P-K COMPACT® (01/07/2020)
1004905932 - Warren 2800

P-K COMPACT® Temperature Control Equipment Guide

To be used in conjunction with the latest editions of:
P-K COMPACT® Semi-Instantaneous Water Heater I&OM
P-K COMPACT® Supplemental Equipment Guide

Patterson-Kelley
155 Burson Street
East Stroudsburg, PA 18301
Telephone: (570) 476-7261
Toll Free: (877) 728-5351
Facsimile: (570) 476-7247
www.pattersonkelley.com

P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE
P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE
P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE
P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE
P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE
P-K COMPACT TEMPERATURE CONTROL EQUIPMENT GUIDE

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

NOTES:

Warren Series 2800 Control Valve

WARREN CONTROLS

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

IOM

Series 2800

PRECISION GLOBE CONTROL VALVES

TABLE OF CONTENTS

PRODUCT OVERVIEW

This document covers the installation, operation and maintenance of the Series 2800 Precision Globe Control Valves presented in the "Series 2800 Product Specification", including the 2820 Two-Way Single Seat Valve, the 2828 Two-Way Single Seat Low Flow Valve, the 2830 Three-Way Mixing Valve, and the 2832 Three-Way Diverting/ Mixing Valve. Warren Controls Series 2800 Precision Globe Control Valves feature rugged bronze or stainless steel bodies with a variety of trim materials and port sizes. The equal percentage and linear plugs in the 2-way valves and linear plugs in the 3-way valves provide excellent modulating control of a wide variety of fluids for pressure, temperature, level, and flow applications from –20 to 500°F (dependent on contruction). The Series 2800 is ideally suited where value and long life are important objectives for applications including but not limited to the Chemical, Food & Beverage, General Service, Refining, District Energy, and ideal for Pharmaceutical Industries.

GENERAL INFORMATION

The instructions given herein cover generally the operation and maintenance of subject equipment. Should any questions arise which may not be answered specifically by these instructions, they should be referred to Warren Controls Inc. for further detailed information and technical assistance. This manual cannot possibly cover every situation connected with the operation, adjustment, inspection, test, overhaul and maintenance of the equipment furnished. Every effort is made to prepare the text of this manual so that engineering and design data is transformed into the most easily understood wording. Warren Controls Inc., in furnishing this equipment and this manual, must presume that the operation and maintenance personnel assigned thereto have sufficient technical knowledge and experience to apply sound safety and operational practices which may not be covered herein. In applications where Warren Controls Inc. furnished equipment is to be integrated with a process or other machinery, these instructions should be thoroughly reviewed to determine the proper integration of the

Valve Identification

equipment into the overall plant operational procedures. Warren Controls does not assume responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any Warren Controls product remains solely with the purchaser and end-user

ACTUATORS AND ACCESSORIES

Series 2800 Precision Globe Control Valves are available with a variety of actuators and accessories. These actuators and accessories have separate instructions. For complete control valve installation, operation, and maintenance instructions see also the instructions for the actuator and accessories in use

VALVE IDENTIFICATION

To use these instructions it is necessary to identify the configuration of the valve. Factory assembled control valves have a nameplate mounted on the actuator. The valve's part number (P/N) is present on the plate. The part number represents the configuration of the control valve. To identify the valve's type, size, actuator, accessories, and other characteristics decode the part number using configuration table. If the information is incomplete, incorrect, or not present contact the factory with the valve serial number listed on the plate. (See Information Present on Control Valves section for location of part number, serial number, and other important information on valve.)

	VALVE BODY							
Model	Valve Type	Size	Body Material	End Connection	Trim Style	Trim Material	Trim Cv	Packing Type
28N	**20** 2-Way Single Seat **28** 2-Way Lo-Flow **30** 3-Way Mixing **32** 3-Way Diverting	**050** 1/2 inch **075** 3/4 inch **100** 1 inch **125** 1-1/4 inch **150** 1-1/2 inch **200** 2 inch	**B** Bronze **F** CF8M	**S** Screwed **B** SCH 40 Buttweld End	**E** Equal % **L** Linear **M** Mod Lin Types 30/32, Linear Only Types 28 Mod Lin Only	**S** 316SS * **B** Bronze **G** Alloy 6 **H** 17-4 PH **T** Teflon **P** PEEK NOTE: * Type 28, 316SS trim uses a harder Nitronic 60 seat.	**F** Full Port **1** 1st Port Reduction **2** 2nd Port Reduction **3** 3rd Port Reduction **4** 4th Port Reduction	**T** Teflon **G** Graphite **V** Vacuum Service **L** EPDM

ACTUATOR

Actuator Series

00 None

DIAPHRAGMS:

49 DL49 (49 Sq.In.)

4X DL49XR

84 DL84 (84 Sq.In.)

8X DL84XR (84 Ext. Rng.)

Action

0 None

R Reverse Stem Fail Down

D Direct Stem Fail Up

Spring Range

0 None

L Low 4-10 PSI 49R ; 3-9 PSI 49D, 84R/D

F Full 5-14 PSI 49R ; 4-13 PSI 49D; 3-15 PSI 84R/D

H High 9-15 PSI 84;115 10-14 PSI 49R 8-12 PSI 49D

X Xtra-High DL49XR, DL84XR

Handwheel

0 None

R Reverse

D Direct

ACCESSORIES

Positioners, I/P's & Limit Switches

0000 None

POSITIONERS:

BxP_ BLX Pneumatic

BxE_ BLX ElectroPneumatic

BxI_ BLX ElectroPneu. Intrn. Safe

BxX_ BLX ElectroPneu. Exp. Proof

BxF_ BLX ElectroPneu. Fail Freeze

76P Moore760 Pneumatic

76E Moore760 Electro-Pneumatic

P24 Siemens PS2 Electro-Pneumatic

P2H Siemens PS2 2,3,4 Wire HART

P2P Siemens PS2 PROFIBUS PA

P2F_ Siemens PS2 FOUND.FIELDBUS

x digit spec.

F Full Range Signal, 3-15 PSI or 4-20mA

L Low of Split Range, 3-9 PSI or 4-12mA

H High of Split Range, 9-15 PSI or 12-20mA

4th digit spec.

0 No Additions

L w/Mech. Lmt Switch's

F w/4-20 Feedback

B w/Switch's & Feedback

NOTE: L,F,B not available for BxI , BxX.

PROXIMITY SWITCHES:

PX11 Mark 1 Series - 2 ea. SPDT

PX12 Mark 1 Series - 2 ea. SPDT w/2k Pot.

PX13 Mark 1 Series - 2 ea. SPDT w/4-20 Feedback

PX14 Mark 1 Series - 4 ea. SPDT

PX15 Mark 1 Series - 6 ea. SPDT

I/P's *Use with Diaphragm Only*

MAP1 Type 500X I/P, 3-9 PSI

MAP2 Type 500X I/P, 9-15 PSI

MAP3 Type 500X I/P, 3-15 PSI

MAP4 Type 500X I/P, 1-17 PSI

MAP5 Type 500X I/P, 6-30 PSI

MAP6 Type 550X I/P, 0-30 PSI

MAP9 Type 950X I/P, 3-15 EXP

Air Filter Regulators

0 None

A Type 300, 0-30 PSI

B Type 300, 0-60 PSI

D Type 350SS, 0-100 PSI

ASCO Solenoids

0 None

120 VAC COILS

A 8320G184 3-Way Brass

B 8320G202 3-Way SS

L EF8320G184 3-Way EXP Br.

M EF8320G202 3-Way EXP SS

24 Vdc COILS

Z 8320G184 3-Way Brass

Special Options

0 None

S Special Opts or Set-up

T SS Tubing

G SS Tagging

B SS Tubing and Tagging

Note: Standard pneumatic tubing is copper. SS tubing "**T**" is optional.

SS tagging "**G**" (Two lines, 24 characters/line) is optional.

SS tubing and tagging together "**B**" is optional.

FAILURE MODES:

MODE	VALVE TYPE	ACTUATOR ACTION
Closed	20/28	Reverse
Open	20/28	Direct
Upper Closed*	30/32	Direct
Upper Open	30/32	Reverse

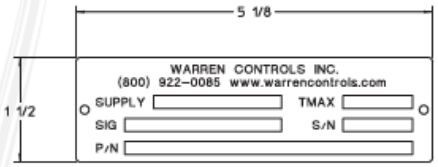
*Standard

Information Present on Control Valves

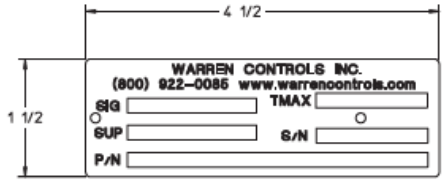
INFORMATION PRESENT ON CONTROL VALVES

There is a great deal of information present on each control valve ranging in importance from the part number and serial number to the color of the paint and casting numbers. This information is important for identifying the valve, installing it correctly, and obtaining parts. Examples of the current factory nameplates and flow arrow plates used on Series 2800 control valves are shown here. The accompanying table identifies the information present and where to find it on the control valve. There may also be other casting numbers and foundry marks present that do not provide useful information. Customer specific tagging may also present. The plates used, and information present, on Warren Controls other product lines or older valves may be different, contact the factory for details.

ACTUATOR NAMEPLATES

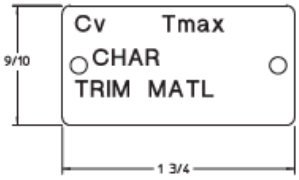


DL84

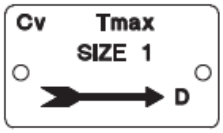


DL49

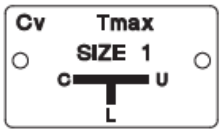
VBA NAMEPLATES



INDUSTRIAL VBA



2-WAY 1/2 THRU 1 INCH • 2800 S/S VBA



3-WAY MIXING 1/2 THRU 1 INCH • 2800 S/S VBA

Information Present on Control Valve Series 2800

INFORMATION PRESENT ON CONTROL VALVE SERIES 2800

Part Number & Serial Number

Information	Symbol(s)	Location	Notes
Part number (Configuration)	**P/N**	On actuator	• On **Actuator Nameplate** attached to leg(s) of actuator.
Serial number	**S/N**	On actuator and valve body	• On **Actuator Nameplate** attached to leg(s) of actuator. • Number only stamped on valve body end connection (2800).* * Number stamped using approximately 1/8 inch tall characters

Flow Direction(s)

Information	Symbol(s)	Location	Notes
Flow direction through valve	➡	On valve body	• On **2800 S/S VBA Nameplate** attached to mounting boss on valve body between the end connections (2800 S/S valves ½ thru 1 inch except 1 inch S/S 2832). • Arrow cast on valve body between the end connections (2800 S/S 2-way 1-1/4 thru 2 inch).
Inlet location	**INLET**	On valve body	• Stamped on valve body inlet end connection (2-way 2800 bronze valves ½ thru 2 inch & S/S valves 1-1/4 thru 2 inch).
Port locations for 3-way valves	**U** upper port, **L** lower port, **C** common port	On valve body	• U, L, & C stamped on valve body end connections (3-way 2800 bronze valves ½ thru 2 inch & 3-way 2800 S/S valves 1-1/4 thru 2 inch & 1 inch S/S 2832).

Input Signal & Supply

Information	Symbol(s)	Location	Notes
Input signal	**SIG**	On actuator	• On **Actuator Nameplate** attached to leg(s) of actuator.
Supply pressure	**SUP or SUPPLY**	On actuator	• On **Actuator Nameplate** attached to leg(s) of actuator.

Valve Attributes

Information	Symbol(s)	Location	Notes
Maximum temperature rating of valve body	**TMAX or Tmax**	On actuator and valve body	• On **Actuator Nameplate** attached to leg(s) of actuator. • On **Industrial VBA Nameplate** wired to valve body between the end connections on side opposite flow arrow plate (2800 bronze valves ½ thru 2 inch & 2800 S/S valves 1-1/4 thru 2 inch, & 1 inch S/S 2832). • On **2800 S/S VBA Nameplate** attached to mounting boss on valve body between the end connections on side opposite flow arrow plate (2800 S/S valves ½ thru 1 inch except 1 inch S/S 2832).
Trim Cv (Flow coefficient)	**Cv**	On valve body	• On **Industrial VBA Nameplate** wired to valve body between the end connections on side opposite flow arrow plate (2800 bronze valves ½ thru 2 inch & 2800 S/S valves 1-1/4 thru 2 inch, & 1 inch S/S 2832). • On **2800 S/S VBA Nameplate** attached to mounting boss on valve body between the end connections on side opposite flow arrow plate (2800 S/S valves ½ thru 1 inch except 1 inch S/S 2832).
Trim style (Characteristic)	**CHAR**	On valve body	• On **Industrial VBA Nameplate** wired to valve body between the end connections on side opposite flow arrow plate (2800 bronze valves ½ thru 2 inch & 2800 S/S valves 1-1/4 thru 2 inch, & 1 inch S/S 2832).
Trim material	**TRIM MATL**	On valve body	• On **Industrial VBA Nameplate** wired to valve body between the end connections on side opposite flow arrow plate (2800 bronze valves ½ thru 2 inch & 2800 S/S valves 1-1/4 thru 2 inch, & 1 inch S/S 2832).
Valve size	**SIZE**	On valve body	• On **2800 S/S VBA Nameplate** attached to mounting boss on valve body between the end connections on side opposite flow arrow plate (2800 S/S valves ½ thru 1 inch except 1 inch S/S 2832).
Valve body material		On valve body	• If CF8M is cast on the valve the valve body material is 316 stainless steel.

Body Style Versus Application

BODY STYLE VERSUS APPLICATION

2-Way Valves (Control of Liquids, Gases, and Steam)

2820 Two-Way Single Seat Unbalanced Valve

The most commonly applied solution with ANSI Class IV and VI shut-off.

Sizes:	1/2, 3/4, 1, 1-1/4, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE)
Trim:	EQ% or Linear, 316 Stainless Steel, Alloy 6, TFE, PEEK, or 17-4 PH Hardened Stainless Steel
Shut-off:	ANSI Class IV (Stainless Steel and Alloy 6 Trim), ANSI Class VI (TFE and PEEK Trim)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (+32 to 350°F) Guided Low-Friction TFE V-Ring, Spring Loaded (+32 to 450°F), Adjustable Graphite Packing (+32 to 500°F)
Temperature:	+32 to 400°F (Bronze 250LB Threaded Body) +32 to 450°F (316 Stainless Steel 300LB Threaded or Buttweld Body w/ TFE or PEEK Trim) +32 to 500°F (316 Stainless Steel 300LB Threaded or Buttweld Body w/ Stainless Steel or Alloy 6 Trim)
Rangeability:	50:1

2828 Two-Way Single Seat Low Flow Unbalanced Valve

Low Flow Trim with ANSI Class IV and VI shut-off.

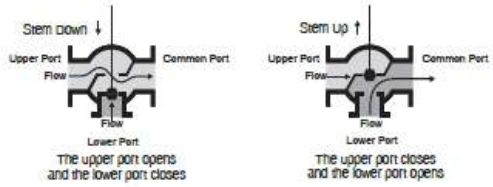
Sizes:	1/2, 3/4, 1 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE)
Trim:	Modified Linear, 316 Stainless Steel, TFE, or PEEK
Shut-off:	ANSI Class IV (Stainless Steel Trim), ANSI Class VI (TFE and PEEK Trim)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (+32 to 350°F) Guided Low-Friction TFE V-Ring, Spring Loaded (+32 to 450°F), Adjustable Graphite Packing (+32 to 500°F)
Temperature:	+32 to 400°F (Bronze 250LB Threaded Body) +32 to 450°F (316 Stainless Steel 300LB Threaded or Buttweld Body w/ TFE or PEEK Trim) +32 to 500°F (316 Stainless Steel 300LB Threaded Body or Buttweld Body w/ Stainless Steel Trim)
Rangeability:	40:1 for Cv 1.00 and 0.50. 20:1 for Cv 0.25

3-Way Valves (Control of Liquids)

2830 Three-Way Mixing Valve

This valve has two inlets and one outlet, and is the simplest solution for mixing or bypass applications with ANSI Class IV shut-off. In normal applications the inlet pressures are near equal and control is possible from 5% to 95% of travel with inlet pressures up to 100 PSI.

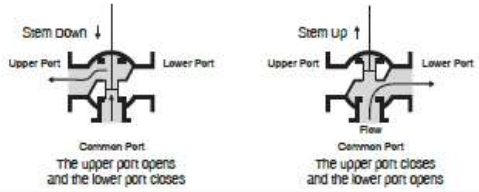
Sizes:	1/2, 3/4, 1, 1-1/4, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE)
Trim:	Linear, 316 Stainless Steel
Packing:	Long-Life Multi-Stack EPDM Lip Packing (+32 to 350°F) Guided Low-Friction TFE V-Ring, Spring Loaded (+32 to 450°F), Adjustable Graphite Packing (+32 to 500°F)
Temperature:	+32 to 400°F (Bronze 250LB Threaded) +32 to 500°F (316 Stainless Steel 300LB Threaded or Buttweld)
Rangeability:	50:1



2832 Three-Way Diverting/Mixing Valve

Designed as a diverting valve with one inlet and two outlets with ANSI Class III shut-off. However, flow can be reversed for mixing if this port configuration is desirable. The difference between the upper port and lower port pressure must not exceed 50 PSID.

Sizes:	1, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE)
Trim:	Linear, Bronze (Bronze 250LB Threaded), or 316 Stainless Steel (316 Stainless Steel 300LB Threaded or Buttweld)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (+32 to 350°F) Guided Low-Friction TFE V-Ring, Spring Loaded (+32 to 450°F), Adjustable Graphite Packing (+32 to 500°F)
O-Ring:	EPR (Bronze 250LB Threaded), Fluoraz 797 (316 Stainless Steel 300LB Threaded or Buttweld)
Temperature:	+32 to 300°F (Bronze 250LB Threaded) +32 to 500°F (316 Stainless Steel 300LB Threaded or Buttweld)
Rangeability:	50:1



Dimensions and Weights

DIMENSIONS & WEIGHTS

Dimension (IN) 2820		Valve Size (IN)		
		1/2, 3/4, 1	1-1/4 & 1-1/2	2
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	2-3/4	3-1/4	3-5/8
	300THD & BWE	3	3-1/2	3-7/8
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
Weight (LB)	250THD	8-1/2	14-1/2	18-1/2
	300THD	8	15-1/2	19
	300BWE	9-1/2	18	22-1/2

Dimension (IN) 2830		Valve Size (IN)		
		1/2, 3/4, 1	1-1/4 & 1-1/2	2
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	2-23/32	3-13/16	4
	300THD	2-23/32	3-3/8	3-3/4
	300 BWE	8	8-3/4	9
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
Weight (LB)	250THD	9	15-1/2	20
	300THD	8	15	18-1/2
	300BWE	10-1/2	19	23-1/2

Dimension (IN) 2828		Valve Size (IN)		
		1/2, 3/4, 1		
A	250THD	4-7/8		
	300THD	5		
	300BWE	15-3/8		
B	250THD	2-3/4		
	300THD & BWE	3		
C	250THD	2-7/8		
	300THD & BWE	2-7/8		
Weight (LB)	250THD	8-1/2		
	300THD	8		
	300BWE	9-1/2		

Dimension (IN) 2832		Valve Size (IN)		
		1	1-1/2	2
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	3-15/32	3-13/16	4
	300THD	2-23/32	3-3/8	3-3/4
	300 BWE	8	8-3/4	9
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
Weight (LB)	250THD	9	16-1/2	21
	300THD	8	16	19-1/2
	300BWE	10-1/2	20	24-1/2

Face to face dimensions conform to Historical Warren Controls standard and are **NOT** ANSI/ISA compatible.

Actual shipping weights may vary.

AGENCY APPROVALS

CRN REGISTERED SERIES 2800 BRONZE VALVES

ISO 9001 : 2000

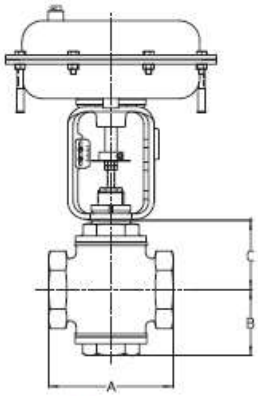
Pressure ratings are PSIG

For applications below 32° consult factory.

For applications above 375°, 300 THD Stainless Steel Body is recommended.

Trim Materials	Flowing Differential Pressure Limit
Bronze	50 PSID
316 Stainless Steel	100 PSID
TFE	100 PSID
PEEK	100 PSID
17-4 pH Hardened Steel	200 PSID
Alloy 6	300 PSID

Body Pressure-Temperature Ratings:		
Temperature (F)	250 THD Bronze	300 THD& BWE SS
+32° To 100°F	400	720
150°	400	670
175°	392	645
200°	385	620
225°	375	605
250°	365	590
275°	350	575
300°	335	560
325°	317	548
350°	300	537
375°	275	526
400°	250	515
450°	-	497
500°	-	480



2-Way or 3-Way
w/ DL49 or 49XR

Valve shown with DL49 Actuator as typical.

For additional actuator information see Series 2800 Product Specification and the Installation Operation and Maintenance Instructions for the actuator in use.

Installation

Check valve for any damage due to improper storage or transportation. Immediately notify your sales organization of any damaged goods upon receipt. Do not attempt to move or disturb the valve further so photos may be taken. If the shipping container is noticeably damaged refuse receipt, as the shipping company should be held liable until a shipping representative is available to take photos.

INSTALLATION

See also separate actuator and accessory instructions for additional installation guidelines.

- Be sure that the flow medium, ambient temperature and the selected location will not exceed the maximum temperature of the valve, actuator, or accessories. Information can be found in the product specifications and on the nameplate(s) regarding these limits (See Information Present on Control Valves section for location of important information on valve).
- Follow good piping practices. Install a bypass around the valve. Install stop valves in inlet and outlet piping to provide means to isolate valve.
- A straight run of pipe is recommended for 10 pipe diameters upstream of the valve and 20 pipe diameters downstream of the valve.
- Protect valve and downstream equipment with a self-cleaning strainer.
- Provide proper inlet and outlet drainage in steam service to prevent water hammer or possible erosion in equipment.
- Install gauges in inlet and outlet piping to provide means for checking adjustment and operation.
- For maximum efficiency and minimum wear install valve in vertical position with the stem pointing upward.
- Actuators mounted in any position other than vertical must be supported independent of the valve. **DO NOT MOUNT DL115 ACTUATORS IN THE HORIZONTAL POSITION.**
- Be sure to leave clearance to allow for actuator removal (See Dimensions & Weights section of Product Specification for actuator removal clearance).
- Before installing, be sure valve and piping are clean inside and free of scale, chips, welding spatter, and foreign material. Thoroughly blow out or flush pipe lines.
- The valve must be installed with the fluid flowing in the correct direction(s). For proper operation in all applications, control valves must be piped according to the corresponding flow arrows, inlet markings, and port markings present on each valve (See Information Present on Control Valves section for location of important information on valve).

- Pipes must be aligned squarely with the valve at each connection.
- If the valve has screwed ends, do not apply pipe dope to the threads of the valve body or to the first two threads of the pipe.
- If the valve has flanged ends, tighten flange bolts evenly to prevent excessive stress and the possibility of cracking.
- If the valve has welded ends, prevent plug and cage distortion by keeping excess heat from the body.
- The valve, actuator, and accessories (if so equipped) are assembled, tested, and calibrated at the factory. The actuator nameplate specifies set-up parameters used (See Information Present on Control Valves section for location of important information on valve). Do not exceed the supply pressure listed on the actuator nameplate or you will damage the valve and void the warranty.
- Supply air or voltage, instrument signal, and accessories should be connected to ports or terminals as indicated on t he control valve.
- Final tuning may be required under actual operating conditions.
- On critical or dangerous equipment, provide suitable safety and emergency systems to protect personnel and property from injury due to a valve malfunction. If the valve handles flammable, toxic, corrosive or explosive fluids, provide for safety in the event of valve leakage or malfunction.
- Do not obscure flow arrow plates or nameplates with paint. If flow arrow plates or nameplates will be covered with insulation, it is recommended the information on the plates be transcribed on the outside of the insulation in the same location as the plate.

OPERATION

- Close inlet and outlet stop valves.
- Check that valve responds through rated travel in relation to changes in input signal. Rated travel is shown by position of travel indicator on valve stem relative to travel indicator on yoke.
- For valves fitted with a handwheel, manually operate valve using handwheel through rated travel to check freedom of movement. Return handwheeel to its standby position.
- Place valve in operation.

For proper operation in all applications, control valves must be piped properly. If you need detailed information, please refer to the "Heat Exchanger Bypass Piping Applications" document.

Maintenance

MAINTENANCE

Series 2800 Precision Globe Control Valves are for the most part maintenance free when properly selected and installed. Rebuilding of these valves should not be necessary under normal operating conditions. For best operation follow installation guidelines (See Installation section); maintain the fluid pressure, temperature, flow, flowing differential pressure, and shut-off differential pressure within the limits of the valve (See Series 2800 Product Specification for details). In installations where high vibration exists, pneumatic and/or electrical connections should periodically be checked for integrity. In water or water and glycol applications, good water quality must be maintained or the service life of the valve may be reduced (See Water Quality Guidelines). The valve stem must be kept free of debris, deposits, dirt, dust, and scratches or the packing parts may be damaged resulting in a packing leak. Control valve hunting will cause excessive stroking of the valve stem and result in premature failure of the packing seal. The system must be stabilized to prevent hunting to ensure reasonable packing life and optimal control performance. Oversizing of a control valve will result in an unstable condition, which can cause noise, vibration, and premature trim and packing seal failure. The use of Warren Controls ValveWorks sizing program will facilitate the selection of the optimum valve.

PACKING ADJUSTMENT

Series 2800 Precision Globe Control Valves have either self-adjusting packing or adjustable packing. Valves with Body Material **B** Bronze and Packing Type **T** V-ring, **V** Vacuum Service, or **L** Lip Packing have self-adjusting packing and require no external adjustment. If the valve has self-adjusting packing and a packing leak is observed replace the packing and if necessary the stem and plug assembly.

Valves with Body Material **B** Bronze and Packing Type **G** Graphite have adjustable packing. Valves with Body Material **S** CF8M and Packing Type **T** V-ring, **G** Graphite, or **V** Vacuum Service Packing also have adjustable packing. If the valve has adjustable packing and a packing leak is observed, tighten the packing nut ¼ turn and observe. If the leak continues tighten the packing nut another ¼ turn and observe. Repeat as necessary. If the leak continues and the packing nut cannot be tightened further with reasonable force replace the packing and if necessary the stem and plug assembly.

PARTS/ OVERHAUL

Damaged or worn parts can decrease performance and shorten valve life.

Damaged or worn packing parts including the packing, bearings, spring, and other bonnet parts can cause a packing leak resulting in damage to the actuator, accessories, and surrounding equipment. Damaged or worn packing parts can also cause increased hysteresis resulting in poor control.

Damaged or worn trim parts including the plug, stem, seat ring, piston, and o-ring can cause increased hysteresis, poor control, excessive internal leakage, and poor shut-off. Damaged or worn trim parts can also cause damage to the packing parts resulting in a packing leak.

Damaged or worn body gaskets or o-ring seals can cause external leakage resulting in damage to the actuator, accessories, and surrounding equipment.

Should parts become worn or damaged, parts kits are available. Repack Kits are available to replace the packing. Repack/Inspection Kits are available to allow the valve to be opened for inspection of its internal parts. Rebuild/Repack Kits are available to completely rebuild/ overhaul the valve. Parts kits come with complete step-by-step instructions. Each kit has its own part number. Please provide the valve's serial number to ensure getting the correct kit part number and correct parts.

DO NOT ATTEMPT TO SERVICE WITHOUT A REPACK/INSPECTION KIT & SUPPLEMENTAL INSTRUCTIONS.

Parts Kits

PARTS KITS

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL B BRONZE & PACKING TYPE T V-RING — SEE DWG C3769950

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
2	1	RETAINER BEARING	7	1	PACKING SPRING
3	1	PACKING RETAINER	8	1	O-RING RETAINER
5	1	V-RING PACKING SET	9	1	O-RING
6	1	MALE ADAPTER	12	1	TUBE STEM LUBE

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL F CF8M & PACKING TYPE T V-RING — SEE DWG C3760953

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
3	1	O-RING	7	1	V-RING PACKING SET
4	1	O-RING RETAINER	9	1	RETAINER BEARING
5	1	SPRING	10	1	PACKING RETAINER
6	1	MALE ADAPTER	12	1	TUBE STEM LUBE

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL B BRONZE & PACKING TYPE G GRAPHITE — SEE DWG C3769952

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
2	1	PACKING RETAINER	5	1	PACKING CARTRIDGE
3	1	RETAINER BEARING	8	1	TUBE STEM LUBE

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL F CF8M & PACKING TYPE G GRAPHITE — SEE DWG C3760955

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
3	1	PACKING CARTRIDGE	6	1	PACKING RETAINER
5	1	RETAINER BEARING	8	1	TUBE STEM LUBE

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL B BRONZE & PACKING TYPE V VACUUM SERVICE — SEE DWG C3761956

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
2	1	PACKING RETAINER	8	1	PACKING SPRING
3	1	RETAINER BEARING	9	1	O-RING RETAINER
5	1	MALE ADAPTER	10	1	O-RING
6	1	V-RING PACKING SET	13	1	TUBE STEM LUBE
7	1	FEMALE ADAPTER			

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL F CF8M & PACKING TYPE V VACUUM SERVICE — SEE DWG C3760961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
2	1	PACKING RETAINER	8	1	SPRING
3	1	RETAINER BEARING	9	1	O-RING RETAINER
5	1	MALE ADAPTER	10	1	O-RING
6	1	V-RING PACKING SET	13	1	TUBE STEM LUBE
7	1	FEMALE ADAPTER			

REPACK KIT
FOR 28N MODELS WITH BODY MATERIAL B BRONZE & TYPE L LIP PACKING — SEE DWG C3769956

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
2	1	RETAINER BEARING	5	3	LIP PACKING
3	1	PACKING RETAINER	8	1	TUBE STEM LUBE

PARTS KITS

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 20 BODY MATERIAL B BRONZE
SEE DWG D3210959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
13	1	TUBE PERMATEX #2		1	REPACK KIT
	1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)			

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 20 BODY MATERIAL B BRONZE SEE DWG D3210959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM (Trim Material **S, 6,or H**)	13	1	TUBE PERMATEX #2
4	1	GROOVE PIN (Valve size 1-1/4, 1-1/2, & 2 in)	16	1	PLUG & STEM ASSEMBLY (Valve size ½, ¾, & 1 in, Trim Material **T or P**)
5	1	PLUG (Trim Material **S, 6,or H**)	17	1	PLUG ASSEMBLY (Valve size 1-1/4, 1-1/2, & 2 in, Trim Material **T or P**)
6	1	SEAT RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
9	1	SELF LOCKING NUT (Valve size ½, ¾, & 1 in, Trim Material **S, 6,or H**)		1	REPACK KIT
12	1	TRAVEL STOP (Valve size ½, ¾, & 1 in)			

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 20 BODY MATERIAL F CF8M SEE DWG D3210961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	2	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
15	1	TUBE PST SEALANT		1	REPACK KIT
16	1	O-RING LUBE			

PARTS KITS

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 20 BODY MATERIAL F CF8M SEE DWG D3210691

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM (Trim Material **S, 6,or H**)	14	1	TRAVEL STOP (Valve size ½, ¾, & 1 in)
5	1	GROOVE PIN (Valve size 1-1/4, 1-1/2, & 2 in)	15	1	TUBE PST SEALANT
6	1	PLUG (Trim Material **S, 6,or H**)	16	1	O-RING LUBE
7	1	SEAT RING	19	1	PLUG & STEM ASSEMBLY (Valve size ½, ¾, & 1 in, Trim Material **T or P**)
9	2	O-RING	20	1	PLUG ASSEMBLY (Valve size 1-1/4, 1-1/2, & 2 in, Trim Material **T or P**)
10	1	BOTTOM PLUG		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
11	1	SELF LOCKING NUT (Valve size ½, ¾, & 1 in, Trim Material **S, 6,or H**)		1	REPACK KIT

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 28 BODY MATERIAL B BRONZE SEE DWG D3210959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
13	1	TUBE PERMATEX #2		1	REPACK KIT
	1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)			

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 28 BODY MATERIAL B BRONZE SEE DWG D3210959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
6	1	SEAT RING	19	1	SEAT RING ASSEMBLY (Trim Material **T or P**)
13	1	TUBE PERMATEX #2		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
18	1	PLUG, TRAVEL STOP, & STEM ASSEMBLY		1	REPACK KIT

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 28 BODY MATERIAL F CF8M SEE DWG D3210961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	2	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
15	1	TUBE PST SEALANT		1	REPACK KIT
16	1	O-RING LUBE			

PARTS KITS

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 28 BODY MATERIAL F CF8M SEE DWG D3210961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
7	1	SEAT RING	21	1	PLUG, TRAVEL STOP, & STEM ASSEMBLY
9	2	O-RING	22	1	SEAT RING ASSEMBLY (Trim Material **T or P**)
10	1	BOTTOM PLUG			
15	1	TUBE PST SEALANT			
16	1	O-RING LUBE		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
				1	REPACK KIT

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 30 BODY MATERIAL B BRONZE SEE DWG D3270957

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
12	1	TUBE PERMATEX #2		1	REPACK KIT
	1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)			

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 30 BODY MATERIAL B BRONZE SEE DWG D3270957

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM	9	1	SELF LOCKING NUT (Valve size ½, ¾, & 1 in)
7	2	SEAT RING	12	1	TUBE PERMATEX #2
5	1	GROOVE PIN (Valve size 1-1/4, 1-1/2, & 2 in)		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
6	1	PLUG		1	REPACK KIT

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 30 BODY MATERIAL F CF8M SEE DWG D3270958

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
4	2	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
14	1	TUBE PST SEALANT		1	REPACK KIT
15	1	O-RING LUBE			

PARTS KITS

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 30 BODY MATERIAL F CF8M SEE DWG D3270958

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM	11	1	SELF LOCKING NUT (Valve size ½, ¾, & 1 in)
4	2	O-RING	14	1	TUBE PST SEALANT
6	1	GROOVE PIN (Valve size 1-1/4, 1-1/2, & 2 in)	15	1	O-RING LUBE
7	1	PLUG		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
8	2	SEAT RING		1	REPACK KIT
10	1	BOTTOM PORT			

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 32 BODY MATERIAL B BRONZE SEE DWG C3270959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	1	TUBE PERMATEX #2		1	REPACK KIT
	1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)			

REBUILD / REPACK KIT
FOR MODEL 28N VALVE TYPE 32 BODY MATERIAL B BRONZE SEE DWG C3270959

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM	9	1	TUBE PERMATEX #2
5	4	JAMNUT	10	1	O-RING LUBE
6	1	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
7	1	PISTON		1	REPACK KIT
8	1	BOTTOM PORT			

REPACK / INSPECTION KIT
FOR MODEL 28N VALVE TYPE 32 BODY MATERIAL F CF8M SEE DWG D3270963

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
3	2	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
10	1	O-RING LUBE		1	REPACK KIT
11	1	TUBE PST SEALANT			

PARTS KITS

REBUILD / REPACK KIT
FOR MODEL **28N** VALVE TYPE **32** BODY MATERIAL **F** CF8M **SEE DWG D3270963**

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	VALVE STEM	8	1	BOTTOM PORT
3	2	O-RING	10	1	O-RING LUBE
5	1	PISTON	11	1	TUBE PST SEALANT
6	1	O-RING		1	ADDITIONAL BONNET SUBASSEMBLY PARTS (SEE TABLE)
7	4	JAMNUT		1	REPACK KIT

ADDITIONAL BONNET SUBASSEMBLY PARTS IN REPACK/ INSPECTION KIT

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **T** V-RING
SEE DWG C3769950

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
8	1	O-RING RETAINER	9	1	O-RING

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & PACKING TYPE **T** V-RING
SEE DWG C3760953

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
3	1	O-RING	4	1	O-RING RETAINER

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & TYPE **G** GRAPHITE
SEE DWG C3769952

NONE

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & TYPE **G** GRAPHITE
SEE DWG C3760955

NONE

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **V** VACUUM SERVICE
SEE DWG C3761956

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	1	O-RING RETAINER	10	1	O-RING

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & PACKING TYPE **V** VACUUM SERVICE
SEE DWG C3760961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	1	O-RING RETAINER	10	1	O-RING

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **L** LIP PACKING
SEE DWG C3769956

NONE

PARTS KITS

ADDITIONAL BONNET SUBASSEMBLY PARTS IN REBUILD/ REPACK KIT

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **T** V-RING
SEE DWG C3769950

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
8	1	O-RING RETAINER	10	1	BONNET BEARING
9	1	O-RING	11	1	BONNET

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & PACKING TYPE **T** V-RING
SEE DWG C3760953

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	BONNET	3	1	O-RING
2	1	BONNET BEARING	4	1	O-RING RETAINER

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & TYPE **G** GRAPHITE
SEE DWG C3769952

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
6	1	BONNET	7	1	BONNET BEARING

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & TYPE **G** GRAPHITE
SEE DWG C3760955

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	BONNET	2	1	BONNET BEARING

FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **V** VACUUM SERVICE
SEE DWG C3761956

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	1	O-RING RETAINER	11	1	BONNET BEARING
10	1	O-RING	12	1	BONNET

FOR **28N** MODELS WITH BODY MATERIAL **F** CF8M & PACKING TYPE **V** VACUUM SERVICE
SEE DWG C3760961

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
9	1	O-RING RETAINER	11	1	BONNET BEARING
10	1	O-RING	12	1	BONNET

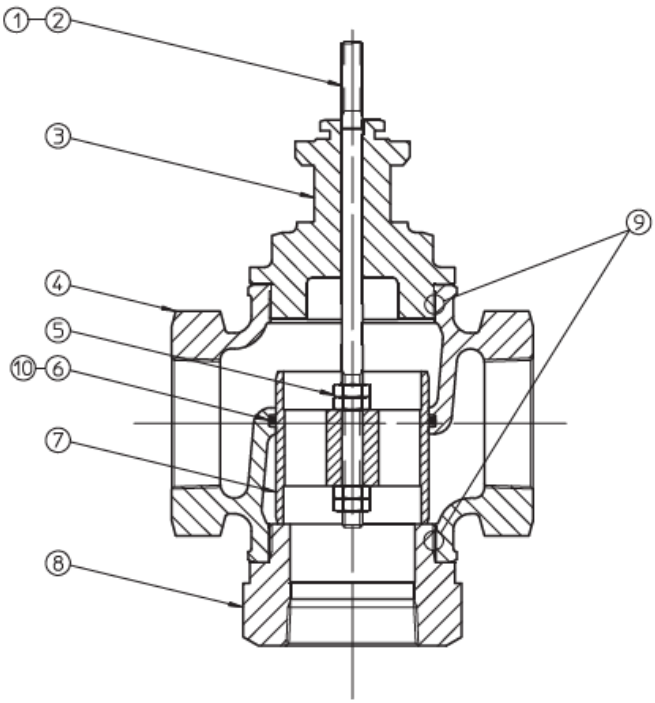
FOR **28N** MODELS WITH BODY MATERIAL **B** BRONZE & PACKING TYPE **L** LIP PACKING
SEE DWG C3769956

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
6	1	BONNET	7	1	BONNET BEARING

C3270959

1) STAMP CHARACTERS PER FLOW ARROW PLATES SHOWN ON D3100018 ON 2 FLATS 180° APART ON EACH HEX END CONNECTION.

NOTES:



ITEM	QTY	DESCRIPTION
10	A/R	O-RING LUBE
9	A/R	PERMATEX #2
8	1	BOTTOM PORT
7	1	PISTON
6	1	O-RING
5	4	JAMNUT
4	1	VALVE BODY
3	1	BONNET SUBASSEMBLY SEE SEPARATE DWG
2	A/R	STEM LUBE
1	1	VALVE STEM

UNLESS OTHERWISE NOTED TOLERANCES ON
DECIMAL .XX ±
DECIMAL .XXX ±
FRACTION ±
ANGLE ±
REMOVE ALL SHARP EDGES AND BURRS
NEXT ASSEMBLY

MATERIAL
TREATMENT
FINISH

DRAWN J.MARTOCCI
DATE 11/18/96
CHECKED
APPROVED

WARREN CONTROLS CORPORATION
BROADWAY, NEW JERSEY 08808

1-2 INCH TYPE 32 BRONZE VBA

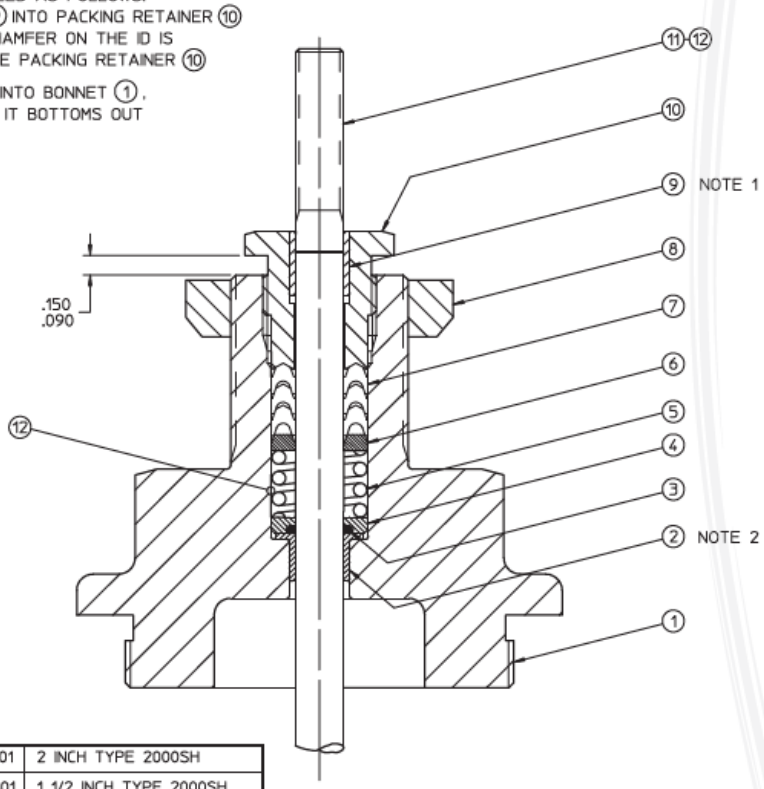
SIZE C
FSCM NO 03847
DWG NO C3270959
REV

C3760953

NOTES:

1) RETAINER BEARING (9) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (9) INTO PACKING RETAINER (10) UNTIL THE END WITH THE CHAMFER ON THE ID IS FLUSH WITH THE TOP OF THE PACKING RETAINER (10)

2) PRESS BONNET BEARING (2) INTO BONNET (1), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND



PART NO	BONNET NO	USED ON
-03	C1180971-01	2 INCH TYPE 2000SH
-02	C1180867-01	1 1/2 INCH TYPE 2000SH
C3760953-01	C1180668-01	1/2 - 1 INCH TYPE 2000SH

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
12	A/R	A0940021	DCIII LUBE	
11	1	AS REQD	VALVE STEM	ST STL TYPE 316
10	1	C1720057-02	PACKING RETAINER	ST STL 300 SERIES
9	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
8	1	B1640034-01	YOKE LOCKNUT	STL PLTD
7	1	A1700054	V-RING PACKING SET	TEFLON
6	1	B1010050-04	MALE ADAPTER	ST STL 300 SERIES
5	1	B1820059	SPRING	ST STL TYPE 302
4	1	B1800050-03	O-RING RETAINER	ST STL 300 SERIES
3	1	04910012	O-RING -012	TEFLON
2	1	B1060055	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
1	1	SEE OTHER TABLE	BONNET	CAST ST STL ASTM A351 CF8M

UNLESS OTHERWISE SPECIFIED: DECIMAL .XX ±, DECIMAL .XXX ±, FRACTION ±, ANGLE ±, ALL FILLET RADII 1/32 MAX, 125 FINISH ON ALL MACHINED SURFACES

MATERIAL: SEE TABLE | TREATMENT | FINISH

DRAWN: J.MARTOCCI 7/2/97 | CHECKED | APPROVED

WARREN CONTROLS CORPORATION
BROADWAY, NEW JERSEY 08808

BONNET SUBASSEMBLY
ADJUSTABLE V-RING PACKING
1/2 THRU 2 INCH TYPE 2000SH

SIZE C | PSCH NO 03847 | DWG NO C3760953- | REV

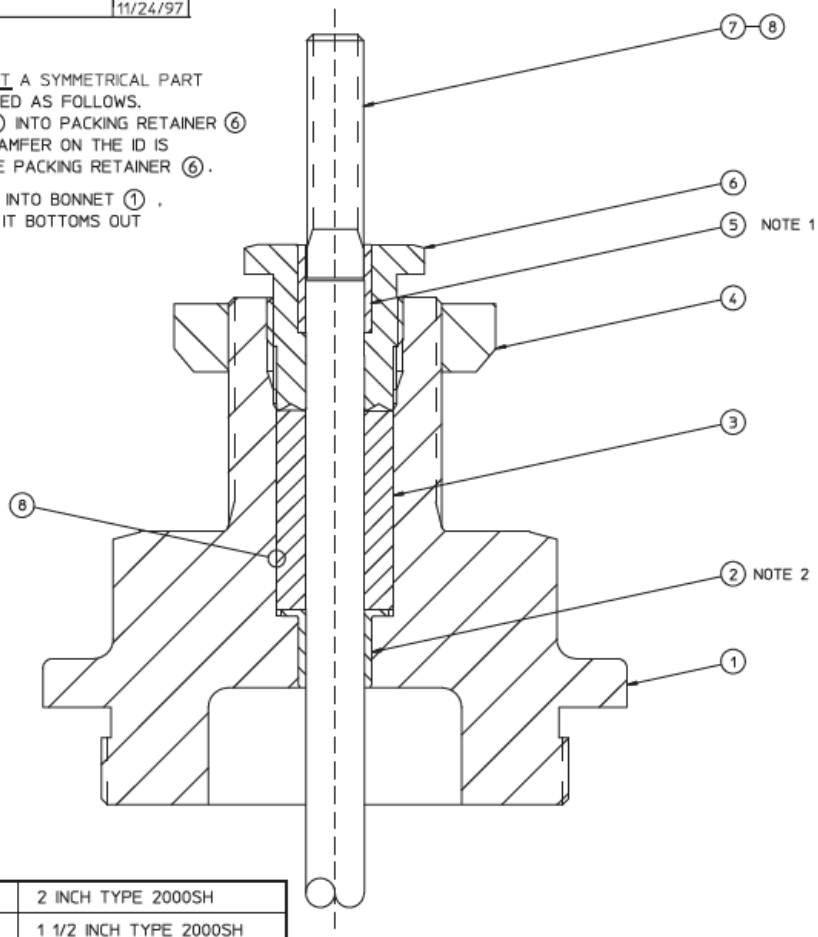
C3760955

REV	DESCRIPTION	DATE
A	ECN 1492	JAM 11/24/97

NOTES:

1) RETAINER BEARING ⑤ IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING ⑤ INTO PACKING RETAINER ⑥ UNTIL THE END WITH THE CHAMFER ON THE ID IS FLUSH WITH THE TOP OF THE PACKING RETAINER ⑥.

2) PRESS BONNET BEARING ② INTO BONNET ① , ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND.



PART NO	BONNET NO	USED ON
-03	C1180971-01	2 INCH TYPE 2000SH
-02	C1180867-01	1 1/2 INCH TYPE 2000SH
C3760955-01	C1180668-01	1/2 - 1 INCH TYPE 2000SH

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
8	A/R	A0940021	DC111 LUBE	
7	1	AS REQD	VALVE STEM	ST STL TYPE 316
6	1	C1720057-02	PACKING RETAINER	ST STL 300 SERIES
5	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
4	1	B1640034-01	YOKE LOCKNUT	STL PLTD
3	1	B1700056	PACKING CARTRIDGE	GRAPHITE
2	1	B1060055	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
1	1	SEE OTHER TABLE	BONNET	CAST ST STL ASTM A351 CF8M

UNLESS OTHERWISE SPECIFIED: DECIMAL .XX ±, DECIMAL .XXX ±, FRACTION ±, ANGLE ±, ALL FILLET RADII 1/32 MAX, 125 FINISH ON ALL MACHINED SURFACES

MATERIAL: SEE TABLE
TREATMENT:
FINISH:

DRAWN: J.MARTOCCI 10/15/97
CHECKED:
APPROVED:

WARREN CONTROLS CORPORATION
BROADWAY, NEW JERSEY 08808

SUBASSEMBLY 1/2-2 INCH TYPE SH BONNET & LOCKNUT W/AGP

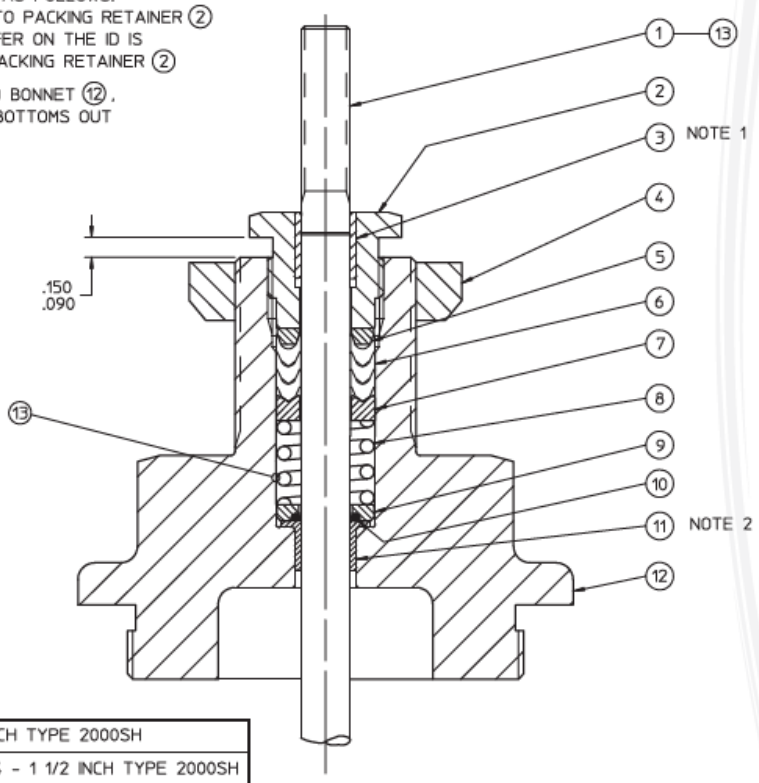
SIZE	PSCH NO	DWG NO	REV
C	03847	C3760955-	A

C3760961

NOTES:

1) RETAINER BEARING (3) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (3) INTO PACKING RETAINER (2) UNTIL THE END WITH THE CHAMFER ON THE ID IS FLUSH WITH THE TOP OF THE PACKING RETAINER (2)

2) PRESS BONNET BEARING (11) INTO BONNET (12), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND



-03	C1180971-01	2 INCH TYPE 2000SH
-02	C1180867-01	1 1/4 - 1 1/2 INCH TYPE 2000SH
C3760961-01	C1180668-01	1/2 - 1 INCH TYPE 2000SH
PART NO	BONNET NO	USED ON

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
13	A/R	A0940021	DC111 LUBE	
12	1	SEE TABLE	BONNET	CAST ST STL ASTM A351 CF8M
11	1	B1060055	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
10	1	04910012	O-RING -012	TEFLON
9	1	B1800050-03	O-RING RETAINER	ST STL 300 SERIES
8	1	B1820059	SPRING	ST STL TYPE 302
7	1	B1010066-02	FEMALE ADAPTER	ST STL 300 SERIES
6	1	A1700054	V-RING PACKING SET	TEFLON
5	1	B1010050-04	MALE ADAPTER	ST STL 300 SERIES
4	1	B1640034-01	YOKE LOCKNUT	STEEL PLATED
3	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
2	1	C1720063-02	PACKING RETAINER	ST STL 300 SERIES
1	1	AS REQD	VALVE STEM	ST STL TYPE 316

UNLESS OTHERWISE SPECIFIED: DECIMAL .XX ± DECIMAL .XXX ± FRACTION ± ANGLE ± ALL FILLET RADII 1/32 MAX 125 FINISH ON ALL MACHINED SURFACES

MATERIAL: SEE TABLE | TREATMENT | FINISH

DRAWN: BLB 6/5/03 | CHECKED | APPROVED

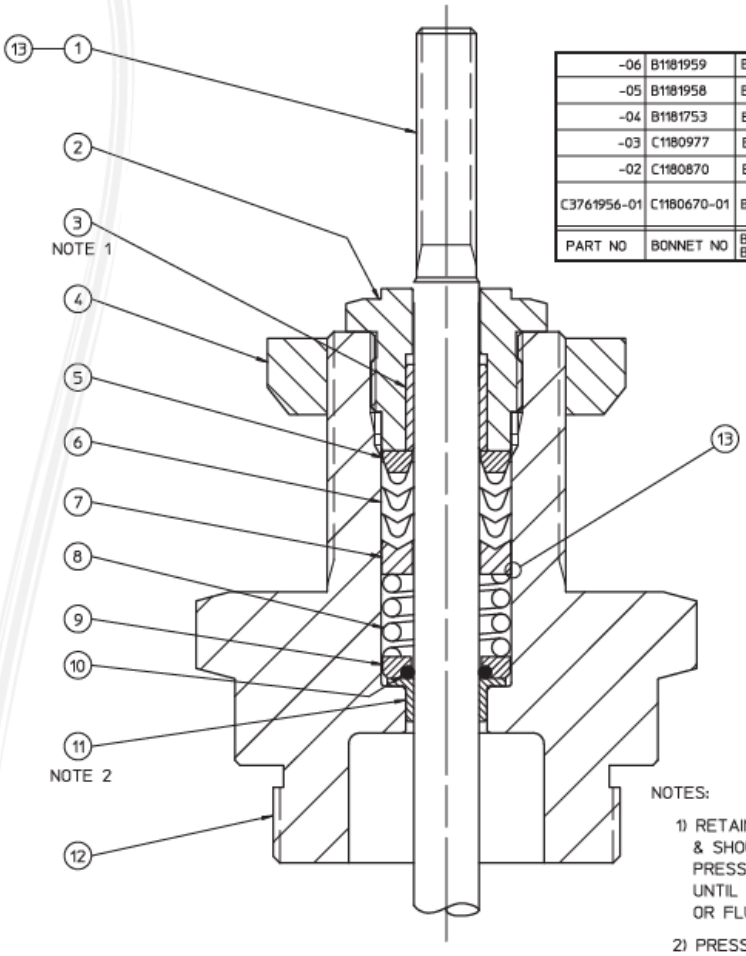
WARREN CONTROLS INCORPORATED
BROADWAY, NEW JERSEY 08808

BONNET SUBASSEMBLY AVP VACUUM SERVICE 1/2 -2 INCH TYPE 2000SH

SIZE C | FSCM NO 03847 | DWG NO C3760961- | REV

C3761956

REV	DESCRIPTION	DATE
A	REDRAWN WITH CHANGE ECN 2161	BLB 11/11/05



PART NO	BONNET NO	BONNET BEARING NO	USED ON
-06	B1181959	B1060057	10 INCH TYPE 22/72 250# FLG
-05	B1181958	B1060057	10 INCH TYPE 22/72 125# FLG
-04	B1181753	B1060057	8 INCH TYPE 22/72
-03	C1180977	B1060055	2 INCH TYPE 20/70, 30
-02	C1180870	B1060055	1 1/2 INCH TYPE 20/70, 30
C3761956-01	C1180670-01	B1060057	1/2 - 1 & 2 1/2 - 10 INCH TYPE 20/70, 30, 32 1 1/2 - 6 INCH TYPE 22/72

NOTES:

1) RETAINER BEARING (3) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (3) INTO PACKING RETAINER (2) UNTIL THE END WITH THE CHAMFER ON THE ID IS ABOVE OR FLUSH WITH THE BOTTOM OF THE PACKING RETAINER (2)

2) PRESS BONNET BEARING (11) INTO BONNET (12), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
13	A/R	A0940021	DC111 LUBE	
12	1	SEE TABLE	BONNET	BRASS OR BRONZE
11	1	SEE TABLE	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
10	1	04910012	O-RING -012	TEFLON
9	1	B1800050-01	O-RING RETAINER	BRASS
8	1	B1820059	SPRING	ST STL TYPE 302
7	1	B1010066-01	FEMALE ADAPTER	BRASS
6	1	A1700054	V-RING PACKING SET	TEFLON
5	1	B1010050-03	MALE ADAPTER	BRASS
4	1	B1640034-01	YOKE LOCKNUT	STEEL PLATED
3	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
2	1	C1720062-03	PACKING RETAINER	BRASS
1	1	AS REQD	VALVE STEM	ST STL TYPE 316

UNLESS OTHERWISE SPECIFIED: DECIMAL .XX ±.010, DECIMAL .XXX ±.005, FRACTION ± 1/64, ANGLE ± 1°, ALL FILLET RADII 1/32 MAX, 125 FINISH ON ALL MACHINED SURFACES, ALL DIMENSIONS ARE IN INCHES

MATERIAL: SEE TABLE | TREATMENT | FINISH

DRAWN: BLB 11/11/05 | CHECKED | APPROVED

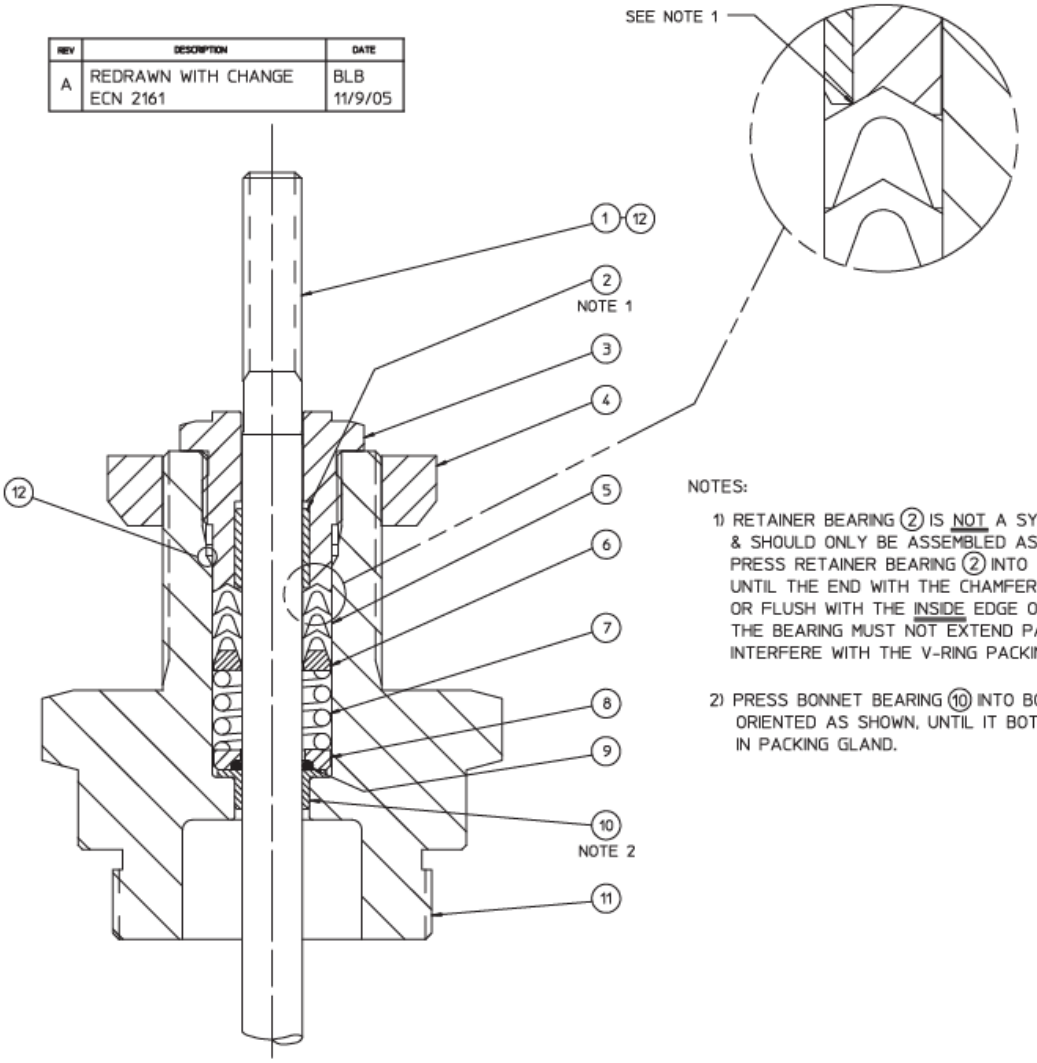
WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-8010

BONNET SUBASSY VACUUM SERVICE
GLFVP 1.376-18 W/ BEARINGS

SIZE C | FSCM NO 03847 | DWG NO C3761956- | REV A

C3769950

REV	DESCRIPTION	DATE
A	REDRAWN WITH CHANGE ECN 2161	BLB 11/9/05



NOTES:

1) RETAINER BEARING (2) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (2) INTO PACKING RETAINER (3) UNTIL THE END WITH THE CHAMFER ON THE ID IS ABOVE OR FLUSH WITH THE INSIDE EDGE OF THE V-NOTCH. THE BEARING MUST NOT EXTEND PAST THE V-NOTCH AND INTERFERE WITH THE V-RING PACKING.

2) PRESS BONNET BEARING (10) INTO BONNET (11), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND.

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
12	A/R	A0940021	DC111 LUBE	
11	1	C1180670-01	BONNET	BRASS
10	1	B1060057	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
9	1	04910012	O-RING -012	TEFLON
8	1	B1800050-01	O-RING RETAINER	BRASS
7	1	B1820059	PACKING SPRING	ST STL TYPE 302
6	1	B1010050-03	MALE ADAPTER	BRASS
5	1	A1700054	V-RING PACKING SET	TEFLON
4	1	B1640034-01	YOKE LOCKNUT	STEEL PLATED
3	1	C1720060-03	PACKING RETAINER	BRASS
2	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
1	1	AS REQD	VALVE STEM	ST STL TYPE 316

REMOVE ALL SHARP EDGES AND BURRS
DIMENSIONED PER ASME Y14.5M-1994
THIRD ANGLE PROJECTION
NEXT ASSEMBLY
UNLESS OTHERWISE SPECIFIED:
DECIMAL .XX ±.010
DECIMAL .XXX ±.005
FRACTION ± 1/64
ANGLE ± 1°
ALL FILLET RADII 1/32 MAX
125 FINISH ON ALL MACHINED SURFACES
ALL DIMENSIONS ARE IN INCHES
MATERIAL: SEE TABLE
TREATMENT
FINISH
DRAWN: BLB 4/15/03
CHECKED
APPROVED

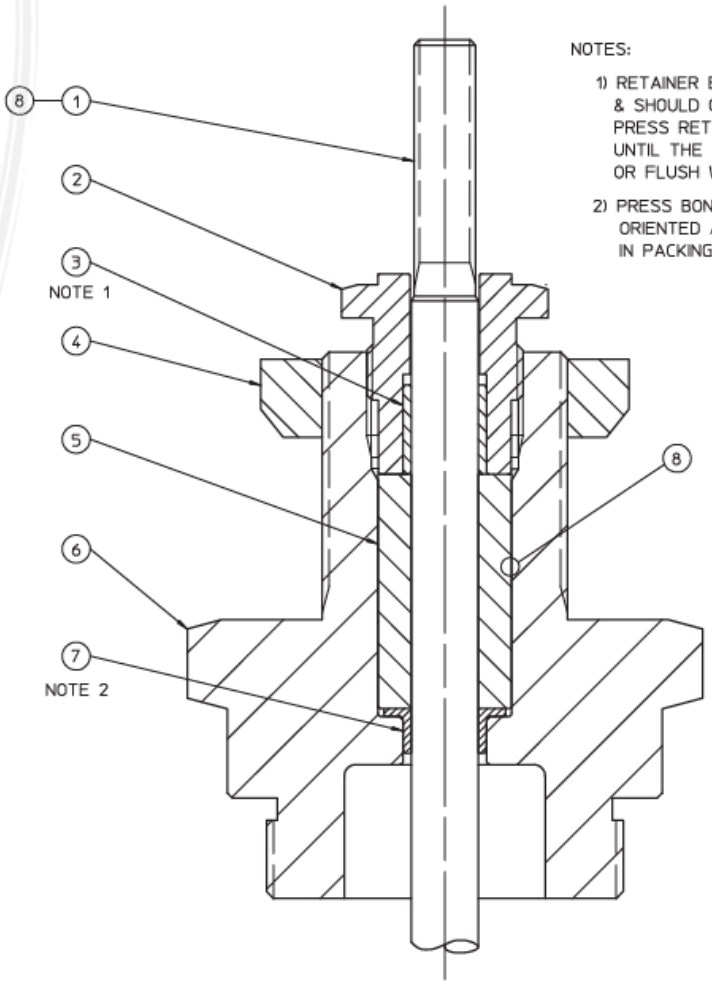
WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-6010

NONADJUSTABLE V-RING PACKING SUBASSY
BONNET 1.376-18, 2-18 W/BEARINGS

SIZE	FSCM NO	DWG NO	REV
C	03847	C3769950	A

C3769952

REV	DESCRIPTION	DATE
A	REDRAWN WITH CHANGE ECN 2161	BLB 11/10/05



NOTES:

1) RETAINER BEARING (3) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (3) INTO PACKING RETAINER (2) UNTIL THE END WITH THE CHAMFER ON THE ID IS ABOVE OR FLUSH WITH THE BOTTOM OF THE PACKING RETAINER (2)

2) PRESS BONNET BEARING (7) INTO BONNET (6), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
8	A/R	A0940021	DC111 LUBE	
7	1	B1060057	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
6	1	C1180670-01	BONNET	BRASS
5	1	B1700056	PACKING CARTRIDGE	GRAPHITE
4	1	B1640034-01	YOKE LOCKNUT	STEEL PLATED
3	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
2	1	C1720061-03	PACKING RETAINER	BRASS
1	1	AS REQD	VALVE STEM	ST STL TYPE 316

REMOVE ALL SHARP EDGES AND BURRS
DIMENSIONED PER ASME Y14.5M-1994
THIRD ANGLE PROJECTION
NEXT ASSEMBLY

UNLESS OTHERWISE SPECIFIED:
DECIMAL .XX ±.010
DECIMAL .XXX ±.005
FRACTION ± 1/64
ANGLE ± 1°
ALL FILLET RADII 1/32 MAX
125 FINISH ON ALL MACHINED SURFACES
ALL DIMENSIONS ARE IN INCHES

MATERIAL: SEE TABLE
TREATMENT
FINISH

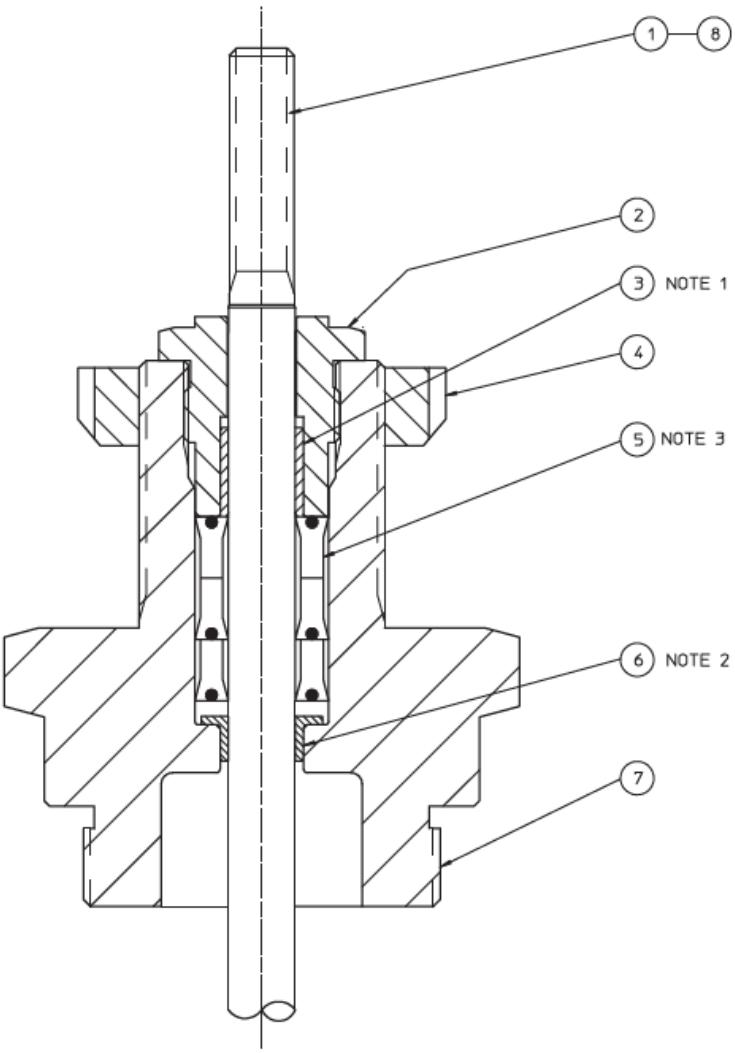
DRAWN: BLB 11/10/05
CHECKED
APPROVED

WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-8010

BONNET SUBASSY ADJUSTABLE GRAPHITE PACKING 1.376-18 2-18 W/ BEARINGS

SIZE	FSCM NO	DWG NO	REV
C	03847	C3769952	A

C3769956



REV	DESCRIPTION	DATE
A	REDRAWN WITH CHANGE ECN 2161	BLB 11/10/05

NOTES:

1) RETAINER BEARING (3) IS NOT A SYMMETRICAL PART & SHOULD ONLY BE ASSEMBLED AS FOLLOWS. PRESS RETAINER BEARING (3) INTO PACKING RETAINER (2) UNTIL THE END WITH THE CHAMFER ON THE ID IS ABOVE OR FLUSH WITH THE BOTTOM OF THE PACKING RETAINER (2).

2) PRESS BONNET BEARING (6) INTO BONNET (7), ORIENTED AS SHOWN, UNTIL IT BOTTOMS OUT IN PACKING GLAND.

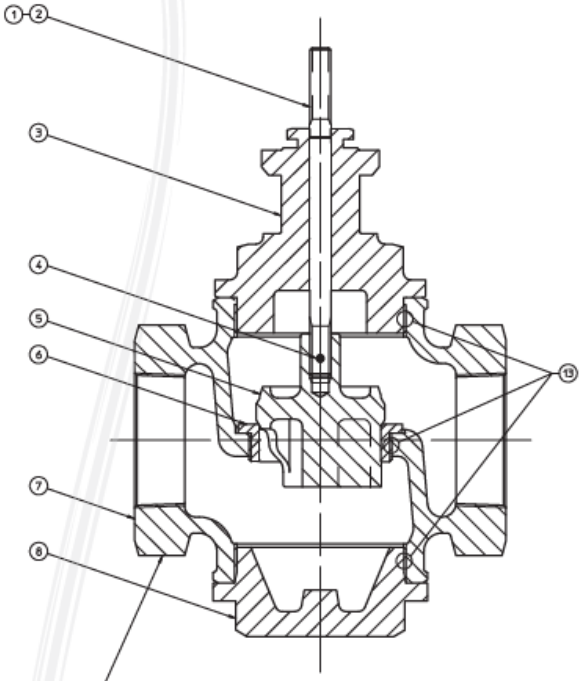
3) PROTECT ID & OD SEALING LIPS OF PACKING FROM CUTS, NICKS OR SCRAPES DURING INSTALLATION. DO NOT FORCE SEALING LIPS PAST BONNET THREADS OR STEM THREADS. USE OF INSTALLATION SLEEVE IS RECOMMENDED. LUBRICATE PACKING ID & OD AND STEM BEFORE INSTALLATION. PACKING MUST BE ORIENTED AS SHOWN.

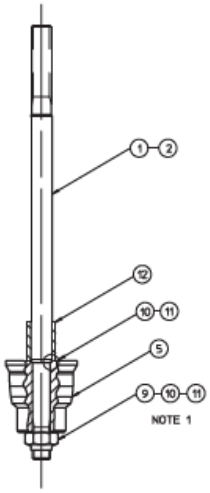
ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
8	A/R	A0940021	DC111 LUBE	
7	1	C1180670-01	BONNET	BRASS ASTM B16 H02
6	1	B1060057	BONNET BEARING	FIBER REINFORCED POLYETHERETHERKETONE
5	3	4207-18700375-312	LIP PACKING	HIGH TEMP ETHYLENE PROPYLENE 90 DURO
4	1	B1640034-01	YOKE LOCKNUT	STL PLTD
3	1	B1060056	RETAINER BEARING	FIBER REINFORCED POLYETHERETHERKETONE
2	1	C1720061-03	PACKING RETAINER	BRASS ASTM B16
1	1	AS REQD	VALVE STEM	ST STL TYPE 316

E SPECIFIED: DECIMAL .XXX ±.005; ANGLE ± 1°; RADII 1/32 MAX; ALL MACHINED; ARE IN INCHES	MATERIAL: SEE TABLE; TREATMENT; FINISH	DRAWN BLB 11/10/05; CHECKED; APPROVED	WARREN CONTROLS INCORPORATED, BETHLEHEM, PENNSYLVANIA 18020-8010	BONNET SUBASSEMBLY NLP PACKING 400°F EPDM 1.376-18 2-18 W/ BEARINGS
			SIZE C; FSCM NO 03847; DWG NO C3769956	REV A

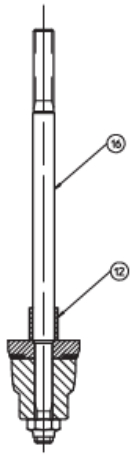
D3210959

REV	DESCRIPTION	DATE
A	REDRAWN WITH CHANGE ECN 2284	BLB 6/29/07



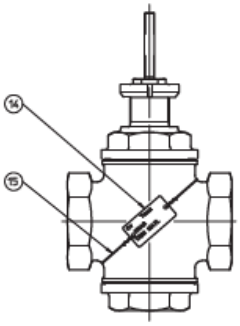


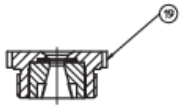
1/2 - 1 INCH PORT PLUG CONSTRUCTION



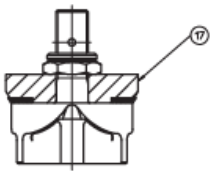
1/2 - 1 INCH PORT SOFT SEAT PLUG CONSTRUCTION

TYPE 2828 PLUG CONSTRUCTION





TYPE 2828 SOFT SEAT SEAT CONSTRUCTION



1 1/4 - 2 INCH PORT SOFT SEAT PLUG CONSTRUCTION

2) ITEMS 16, 17, 18 & 19 ARE ONLY AVAILABLE AS INSEPARABLE ASSEMBLIES.
1) TORQUE ITEM 11 TO 120 INCH LBS.
NOTES:

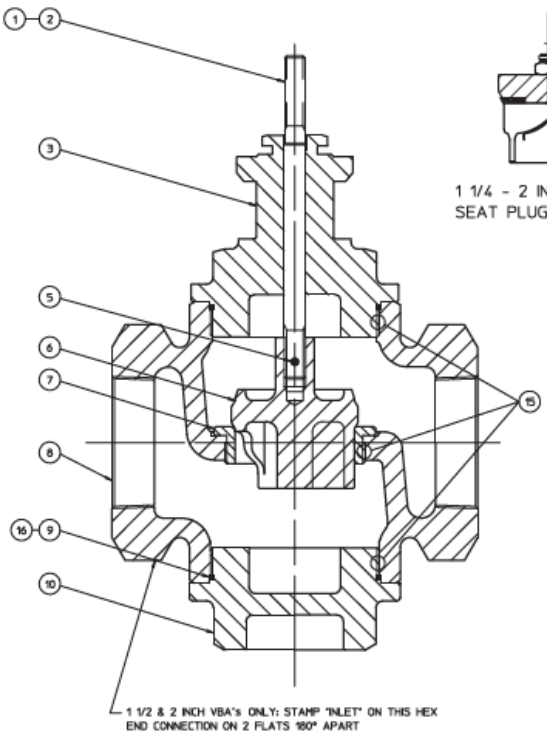
ITEM	QTY	DESCRIPTION
19	A/R	TYPE 2828 SOFT SEAT SEAT RING ASSEMBLY - SEE NOTE 2
18	A/R	TYPE 2828 PLUG, TRAVEL STOP AND STEM ASSEMBLY - SEE NOTE 2
17	A/R	1 1/4 - 2 INCH PORT SOFT SEAT PLUG ASSEMBLY - SEE NOTE 2
16	A/R	1/2 - 1 INCH PORT SOFT SEAT PLUG & STEM ASSEMBLY - SEE NOTE 2
15	A/R	NAMEPLATE WIRE
14	A/R	NAMEPLATE
13	A/R	THD SEALANT
12	A/R	TRAVEL STOP
11	A/R	LOCTITE PRIMER T
10	A/R	LOCTITE 272
9	A/R	5/16-24 ALL METAL SELF LOCKING NUT
8	1	BOTTOM PLUG
7	1	VALVE BODY
6	1	SEAT RING
5	1	PLUG
4	A/R	GROOVE PIN
3	1	BONNET SUBASSEMBLY SEE SEPARATE DWG
2	A/R	STEM LUBE
1	1	VALVE STEM

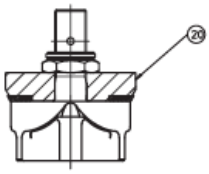
DRAWN	BLB	6/29/07	WARREN CONTROLS INCORPORATED BETHLEHEM, PENNSYLVANIA 18020-8010
CHECKED			
APPROVED			1/2 THRU 2 INCH TYPE 2820 & 2828 BRONZE VBA
SIZE D	PROD NO 03847	DWG NO D3210959	REV A

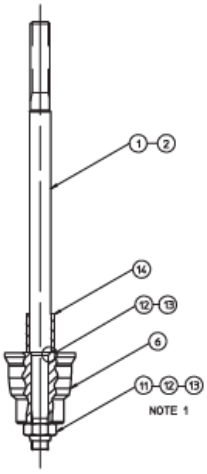
D3210961

B	REDRAWN WITH CHANGE ECN 2284	BLB 6/29/07

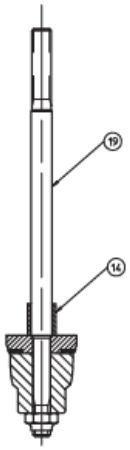
NOTES:
1) TORQUE ITEM 11 TO 120 INCH LBS.
2) 1/2-1 INCH VBA's ONLY: SECURE FLOW ARROW PLATE (ITEM 17) TO PAD ON SIDE OF VALVE BODY USING 2 DRIVE SCREWS (ITEM 18).
3) ITEMS 19, 20, 21 & 22 ARE ONLY AVAILABLE AS INSEPARABLE ASSEMBLIES.

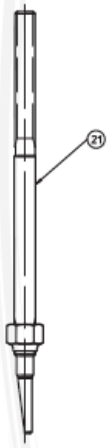


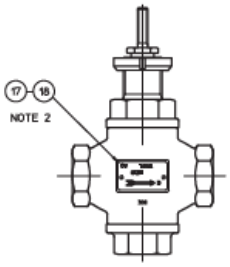

1 1/4 - 2 INCH PORT SOFT SEAT PLUG CONSTRUCTION



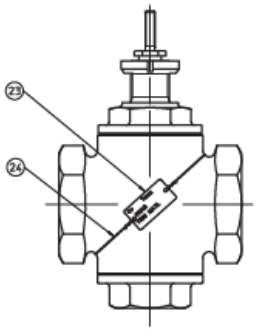
1/2 - 1 INCH PORT PLUG CONSTRUCTION


1/2 - 1 INCH PORT SOFT SEAT PLUG CONSTRUCTION

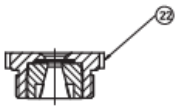

TYPE 2828 PLUG CONSTRUCTION



1/2-1 INCH VBA FLOW ARROW PLATE


1 1/4-2 INCH VBA NAMEPLATE


O-RING ASSY DETAIL TYP 2 PLACES

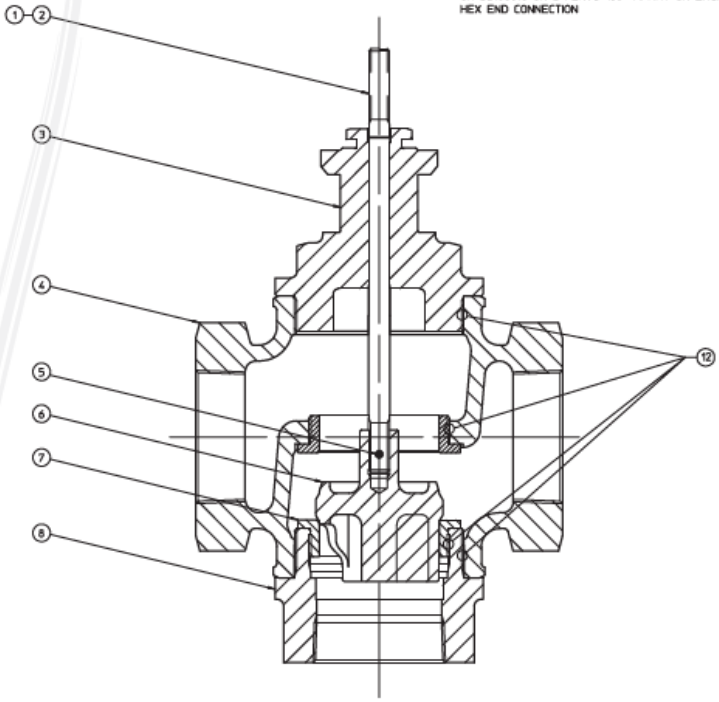

TYPE 2828 SOFT SEAT SEAT CONSTRUCTION

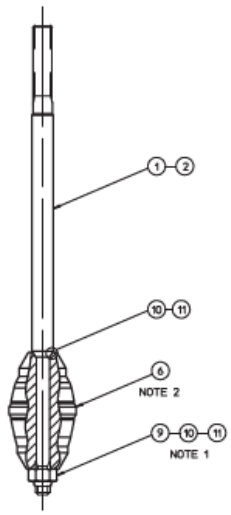
ITEM	QTY	DESCRIPTION
24	A/R	NAMEPLATE WIRE
23	A/R	NAMEPLATE
22	A/R	TYPE 2828 SOFT SEAT SEAT RING ASSEMBLY - SEE NOTE 3
21	A/R	TYPE 2828 PLUG, TRAVEL STOP AND STEM ASSEMBLY - SEE NOTE 3
20	A/R	1 1/4 - 2 INCH PORT SOFT SEAT PLUG ASSEMBLY - SEE NOTE 3
19	A/R	1/2 - 1 INCH PORT SOFT SEAT PLUG & STEM ASSEMBLY - SEE NOTE 3
18	A/R	DRIVE SCREW NO 4 x 1/4
17	A/R	FLOW ARROW PLATE
16	A/R	O-RING LUBE
15	A/R	THD SEALANT
14	A/R	TRAVEL STOP
13	A/R	LOCTITE PRIMER T
12	A/R	LOCTITE 272
11	A/R	5/16-24 ALL METAL SELF LOCKING NUT
10	1	BOTTOM PLUG
9	2	O-RING
8	1	VALVE BODY
7	1	SEAT RING
6	1	PLUG
5	A/R	GROOVE PIN
3	1	BONNET SUBASSEMBLY SEE SEPARATE DWG
2	A/R	STEM LUBE
1	1	VALVE STEM

DRAWN	BLB	6/29/07	WARREN CONTROLS INCORPORATED BETHLEHEM, PENNSYLVANIA 18020-8010
CHECKED			1/2 THRU 2 INCH TYPE TYPE 2820 & 2828 STAINLESS STEEL VBA WITH BODY SEALS
APPROVED			SIZE D · PART NO 03647 · SIZE NO D3210961 · REV B

D3270957

NOTES:
1) TORQUE ITEM 9 TO 80 INCH LBS
2) CONTOURED PLUGS ARE NOT SYMMETRICAL AND MUST BE ASSEMBLED SO .289 DIA x 60° COUNTERSINK ON PLUG SEALS ON 64° ANGLE ON VALVE STEM
3) STAMP CHARACTERS PER FLOW ARROW PLATES SHOWN ON D3100018 ON 2 FLATS 180° APART ON EACH HEX END CONNECTION





1/2 - 1 INCH
PLUG CONSTRUCTION

ITEM	QTY	DESCRIPTION
12	A/R	PERMATEX #2
11	A/R	LOCTITE PRIMER T
10	A/R	LOCTITE 272
9	A/R	1/4-28 ALL METAL SELF LOCKING NUT
8	1	BOTTOM PORT
7	2	SEAT RING
6	1	PLUG
5	A/R	GROOVE PIN
4	1	VALVE BODY
3	1	BONNET SUBASSEMBLY SEE SEPARATE DWG
2	A/R	STEM LUBE
1	1	VALVE STEM

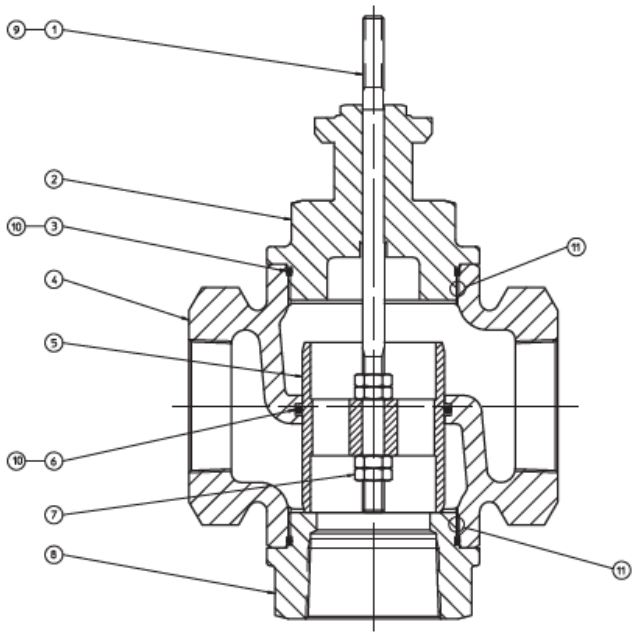
UNLESS OTHERWISE NOTED TOLERANCES ON
DECIMAL .XX ±
DECIMAL .XXX ±
FRACTION ±
ANGLE ±
REMOVE ALL SHARP EDGES AND BURRS
SET ASSEMBLY
MATERIAL
TREATMENT
FINISH
DRAWN J.MARTOCCI
DATE 10/24/96
CHECKED
APPROVED

WARREN CONTROLS CORPORATION
BROADWAY, NEW JERSEY 08808

1/2 THRU 2 INCH TYPE 30 BRONZE VBA

SIZE	PROD NO	DWG NO	REV
D	03847	D3270957	

D3270963



NOTES:
1) STAMP CHARACTERS PER FLOW ARROW PLATES SHOWN ON D3100018 ON 2 FLATS 180° APART ON EACH HEX END CONNECTION.

ITEM	QTY	DESCRIPTION
11	A/R	PST SEALANT
10	A/R	O-RING LUBE
9	A/R	STEM LUBE
8	1	BOTTOM PORT
7	4	HEX JAMNUT
6	1	O-RING
5	1	PISTON
4	1	VALVE BODY
3	2	O-RING
2	1	BONNET SUBASSEMBLY SEE SEPARATE DRAWING
1	1	VALVE STEM

REMOVE ALL SHARP EDGES AND BURRS
UNLESS OTHERWISE SPECIFIED: DECIMAL .XX ±.010, DECIMAL .XXX ±.005, FRACTION ± 1/64, ANGLE ± 1°
DIMENSIONED PER ASME Y14.5M-1994
THIRD ANGLE PROJECTION
ALL FILLET RADII 1/32 MAX
125 FINISH ON ALL MACHINED SURFACES
NEXT ASSEMBLY
MATERIAL
TREATMENT
FINISH
DRAWN BLB 8/11/03
CHECKED
APPROVED

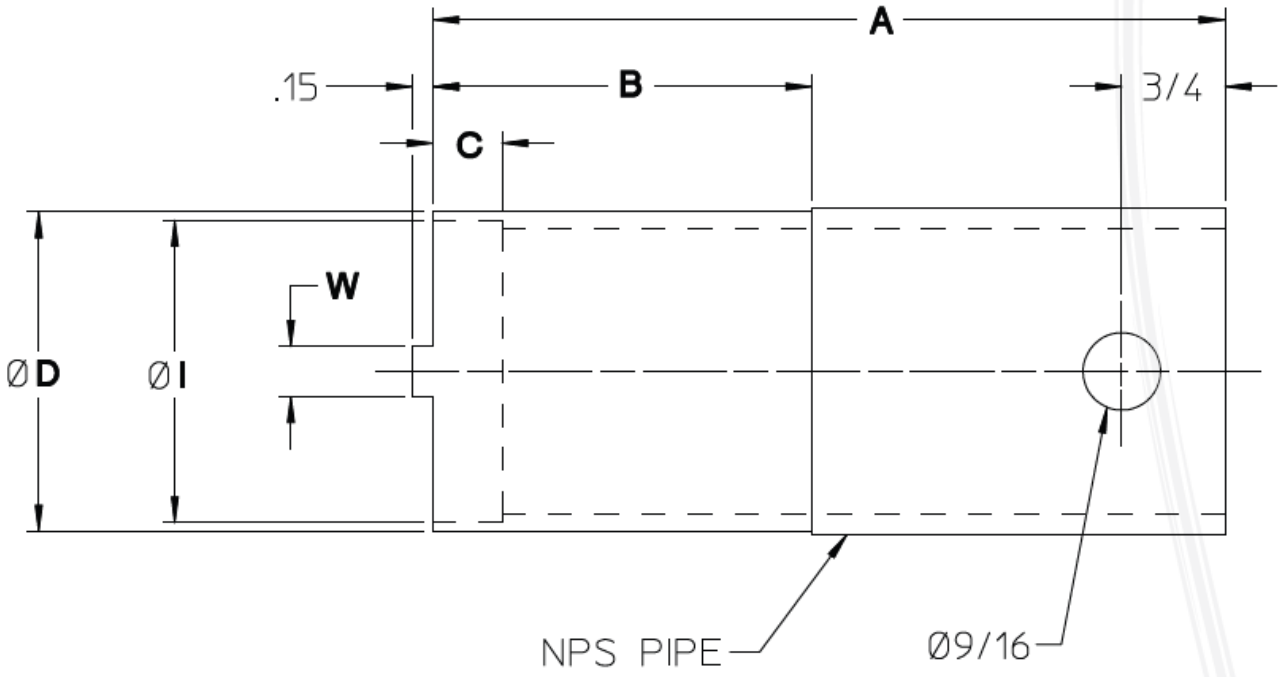
WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-8010

1/2 THRU 2 INCH TYPE 32SH
VALVE BODY ASSEMBLY

SIZE D | PROD NO 03847 | DWG NO D3270963 | REV

SEAT WRENCH

SEAT WRENCH FOR SLOTTED SEAT RINGS
0.5 TO 2.0 INCH TYPES 20, 70, 30 AND 26



SIZE	NPS	SCH	A	B	C	D	I	W
0.50-1.00	1 1/2	80	5 1/4	2 1/4	1/2	1.900	1.595	0.295
1.25-1.50	2	40	5 3/4	2 3/4	1/2	2.375	2.285	0.365
2.00	2 1/2	40	6	3	1/2	2.875	2.725	0.365

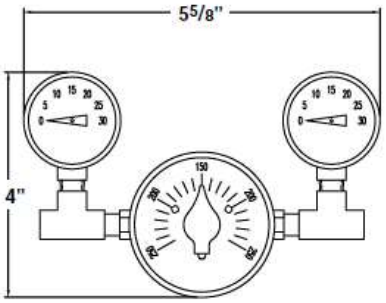

WARREN CONTROLS INC.
A VETERAN OWNED, PRIVATELY HELD, SMALL BUSINESS
WARREN CONTROLS INC.
Series 2800
IOM2800 A 1209
IOM
WARREN CONTROLS
2600 EMRICK BLVD • BETHLEHEM, PA 18020 • USA
800-922-0085 • WWW.WARRENCONTROLS.COM

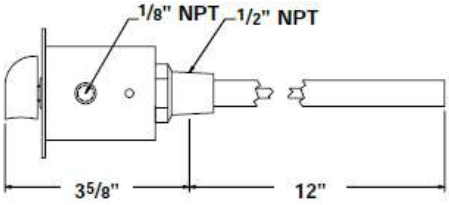
Spence T-61 Temperature Controller

SPENCE
A division of CIRCOR International, Inc.
Technical Data
SD 4522C

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

Air Master TYPE T61, T62 & T63 PNEUMATIC TEMPERATURE CONTROLLER





TYPE T61, T62 & T63 PILOT

The T61 Series Temperature Regulator is ideal for wide ranging, fast changing loads on instantaneous heaters and other difficult process applications. The cascade principle, normally used only on instrument type regulators, is the basis for this inexpensive design. The T61, when used with a properly selected A Series Pilot or Control Valve, continuously adjusts a pressure regulator to the required heater pressure. This action, coupled with the fast response of a bimetallic thermostat, gives exceptional results. Added convenience and economy results from the wide (200°F) adjustable range and the low air consumption (.35 cfm). These controllers have adjustable proportional band as well as overtemperature protection.

SPECIFICATIONS

Max. Air Supply Pressure	32 psi
Max. Signal Pressure	2 psi below Supply
Mounting	1/2" NPT
Air Connections	1/8" NPT
Air Consumption, Maximum	0.70 SCFM
Air Consumption, Normal	0.35 SCFM
Proportional Band (Adjustable)	1/4 to 2 psi per 1°F
Weight	2 3/4 lb.

TEMPERATURE RANGES

T61 & T62	50° to 250°F
T63	150° to 300°F

OPERATING PRINCIPLE

When used with Regulator

The regulator is operated by it's initial steam pressure. It is normally closed, being held so by initial pressure on the disc and by an internal main spring. The pressure pilot is actuated by means of an air signal applied to it's diaphragm. This signal is received from the temperature pilot as a result of the temperature bulb sensing a drop in temperature from the control setting.

When steam is turned on, it flows through the pressure pilot (Fig. 2) to the No 8B tee. Bleedport No. 4A restricts the flow, builds pressure under the diaphragm and opens the main valve. Restriction No. 5A steadies the operation of the regulator.

Steam flowing to the heater develops a rising delivery pressure which feeds back through the control pipe to the pressure pilot diaphragm. As this pressure approached a balance with the air pressure signal supplied by the temperature pilot , the pressure pilot throttles. This, in turn, allows the main valve to assume a position to maintain the set temperature.

As the temperature at the outlet of the heater increases, it causes the T61 Pilot to reduce the loading air pressure and this, in turn, will cause the pressure regulator to modulate the steam flow to the heater.

When used with Pneumatic Control Valve

The T61 Series Pilot will send a proportional air signal from 0 psi to a maximum of 30 psi (not greater than 2 psi less than the supplied pressure) within a ???? degree span. The Pilot will increase signal as the temperature falls, which will either open or close the control valve, depending upon actuator configuration.

Installation

INSTALLATION

PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

MAIN VALVE

Flush the main piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valve should be mounted in unions.

PILOT

Mount the pilot with the bulb projecting entirely into the liquid or air being controlled. If the body is not in a horizontal position with air gages on top, the set screw (5) on bottom of body nearest the bulb may be loosened and body rotated to horizontal position. Retighten the set screw.

Connect a reliable source of clean compressed air (not to exceed 32 psi) to the inlet of the pilot. The supply air should be set at 2 psi above the maximum desired air signal. If air is available at a higher pressure, install a pressure reducing valve. CAUTION: Be sure to blow out all lines before making final connections.

Connect pilot outlet to 1/4" tap on top of pressure pilot.

START-UP AND SETTING

With supply air shut off, set temperature adjusting knob at the lowest temperature setting. Turn on supply air. The supply air should be set at 2 psi above the maximum desired air signal. If air is available at a higher pressure, install a pressure reducing valve. No more than 1 to 2 pounds should show on the control air gage (supplied with the T61 Pilot).

Gradually turn up temperature adjusting knob until rising loading air pressure causes regulator to open. Continue raising temperature setting in this fashion until desired control temperature is reached.

The T61 Pilot is factory set so that 5 degrees variation above and below the controlled temperature will cause the loading air pressure to vary approximately 8 pounds. The factory setting will usually produce satisfactory control.

If closer control is desired, the sensitivity of the T61 Pilot can be increased by turning the sensitivity screw (7) clockwise. This will cause the control temperatures to move to a position below the set point. This effect must then be corrected by readjusting the temperature adjusting knob (4).

Make these adjustments slowly, turning the sensitivity screw no more than 1/8 turn and allow two or three minutes after each adjustment for the system to settle out. Practical range of adjustment of the sensitivity screw is 1/2 turn from the factory setting.

After final setting is reached, it may be necessary to release the set screw in the temperature adjusting knob and reposition it so that the indicator is aligned with the temperature being controlled. At this point, the set screw is retightened.

If a hunt develops (a steadily swinging temperature) when the sensitivity is increased, the temperature pilot is being called on to function at a setting finer than the installation will permit. At this point, factors such as thermostat location, trapping and valve size should be reexamined.

If the regulator swings immediately on startup and does not settle out and decreasing the sensitivity by turning the sensitivity screw (7) counterclockwise cannot be tolerated, the installation as a whole should be restudied.

RECOMMENDED INSTALLATION

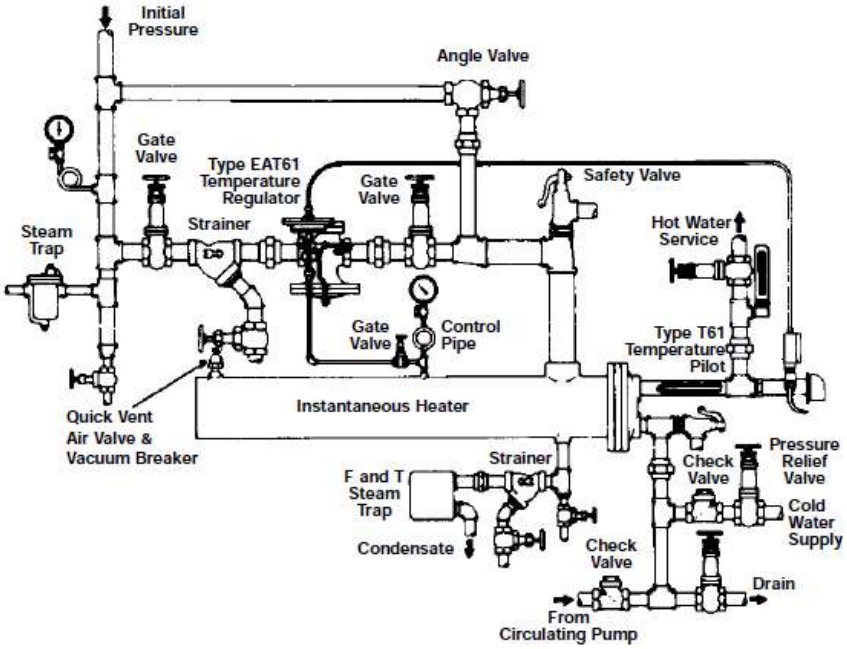


FIGURE 1

Troubleshooting

TROUBLE SHOOTING

FAILURE TO OPEN

1. Check supply gage to be sure it shows 2 psi higher than the required signal pressure.
2. Turn adjusting knob to top of temperature range. Pressure should go to within 2 or 3 pounds of supply pressure. If not, check for dirt in sensitivity screw and ball seating surface.

FAILURE TO CLOSE OR OVERRIDING DELIVERY PRESSURE

1. Adjusting knob may have been tampered with.
2. If air pressure will not bleed down when adjusting knob is turned to bottom of range, it is likely that vent is plugged. Sensitivity screw (7) improperly adjusted (open too wide).

ERRATIC CONTROL

1. Hunting
2. Gradual wandering over too wide a spread.
3. Fast over and under rides are the result of fast load changes, usually accentuated by the thermostat being located at a point where it cannot immediately sense a change in conditions.

INSTALLATION FAULTS

1. Poor circulation through heater. Constant circulation should be employed.
2. Traps on the return may be discharging erratically or may be improperly installed.
3. Sticky check valve.
4. High lift to condensate hot well. Gravity drainage from heater should be arranged or return pump installed.

DISMANTLING

1. Remove sensitivity screw (7) and clean.
2. Unlock knob set screw. Loosen and move adjusting knob (4) out to clear stop on dial plate and lock to shaft. Unscrew spool (3) from body by rotating adjusting knob counterclockwise.

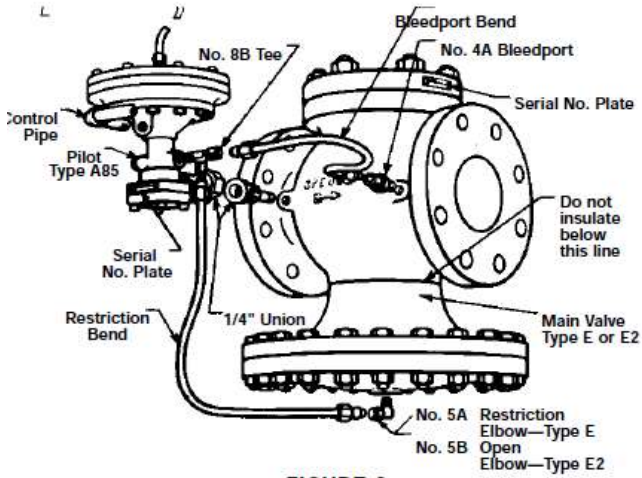


FIGURE 2

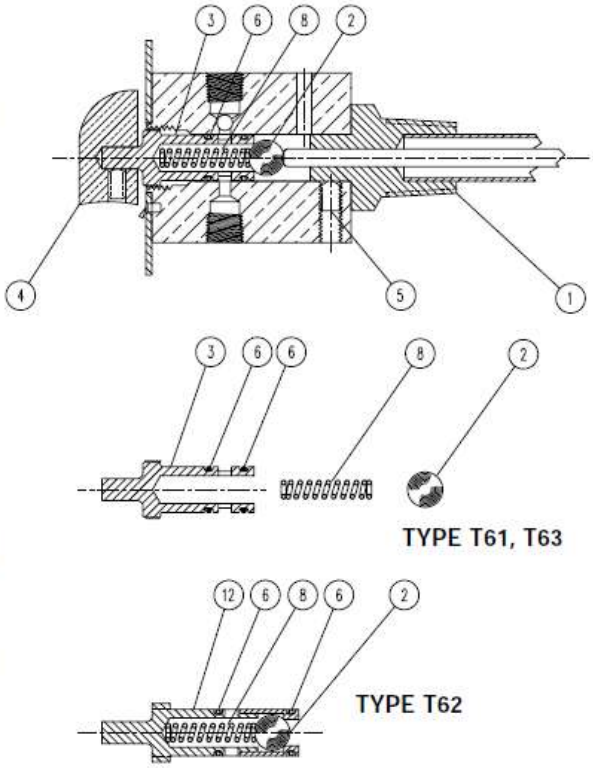


FIGURE 3

3. Care should be taken not to damage O-rings (6). Examine for nicks and other defects.
4. Examine spool (3) and ball (2) for defects.
5. Clean spool and ball with air pressure.
6. Reassemble.

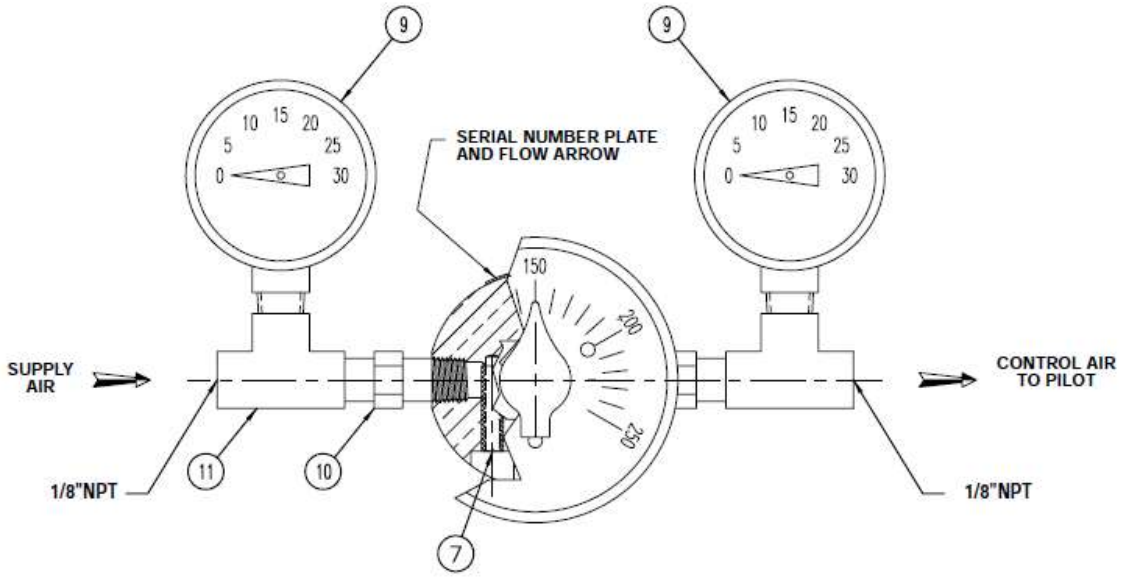
TESTING & CALIBRATING

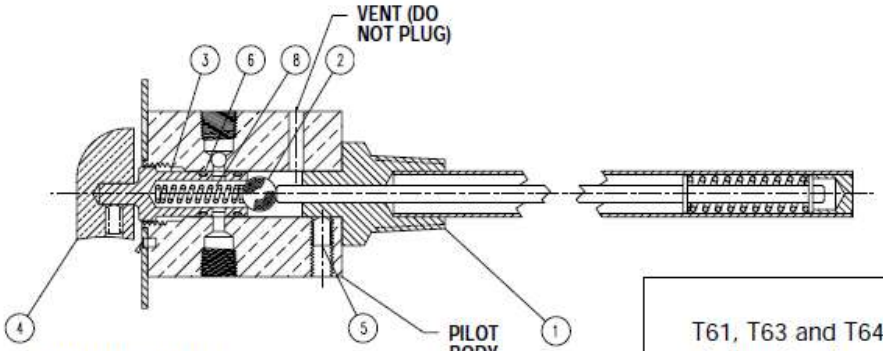
Reverse or Direct Acting

1. Plug the pilot control air port and apply supply pressure 2 psi above the control range to the supply air port.
2. Open the sensitivity screw (7) one turn while establishing a steady system temperature.

Reverse Acting (T61 & T63) Pilots Only
(Control pressure decreases with increasing temperature)

1. Turn the spool (3) clockwise to the point where the invar rod, ball and seat are in contact. The control gauge should show pressure near the top of the control range.
2. Turn the spool counter-clockwise until the control pressure is at the middle of the range.
3. Continue to turn the spool counter-clockwise until the low end of the range is reached. Adjust the sensitivity screw as required so this occurs within a 5° change on the dial. The control pressure should vary from the minimum to the maximum (15 or 30 psi) with a 10° change of the dial setting. When used with an A-pilot the minimum is 3 psi, when used with a control valve the minimum is the lower end of the bench range.





TYPE T61 PILOT
REVERSE ACTING

T61, T63 and T64 Pilots are designed and manufactured in accordance with Aritcle 3, Section 3 of the Pressure Equipment Directive 97/23/EC.

ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Bulb Assy. 50-250 (T61,T62 except SS)	Bronze	07-40190-03
	Bulb Assy. 150-350 (T63 & T61,T62 SS only)	St. Steel	07-40191-03
2	*Ball	St. Steel	05-07709-00
3	*Spool Reverse Acting - T61 & T63	Brass	04-07741-00
4	Adjusting Knob	Plastic	05-07927-00
5	Body Set Screw	Steel	05-11134-00
6	*Spool Sealing Rings	Viton	05-04004-00
7	*Sensitivity Screw	Steel	05-07930-0
8	*Valve Spring	St. Steel	05-05175-00
9	Pressure Gauge		05-17460-00
10	1/8 Nipple	Brass	05-17459-00
11	1/8 Tee	Brass	05-17458-00
12	Spool Direct Acting Assy. - T62	Brass	07-43770-00
	Repair Kit - T61, T63, T64 (Reverse Acting)		08-11507-01

*These parts furnished in Repair Kit

T61–Reverse Acting
T62–Direct Acting
T63–High Temperature Reverse Acting
Reverse Acting–Air control signal decreases as process temperature increases.
Direct Acting–Air control signal increases as process temperature increases.

When ordering parts, it is essential that the pilot type, service and serial number be stated.

Select part by item number, but order by part number. Specify complete part number when ordering.

NOTES: