

---

# Pure-Flo<sup>®</sup>

## Handwheel Operated Valves (970)

### Instruction Manual

This manual provides installation, operation and maintenance instructions for manually operated Pure-Flo diaphragm valves. If additional information is required, please contact:

ITT Industrial Process  
33 Centerville Road, P.O. Box 6164  
Lancaster, PA 17603-2064 USA  
Or call: (800) 366-1111  
(717) 509-2200  
Fax: (717) 509-2336  
Website: [www.ittpureflo.com](http://www.ittpureflo.com)  
E-mail: [pureflo.custserv@itt.com](mailto:pureflo.custserv@itt.com)

---

#### **CONTENTS:**

- 0.0 General
- 1.0 Installation
- 2.0 Operation & Adjustment
- 3.0 Maintenance

#### **TABLES:**

- 1. Bonnet Bolt Torques
- 2. Valve Travel & No. of Turns

#### **FIGURES:**

- 1. Stainless Steel Bonnet - 970
- 2. Diaphragm Identification
- 3. Test Fixture for Valve Installation

#### **WARNING**

Valves and related products are designed and manufactured using good workmanship and materials, and they meet all applicable industry standards. These valves are manufactured with various materials, and they should be used only in services recommended by a company engineer.

Misapplication of the product may result in injuries or property damage. A selection of valve and valve components of the proper material and consistent with the particular performance requirement is important for proper application.

Examples of misapplication or misuse of any products include use in an application in which the pressure/temperature rating is exceeded or failure to maintain valve or related product as recommended and use of products to handle caustic and/or hazardous substances when not designed for that purpose.

If valve exhibits any indication of leakage, do not operate. Isolate valve and either repair or replace.

## 0.0 GENERAL

The latest edition of this manual can be found on the website listed within this manual.

### 0.1 Safety



The safety precautions in these operating instructions are specially marked with the standard symbol for danger when non-observance could result in personal injury, loss of life or property damage.

#### CAUTION!

Non-observance of these safety precautions can endanger the valve and its functions.

#### 0.1.1 Qualifications and training of personnel

The personnel responsible for operation, maintenance, inspection and assembly must be appropriately qualified.

The operating company must precisely define the responsibilities, competence and supervision of the personnel. If the personnel lack the necessary knowledge, they are to be trained and instructed. If required this can be carried out by the manufacturer/supplier of the valve by order of the operating company. Furthermore, the operating company is to ensure that the contents of the operating instructions have been fully understood by the personnel.

#### 0.1.2 Dangers through non-observance of the safety precautions

The non-observance of the safety precautions can result in the endangering of lives as well as the environment and the valve. The non-observance of the safety precautions can lead to the loss of all claims for damages.

Non-observance can result in the following:

- Failure of important functions of the valve/plant.
- Endangering of lives by electrical, mechanical and chemical influences.
- Endangering the environment through leakage of dangerous materials.
- Personal injury or property damage.

#### 0.1.3 Safety awareness at work

Attention must be paid to the safety precautions in these operating instructions, the current national regulations concerning the prevention of accidents as well as any labor, company and safety-regulations of the operating company.

#### 0.1.4 Safety precautions for the operating company/individual operator

- If hot or cold components of the valves are a source of danger, these components must be secured against contact by operating company.
- Contact guard for moving parts may not be removed when valve is in operation.

- Do not hang items off the valves. Any accessories must be firmly or permanently attached.
- Do not use the product as a step or hand hold.
- Do not paint over identification tag, warnings, notices or other identification marks associated with the product.
- PTFE diaphragms emit toxic fumes due to thermal decomposition at temperatures of 380C or greater.

#### 0.1.5 Safety precautions for maintenance, inspection and assembly

Work on externally actuated valves should only be carried out when the valve is removed from service. Valves that have been exposed to harmful media such as caustic chemicals must be decontaminated.

On completion of work, all safety and protective equipment must immediately be fitted again or reactivated.

Before the re-operation, attention should be paid to the points in the following sections.

#### 0.1.6 Unauthorized reconstruction, manufacture and use of spare parts

Reconstruction or modification of the valve is only admissible after consultation with the manufacturer.

Genuine spare parts and accessories authorized by the manufacturer serve to maintain safety. The use of diaphragms other than genuine ITT diaphragms violates Diaphragm valve industry standard MS SP88. Valve pressure, temperature and overall performance can not be guaranteed. Use of non-genuine ITT diaphragms or parts can annul all liability for the consequences.

Manufacturer's parts are not to be used in conjunction with products not supplied by the manufacturer. The use of manufacturer's parts with products not supplied by the manufacturer can annul all liability for the consequences.

#### 0.1.7 Inadmissible modes of operation

The operational reliability of the valve supplied is only guaranteed when used as designated. The operating limits given on the identification tag and in the data sheet may not be exceeded under any circumstances.

If the product label is missing or worn contact manufacturer at the address listed within this manual for specific instructions.

## 0.2 Transport and storage



The universally recognized technical standards and the regulations regarding prevention of accidents must be observed at all times when handling.

### 0.2.1 Transport

The goods have to be carefully handled in order to prevent damage.

The end flange caps supplied are to be fitted to the valve as applicable.

### 0.2.2 Unpacking

Unpack the shipment, check to make sure that all contents are present and undamaged.

### 0.2.3 Storage

If the valve is not to be installed immediately following delivery, it must be properly stored.

Storage should be in a dry room at a temperature as constant as possible. Product should not be stacked on top of one another.

Storage over a longer period may necessitate individual moisture proof packing. This is dependent on the local conditions.

### 0.2.4 Disposal, Recycle or Return shipment

The personnel responsible for disposal of the product or associated components are to comply with federal, state and local requirements.

If the return shipment is required, contact manufacturer at the address listed within this manual for specific instructions.



The operator of valves used for aggressive or toxic media such as caustic chemicals must ensure that these are well flushed and cleaned before being handed to the maintenance personnel. This is particularly important when returning to the product manufacturer, disposing of or recycling the product or its component parts. MSDS are required for authorization to return valves to the manufacturer.

## 1.0 INSTALLATION

### CAUTION!

#### Weld End Valves

Weld end valves for schedule 10 and heavier pipe require bonnet and diaphragm removal prior to welding in line. See Section 3.4, steps 1-3, 6-10. 2.0mm and lighter pipe and tubing may be welded with automatic equipment without removing the diaphragm. Manual welding requires diaphragm removal for all pipe wall thickness.

1.1 Pure-Flo diaphragm valves may be installed in any orientation. To ensure optimum draining in horizontal pipelines, the valve should be installed so that one of the drain marks on either valve end is precisely in the 12 o'clock position.

Note: According to good practice, horizontal pipework should be sloped toward the drain point to ensure optimum draining.

1.2 **CAUTION!** Prior to pressurization (with the valve slightly open), tighten the bonnet nuts in a crisscross pattern in accordance with Table 1.

It is recommended that bonnet fasteners be retightened at ambient conditions after the system has cycled through operating pressure and temperature. If leakage occurs at the body-diaphragm seating area, immediately depressurize system and tighten bonnet nuts as noted above. If leakage continues, diaphragm replacement is required. See Section 3.4.

1.3 The travel stop should be adjusted at time of installation. See Section 2.3.

## 2.0 OPERATION & ADJUSTMENT

### 2.1 General

The valve is closed with a clockwise rotation of the handwheel. See Table 2 for stroke length and number of turns information.

### 2.2 Stainless Steel Bonnet - 970 (Fig. 1)



The bonnet is a non-sealed design and does not provide secondary containment of process fluids in the event of a diaphragm failure. Each bonnet is equipped with a weep hole to allow fluid seepage indicating a diaphragm failure. Replace diaphragm immediately.

Failure to follow these instructions could result in serious personal injury or death, and property damage.

NOTE: The o-ring provided in the bonnet assembly is strictly for wash-down protection only. It is not designed for pressure containment.

### 2.3 Travel Stop

The purpose of the travel stop is to prevent over closing of the valve, thus prolonging diaphragm life. For bonnets delivered with valve bodies, the travel stop is set at the factory and should not require further adjustment; however, if adjustment is necessary, the following procedure should be followed:

The first (and preferred) option is to install the valve in a test fixture (Figure 3) with the travel stop screw (Figure 1) removed. Supply air pressure equal to the system operating pressure to one side of the valve. Cap the other side of the valve and install a venting rubber or plastic tube. Hold the tube in a container of water. Air bubbles indicate leakage. Turn handwheel closed until the leakage stops. Push down on handwheel until it bottoms out on bonnet. Install and tighten travel stop screw.

If a test fixture is not available, the following procedure may be used.

#### For Elastomer Diaphragms:

1. Remove pressure from the line containing the valve.
2. Remove bonnet bolts and nuts. Remove the bonnet and unscrew the diaphragm from the compressor, but leave the compressor on the spindle.
3. Replace the bonnet on the valve body (without a diaphragm).

4. Replace two bonnet bolts and nuts on opposite sides of the bonnet, hand tight.
5. Turn the handwheel until the compressor touches the weir. The valve will not close further.
6. Push down on handwheel until it bottoms out on bonnet. Install and tighten travel stop screw. The travel stop is now adjusted.
7. Remove the bonnet from the valve body. Screw a diaphragm into the compressor hand tight. Then back it off until the bolt holes in the diaphragm and bonnet flange align. Assemble compressor onto spindle.
8. Rotate the handwheel counterclockwise just enough to permit flange area of diaphragm to rest flat against flange area of bonnet.
9. Replace the bonnet, which now includes the diaphragm, on the valve body. The bonnet should be opened one-half to one turn of the handwheel. Tighten the bonnet nuts in accordance with Section 1.2.

#### For PTFE Diaphragms:

If a test fixture is not available for valves with PTFE diaphragms, use the following procedure:

1. Remove travel stop screw.
2. Turn handwheel clockwise until the initial resistance of the diaphragm seating is felt. From this point, turn the handwheel another 5/8 turn.
3. Push down on the handwheel until it bottoms on travel stop surface of bonnet. Install & tighten travel stop screw.

### 3.0 MAINTENANCE

**ALL MAINTENANCE PROCEDURES MUST BE PERFORMED BY QUALIFIED PERSONNEL. MAINTENANCE DONE BY PERSONNEL NOT QUALIFIED TO PERFORM IT COULD RESULT IN PERSONAL INJURY, DEATH OR PROPERTY DAMAGE.**



Remove all line pressure.

#### 3.1 Periodic inspection

When the process fluid is hazardous or corrosive, extra precautions should be taken.



The user should employ appropriate safety devices and should be prepared to control a leak of the process fluid. Fluid seeping from the weep hole indicates a diaphragm failure.

Replace diaphragm immediately. Failure to follow these instructions could result in serious personal injury or death, and property damage.

Periodically inspect condition of external valve parts. Replace all parts showing excessive wear or corrosion. Contact manufacturer at the address listed within this manual in order to obtain replacement parts or for specific instructions.

3.2 If body-diaphragm seating area leaks, depressurize system and open valve slightly. Tighten bonnet nuts as described in Section 1.2. If leakage continues, diaphragm replacement is required.

3.3 If leakage is occurring around the handwheel, spindle, or through a bonnet weep hole, the diaphragm is ruptured and must be replaced.

#### 3.4 Diaphragm Replacement:

1. Remove pressure from line containing valve. Rotate handwheel clockwise to just close valve.
2. Remove bonnet nuts.
3. Lift off bonnet, rotate handwheel to lower compressor diaphragm assembly, remove diaphragm compressor assembly.
4. Replacement diaphragm should be identical size and grade as original diaphragm. See Figure 2 for location of size and grade marking.
5. Unscrew the diaphragm from the compressor by turning counterclockwise.  
NOTE: For PTFE diaphragms, the tube nut must be held from turning in order to remove diaphragm.
6. For PTFE assemblies only:
  - a. Install the new elastomer backing cushion over the tube nut.



- b. Invert the PTFE diaphragm by pressing the center of the diaphragm face with your thumbs while holding the edge of the diaphragm with your fingers.



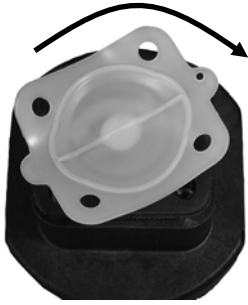
- c. Engage the threads of the diaphragm into the tube nut by rotating clockwise.



- d. Continue rotating the PTFE diaphragm clockwise into the compressor while securing the backing cushion from rotating.



- Rotate the diaphragm until hard stop or heavy resistance is achieved and additional force does not significantly rotate the diaphragm into the compressor.



- For PTFE assemblies only reinvert diaphragm.



- Back off (no more than 1/2 turn) until the bolt holes in diaphragm and the bonnet flange align.



- Lubrication should be applied to the end face of the spindle (see Section 3.5). Assemble compressor onto spindle. Back off diaphragm until bolt holes in diaphragm align with bolt holes in bonnet flange.
- Rotate handwheel counterclockwise just enough to permit flange area of diaphragm to rest flat against flange area of bonnet.
- Replace valve bonnet on body and tighten bonnet nuts evenly in a crisscross pattern in accordance with Table 1.
- If diaphragm leaks at body/bonnet joint after reaching temperature and pressure, depressurize system and retighten nuts in accordance with Section 1.2.

### 3.5 Lubrication

**Standard lubricants are as outlined below. Special lubricants may be required for oxygen or other unique services. Contact ITT Corporation for evaluation of non-standard lubricants.**

3.5.1 Bonnets are not equipped with grease fittings and must be disassembled to be lubricated. Under normal operation, lubrication is not necessary. However, adequate lubrication should be verified at diaphragm replacement. If re-lubrication is necessary remove residual grease prior to re-lubrication.

3.5.2 Surfaces requiring lubrication are as follows:

- spindle threads – Chevron FM ALC EP
- lower spindle face and neck where it interfaces with the compressor – Chevron FM ALC EP
- o-ring – DOW 111

3.5.3 Where valves are exposed to corrosive atmospheres or weather conditions, contacting surfaces of the handwheel and bonnet shell should be lubricated.

### 3.6 O-Ring Replacement (Fig. 1)

- Remove travel stop screw.
- Remove handwheel.
- Remove o-ring from groove in bonnet.
- Clean o-ring groove.
- Apply lubricant to o-ring.
- Install o-ring into groove.
- Re-install handwheel and re-set travel stop per Section 2.3.

Size	Metal Bonnet Bolt Torque in-lbs (N-m)	
	PTFE	Elastomer
.5" DN15	25 - 80 (2.8 - 9.1)	20 - 40 (2.3 - 4.5)
.75" DN20	50 - 80 (5.7 - 9.1)	20 - 50 (2.3 - 5.7)
1" DN25	65 - 120 (7.4 - 13.6)	45 - 70 (5.1 - 7.9)
1.25 & 1.5" DN32 & DN40	200 - 225 (23 - 25)	75 - 130 (8.5 - 14.7)
2" DN50	225 - 300 (25 - 34)	100 - 180 (11 - 20)

**Table 1**

Notes:

- Make multiple criss-cross passes to build up torque to final table values. Make additional criss-cross passes using table values to evenly tighten each bolt to within 5% of stated torque.
- Values given are for lubricated fasteners.
- Minimum values given will provide longer diaphragm cycle life for valves in non-autoclave and low thermal cycle conditions.
- Maximum values given may be required for autoclave conditions and for high thermal cycle conditions.
- Torques should be applied at near ambient conditions (< 100° F)

Size	Stem Travel (inch)	Stem Travel (mm)	Number of Turns
.5" DN15	0.25	6.4	2
.75" DN20	0.38	9.5	3
1" DN25	0.50	13	4
1.25 & 1.5" DN32 & DN40	0.81	21	4.88
2" DN50	1.12	29	6.75

**Table 2**

Valve Travel and Number of Turns

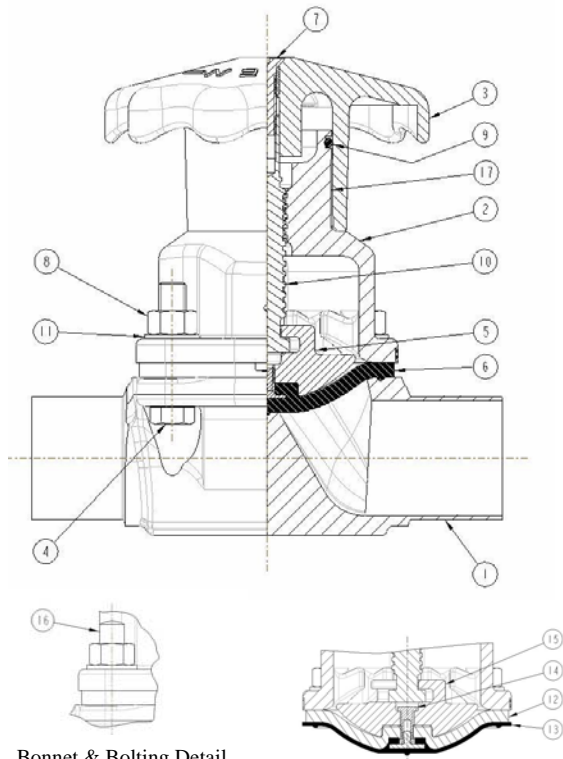
### 3.7 Change Diaphragm Type

To change from an elastomer diaphragm to PTFE, the compressor must be changed, and a tube nut must be installed.

1. Remove bonnet nuts and lift off bonnet.
  2. Remove travel stop screw.
  3. Turn handwheel clockwise to lower compressor low enough to slide the compressor off the spindle.
  4. Install tube nut into hexagonal hole in new compressor.
- Lubricate the spindle end where it interfaces with the compressor. Then locate the new compressor on the spindle, turn handwheel counter clockwise to raise assembly into bonnet. Follow Section 3.4.

To change from a PTFE diaphragm to elastomer, the compressor must be changed. The procedure is the same as above, except a tube nut is not required.

## Stainless Steel Bonnet – 970 Figure 1

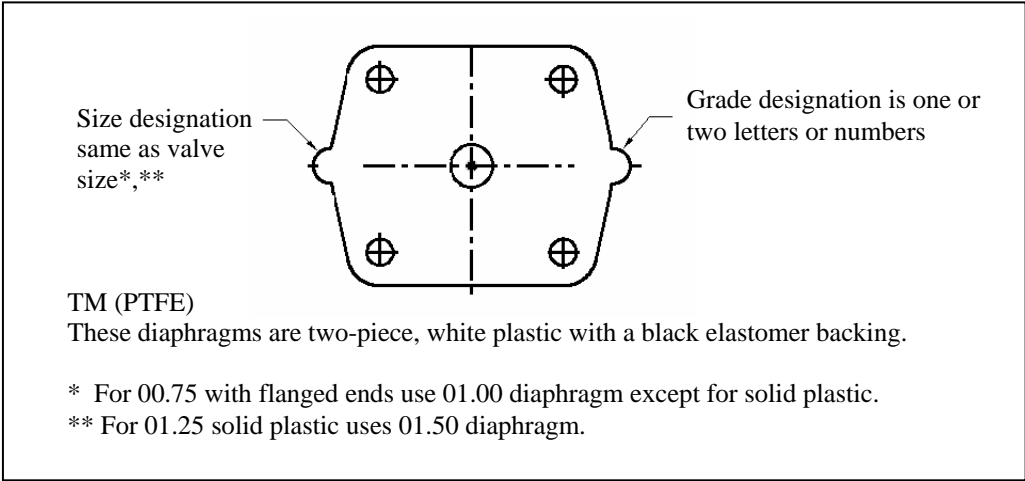


Bonnet & Bolting Detail  
Tank Bottom Body & Fabrications

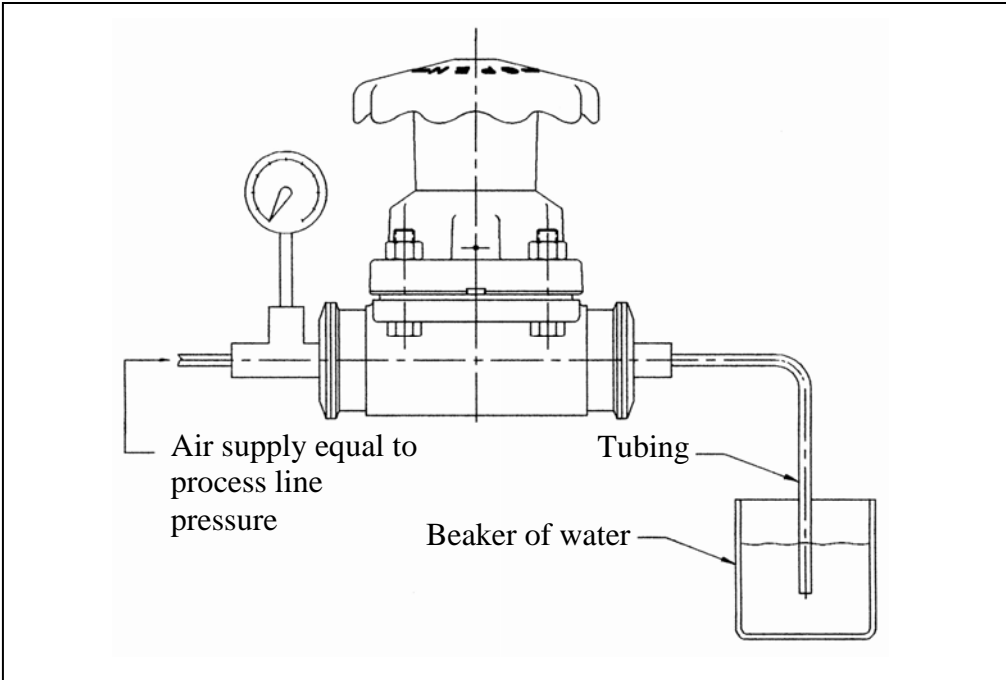
Materials of Construction			
Item	Description	Material	Quantity
1	Body	Stainless Steel, 316L	1
2	Bonnet	Stainless Steel, 316	1
3	Handwheel	PAS	1
4	Screw - Hex Head Cap	Stainless Steel 18-8	4
5	Compressor for Elastomer	Bronze	1
6	Elastomer Diaphragms	EPDM, BUNA-N	1
7	Travel Stop Screw	Stainless Steel 18-8	1
8	Nut - Hex	Stainless Steel 18-8	4
9	"O" Ring	FKM, (FDA)	1
10	Spindle	Stainless Steel	1
11	Washer - Plain	Stainless Steel, 18-8	4
12	Backing Cushion	EPDM	1
13	Plastic Diaphragms	PTFE, Grade TM	1
14	Tube Nut	Brass	1
15	Compressor - for Plastic	Bronze	1
16	Stud	Stainless Steel, SA-193-B8*, 18-8	AR
17	Label - Indicating	Mylar	1

ASME Grade fasteners available only on Tank Bottom Valve.

### Diaphragm Marking - Figure 2



### Test Fixture - Figure 3



---

For more information, please contact:

**ITT Pure-Flo**

33 Centerville Road, P.O. Box 6164

Lancaster, PA 17603-2064 USA

Or call: (800) 366-1111

(717) 509-2200

Fax: (717) 509-2336

Website: [www.ittpureflo.com](http://www.ittpureflo.com)

E-mail: [pureflo.custserv@itt.com](mailto:pureflo.custserv@itt.com)

**OFFICE LOCATIONS**

**ITT Pure-Flo**

110-B West Cochran

Simi Valley, CA 93065USA

Phone: (805) 520-7200

Fax: (805) 520-7205

**ITT Pure-Flo**

Richards Street, Kirkham

Lancashire PR4 2HU United Kingdom

Phone: +44 1772-682696

Fax: +44 1772-686006