</td>
<td>14923-104 14923-71 Red</td>
</tr>
<tr>
<td>Kit Supplied With Mounting Plate</td>
<td>Kit No. Spring No. Color Code</td>
<td>Consult Factory</td>
<td>14923-154 14923-70 White</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consult Factory</td>
<td>14923-103 14923-71 Red</td>
</tr>
</tbody>
</table>

Mounting Dimensions

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 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
Transducers
Models 77 and 771 Current-to-Pneumatic Transducers

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
Current-to-Pneumatic Transducer

Exhaust
• Atmospheric
• Tapped Exhaust

Input/Output

<table>
<thead>
<tr>
<th>Input Range (mA dc)</th>
<th>Output Range (psig)</th>
<th>Impedance (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5</td>
<td>3 to 15</td>
<td>2450</td>
</tr>
<tr>
<td>0 to 4</td>
<td>3 to 15</td>
<td>2450</td>
</tr>
<tr>
<td>4 to 20</td>
<td>3 to 27</td>
<td>610</td>
</tr>
<tr>
<td>4 to 20</td>
<td>3 to 15</td>
<td>185</td>
</tr>
<tr>
<td>10 to 50</td>
<td>3 to 15</td>
<td>30</td>
</tr>
</tbody>
</table>

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

Accessories
• Reverse Acting Output

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.

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

Order No.

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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current-to-Pneumatic Transducer</td>
<td>771-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input/Output</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Range1</td>
<td>3 to 15</td>
</tr>
<tr>
<td>Output Range</td>
<td>4 to 20</td>
</tr>
<tr>
<td>Impedence</td>
<td>5 to 15</td>
</tr>
<tr>
<td>(mA dc)</td>
<td>4 to 20</td>
</tr>
<tr>
<td>(psig)</td>
<td>3 to 15</td>
</tr>
<tr>
<td>(Ohms)</td>
<td>610</td>
</tr>
</tbody>
</table>

### Output Capacity
- Boosted
- Standard

<table>
<thead>
<tr>
<th>Terminal Strip</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Approval</td>
<td>771-</td>
</tr>
<tr>
<td>None Required</td>
<td>3</td>
</tr>
<tr>
<td>Intrinsically Safe</td>
<td>8</td>
</tr>
<tr>
<td>Non-incendive</td>
<td>16</td>
</tr>
<tr>
<td>Standard</td>
<td>40</td>
</tr>
</tbody>
</table>

### 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

![Mounting Dimensions Diagram]

**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 TRANSCLUDER ON A BLIND WALL.
Mounting Dimensions – Model 771 S/B

Model Series 771S
Standard Output Capacity

Model Series 771B
Boosted Output Capacity

NOTES:
1. Sealing screw must not be removed in a Class I hazard 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.
Regulators
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 widest 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 spring, 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 increasing 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 action closes the exhaust port, and contacts and moves the valve plunger, which opens the supply port. This increases the regulated output, which also 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 psig 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 80°C)

Ambient Temperature Effect
Approximately 1% of set pressure with standard range spring; for 50°F (27°C) 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

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: 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 Siemens 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

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
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

Graph 3 Air Consumption

Graph 4 Drift Effect

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.

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.

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 40H</td>
<td>4.5</td>
</tr>
<tr>
<td>Model 42</td>
<td>4</td>
</tr>
<tr>
<td>Model 42H</td>
<td>14</td>
</tr>
</tbody>
</table>
# Model Selection

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Range psig¹</th>
<th>Recommended</th>
<th>Maximum</th>
<th>Standard Modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-2¹</td>
<td>(1-50&quot;H₂O)</td>
<td>5-10</td>
<td>25</td>
<td>X</td>
</tr>
<tr>
<td>40-7</td>
<td>(6-200&quot;H₂O)</td>
<td>50</td>
<td>100</td>
<td>A &amp; X</td>
</tr>
<tr>
<td>40-15</td>
<td>0.5-15</td>
<td>75</td>
<td>150</td>
<td>A &amp; X</td>
</tr>
<tr>
<td>40-30</td>
<td>1-30</td>
<td>120</td>
<td>150</td>
<td>A &amp; X</td>
</tr>
<tr>
<td>40-50</td>
<td>1-50</td>
<td>120</td>
<td>150</td>
<td>A &amp; X</td>
</tr>
<tr>
<td>40-100</td>
<td>1.5-100</td>
<td>150</td>
<td>500</td>
<td>H &amp; A</td>
</tr>
<tr>
<td>40-200</td>
<td>3-200</td>
<td>250</td>
<td>500</td>
<td>A</td>
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<tr>
<td>40-300</td>
<td>7-300</td>
<td>350</td>
<td>500</td>
<td>A</td>
</tr>
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<td>40-450</td>
<td>15-450</td>
<td>500</td>
<td>500</td>
<td>A</td>
</tr>
<tr>
<td>41-15</td>
<td>0.5-15</td>
<td>75</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>41N15³</td>
<td>0.5-15</td>
<td>75</td>
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</tr>
<tr>
<td>41-30</td>
<td>1-30</td>
<td>120</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>41-50</td>
<td>1-50</td>
<td>120</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>41-100</td>
<td>1.5-100</td>
<td>150</td>
<td>250</td>
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</tr>
<tr>
<td>41-2550</td>
<td>25-50</td>
<td>120</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>42-15</td>
<td>0.5-15</td>
<td>75</td>
<td>150</td>
<td>A, E &amp; X</td>
</tr>
<tr>
<td>42-30</td>
<td>1-30</td>
<td>120</td>
<td>150</td>
<td>H, A, E &amp; X</td>
</tr>
<tr>
<td>42-50</td>
<td>1-50</td>
<td>120</td>
<td>150</td>
<td>H, A, E &amp; X</td>
</tr>
<tr>
<td>42-100</td>
<td>1.5-100</td>
<td>150</td>
<td>500</td>
<td>H, A &amp; E</td>
</tr>
<tr>
<td>42-200</td>
<td>3-200</td>
<td>250</td>
<td>500</td>
<td>A &amp; E</td>
</tr>
</tbody>
</table>

**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**
- Max. panel: 2.812" (71.4mm)
- Max. for air-loaded: 2.25" (57.1mm)
- Max. for all others: 5.187" (131.7mm)
- Connections: ≤ 1/8" NPT
- 0.25" (6.4mm)
- 3.375" (8.57cm)

**Model 41**
- Max. panel: 1.375" (34.9mm)
- 0.25" (6.35mm)
- 3.175" (80.9mm)
- 2.25" (57.1mm)
- (Connections = 1/8")

**Model 42**
- Max. panel: 2.812" (71.4mm)
- 0.25" (8.35mm)
- 7.0" (177.8mm)
- 5.0" (12.7cm)
- Supply
- 5.0" (12.7cm)
- 12.7 cm

*Add 0.125" 0.31cm for 200 psig Models
(Connections = 1/2" NPT)*
Features & Benefits
- Stable output and repeatability - provides constant control under variable flow rates and supply pressures.
- Corrosion-resistant construction - aluminum die-castings are finished with fritidite 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 Filter Regulator 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. Fritdite 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
**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**: 0.5 scfm at 75 psig (14 dm³/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)

**Materials of Construction**

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

---

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 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 externally 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 stroking 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 Relay
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 straightforward 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 circuits.

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 applications 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

<table>
<thead>
<tr>
<th>Model</th>
<th>61H</th>
<th>61L</th>
<th>61F &amp; 61FE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Input &amp; Output Pressure</td>
<td>3-15</td>
<td>3-15</td>
<td>3-15</td>
</tr>
<tr>
<td>Maximum Input Pressure</td>
<td>100 psi</td>
<td>100 psi</td>
<td>50 psi</td>
</tr>
<tr>
<td>Maximum Supply Pressure</td>
<td>100 psi</td>
<td>100 psi</td>
<td>50 psi</td>
</tr>
<tr>
<td>Overload Protection to any Connection</td>
<td>100 psi</td>
<td>100 psi</td>
<td>100 psi</td>
</tr>
<tr>
<td>Accuracy of 1:1 Ratio</td>
<td>5%</td>
<td>2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Zero Error</td>
<td>—-</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Reproducibility¹</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Linearity¹</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Ambient Temperature Limits</td>
<td>-40 to 180°F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Capacity²</td>
<td>10.5 scfm</td>
<td>4.5 scfm</td>
<td>2.4 scfm</td>
</tr>
</tbody>
</table>

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.

### Technical data

![Diagram of Series 61 Booster Relays]

**Model A**

- 61F, 61FE: 2-13/16
- 61L: 2-5/8

**Model B**

- 61F, 61FE: 4-3/16
- 61L: 4
Relays
Model 61H Booster Relays

Technical data
Relays
61VH Booster Relay

Technical data
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 sapphire (float), and brass (fittings)
**Relays**

Series 62 Constant-Differential Relays

**Ordering data**

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**Model Number**

Constant-Differential Relay

**Purge Rate**

- 0.09 to 2.1 scfh
  - Built-in needle valve has internal bypass to prevent tight shut-off of purge flow
- 0.06 to 1.8 scfh
  - Built-in needle valve provides tight shut-off of purge flow

**Flow Indicator**

- Indicating Rotometer
  - 0.25 to 2.5 scfh scale range
  - Letter omitted - Less Rotometer

**Mounting Dimensions**

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

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3.14
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 scfm
Minimum: 0.01 scfm
Model 63BUL & Model 63SUL
Maximum: 2800 scfm
Minimum: 13 scfm
Supply Pressure
Minimum: At least 5 psi greater than the maximum downstream pressure of the needle valve-controller combination
Maximum
Needle Valve

<table>
<thead>
<tr>
<th>Model</th>
<th>Closed</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>63BU</td>
<td>50 psi</td>
<td>250 psi</td>
</tr>
<tr>
<td>63BUL</td>
<td>50 psi</td>
<td>250 psi</td>
</tr>
<tr>
<td>63SU</td>
<td>100 psi</td>
<td>500 psi</td>
</tr>
<tr>
<td>63SUL</td>
<td>50 psi</td>
<td>500 psi</td>
</tr>
</tbody>
</table>

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)

Controlled Differential
3.1 ± .5 psig (others optional)

Materials
<table>
<thead>
<tr>
<th>Brass</th>
<th>316 SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Units</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>Neoprene</td>
</tr>
<tr>
<td>Differential Spring</td>
<td>18-8 SS</td>
</tr>
<tr>
<td>Valve Plunger &amp; Seat</td>
<td>303 SS</td>
</tr>
<tr>
<td>Plunger Spring (used in &quot;D&quot; 63BD)</td>
<td>316 SS</td>
</tr>
<tr>
<td>(models only) 63BD-L</td>
<td>Phos. Br.</td>
</tr>
</tbody>
</table>

Ambient Temperature
-40 to 180°F (-40 to 82°C)
### Flow Capacity Formula

<table>
<thead>
<tr>
<th>GAS FLOW-CAPACITY</th>
<th>Higher Range Models 63BD and 63SD; 63BU and 63SU</th>
<th>Low Flow Models 63BD-L and 63SD-L; 63BU-L and 63SU-L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum at less than critical flow</strong></td>
<td>$SCCM = 4000 \sqrt{\frac{\Delta P \times Pd \times 530}{SG \cdot T}}$</td>
<td>$SCCM = 400 \sqrt{\frac{\Delta P \times Pd \times 530}{SG \cdot T}}$</td>
</tr>
<tr>
<td><strong>Maximum at critical flow</strong></td>
<td>$SCCM = 2000 \sqrt{\frac{1 \times 530}{SG \cdot T}}$</td>
<td>$SCCM = 200 \sqrt{\frac{1 \times 530}{SG \cdot T}}$</td>
</tr>
<tr>
<td><strong>Minimum controllable flow</strong></td>
<td>Approximately 1/200 of maximum</td>
<td>$SCCM = \frac{8 \Delta P (Pu + Pd)}{Rv \cdot T}$</td>
</tr>
</tbody>
</table>

### LIQUID FLOW-CAPACITY

| **Maximum**                                                                        | $CCM = 470 \sqrt{\frac{\Delta P}{SG}}$                                      | $CCM = 47 \sqrt{\frac{\Delta P}{SG}}$ |
| **Minimum**                                                                        | Approximately 1/200 of maximum                                                | $CCM = 0.06 \frac{\Delta P}{Rv}$ |

### NEEDLE VALVE SIZING (With 3 psi drop across valve)

| For any liquid                                                                    | $Kn = \sqrt{\frac{CCM \cdot \frac{1}{6550}}{SG}}$                           |                                           |
| For any gas                                                                        | $Kn = \sqrt{\frac{SCCM \cdot \frac{1 \times Pn \times 530}{SG \cdot T}}{10000}}$ |                                           |

### Mounting Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>DIM. A</th>
<th>DIM. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>63BU</td>
<td>2 1/8”</td>
<td>3 1/4”</td>
</tr>
<tr>
<td>63BUL</td>
<td>2 1/8”</td>
<td>3 1/4”</td>
</tr>
<tr>
<td>63SU</td>
<td>2 3/8”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>63SUL</td>
<td>2 3/8”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>63BD</td>
<td>2 1/8”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>63BDL</td>
<td>2 1/8”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>63SD</td>
<td>2 3/8”</td>
<td>3 3/4”</td>
</tr>
<tr>
<td>63SDL</td>
<td>2 3/8”</td>
<td>3 3/4”</td>
</tr>
</tbody>
</table>

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.
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 normal 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 H2O (5 mm H2O)

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.
Relays
Model 66 Amplifying Relay

Technical data

INPUT CONNECTION

VENT MUST BE KEPT OPEN

SUPPLY CONNECTION

OUTPUT CONNECTION

ALL CONNECTIONS ARE 1/4" N.P.T.
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 fixed-gain force-balance instruments, which incorporate bias adjustment that amplify pneumatic instrument signals. For example, a 3-15 psi signal can be amplified to operate a 3-27 psi control valve.

The input pressure signal, acting upon the effective 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 imbalance in the opposing forces will operate the pilot 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 biasing spring, which 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 normal ratio

Linearity
- ±1% of output span

Reproducibility
- Within 0.1% of output span

Response Level
- 0.2” H₂O (5 mm H₂O)

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

Flow Capacity
- 2.2 scfm minimum (62.3 SDM³/M)

Air Consumption
- 0.15 scfm maximum (4.25 SDM³/M)

Ambient Temperature Limits
- -40° to 180° F (-40 to 82° C)

Materials of Construction
- Brass, aluminum, stainless steel, and Neoprene
Relays
Model 661 Amplifying Relays with Bias

Technical data

Model Selection

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>661A2</td>
<td>2</td>
</tr>
<tr>
<td>661A3</td>
<td>3</td>
</tr>
<tr>
<td>661A4</td>
<td>4</td>
</tr>
<tr>
<td>661A6</td>
<td>6</td>
</tr>
</tbody>
</table>

Function Equation:

\[ P_{out} = G (P_{in} \pm K) \]

Where \( P_{in} \) = input pressure
\( P_{out} \) = output pressure

Mounting Dimensions

All connections are 1/4"NPT except where noted
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