Meggitt Fuelling Products
Avery-Hardoll
Whittaker Controls

Solenoid operated preset valves

Installation, operation and maintenance manual

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AMENDMENT RECORD

AMENDMENT NO.	CHAP/ PAGE	DESCRIPTION	DATE

Avery-Hardoll

It is the aim of Avery-Hardoll to maintain a policy of continuous progress and for this reason reserve the right to modify specifications without notice. This manual provides the information required to install, service and overhaul the equipment. Although every effort has been made to ensure absolute accuracy, Avery-Hardoll does not hold itself responsible for any inaccuracies that may be found.

HEALTH AND SAFETY AT WORK ACT 1974

REFERENCE: CHAPTER 37, PART 1, SECTION 6

Avery-Hardoll take every care to ensure that, in accordance with the above Act, our products, as far as is reasonably practical in an industrial environment, are when operated and maintained in accordance with the appropriate manual, safe without risk to health.

PRODUCT SAFETY

In the interest of safety it is strongly recommended by Avery-Hardoll that the following details receive strict attention.

For the Purpose of Definition, the word PRODUCT applies to any product sold by Avery-Hardoll.

1 The Product is used only with fluids stated as acceptable by Avery-Hardoll.

2 The Product, whilst in service, must not be subjected to pressures greater than the Maximum Working Pressure or tested to pressures greater than the Test Pressure as specified in the manual.

3 The Product must only be coupled/connected to equipment considered acceptable by Avery-Hardoll.

4 The Product must be handled using the lifting handles where fitted, or in accordance with the manual.

5 The Product must not be misused or handled in any way liable to cause damage.

6 The Product must be inspected for any signs of damage prior to use e.g. cracks, damaged seals, seized or tight operating mechanisms.

7 The Product must be subjected to a regular maintenance programme, either in accordance with the manual or as agreed with Avery-Hardoll.

8 Only technically competent personnel should repair or maintain the Product and only parts supplied by Avery-Hardoll may be used.

9 Products covered by warranty may not be modified in any way without prior written permission of Avery-Hardoll.

10 Products not in service, must be stored in a clean area, and should not be subjected to excessive temperature, humidity, sunlight, or strong artificial light. Products should be protected to prevent damage or the ingress of foreign matter.

11 Where applicable, attention should be drawn to dangers resulting from the generation of static electricity in product flow lines. We strongly recommend account is taken of BS5958 parts 1 and 2.x

12 This equipment is not suitable for use with Liquid Petroleum Gas (L.P.G).

WARNINGS

(1) FLUOROCARBON. O-RINGS/SEALS CONTAINING FLUOROCARBONS MAY BECOME TOXIC IF OVERHEATED. DO NOT HANDLE O-RINGS/SEALS IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

(2) PRIOR TO COMMENCING WORK, ENSURE THAT ALL AIRPORT/COMPANY SAFETY PROCEDURES HAVE BEEN COMPLIED WITH.

(3) NO SOLVENTS, CLEANING AGENTS, GREASES OR OTHER MATERIALS ARE TO BE USED ON INTERNAL SURFACES IN CONTACT WITH FUEL. CLEANING IS TO BE CARRIED OUT USING CLEAN AVIATION FUEL ONLY.

(4) WORK MUST BE CARRIED OUT ONLY BY SUITABLY QUALIFIED PERSONNEL.

(5) ENSURE THAT ALL LOCAL REGULATIONS REGARDING THE USE OF EQUIPMENT IN ZONE 1 HAZARDOUS AREAS ARE COMPLIED WITH.

(6) ENSURE POWER SUPPLIES TO THE AUTOMATION SYSTEM UNIT ARE ISOLATED BEFORE WIRING UP THE VALVE.

CONTENTS

Preliminary material

Chapters

ASSOCIATED PUBLICATIONS

Manual No. TP0025 - MASTERLOAD (Vehicle)

Manual No. TP0027 - MASTERLOAD (Gantry)

Chapter 1

TECHNICAL DESCRIPTION

CONTENTS

1 GENERAL INFORMATION

1.1 The Solenoid Operated Preset Valve is a development of the well established Avery-Hardoll brand mechanical preset valve which has been in service for many years. The design has been improved to allow “in-line” installation and full electronic control.

1.2 In its standard form the Solenoid Operated Preset Valve is ideal for use with the Avery-Hardoll brand Masterload system. Control of the valve is achieved electronically by Masterload without any mechanical accessories (e.g. stem switch) on the valve.

1.3 The Solenoid Operated Preset Valve is also compatible with any automation system capable of achieving full electronic control.

1.4 For less sophisticated electronic controllers there are other versions of the valves to suit the particular control system. Please contact Meggitt Fuelling Products, Avery-Hardoll for further details.

1.5 The performance of the Solenoid Operated Preset Valve depends upon the properties of the fluid and upon the method of electronic control.

1.6 With Masterload the flow is fully controlled for two stage opening with ramp down closure to a final shut off within typically 0.05 litres of target.

1.7 The valve is approved for use in a Zone 1 Hazardous Area and is available in three pipeline sizes, 2.5”, 3” and 4”, with bodies of steel (4” only) or SG Cast Iron.

2 TECHNICAL DESCRIPTION

2.1 The Solenoid Operated Preset Valve is available in 2.5”, 3” and 4” pipeline sizes. Each are similar in construction and identical in function.

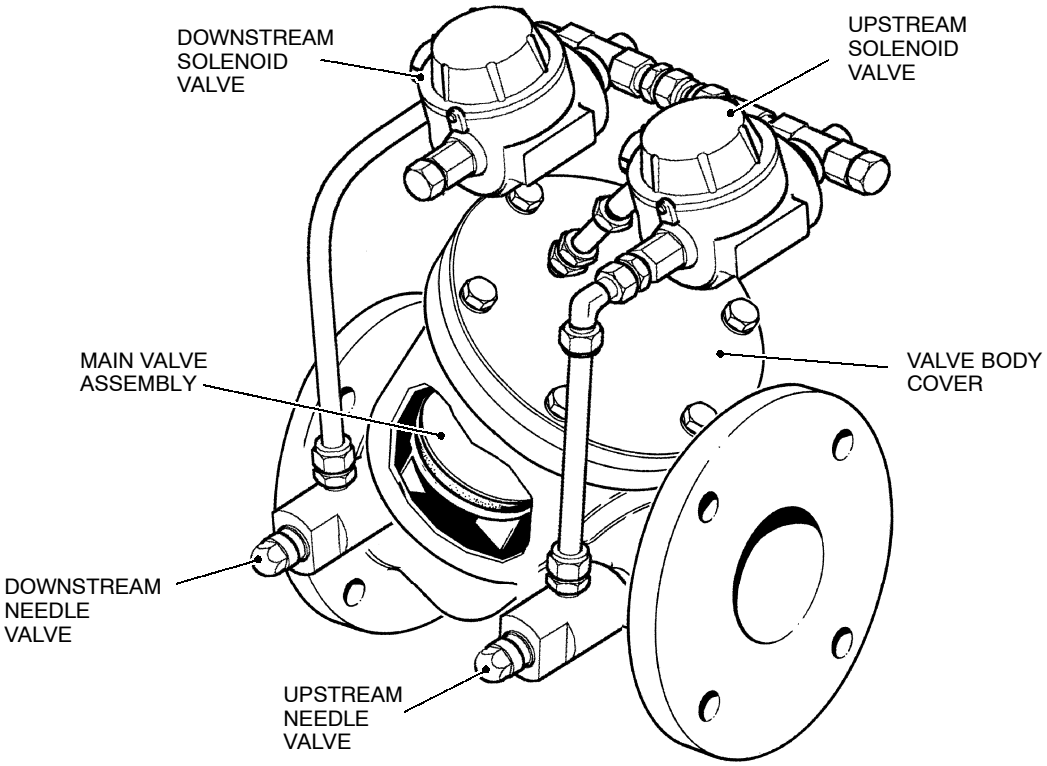

Fig 1.1 2.5 and 3 inch Standard Valves – Main components

2.2 The Valve comprises:

- A Valve Body.
- Main Valve Assembly.
- Valve Body Cover.
- External Pipework and Connections.
- Upstream Solenoid Valve.
- Downstream Solenoid Valve.
- Two Needle Valves.

2.3 The design of the body places the main valve assembly at an angle of approximately 40 degrees to the vertical in order to reduce the pressure drop across the valve.

2.4 The body is drilled and threaded on the upstream and downstream side to accept the needle valve and solenoid pipework connections. A valve seat and sleeve are fitted inside the body, the sleeve forms a bore in which the upper part of the main valve (designed as a piston) operates.

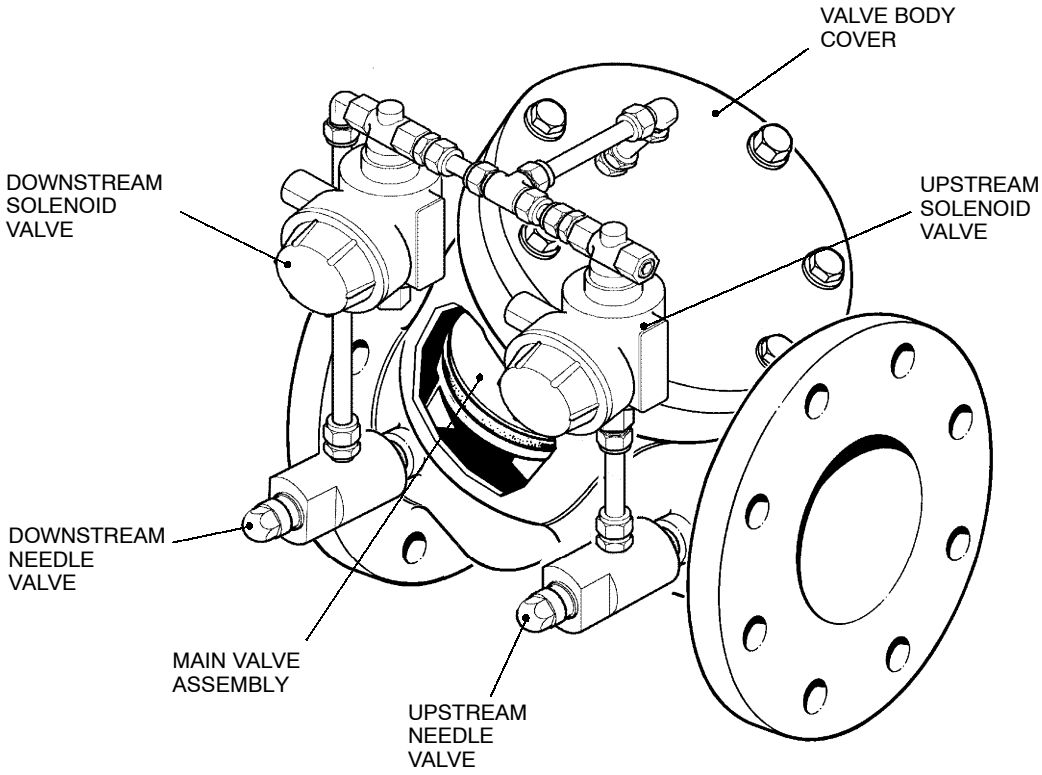

Fig 1.2 4 inch Valve - Main components

2.5 The main valve assembly comprises a valve guide, renewable bonded seal and main valve. A PTFE seal is fitted around the piston section of the main valve to form a compression ring and a valve spring fitted between the top of the main valve and the valve body cover retains the valve in the closed position. The valve body cover is drilled and threaded to take a pipework connection.

2.6 The pipework, needle valves and solenoid valves form the pressure sensing and control system of the valve. The needle valves are fully adjustable and are used to set up the valve to the system on installation. The two solenoid valves are designed to be fully open or fully closed depending on the solenoids being energised or de-energised. With the solenoids de-energised the upstream valve is open and the downstream valve closed. Electrical control of the solenoids is by the automation system; the interconnecting wiring is by conventional three core cable.

2.7 Sealing of the valve is achieved by 'O' ring seals and gaskets.

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Chapter 2

SPECIFICATION

CONTENTS

1 VALVE SIZES

1.1 The Solenoid Operated Preset Valve is available in three sizes; 2.5”, 3” and 4”.

2 MATERIALS

2.1 The valve body may be of:

- Cast Steel.
- Spheroidal Graphite Cast Iron.

2.2 Seat is Stainless Steel.

2.3 Pipework and fittings are Stainless Steel.

2.4 Seals are nitrile or fluorocarbon material and the sliding seal is P.T.F.E.

3 DIMENSIONS

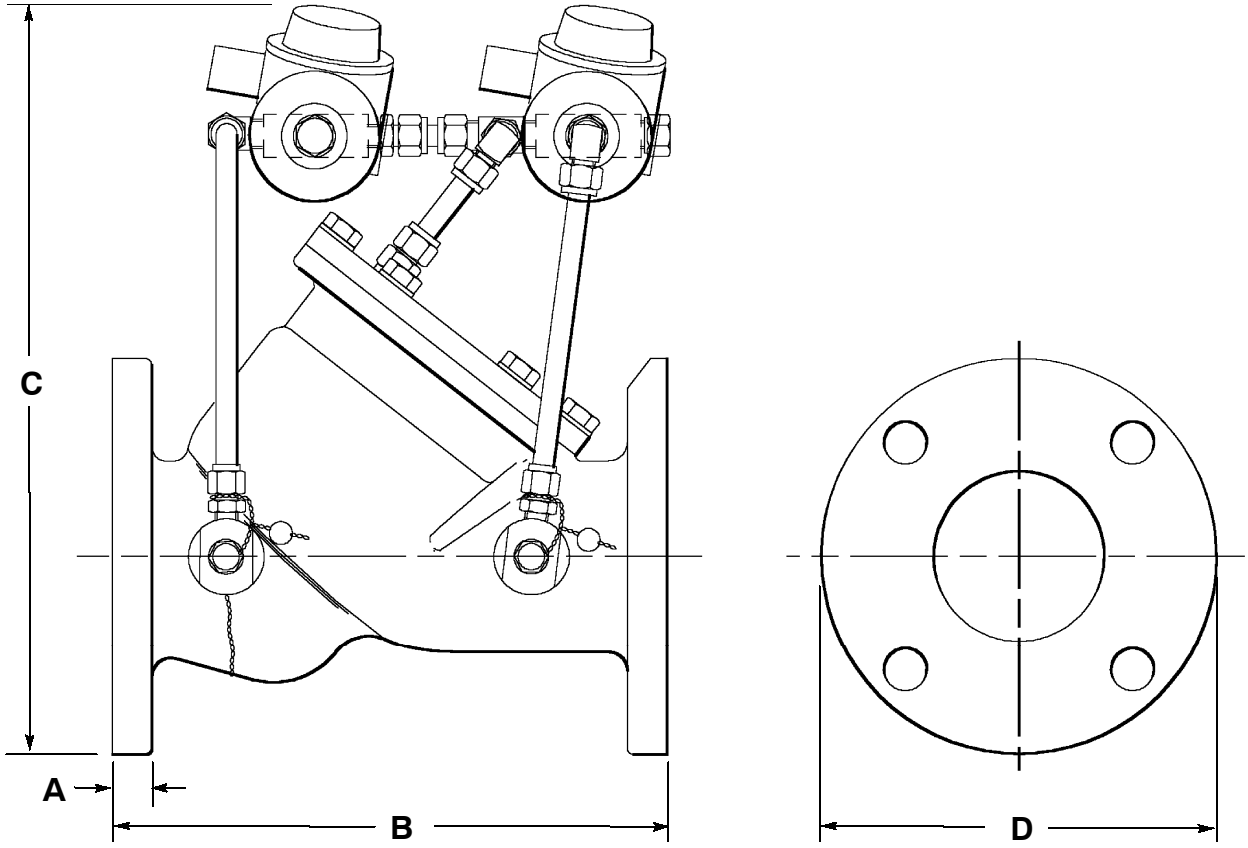


Fig 2.1 Valve Dimensions

Dimension	A	B (FF)	B (RF)	C	D
Valve size					
2.5 inch	0.75 inch (19mm)	10.5 inches (267mm)	10.6 inches (270mm)	14 inches (356mm)	7 inches (177.8mm)
3 inch	0.75 inch (19mm)	10.5 inches (267mm)	10.6 inches (270mm)	14 inches (356mm)	7.5 inches (190.5mm)
4 inch	0.95 inch (24mm)	13.5 inches (343mm)	13.6 inches (346mm)	14 inches (356mm)	9 inches (228mm)

4 FLANGE DETAILS

4.1 **2.5" Valve :** 4 holes diameter 0.75" (19.05mm) equispaced on 5.5" (139.7mm) P.C.D.

4.2 **3" Valve :** 4 holes diameter 0.75" (19.05mm) equispaced on 6" (152.4mm) P.C.D.

4.3 **4" Valve :** 8 holes diameter 0.75" (19.05mm) equispaced on 7.5" (190.5mm) P.C.D.

4.4 Flange connections:

- ANSI50 available with raised **(RF)** or flat face **(FF)**.

5 PRESSURE AND OPERATING TEMPERATURES

5.1	Maximum Working Pressure:	AC versions: 145 p.s.i. (10 bar) DC versions: 145 p.s.i. (10 bar)
5.2	Test Pressure:	300 p.s.i. (21 bar)
5.3	Temperature:	AC versions: –10° C to + 90° C DC versions: –10° C to + 90° C

6 ELECTRICAL

6.1 Power Supply: 110/220/240Vac or 12/24Vdc. Other voltages specified on request.

6.2 Solenoid Valves: “NADI” Red Dragon fitted as standard. ATEX approved EExd II C.

7. SUITABILITY

7.1 The Solenoid Operated Preset Valves are compatible with most automation systems especially the Avery Hardoll Masterload System, allowing:

- Flow Control at all stages (no flow governor required).
- Two Stage Opening.
- Ramp Down Closure.
- Precise Final Closure.
- Safety and Error Interlocked Operation.
- Minimised Number of moving parts.

8 VISCOSITY

8.1 Maximum Viscosity (standard valves): 150 cSt.

9 PERFORMANCE

9.1 The Solenoid Operated Preset Valve when used with MASTERLOAD will deliver the preset volume of product typically to +0.05/–0.00 units with the valve closing without shock or pressure surge.

9.2 PRESSURE LOSS

The graph shows pressure loss on kerosene at 2.4 cSt for each size of valve.

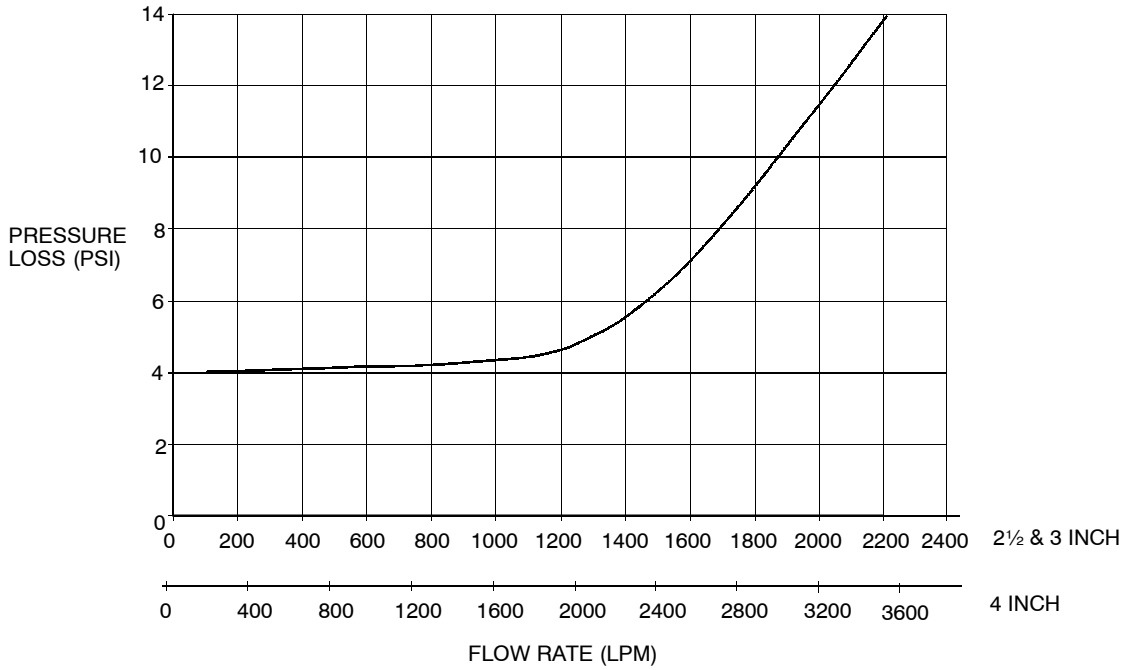


Fig 3.2 Pressure Loss

10 STORAGE LIFE

10.1 Storage life is limited by seal deterioration to two years when stored in cool dry conditions.

Chapter 3

INSTALLATION & OPERATION

CONTENTS

WARNING

PRIOR TO CARRYING OUT ANY WORK ENSURE THAT ALL LOCAL AND COMPANY SAFETY PROCEDURES HAVE BEEN COMPLIED WITH.

1 RECEIPT

1.1 The preset valve will be delivered in a suitable container. Upon receipt the container should be inspected for signs of external damage which must be reported to the carrier immediately.

1.2 After unpacking, inspect the valve. Any signs of damage or missing components, must be reported to Meggitt Fuelling Products, Avery-Hardoll immediately.

2 VALVE INSTALLATION

WARNING

ENSURE THAT ALL LOCAL REGULATIONS REGARDING THE USE OF EQUIPMENT IN ZONE 1 HAZARDOUS AREAS ARE COMPLIED WITH.

ELECTRICAL POWER AND VALVE SYSTEM PRESSURE SHOULD FIRSTLY BE ISOLATED. WIRING THE ELECTRICAL CONNECTIONS OF SOLENOID VALVES SHOULD ONLY BE CARRIED OUT BY A QUALIFIED TECHNICIAN IN ACCORDANCE WITH EN60079.

2.1 The Inline Preset Valve is designed to be mounted downstream of the bulkmeter in either the vertical or horizontal position but the following must be checked:

- The valve is the correct way round, with the angled top face facing upstream (refer to Fig. 3.3).
- The solenoid valves are fitted with the normally closed valve downstream and the normally open valve upstream of the main valve.

3 WIRING CONNECTIONS OF SOLENOIDS

3.1 Tools required:
2mm allen key.
Flat screwdriver, maximum 3x1

3.2 Loosen the security grub screw using a 2mm allen key, turning anticlockwise (Fig. 3.1).

3.3 Remove solenoid housing cover and let it hang carefully by the safety chain. Inside the solenoid housing is a terminal block for live/neutral (AC) or + - (DC) connections. Orientation is not important.

3.4 An earthing screw is located in the base of the solenoid housing.

3.5 Wiring to the solenoids is by 3-core (AC) or 2 core (DC) cable.

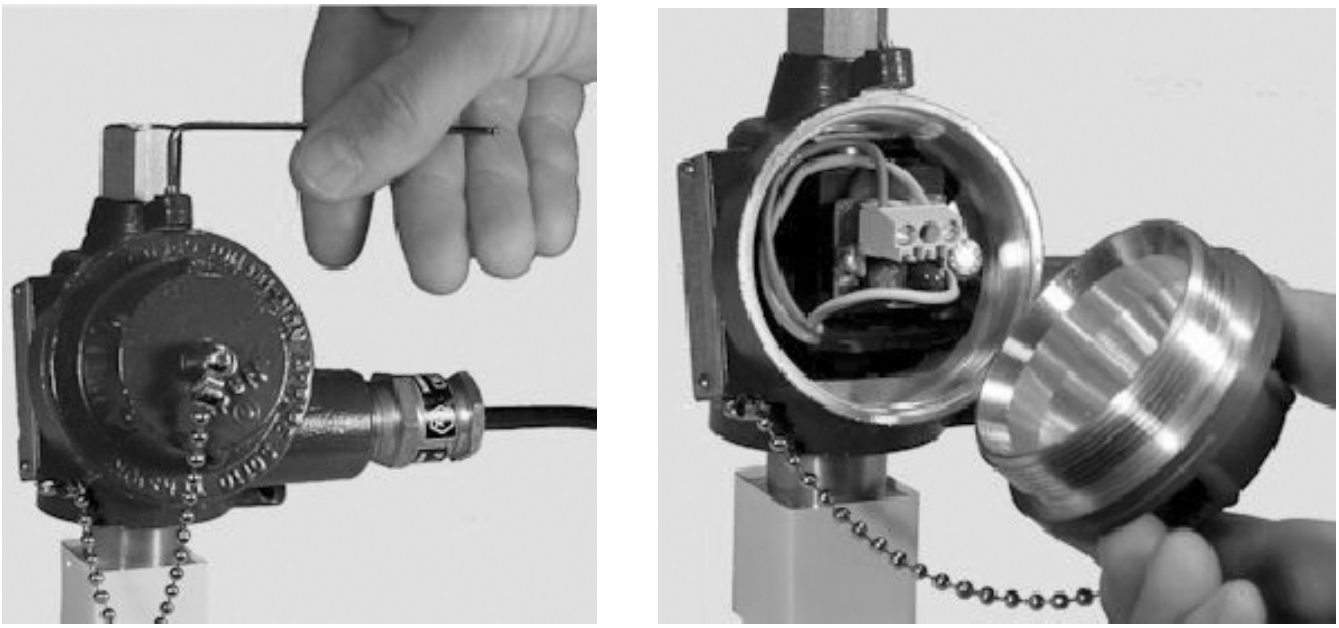


Fig. 3.1 LOOSENING SECURITY GRUB SCREW AND UNSCREWING THE COVER

3.6 Connect the power supply wires to the terminals on the solenoid coil terminal board (Fig. 3.2).

3.7 Connect the internal earth wire to the internal earth screw.

3.8 Connect the external earth terminal to ground

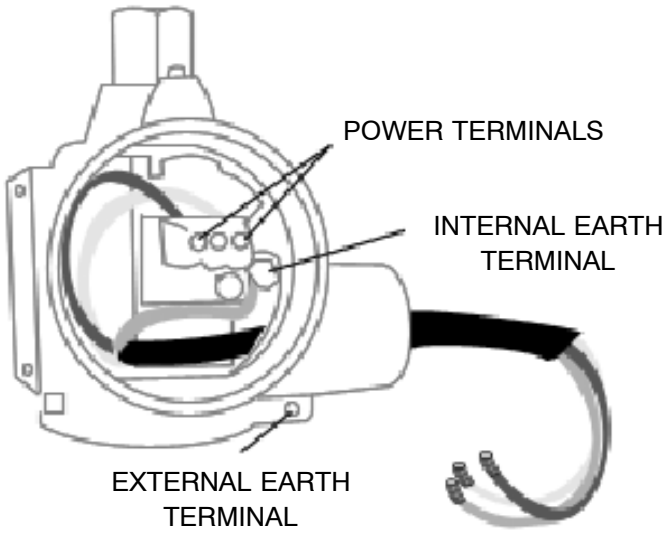


Fig. 3.2 WIRING TERMINALS

3.9 Replace the solenoid housing cover making sure that no internal wiring is trapped.

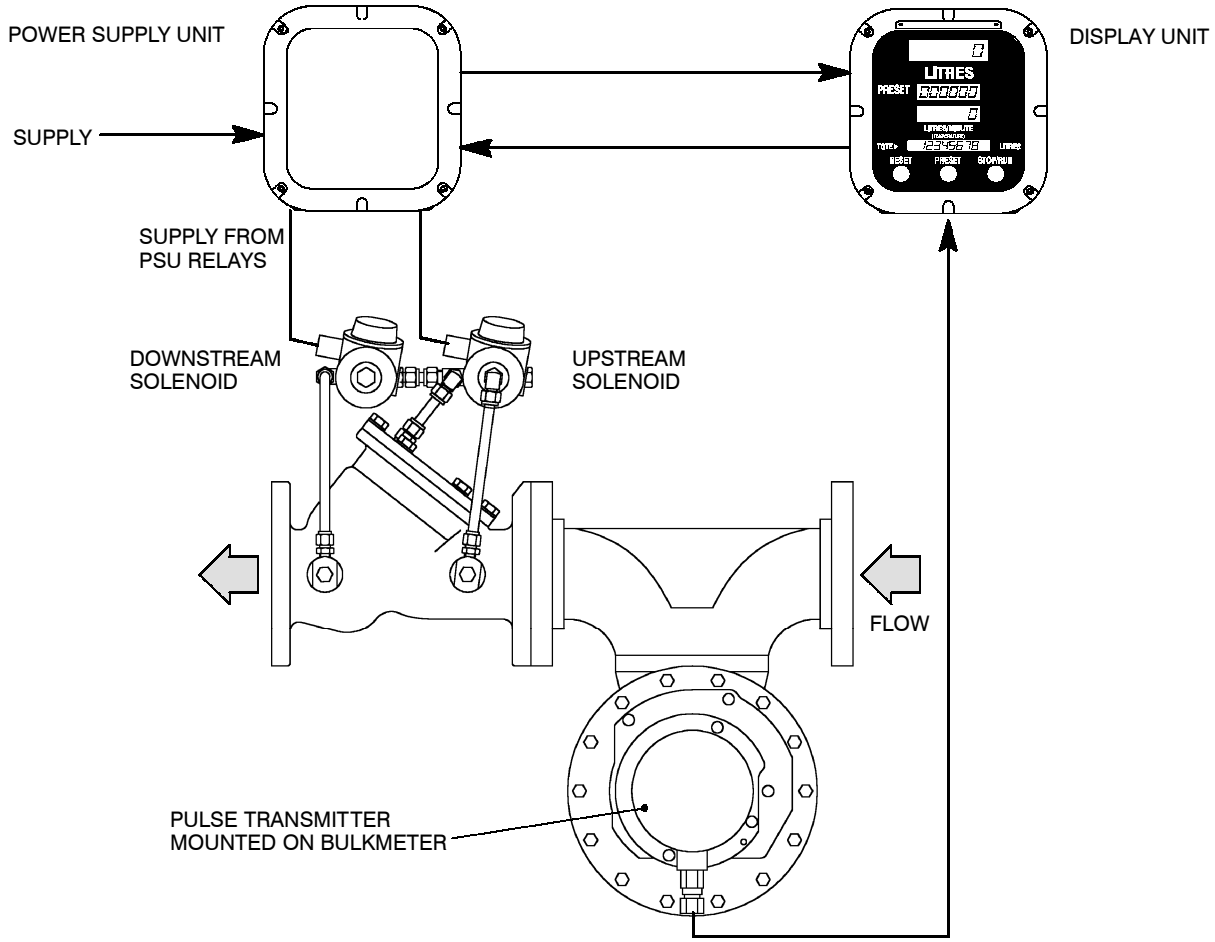


Fig 3.3 Typical valve / Masterload installation

3 OPERATION

3.1 The Solenoid Operated Preset Valve makes use of upstream and downstream pressures, sensed each side of the main valve and acting on the piston crown to open and close the main valve. Solenoid Valves control the pressure on the piston by closing or opening the upstream and downstream sensing points as commanded.

3.2 **In a standby, non-operational state**, with no pressure in the system the main valve is held closed by spring pressure and both solenoids de-energised. The upstream Solenoid Valve is normally open and the downstream Solenoid Valve is normally closed.

3.3 **On pressurising the system**, the main valve is held closed under spring pressure aided by upstream pressure acting on the top of the main valve.

3.4 **The main valve is opened** by energising both solenoids, this action causes the upstream solenoid valve to close and the downstream to open. The pressure on top of the piston is released to the downstream level allowing upstream pressure under the piston to open the valve and allow product to flow. The pressure drop across the valve maintains the opening action.

3.5 **Steady flow rate through the main valve** is achieved by energising the upstream solenoid only (both upstream and downstream solenoids are closed). This locks a fixed volume of product above the piston, holding the valve in a steady partially open position.

3.6 **The valve is closed** by de-energising both solenoids causing the upstream solenoid valve to open and the downstream solenoid valve to close. Pressure above the piston increases to the upstream level and, aided by the spring, the main valve begins to close.

3.7 **Bypass State**. If, when the final few litres of the preset quantity is reached, the upstream solenoid is de-energised and the downstream solenoid energised, placing both valves in the open position (leak state), the final quantity of product will pass through the control pipework with the main valve closed.

3.8 The table below shows the state of the main valve, control valves and solenoids at all stages of the valve opening and closing.

MAIN VALVE STATE	UPSTREAM Vv POSITION	DOWNSTREAM Vv POSITION	UPSTREAM SOLENOID STATE	DOWNSTREAM SOLENOID STATE
Closed (Standby)	OPEN	Closed	D	D
Opening	Closed	OPEN	E	E
Steady Flow	Closed	Closed	E	D
Closing	OPEN	Closed	D	D
Closed (Bypass State)	OPEN	OPEN	D	E

TABLE 3.1 Preset valve operation

D = De-Energised
E = Energised

Chapter 4

MAINTENANCE AND OVERHAUL

CONTENTS

WARNING

WORK MUST ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL.

PRIOR TO COMMENCING WORK, ENSURE THAT ALL AIRPORT/COMPANY SAFETY PROCEDURES HAVE BEEN COMPLIED WITH.

ALL POWER SUPPLIES ARE TO BE ISOLATED BEFORE DISCONNECTING SOLENOIDS.

ENSURE THE SYSTEM IS DRAINED BEFORE DISCONNECTING ANY PIPEWORK.

1 ROUTINE MAINTENANCE

1.1 Minimum maintenance is required to be carried out on the preset valve and is confined to keeping the unit clean, checking the security and condition of cables and connections. An internal inspection should be carried out and seals renewed every two years.

WARNING

FLUOROCARBON. DO NOT HANDLE O-RINGS/SEALS IF THEIR MATERIAL APPEARS CHARRED, GUMMY OR STICKY. USE TWEEZERS AND WEAR NEOPRENE OR PVC GLOVES. DO NOT TOUCH ADJACENT PARTS WITH UNPROTECTED HANDS. NEUTRALIZE ADJACENT PARTS WITH A SOLUTION OF CALCIUM HYDROXIDE. IF THE DEGRADED MATERIAL OR ADJACENT PARTS TOUCH THE SKIN, DO NOT WASH OFF WITH WATER, SEEK IMMEDIATE MEDICAL AID FOR POSSIBLE CONTAMINATION WITH HYDROFLUORIC ACID. HYDROFLUORIC ACID IN CONTACT WITH SKIN HAS DELAYED SYMPTOMS OF CONTAMINATION. IT IS EXTREMELY TOXIC.

2 DISASSEMBLY – 2.5 and 3 inch standard preset valves (Refer to Fig. 4.1)

2.1 **Before dismantling, ensure the valve is isolated, with upstream and downstream valves in the pipeline closed. Be aware of any slight fluid residue leak that may occur.**

2.2 Unscrew the solenoid covers. Disconnect the wires from each solenoid, refer to Chap. 3 for more information.

2.3 Support the weight of the preset valve and remove the flange bolts, nuts and washers. Using suitable lifting equipment lift the valve clear and place on a suitable clean working surface. Remove and discard gaskets.

DISCONNECTING THE PIPEWORK AND SOLENOIDS ASSEMBLY

2.4 Disconnect the pipework at connectors A, B and C. Remove the pipework and solenoids assembly and place on a suitable clean working surface.

2.5 Thoroughly check all connections and pipes for leaks or damage. If any are found please follow the next section.

DISMANTLING THE PIPEWORK AND SOLENOIDS ASSEMBLY

2.6 Disconnect tubes (1) and (2) from elbow connectors (3) and (4). Disconnect tube (5) from elbow connector (6).

2.7 Disconnect elbow connector (3) from DOWNSTREAM solenoid (7). Disconnect tube (15) from tube adaptor (8) and remove the solenoid. Remove tube adaptor (8) and plug (9).

2.8 Remove elbow connector (4) and adaptor (10) from UPSTREAM solenoid (11) and remove the solenoid from tee connector (12). Remove plug (13).

2.9 Dismantle remaining items, elbow connector (6), tubes (14 &15), tee connector (12) and connector (16).

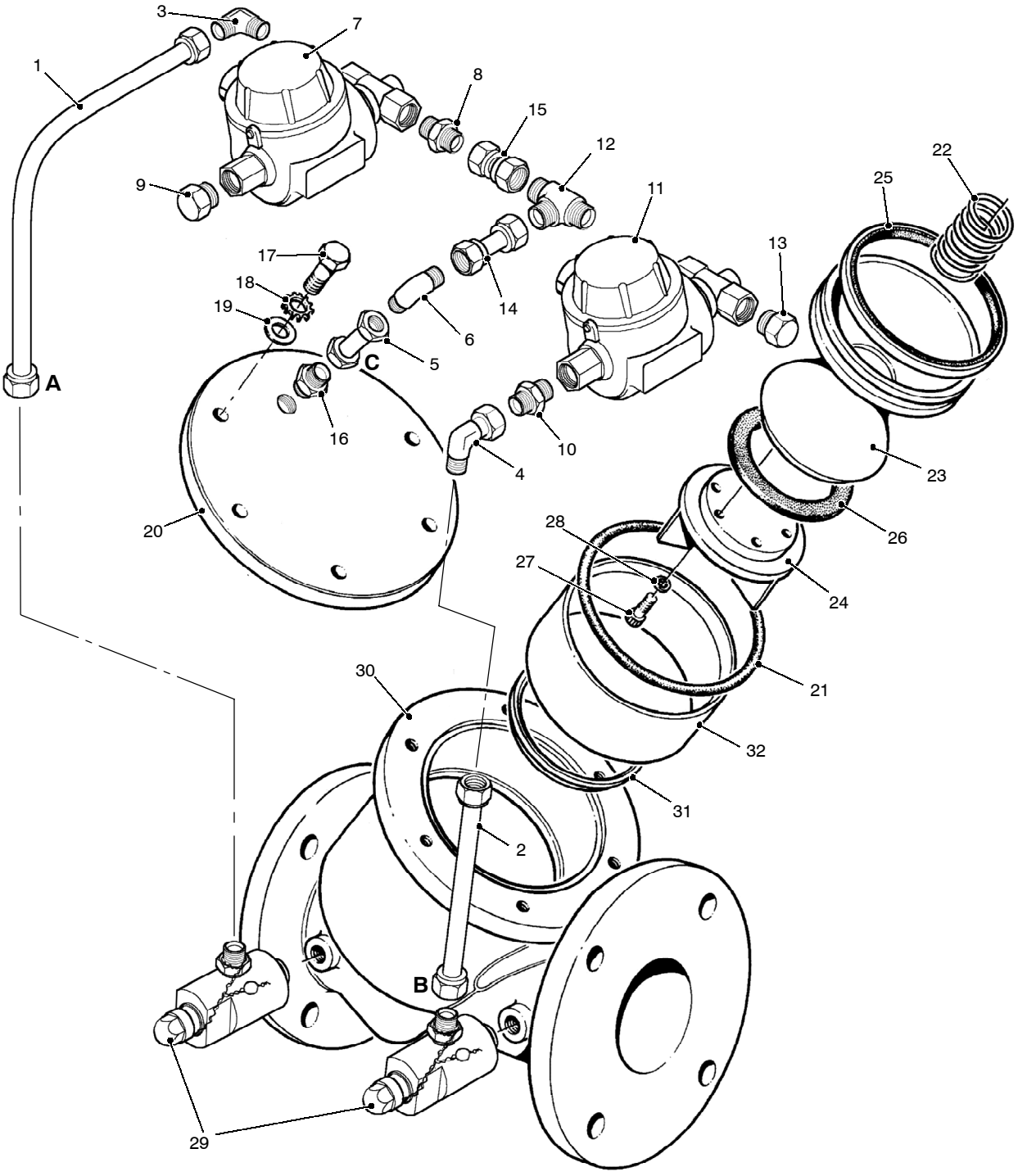


Fig 4.1 2.5 & 3 inch Valve

DISMANTLING THE PRESET VALVE

2.10 Relieve the spring tension by slackening off evenly on the six cover bolts. Remove the bolts (17), shake-proof washers (18) and plain washers (19) and lift the valve body cover (20). Remove and discard the 'O' ring seal (21).

2.11 Remove and retain the valve spring (22) and withdraw the main valve assembly (23-26) from the body by screwing a bolt (M6) into the threaded hole provided.

2.12 Cut the PTFE seal (25) and remove it from the main valve assembly. Remove the screws (27) and shake-proof washers (28) securing the valve guide (24) to the valve (23). Separate the valve and guide and remove the bonded seal (26).

REMOVING THE NEEDLE VALVES

2.13 Using a suitable spanner against the flat sections of the body carefully unscrew the needle valves (29). DO NOT remove the wire locking.

2.14 **Dismantling of the needle valves IS NOT RECOMMENDED by Meggitt Fuelling Products, Avery-Hardoll as any alteration to the needle valve settings could affect the performance of the valve and may render any warranty void.**

3 DISASSEMBLY - 4 inch preset valves (Refer to Fig. 4.2)

3.1 **Before dismantling, ensure the valve is isolated, with upstream and downstream valves in the pipeline closed. Be aware of any slight fluid residue leak that may occur.**

3.2 Unscrew the solenoid covers. Disconnect the wires from each solenoid, refer to Chap. 3 for more information.

3.3 Support the weight of the preset valve and remove the flange bolts, nuts and washers. Using suitable lifting equipment lift the valve clear and place on a suitable clean working surface. Remove and discard gaskets.

DISCONNECTING THE PIPEWORK AND SOLENOIDS ASSEMBLY

3.4 Disconnect the pipework at connectors A, B and C. Remove the pipework and solenoids assembly and place on a suitable clean working surface.

3.5 Thoroughly check all connections and pipes for leaks or damage. If any are found please follow the next section.

DISMANTLING THE PIPEWORK AND SOLENOIDS ASSEMBLY

3.6 Disconnect tubes (1) and (2) from elbow connector (3) and connector (4). Disconnect tube (5) from elbow connector (6).

3.7 Disconnect elbow connector (3) from DOWNSTREAM solenoid (12). Disconnect tube (14) from tube adaptor (8) and remove the solenoid. Remove tube adaptor (8) and plug (9).

3.8 Disconnect tube (15) from tube adaptor (11). Remove UPSTREAM solenoid (10). Disconnect tube (2), adaptors (4 &11) and plug (12).

3.9 Dismantle remaining items, elbow connector (6), tubes (13-15), tee connector (16) and connector (17).

DISMANTLING THE PRESET VALVE

3.10 Relieve the spring tension by slackening off evenly on the seven cover bolts. Remove the bolts (18), shake-proof washers (19) and plain washers (20) and lift the valve body cover (21). Remove and discard the 'O' ring seal (22).

3.11 Remove and retain the valve spring (23) and withdraw the main valve assembly (24-27) from the body by screwing a bolt (M6) into the threaded hole provided.

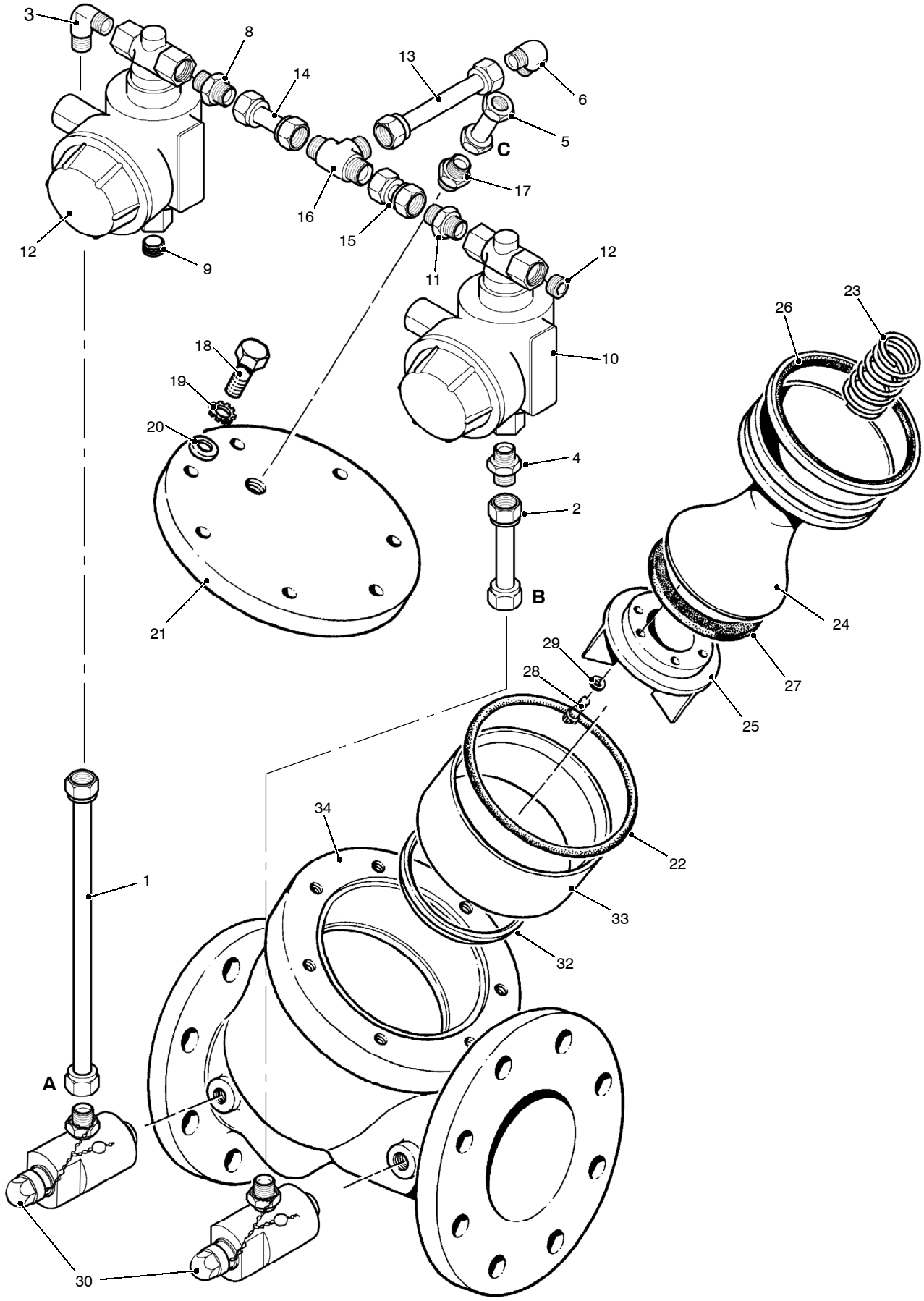


Fig 4.2 4 inch Valve

3.12 Cut the PTFE seal (26) and remove it from the main valve assembly. Remove the screws (28) and shake-proof washers (29) securing the valve guide (25) to the valve (24). Separate the valve and guide and remove the bonded seal (27).

REMOVING THE NEEDLE VALVES

3.13 Using a suitable spanner against the flat sections of the body carefully unscrew the needle valves (30). DO NOT remove the wire locking.

3.14 **Dismantling of the needle valves IS NOT RECOMMENDED by Meggitt Fuelling Products, Avery-Hardoll as any alteration to the needle valve settings could affect the performance of the valve and may render any warranty void.**

4 CLEANING AND INSPECTION (All valve sizes)

4.1 Thoroughly clean all components using approved cleaning methods and materials. Inspect for damage or excessive wear. Renew components as necessary, renew 'O' rings and seals.

4.2 Inspect valve seat (31) and sleeve (32) for any signs of wear or damage (Figs. 4.1 and 4.2). If found contact the service department at Meggitt Fuelling Products, Avery-Hardoll for advice.

5 ASSEMBLY - 2.5 and 3 inch standard preset valves (Refer to Fig. 4.1)

ASSEMBLY OF THE PRESET VALVE

5.1 Fit a new 'O' ring seal (21) to the top face of the valve body (30).

5.2 Fit a new bonded seal (26) to the main valve (23). Secure the valve guide (24) to the valve with screws (27) and shake proof washers (28). Fit a new PTFE seal (25) to the piston section.

5.3 Apply a light smear of petroleum jelly to the PTFE seal and fit the main valve assembly into the body.

5.4 Fit the valve spring (22) into the top of the main valve assembly (24-27). Fit the valve body cover (20) with bolts (17), shake-proof washers (18) and plain washers (19). Ensure that the spring has located correctly into the recess in the cover. Secure the cover by tightening down on the six cover securing bolts evenly.

RE-FITTING THE NEEDLE VALVES

5.5 Apply the recommended Loctite to the thread of each of the needle valves.

5.6 Using a suitable spanner against the flat sections of the body carefully screw each needle valve (29) into the body. DO NOT overtighten and make sure the pipe connector is in the right attitude.

ASSEMBLING THE PIPEWORK AND SOLENOIDS

Note:

Sealing of elbows and male connectors etc. Where male and female threads are sealed to each other, a suitable thread sealant such as Loctite 572 should be used.

5.7 Assemble connector (16) to valve body cover (20). Assemble tee connector (12), tube (14), elbow connector (6), and tube (15).

5.8 Assemble adaptor (10) and elbow connector (4) to the UPSTREAM solenoid (11) and connect the solenoid to the tee connector (12). Replace plug (13).

5.9 Assemble elbow connector (3) and tube adaptor (8) to the DOWNSTREAM solenoid (7) and connect the solenoid to tube (15). Replace plug (9).

5.10 Hand tighten tubes (1) and (2) to elbow connectors (3) and (4) and tube (5) to elbow connector (6).

CONNECTING THE PIPEWORK AND SOLENOIDS ASSEMBLY

5.11 Connect the pipework and solenoids assembly at connectors A, B and C. Check and tighten all connections to specified torque. DO NOT overtighten.

5.12 Fit new gaskets and, using suitable lifting equipment, refit the valve to the system.

5.13 Re-connect the wires to each solenoid, refer to Chap. 3 for more information.

5.14 Replace the solenoid covers.

6 ASSEMBLY - 4 inch preset valves (Refer to Fig. 4.2)

6.1 Fit a new 'O' ring seal (22) to the top face of the valve body (33).

6.2 Fit a new bonded seal (27) to the main valve (24). Secure the valve guide (25) to the valve with screws (28) and shake proof washers (29). Fit a new PTFE seal (26) to the piston section.

6.3 Apply a light smear of petroleum jelly to the PTFE seal and fit the main valve assembly into the body.

6.4 Fit the valve spring (23) into the top of the main valve assembly. Fit the valve body cover (21) with seven bolts (18), shake-proof washers (19) and plain washers (20). Ensure that the spring has located correctly into the recess in the cover. Secure the cover by tightening down on the seven bolts evenly.

RE-FITTING THE NEEDLE VALVES

6.5 Apply the recommended Loctite to the thread of each of the needle valves.

6.6 Using a suitable spanner against the flat sections of the body carefully screw each needle valve (30) into the body. DO NOT overtighten and make sure the pipe connector is in the right attitude.

ASSEMBLING THE PIPEWORK AND SOLENOIDS

Note:

Sealing of elbows and male connectors etc. Where male and female threads are sealed to each other, a suitable thread sealant such as Loctite 572 should be used.

6.7 Assemble connector (17) to valve body cover (21). Assemble tubes (13-15) to tee connector (16). Assemble elbow connector (6) to tube (13).

6.8 Assemble tube connectors (4) and (11) to the UPSTREAM solenoid (10) and connect the solenoid to the tube (15). Replace plug (12).

6.9 Assemble elbow connector (3) and tube adaptor (8) to the DOWNSTREAM solenoid (12) and connect the solenoid to tube (14). Replace plug (9).

6.10 Hand tighten tubes (1) and (2) to elbow connector (3) and tube connector (4) and tube (5) to elbow connector (6).

CONNECTING THE PIPEWORK AND SOLENOIDS ASSEMBLY

6.11 Connect the pipework and solenoids assembly at connectors A, B and C. Check and tighten all connections to specified torque. DO NOT overtighten.

6.12 Fit new gaskets and, using suitable lifting equipment, refit the valve to the system.

6.13 Re-connect the wires to each solenoid, refer to Chap. 3 for more information.

6.14 Replace the solenoid covers.

7 FAULT FINDING

7.1 Faults occurring with the Solenoid Operated Preset Valve will in most cases show as:

- Incorrect quantity of product passed
- Failure of valve to open
- Failure of valve to close
- Incorrect opening and closing times causing sluggish response or pressure surges and shock.

7.2 Faults may also occur in the system in which the valve has been installed. Operation and Maintenance procedures correctly carried out should keep faults to a minimum.

7.3 The following table is a guide for possible faults and causes, with remedies that can be carried out by maintenance staff.

7.4 If the fault cannot be cured by the remedies listed, advice should be sought from Meggitt Fuelling Products, Avery-Hardoll.

8 FAULT FINDING TABLE

TABLE 8.1

Fault	Possible Cause	Remedy
No flow - Solenoids inoperative.	No Permissive Feed.	Check Permissive Feed supply.
	Wiring fault.	Check Power Supply and Solenoids wiring. Check wiring run for damage.
	Automation System.	Refer to System Manual.
No Flow- but Solenoids 'Cllck' when flow is initiated.	Only one Solenoid operating.	Check Wiring.
One Solenoid fails to energise.	Fuse Blown in Power Supply.	Renew Fuse after eliminating cause.
	Wiring Fault.	Check Power Supply and Solenoids wiring. Check wiring run for damage.
Over delivery of product.	By-pass volume to small. (Masterload only).	FLAG 13 - increase volume by 0.5 litres.
	Deceleration Rate too high. (Masterload only).	FLAG 13 - reduce deceleration by 50.
	Upstream Needlevalve closed too far.	Turn Upstream Needlevalve counter-clockwise.
	Automation System.	Refer to System Manual.

Fault	Possible Cause	Remedy
Sluggish response on opening.	Downstream Needlevalve not opened sufficiently. Blockage in pipework, main valve sticking.	Turn Downstream Needlevalve counter-clockwise. Check pipework and valve, dismantle as detailed in Para 2.
Sluggish response on closing.	Upstream Needlevalve not opened sufficiently. Main Valve sticking.	Turn Upstream Needlevalve counter-clockwise. Check Valve, dismantle as detailed in Para 2.
Opening action too fast causing surges.	Downstream Needlevalve opened too far.	Turn Downstream Needlevalve clockwise.
Closing action too fast causing shock.	Upstream Needlevalve opened too far.	Turn Upstream Needlevalve clockwise.
Product permanently leaking through valve	Downstream Solenoid valve-seat contaminated. Main valve-seat contaminated. Main bonded seal worn.	Strip and check valve-seat. Strip valve, inspect. and replace parts as necessary.
Excessive “clicking” from solenoids.	Maximum flow rate (Flag 12) set too high (Masterload only).	Reduce flow rate value to an attainable figure.

Chapter 5

COMMISSIONING

CONTENTS

1 GENERAL

1.1 With the Solenoid Operated Preset Valve installed into the system it is necessary to 'tune' the valve to the system, in particular taking into account the product being handled and the line pressure.

1.2 In a newly installed system, set-up of the valve will be carried out during the commissioning of the complete system.

2 SETTING UP

2.1 For setting up the preset valve with Masterload refer to Section 3 of this chapter and the Masterload manual.

2.2 It is only possible for this manual to provide information for setting up the preset valve with Masterload. When using the preset valve with other manufacturers equipment refer to the automation system/meter head manufacturers manual for set-up information.

3 SET-UP DETAILS - Masterload

3.1 The valve is tested and given an initial set-up at the factory, and this should serve as an initial setting. If this has been lost close both needle valves. Open the upstream needle valve one turn and the downstream needle valve half a turn, this will provide a starting point for adjustment. The upstream needle valve must always be further open than the downstream valve.

3.2 Set flags 10 to 13 to required values. (Refer to the Masterload manual).

NOTE:

Flag 10: controls first stage flow rate.

Flag 11: controls first stage duration.

Flag 12: controls maximum flow rate.

Flag 13: controls the deceleration rate and the volume at which the valve closes before the end of the preset quantity and enters by-pass state.

3.3 Initiate product flow by pressing the RUN button on the Display Unit. Flow Rate should increase to first stage level and hold the first stage flow rate without excessive pulsing of the solenoids. Flow rate should continue to increase until second stage flow rate is reached and held once again without excessive pulsing of the solenoids.

3.4 After deceleration has taken place, the leak state flow rate should be between 2 - 9 lt/min, with leak state lasting no longer than 5 seconds. Deceleration should take place in at least three stages, reaching a flow rate of 100 lpm or less with 10 litres remaining.

3.5 The preset valve should now be in full control by the Masterload system.

3.7 The following list may be helpful for diagnosing and curing faults during initial set-up. For further information refer to Chapter 4, Para 7 Fault Finding.

3.8 Flow rate increases rapidly and overshoots desired flow rate; valve “hunts”:

Downstream Needlevalve open too far.

3.9 Flow rate “hunts” trying to find first or second stage flow rates; valve decelerates in large sudden steps:

Upstream Needlevalve open too far.

3.10 Flow rate increases slowly followed by “pulsing” and “hunting”; Leak state flow rate low:

Downstream Needlevalve closed too far.

3.11 Flow rate decreases slowly during deceleration; final preset volume is overshot (even with by-pass volume in excess of 2 litres):

Upstream Needlevalve closed too far.

Chapter 6

SPARE PARTS

CONTENTS

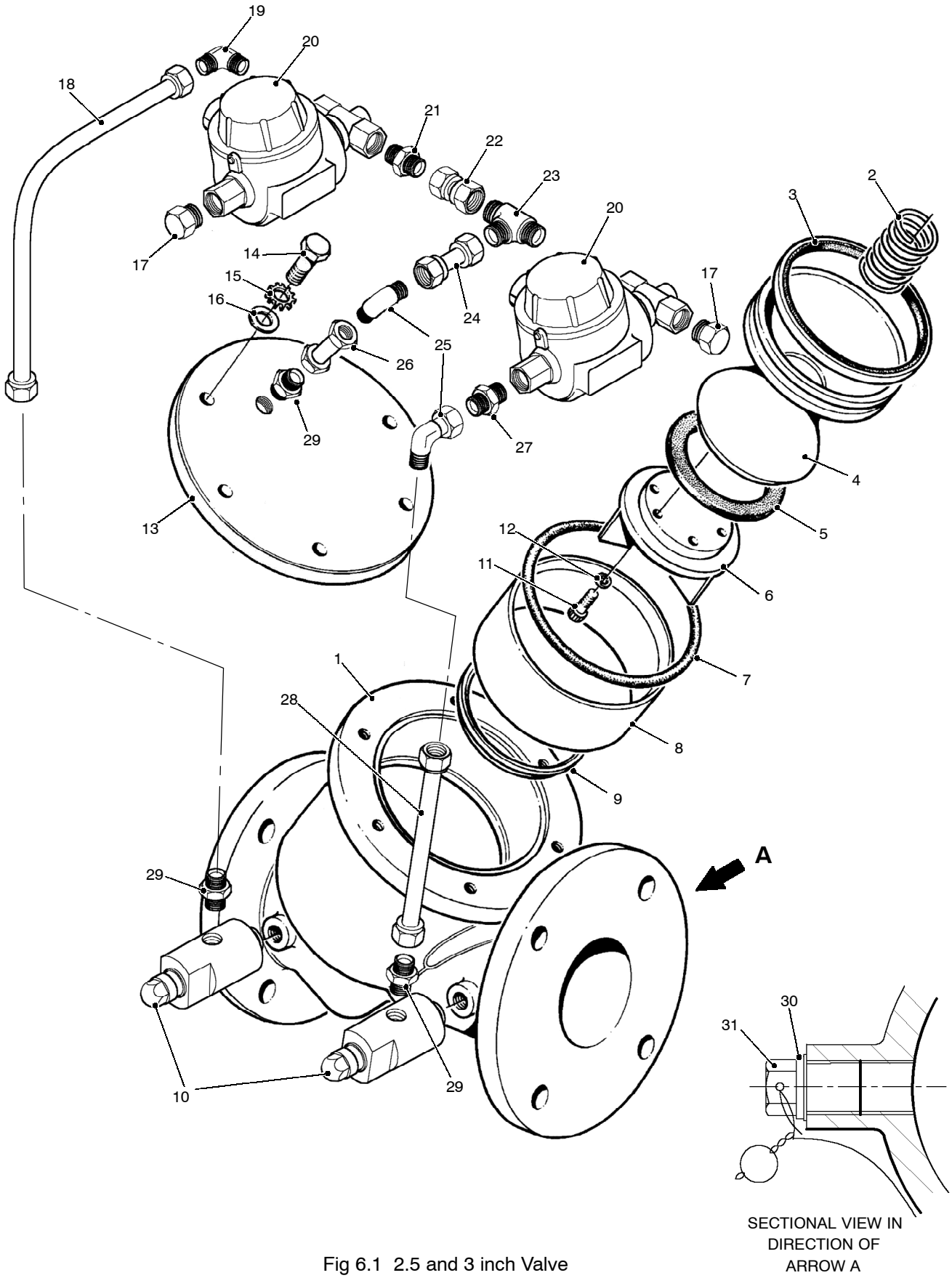
1 GENERAL INFORMATION

1.1 When ordering spare parts please quote the following information:

- Model Number and Mark.
- Publication Number and Issue.
- Figure Number.
- Figure Reference Number.
- Part Number.
- Description.

1.2 '+' in the Fig/Item column indicates Item is not illustrated.

1.3 '*' in the Fig/Item column indicates Item is recommended as a spare part.



SECTIONAL VIEW IN DIRECTION OF ARROW A

Fig 6.1 2.5 and 3 inch Valve

PARTS LIST - SOLENOID OPERATED PRESET VALVE - 2.5 inch and 3 inch

Fig 6.1

	1	Valve Body	Not Spared	-
	2	Spring	ZMSZ0101-8	1
*	3	Glydring Seal	ZARZ0097-18	1
	4	Valve	BEAZ1308	1
*	5	Bonded Seal	BMRZ19324-1	1
	6	Valve Guide	BEAZ1307	1
*	7	'O' Ring Seal	Z022E246139A	1
	8	Sleeve	BEBZ1310	1
	9	Valve Seat	BESZ1309	1
	10	Needle Valve (each valve comprising following items)	BESZ1399	2
+		Needle valve body	REF ONLY	1
+		'O' Ring Seal	REF ONLY	1
+		1/4 inch UNF nut	REF ONLY	1
+		Nut, dome	REF ONLY	1
+		Washer, fibre	REF ONLY	1
	11	Screw skt. head M5 x 20 long	ZW8205M05020A	6
	12	Washer M5 int. shake proof	ZW8206M05A	6
	13	Valve Body Cover	BESZ1311	1
	14	Screw hex head M10 x 25 long	ZS3228M10025A	6
	15	Washer M10 plain	ZW2201M10A	6
	16	Washer ext. shake proof	ZW8205M10A	6
	17	Plug 1/4 inch	BESZ1451	2
	18	Tube, 90 deg bend 160 x 160mm	BESZ1475	1
	19	Elbow, male 3/8 inch	ZACZ0305-47	1
	20	Solenoid Valve, three way direct acting	SEE TABLE 1	2
	21	Tube adaptor	ZACZ0032	1
	22	Tube 3/8 inch	BESZ1324-1	1
	23	Tee connector, male	ZACZ0305-48	1
	24	Tube connector	BESZ1324-2	1
	25	Union, elbow 3/8 inch	ZACZ0305-13	2
	26	Tube connector	BESZ1324-3	1
	27	Tube end, male adaptor	ZACZ0305-49	1
	28	Tube, 150mm long	BESZ1476	1
	29	Connector 3/8 inch	ZACZ0305-18	3
*	30	Bonded seal	ZMMZ0135-1	2
	31	Drain plug 3/8 inch BSPP	ZACZ0017-11	2

* = SUGGESTED SPARE PART

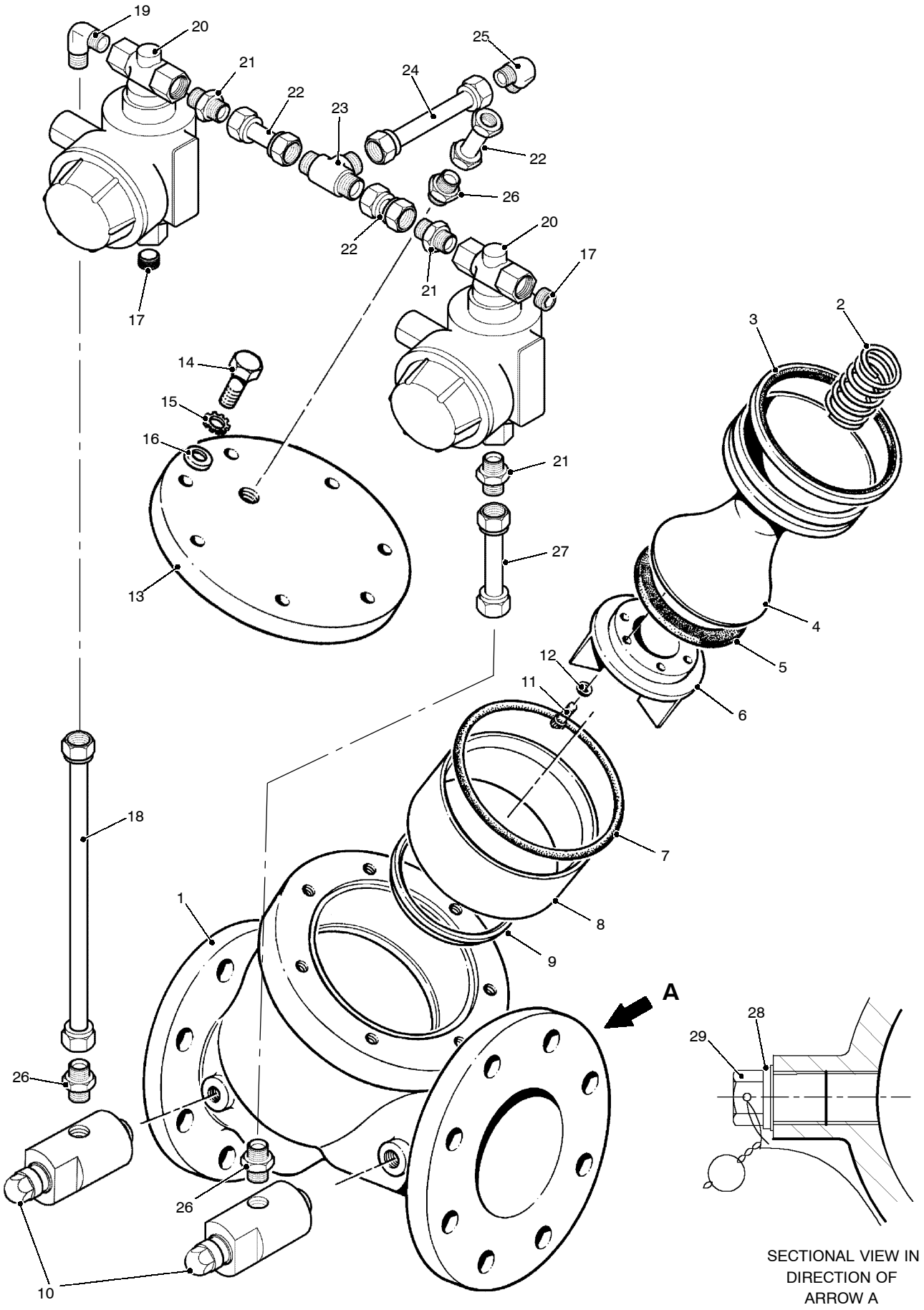


Fig 6.2 4 inch Valve

PARTS LIST - SOLENOID OPERATED PRESET VALVE - 4 inch

Fig 6.2

	1	Valve Body	Not Spared	-
	2	Spring	ZMSZ0101-6	1
*	3	Glydring Seal	ZARZ0097-17	1
	4	Valve	BEAZ1302	1
*	5	Bonded Seal	BMRZ16764-1	1
	6	Valve Guide	BEAZ1306	1
*	7	'O' Ring Seal	Z022E259139A	1
	8	Sleeve	BEBZ1303	1
	9	Valve Seat	BESZ1304	1
	10	Needle Valve (each valve comprising following items)	BESZ1399	2
+		Needle valve body	REF ONLY	1
+		'O' Ring Seal	REF ONLY	1
+		1/4 inch UNF nut	REF ONLY	1
+		Nut, dome	REF ONLY	1
+		Washer, fibre	REF ONLY	1
	11	Screw skt. head M5 x 20 long	ZS3225M020A	6
	12	Washer M5 int. shake proof	ZW8206M05A	6
	13	Valve Body Cover	BESZ1305	1
	14	Screw hex head M12 x 30 long	ZS3228M12030A	7
	15	Washer M12 plain	ZW2201M12A	7
	16	Washer ext. shake proof	ZW8205M12A	7
	17	Plug 1/4 inch	BESZ1451	2
	18	Tube, 187mm long (trim to fit)	BESZ1477	1
	19	Elbow, male 3/8 inch	ZACZ0305-47	1
	20	Solenoid Valve, three way direct acting	SEE TABLE 1	2
	21	Tube connector, 1/4 NPT x 3/8 inch	ZACZ0032	1
	22	Port connector, 1/4 NPT x 3/8 inch	BESZ1453	3
	23	Tee union 3/8 inch	ZACZ0305-14	1
	24	Tube ????mm long	BESZ1470	1
	25	Union, elbow 3/8 inch	ZACZ0305-13	2
	26	Connector 3/8 inch	ZACZ0305-18	1
	27	Tube 60mm long	BESZ1478	1
*	28	Bonded seal	ZMMZ0135-1	2
	29	Drain plug 3/8 inch BSPP	ZACZ0017-11	2

* = SUGGESTED SPARE PART

TABLE 1 - ITEM 20 SOLENOID VALVE 3 WAY DIRECT ACTING

BEMY1478-			220/230/240V	110V	24V	12V
3" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
1	230V	CAST IRON FF	2			
1RF	230V	CAST IRON RF	2			
2	110V	CAST IRON FF		2		
2RF	110V	CAST IRON RF		2		
3	24V	CAST IRON FF			2	
3RF	24V	CAST IRON RF			2	

BEMY1478-			220/230/240V	110V	24V	12V
3" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
4FF	230V	CAST ALLUM	2			
5FF	110V	CAST ALLUM		2		
6FF	24V	CAST ALLUM			2	

BEMY1478-			220/230/240V	110V	24V	12V
2.5" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
7	230V	CAST IRON FF	2			
7RF	230V	CAST IRON RF	2			
8	110V	CAST IRON FF		2		
8RF	110V	CAST IRON RF		2		
9	24V	CAST IRON FF			2	
9RF	24V	CAST IRON RF			2	

BEMY1478-			220/230/240V	110V	24V	12V
2.5" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
10FF	230V	CAST ALLUM	2			
11FF	110V	CAST ALLUM		2		
12FF	24V	CAST ALLUM			2	

BEMY1478-			220/230/240V	110V	24V	12V
3" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
13	230V	CAST STEEL	2			
14	110V	CAST STEEL		2		
15	24V	CAST STEEL			2	

BEMY1478-			220/230/240V	110V	24V	12V
2.5" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
16	230V	CAST STEEL	2			
17	110V	CAST STEEL		2		
18	24V	CAST STEEL			2	

BEMY1478-			220/230/240V	110V	24V	12V
3" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
19	12V	CAST IRON FF				2
19RF	12V	CAST IRON RF				2
20	12V	CAST ALLUM FF				2

TABLE 1 - ITEM 20 SOLENOID VALVE 3 WAY DIRECT ACTING

BEMY1478-			220/230/240V	110V	24V	12V
2.5" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
21	12V	CAST IRON FF				2
21RF	12V	CAST IRON RF				2
22	12V	CAST ALLUM FF				2

BEMY1477-			220/230/240V	110V	24V	12V
4" PRESET VALVE ASSY			ZEMZ0177-52	ZEMZ0177-53	ZEMZ0177-54	ZEMZ0177-55
1	240V	CAST IRON FF	2			
1RF	240V	CAST IRON RF	2			
2	110V	CAST IRON FF		2		
2RF	110V	CAST IRON RF		2		
3	220V	CAST STEEL	2			
3RF	220V	CAST STEEL	2			
4	110V	CAST STEEL		2		
4RF	110V	CAST STEEL		2		
5	24V	CAST IRON			2	
5RF	24V	CAST IRON			2	
6	12V	CAST IRON				2
6RF	12V	CAST IRON				2
7	24V	CAST STEEL			2	
7RF	24V	CAST STEEL			2	
8	12V	CAST STEEL				2
8RF	12V	CAST STEEL				2

Different voltages are available to meet other power supplies or applications, please contact Meggitt Fuelling Products, Avery–Hardoll for further information.