Fisher™ 4195K Gauge Pressure Indicating Controllers

Fisher 4195K gauge pressure indicating controllers show process pressure and set point on an easy-to-read process scale. The controllers compare process pressure with an operator-adjusted set point and delivers a pneumatic signal to a control element so that process pressure changes toward the set point. Controller types are available for proportional-only, proportional-plus-reset, proportional-plus-reset-plus-rate, and differential gap for on-off control. 4195K controllers are used in industries where accurate pressure control and process monitoring are required.

Unless otherwise noted, all NACE references are to NACE MR0175-2002.

Notes:

1. An internal cover protects the proportional band adjustment mechanism. In this photograph, the cover has been removed.
2. Controller components are indicated in figure 1.
Specifications

Available Configurations
See table 1

Process Sensor Range (Input Signal)
Lower and Upper Range Limits:
As shown in tables 2 and 5
Maximum Allowable Pressure:
As shown in tables 2 and 5

Process Scale
Standard scale is matched to the range of the sensing element, with exception of receiver controllers.
Optional scales available(1).

Process Connections
Standard: 1/4 NPT internal stainless steel (all input ranges)
Optional: 1/2 NPT adaptors (see table 3)

Output Signal
Proportional, Proportional-Plus-Reset, or
Proportional-Plus-Reset-Plus-Rate Range: ■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)
Differential Gap Range: ■ 0 to 1.4 bar (0 to 20 psig) or ■ 0 to 2.4 bar (0 to 35 psig)
Action: Field-reversible between ■ direct (increasing sensed pressure increases output pressure), and ■ reverse (increasing sensed pressure decreases output pressure) action

Supply and Output Connections
1/4 NPT internal

Supply Pressure Requirements(2)
See table 4

Supply Pressure Medium
Air or non-corrosive Natural Gas

Remote Set Point Pressures
■ 0.2 to 1.0 bar (3 to 15 psig) or ■ 0.4 to 2.0 bar (6 to 30 psig)

Construction Materials
See table 6

Controller Adjustments
Proportional Band: 5 to 500% of process scale span
Reset: Adjustable from 0.01 to more than 74 minutes per repeat (from 100 to less than 0.0135 repeats per minute)
Rate: Adjustable from 0 to 20 minutes
Differential Gap Controllers: Adjustable from 5 to 100% of process scale span
Set Point: Adjustable from 0 to 100% of the scale span

Controller Performance
Repeatability: 0.4% of output span
Dead Band: Less than 0.4% of process scale span
Typical Frequency Response: 1.5 hertz and 90 degree phase shift with 3.05 m (10 feet) of 6.4 mm (1/4-inch) tubing and 1639 cm³ (100 cubic inch) volume

Steady-State Air Consumption(3)(4)
0.2 to 1.0 Bar (3 to 15 Psig) Output:
0.08 m³/hr (2.8 scfh)
0.4 to 2.0 Bar (6 to 30 Psig) Output:
0.07 m³/hr (2.5 scfh)

Operative Ambient Temperature Limits(2)(5)
-40 to 71°C (−40 to 160°F)

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### Specifications (continued)

#### Hazardous Area Classification

Complies with the requirements of ATEX Group II Category 2 Gas and Dust

![ATEX Group II Category 2 Gas and Dust]

Maximum surface temperature (Tx) depends on operating conditions

**Gas:** T6  
**Dust:** T7

Meets Customs Union technical regulation TP TC 012/2011 for Groups II/III Category 2 equipment

![Customs Union technical regulation TP TC 012/2011]

#### Housing

Designed to NEMA 3 (Weatherproof) and IEC 529 IP54 Specifications

#### Mounting

Controller can be mounted on: actuator, panel, wall, or pipestand

#### Approximate Weight

4.5 kg (10 pounds)

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NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.

1. Consult your Emerson sales office for additional information.

2. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.

3. Normal m³/hr - normal cubic meters per hour (m³/hr, 0°C and 1.01325 bar, absolute). Scfh - standard cubic feet per hour (ft³/hr, at 60°F and 14.7 psig).

4. Without auto/manual station. With auto/manual station add 0.01 m³/hr (0.5 scfh).

5. Also use these temperatures for transportation and storage limits.

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### Table 1. Available Configurations

<table>
<thead>
<tr>
<th>TYPE NUMBER(1)</th>
<th>MODES</th>
<th>OPTIONS</th>
<th>Internal Auto/ Manual Station (suffix letter E)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportional-Only</td>
<td>Proportional-Plus-Reset</td>
<td>Proportional-Plus-Reset-Plus-Rate</td>
</tr>
<tr>
<td>4195KA</td>
<td>X</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KAE</td>
<td>X</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KAM</td>
<td>X</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KAME</td>
<td>X</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KB</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KBE</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KBF</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KBE</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KBFM</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KBFME</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>4195KC</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCE</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCF</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCFE</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCM</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCM</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCFM</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KCFME</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>4195KS</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KSE</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KSM</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4195KSM</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

1. Reverse-acting constructions are designated by the suffix letter R in the type number.
Features

- **Easy Maintenance**—Simple design allows fast, easy maintenance and minimal spare parts inventory.

- **Easy Adjustment**—Adjusting the set point, the zero and span of the process pointer, and switching between direct and reverse action are accomplished quickly and without special tools. Additionally, the set point and proportional band can be adjusted with no interaction between the two adjustments.

- **Application Versatility**—Either a Bourdon tube or capsular input element is available to control a wide range of positive pressures, vacuum pressures, or compound pressures.

- **Mounting Versatility**—A 4195K controller can be mounted directly on the actuator or it can mount on a pipe stand, wall, or in a panel.

- **Vibration Resistance**—The simple design and low mass of internal parts allow a 4195K controller to withstand the vibration levels encountered in most plant environments.

- **High-Visibility Display**—Two red pointers on a 114 mm (4 1/2-inch) long, white-on-black scale show process pressure and deviation from set point at a glance. Two other gauges monitor supply pressure and output pressure.

- **Low Air/Gas Consumption**—The relay and nozzle design reduces the steady-state consumption rate to as low as 0.07 m³/hr (2.5 scfh); less than the 6 scfh requirement set for the oil and gas industry by the US Environmental Protection Agency (New Source Performance Standards Subpart OOOO, EPA-HQ-QAR-2010-0505).

- **Corrosion Resistance**—Tough, plastic housing resists such corrosive environments as chemical plants and the salt spray atmosphere on an offshore oil platform. Internal constructions are available to resist a corrosive supply pressure media.

Construction Features

- **Simplified Relay Maintenance**
  A clean-out wire provides a fast, easy means of cleaning the relay primary orifice during service.

- **Pressure Protection for the Case**
  A rubber plug in the plastic case pops out to relieve excessive pressure buildup inside the case.

- **Easy Direct/Reverse Switching**
  Controller action can be switched from direct to reverse or vice versa by simply loosening the screws on the proportional band cover and moving the cover out to rotate the proportional band knob to the desired action (see figure 1).

- **Easy Mode Conversion**
  Conversion from proportional to proportional-plus-reset control requires the addition of a reset valve and two pieces of tubing. Conversion from proportional to proportional-plus-reset-plus-rate control requires the addition of a reset/rate valve and three pieces of tubing. Conversion from proportional to differential gap for on/off control requires the addition of one piece of tubing.

- **Anti-Reset Windup**
  Anti-reset windup is available with proportional-plus-reset controllers. A relief valve may be installed to limit reset windup in either direction.

- **Remote Set Point**
  The capability to adjust the set point from a remote location is available as an option on 4195K controllers.

- **Auto/Manual Capability**
  An optional internal auto/manual station permits smooth, bumpless transfer between automatic control and manual operation without disturbing the controller output. A positive-acting, two-position switch, showing either automatic or manual control mode, is clearly visible with the controller cover closed.
Table 2. Process Sensor (Capsular Element) Pressure Ratings

<table>
<thead>
<tr>
<th>CAPSULE MATERIAL</th>
<th>STANDARD RANGES</th>
<th>SPAN(1)</th>
<th>OPERATING RANGE</th>
<th>OPERATING LIMIT (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive pressure</td>
<td>0 to 150 mbar</td>
<td>100 mbar</td>
<td>-350 mbar</td>
<td>510 mbar</td>
</tr>
<tr>
<td>Metric units</td>
<td>0 to 400 mbar</td>
<td>160 mbar</td>
<td>-1 bar</td>
<td>1.5 bar</td>
</tr>
<tr>
<td>Vacuum</td>
<td>-50 to 0 mbar</td>
<td>170 mbar</td>
<td>-1 bar</td>
<td>1.5 bar</td>
</tr>
<tr>
<td>Compound</td>
<td>-150 to 0 mbar</td>
<td>170 mbar</td>
<td>-1 bar</td>
<td>1.5 bar</td>
</tr>
<tr>
<td>U.S. units</td>
<td>-340 to 0 mbar</td>
<td>170 mbar</td>
<td>-1 bar</td>
<td>1.5 bar</td>
</tr>
<tr>
<td>Positive pressure</td>
<td>0 to 60 inch wc</td>
<td>40 inch wc</td>
<td>-10 inch Hg</td>
<td>7.5 psig</td>
</tr>
<tr>
<td>Vacuum</td>
<td>-150 to 250 mbar</td>
<td>350 mbar</td>
<td>-30 inch Hg</td>
<td>30 psig</td>
</tr>
<tr>
<td>Compound</td>
<td>-6 to 10 inch Hg</td>
<td>15 inch Hg</td>
<td>-30 inch Hg</td>
<td>30 psig</td>
</tr>
<tr>
<td>U.S. units</td>
<td>-150 to 250 mbar</td>
<td>350 mbar</td>
<td>-30 inch Hg</td>
<td>30 psig</td>
</tr>
</tbody>
</table>

1. Minimum or maximum span or any span in between may be positioned anywhere within the operating range. For example, if a 0 to 350 mbar (0 to 5 psig) sensing element is used and the minimum span of 175 mbar (2.5 psig) is set, the process indication can be calibrated to a range of 340 mbar to 203 mbar (10 inch Hg to 6 inch Hg), 0 to 172 mbar (0 to 2.5 psig), 172 to 345 mbar (2.5 to 5 psig), 305 to 480 mbar (4.5 to 7 psig), or any value between minimum and maximum values of operating range.

2. Capsules with the travel stops set may be pressured to this value without permanent zero shift.

Table 3. Optional Process Connection Adaptors

<table>
<thead>
<tr>
<th>BAR INPUT RANGE</th>
<th>PSIG INPUT RANGE</th>
<th>CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 0 to 400</td>
<td>Up to 0 to 5000</td>
<td>1/2 NPT external or 1/2 NPT internal steel or stainless steel</td>
</tr>
<tr>
<td>0 to 400 to 0 to 600</td>
<td>0 to 5000 to 0 to 10,000</td>
<td>1/2 NPT internal stainless steel</td>
</tr>
<tr>
<td>0 to 400 to 0 to 600</td>
<td>0 to 5000 to 0 to 10,000</td>
<td>1/2 NPT external stainless steel</td>
</tr>
</tbody>
</table>

Table 4. Supply Pressure Data

<table>
<thead>
<tr>
<th>Bar</th>
<th>Normal Operating Supply Pressure (1)</th>
<th>Maximum Pressure Limit (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 to 1.0 or 0 and 1.4 (diff gap)</td>
<td>1.4</td>
<td>2.8</td>
</tr>
<tr>
<td>0.4 to 2.1 or 0 and 2.4 (diff gap)</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>3 to 15 or 0 and 20 (diff gap)</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>6 to 30 or 0 and 35 (diff gap)</td>
<td>35</td>
<td>40</td>
</tr>
</tbody>
</table>

1. If this pressure is exceeded, control stability may be impaired.
2. If this pressure is exceeded, damage to controller components may result.
## Table 5. Process Sensor (Bourdon Tube) Pressure Ratings and Materials

<table>
<thead>
<tr>
<th>BOURDON TUBES</th>
<th>SPAN(1)</th>
<th>OPERATING RANGE(2)</th>
<th>OPERATING LIMITS(4)</th>
<th>STANDARD MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td></td>
<td>Bar</td>
<td>Bar</td>
<td>Bar</td>
<td>Bar</td>
</tr>
<tr>
<td>Metric units</td>
<td>0 to 1.6</td>
<td>1</td>
<td>-1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>0 to 2.5</td>
<td>2</td>
<td>-1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>0 to 4</td>
<td>2</td>
<td>-1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>0 to 6</td>
<td>3.5</td>
<td>-1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>0 to 10</td>
<td>7</td>
<td>-1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>0 to 25</td>
<td>20</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>0 to 40</td>
<td>20</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>0 to 60</td>
<td>55</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>0 to 100</td>
<td>76</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>0 to 160</td>
<td>160</td>
<td>200</td>
<td>270</td>
</tr>
<tr>
<td>Psig</td>
<td>0 to 30</td>
<td>15</td>
<td>30</td>
<td>-30</td>
</tr>
<tr>
<td></td>
<td>0 to 60</td>
<td>30</td>
<td>60</td>
<td>-30</td>
</tr>
<tr>
<td></td>
<td>0 to 100</td>
<td>50</td>
<td>100</td>
<td>-30</td>
</tr>
<tr>
<td></td>
<td>0 to 200</td>
<td>100</td>
<td>200</td>
<td>-30</td>
</tr>
<tr>
<td></td>
<td>0 to 300</td>
<td>150</td>
<td>300</td>
<td>-30</td>
</tr>
<tr>
<td></td>
<td>0 to 600</td>
<td>300</td>
<td>600</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 to 1000</td>
<td>750</td>
<td>1000</td>
<td>0</td>
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<tr>
<td></td>
<td>0 to 1500</td>
<td>1100</td>
<td>1500</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 to 3000</td>
<td>2200</td>
<td>3000</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0 to 3000</td>
<td>3700</td>
<td>5000</td>
<td>0</td>
</tr>
</tbody>
</table>

1. Minimum or maximum span or any span in between may be positioned anywhere within the operating range. For example, if a 0 to 2 bar (0 to 30 psig) sensing element is used and the minimum span of 1 bar (15 psig) is set, the process indication can be calibrated to a range of 1 to 0 bar (30 in. Hg to 0 psig), 0 to 1 bar (0 to 15 psig), 1 to 2 bar (15 to 30 psig), 2 to 3 bar (27 to 42 psig) or any value between minimum and maximum values of operating range.

2. Travel stops should be used when the maximum or minimum process pressure will be 5% over or under the calibrated range. For example, a 0 to 2 bar (0 to 30 psig) sensing element is calibrated for 0.7 to 2 bar (10 to 30 psig), the desired range. The minimum expected pressure is 0 psig and the maximum expected pressure is 2.8 bar (40 psig). Travel stops must be used to prevent excessive overtravel and undertravel since the maximum allowable overpressure and underpressure is higher than 5% of the 1.4 bar (20 psig) span which is ±70 mbar (1 psig).

3. Bourdon tube without travel stops may be pressured to this value without permanent zero shift.

4. Bourdon tube with travel stops set may be pressured to this value without permanent zero shift.

## Table 6. Construction Materials

<table>
<thead>
<tr>
<th>Part</th>
<th>Standard Material</th>
<th>Optional Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case and cover</td>
<td>Polyester plastic</td>
<td>- -</td>
</tr>
<tr>
<td>Exterior tubing</td>
<td>Copper</td>
<td>■ stainless steel, ■ polyethylene</td>
</tr>
<tr>
<td>Exterior fittings</td>
<td>C36000 (brass)</td>
<td>■ stainless steel, ■ polyethylene</td>
</tr>
<tr>
<td>Interior tubing</td>
<td>Copper</td>
<td>S30400 (304 stainless steel)</td>
</tr>
<tr>
<td>Bourdon tube(1)</td>
<td>S31600 (316 stainless steel)</td>
<td>■ N09902 nickel alloy, ■ N05500 nickel alloy (for NACE applications)</td>
</tr>
<tr>
<td>Nozzle</td>
<td>S30300 (303 stainless steel)</td>
<td>- -</td>
</tr>
<tr>
<td>Flapper</td>
<td>S31600</td>
<td>- -</td>
</tr>
<tr>
<td>Relay springs</td>
<td>■ S30200 (302 stainless steel), ■ steel</td>
<td>- -</td>
</tr>
<tr>
<td>Relay O-rings</td>
<td>Nitrile</td>
<td>- -</td>
</tr>
<tr>
<td>Relay diaphragms</td>
<td>Nitrile</td>
<td>- -</td>
</tr>
<tr>
<td>Other relay metal parts</td>
<td>■ Aluminum, ■ stainless steel</td>
<td>- -</td>
</tr>
<tr>
<td>Feedback bellows assembly</td>
<td>C51000 (bronze)</td>
<td>S32100 (321 stainless steel)</td>
</tr>
<tr>
<td>Supply, output gauges</td>
<td>Brass (wetted parts only)</td>
<td>stainless steel (wetted parts only)</td>
</tr>
<tr>
<td>Remote set point element</td>
<td>■ N09902 nickel alloy</td>
<td>■ S30300</td>
</tr>
<tr>
<td>Capsular input element</td>
<td>N09902 nickel alloy</td>
<td>S31600</td>
</tr>
</tbody>
</table>

1. Consult your Emerson sales office for information on other materials.
Figure 1. Controller Construction Details

Notes:
1. White portion of proportional band adjustment enables direct controller action; black portion enables reverse controller action.
2. For the process pointer.
3. Input element is a bourdon tube or a capsular element (as shown in inset) depending on input range. See tables 2 and 5.
Principle of Operation

Refer to the schematic diagrams in figures 2, 3, and 4. Refer to table 1 for a complete description of type number suffixes.

Proportional-Only Controllers (4195KA)

The input element is connected to the process pointer and to the flapper by connecting links. As the process pressure increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows. The action of the proportional bellows counteracts the flapper movement that resulted from the process pressure change and backs the flapper away from the nozzle until equilibrium is reached.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure except that when the set point is changed, the nozzle moves with respect to the flapper.

The proportional band adjustment knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle to a position on the flapper where less input and more feedback motion occurs, which decreases the gain of the controller.

Decreasing (narrowing) the proportional band moves the nozzle toward a position where more input and less feedback motion occurs, which increases the gain.

The controller action is changed from direct to reverse by turning the proportional band adjustment knob to position the nozzle on the flapper quadrant to a point where the direction of the flapper motion versus input motion is reversed (see flapper detail in figure 2). With the controller in the reverse-acting mode, an increase in process pressure causes a decrease in output pressure.

Proportional-Plus-Reset and Proportional-Plus-Reset-Plus-Rate Controllers (4195KB and KC)

The operation of proportional-plus-reset controllers (4195KB) is similar to that of proportional-only controllers (described above). However, in 4195KB controllers, output pressure is fed back to the reset bellows as well as to the proportional bellows. In operation, proportional-plus-reset controllers minimize the offset between the process pressure and set point.

As the process pressure increases (in a direct-acting controller), the flapper moves toward the nozzle, restricting flow through the nozzle and increasing nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the proportional bellows and to the reset bellows.

The action of the proportional bellows quickly counteracts the flapper movement that resulted from the process pressure change and backs the flapper away from the nozzle. Pressure in the reset bellows opposes the action of the proportional bellows and slowly moves the flapper closer to the nozzle. Thus, when the process pressure changes, proportional action temporarily reduces the gain of the controller for improved stability. The process pressure then slowly returns to set point, as pressure in both bellows equalizes via the reset action.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure. However, when the set point changes, the nozzle moves with respect to the flapper.

The proportional band adjustment knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle to a position on the flapper where less input and more feedback motion occurs, which decreases the gain.

Decreasing (narrowing) the proportional band moves the nozzle toward a position where more input and less feedback motion occurs, which increases the gain.

The controller action is changed from direct to reverse by turning the proportional band adjustment knob to position the nozzle on the flapper quadrant to a point where the direction of the flapper motion versus input motion is reversed. With the controller in the reverse-acting mode, an increase in process pressure causes a decrease in output pressure.

A 4195KC controller also has a rate valve, which is an adjustable restriction that momentarily increases the controller gain to accelerate the corrective action for slow pressure systems. A proportional-plus-reset-plus-rate controller responds to a change in process pressure as follows: First, the rate action delays the proportional action just long enough to allow the
Figure 2. Schematic of Fisher 4195K Controllers

- Manual Set Point Adjustment
- Reset Bellows (Vented)
- Proportional Bellows
- Proportional Band Adjustment
- Feedback Link
- Feedback Motion
- Direct Action Quadrant
- Input Motion
- Reverse Action Quadrant
- Flapper Pivot
- Flapper Detail
- Output Pressure to Final Control Element
- Relay

- Supply Pressure
- Output Pressure
- Nozzle Pressure
- Reset Pressure
- Proportional Pressure

- Proportional-Only Control
- Proportional-PLUS-RESET Control
- Proportional-PLUS-RESET-PLUS-Rate Control
- Differential Gap Control
- Differential Relief Valve
- Rate Valve
- Reset Valve
- Differential Relief Valve

- Direct Action Quadrant
- Reverse Action Quadrant
- Connecting Link
- Beam
- Flapper
- Nozzle
- Input Element

- To Reset Bellows
- To Nozzle
- To Proportional Bellows
- To Positive Feedback Bellows (Reset Bellows)
- To Final Control Element
- Output Pressure to Final Control Element
- Output to Nozzle
- Rate Valve
- Reset Valve
Differential Gap (For On-Off Control) Controllers (4195KS)

The operation of differential gap controllers (4195KS) is similar to that of proportional-only controllers (described above). However, in 4195KS controllers, as the process pressure increases, approaching the upper switching point, the flapper moves toward the nozzle (in a direct-acting controller). This movement restricts the flow through the nozzle and increases nozzle pressure. When this occurs, relay action increases the output pressure (delivery) of the controller. Output pressure is fed back to the positive feedback bellows. The action of the positive feedback bellows moves the flapper closer to the nozzle, increasing nozzle pressure, which in turn, increases the relay output. Output pressure to the final control element switches to full supply pressure.

As the process pressure decreases, approaching the lower switching point, the flapper moves away from the nozzle (in a direct-acting controller) reducing nozzle pressure. Through relay action, pressure to the positive feedback bellows is reduced, moving the flapper farther away from the nozzle, and further reducing nozzle pressure. Output pressure to the final control element switches to zero.

The set point adjustment changes the proximity of the nozzle and flapper as does a change in process pressure except that, when the set point is changed, the nozzle moves with respect to the flapper. The set point adjustment moves both the upper and lower switching points.

The proportional band knob positions the nozzle on the flapper. Increasing (widening) the proportional band moves the nozzle away from the input connection. When the proportional band adjustment moves the nozzle across the feedback connection, the controller action changes between direct and reverse. On a direct-acting controller, changing the proportional band adjustment will widen or narrow the differential gap between the two switching points. This is accomplished by moving the position of the lower switching point. On a reverse-acting controller, changing the proportional band adjustment will widen or narrow the differential gap between the two switching points by moving the position of the upper switching point.

Remote Set Point Option (Suffix Letter M)

The capability to adjust the controller set point from a remote location is available for all 4195KA controllers. With this option, a control pressure is applied to the capsular element within the remote set point assembly. The expansion and contraction of the capsule moves the set point adjustment via connecting linkage. Increasing the control pressure to the capsule increases the set point setting, and decreasing the control pressure reduces the set point setting. This option is designated by the letter M in the type number.

Auto/Manual Station Option (Suffix Letter E)

A controller with the auto/manual option (designated by the letter E in the type number) has piping on the output side of the relay as shown in figure 3. Supply pressure to the relay is also applied to the manual loader. The manual loader, functioning as a regulator, applies pressure to one side of the plastic tube and to the auto/manual switch. Output pressure from the relay registers on the other side of the plastic tube as well as in the auto/manual switch.

When the auto/manual switch is in the MANUAL position, the manual loader output is channeled through the auto/manual switch and becomes the controller output. When the auto/manual switch is in the AUTO position, the relay output is channeled through the switch to become the controller output.

Before the auto/manual switch is operated, the relay output must equal the manual loader output to avoid bumping the process. Adjusting the set point varies the pressure on the left-hand side of the plastic tube. Adjusting the manual loader knob varies the pressure on the right-hand side of the plastic tube. When the pressures are equal, the metal ball is centered in the tube and is held in place by a small magnet. Pressure imbalance forces the ball to one end of the tube where it forms a seal, blocking air flow through the tube.
Anti-Reset Windup Option (Suffix Letter F)

Anti-reset windup is available for all 4195KB and KC controllers and is designated by the letter F in the type number. The differential relief valve operates when the difference between the proportional bellows pressure and the reset bellows pressure reaches a predetermined value. Anti-reset windup reduces overshoot of the process pressure that can result from a large or prolonged deviation from set point.

External Feedback Option

External feedback is available for all 4195KB controllers. Controllers with this option have an external connection on the bottom of the controller case (see figure 6). This connection breaks the positive feedback (reset) loop inside the controller and brings it outside (see figure 4).

The connection allows the positive feedback loops of two controllers (primary and secondary) to be tied together when the controllers are used in an override application. When connected, the secondary controller reset pressure tracks the primary controller output pressure, minimizing reset windup in the secondary controller.
Installation

4195K gauge pressure controllers can be shipped alone for a separate installation or for installation on a control valve actuator. The controllers can also be mounted on a pipe stand, on a wall, or in a panel. When a controller is mounted on an actuator and a positioner is not used, the controller will usually be opposite the supply regulator as shown in figure 5. If a positioner is used, the supply regulator can be mounted on the actuator casing.

The controller must be installed so the vent points down. Basic controller dimensions are shown in figure 6. Dimensions for specific mounting configurations are shown in figure 7.

Ordering Information

When ordering a 4195K controller, specify:

**Application**

1. Description of the service, such as throttling or on-off
2. Pressure range, composition, and temperature of process fluid
3. Ambient temperature

**Construction**

Refer to the specifications and to the Construction Features section. Carefully review each specification and feature, indicating your choice whenever a selection is to be made. Refer to table 1 for type numbers; add an R to any type number if reverse action is desired.
Figure 6. Controller Dimensions and Connections

Notes:
1. 1/4-18 NPT process connection (marked A) for all bourdon tube controllers and for those capsular element controllers used in vacuum pressure applications.
2. 1/4-18 NPT process connection (marked B) for capsular element controllers used in positive and compound pressure applications.
3. For the external feedback connections (4195KB controllers only), either the A or B connection is used, depending on the location of the process connection.
Figure 7. Mounting Dimensions

HORIZONTAL PIPE

SIDE VIEW

VERTICAL PIPE

PIESTAND MOUNTING

TOP VIEW

REAR VIEW

DIMENSIONS OF PANEL CUTOUT

PANEL MOUNTING

WALL MOUNTING

mm

(INCH)