



# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation these instructions must be fully read and understood

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### Product warranty

Emerson warrants its Penberthy products as designed and manufactured by Emerson to be free of defects in the 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. Emerson will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

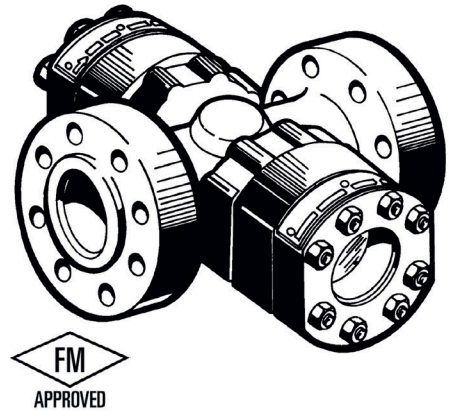
Prior to submitting any claim for warranty service, the owner must submit proof of purchase to Emerson and obtain written authorization to return the product. Thereafter, the product shall be returned to Emerson, with freight paid.

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

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

**THIS IS EMERSON'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 Emerson unless made in writing and signed by the General Manager or Director of Engineering of Emerson.

# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 1.0 ABOUT THE MANUAL

This manual has been prepared as an aid and guide for personnel involved installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation, or maintenance.

**Important:** Penberthy does not have control over the manner in which its dual window sight flow indicator is handled, installed, or used, and Penberthy cannot and does not warrant or guarantee that a dual window sight flow indicator is suitable or compatible with the user's specific application.

#### WARNING

*Always wear safety glasses when installing, servicing or operating a dual window sight flow indicator. Failure to follow any instruction could possibly result in a malfunction of the dual window sight flow indicator or glass breakage with resulting sudden release of pressure, causing serious personal injury or property damage.*

### 2.0 INTRODUCTION

#### 2.1 Features and specifications

Penberthy dual window sight flow indicators are designed for the observation of flow in a process line. They are designed with dual glass to double the protection in case of accidental breakage of the inner or outer glass. They are available in a variety of models, sizes and connection styles. The user should refer to Penberthy dimension sheets to determine specific models and connection styles available.

#### 2.2 Design ratings at maximum and minimum operating temperatures

Refer to Table 1

**TABLE 1 - MAXIMUM DESIGN RATINGS FOR UNITS WITH TEMPERED GLASS**

Body		Gasket material (psig (MPa))			
material	Temp rating	Teflon®	Grafoil®	IFG-5500®	Viton®
Carbon steel	-20°F (-29°C) to +100°F (38°C)	740 (5.10)	740 (5.10)	740 (5.10)	740 (5.10)
	AT +250°F (121°C)				
	AT +300°F (149°C)				
	AT +400°F (204°C)				635 (4.38)
316 Stainless steel	AT +500°F (260°C)	605 (4.17)	605 (4.17)	605 (4.17)	
	-20°F (-29°C) to +100°F (38°C)				720 (4.96)
	-65°F (-54°C) to +100°F (38°C)				
	-300°F (-184°C) to +100°F (38°C)	720 (4.96)	720 (4.96)	720 (4.96)	
	AT +250°F (121°C)				
316 Stainless steel	AT +300°F (149°C)				
	AT +400°F (204°C)				515 (3.55)
	AT +500°F (260°C)	480 (3.31)	480 (3.31)	480 (3.31)	

Body		Gasket material (psig (MPa))		
material	Temp rating	PCTFE (KEL-F®)	Neoprene®	Buna-N
Carbon steel	-20°F (-29°C) to +100°F (38°C)	740 (5.10)	740 (5.10)	740 (5.10)
	AT +250°F (121°C)			670 (4.62)
	AT +300°F (149°C)		655 (4.52)	
	AT +400°F (204°C)	635 (4.38)		
316 Stainless steel	AT +500°F (260°C)			
	-20°F (-29°C) to +100°F (38°C)			
	-65°F (-54°C) to +100°F (38°C)		720 (4.96)	720 (4.96)
	-300°F (-184°C) to +100°F (38°C)	720 (4.96)		
	AT +250°F (121°C)			590 (4.07)
316 Stainless steel	AT +300°F (149°C)		560 (3.86)	
	AT +400°F (204°C)	515 (3.55)		
	AT +500°F (260°C)			

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### 2.3 Design ratings for FM approved units

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

### 2.4 Application data

#### NOTE

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

#### WARNING

*Never exceed these design ratings or application data limits. Exceeding design ratings or application data limits can cause serious personal injury or property damage.*

### 3.0 INSPECTION AND PERFORMANCE CONFIRMATION

#### 3.1 Receiving inspection

Upon receipt of dual window sight flow indicator, 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 Users' rating inspection

The user should confirm that:

1. The dual window sight flow indicator 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 conditions at the installation site.
3. The actual operating conditions at the installation site are within the application data shown on the Penberthy Technical Data Bulletin referred to above.
4. The materials of construction of the sight flow indicator are compatible with both the contained fluid and surrounding atmosphere in the specific application.

**TABLE 2**

Body material	Temp rating	Gasket material (psig (MPa))	
		IFG-5500®	GRAFOIL®
Carbon steel	100°F (38°C)	300 (2.10)	
316 Stainless steel	100°F (38°C)	300 (2.10)	

#### IMPORTANT

*If the size, model or performance data of the dual window sight flow indicator as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for direction 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 dual window sight flow indicator.

#### WARNING

*Do not proceed with installation of a dual window sight flow indicator unless the glass has been examined and is free of scratches and other imperfections and the connections and inside of the dual window sight flow indicator have been cleaned and are free of any foreign materials. Glass that is chipped or scratched is weakened and should not be used under any circumstances. Pressure/temperature ratings within Table 1 and 2 are no longer valid for glass that is weakened. Failure to comply can cause serious personal injury or property damage.*

Check the exploded view Figure 4 for the location of the inlet and outlet connections, and for the direction of the flow arrow to insure correct hook up.

# PENBERTHY SIGHT FLOW INDICATORS

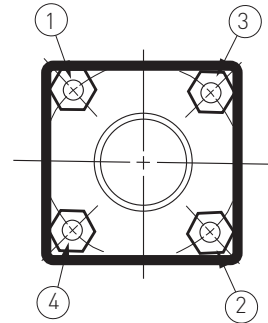
## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

**TABLE 3 - BOLT TORQUE VALUES**

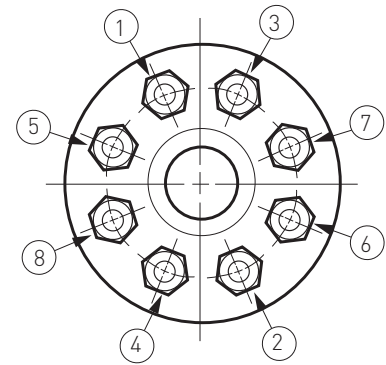
Unit size in inches	Gasket material (ft-lb (Nm))					
	Neoprene®, Buna-N, Viton®		Teflon®	Grafoil®	PCTFE (KEL-F®)	IFG-5500®
	Tempered glass	Tempered glass	Tempered glass	Tempered glass	Tempered glass	
½ and ¾	8 to 10 (11 to 14)	10 to 12 (14 to 17)	9 to 11 (13 to 15)	10 to 12 (14 to 17)	18 to 21 (24 to 29)	
1	8 to 11 (11 to 15)	12 to 15 (17 to 21)	10 to 13 (14 to 18)	12 to 15 (17 to 21)	21 to 25 (29 to 34)	
1¼ and 1½	9 to 12 (13 to 17)	13 to 16 (18 to 22)	11 to 14 (15 to 19)	13 to 16 (18 to 22)	23 to 26 (31 to 35)	
2	17 to 20 (23 to 28)	25 to 28 (34 to 38)	22 to 25 (30 to 34)	26 to 29 (36 to 40)	44 to 47 (60 to 64)	
2 ½ and 3	41 to 44 (56 to 60)	61 to 64 (83 to 87)	53 to 56 (72 to 76)	63 to 66 (86 to 90)	110 to 113 (149 to 153)	
4	70 to 73 (95 to 99)	98 to 101 (133 to 137)	N/A	101 to 104 (137 to 141)	170 to 173 (231 to 235)	
6 and 8	149 to 153 (202 to 208)	217 to 221 (295 to 300)	N/A	223 to 227 (303 to 308)	387 to 391 (525 to 530)	

**FIGURE 1**

Bolt tightening sequence  
Sizes ½" through 1"



Bolt tightening sequence  
Sizes 1¼" through 8"



### 4.1 Effect of related piping and precautions

- Do not impose system piping loads on dual window sight flow indicator. Unit is not designed to be a load bearing component. Piping must be supported and aligned with sight flow indicator connections to reduce the possibility of stresses imposed on the unit.
- Locate the dual window sight flow indicator where it can be easily seen.
- Locate the dual window sight flow indicator away from areas where objects may be dropped, thrown, or generally allowed to effect contact with the viewing window glass.
- Locate the dual window sight flow indicator so it is protected from dust, grit, tools, and any other objects which may scratch, chip, or break the viewing window glass.
- Locate the dual window sight flow indicator 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.

### WARNING

Failure to mount, protect, and locate the dual window sight flow indicator as described within items 1 through 5 above can cause serious personal injury or property damage.

### 4.2 Positioning of specific models

- Flapper models may be mounted in a horizontal plane provided the flapper closes over the inlet port by gravity when there is no flow.
- Plain or rotator models may be mounted in any acceptable position.
- Drip tube models should be mounted in a vertical plane with the flow arrow pointing downward.
- Ball models should be mounted in a horizontal or vertical plane with the flow arrow pointing upward.

### 4.3 Bolt torque

Refer to Table 3

### IMPORTANT

Prior to any bolt torque checks, the dual window sight flow indicator must be relieved of all pressure or vacuum, have been allowed to reach ambient temperature, and drained or purged of all fluids.

Bolt torque is vital to the proper operation of a dual window sight flow indicator. Gaskets compress over a period of time; therefore, bolt torque values must be checked, and brought up to those recommended in Table 3 by following the bolt tightening sequence in Figure 1.

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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 5.0 OPERATION

#### 5.1 Pre-operational check

1. Check that all installation procedures have been completed.
2. Check that bolts have been torqued to their proper values as stated in Table 3.
3. Check that glass is clean and free of any damage as described in Section 4.0.
4. Check to determine that all connections are pressure tight.

#### 5.2 Hydrostatic pressure test

1. Take all precautions necessary to handle the possibility of leakage.
2. Hydrostatic pressure test installation to at least 50 psig (340 kPaG), and correct any leakage before proceeding.

#### 5.3 Operating

##### WARNING

Dual window sight flow indicator installations should be brought into service slowly to avoid excessive shock or stress on glass. Rapid pressurization of sight flow indicator can cause glass breakage with resulting sudden release of pressure, causing serious personal injury or property damage.

### 6.0 MAINTENANCE

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

##### WARNING

Do not proceed with any maintenance unless the dual window sight flow indicator 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 or property damage.

#### 6.1 Preventative maintenance

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

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

1. Glass, for cleanliness and signs of damage or wear.
2. Shields, if used, for signs of clouding, wear, or deterioration.
3. Sight flow indicator for signs of leakage at gaskets, or at connections.
4. Sight flow indicator, for signs of internal or external corrosion.
5. Bolt torque values.

Determine upon evaluation of your own operating experience an 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

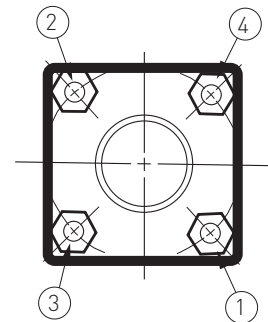
##### WARNING

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 in Section 2.2 and 2.3 are no longer valid for sight flow indicators that contain scratched, worn, or otherwise damaged glass, and such glass must be immediately replaced. Failure to do so can cause serious personal injury or property damage.

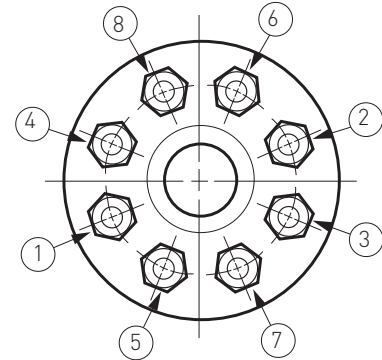
1. Glass
  - a. Keep glass clean using a commercial glass cleaner and a soft cloth. DO NOT use a wire brush, metal scraper or any device which could scratch the glass.
  - b. Inspect the surface of the glass for any signs of clouding, etching, scratching, or physical damage such as bruises, checks or corrosion 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 flow indicator out of service. Do not proceed with operation of dual window sight flow indicator until the glass has been replaced by following the Disassembly-Reassembly instructions in Section 7.0.

FIGURE 2

Bolt loosening sequence  
Sizes ½" through 1"



Bolt loosening sequence  
Sizes 1¼" through 8"



# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 2. Shields

Shields which show any signs of clouding, wear, or deterioration are an indication that the sight flow indicator glass has been exposed, or could soon become exposed to the contained fluid. Immediately take sight flow indicator out of service. Do not proceed with operation of sight flow indicator until shields and glass have been replaced by following the Disassembly-Reassembly instructions in Section 7.0.

### 3. Gasket leaks

Gasket leaks must be immediately repaired. Do not proceed with operation of a dual window sight flow indicator until glass, gaskets and cushions have been replaced by following the Disassembly-Reassembly instructions in Section 7.0.

### 4. Connection leaks

Leaks at a flanged or threaded connection should be corrected by tightening the bolts at the connection or by taking the sight flow indicator out of service and remaking the connection using Teflon® tape or equivalent on all male pipe threads.

### 5. Corrosion

It is the user's responsibility to choose a material 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 consultation with an authorized Penberthy distributor.

### 6. 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 Table 3.

### 6.3 Troubleshooting

**Problem:** Glass or shield becomes etched or clouded in service.

**Cause:** Fluid being handled is not compatible with the glass or shield material.

**Cure:** Install shields that are unaffected by fluid.

**Problem:** Glass continually breaks in service.

**Cause:** Warped body as a result of mechanical or thermal stresses.

**Cure:** Replace sight flow indicator.

## 7.0 REMOVAL-DISASSEMBLY-REASSEMBLY

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### WARNING

*Do not proceed with the removal or disassembly of a dual window sight flow indicator from connecting piping unless the sight flow indicator 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 or property damage.*

### 7.1 Disassembly

a. Dual window sight flow indicators should be disassembled by holding sight flow indicator firmly and loosening the bolts by following the bolt loosening sequence shown in Figure 2 for the specific size sight flow indicator.

### WARNING

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

### 7.2 Reassembly

a. Refer to exploded view Figure 4.  
b. Prepare for installation of new glass by first cleaning the gasket seating surfaces on the housing (181), the body (11), and the cushion seating surfaces on the glass covers (1). This should be done using a soft metal scraper (preferably brass) to remove all burrs, rust, and bits of old gasket or cushion which may be present. Exercise extreme care to avoid gouging or scarring gasket or cushion seating surfaces.

### WARNING

*Failure to prepare gasket or cushion surfaces as described above can result in leaks or glass breakage with resulting serious personal injury or property damage.*

c. 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 a damage inspection. Glass should be kept in original wrap within original box until ready to use.

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### Safety instructions

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 should be disposed of in a safe manner determined by the user. Glass that is chipped or scratched is weakened and should not be used under any circumstances. Pressure/temperature ratings within Table 1 and 2 are no longer valid for glass that is weakened.

- d. Place the sight flow indicator in a horizontal position.
- e. Install glass gasket (7) and housing gasket (7B) on gasket surfaces of body.
- f. Place band (331) around glass (48) and center glass on gasket.
- g. Place gasket (7A) centered on glass.
- h. Prior to assembling housing over glass, some measurements must be taken to determine if any shim gaskets are required to be installed between glass gasket and housing in order to insure a proper seal of the housing to the body. See Figure 3.
  1. Measure the distance from the top surface of the housing gasket to the top surface of the glass gasket, Dim "A".
  2. Measure the counter bore depth of the housing, Dim. "B". If Dim. "B" is greater than Dim "A", subtract Dim "A" from Dim. "B". The difference of these measurements will determine what total thickness of shim gaskets will need to be installed between the top of the glass gasket and the housing.

**Note:** if Dim "A" and Dim. "B" measure the same, no shim gaskets will be required.

  3. Install proper thickness of shim gaskets, if required, on top of glass gasket making sure that all gaskets are centered on glass.
- i. Assemble housing (181) over glass, making sure that all components stay centered.
- j. Place gasket centered inside housing.
- k. Place band around glass and center on gasket.
- l. Place cushion (8) on glass and housing gasket on housing.
- m. Prior to assembly of cover over glass, more measurements must be taken to determine if any shim gaskets are required to be installed between cushion and cover to insure a proper seal of the housing to the cover. See Figure 3.

1. Measure the distances from the top surface of the housing gasket to the top surface of the glass cushion, Dim "C".
2. Measure the counter bore depth of the cover, Dim. "D".
3. If Dim. "D" is greater than Dim "C", subtract Dim "C" from Dim. "D". The difference of these dimensions will determine what total thickness of shim gaskets will need to be installed between the top of the glass cushion and the cover.

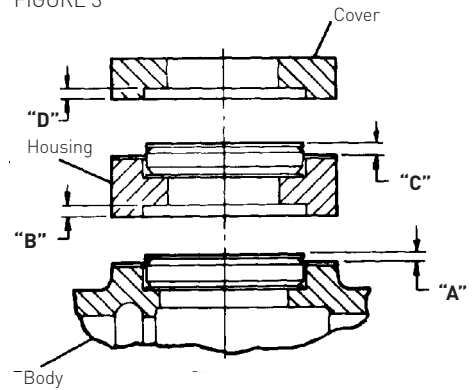
- Note:** if Dim "C" and Dim. "D" measure the same, no shim gaskets will be required.
4. Install proper thickness of shim gaskets, if required, on top of the glass cushion making sure that all gaskets are centered on glass.
- n. Install cover into place.
  - o. Turn assembly over making sure that all components stay aligned and follow the same procedures above for the opposite side.
  - p. Threads on studs (3) and nuts (4) must be cleaned of paint, rust, and scale. Apply a light coat of oil to the threads and insert bolts through the nameplate and two (2) covers, and install nuts finger tight.
  - q. Use a torque wrench to tighten the bolts. Tighten the bolts in a sequence as shown in Figure 1. Tighten bolts in increments of 5 ft-lb (7 Nm) or 50% of torque value as shown in Table 3, whichever is greater. Continue tightening sequence at 5 ft-lb (7 Nm) max. torque until torque values in Table 3 are reached.
  - r. Gaskets will become compressed a short time after bolts are tightened and torque values will decrease. Therefore, the sight flow indicator must be retorqued after 24 hours in service, to values established in Table 3 for the specific model dual window sight flow indicator.

### WARNING

*Do not re-torque a sight flow indicator while under pressure. A sight flow indicator in service must be freed of all pressure or vacuum, allowed to reach ambient temperature and be drained or purged of all fluids before retorquing is performed. Failure to follow this procedure can result in serious personal injury or property damage.*

- s. Refer to Section 4.0 Installation and Section 5.0 Operation when returning dual window sight flow indicator to service.

FIGURE 3



# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 8.0 DISPOSAL AT END OF USEFUL LIFE

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

Metal, glass and polymers should be recycled whenever possible. Refer to order and Emerson Material Specification sheets for materials of construction.

### 9.0 TELEPHONE ASSISTANCE

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If you are having difficulty with your Dual Window Sight Flow Indicator, contact your local Penberthy distributor. You may also contact the factory direct at (956) 430-2500 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information available as possible when you call:

- Model #
- Name of the company from whom you purchased the sight flow indicator
- Invoice # and date
- Process conditions (pressure, flow rates, tank shape, etc)
- A brief description of the problem
- Trouble shooting procedures that failed

If attempts to solve your problem fail, you may request to return your Sight Flow Indicator to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from Emerson before returning anything. Failure to do so will result in the unit being returned to you without being tested, freight collect. To obtain an 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

There is a minimum charge 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 under warranty, but is not defective, the minimum charge will apply.

### NOTES

Grafoil® is a registered trademark of Graftech, Inc.  
IFG-5500® is a registered trademark of Garlock.  
Neoprene®, Viton® and Teflon® are registered trademarks of E. I. duPont de Nemours and Company.  
PCTFE (formerly known as Kel-F® - a registered trademark of the 3M company) now manufactured by Daikin.

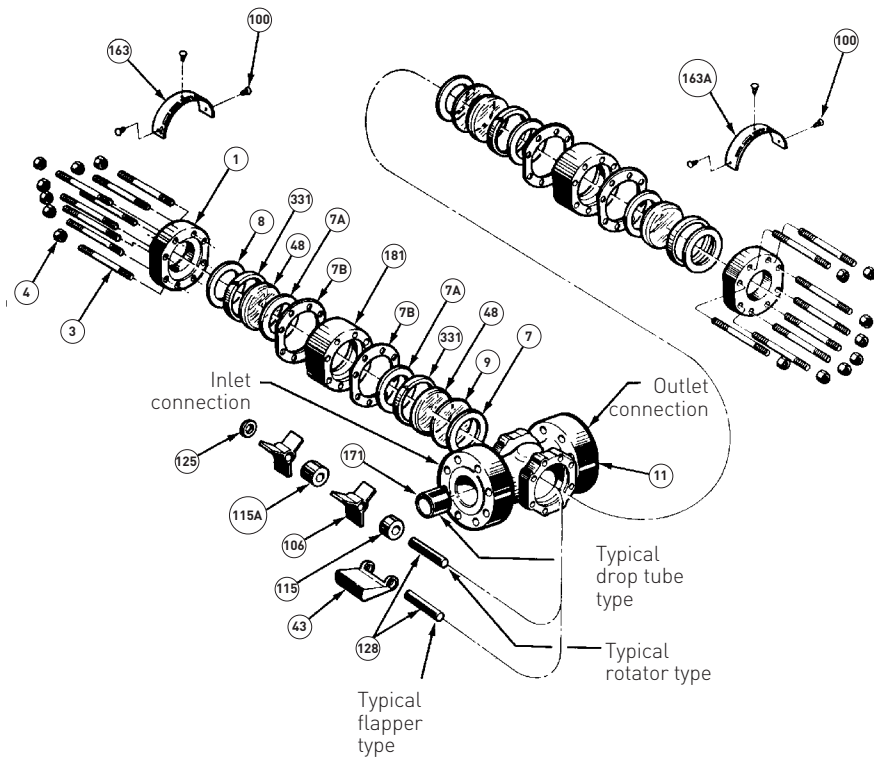


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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 10.0 EXPLODED PARTS DRAWING

FIGURE 4



#### PART LIST

Pos	Description
1	Cover
3	Stud
4	Nut
7	Gasket
7A	Gasket
7B	Gasket
8	Cushion
9	Shield*
11	Body
43	Flapper
48	Glass
100	Screw
106	Rotator
115	Spacer
115A	Spacer
125	Washer
128	Pin
137	Bolt
163	Nameplate
163A	Nameplate
171	Tube
181	Housing
331	Band

#### RECOMMENDED SPARE PARTS

Ref no.	Item	Qty.
7	Gasket	2
7A	Gasket	4
7B	Gasket	2
8	Cushion	2
9	Shield*	2
48	Glass	4

\* Shields are optional

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