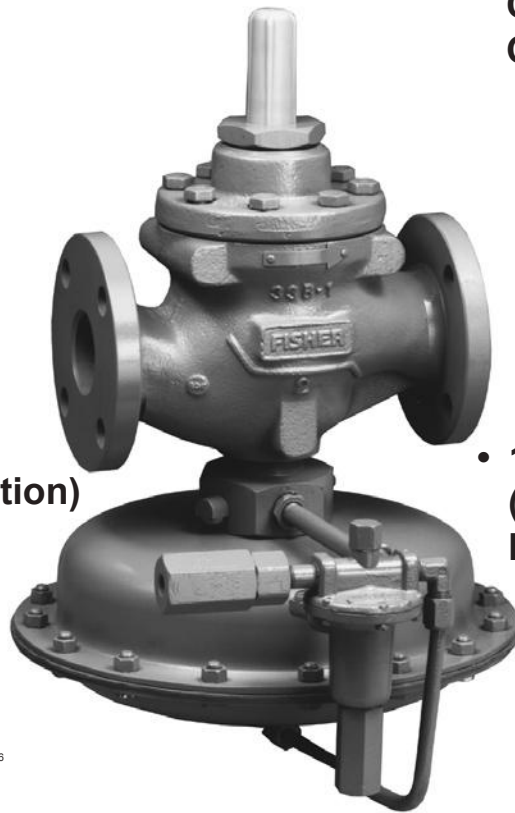




Types 1098-EGR and 1098H-EGR Pressure Reducing Regulators

- Differential as low as 1 psid (70 mbar d)
- Quick Change Trim Package
- Optional Noise Abatement Trim (Up to 30dBA reduction)
- No Atmospheric Bleed
- Materials of Construction Compatible with Below Grade Installations
- In-Service Travel Inspection
- 1 through 12 x 6-inches (DN 25 through 300 x 150) Body Sizes Available
- Aqueous Trim Packages (Application Specific)
- Easy Top Entry In-Line Maintenance
- Stainless Steel Construction for Corrosive Environments and Oxygen Service



W6956

Specifications

Body Sizes and End Connection Styles

See Table 1

Main Valve Maximum Inlet Pressure⁽¹⁾

400 psig (27,6 bar) or body rating limit
whichever is lower

Maximum Pilot Supply Pressure^(1,2)

600 psig (41,4 bar)

Outlet Pressure Ranges

See Table 2

Maximum and Minimum Differential Pressures

See Table 4

Actuator Sizes and Maximum Pressures

See Table 3

Supply Pressure Settings Required for the Type 95H Regulator

See Table 5

Pressure Registration

External

Temperature Capabilities⁽²⁾

Nitrile (NBR): -20° to 180°F (-29° to 82°C)

Fluorocarbon (FKM): 0° to 300°F (-18° to 149°C),
except water is limited to 0° to 180°F (-18° to 82°C)

Ethylene propylene (EPR):
-20° to 275°F (-29° to 135°C)

Options

- NACE Construction
- Monitor Configuration
- Boiler Fuel Construction
- Aqueous (Liquid) Service Construction
- Noise Abatement Trim

Port Diameters and Travels

BODY SIZES, NPS (DN)	PORT DIAMETER	TRAVEL		
		Standard	Restricted	Inches (mm)
	Inches (mm)	Inches (mm)	Percentage of Flow Capacity	
1 (25)	1-5/16 (33,3)	3/4 (19)	----	----
2 (50)	2-3/8 (60,3)	1-1/8 (29)	30	3/8 (9,5)
3 (80)	3-3/8 (85,7)	1-1/2 (38)	70	5/8 (16)
4 (100)	4-3/8 (111)		40	7/8 (22)
6 (150)			40	1 (25)
8 x 6 and 12 x 6 (200 x 150 and 300 x 150)	7-3/16 (183)	2 (51)	----	----

Construction Materials

Main Valve

Body and Body Flange: Cast iron,
WCC Steel, CF8M Stainless steel

Bonnet: Steel or CF8M Stainless steel

Cage: CF8M Stainless steel (linear), 416 or 316
Stainless steel (whisper), or hardened ENC coated
Cast iron (quick opening)

Seat Ring and Valve Plug: Hardened 416 Stainless
steel or 316 Stainless steel

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

Piston Ring: Polytetrafluoroethylene (PTFE)

O-rings and Soft Parts: Nitrile (NBR) (**standard**),
Fluorocarbon (FKM) or Ethylene propylene (EPR)

Spring: Steel or Inconel®

Bolting: Steel, Stainless steel

Actuator

Diaphragm Case: Steel, 304 Stainless steel
or CF8M Stainless steel

Bolting: Steel, Stainless steel

Diaphragm Plate: Cast iron or
CF8M Stainless steel

Stem Guide: Stainless steel

Diaphragm and O-rings: Nitrile (NBR) (**standard**),
Fluorocarbon (FKM), Ethylene propylene (EPR)

Stem: 17-4 PH Stainless steel (**standard**) or
316 Stainless steel

Pilot Mounting Parts

Tubing and Connector Fittings: Steel (**standard**)
or Stainless steel

Pipe Bushing: Malleable iron, Stainless steel

Pipe Nipples: Galvanized steel, Stainless steel

Type 6351 Pilot

Body, Body Plug, and Spring Case: Aluminum

Valve Plug Stem: Brass (**standard**) or Stainless steel

Diaphragm, O-rings, and Gaskets: Nitrile (NBR)
(**standard**) or Fluorocarbon (FKM)

Type 6352, 6353, 6354L, 6354M, or 6354H Pilot

Body, Body Plug, Spring Case, and Closing Cap:
Aluminum (**standard**) or Stainless steel

Diaphragm: Nitrile (NBR), Fluorocarbon (FKM),
or Ethylene propylene (EPR)

Types 6354M and 6354H Diaphragm

Limiter: Aluminum

O-rings and Soft Parts: Nitrile (NBR) (**standard**) or
Fluorocarbon (FKM)

Filter: Brass (Type P594-1 standard) or Aluminum
(Type P593-1), except cellulose for filter element

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

2. For stability or overpressure protection, a reducing regulator may be installed upstream of the pilot according to the Installation section.

- continued -

Specifications (continued)

61 Series Pilots

Body and Spring Case: Cast iron

Upper and Lower Diaphragm: Neoprene (CR) or Fluorocarbon (FKM) for Types 61H and 61HP only

Composition Seats: Nitrile (NBR) or Fluorocarbon (FKM)

O-rings: Nitrile (NBR) or Fluorocarbon (FKM)

Type Y600A or Y600AM Pilot

Body, Spring, and Lower Casing: Cast Iron

Diaphragm: Nitrile (NBR)

Composition Seats: Nitrile (NBR)

Trim: Aluminum

Pilot and Actuator Vents

Type Y602 vent assembly

Approximate Weights (With Standard Single-Pilot Construction)

Type 1098 Actuator

Size 30

NPS 1 (DN 25) Body: 55 pounds (25 kg)

NPS 2 (DN 50) Body: 75 pounds (34 kg)

NPS 3 (DN 80) Body: 115 pounds (52 kg)

NPS 4 (DN 100) Body: 165 pounds (75 kg)

NPS 6 (DN 150) Body: 350 pounds (159 kg)

NPS 8 x 6 (DN 200 x 150) Body: 625 pounds (284 kg)

NPS 12 x 6 (DN 300 x 150) Body:

1102 pounds (500 kg)

Size 40 (Standard)

NPS 1 (DN 25) Body: 65 pounds (29 kg)

NPS 2 (DN 50) Body: 85 pounds (39 kg)

NPS 3 (DN 80) Body: 125 pounds (57 kg)

NPS 4 (DN 100) Body: 175 pounds (79 kg)

NPS 6 (DN 150) Body: 360 pounds (163 kg)

NPS 8 x 6 (DN 200 x 150) Body: 635 pounds (288 kg)

NPS 12 x 6 (DN 300 x 150) Body:

1112 pounds (504 kg)

Size 70

NPS 1 (DN 25) Body: 140 pounds (64 kg)

NPS 2 (DN 50) Body: 160 pounds (73 kg)

NPS 3 (DN 80) Body: 200 pounds (91 kg)

NPS 4 (DN 100) Body: 250 pounds (113 kg)

NPS 6 (DN 150) Body: 435 pounds (197 kg)

NPS 8 x 6 (DN 200 x 150) Body: 710 pounds (322 kg)

NPS 12 x 6 (DN 300 x 150) Body:

1187 pounds (538 kg)

Type 1098H Size 30 Actuator

NPS 1 (DN 25) Body: 80 pounds (36 kg)

NPS 2 (DN 50) Body: 100 pounds (45 kg)

NPS 3 (DN 80) Body: 140 pounds (64 kg)

NPS 4 (DN 100) Body: 190 pounds (86 kg)

NPS 6 (DN 150) Body: 375 pounds (170 kg)

NPS 8 x 6 (DN 200 x 150) Body: 650 pounds (295 kg)

NPS 12 x 6 (DN 300 x 150) Body:

1127 pounds (511 kg)

Introduction

The Types 1098-EGR and 1098H-EGR regulators 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 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.

Bubble tight shutoff is achieved utilizing knife-edge seats in the valve plug. When the regulator is in the closed position, the knife edge seats make a gas-tight seal against the upper and lower (port) valve seal. A variety of cages are offered for standard, speed of response, and noise applications. The cage guided metal plug provides superior control and stability.

Principle of Operation

The pilot-operated Types 1098-EGR and 1098H-EGR regulators both use 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. The Type 1098-EGR regulator operation schematic is shown in Figure 2.

Bulletin 71.2:1098-EGR

Table 1. Body Sizes and End Connection Styles

BODY SIZES, NPS (DN)	CAST IRON	STEEL OR STAINLESS STEEL
1 or 2 (25 or 50)	NPT or CL125 FF or CL250 RF	NPT, CL150 RF, CL300 RF, CL600 RF, BWE, SWE, or PN 16/25/40
3, 4 or 6 (80, 100 or 150)	CL125 FF or CL250 RF	CL150 RF, CL300 RF, CL600 RF, BWE, or PN 16/25/40
8 x 6, 12 x 6 (200 x 150, 300 x 150)	----	

Table 2. Outlet Pressure Ranges

PILOT TYPE	OUTLET (CONTROL) PRESSURE RANGE	SPRING COLOR	SPRING PART NUMBER
6351	3 to 20 psig (0,2 to 1,4 bar)	Green	1B986027212
	5 to 35 psig (0,3 to 2,4 bar)	Cadmium	1B788327022
	35 to 100 psig (2,4 to 6,9 bar)	Red	1K748527202
6352	14-inches w.c. to 2 psig (35 mbar to 0,1 bar)	Yellow	14A9672X012
	2 to 10 psig (0,1 to 0,7 bar)	Black	14A9673X012
6353	3 to 40 psig (0,2 to 2,8 bar)	Yellow	1E392527022
	35 to 125 psig (2,4 to 8,6 bar)	Red	1K748527202
6354L ⁽¹⁾	85 to 200 psig (5,9 to 13,8 bar) ⁽¹⁾	Blue	1L346127142
6354M ⁽²⁾	175 to 220 psig (12,1 to 15,2 bar) ⁽²⁾	Blue	1L346127142
6354H	200 to 300 psig (13,8 to 20,7 bar) ⁽²⁾	Green	15A9258X012
61L 61LD 61LE	0.25 to 2 psig (0,02 to 0,1 bar)	Red	1B886327022
	1 to 5 psig (0,07 to 0,3 bar)	Yellow	1J857827022
	2 to 10 psig (0,1 to 0,7 bar)	Blue	1B886427022
	5 to 15 psig (0,3 to 1,0 bar)	Brown	1J857927142
	10 to 20 psig (0,7 to 1,4 bar)	Green	1B886527022
61H	10 to 65 psig (0,7 to 4,5 bar)	Green Stripe	0Y066427022
61HP	15 to 45 psig (1,0 to 3,1 bar)	Yellow	1E392527022
	35 to 100 psig (2,4 to 6,9 bar)	Blue	1D387227022
	100 to 300 psig (6,9 to 20,7 bar)	Red	1D465127142
Y600AM	4 to 8-inches w.c. (10 to 20 mbar)	Red	1B653827052
	7 to 16-inches w.c. (17 to 4 mbar)	Olive Drab	1B653927022
	15-inches w.c. to 1.2 psig (37 mbar to 0,08 bar)	Yellow	1B537027052
	1.2 to 2.5 psig (0,08 to 0,17 bar)	Light Green	1B537127022
	2.5 to 4.5 psig (0,17 to 0,31 bar)	Light Blue	1B537227022
	4.5 to 7 psig (0,31 to 0,48 bar)	Black	1B537327052

1. Without diaphragm limiter.
2. With diaphragm limiter.

In operation, assume that outlet pressure is below the pilot control setting. Control spring force on the pilot diaphragm thus opens the pilot valve plug, providing additional loading pressure to the actuator diaphragm. This loading pressure forces the actuator stem upward, opening the main valve plug via a bump connection. The upward motion of the plug allows gas to flow through the cage into the downstream system.

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, 61 Series pilots or Y600AM) or bellows (Types 6352 through 6354M pilot) close the pilot valve plug (unbalanced in the Type 6351 or 61 Series pilots but balanced in the Types 6352 through 6354M pilot). Excess loading pressure on the actuator diaphragm escapes downstream through the bleed hole (Type 6351 pilot), bleed orifice (61 Series pilot), restriction (Types 6352 through 6354M pilot) or fixed restrictor (Type Y600AM pilot).

Reduced actuator loading pressure permits the main valve to close. The combination of main valve spring force and valve plug unbalance provides positive valve plug shutoff against the port and upper seals.

To protect the Type 1098 or 1098H actuator diaphragm from excessive differential pressure, the 6300 Series pilots have a relief valve that allows loading pressure to bleed downstream at approximately 25 psig (1,7 bar) differential across the actuator diaphragm. An external relief valve (Type 1806) is required when differential is higher than 25 psid (1,7 bar d) or when using the 61 or Y600A Series pilots.

Installation

On the Type EGR main valve, normal pressure drop assists shutoff. Therefore, leakage may result during any reverse pressure drop condition. The 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; however, the pilot may be moved to the left side. Control and supply lines necessary for installation are not supplied with the regulator.

In some cases, 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 as close to the regulator outlet size as possible.

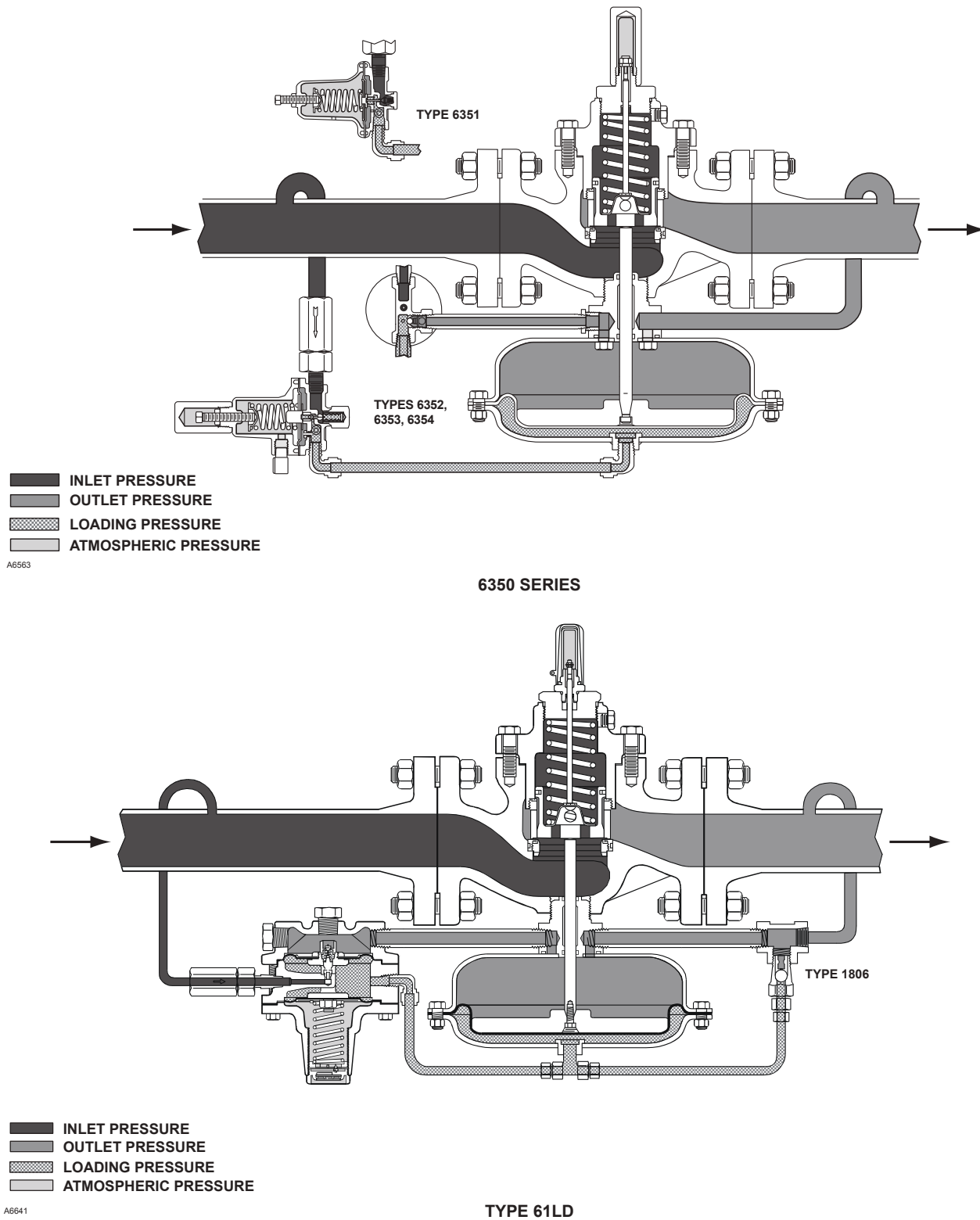
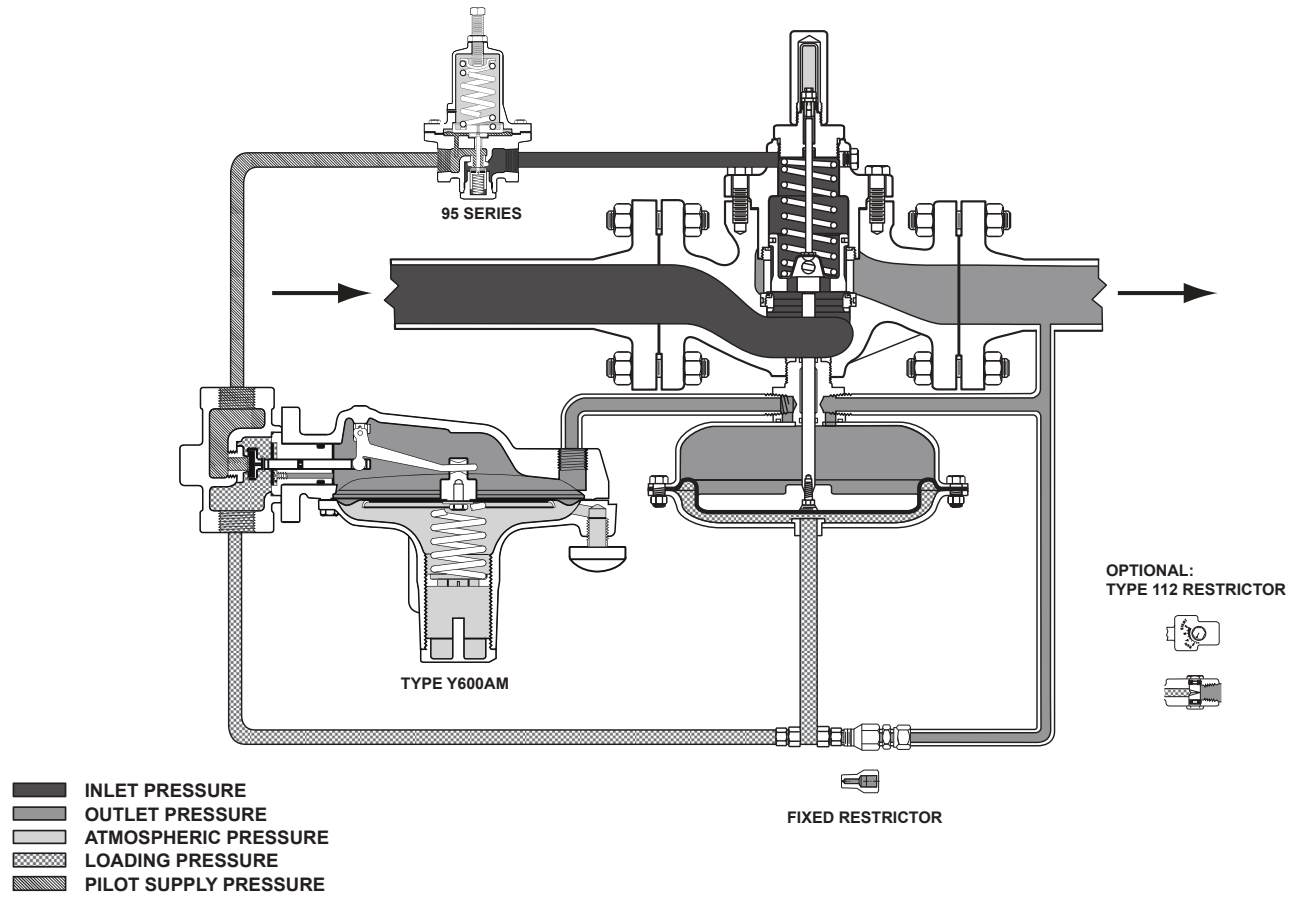
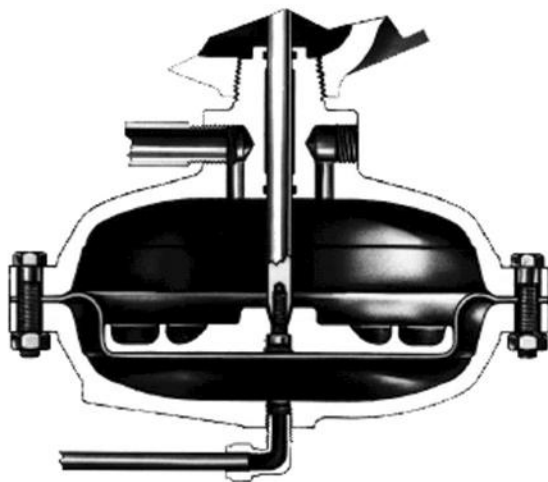


Figure 2. Principle of Operation Schematics

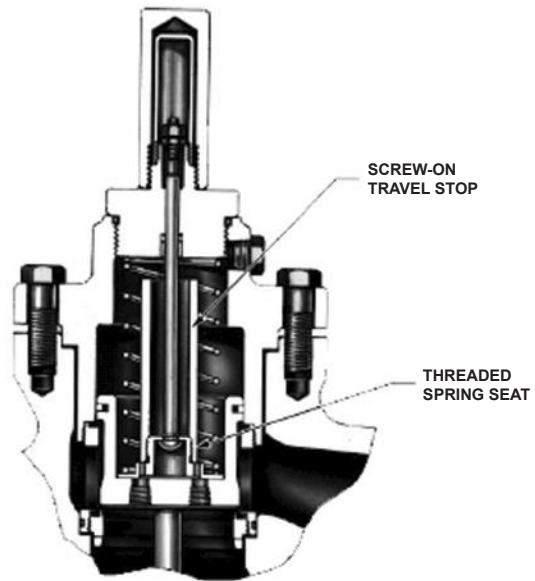


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TYPE Y600AM WITH TYPE 95H SUPPLY PILOT



DETAIL OF TYPE 1098H ACTUATOR



DETAIL OF OPTIONAL
RESTRICTED CAPACITY CONSTRUCTION

Figure 2. Principle of Operation Schematics (continued)



Figure 3. Type 1098H-EGR with RegFlo Type RF100

Construction Features

Pilots for Application Versatility

The balanced valve plug in the Types 6352, 6353, and 6354 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 is standard for remote venting or for pressure loading applications involving differential pressure control or remote pneumatic adjustment of the downstream pressure setting.

The Y600AM and 61 Series pilots provide the option for low setpoints and improved accuracy. The 61 Series pilot is available in a variety of configurations to meet your specific application needs – Type 61L low pressure pilot, Type 61LE low pressure, wide proportional band pilot, Type 61LD low pressure, narrow proportional band pilot, and the Type 61H high pressure pilot. These pilots can be configured to maximize the performance under various application

scenarios. For instance, the 61 Series pilots are available for fast closing, fast opening, or monitor applications. Refer to Bulletin 71.8:61 for specifics.

Boiler Fuel Pressure Control

To enhance proper operation and adequate response to negative pressure shock condition in low differential pressure boiler fuel control applications, use the Type 1098-EGR boiler fuel configuration: Type 1098-EGR with Yellow Main Spring, Quick Opening Cage, Type 6352 pilot, Size 70 Actuator, and Type Y600AM or 627M Auxiliary Pilot mounted in parallel with the Type 6352 pilot.

To provide faster response, two pilots mounted in parallel sense the downstream pressure. The Type 6352 pilot is the primary controlling pilot and the Type Y600AM or 627M auxiliary pilot stands by until it senses a negative pressure shock condition. The auxiliary pilot opens, allowing additional flow into the actuator, increasing the stroking speed and providing faster response. See Figure 6 for schematic.

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Table 3. Actuator Sizes and Maximum Pressures

ACTUATOR TYPE	ACTUATOR SIZE	OUTLET CONTROL PRESSURE, PSIG (bar)	EMERGENCY CASING PRESSURE, PSIG (bar)
1098	30 40 (standard) 70	100 (6,9) 75 (5,2) 50 (3,4)	115 (7,9) 82 (5,6) 65 (4,5)
1098H	30	300 (20,7)	400 (27,6)

Table 4. Maximum and Minimum Differential Pressures for Main Valve Selection

BODY SIZES, NPS (DN)	SPRING PART NUMBER AND COLOR	MAXIMUM ALLOWABLE DIFFERENTIAL PRESSURE, PSIG (bar) ⁽¹⁾	MINIMUM DIFFERENTIAL PRESSURE REQUIRED FOR FULL STROKE, PSIG (bar)		
			Size 30 Actuator	Size 40 Actuator	Size 70 Actuator
1 (25)	14A9687X012 Green	60 (4,1)	3.5 (0,24)	2.5 (0,17)	1 (0,069)
	14A9680X012 Blue	125 (8,6)	5 (0,34)	4 (0,28)	1.5 (0,10)
	14A9679X012 Red	400 (27,6) or body rating limit, whichever is lower	7 (0,48)	5 (0,34)	2.5 (0,17)
2 (50)	14A6768X012 Yellow	20 (1,4)	----	2 (0,14)	1 (0,069)
	14A6626X012 Green	60 (4,1)	4 (0,28)	3 (0,21)	1.5 (0,10)
	14A6627X012 Blue	125 (8,6)	6 (0,41)	5 (0,34)	2 (0,14)
	14A6628X012 Red	400 (27,6) or body rating limit, whichever is lower	11 (0,76)	10 (0,69)	3 (0,21)
3 (80)	14A6771X012 Yellow	20 (1,4)	----	2.5 (0,17)	1 (0,069)
	14A6629X012 Green	60 (4,1)	5 (0,34)	4 (0,28)	2 (0,14)
	14A6630X012 Blue	125 (8,6)	8 (0,55)	6 (0,41)	2.5 (0,17)
	14A6631X012 Red	400 (27,6) or body rating limit, whichever is lower	14 (0,97)	11 (0,76)	4 (0,28)
4 (100)	14A6770X012 Yellow	20 (1,4)	----	3.5 (0,24)	1.3 (0,09)
	14A6632X012 Green	60 (4,1)	10 (0,69)	5 (0,34)	2.5 (0,17)
	14A6633X012 Blue	125 (8,6)	13 (0,90)	8 (0,55)	3 (0,21)
	14A6634X012 Red	400 (27,6) or body rating limit, whichever is lower	22 (1,5)	13 (0,90)	5 (0,34)
6, 8 x 6, and 12 x 6 (150, 200 x 150, and 300 x 150)	15A2253X012 Yellow	20 (1,4)	----	6 (0,41)	2.2 (0,15)
	14A9686X012 Green	60 (4,1)	13 (0,90)	9.5 (0,66)	4 (0,28)
	14A9685X012 Blue	125 (8,6)	19 (1,3)	14 (0,97)	6 (0,41)
	15A2615X012 Red	400 (27,6) or body rating limit, whichever is lower	28 (1,9) ⁽²⁾	19 (1,3)	8 (0,55)

1. Maximum inlet pressure is equal to set pressure plus maximum differential.
2. Requires special 6300 Series pilot construction without integral relief valve and with external Type 1806 40 psid (2,8 bar d) relief valve.

Table 5. Supply Pressure Settings Required for the Type 95H Regulator

BODY SIZES, NPS (DN)	TYPE EGR SPRING COLOR	SUPPLY PRESSURE, PSIG (bar)					
		Type Y600AM Spring Color					
		Red	Olive Drab	Yellow	Green	Light Blue	Black
1 (25)	Green	6 (0,41)	6 (0,41)	7 (0,48)	8 (0,55)	11 (0,76)	13 (0,90)
	Blue	7 (0,48)	7 (0,48)	8 (0,55)	10 (0,69)	13 (0,90)	14 (0,97)
	Red	8 (0,55)	8 (0,55)	9 (0,62)	11 (0,76)	14 (0,97)	15 (1,0)
2 (50)	Green	6 (0,41)	6 (0,41)	7 (0,48)	9 (0,62)	12 (0,83)	13 (0,90)
	Blue	8 (0,55)	8 (0,55)	9 (0,62)	11 (0,76)	14 (0,97)	15 (1,0)
	Red	13 (0,90)	13 (0,90)	14 (0,97)	16 (1,1)	19 (1,3)	20 (1,4)
3 (80)	Green	7 (0,48)	7 (0,48)	8 (0,55)	10 (0,69)	13 (0,90)	14 (0,97)
	Blue	9 (0,62)	9 (0,62)	10 (0,69)	12 (0,83)	15 (1,0)	16 (1,1)
	Red	14 (0,97)	14 (0,97)	15 (1,0)	17 (1,2)	20 (1,4)	21 (1,5)
4 (100)	Green	8 (0,55)	8 (0,55)	9 (0,62)	11 (0,76)	14 (0,97)	15 (1,0)
	Blue	11 (0,76)	11 (0,76)	12 (0,83)	14 (0,97)	17 (1,2)	18 (1,2)
	Red	16 (1,1)	16 (1,1)	17 (1,2)	19 (1,3)	22 (1,5)	23 (1,6)
6 (150) 8 x 6 (200)	Green	13 (0,90)	13 (0,90)	14 (0,97)	15 (1,0)	18 (1,2)	20 (1,4)
	Blue	17 (1,2)	17 (1,2)	18 (1,2)	20 (1,4)	23 (1,6)	24 (1,7)
	Red	22 (1,5)	22 (1,5)	23 (1,6)	25 (1,7)	28 (1,9)	29 (2,0)

1. The pressures shown in the table are the minimum supply pressures required by the pilot. If the inlet pressure is less than shown, an external pilot supply is necessary.

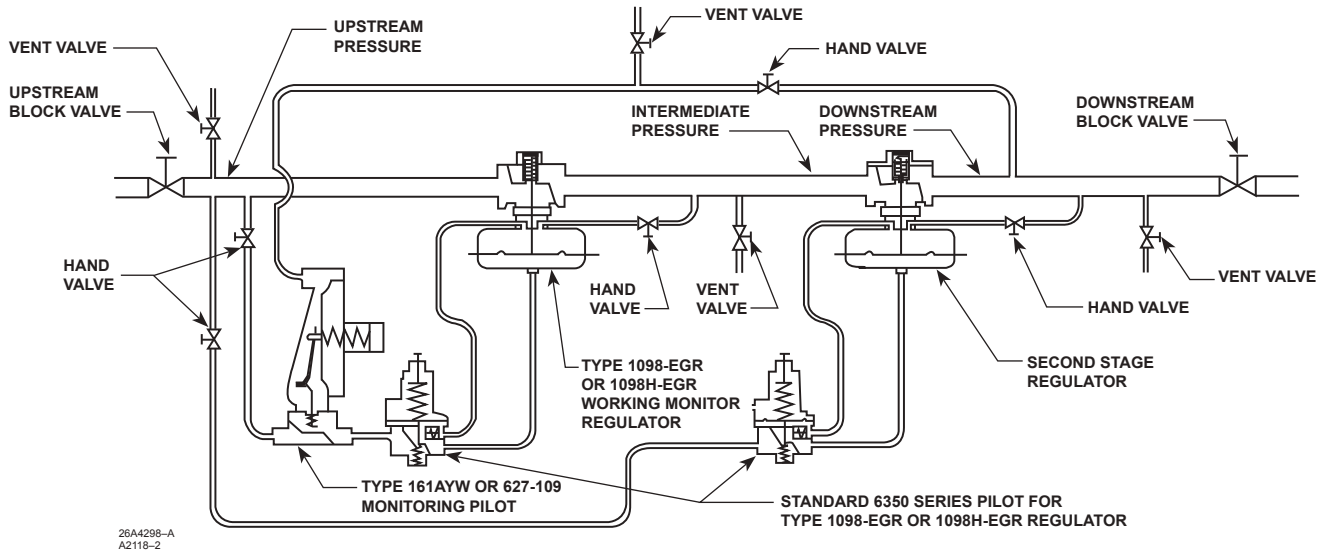


Figure 4. Working Monitor System

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 161AYW pilot and 150 psig (10,3 bar) maximum allowable pilot inlet	3 to 12-inches w.c. (7 to 30 mbar)	1B653927022	3-inches w.c. (7 mbar) over normal distribution pressure
	11 to 25-inches w.c. (27 to 62 mbar)	1B537027052	
	0.9 to 2.5 psi (0,06 to 0,17 bar) 2.5 to 4.5 psi (0,17 to 0,31 bar) 4.5 to 7 psi (0,31 to 0,48 bar)	1B537127022 1B537227022 1B537327052	
Type 627-109 pilot and 150 psig (10,3 bar) maximum allowable pilot for cast iron body or 750 psig (51,7 bar) maximum allowable inlet for malleable iron or steel body	5 to 20 psig (0,34 to 1,4 bar) 15 to 40 psig (1,0 to 2,8 bar) 35 to 80 psig (2,4 to 5,5 bar)	10B3076X012 10B3077X012 10B3078X012	3.0 psig (0,21 bar) over normal distribution pressure
	70 to 150 psig (4,8 to 10,3 bar) 130 to 200 psig (9,0 to 13,8 bar)	10B3079X012	5.0 psig (0,34 bar) over normal distribution pressure

The quick opening cage allows maximum capacity at shorter travels to decrease stroking time in opening and closing directions. The Yellow Main Spring requires that service conditions not exceed 20 psig (1,4 bar) maximum inlet pressure and 10 psid (0,69 bar d) maximum differential pressure.

Supply the boiler pilot light gas with the Type 1098-EGR. The pilot light gas supply line should branch off the main fuel line downstream of the Type 1098-EGR and include a separate regulator to control the final pilot light gas pressure, if required (see Figures 6 and 7). This allows the Type 1098-EGR to have its main valve plug just off the seat waiting for the sudden negative shock created when the boiler solenoid valve is opened to light the boiler to the low fire load. This configuration significantly increases the stroking speed of the Type 1098-EGR.

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. A Type 252 filter is recommended for heavy amounts of foreign material in the lines. These filters are described in separate bulletins.

Noise Abatement Trim

At elevated pressure drops and flow rates regulators with standard trims can produce noise levels that exceed regulatory limits, causing a nuisance for neighbors and even causing mechanical damage to equipment and piping. Whisper trims are available with the Type 1098-EGR to reduce noise be up to 30 dBA.

Applications

Low Pressure Gas Distribution Systems

The Type 1098-EGR offers superior performance when utilized to supply low pressure [typically 4 to 12-inches w.c. (10 to 30 mbar)] at district stations operated by gas distribution companies. The two path control system (outlet pressure by control pilot) allows for tight control over the large range of flows typical to district stations. The knife edged seats in the main valve plug allow for tight shutoff, and the cage-guiding aids in stability. Droop can be reduced to a minimum by utilizing an application specific pilot control system, main valve spring, and actuator combination (for example, a low droop system would utilize a 95 Series Pilot supplying a Type Y600AM control pilot, size 70 actuator, a fixed restrictor or the Type 112 variable restrictor set at 3, and the smallest appropriate main valve spring).

Monitoring Systems

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 regulators in monitoring systems are as follows:

Working Monitor (Figure 4)

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.

If the second-stage regulator fails to open, the working monitor regulator assumes the entire pressure reduction function of the system via the monitoring pilot. Note that the working monitor regulator actuator must be able to withstand full inlet pressure or be protected from it if the working monitor fails wide-open.

The monitoring pilot must be upstream of the working monitor regulator. This enables a close setpoint between the working regulator and the monitoring pilot. Special Types 161AYW and 627-109 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.

Wide-Open Monitor (Figure 5)

Either the upstream or downstream regulator can be the monitoring regulator. 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 prevents differential relief valve chatter on the monitoring regulator pilot.

Adjustment Recommendations for Monitor Applications

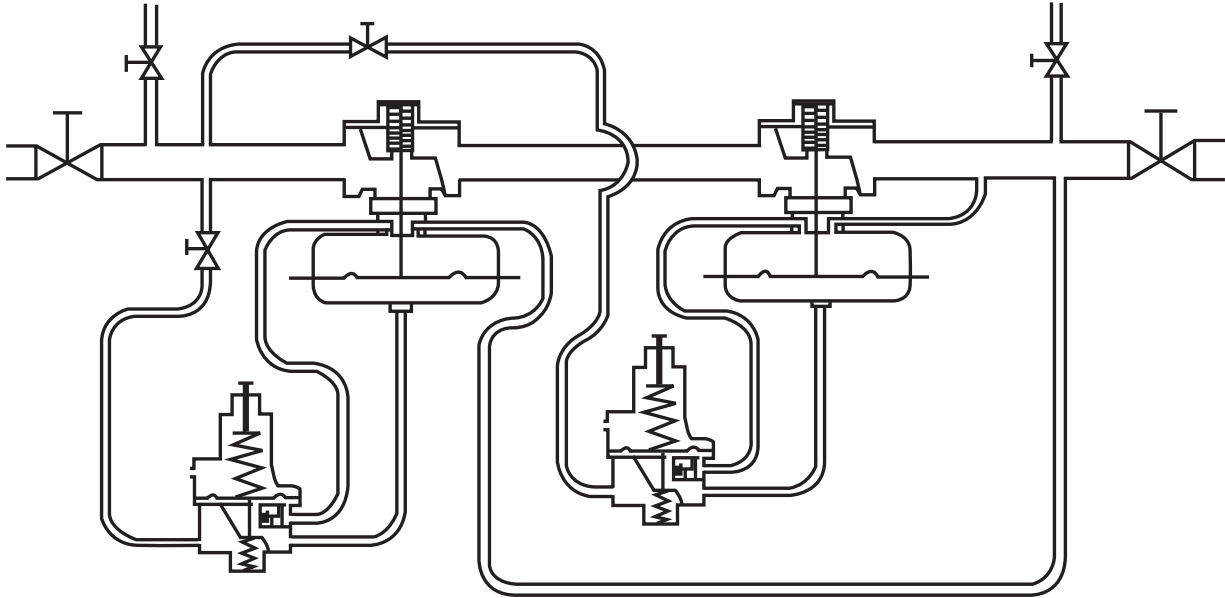
Low amplitude/high frequency monitor trim oscillations can occur if the monitor regulator pressure setting is adjusted too closely to the working regulator pressure setting and/or if the monitor pilot supply regulator pressure setting is adjusted too closely to the monitor regulator pressure setting. The monitor pressure setting should be adjusted so it is at minimum 2 times the pilot proportional band pressure above the working regulator pressure setting. The monitor pilot supply pressure setting should be adjusted so it is at minimum 5 psig (0,34 bar) plus the monitor minimum differential pressure above the working regulator pressure setting. These adjustments must be made such that other governing pressure limits, such as casing ratings, pilot maximum differential pressures, or regulatory limits, are not exceeded.

Water Service

When using the Type 1098-EGR in aqueous service, it is important to make the proper material and pilot selections. Table 9 shows proper material selections for erosive or corrosive service. In both cases, a low gain pilot should be used on any aqueous service. The low gain pilot improves the speed of response of the regulator in aqueous applications. Follow all general procedures when operating the Type 1098-EGR in aqueous service.

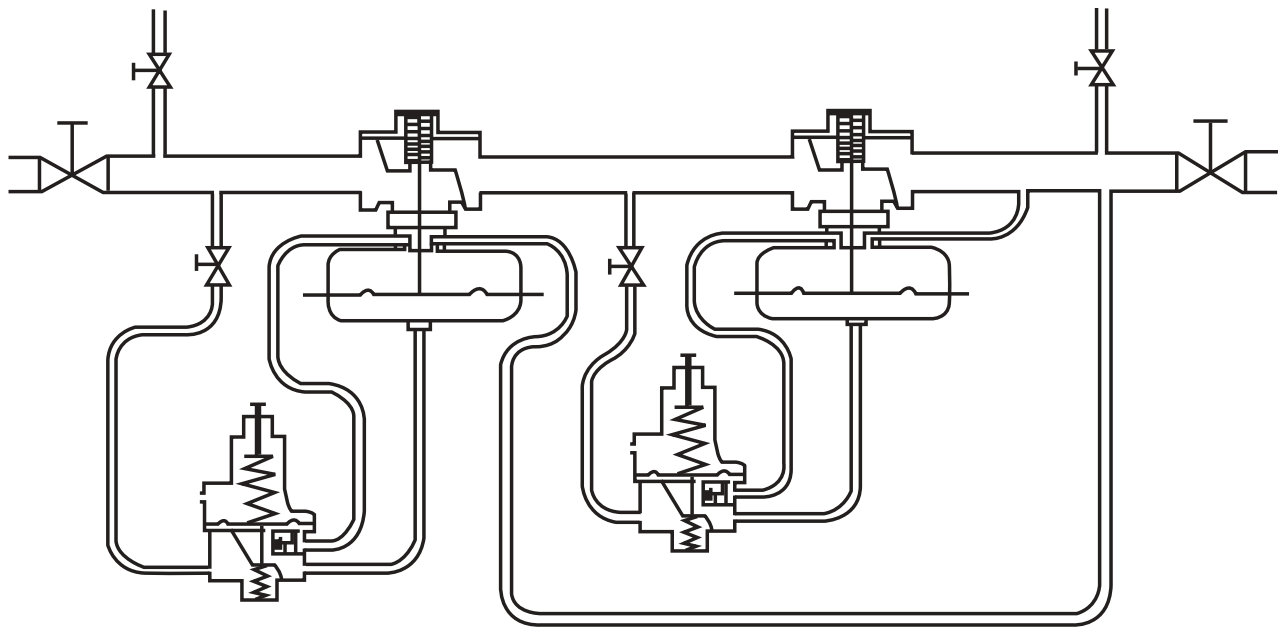
Fast Closing Regulator (Figure 8)

When a Type 1098-EGR regulator is used upstream of a double block and bleed system, it is sometimes necessary to modify the Type 1098-EGR control system to increase the closing speed.



16A4296-A

**FLEXIBLE WIDE-OPEN MONITOR ARRANGEMENT
THAT PERMITS WIDE-OPEN MONITOR TO BE
EITHER UPSTREAM OR DOWNSTREAM**



16A4297-A

**MINIMUM PIPING WIDE-OPEN MONITOR ARRANGEMENT
THAT REQUIRES WIDE-OPEN MONITOR
ALWAYS TO BE UPSTREAM**

Figure 5. Wide-Open Monitor System

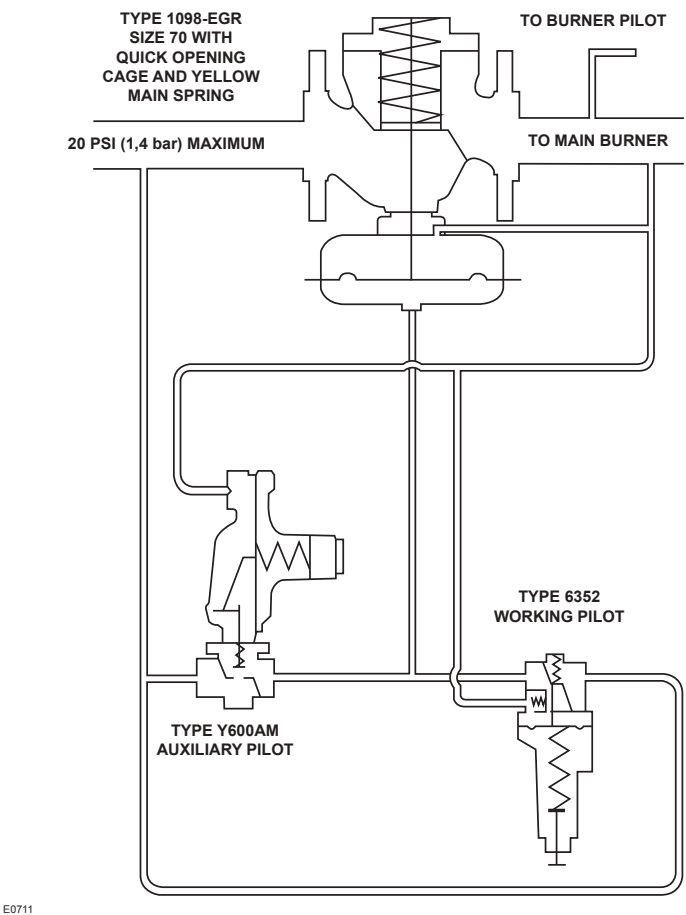


Figure 6. Boiler Fuel Configuration

Table 7. Auxiliary Pilot Selection (Fast Stroke Dual Pilot)

SIZE, INCHES (mm)	CONSTRUCTION	ORIFICE, INCHES (mm)	SPRING RANGE	SPRING NUMBER	SPRING COLOR	MINIMUM PRESSURE AT WHICH AUXILIARY PILOT CAN BE SET
3/4 (19,0)	Type Y600AM	1/2 (12,7)	4 to 8-inches w.c. (10 to 20 mbar)	1B653827052	Red	1-inch w.c. (2 mbar) Under working pilot setpoint
			7 to 16-inches w.c. (17 to 40 mbar)	1B653927022	Olive Drab	
			15-inches w.c. to 1.2 psi (37 mbar to 0,08 bar)	1B537027052	Yellow	
			1.2 to 2.5 psi (0,08 to 0,17 bar)	1B537127022	Light Green	0.2 psig (0,014 bar) Under working pilot setpoint
			2.5 to 4.5 psi (0,17 to 0,31 bar)	1B537227022	Light Blue	
			4.5 to 7 psi (0,31 to 0,48 bar)	1B537327052	Black	
	Type 627M		5 to 10 psi (0,34 to 0,69 bar)	10B3076X012	Yellow	0.3 psig (0,021 bar) Under working pilot setpoint

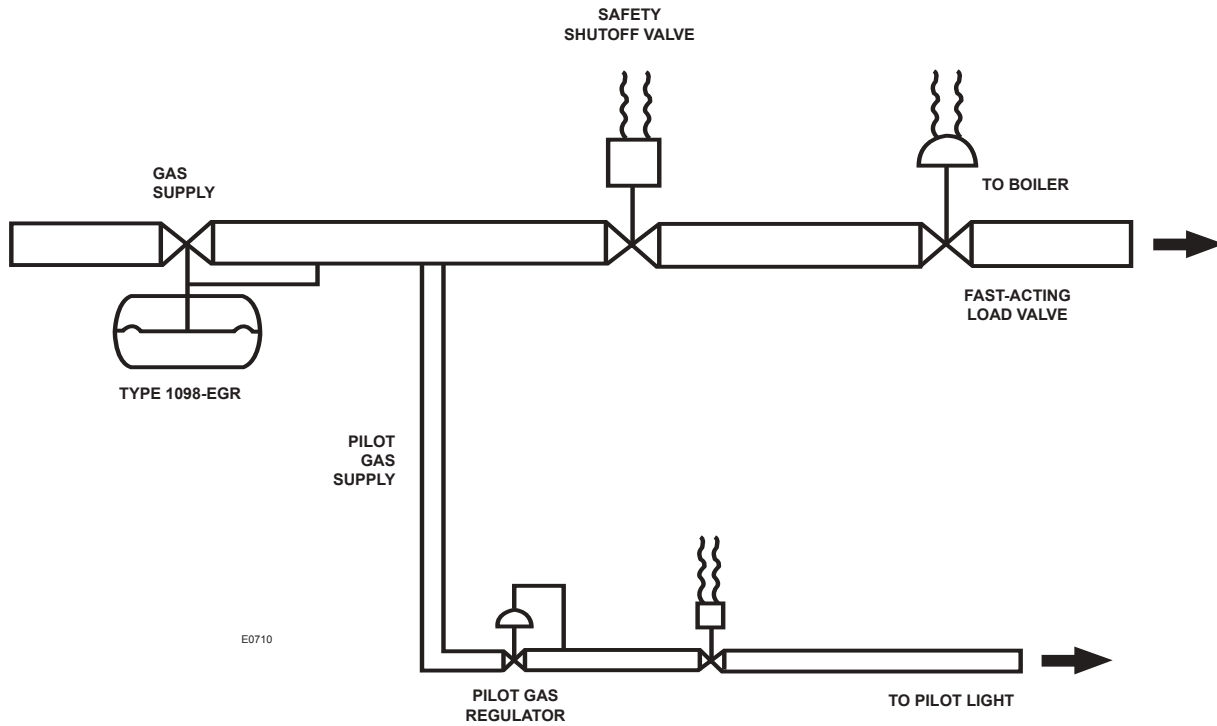
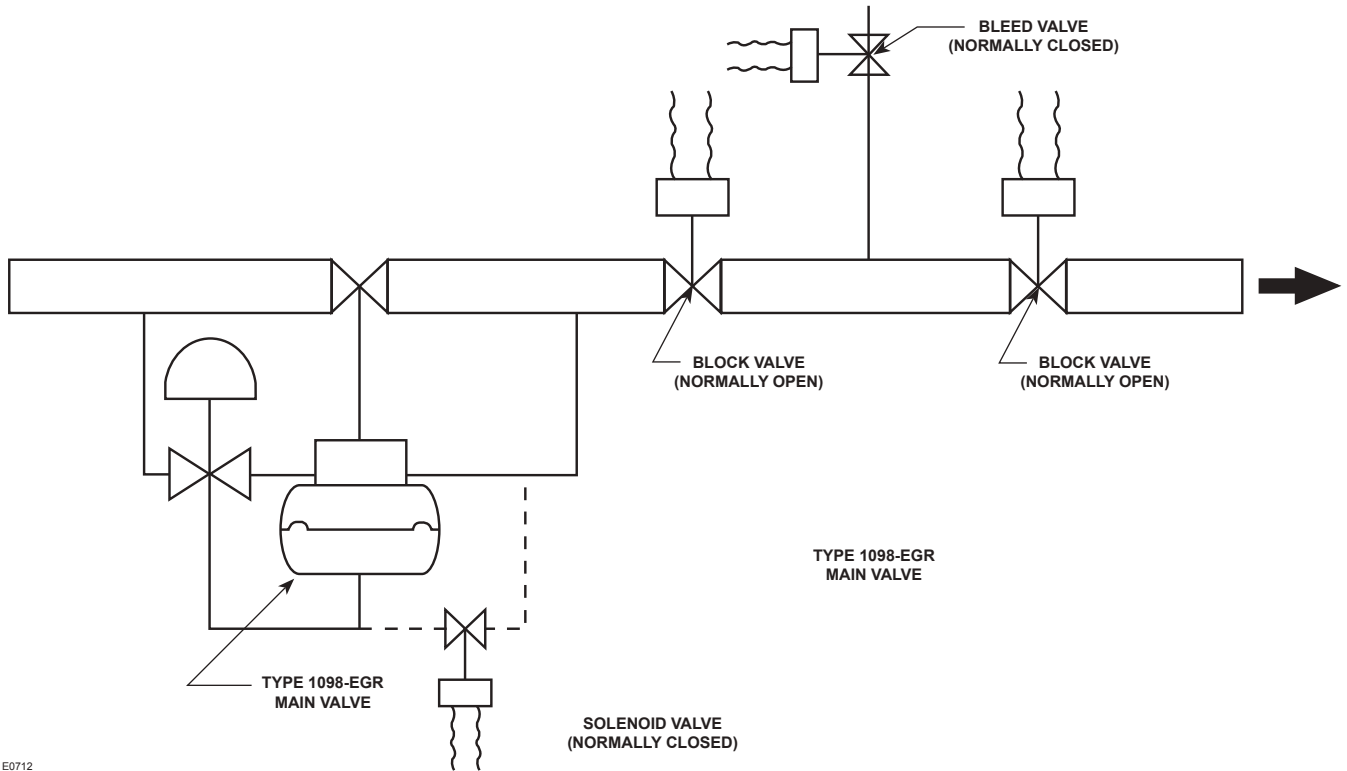


Figure 7. Boiler Fuel Configuration Installation Guide

Table 8. Boiler Fuel Pressure Control Construction Selections

TYPE EGR BODY SIZE, NPS (DN)	QUICK-OPENING CAGE PART NUMBER ⁽¹⁾	YELLOW MAIN SPRING PART NUMBER ⁽²⁾	MINIMUM DIFFERENTIAL PRESSURE FOR FULL STROKE ⁽³⁾ , PSID (bar d)
1 (25)	37A7211X012	NA	----
2 (50)	37A7212X012	14A6768X012	1.0 (0,069)
3 (80)	37A7213X012	14A6771X012	
4 (100)	37A7214X012	14A6770X012	1.3 (0,09)
6 (150)	37A7215X022	15A2253X012	2.2 (0,15)

1. Limited to maximum P_1 of 20 psig (1,4 bar).
 2. Yellow spring is limited to use with Size 70 actuator only.
 3. Minimum differential pressure for full stroke is based on yellow main spring and a Size 70 actuator.



E0712

Figure 8. Fast-Closing Application Installation Guide

Table 9. Construction Materials for Aqueous Service

AQUEOUS SERVICE TYPE	CONSTRUCTION MATERIALS		
	Cage and Seat Ring	Body Flange	Main Spring
Erosive	416 Stainless steel	CF8M Stainless steel	InconeI® X750
Corrosive	316 Stainless steel		
1. A low gain pilot should be used on aqueous applications.			

A solenoid can be installed as shown. In normal operation, the solenoid valve is closed. The solenoid wiring is connected to the block valve electric logic so that the solenoid on the regulator opens when the block valve is closed.

This concept will quickly equalize pressure on both sides of the Type 1098 diaphragm and allow quick closure. In some systems, the Type 1098-EGR will close faster than the block valve as evidenced by a momentary decline in the Type 1098-EGR outlet pressure. The pressure is then promptly restored back to a setpoint by flow through the pilot only (i.e., the main valve is unable to open because of the solenoid valve).

Capacity Information

Note

Flow capacities are laboratory verified; therefore, regulators may be sized for 100% of the published flow capacities. It is not necessary to reduce published capacities.

Gases

Table 12 shows the natural gas regulating capacities of the Type 1098-EGR at selected inlet and outlet pressure settings. Flows are in thousands of SCFH at 60°F and 14.7 psia and in thousands of Nm³/h at 0°C and 1,01325 bar of 0.6 specific gravity natural gas.

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.

To find appropriate regulating capacities at pressure settings not given in Table 12 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 above.

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

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

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 Table 14, 15, or 16

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

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

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

where,

Q = gas flow rate, SCFH

G = gas specific gravity of the gas

T = absolute temperature of gas at inlet, °Rankine

C_g = gas sizing coefficient

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

C₁ = flow coefficient

ΔP = pressure drop across the regulator, psi

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

Liquids

The liquid capacities in Table 13 are in gallons per minute and liters per minute of water. To determine flow capacity not given, use the following equation:

$$Q = C_v \sqrt{\frac{\Delta P}{G}}$$

where,

Q = liquid flow rate, GPM

C_v = liquid sizing coefficient

ΔP = pressure drop across the regulator, psi

G = specific gravity (specific gravity of water is 1)

If capacity is desired in liters per minute, multiply gallons per minute by 3.785. Use the K_m values to predict choked flow on aqueous service.

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Table 10. Proportional Band (Standard Pilot Restriction and Size 40 Type 1098 Actuator⁽¹⁾)

BODY SIZE, NPS (DN)	PILOT		PROPORTIONAL BAND, PSI (mbar)		
	Types	Control Spring Color	Yellow or Green Main Valve Spring	Blue Main Valve Spring	Red Main Valve Spring
1 (25)	6351	Green	0.10 (7)	0.20 (14)	0.40 (28)
		Cadmium	0.20 (14)	0.40 (28)	0.80 (55)
		Red	0.40 (28)	0.80 (55)	1.00 (69)
	6352	Yellow	0.04 (3)	0.10 (7)	0.20 (14)
		Black	0.08 (6)	0.20 (14)	0.40 (28)
	6353	Yellow	0.20 (14)	0.40 (28)	0.80 (55)
		Red	0.40 (28)	0.80 (55)	1.00 (69)
	61L	All	0.09 (6)	0.16 (11)	0.30 (21)
	61LD		0.04 (3)	0.08 (6)	0.20 (14)
	61LE, 61H, and 61HP		0.40 (28)	0.80 (55)	1.00 (69)
	Y600AM	Red	0.01 (0,6)	0.02 (1)	0.04 (3)
		Olive Drab	0.01 (0,6)	0.02 (1)	0.04 (3)
		Yellow	0.05 (3)	0.10 (7)	0.15 (10)
		Light Green	0.10 (7)	0.15 (10)	0.20 (14)
		Light Blue	0.15 (10)	0.20 (14)	0.25 (17)
		Black	0.20 (14)	0.25 (17)	0.30 (21)
2 (50)	6351	Green	0.20 (14)	0.30 (21)	0.50 (34)
		Cadmium	0.30 (21)	0.50 (34)	1.00 (69)
		Red	0.50 (34)	1.00 (69)	1.40 (97)
	6352	Yellow	0.05 (3)	0.15 (10)	0.30 (21)
		Black	0.10 (7)	0.30 (21)	0.60 (41)
	6353	Yellow	0.30 (21)	0.50 (34)	1.00 (69)
		Red	0.50 (34)	1.00 (69)	1.40 (97)
	61L	All	0.10 (7)	0.20 (14)	0.60 (41)
	61LD		0.05 (3)	0.10 (7)	0.30 (21)
	61LE, 61H, and 61HP		0.50 (34)	1.00 (69)	1.40 (97)
	Y600AM	Red	0.01 (0,6)	0.02 (1)	0.04 (3)
		Olive Drab	0.01 (0,6)	0.02 (1)	0.04 (3)
		Yellow	0.05 (4)	0.10 (7)	0.15 (10)
		Light Green	0.10 (7)	0.15 (10)	0.20 (14)
		Light Blue	0.15 (10)	0.20 (14)	0.25 (17)
		Black	0.20 (14)	0.25 (17)	0.30 (21)
3 (80)	6351	Green	0.30 (21)	0.40 (28)	0.60 (41)
		Cadmium	0.40 (28)	0.60 (41)	1.20 (83)
		Red	0.90 (62)	1.20 (83)	1.50 (103)
	6352	Yellow	0.10 (7)	0.20 (14)	0.40 (27,6)
		Black	0.20 (14)	0.40 (28)	0.80 (55,2)
	6353	Yellow	0.40 (28)	0.60 (41)	1.20 (82,8)
		Red	0.90 (62)	1.20 (83)	1.50 (103)
	61L	All	0.20 (14)	0.40 (28)	1.00 (69,0)
	61LD		0.10 (7)	0.20 (14)	0.50 (34,5)
	61LE, 61H, and 61HP		0.90 (62)	1.20 (83)	1.50 (103)
	Y600AM	Red	0.01 (0,6)	0.02 (1)	0.04 (3)
		Olive Drab	0.01 (0,6)	0.02 (1)	0.04 (3)
		Yellow	0.05 (4)	0.10 (7)	0.15 (10)
		Light Green	0.10 (7)	0.15 (10)	0.20 (14)
		Light Blue	0.15 (10)	0.20 (14)	0.25 (17)
		Black	0.20 (14)	0.25 (17)	0.30 (21)

1. 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 NPS 2 (DN 50) 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).

2. The configuration utilized in determining the proportional band of the Type Y600AM included the 95 Series pilot supplying the Type Y600AM for improved stability and a fixed restrictor, part number 1K9484X0022, or an optional Type 112 variable restrictor with a setting of 3.

- continued -

Table 10. Proportional Band (Standard Pilot Restriction and Size 40 Type 1098 Actuator⁽¹⁾) (continued)

BODY SIZES, NPS (DN)	PILOT		PROPORTIONAL BAND, PSI (mbar)		
	Types	Control Spring Color	Yellow or Green Main Valve Spring	Blue Main Valve Spring	Red Main Valve Spring
4 (100)	6351	Green	0.40 (28)	0.50 (34)	0.80 (55)
		Cadmium	0.70 (48)	0.80 (55)	1.40 (97)
		Red	1.20 (83)	2.00 (138)	3.00 (207)
	6352	Yellow	0.15 (10)	0.30 (21)	0.60 (41)
		Black	0.30 (21)	0.60 (41)	1.20 (83)
	6353	Yellow	0.70 (48)	0.80 (55)	1.40 (97)
		Red	1.20 (83)	2.00 (138)	3.00 (207)
	61L	All	0.30 (21)	0.60 (41)	1.40 (97)
	61LD		0.15 (10)	0.30 (21)	0.70 (48)
	61LE, 61H, and 61HP		1.20 (83)	2.00 (138)	3.00 (207)
	Y600AM	Red	0.01 (0.6)	0.02 (1)	0.04 (3)
		Olive Drab	0.01 (0.6)	0.02 (1)	0.04 (3)
		Yellow	0.05 (3)	0.10 (7)	0.15 (10)
		Light Green	0.10 (7)	0.15 (10)	0.20 (14)
		Light Blue	0.15 (10)	0.20 (14)	0.25 (17)
		Black	0.20 (14)	0.25 (17)	0.30 (21)
6, 8 x 6, and 12 x 6 (150, 200 x 150, and 300 x 150)	6351	Green	0.50 (34)	0.60 (41)	1.00 (69)
		Cadmium	0.90 (62)	1.50 (103)	2.00 (138)
		Red	1.50 (103)	2.50 (172)	3.50 (241)
	6352	Yellow	0.20 (14)	0.40 (28)	0.80 (55)
		Black	0.40 (28)	0.80 (55)	1.60 (110)
	6353	Yellow	0.90 (62)	1.50 (103)	2.00 (138)
		Red	1.50 (103)	2.50 (172)	3.50 (241)
	61L	All	0.60 (41)	1.20 (83)	2.00 (138)
	61LD		0.30 (21)	0.60 (41)	2.00 (69)
	61LE, 61H, and 61HP		1.50 (103)	2.50 (172)	3.50 (241)
	Y600AM	Red	0.01 (0.6)	0.02 (1)	0.04 (3)
		Olive Drab	0.01 (0.6)	0.02 (1)	0.04 (3)
		Yellow	0.05 (3)	0.10 (7)	0.15 (10)
		Light Green	0.05 (3)	0.15 (10)	0.20 (14)
		Light Blue	0.15 (10)	0.20 (14)	0.25 (17)
		Black	0.20 (14)	0.25 (17)	0.30 (21)

1. 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 NPS 2 (DN 50) 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).

2. The configuration utilized in determining the proportional band of the Type Y600AM included the 95 Series pilot supplying the Type Y600AM for improved stability and a fixed restrictor, part number 1K9484X0022, or an optional Type 112 variable restrictor with a setting of 3.

Table 11. Approximate Proportional Band Range (Standard Pilot Restriction, Size 30 Type 1098H Actuator⁽¹⁾)

BODY SIZE, NPS (DN)	PILOT		APPROXIMATE PROPORTIONAL BAND RANGE, PSI (bar)		
	Type	Control Spring Color	Green Main Valve Spring	Blue Main Valve Spring	Red Main Valve Spring
1 (25)	6354L, 6354M, or 6354H	Blue or Green	1 (0,07)	1.5 (0,10)	2.5 (0,17)
2 (50)			1.5 (0,10)	2.0 (0,14)	3.0 (0,21)
3 (80)			2.5 (0,17)	3.0 (0,21)	4.0 (0,28)
4 (100)			3.5 (0,24)	4.0 (0,28)	5.0 (0,34)
6 (150)			4 (0,28)	5.0 (0,34)	Not Available

1. 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 NPS 2 (DN 50) 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).

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Table 12. Natural Gas Capacities

INLET PRESSURE, PSIG (bar)	OUTLET PRESSURE SETTING, PSIG (bar)	CAPACITIES IN THOUSANDS OF SCFH (Nm ³ /h) OF 0.6 SPECIFIC GRAVITY NATURAL GAS FOR REGULATORS WITH STANDARD LINEAR CAGE, STANDARD TRAVEL, AND LINE SIZE EQUALS MAIN VALVE BODY SIZE						
		NPS 1 (DN 25) Body Size	NPS 2 (DN 50) Body Size	NPS 3 (DN 80) Body Size	NPS 4 (DN 100) Body Size	NPS 6 (DN 150) Body Size	NPS 8 x 6 (DN 200 x 150) Body Size	NPS 12 x 6 (DN 300 x 150) Body Size
3 (0,21)	7-inches w.c. (17 mbar)	8 (0,2)	32 (0,9)	66 (1,8)	101 (2,7)	----	----	----
5 (0,34)	7-inches w.c. (17 mbar)	11 (0,3)	42 (1,1)	87 (2,3)	135 (3,6)	257 (6,9)	318 (8,5)	318 (8,5)
	1 (0,07)	10 (0,3)	39 (1,0)	82 (2,2)	126 (3,4)	241 (6,5)	299 (8,0)	299 (8,0)
	2 (0,1)	9 (0,2)	35 (0,9)	73 (2,0)	112 (3,0)	----	----	----
10 (0,69)	7-inches w.c. (17 mbar)	17 (0,5)	63 (1,7)	129 (3,5)	201 (5,4)	376 (10,1)	463 (12,4)	463 (12,4)
	3 (0,2)	15 (0,4)	56 (1,5)	116 (3,1)	180 (4,8)	341 (9,1)	421 (11,3)	421 (11,3)
	5 (0,3)	13 (0,4)	49 (1,3)	102 (2,7)	158 (4,2)	302 (8,1)	374 (10,0)	374 (10,0)
	7 (0,5)	11 (0,3)	40 (1,1)	82 (2,2)	127 (3,4)	----	----	----
15 (1,0)	1 (0,07)	21 (0,6)	79 (2,1)	163 (4,4)	254 (6,8)	471 (12,6)	579 (15,5)	579 (15,5)
	4 (0,3)	20 (0,5)	74 (2,0)	153 (4,1)	237 (6,4)	445 (11,9)	548 (14,7)	548 (14,7)
	8 (0,5)	17 (0,5)	63 (1,7)	130 (3,5)	201 (5,4)	385 (10,3)	476 (12,8)	476 (12,8)
	12 (0,8)	12 (0,3)	44 (1,2)	91 (2,4)	140 (3,8)	----	----	----
20 (1,4)	1 (0,07)	27 (0,7)	102 (2,7)	207 (5,6)	328 (8,8)	577 (15,5)	706 (18,9)	706 (18,9)
	10 (0,7)	21 (0,6)	79 (2,1)	164 (4,4)	254 (6,8)	482 (12,9)	595 (15,9)	595 (15,9)
	15 (1,0)	16 (0,4)	60 (1,6)	125 (3,4)	192 (5,2)	371 (9,9)	459 (12,3)	459 (12,3)
	17 (1,2)	13 (0,4)	48 (1,3)	99 (2,7)	153 (4,1)	----	----	----
30 (2,1)	4 (0,3) or less	35 (0,9)	131 (3,5)	267 (7,2)	422 (11,3)	744 (19,9)	909 (24,4)	909 (24,4)
	15 (1,0)	29 (0,8)	108 (2,9)	223 (6,0)	345 (9,3)	651 (17,5)	803 (21,5)	803 (21,5)
	20 (1,4)	25 (0,7)	93 (2,5)	192 (5,2)	297 (8,0)	568 (15,2)	702 (18,8)	702 (18,8)
	25 (1,7)	18 (0,5)	69 (1,6)	144 (3,9)	221 (5,9)	429 (11,5)	531 (14,2)	531 (14,2)
40 (2,8)	9 (0,6) or less	42 (1,1)	161 (4,3)	327 (8,8)	517 (13,9)	910 (24,4)	1113 (29,8)	1113 (29,8)
	20 (1,4)	36 (1,0)	136 (3,6)	280 (7,5)	434 (11,6)	816 (21,9)	1006 (27,0)	1006 (27,0)
	30 (2,1)	28 (0,8)	105 (2,8)	217 (5,8)	335 (9,0)	644 (17,3)	797 (21,4)	797 (21,4)
	35 (2,4)	21 (0,6)	77 (2,1)	161 (4,3)	247 (6,6)	480 (12,9)	595 (15,9)	595 (15,9)
50 (3,4)	13 (0,9) or less	50 (1,3)	190 (5,1)	386 (10,3)	611 (16,4)	1077 (28,9)	1316 (35,3)	1316 (35,3)
	20 (1,4)	45 (1,2)	172 (4,6)	354 (9,5)	551 (14,8)	1023 (27,4)	1258 (33,7)	1258 (33,7)
	30 (2,1)	40 (1,1)	152 (4,1)	313 (8,4)	485 (13,0)	919 (24,6)	1134 (30,4)	1134 (30,4)
	40 (2,8)	31 (0,8)	115 (3,1)	240 (6,4)	369 (9,9)	712 (19,1)	881 (23,6)	881 (23,6)
	45 (3,1)	22 (0,6)	85 (2,3)	176 (4,7)	270 (7,24)	526 (14,1)	653 (17,5)	653 (17,5)
75 (5,2)	24 (1,6) or less	69 (1,9)	264 (7,1)	536 (14,4)	847 (22,7)	1493 (40,0)	1825 (48,9)	1825 (48,9)
	50 (3,4)	54 (1,5)	203 (5,4)	419 (11,2)	648 (17,4)	1232 (33,0)	1521 (40,8)	1521 (40,8)
	60 (4,1)	44 (1,2)	166 (4,5)	343 (9,2)	529 (14,2)	1019 (27,3)	1261 (33,8)	1261 (33,8)
	70 (4,8)	27 (0,7)	101 (2,7)	209 (5,6)	322 (8,63)	627 (16,8)	778 (20,9)	778 (20,9)
100 (6,9)	35 (2,4) or less	89 (2,4)	337 (9,0)	685 (18,4)	1083 (29,0)	1909 (51,2)	2333 (62,5)	2333 (62,5)
	60 (4,1)	74 (2,0)	280 (7,5)	578 (15,5)	896 (24,0)	1689 (45,3)	2082 (55,8)	2082 (55,8)
125 (8,6)	75 (5,2)	62 (1,7)	236 (6,3)	489 (13,1)	754 (20,2)	1444 (38,7)	1786 (47,9)	1786 (47,9)
	46 (3,2) or less	108 (2,9)	411 (11,0)	834 (22,4)	1319 (35,3)	2325 (62,3)	2842 (76,2)	2842 (76,2)
150 (10,3)	75 (5,2)	91 (2,4)	344 (9,2)	710 (19,0)	1101 (29,5)	2072 (55,5)	2555 (68,5)	2555 (68,5)
	57 (3,9) or less	127 (3,4)	484 (13,0)	984 (26,4)	1555 (41,7)	2741 (73,5)	3351 (89,8)	3351 (89,8)
175 (12,1)	75 (5,2)	115 (3,1)	436 (11,7)	897 (24,0)	1396 (37,4)	2593 (69,5)	3191 (85,5)	3191 (85,5)
	68 (4,7) or less	147 (3,9)	558 (15,0)	1133 (30,4)	1791 (48,0)	3157 (84,6)	3859 (103)	3859 (103)
200 (13,8)	75 (5,2) or less	166 (4,5)	631 (16,9)	1282 (34,4)	2027 (54,3)	3573 (95,8)	4368 (117)	4368 (117)
250 (17,2)		205 (5,5)	779 (20,9)	1581 (42,4)	2500 (67,0)	4405 (118)	5385 (144)	5385 (144)
300 (20,7)		244 (6,5)	926 (24,8)	1880 (50,4)	2972 (79,6)	5237 (140)	6402 (172)	6402 (172)
350 (24,1)		282 (7,6)	1073 (28,8)	2178 (58,4)	3444 (92,3)	6069 (163)	7419 (199)	7419 (199)
400 (27,6)		321 (8,6)	1220 (32,7)	2477 (66,4)	3916 (105)	6901 (185)	8436 (226)	8436 (226)

Table 13. Liquid Capacities

INLET PRESSURE, PSIG (bar)	OUTLET PRESSURE SETTING, PSIG (bar)	CAPACITIES IN GPM (l/min) OF WATER FOR REGULATORS WITH STAINLESS STEEL LINEAR HOLE CAGE						
		NPS 1 (DN 25) Body Size	NPS 2 (DN 50) Body Size	NPS 3 (DN 80) Body Size	NPS 4 (DN 100) Body Size	NPS 6 (DN 150) Body Size	NPS 8 x 6 (DN 200 x 150) Body Size	NPS 12 x 6 (DN 300 x 150) Body Size
3 (0,21)	0.25 (0,02)	28 (106)	105 (397)	219 (829)	335 (1268)	658 (2491)	818 (3096)	818 (3096)
5 (0,34)	0.25 (0,02)	37 (140)	138 (522)	288 (1090)	440 (1665)	865 (3274)	1074 (4065)	1074 (4065)
	1 (0,07)	34 (129)	127 (481)	264 (999)	404 (1529)	794 (3005)	986 (3732)	986 (3732)
	2 (0,1)	29 (110)	110 (416)	229 (867)	350 (1325)	688 (2604)	854 (3232)	854 (3232)
10 (0,69)	0.25 (0,02)	52 (197)	198 (749)	412 (1559)	631 (2388)	1240 (4693)	1539 (5825)	1539 (5825)
	3 (0,2)	44 (167)	167 (632)	349 (1321)	534 (2021)	1050 (3974)	1304 (4936)	1304 (4936)
	5 (0,3)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
	7 (0,5)	29 (110)	110 (416)	229 (867)	350 (1325)	688 (2604)	854 (3232)	854 (3232)
15 (1,0)	1 (0,07)	63 (238)	237 (897)	494 (1870)	756 (2861)	1485 (5621)	1845 (6983)	1845 (6983)
	4 (0,3)	56 (212)	210 (795)	438 (1658)	670 (2536)	1317 (4985)	1635 (6188)	1635 (6188)
	8 (0,5)	44 (167)	167 (632)	349 (1321)	534 (2021)	1050 (3974)	1304 (4936)	1304 (4936)
	12 (0,8)	29 (110)	110 (416)	229 (867)	350 (1325)	688 (2604)	854 (3232)	854 (3232)
20 (1,4)	1 (0,07)	73 (276)	276 (1045)	575 (2176)	880 (3331)	1730 (6548)	2149 (8134)	2149 (8134)
	10 (0,7)	53 (201)	200 (757)	417 (1578)	639 (2419)	1255 (4750)	1559 (5901)	1559 (5901)
	15 (1,0)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
	17 (1,2)	29 (110)	110 (416)	229 (867)	350 (1325)	688 (2604)	854 (3232)	854 (3232)
30 (2,1)	4 (0,3) or less	86 (326)	323 (1223)	673 (2547)	1030 (3899)	2024 (7661)	2514 (9515)	2514 (9515)
	15 (1,0)	65 (246)	245 (927)	511 (1934)	782 (2960)	1538 (5821)	1909 (7226)	1909 (7226)
	20 (1,4)	53 (201)	200 (757)	417 (1578)	639 (2419)	1255 (4750)	1559 (5901)	1559 (5901)
	25 (1,7)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
40 (2,8)	9 (0,6) or less	94 (356)	352 (1332)	735 (2782)	1125 (4258)	2210 (8365)	2745 (10 390)	2745 (10 390)
	20 (1,4)	75 (284)	283 (1071)	590 (2233)	903 (3418)	1775 (6718)	2205 (8346)	2205 (8346)
	30 (2,1)	53 (201)	200 (757)	417 (1578)	639 (2419)	1255 (4750)	1559 (5901)	1559 (5901)
	35 (2,4)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
50 (3,4)	13 (0,9) or less	102 (386)	385 (1457)	803 (3039)	1229 (4652)	2415 (9141)	2999 (11 351)	2999 (11 351)
	20 (1,4)	92 (348)	347 (1313)	723 (2737)	1106 (4186)	2174 (8229)	2700 (10 220)	2700 (10 220)
	30 (2,1)	75 (284)	283 (1071)	590 (2233)	903 (3418)	1775 (6718)	2205 (8346)	2205 (8346)
	40 (2,8)	53 (201)	200 (757)	417 (1578)	639 (2419)	1255 (4750)	1559 (5901)	1559 (5901)
	45 (3,1)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
75 (5,2)	24 (1,6) or less	120 (454)	452 (1711)	943 (3569)	1443 (5462)	2835 (10 730)	3521 (13 327)	3521 (13 327)
	50 (3,4)	84 (318)	317 (1200)	660 (2498)	1010 (3823)	1985 (7513)	2465 (9330)	2465 (9330)
	60 (4,1)	65 (246)	245 (927)	511 (1934)	782 (2960)	1538 (5821)	1909 (7226)	1909 (7226)
	70 (4,8)	38 (144)	142 (537)	295 (1117)	452 (1711)	888 (3361)	1102 (4171)	1102 (4171)
100 (6,9)	35 (2,4) or less	135 (511)	510 (1930)	1064 (4027)	1629 (6166)	3201 (12 116)	3975 (15 045)	3975 (15 045)
	60 (4,1)	106 (401)	400 (1514)	835 (3160)	1278 (4837)	2511 (9504)	3118 (11 802)	3118 (11 802)
	75 (5,2)	84 (318)	317 (1200)	660 (2498)	1010 (3823)	1985 (7513)	2465 (9330)	2465 (9330)
125 (8,6)	46 (3,2) or less 75 (5,2)	149 (564) 119 (450)	563 (2131) 448 (1696)	1173 (4440) 933 (3531)	1795 (6794) 1428 (5405)	3529 (13 357) 2807 (10 624)	4382 (16 586) 3486 (13 195)	4382 (16 586) 3486 (13 195)
150 (10,3)	57 (3,9) or less 75 (5,2)	162 (613) 145 (549)	610 (2309) 548 (2074)	1273 (4818) 1143 (4326)	1948 (7373) 1749 (6620)	3829 (14 493) 3438 (13 013)	4754 (17 994) 4270 (16 162)	4754 (17 994) 4270 (16 162)
175 (12,1)	68 (4,7) or less	174 (659)	655 (2479)	1365 (5167)	2090 (7911)	4107 (15 545)	5100 (19 304)	5100 (19 304)
200 (13,8)	75 (5,2) or less	188 (712)	708 (2680)	1476 (5587)	2258 (8547)	4439 (16 802)	5512 (20 863)	5512 (20 863)
250 (17,2)		222 (840)	837 (3168)	1746 (6609)	2672 (10 114)	5252 (19 879)	6522 (24 686)	6522 (24 686)
300 (20,7)		252 (954)	950 (3596)	1980 (7494)	3030 (11 469)	5955 (22 540)	7395 (27 990)	7395 (27 990)
350 (24,1)		279 (1056)	1050 (3974)	2189 (8285)	3350 (12 680)	6584 (24 920)	8175 (30 942)	8175 (30 942)
400 (27,6)		303 (1147)	1141 (4319)	2380 (9008)	3642 (13 785)	7157 (27 089)	8888 (33 641)	8888 (33 641)

Bulletin 71.2:1098-EGR

Table 14. Flow Coefficients for Type 1098-EGR with Linear Cage

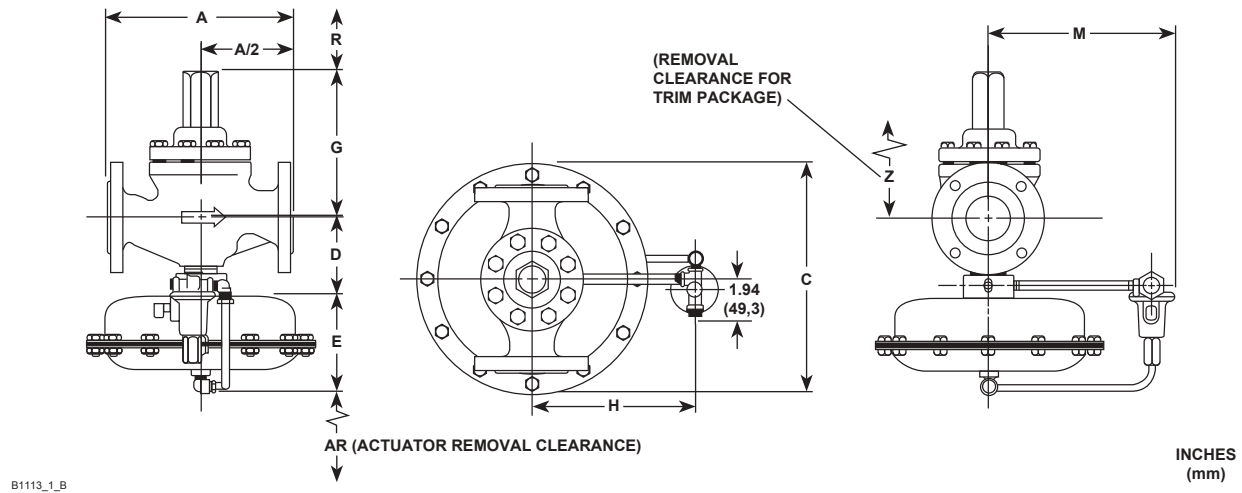
BODY SIZE, NPS (DN)	1:1 LINE SIZE TO BODY SIZE					2:1 LINE SIZE TO BODY SIZE					K _m	IEC SIZING COEFFICIENTS		
	C _g		C _v		C ₁	C _g		C _v		C ₁		X _T	F _D	F _L
	Regulating	Wide-Open	Regulating	Wide-Open		Regulating	Wide-Open	Regulating	Wide-Open					
1 (25)	600	632	16.8	17.7	35.7	568	598	17.2	18.1	33.0	0.70	0.806	0.43	0.84
2 (50)	2280	2400	63.3	66.7	36.0	2050	2160	59.6	62.8	34.4		0.820	0.35	
3 (80)	4630	4880	132	139	35.1	4410	4650	128	135			0.779	0.30	
4 (100)	7320	7710	202	213	36.2	6940	7310	198	209	35.0		0.829	0.28	
6 (150)	12,900	13,600	397	418	32.5	12,100	12,800	381	404	31.7		0.668		
8 x 6 (200 x 150)	18,480	19,450	578	608	32.0	17,370	18,280	543	571	32.0		0.648		
12 x 6 (300 x 150)	21,180	22,290	662	697		19,900	20,950	622	655					

Table 15. Flow Coefficients for Type 1098-EGR with Quick Opening Trim

BODY SIZE, NPS (DN)	1:1 LINE SIZE TO BODY SIZE					2:1 LINE SIZE TO BODY SIZE					K _m	IEC SIZING COEFFICIENTS		
	C _g		C _v		C ₁	C _g		C _v		C ₁		X _T	F _D	F _L
	Regulating	Wide-Open	Regulating	Wide-Open		Regulating	Wide-Open	Regulating	Wide-Open					
1 (25)	769	810	23.9	25.2	32.2	728	766	24.5	25.7	29.8	0.70	0.656	0.36	0.84
2 (50)	2460	2590	68.3	71.9	36.0	2214	2331	64.4	67.8	34.4		0.820		
3 (80)	4790	5050	141	149	33.9	4571	4812	137	145	33.3		0.727		
4 (100)	8120	8550	229	242	35.4	7701	8106	225	237	34.2		0.793	0.30	
6 (150)	14,915	15,700	445	469	33.5	14,571	15,350	435	458	33.5		0.710	0.28	
8 x 6 (200 x 150)	15,770	22,470	478	681	33.0	15,410	20,100	467	609	33.0		0.689		
12 x 6 (300 x 150)		25,750		780			25,760		781					

Table 16. Flow Coefficients for Type 1098-EGR with Whisper Trim® Cage

BODY SIZE, NPS (DN)	1:1 LINE SIZE TO BODY SIZE					2:1 LINE SIZE TO BODY SIZE					K _m	IEC SIZING COEFFICIENTS		
	C _g		C _v		C ₁	C _g		C _v		C ₁		X _T	F _D	F _L
	Regulating	Wide-Open	Regulating	Wide-Open		Regulating	Wide-Open	Regulating	Wide-Open					
1 (25)	576	607	16.7	17.6	34.5	529	557	15.6	16.4	34.0	0.80	0.753	0.10	0.89
2 (50)	1970	2080	54.7	57.8	36.0	1830	1930	52.3	55.1	35.0		0.820	0.07	
3 (80)	3760	3960	107	113	35.0	3630	3830	106	110	34.2		0.775	0.05	
4 (100)	6280	6610	180	190	34.8	6020	6340	171	180	35.2		0.766	0.04	
6 (150)	9450	9950	295	310	32.0	9240	9730	291	306	31.7		0.648	0.03	
8 x 6 (200 x 150)	10,660	11,220	305	321	35.0	10,020	10,550	286	301	35.0		0.775		
12 x 6 (300 x 150)	11,050	11,630	316	332		10,380	10,930	297	312					



B1113_1_B

ACTUATOR DIMENSIONS					
Type and Actuator Size	Dimensions, Inches (mm)				
	C (Diameter)	E	H	M	
				With Pilot Spring Case Vent	Without Pilot Spring Case Vent
1098 - 30	11.38 (289)	5.69 (145)	7.88 (200)	9.50 (241)	9.31 (236)
1098 - 40	13.12 (333)	5.75 (146)			
1098 - 70	21.12 (536)	7.44 (189)	14.19 (360)	15.81 (402)	15.62 (397)
1098H - 30	11.38 (289)	6.06 (154)	7.88 (200)	9.50 (241)	9.31 (236)

MAIN VALVE DIMENSIONS										
Body Size, NPS (DN)	Dimensions, Inches (mm)									
	A				D	G	R	Z		AR
	NPT Cast Iron, CL600 RF, BWE or NPT Steel and Stainless Steel	CL125 FF Cast Iron or CL150 RF Steel and Stainless Steel	CL250 RF Cast Iron or CL300 RF Steel and Stainless Steel	PN 16/25/40 Steel and Stainless Steel				Cast Iron	Steel and Stainless Steel	
1 (25)	8.25 (210)	7.25 (184)	7.75 (197)	7.62 (194)	3.88 (98,6)	8.62 (219)	4.06 (103)	12.00 (305)	13.75 (349)	3.00 (76,2)
2 (50)	11.25 (286)	10.0 (254)	10.50 (267)	10.19 (259)	4.56 (116)	9.12 (232)		13.31 (338)	15.06 (383)	3.12 (79,2)
3 (80)	13.25 (337)	11.75 (298)	12.50 (317)	11.81 (300)	5.31 (135)	11.31 (287)	5.06 (129)	16.50 (419)	18.25 (464)	3.88 (98,6)
4 (100)	15.50 (394)	13.88 (353)	14.50 (368)	13.56 (344)	6.56 (167)	12.69 (322)		19.12 (486)	21.12 (536)	5.12 (130)
6 (150)	20.0 (508)	17.75 (451)	18.62 (473)	17.48 (444)	8.06 (205)	13.62 (346)	8.00 (203)	20.25 (514)	23.25 (591)	6.62 (168)
8 x 6 (200 x 150)	24.0 (610)	21.4 (544)	22.4 (569)	----	9.76 (248)	15.02 (382)				
12 x 6 (300 x 150)	32.3 (820)	29.0 (737)	30.5 (775)		12.56 (319)	17.72 (450)				

Figure 9. Type 1098-EGR Dimensions

Ordering Guide

Main Valve Body Size (Select One)

- ☐ NPS 1 (DN 25)***
- ☐ NPS 2 (DN 50)***
- ☐ NPS 3 (DN 80)***
- ☐ NPS 4 (DN 100)***
- ☐ NPS 6 (DN 150)***
- ☐ NPS 8 x 6 (DN 200 x 150)
(not available in cast iron)***
- ☐ NPS 12 x 6 (DN 300 x 150)
(not available in cast iron)***

Main Valve Body Material and End Connection Style (Select One)

Cast Iron Body

- ☐ 1 and 2 NPT only***
- ☐ CL125 FF***
- ☐ CL250 RF***

WCC Steel Body

- ☐ 1 or 2 NPT only***
- ☐ CL150 RF***
- ☐ CL300 RF***
- ☐ CL600 RF*
- ☐ SWE [1 or 2
(DN 25 or 50) only]**
- ☐ BWE**
- ☐ PN 16/25/40*

CF8M Stainless Steel

- ☐ 1 or 2 NPT only***
- ☐ CL150 RF***
- ☐ CL300 RF***
- ☐ CL600 RF*
- ☐ SWE [1 or 2
(DN 25 or 50) only]**
- ☐ BWE**
- ☐ PN 16/25/40*

Cage and Cage Material (Select One)

- ☐ CF8M stainless steel linear cage***
- ☐ 416 Stainless steel Whisper Trim® cage***
- ☐ 316 Stainless steel Whisper Trim cage**
- ☐ ENC coated cast iron quick opening cage***

Main Valve Spring (Select One)

Maximum Differential and Spring Color

- ☐ 20 psi (1,4 bar), Yellow**
- ☐ 60 psi (4,1 bar), Green***
- ☐ 125 psi (8,6 bar), Blue***
- ☐ 400 psi (27,6 bar), Red***

Spring Material (Select One)

- ☐ Steel
- ☐ Inconel®

Actuator Size (Select One)

- ☐ Type 1098 Size 70, maximum set pressure
50 psig (3,4 bar)
- ☐ Type 1098 Size 40, maximum set pressure
75 psig (5,2 bar)
- ☐ Type 1098 Size 30, maximum set pressure
100 (6,9 bar)
- ☐ Type 1098H Size 30H, maximum set pressure
300 psig (20,7 bar)

Actuator and Bonnet Material (Select One)

- ☐ Steel casing with steel bonnet***
- ☐ Stainless steel casing with stainless steel bonnet**

Body Flange Material (Select One)

- ☐ ENC Coated cast iron***
- ☐ ENC Coated steel***
- ☐ ENC Coated CF8M stainless steel**

Plug and Seat Ring (Select One)

- ☐ 416 Stainless steel***
- ☐ 316 Stainless steel**

Diaphragm, O-rings, and Other Elastomers (Select One)

- ☐ Nitrile (NBR)***
- ☐ Fluorocarbon (FKM)***
- ☐ Ethylenepropylene (EPDM)**

Outlet Pressure Range (Select One)

Type 6351 Pilot

- ☐ 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)**

Type 6352 Pilot

- ☐ 14-inches w.c. to 2 psig (35 mbar to 0,14 bar)***
- ☐ 2 to 10 psig (0,14 to 0,69 bar)**

Type 6353 Pilot

- ☐ 3 to 40 psig (0,21 to 2,8 bar)**
- ☐ 35 to 125 psig (2,4 to 8,6 bar)**

Type 6354L, 6354M, or 6354H Pilot

Specify Type _____

- ☐ 85 to 200 psig (5,9 to 13,8 bar)**
- ☐ 175 to 220 psig (12,1 to 15,2 bar)**
- ☐ 200 to 300 psig (13,8 to 20,7 bar)**

- continued -

Ordering Guide (Continued)

Outlet Pressure Range (Select One) (Continued)

Type 61L, 61LD, or 61LE Pilot

Specify Type _____

- ☐ 0.25 to 2 psig (0,02 to 0,14 bar)**
- ☐ 1 to 5 psig (0,07 to 0,34 bar)**
- ☐ 2 to 10 psig (0,14 to 0,69 bar)**
- ☐ 5 to 15 psig (0,34 to 1,0 bar)**
- ☐ 10 to 20 psig (0,69 to 1,4 bar)**

Type 61H Pilot

- ☐ 10 to 65 psig (0,69 to 4,5 bar)**

Type 61HP Pilot

- ☐ 15 to 45 psig (1,0 to 3,1 bar)**
- ☐ 35 to 100 psig (2,4 to 6,9 bar)**
- ☐ 100 to 300 psig (6,9 to 20,7 bar)**

Type Y600AM

- ☐ 4 to 8-inches w.c. (10 to 20 mbar)
- ☐ 7 to 16-inches w.c. (17 to 40 mbar)
- ☐ 15-inches w.c. to 1.2 psig (37 mbar to 0,08 bar)
- ☐ 1.2 to 2.5 psig (0,08 to 0,17 bar)
- ☐ 2.5 to 4.5 psig (0,17 to 0,31 bar)
- ☐ 4.5 to 7 psig (0,31 to 0,48 bar)

Liquid Service

- ☐ Low gain restriction

6350 Series Pilot Construction (Select One)

- ☐ Aluminum***
- ☐ Stainless steel**

Tubing and Fittings (Select One)

- ☐ Stainless steel tubing and steel plated fittings**
- ☐ Stainless steel tubing and fittings**

Main Valve Replacement Parts Kit (Optional)

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

Actuator Replacement Parts Kit (Optional)

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

Pilot Replacement Parts Kit (Optional)

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

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

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):
