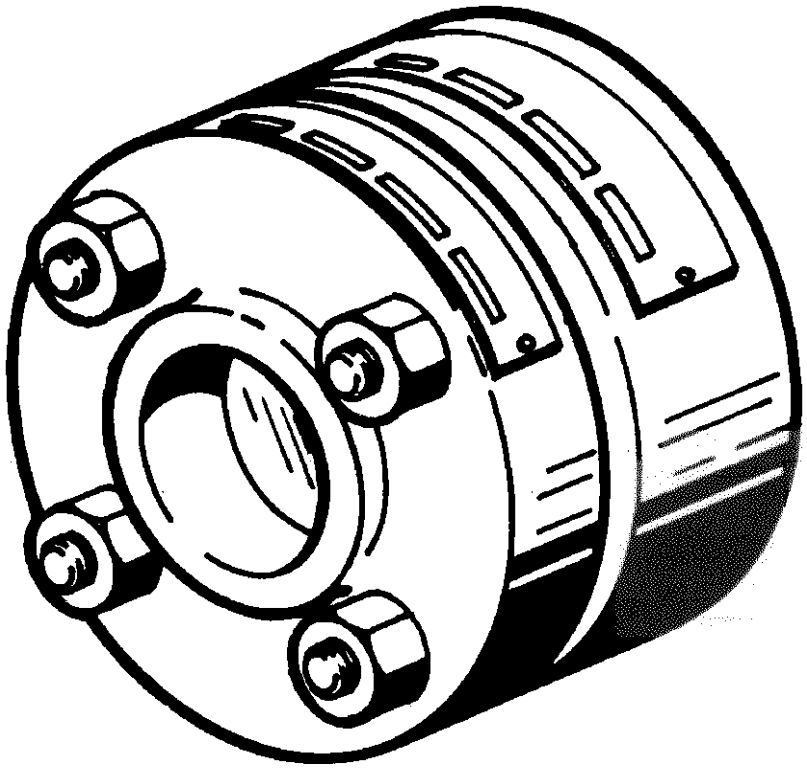
PENBERTHY®

Section	3000
Instal. Instr.	3965.1
Issued	12/98
Replaces	NEW

Sight Windows

300 Lb. ANSI



Installation/Operation/Maintenance Instructions

TABLE OF CONTENTS

TABLES AND FIGURE **page**

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 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 sight window 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 sight windows are handled, installed or used. Penberthy cannot and will not guarantee that a sight window is suitable or compatible for the user's specific application.

⚠ WARNING ⚠

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 sight window. Failure to do so could result in serious personal injury and/or property damage.

2.0 INTRODUCTION

2.1 Features and Specifications

Penberthy sight windows are designed for either the observation of flow in a process line or to observe level in a tank or vessel. They are available in a variety of models, sizes and connection styles. The user should refer to Penberthy dimension sheets to determine specific models, sizes and connection styles available.

2.2 Design Ratings PSIG at Maximum and Minimum Operating Temperatures

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

2.3 Application Data

NOTE: For specific application data within the above ranges, consult the Penberthy product proposal for the specific model and size sight window or request Penberthy to supply the applicable Technical Data.

Pressure/Temperature Ratings Using Tempered Borosilicate Glass
Table 1

Body Material	Gasket Material	Temperatures in °F & [°C]					
		-20° [-29°]	100° [38°]	200° [93°]	300° [149°]	400° [204°]	500° [260°]
Carbon Steel	Teflon®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]	635 psig [4378 kPa]	600 psig [4137 kPa]
	Grafoil®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]	635 psig [4378 kPa]	600 psig [4137 kPa]
	Non-Asbestos	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]	635 psig [4378 kPa]	600 psig [4137 kPa]
	Viton®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]	635 psig [4378 kPa]	
	Kel-F®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]	635 psig [4378 kPa]	
	Neoprene®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]		
	Buna-N®	740 psig [5137 kPa]	740 psig [5137 kPa]	675 psig [4654 kPa]	655 psig [4516 kPa]		
Stainless Steel	Teflon®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]	515 psig [3551 kPa]	480 psig [3309 kPa]
	Grafoil®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]	515 psig [3551 kPa]	480 psig [3309 kPa]
	Non-Asbestos	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]	515 psig [3551 kPa]	480 psig [3309 kPa]
	Viton®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]	515 psig [3551 kPa]	
	Kel-F®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]	515 psig [3551 kPa]	
	Neoprene®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]		
	Buna-N®	720 psig [4964 kPa]	720 psig [4964 kPa]	620 psig [4275 kPa]	560 psig [3861 kPa]		

NEVER exceed the design ratings, application ratings or application data limits. Exceeding these design ratings or application data may result in mechanical failure of the sight window, resulting in serious personal injury and/or property damage.

3.0 INSPECTION AND PERFORMANCE CONFIRMATION

3.1 Receiving Inspection

Upon receipt of the sight window, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request a damage inspection.

3.2 User's Rating Inspection

The user is to confirm:

a. That the sight window model number and pressure/temperature rating stamped on the nameplate (163) conforms to the description on the user's purchase order.

b. That the operating conditions described in the purchase order agree with the actual operating conditions at the installation site.

c. That the actual operating conditions at the installation site are within the application data shown on the Penberthy Technical Data Bulletin or product proposal referred to above.

d. That the materials of construction of the sight window are compatible with both the contained fluid and surrounding atmosphere in the specific application.

Important: If the size, model, or performance data of the sight window as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for directions on what to do.

4.0 INSTALLATION

Use only qualified experienced personnel who are familiar with this equipment and thoroughly understand all the instructions in this manual for the installation of this equipment.

Refer to Penberthy dimension sheets or Penberthy product proposal to obtain dimensional information for the specific size and model sight window.

Do not proceed with installation of sight window unless:

a. The glass has been examined and is free of scratches and other imperfections. *Glass that is chipped or scratched is weakened and may break under pressure and should not be used under any circumstances. Pressure/temperature ratings within the chart above are no longer valid for glass that is weakened.*

b. The connections of the sight window have been cleaned and free of any foreign materials. Failure to do so can cause serious personal injury and/or property damage.

4.1 Effect of Related Piping and Precautions

a. Locate the sight window where it can be easily seen.
b. Locate the sight window away from areas where objects will be dropped, thrown, or generally allowed to make contact with the viewing window glass.
c. Locate the sight window so it is protected from dust, grit, tools and any other objects which may scratch, chip or break the viewing window glass.
d. Locate the sight window so it is protected from external thermal shock, such as would be imposed on a unit in a high temperature application when exposed to a cold air blast or a cold water wash.

Failure to mount, protect, and locate the sight window as described with items 1 thru 4 above can cause serious personal injury and/or property damage.

4.2 Preparation for Units that Require Welding

Secure work bench to lay out parts as removed.

4.3 Disassembly Prior To Welding

a. Hold sight window firmly, loosen and remove nuts and bolts as required.
b. Remove cover, cushions, glass shields (if any) and gaskets and set aside.

Extreme care must be taken to avoid damage to the cushions, glass, shields (if any) and gaskets. If any of the items are damaged in any way, their subsequent use can result in glass breakage, resulting in sudden release of pressure causing serious personal injury and/or property damage.

4.4 Reassembly Prior to Welding w/ Steel Spacer

a. Place steel spacer on chamber in place of glass.
b. Install covers in place.
c. Install bolts and nuts as required, hand tight.

Note: Cushions, glass, shields (if any) and gaskets can be re-installed after welding in this instance only because the sight window has not been torqued at assembly.

Important: Extreme care must be taken to avoid gouging or scarring glass seating surfaces on the chamber and cover.

Note: Penberthy recommends that all flat pad, radius pad, socket weld and weld neck sight windows be provided with a steel spacer. Steel spacers are designed to prevent warpage of the chamber during welding.

4.5 Welding

Important: Welding must adhere to all applicable local and national codes and recognized safety practices.

1. Flat Pad, Radius Pad and Weld Neck Sight Windows
   a. Tank or vessel must be relieved of all pressure or vacuum, allowed to reach ambient temperature and must be drained or purged of all fluids prior to welding.
   b. A hole must be cut in the tank or vessel at the location that the user wants the sight window to read. The hole must be equal in size or slightly larger than the vision diameter of the chamber.
   c. Locate chamber assembly over the hole in the tank or vessel making sure that the hole in the chamber and the hole in the tank or vessel are centered with each other.
   d. Hold chamber assembly in place and tack weld four places 90° apart.
   e. Complete welding of chamber to tank or vessel by making a continuous pass around the entire circumference of the chamber.

2. Socket Weld Sight Windows
   a. Place socket weld connection of sight window over the connecting pipe until the pipe bottoms out inside the sight window.
   b. Back sight window out so that there is a 1/16" [1.59 mm] gap between the end of the connecting pipe and the bottom surface of the socket weld connection of the sight window.
   c. Hold chamber assembly in place and tack weld two places 180° apart
   d. Complete welding of chamber to pipe by making a continuous pass around the entire circumference of the pipe.

4.6 Disassembly – Reassembly After Welding

1. Disassembly
   a. Make sure that the sight window has cooled to ambient temperature before disassembling.
   b. Remove bolts, nuts, cover and steel spacer as required.
2. Reassembly
   a. Check flatness of each glass seating surface of chamber (2) and under cover (1) for distortion by using a known flat piece of material the same size as the glass (48) and a thickness gage. Surface must be flat within .005" [0.127 mm].
   b. If any one glass seating surface flatness is found to be beyond a tolerance of .005" [0.127 mm] it must be restored to this flatness.
   c. If the glass seating surface cannot be restored to within the .005" [0.127 mm] tolerance, the entire sight window must be disposed of and replaced.

WARNING

Flatness of the seating surface outside the .005" [0.127 mm] tolerance specified above can cause glass breakage resulting in sudden release of contained fluid causing serious personal injury and/or property damage.

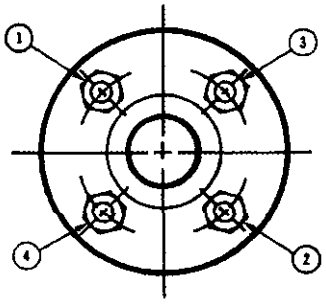
d. If glass seating surfaces are found to be within the .005 [0.127 mm] tolerance described above, proceed to assemble window.
e. Install one cushion (8) inside cover.
f. Install glass, with band, centered inside cover.
g. Install shields (9), if used, and gasket (7) on glass being careful to keep components centered.
h. Install cover to chamber being careful to maintain components aligned inside.
i. Install bolts and nuts as required. Using a torque wrench, tighten nuts in three foot/pound increments, following the sequence in Figure 2 until the torque values shown in the table Figure 1 for the specific sight window are reached.

Bolt torque is vital to the proper operation of a sight window. Gaskets compress over a period of time; therefore, bolt torque values must be checked on a regular basis and brought up to those recommended in chart Figure 1 by following the bolt tightening sequence Figure 2 for the specific size sight window.

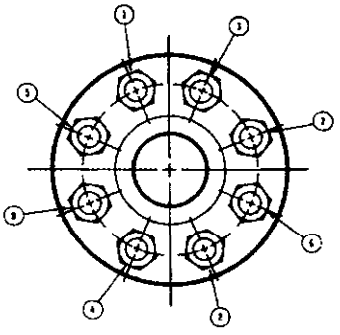
Bot Torque Values in Ft/Lbs.
Figure 1

Unit Size	Gasket Material	
	Neoprene®, Buna "N"® Viton®	Teflon®, Non-Asbestos Grafoil®, Kel-F®
1	3 – 5	3 – 5
1 1/2	5 – 7	7 – 10
2	9 – 11	14 – 16
3	17 – 21	31 – 35
4	11 – 15	19 – 23
6	30 – 34	46 – 50
8	37 - 41	48 - 52

Bolt Tightening Sequence
Figure 2



Sizes 1" thru 3"



Sizes 4" thru 8"

5.0 Operation:

5.1 Pre-Operational Check

a. Check that all installation procedures have been completed.
b. Check that bolts have been torqued to their proper values as stated within Section 4.0 Figure 1 above.
c. Check that glass is clean and free of any damage as described within Section 4.0 Installation above.
d. Check to determine that all connections are pressure tight.

5.2 Operating

WARNING

Sight window installations must be brought into service slowly to avoid excessive shock or stress on the glass. Rapid pressurization of a sight window can cause glass breakage with resulting sudden release of pressure, causing serious personal injury and/or property damage.

6.0 Maintenance

Use only qualified experienced personnel who are familiar with this equipment and have thoroughly understood all the instructions in this manual for all maintenance.

WARNING

Do not proceed with any maintenance unless the sight window 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/or property damage.

6.1 Preventative Maintenance

Create maintenance schedules, safety manuals and inspection details for each specific installation of a sight window.

On all installations, regularly check the following items for purposes of maintenance.

a. Glass, for cleanliness and signs of damage or wear.
b. Shields, if used, for signs of clouding, wear or deterioration.
c. Sight window, for signs of leakage at gaskets or at connections.
d. Sight window, for signs of internal or external corrosion.
e. Bolt torque values.

Determine upon evaluation of your operating experience, the appropriate maintenance schedule necessary for the specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

6.2 Maintenance Procedures

a. Glass

WARNING

Regular and careful attention must be given to the cleaning and inspection of glass. *Glass that is etched or even slightly scratched is weakened and may break under pressure. Design ratings listed under Section 2.0 above are no longer valid for sight windows that contain scratched, worn, or otherwise damaged glass, and such glass must be immediately replaced.* Failure to do so can cause serious personal injury and/or property damage.

1. Cleaning of glass – keep glass clean using a commercial glass cleaner and a soft cloth. DO NOT use wire brushes, metal scrapers, or any device which could scratch the glass.
2. Inspect the surface of the glass for any signs of clouding, etching, scratching or physical damage such as bruises, checks or erosion that penetrates the outer surface of the glass. Shining a light at approximately a 45° angle will aid in detecting some of these conditions, which will glisten more brightly than the surrounding glass when reflecting light. Detection of any such problem areas or any surface wear is sufficient evidence of damage. Immediately take sight window out of service. Do not proceed with operation of sight window until the glass has been replaced by following the disassembly – reassembly instructions under Section 6.4 below.

b. Shields – Shields which show any signs of clouding, wear or deterioration are an indication that the sight window glass has been exposed or could soon become exposed to the contained fluid. Immediately take sight window out of service. Do not proceed with operation of sight window until shields and glass have been replaced by following the disassembly – reassembly instructions under Section 6.4 below.

c. Gasket Leaks – Gasket leaks must be immediately repaired, taking the sight window out of service. Do not proceed with operation of a sight window until glass, gaskets and cushions have been replaced by following the disassembly – reassembly instructions under section 6.4 below.

d. Connection Leaks – Leaks at a flanged or threaded connection should be corrected by tightening the bolts at the connection or by taking the sight window out of service and remaking the connection using Teflon® tape or equivalent on all male pipe threads as shown in Figure 3 below.

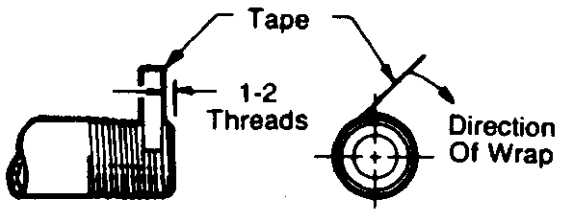


Figure 3

e. Corrosion – It is the user's responsibility to choose materials of construction compatible with both the contained fluid and surrounding atmosphere in the user's specific application. If internal or external corrosion are present, an investigation must immediately be carried out by the user as to the cause of the problem, including consulting with an authorized Penberthy distributor.
f. Bolt Torque – Bolt torque schedules should be developed by checking bolt torque values daily until an appropriate cycle becomes apparent. The appropriate schedule is such that the minimum torque is always maintained while not exceeding maximums at any time as shown in chart Figure 1.

6.3 Troubleshooting for Soundness of Glass

Problem
Glass or shield becomes etched or clouded in service.

Cause	**Cure**
Fluid being handled is not compatible with glass or shield material	Install shields that are unaffected by fluid

Problem
Glass continually breaks in service

Cause	**Cure**
Warped chamber as a result of mechanical or thermal stress	Replace sight window

6.4 Removal – Disassembly – Reassembly

WARNING

Do not proceed with the removal or disassembly of the sight window unless the sight window 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/or property damage.

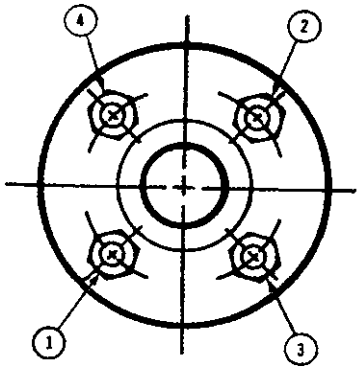
a. Disassembly

1. Sight windows should be disassembled by loosening the bolts (137) by following the bolt loosening sequence shown in Figure 4 for the specific size sight window.

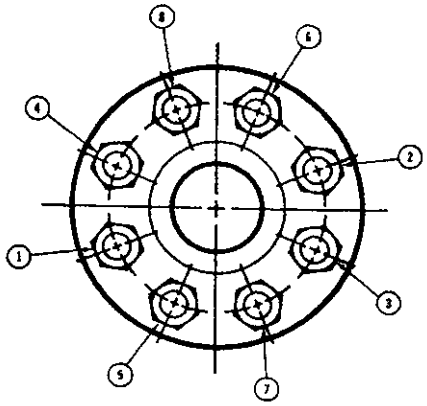
WARNING

Once a sight window has been disassembled, all glass, gaskets, cushions and shields (if any) must be disposed of since they are all permanently deformed by compression. Do not under any circumstance re-use those items since they may cause leaks and may have high stress points resulting in glass breakage. If re-used, the glass can break causing serious personal injury and/or property damage.

Bolt Loosening Sequence
Figure 4



Sizes 1" thru 3"



Sizes 4" thru 8"

b. Reassembly

1. Refer to exploded views Figure 5 and 6.
2. Prepare for installation of new glass by first cleaning the cushion seating surface on the glass cover (1) and the gasket seating surface on the chamber (2). This must be done using a soft metal scraper (preferably brass) to remove all burrs, rust, and bits of old cushion which may be present. Exercise extreme care to avoid gouging or scarring cushion/ gasket surface.

WARNING

Failure to prepare gasket surface as described above can result in leaks or glass breakage resulting in serious personal injury and/or property damage.

3. Upon receipt of glass, inspect each piece individually for shipping damage. During inspection, and during any subsequent handling of glass, care must be exercised to keep glass (especially the polished faces) from contacting each other or any other surfaces including table tops. If shipping damage is evident or suspected, notify carrier immediately and request damage inspection. Glass should be kept within original box until ready to use.

WARNING

Bumping or sliding of glass against each other or against other surfaces may result in glass breaking, scratching, or chipping. Glass that is broken is dangerous and useless and must be disposed of in a safe manner determined by the user. *Glass that is chipped or scratched is weakened and must not be used under any circumstances. Pressure/temperature ratings within Section 2.0 chart above are no longer valid for glass that is weakened.* Failure to do so can cause serious personal injury and/or property damage.

4. Assemble the components as shown in the exploded views Figure 5 and 6 for the specific style sight window. Install band (331) around glass and place glass centered within the chamber and cover.
5. Threads on bolts must be cleaned of paint, rust and scale. Apply a light coat of oil to the threads and tighten the bolts finger tight.
6. Use a torque wrench to tighten the bolts. Tighten the bolts in a sequence as shown in Figure 2 for the specific size sight window. Tighten bolts in increments of 3 ft./lbs. max; torque until value in chart Section 4.6 Figure 1 are reached.
7. Gaskets will become compressed a short time after the bolts are tightened and torque values will decrease. Therefore, the sight window must be retorqued after 24 hours of service to the values established within chart Figure 1 for the specific model sight window.

WARNING

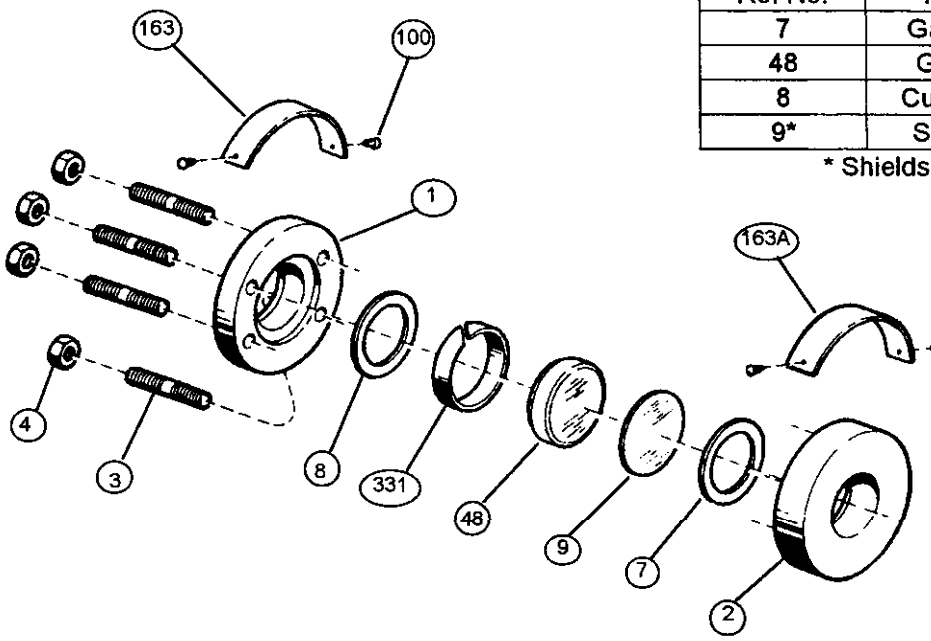
Do not retorque a sight window while under pressure. A sight window in service must be relieved of all pressure or vacuum, allowed to reach ambient temperature and been drained or purged of all fluids before retorquing is performed. Failure to follow this procedure can result in serious personal injury and/or property damage.

8. Refer to Section 5.0 Operation, when returning sight window to service.

RECOMMENDED SPARE PARTS

Ref No.	Item	Min. Qty.
7	Gasket	1
48	Glass	1
8	Cushion	1
9*	Shield	1

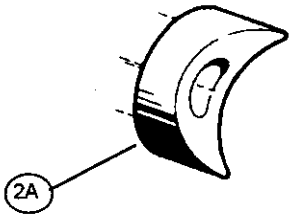
* Shields are optional



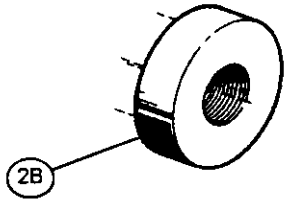
Typical Flat Pad Chamber

Figure 5

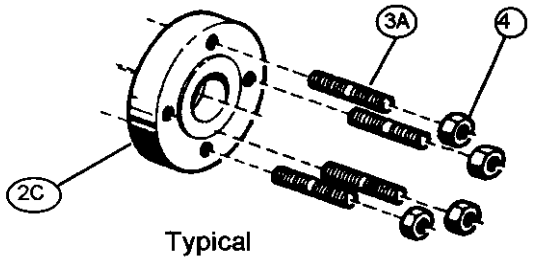
1	Cover
2	Chamber
2A	Chamber
2B	Chamber
2C	Chamber
3	Stud
3A	Stud
4	Nut
7	Gasket
8	Cushion
9	Shield
48	Glass
100	Screw
163	Nameplate
163A	Nameplate
331	Band



Typical Radius Pad Chamber



Typical Female NPT

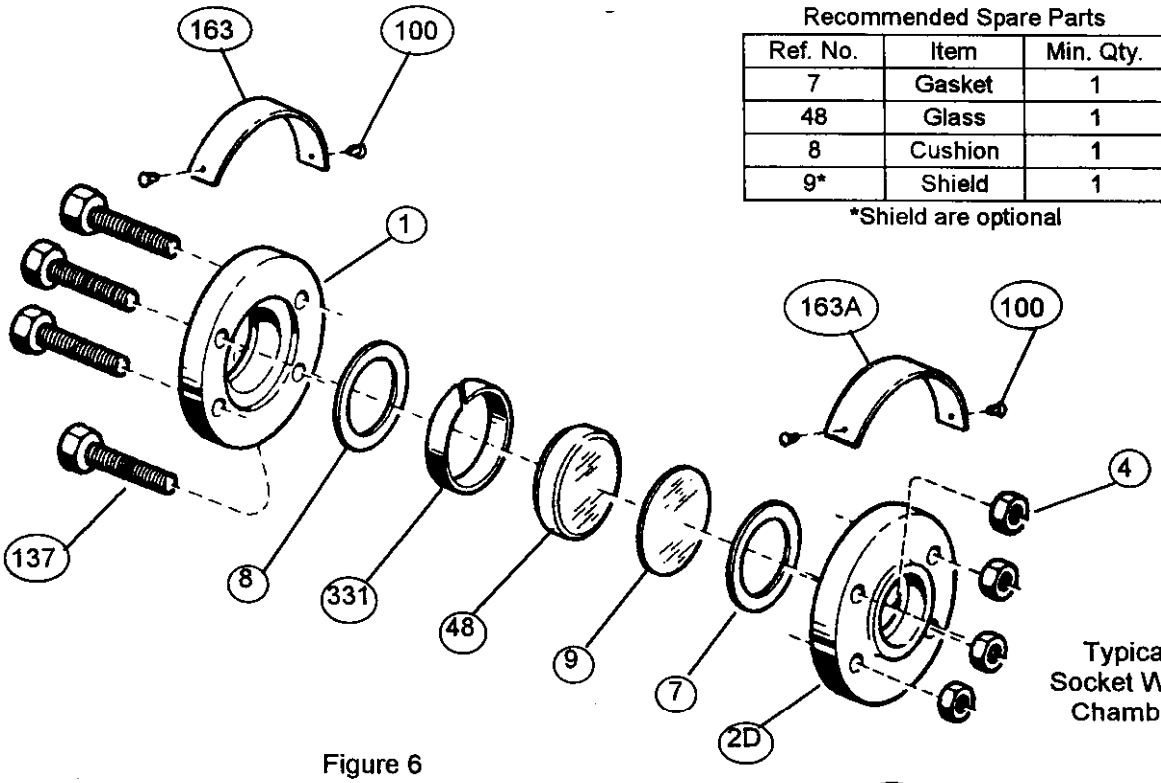


Typical Flanged Chamber

Recommended Spare Parts

Ref. No.	Item	Min. Qty.
7	Gasket	1
48	Glass	1
8	Cushion	1
9*	Shield	1

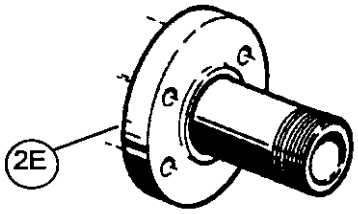
*Shield are optional



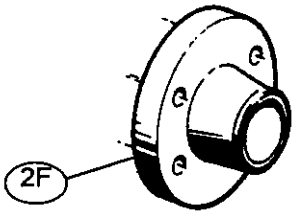
Typical Socket Weld Chamber

Figure 6

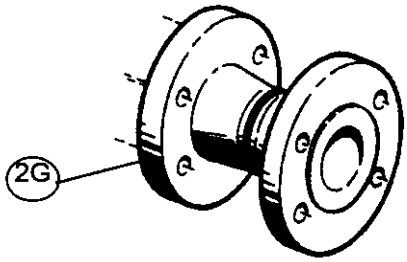
1	Cover
2D	Chamber
2E	Chamber
2F	Chamber
2G	Chamber
4	Nut
7	Gasket
8	Cushion
9	Shield
48	Glass
100	Screw
137	Bolt
163	Nameplate
163A	Nameplate
331	Band



Typical Male NPT Chamber



Typical Weld Neck Chamber



Typical Weld Neck Flanged Chamber

NOTES