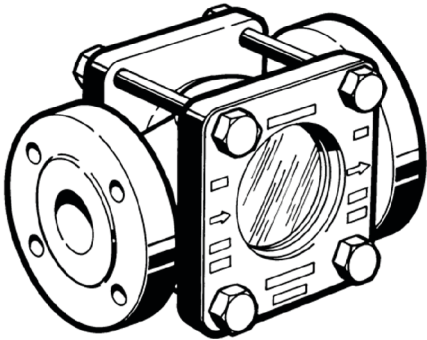




**PENBERTHY SIGHT FLOW INDICATORS**  
 INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Before installation these instructions must be fully read and understood



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# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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### PRODUCT WARRANTY

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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.

### 1 ABOUT THE MANUAL

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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.

#### IMPORTANT

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

#### WARNING

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

### 2 INTRODUCTION

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#### 2.1 Features and Specifications

Penberthy sight flow indicators are designed for the observation of flow in a process line. 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.

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### 2.2 Design Ratings at Maximum and Minimum Operating Temperatures

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

Body material	Temp rating	Gasket Material psig [MPa]		
		Teflon®	IFG-5500®	Grafoil®
Iron	-20°F [-29°C] to +100°F [38°C]	250 [1.72]	250 [1.72]	250 [1.72]
	at +500°F [260°C]	170 [1.17]	170 [1.17]	170 [1.17]
Bronze	-20°F [-29°C] to +150°F [66°C]	225 [1.55]	225 [1.55]	225 [1.55]
	at +400°F [204°C]	170 [1.17]	170 [1.17]	170 [1.17]
Carbon steel	-20°F [-29°C] to +100°F [38°C]	285 [1.97]	285 [1.97]	285 [1.97]
	at +500°F [260°C]	170 [1.17]	170 [1.17]	170 [1.17]
316 Stainless steel	-300°F [-184°C] to +100°F [38°C]	275 [1.90]	275 [1.90]	275 [1.90]
	at +500°F [260°C]	170 [1.17]	170 [1.17]	170 [1.17]

Body material	Temp rating	Gasket Material psig [MPa]			
		Viton®	PCTFE	Neoprene®	Buna "N"
Iron	-20°F [-29°C] to +100°F [38°C]	250 [1.72]	250 [1.72]	250 [1.72]	250 [1.72]
	at +250°F [121°C]				225 [1.55]
	at +300°F [149°C]			215 [1.48]	
	at +400°F [204°C]	200 [1.38]	200 [1.38]		
Bronze	-20°F [-29°C] to +150°F [66°C]	225 [1.55]	225 [1.55]	225 [1.55]	225 [1.55]
	at +250°F [121°C]				205 [1.41]
	at +300°F [149°C]			195 [1.34]	
	at +400°F [204°C]	170 [1.17]	170 [1.17]		
Carbon steel	-20°F [-29°C] to +100°F [38°C]	285 [1.97]	285 [1.97]	285 [1.97]	285 [1.97]
	at +250°F [121°C]				245 [1.69]
	at +300°F [149°C]			230 [1.59]	
	at +400°F [204°C]	200 [1.38]	200 [1.38]		
316 Stainless steel	-20°F [-29°C] to +100°F [38°C]	275 [1.90]			
	-65°F [-54°C] to +100°F [38°C]			275 [1.90]	275 [1.90]
	-300°F [-184°C] to +100°F [38°C]		275 [1.90]		
	at +250°F [121°C]				225 [1.55]
	at +300°F [149°C]			215 [1.48]	
	at +400°F [204°C]	195 [1.34]	195 [1.34]		

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.

### 2.3 Application Data

#### NOTE

For specific application data within the above ranges, consult the Penberthy product proposal for the specific model and size 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.*

# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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### 3 INSPECTION AND PERFORMANCE CONFIRMATION

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#### 3.1 Receiving Inspection

Upon receipt of 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 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.

#### IMPORTANT

*If the size, model or performance data of the 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 INSTALLATION

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Use 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 flow indicator.

#### WARNING

*Do not proceed with installation unless the glass has been examined and is free of imperfections, and the connections and inside of the 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 are no longer valid for glass that is weakened. Failure to comply may cause a sudden release of pressure with resulting severe personal injury or property damage.*

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

#### 4.1 Effect of Related Piping and Precautions

1. Do not impose system piping loads on sight flow indicator. Unit is not designed to be a load bearing component. Piping must be supported and aligned with sight flow indicator end connections to reduce the possibility of stresses imposed on the unit.
2. Locate the sight flow indicator where it can be easily seen.
3. Locate the sight flow indicator away from areas where objects may be dropped, thrown, or generally allowed to effect contact with the viewing window glass.
4. Locate the 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.
5. Locate the 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 sight flow indicator as described above can cause serious personal injury or property damage.*

#### 4.2 Positioning of Specific Models

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

#### 4.3 Bolt Torque

#### IMPORTANT

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

*Bolt torque is vital to the proper operation of a sight flow indicator. Gaskets compress over a period of time; therefore, bolt torque should be checked, and bolt torque values should be brought up to those recommended in Table 2 by following the bolt tightening sequence Figure 1.*

# PENBERTHY SIGHT FLOW INDICATORS

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**TABLE 2 - BOLT TORQUE VALUES**

Unit Size in inches	Gasket material ft•lb [N•m]									
	Neoprene® Buna "N", Viton®		Teflon®		IFG-5500®		Grafoil®		PCTFE	
	Tempered Glass		Tempered Glass		Tempered Glass		Tempered Glass		Tempered Glass	
¼ & ¾	2 to 3	[3 to 4]	2 to 4	[3 to 6]	2 to 4	[3 to 6]	2 to 3	[3 to 4]	2 to 4	[3 to 6]
½ & ¾	2 to 4	[3 to 6]	3 to 5	[4 to 7]	5 to 7	[7 to 10]	3 to 5	[4 to 7]	3 to 5	[4 to 7]
1	3 to 6	[4 to 8]	5 to 8	[7 to 11]	9 to 12	[12 to 16]	4 to 7	[6 to 10]	5 to 8	[7 to 11]
1¼ & 1½	7 to 10	[10 to 14]	10 to 13	[14 to 18]	18 to 21	[24 to 29]	9 to 12	[13 to 17]	11 to 14	[15 to 19]
2	14 to 17	[19 to 23]	20 to 23	[28 to 32]	35 to 38	[48 to 52]	18 to 21	[25 to 29]	21 to 24	[29 to 33]
2½ & 3	33 to 36	[45 to 49]	49 to 52	[67 to 71]	88 to 91	[119 to 123]	43 to 46	[59 to 63]	50 to 53	[68 to 72]
4	56 to 59	[76 to 80]	79 to 82	[108 to 112]	136 to 138	[184 to 189]	N/A		81 to 84	[110 to 114]
6	126 to 130	[171 to 176]	170 to 174	[231 to 236]	278 to 282	[377 to 382]	N/A		174 to 177	[236 to 240]
8	145 to 150	[197 to 204]	207 to 210	[281 to 285]	294 to 299	[399 to 405]	N/A		211 to 216	[287 to 293]

**WARNING**

Failure to comply with the proper torquing sequence or force value can lead to leakage, gasket blow-out or glass breakage resulting in gage failure, serious personal injury or property damage.

**5 OPERATION**

**5.1 Pre-Operational Check**

1. Check that all installation instructions have been completed.
2. Check that bolts have been torqued to their proper limits as stated in Section 4.3.
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**

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

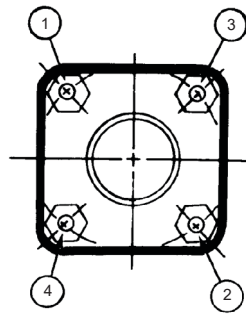


FIGURE 1  
Bolt tightening sequence

# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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### 6 MAINTENANCE

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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 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 could result in a sudden release of pressure causing serious personal injury or property damage.*

#### 6.1 Preventative Maintenance

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

1. 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 in Section 2.2 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 comply can cause serious personal injury or property damage.*

- a. Keep glass clean using a commercial glass cleaner and a soft cloth. DO NOT use wire brushes, 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 sight flow indicator until the glass has been replaced with a glass replacement kit by following the Disassembly-Reassembly instructions in Section 7.0.

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.

# PENBERTHY SIGHT FLOW INDICATORS

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

### 3. Gasket Leaks

Gasket leaks must be immediately repaired. Do not proceed with operation of a 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 with Teflon® tape or equivalent on all male pipe threads as shown in Figure 2.

### 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 consulting 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 maximum torque is always maintained while not exceeding maximums at any time as shown in Table 2.

## 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

### WARNING

*Do not proceed with the removal or disassembly of 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

- Sight flow indicators should be disassembled by holding sight flow indicator firmly and loosening bolts by following the bolt loosening sequence shown in Figure 3.

### WARNING

*Once a 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 can break causing serious personal injury or property damage.*

### 7.2 Reassembly

- Refer to exploded view Figure 4.
- Prepare for installation of new glass (48) by first cleaning the gasket seating surfaces on body (11) and the cushion seating surfaces on 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 seating surfaces described above can result in leaks or glass breakage with resulting serious personal injury or property damage.*

- 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.

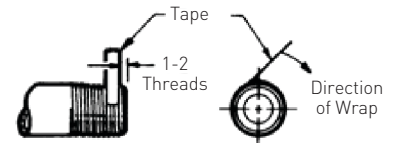


FIGURE 2  
Pipe threads

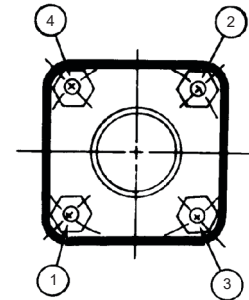


FIGURE 3  
Bolt loosening sequence

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### WARNING

*Bumping or sliding of glass against each other or against other surfaces can 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 are no longer valid for glass that is weakened. Using broken, chipped or scratched glass can cause serious personal injury or property damage.*

- d. Place the sight flow indicator in a horizontal position and assemble the components as shown in Figure 4. Install band (331) around glass and place glass centered within the body and cover.
- e. Threads on bolts (137) and nuts (4) must be clean of paint, rust, and scale. Apply a light coat of oil to the threads and insert bolts through nameplate and two (2) covers, and install nuts finger tight.
- f. Use a torque wrench to tighten the bolts. Tighten bolts in increments of 3 ft•lb [4 N•m] or 50% of torque value as shown in Table 2, whichever is smaller. Continue tightening sequence at 3 ft•lb [4 N•m] max. torque until values in Table 2 are reached.
- g. 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 2 for the specific model 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 drained or purged of all fluids before re-torque is performed. Failure to follow this procedure can result in serious personal injury or property damage.*

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

## 8 DISPOSAL AT END OF USEFUL LIFE

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Penberthy 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 TELEPHONE ASSISTANCE

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If you are having difficulty with your 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.

Grafoil® is a registered trademark of Graftech, Inc. IFG-5500® is a registered trademark of Garlock Neoprene®, Teflon® and Viton® 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



# PENBERTHY SIGHT FLOW INDICATORS

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### 10 EXPLODED PARTS DRAWING

REF NO.	ITEM	MIN. QTY.
7	Gasket	2
48	Glass	2
8	Cushion	2
9	Shield	2

\* Shields are optional

To ensure proper operation, use Penberthy spare parts.

### PARTS LIST

Item	
137	Bolt
163	Nameplate
128	Pin
115	Spacer
106	Rotator
115A	Spacer
125	Washer
11	Body
7	Gasket
9	Shield
48	Glass
8	Cushion
1	Cover
4	Nut
43	Flapper
171	Tube
331	Band

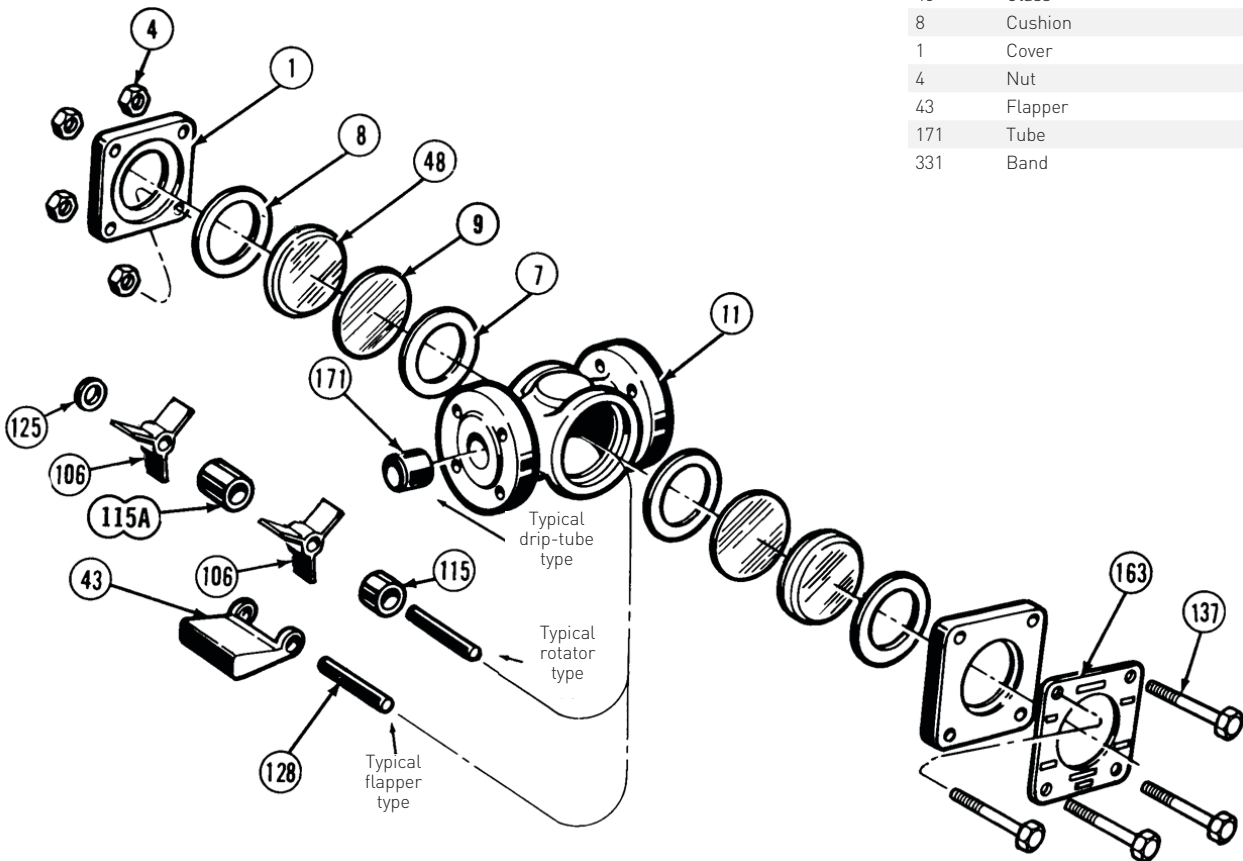


FIGURE 4

Neither Emerson, Emerson Automation Solutions, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

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