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WARNING

Conoflow's products are designed and manufactured using materials and workmanship required to meet all applicable standards. The use of these products should be confined to services specified and/or recommended in the Conoflow catalogs, instructions, or by Conoflow application engineers.

To avoid personal injury or equipment damage resulting from misuse or misapplication of a product, it is necessary to select the proper materials of construction and pressure-temperature ratings which are consistent with performance requirements.

INSTRUCTION AND MAINTENANCE MANUAL HP400 HIGH PRESSURE REGULATOR

CAUTION: These instructions should be read and understood prior to installation, use, or maintenance.

GENERAL PRODUCT OVERVIEW

The HP400 Regulator is a hand operated, self-contained, spring loaded pressure reducing regulator. This unit offers the safety and reliable service of a piston sensed regulator.

The model HP400 has non-venting piston sensor and a captured bonnet feature. An adjustable stop to limit the maximum output pressure is standard.

MATERIALS OF CONSTRUCTIONS

The HP400 will operate with any fluid (liquid or gas) compatible with the materials of construction. To identify the materials of construction refer to the Control Engineering Data contained on page 3.

Body	Brass
Bonnet	Brass
Main Valve Seat	Kel-F (Vespel Optional)
Sensor and Trim	300 Series Stainless Steel
Seals	Teflon / Viton (Buna-N Optional)

REGULATOR CLEANING

The HP400 Series High Pressure Regulators are cleaned to ITT Conoflow Specification ES8A 01 294.

OXYGEN SERVICE

Specification of materials in regulators used for oxygen service is the USER'S RESPONSIBILITY. Cleaning for oxygen service (per ES8A 01 297) to 3500 PSIG (24.20 MPa) is supplied by ITT Conoflow at no additional cost. For special cleaning requirements, the customer must supply specifications for the desired level of cleaning. Cost will be advised prior to performing the cleaning operation.

CAUTION: Maximum Supply Pressure 3500 PSI (24.20 MPa) Maximum supply pressure can be derated based on connection and internal material selections. See notes in CED code (page 3).

An internal filter screen is provided in the inlet ("IN") port only to stop random contamination resulting from installation. An auxiliary filter is recommended for all but the cleanest fluid. Gaseous fluid must be free of excessive moisture to prevent internal icing or condensation during operation.

OUTLET PRESSURE RANGES

OPTION CODE	RANGE
"J"	20-2500 PSIG (0.14 -17.25 MPa)

PORTING CONFIGURATIONS

There are four (4) 1/4" NPTF connections on the HP400. The supply connection port is labeled "IN" and the supply gauge port is labeled "HI." The outlet port is labeled "OUT" and the outlet gauge port is labeled "LOW." Care should be exercised when installing the high pressure line to assure it is connected to the inlet ("IN") port, otherwise the regulator will not function properly.

Teflon thread tape is the preferred thread sealant when the regulator is installed.

INSTALLATION

The HP400 can be line or panel mounted. For line mounted applications refer to porting configurations for proper orientation of ports.

Panel Mounting:

1. Remove handwheel, knob, or "T" bar handle and insert the regulator from the rear of the panel.
2. Projection of regulator through the panel may be controlled by adjustment of panel mounting nuts
3. Replace the handwheel, knob, or "T" handle.
4. Connect inlet, outlet and gauge ports as applicable.

PRINCIPLE OF OPERATION

Turning the control knob clockwise will increase the force on the range spring and, in turn, the outlet set pressure. Conversely, turning the control knob counterclockwise will decrease the force on the range spring and decrease the outlet

set pressure. In equilibrium, the force exerted by the range spring is balanced by the outlet pressure.

An unbalance between the outlet pressure and the set pressure causes a corresponding reaction on the piston sensor and valve. If the outlet pressure rises above the set pressure, the piston sensor will lift allowing the valve to seat. If the outlet pressure falls below the set pressure, the range spring will push the piston down and unseat the valve. At equilibrium, the valve plug assumes a position which supplies the required flow while maintaining the outlet pressure at the set pressure. (See Figure 1 on page 4 for labeled section view)

Setting Limit on Maximum Outlet (Control) Pressure

The handwheel on the HP400 Regulator can be adjusted to limit the maximum outlet pressure attainable to any value up to 100% of the rated outlet pressure range. To set this limit, connect the regulator to a pressure source and a gauge to indicate the regulator outlet pressure. Apply an inlet pressure to the regulator equal to the maximum inlet pressure expected in service. Remove the hole plug from the handwheel and loosen the jam nut using a 9/16" socket. Using a screwdriver, turn the adjusting screw clockwise until the indicated outlet pressure is at the pressure at which the limit is desired. Spin the handwheel clockwise until it stops against the top of the bonnet. Then turn the handwheel back about 1/8 of a turn counterclockwise and hold it in this position. While doing so, tighten the jam nut against the handwheel with 70 – 120 in.lbs of torque. Turn the handwheel counterclockwise until it is no longer seated against the top of the bonnet. Check by adjusting the handwheel clockwise to insure that it stops against the bonnet when the output pressure reaches the desired maximum pressure.

SCHEDULED MAINTENANCE

All regulators require scheduled maintenance to remove deposits left by the media and to replace parts worn or damaged as a result of use. Annual maintenance is recommended when the regulator is used under normal conditions. More frequent maintenance may be required due to the condition, cleanliness and/or corrosiveness of the media.

TOOLS REQUIRED

7/16" Wide blade screwdriver bit having 1/8" wide x 3/8" deep notch (seat gland)
9/16" Socket (jam nut within standard hand knob)
9/16" Open end wrench (jam nut on wrench knob or "T" handle)
1-7/8" Socket or wrench (bonnet)
Internal snap ring pliers (retaining rind in sensor bore)
Pliers (to remove sensor from bore)

Other tools and maintenance aids include a vise, tweezers, clean lint free cloth, swabs, and a torque wrench.

CAUTION: MAINTENANCE

It is recommended that maintenance be performed by a person experienced in the operation and repair of high pressure regulators.

Maintenance of this unit is best performed by gripping a protruding end of a pipe fitting installed into the regulator body.

WARNING: Bleed System Pressure Prior to Removing Regulator for Servicing.

MAINTENANCE PROCEDURE

1. Adjust the handwheel to the full counterclockwise position until the handwheel, hole plug, jam nut, and adjusting screw are fully disengaged.
2. Using a 1-7/8" wrench, loosen and remove the bonnet.
3. Remove the spring button, range spring, and the range spring backup plate.
4. With internal snap ring pliers, remove the retaining ring.
5. Using pliers, grip and remove the piston sensor for service to the backup ring and O-ring.
6. The main valve assembly can be disassembled by using a modified screwdriver bit to turn the seat gland counterclockwise until it is free from the regulator body. The main valve plug, main valve seat, and the plug spring can be lifted from the body.
7. Remove the main valve seat from the seat gland.

(See Figure 2 on page 4 for exploded view)

THE REGULATOR IS RE-ASSEMBLED IN THE REVERSE ORDER OF DISASSEMBLY, OBSERVING THE FOLLOWING PRECAUTIONS:

1. Inspect all component parts and replace those worn or damaged with ITT Conoflow replacement parts.
2. All component parts should be cleaned to the cleanliness level required for safe operation with the media used. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Place the plug spring in the body bore (See Figure 3 for section view) Place the main valve plug into the body. Lubricate the threads of the seat gland with Krytox grease and press the main valve seat into the seat gland. For the standard Kel-F (PCTFE) seat, install the seat into the seat gland with the identification face groove facing out of the seat gland (ignore this orientation requirement if the valve seat is Vespel).
4. Carefully guide the seat gland and the main valve seat assembly into the body, as to not scratch or score the piston sensor bore. Once in place screw the seat gland into the body. Make sure the seat is correctly positioned in the seat gland before tightening the seat gland.
5. Lubricate the O-ring(s) and the backup ring with Krytox. Lubricate the groove on the piston sensor with Krytox. Install the O-ring in the groove. Install the backup ring in the groove on the side which is closest to the small diameter end of the sensor. If the standard scarf cut Teflon backup ring is used, be careful not to bend the backup ring too much. If an optional Buna-N backup ring is used, install the backup ring with the curved side towards the O-ring.
6. Lightly lubricate the piston sensor bore of the body with Krytox and slide the piston sensor into the body with the small

diameter facing out of the bore. Move the piston sensor in the bore and make sure the piston sensor is free to move with only light resistance and the main valve plug and the plug spring will push the piston sensor back up.

7. Install the retaining ring in the groove in the piston sensor bore using internal snap ring pliers.

8 Place the range spring backup plate, the range spring, and the spring button on the piston sensor. Lubricate the center of the spring button and the large internal threads and chamfer of the bonnet with Krytox.

9. Screw the bonnet onto the body and tighten it to 50 ft.lbs.

10. Lubricate and install the handwheel assembly onto the bonnet. The handwheel assembly consists of the handwheel, the hole plug, the adjusting screw, and the jam nut.

11. Install a filter screen in the inlet port of the body.

Prior to re-installation, the regulator should be connected to a pressure source with a media compatible with use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

Regulator Model Breakdown (CED Code)

Control Engineering Data is intended to provide a single source from which one can determine, in detail, the full scope of the product line. In addition to the materials of construction, diaphragm and elastomer selection, it also provides all necessary data regarding adjustment option and range selections. Control Engineering Data also provides a means of communicating by way of a code number which is fully descriptive in product selection. All catalog numbers received must contain fifteen (15) characters.

1 through 5	HP400	Pressure Reducing Regulator, Piston Type (Low Flow)
6	B	<i>Body / Bonnet / Trim</i> Brass / Brass / 300 Stainless Steel
7 through 8	11	<i>Main Valve Seat(s) / Backup Rings / O-Ring(s)</i> Kel-F / Teflon / Buna-N
	12	Vespel / Teflon / Buna-N (See Note 1)
	13	Kel-F / Buna-N / Buna-N
	14	Vespel / Buna-N / Buna-N (See Note 1)
	17	Vespel / Teflon / Viton (See Note 1)
	18	Kel-F / Teflon / Viton (Standard)
9	R	Non-Relieving, Captured Bonnet
10 through 11	81	1/4" NPT Connections (See Note 2)
12	P	Panel Mounting (2-nut) (Optional)
	S	Plain bonnet (No threads) (Standard)
13	A	Regulator is cleaned to ITT Conoflow Specification ES8A 01 294
	B	Oxygen Cleaning: Specification of materials in regulators used for oxygen service is the user's responsibility. Cleaning for oxygen service to 3500 PSIG (24.20 MPa) is supplied by ITT Conoflow at no additional cost.
	C	Customer Specified Cleaning: Customer to specify the desired level of cleanliness. ITT Conoflow will advise cost prior to performing cleaning operation. Specification of materials is the USER'S RESPONSIBILITY.
14	B	Handwheel (Large)
	K	Wrench knob with locking device (Optional)
	T	"T" bar handle (Optional)
15	J	20-2500 PSI (0.14-17.25 MPa)

NOTES:

1. The use of the Vespel valve seat increases the inlet pressure rating to 6000 psig
2. Gauge port connections are 1/4" NPT.

CONNECTION IDENTIFICATION AND TYPICAL GEOMETRY

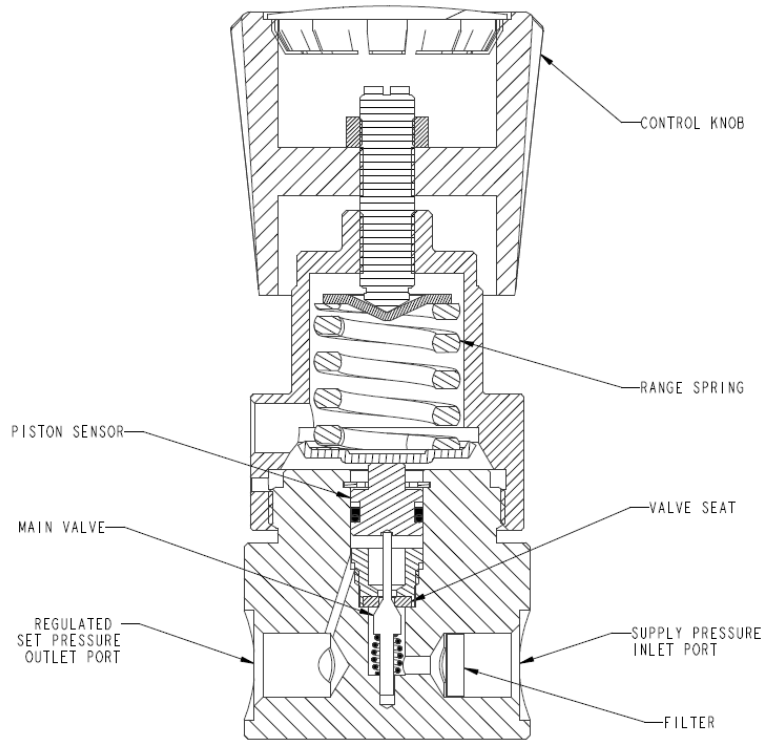


FIGURE 1: HP400 REGULATOR SECTIONED VIEW

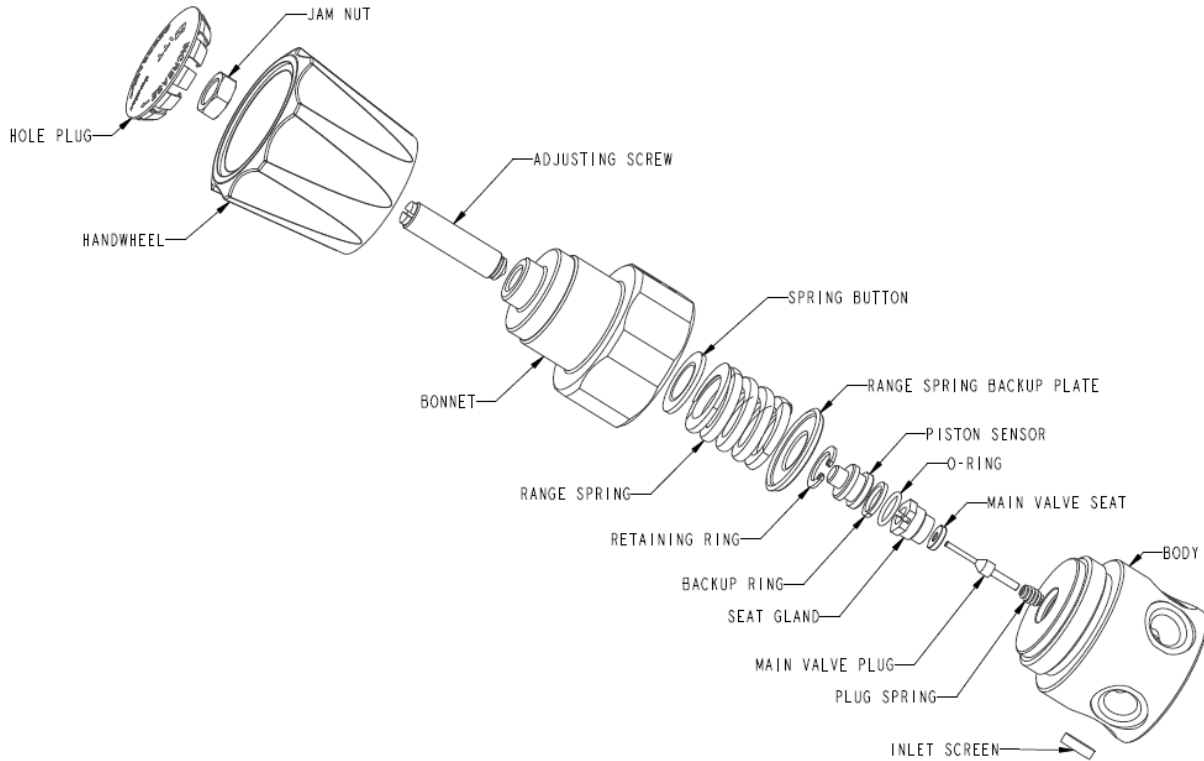
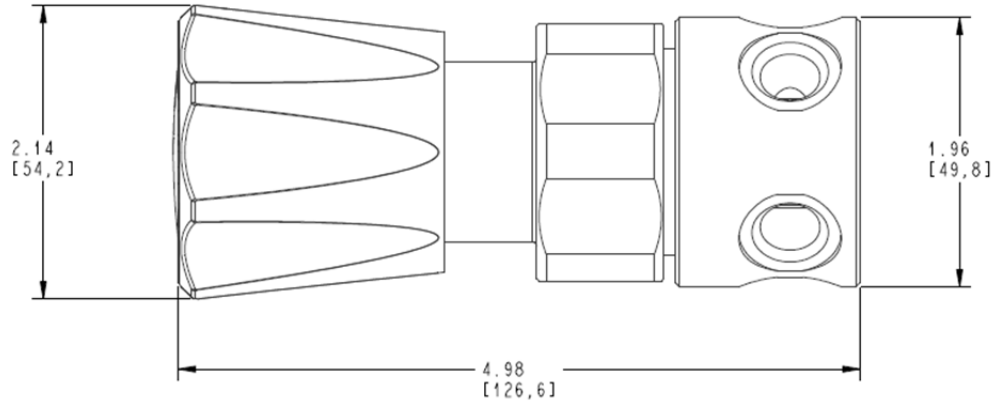
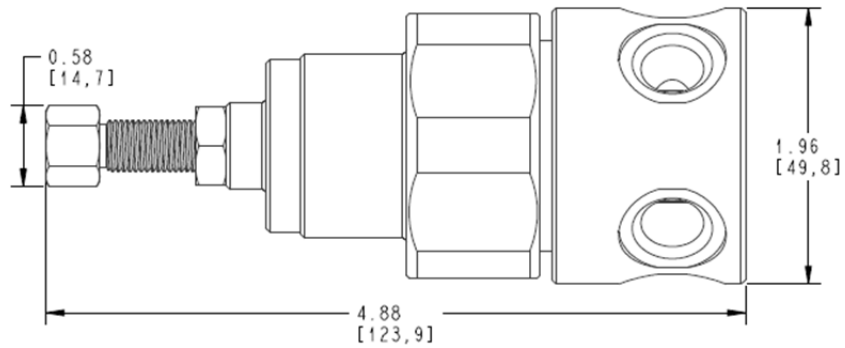


FIGURE 2: HP400 REGULATOR EXPLODED VIEW



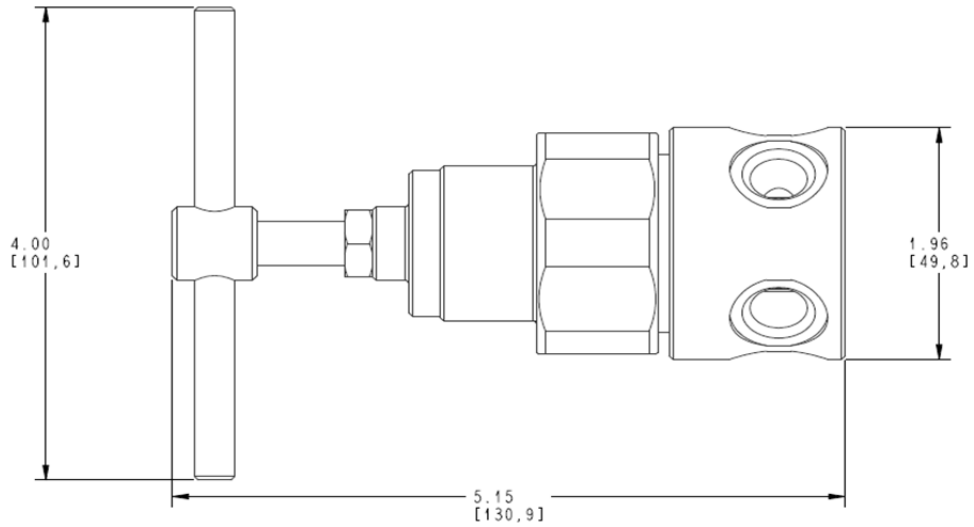
NOTE: OVERALL LENGTH DIMENSION WILL VARY WITH HAND KNOB ADJSUTMENT
 5.56 (141.2) MAXIMUM
 4.90 (124.4) MINIMUM

FIGURE 3: STANDARD HANDKNOB DIMENSIONAL DRAWING



NOTE: OVERALL LENGTH DIMENSION WILL VARY WITH WRENCH KNOB ADJUSTMENT
 5.18 (131.5) MAXIMUM
 4.46 (113.2) MINIMUM

FIGURE 4: OPTIONAL WRENCHKNOB DIMENSIONAL DRAWING



NOTE: OVERALL LENGTH DIMENSION WILL VARY WITH "T" BAR HANDLE ADJUSTMENT
 5.18 (121.5) MAXIMUM
 4.45 (113.2) MINIMUM

FIGURE 5: OPTIONAL "T" BAR HANDLE DIMENSIONAL DRAWING

TROUBLESHOOTING

When performing necessary corrective action in the following operations, refer to the **MAINTENANCE** section for the necessary procedure.

PROBLEM:

The regulated pressure continues to increase after lock-up and without change in the control mechanism position.

POSSIBLE CAUSE:

The main valve seat needs replacement; follow maintenance procedure and regulator assembly.

PROBLEM:

Continuous leakage through the bonnet with the outlet pressure on the regulator.

POSSIBLE CAUSE:

Sensor O-ring is worn, leaking, and needs to be replaced.

PROBLEM:

Regulated pressure drops off sharply when the flow is within the regulator's capabilities.

POSSIBLE CAUSE:

Clogged inlet screen. Remove the old filter with a sharp instrument and press in a new filter using the blunt end of an instrument.

PROBLEM:

Outlet Pressure will not adjust high enough.

POSSIBLE CAUSE:

Supply pressure is too low and needs to be increased.

Maximum pressure limit (handwheel) is improperly adjusted and needs to be re-adjusted, follow maintenance procedure "setting the maximum output limit."

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