

Type Cronos Pressure Reducing Regulator

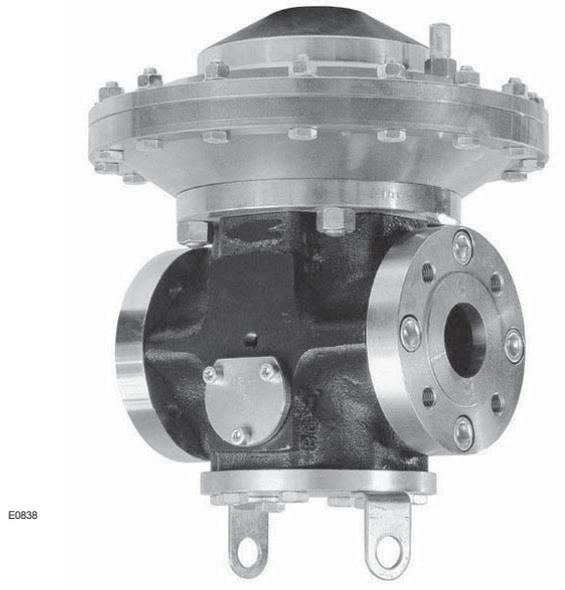


Figure 1. Type Cronos Regulator

Features

- ◆ **Control Accuracy**—Keeps constant inlet pressures to downstream equipment by accurately controlling system pressures at widely varying flow rates and supply pressures for maximum efficiency and best operation.
- ◆ **Versatility**—A wide variety of applications such as medium to high pressure natural gas transmission distribution systems, power plants, monitors, and sour gas.
- ◆ **Easy Adjustment**—Easy adjustment of the outlet pressure by simple adjustment of the pilot.
- ◆ **Tight Shutoff**—A combination of soft seat and metal plug with a knife edge provides a long lasting reliable shutoff in normal and erosive service.
- ◆ **Easy Startup**—Equal inlet and outlet pressure ratings allows easier startup and shutdown.
- ◆ **No Atmospheric Bleed**—Main regulator loading pressure from pilot bleeds downstream through pilot bleed.
- ◆ **High Capacity**—Available in 1, 2, or 3-inch (DN 25, 50, or 100) body sizes, the body design and flow passage allows exceptionally high capacities with a maximum C_g of 5100.
- ◆ **Quiet Operation**—Optional noise abatement trim is available for up to 20 to 30 dB(A) reduction.
- ◆ **In-Service Travel Indicator**—The travel indicator with protective cover, responds to the precise movement of the diaphragm and plug assembly and shows the actual valve position.



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Specifications

Available Configuration

Type Cronos: Pilot-operated pressure reducing regulator for low to high outlet pressure.

Body Sizes

1, 2, and 3-inch (DN 25, 50, and 100)

With Type SRS Silencer (inlet x outlet):

1 x 4, 2 x 6, and 3 x 10-inch (DN 25 x 100, 50 x 150, and 80 x 250)

End Connection Style

ANSI 150, 300 or 600 RF Flanges

Main Body Pressure Ratings⁽¹⁾

ANSI Class 150 RF: 290 psig (20,0 bar)

ANSI Class 300 and 600 RF: 1450 psig (100 bar)

Maximum Inlet Pressure⁽¹⁾

ANSI Class 150 RF: 290 psig (20,0 bar)

ANSI Class 300 and 600 RF: 1450 psig (100 bar)

Maximum Outlet (Casing) Pressure⁽¹⁾

1450 psig (100 bar)

Maximum Emergency (Design Pressure)

1450 psig (100 bar)

Minimum Operating Differential Pressure

ANSI Class 150 RF: 2.9 psid (0,2 bar d)

ANSI Class 300 and 600 RF: 7.3 psid (0,5 bar d)

Outlet Pressure Ranges

See table 1

Flow Coefficients

See table 2

Pilot Flow Coefficients

C_g: 10.5; **C_v:** .36; **C₁:** 29

Pressure Registration

External

Maximum Temperature Capabilities⁽¹⁾

-20° to 150°F (-29° to 66°C)

Approximate Weight (Including Pilot)

See figure 5

Construction Materials

Cronos Series Main Valve

Main Body: Steel, ASTM A352 LCB

Flanges and Diaphragm Casings: Steel, ASTM A350 LF2

Diaphragm Plates: Sheet steel

Diaphragm: Nitrile (NBR) with PVC coating

O-ring and Seat: Nitrile (NBR) or Fluoroelastomer (FKM)

Type PRX Pilot

Body: Steel, ASTM 105

Trim: Stainless Steel

Diaphragm: Nitrile (NBR) with PVC coating

O-ring and Seat: Nitrile (NBR) or Fluoroelastomer (FKM)

Type SA/2 Supply Pressure Regulator

Body: Steel

Diaphragm: Nitrile (NBR) with PVC coating

O-ring and Seat: Nitrile (NBR) or Fluoroelastomer (FKM)

1. The pressure/temperature limits in this bulletin or any applicable standard limitation should not be exceeded.

Table 1. Outlet Pressure Ranges

TYPE	OUTLET PRESSURE RANGE, PSIG (bar)	SPRING COLOR
PRX/120 PRX/125	7.3 to 16 (0,5 to 1,1)	White
	14.5 to 26 (1 to 1,8)	Yellow
	23 to 44 (1,6 to 3)	Green
	41 to 80 (2,8 to 5,5)	Blue
	73 to 123 (5 to 8,5)	Black
PRX/120-AP PRX/125-AP	116 to 210 (8 to 14,5)	Silver
	203 to 334 (14 to 23)	Gold
	319 to 435 (22 to 30)	Aluminum
	421 to 609 (29 to 42)	Red
PRX/120-AP PRX/125-AP	435 to 1160 (30 to 80)	Clear

Table 2. Flow Coefficients

BODY SIZE, INCHES (DN)	FLOW COEFFICIENT	REGULATING AND WIDE OPEN FOR RELIEF SIZING			
		STD	WITH TYPE SR	WITH TYPE SRS	WITH WIDE OUTLET
1 (25)	C _g	550	540	500	580
	C _v	18.3	18	15.2	19.3
	C ₁	30	30	33	30
2 (50)	C _g	2250	2200	1900	2300
	C _v	77.6	75.9	59.4	79.3
	C ₁	29	29	32	29
3 (80)	C _g	5100	5000	4200	5200
	C _v	176	172	131	179
	C ₁	29	29	32	29

Introduction

Type Cronos regulators are accurate pilot-operated, pressure balanced, soft seated regulators designed for high pressure transmission/city gate, large capacity distribution systems and power plant feeds. They provide smooth, quiet operation, tight shutoff and long life.

The regulator utilizes a main valve actuator, a Type PRX pressure reducing pilot, and a Type SA/2 pilot supply pressure regulator. The Type PRX pilot uses inlet pressure reduced by the Type SA/2 supply pressure regulator, as loading pressure to operate the main valve actuator. The outlet pressure is sensed through a control line on the main valve actuator and also on the Type PRX pilot diaphragm.

The superior performance of this regulator is due to the amplifying effect of the pilot and the two-path control system. Changes in outlet pressure act quickly on the actuator diaphragm to provide fast response to system change. Then the pilot amplifies any small system changes to position the main valve for precise pressure control.

Pilot Type Descriptions

A pressure reducing pilot that has the ability to handle a wide range of set points from 7.3 to 1160 psig (0,5 to 80 bar) in two versions:

Type PRX/120: A pressure reducing pilot with an outlet pressure range of 7.3 to 609 psig (0,5 to 42 bar). The Type PRX/120 can be used as the pilot on single stage pressure reducing regulators or as the monitor pilot or as the working pilot in wide-open monitor systems.

Type PRX/120-AP: A pressure reducing pilot with an outlet pressure range of 435 to 1160 psig (30 to 80 bar). The Type PRX/120-AP can be used as the pilot on single stage pressure reducing regulators or as the monitor pilot or as the working pilot in wide-open monitor systems.

Type PRX/125: This pilot is identical to the Type PRX/120 except that the restriction screw is removed. The Type PRX/125 can only be used as the monitor override pilot on working monitor applications. The pilot has an outlet pressure range of 7.3 to 609 psig (0,5 to 42 bar).

Type PRX/125-AP: This pilot is identical to the Type PRX/120-AP except that the restriction screw is removed. The Type PRX/125-AP can only be used as the monitor override pilot on working monitor applications. The pilot has an outlet pressure range of 435 to 1160 psig (30 to 80 bar).

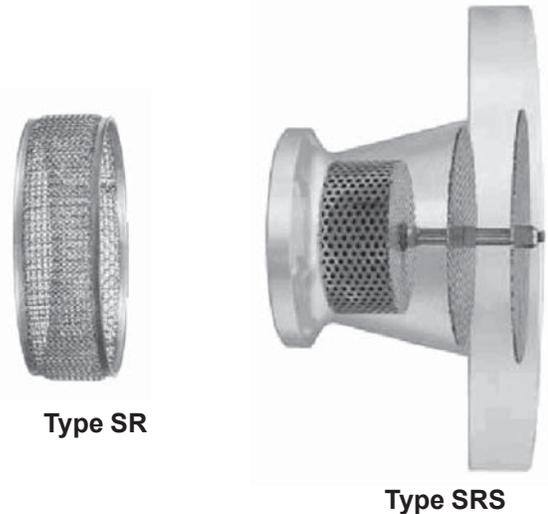


Figure 2. Noise Abatement Constructions

Pilot Supply Regulator

The Type SA/2 pilot supply filter regulator, provides a constant supply pressure to the Type PRX pilot that is 45 psig (3 bar) over set pressure. The Type SA/2 has a integral 5 micron filter.

Noise Abatement

Type SR: The Type SR (figure 2) high velocity (up to 262 ft/s at the outlet flange) noise abatement device is incorporated into the regulator on the downstream side and consists of plated stainless steel wires containing no sound deadening materials. Depending on flows and pressure drop, the silencer can reduce noise levels as much as 20 dB (A) with an approximate 3% C_g reduction.

Type SRS: A second noise reduction device may be added to the Type Cronos regulators. The Type SRS (figure 2) consists of an Type SR plus a widened outlet flange in which a second silencer is fitted. Noise reduction is based on the principle of stream splitting and gradual expansion in several stages. By using a wider outlet flange the silencer can be mounted integral to the regulator body which allows installation of the regulator directly into the downstream piping without an expansion joint. Noise reduction up to 25 dB (A) is reached without limiting the velocity in the outlet flange. However, there is a C_g reduction of about 15%.

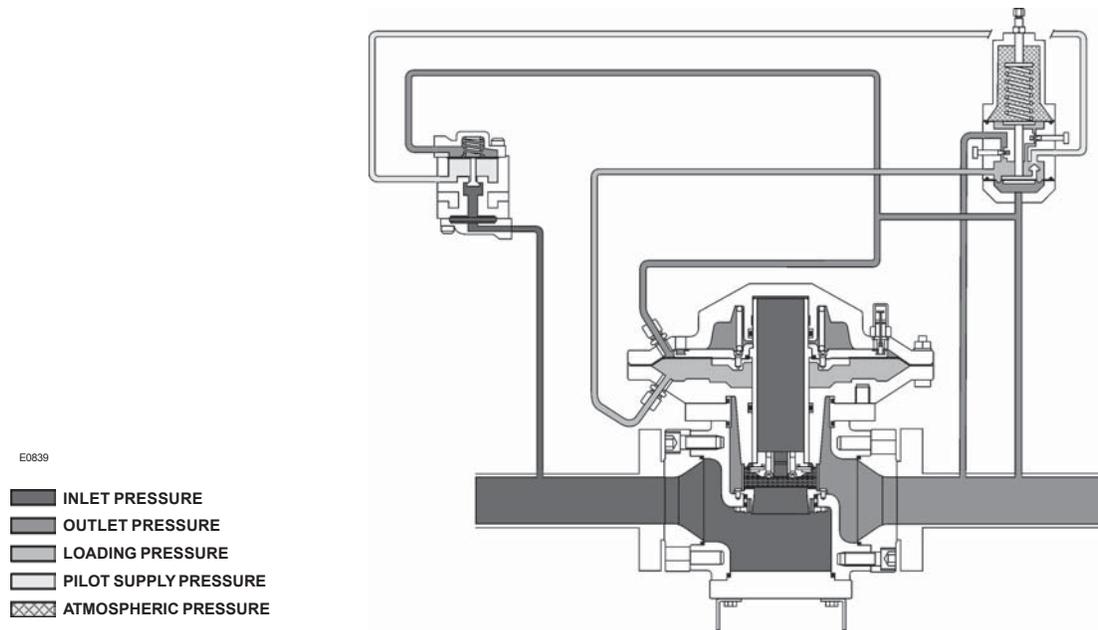


Figure 3. Type Cronos Operational Schematic

Principle of Operation

The pilot-operated Type Cronos (figure 3) uses inlet pressure as the operating medium, which is reduced through pilot operation to load the actuator diaphragm. Outlet or downstream pressure opposes loading pressure in the actuator and also opposes the pilot control spring.

When outlet pressure drops below the setting of the pilot control spring, pilot control spring force on the pilot diaphragm thus opens the pilot valve plug, providing additional loading pressure to the actuator diaphragm. This diaphragm loading pressure opens the main valve plug, supplying the required flow to the downstream system. Any excess loading pressure on the actuator diaphragm escapes downstream through the bleed restriction in the pilot.

When the gas demand in the downstream system has been satisfied, the outlet pressure increases. The increased pressure is transmitted through the downstream control line and acts on the pilot diaphragm. This pressure exceeds the pilot spring setting and moves the diaphragm, closing the orifice. The loading pressure acting on the main diaphragm bleeds to the downstream system through a bleed restriction in the pilot.

Adjustment

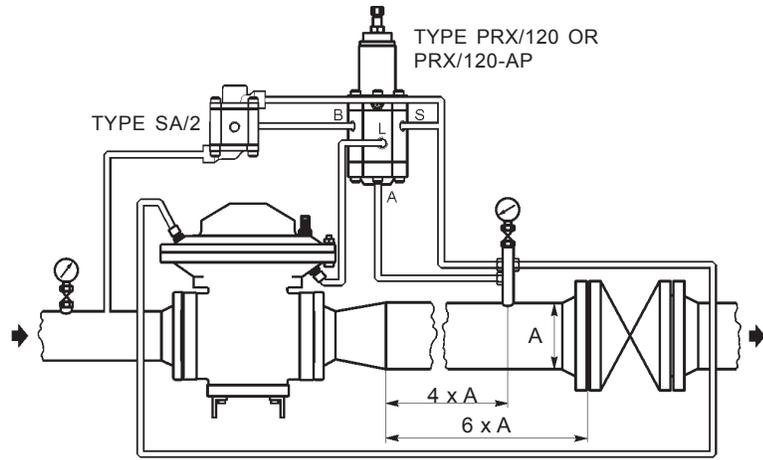
The adjustment of the regulator is performed by means of the pilot adjusting screw, which varies the compres-

sion of the control spring. Adjustment is performed while the regulator is in operation with the aid of a test pressure gauge of suitable range or of a water column. The shutoff valve downstream of the regulator must not be completely closed; it is necessary that a small quantity of gas flows downstream to allow the outlet side to vent down, when it is necessary to lower the pressure.

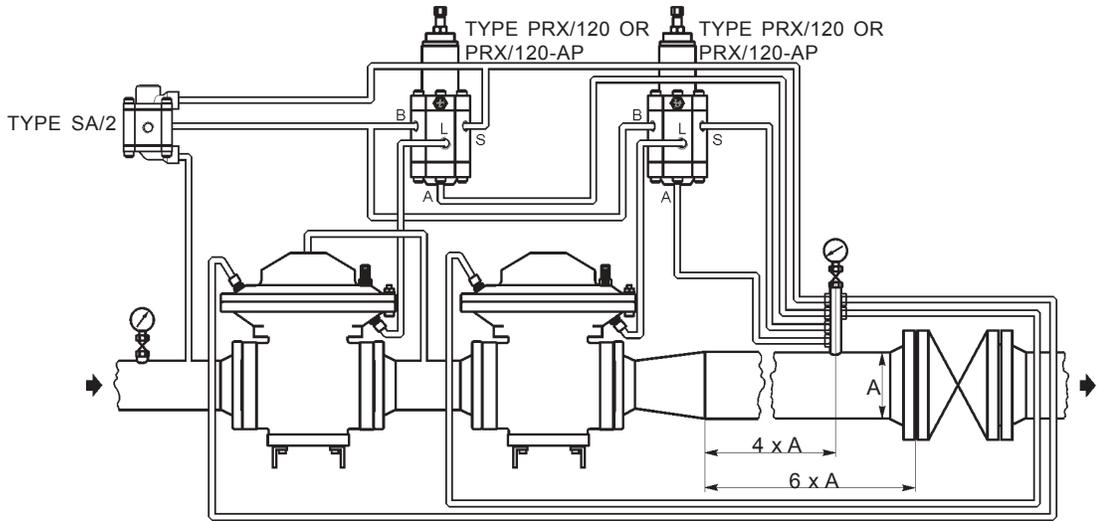
Loosen the locknut and turn the adjusting screw slowly to adjust outlet pressure. Use a pressure gauge to check the outlet pressure until the desired pressure is reached.

Monitoring Systems

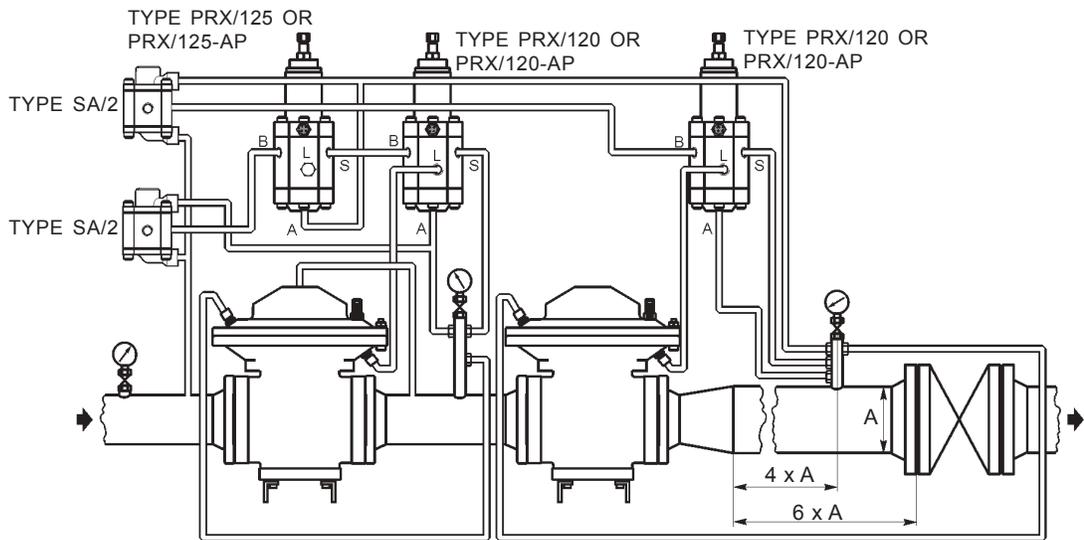
Monitoring regulation is overpressure protection by containment, therefore, there is no relief valve to vent to the atmosphere. When the working regulator fails to control the pressure, a monitor regulator installed in series, which has been sensing the downstream and control pressure, goes into operation to maintain the downstream pressure at a slightly higher than normal pressure. During an overpressure situation, monitoring keeps the customer on line. Also, testing is relatively easy and safe. To perform a periodic test on a monitoring regulator, increase the outlet set pressure of the working regulator and watch the outlet pressure to determine if the monitoring regulator takes over at the appropriate outlet pressure.



Single Pilot System Installation



Upstream or Downstream Wide-Open Monitoring System Installation



Working Monitoring System Installation

E0840

Figure 4. Typical Type Cronos Installation Schematics

Wide-Open Monitoring Systems (figure 4)

There are two types of wide-open monitoring systems: upstream and downstream. The difference between upstream and downstream monitoring is that the functions of the regulators are reversed. Systems can be changed from upstream to downstream monitoring, and vice-versa, by simply reversing the setpoints of the two regulators. The decision to use either an upstream or downstream monitoring system is largely a matter of personal preference or company policy.

In normal operation of a wide-open configuration, the working regulator controls the system's outlet pressure. With a higher outlet pressure setting, the monitor regulator senses a pressure lower than its setpoint and tries to increase outlet pressure by going wide-open. If the working regulator fails, the monitoring regulator assumes control and holds the outlet pressure at its outlet pressure setting.

Working Monitoring Regulators (figure 4)

In a working monitoring system, the upstream regulator requires two pilots and it is always the monitoring regulator. The additional pilot permits the monitoring regulator to act as a series regulator to control an intermediate pressure during normal operation. In this way, both units are always operating and can be easily checked for proper operation.

In normal operation, the working regulator controls the outlet pressure of the system. The monitoring regulator's working pilot controls the intermediate pressure and the monitoring pilot senses the system's outlet pressure. If the working regulator fails, the monitoring pilot will sense the increase in outlet pressure and take control.

Note

The working regulator must be rated for the maximum allowable operating pressure of the system because this will be its inlet pressure if the monitoring regulator fails. Also, the outlet pressure rating of the monitoring pilot, and any other components that are exposed to the intermediate pressure must be rated for full inlet pressure.

Working monitor installations require a Type Cronos main valve with a Type PRX/120 or PRX/120-AP working pilot and a Type PRX/125 or PRX/125-AP monitoring

pilot for the upstream regulator and a Type Cronos with the appropriate Type PRX/120 or PRX/120-AP pilot for the downstream regulator.

Adjustment

Adjusting the monitor regulator is similar to adjusting the main regulator. Monitor setpoints are set slightly higher than the main regulator. However, the value of this difference cannot be determined in advance, as it depends on the particular characteristics of each application.

Capacity Information

To find approximate regulating capacities or to find wide-open flow capacities for relief sizing at any inlet pressure, perform one of the following procedures. Then, if necessary, convert using the factors provided below.

For critical pressure drops (absolute outlet pressure equal to or less than one-half of absolute inlet pressure), use the following formula:

$$Q = (P_1)(C_g)(1.29)$$

For pressure drops lower than critical (absolute outlet pressure greater than one-half of absolute inlet pressure).

$$Q = \sqrt{\frac{520}{GT}} C_g P_1 \text{SIN} \left(\frac{3417}{C_1} \sqrt{\frac{\Delta P}{P_1}} \right) \text{DEG}$$

where,

Q = gas flow rate, scfh

P₁ = absolute inlet pressure, psia (P₁ gauge + 14.7)

C_g = regulating or wide-open gas sizing coefficient from the Specifications table

G = gas specific gravity of the gas

T = absolute temperature of gas at inlet, °Rankine

C₁ = flow coefficient

ΔP = pressure drop across the regulator, psi

To determine equivalent capacities for air, propane, butane, or nitrogen, multiply the capacity by the following appropriate conversion factor: 0.775 for air, 0.628 for propane, 0.548 for butane, or 0.789 for nitrogen. For gases of other specific gravities, multiply the given capacity by 0.775, and divide by the square root of the appropriate specific gravity.

Then, if capacity is desired in normal cubic meters per hour at 0°C and 1,01325 bar, multiply scfh by 0.0268.

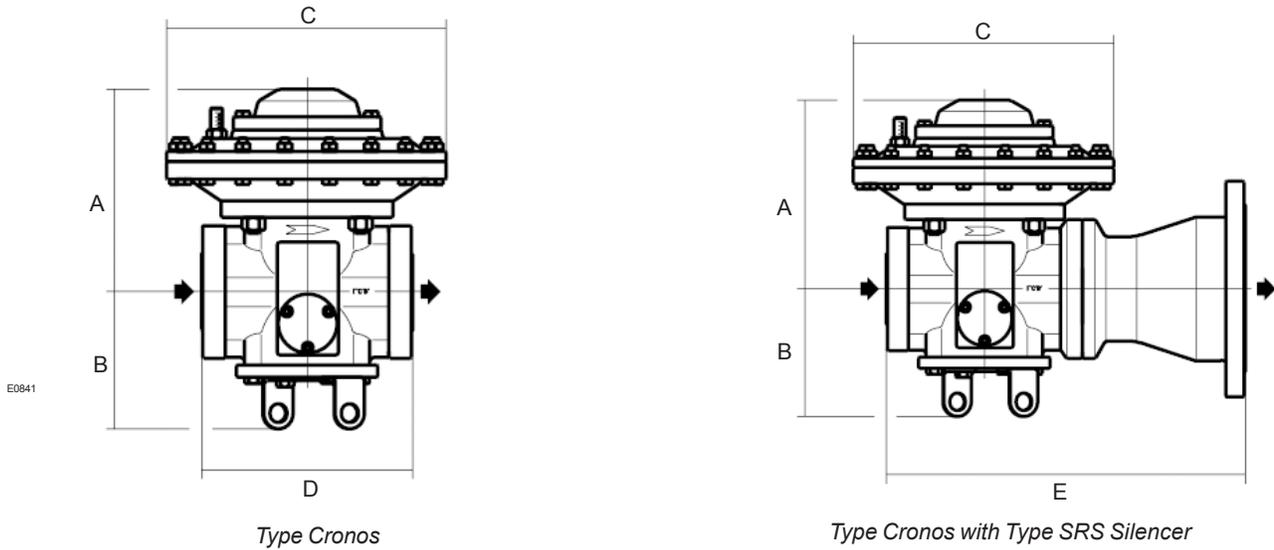
Installation

The Type Cronos regulators are installed in a horizontal or vertical pipeline. See figure 4 for typical piping installations.

Dimensions are given in figure 5.

Ordering Information

Carefully review each specification in the Specifications section, then complete the Specification Worksheet on page 8. If a pilot setpoint is not requested, the regulator will be set at the approximate midrange.



BODY SIZE, INCH (DN)	DIMENSIONS, INCHES (mm)												WEIGHTS, POUNDS (KG)	
	150 RF Flanged PN 16					300 RF or 600 RF Flanged PN 25 or 40			300 RF Flanged PN 25		600 RF Flanged PN 40		STANDARD	WITH TYPE SRS
	A	B	C	D	E	A	B	C	D	E	D	E		
1 (25)	8.5 (215)	7.1 (180)	11.2 (285)	7.3 (184)	13.8 (350)	8.7 (220)	7.1 (180)	8.9 (225)	7.8 (197)	13.9 (353)	8.3 (210)	14.2 (360)	79 (36)	108 (49)
2 (50)	9.6 (245)	7.7 (195)	13.2 (335)	10.0 (254)	18.3 (465)	10.2 (260)	7.7 (195)	11.3 (287)	10.5 (267)	18.6 (471)	11.3 (286)	18.9 (480)	137 (62)	192 (87)
3 (80)	13.0 (330)	10.3 (260)	15.7 (400)	11.8 (298)	22.5 (571)	13.8 (350)	10.3 (260)	15.7 (400)	12.5 (317)	23.2 (590)	13.3 (337)	23.6 (600)	282 (128)	419 (196)

Figure 5. Dimensions

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Ordering Guide

Body Size (Select One)

- 1-inch (DN 25) Body **
- 2-inch (DN 50) Body **
- 3-inch (DN 80) Body **

Body inlet x outlet with a Type SRS

- 1 x 4-inch (DN 25 x 100) Body **
- 2 x 6-inch (DN 50 x 150) Body **
- 3 x 10-inch (DN 80 x 250) Body **

End Connection Styles (Select One)

- 150 RF**
- 300 RF**
- 600 RF**

O-Ring Material (Select One)

- Nitrile (NBR) (standard)**
- Fluoroelastomer (FKM)**

Pilot Type (Select One)

- Type PRX-120 **
- Type PRX/120-AP **
- Type PRX-125 ** (monitor override pilot)
- Type PRX/125-AP ** (monitor override pilot)

Outlet Pressure Range (Select One)

PRX120/125

- 7.3 to 16 psig (0,5 to 1,1 bar)**
- 14.5 to 26 psig (1 to 1,8 bar)**
- 23 to 44 psig (1,6 to 3 bar)**
- 41 to 80 psig (2,8 to 5,5 bar)**
- 73 to 123 psig (5 to 8,5 bar)**
- 116 to 210 psig (8 to 14,5 bar)**
- 203 to 334 psig (14 to 23 bar)**
- 319 to 435 psig (22 to 30 bar)**
- 421 to 609 psig (29 to 42 bar)**

PRX120/125-AP

- 435 to 1160 psig (30 to 80 bar)**

Fisher Regulators Quick Order Guide	
* * *	Standard - Readily Available for Shipment
* *	Non-Standard - Allow Additional Time for Shipment
*	Special Order, Constructed from Non-Stocked Parts. Consult Your Fisher Sales Representative for Availability.
Availability of the product being ordered is determined by the component with the longest shipping time for the requested construction.	

Type SA/2 O-Ring and Seat Material

- Nitrile (NBR) (standard)**
- Fluoroelastomer (FKM)**

Noise Abatement

- Type SR**
- Type SRS**
- None

Pilot Diaphragm (Select One)

- Nitrile (NBR) (standard)**
- Fluoroelastomer (FKM)**

Pilot Valve Disk Assembly (Select One)

- Nitrile (NBR) (standard)**
- Fluoroelastomer (FKM)**

Pilot Valve Replacement Parts Kit (Optional)

Yes, send one replacement parts kit to match this order.

Specification Worksheet

Application:

Specific Use _____
 Line Size _____
 Fluid Type _____
 Specific Gravity _____
 Temperature _____
 Does the Application Require Overpressure Protection?
 Yes No

Pressure:

Maximum Inlet Pressure _____
 Minimum Inlet Pressure _____
 Differential Pressure _____
 Set Pressure _____
 Maximum Flow _____

Accuracy Requirements:

Less Than or Equal To:
 5% 10% 20% 40%

Construction Material Requirements (if known):

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