

MODEL 764P & 764PD

PNEUMATIC PRESSURE CONTROLLERS

SECTION I

I. DESCRIPTION AND SCOPE

The Model 764P is a pressure controller used for sensing static pressure, and outputting a pneumatic signal proportional to the deviation from the setpoint.

The Model 764PD is a differential pressure controller used for sensing two static pressures ("HIGH" and "LOW"), and outputting a pneumatic signal proportional to the deviation from the setpoint.

With proper materials selection, the units are suitable for gaseous, liquid or steam service. Refer to Technical Bulletin 764P-TB for design conditions and selection recommendations.

Use of oxygen gas as the IAS for a 764P or 764PD is outside the scope of this IOM, and is considered "special construction".

Abbreviations Utilized:

CCW – Counter Clockwise
CW – Clockwise
DIR – Direct
EXH – Exhaust
IAS – Instrument Air Supply

P1 – Inlet Pressure
P2 – Outlet Pressure
PB – Proportional Band
PC – Pressure Controller
PCV – Pressure Control Valve
PI – Pressure Indicator

P/P – Pneumatic-to-Pneumatic
REV – Revolution or Reverse
SIG – Signal
SRV – Safety Relief Valve
TR – Condensate Trap
V – Vent

SECTION II

II. INSTALLATION

1. A block valve of the globe/needle type should be installed at the location of the pressure tapping. Ball, butterfly or gate valves are not recommended.
2. Recommended sensing tap pipe size is 1/2" (DN15).
3. Location of pressure sensing tap should be in a zone not subject to flow disturbances. Recommend a minimum of 10 pipe diameters upstream and 10 pipe diameters downstream from any elbow, tee, valve, etc. that disturbs flow.
4. A pressure gauge is recommended at the location of each tapping. Differential pressure designs may incorporate a differential pressure gauge.
5. A pigtail siphon is required for hot condensing fluids, such as steam, to assure a liquid trap at the controller. The siphon should be installed as near to the pressure connection(s) on the controller's diaphragm housing as practical.

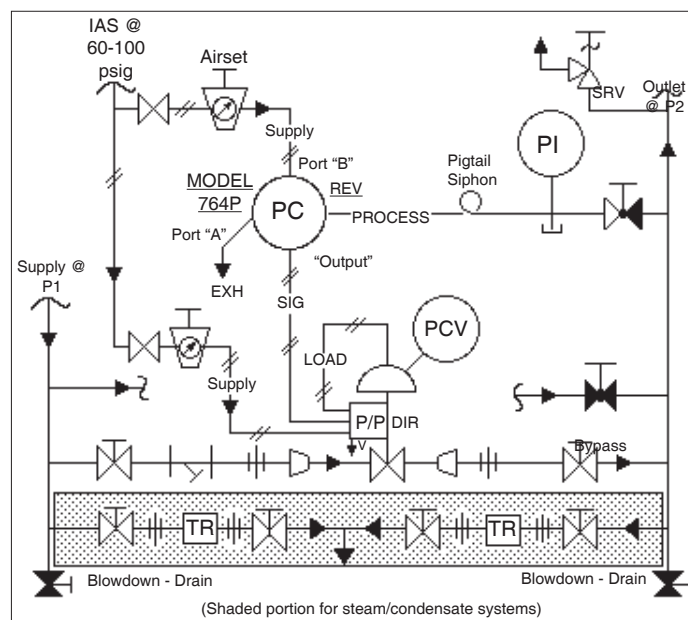


Figure 1: Recommended Piping Schematic for Pressure Reducing Control Valve with Positioner

6. It is recommended as a good practice to locate the controller as close as practical to the pressure tapping and at a similar elevation. For installations where the controller was factory mounted on a control valve unit, the pressure tapping should be within 6 - 10 feet (2 - 3 meters) of the control valve. (Remember to compensate for tappings located above the elevation of the controller for any liquid pressure head that may occur.)
7. The controller's pneumatic output signal (SIG) piping or tubing should be limited in length, and consideration must be given for the ultimate purpose of the SIG at its final destination. The following are recommended practices:

Purpose	Tubing	
	Size	Max Length*
SIG to Positioner	1/4" O.D.	100 ft.
SIG to Supply Booster	1/4" O.D.	100 ft.
LOAD to Actuator	1/4" O.D.	10 - 12 ft.

* Contact factory for longer lengths.

8. 764P controllers may be mounted by various methods:

Bracket Mounted. Includes a bracket with machine screws to allow attachment to a fixed structural appendage; requires specifying Option -23. (This is the method utilized when the 764P/PD is specified to be mounted to a control valve actuator.)

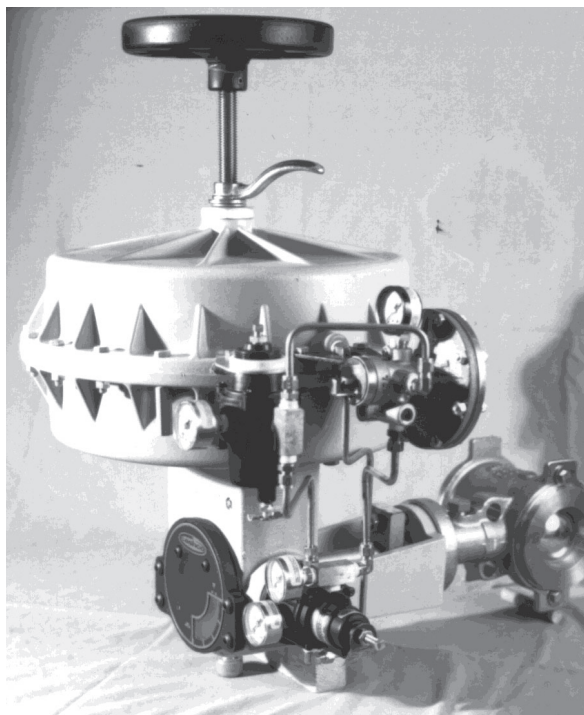


Figure 2

Factory Bracket Mounted to Ranger QCT Control Valve

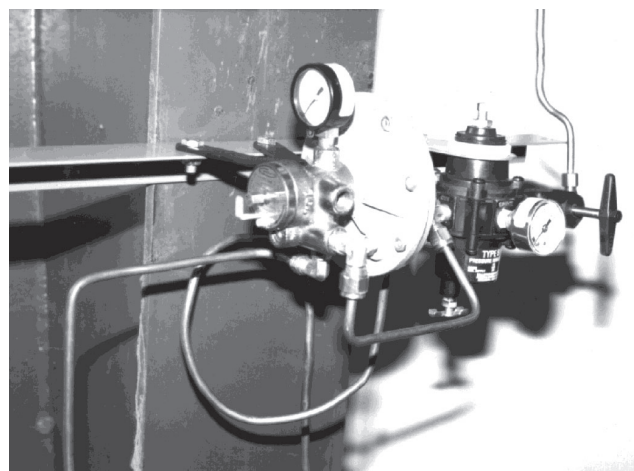


Figure 3

With Option -23; Field Bracket Mounting to Structure

Field Pipe Nipple Mounted. Recommend pipe tap on top or side of pipe.

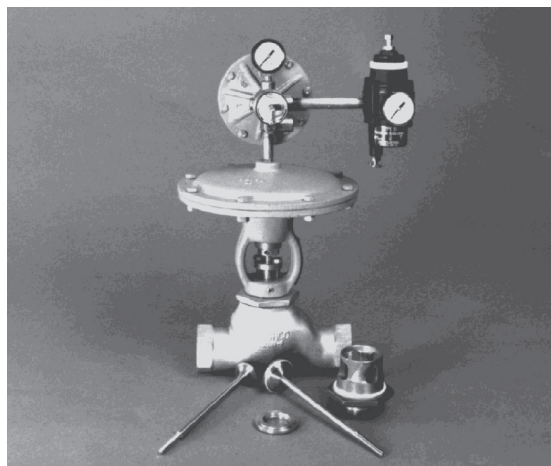


Figure 4

Output Pipe Nipple Mounted to Model 2266 Control Valve

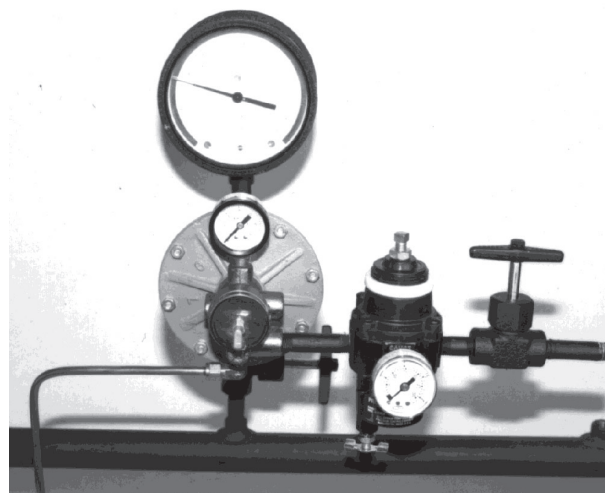


Figure 5

Field Pipe Nipple Mounted to Piping

Panel Mounted. Not factory provided. Requires field provision of a panel opening and support bracket per the below dimensions:

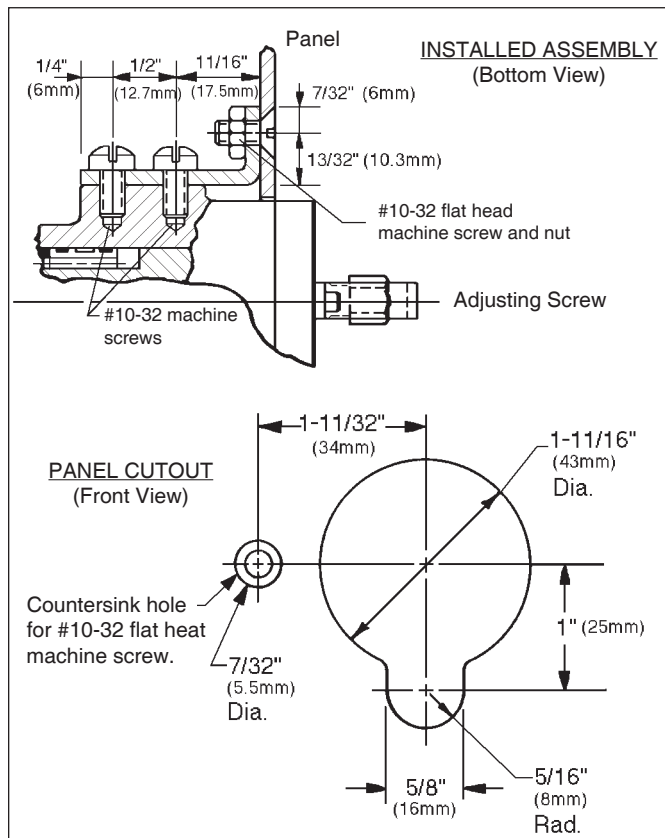


Figure 6

Panel Mounted Assembly View

9. It is recommended that a 764PD be bracket or panel mounted. A 764PD can be pipe nipple mounted from 1/4" NPT connection.
10. Clean the piping and tubing of all foreign materials including chips, burrs, dirt, etc., prior to use. Use care in applying thread sealant or TFE tape to prevent excess material from entering the connecting pipe or tubing.
11. Controllers may be oriented in any position indoors. Outdoors, recommended locations are with the main longitudinal axis in a horizontal position, or with the pneumatic sensor head directed downwards. Exhibit care to assure rainwater is prevented from entering the unused exhaust port (Port A or Port B).
12. Connect piping/tubing per Tables 1 and 2.
13. 764P/PD's can operate with a lubricated, non-dried air supply. However, good practice and other system components (airsets, relays, etc.) dictate use of the highest quality air supply available. If air can not be practically dried and bears oil, coalescing filters should be utilized to remove as much oil and water as possible, as well as

particles over 20 microns. Desiccant dried air is absolutely required for outdoor installations exposed to freezing temperatures.

14. For 764PD the system must be designed such that the "HIGH" pressure is always at a higher value than the "LOW" pressure is at the same time. If the expected HIGH and LOW pressures reverse with respect to each other, the unit will become inoperative, and the output will increase towards full IAS pressure of 18–20 psig (1.24–1.38 Barg).

TABLE 1

Controller	764P	
	Action	
IAS to Port	Direct	Reverse
A	Supply	Exhaust
B	Exhaust	Supply
Process Pressures Above Atm. Pressure	Increase in pressure <u>Increases</u> output signal	Increase in pressure <u>Decreases</u> output signal
	764PD	
	Increase in differential pressure <u>Increases</u> output signal	Increase in differential pressure <u>Decreases</u> output signal
Controller	764P	
	Action	
IAS to Port	Direct	Reverse
B	Supply	Exhaust
A	Exhaust	Supply
Vacuum Process Below Atm. Pressure	Increase in vacuum <u>Increases</u> output signal	Increase in vacuum <u>Decreases</u> output signal

NOTE: 764PD cannot be utilized in vacuum service.

TABLE 2

TABLE 2			
Controller	Pressure Reducing Applications		Controller Pressure Adjustment
	Actions		
IAS to Port	Control Valve	Controller	
B *	ATO-FC (REVERSE)	<u>Reverse</u> - Increase in pressure decreases output signal. Valve "fails closed".	CW = - Pres CCW = + Pres
A	ATC-FO (DIRECT)	<u>Direct</u> - Increase in pressure increases output signal. Valve "fails open".	CW = + Pres CCW = - Pres
	Back Pressure/Relief Applications		
	Actions		
B *	ATC-FO (DIRECT)	<u>Reverse</u> - Increase in pressure decreases output signal. Valve "fails open".	CW = - Pres CCW = + Pres
A	ATO-FC (REVERSE)	<u>Direct</u> - Increase in pressure increases output signal. Valve "fails closed".	CW = + Pres CCW = - Pres

* Common applications

Uncommon applications

SECTION III

III. PRINCIPLE OF OPERATION

1. The 764 controllers employ laminar flow to produce the 3-15 psig (nominal 0.2–1.0 Barg) output signal. Laminar flow eliminates the need for range springs, levers, pivots and other parts that produce friction and lost motion.
2. The sensing diaphragm in the 764P and 764PD has a high spring rate and any change in the sensed pressure produces a minute diaphragm movement which strokes the sensor plate. The sensor plate, in turn, throttles the flow of instrument air through the sensor to develop the 3-15 psig (0.2-1.0 Barg) output signal.
3. On direct acting 764P controllers (see Figure 7) the supply air enters PORT A and passes through the proportional band restriction. With an increase in the controlled pressure the flow through the sensor is reduced which increases the output signal. The proportional band restriction regulates the flow rate of supply air into PORT A. PORT B is the exhaust port. A 764PD operates the same.
4. On reverse acting 764P controllers (see Figure 8) the supply enters PORT B (not PORT A). With an increase in the controlled pressure, the supply air flowing through the sensor decreases, which reduces the output signal. The proportional band restriction regulates the flow of exhaust through PORT A. A 764PD operates in a similar manner.

5. Closing (CW rotation) the proportional band adjusting screw reduces the proportional band. Opening the screw increases the proportional band.
6. The setpoint adjustment positions the sensor so the diaphragm must deflect its maximum for its highest controlled pressure setting and hardly deflects for the lowest controlled pressure setting.

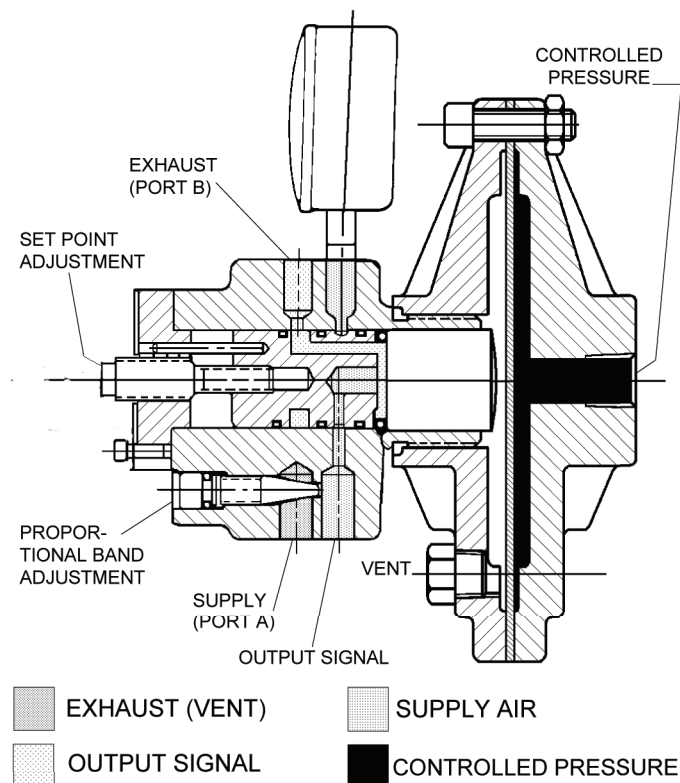


Figure 7
Direct Action 764P

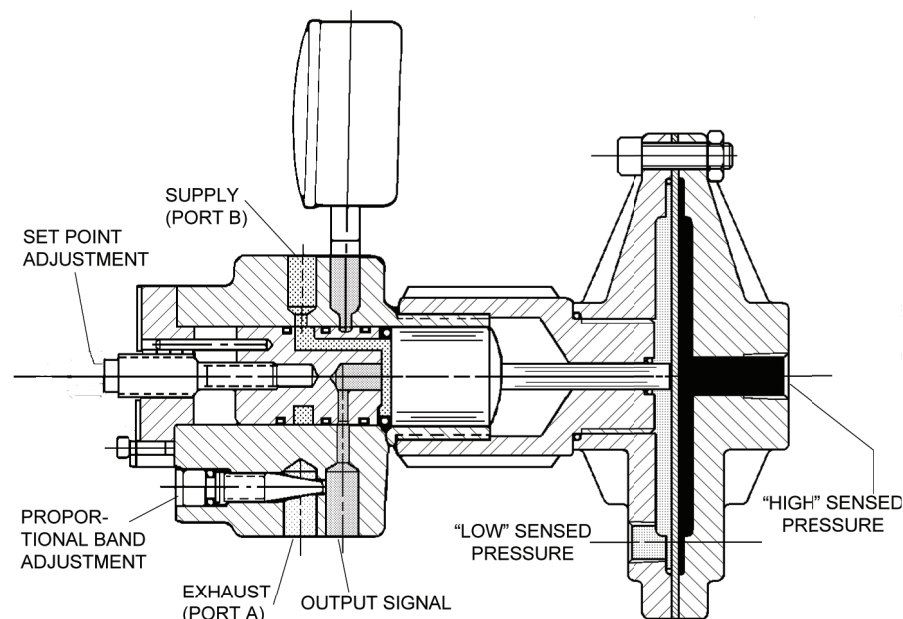


Figure 8
Reverse Action 764PD

SECTION IV

IV. STARTUP

1. Prior to pressurizing through the airset, disconnect the instrument air supply (IAS) at the airset inlet, open the IAS block valve and blow the piping clear of any debris. Reconnect the piping and open the isolation valve. Set the airset to 18 psig (1.2 Barg).
2. The unit is shipped with the proportional band (PB) set at a minimum value of approximately 3 percent. Matchmarks are factory placed on the housing (1) and the PB needle valve (3) head approximately perpendicular to the screwdriver slot of the needle valve (3) head.



CAUTION

Do not rotate the needle valve (3) CW beyond this location as the unit will be rendered inoperative. Rotate needle valve (3) CCW approximately 1/8 of a revolution increments at each adjustment. 1-1/2 revolutions are the maximum rotation available from the 3 percent minimum PB position to the 20% maximum PB position.

3. Units are factory calibrated to approximately mid-range; i.e. 50-150 psig (3.4-10.3 Barg) range will have setpoint at approximately 100 psig (6.9 Barg). It is recommended that the unit be field calibrated following installation and prior to startup. (See Section VI. CALIBRATION for detailed procedure.)

Direct Action: Adjust setpoint by rotating adjusting screw CCW to decrease setpoint or turn CW to increase setpoint.

Reverse Action: Adjust setpoint by rotating adjusting screw CW to decrease setpoint or turn CCW to increase setpoint.

4. Start the process, observing the output gauge of the controller and the process pressure gauge. (For 764PD's, always pressure the HIGH pressure before the LOW pressure.) Assure that the output is changing (decreasing from 18 psig (1.2 Barg) if reverse acting, or increasing from 0 psig (0.0 Barg) is direct acting) as the controller approaches setpoint. Confirm proper action of control valve. Vary the process flow and observe the reaction of the controller to the disturbances.
5. If the controller seems to be "hunting" with overshoot and undershoot of setpoint, additional PB should be added. Rotate the needle valve (3) CCW in increments of 1/8 revolution. NOTE: When PB is adjusted, setpoint will normally require slight resetting; rotate the adjusting screw (2.3) as required. Repeat until best stability is obtained, or up to the maximum of 1-1/2 revolutions.



CAUTION

Always make adjustments in small increments and wait until reactions can be observed before making further adjustments.

6. If "hunting" persists after completion of Step 5, the controller can be slowed down by reducing airset supply pressure down to 16 psig (1.1 Barg) in 1 psi (0.07 Bar) increments. If this procedure is used, repeat Step 5.
7. If "hunting" persists after completion of Step 6, rotate the needle valve on the sensing line "towards closed" to provide "snubbing" action. **DO NOT FULLY CLOSE SENSING NEEDLE VALVE.**

SECTION V

V. MAINTENANCE

A. General:

1. Refer to Figure 12 for basic pressure controller. Refer to Figure 13 for differential pressure controller.
2. Maintenance procedures hereinafter are based on removal from the process piping system where installed. When removing the tubing, put a tag on the tubing which port, "A" or "B", was utilized.

3. If complete overhaul is undertaken, it is recommended that the pneumatic circuit overhaul be completed prior to diaphragm replacement.
4. Lightly grease all sensor sub-assembly (2) O-rings (5) (6) upon replacement with lithium grease; cloth wipe all excess grease.

B. Diaphragm Replacement:

1. If diaphragm (12) has cracked and leaked, complete unit must be overhauled including the pneumatic circuit portion.

2. Remove cap screws (19) and nuts (18). Remove diaphragm upper case (13) and upper diaphragm O-ring (16). Remove diaphragm (12), and SST diaphragm cover (17) if supplied. Remove lower case diaphragm O-ring (16) and pusher post O-ring (23) for 764PD. Inspect for any corrosion damage and/or permanent deformation of the diaphragm (12) and diaphragm cover (17); if bent, replace.
3. For 764PD, separate at the screwed joint between the diaphragm lower case (14) and the adapter (21) turning the diaphragm case (14) CCW (viewed from diaphragm case end). When separated, remove the adapter O-ring (22) and replace. Reinstall the adapter (21) and diaphragm lower case (14).
4. For the 764PD, replace diaphragm O-ring (16) for the lower case (14) and the pusher post O-ring (23).
5. Replace diaphragm (12) and diaphragm cover(s) (17), if supplied. Assure that the diaphragm cover (thin SST material) (17) is placed on side(s) exposed to the process fluid(s). (764PD requires both sides to be covered, if supplied with diaphragm covers (17).
6. Replace with new upper case diaphragm O-ring (16), upper case (13), and cap screws with nuts (19 and 18).
7. Recalibrate per Section VI.

C. Pneumatic Circuit Overhaul:

1. Remove output pressure gauge (11) and test calibration. If gauge is off ± 2 psi (± 0.14 Bar) recommend replacement.
2. Remove lower diaphragm case (14) from the pneumatic housing (1) at the point where screwed together. Rotate the diaphragm case (14) CCW (viewed from diaphragm case end) to loosen. For 764PD: Remove adapter (21) together with lower diaphragm casing (14) at the screwed joint between the pneumatic housing (1) and the adapter (21). Rotate the adapter (21) CCW (viewed from diaphragm case end) to loosen. Once loosened, orient the unit along a horizontal axis to prevent internal parts from falling from within when separated. **DO NOT REMOVE PUSHER-POST (24) FROM 764PD.**
3. Remove sensor plate (15.1) (15).
4. Remove nameplate screw (9), nameplate (10), and four housing screws (8). Grasp the sensor

sub-assembly (2) end plate (2.2), and pull it outwards from the housing (1). Watch for the sensor pin (2.4) as the sensor sub-assembly (2) is withdrawn, as pin (2.4) easily falls out and could be lost.

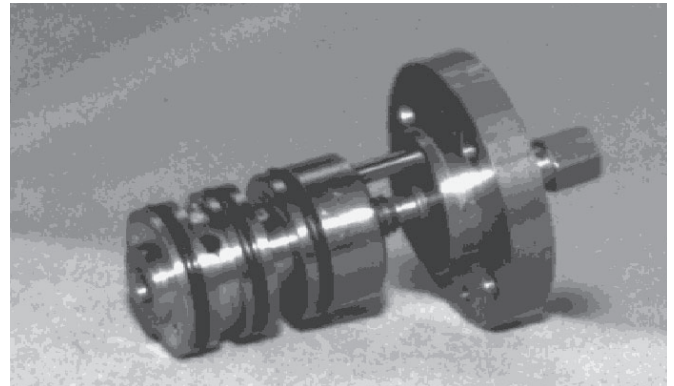


Figure 9: Sensor Sub-Assembly (2)

5. Remove sensor plate O-ring (6).
6. Take note of the position of the PB needle valve (3) by rotating it CW until it seats: count the exact amount of rotation in 1/8 rev. increments; record the count in Table 3. Remove the PB needle valve (3) with O-ring (7) by rotating CCW. Remove O-ring (7).

TABLE 3		
Part	DESCRIPTION OF ROTATION	NO. OF REVOLUTIONS
PB Needle Valve (3)	No. of Revolutions rotated CW to fully seat	

7. Remove the three sensor O-rings (5) from the sensor (2.1).

NOTE: Typically, additional dis-assembly of the sensor sub-assembly (2) is not required. If it is necessary to replace any of the sensor sub-assembly parts (2.1, 2.2, 2.3, 2.4, 2.5) a complete new sensor sub-assembly must be installed. Contact the factory for assistance.

8. Take all the metal parts except the gauge (11) and nameplate (10) and clean in suitable solvent. Clean and air blow all drilled air passages.
9. Install pressure gauge (11) into the pneumatic housing (1) using suitable thread sealant.
10. Install new O-rings (5) on sensor sub-assembly (2). Check the two dimensions given in Figure 10 of the sensor sub-assembly as "final settings".

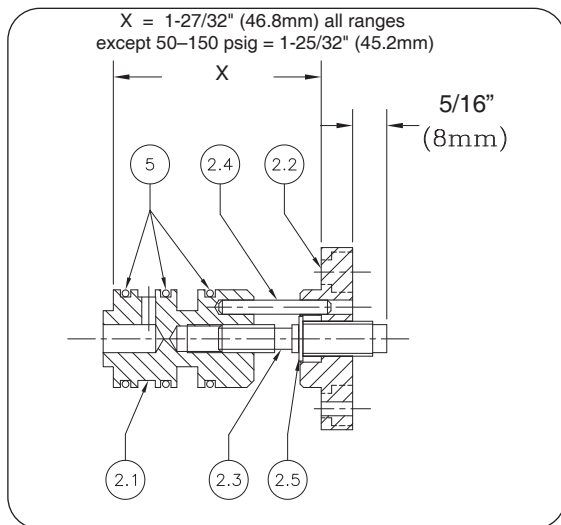


Figure 10
Sensor Sub-Assembly
Assemble per these Dimensions

11. Slide the sensor sub-assembly (2) back into the housing (1) so as not to damage the sensor O-rings (5). The final position should have the sensor pin (2.4) directly above the center of the adjusting screw (2.3). Install the four end plate screws (2.5). See Figure 11.

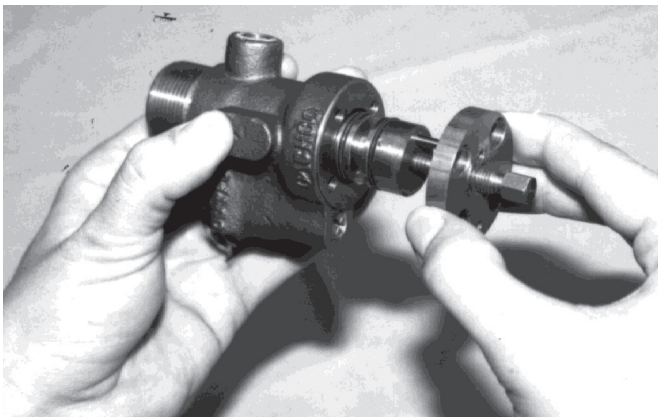


Figure 11

12. Install the nameplate (10) and nameplate screw (9).
13. Install the PB needle valve (3) with a new O-ring (7). Screw the needle valve (3) CW until seated, then back out to same position recorded in Table 3 prior to disassembly.
14. Place a new sensor plate O-ring (6) down into the housing (1) cavity next to the end of the sensor (2.1). Slide the sensor plate (15) into the housing (1); the flat portion of the sensor plate (15) should seat against the O-ring (6).

The rounded end of the sensor plate (15) will touch the diaphragm (16) for the 764P, or the pusher post (24) of the 764PD.

NOTE: The previous description is for 764PD's and 764P's in pressure ranges 2" - 30" Hg, 1-30 psig, 20-100 psig, 50-150 psig and 90-500 psig; it is also for 764PD's for differential pressure ranges 1-30, 20-100 and 50-150 psid. Refer to Figure 12 "Diaphragm Sub-Assembly for 450-2500 psig". Observe that the sensor plate (15) consists of a four part sub-assembly as follows:

- 15.1 Sensor Plate
- 15.2 Adaptor
- 15.3 Retaining Ring
- 15.4 Spring

17. Re-engage the pneumatic housing (1) to the diaphragm lower case (14) of the 764P, or the adapter (21) of the 764PD; rotate CW. Wrench tighten.
18. Calibrate per Section VI.

SECTION VI

VI. SHOP CALIBRATION

1. Install a 1/4" pipe plug in the "OUTPUT" port of unit.
2. Provide an 18 psig (1.2 Barg) IAS to the proper port as determined by Table 1, Section II.
3. Leave PB as set in Section V.C.13. If this setting is unknown, rotate the PB needle valve (3) CW until seated. Rotate needle valve (3) CCW until "indented matchmarks" align; this is approximately 8–1/4 of a revolution.
- 4.1. Provide a known pressure (compressed nitrogen, etc.) equal to the desired setpoint to the diaphragm "PROCESS" connection for the 764P.
- 4.2. For the 764PD, place a known static pressure equal to the desired differential pressure setpoint to the "HIGH" process connection; leave the "LOW" process connection vented to atmosphere.

- 5.1. FOR DIRECT ACTION: If the output pressure gauge is at/near 15 psig (1.03 Barg) increase the setpoint by rotating the adjusting screw (2.3) CW until the output decreases to 9 psig (0.62 Barg)

If the output pressure gauge is at/near 0 psig (0.0 Barg) decrease the setpoint by rotating the adjusting screw (2.3) CCW until the output rises to 9 psig (0.62 Barg).

- 5.2. FOR REVERSE ACTION: If the output pressure gauge is at/near 15 psig (1.03 Barg) decrease the setpoint by rotating the adjusting screw (2.3) CCW until the output decreases to 9 psig (0.62 Barg).

If the output pressure gauge is at/near 0 psig (0.0 Barg) increase the setpoint by rotating the adjusting screw (2.3) CW until the output rises to 9 psig (0.62 Barg).

NOTE: *If the unit cannot be shop calibrated to either the upper or lower value of the stated range, refer to statement in VII.7.A. for recommendation. Repeat shop calibration.*

SECTION VII

VII. TROUBLE SHOOTING GUIDE

1. No controller response

Possible Cause	Remedy
A. No air supply.	A1. Check to see if air is available at airset. A2. Check to see if airset filter and/or dripwell is plugged.
B. Improper action; port "A" or "B" connections reversed.	B. Reference Tables 1 & 2 herein for desired action and proper port; reverse as required.
C. Check process isolation valve and line to see if open and/or clear.	C1. Open block needle valve on process. C2. Disconnect piping/tubing at both ends, blow to determine if obstructed. Carefully blow needle valve to clear obstruction; use caution commensurate with fluid handled in accordance with Owner's procedures.
D. Improper pressure tap location.	D. For relief applications, tapping is upstream; for reducing applications tapping is downstream of the control valve.
E. PB needle valve is fully closed.	E. Open at east to alignment of matchmarks on valve's screw head and housing.
F. Adjusting Screw is outside of operating window.	F. Reset Adjusting Screw length to be 5/16" out from nameplate.
G. Ice formation.	G. Use dry air as an IAS medium in cold weather. Thaw as necessary by use of air heater. Trace as necessary.
H. Final element operation problem; i.e. control valve, positioner, solenoid, etc.	H. Reference instructions for operation of final element.

2. Improper control valve action.

Possible Cause	Remedy
A. Mismatch of pneumatic hardware.	A. Check bench set of actuator. Consider positioner or booster.
B. Improper action; port "A" or "B" connections are reversed.	B. Reference Tables 1 and 2 herein for desired action and proper port; reverse as required.

3. Erratic Operation; Rapid Cycling.

Possible Cause	Remedy
A. Insufficient PB	A. Increase PB in 1/8 rev. increments by turning the needle valve CCW. Reset setpoint as required (Max PB at 1-1/2 revs.).
B. Improper air supply.	B1. Supply pressure too high. Reduce airset output supply pressure to 15-18 psig. B2. Air supply unsteady. Replace airset.
C. Pulsing process sensing.	C1. Snub process needle valve as far as practical without shutting off. Observe process gauges carefully. C2. Poor location of process pressure tap. Evaluate and consider relocation.
D. Non-Correctible process dynamics.	D1. Bypass control valve positioner and directly load actuator. D2. Review sizing of control valve, may be oversized. Use restricted trim if necessary. D3. Consult factory

4. Sluggish operation; slow action.

Possible Cause	Remedy
A. Restricted flow(s).	A1. Open process needle valve adequately. Disconnect tubing and blow sensing line. A2. Check equivalent output tubing line length against those indicated herein in Section 11.7. Relocate controller, or consider adding an air booster or positioner at the control valve. A3. Check for mashed or pinched tubing. A4. Installation debris. Air blow line. A5. Ice in lines. Use dry air supply.
B. Insufficient air supply.	B. Increase supply up to 18-20 psig.
C. Too much PB.	C. Decrease PB in 1/8 rev. increments. Reset setpoint as required.
D. Improper range selection.	D. Use the lowest range possible, if available to obtain the best response.
E. Too large actuator.	E. Add an air booster or positioner at the actuator.
F. Use of alcohols, glycols in freezing weather; dissolved lubricant on O-rings.	F. Remove sensor sub-assembly and lubricate O-rings.

5. Calibration Erratic; frequent setpoint adjustments.

Possible Cause	Remedy
A. Sensing diaphragm loose at screwed connection to housing or adapter.	A. Piping weight is cantilevered off of process connections or instrument air connections causing unscrewing, and effecting internal clearances. Change piping or add supports as required.
B. Bent sensing diaphragm.	B. Inspect diaphragm; replace if bent. Bent diaphragm indicates an overpressure condition; correct if necessary.
C. Air supply debris.	C1. Provide a cleaner air supply or piping source. C2. Ice in lines. Correct as necessary.

6. Leakage of process fluid.

Possible Cause	Remedy
A. Sensing diaphragm O-ring failure.	A1. Improper installation causing overheating by not providing a loop seal for hot condensing fluids; i.e. steam. A2. Chemical attack. Consult factory.
B. For 764PD, pusher post O-ring failure.	B1. Same as A1. above. B2. Same as A2. above.
C. Diaphragm failure.	C. Corrosive attack. Consult factory.

7. Cannot reach upper or lower pressure levels of stated range.

Possible Cause	Remedy
A. Improper sensor sub-assembly setting.	A. Remove sensor sub-assembly. Check dimension to those indicated in Figure 10. If dimension is correct, and high setting cannot be reached, decrease dim. "X" by rotating sensor end plate 1/2 revolution CW; reverse for lower setting.

SECTION VIII

VIII. ORDERING INFORMATION

NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material ("BOM"), a parts list that was provided when unit was originally shipped. (Serial Number typically 6 digits). Product Code typical format as follows: (last digit is alpha character that reflects revision level for the product).

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NEW REPLACEMENT UNIT:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. With this information they can provide a quotation for a new unit including a complete description, price and availability.

PARTS "KIT" for FIELD REPAIR:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the "BOM" sheet that was provided when unit was originally shipped.



CAUTION

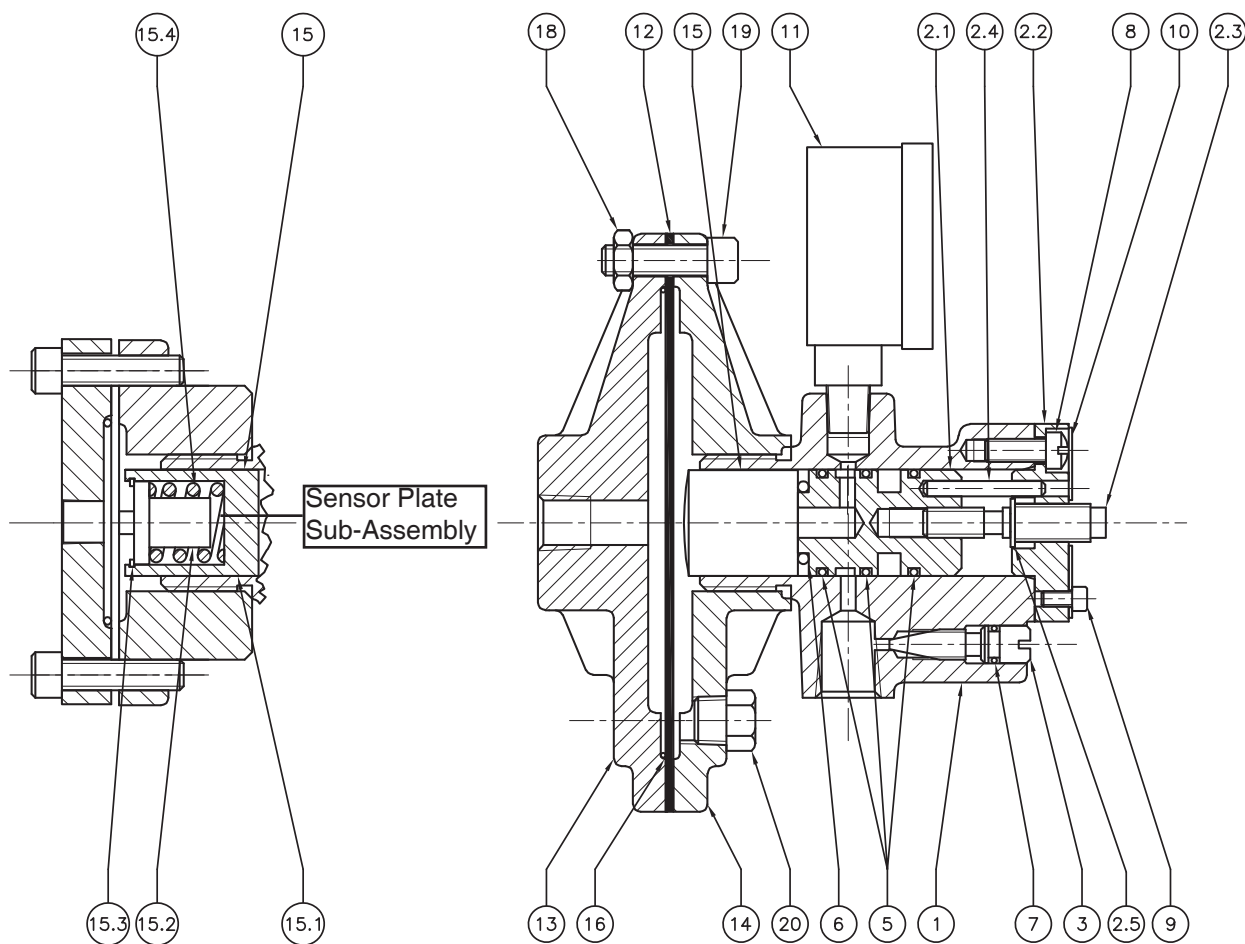
Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accommodate the recommended part(s) changes.

NOTE: Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

A Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

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Sensor Plate Sub-Assembly
450-2500 psig Range

Figure 12
Model 764P

Available Ranges	
psig	(Barg)
1-30	(0.7-2.1)
20-100	(1.4-6.9)
50-150	(3.5-10.3)
90-500	(6.2-34.5)
450-2500	(31.0-172.4)
2"-30" Hg Vac.	(50-760 mm Hg Vac.)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Housing	12	Diaphragm
2	Sensor Sub-Assembly	13	Upper Case
2.1	Sensor	14	Lower Case
2.2	End Plate	15	Sensor Plate Sub-Assembly
2.3	Adjusting Screw	15.1	Sensor Plate
2.4	Sensor Pin	15.2	Adaptor
2.5	Retsainer Clip	15.3	Retaining Ring
3	Needle Valve	15.4	Spring
5	O-Ring - Sensor	16	O-ring – Diaphragm
6	O-Ring - Sensor Plate	17	Diaphragm Cover (if supplied)
7	O-Ring - Needle Valve	18	Nut
8	End Plate Screw	19	Screw
9	Name Plate Screw	20	Vent Plug
10	Name Plate		
11	Gauge		

*** Not Sold as individual parts.**
(Purchase Sensor Sub_Assembly 2)

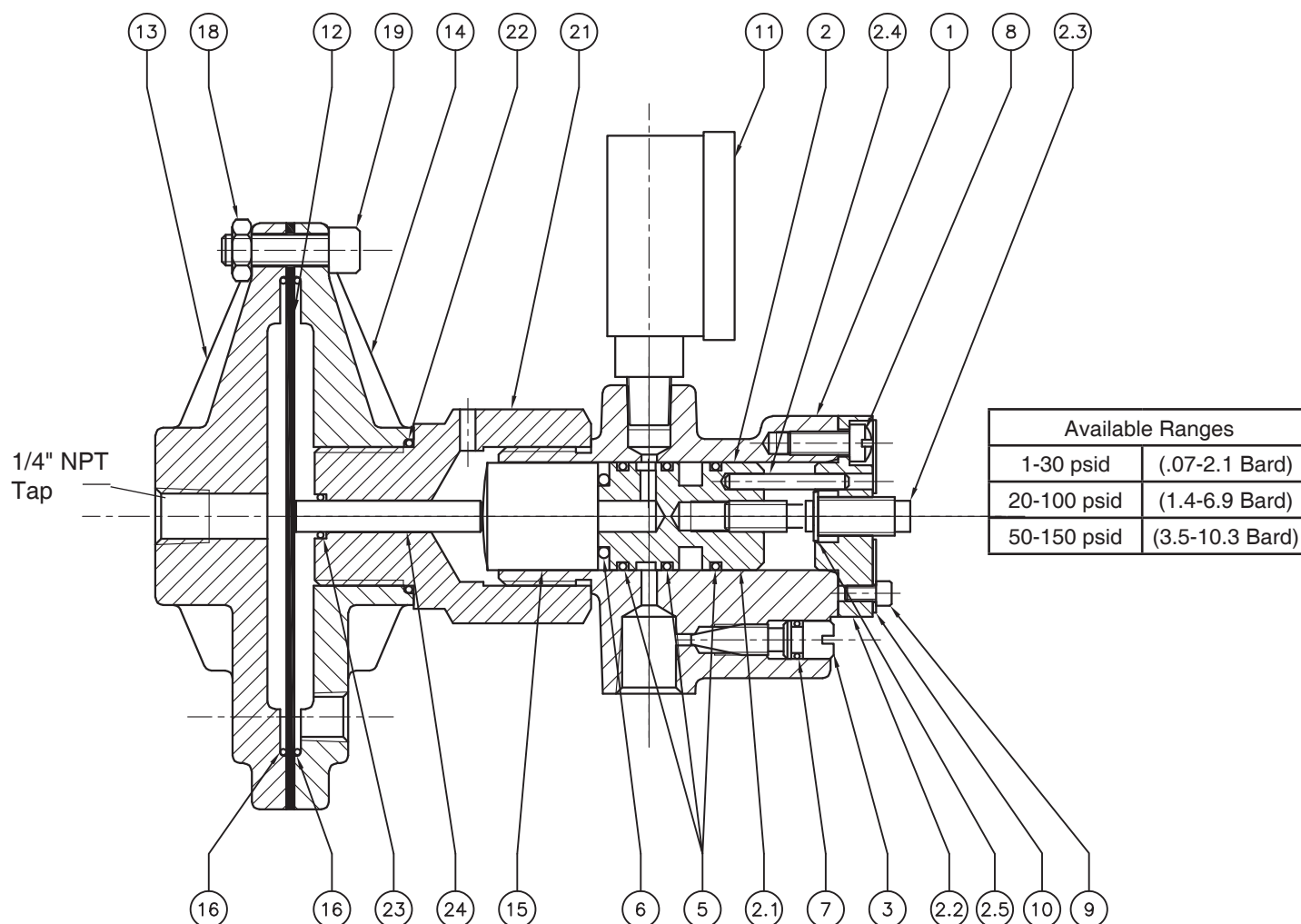


Figure 13
Model 764PD

ITEM NO.	DESCRIPTION		ITEM NO.	DESCRIPTION
1	Housing		11	Gauge
2	Sensor Sub-Assembly		12	Diaphragm
2.1	Sensor	*	13	Upper Case
2.2	End Plate	*	14	Lower Case
2.3	Adjusting Screw	*	15	Sensor Plate
2.4	Sensor Pin	*	16	O-ring – Diaphragm
2.5	Retainer Clip	*	17	Diaphragm Cover (if supplied)
3	Needle Valve		18	Nut
5	O-Ring - Sensor		19	Screw
6	O-Ring - Sensor Plate		21	Adaptor
7	O-Ring - Needle Valve		22	O-Ring – Adaptor
8	End Plate Screw		23	O-Ring – Pusher Post
9	Name Plate Screw		24	Pusher Post
10	Name Plate			

*** Not Sold as individual parts.**
(Purchase Sensor Sub-Assembly 2)



IOM ADDENDUM:

ATEX DIRECTIVE 2014/34/EU and THE EQUIPMENT AND PROTECTIVE SYSTEMS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES REGULATIONS 2016

Cashco, Inc. declares that the products listed in the table below has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II of the ATEX Directive 2014/34/EU and given in Schedule 1 of The Equipment and Protective Systems Indented for Use in Potentially Explosive Atmospheres Regulations 2016. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN ISO 80079-36:2016 and EN ISO 80079-37:2016. The product will be marked as follows:



The 'X' placed after the technical file number indicates that the product is subject to specific conditions of use as follows:

1. The maximum surface temperature depends entirely on the operating conditions and not the equipment itself. The combination of the maximum ambient and the maximum process medium temperature shall be used to determine the maximum surface temperature and corresponding temperature classification, considering the safety margins described prescribed in EN ISO 80079-36:2016, Clause 8.2. Additionally, the system designer and users must take precautions to prevent rapid system pressurization which may raise the surface temperature of system components and tubing due to adiabatic compression of the system gas. Furthermore, the Joule-Thomson effect may cause process gases to rise in temperature as they expand going through a regulator. This could raise the external surface temperature of the regulator body and the downstream piping creating a potential source of ignition. Whether the Joule-Thomson effect leads to heating or cooling of the process gas depends on the process gas and the inlet and outlet pressures. The system designer is responsible for determining whether the process gas temperature may raise under any operating conditions.
2. Where the process medium is a liquid or semi-solid material with a surface resistance in excess of $1\text{G}\Omega$, special precautions shall be taken to ensure the process does not generate electrostatic discharge.
3. Special consideration shall be made regarding the filtration of the process medium if there is a potential for the process medium to contain solid particles. Where particles are present, the process flow shall be $<1\text{m/s}$ ($<3.3\text{ ft/s}$) in order to prevent friction between the process medium and internal surfaces.
4. Effective earthing (grounding) of the product shall be ensured during installation.
5. The valve body/housing shall be regularly cleaned to prevent build up of dust deposits.
6. Regulators must be ordered with the non-relieving option (instead of the self-relieving option) if the process gas they are to be used with is hazardous (flammable, toxic, etc.). The self-relieving option vents process gas through the regulator cap directly into the atmosphere while the non-relieving option does not. Using regulators with the self-relieving option in a flammable gas system could create an explosive atmosphere in the vicinity of the regulator.
7. Tied diaphragm regulators with outlet ranges greater than 7 barg (100 psig) should be preset to minimize the risk that improper operation might lead to an outboard leak and a potentially explosive atmosphere.
8. All equipment must only be fitted with manufacturer's original spare parts.
9. Ensure that only non-sparking tools are used, as per EN 1127-1, Annex A.

	PRODUCT
	31-B, 31-N
	1164, 1164(OPT-45)
	1171, 1171(OPT-45), 1171(CRYO)
	2171, 2171(OPT-45), 2171(CRYO), 3171
	1465, 3381, 3381(OPT-45), 3381(OPT-40)
	4381, 4381(OPT-37), 4381(CRYO), 4381(OPT-45), 5381
	MPRV-H, MPRV-L
	PBE, PBE-L, PBE-H
	CA-1, CA-2
	CA1, SA1, CA4, SA4, CA5, SA5
	DA2, DA4, DA5, DA6, DA8
	DA0, DA1, DAP, SAP
	SLR-1, SLR-2, PTR-1
	ALR-1, ULR-1, PGR-1
	BQ, BQ(OPT-45), BQ(CRYO)
	123, 123(CRYO), 123(OPT-45), 123(OPT-46G)
	123-1+6, 123-1+6(OPT-45), 123-1+6(OPT-46G), 123-1+6+S, 123-1+6+S(OPT-40)
	1000HP, 1000HP(OPT-37), 1000HP(OPT-45), 1000HP(OPT-45G), 1000HP(CRYO)
	1000HP-1+6, 1000HP-1+8, 1000LP, 1000LP(OPT-45), 1000LP(OPT-46G)
	6987
	8310HP, 8310HP-1+6, 8310HP-1+8, 8310LP, 8311HP, 8311LP
	345, 345(OPT-45)
	BA1/BL1, PA1/PL1
	C-BPV, C-PRV, C-CS
	D, D(CRYO), D(OPT-37), D(OPT-20), D(OPT-45)
	DL, DL(LCC), DL(OPT-45)
	BR, BR(CRYO)
	HP, HP(LCC), HP(OPT-45), HP(OPT46G), HP-1+6+S(OPT-40), HP-1+6+S
	P1, P2, P3, P4, P5, P7
	B2, B7
	POSR-1, POSR-2
	5200P, 5300P
	135
	NW-PL, NW-SO
	CG-PILOT
	FG1
REGULATORS	RANGER, 987, PREMIER
	964, 521, 988, 988-MB, 989
	2296/2296HF
	SCV-30, SCV-S
TANK BLANKETING	8700, 8910, 8920, 8930, 8940
	2100, 2199
	3100, 3200, 3300, 3400, 3500, 3600, 3700
	1078, 1088, 1100, 1049
	5100, 5200, 5400, 5500
	4100, 4200, 4300, 4400, 4500, 4600
MISC	764P/PD, 764-37, 764T

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