

The Type 1098-EGR and Type 1098H-EGR regulators (figure 1) provide economical and accurate pressure control in a wide variety of applications; natural gas distribution systems; fuel gas supply to industrial boilers, furnaces, ovens, and mixers; and large commercial/industrial establishments such as shopping centers and schools. They are also used in plant air service and in liquid service where a slow stroking time (approximately 30 to 90 seconds) is desired on both opening and closing the main valve. The Type 1098-EGR regulator is used with a Type 6351, 6352, or 6353 pilot. The Type 1098H-EGR regulator is used only with a Type 6354L, 6354M or 6354H pilot.

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 changes. Then the pilot amplifies any small system changes to position the main valve for precise pressure control.

Features

- **Quick-Change Trim Package**—Tested trim packages can be made up and stocked ahead of time for fast replacement.

- **Labor-Saving Trim Maintenance**—Only body flange screws or stud bolt nuts need be removed for quick trim change (figure 2). Body and actuator can stay in line. Actuator stem, pilot, control line, or supply line need not be disconnected.

- **No Assembly Adjustments for Actuator or Valve Plug Seating**—Actuator design eliminates valve stem connector. Precise machining ensures that both valve plug edges shut off at same time against port and upper seals (figure 3).

- **Ease of On-Site Maintenance**—To remove seat ring, trim package may be flipped over and reanchored right on body. Threaded bonnet connection permits easy actuator removal with standard tools.

- **No Atmospheric Bleed**—Loading pressure bleeds downstream through pilot and control line and only when regulator is throttling, making this regulator suitable for installation in its and other enclosed locations.

- **Noise Reduction Capability**—Optional **Whisper Trim®** cage can reduce noise from high-velocity gas by as much as 20 decibels. **Whisper Trim** equipped bodies are especially engineered for such noise-environment applications as high-pressure gas reducing stations where sonic gas velocities are often encountered at regulator outlets.



Figure 1. Typical Regulator Constructions

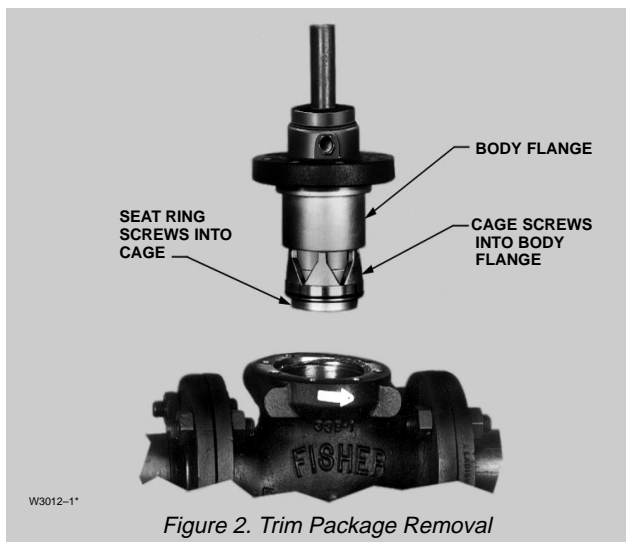


Figure 2. Trim Package Removal

- **In-Service Travel Inspection**—Standard indicator assembly with protective cover permits periodic inspection of plug travel without removing regulator from service.

- **Low Leakage**—Composition upper seal and port seal (figure 3) provide positive shutoff, minimizing seat leakage when downstream demand is zero and the regulator is shut off.

Specifications

BODY SIZES AND END CONNECTION STYLES

BODY SIZE, IN.	END CONNECTION STYLES AND RATINGS*	
	Cast Iron Body	Steel Body
1, 2	Screwed	Screwed, butt weld, or socket weld ends
2, 3, 4, 6	Flat-face Class 125B or raised-face Class 250B flanged	Raised-face Class 150, 300, or 600 flanged, or butt weld ends

AVAILABLE PILOT CONFIGURATIONS

See table 1

MAXIMUM MAIN VALVE INLET PRESSURE*

400 psig (28 bar) or body rating limit, whichever is lower

MAXIMUM PILOT SUPPLY PRESSURE*

600 psig (41 bar)

OUTLET (CONTROL) PRESSURE RANGES

See table 2

MAXIMUM AND MINIMUM DIFFERENTIAL PRESSURES

See table 3

ACTUATOR SIZES AND MAXIMUM ACTUATOR PRESSURES*

ACTUATOR		OUTLET (CONTROL) PRESSURE		EMERGENCY CASING PRESSURE	
Type	Size	Psig	Bar	Psig	Bar
1098	30	100	6.9	115	7.9
	40 (std)	75	5.2	82	5.7
	70	50	3.4	65	4.5
1098H	30	300	20.7	400	27.6

MAIN VALVE FLOW CHARACTERISTIC

Linear

MAIN VALVE FLOW DIRECTION

In through seat ring and out through cage

PORT DIAMETERS AND TRAVELS

BODY SIZE, IN.	PORT DIAMETER		TRAVEL				
	In.	mm	Standard		Restricted		
			In.	mm	Percentage of Flow Capacity	In.	mm
1	1-5/16	33	3/4	19
2	2-3/8	60	1-1/8	29	30	3/8	9.5
					70	5/8	16
3	3-3/8	86	1-1/2	38	40	7/8	22
4	4-3/8	111	2	51	40	1	25.4
6	7-3/16	183					

APPROXIMATE PROPORTIONAL BANDS

See tables 4 and 5

TYPICAL REGULATING CAPACITIES

See table 7 and Capacity Information section

FLOW COEFFICIENTS

See table 8

NOISE INFORMATION

See Fisher Catalog 10 for sound pressure level prediction

CONSTRUCTION MATERIALS

Main Valve

Body and Body Flange: Cast iron (standard) or steel

Cage: Hardened electroless nickel coated cast iron (standard) or 416 stainless steel (**Whisper Trim** cage)

Seat Ring and Valve Plug: Hardened 416 stainless steel

Spring, Bolting, and Pipe Plug: Steel or stainless steel

Travel Indicator Assembly: Steel or stainless steel except plastic for indicator scale

Piston Ring: TFE

O-Rings and Soft Parts: Nitrile (standard) or fluoroelastomer (high-temperature), except asbestos for body flange gasket

Actuator

Bonnet, Diaphragm Cases, and Bolting: Steel

Diaphragm Plate: Cast iron

Diaphragm and O-Rings: Nitrile (standard) or fluoroelastomer (high-temperature)

Stem: 316 stainless steel

Pilot Mounting Parts

Tubing and Connector Fittings: Steel (standard) or stainless steel

Pipe Bushing: Malleable iron

Pipe Nipples: Galvanized steel

Type 6351 Pilot

Body, Body Plug, and Spring Case: Aluminum

Control Spring: Plated steel

Valve Plug Stem: Brass (standard) or stainless steel

Other Metal Trim Parts: Steel, aluminum, and/or stainless steel

Diaphragm, O-Rings, and Other Soft Parts: Nitrile (standard) or fluoroelastomer (high-temperature), except asbestos for body plug gasket

Specifications (Continued)

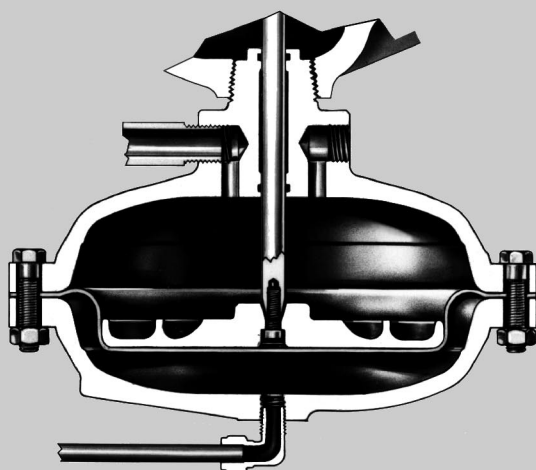
MATERIAL TEMPERATURE CAPABILITIES*	<p>Type 6352, 6353, 6354L, 6354M, or 6354H Pilot Body, Body Plug, Spring Case, and Closing Cap: Aluminum (standard), brass, steel, or stainless steel Control Spring: Plated steel Bellows Assembly: Nickel and stainless steel Type 6352 Diaphragm: Natural rubber† Types 6353, 6354L, 6354M, or 6354H Diaphragm: Nitrile Type 6354M and 6354H Diaphragm Limiter: Aluminum O-Rings and Other Soft Parts: Nitrile (standard) or fluor elastomer (high-temperature), except asbestos for body plug and closing cap gaskets Filter: Brass (Type P594-1 standard) or aluminum (Type P593-1), except cellulose for filter element and asbestos for gasket Pilot and Actuator Vents: Zinc/stainless steel</p>	PRESSURE CONNECTIONS	See figure 8
	<p>Standard Elastomers: -20°F to 150°F (-29°C to 66°C) High-Temperature Elastomers: 0°F to 300°F (-18° to 149°C), except 0 to 180°F (-18 to 82°C) for water service</p>	<p>APPROXIMATE WEIGHTS (WITH STANDARD SINGLE-PILOT CONSTRUCTION)</p> <p>Type 1098 Actuator ■ Size 30 1 In. Body: 55 lb (25 kg) 2 In. Body: 75 lb (34 kg) 3 In. Body: 115 lb (52 kg) 4 In. Body: 165 lb (75 kg) 6 In. Body: 350 lb (159 kg) ■ Size 40 (Standard) 1 In. Body: 65 lb (29 kg) 2 In. Body: 85 lb (39 kg) 3 In. Body: 125 lb (57 kg) 4 In. Body: 175 lb (79 kg) 6 In. Body: 360 lb (163 kg) ■ Size 70 1 In. Body: 140 lb (64 kg) 2 In. Body: 160 lb (73 kg) 3 In. Body: 200 lb (91 kg) 4 In. Body: 250 lb (113 kg) 6 In. Body: 435 lb (197 kg) Type 1098H Size 30 Actuator 1 In. Body: 80 lb (36 kg) 2 In. Body: 100 lb (45 kg) 3 In. Body: 140 lb (64 kg) 4 In. Body: 190 lb (86 kg) 6 In. Body: 375 lb (170 kg)</p>	
		ADDITIONAL OPTIONS	See Construction Features section

*The pressure/temperature limits in this bulletin, and any applicable ANSI standard limitation, should not be exceeded.

†Consult your Fisher sales office or sales representative for nitrile and other optional materials.

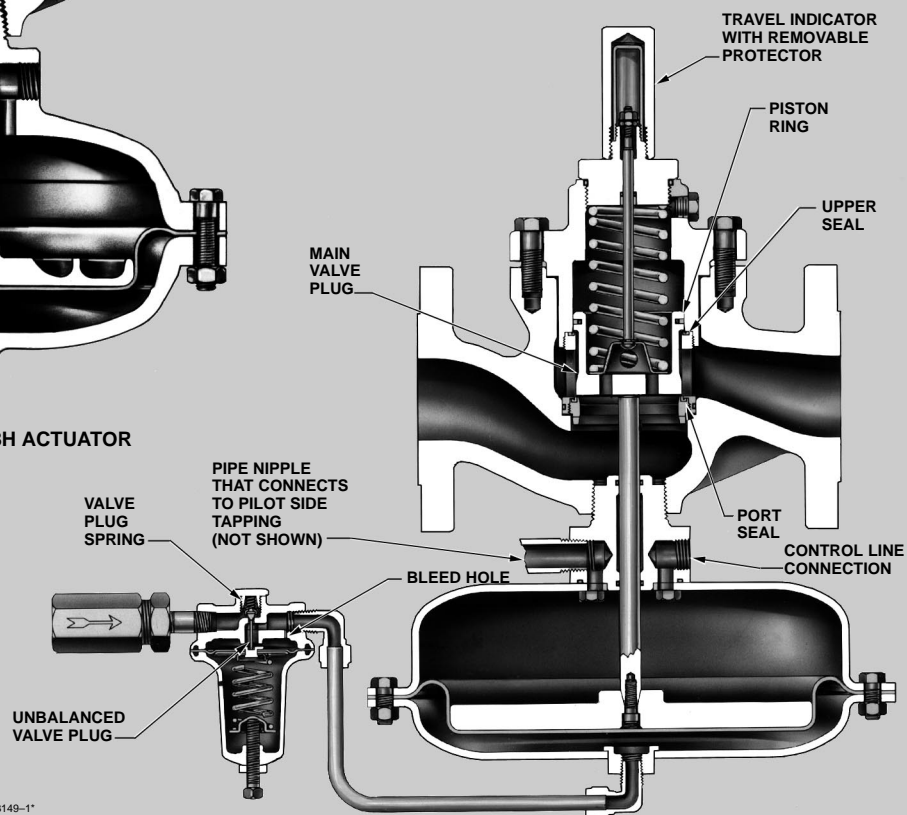
Table 1. Available Pilot Configurations

CONSTRUCTION		TYPE NUMBER			
		6351	6352	6353	6354L, 6354M, or 6354H
Unbalanced pilot valve plug		Standard
Balanced pilot valve plug		...	Standard	Standard	Standard
Aluminum spring case with drilled vent and without closing cap		Standard	Optional	Optional	Optional
1/4 in. 18-NPT tapped spring case with closing cap and removable vent	Aluminum	...	Standard	Standard	Standard
	Brass	...	Optional	Optional	Optional
	Steel	...	Optional	Optional	Optional
	Stainless Steel	...	Optional	Optional	Optional
Pilot restriction	Standard gain (indicated by S stamped on pilot body and nameplate)	Standard	Standard	Standard	Standard
	Low gain for liquid service and/or broader proportional bands (indicated by L stamped on pilot body and nameplate)	...	Optional	Optional	Optional
	High gain for narrower proportional bands (indicated by H stamped on pilot body and nameplate)	...	Optional	Optional	Optional



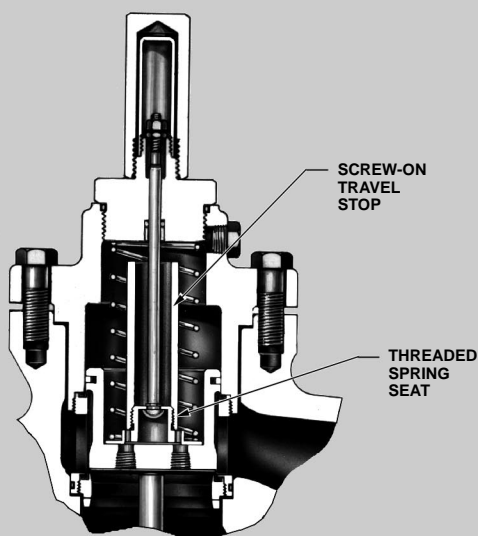
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DETAIL OF TYPE 1098H ACTUATOR



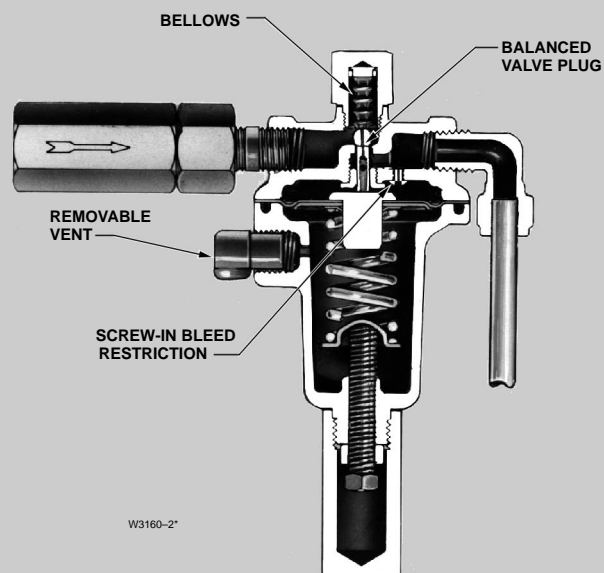
W3149-1*

TYPE 1098-EGR REGULATOR SHOWN WITH TYPE 6351 PILOT



W3161-1*

DETAIL OF OPTIONAL
RESTRICTED CAPACITY CONSTRUCTION



W3160-2*

DETAIL OF TYPE 6352,
6533, OR 6345L PILOT

Figure 3. Construction Features

Table 2. Outlet (Control) Pressure Ranges

PILOT	OUTLET (CONTROL) PRESSURE RANGE	PILOT CONTROL SPRING DATA	
		Color Code	Part Number
Type 6351	3 to 20 psig (0.21 to 1.4 bar) 5 to 35 psig (0.34 to 2.4 bar) 35 to 100 psig (2.4 to 6.9 bar)	Green Cadmium Red	1B9860 27212 1B7883 27022 1K7485 27202
Type 6352	2 in. w.c. to 2 psig (5 to 140 mbar) 2 to 10 psig (0.14 to 0.69 bar)	Yellow Black	14A9672 X012 14A9673 X012
Type 6353	3 to 40 psig (0.21 to 2.8 bar) 35 to 100 psig (2.4 to 6.9 bar)	Yellow Red	1E3925 27022 1K7485 27202
Type 6354L Type 6354M Type 6354H	85-200 psig (5.9 - 13.8 bar)* 175-220 psig (12.1 - 15.2 bar)† 200-300 psig (13.8 - 20.7 bar)†	Blue* Blue† Green†	1L3461 27412 1L3461 27412 15A9258 X012
*Without diaphragm limiter. †With diaphragm limiter.			

Table 3. Maximum and Minimum Differential Pressures for Main Valve Spring Selection

MAIN VALVE SPRING	Color Code		Green	Blue	Red
	Part Number	1 In. Body	14A9687 X012	14A9680 X012	14A9679 X012
		2 In. Body	14A6626 X012	14A6627 X012	14A6628 X012
		3 In. Body	14A6629 X012	14A6630 X012	14A6631 X012
		4 In. Body	14A6632 X012	14A6633 X012	14A6634 X012
		6 In. Body	14A9686 X012	14A9685 X012	15A2615 X012
MAXIMUM ALLOWABLE DIFFERENTIAL PRESSURE			60 psi (4.1 bar)	125 psi (8.6 bar)	400 psi (28 bar) or body rating limit, whichever is lower
MINIMUM DIFFERENTIAL PRESSURE REQUIRED FOR FULL STROKE	1 In. Body	Size 40 Actuator	2.5 psi (0.17 bar)	4 psi (0.28 bar)	5 psi (0.34 bar)
		Size 30 Actuator	3.5 psi (0.24 bar)	5 psi (0.34 bar)	7 psi (0.48 bar)
		Size 70 Actuator	1 psi (0.069 bar)	1.5 psi (0.10 bar)	2.5 psi (0.17 bar)
	2 In. Body	Size 40 Actuator	3 psi (0.21 bar)	5 psi (0.34 bar)	10 psi (0.69 bar)
		Size 30 Actuator	4 psi (0.28 bar)	6 psi (0.42 bar)	11 psi (0.76 bar)
		Size 70 Actuator	1.5 psi (0.10 bar)	2 psi (0.14 bar)	3 psi (0.21 bar)
	3 In. Body	Size 40 Actuator	4 psi (0.28 bar)	6 psi (0.41 bar)	11 psi (0.76 bar)
		Size 30 Actuator	5 psi (0.34 bar)	8 psi (0.55 bar)	14 psi (0.97 bar)
		Size 70 Actuator	2 psi (0.14 bar)	2.5 psi (0.17 bar)	4 psi (0.28 bar)
	4 In. Body	Size 40 Actuator	5 psi (0.34 bar)	8 psi (0.55 bar)	13 psi (0.90 bar)
		Size 30 Actuator	10 psi (0.69 bar)	13 psi (0.90 bar)	22 psi (1.5 bar)
		Size 70 Acutator	2.5 psi (0.17 bar)	3 psi (0.21 bar)	5 psi (0.34 bar)
	6 In. Body	Size 40 Actuator	9.5 psi (0.66 bar)	14 psi (0.97 bar)	19 psi (1.3 bar)
		Size 30 Actuator	13 psi (0.90 bar)	19 psi (1.3 bar)	Not Available
		Size 70 Actuator	4 psi (0.28 bar)	6 psi (0.42 bar)	8 psi (0.55 bar)

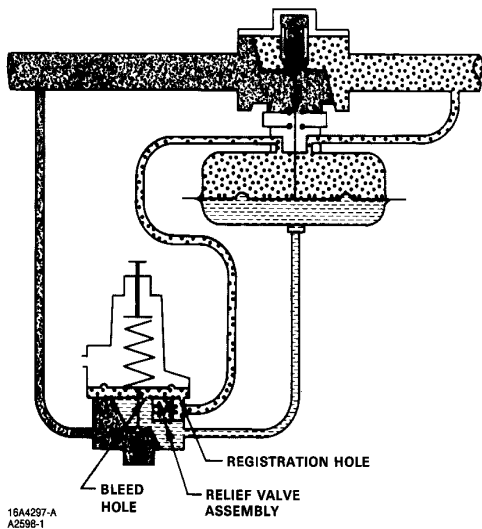


Figure 4. Type 1098-EGR-6351 Regulator Schematic

Principle of Operation

The pilot-operated Type 1098-EGR or 1098H-EGR regulator (figure 4) 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 hole (Type 6351 pilot) or restriction (Type 6352, Type 6353, or 6354 Series pilot).

When downstream demand has been satisfied, outlet pressure tends to increase, acting on the pilot and actuator diaphragms. This pressure exceeds the pilot control spring setting, moving the pilot diaphragm away and letting the valve plug spring (Type 6351 pilot) or bellows (Type 6352, Type 6353, or 6354 Series pilot) close the pilot valve plug (unbalanced in the Type 6351 pilot but balanced in the Type 6352, Type 6353, or 6354 Series pilot). The stem in the Type 6352, Type 6353, or 6354 Series pilot is hollow to provide an additional loading pressure exhaust route if the outlet pressure increase is enough to lift the pilot diaphragm off the stem of the pilot valve plug.

Table 4. Approximate Regulator Proportional Band Range with Standard Pilot Restriction and Size 40
Type 1098 Actuator*

BODY SIZE, IN.	PILOT		APPROXIMATE PROPORTIONAL BAND RANGE PSI (BAR)		
	Type Number	Control Spring Color	Green Main Valve Spring	Blue Main Valve Spring	Red Main Valve Spring
1	6351	Green	0.1 (0.0069)	0.2 (0.014)	0.4 (0.028)
		Cadmium	0.2 (0.014)	0.4 (0.028)	0.8 (0.055)
		Red	0.4 (0.028)	0.8 (0.055)	1.0 (0.069)
	6352	Yellow	0.04 (0.0028)	0.1 (0.0069)	0.2 (0.014)
		Black	0.08 (0.0056)	0.2 (0.014)	0.4 (0.028)
	6353	Yellow	0.2 (0.014)	0.4 (0.028)	0.8 (0.055)
2	6351	Green	0.2 (0.014)	0.3 (0.021)	0.5 (0.034)
		Cadmium	0.3 (0.021)	0.5 (0.034)	1.0 (0.069)
		Red	0.5 (0.034)	1.0 (0.069)	1.4 (0.097)
	6352	Yellow	0.05 (0.0034)	0.15 (0.010)	0.3 (0.021)
		Black	0.1 (0.0069)	0.3 (0.021)	0.6 (0.042)
	6353	Yellow	0.3 (0.021)	0.5 (0.034)	1.0 (0.069)
3	6351	Green	0.3 (0.021)	0.4 (0.028)	0.6 (0.042)
		Cadmium	0.4 (0.028)	0.6 (0.042)	1.2 (0.083)
		Red	0.9 (0.062)	1.2 (0.083)	1.5 (0.10)
	6352	Yellow	0.1 (0.0069)	0.2 (0.014)	0.4 (0.028)
		Black	0.2 (0.014)	0.4 (0.028)	0.8 (0.055)
	6353	Yellow	0.4 (0.028)	0.6 (0.042)	1.2 (0.083)
4	6351	Green	0.4 (0.028)	0.5 (0.034)	0.8 (0.055)
		Cadmium	0.7 (0.048)	0.8 (0.055)	1.4 (0.097)
		Red	1.2 (0.083)	2.0 (0.14)	3.0 (0.21)
	6352	Yellow	0.15 (0.010)	0.3 (0.021)	0.6 (0.042)
		Black	0.3 (0.021)	0.6 (0.042)	1.2 (0.083)
	6353	Yellow	0.7 (0.048)	0.8 (0.055)	1.4 (0.097)
6	6351	Green	0.5 (0.034)	0.6 (0.042)	1.0 (0.069)
		Cadmium	0.9 (0.062)	1.5 (0.10)	2.0 (0.14)
		Red	1.5 (0.10)	2.5 (0.17)	3.5 (0.24)
	6352	Yellow	0.2 (0.014)	0.4 (0.028)	0.8 (0.055)
		Black	0.4 (0.028)	0.8 (0.055)	1.6 (0.11)
	6353	Yellow	0.9 (0.062)	1.5 (0.10)	2.0 (0.14)

*For other combinations, multiply table values by 1.6 for a size 30 actuator, 0.4 for a size 70 actuator, 2.0 for a low-gain Type 6352 or 6353 pilot restriction, and 0.5 for a high-gain Type 6352 or 6353 pilot restriction. For instance, a standard 2 in. Type 1098-EGR 6352 regulator with black pilot control spring and blue main valve spring has a proportional band of 0.3 psi (0.021 bar) as given in the table. But this same regulator with low-gain restriction and size 70 actuator has a proportional band of 0.3 psi (0.021 bar) x 2.0 x 0.4 = 0.24 psi (0.017 bar).

Reduced actuator loading pressure permits the main valve to close. The combination of main valve spring force and main valve plug unbalance provides positive shutoff of the valve plug against the port and upper seals. Under no-flow conditions, the pilot is completely closed to stop any loading pressure buildup on the actuator diaphragm.

Table 5. Approximate Regulator Proportional Band Range with Standard Pilot Restriction and Size 30 Type 1098H Actuator*

BODY SIZE, IN.	PILOT		APPROXIMATE PROPORTIONAL BAND RANGE, PSI (BAR)		
	Type Number	Conrol Spring Color	Green Main Valve Spring	Blue Main Valve Spring	Red Main Valve Spring
1	6354L, 6354M, or 6354H	Blue or Green	1.0 (0.07)	1.5 (0.10)	2.5 (0.17)
2	6354L, 6354M, or 6354H	Blue or Green	1.5 (0.10)	2.0 (0.14)	3.0 (0.21)
3	6354L, 6354M, or 6354H	Blue or Green	2.5 (0.17)	3.0 (0.21)	4.0 (0.28)
4	6354L, 6354M, or 6354H	Blue or Green	3.5 (0.24)	4.0 (0.28)	5.0 (0.34)
6	6354L, 6354M, or 6354H	Blue or Green	4.0 (0.28)	5.0 (0.34)	Not available

*For other restrictions, multiply table values by 2.0 for a low-gain restriction or by 0.5 for a high gain restriction. For instance, a standard 2 in. Type 1098H-EGR-6354L regulator with blue control spring and blue main valve spring has a proportional band of 2.0 psi (0.14 bar) as given in the table.

But this same regulator with low-gain restriction has a proportional band of 2.0 psi (0.14 bar) x 2.0 = 4.0 psi (0.28 bar).

To protect the Type 1098 and Type 1098H actuator diaphragms from excessive differential pressure, all pilots have a relief valve that allows loading pressure to bleed downstream at approximately 25 psi (1.7 bar) differential across the actuator diaphragm.

Construction Features

Pilots for Application Versatility

The balanced valve plug in the Type 6352, Type 6353, and 6354 Series pilots provides fast closing action when quick response is required and also minimizes outlet pressure changes due to varying supply pressures. A tapped spring case with gasketed closing cap (both available in brass, steel, or stainless steel) is standard for remote venting or for pressure loading applications involving differential pressure control or remote pneumatic adjustment of the downstream pressure setting (figure 5).

Pressure Loading Flexibility

Type 6352, Type 6353, and 6354 Series pilots additionally can be furnished with a handwheel for precise trimming of the final pressure setting. Consult your Fisher sales office or sales representative for the combined spring and pressure loading limits of the various spring case constructions.

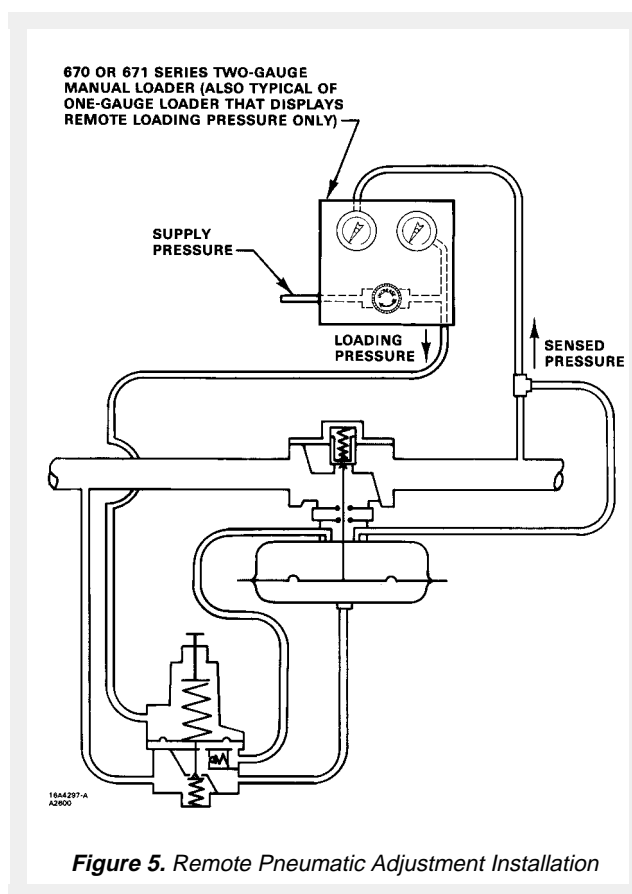


Figure 5. Remote Pneumatic Adjustment Installation

Monitoring System

Monitoring regulators serve as overpressure protection devices to limit system pressure in the event of open failure of a working regulator feeding the system. Two methods of using Type 1098-EGR or 1098H-EGR regulators in monitoring systems are as follows (figure 6):

- **Working Monitor**—On a working monitor installation, the working monitor regulator is always upstream and acts as a first-stage regulator through the working pilot during normal operation. This arrangement allows the working monitor's performance to be observed at all times. Then, should the second-stage regulator fail open, the working monitor regulator assumes the entire pressure reduction function of the system through the monitoring pilot. Note

that the working monitor regulator actuator must be able to withstand full inlet pressure or be protected from it in case the working monitor fails wide open.

The monitoring pilot must be upstream of the working monitor regulator. This enables a close set point between the working regulator and the monitoring pilot. Special Type Y600-15 and 621-109 monitoring pilots with quick-bleed operation have been designed to give faster response to abnormal downstream conditions. Table 6 gives the spread between normal distribution pressure and the minimum pressure at which the working monitor regulator can be set to take over if the working regulator fails open.

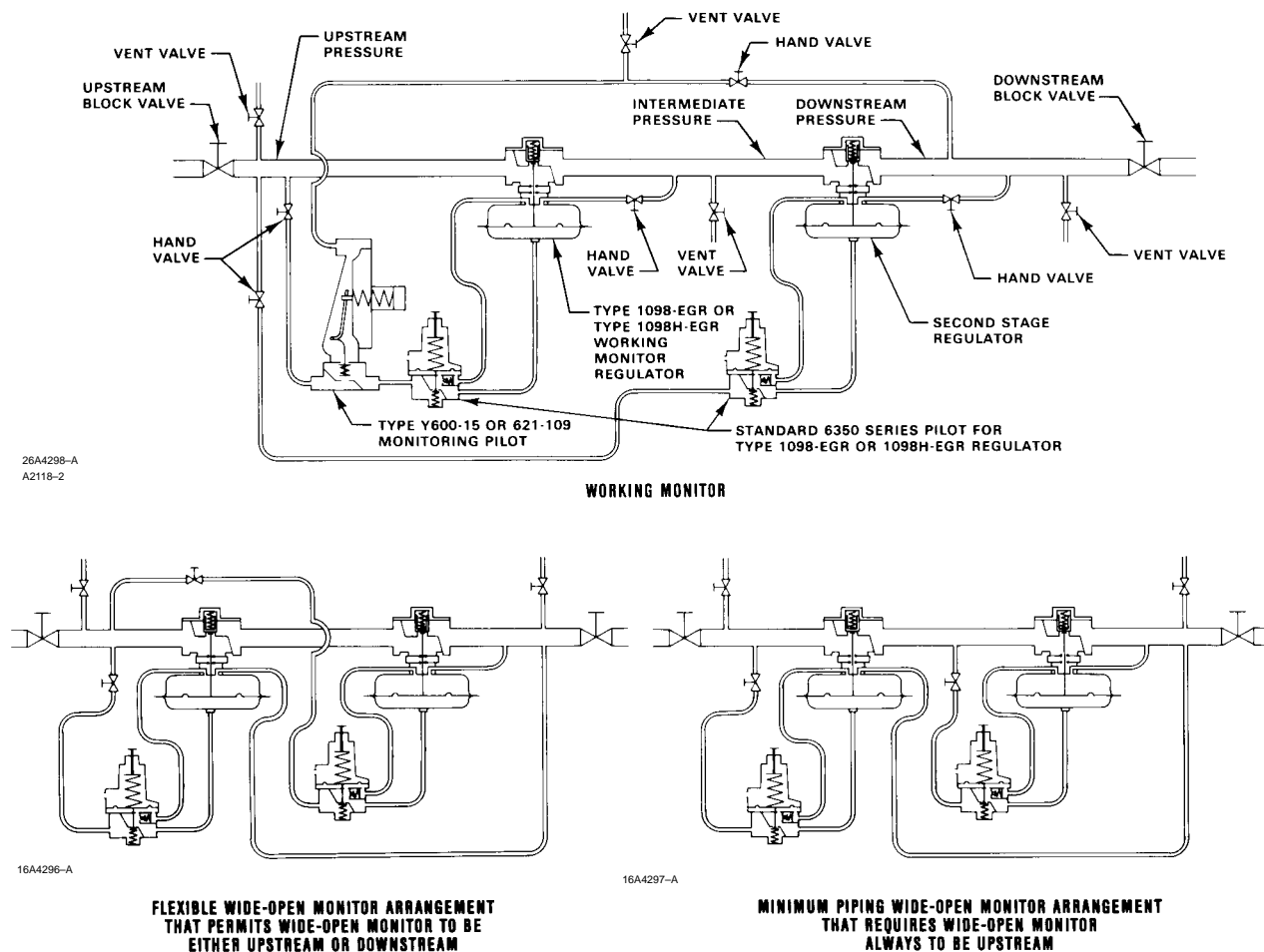


Figure 6. Monitoring Systems

- Wide-Open Monitor**—Either the upstream or downstream regulator can be the monitoring regulator as shown in figure 6. During normal operation, the monitoring regulator is standing wide open with the reduction to distribution pressure being taken across the working regulator. Only in case of open failure of the working regulator does the wide-open monitoring regulator take control at its slightly higher setting.

Regardless of which regulator is used as the monitor, it should be equipped with a pilot supply regulator set to limit the pilot supply pressure to 10 to 15 psig (0.69 to 1.0 bar) above control pressure. Since the pilot on the monitoring regulator is wide open during normal operation, the pilot supply regulator is used to prevent differential relief valve chatter on the monitoring regulator pilot.

Dual-Pilot Capability

A standby as well as a working pilot may be mounted in parallel on a Type 1098-EGR or 1098H-EGR regulator (figure 7) to take over in case of working pilot failure. Either pilot can be the standby pilot, but the one chosen should be set far enough below the working pilot for it to stay closed during normal operation.

Electric Remote Control Capability

Where remote adjustment of the pilot control spring setting is desired, Type 661 **Kixcel®** drive units that mount to the pilot and accept a variety of electrical inputs are available.

Table 6. Working Monitor Performance

MONITORING PILOT INFORMATION			MINIMUM PRESSURE AT WHICH WORKING MONITOR REGULATOR CAN BE SET
Construction	Spring Range	Spring Part Number	
Type Y600-15 pilot with 150 psig (10 bar) maximum allowable inlet	5 to 15 in. w.c. (12 to 38 mbar)	1B6539 27022	3 in. w.c. (7 mbar differential) over normal distribution pressure
	11 to 28 in. w.c. (27 to 69 mbar)	1B5370 27052	
	1.3 to 3 psig (0.09 to 0.2 bar)	1B5371 27022	0.5 psi (0.034 bar differential) over normal distribution pressure
	3 to 5 psig (0.2 to 0.3 bar)	1B5372 27022	
Type 621-109 pilot with 750 psig (52 bar) maximum allowable inlet for malleable iron or steel body	5 to 7 psig (0.3 to 0.48 bar)	1B5373 27052	3.0 psi (0.21 bar differential) over normal distribution pressure
	10 to 15 psig (0.69 to 1.0 bar)	1D8923 27022	
	10 to 25 psig (1.0 to 1.7 bar)	1D7515 27022	
	20 to 35 psig (1.4 to 2.4 bar)	1D6659 27022	
	25 to 60 psig (1.7 to 4.1 bar)	1D7555 27142	5.0 psi (0.34 bar differential) over normal distribution pressure
	40 to 100 psig (2.8 to 6.9 bar)	1E5436 27142	
	80 to 150 psig (5.5 to 10 bar)	1P9013 27142*	
	130 to 200 psig (9.0 to 14 bar)	1P9013 27142†	

*With large diaphragm plate.

†With small diaphragm plate.

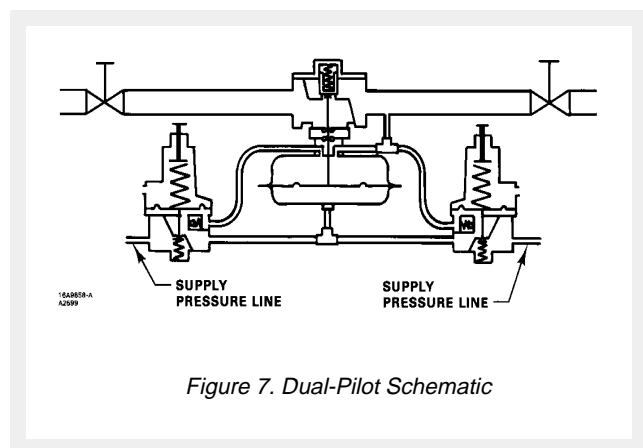


Figure 7. Dual-Pilot Schematic

nitrogen, multiply the table 7 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.

To determine regulating capacities at pressure settings not given in table 7 or to determine wide-open capacities for relief sizing at any inlet pressure, use the following formula for critical pressure drops (absolute outlet pressure is equal to or less than one-half the absolute inlet pressure):

$$Q = (P_{1abs}) (C_g) (1.29)$$

where,

Q = flow capacity in scfh

P_{1abs} = absolute inlet pressure in psig (P_1 gauge + 14.7)

C_g = regulating or wide-open gas sizing coefficient from table 8.

If pressure drops will be lower than critical (absolute outlet pressure greater than one-half the absolute inlet pressure), use the Fisher sizing slide rule or the sizing nomographs in Fisher Catalog 10.

Protection from Foreign Material

The standard brass Type P594-1 filter or aluminum Type P593-1 filter in the pilot inlet connection has a replaceable cellulose filter element. Optional filters recommended for heavy amounts of foreign material in the lines are the Type 254 filter for pressures up to 250 psig (17 bar) or the Type 254E or 254F filter for pressures above 250 psig (17 bar). Or, on liquid service, a 260 Series strainer may be used upstream of both the pilot supply and main lines. These filters and strainers are both described in separate bulletins.

Capacity Information

Gases

Table 7 gives typical natural gas regulating capacities. To determine equivalent capacities for air, propane, butane, or

Liquids

To determine flows in U.S. gallons per minute, use the Fisher Catalog 10 liquid-sizing procedures in conjunction with the appropriate liquid-sizing coefficient (C_v) from table 8. Then, if capacity is desired in cubic meters per hour multiply gallons per minute by 0.2271.

Table 7. Typical Regulating Capacities* with Any Size or Type of Actuator

INLET PRESSURE		OUTLET PRESSURE SETTING	REGULATING CAPACITIES IN THOUSANDS OF SCFH OF 0.6 SPECIFIC GRAVITY GAS† FOR REGULATORS WITH STANDARD LINEAR CAGE, STANDARD TRAVEL, AND PIPING SIZE SAME AS MAIN VALVE BODY SIZE				
Psig	Bar		1 In. Body Size	2 In. Body Size	3 In. Body Size	4 In. Body Size	6 In. Body Size
3	0.21	7 in. w.c. (17 mbar)	8.5	32	64‡	100‡	
5	0.34	7 in. w.c. (17 mbar)	11.2	42	86	133‡	255‡
		1 psig (0.069 bar)	10.5	39	80	125‡	240‡
		2 psig (0.14 bar)	9.2	35	72‡	112‡	
10	0.69	7 in. w.c. (17 mbar)	16.8	63	126	200	370
		3 psig (0.21 bar)	14.0	56	112	177	320‡
		5 psig (0.34 bar)	13.2	49	100	155	300‡
		7 psig (0.48 bar)	10.5	39	80	125‡	
15	1.0	1 psig (0.069 bar)	21.0	80	160	250	470
		4 psig (0.28 bar)	19.5	74	150	235	440
		8 psig (0.55 bar)	16.7	63	125	200	380‡
		12 psig (0.83 bar)	11.7	44	89‡	140‡	
20	1.4	1 psig (0.069 bar)	25.5	97	195	325	570
		10 psig (0.69 bar)	21.0	79	160	250	530
		15 psig (1.0 bar)	15.5	63	122	188	370‡
		17 psig (1.2 bar)	12.5	47	95‡	155‡	
30	2.1	4 psig (0.28 bar) or less	34.6	131	267	422	744
		15 psig (1.0 bar)	28.5	110	220	340	650
		20 psig (1.4 bar)	24.5	93	185	295	570
		25 psig (1.7 bar)	18.3	69	140	217	420‡
40	2.8	9 psig (0.62 bar) or less	42.3	161	327	517	910
		20 psig (1.4 bar)	36.0	135	275	430	800
		30 psig (2.1 bar)	27.5	105	215	330	650
		35 psig (2.4 bar)	20.0	78	155	245	350‡
50	3.4	13 psig (0.90 bar) or less	50	190	386	611	1077
		20 psig (1.4 bar)	46	175	350	540	1020
		30 psig (2.1 bar)	41	152	302	470	920
		40 psig (2.8 bar)	32	115	235	370	710
		45 psig (3.1 bar)	23	85	172	265	450‡
75	5.2	24 psig (1.7 bar) or less	69.4	264	536	847	1493
		50 psig (3.4 bar)	53	210	420	630	1220
		60 psig (4.1 bar)	43	165	330	525	1020
		70 psig (4.8 bar)	26	100	200	320	630‡
100	6.9	35 psig (2.4 bar) or less	88.8	337	685	1083	1909
		60 psig (4.1 bar)	74	280	560	880	1700
		75 psig (5.2 bar)	62	235	480	740	1450
125	8.6	46 psig (3.2 bar) or less	108	411	834	1319	2325
		75 psig (5.2 bar)	90	340	700	1080	1830
150	10	57 psig (3.9 bar) or less	127	484	984	1555	2741
		75 psig (5.2 bar)	115	430	870	1370	2550
175	12	68 psig (4.7 bar) or less	147	558	1133	1791	3157
200	14	75 psig (5.2 bar) or less	166	631	1282	2027	3573
250	17	75 psig (5.2 bar) or less	205	779	1581	2500	4405
300	21	75 psig (5.2 bar) or less	244	926	1880	2972	5237
350	24	75 psig (5.2 bar) or less	282	1070	2178	3444	6069
400	28	75 psig (5.2 bar) or less	321	1220	2477	3916	6901

*When sizing a regulator, always use the lowest inlet pressure, the highest outlet pressure, and the maximum capacity desired.
†See Capacity Information section for conversion to equivalent capacities of other gases and/or m³/hr.
‡Requires size 70 actuator.
Shaded areas show where differential pressure with any size actuator is less than minimum required to stroke main valve.

Table 8. Flow Coefficients at Maximum Rated Travels*

BODY SIZE, IN.	PIPING STYLE															
	Line Size Equals Body Size								2:1 Line Size to Body Size							
	Standard Cage					Whisper Trim Cage			Standard Cage					Whisper Trim Cage		
	C _g		C _v		C ₁	C _g		C ₁	C _g		C _v		C ₁	C _g		C ₁
	Regu- lating	Wide Open	Regu- lating	Wide Open		Regu- lating	Wide Open		Regu- lating	Wide Open	Regu- lating	Wide Open		Regu- lating	Wide Open	
1	600	632	16.8	17.7	35.7	576	607	33.7	568	598	17.2	18.1	33.0	529	557	34.0
2	2280	2400	63.3	66.7	36.0	1970	2080	36.0	2050	2160	59.6	62.8	34.4	1830	1930	35.0
3	4630	4880	132	139	35.1	3760	3960	35.0	4410	4650	128	135	34.4	3630	3830	34.2
4	7320	7710	202	213	36.2	6280	6610	34.8	6940	7310	198	209	35.0	6020	6340	35.2
6	12,900	13,600	397	418	32.5	9450	9950	32.0	12,100	12,800	381	404	31.7	9240	9730	31.7

*To determine coefficient for restricted-capacity construction, multiply appropriate coefficient in this table by appropriate percentage restriction in specifications table.

Installation

On the Design EGR main valve, normal pressure drop assists shutoff. Therefore, leakage may result during any reverse pressure drop condition.

The Type 1098-EGR or 1098H-EGR regulator may be installed in any position. The normal mounting position is with the pilot mounted to the right of the main valve when looking downstream as shown in figure 1 or 8. However, the mounting may be changed in the field so that the pilot is on the left side. Control and supply lines necessary for installation are not supplied with the regulator.

In many instances, good piping practice will require that outlet piping be swaged up above the body size to prevent excessive pressure drop along the outlet line. The piping should be expanded as close to the regulator outlet as possible.

Dimensions are given in figure 8.

Ordering Information

Application

1. Composition and specific gravity of gas (including chemical analysis if possible)
2. Fluid temperature
3. Inlet pressures (maximum, minimum, normal)
4. Outlet pressure
5. Flow rates (minimum, maximum, normal)
6. Piping size(s)

Construction

Refer to the page 2 specifications and the Construction Features section. Review the descriptions to the right of each specification, under each construction feature, and in the referenced tables; specify the desired selection whenever there is a choice to be made. Right-side pilot mounting will be provided as standard unless left-side mounting is specified. Always specify the type numbers of other desired equipment as well as the regulator, pilot, and filter.

Trim packages may be ordered by specifying body size, body flange material, main valve spring, standard or high-temperature elastomers, rated travel, and standard or **Whisper Trim** cage.

BODY SIZE, IN.	A						D		G		R		Z				AR	
	Screwed* Cast Iron Body, or Screwed* or 600 RF Steel Body		125B FF Cast Iron Body, or 150 RF Steel Body		250B FF Cast Iron Body, or 300 RF Steel Body								Cast Iron Body		Steel Body			
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		
1	8.25	210	7.25	184	7.75	197	3.88	98	8.62	219	4.06	103	12.00	305	13.75	349	3.00	76
2	11.25	286	10.00	254	10.50	267	4.56	116	9.12	232	4.06	103	13.31	338	15.06	383	3.12	79
3	13.25	337	11.75	298	12.50	318	5.31	135	11.31	287	5.06	129	16.50	419	18.25	464	3.88	98
4	15.50	394	13.88	352	14.50	368	6.56	167	12.69	322	5.06	129	19.12	486	21.12	536	5.12	130
6	20.00	508	17.75	451	18.62	473	8.06	205	13.62	346	8.00	203	20.25	514	23.25	591	6.62	168

*Screwed body available only in 1-inch and 2-inch sizes.

ACTUATOR		C, DIA		E		H		M			
								With Pilot Spring Case Vent		Without Pilot Spring Case Vent	
Type	Size	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm
1098	30	11.38	289	5.69	144	7.88	200	9.50	241	9.31	237
1098H	30	11.38	289	6.06	154						
1098	40	13.12	333	5.75	146						
1098	70	21.12	537	7.44	189	14.19	360	15.81	402	15.62	397

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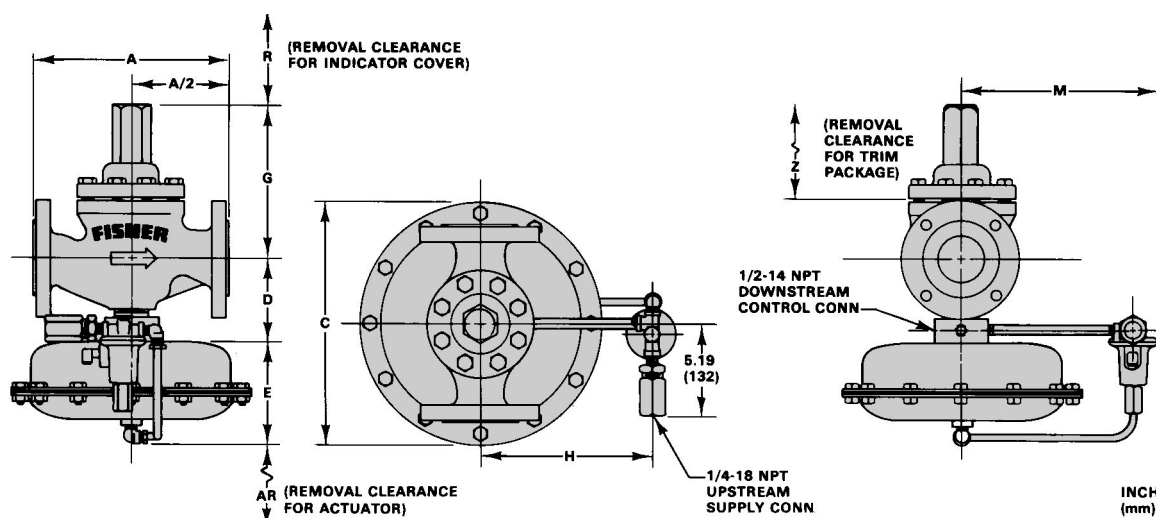


Figure 8. Dimensions (Standard Type 6352, 6353, 6354L, 6354M, or 6354H Pilot Shown)

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