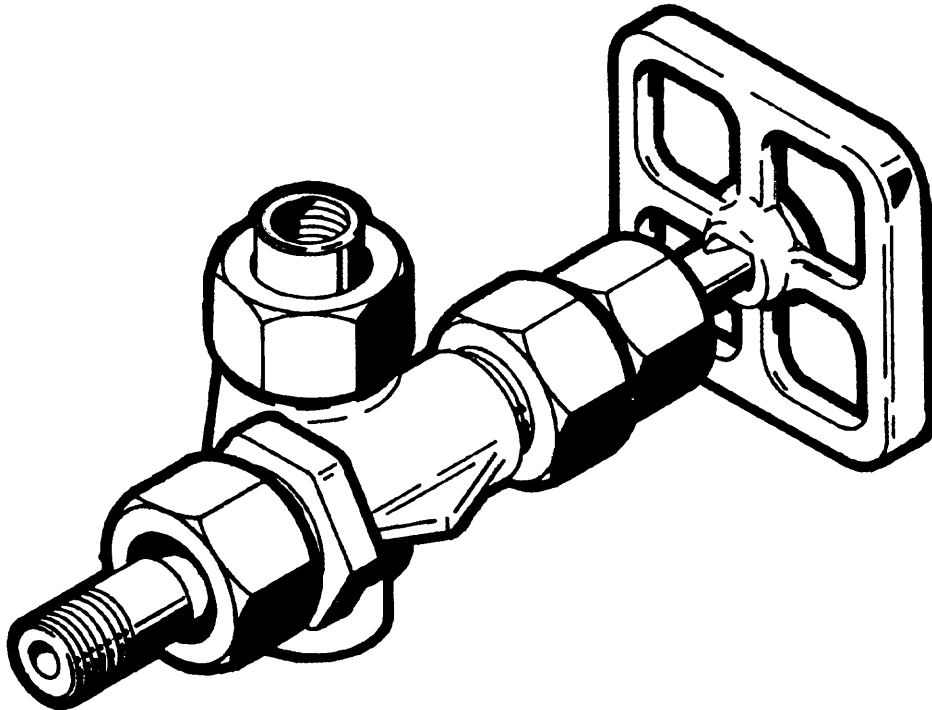


PENBERTHY®

Section 2000
Instal. Instr. 2960
Issued 8/96
Replaces 2/94

Gage Valves

Series 100, 200, 300 and 400



Installation/Operation/Maintenance Instructions

TABLE OF CONTENTS

Product Warranty	i
1.0 About the Manual	1
2.0 Introduction	1
2.1 System Description	1
3.0 Available Models	2
3.1 Design Ratings at Maximum and Minimum Operating Temperature	2
3.2 Steam Application	3
4.0 Inspection	3
4.1 User Rating Inspection	3
5.0 Installation	4
5.1 Piping Strain	4
5.2 Differential Thermal Expansion	4
5.3 Mounting	4
6.0 Operation	5
6.1 Hydrostatic Test	5
7.0 Maintenance	5
7.1 Preventative Maintenance	6
7.2 Ball Check Shutoff	6
7.3 Troubleshooting	7
8.0 Removal – Disassembly – Reassembly	7
8.1 Disassembly	8
8.2 Reassembly	8
9.0 Disposal at End of Useful Life	8
10.0 Telephone Assistance	9
11.0 Exploding Parts Drawing	10

TABLES AND FIGURE		page
Table 1	Design Ratings for Threaded or Welded Connections	3
Figure 1	Teflon® Tape Wrapping	5

PRODUCT WARRANTY

Penberthy Inc., warrants its products as designed and manufactured by Penberthy to be free of defects in material and workmanship for a period of one year after the date of installation or eighteen months after the date of manufacture, whichever is earliest. Penberthy will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

Prior to submitting any claim for warranty service, the owner must submit proof of purchase to Penberthy and obtain written authorization to return the product. Thereafter, the product shall be returned to Penberthy in Prophetstown, Illinois, with freight prepaid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or altered outside of the Penberthy factory, or if it has been subjected to misuse, neglect or accident.

Penberthy's responsibility hereunder is limited to repairing or replacing the product at its expense. Penberthy shall not be liable for loss, damage, or expenses directly or indirectly related to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that Penberthy is not responsible for damage or injury caused to other products, building, property or persons, by reason of the installation or use of its product.

THIS IS PENBERTHY'S SOLE WARRANTY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of Penberthy unless modified or made in writing and signed by the President or a Vice President of Penberthy.

1.0 About the Manual

This manual has been prepared as an aid and guide for personnel involved in installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation, or maintenance. Failure to follow *any* instruction could possibly result in a malfunction of the valve with resulting sudden release of pressure, property damage or physical injury to personnel.

SAFETY INSTRUCTION

Penberthy does not have any control over the manner in which its gage valves are handled, installed, or used. Penberthy cannot and will not guarantee that a gage valve is suitable or compatible for the user's specific application.



CAUTION



Vessel fluids may be pressurized and can unexpectedly exit vessel connections due to apparatus or material failure. Safety glasses should be worn when installing a gage valve. Failure to do so could result in serious physical injury to personnel or property damage.

2.0 Introduction

Penberthy armored gage valves are used to isolate gage glass, magnetic gages or other apparatus from the holding or pressure vessel when it becomes necessary to drain and service the gage. Penberthy Series 100, 200, 300, and 400 gage valve are supplied in pairs (upper and lower) and are available with socketweld, flanged and NPT connections.

These valves are equipped, as a standard feature, with a floating shank union vessel connection, which permits up to 3/8" [9.5mm] variation in center to center distance and with ball check shut-offs to prevent leakage of contained fluid in case of accidental gage glass breakage.

Series 100, 200, 300, and 400 valves for process use should include ball check shut-off feature. Valves without the ball check shut-off feature will not automatically stop leakage of contained fluid in the event of accidental gage glass breakage.

2.1 System Description

Penberthy armored valves are comprised of six basic components. Each component may vary slightly, depending on the desired physical and mechanical properties for the valve. Use the exploded parts view in Section 11.0 as additional reference material.

Body – a pressure retaining structure through which liquid passes to enter a gage glass or other apparatus. Provides a rigid, union, or spherical union connection to the vessel and seating surfaces for most valve components. Series 100 and 200 are straight pattern bodies; Series 300 and 400 are offset pattern bodies.

Ball Checks – sphere installed loosely within the body of the valve that seats to prevent significant leakage when a differential pressure surge occurs (e.g., mechanical failure). Ball checks for ASME steam service incorporate a vertically rising lower and leaky horizontal upper or omit ball checks completely. “Reverse acting” ball checks are available for vacuum service.

Trim – wetted parts that mechanically control the liquid path from the vessel to the gage glass or other apparatus. The ball and stem act to seal and release the liquid. In the event of mechanical failure, the ball will seat to prevent large quantities of the contained fluid from exiting the vessel. Liquid is allowed to exit the vessel into the gage glass or other apparatus when the stem is screwed away from its seated position. The liquid is sealed when the stem is screwed into its seated position.

The stem packing retainer provides a compression surface between the process liquid and the stem packing. A stem packing gland is used to compress the packing against the retainer and around the stem to prevent leakage.

Stem Packing – under compression the stem packing is forced to mold around the stem and prevent leakage of media during operation.

Gage Connection – provides connection between the valve and the gage glass or other apparatus. A union, spherical union or rigid connection may be used. A union connection can move in a plane parallel to the vessel connection.

Handwheel/Lever – rotated to engage threads and provide screw action of stem.

3.0 Available Models

Armored valves standard feature are listed in chart below.

Features	Model No.							
	120	130	220	230	320	330	420	430
Straight Pattern	X	X	X	X				
Offset Pattern					X	X	X	X
Integral Bonnet	X	X			X	X		
Union Bonnet			X	X			X	X
Union Gage Connection	X		X		X		X	
Rigid Gage Connection		X		X		X		X
Screwed in Seat			X	X			X	X

3.1 Design Ratings at Maximum and Minimum Operating Temperatures

To determine the maximum allowable working pressure for a specific temperature within the design limits stated below, the user must refer to Penberthy Dimension Sheets, or when provided, the specifically stated design limits on a Penberthy product proposal.

DESIGN RATINGS FOR THREADED OR WELDED CONNECTIONS

Valve Series	Material of Construction	Maximum Allowable Working Pressure	
		Teflon® packing	Grafoil® packing
100 200 300 400	Carbon Steel	4000 psig [27579 kPa] @ -20°F to +100°F [-29°C to +38°C] 3525 psig [24304kPa] @ 500°F [260°C]	4000 psig [27579 kPa] @ -20°F to +100°F [-29°C to +38°C] 2620 psig [18064 kPa] @ 750°F [399°C]
	316 STS Construction	4000 psig [27579 kPa] @ -300°F to +100°F [-184°C to +38°C] 3525 psig [24304kPa] @ 500°F [260°C]	4000 psig [27579 kPa] @ -300°F to +100°F [-184°C to +38°C] 2755 psig [18995 kPa] @ 750°F [399°C]
For other materials or connections consult factory			

TABLE 1



NEVER exceed these design ratings or application data. Exceeding design ratings or application data may result in mechanical failure of valve components resulting in serious personal injury and/or property damage.

3.2 Steam Application

Penberthy series 100, 200, 300 and 400 valves are designed for process conditions. In low pressure steam/water applications (≤ 350 psig [2413 kPa] @ 431°F [221°C]), Penberthy allows the use of 300 and 400 series valves because the potential mechanical stress imposed on the valve assembly by the thermodynamic steam environment is relatively small. Request Penberthy Application Reports for more detailed information.

4.0 Inspection

Upon receipt of a gage valve set, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request damage inspection. Refer to exploded view drawing in Section 11.0 to inventory parts.

4.1 User Rating Inspection

The user should confirm that:

- 1) The gage valve set model number and pressure/temperature rating stamped on nameplate (163) conforms to the description on the user's purchase order
- 2) The operating conditions described in the purchase order agree with the actual operating conditions at the installation site
- 3) The actual operating conditions at the installation site are within the applications data shown on the Penberthy Technical Data Bulletin or product proposal referred to previously.

- 4) The materials of construction of the gage valve set are compatible with both the contained fluid and the surrounding atmosphere in the specific application.

SAFETY INSTRUCTIONS

If the size, model or performance data of the gage valve set as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for assistance. The incorrect valve can result in unacceptable performance and potential damage to the gage.

5.0 Installation

Installation should only be undertaken by qualified personnel who are familiar with this equipment. They should have read and understood all of the instructions in this manual. The user should refer to Penberthy dimension sheets or Penberthy product proposal to obtain dimensional information for specific size and model gage valve.

Penberthy recommendations on gage valve installations are not necessarily related to the installation of flat glass liquid level gages. The number of different types of gage and valve installations is too great to adequately explain in an installation manual. Therefore, it is the user's responsibility to assure that knowledgeable installation personnel plan and carry out the installation in a safe manner. The following procedures are some of the guidelines that should be employed.

5.1 Piping Strain

The gage valve should be mounted and connected so that it can support the gage without binding. Torsional stresses can make it difficult or impossible to seal tailpipes. Although union connections will allow marginal errors in piping alignment, misalignment can still create unusual strain on connectors. Gages not properly supported by brackets may subject the gage valve to stresses that can cause leaks or mechanical failure.

5.2 Differential Thermal Expansion

High mechanical loading may be imposed on a gage valve by expanding and contracting gages due to hot or cold service. Such mechanical loads on the valve must be minimized by controlling process conditions in the system.

5.3 Mounting

- 1) Prior to installation, turn the handwheel of each valve clockwise until the stem closes against the seat
- 2) Remove union vessel connections from valves, where applicable, and apply heavy grease (where allowable) to tailpipe seat. (the grease minimizes galling of the seat surfaces when tightening the coupling nuts.)

- 3) Wrench tighten tailpipes of upper and lower valves to the vessel using Teflon® tape, or equivalent, on all male tapered pipe thread connections as shown in Figure 1. If the valve is flanged or weld mount, use proper industry standard procedures.

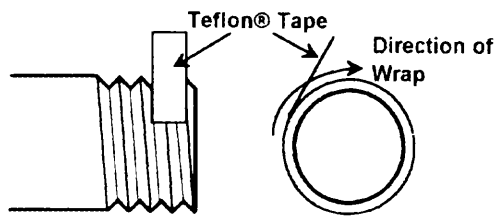


FIGURE 1

- 4) If installing with a flat glass gage, follow all installation instructions for the specific liquid level gage as there are many points to consider on gage installation; among them, piping strain, differential thermal expansion, weight and bolt torque.
- 5) Install gage tailpipes to union gage connections, where applicable, making sure that coupling nuts are in place.

6.0 Operation

Before initializing gage valve operation, check that all installation procedures have been completed. Use only qualified, experienced personnel who are familiar with valve equipment and thoroughly understand the implications of the tables and all the instructions. Check to determine that all connections are pressure tight.



DANGER



Valve installations should be brought into service slowly. Valves should be opened slightly, and the valve assembly temperature and pressure allowed to slowly equalize. If the valves are equipped with ball checks, the valves must be opened all the way after the pressure and temperature have equalized to permit operation of the automatic ball check in the event of failure. Failure to follow the recommended operating procedures can result in severe personal injury and property damage.

6.1 Hydrostatic Test

Take all precautions necessary to handle the possibility of leakage during the test. Hydrostatic pressure test all installations to 100 psig [689 kPa] and correct any leakage before proceeding.

7.0 Maintenance



WARNING



Use only qualified, experienced personnel who are familiar with valve equipment and thoroughly understand the implications of the tables and all the instructions. DO NOT proceed with any maintenance unless the valve assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.

The user must create maintenance schedules, safety manuals, and inspection details for each gage valve. These will be based upon the users own operating experience with their specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situations involved.

During system shutdown, the valves should be left open to permit the gage to lose pressure and cool with the rest of the system. Failure to leave the valve open during system shutdown may trap high pressure fluid in the gage.

7.1 Preventive Maintenance

On all installations the following items should be regularly evaluated by the user for purposes of maintenance:

- 1) Leakage around stem area
- 2) Internal stem leak
- 3) Leakage around union connections
- 4) Internal or external corrosion

The user must determine upon evaluation of his or her own operating experience an appropriate maintenance schedule necessary for his or her own specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

7.2 Ball Check Shut-Off

SAFETY INSTRUCTION

Ball checks, when installed, may fail to seat due to corrosion of the ball or seat, foreign material in ball chamber or viscous material in the ball chamber. A routine operational test of the ball check can prevent significant seepage of liquid in the event of glass breakage.

An operational check can be performed on the valve ball checks by closing both the upper and lower valve stems completely. Drain contents from and relieve pressure on liquid gage to an appropriate safe container/area. NOTE: some loss of process fluid to the drain line is expected with this test procedure.



WARNING



Use only qualified, experienced personnel who are familiar with valve equipment and thoroughly understand the implications of the tables and all the instructions. DO NOT proceed with any maintenance unless the valve assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.

With drain line still in place, open **BOTTOM** valve as rapidly as possible. Listen for “click” sound which will indicate that the ball has seated. If possible, observe the quantity of flow from the drain line. Flow should either stop completely or be no greater than single drips (no solid stream). Close lower valve. Repeat above procedure for **UPPER** valve. There must be a pressure differential of at least 5 psi [34.5 kPa] for the above procedure to work properly.

If the above procedure is not successful, the only alternative is to isolate the gage and valve assembly from the vessel or to shut the process down completely. Disassemble the valve as outlined in Section 8.1 using the exploded parts drawing in Section 11.0 as reference. Visibly inspect ball check and ball seats in the valve body. Remove any foreign matter and/or replace with new ball checks if inspection indicates this is required. If the ball seat is damaged, consider replacing the valve or the seat (if it is removable). Reassemble valves as outlined in Section 8.2

7.3 Troubleshooting

STEM PACKING LEAKAGE can often be stopped by tightening the stem packing nut. If leak persists, the stem packing should be replaced by following steps 1) through 5) of the Disassembly and 1) through 6) of the Reassembly instructions

INTERNAL SEAT LEAKAGE is an indication of a worn or damaged stem or seat. To replace the stem follow steps 1) through 5) of the Disassembly and 1) through 7) of the Reassembly instructions. To renew the seat surface, follow steps 1) and 2) of the Disassembly instructions. Renew the seats by using a fine lapping compound and a mandrel the same size, shape and seat angle as the stem. Flush the valve body clean and reassemble by following steps 4) and 5) of the Reassembly instructions.

Renewable Threaded Seats (Series 200 and 400). Remove the seat by inserting a ¼” [6.4mm] square driver in the seat and turning it counterclockwise. Replace the new seat by turning it clockwise using the square driver, making sure that the ball check, if used, is replaced in the body. Tighten the seat in place. Follow steps 4) and 5) of the Reassembly instructions.

LEAKAGE AROUND UNION connections can often be stopped by tightening union coupling nut or remake connection using Teflon® tape, or equivalent, on all male pipe threads as shown in Figure 1

INTERNAL OR EXTERNAL CORROSION could be an indication of a misapplication. An investigation should immediately be carried out to determine the cause of the problem. It is the user’s responsibility to choose a material of construction compatible with both the contained fluid and the surrounding atmosphere.

8.0 Removal – Disassembly – Reassembly



WARNING



Use only qualified, experienced personnel who are familiar with valve equipment and thoroughly understand the implications of the tables and all the instructions.

DO NOT proceed with any maintenance unless the valve assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.

8.1 Disassembly

Refer to the exploded parts drawing in Section 11.0 for additional reference during disassembly and reassembly of the valves.

- 1) Remove handwheel nut (30), nameplate (163) and handwheel (28) or lever from stem.
- 2) Loosen and remove stem packing nut (26).
- 3) Remove stem by turning counterclockwise, along with stem packing gland, stem packing, and stem packing retainer.
- 4) Slip the stem packing gland, stem packing and stem packing retainer off stem.
- 5) On Series 200 and 400 valves, remove bonnet nut and bonnet.
- 6) To replace seat on Series 200 and 400 valves, follow instructions as described in maintenance procedures.

8.2 Reassembly

Refer to the exploded parts drawing in Section 11.0 for additional reference during disassembly and reassembly of the valves.

- 1) Prepare for installation of new packing by cleaning all packing chambers and glands of upper and lower valves.
- 2) On Series 200 and 400 valves, replace bonnet (20), and bonnet nut (21) and tighten securely in place.
- 3) Slip packing retainer (18) on stem (17)
- 4) Install new stem packing (25) and stem packing gland (19)
- 5) Thread stem assembly into valve by turning clockwise until stem seats and then back off one turn (1/8 turn with quick close stem).
- 6) Assemble stem packing nut (26) and tighten in place.
- 7) Assemble handwheel (28) or lever (261), nameplate (163) and handwheel nut (30) on stem and tighten securely in place.
- 8) Close both valves by turning handwheel or lever clockwise until stem seats.

Refer to Section 6.0 for operation of the gage valve when returned to service.

9.0 Disposal at End of Useful Life

Penberthy valves are used in a variety of fluid applications. By following the appropriate governmental and industry regulations, the user must determine the extent of preparation and treatment the valve must incur before its disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metals and polymers should be recycled whenever possible. Refer to order and Penberthy's Material Specification sheets for materials of construction.

10.0 Telephone Assistance

If you are having difficulty with your armored gage valve, notify your local Penberthy distributor. You may also contact the factory direct at (815) 537-2311 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information as possible when you call:

- Model #
- Name of the company from whom you purchased your valve
- Invoice # and date
- Process fluid
- Operating pressures
- Operating temperature
- A brief description of the problem
- Troubleshooting procedures that failed

If attempts to solve your problem fail, you may be requested to return your valve to the factory for intensive testing. You must obtain a Return Authorization (RA) number from Penberthy prior to returning anything. Failure to do so will result in the unit being returned to you, without being tested, freight collect. To obtain a R.A. number, the following information (in addition to that above) is needed:

- Reason for return
- Person to contact at your company
- "Ship To" address
- MSDS sheet if in harmful service

We recommend that you return the entire valve set for testing. There is a minimum charge of \$50.00 for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit that is covered by the warranty, but is not defective, the minimum charge will apply.

Grafoil® is a registered trademark of Union Carbide Corporation
Teflon® is a registered trademark of E.I. duPont de Nemours and Company

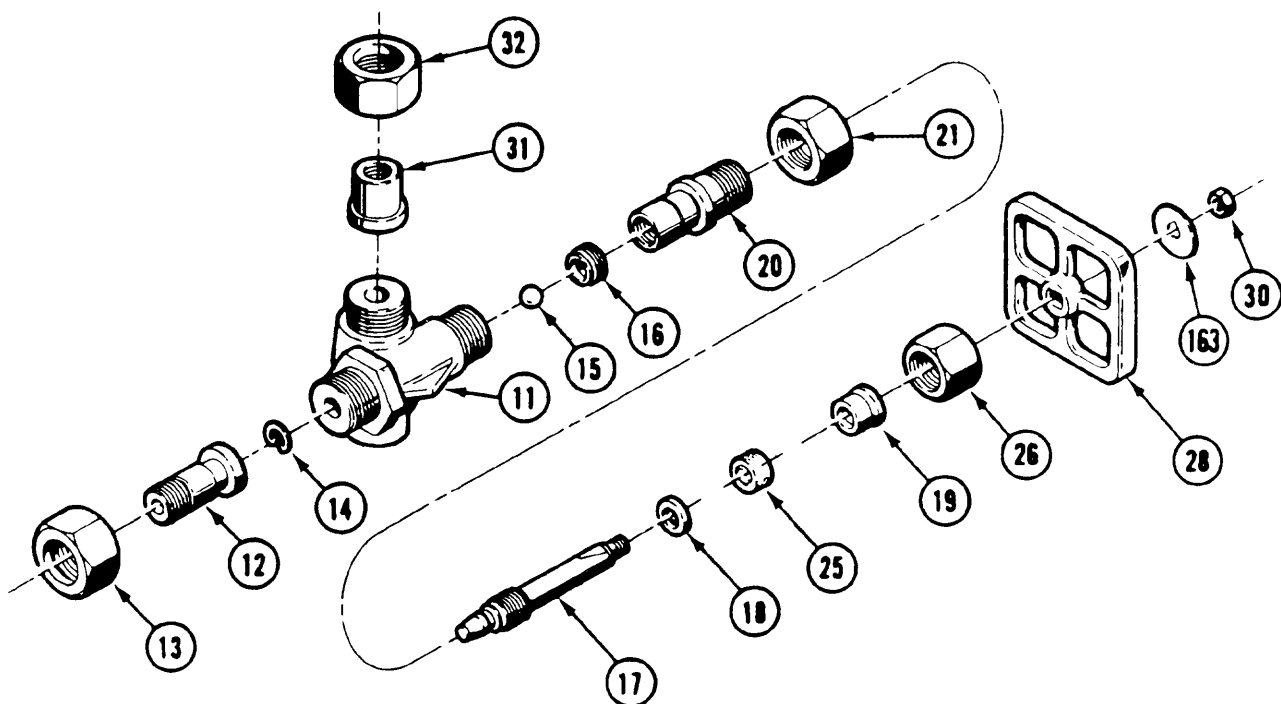
11.0 Exploded Parts Drawing

- 11 Body
- 12 Tailpipe, Vessel
- 13 Nut, Vessel Coupling
- 15 Ball
- 16 Seat
- 17 Stem
- 18 Retainer, Stem Packing
- 19 Gland, Stem Packing
- 20 Bonnet
- 21 Nut, Bonnet
- 25 Packing, Stem
- 26 Nut, Stem Packing
- 30 Nut, Handwheel
- 31 Tailpipe, Gage
- 32 Nut, Gage Coupling
- 163 Nameplate
- 261 Lever

SPARE PARTS

Ref. No.	Item	Min. Qty.
18	Retainer, Stem Packing	1
19	Gland, Stem Packing	1
25	Packing, Stem	1
30	Nut, Handwheel	1

RECOMMENDED MAXIMUM QUANTITIES SHOULD PROVIDE SPARE PARTS FOR 10% OF THE VALVES IN SERVICE



Note: Seat (16), Bonnet (20) and Nut (21) to be used on Series 200 and 400 valves only.

PENBERTHY

DECLARATION of CONFORMITY

In conformance with ISO/IEC Guide 22 – 96
VLV.DC r C


Manufacturer's Name: Penberthy, Incorporated
Manufacturer's Address: 320 Locust Street
Prophetstown, IL 61277-1147 U.S.A

Product:
Type of Equipment: Pressure Vessel – Armored and Tubular Gauge Glass Valves
Equipment Class: Industrial Instrumentation – Hazardous Area
Model Designations: 100, 200, 300, 400, 500, 600, 700 series N2, K2, K3, N6, N7, A5

The product described above is in conformity with:

92/59/EEC	General product safety	1992
87/404/EEC	Simple pressure vessels	1987
89/392/EEC	Machinery	1989
EN 10213-1:4	Technical delivery conditions for steel castings	1996
ISO 7 – 1	Pipe threads where pressure-tight joints are made	1994
BS 10	Flanges and bolting for pipes, valves and fittings	1962
BS 21	Pipe threads for tubes and fittings where pressure tight	1985
BS759	Valves, gauges and other safety fittings for application	1984
BS 970 Part 1	Wrought steels for mechanical and allied engineering	1996
BS 970 Part 3	Wrought steel for mechanical and allied engineering	1991
BS 970 Part 4	Wrought steels in the form of blooms, billets, bars	1970
BS 1502	Steels for fired and unfired pressure vessel	1982
BS 1506	Carbon, low alloy and stainless steel bars and billets	1990
BS 1560	Circular flanges for pipes, valves and fittings	1989
BS 1640 Part 1	Steel butt-welding pipe fittings	1962
BS 1640 Part 2	Steel butt-welding pipe fittings	1962
BS 1965	Butt-welding pipe fittings	1963
BS 3076	Nickel and nickel alloys: bar	1989
BS 3463	Observation and gauge glasses for pressure vessels	1975
BS Part 1	Steel pipes and tubes for pressure purposes	1987
BS 3605	Austenitic stainless steel pipes and tubes	1991
BS 3643	ISO metric screw threads	1981
BS 3799	Steel pipe fittings, screwed and socket-welding	1974
BS 4504	Circular flanges for pipes, valves and fittings	1989
ASME B&PV Code, Section VIII	Rules for construction of pressure vessels	1995
ANSI/ASME B1.1	Unified screw inch threads un and unr thread form	1982
ANSI/ASME B1.20.1	Pipe threads, general purpose (inch)	1983
ANSI/ASME B16.5	Pipe flanges and flanged fittings	1988
ANSI/ASME B18.2.1	Square and hex bolts and screw inch series	1981
ANSI/ASME B18.2.2	Square and hex nuts	1972
ANSI/ASME B18.3	Socket cap shoulder and set screws inch series	1982
ANSI/ASME B31.3	Process piping	1996

Date: 30 December 1996
Prophetstown, IL U.S.A.

Signature: 
Name: David J. Williams, C.Q.E.
Position: Quality Assurance Manager

Technical Construction File is available at stated address. Signatory is contact person.

NOTES

PENBERTHY

320 Locust St., Prophetstown, Illinois 61277

Telephone: (815) 537-2311

Fax No: (815) 537-5764

e-mail: www.pcc-penberthy.com

Printed in U.S.A

Part No. 14912-009