

Conoflow

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WARNING

Conoflow's products are designed and manufactured using materials and workmanship required to meet all applicable industry 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 (i.e. exceeding pressure-temperature rating or using device for services other than those specified).

To avoid personal injury or equipment damage due to 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

HP600 HIGH PRESSURE REGULATOR HIGH PURITY MODEL

These instructions should be read carefully before installation or maintenance.

GENERAL

ITT Conoflow's HP600 Regulator is a handwheel adjustable, self-contained, spring loaded pressure reducing regulator. This diaphragm sensed, HIGH PURITY, model is designed to provide accurate regulation of corrosive medias and high purity gases.

The HP600 uses a 316 stainless steel valve plug connected to the 316 stainless steel diaphragm for positive shut off.

MATERIALS OF CONSTRUCTIONS

The HP600 will operate with any fluid (liquid or gas) which is compatible with the materials of construction. To identify the materials of construction, refer to Control Engineering Data contained on Page 3.

Body	316 / 316L Stainless Steel N.A.C.E.
Bonnet	Brass, Nickel Plated
Main Valve Seat	Kel-F (Teflon/Vespel-Optional)
Diaphragm and Trim	316 Stainless Steel (Elgiloy Optional)

REGULATOR CLEANING

The HP600 Series High Pressure Regulator is 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.

**CAUTION: Maximum Supply Pressure
 3000 PSIG (20.70 MPa)**

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

OUTLET PRESSURE RANGES

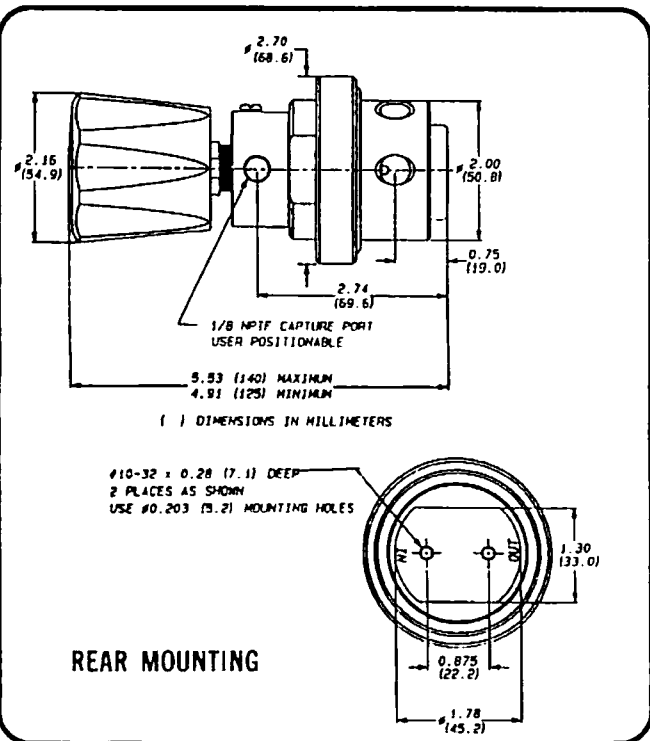
OPTION CODE	RANGE
"A"	0- 25 PSIG(.173 MPa)
"B"	0- 50 PSIG(.345 MPa)
"C"	0-100 PSIG(.690 MPa)
"D"	0-150 PSIG(1.04 MPa)

PORTING CONFIGURATIONS

There are four (4) 1/4" NPTF connections on the HP600. 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.

OTHER PORTING CONFIGURATIONS AND STYLES ARE AVAILABLE. REFER TO CONTROL ENGINEERING DATA ON PAGE 3 FOR ADDITIONAL INFORMATION.



INSTALLATION

The HP600 can be line or rear mounted. For line mounted applications refer to porting configurations for proper orientation of ports.

REAR MOUNTING

This style of mounting can be achieved by using the two (2) #10-32 screws.

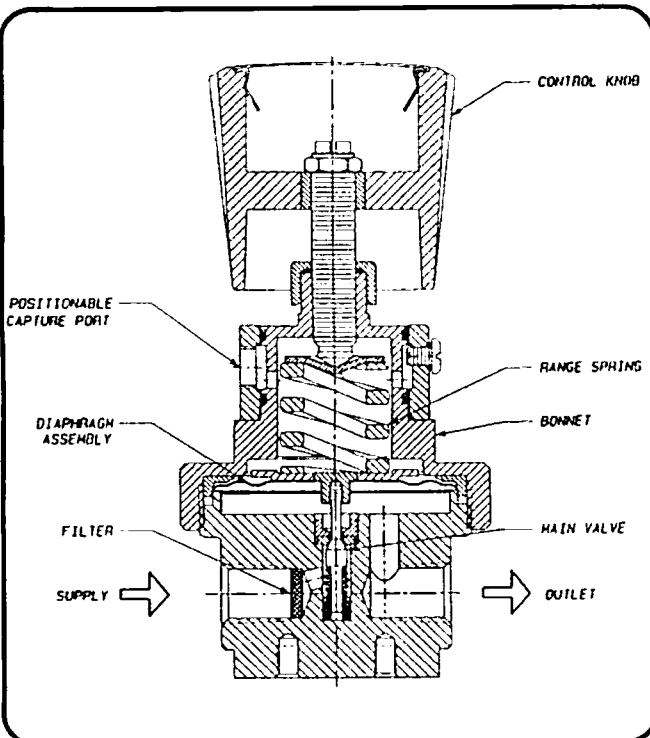
PRINCIPLE OF OPERATION

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

An unbalance between the force of the range spring and the outlet pressure acting upon the diaphragm will cause a corresponding reaction in the main valve. When the force of the range spring overcomes the force exerted on the diaphragm by the outlet pressure, the diaphragm will move down and open the main valve.

The difference between the supply pressure and the outlet pressure will allow flow when the main valve opens. When the outlet pressure reaches set pressure, the force exerted by the outlet pressure acting on the diaphragm will balance the force of the range spring at the set pressure position and permit the diaphragm to rise. As the diaphragm rises, the main valve moves toward the closed position. When the main valve closes, the flow path will close and flow will cease.

When the outlet pressure acting on the diaphragm exceeds the force on the range spring, the diaphragm will rise beyond the valve closed position. Since the diaphragm is positively linked (tied) to the diaphragm, the additional load of the outlet pressure acting on the diaphragm will pull the valve plug against the seat. With the valve positively closed, no flow can occur.



Control Engineering Data

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 materials of construction, diaphragm and elastomer selection, it also provides all necessary data, regarding adjustment options and range selections. Control Engineering Data also provides a means of communicating by way of a code number which is fully descriptive of the product selection. All Catalog Numbers as received must contain fifteen (15) characters.

1-5
Basic Model Number

HP600 = Pressure Reducing Regulator
High Purity Tied Diaphragm Type

6
Materials of Construction

Body/Bonnet/Trim
H = 316SS/Nickel Plated Brass/316 SS
3 = 316SS/Nickel Plated Brass/316SS-15Ra
(See Note 2)
R = N.A.C.E. 316SS/Nickel Plated Brass /316SS
(See Note 1)
L = 316L SS/Nickel Plated Brass/316 SS
(See Note 3).
5 = 316L SS/Nickel Plated Brass/316SS-15Ra
(See Notes 2 and 3).
J = N.A.C.E. 316L SS/Nickel Plated Brass
/316SS (See Notes 1 and 3).

NOTES:
1. National Association of Corrosion Engineers.
2. These options are offered when a 15 Ra microinch finish is required. This finish will apply to the wetted surfaces only. Refer to price sheets for list price adder.
3. 316L Stainless Steel is required for welded connections. Refer to position 10-11.

7-8
Elastomers & Diaphragm

Seals and Diaphragm	Main Valve Seat(s)	
11 = 316 Stainless Steel	Kel-F (Standard)	
12 = 316 Stainless Steel	Teflon - (See Note 1)	
13 = 316 Stainless Steel	Vespel	
14 = Elgiloy	} See Note 2	
15 = Elgiloy		Kel-F (Standard)
16 = Elgiloy		Teflon (See Note 1)
	Vespel	

NOTE:
1. Utilizing this option will reduce the maximum supply pressure rating to 400 PSIG(2.76 MPa)
2. Elgiloy diaphragm required for N.A.C.E.

9
Relieving Option

R = Non-relieving, captured bonnet
NOTE: 1. Captured bonnet vent is positionable.

10-11
Inlet/Outlet Gauge Ports

Inlet/Outlet Ports (No Gauge Ports)(60 degrees)
Gauge Port Configuration = Inlet(High) Outlet(Low)
- See Note 4.
NPT Connections Butt Welded Tubing Connections
61 = 1/4" 62 = 316L SS 1/4" x 4"
(Standard) Tubing welded per port
63 = 316L SS 1/4" x 4"
 Tubing welded per port
 15Ra micro finish
Field Welded Connections - See Note 1
64 = 1/4" Butt weld preparation
65 = 1/4" Socketweld preparation
High Purity Internal Connections - See Note 5
66 = 1/4" Vacuseal - Preparation
67 = 1/4" VCR - Preparation
68 = 1/4" Ultra Seal - Preparation
Butt Weld (Zero Clearance) - High Purity Connections
- See Note 2.
69 = 1/4" Vacuseal
6A = 1/4" VCR
6F = 1/4" Ultra Seal
Butt Weld 90 Degree Elbow - See Note 3
6H = 1/4" Butt Weld 90 Degree Elbow

NOTES:
1. Weld preparation to standard tubing tolerance
2. Fitting(s) supplied by ITT Conoflow.
3. Fittings are installed down away from control handle.
4. All gauge connections are 1/4" NPT.
5. Customer to supply fitting(s).

12
Mounting

R = Rear Mounting (Standard)

13
Cleaning

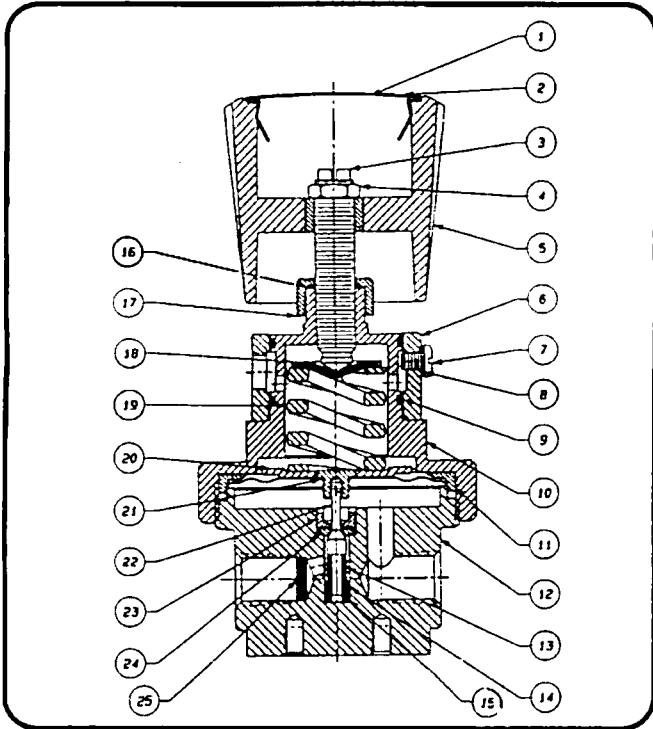
A = Regulator is cleaned to ITT Conoflow Specification ES8A 01 294.
B = Oxygen Cleaning
Specification of materials in regulators used for oxygen service is the user's responsibility. Cleaning for oxygen service (per ES8A 01 297) to 3500 PSIG (24.20 MPa) is supplied by ITT Conoflow at no additional cost.
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
Adjustment Selection

B = Handwheel
K = Wrench knob with locking device (Optional)
T = "T" bar handle (Optional)

15
Regulated Output Range

A = 0- 25 PSI (0-0.173 MPa)
B = 0- 50 PSI (0-0.345 MPa)
C = 0-100 PSI (0-0.690 MPa)
E = 0-250 PSI (0-1.73 MPa)



PRINCIPLE OF OPERATION

Setting limit on maximum outlet (control) pressure

The handwheel on the HP600 Regulator can be adjusted to limit the maximum outlet pressure attainable to any value between 50 and 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 hole plug (2) from handwheel (5) and loosen jamnut (4) using a 9/16" socket. Using a screwdriver, turn adjusting screw (3) clockwise until the indicated outlet pressure is 5 to 10% higher than the pressure at which the limit is desired. Spin handwheel (5) clockwise until it stops against top of packing nut (17). Then turn the handwheel back about 1/8 turn counterclockwise and hold it in this position with one hand. While doing so, tighten jamnut (4) against handwheel (5) with 70-120 in. lbs. torque. Turn handwheel counterclockwise until it is no longer seated against the top of packing nut (17). Check by adjusting handwheel clockwise to insure that it stops when outlet pressure reaches desired maximum pressure.

FIGURE 1

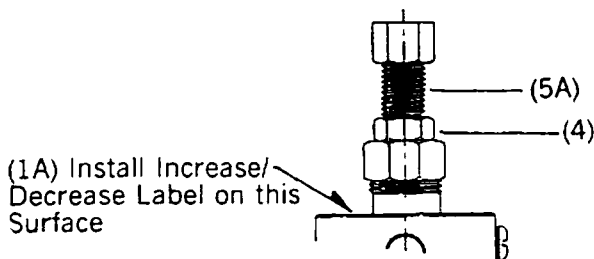
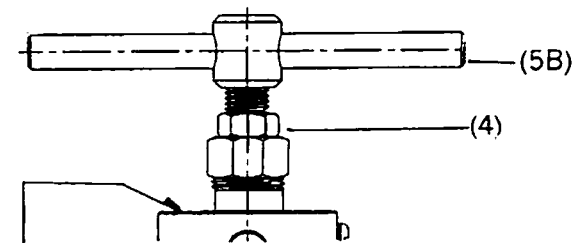


FIGURE 2



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" Socket wrench
9/16" Socket (jam nut within standard handknob)
9/16" Open end wrench (jam nut on wrench knob or "T" handle)
1/2" Open or box wrench (wrench knob adjustment option)
3/4" Wrench or socket (packing nut)
1-3/4" Open end or crowfoot wrench (bonnet)
Krytox 240 AB grease or equivalent

Other possible tools would be vise, tweezers, clean lint free cloth 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 with the regulator clamped in a vise. Securing the regulator in a vise can be at the flats on the regulator body or 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 handwheel (5) to the full counterclockwise position until handwheel (5), hole plug (2), jamnut (4) and adjusting screw (3) are fully disengaged.
2. Using 1-3/4" wrench, loosen and remove bonnet (10). Use a 3/4" wrench or socket to remove packing nut (17) to service packing washers (16). To service bonnet ring screw o-ring (8) and o-rings (9), loosen and remove bonnet ring screw (7) and lift off bonnet ring (6).
3. Remove spring button (18), range spring (19), diaphragm backup plate (20) and seal ring (11).
4. To remove diaphragm assembly (21) grip the diaphragm weld insert that protrudes on the top of the diaphragm and unscrew the diaphragm assembly counterclockwise from the valve plug until it is free.
5. To remove main valve plug (22), disassemble by using a socket wrench. Turn seat gland (23) counterclockwise until it is freed from regulator body (12). The main valve seat (24), main valve plug (22) and plug spring (13) can be lifted from the body (12). The inner and outer friction bushings (14) (15) can be removed from the body by either just in-

verting the body (if the bushings are loose), or by carefully easing them out with a long, thin instrument inserted in the center hole.

THE REGULATOR IS REASSEMBLED 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 outer friction bushing (15) in the 1/4" center hole of the body with the countersunk side up.
4. Place the plug spring (13) on the main valve plug (22) so it mates with the shoulder. Slide the inner friction bushing (14) on the main valve plug (22) with the flat side against the plug spring (13). Holding the main valve plug by the small diameter end, slide the three components into the body on top of the outer friction bushing (16).
5. Lubricate the threads of the seat gland (23) lightly with Krytox grease. Snap the main seat (24) into the seat gland with the countersunk side facing out (Kel-F seats have a countersunk side, Vespel seats do not).
6. Place the seat gland (23) and main valve seat (24) assembly over the main valve plug (22) and screw the seat gland into the body. Torque the seat gland 70-80 in.lbs.
7. Hand thread the diaphragm assembly (21) onto main valve plug (22) until it is snug.
8. Place diaphragm backup plate (20) on diaphragm assembly (22) with the smallest diameter facing down. Place range spring (19) on diaphragm backup plate. Dab Krytox grease in the well of spring button (18) and place it on the top of the range spring.
9. Lubricate, with Krytox grease, the threads of bonnet (10) and the chamfer on seal ring (11). Place bonnet/seal ring over stacked parts and torque to 100 ft.lbs. three times. This step is critical as the regulator relies on a metal to metal seal to contain the outlet pressure.
10. Place O-rings (9), after greasing with Krytox, in grooves located in bonnet (10). Slide bonnet ring (6) over bonnet (10) and position the captured vent port to the desired location. Slide O-ring (8) over bonnet ring screw (7) and thread and tighten until secure.
11. Place four packing washers (16) into packing nut (17). Using a 3/4" wrench or socket thread packing nut (17) onto bonnet (10).
12. Lubricate and install adjusting screw (3) into bonnet (10). Tighten packing nut (17) to 75 in.lbs.. The handwheel assembly consist of handwheel (5), jam nut (4), adjusting screw (3) and hole plug (2). Tighten jam nut within the handwheel to 70-120 in.lbs.
13. Install a filter screen (20) in the inlet port and the supply gauge port of the body and seat it by pushing lightly with a small, clean socket wrench.

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

Item No.	Description	Qty. Req'd	Part No.
1	Handwheel Label	1	76601MY
1A(1)	Increase/Decrease Label	1	76607MY
2	Hole Plug	1	76401SN
3	Adjusting Screw	1	71070S3
4	Jamnut	1	75850NB
5	Handwheel	1	71450PP
5A(5)	Wrench Knob - OPTION CODE "K" (See Figure 1)	1	6020614
5B(5)	"T" Handle - OPTION CODE "T" (See Figure 2)	1	71140S3
6(2)	Bonnet Ring	1	71960NB
7	Bonnet Ring Screw	1	75860S8
8(6)	Bonnet Ring Screw O-Ring	1	77006VI
9(6)	O-Ring	2	77023VI
10	Bonnet	1	71260NB
11	Seal Ring	1	71860S6
12	Body	1	See Table I
13	Plug Spring	1	72550S6
14(6)	Inner Friction Bushing	1	73400TF
15	Outer Friction Bushing	1	73401S6
16(6)	Packing Washers	4	71760TF
17	Packing Nut	1	71761NB
18(8)	Spring Button 0-25, 100, 150 PSIG(0-0.173, 0.690, 1.04 MPa)	1	6378111
	0-50 PSIG(0-0.345 MPa)	1	71550S6
19(8)	Range Spring 0-25 PSIG(0-0.173 MPa)	1	72150CS
	0-50, 100 PSIG(0-0.345, 0.690 MPa)	1	72151CS
	0-150 PSIG(0-1.04 MPa)	1	72155CV
20	Diaphragm Backup Plate	1	72961S6
21(9)	Diaphragm Assembly 316 Stainless Steel	1	74460S6
	Elgiloy	1	74460EG
22	Main Valve Plug	1	73160S6
23	Seat Gland	1	73550S6
24(6)	Main Valve Seat Kel-F	1	73660KF
	Teflon (3)	1	73660TF
	VespeI	1	73660VP
25(7)	Screen (Inlet)	2	6072649
-(4)	Product Label(Not Shown)	1	76604MY

- NOTES:
- When using the Wrench Knob or "T" Handle adjustments, install Increase/Decrease Label (1A) on top of bonnet (10). See Figures 1 and 2.
 - The capture port in the bonnet ring is positionable. Loosen ring screw (7) and position capture port on bonnet ring (6) to desired location. Re-tighten bonnet ring screw (7).
 - When using a Teflon, main valve seat (24) the maximum supply pressure rating will be reduced to 400 PSIG(2.76 MPa)
 - Product Label- When ordering a product label specify complete catalog number so proper nameplate stampings can be made.
 - Wrench Knob - OPTION CODE "K"
"T" Handle- OPTION CODE "T"
When installing the above adjustment mechanisms, remove hole plug (2), handwheel (5), adjusting screw (3) and jamnut (4). Before installing the Knob or "T" Handle, remove jamnut (4) from adjusting screw (3) and thread jamnut (4) onto Knob or "T" Handle threads. This jamnut will act as a locking device.
 - Soft Goods Repair Kit-Soft goods can be purchased individually or as a kit under kit number:
80600KF (For all control ranges) Consist of items 8, 9, 14, 16 and 24.
 - Repair Kit- Repair kit parts can be purchased individually or as a kit under kit number:
81600KF (For all control ranges) Consist of a soft goods kit 80600KF and item 25.
 - Control Kit- Control kits consist of all parts necessary to convert from one range to another within the HP600 Product line.
83600CS 0-25 PSIG(0-0.173 MPa)
83601CS 0-50 PSIG(0-0.345 MPa)
83602CS 0-100 PSIG(0-0.690 MPa)
83603CS 0-150 PSIG(0-1.040 MPa) } Consist of items 18 and 19.
 - Elgiloy diaphragm required for N.A.C.E.

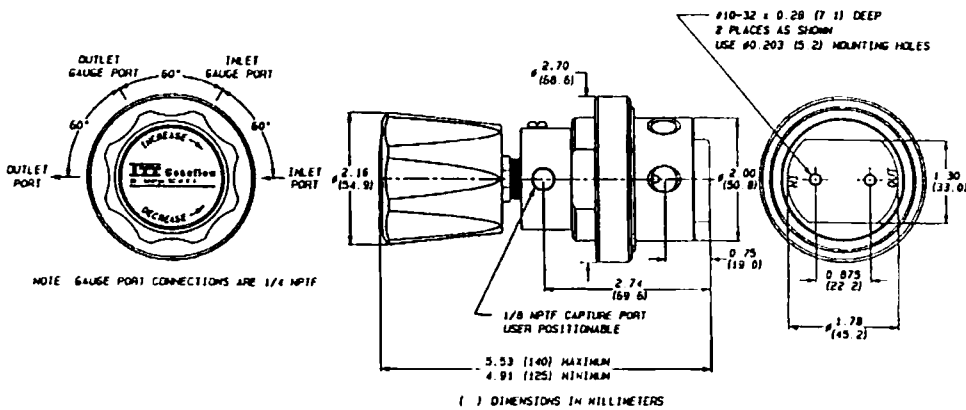
TABLE I – BODIES Inlet/Outlet/2-Gauge Ports (60°)(H)

Description	316SS	316LSS(C)	N.A.C.E.(A) 316SS	N.A.C.E. 316LSS (A)(C)	316SS 15Ra Finish (B)	316LSS 15Ra Finish (B)(C)
NPT Connections						
1/4" NPT (61)	70601S6	70601S6	L	L	L	L
Butt welded Tubing Connections						
316LSS 1/4" x 4" Tubing						
Welded Per Port (62)	L	L	L	L	L	L
316LSS 1/4" x 4" Tubing						
Welded Per Port						
15 Ra Finish (63)	L	L	L	L	L	L
Field Welded Connection (D)						
1/4" Butt weld Preparation (64)	L	L	L	L	L	L
1/4" Socket weld Preparation (65)	L	L	L	L	L	L
High Purity Internal Connections(J)						
1/4" Vacuseal-Preparation (66)	L	L	L	L	L	L
1/4" VCR-Preparation (67)	L	L	L	L	L	L
1/4" UltraSeal-Preparation (68)	L	L	L	L	L	L
Butt weld (Zero Clearance)						
High Purity Internal Connections(E)						
1/4" Vacuseal (69)	L	L	L	L	L	L
1/4" VCR (6A)	L	L	L	L	L	L
1/4" Ultra Seal (6F)	L	L	L	L	L	L
Butt weld 90 Degree Elbow (F)						
1/4" Butt weld 90° Elbow (6H)	L	L	L	L	L	L

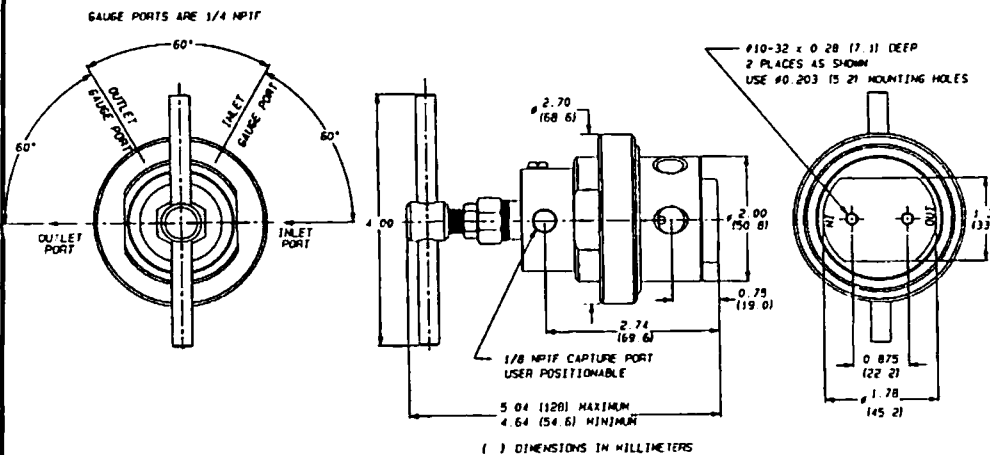
N/A - Not Available () Control Engineering Data Code

NOTES: A. National Association of Corrosion Engineers
 B. 15 Ra micro inch finishes will apply to wetted surfaces only.
 C. 316L Stainless Steel is offered for welded connections.
 D. Weld preparation to standard tubing tolerance.

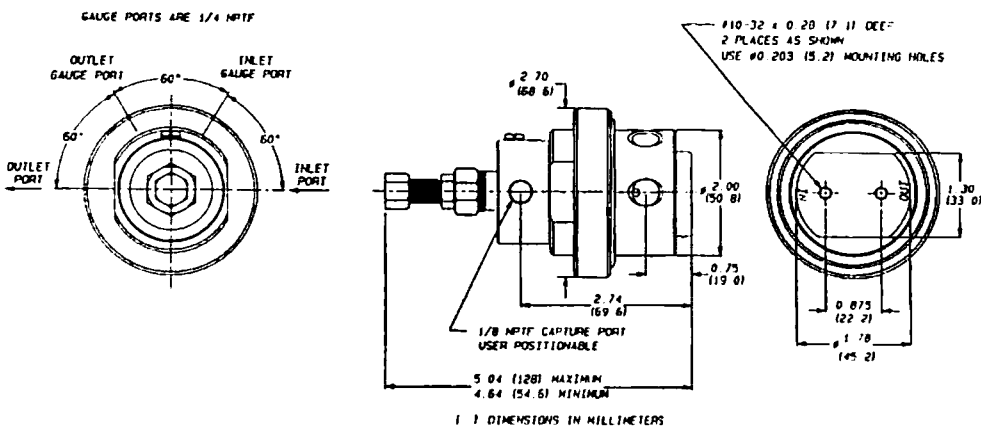
E. Fitting(s) supplied by ITT Conoflow
 F. Fittings are installed down away from control handle.
 H. All gauge ports are 1/4" NPT.
 J. Customer to supply fitting(s).
 L. Part number to be assigned.



For Certified Dimensional Drawing, refer to Drawing HP600-C1.



For Certified Dimensional Drawing, refer to Drawing HP600-C2.



For Certified Dimensional Drawing, refer to Drawing HP600-C3.