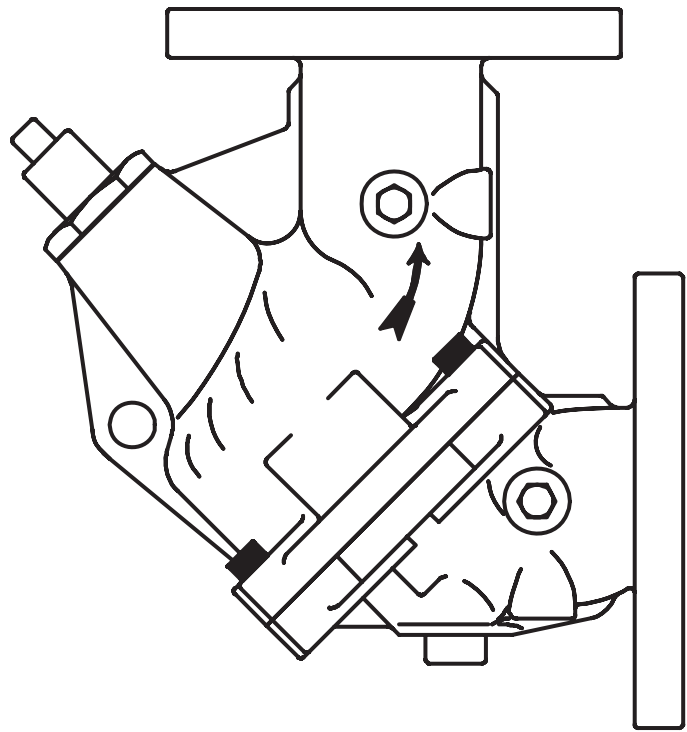




AURORA[®]



1040 SERIES

TRIPLE DUTY COMBINATION VALVES

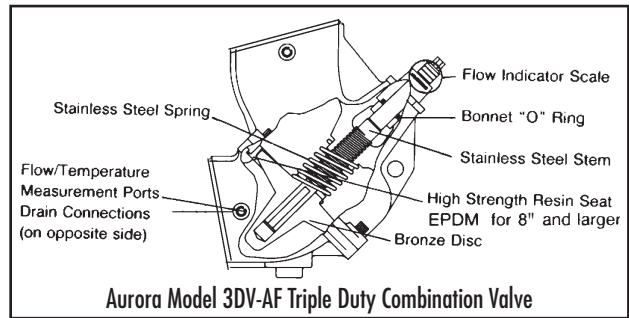
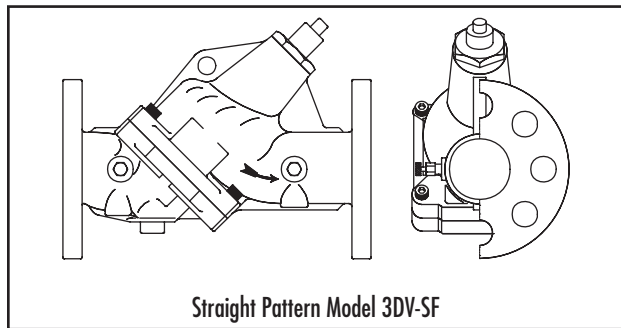
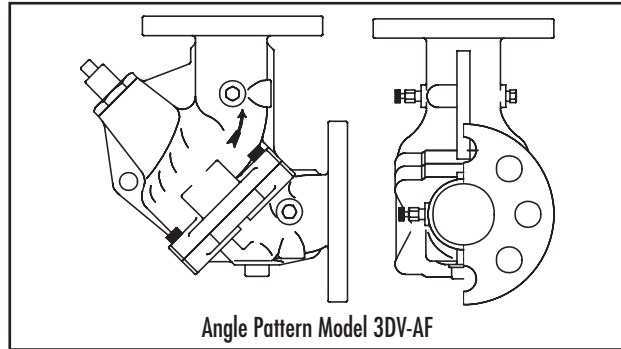
INSTRUCTION, INSTALLATION, MAINTENANCE AND REPAIR MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

CALIFORNIA PROPOSITION 65 WARNING:

⚠ WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

**MODEL 3DV, HARD FLANGED
 TRIPLE DUTY COMBINATION VALVE**

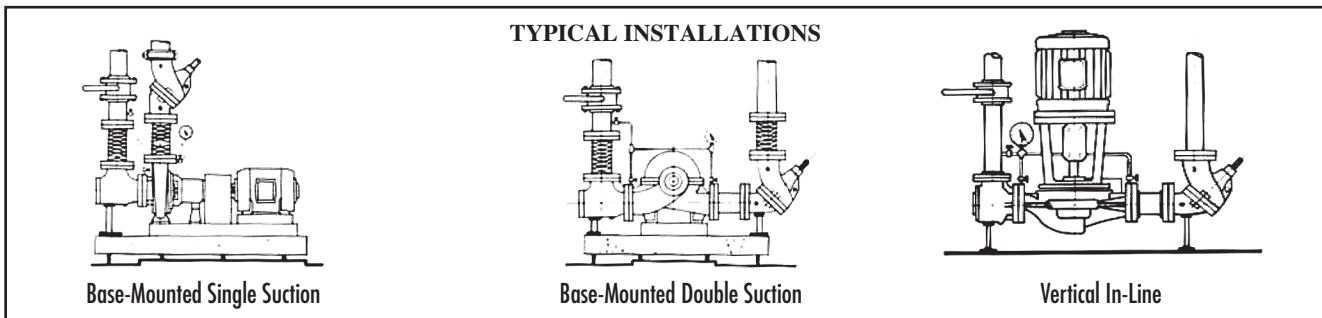


- 2.1 The valve should be mounted to a spool piece on the discharge side of the pump. Spool piece required is based on a minimum recommended space of 12" for pump sizes 2 x 2 to 6 x 6 and 24" for pump sizes 8 x 8 to 12 x 12.
- 2.2 It is not recommended to mount a valve directly to the pump as this could cause undesirable noise in the system.
- 2.3 Sufficient clearance around the valve should be left for valve removal or repair.
- 2.4 Install valve in the direction of the flow arrows on the valve body.
- 2.5 The valve body has been designed to handle the weight of the pump on vertical in-line installations. The body is not designed to support the piping weight. It is recommended that the piping be supported by hangers. Pipe supports should be provided under the valve and strainer bodies.
- 2.6 Ensure that the 3DV is installed with the valve stem in the upright position. Valve slam may occur if installed in any other configuration.

1.0 INTRODUCTION:

1.1 The Aurora Model 3DV Triple Duty Combination Valves are designed for installation on the discharge side of centrifugal pumps. The Aurora Triple Duty Combination Valve incorporates three functions in one valve:

- Drip-tight, shut-off valve
- Spring closure design; non-slam check valve
- Flow throttling valve



3.0 FLANGE BOLT TIGHTENING:

Valve Size	125 psi/150 psi Cast Iron	
	Bolt	
	No.	Size
2½	4	5/8
3	4	5/8
4	8	5/8
5	8	¾
6	8	¾

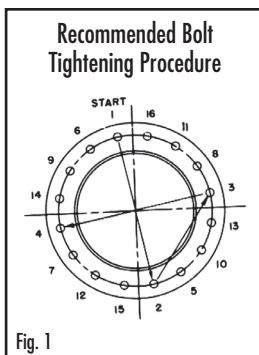
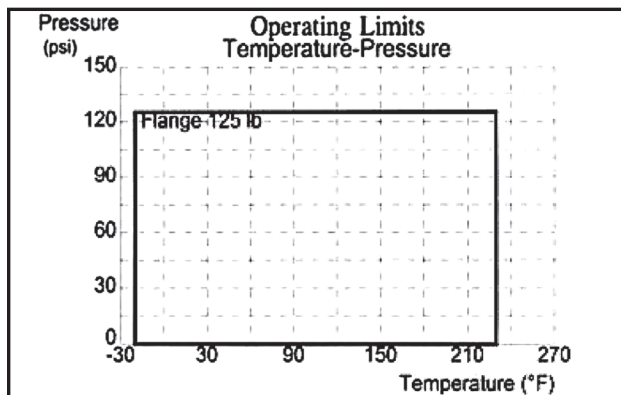


Fig. 1

Table 1

3.1 Tighten nuts evenly, following bolting instructions (Fig.1) so that the flange faces remain parallel. Flange bolts should be tightened to 70 ft./lbs. Torque minimum to assure firm metal-to-metal contact. When raised face flanges are used, there will be a gap between the faces of the outer diameter.

4.0 PRESSURE TEMPERATURE LIMITS:



**5.0 FIELD CONVERSION
 (Straight to Angle pattern valve):**

- 5.1 Open valve at least one complete turn.
- 5.2 Remove the body bolts from valve body using Allen Key.
- 5.3 Rotate one half of the valve body 180° making sure the lower valve seat and "O" Ring stay in position. Inspect the "O" Ring for any cuts or nicks and replace if necessary.
- 5.4 Replace body bolts and torque evenly to 70 ft./lbs.

6.0 FLOW MEASUREMENT:

6.1 Where approximate indication of flow is acceptable the Aurora Triple Duty valve can be used.

6.2 FLOW MEASUREMENT VALVE IN WIDE OPEN POSITION.

6.2.2 Measure and record the differential pressure across the valve using an Aurora CompuFlo with high pressure range transducer, or CBDM-135/60 meter, or pressure gauges with PMP adapters.

CAUTION

Safety glasses should be used and the probe should not be left inserted into fittings for prolonged periods of time (overnight, etc), as leakage from the PMP may occur when probe is removed.

6.2.3 Refer to Triple Duty Performance Curves with valve in full open position (Fig 2).

Locate Pressure Differential on left hand side of chart and extend line horizontally across to valve size being used. Drop line vertically down and read flow rate from bottom of chart.

6.3 DETERMINING FLOW RATE WITH VALVE IN THROTTLED POSITION.

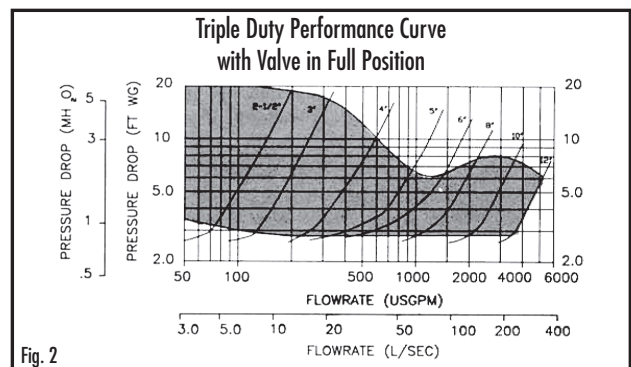


Fig. 2

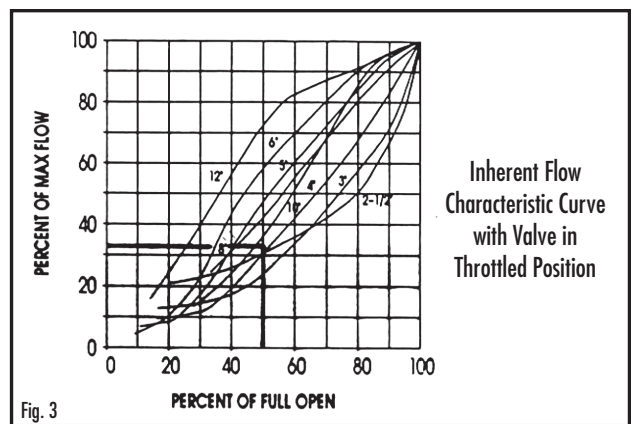


Fig. 3

6.3.1 Record the size of the valve and stem position using the Flow Indicator Scale (page 5). Calculate percentage of valve opening referring to table below:

Valve Size	2½	3	4	5	6	8	10	12
No. of Rings (valve full open)	5	5	6	9	10	12	18	28

6.3.2 Measure and record the differential pressure across the valve in the throttled position.

6.3.3 Locate percentage of valve opening on the bottom scale of Flow Characteristic Curve (Fig 3). Project line vertically up to intersect with the Valve Characteristic Curve and from this point project line horizontally across to the left of the chart and record the percentage of maximum flow rate.

6.3.4 On the Triple Duty Performance Curve (Fig. 2) locate the differential pressure obtained in Step 6.3.2 and project line horizontally across to intercept with Valve Performance Curve. Drop a line vertically down to read the flow rate at the bottom of the chart.

6.3.5 To calculate flow rate of valve in the throttled position, multiply the flow rate from Step 6.3.4 by the percentage flow rate from Step 6.3.2 divided by 100.

Example: Valve size 4 inch.

Differential Pressure is 5.4 ft. (1.65 m).

Number of rings open = 3. Therefore: 3 rings ÷ 6 rings x 100 = 50% throttled.

From the Triple Duty Performance Curve (Fig. 5), a 4 inch valve with 5.4 ft. pressure drop (1.65 m) represents a flow of 400 USgpm (25.2 l/s).

From Flow Characteristic Curve (Fig. 6), a 4 inch valve, 50% open, represents 34% of maximum flow.

Approximate flow of a 4 inch valve, with a 5.4 ft. (1.65 m) pressure drop when 50% throttled is:

$$\frac{400 \times 34}{100} = 136 \text{ USgpm or in metric } \frac{25.2 \times 34}{100} = 8.57 \text{ l/s}$$

Note: To prevent premature valve failure it is not recommended that the valve operate in the throttled position with more than 25 ft. pressure differential. Instead the pump impeller should be trimmed or valves located elsewhere in the system be used to partially throttle the flow.

FLOW INDICATOR SCALE:

The valve stem with its grooved rings and positioning sleeve indicates the throttled position of the valve. The quarter turn graduations on the sleeve, with the scribed line on the stem provides for approximate flow measurement.



Note: The valve is shipped in the closed position. The indicator on the plastic sleeve is aligned with the vertical scribed line on the stem.

7.0 OPERATION:

7.1 To assure tight shut off the valve must be closed using a wrench with 25 to 30 ft./lbs. of torque.

7.2 To assure trouble-free check valve operation and shut off operation, the valve should be periodically opened and closed to keep valve seat and valve disc guide stem free of build up of system contaminants.

8.0 REPACKING OF 3DV UNDER FULL SYSTEM PRESSURE:

8.1 Should it be necessary, stem “O” Ring can be changed under full system pressure. **Caution:** Safety glasses should be worn.

8.2 Record the valve setting.

8.3 Turn the valve stem counter-clockwise until the valve is fully open and will not turn any further. Torque to a

maximum force of 45 ft./lbs. This will ensure good metal-to-metal contact and minimum leakage.

8.4 The valve bonnet may now be removed. There may be a slight leakage. As the metal-to-metal back seating does not provide a drip-tight seal.

8.5 Clean exposed portion of valve stem (Do not scratch).

8.6 Remove and replace the “O” Ring and gasket.

8.7 Install the valve bonnet.

8.8 Tightening valve bonnet is necessary to stop any leaks.

8.9 Open valve to balance set point as recorded in 8.2.

9.0 MAXIMUM NUMBER OF TURNS FULL OPEN VALVE:

Note: On valve sizes 2-1/2" and 3", full open position of valve is 5 turns. However valve will open to 5-1/2 turns which is just back of seating of valve.

10.0 SEAT REPLACEMENT:

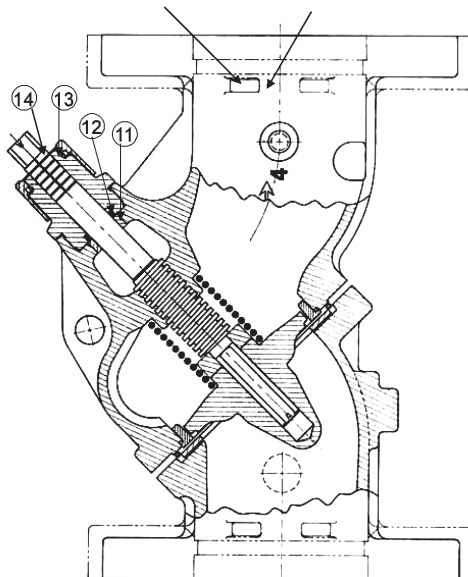
10.1 Drain system and remove valve from piping.

10.2 Remove the body bolts from the body using an Allen Key.

10.3 Remove seat and “O” Ring.

10.4 Inspect and clean “O” Ring cavity and install new “O” Ring and seat. Valve disc stem also should be inspected and replaced if worn. Valve stem “O” Ring should be replaced at this time. Refer to section 8.

HARD FLANGED TRIPLE DUTY VALVES REPLACEMENT PARTS LIST

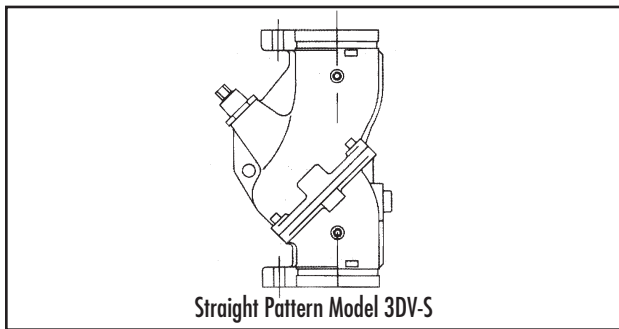
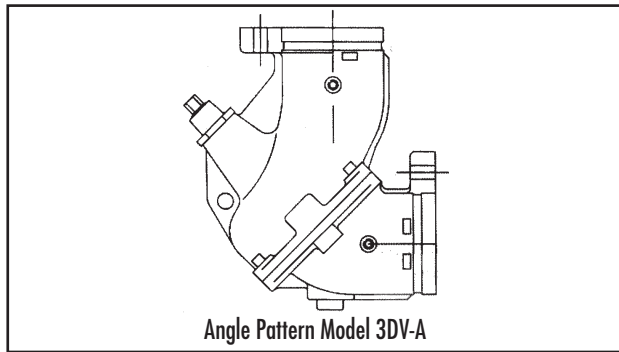


Part	Item No.	2-1/2" Straight or Angle	3" Straight or Angle	4" Straight or Angle	5" Straight or Angle	6" Straight or Angle
Shaft	3	570202-006	570202-006	570202-006	570202-007	570202-007
Spring	4	570203-002	1070-AP8	570203-004	570203-005	570203-006
Bushing	-	570223-001	1070-AP9	570223-002	570223-001	570223-002
Bonnet	13	570201-006	1070-AP10	570201-006	570201-006	570201-006
Eye Bolt	2	N/A	1070-AP11	N/A	N/A	N/A
Cap-Sleeve	15	N/A	1070-AP12-150	N/A	N/A	N/A
"O" Ring **	12	961131-210	1070-AP12	961131-210	961131-210	961131-210
Sleeve	14	570216-000	1070-AP13	570216-000	570216-000	570216-000
Spacer	5	570198-006	1070-AP14-150	570198-006	570198-006	570198-006
Disc	6	570232-041	1070-AP14	570234-041	570235-041	570236-041
Body Main	1	570518-611	1070-AP15	570522-611	570524-611	570526-611
Seat**	7	570196-000	1070-AP16	570196-002	570196-003	570196-004
"O" Ring Body**	8	961131-238	1070-AP17	961131-250	961131-259	961131-263
Body Suction	9	570500-611	1070-AP19	570504-611	570506-611	570508-611
Capscrew	10	911821-112	1070-AP21	911825-112	911829-114	911829-114
Performed Insulation (Straight)	-	570225-386	1070-AP22	570225-388	570225-389	570225-390
Performed Insulation (Angle)	-	570225-486	1070-AP24	570225-488	570225-498	570225-490

**** Recommended Spare Parts**

Common parts to all: Gasket – 570217-006; 14" Brass Pipe Plug – 935105-001; 14" Brass Metering Ports – 570148-001

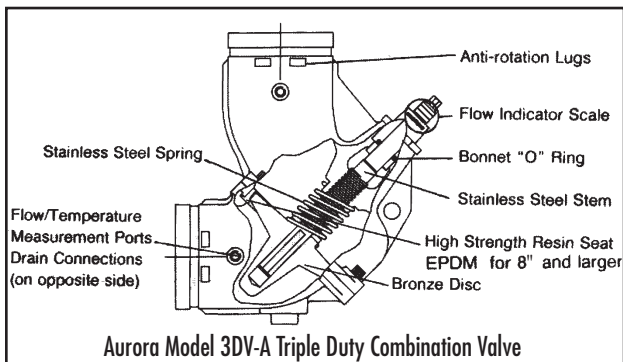
MODEL 3DV, GROOVED END TRIPLE DUTY COMBINATION VALVE



1.0 INTRODUCTION:

1.1 The Aurora Model 3DV Triple Duty Combination Valves are designed for installation on the discharge side of centrifugal pumps. The Aurora Triple Duty Combination Valve incorporates three functions in one valve:

- Drip-tight, shut-off valve
- Spring closure design; non-slam check valve
- Flow throttling valve

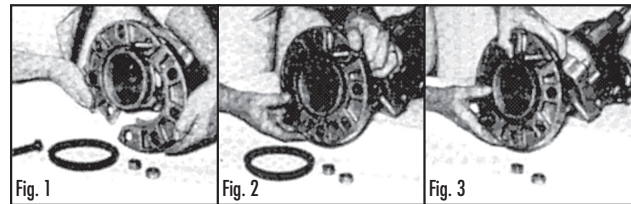


2.0 INSTALLATION:

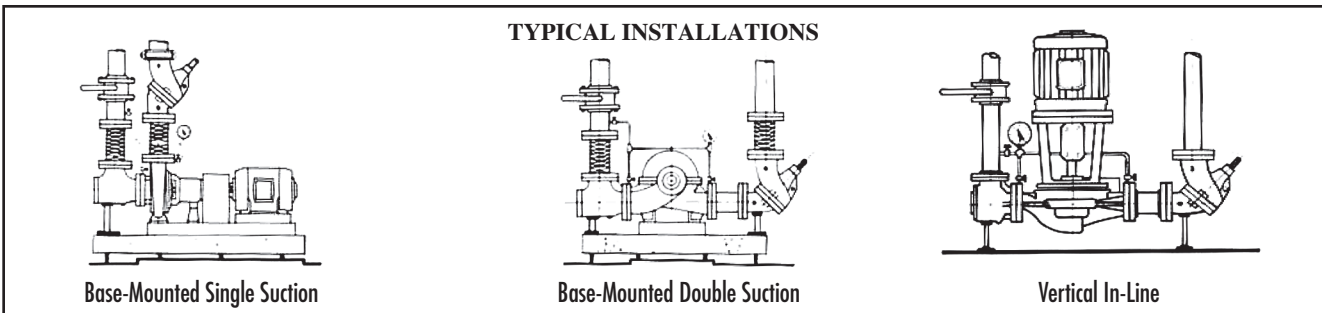
- 2.1 The valve should be mounted to a spool piece on the discharge side of the pump. Spool piece required is based on a minimum recommended space of 12" for pump sizes 2 x 2 to 6 x 6 and 24" for pump sizes 8 x 8 to 12 x 12.
- 2.2 It is not recommended to mount a valve directly to the pump as this could cause undesirable noise in the system.
- 2.3 Sufficient clearance around the valve should be left for valve removal or repair.
- 2.4 Install valve in the direction of the flow arrows on the valve body.
- 2.5 The valve can be mounted to flanged equipment using Anti-Rotation Flange Adapter or industry standard grooved coupling, suitable for system pressure and temperatures encountered.
- 2.6 The Aurora Model 3DV valve bodies have anti-rotation lugs on the inlet and outlet. These lugs, combined with the Flange Adapters, provide a ridged rotation free installation.
- 2.7 The valve body has been designed to handle the weight of the pump on vertical in-line installations. The body is **not** designed to support the piping weight. It is recommended that the piping be supported by hangers. Pipe supports should be provided under the valve and strainer bodies.

3.0 AURORA FLANGE ADAPTER INSTALLATION:

3.1 Position the two halves of Aurora Flange Adapter on the valve body (Fig. 1) ensuring that the lugs on each half of the flange adapters are located between the anti-rotation lugs on the valve body. Insert two bolts of specified size (Table 1) to secure the halves of the flange adapter to the valve body (Fig. 2). The gasket cavity should face out to the adjoining flange.



TYPICAL INSTALLATIONS



Flange Adapter Details				
Valve Size	125 psi/150 psi Ductile Iron		250 psi/300 psi Ductile Iron	
	Bolt		Bolt	
	No.	Size	No.	Size
2½	4	¾	8	¾
3	4	¾	8	¾
4	8	¾	8	¾
5	8	¾	8	¾
6	8	¾	12	¾
8	8	¾	12	7/8
10	12	7/8	16	1
12	12	7/8	16	1 1/8

Table 1

- 3.2 Lubricated the inner and outer diameter of the gasket with the lubricant provided or a similar non-petroleum base water soluble grease.
- 3.3 Press the gasket firmly into the flange cavity ensuring that the sealing lip is pointed outward. When in place, the gasket should not extend beyond the end of the pipe (Fig. 3).
- 3.4 Position the adjoining flange or the pipe to the Flange Adapter and install the remaining bolts. The two locking bolts should be tightened first in order to position the flanges correctly as shown in Fig. 1. **Note:** Care should be taken to ensure that the gasket is not pinched or bent between flanges.
- 3.5 Tighten remaining nuts evenly, following bolting instructions (Fig. 4), so that the flange faces remain parallel. Flange bolts should be tightened to 70 ft./lbs. torque minimum to assure firm metal-to-metal contact. When raised face flanges are used, there will be a gap between the faces of the outer diameter.
- 3.6 Flange gaskets are not interchangeable with other mechanical pipe couplings or flange gaskets.

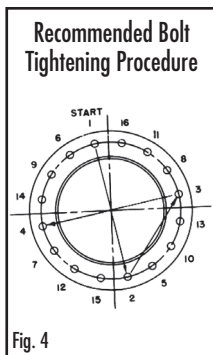
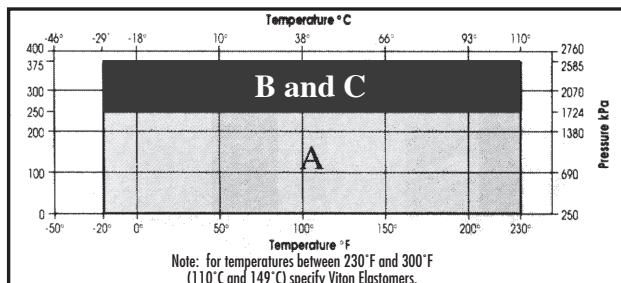


Fig. 4

4.0 PRESSURE TEMPERATURE LIMITS:



LEGEND:

- A** Ductile iron flange adapters for ANSI 150# flanges.
- B** Ductile iron flange adapters for ANSI 300# flanges.
- C** Grooved end with 375 psi rated pipe coupling.

5.0 FIELD CONVERSION
(Straight to Angle pattern valve):

- 5.1 Open valve at least one complete turn.
- 5.2 Remove the body bolts from valve body using Allen Key.
- 5.3 Rotate one half of the valve body 180° making sure the lower valve seat and "O" Ring stay in position. Inspect the "O" Ring for any cuts or nicks and replace if necessary.
- 5.4 Replace body bolts and torque evenly to 70 ft./lbs.

6.0 FLOW MEASUREMENT:

- 6.1 Where approximate indication of flow is acceptable the Aurora Triple Duty valve can be used.
- 6.2 **FLOW MEASUREMENT VALVE IN WIDE OPEN POSITION.**
 - 6.21 Measure and record the differential pressure across the valve using an Aurora CompuFlo Meter with high pressure range transducer or pressure gauges with PMP adapters.

CAUTION

Safety glasses should be used and the probe should not be left inserted into fittings for prolonged periods of time (overnight, etc), as leakage from the PMP may occur when probe is removed.

- 6.22 Refer to Triple Duty Performance Curves with valve in full open position (Fig 4).

Locate Pressure Differential on left hand side of chart and extend line horizontally across to valve size being used. Drop line vertically down and read flow rate from bottom of chart.

6.3 DETERMINING FLOW RATE WITH VALVE IN THROTTLED POSITION.

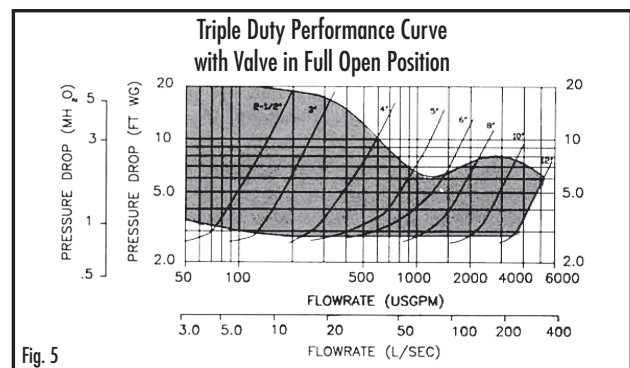


Fig. 5

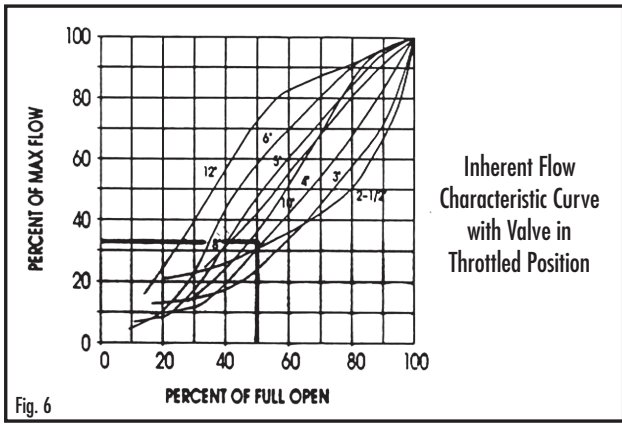


Fig. 6

6.3.1 Record the size of the valve and stem position using the Flow Indicator Scale (at right). Calculate percentage of valve opening referring to table below:

Valve Size	2½	3	4	5	6	8	10	12
No. of Rings (valve full open)	5	5	6	9	10	12	18	28

6.3.2 Measure and record the differential pressure across the valve in the throttled position.

6.3.3 Locate percentage of valve opening on the bottom scale of Flow Characteristic Curve (Fig 6). Project line vertically up to intersect with the Valve Characteristic Curve and from this point project line horizontally across to the left of the chart and record the percentage of maximum flow rate.

6.3.4 On the Triple Duty Performance Curve (Fig. 5) locate the differential pressure obtained in Step 6.3.2 and project line horizontally across to intercept with Valve Performance Curve. Drop a line vertically down to read the flow rate at the bottom of the chart.

6.3.5 To calculate flow rate of valve in the throttled position, multiply the flow rate from Step 6.3.4 by the percentage flow rate from Step 6.32 divided by 100.

Example: Valve size 4 inch.

Differential Pressure is 5.4 ft. (1.65 m).

Number of rings open = 3. Therefore: 3 rings ÷ 6 rings x 100 = 50% throttled.

From the Triple Duty Performance Curve (Fig. 5), a 4 inch valve with 5.4 ft. pressure drop (1.65 m) represents a flow of 400 USgpm (25.2 l/s).

From Flow Characteristic Curve (Fig. 6), a 4 inch valve, 50% open, represents 34% of maximum flow.

Approximate flow of a 4 inch valve, with a 5.4 ft. (1.65 m) pressure drop when 50% throttled is:

$$\frac{400 \times 34}{100} = 136 \text{ USgpm or in metric } \frac{25.2 \times 34}{100} = 8.57 \text{ l/s}$$

Note: To prevent premature valve failure it is not recommended that the valve operate in the throttled position with more than 25 ft. pressure differential. Instead the pump impeller should be trimmed or valves located elsewhere in the system be used to partially throttle the flow.

FLOW INDICATOR SCALE:

The valve stem with its grooved rings and positioning sleeve indicates the throttled position of the valve. The quarter turn graduations on the sleeve, with the scribed line on the stem provides for approx. flow measurement.



Note: The valve is shipped in the closed position. The indicator on the plastic sleeve is aligned with the vertical scribed line on the stem.

7.0 OPERATION:

- 7.1 To assure tight shut off the valve must be closed using a wrench with 25 to 30 ft./lbs. of torque.
- 7.2 To assure trouble-free check valve operation and shut off operation, the valve should be periodically opened and closed to keep valve seat and valve disc guide stem free of build up of system contaminants.

8.0 REPACKING OF 3DV UNDER FULL SYSTEM PRESSURE:

- 8.1 Should it be necessary, stem “O” Ring can be changed under full system pressure. **Caution:** Safety glasses should be worn.
- 8.2 Record the valve setting.
- 8.3 Turn the valve stem counter-clockwise until the valve is fully open and will not turn any further. Torque to a maximum force of 45 ft./lbs. This will ensure good metal-to-metal contact and minimum leakage.
- 8.4 The valve bonnet may now be removed. There may be a slight leakage. As the metal-to-metal back seating does not provide a drip-tight seal.
- 8.5 Clean exposed portion of valve stem (Do not scratch).
- 8.6 Remove and replace the “O” Ring and gasket.
- 8.7 Install the valve bonnet.
- 8.8 Tightening valve bonnet is necessary to stop any leaks.
- 8.9 Open valve to balance set point as recorded in 8.2.

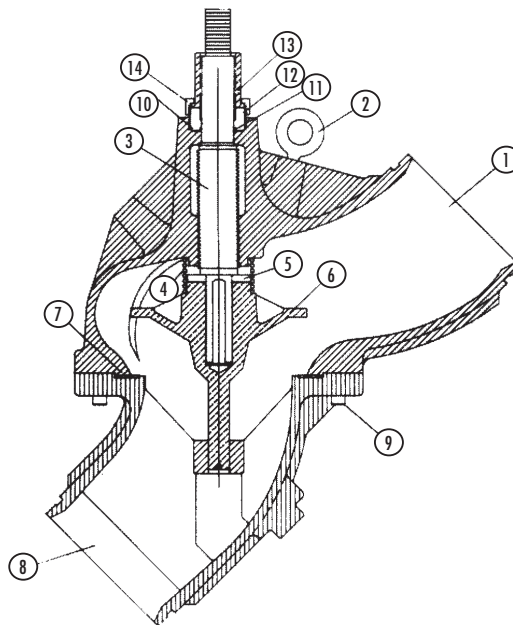
9.0 MAX. NUMBER OF TURNS FULL OPEN VALVE:

Note: On valve sizes 2-½" and 3", full open position of valve is 5 turns. However valve will open to 5-½ turns which is just back of seating of valve.

10.0 SEAT REPLACEMENT:

- 10.1 Drain system and remove valve from piping.
- 10.2 Remove the body bolts from the body using an Allen Key.
- 10.3 Remove seat and “O” Ring. “O” Ring is not used on valves 8" and larger.
- 10.4 Inspect and clean “O” Ring cavity and install new “O” Ring and seat. Valve disc stem also should be inspected and replaced if worn. Valve stem “O” Ring should be replaced at this time. Refer to section 8.

GROOVED END TRIPLE DUTY VALVES REPLACEMENT PARTS LIST



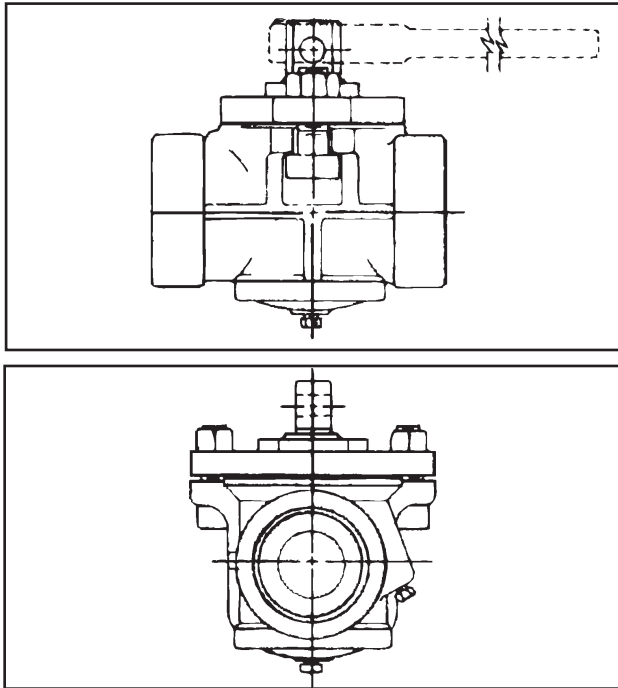
Part	Item No.	2-1/2" Straight or Angle	3" Straight or Angle	4" Straight or Angle	5" Straight or Angle	6" Straight or Angle	8" Straight or Angle	10" Straight or Angle	12" Straight or Angle
Shaft	3	570202-006	570202-006	570202-006	570202-007	570202-007	570202-008	570202-010	570202-012
Spring	4	570203-002	570203-003	570203-004	570203-005	570203-006	570203-008	570203-010	570203-012
Bushing	-	570223-001	570223-001	570223-002	570223-001	570223-002	N/A	N/A	N/A
Bonnet	13	570201-006	570201-006	570201-006	570201-006	570201-006	570151-008	570201-008	570201-008
Eye Bolt	2	N/A	N/A	N/A	N/A	N/A	911900-124	911900-124	911900-124
Cap-Sleeve	15	N/A	N/A	N/A	N/A	N/A	570274-012	570274-012	570274-012
"O" Ring **	12	961131-210	961131-210	961131-210	961131-210	961131-210	961131-137	961131-327	961131-327
Sleeve	14	570216-000	570216-000	570216-000	570216-000	570216-000	570216-008	570216-012	570216-012
Spacer	5	570198-006	570198-006	570198-006	570198-006	570198-006	570278-012	570278-012	570278-012
Disc	6	570232-041	570233-041	570234-041	570235-041	570236-041	570237-041	570238-041	570239-041
Body Main	1	570178-031	570181-031	570184-031	570187-031	570190-031	570261-031	570264-031	570267-031
Seat**	7	570196-000	570196-0001	570196-002	570196-003	570196-004	570196-008	570196-010	570196-012
"O" Ring Body**	8	961131-238	961131-242	961131-250	961131-259	961131-263	961131-450	961131-454	961131-458
Body Suction	9	570163-031	570166-031	570169-031	570172-031	570175-031	570252-031	570255-031	570258-031
Capscrew	10	911821-112	911821-112	911825-112	911829-114	911829-114	911829-118	911829-120	911829-124
Performed Insulation (Straight)	-	570225-386	570225-387	570225-388	570225-389	570225-390	N/A	N/A	N/A
Performed Insulation (Angle)	-	570225-486	570225-487	570225-488	570225-498	570225-490	N/A	N/A	N/A
Flanges 125/150*	-	570204-030	570206-030	570208-030	570210-030	570212-030	570214-030	570228-030	570230-030
Flanges 250/300*	-	570205-030	570207-030	570209-030	570211-030	570213-030	570215-030	570229-030	570231-030
Flange Gasket	-	570218-002	570218-003	570218-004	570218-005	570218-006	570218-008	570218-010	570218-012
Lubrication tube	-	999003-010	99003-010	99003-010	99003-010	99003-010	99003-010	99003-010	99003-010

* Part numbers are for a flange half – 2 are required for a complete flange.

** Recommended Spare Parts

Common parts to all: Gasket – 570217-006; 14" Brass Pipe Plug – 935105-001; 14" Brass Metering Ports – 570148-001

MODEL 3DV THREADED – STRAIGHT TRIPLE DUTY COMBINATION VALVE



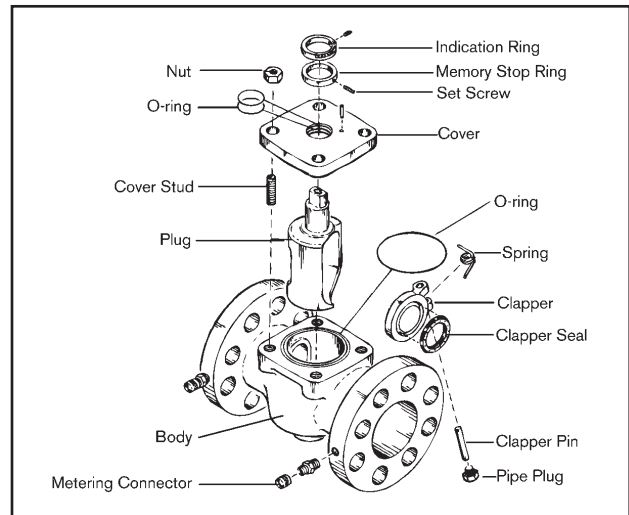
1.0 INTRODUCTION:

1.1 The Aurora Model 3DV Triple Duty Combination Valves are designed for installation on the discharge side of centrifugal pumps. The Aurora Triple Duty Combination Valve incorporates two functions in one valve:

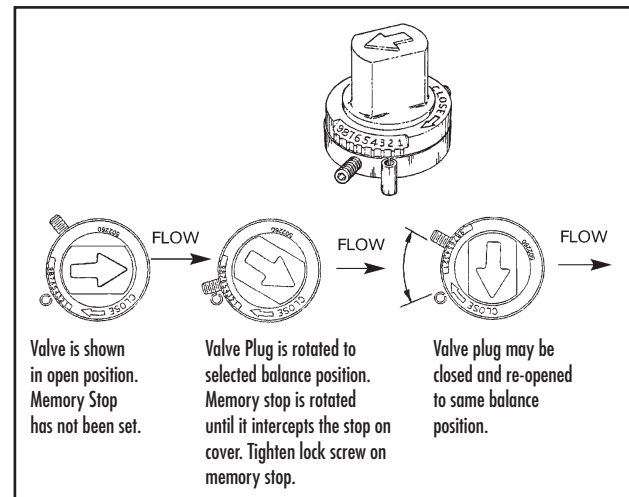
- Flow regulator valve
- Positive shut-off valve

2.0 INSTALLATION:

- 2.1 Mount 2" and 2½" valves with the stem in a vertically up or horizontal position and the flow arrow (Cast in the valve body) aligned with the direction of flow.
- 2.2 Install valve in a location which allows easy access for an adjustment wrench and flow meter connections.
- 2.3 Install with the equivalent of at least 10 diameters of straight pipe, sized to the 3DV threaded valve, upstream of the valve and the equivalent of at least 5 diameters of pipe downstream of the 3DV threaded valve.
- 2.4 Once a flow rate has been set, adjust the memory stop located on the stem of the 3DV threaded valve (see below for memory stop adjustment instructions). The memory stop allows the valve to be closed and re-opened to the same balance position.



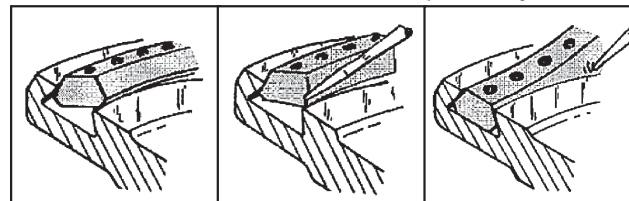
3.0 MEMORY STOP ADJUSTMENT INSTRUCTION:



4.0 CLAPPER SEAL REPAIR:

Aurora Model 3DV Threaded Triple Duty Combination valves are equipped with Buna-N clapper seals. If the clapper seal is damaged, it can be replaced by removing the clapper and installing a new seal (see steps 1-3 below).

Remove all sharp edges from the screwdriver to prevent damage to the seal.



Step 1
Place the outer edge of the seal into the clapper groove as shown.

Step 2
Using a blunt screwdriver, force the inside lower edge of the seal into the clapper.

Step 3
As the seal is pressed into the groove, maintain force on the portion of the seal that has been installed. This will prevent elongation and excessive build-up of closing portion.

5.0 CLAPPER REPLACEMENT PROCEDURE:

5.1 Position clapper firmly against the seat face.

5.2 Pre-load spring and bind using filament tape (see Fig. 1).

5.3 Take the clapper pin with the extension screw and insert the pin into the spring and support hangers (see Fig. 2).

5.4 When holding the clapper firmly against the seat, the clapper pin must move freely into position.

5.5 Remove the extension screw, replace the clapper pin plug, and cut the filament tape to free the spring.

5.6 Check the clapper for free movement by opening and closing the clapper by hand.

5.7 If movement is free, complete the valve assembly.

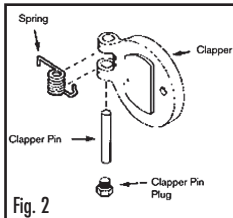
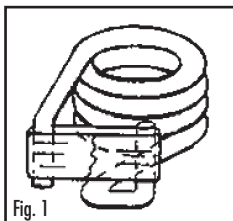
6.0 MAINTENANCE:

The 3DV threaded valve requires no day-to-day maintenance or lubrication. It is suggested that the valve be operated once a month to ensure it is in operable condition. If at any time it is suspected that the valve is leaking, either in the plug position or as a check, it is possible that particulate is trapped between the mating faces of the seal and seat, and is preventing tight seal action. Cycling the valve from full open to full close causes a jetting action that will wash away particulate that may be trapped.

It is not uncommon to discover that when an 3DV threaded valve has been reported leaking in the closed position, that the valve is actually not completely closed. The cam-based design of the 3DV threaded valve makes it almost impossible to over-close. The 3DV threaded valve is designed to close at an approximate ninety degree rotation of the plug stem. To close the valve, rotate the stem one quarter turn and tighten.

An adjustable wrench may be used with the cam-based design of the valve to assure a positive closure. The most satisfactory closure is accomplished by turning the plug to a tight fit and then 'bumping' the plug lightly using the wrench.

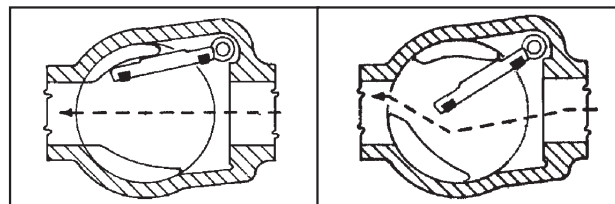
If these procedures have been completed and a tight seal is still not apparent, the valve should be disassembled and inspected for damage of the clapper seal and seat face, or for excessive wear of the clapper pin and pin hanger supports.



7.0 STANDARD OPERATION:

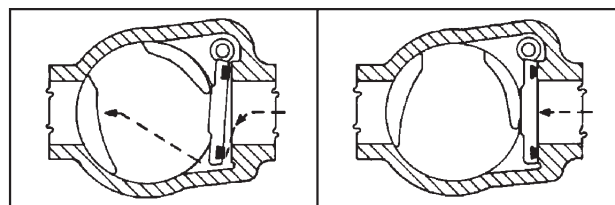
The principle of operation for the 3DV threaded valve is simple. When in the open position, the clapper swings out of the flow. If the flow stops, the spring allows the clapper to close.

When closing the valve, a final 'bumping' action with a wrench gives the final positive seal closure.



Open Position
 With the plug in the open position, the clapper operates as an efficient check valve. The clapper being hinged at an angle provides 90% less dead weight to minimize clapper slam and chatter.

Balancing
 The plug holds the clapper at the selected flow requirement for balancing.



Closed Downstream
 As the plug is rotated toward the closed position, the downstream part closes first. This equalizes the pressure so the clapper closes with little resistance.

Positive Seal Closure
 Final closing is accomplished by the plug camming against the back of the clapper.

WARRANTY

Seller warrants equipment (and its component parts) of its own manufacture against defects in materials and workmanship under normal use and service for one (1) year from the date of installation or start-up, or for eighteen (18) months after the date of shipment, whichever occurs first. Seller does not warrant accessories or components that are not manufactured by Seller; however, to the extent possible, Seller agrees to assign to Buyer its rights under the original manufacturer's warranty, without recourse to Seller. Buyer must give Seller notice in writing of any alleged defect covered by this warranty (together with all identifying details, including the serial number, the type of equipment, and the date of purchase) within thirty (30) days of the discovery of such defect during the warranty period. No claim made more than 30 days after the expiration of the warranty period shall be valid. Guarantees of performance and warranties are based on the use of original equipment manufactured (OEM) replacement parts. Seller assumes no responsibility or liability if alterations, non-authorized design modifications and/or non-OEM replacement parts are incorporated. If requested by Seller, any equipment (or its component parts) must be promptly returned to Seller prior to any attempted repair, or sent to an authorized service station designated by Seller, and Buyer shall prepay all shipping expenses. Seller shall not be liable for any loss or damage to goods in transit, nor will any warranty claim be valid unless the returned goods are received intact and undamaged as a result of shipment. Repaired or replaced material returned to customer will be shipped F.O.B., Seller's factory. Seller will not give Buyer credit for parts or equipment returned to Seller, and will not accept delivery of any such parts or equipment, unless Buyer has obtained Seller's approval in writing. The warranty extends to repaired or replaced parts of Seller's manufacture for ninety (90) days or for the remainder of the original warranty period applicable to the equipment or parts being repaired or replaced, whichever is greater. This warranty applies to the repaired or replaced part and is not extended to the product or any other component of the product being repaired. Repair parts of its own manufacture sold after the original warranty period are warranted for a period of one (1) year from shipment against defects in materials and workmanship under normal use and service. This warranty applies to the replacement part only and is not extended to the product or any other component of the product being repaired. Seller may substitute new equipment or improve part(s) of any equipment judged defective without further liability. All repairs or services performed by Seller, which are not covered by this warranty, will be charged in accordance with Seller's standard prices then in effect.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND SELLER HEREBY EXPRESSLY DISCLAIMS AND BUYER WAIVES ALL OTHER WARRANTIES EXPRESSED, IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller's sole obligation under this warranty shall be, at its option, to repair or replace any equipment (or its component parts) which has a defect covered by this warranty, or to refund the purchase price of such equipment or part. Under the terms of this warranty, Seller shall not be liable for (a) consequential, collateral, special or liquidated losses or damages; (b) equipment conditions caused by normal wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment; (c) the expense of, and loss or damage caused by, repairs or alterations made by anyone other than the Seller; (d) damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage, mishandling, or other similar conditions; (e) any loss, damage, or expense relating to or resulting from installation, removal or reinstallation of equipment; (f) any labor costs or charges incurred in repairing or replacing defective equipment or parts, including the cost of reinstalling parts that are repaired or replaced by Seller; (g) any expense of shipment of equipment or repaired or replacement parts; or (h) any other loss, damage or expense of any nature.

The above warranty shall not apply to any equipment which may be separately covered by any alternate or special warranties.

PERFORMANCE: In the absence of Certified Pump Performance Tests, equipment performance is not warranted or guaranteed. Performance curves and other information submitted to Buyer are approximate and no warranty or guarantee shall be deemed to arise as a result of such submittal. All testing shall be done in accordance with Seller's standard policy under Hydraulic Institute procedures.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability under the Order or otherwise for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, regardless of the cause of such damages or losses. In any event, Seller's aggregate total liability under the Order or otherwise shall not exceed the contract price.

ACTS OF GOD: Seller shall in no event be liable for delays in delivery of the equipment or other failures to perform caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control.

COMPLIANCE WITH LAW: Seller agrees to comply with all United States laws and regulations applicable to the manufacturing of the subject equipment. Such compliance shall include: The Fair Labor Standards Acts of 1938, as amended; Equal Employment Opportunity clauses of Executive Order 11246, as amended; Occupational Safety and Health Act of 1970 and the standards promulgated thereunder, if applicable. Since compliance with the various Federal, State, and Local laws and regulations concerning occupational health and safety, pollution or local codes are affected by the use, installation and operation of the equipment and other matters over which Seller has no control, Seller assumes no responsibility for compliance with those laws and regulations, whether by way of indemnity, warranty, or otherwise. It is incumbent upon the Buyer to specify equipment which complies with local codes and ordinances.



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