Meggitt Fuelling Products
Avery-Hardoll
Whittaker Controls

4 inch inline pressure control valve CCMY8600M2

Installation, operation and maintenance manual

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AMENDMENT RECORD

AMENDMENT NO.	CHAP/ PAGE	DESCRIPTION	DATE
1	Chap 4 Para 4.2.2	NORGREN Precision Regulator specification details added	Jan 02

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).

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1 INTRODUCTION

1.1 The Avery–Hardoll CCMY8600M2 inline pressure control valve is designed for use on aviation refuelling vehicles, either fuellers or dispensers, for delivery of aviation kerosenes and gasolines only; for applications with other liquids Meggitt Fuelling Products, Avery–Hardoll must be consulted.

1.2 The valve is of the direct pressure feedback type and works on the balanced diaphragm principle. Its purpose is to maintain a constant pressure at varying flowrates.

1.3 Incorporated within the valve is an emergency 'deadman' shut off feature which may be used to both initiate and terminate product flow.

1.4 The valve is flanged on both the inlet and outlet side to a standard 4" ASA 150. Adaptors pieces, from 4" – 6" flanges, are available on the CCMY8600A–M2 model.

2 DESCRIPTION

2.1 The valve is comprised of two aluminium alloy castings bolted together on a central flange and sealed with an 'O' ring.

2.2 Internally the valve is divided into two sections, an outer section through which, when the valve is open, the fuel passes and an inner chamber, formed by the fuel chamber insert and the internal casting of the inlet half of the body.

2.3 The inner chamber, which is divided by the main diaphragm, is sealed to the main flow of fuel but connected, through internal drillings, to external fuel sensing and air reference lines. These service lines operate on either side of the main diaphragm via a sealed stem.

2.4 The diaphragm is biased to the closed position by a spring fitted inside the fuel chamber, thus ensuring that in the event of a diaphragm failure or deadman shut off the valve will always terminate flow.

2.5 A one–way restrictor valve, incorporating a small fixed orifice (1mm standard), forms the fuel sense line connector and governs the opening time of the valve whilst allowing rapid closure response to rising downstream pressure.

2.6 Opening time is preset at about 10 seconds to maximum flow rate. (This varies slightly with air reference pressure).

2.7 A diaphragm operated air exhaust valve, and exhaust vent port with a small fixed orifice (0.8mm standard) control the rate of closure of the main valve on deadman release. This is preset between 3 and 5 seconds. This also operates on closure due to a downstream pressure surge.

2.8 In operation a preset air pressure (approximately 0.82 bar (12 psi) above the required control pressure) is applied to the unit via a deadman valve. This tends to open the piston valve against spring pressure.

2.9 As the piston moves off the main seal, flow commences and the downstream pressure increases. This pressure is sensed at the control point (the junction of the sense line and the main pipework downstream of the valve) and fed back down the sense line to the fuel side of the diaphragm. The piston will stop moving when the fuel pressure is balanced against the air reference pressure. The pressure at the sense point will always be below air reference pressure due to a) the spring bias force – this will vary slightly depending upon the position of the piston, and b) to a small area imbalance on the piston – this varies with control pressure. An allowance can be made for both these factors in the air reference pressure.

2.10 If the downstream pressure increases due to an increase in inlet pressure or back pressure, the pressure on the fuel side of the diaphragm overcomes the air reference pressure and the piston closes to reduce the pressure at the control point until the diaphragm is balanced.

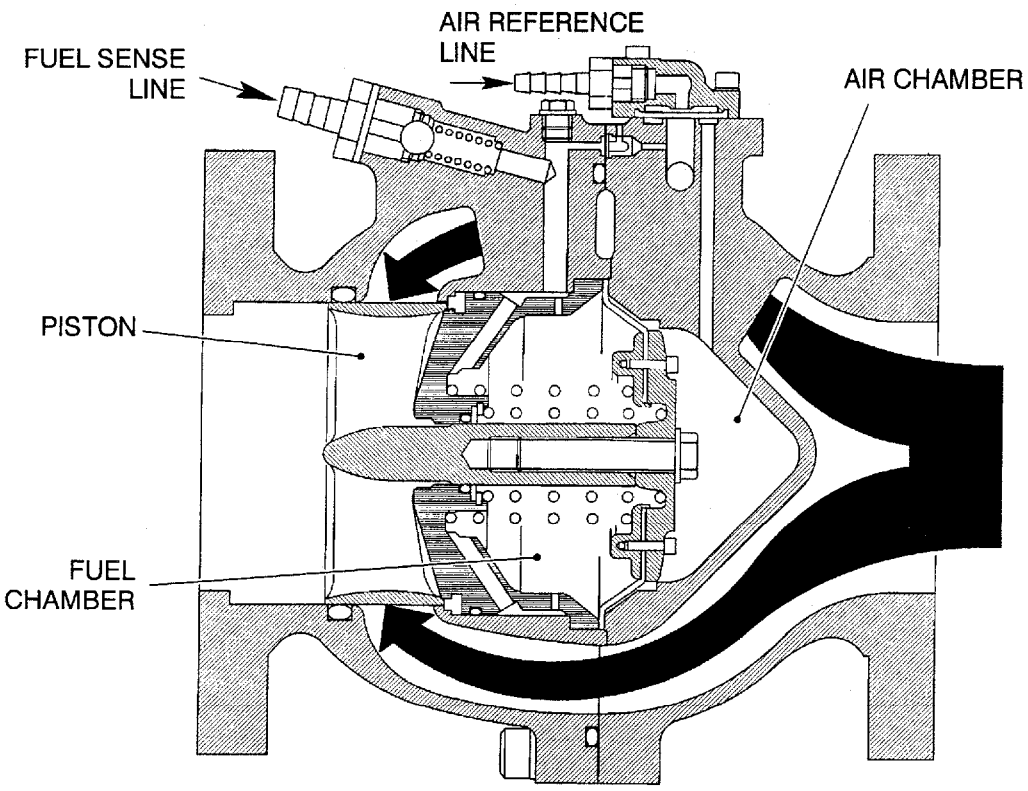

FIG. 1A 4" INLINE PRESSURE CONTROL VALVE - CLOSED POSITION

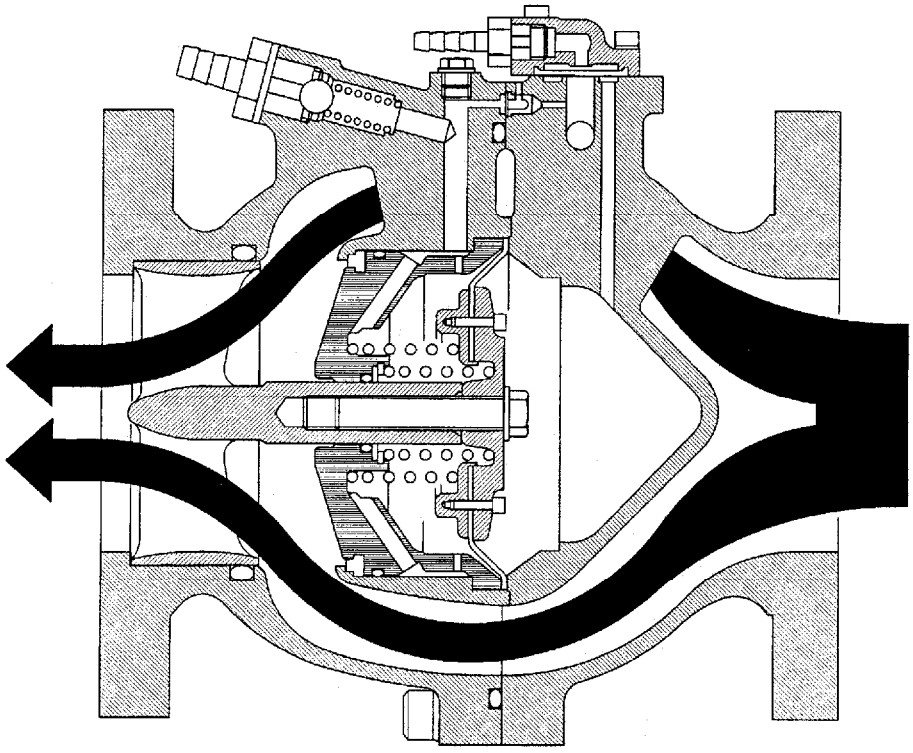

FIG. 1B 4" INLINE PRESSURE CONTROL VALVE - OPEN POSITION

2.11 If the downstream pressure drops for any reason this decrease is sensed at the diaphragm, the air reference pressure overcomes the fuel pressure and the piston opens until once again the diaphragm is balanced.

2.12 Fig. 1A shows the valve fully closed. Fig. 1B shows the valve in the fully open position with the air pressure overcoming the combined effect of fuel and spring pressure. In practise the valve, under normal operating conditions, will balance around the mid stroke position with small changes in pressure being compensated for by small movements of the piston.

3 SPECIFICATION

3.1 **Dimensions**

Length between flanges – 279 mm (11 inches)

Maximum Diameter – 318 mm (12.5 inches)

Weight – 12.7 kg (28 lbs)

Flanges:	CCMY8600M2	4” ASA 150 or
	CCMY8600A–M2	6” ASA 150

3.2 **Materials**

Materials in contact with the fuel are anodised aluminium, stainless steel, nickel plated steel, PTFE viton and high Nitrile rubber.

3.3 **Pressures**

Maximum Working Pressure	12.1 bar (175 lbf/sq in)
Test Pressure	19 bar (275 lbf/sq in)
Maximum Flow Rate	4546 Ltr (1000 Igpm 1200 USgpm)

3.4 **Performance**

Pressure Drop at maximum flow rate – 0.28 bar (4 lbf/sq in)

Pressure Control:–	Air reference pressure minus 0.7 to 0.8 bar (10 to 12 lbf/sq in) ± 0.14 bar (±2 lbf/sq in)
Deadman Control:–	Opening time 10 seconds approximately (with 1mm Fuel Restriction valve as standard)
	Closure time 5 seconds approximately (with 0.8mm Vent Port as standard)
	Overshoot 191 Ltr (42 Impg 50 USg) (At maximum flow rate)

3.5 **Storage life**

Three years, when stored in a cool dry condition, limited by the deterioration of seals only (refer to Section 5.3).

4 INSTALLATION AND COMMISSIONING

4.1 **Receipt**

The controller will be delivered, complete with one spare fuel restrictor valve (1.5mm), and two spare vent port assemblies (0.6mm & 1.0mm), in a suitably packed container. Any signs of damage to the container must be reported immediately to the carrier. Damage to the controller should be reported immediately to Avery–Hardoll.

4.2 **Installation**

4.2 .1 The controller may be installed in any position to suit the particular application, however, if the installation is horizontal then the bleed tapping, situated between the air reference line connection and the fuel sensing line connection, must be on the upper side of the unit to facilitate bleeding the fuel chamber.

4.2 .2 A fuel sense line of 3/8 inch diameter bore (fuel resistant) hydraulic hose, and an air reference line of 1/4 inch diameter bore (fuel resistant) air hose are required. The maximum length of these hoses must not exceed 12.2 metres (40 feet). For optimum surge pressure response of the valve, restrictions in the sense line must be kept to a minimum.

NOTE:

The air reference pressure must be supplied through a relieving type pressure regulator. A 'NORGREN' Precision Regulator Type 11–818–110 or equivalent, with a range of 1–7 bar minimum, is recommended. The use of an insufficiently sized or non–relieving type pressure regulator will result in high control/shut–off pressures. For reference to the Regulator, visit the 'NORGREN' website at www.norgren.com

4.3 **Commissioning**

Prior to using the Inline Pressure Control Valve for the first time or following maintenance or repair work it will be necessary to purge the fuel sense line and fuel chamber of air in accordance with the following procedure:

4.3 .1 Connect the unit to a re–circulating rig capable of providing a minimum flow rate of 450 Ltr/min (100 igpm) at a pressure of not less than the desired flow control pressure.

4.3 .2 Set the air reference pressure 0.82 bar (12psi) above the required flow control pressure and open the main valve piston by applying air pressure via the hand–held deadman valve.

4.3 .3 Circulate product through the system at a flow rate of approximately 450 Ltr/min.

4.3 .4 Place a drip tray beneath the controller and, with a rag draped over it unscrew the bleed valve, situated in the valve body between the fuel sensing inlet and air reference inlet, two or three turns.

4.3 .5 Using a downstream valve, slowly reduce the flow rate to zero and then gradually increase back to 450 Ltr/min. Air and product will be expelled from the bleed valve. Repeat the procedure until clear product flows from the bleed valve and then tighten the valve.

4.3 .6 If all the air has been expelled from the system then the opening of the valve will be smooth and progressive over several seconds. If the opening is too fast then air is still present and the unit will require further bleeding.

4.3 .7 Opening and closing times for the unit are controlled by fixed orifices. The unit is supplied as standard with a 1 mm fuel restrictor to control opening, and a 0.8 mm closing orifice, providing opening and closing times of approximately 10 and 5 seconds respectively at rated flow (the speed will vary slightly dependent upon inlet and control pressure).

4.3 .8 An alternative fuel restrictor valve and two exhaust vent ports are supplied as standard. If fitted, these will effect the opening and closing times as follows:–

1.5mm Fuel Restrictor Valve	– This will decrease the *opening* time to approx. 2 seconds.
1.0 mm Exhaust Vent port	– This will decrease the *closing* time by approx. 2 seconds.
0.6 mm Exhaust Vent port	– This will increase the *closing* time by approx. 2 seconds.

4.3 .9 The opening orifice is in the fuel restrictor valve and the orifice size is stamped on the hexagonal section. A 1 mm Valve is supplied as standard. To change the opening orifice carry out the following procedure:

4.3 .9.1 Ensure that the pressure control valve is closed (ie. deadman released and system depressurised).

4.3 .9.2 Remove the fuel sense line from the hose tail of the restrictor valve and unscrew the valve, taking care not to lose the ball and spring.

4.3 .9.3 Ensure that the ball and spring are correctly positioned and fit the required size of restrictor valve with its sealing washer.

4.3 .9.4 Replace the sense line hose and purge the system of air as described earlier in this section.

4.3 .10 To change the vent port assembly, a 0.8 mm Exhaust Vent port is supplied as standard (closing orifice), simply unscrew the existing component and fit the replacement. This may be done without depressurising the system.

5 MAINTENANCE

The frequencies recommended below are a minimum, however, local company instructions must be observed.

5.1 Daily
Carefully inspect the unit for signs of damage or leaks, paying particular attention of the area around the vent port assembly. Defects must be rectified immediately or the unit withdrawn from service.

5.2 Six Monthly
Carry out a complete operation check.

5.3 Seal Renewal

Inservice	–	dynamic seals	–	annually
	–	static seals	–	every two years
In Storage	–	all seals	–	every three years

6 OPERATING PROCEDURE

6.1 Adjust the air pressure to approximately 0.82 bar (12 psi) above the required control pressure. Product flow will be initiated when air pressure is applied to the valve via the deadman valve.

6.2 To terminate product flow or to isolate flow on completion of fuelling, release the deadman valve.

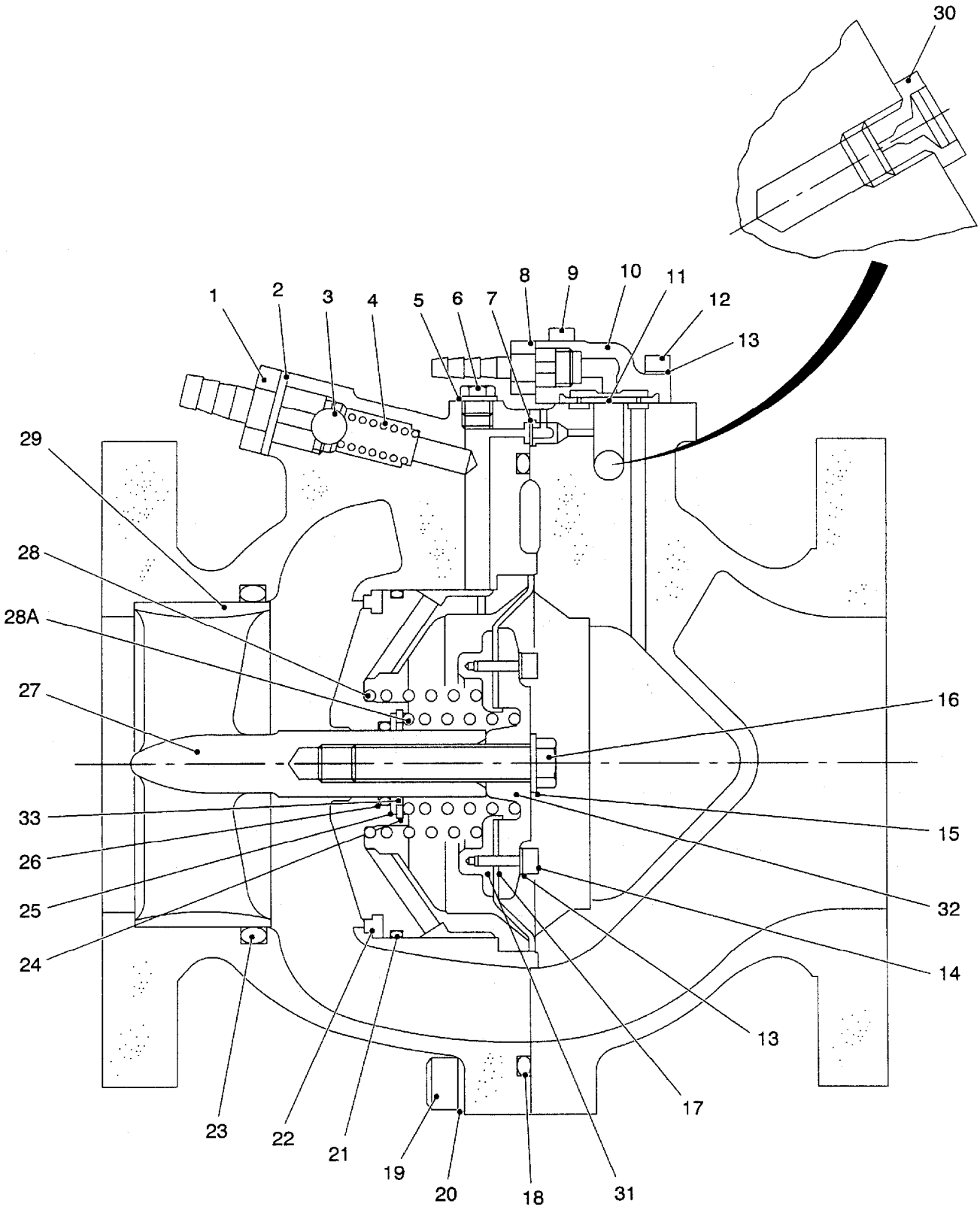
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Figure 2

7 OVERHAUL AND REPAIR

This section details the procedures to be followed when dismantling the inline pressure controller for overhaul and repair. These procedures must be carried out by suitably qualified engineers in clean workshop conditions. Before commencing dismantling procedures, ensure that all the required materials and spare parts are available. On completion of the procedures carry out the tests laid down in Section 9.

7.1 **Dismantling (refer to Figure 2)**

7.1 .1 Drain the flow line completely, disconnect the fuel sense line and air reference line at the controller and remove the valve from the system. Drain the fuel chamber by removing the bleed screw (6) and bonded seal (5) and inverting the unit.

7.1 .2 Remove fuel restrictor valve (1), seal (2), ball (3) and spring (4).

7.1 .3 Remove the four screws and washers (9, 12, 13) securing the exhaust valve cover (10). Carefully remove the cover assembly and gently prise out the air diaphragm (11).

7.1 .4 Remove the vent port assembly (30).

7.1 .5 Stand the unit on the inlet flange and remove the ten cap head screws (19) and spring washers (20) from the central flange. Separate the two halves of the unit taking care not to lose the small diaphragm (7). It may be necessary to lightly tap the two halves of the flange with a soft faced mallet to break the seal. Remove the main 'O' Ring (18).

CAUTION:

The diaphragm carrier assembly is subject to spring pressure, extreme care must be taken when dismantling to prevent personal injury and/or equipment damage.

7.1 .6 Whilst preventing the piston (29) from rotating, carefully loosen the main bolt (16) and bonded sealing washer (15). A sharp tap should release the bolt if required. Remove both springs (28, 28A) and the diaphragm carrier assembly.

7.1 .7 Remove the twelve cap head screws (14) and spring washers (13) securing the diaphragm and peel the diaphragm away from its clamp (31, 32).

7.1 .8 Turning the unit onto its side, and using a wood or nylon drift against the head of the fuel chamber insert (27), carefully remove the piston/fuel chamber assembly complete.

7.1 .9 Remove both parts of the double delta seal (23) from the groove in the fuel side body. Take care with the PTFE inner part as it may be reusable if undamaged.

7.1 .10 Remove the small packing washer (33) before removing the circlip (24) from inside the fuel chamber insert. Withdraw the washer (25) and both parts of the small double delta seal (26).

7.1 .11 Remove the main seal (22) and 'O' ring (21) from the fuel chamber insert.

7.2 **Inspection**

7.2 .1 Carefully wash all parts in clean aviation fuel and inspect for signs of wear or damage. Defective parts must be renewed immediately.

7.2 .2 Ensure that the small orifices in the fuel restrictor valve (1), the vent port assembly (30), the exhaust valve diaphragm (11) and all other air and fuel passageways are clear. The exhaust valve diaphragm may be re–used if in good condition.

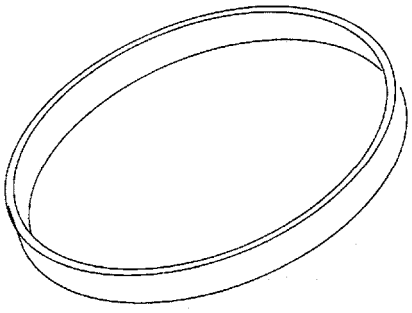
7.2 .3 If there is no obvious signs of wear or abrasion then the PTFE outer rings of the double delta seals may be re–used. The 'O' rings must be changed every two years.

7.2 .4 Check that the sealing edge and ground outer diameter of the piston are in good condition.

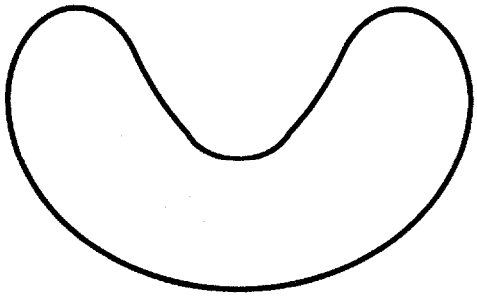
7.2 .5 Ensure all foreign matter is removed from the fuel sense line by flushing.

7.3 **Assembly**

7.3 .1 Fit the large double delta seal (23) into the fuel side of the body. Insert the 'O' ring into its groove then carefully distort the PTFE seal, as shown in Figure 3, and position it over the 'O' ring.



PTFE Seal – Free Position



PTFE Seal – Distorted Shape

NOTE: Take care not to form the bends too tightly

Figure 3 Installation of PTFE Seals

7.3 .2 Fit the 'O' ring (21) and main seal (22) to the fuel chamber insert.

7.3 .3 Assemble the small double delta seal (26), locate it in the fuel chamber insert, and cover with washer (25). secure with circlip (24), and place the packing washer (33) into the space.

7.3 .4 Apply a thin smear of petroleum jelly to the small double delta seal and carefully insert the stem of the piston through the seal.

7.3 .5 With the piston sealing edge resting on the main seal, position the springs (28, 28A) in the fuel chamber insert. Place the diaphragm carrier assembly over the springs and secure with the bolt (16) and bonded sealing washer (15). Tighten the bolt to a torque of 2.8 kgm (20ft lbf).

7.3 .6 Position the diaphragm (17) on the diaphragm carrier (31), place the diaphragm clamp plate (32) in position, (as shown in Figure 2), and secure with the twelve cap head screws (14) and spring washer (13). Tighten the screws in a diametrical sequence to a torque of 0.5 kg m (4ft lbf). Repeat the sequence three times to ensure even torque on all screws.

7.3 .7 Lightly smear the main seal (22) and 'O' ring (21) of the fuel chamber insert with petroleum jelly and carefully press the piston/fuel chamber insert into the body ensuring that the assembly is square and the small air bleed hole in the fuel chamber insert aligns with the bleed screw hole in the body.

WARNING:

It is essential that the air bleed hole is visible through the bleed screw hole after assembly.

7.3 .8 Lightly smear the air side of the diaphragm (17) with petroleum jelly and ensure that the diaphragm bead is fitted correctly into the counterbore in the fuel side body flange.

7.3 .9 Fit the small diaphragm (7) into position as shown in Figure 2.

7.3 .10 Position the 'O' ring seal (18) in its groove in the fuel side body and fit the two halves of the body together. Looking at the outlet end of the unit, insert one of the securing screws (19) into the hole immediately to the right of the service line connectors to align the two halves of the body. Insert the remaining nine cap head screws and washers (20) and tighten all the screws in a diametral sequence to a final torque of 5.5 Kg m (40ft lbf).

7.3 .11 Replace the bleed screw (6) and bonded seal (5).

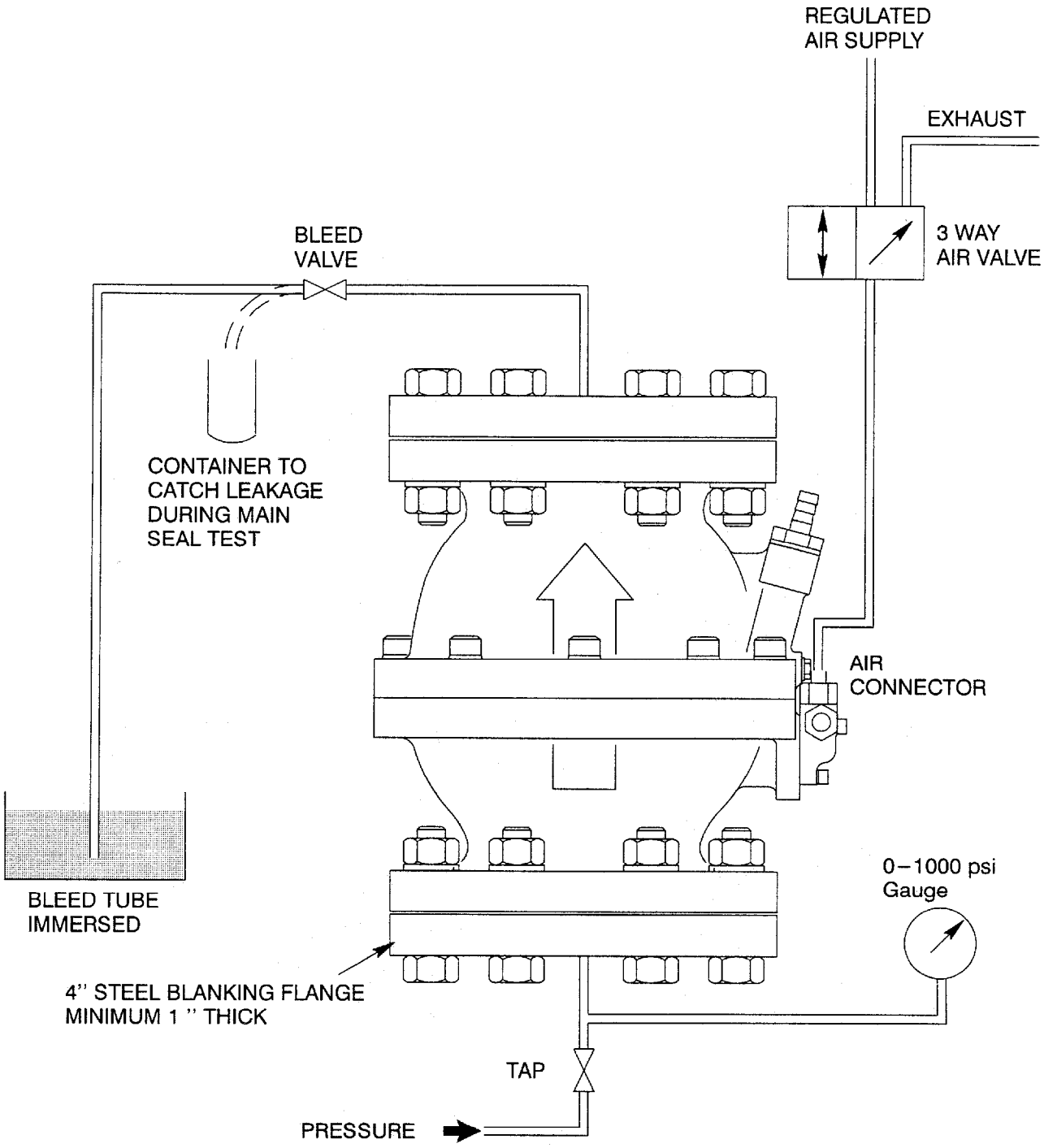
7.3 .12 Position the air diaphragm (11) into the exhaust valve cover (10) and secure the assembly in place on the air side body using the four cap head screws (9, 12) and spring washers (13).

7.3 .13 Fit the vent port assembly (30).

7.3 .14 Locate the spring (4) and ball (3) in the fuel side body and fit the restrictor valve (1) and bonded sealing washer (2).

7.3 .15 Carry out the test procedures laid down in Section 8.

7.3 .16 Install the valve into the system and purge the system of air as described in Section 4.3.



NOTE: TO BE TESTED IN THIS ATTITUDE

Figure 4 Test Rig for use with Tests 1 and 2

8 TEST PROCEDURES

8.1 **General Seal Test (Refer to Figure 4)**

8.1 .1 Stand the unit on its inlet flange, apply approximately 80 psi air pressure to the reference air inlet through the three–way air valve and ensure that the piston opens fully.

8.1 .2 Check for air leaks into the fuel chamber by placing a thumb over the fuel sense line for approximately 20 seconds. NO AIR SHOULD ACCUMULATE.

8.1 .3 Fit a blanking plate, complete with bleed valve, to the outlet flange of the unit. Stand the valve on the blanking plate and fill to the brim with clean test spirit or aviation fuel. When the liquid has settled, check for air bubbles rising within the unit indicating an internal air leak.

8.1 .4 Fit a blanking plate, complete with 'T' piece, to the inlet flange of the unit. Purge all air from the system.

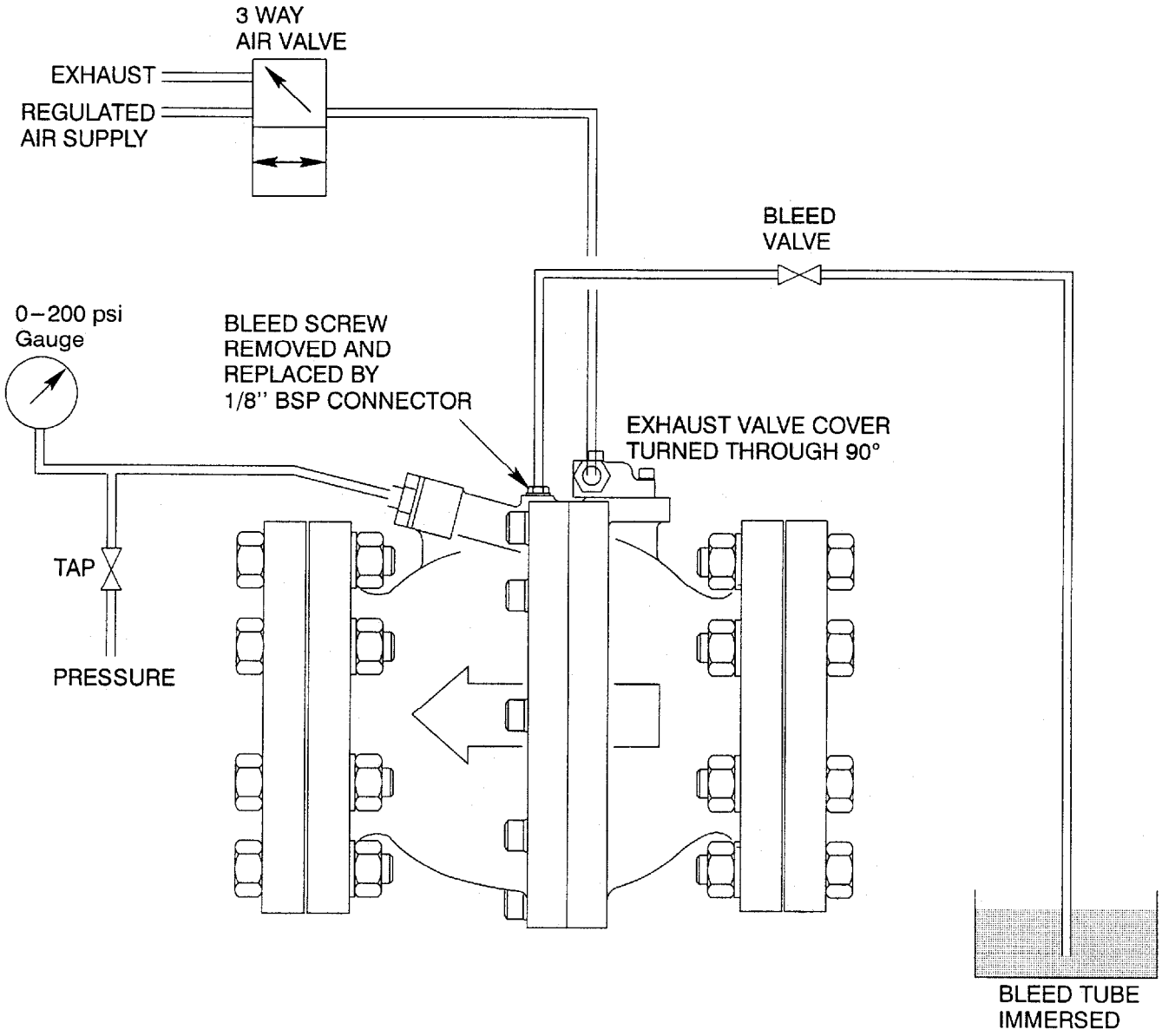
8.1 .5 Slowly increase pressure in the unit to 275 psi and seal off for one minute. No drop in pressure should occur.

8.1 .6 Decay the pressure through the bleed valve and release the air to close the piston

8.2 **Main Seal Test (Refer to Figure 4)**

8.2 .1 Disconnect the bleed tube from the bleed valve and, with the bleed valve open and no air pressure applied, slowly increase pressure to 175 psi. A total leakage of 1 ml per minute is permissible.

8.2 .2 Decay pressure in the unit.



NOTE: TO BE TESTED IN THIS ATTITUDE

Figure 5 Test Rig for use with Test 3

8.3 **Fuel Chamber Test (Refer to Figure 5)**

NOTE:

For this test the exhaust valve cover must be removed, turned through 80° and refitted.

8.3 .1 Remove the bleed plug from the top of the unit and replace with a suitable bleed valve and tube. Fill the fuel chamber with test fluid through the fuel sense line hose tail until all air is expelled through the bleed tube (it is important that the end of the tube is immersed in fluid).

8.3 .2 Apply air pressure to the valve and release two or three times to expel any remaining air in the chamber.

8.3 .3 Apply approximately 60 psi regulated air pressure to open the valve, with the bleed valve open.

8.3 .4 Close the bleed valve and slowly apply 100 psi of fluid pressure to the fuel chamber through the sense line inlet and seal off for one minute. No more than 5 psi pressure drop and no signs of external leakage are permitted during this period.

8.3 .5 Reduce the pressure in the chamber to 60 psi.

8.3 .6 Place a finger over the secondary air vent, release the air pressure using the three–way air valve. Little or no air should be expelled through this vent.

8.3 .7 Release the pressure in the fuel chamber and re–apply air pressure.

8.3 .8 Release the air pressure again and air should be expelled forcibly from the secondary air vent.

8.3 .9 Drain the unit thoroughly including the fuel chamber, replace the bleed plug and reposition the exhaust valve cover correctly.

9 FAULT FINDING

Fault	Cause	Remedy
Valve fails to open for is very slow to open	Restrictor valve orifice blocked	Remove restrictor valve and clean
	Sense line blocked	Remove blockage
	Air supply fault	Check air supply
	Locked in pressure higher than applied air reference pressure	Depressurise the system
	Piston jammed by foreign matter	Remove the valve, clean and inspect for damage
	Diaphragm defective	Refer to Section 7 and renew the diaphragm
Valve fails to close	Piston jammed open by foreign matter	Remove the valve, clean and inspect for damage
	Piston sealing edge or main seal damaged	Check for damage and renew if necessary (Refer to Section 7)
	Air pressure not fully released	Check deadman air valve
	Blockage in sense line causing a hydraulic lock	Remove blockage
	Negative head on valve discharge	This may occur on some dispersion test rigs with underground tanks but will not occur during normal fuelling
Valve unstable ('Hunting')	Air in fuel chamber and/or fuel sense line	Purge system of air (Refer to Section 4)
Valve opens too quickly	Air in fuel chamber and/or fuel sense line	Purge system of air (Refer to Section 4)
	Opening orifice too large	Exchange the restrictor valve for one with a smaller orifice
	Diaphragm perished or ruptured	Inspect diaphragm and renew if necessary
	Restrictor valve ball not seating correctly or missing	Clean and inspect the restrictor valve seat renew if necessary
Valve response too slow to deadman shutdown	Restriction in air supply line	Remove restriction
	Restriction in fuel sense line	Remove restriction
	Vent port orifice too small	Exchange the vent port assembly for one with a larger orifice

Fault	Cause	Remedy
	Piston partially jammed by foreign matter	Clean and inspect for damage
	Air passage blocked	Remove blockage
	Small diaphragm distorted	Dismantle and renew the diaphragm (Refer to Section 7)
Valve responds too quickly to deadman shutdown	Small diaphragm distorted	Refer to Section 7 dismantle and renew the diaphragm
	Small diaphragm too large	Exchange the vent port assembly for one with a smaller orifice
Valve responds too slowly to pressure surges	Restriction in fuel sense line	Remove restriction
	Sense line too long or too small in diameter	Reduce length of line or increase diameter
	Air in fuel chamber and/or fuel sense line	Refer to Section 4 and purge system of air
	Air reference pressure set too high	Adjust air pressure to give 10–12 psi bias over required control pressure
Fuel leaking from the vent port assembly	Main diaphragm ruptured or incorrectly fitted	Dismantle inspect and refit or replace as required (Refer to Section 7)
NOTE: The design of the valve is such that no fuel should leak from the vent port. If leaks do occur they must be rectified immediately	'Wet' air in supply line	Check air supply
	Small diaphragm ruptured	Dismantle and renew (Refer to Section 7)

10 SPARE PARTS

When ordering spare parts please quote the following information.

Publication number and issue

Page number

Figure reference number

Part number

Part name

Please note with the exception of the two body half castings, the fuel chamber insert and the body 'O' ring seal all spare parts for the CCMY8600M2 are interchangeable with the spare parts for the CCMY8500M2 Series 4" API Coupler.

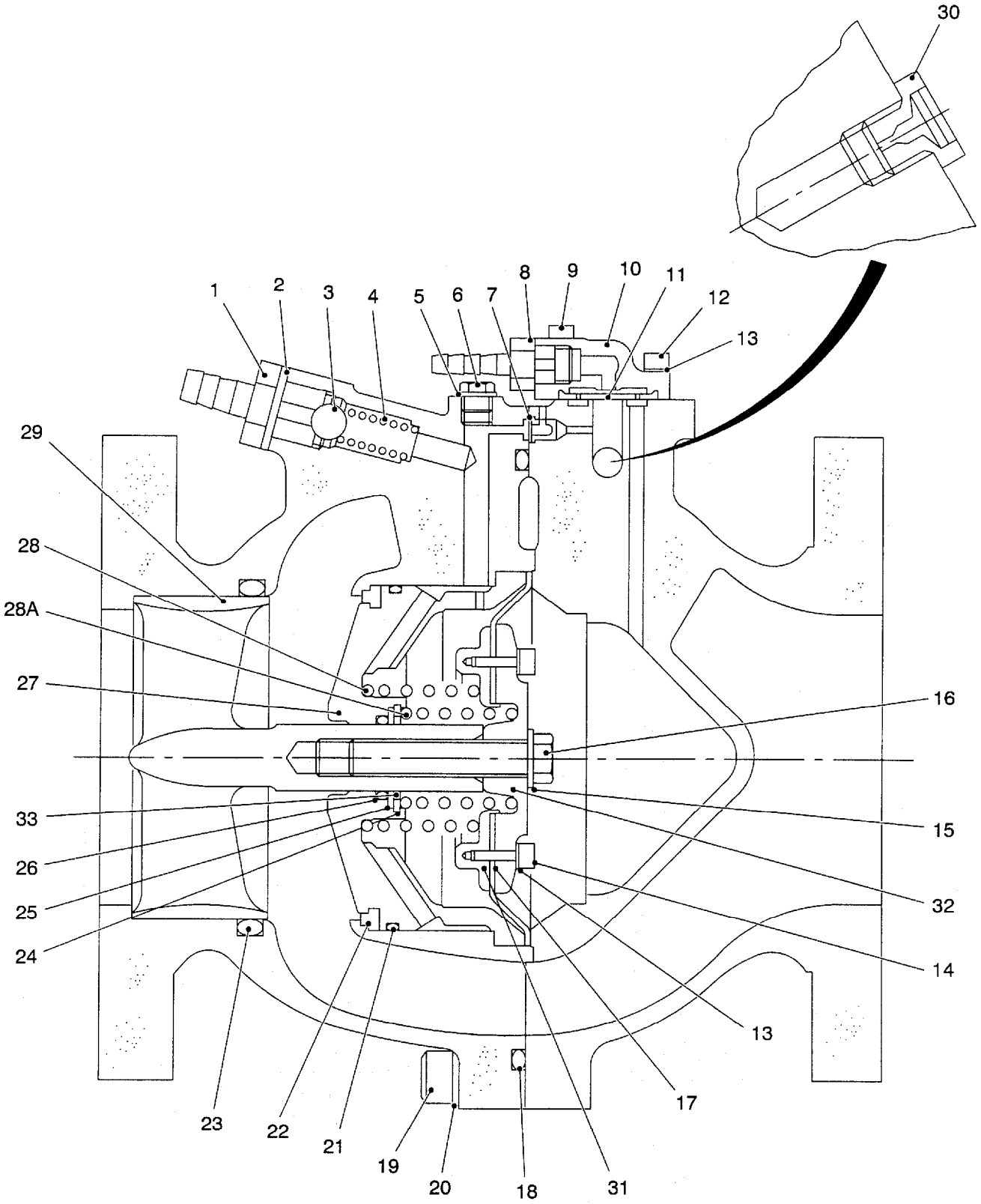


Figure 6 Spare Parts

Fig/ Item No.	Part No.	Description	Qty
1	CCCZ7346A	Fuel Restrictor Valve 0.8 mm	1
	CCCZ7346B	0.7 mm	1
	CCCZ7346	1.0 mm (standard)	1
	CCCZ7346C	1.5 mm	1
*2	ZMMZ0135-7	Bonded Seal	1
*3	ZASZ0068-11	Ball	1
4	CCSZ7336	Spring-fuel sense valve	1
*5	ZMMZ0135-4	Bonded Seal	1
6	CCSZ7347	Bleed Screw	1
*7	CCRZ7377	Small Diaphragm	1
8	ZACZ0103-2	Coupling	1
9	ZS3225D0616A	Screw 10-24 UNC x 1" lg HTS	1
10	CCAZ7317	Exhaust Valve Cover	1
*11	CCRZ7344	Exhaust Valve Diaphragm	1
12	ZS3225D0610A	Screw 10-24 UNC x 5/8" lg HTS	3
13	ZW8207G06A	Washer 3/16" Single Coil Spring	16
14	ZS3225D0610A	Screw 10-24 UNC x 5/8" lg HTS	12
*15	ZMMZ0135-8	Bonded Sealing Washer	1
16	ZS3228D1440A	Screw 7/16" UNC x 1 1/4" lg HTS	1
*17	CCRZ7342	Diaphragm	1
*18	ZARZ0041-38	'O' Ring Seal NITRILE	1
19	ZS3225D1636A	Screw 1/2" UNC x 2 1/4" HTS	10
20	ZW8207G16A	Washer 1/2" Single Coil Spring	10
*21	Z032M114530A	'O' Ring Seal VITON	1
*22	CCRZ7343	Main Seal	1
*23	ZARZ0097-8	Double Delta Seal (Large)	1
24	ZASZ0058-8	Circlip	1
25	CCSZ7339	Washer	1
*26	ZARZ0097-9	Double Delta Seal (Small)	1
27	CCAZ7376	Fuel Chamber Insert	1
28	CCSZ7404	Spring Main	1
28 A	CCSZ7403	Spring Supplementary	1
29	CCAZ7369	Piston	1
30	CCMS7352D	Vent Port Assembly 0.6 mm	1
	CCMS7352	1.0 mm	1
	CCMS7352B	0.7 mm	1
	CCMS7352C	1.4 mm	1
	CCMS7352A	0.8 mm (standard)	1
31	CCAZ7401	Diaphragm Carrier	1
32	CCAZ7400	Diaphragm Clamp	1
33	CCSZ7402	Washer	1
	CCMS7500	Seal Kit Set Comprising items: 2, 5, 7, 11, 15, 17, 18, 21, 22, 23 & 26	