July 2009

Type 1805P Pilot-Operated Relief Valve

W6913

Figure 1. *Type 1805P Relief Valve*

Introduction

The Type 1805P is an accurate, economical, pilot-operated relief valve consisting of a Type 1805 main valve and a Type 6358B pilot. It is available in NPS 2 (DN 50) body size and is capable of relief pressure settings from 10 to 100 psig (0,69 to 6,9 bar) in three ranges. The relief pressure setting can be adjusted by turning the pilot spring adjustment screw.

Relief pressure build-up of the Type 1805P in the wide-open position is less than 2.5 psig (0,17 bar). This is in concurrence with federal safety standards for systems having normal operating pressures within the Type 1805P relief set pressure range, which makes the relief valve suitable for use in many natural gas transmission and distribution systems. This relief valve is also suited for many other applications requiring high capacity with low build-up. Fisher® relief valves cannot be used as ASME safety relief valves.

Features

- **Accurate**—Pilot-operated style relief valve and the light-rate main valve spring enable the main valve to travel wide-open with less than 2.5 psig (0,17 bar) relief pressure build-up.
- **Economical**—Simple, compact design with accuracy and capacity of higher priced relief valves.

D100161X012

Specifications

Body Size and End Connection Style
NPS 2, NPT

Maximum Relief (Inlet) Pressure[1, 2]
50 psi (3,45 bar) over relief pressure setting or 150 psig (10,3 bar), whichever is lower

Set Pressure Ranges[2]
See Table 1

Flow Capacities and Pilot Information[2]
See Table 2

Wide-Open Flow Coefficients
C_g: 900 (without outlet piping), **C_v:** 23.7, **C_1:** 38

IEC Sizing Coefficients
X_T: 0.91
F_D: 0.44
F_L: 0.89

Pressure Registration
External

Pilot Control Line and Vent Connections
1/4 NPT

Maximum Temperature Capabilities[2]
Nitrile (NBR): -20° to 180°F (-29° to 82°C)
Fluorocarbon (FKM): 0° to 300°F (-18° to 149°C)

Approximate Weight
13 pounds (6 kg)

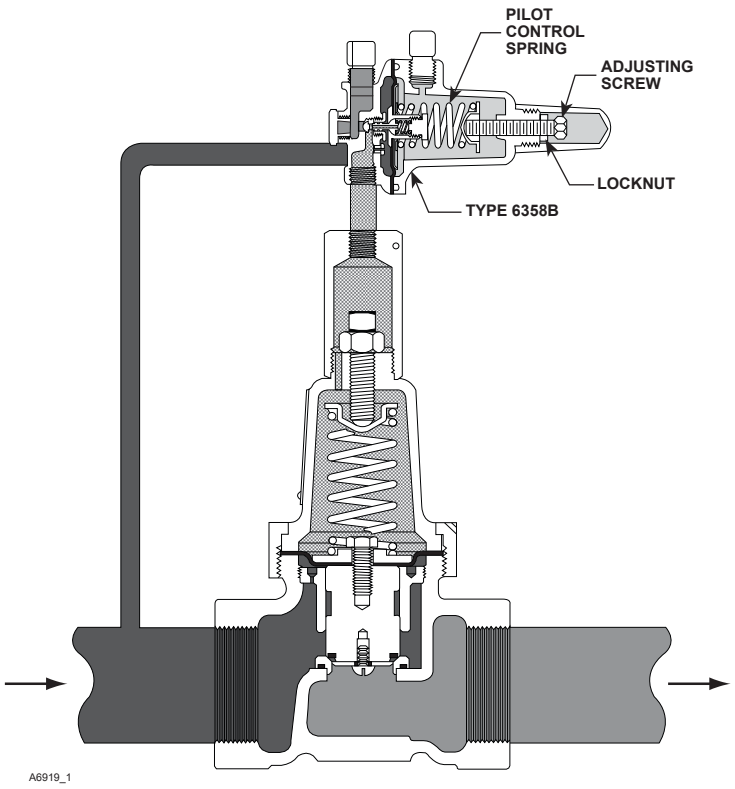
Construction Materials

1805 Series Main Valve
Body and Spring Case: Cast iron
Diaphragm and O-Rings: Nitrile (NBR) **(standard)** or Fluorocarbon (FKM) (high temperature)
Valve Guide Orifice and O-Ring Holder: Aluminum
Spring: Plated steel
Diaphragm Plate: Brass
Spring Seat and Cap Screw: Steel

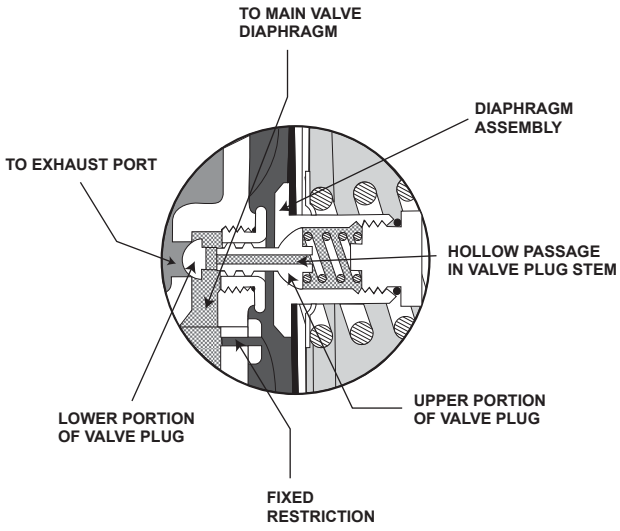
Type 6358B Pilot
Body and Spring Case: Aluminum
Valve Plug and Stem: Nitrile (NBR) **(standard)** or Fluorocarbon (FKM) (high temperature) plug and Stainless steel stem
Diaphragm: Nitrile (NBR) **(standard)** or Fluorocarbon (FKM) (high temperature)
Stem Guide: Stainless steel
O-Rings and Gaskets: Nitrile (NBR) **(standard)** or Fluorocarbon (FKM) (high temperature)
Valve Spring: Stainless steel
Pilot Spring: Steel
Body Plug: Stainless steel

1. Relief pressure plus maximum allowable build-up over setting.
2. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for this relief valve should not be exceeded.

- **High Flow Capacity**—Since spring effect is minimized by the use of a light-rate main valve spring, the main valve opens farther for a given pressure build-up than it would with a higher rate spring.
- **Fast Reseat After Operation**—The fixed restriction in the pilot allows the valve plug to quickly reseat after operation.
- **Low Build-ups to Reach Wide-Open**—Very little build-up over relief set pressure required for main valve to reach wide-open flow for maximum relief capacity.
- **Rugged Construction**—The Type 1805P relief valves are built to last with minimal maintenance requirements.
- **Powder Paint Coating**—Fisher products are powder paint coated, offering impact, abrasion, and corrosion resistance.
- **Full Usable Capacity**—Fisher regulators are laboratory tested. 100 percent of the published capacities can be used with confidence.
- **Tight Shutoff**—Provided by the elastomer seats (Class VI shutoff per ANSI/FCI 70-3-2004).



TYPE 1805P RELIEF VALVE



EXPANDED VIEW OF THE TYPE 6358B RELIEF PILOT DIAPHRAGM ASSEMBLY AND VALVE PLUG

- INLET PRESSURE
- OUTLET PRESSURE
- ATMOSPHERIC PRESSURE
- LOADING PRESSURE

Figure 2. *Operational Schematic*

Table 1. *Type 6358B Set Pressure Ranges*

RELIEF SET PRESSURE, PSIG (bar)	COLOR	SPRING WIRE DIAMETER, INCHES (mm)	SPRING FREE LENGTH, INCHES (mm)	PART NUMBER
10 to 18 (0,69 to 1,2)	Green	0.120 (3,05)	2.12 (53,8)	1B986027212
18 to 30 (1,2 to 2,1)	Unpainted	0.142 (3,61)	2.12 (53,8)	1B788327022
30 to 100 (2,1 to 6,9)	Red	0.192 (4,88)	2.19 (55,6)	1K748527202

Table 2. *Main Valve Capacities and Pilot Information*

MAIN VALVE SPRING, PART NUMBER, AND COLOR, PSIG (bar)	SET PRESSURE RANGE, PSIG (bar)	SET PRESSURE[1], PSIG (bar)	BUILD-UP OVER SET PRESSURE TO BEGIN OPENING MAIN VALVE[2], PSIG (bar)	BUILD-UP OVER SET PRESSURE TO FULLY OPEN MAIN VALVE[3], PSIG (bar)	PRESSUREDROP BELOW SET PRESSURE TO RESEAT PILOT, PSIG (bar)	CAPACITIES OF 0.6 SPECIFIC GRAVITY NATURAL GAS[4], SCFH (Nm³/h)
For set pressures up to 30 psig (2,1 bar) 1F826927052 Pink	10 to 18 (0,69 to 1,2)	10 (0,69) 15 (1,0) 18 (1,2)	0.8 (0,06)	1.1 (0,08)	1.0 (0,07)	26 000 (697) 32 000 (858) 36 000 (965)
	18 to 30 (1,2 to 2,1)	18 (1,2) 25 (1,7) 30 (2,1)	0.9 (0,06)	1.3 (0,09)		37 000 (992) 45 000 (1206) 53 000 (1420)
For set pressures over 30 psig (2,1 bar) 1D751527022 Unpainted	30 to 100 (2,1 to 6,9)	30 (2,1) 40 (2,8) 50 (3,5) 60 (4,1)	1.5 (0,10)	2.2 (0,15)		54 000 (1447) 66 000 (1769) 78 000 (2090) 89 000 (2385)
		70 (4,8) 80 (5,5) 90 (6,2) 100 (6,9)	1.7 (0,12) 1.7 (0,12) 1.7 (0,12) 2.0 (0,14)	2.5 (0,17)		101 000 (2707) 113 000 (3028) 124 000 (3323) 136 000 (3645)

1. Set pressure is defined as the pressure at which the pilot exhaust starts to bubble (discharge).
2. Crack pressure is the inlet pressure at which the main valve starts audible flow.
3. Inlet pressure build-up over the set pressure to achieve wide-open capacity.
4. Capacities with inlet piping equal to body size and without outlet piping.

Principle of Operation

A pressure relief valve is a throttling pressure control device that opens and closes to ensure the downstream pressure does not rise above a predetermined pressure.

Inlet pressure registers on the underside of the main valve diaphragm and underside of the pilot diaphragm. As long as the inlet pressure is below the set pressure, the pilot control spring keeps the pilot's valve plug closed. Inlet pressure passes through the pilot's restriction and registers as loading pressure on top of the main valve diaphragm, keeping it closed.

When inlet pressure rises above the set pressure, the pressure on the pilot diaphragm overcomes the pilot control spring and opens the pilot valve plug. The pilot exhausts the loading pressure from the top of the main valve diaphragm and plug assembly. While inlet pressure is above the set pressure, the pilot continuously exhausts gas. Inlet pressure unbalance overcomes the main spring force and opens the main valve, reducing the inlet pressure to set pressure.

As the inlet pressure drops below the set pressure, the pilot control spring closes the pilot valve plug and the exhaust stops. This causes the inlet pressure to build in the main valve diaphragm casing, allowing the main valve spring to close the main valve.

Installation

Type 6358B Pilot

A Type 6358B pilot is typically used with one of several different main valves in a pressure relief application. This pilot is usually used in gas service and has an easily-installed valve plug that can be removed without removing the valve plug stem guide.

This relief valve may be installed in any position but must be oriented so that gas discharge from the main valve outlet and pilot vent does not create a fire hazard or explosion hazard. The main valve outlet, pilot vent, and pilot spring case vent must be protected against the entrance of water or other foreign material that may plug the openings or affect relief valve operation. Remote vent piping and rain cap may be required.

Flow through the main valve must be as indicated by the flow direction arrow on the main valve. An upstream control line is required for operation of this relief valve. For dimensional information see Figure 3.

Capacity Information

Capacities at selected pressures and outlet pressure flows are given in SCFH (at 60°F and 14.7 psia) and Nm^3/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, 0.625 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 approximate relief capacities at set pressures or build-ups not given in Table 2 use one of the following formulas and, if necessary, convert according to the factors in the paragraph above. Then, if capacity is desired in normal cubic meters per hour at 0°C and 1,01325 bar, multiply SCFH by 0.0268.

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

$$Q = (P_1 + \text{Build-up})_{abs}\, C_g \sqrt{\frac{520}{GT}}$$

2. For pressure drops lower than critical (absolute outlet pressure greater than the one-half of absolute inlet pressure), use the following formula:

$$Q = \sqrt{\frac{520}{GT}}\; C_g(P_1 = \text{Build-up})_{abs} \text{SIN}\left(\frac{3417}{G_1}\sqrt{\frac{\triangle P}{P^1}}\right) \text{Deg.}$$

where,

Q = flow capacity in SCFH

G = specific gravity of gas

T = absolute temperature of gas at inlet in degrees Rankine

C_g = gas sizing coefficient from Specifications section

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

C_1 = C_g/C_v from Specifications section

$\triangle P$ = pressure drop across the valve in psig

Ordering Information

Refer to the Specifications on page 2. Carefully review each specification; then complete the Ordering Guide. If not otherwise specified, the pilot is factory set in the middle of the set pressure range.

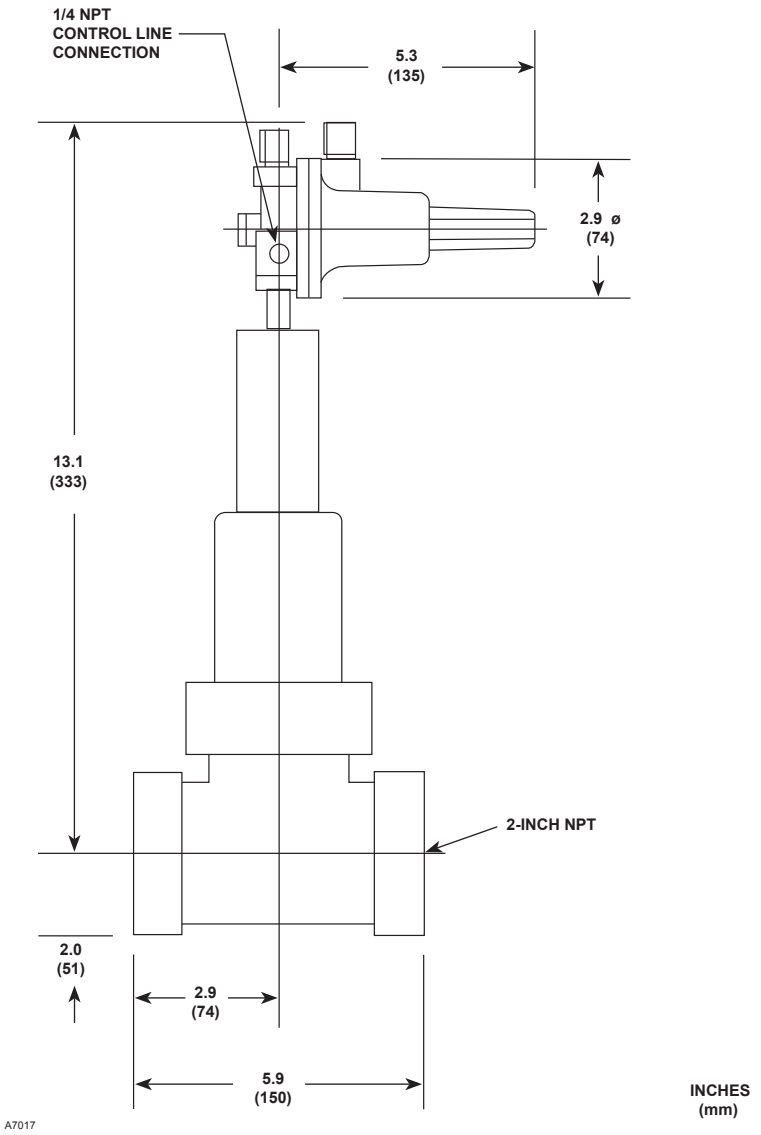


Figure 3. *Type 1805P-6358B Dimensions*

Ordering Guide

Main Valve Diaphragm Material (Select One)
- ☐ Nitrile (NBR) (**standard**)***
- ☐ Fluorocarbon (FKM)*

Main Valve O-Ring Material (Select One)
- ☐ Nitrile (NBR) (**standard**)***
- ☐ Fluorocarbon (FKM)*

Relief Set Pressure Range (Select One)
- ☐ 10 to 18 psig (0,69 to 1,2 bar), Green***
- ☐ 18 to 30 psig (1,24 to 2,1 bar), Unpainted***
- ☐ 30 to 100 psig (2,1 to 6,9 bar), Red***

Pilot Diaphragm Material (Select One)
- ☐ Nitrile (NBR) (**standard**)***
- ☐ Fluorocarbon (FKM)*

Pilot Valve Plug Material (Select One)
- ☐ Nitrile (NBR) (**standard**)***
- ☐ Fluorocarbon (FKM)*

Pilot Gasket Material (Select One)
- ☐ Nitrile (NBR) (**standard**)***
- ☐ Fluorocarbon (FKM)*

Tubing and Fittings (Select One)
- ☐ Stainless steel tubing and steel plated fittings***
- ☐ Stainless steel tubing and stainless steel fittings***

Main Valve Replacement Parts Kit (Optional)
- ☐ Yes, send one parts kit to match this order.

Pilot Replacement Parts Kit (Optional)
- ☐ Yes, send one 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 _____

Gas Type and Specific Gravity _____

Gas Temperature _____

Upstream Regulator Specifications:

Brand of upstream regulator? _____

Orifice size of the upstream regulator? _____

Wide-open coefficient of the upstream regulator? _____

Maximum Inlet Pressure (P_{1max}) _____

Downstream Pressure Setting(s) (P_2) _____

Maximum Flow (Q_{max}) _____

Relief Valve Specifications:

Relief Valve Setpoint _____

Accuracy Requirements? _____

Need for Extremely Fast Response? _____

Other Requirements: _____

_____

Industrial Regulators

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Regulator Technologies, Inc.

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