Meggitt Fuelling Products
Avery-Hardoll
Whittaker Controls

2.5, 3 and 4 inch preset valves

maintenance manual with spare parts catalogue

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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

ASBESTOS

SOME GASKET MATERIALS USED IN THIS PRODUCT ARE MANUFACTURED TO BS F125 AND CONTAIN ASBESTOS BONDED IN RUBBER. THERE IS NO DANGER IN HANDLING THESE MATERIALS UNDER NORMAL CONDITIONS, BUT IF THE PRODUCT IS INVOLVED IN A FIRE, THE ASBESTOS MAY BECOME FREE AND SO PRESENT A SERIOUS HEALTH HAZARD. IN THIS EVEN, ALL NATIONAL AND LOCAL REGULATIONS COVERING THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS MUST BE STRICTLY FOLLOWED.

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.

DO NOT EXCEED PRESSURES AND TEMPERATURES QUOTED OR SERIOUS INJURY AND COMPONENT FAILURE MAY OCCUR.

PRIOR TO OPERATING THE EQUIPMENT, ENSURE THAT ALL AIRPORT/LOCAL PROCEDURES HAVE BEEN COMPLIED WITH.

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.

WORK MUST BE CARRIED OUT ONLY BY SUITABLY QUALIFIED PERSONNEL.

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HIGH PRESSURE AIR IS DANGEROUS. HIGH PRESSURE SOURCES MUST NOT BE DIRECTED TOWARDS ANY PART OF THE HUMAN BODY.

CONTENTS

ASSOCIATED PUBLICATIONS

Manual No. 251278 (TM8-015) (Veeder-Root)	Series 7889 Meter Preset

Chapter 1

INTRODUCTION

1 It is often a requirement that a predetermined quantity of liquid be delivered through a bulkmeter. A preset valve fitted in conjunction with a Veeder Root Preset Unit mechanism provides an accurate automatic method of achieving this.

2 The preset valve is mounted on the outlet flange of the bulkmeter manifold and connected by a control linkage to the preset unit mechanism which is installed between the calibrating mechanism and the Veeder Root register, driven by the calibrating mechanism output drive.

3 When a delivery is required, the quantity is selected on the preset unit and the preset valve is then opened by operating the control handle. On completion of the delivery the preset unit mechanism automatically closes the valve.

4 Preset assemblies are available for fitting to the BM series bulkmeters, either LH or RH discharge, horizontally or vertically mounted with 2.5 in, 3 in or 4 in manifold. Alternative preset units can be supplied for setting in Imperial Gallons, US Gallons, Litres, Decalitres and Cubic Metres. When used with a Volume/Weight adaptor, preset by weight in pounds or kilograms is also available.

5 The preset valves are, with some minor differences, supplied for horizontal or vertical mounting.

6 This manual is concerned with the Company range of preset valves and control linkages. Information on the Veeder Root 7889 Preset Unit will be found in the Veeder Root Manual No. 251278 which should be read in conjunction with this manual.

7 In some installations, extra linkages are fitted to operate microswitches, which provide control of solenoid operated valves, alarms or controls as required by the customer.

8 The preset unit can be fitted to the calibrating mechanism, using a 5.5 in. direct mounting adaptor. It can also be fitted to an extension or on a column adaptor which can be up to 3810 mm (12 ft) long.

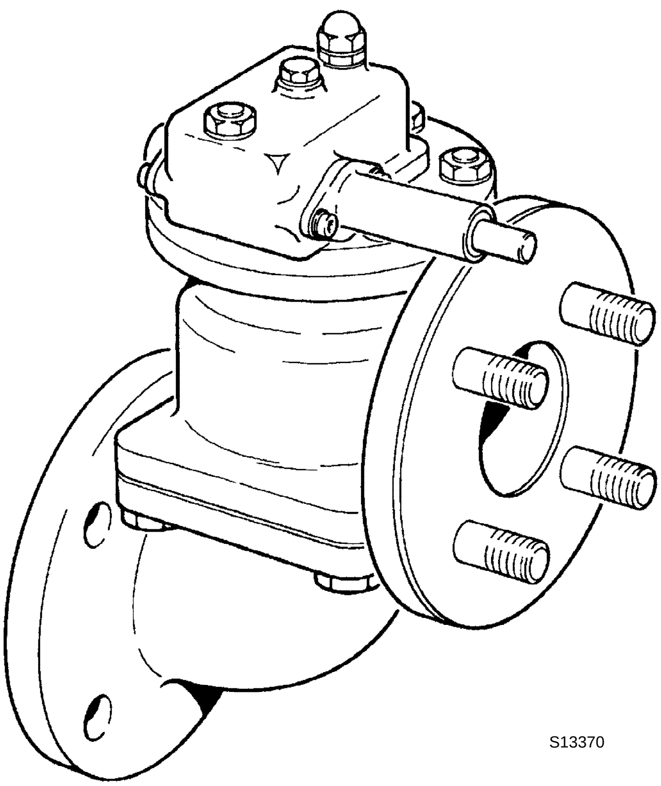


Fig 1.1 Preset valve

Chapter 2

TECHNICAL DESCRIPTION

CONTENTS

1 GENERAL DESCRIPTION (Fig 2.1)

1.1 The three sizes of preset valves are similar in construction and identical in function. Each valve comprises a valve body, which houses the main valve and pilot valve assemblies, a pilot valve operating lever assembly housed in the pilot valve cover and a valve elbow incorporating an outlet flange. The inlet flange, which bolts to the outlet flange of the bulkmeter manifold is incorporated in the valve body.

1.2 The main valve assembly comprises a valve guide, renewable bonded seal and main valve piston, fitted with a compression ring. The bonded seal mates with a seat formed in the valve body, while the upper section of the valve, which has ports drilled in it, forms the piston which runs in a cylinder formed by the valve body. The valve spring holds the main valve in the closed position.

1.3 The pilot valve assembly fits through the valve body cover and comprises the pilot valve to which is secured a dashpot piston fitted with a piston ring. The piston fits into the dashpot cylinder secured to the valve body cover. The pilot valve, when closed, sits onto a seat formed in the main valve guide. The diameter of the pilot valve is formed so that when the valve is set to the open position the ports in the main valve are closed.

1.4 The pilot valve is controlled by the operating lever assembly, fitted in the pilot valve cover. The assembly comprises the pilot valve arm lever spindle, spindle support tube, torsion spring and spring adjuster. The pilot valve arm mates with a slot in the pilot valve. The arm is secured to the lever spindle by a woodruff key and clamp screw. A spindle support tube is secured to the pilot valve cover, the length of the spindle and tube varies depending on the size of bulkmeter. The pilot valve arm is biased to the closed position by the torsion spring, the setting of which is controlled by the spring adjuster. A pilot valve operating lever is secured to the spindle and is connected by linkage and levers to the preset unit.

1.5 Sealing of the preset valves is achieved by fitting O-ring seals and gaskets.

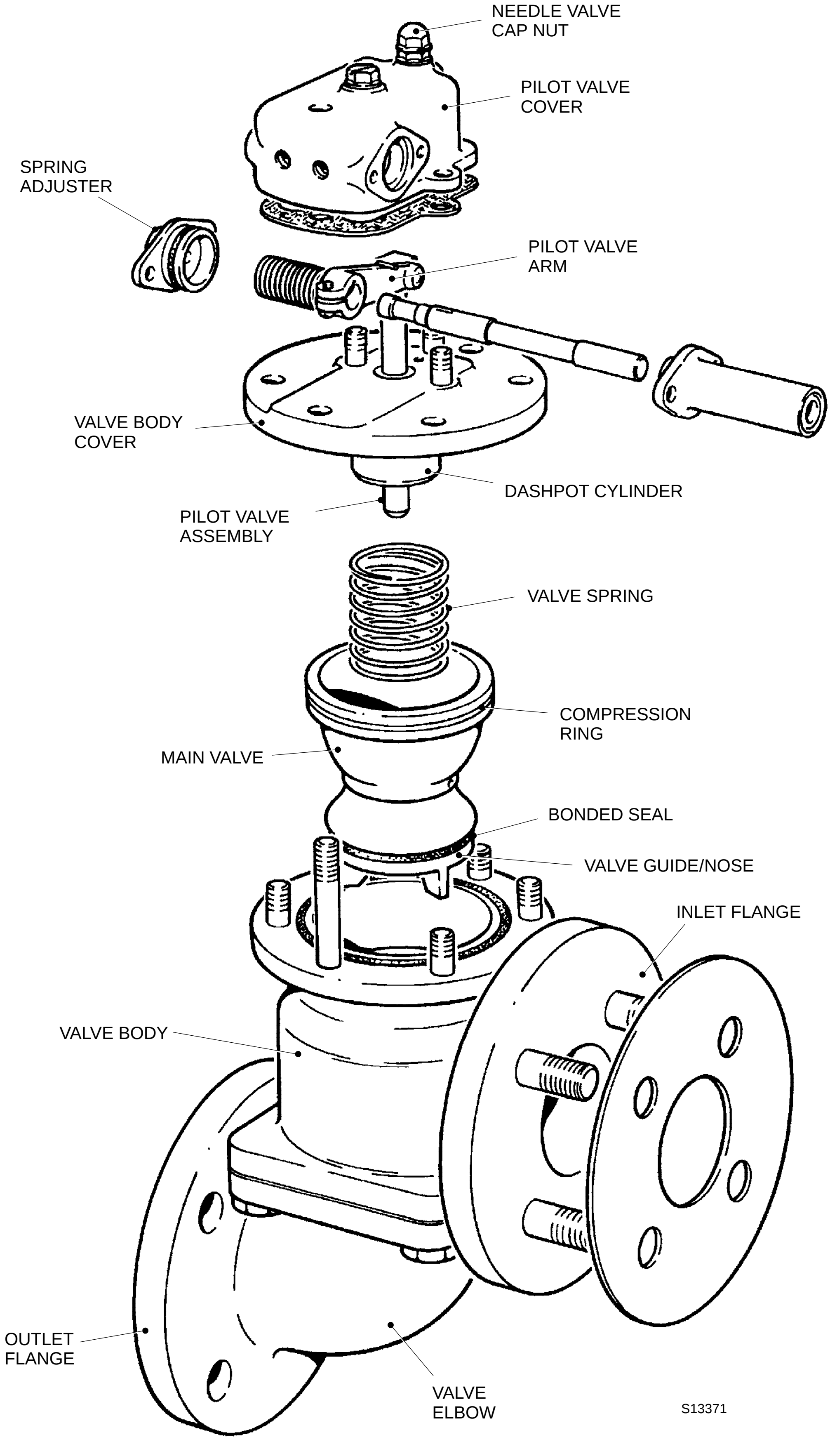


Fig 2.1 Preset valve main components

2 PRESET VALVE OPERATION (Fig 2.2)

2.1 The principle of operation of the preset valve makes use of pressure differential above and below a piston, using a pilot valve to control this.

2.2 Fig 2.2 shows the basic stages of valve operation. With the pilot valve in the closed position, ports in the main valve allow intake pressure to pass to the top of the main valve piston. The combination of this pressure plus spring pressure is enough to hold the main valve closed.

2.3 When the preset quantity has been selected, the pilot valve is opened manually, through the linkage and pilot valve lever assembly, and latched open by the preset unit mechanism. The action of opening the pilot valve closes the parts in the main valve, so reducing pressure on the top of the main valve piston. This allows pressure on the underside of the main valve piston to overcome the above-piston pressure and so to open the valve and allow liquid to flow.

NOTE

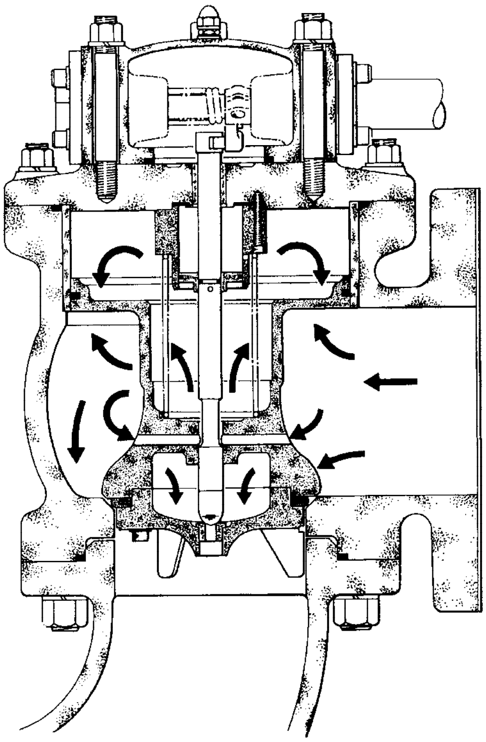
The valve can be set to a ‘SLOW RUN’ position if required.

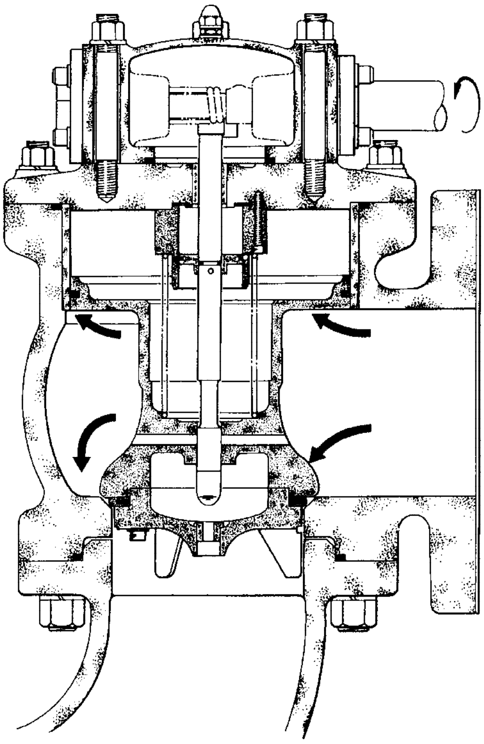
2.4 As flow commences, the pilot valve, lifted off its seat in the valve guide, allows the fluid on the upper side of the main valve piston to drain away downstream. This reduces the pressure on the upper side of the piston, which allows the line pressure acting on the underside of the piston to open the valve to a position where the pressures above and below the piston are equalised.

2.5 When nearing completion of delivery, the preset unit mechanism, through the control linkage, partially closes the pilot valve to the slow flow position. The main valve in turn partially closes, until pressure above and below the piston is balanced.

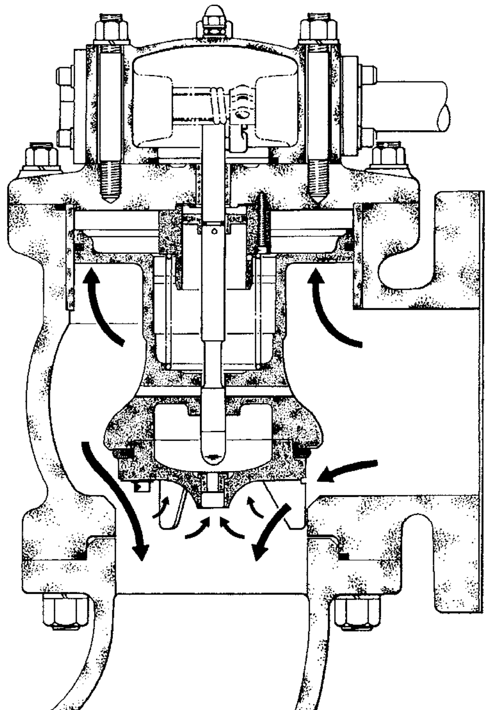
2.6 On completion of delivery the preset unit mechanism unlatches the control linkage. The pilot valve closes, aided by the torsion spring, to allow full pressure to the top of the piston. This, combined with valve spring pressure, closes the main valve. The initial closure of the pilot valve is slowed by the fitting of the dashpot piston running in the dashpot cylinder. This alleviates shock pressure in the pipe line, due to fast closure of the main valve. The speed of closure is adjustable by screwing in or out on the needle valve in the pilot valve cover. If closure is too fast the needle valve is screwed in, if too slow the needle valve is screwed out.

- Pilot valve closed
- Main valve closed
- Pressure balanced above and below main valve piston
- No flow





- Pilot valve open
- Main valve closed
- Pressure below main valve piston starts to life valve
- Flow commnces



- Pilot valve open
- Main valve open
- Pressure balanced above and below main valve piston
- Full flow

S13372

Fig 2.2 Preset valve operation

3 CONTROL LINKAGES (Fig 2.3, 2.4, 2.5)

3.1 The control linkages between the preset unit and the preset valve vary slightly but all operate on the same principle.

3.2 Fig 2.3 shows the method of linking the control handle on the preset unit to the preset operating lever. Although this figure shows the unit mounted on a column adaptor, the construction and operation is the same for all forms of mounting.

3.3 The control handle plate and control handle are secured to the preset ring. A linkage, comprising two rod end bearings screwed together and secured by a locknut, connects the control handle plate to the control lever.

3.4 The control lever is secured to the cross shaft which runs in bearings in a housing welded to the mounting. The opposite end of the cross shaft has the preset operating lever secured to it.

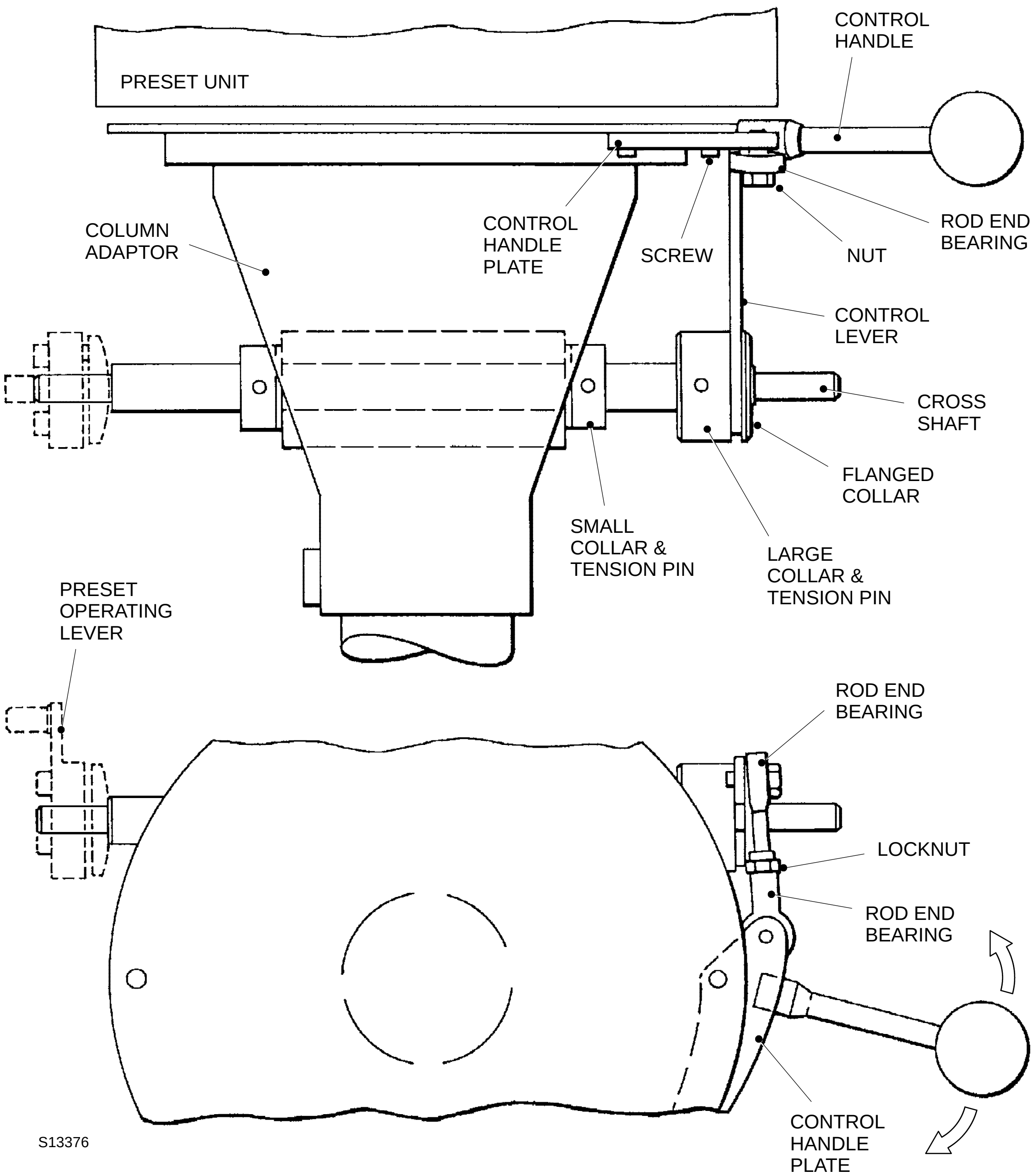


Fig 2.3 Control handle and cross shaft

3.5 The preset operating lever is in turn secured to the control linkage. Fig 2.4 shows the adjustable linkage used on most types of horizontally and vertically mounted bulkmeters. Rod end bearings are secured by circlips to pivot pins on the preset and valve operating levers. The two bearings are connected by the adjuster and linkage rod.

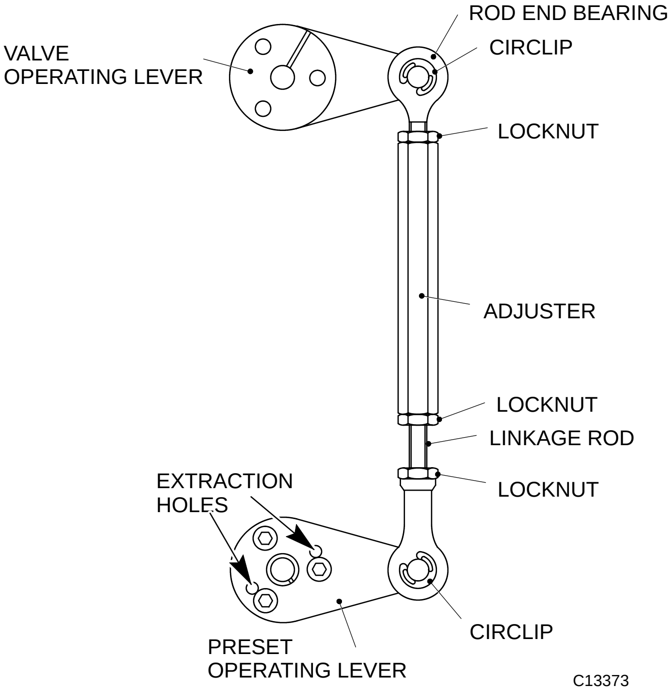


Fig 2.4 Control linkage

3.6 The linkage shown in Fig 2.5 is fitted as an option to some vertically mounted 4 in bulkmeters. Two “handed” lever connectors are joined by an adjuster, fitted with lock nuts. This type of linkage is also used, with the two levers in line with each other, on some horizontally mounted bulkmeters fitted with volume/weight adaptors.

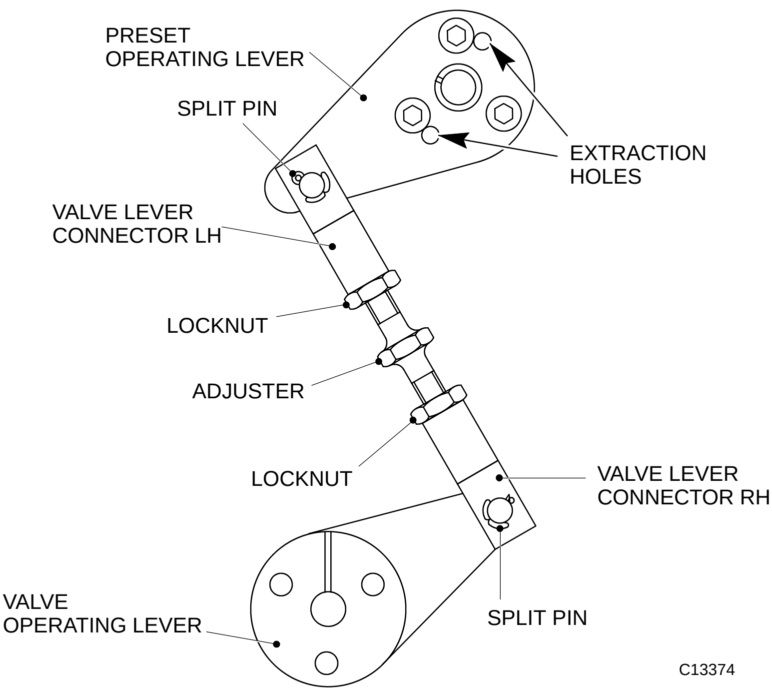


Fig 2.5 Alternative control linkage

4 CONTROL LINKAGE OPERATION

4.1 The control handle operates the linkage to start flow and reset the preset unit. The STOP button operates to stop flow.

4.2 When a quantity has been set on the preset unit, the control handle is moved to the open position. This action allows the preset unit mechanism to latch and hold the preset ring, also through the linkage the preset valve pilot valve is opened and delivery commences.

4.3 Near the completion of delivery, at a figure determined by pre-adjustment of the preset unit, the preset ring is partially released and moves to the 'low flow' position. The pilot valve is partially closed by the linkage, so partially closing the preset valve and reducing delivery flow.

4.4 When the preset figure reaches zero, the preset ring is completely released and moves to the 'off' position. The preset valve closes to stop flow.

4.5 On initial set up, a certain amount of overtravel in both open and closed positions must be left in the preset ring travel. Details of setting this are contained in Veeder Root Manual 251278.

5 MICROSWITCH LINKAGE

5.1 If a microswitch or switches are required to be controlled by the preset unit, either for controlling solenoid operated preset valves or for other duties required by the customer, the switches are operated by levers and links.

5.2 One or two levers are secured to the cross shaft as shown in Fig 2.6. These can be in place of or additional to the preset operating lever.

5.3 The micro switches are mounted on brackets secured to the unit mounting and connection is made between the levers and switches by link rods which locate through holes and are secured by split pins.

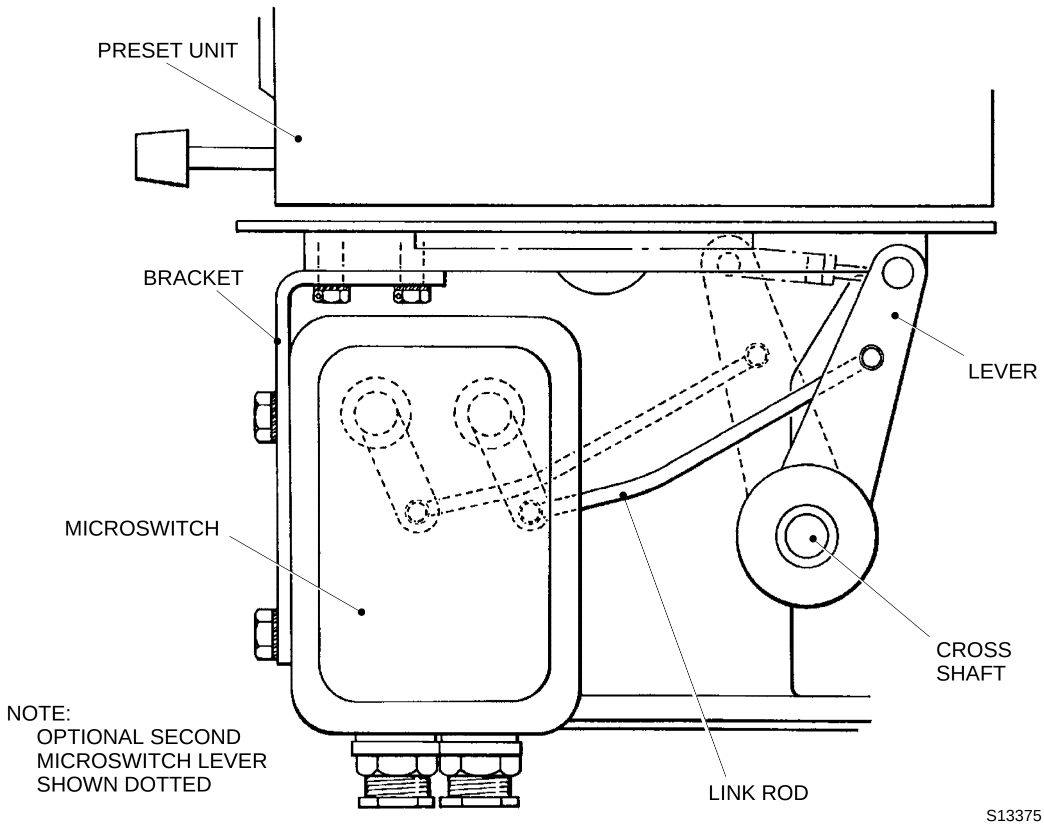


Fig 2.6 Microswitch and linkage

Chapter 3

SPECIFICATION

1 MATERIALS

1.1 Preset valve bodies and main valves are of aluminium. Other components are manufactured from the following materials:

Zinc plated mild steel
Stainless steel
Nickel plated steel
PTFE
High nitrile and fluorocarbon elastomers

2 OPERATING ENVIRONMENT

2.1 Preset valves operate under the same pressure and tempeature conditions as the bulkmeter to which they are fitted, as follows:

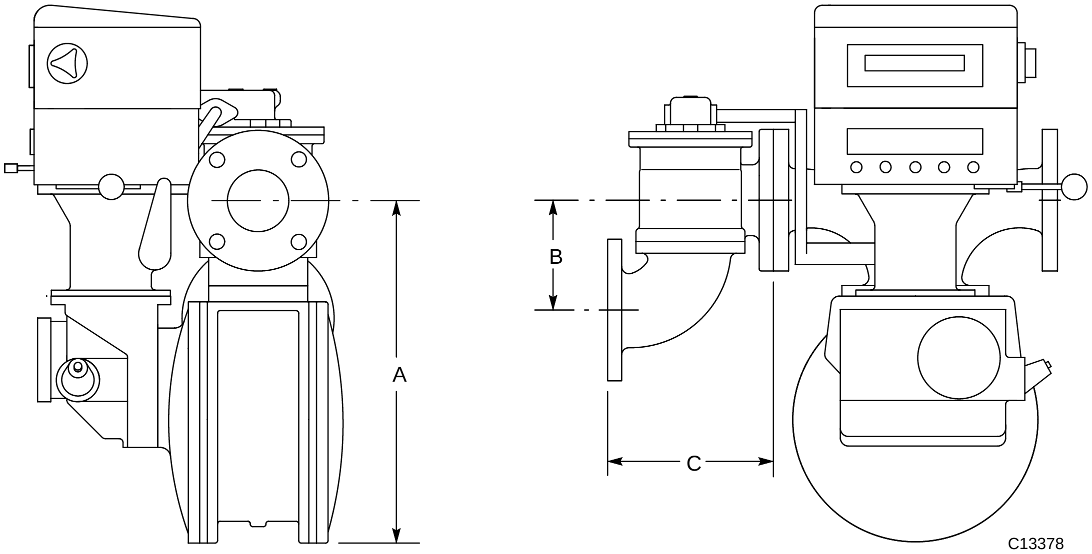
Maximum safe working pressure (gauge) .... 10.34 bar (150 psi)
Operating temperature .... -28 to +100 deg C (-18 to +212 deg F)

3 STORAGE LIFE

3.1 Storage life of units is two years when in cool, dry conditions, limited by deterioration of seals and O-rings only.

4 DIMENSIONS

4.1 The dimensions of a typical unit are as follows:



Dim.	BM250 Bulkmeters with 2.5 in. Preset Valves		BM950 Bulkmeters with 3 in. Preset Valves		BM450 Bulkmeters with 3 in. Preset Valves		BM550 and BM650 Bulkmeters with 4 in. Preset Valves	
	in.	mm	in.	mm	in.	mm	in.	mm
A	15.94	405	15.94	405	15.75	400	16.69	424
B	5.00	127	5.87	149	5.87	149	9.62	244
C	7.87	200	8.75	222	8.75	222	12.62	321

Fig 3.1 Dimensions

5 WEIGHTS

5.1 The maximum weights of the units are as follows:

2.5 in. valve . . . . 17 kg (37 lb)
3 in. valve . . . . 20 kg (44 lb)
4 in. valve . . . . 25 kg (55 lb)

Chapter 4

INSTALLATION, OPERATION AND MAINTENANCE

WARNING - ASBESTOS

SOME GASKET MATERIALS USED IN THIS PRODUCT ARE MANUFACTURED TO BS F125 AND CONTAIN ASBESTOS BONDED IN RUBBER. THERE IS NO DANGER IN HANDLING THESE MATERIALS UNDER NORMAL CONDITIONS, BUT IF THE PRODUCT IS INVOLVED IN A FIRE, THE ASBESTOS MAY BECOME FREE AND SO PRESENT A SERIOUS HEALTH HAZARD. IN THIS EVEN, ALL NATIONAL AND LOCAL REGULATIONS COVERING THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS MUST BE STRICTLY FOLLOWED.

1 INSTALLATION OF PRESET VALVES

1.1 In a new system the preset valve is assembled to the bulkmeter and fully tested in the factory. The complete assembly is installed following the instructions despatched with the equipment.

1.2 Convert an existing bulkmeter on site as follows:

1.2.1 Before removing any flange nuts and/or bolts, support the bulkmeter and associated pipework to ensure no strain is imposed.

1.2.2 Isolate the bulkmeter, by closing upstream and downstream shut off valves. Using a suitable container, drain down the bulkmeter and pipework as far as possible.

1.2.3 Remove the outlet pipe and gasket from the bulkmeter outlet flange.

1.2.4 Ensuring its inlet gasket is in place, fit the preset valve to the bulkmeter outlet flange.

1.2.5 Follow correct procedures, modify the outlet pipeline as necessary and, with a new gasket, fit the outlet pipe to the preset valve elbow outlet flange.

2 CONNECTION OF LINKAGE

2.1 Fit the preset unit to the calibrating mechanism or adaptor as detailed in Veeder-Root Manual No. 251278.

2.2. Connect the linkage between the preset unit and preset valve as follows:

2.2.1 Ensure the preset valve is closed and the control handle on the preset unit is in the fully OFF position.

2.2.2 With both the preset operating lever and the valve operating lever LOOSELY fitted to their respective shafts, adjust the linkage so that both levers are at right angles to the linkage as shown in Fig 2.4.

2.2.3 With the levers still loose, move the valve operating lever 15° in the valve closing direction. Secure the lever to the shaft with three locking screws.

2.2.4 Move the control handle on the preset unit so as to take out the re-cocking travel (about 4 in.), leave sufficient slackness in the linkage to ensure that the preset valve closes tightly. Secure the preset operating lever with three locking screws.

3 INITIAL OPERATION

WARNING

PRIOR TO OPERATING THE EQUIPMENT, ENSURE THAT ALL AIRPORT/LOCAL PROCEDURES HAVE BEEN COMPLIED WITH.

3.1 After installation and connection has been completed, open the preset valve by means of the control handle, then slowly open the upstream isolating valve, to pressurise the system. Inspect for leaks.

3.2 Close the preset valve and open the bleed screw on the pilot valve cover up to three full turns. Retighten the screw when clear product flows.

3.3 Set a large quantity on the preset unit. Check that when the SET button is pressed in, it remains in during the setting operation. Run the product with the control handle set in the SLOW RUN position. Screw in or out on the linkage adjuster until the flowrate is approximately 150 ltrs/min (33 Imp. gal/min). Other flow rates may be used to suit meter size and to achieve smoother shut off.

3.4 Operate the EMERGENCY STOP button. Check that the valve fully closes with no leakage.

3.5 Set the control handle to the fully OPEN position and check that it latches in that position.

3.6 With product flowing, check that the preset valve is operating smoothly, by closing and opening it several times. Ensure there is no flow restriction with the valve open, and no leakage when it is closed.

4 NORMAL OPERATION

4.1. During normal operation the primary task of the operator is to set the required quantity on the preset unit, set the control handle and stop the sequence under emergency conditions.

4.2. Full details of setting the preset unit is contained in the Veeder Root manual 251278, an outline of the procedure is as follows:

4.2.1 Press the ‘SET’ button, ensure that it latches. This disengages the meter drive.

4.2.2 Set the required quantity to be delivered on the Preset buttons.

4.2.3 Move the control handle to the open position, this action rotates the preset ring and through the linkage opens the preset valve. At the same time the ‘SET’ button pops out, the preset button are inhibited and the meter drive is engaged. Product flows and the preset wheels count down towards zero.

4.2.4 As the quantity remaining reaches the lst stage knock-off the preset ring is allowed to move back to the slow flow position. The preset valve partially closes.

4.2.5 When the count reaches zero the preset ring is released by the mechanism and moves to the stop position. The preset valve closes completely.

4.3 If at any time the Emergency STOP button is pressed, the preset ring is immediately released and the preset valve closes completely.

5 MAINTENANCE

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5.1 Maintenance and routine servicing of the preset unit is described in Veeder Root Manual 251278.

5.2 The following maintenance should be carried out at weekly intervals:

5.2.1 Inspect the assembly for damage, security, cleanliness and any signs of corrosion. Ensure that sealing wires are intact.

5.2.2 Inspect all joints and flanges for evidence of leakage.

5.2.3 Inspect the control linkage for damage, distortion and security of locknuts, circlips and/or split pins. Ensure that there is no binding or excessive wear at linkage pivot points.

5.2.4 Lightly lubricate pivot points and load bearing surfaces.

5.3 Every two years, renew all O-ring seals.

Chapter 5

SERVICING

CONTENTS

1 GENERAL INFORMATION

1.1 Instructions for dismantling and servicing the preset unit are detailed in Veeder Root Manual 251278.

1.2 The following sections cover the dismantling, inspection and reassembly of the preset valve. dismantling may be carried out with the valve still in situ, the only exception being that if the main valve seating is found to be damaged, the valve will have to be removed from the pipeline.

1.3 Dismantling and reassembly of all three size of valve is almost identical. In the following procedures reference should be made to Fig 5.1 and 5.2. Where Item(s) in Fig 5.1 have a different identity in Fig 5.2, then the Fig 5.1 Item(s) are shown first. Unique items to one size are identified as such in the text.

2 DISMANTLING

2.1 Before dismantling, ensure the system is isolated with upstream and downstream valves in the pipeline closed.

WARNING - FLUOROCARBON

O-RINGS/SEALS CONTAINING FLUOROCARBON MAY BECOME TOXIC IF OVERHEATED. DO NOT HANDLE O-RINGS/SEALS (19, 30 and 16, 37, 55) 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.

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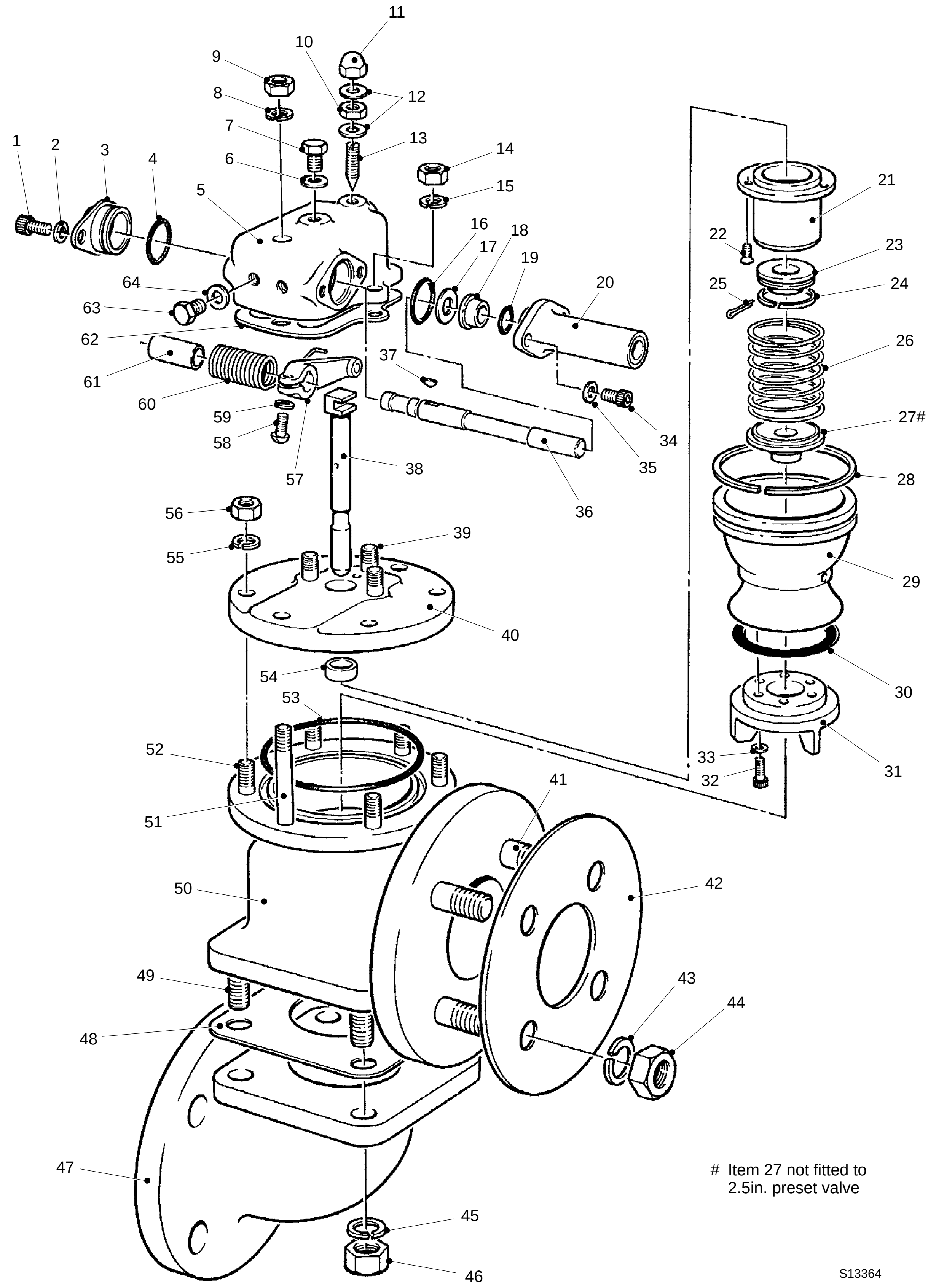

Fig 5.1 2.5 in. and 3 in. Preset valve

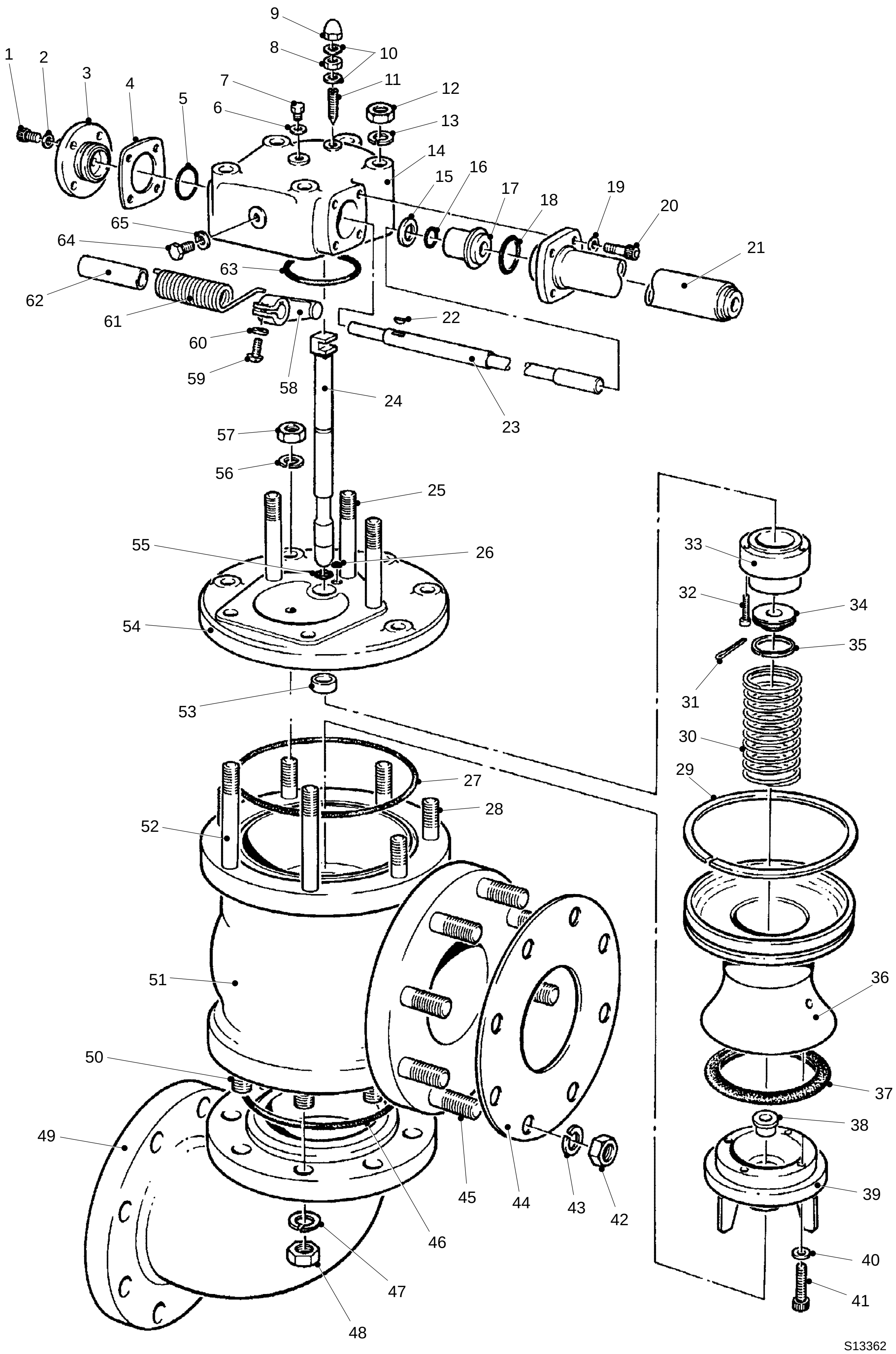

Fig 5.2 4 in. Preset valve

2.2 With the preset valve in the closed position, disconnect the control linkage from the valve operating lever, replace the circlip or split pin on its pivot for safe keeping.

2.3 Take note of the position of the spring adjuster cap (3) in relation to the pilot valve cover (5 and 14), slacken the socket head cap screws (1) securing the cap. With a suitable spanner fitted to the adjuster cap take up the spring tension by applying pressure on the spanner in a counter clockwise direction for LH discharge valves and clockwise for RH discharge valves. Remove the cap screws complete with washers (2).

2.4 Carefully release the pressure on the spanner and allow the adjuster cap to rotate until the tension has been released from the spring.

2.5 Remove the adjuster cap, O-ring seal (4 and 5), and on the 4 in. valve, gasket (4) from the pilot valve cover.

2.6 Remove the nuts (19, 14 and 12) and washers (8, 15 and 13) securing the pilot valve cover to the valve body cover (40 and 54).

2.7 Carefully lift the cover off its studs, disengaging the pilot valve arm (57 and 58) from the pilot valve (38 and 24). Remove the gasket or O-ring seal (62 and 63). On 4 in. valves remove the O-ring seal (26).

2.8 Slacken the clamping screw in the pilot valve arm (57 and 58) and slide the arm along the pilot valve lever spindle (36 and 23) until the woodruff key (37 and 22) can be removed. Remove the key and slide the spindle out of the support tube (20 and 21).

2.9 Recover the pilot valve arm (57 and 58) torsion spring (60 and 61) and torsion spring sleeve (61 and 62) from the cover.

2.10 If it is required to remove the valve operating lever from the spindle, slacken the three socket head cap screws in the side face of the lever. Using a 2 BA screw of suitable length in the extraction hole provided, jack the lever away from its tapered bush until it releases its clamping effect on the spindle. Remove the lever from the spindle.

2.11 Remove the screws (34 and 20) and washers (35 and 19) securing the support tube (20 and 21) to the cover and remove the tube. Remove the O-ring seals (16, 19 and 16, 18) thrust washers (17 and 15) and thrust washers/sealing bush (18 and 17) from the cover and tube.

2.12 Remove the nuts (56 and 57) and washers (55 and 56) securing the valve body cover (40 and 54) to the valve body (50 and 51).

2.13 Carefully lift the valve body cover, complete with dashpot (21 and 33) and pilot valve assembly clear of the valve body and place on a clean working surface. Remove the O-ring seal (53 and 27).

2.14 Push the pilot valve (38 and 24) down to allow the split pin (25 and 31) to be removed. Remove the split pin and withdraw the pilot valve from the cover. Remove the dashpot piston (23 and 34) from the dashpot cylinder (21 and 33), taking care not to damage the piston ring (24 and 35) .

2.15 If required, the dashpot cylinder may be removed from the cover by removing the socket head cap screws (22 and 32) securing the cylinder to the cover. The compo bush (54 and 53) may also be removed as necessary from the cover.

2.16. Remove the main valve spring (26 and 30) from the valve body. Remove the spring base (27) from the 3 in. valve.

2.17 Press the fingers of both hands against the inner surface of the main valve (29 and 36) and slide it out of the valve body (50 and 51).

2.18 Remove the screws (32 and 41) and washers (33 and 40) securing the valve guide (31 and 39) to the main valve. Remove the valve guide and valve seal (30 and 37). If necessary remove the compression ring (28 and 29).

3 CLEANING AND INSPECTION

WARNING

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.

3.1 Carefully wash all parts in clean aviation fuel. Inspect the dismantled components as follows.

3.2 Spindle support tube for damage and/or wear in bushes.

3.3 Pilot valve arm and valve operating lever for damage and security. Check all pivot pins for signs of wear and/or damage.

3.4 Pilot valve lever spindle for wear, signs of corrosion and condition of thrust washers.

3.5 Pilot valve spindle for wear or damage, dashpot piston ring and dashpot cylinder for wear and/or damage.

3.6 Main valve compression ring for damage. Ensure ring groove is thoroughly clean.

3.7 Main valve seal from damage or deterioration. Ensure interior of main valve is thoroughly clean, particularly the pilot valve bearing surfaces.

3.8 Main valve seating for wear, damage or scoring. If damage has occurred, remove the complete assembly from the pipeline for repair or renewal as necessary.

4 REASSEMBLY

4.1 When assembling use new O-ring seals and gaskets. Assemble the valve as follows.

4.2 Fit the valve seal (30 and 37) to the main valve (29 and 36). Coat mating faces and screws with Heldite and secure the valve guide (31 and 39) to the main valve with screws (32 and 41) and washers (33 and 40).

4.3 If removed, carefully refit the compression ring (28 and 29) to the main valve. Ensuring the compression ring is parallel with the valve body rim, ease the main valve into the valve body.

4.4 Fit the spring base (27) into the 3 in. valve, fit the main valve spring (26 and 30) ensuring it locates correctly in its recess.

4.5 If removed, refit the compo bush (54 and 53) into the valve body cover (40 and 54). Smear the mating surfaces with Heldite and secure the dashpot cylinder (21 and 33) to the cover with socket head cap screws (22 and 32).

4.6 Insert the pilot valve (38 and 24) into the valve body cover. Fit the dashpot piston (23 and 34) complete with piston ring (24 and 35) to the pilot valve and secure with the split pin (25 and 31), ensure the legs of the split pin are bent back sufficiently to clear the dashpot bore. Carefully ease the dashpot piston into the cylinder.

4.7 Fit O-ring seals (53 and 27) to the valve body, locate the valve body cover assembly squarely onto the body and secure with nuts (56 and 57) and washers (55 and 56). Do not fit nuts to the long studs.

4.8 Fit thrust washer/sealing bush (18 and 17), thrust washers (17 and 15) and O-ring seals (16, 19 and 16, 18) to the spindle support tube (20 and 21) and pilot valve cover (5 and 14).

4.9 Secure the support tube to the cover with screws (34 and 20) fitted with washers (35 and 19).

4.10 Loosely fit the valve operating lever to the spindle, final alignment and securing of the lever will be carried out as detailed in Chapter 4 Para 2.

4.11 Lightly lubricate and locate the pilot valve lever spindle (36 and 23) into the support tube, push the spindle into the cover fitting in sequence the pilot valve arm (57 and 58), torsion spring sleeve (61 and 62) and torsion spring (60 and 61) to the spindle.

4.12 Fit the Woodruff key (37 and 22) to the spindle, locate the pilot valve arm so that the slot aligns with the key and slide the arm into position, tighten up on the clamping screw.

4.13 Fit gasket or O-ring seal (62 and 63) and on the 4 in. valve the O-ring seal (26) to the body cover.

4.14 Ensure the pivot pin on the valve arm lines up and engages with the slot in the top of the pilot valve stem. Carefully fit the pilot valve cover (5 and 14) to the body cover, secure with nuts (9, 14 and 12) fitted with washers (8, 15 and 13).

4.15 Fit O-ring seal (4 and 5) and in the case of 4 in. valve the gasket (4) to the pilot valve cover.

4.16 Fit the adjuster cap (3), and ensuring the tail of the torsion spring is correctly engaged, rotate the cap, putting tension on the spring, and secure in its original position with socket head cap screws (1) and washers (2).

4.17 Reconnect the control linkage to the valve operating lever.

4.18 On completion of assembly carry out the procedures detailed in Chapter 4 Para 2 and 3.

Chapter 6

TESTING

Refer to Chapter 4, Para 3

Chapter 7

FAULT FINDING

1 Faults on preset valves will tend to be self evident, either showing as leakages, restricted or no flow of product, or jamming of mechanical components.

2. Faults in the preset unit mechanism, their cause(s) and remedy are detailed in Veeder Root Manual 251278. Refer also to Chapter 8 for spares.

3 To identify whether a fault lies in the valve or preset unit, disconnect the control linkage at a convenient point and check freedom of movement of the valve and unit separately.

Chapter 8

SPARE PARTS CATALOGUE

CONTENTS

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1 GENERAL

1.1 When ordering spare parts please quote the following information:

(a) Publication number and issue

(b) Fig/Item Number

(c) Part Number and description

(d) Quantity

2 SPARE PARTS DETAILS

2.1 The following tables of spare parts also contain the relevant attaching parts, i.e. screws, washers, nuts, etc, which may fail as a result of repeated removal and insertion.

NOTES

(1) '+' in the Fig/Item column indicates Item is not illustrated.

(2) 'REF' in the Qty column indicates Item is for reference purposes only and is **not available** as a spare.

(3) '*' in the Fig/Item column indicates Item is recommended as a spare part

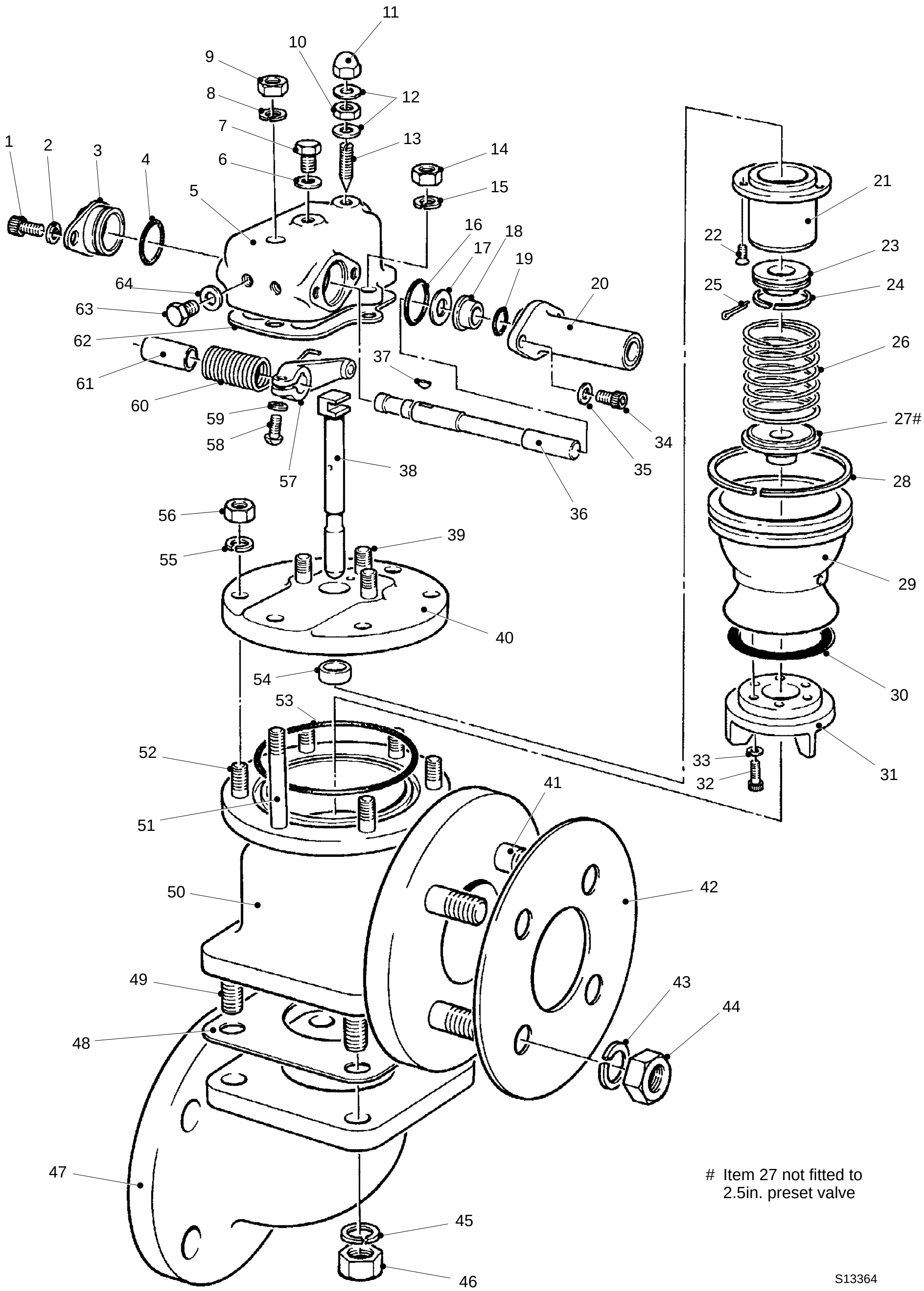

Fig 8.1 2.5 in. Preset valve

2.5 in. PRESET VALVE

Fig/ Item No.	Part No.	Description	Qty
8.1- +	BMMZ18314 Series	Valve, preset, 2.5 in., LH	1
+	BMMZ18315 Series	Valve, preset, 2.5 in., RH	1
1	ZS3225D0810A	Screw, UNBRAKO, cap, 1/4 in. UNC-2A x 5/8 in. lg	2
2	ZW8206G08A	Washer, spring, 1/4 in. id. S/Coil	2
3	BMMZ17939	Cap, spring adjuster sub-assy	1
*4	ZO22E119103A	O-ring	1
5	BMAS17940	Cover, pilot valve - LH	1
	BMAS17941	- RH	
*6	ZAFZ0010-12	Washer, red fibre, 1/4 in. id, x 1/2 in. od x 1/16 in. thick	1
7	ZS3228E0806A	Screw, 1/4 in. UNF-2A x 3/8 in. lg, hex.hd	1
8	ZW8207G10A	Washer, spring 5/16 in. id. S/Coil	1
9	ZN2201E10A	Nut, 5/16 in. UNF-2B, hex	1
10	ZN2204E08A	Locknut, 1/4 in. UNF-2B, hex	1
11	BMCZ3608	Nut, dome	1
*12	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	2
13	BMCZ3609	Valve, needle	1
14	ZN2201E10A	Nut, 5/16 in. UNF-2B, hex	3
15	ZW8207G10A	Washer, spring, 5/16 in. id, S/Coil	3
*16	ZO12E212139A	O-ring	1
17	ZASZ0085-1	Washer, thrust, DU06	1
18	BMBZ4131	Washer, thrust	1
*19	ZO32E111103A	O-ring, Fluorocarbon	1
20	–	Support tube pilot valve sub-assy	1
	BMMZ33126-2	Horizontal or vertical, LH - RH, to fit manifold 2.5 in., CI-125FF, 14 in.	
	BMMZ33126-4	Horizontal, LH - RH, to fit manifold 2.5 in., steel 150FF, 15.75 in.	
21	BMCZ3603	Cylinder, dashpot	1
22	ZS2301A0406A	Screw, 4BA x 3/8 in. lg, csk hd	3
23	BMCZ3622	Piston, dashpot	1
24	PPCZ832	Ring, piston	1
25	ZT4006E0316A	Pin, split, 3/32 in. dia. x 1 in. lg., st.st.	1
26	BMSZ3610	Spring, main valve	1
27	NOT USED	Base, spring	-
28	BMPZ33256	PTFE Strip	1

(continued)

* = Suggested spare part

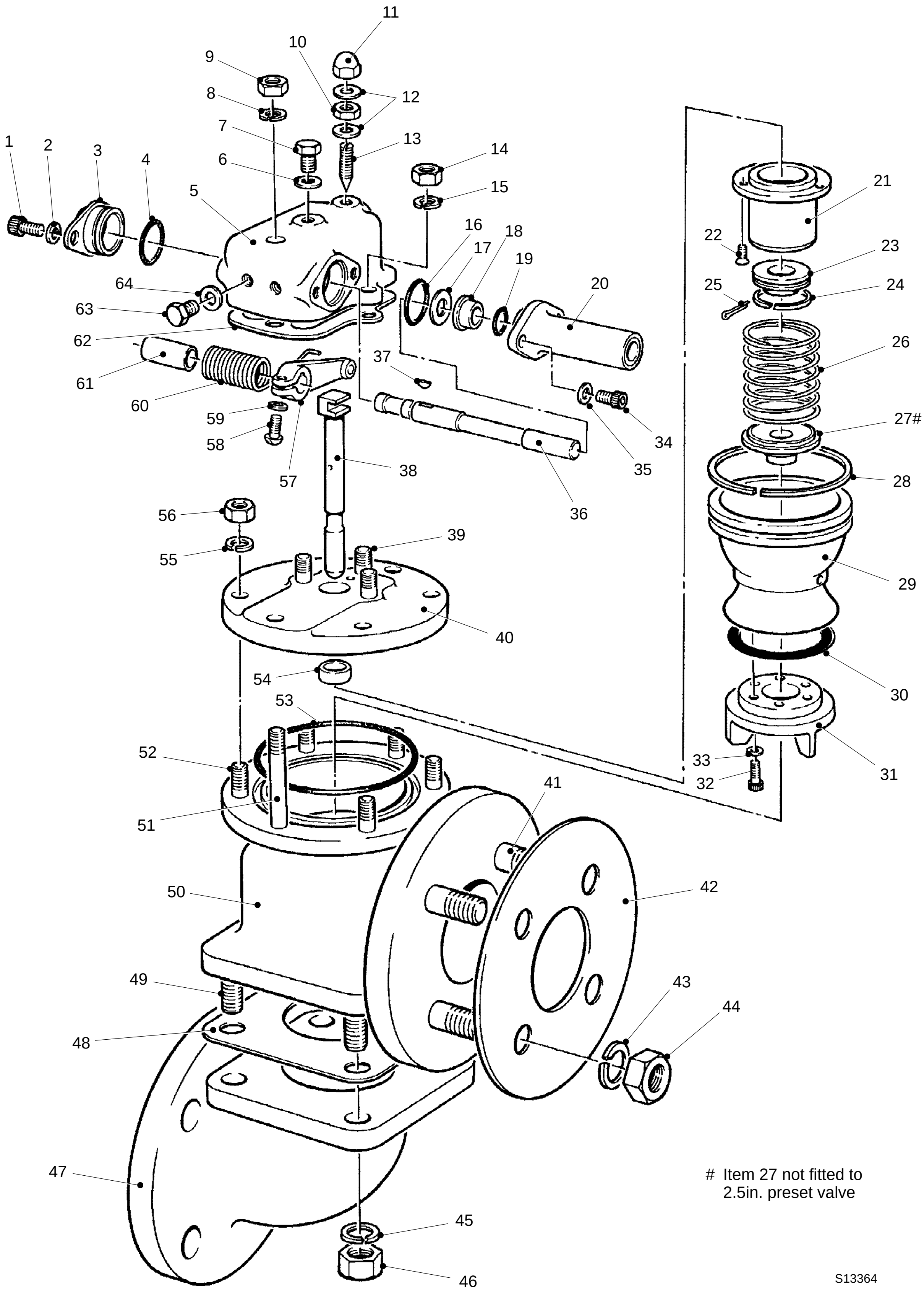

Fig 8.1 2.5 in. Preset valve

2.5 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
29	BMAZ33255	Valve, main	1
*30	BMRZ14064-1	Seal, bonded (Fluorocarbon)	1
31	BMMZ24903	Guide, valve	1
32	ZS3325A0212A	Screw, 2BA x 3/4 in.lg, skt cap hd	6
33	ZW4007G06A	Washer. 2BA	6
34	ZS3225D0810A	Screw, UNBRAKO cap, 1/4 in. UNC-2A x 5/8 in. lg	2
35	ZW8206G08A	Washer, spring, 1/4 in. id, S/Coil	2
36	–	Spindle, pilot valve lever	1
	BMSZ33124-2	Horizontal/vertical, LH-RH, CI125FF, 14 in. (single capsule)	
	BMSZ33124-4	Horizontal, LH-RH, steel 150FF, 15.75 in. (single capsule)	
37	ZASZ0059-2	Key, Woodruff, 3/32 in. dia. x 1/2 in. lg	1
38	BMMZ14066	Valve, pilot sub-assy	1
39	BMSZ1385	Stud, pilot valve cover	3
40	BMAZ3605	Cover, valve body	1
41	BMSZ1434	Stud, valve body	4
42	BMDZ1422	Gasket, flange	1
43	ZW8207G20A	Washer, spring, 5/8 in. id., S/Coil	4
44	ZN2201E20A	Nut, 5/8 in. UNF-2B, hex	4
45	ZW8207G16A	Washer, spring, 1/2 in. id, S/Coil	4
46	ZN2201E16A	Nut, 1/2 in. UNF-2B, hex	4
47	BMAZ1418	Elbow, valve	1
48	BMDZ1379	Gasket, valve elbow	1
49	BMSZ1386	Stud, valve, elbow	4
50	BMMZ3551	Valve body - horizontal	1
	BMMZ4496	Valve body - vertical	1
51	BMSZ1384	Stud, long, valve body cover	1
52	BMSZ1385	Stud, valve body cover	5
*53	ZO22E240139A	O-ring seal	1
54	BMCZ3640	Bush, body cover	1
55	ZW8207G10A	Washer, spring, 5/16 in. id, S/Coil	5
56	ZN2201E10A	Nut, 5/16 in. UNF-2B, hex	5
57	BMMZ3567	Arm, pilot valve, sub-assy	1
58	ZS2306A0212A	Screw, 2BA x 3/4 in. lg, round hd	1
59	ZW8306A02A	Washer, 2BA, int. s/proof, sp.stl.	1

(continued)

* = Suggested spare part

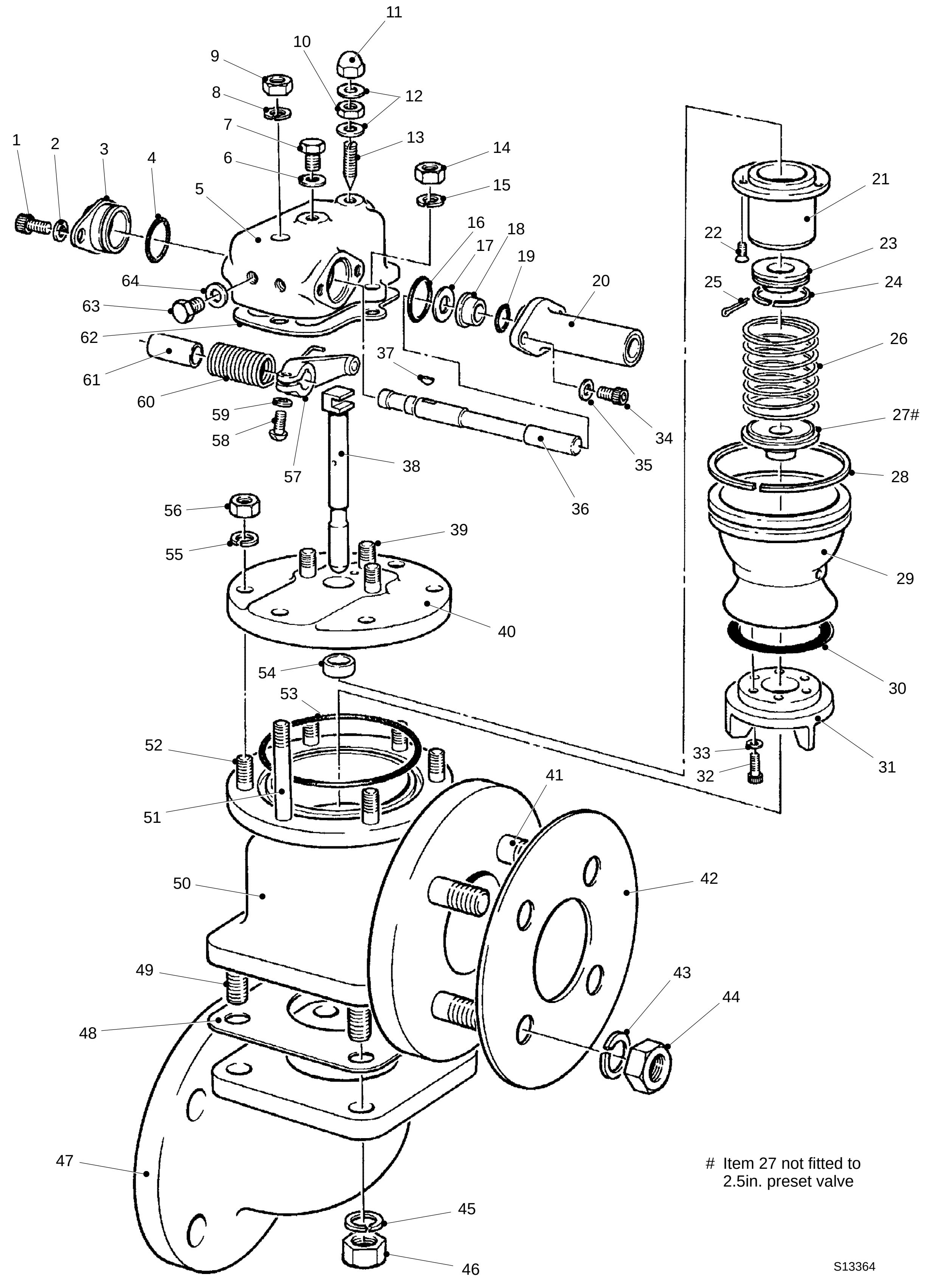

Fig 8.1 2.5 in. Preset valve

2.5 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
60	ZASZ0027-4	Spring, pilot valve - LH	1
	ZASZ0027-3	Spring, pilot valve - RH	
61	BMSZ17937	Sleeve, torsion spring	1
*62	BMDZ3620	Gasket, pilot valve cover	1
63	ZASZ0009-3	Screw, sealing	1
*64	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	1

* = Suggested spare part

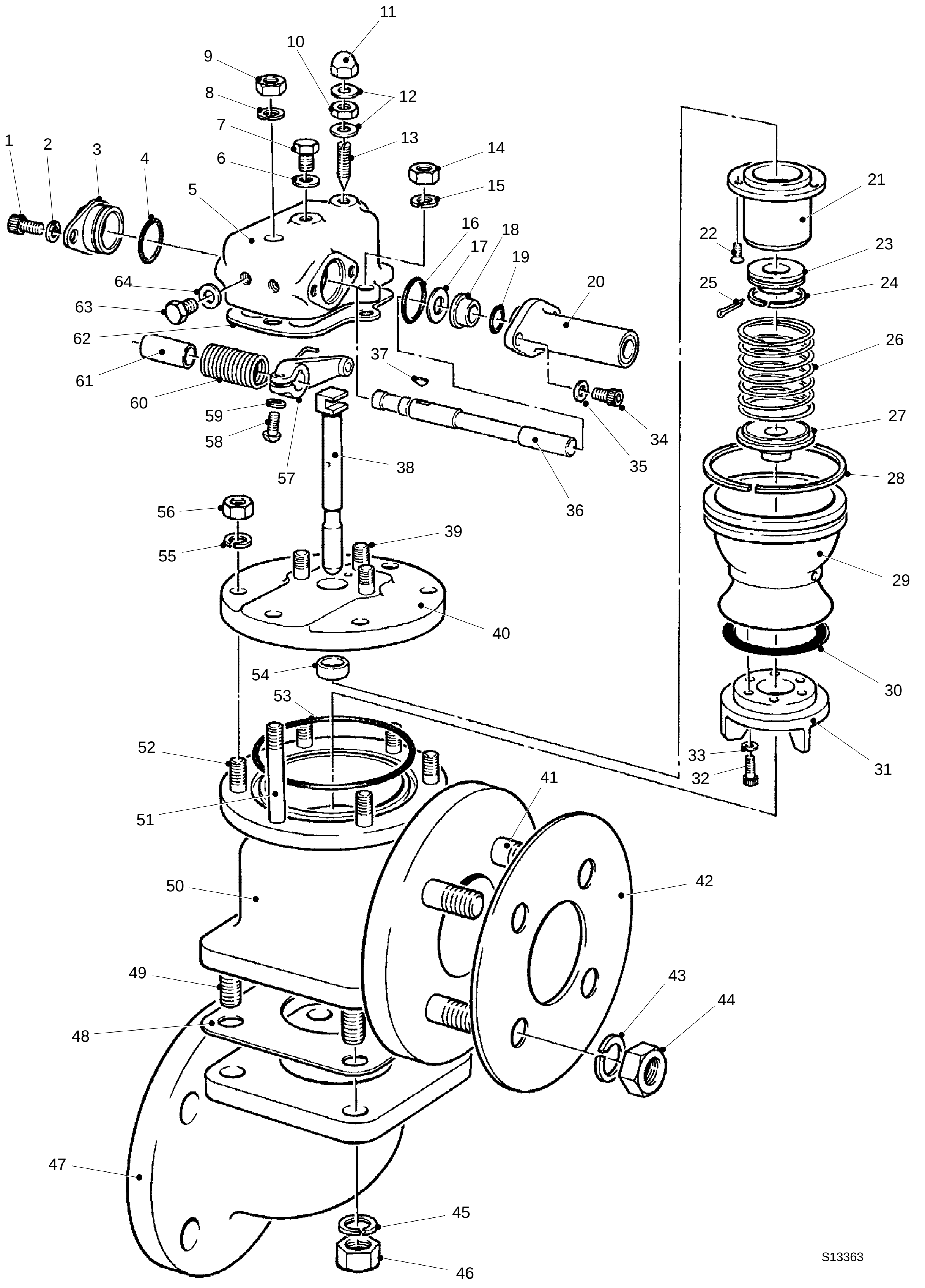

Fig 8.2 3 in. Preset valve

3 in. PRESET VALVE

Fig/ Item No.		Part No.	Description	Qty
8.2-	+	BMMZ18312 Series	Valve, preset, 3 in., LH	1
	+	BMMZ18313 Series	Valve, preset, 3 in., RH	1
1		ZS3225D0810A	Screw, UNBRAKO, cap, 1/4 in. UNC-2A x 5/8 in. lg	2
2		ZW8206G08A	Washer, spring, 1/4 in. id. S/Coil	2
3		BMMZ17939	Cap, spring adjuster sub-assy	1
*4		ZO22E119103A	O-ring	1
5		BMAS17942	Cover, pilot valve - LH	1
		BMAS17943	- RH	
*6		ZAFZ0010-12	Washer, red fibre, 1/4 in. id, x 1/2 in. od x 1/16 in. thick	1
7		ZS3228E0806A	Screw, 1/4 in. UNF-2A x 3/8 in. lg, hex.hd	1
8		ZW8207G12A	Washer, spring 3/8 in. id. S/Coil	1
9		ZN2201E12A	Nut, 3/8 in. UNF-2B, hex	1
10		ZN2204E08A	Locknut, 1/4 in. UNF-2B, hex	1
11		BMCZ3608	Nut, dome	1
*12		ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	2
13		BMCZ3609	Valve, needle	1
14		ZN2201E10A	Nut, 5/16 in. UNF-2B, hex	3
15		ZW8207G10A	Washer, spring, 5/16 in. id, S/Coil	3
*16		ZO12E212139A	O-ring	1
17		ZASZ0085-1	Washer, thrust, DU06	1
18		BMBZ4131	Washer, thrust	1
*19		ZO32E111103A	O-ring, Fluorocarbon	1
20		–	Support tube, pilot valve sub-assy	1
		BMMZ33126-1	Vertical, LH - RH, to fit manifold 3 in., steel 150FF, 15.75 in. (single or double capsule)	
		BMMZ33126-3	Horizontal, LH - RH, to fit manifold 3 in., CI125FF, 14 in. (single capsule)	
		BMMZ33126-4	Vertical, LH, to fit manifold 3 in., steel 150FF, 15.75 in. (double capsule)	
		BMMZ33126-5	Horizontal, LH - RH, to fit manifold 3 in., steel 150FF, 15.75 in. (single capsule)	
21		BMCZ3603	Cylinder, dashpot	1
22		ZS2301A0406A	Screw, 4BA x 3/8 in. lg, csk hd	3
23		BMCZ3622	Piston, dashpot	1
24		PPCZ832	Ring, piston	1
25		ZT4006E0314A	Pin, split, 3/32 in. dia. x 7/8 in. lg., st.st.	1

(continued)

* = Suggested spare part

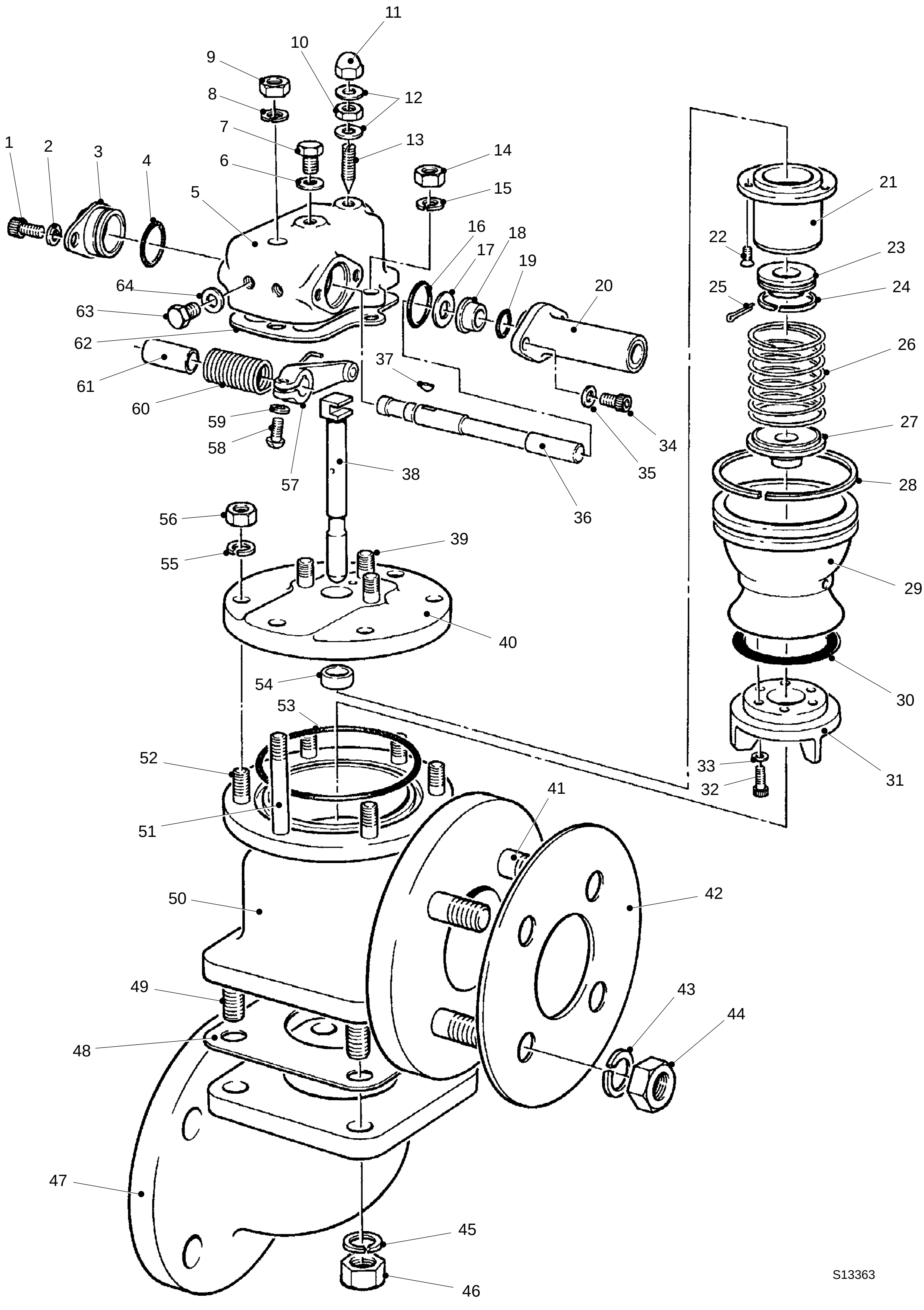

Fig 8.2 3 in. Preset valve

3 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
26	BMSZ3619	Spring, main valve	1
27	BMCZ3616	Base, spring	-
28	BMCZ3626	Ring, compression	1
29	BMCZ3611	Valve, main	1
*30	BMRZ19324-1	Seal, bonded (Fluorocarbon)	1
31	BMMZ24909	Guide, valve	1
32	ZS3325A0214A	Screw, 2BA x 7/8 in.lg, skt cap hd	6
33	ZW4007G06A	Washer. 2BA	6
34	ZS3225D0810A	Screw, UNBRAKO cap, 1/4 in. UNC-2A x 5/8 in. lg	2
35	ZW8206G08A	Washer, spring, 1/4 in. id, S/Coil	2
36	–	Spindle, pilot valve lever	1
	BMSZ33124-1	Vertical, LH-RH, steel 150FF, 15.75 in. (single capsule)	
	BMSZ33124-3	Horizontal, LH-RH, steel CI125FF, 14 in. (single capsule)	
	BMSZ33124-4	Vertical, LH, steel 150FF, 15.75 in. (double capsule)	
	BMSZ33124-5	Horizontal, LH-RH, steel CI150FF, 15.75 in. (single capsule)	
37	ZASZ0059-2	Key, Woodruff, 3/32 in. dia. x 1/2 in. lg	1
38	BMMZ19335	Valve, pilot sub-assy	1
39	BMSZ1385	Stud, pilot valve cover	3
40	BMAZ3612	Cover, valve body	1
41	BMSZ1974	Stud, valve body	4
42	BMFZ1423	Gasket, flange	1
43	ZW8207G20A	Washer, spring, 5/8 in. id., S/Coil	4
44	ZN2201E20A	Nut, 5/8 in. UNF-2B, hex	4
45	ZW8207G20A	Washer, spring, 5/8 in. id, S/Coil	4
46	ZN2201E20A	Nut, 5/8 in. UNF-2B, hex	4
47	BMAZ1405	Elbow, valve	1
48	BMDZ1435	Gasket, valve elbow	1
49	BMSZ1434	Stud, valve, elbow	4
50	BMMZ3554	Valve body - horizontal	1
	BMMZ2894	Valve body - vertical	1
51	BMSZ10862	Stud, long, valve body cover	1
52	BMSZ1391	Stud, valve body cover	5

(continued)

* = Suggested spare part

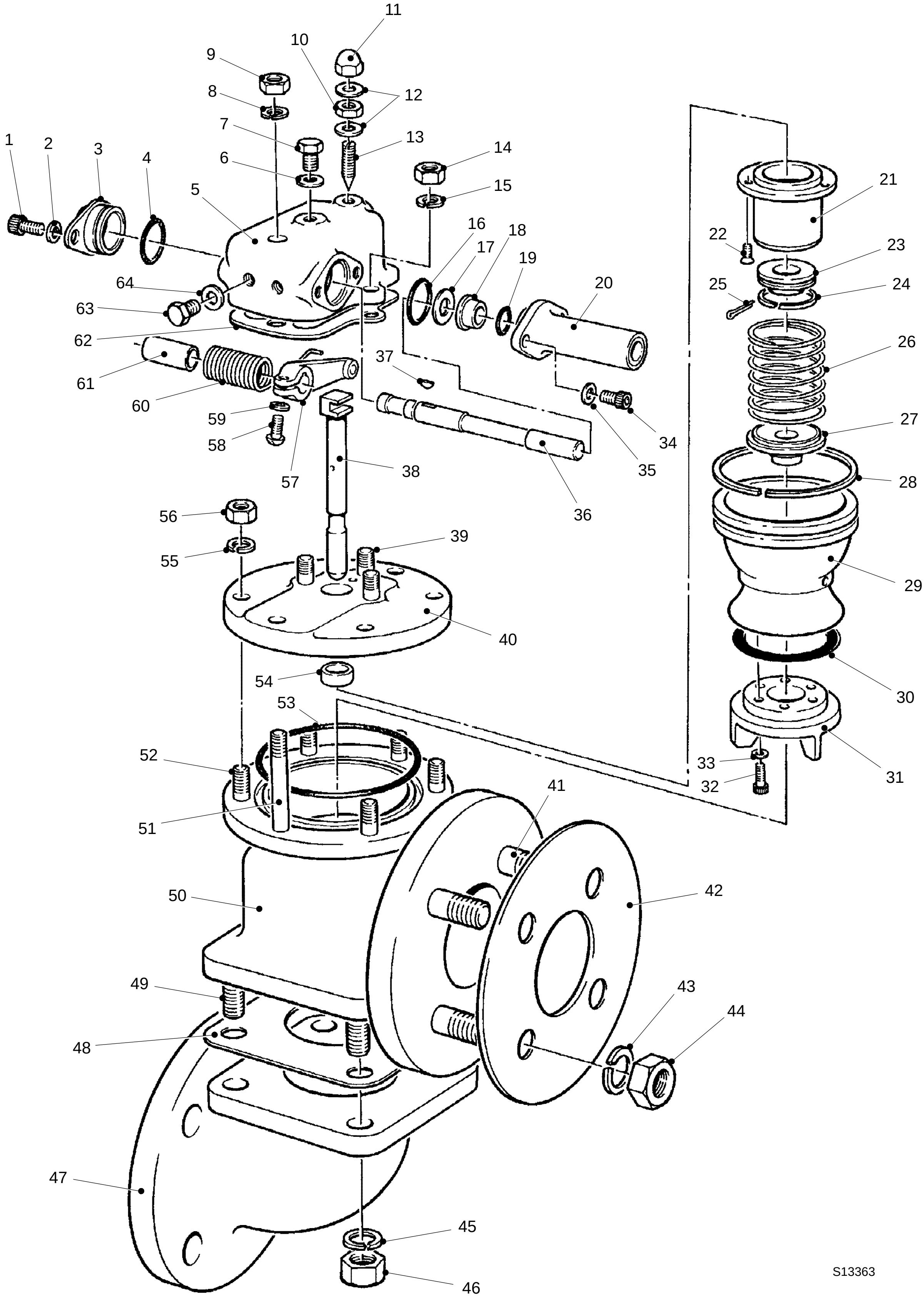

Fig 8.2 3 in. Preset valve

3 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
*53	ZO22E246139A	O-ring seal	1
54	BMCZ3640	Bush, body cover	1
55	ZW8207G12A	Washer, spring, 3/8 in. id, S/Coil	5
56	ZN2201E12A	Nut, 3/8 in. UNF-2B, hex	5
57	BMMZ3568	Arm, pilot valve, sub-assy	1
58	ZS2306A0212A	Screw, 2BA x 3/4 in. lg, round hd	1
59	ZW8306A02A	Washer, 2BA, int. s/proof, sp.stl.	1
60	ZASZ0027-4	Spring, pilot valve - LH	1
	ZASZ0027-3	Spring, pilot valve - RH	
61	BMSZ17937	Sleeve, torsion spring	1
*62	BMDZ3621	Gasket, pilot valve cover	1
63	ZASZ0009-3	Screw, sealing	1
*64	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	1

* = Suggested spare part

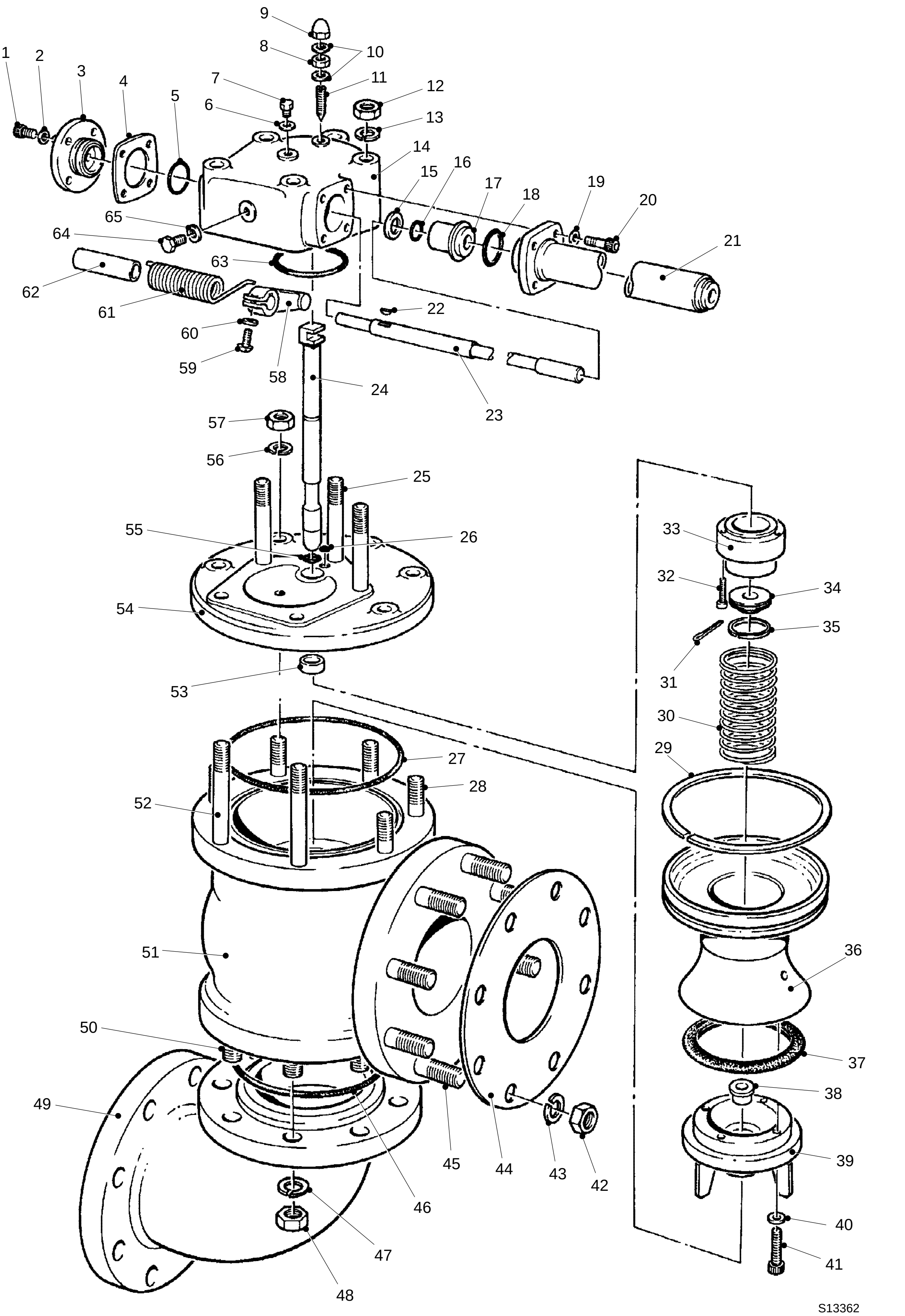

Fig 8.3 4 in. Preset valve

4 in. PRESET VALVE

Fig/ Item No.	Part No.	Description	Qty
8.3- +	BMMZ18316 Series	Valve, preset, 4 in., LH	1
+	BMMZ18317 Series	Valve, preset, 4 in., RH	1
1	ZS3525E1014A	Screw, 5/16 in. UNF x 7/8 in. lg, skt cap hd	4
2	ZN8207G10A	Washer, spring, 5/16 in. id, S/Coil	4
3	BMMZ17792	Cap, spring adjuster sub-assy	1
4	BMDZ1942	Gasket, adjuster cap	1
*5	ZO22E215139A	O-ring	1
*6	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	1
7	ZS3228E0806A	Screw, 1/4 in. UNF-2A x 3/8 in. lg, hex hd	1
8	ZN2204E08A	Locknut, 1/4 in. UNF-2B, hex	1
9	BMCZ3608	Nut, dome	1
*10	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	2
11	BMCZ3609	Valve, needle	1
12	ZN2201E16A	Nut, 1/2 in. UNF-2B, hex	3
13	ZW8207G16A	Washer, spring, 1/2 in. id, S/Coil	3
14	BMAZ2406	Cover, pilot valve	1
15	ZASZ0085-1	Washer, thrust DU06	1
*16	ZO32E111103A	O-ring, Fluorocarbon	1
17	BMSZ19442	Bush, spindle sealing	1
*18	ZO12E215139A	O-ring	1
19	ZW8207G10A	Washer, spring, 5/16 in. id, S/Coil	4
20	ZS3525E1014A	Screw, UNBRAKO cap, 5/16 in. UNF x 7/8 in. lg.	4
21	–	Support tube, pilot valve sub-assy:	1
	BMMZ33129-3	Horizontal, LH-RH, to fit manifold 4 in., steel 150FF, 15.75 in. (double and triple capsules)	
	BMMZ33129-1	Vertical, LH-RH, to fit manifold 4 in., steel 150FF, 15.75 in. (double capsule)	
	BMMZ33129-8	Horizontal, LH-RH, to fit manifold 6 in., steel 150FF plus adapter (triple capsule)	
	BMMZ33129-4	Vertical, LH-RH, to fit manifold 6 in., steel 150FF plus adapter (triple capsule)	
	BMMZ33129-5	Vertical, LH, to fit manifold 4 in., steel 150FF, 15.75 in. (triple capsule)	
	BMMZ33129-2	Vertical, RH, to fit manifold 4 in., steel 150GG, 15.75 in (triple capsule)	
22	ZASZ0059-2	Key, Woodruff, 3/32 in. dia. x 1/2 in. lg.	1

(continued)

* = Suggested spare part

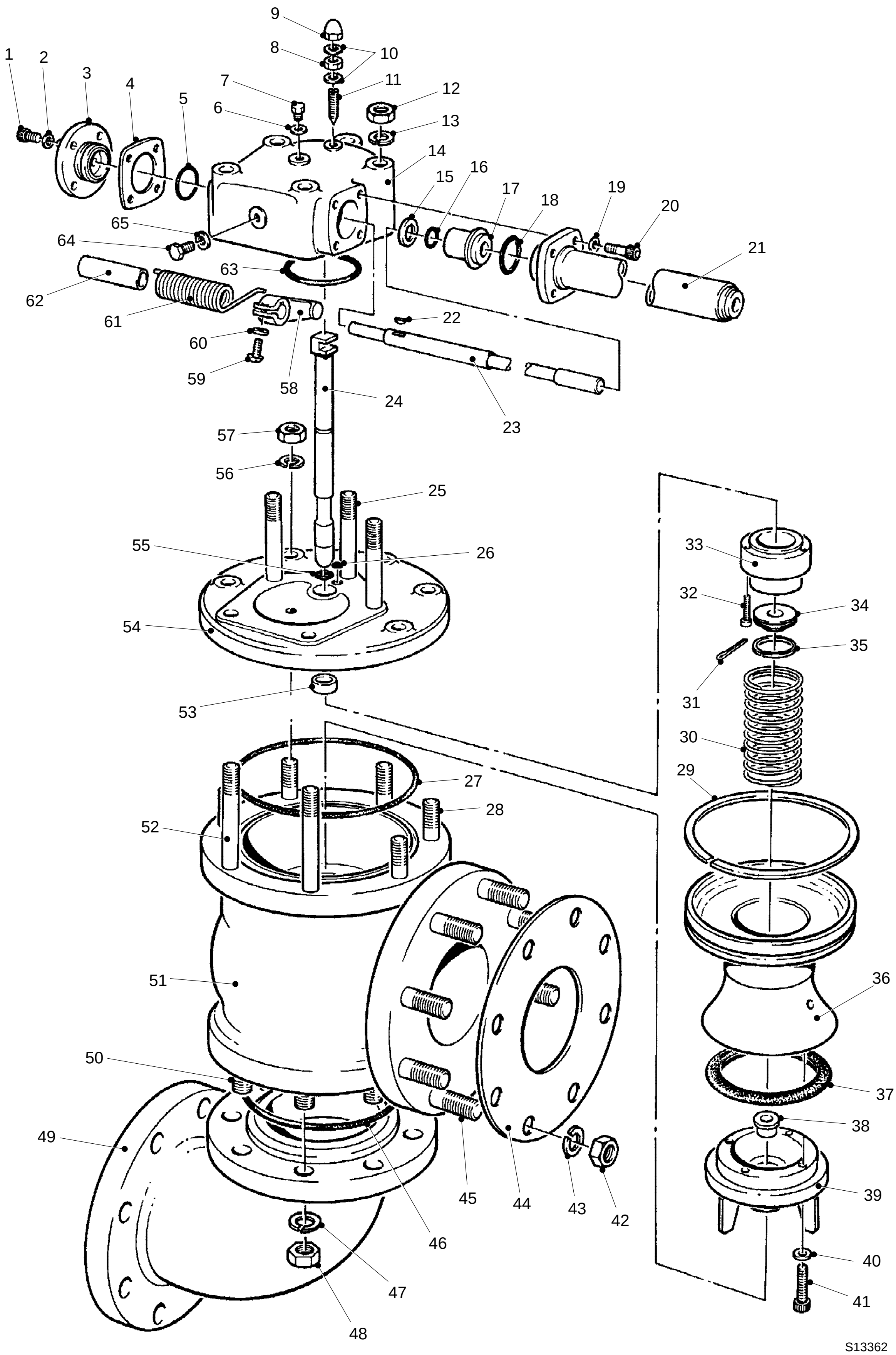

Fig 8.3 4 in. Preset valve

4 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
23	–	Spindle, pilot valve lever	1
	BMSZ33127-3	Horizontal, LH-RH, steel 150FF, 15.75 in. (double and triple capsules)	
	BMSZ33127-1	Vertical, LH-RH, steel 150FF, 15.75 in. (double capsule)	
	BMSZ33127-8	Horizontal, LH-RH, steel 150FF plus adapter (triple capsule)	
	BMSZ33127-4	Vertical, LH-RH, steel 150FF plus adapter (triple capsule)	
	BMSZ33127-5	Vertical, LH, steel 150FF, 15.75 in. (triple capsule)	
	BMSZ33127-2	Vertical, RH, steel 150FF, 15.75 in. (triple capsule)	
24	BMMZ10331	Valve, pilot sub-assy	1
25	BMSZ1977	Stud, pilot valve cover	3
*26	ZO22E008070A	O-ring	1
*27	ZO22E259139A	O-ring	1
28	BMSZ1975	Stud, valve body cover	5
29	BMCZ2249	Ring, compression	1
30	BMSZ1979	Spring, main valve	1
31	ZT4006E0316A	Pin, split, 3/32 in. dia. x 1 in. lg.	1
32	ZS3525A0416A	Screw, 4BA x 1 in. lg, skt cap hd	3
33	BMBZ17798	Cylinder, dashpot	1
34	BMCZ3622	Piston, dashpot	1
35	PPCZ832	Ring, piston	1
36	BMAZ1937	Valve, main preset	1
*37	BMRZ16764-1	Seal, bonded (Fluorocarbon)	1
38	BMSZ2394	Seat, main valve	1
39	BMAZ24912	Guide, main valve	1
40	ZW2306A02A	Washer, 2BA, nit. s/proof	6
41	ZS3325A022A	Screw, 2BA x 1 3/8 in. lg, skt cap hd	6
42	ZN2201E20A	Nut, 5/8 in. UNF-2B, hex	8
43	ZW8207G20A	Washer, spring, 5/8 in. id. S/Coil	8
44	BMDZ1994	Gasket, flange	1
45	BMSZ1974	Stud, valve body flange	8
*46	ZO22E252139A	O-ring	1
47	ZW8207G20A	Washer, spring 5/8 in. id, S/Coil	8
48	ZN2201E20A	Nut, 5/8 in. UNF-2B	8
49	BMAZ1933	Elbow, valve	1

(continued)

* = Suggested spare part

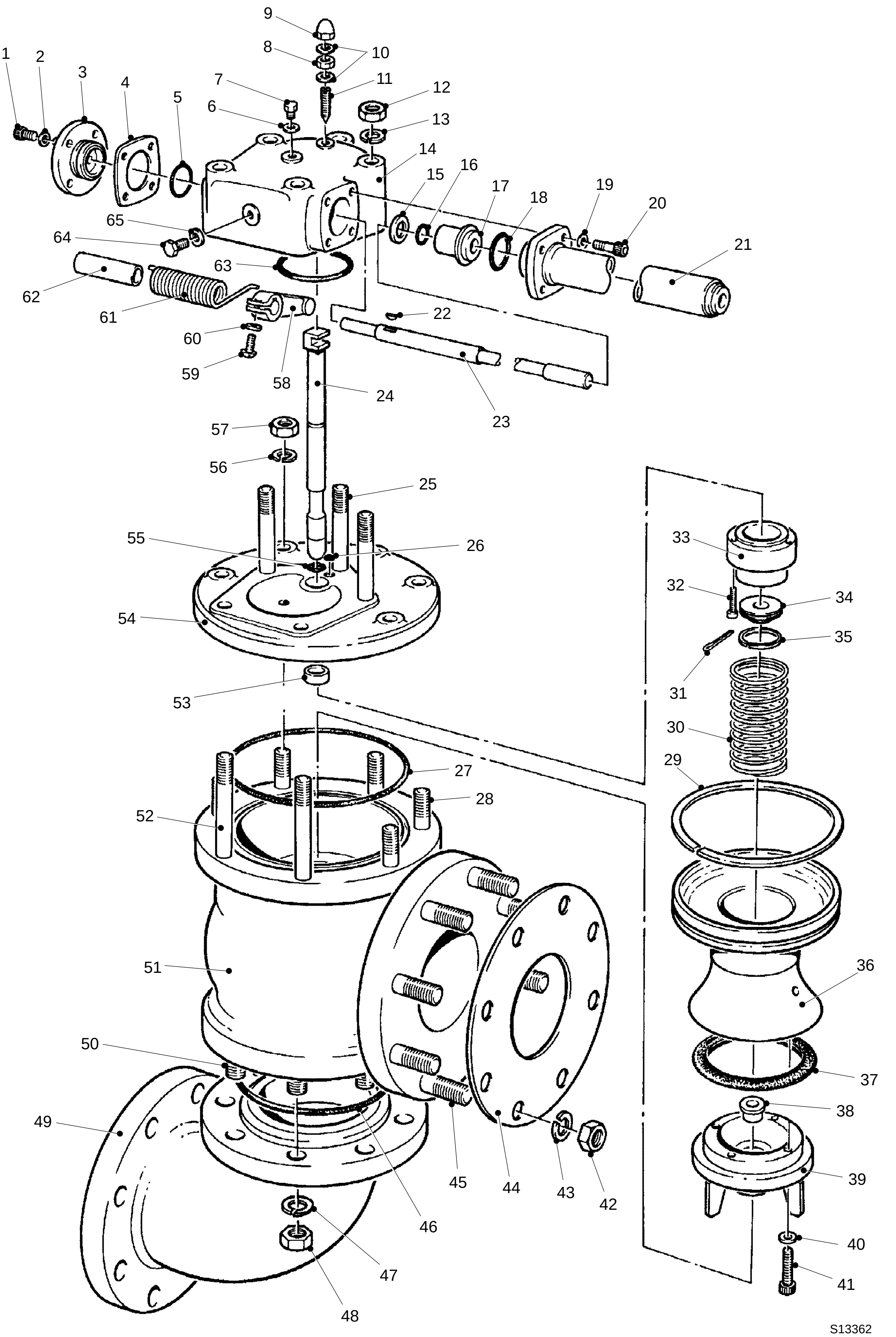

Fig 8.3 4 in. Preset valve

4 in. PRESET VALVE (continued)

Fig/ Item No.	Part No.	Description	Qty
50	BMSZ1434	Stud, valve elbow	8
51	BMMZ1982	Body, valve, LH-RH - horizontal	1
	BMMZ4500	Body, valve, LH-RH - vertical	
52	BMSZ1976	Stud, long, valve body cover	2
53	ZACZ0062-30	Bush, COMPO, SN028 x 3/4 in. lg	1
54	BMAZ3638	Cover, valve body	1
*55	ZO32E012070A	O-ring, Fluorocarbon	1
56	ZW8207G16A	Washer, spring, 1/2 in. id, S/Coil	7
57	ZN2201E16A	Nut, 1/2 in. UNF-2B, hex	7
58	BMMZ1984	Arm, pilot valve sub-assy	1
59	ZS2306A0212A	Screw, 2BA x 3/4 in. lg, rd hd	1
60	ZW8306A02A	Washer, 2BA, int. S/proof	1
61	ZASZ0027-1	Spring, pilot valve - LH	1
	ZASZ0027-2	Spring, pilot valve - RH	
62	BMSZ17793	Sleeve, torsion spring	1
*63	ZO22E240139A	O-ring	1
64	ZASZ0009-3	Screw, sealing	1
*65	ZAFZ0010-12	Washer, red fibre, 1/4 in. id x 1/2 in. od x 1/16 in. thick	1
66 +	BMAZ31437	Adaptor, 4 in. to 6 in., flanged (for 6 in. manifold only. For details and attaching parts refer to Fig 8.4)	2

* = Suggested spare part

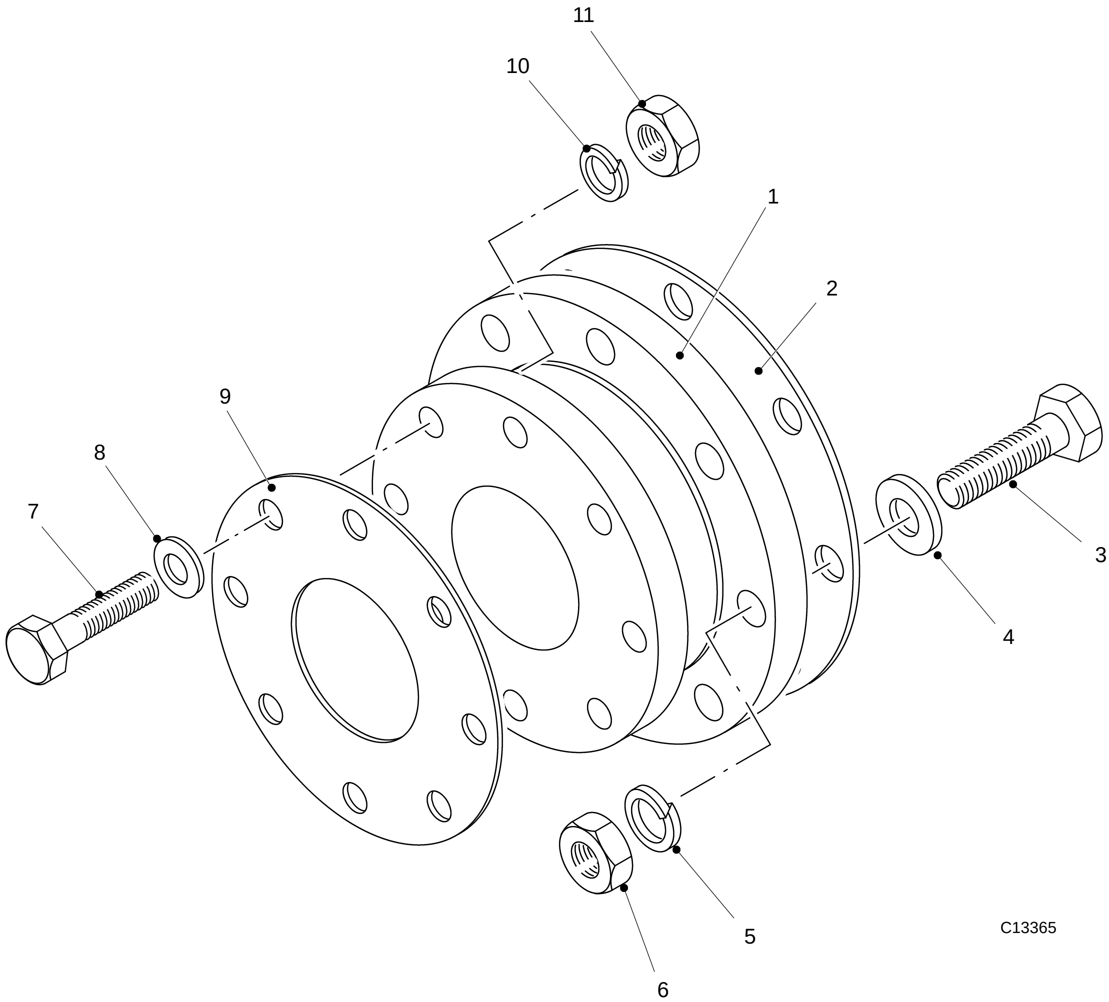

Fig 8.4 Adaptor (for 6 in. manifolds)

ADAPTOR

Fig/ Item No.	Part No.	Description		Qty
8.4- 1	BMAZ31437	Adaptor, 4 in. - 6 in. flanged		REF
2	BMDZ31440	Gasket, flange, 6 in.		1
3	ZS3226E2448A	Bolt, 3/4 in. UNF x 3 in. lg, hex		8
4	ZW2201G24A	Washer, plain, 3/4 in. id.	required for inlet adaptor only	8
5	ZW8207G24A	Washer, spring, 3/4 in. id, S/Coil		8
6	ZN2201E24A	Nut, 3/4 in. UNF, hex		8
7	ZS3226E2044A	Bolt, 5/8 in. UNF x 2 3/4 in. lg, hex.		8
8	ZW2201G20A	Washer, plain, 5/8 in. id.		8
9	BMDZ1994	Gasket, flange, 4 in.	required for outlet adaptor only	1
10	ZW8207G20A	Washer, spring, 5/8 in. id. S/Coil		8
11	ZN2201E20A	Nut, 5/8 in. UNF, hex.		8

* = Suggested spare part

TABLE 8.1 STANDARD CONTROL LINKAGE ASSEMBLIES

Flange Size	Capsule	Manifold Type	Direct Mount or Vol/Wt	Linkage Assy Part No.
2.5 in.	Single	Cast iron	Direct	BMMZ24878A/B
2.5 in.	Single	Fabricated steel	Direct	BMMZ24878-12A/B
3 in.	Single	Cast iron	Direct	BMMZ24878-1A/B
3 in.	Single	Fabricated steel	Direct	BMMZ24878-13A/B
3 in.	Double	Fabricated steel	Direct	BMMZ24878-3A/B
4 in.	Double	Fabricated steel	Direct	BMMZ24878-4A/B
4 and 6 in.	Triple	Fabricated steel	Direct	BMMZ24878-5A/B
2.5 in.	Single	Cast iron	Vol/Wt	BMMZ24878-10A/B
2.5 in.	Single	Fabricated steel	Vol/Wt	BMMZ24878-10C/D
3 in.	Single	Fabricated steel	Vol/Wt	BMMZ24878-11A/B
3 in.	Single	Cast iron	Vol/Wt	BMMZ24878-11C/D
3 in.	Double	Fabricated steel	Vol/Wt	BMMZ24878-15A/B
4 in.	Double	Fabricated steel	Vol/Wt	BMMZ24878-6A/B
4 and 6 in.	Triple	Fabricated steel	Vol/Wt	BMMZ24878-14A/B

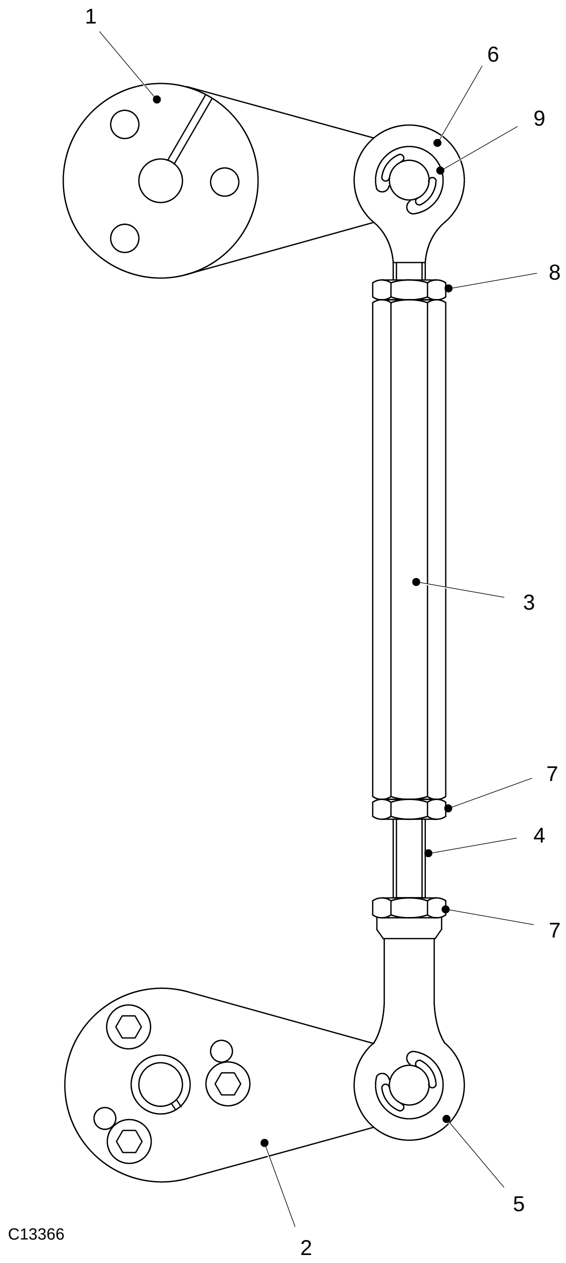

Fig 8.5 Control linkage, with linkage rod

CONTROL LINKAGE WITH LINKAGE ROD

Fig/ Item No.	Part No.	Description	Qty
8.5- +	BMMZ24878- See Table 8.1 for details)	Linkage lever assy for preset valve/VR7889 preset, direct mount or Vol/Wt adaptor, comprising	1
1	BMMZ17956-3	Lever assy, valve operating	1
2	BMMZ24873	Lever assy, preset operating, for versions BMMZ24878, 24878-12	1
	BMMZ24873-1	Lever assy, preset operating, for versions BMMZ24878-1, -3, -13	1
	BMMZ24877	Lever assy, preset operating, for versions BMMZ24878-7, -5, -6, -14	1
3	BMCZ2773	Adjuster, 4 in. lg, for versions BMMZ24878-3, -4, -5, -12, -13, -14	1
	BMCZ2773-1	Adjuster, 2.8 in. lg, for versions BMMZ24878, 24878-1, -6	1
4	BMSZ18932	Rod, linkage, for versions BMMZ24878, 24878-1, -6, -12, -13	1
	BMSZ18932-1	Rod, linkage, for versions BMMZ24878-3, -14	1
	BMSZ18932-2	Rod, linkage, for version BMMZ24878-4	1
	BMSZ18932-3	Rod, linkage, for version BMMZ24878-5	1
5	ZMMZ0249-3	Bearing, rod end, UNIBAL, 5/16 in. UNF, RH, female	1
6	ZMMZ0249-5	Bearing, rod end, UNIBAL, 5/16 in. UNF, LH, male	1
7	ZN2204E10A	Locknut, 5/16 in. UNF	2
8	BMCZ3231	Locknut, 5/16 in. UNF, LH thread	1
9	ZASZ0058-14	Circlip, 5/16 in. ext.	2

* = Suggested spare part

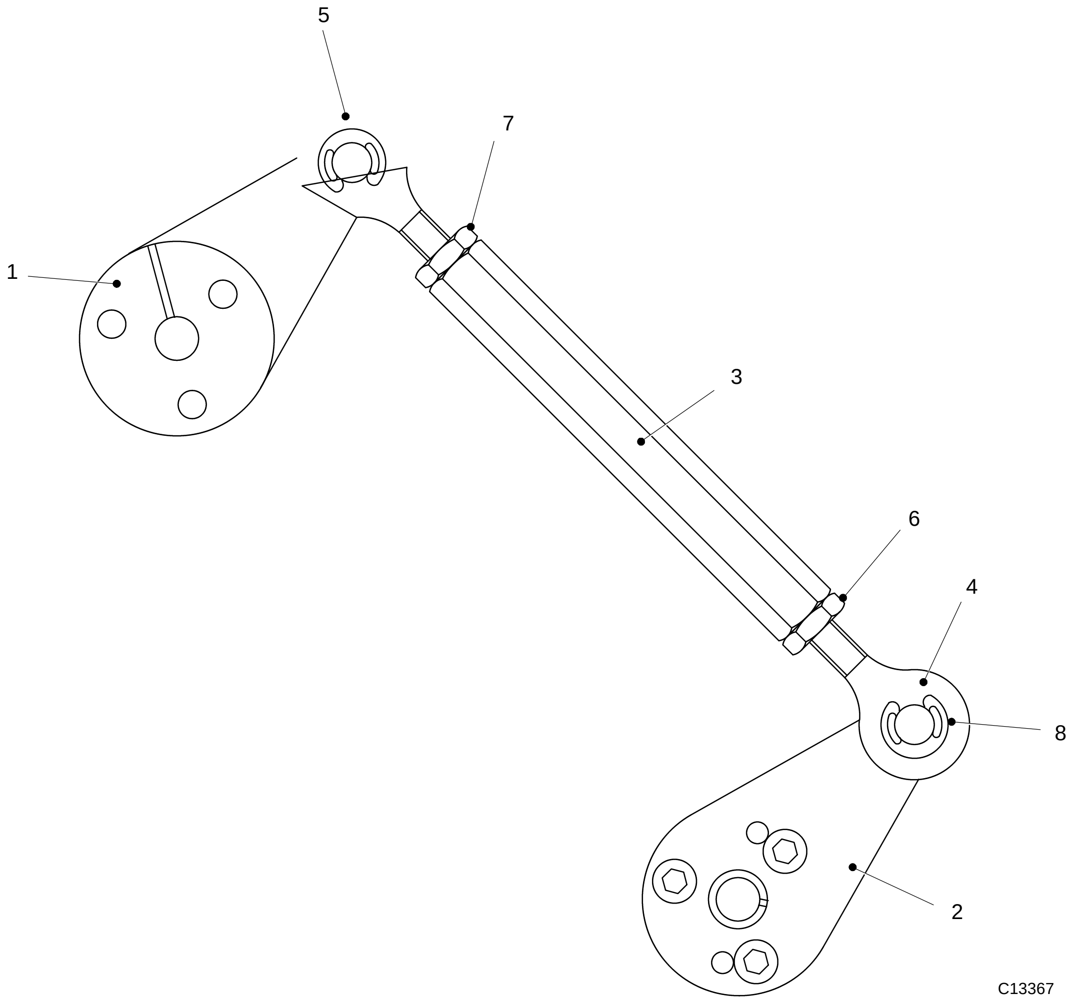

Fig 8.6 Control linkage, without linkage rod

CONTROL LINKAGE WITHOUT LINKAGE ROD

Fig/ Item No.	Part No.	Description	Qty
8.6- +	BMMZ24878-15 (see Table 8.1 for details)	Linkage lever assy for preset valve/VR7889 preset, Vol/Wt adaptor, comprising:	1
1	BMMZ17956-3	Lever assy, valve operating	1
2	BMMZ24873-1	Lever assy, preset operating	1
3	BMCZ2773	Adjuster, 4 in. lg	1
4	ZMMZ0249-3	Bearing, rod end, UNIBAL, 5/16 in. UNF, RH, male	1
5	ZMMZ0249-5	Bearing, rod end, UNIBAL, 5/16 in. UNF, LH, male	1
6	ZN2204E10A	Locknut, 5/16 in. UNF	1
7	BMCZ3231	Locknut, 5/16 in. UNF, LH thread	1
8	ZASZ0058-14	Circlip, 5/16 in. ext.	2

* = Suggested spare part

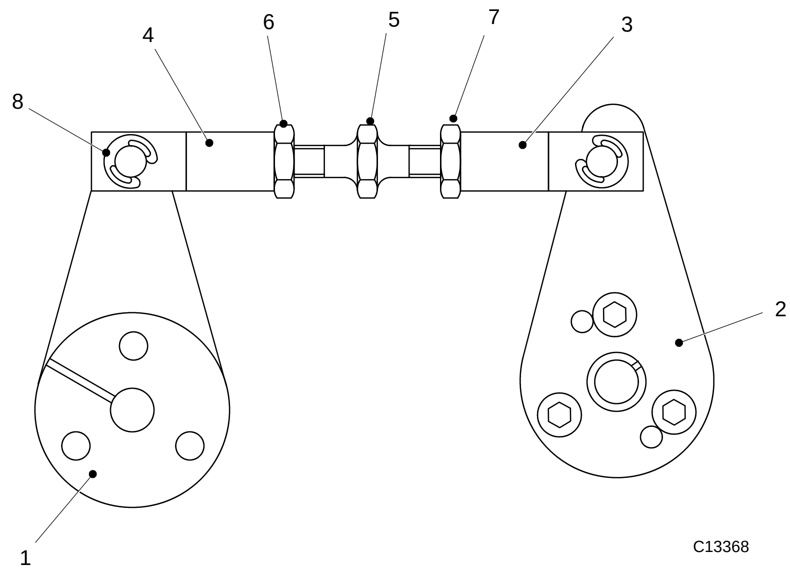

Fig 8.7 Control linkage with volume/weight adaptor

CONTROL LINKAGE WITH VOLUME/WEIGHT ADAPTOR

Fig/ Item No.	Part No.	Description	Qty
8.7- +	BMMZ24878- (see Table 8.1 for details)	Linkage lever assy for preset valve/VR7889, preset, Vol/Wt adaptor, comprising	1
1	BMMZ17952-3	Lever assy, valve operating	1
2	BMMZ24882	Lever assy, preset operating, for version BMMZ24878-10	1
	BMMZ24882-1	Lever assy, preset operating, for version BMMZ24878-11	
3	BMCZ3224R	Connector, valve lever, RH	1
4	BMCZ3224L	Connector, valve lever, LH	1
5	BMSZ19389	Adjuster	1
6	BMCZ3231	Locknut, 5/16 in. UNF, LH thread	1
7	ZN2204E10A	Locknut, 5/16 in. UNF	1
8	ZT2206E0208A	Pin, split, 1/16 in. dia. x 1/2 in. lg.	2

* = Suggested spare part

TABLE 8.2 EXTENDED (HORIZONTAL) CONTROL LINKAGE ASSEMBLIES

Flange Size	Capsule	Manifold Type	Direct Mount or Vol/Wt	Linkage Assy Part No.
2.5 in.	Single	Cast iron	Direct	BMMZ31435-4A/K
2.5 in.	Single	Fabricated steel	Direct	BMMZ31435A/K
3 in.	Single	Cast iron	Direct	BMMZ31435-1A/K
3 in.	Single	Fabricated steel	Direct	BMMZ31435-1A/K
3 in.	Double	Fabricated steel	Direct	BMMZ31435-1A/K
4 in.	Double	Fabricated steel	Direct	BMMZ31435-2A/K
4 in.	Triple	Fabricated steel	Direct	BMMZ31435-2A/K
6 in.	Triple	Fabricated steel	Direct	BMMZ31435-3A/K
2.5 in.	Single	Cast iron	Vol/Wt	BMMZ31435-4A/K
2.5 in.	Single	Fabricated steel	Vol/Wt	BMMZ31436-A/K
3 in.	Single	Fabricated steel	Vol/Wt	BMMZ31436-1A/K
3 in.	Single	Cast iron	Vol/Wt	BMMZ31436-1A/K
3 in.	Double	Fabricated steel	Vol/Wt	BMMZ31436-1A/K
4 in.	Double	Fabricated steel	Vol/Wt	BMMZ31436-2A/K
4 in.	Triple	Fabricated steel	Vol/Wt	BMMZ31436-2A/K
6 in.	Triple	Fabricated steel	Vol/Wt	BMMZ31436-3A/K

TABLE 8.3 EXTENDED (VERTICAL) CONTROL LINKAGE ASSEMBLIES

Flange Size	Capsule	Manifold Type	Direct Mount or Vol/Wt	Linkage Assy Part No.
2.5 in.	Single	Cast iron	Direct	BMMZ31435-9A/K
2.5 in.	Single	Fabricated steel	Direct	BMMZ31435-5A/K
3 in.	Single	Cast iron	Direct	BMMZ31435-6A/K
3 in.	Single	Fabricated steel	Direct	BMMZ31435-6A/K
3 in.	Double	Fabricated steel	Direct	BMMZ31435-6A/K
4 in.	Double	Fabricated steel	Direct	BMMZ31435-7A/K
4 in.	Triple	Fabricated steel	Direct	BMMZ31435-7A/K
6 in.	Triple	Fabricated steel	Direct	BMMZ31435-8A/K
2.5 in.	Single	Cast iron	Vol/Wt	BMMZ31435-9A/K
2.5 in.	Single	Fabricated steel	Vol/Wt	BMMZ31436-5A/K
3 in.	Single	Fabricated steel	Vol/Wt	BMMZ31436-6A/K
3 in.	Single	Cast iron	Vol/Wt	BMMZ31436-6A/K
3 in.	Double	Fabricated steel	Vol/Wt	BMMZ31436-6A/K
4 in.	Double	Fabricated steel	Vol/Wt	BMMZ31436-7A/K
4 in.	Triple	Fabricated steel	Vol/Wt	BMMZ31436-7A/K
6 in.	Triple	Fabricated steel	Vol/Wt	BMMZ31436-8A/K

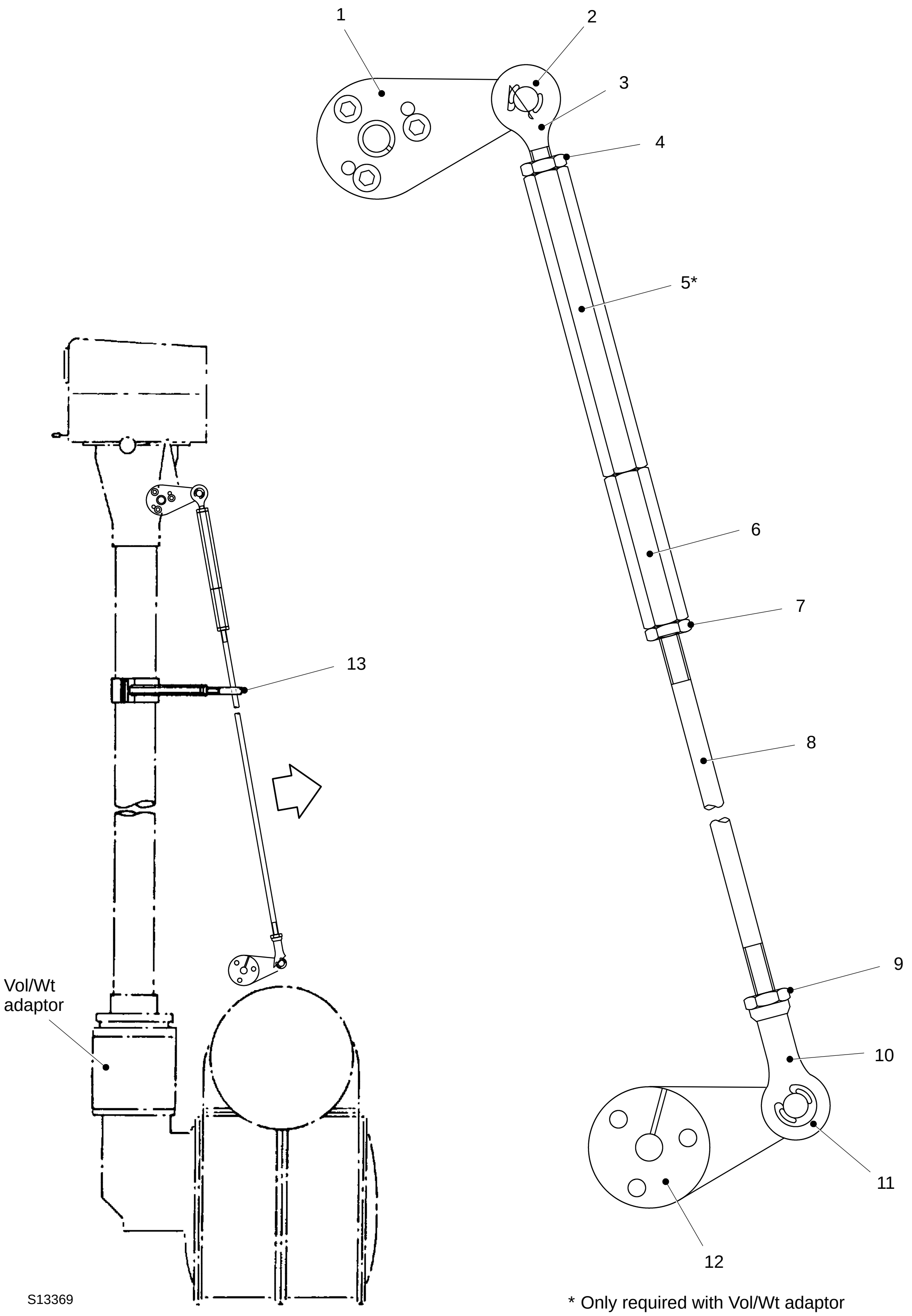

Fig 8.8 Extended control linkages

EXTENDED CONTROL LINKAGES

Fig/ Item No.	Part No.	Description	Qty
8.8- +	BMMZ31435- (see Table 8.2 for details)	Linkage lever assy for preset valve/VR7889 preset, horizontal capsule, direct mount	1
+	BMMZ31436- (see Table 8.2 for details)	Linkage lever assy for preset valve/VR7889 preset, horizontal capsule, Vol/Wt adaptor	1
+	BMMZ31435- (see Table 8.3 for details)	Linkage lever assy for preset valve/VR7889 preset, vertical capsule, direct mount	1
+	BMMZ31436- (see Table 8.3 for details)	Linkage lever assy for preset valve/VR7889 preset, vertical capsule, Vol/Wt adaptor	1
1	BMMZ24873	Lever assy, preset operating, for versions BMMZ31435A/K, -4A/K, -5A/K, -9A/K and BMMZ31436A/K, -4A/K, -5A/K, -9A/K	1
	BMMZ24873-1	Lever assy, preset operating, for versions BMMZ31435-1A/K, -4A/K, -6A/K and BMMZ314361A/K, -6A/K	1
2	ZASZ0058-14	Circlip, 5/16 in. external	1
3	ZMMZ0249-4	Bearing, rod end, UNIBAL, 5/16 in. UNF, RH, female	1
4	ZN2204E10A	Locknut, 5/16 in. UNF	1
5	BMCZ31434	Adaptor, 120 mm lg. for versions BMMZ31436- (Vol/Wt adaptor)	1
6	-	Adjuster,	1
	BMCZ31433A	90 mm lg, for versions -2A/K	
	BMCZ31433B	100 mm lg, for versions -3A/K	
	BMCZ31433C	130 mm lg, for versions -1A/K	
	BMCZ31433D	135 mm lg, for versions -7A/K	
	BMCZ31433E	140 mm lg, for versions -8A/K	
	BMCZ31433F	150 mm lg, for versions A/K	
	BMCZ31433G	175 mm lg, for versions -4A/K, -6A/K	
	BMCZ31433H	200 mm lg, for versions -5A/K	
	BMCZ31433J	220 mm lg, for versions -9A/K	
7	BMCZ3231	Locknut, 5/16 in. UNF, LH thread	1
8	-	Rod, linkage,	1
	BMSZ31432A	650 mm lg, for versions A to -9A	
	BMSZ31432B	950 mm lg, for versions B to -9B	
	BMSZ31432C	1250 mm lg, for versions C to -9C	
	BMSZ31432D	1550 mm lg, for versions D to -9D	

(continued)

* = Suggested spare part

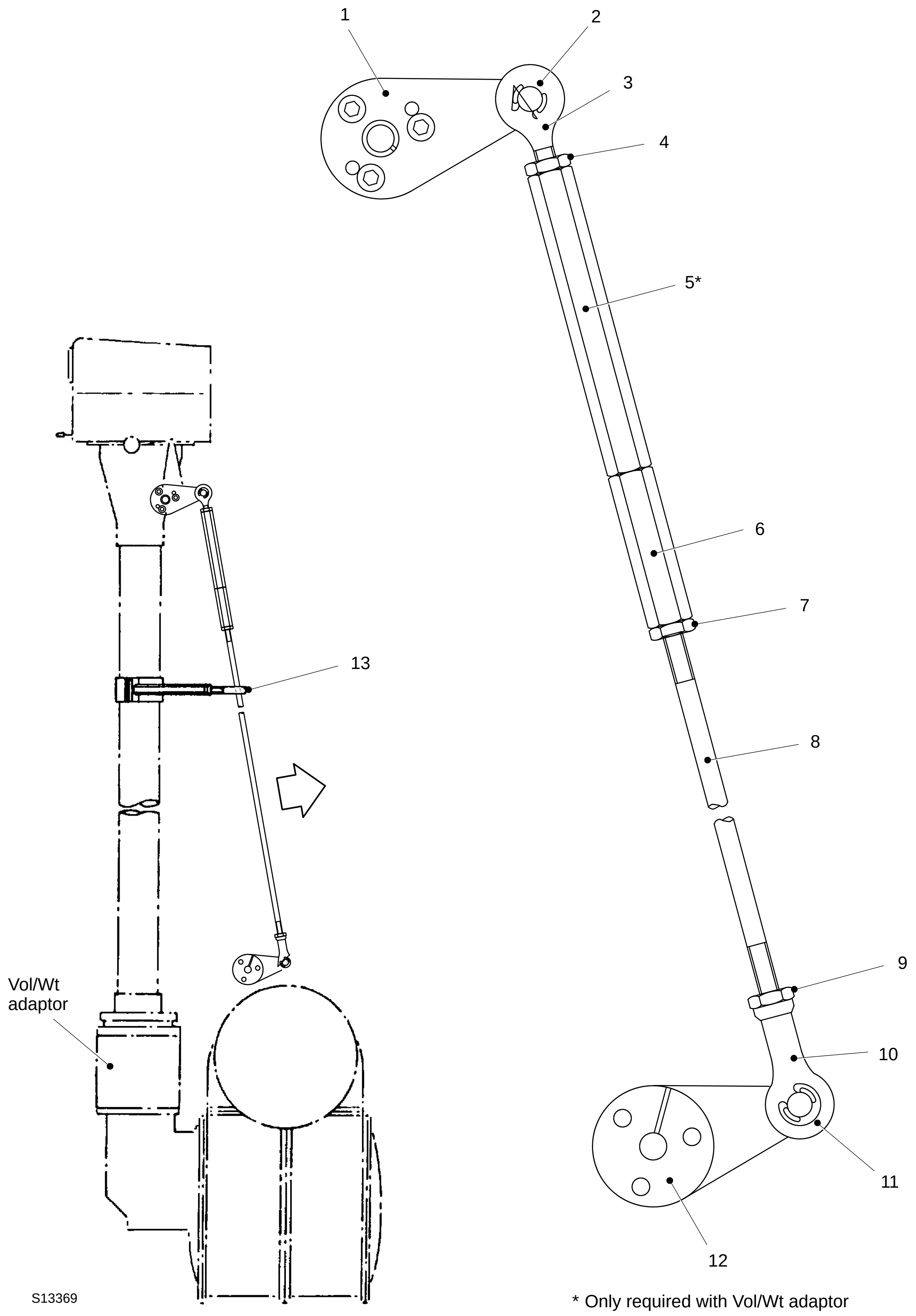

Fig 8.8 Extended control linkages

EXTENDED CONTROL LINKAGES (continued)

Fig/ Item No.	Part No.	Description	Qty
	BMSZ31432E	1850 mm lg, for versions E to -9E	
	BMSZ31432F	2150 mm lg, for versions F to -9F	
	BMSZ31432G	2450 mm lg, for versions G to -9G	
	BMSZ31432H	2750 mm lg, for versions H to -9H	
	BMSZ31432J	3050 mm lg, for versions J to -9J	
	BMSZ31432K	3350 mm lg, for versions K to -9K	
9	ZN2204E10A	Locknut, 5/16 in. UNF	1
10	ZMMZ0249-3	Bearing, rod end, UNIBAL, 5/16 in. UNF, RH, female	1
11	ZASZ0058-14	Circlip, 5/16 in., external	1
12	BMMZ17956-3	Lever assy, valve operating	1
13	BMMZ19384	Rod guide assembly (Refer to Fig 8.12)	1

* = Suggested spare part

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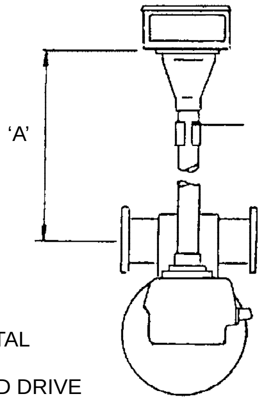
TABLE 8.4 ADAPTOR/CONTROL HANDLE ASSEMBLIES- SHORT PRESET DRIVE

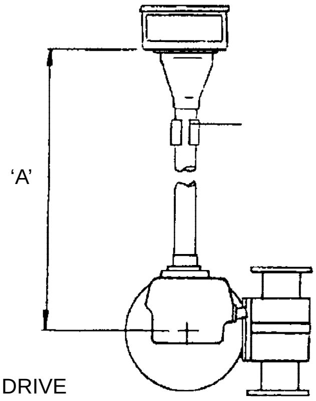
CALIBRATION MECHANISM (Mk2A/Mk3)	PART NUMBER		
	DRIVE ASSEMBLY	BASE ADAPTOR SUB-ASSY	PRIMARY DRIVE SUB-ASSY
SINGLE MICROSWITCH ASSEMBLIES			
Mk2A (READOUT)			
Imp. gal	BMMZ30297	BMMZ30294	BMMZ1869
Litres	BMMZ30297-1	BMMZ30294-1	BMMZ1869-1
U.S. gal	BMMZ30297-2	BMMZ30294-2	BMMZ1869-2
Decalitres/m3	BMMZ30297-3	BMMZ30294-3	BMMZ1869-3
Unit drum	BMMZ30297-6	BMMZ30294-6	BMMZ24923
Mk3 (ALL READOUTS)	BMMZ30297-5	BMMZ30294-5	BMMZ12219
Vol/Wt Adaptor Mk2A & Mk 3 (ALL READOUTS)	BMMZ30297-7	BMMZ30294-7	BMMZ-31431
DOUBLE MICROSWITCH ASSEMBLIES			
Imp. gal	BMMZ30297-8	BMMZ30294-8	BMMZ1869
Litres	BMMZ30297-9	BMMZ30294-9	BMMZ1869-1
U.S. gal	BMMZ30297-10	BMMZ30294-10	BMMZ1869-2
Decalitres	BMMZ30297-11	BMMZ30294-11	BMMZ1869-3
Mk3 (ALL READOUTS)	BMMZ30297-12	BMMZ30294-12	BMMZ12219
Vol/Wt Adaptor Mk2A & Mk 3 (ALL READOUTS)	BMMZ30297-13	BMMZ30294-13	BMMZ-31431

KEY TO TABLE 8.6



HORIZONTAL
METERS –
EXTENDED DRIVE

DIMENSION 'A' IS FROM MANIFOLD
CENTRE LINE TO TOP OF
EXTENDED DRIVE



VERTICAL
METERS –
EXTENDED DRIVE

DIMENSION 'A' IS FROM METER
CENTRE LINE TO TOP OF
EXTENDED DRIVE

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TABLE 8.5 ADAPTOR/CONTROL HANDLE ASSEMBLIES - EXTENDED PRESET DRIVE

CALIBRATION MECHANISM (Mk2A/Mk3)	PART NUMBER		
	DRIVE ASSEMBLY	EXTENDED PRESET DRIVE ASSY	EXTENDED DRIVE ADAPTOR SUB-ASSY
Mk2A (READOUT)			
Imp. gal	BMMZ30298A/K	BMMZ30296A/K	BMMZ19426
Litres	BMMZ30298-1A/K	BMMZ30296-1A/K	BMMZ19426-1
U.S. gal	BMMZ30298-2A/K	BMMZ30296-2A/K	BMMZ19426-2
Decalitres/m3	BMMZ30298-3A/K	BMMZ30296-3A/K	BMMZ19426-3
Mk3 (ALL READOUTS)	BMMZ30298-6A/K	BMMZ30296-6A/K	BMMZ19426-6
Vol/Wt Adaptor Mk2A & Mk 3 (ALL READOUTS)	BMMZ30298-8A/K	BMMZ30296-8A/K	BMMZ-19426-8

TABLE 8.6 EXTENSION TUBE AND DRIVE TUBE SUB-ASSEMBLY LENGTHS

BMMZ30296-SUFFIX	SALES EXTENSION CODES	DIMENSION 'A'		EXTENSION TUBE LENGTH	DRIVE TUBE SUB-ASSY LENGTH
		HORIZONTAL	VERTICAL		
/A-/8A	D	1000 mm	1275 mm	951 mm	1071 mm
/B-/8B	D1	1300 mm	1575 mm	1251 mm	1371 mm
/C-/8C	D2	1600 mm	1875 mm	1551 mm	1671 mm
/D-/8D	D3	1900 mm	2175 mm	1851 mm	1971 mm
/E-/8E	D4	2200 mm	2475 mm	2151 mm	2271 mm
/F-/8F	D5	2500 mm	2775 mm	2451 mm	2571 mm
/G-/8G	D6	2800 mm	3075 mm	2751 mm	2871 mm
/H-/8H	D7	3100 mm	3375 mm	3051 mm	3171 mm
/J-/8J	D8	3400 mm	3675 mm	3351 mm	3471 mm
/K-/8K	D9	3700 mm	3975 mm	3651 mm	3771 mm

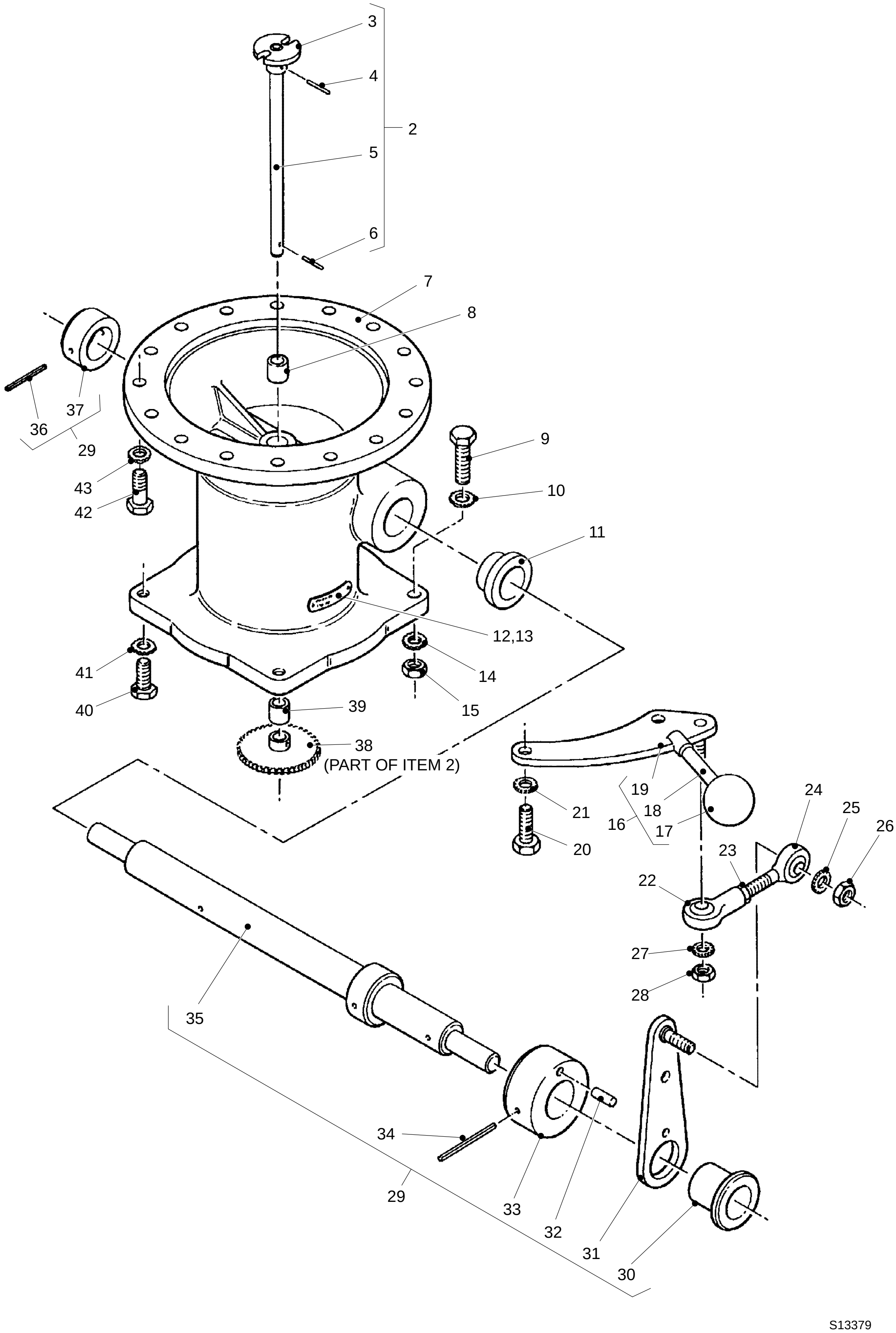


Fig 8.9 Adaptor/control handle – short preset drive

ADAPTOR/CONTROL HANDLE - SHORT PRESET DRIVE

Fig/ Item No.		Part No.	Description	Qty
8.9-	+	BMMZ30297- (see Table 8.4)	Adaptor/control handle assy, LH/RH, short preset drive	1
1	+	BMMZ30294- (see Table 8.4)	Preset base adaptor sub-assy, LH/RH	1
2	+	BMMZ1869- (see Table 8.4)	Primary vertical drive sub-assy - toothed gear coupling	1
		BMMZ24923 (see Table 8.4)	- bar and pin coupling	
		BMMZ12219 (see Table 8.4)	- plate and pin coupling	
		BMMZ31431 (see Table 8.4)	- fork coupling	
3		BMSZ159	Collar	1
4		ZT8001E0007A	Tension pin, 5/64 in. dia x 7/16 in. lg	1
5		BMSZ1868	Drive spindle	1
6		ZT8001E0007A	Tension pin, 5/64 in. dia x 7/16 in. lg	1
7		BMAZ30292	Register base adaptor	1
8		ZACZ0062-11	Bush, plain, 7/16 in. od x 1/4 in. id x 1/2 in. lg	1
9		ZS3228E0818A	Screw, hex hd, 1/4 in. UNF x 1 1/8 in. lg	2
10		ZW2201G08A	Washer, plain, 1/4 in. id	2
11		ZACZ0062-9	Bearing	2
12		BMAZ3700	Label	1
13	+	ZMMZ0232-8	Hammer drive screw, size 00 x 1/8 in. lg	2
14		ZW8205G08A	Washer, ext s/proof, 1/4 in. id	2
15		ZN2201E08A	Nut, hex, 1/4 in. UNF	2
16		BMMZ24870	Control handle assy	1
17		BMPZ1469	Ball knob	1
18		BMSZ24866	Control handle arm	1
19		BMMZ24869	Control handle plate asub-assy (qty 2 required if Item 16 is in optional position)	1
20		ZS3228E0806A	Screw, hex hd, 1/4 in. UNF x 3/8 in. lg (qty 4 required if Item 16 is in optional position)	2
21		ZW8205G08A	Washer, ext s/proof, 1/4 in. id (qty 4 required if Item 16 is in optional position)	2
22		ZMMZ0249-1	Bearing, rod end, UNIBAL, female	1
23		ZN2204M05A	Locknut, hex, M5	1
24		ZMMZ0249-2	Bearing, rod end, UNIBAL, male	1
25		ZW8205M05A	Washer, ext, s/proof, M5	1

(continued)

* = Suggested spare part

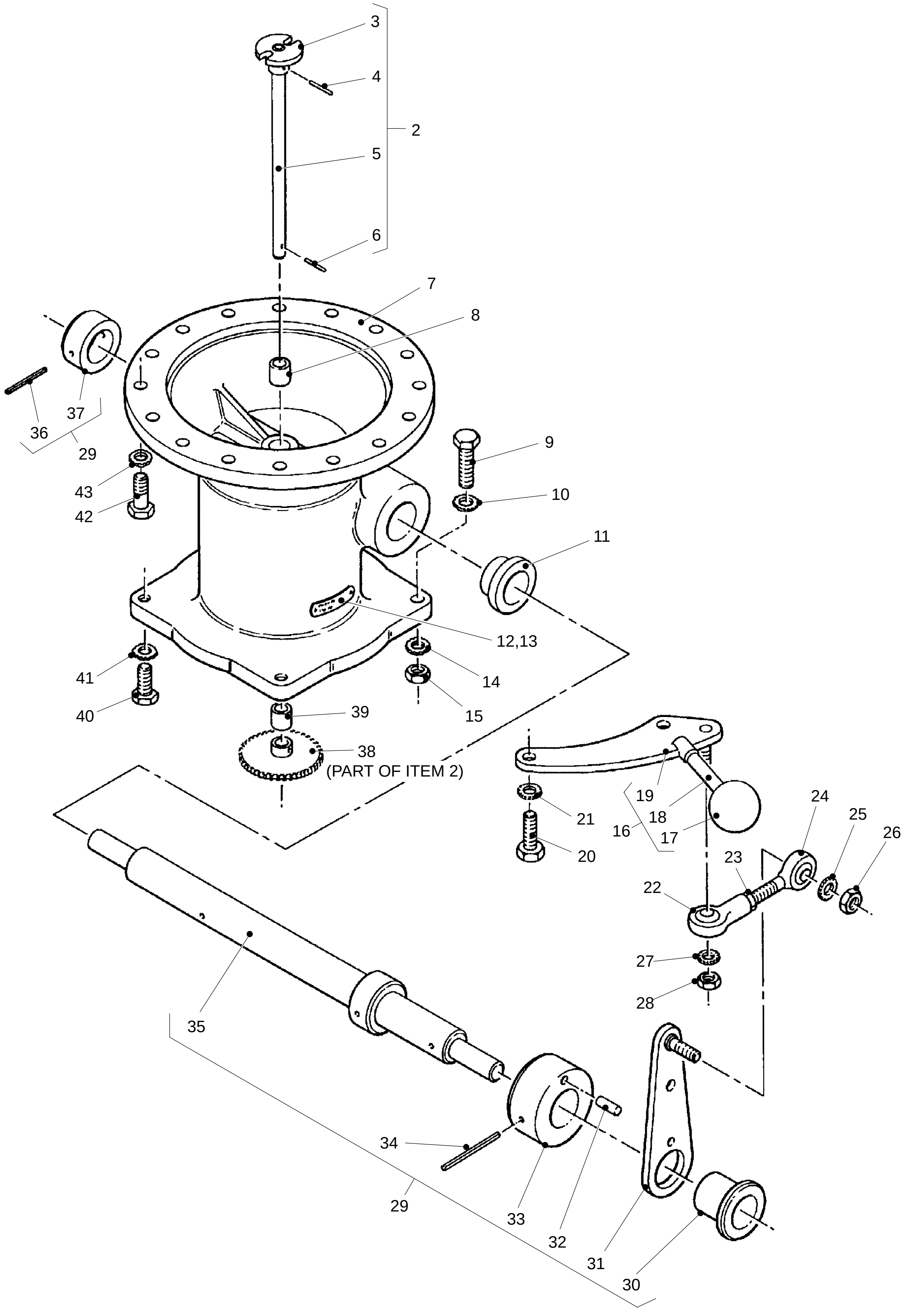


Fig 8.9 Adaptor/control handle – short preset drive

ADAPTOR/CONTROL HANDLE - SHORT PRESET DRIVE (continued)

Fig/ Item No.	Part No.	Description	Qty
26	ZN2201M05A	Nut, hex, M5	1
27	ZW8205M05A	Washer, ext s/proof, M5	1
28	ZN2201M05A	Nut, hex, M5	1
29	BMMZ30274	Shaft sub-assy single microswitch	1
	BMMZ23027-1	Shaft sub-assy double microswitch	
30	BMSZ30278	Collar, flanged (Qty 2 required with double microswitch)	1
31	BMMZ30279	Lever sub-assy (Qty 2 required with double micro-switch)	1
32	ZASZ0104-3	Dowel pin, 3/16 in. dia x 5/8 in. lg. (single microswitch)	1
	ZT8001M0312A	Tension pin, 3 mm dia x 12 mm lg (double microswitch)	2
33	BMSZ30276	Collar, large (Qty 2 required with double microswitch)	1
34	ZT8001E0624A	Tension pin, 3/16 in. dia x 1 1/2 in. lg (Qty 2 required with double microswitch)	1
35	BMSZ30275	Shaft	1
36	ZT8001E0418A	Tension pin, 1/8 in, dia x 1 1/8 in. lg	2
37	BMSZ30277	Collar, small	2
38	BMCZ1765	Counter drive gear - Imp gal	1
	BMCZ1759	Counter drive gear - Litres	
	BMCZ1776	Counter drive gear - US gal	
	BMCZ1777	Counter drive gear - Decalitres	
+	BMMZ24921	Drive coupling sub-assy - bar and pin (with Item 2 - BMMZ24923)	
+	BMMZ2882	Drive coupling sub-assy - plate and pin (with Item 2 - BMMZ12219)	
+	BMMZ18993	Fork coupling (with Item 2 - BMMZ31431)	
39	ZACZ0062-12	Bush, plain, /4 in. id x 7/16 in. od x 3/8 in. lg	1
40	BMSZ2362	Sealing screw	2
41	ZW8205G08A	Washer, ext s/proof, 1/4 in. id	2
42	BMSZ2362	Sealing screw	4
43	ZW8205G08A	Washer, ext s/proof, 1/4 in. id	4
44	ZACZ0062-9	Bearing	1

* = Suggested spare part

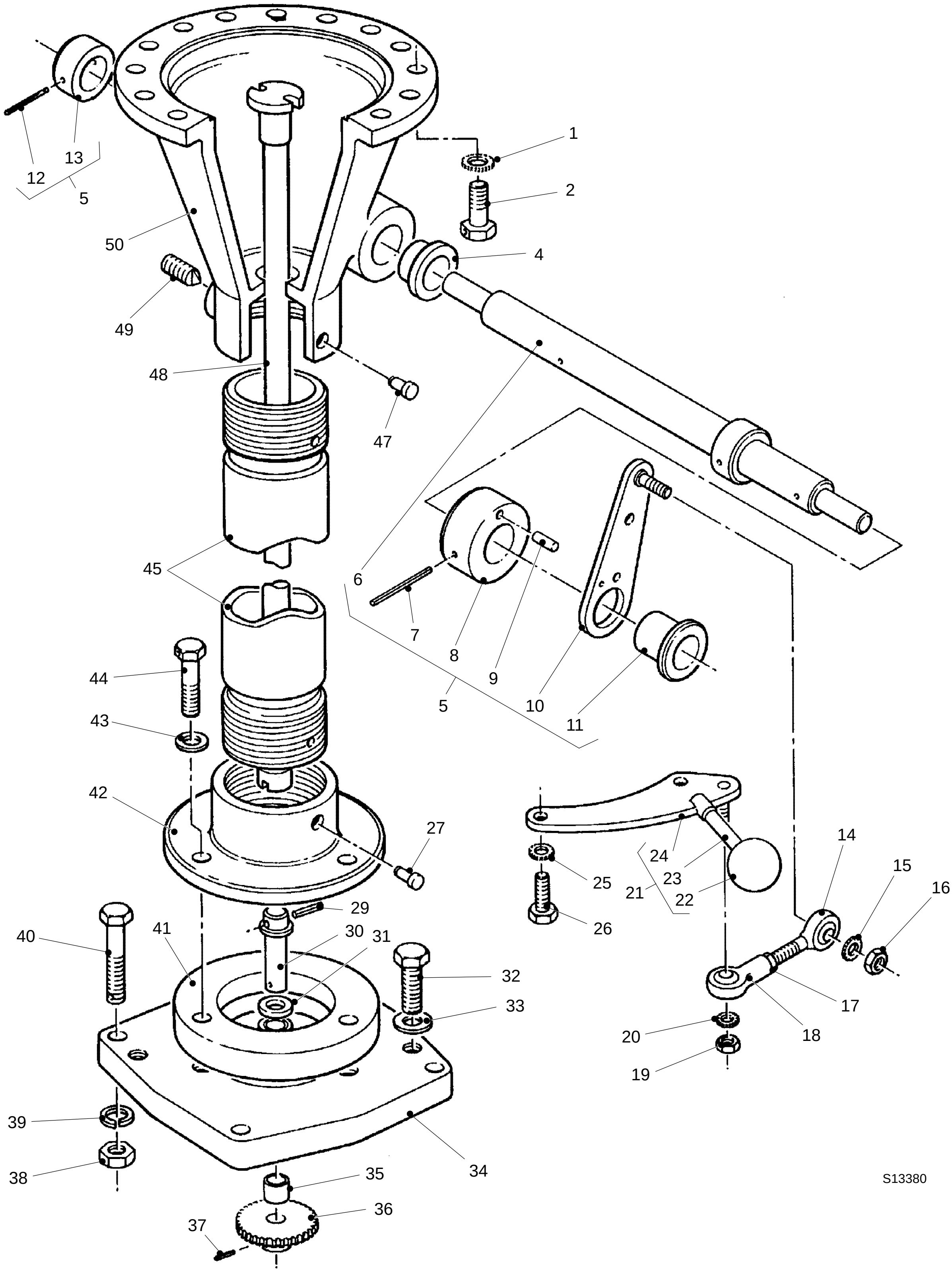


Fig 8.10 Adaptor/control handle – extended preset drive

ADAPTOR/CONTROL HANDLE - EXTENDED PRESET DRIVE

Fig/ Item No.	Part No.	Description	Qty
8.10- +	BMMZ30298- (see Table 8.5)	Adaptor/control handle assy, LH/RH extended preset drive	1
+	BMMZ30296- (see Table 8.5)	Extended preset/register drive sub-assy	1
1	ZW8205G08A	Washer, ext s/proof, 1/4 in. id	4
2	BMSZ2362	Sealing screw	4
3 +	BMMZ230295	Register column adaptor sub-assy	1
4	ZACZ0062-9	Bearing	2
5 +	BMMZ30274	Shaft sub-assy	1
6	BMSZ30275	Shaft	1
7	ZT8001E0624A	Tension pin, 3/16 in. dia x 1 1/2 in. lg.	1
8	BMSZ30276	Collar, large	1
9	ZASZ0104-3	Dowel pin,. 3/16 in. dia x 5/8 in. lg	1
10	BMMZ30279	Lever	1
11	BMSZ30278	Collar, flanged	1
12	ZT8001E0418A	Tension pin, 1/8 in. dia x 1 1/8 in. lg	2
13	BMSZ30277	Collar, small	2
14	ZMMZ0249-2	Bearing, rod end, UNIBALL, male	1
15	ZW8205M05A	Washer, ext s/proof, M5	1
16	ZN2201M05A	Nut, hex, M5	1
17	ZN2204M05A	Locknut, hex, M5	1
18	ZMMZ0249-1	Bearing, rod end, UNIBALL, female	1
19	ZN2201M05A	Nut, hex, M5	1
20	ZW8205M05A	Washer, ext s/proof, M5	1
21	BMMZ24870	Control handle assy	1
22	BMPZ1469	Ball knob	1
23	BMSZ24866	Control handle arm	1
24	BMMZ24869	Control handle plate sub-assy (Qty 2 required if Item 21 is in optional position)	1
25	ZW8205G08A	Washer, ext s/proof, 1/4 in. id (Qty 4 required if Item 21 is in optional position)	2
26	ZS3228E0806A	Screw, hex hd, 1/4 in. UNF x 3/8 in. lg (Qty 4 required if Item 21 is in optional position)	2
27	BMSZ19435	Locking pin	1
28 +	BMMZ19426 (see Table 8.5)	Extended drive adaptor sub-assy - toothed gear coupling	1
	BMMZ19426-1	- toothed gear coupling	

(continued)

* = Suggested spare part

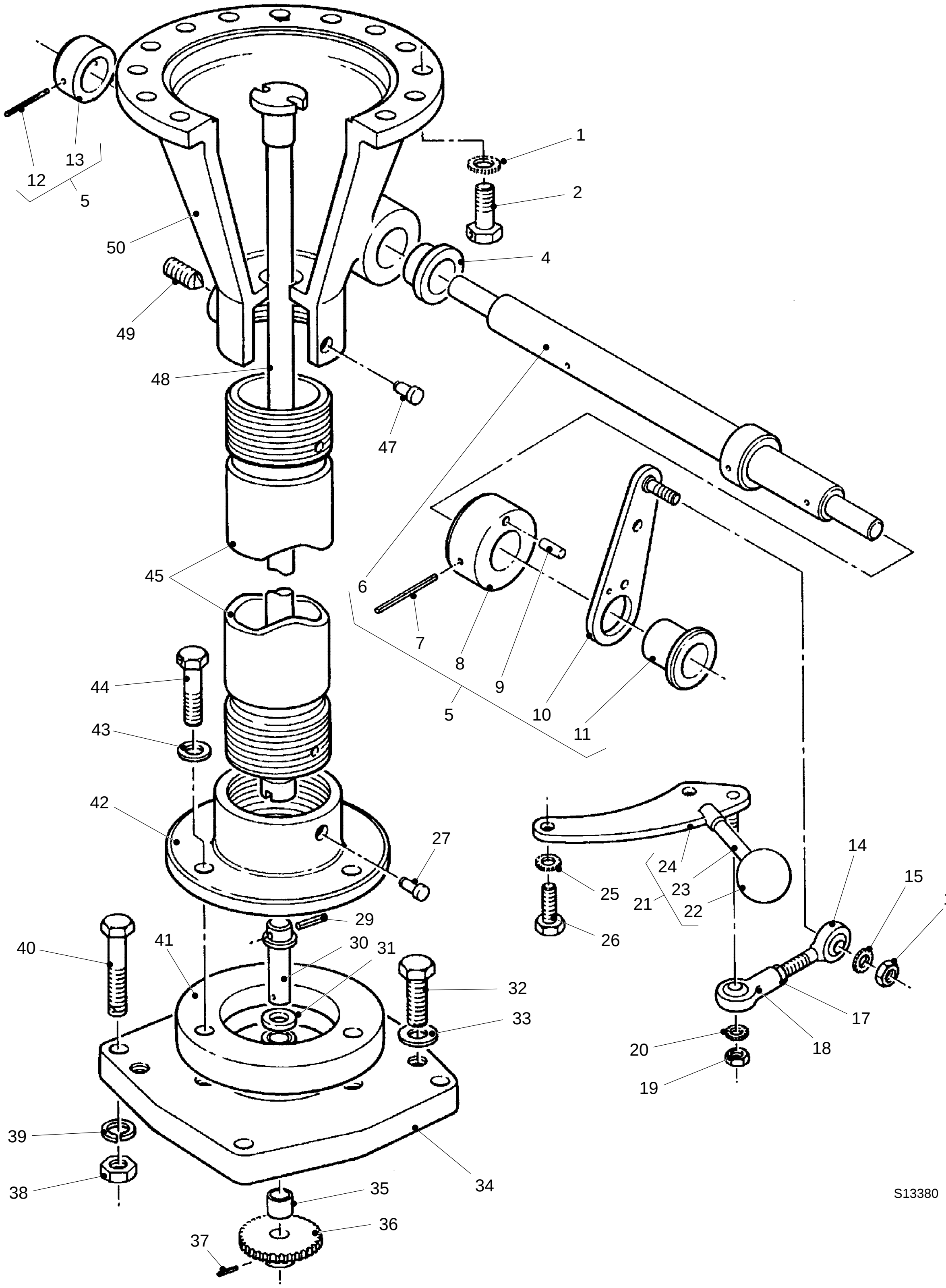
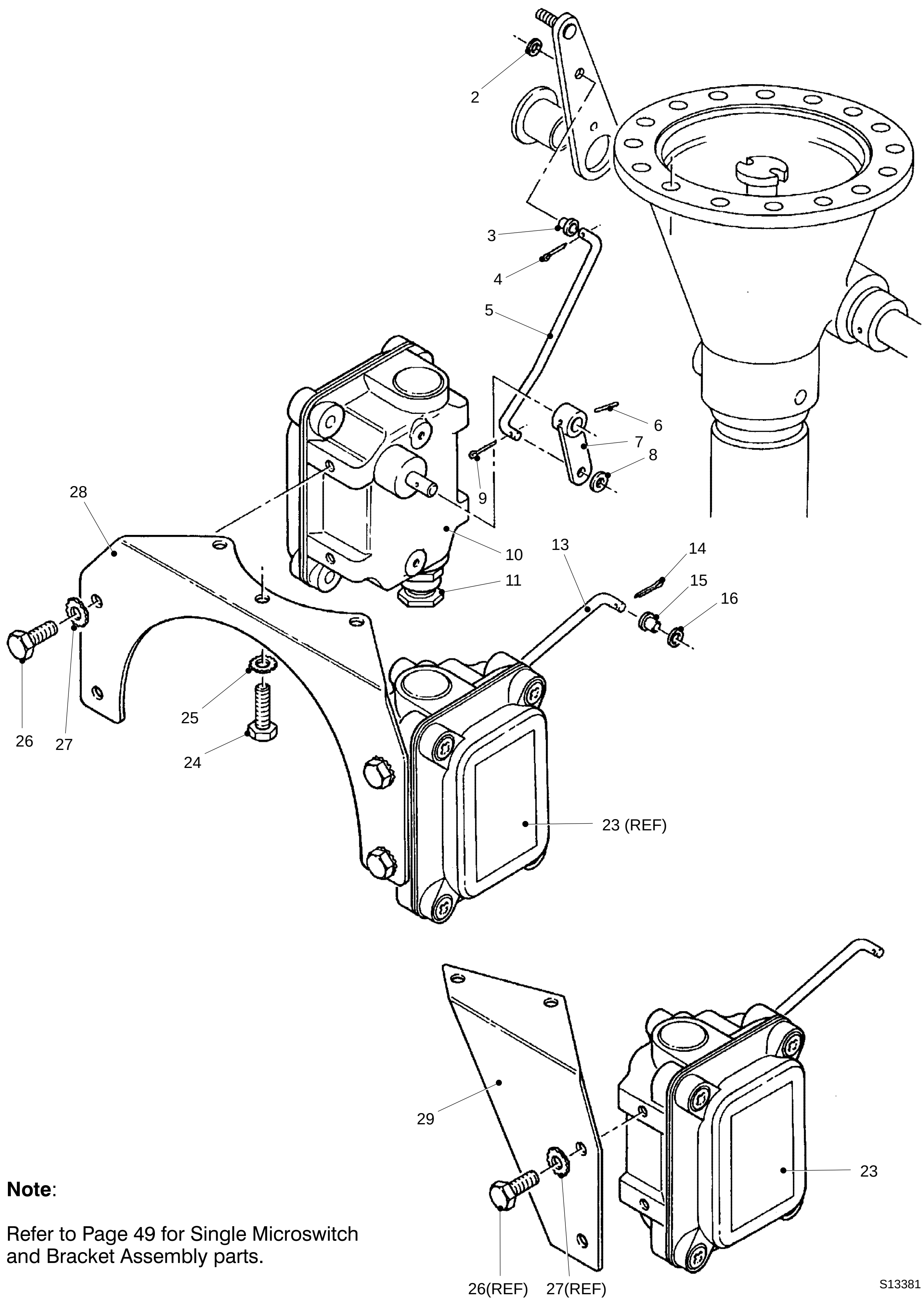


Fig 8.10 Adaptor/control handle – extended preset drive

ADAPTOR/CONTROL HANDLE - EXTENDED PRESET DRIVE (continued)

Fig/ Item No.	Part No.	Description	Qty
8.10-	BMMZ19426-2	- toothed gear coupling	
	BMMZ19426-3	- toothed gear coupling	
	BMMZ19426-6	- plate and pin coupling	
	BMMZ19426-8	- fork coupling	
29	ZT8001E0412A	Tension pin, 1/8 in. dia x 3/4 in. lg	1
30	BMSZ19428	Coupling shaft	1
31	ZAPZ0010-3	Thrust washer	1
32	ZS3228D1208A	Set screw, hex hd, 3/8 in. UNC x 1/2 in. lg	2
33	ZW2201G12A	Washer, plain, 3/8 in. id	2
34	BMAZ17825	Bearing support plate	1
35	ZACZ0062-18	Bush, plain, 1/4 in. id x 3/8 in. od x 3/8 in. lg	2
36	BMCZ1765	Counter drive gear - Imp gal	1
	BMCZ1776	Counter drive gear - US gal	
	BMCZ1759	Counter drive gear - Litres	
	BMCZ1777	Counter drive gear - Decalitres	
+	BMMZ2882	Drive coupling sub-assy - plate and pin (Mk 3 Temp Comp.)	1
+	BMMZ18993	Fork coupling (Vol/Weight Adaptor)	
37	ZT8001E0307A	Tension pin, 3/32 in. dia x 7/16 in. lg	1
38	ZN2201D08A	Nut, 1/4 in. UNC, hex	4
39	ZW8207G08A	Washer, spring, 1/4 in. id	4
40	ZASZ0006-4	Bolt, hex hd, 1/4 in. UNC x 1 3/8 in. lg, drilled shank	4
41	BMRZ1764	Sealing ring	1
42	BMBZ19427	Flange, bottom	1
43	ZW2201G10A	washer, plain, 5/16 in. id	3
44	ZASZ0008-6	Bolt, hex hd, 5/16 in. UNC x 1 1/2 in. lg, drilled head	3
45	BMSZ17533 (see Table 8.6)	Extension tube (Part No. suffix is the same as relevant BMMZ30296- as listed in Table 8.6)	1
46 +	BMMZ16362	Gantry support clamp sub-assy (Refer to Fig 8.13)	1
47	BMSZ19435	Locking pin	1
48	BMMZ17828- (see Table 8.6)	Drive tube sub-assy	1
49	ZS3233D1008A	Grubscrew, 5/16 in. UNC x 1/2 in. lg, hex skt hd, half dog point	1
50	BMAZ30293	Register column adaptor	1

* = Suggested spare part



Note:

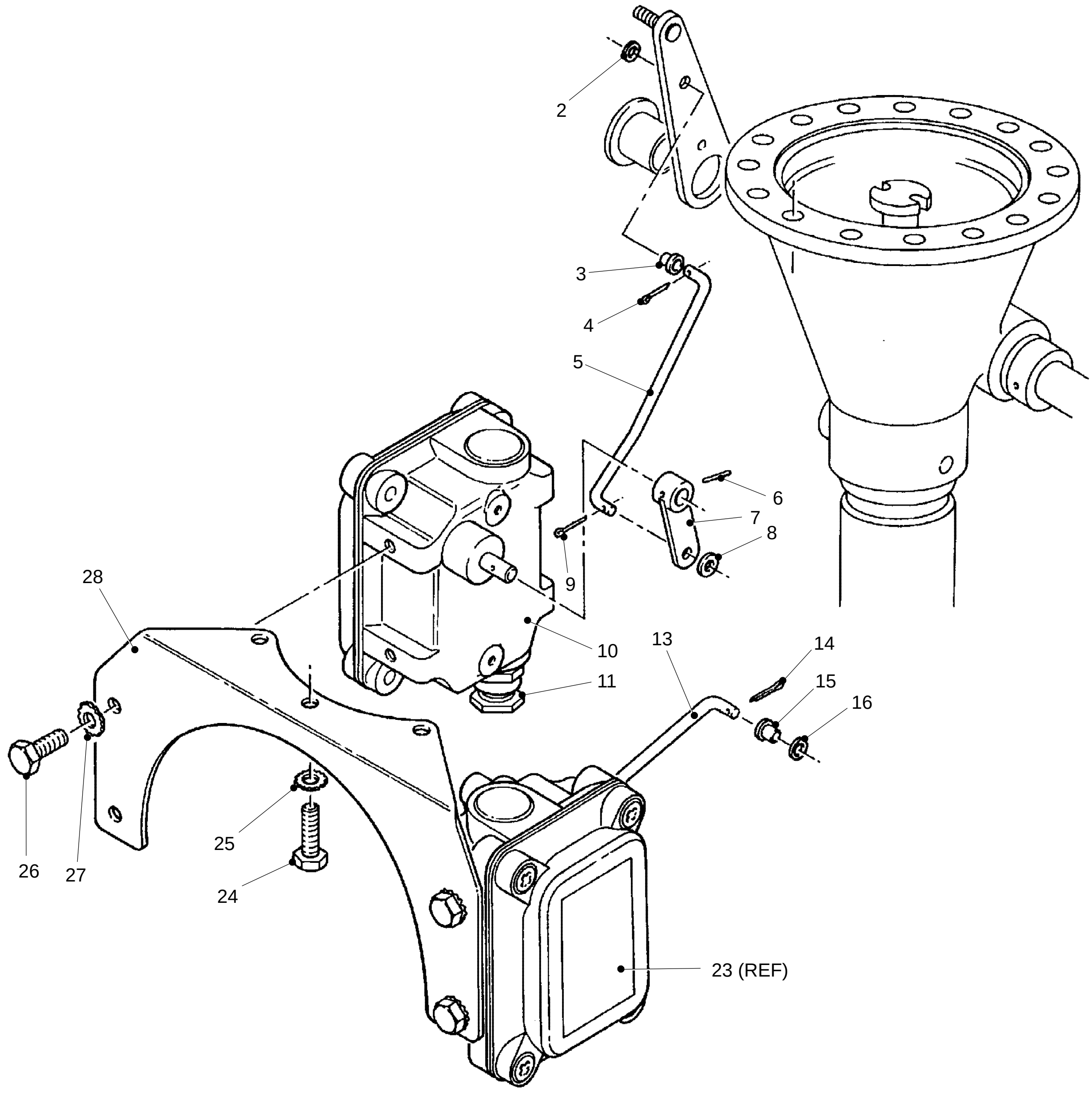
Refer to Page 49 for Single Microswitch and Bracket Assembly parts.

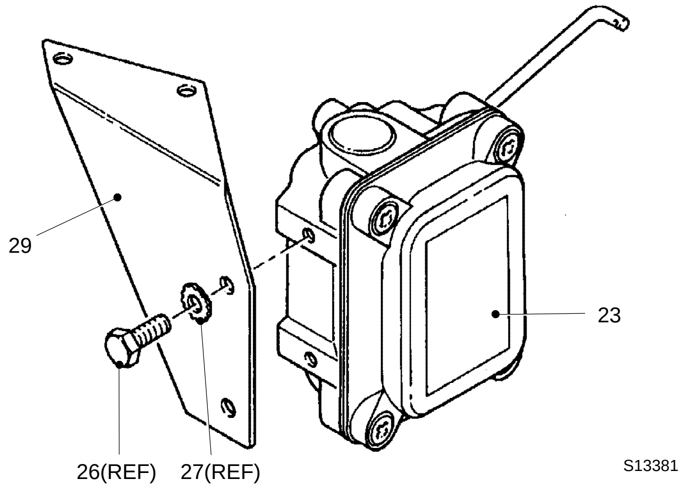
Fig 8.11 Microswitch and bracket assembly

DOUBLE MICROSWITCH AND BRACKET ASSEMBLY

Fig/ Item No.	Part No.	Description	Qty
8.11-			
1 +	BMMZ30268-1	Double microswitch assembly, direct mounted or extended drive	1
2	ZW2201G08A	Washer, plain, 1/4 in. id	1
3	BMPZ30271	Bush	1
4	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
5	BMSZ30270-1	Link	1
6	ZT8001E0308A	Tension pin, 3/32 in. dia x 1/2 in. lg	1
7	MFCZ10-4122	Lever	1
8	ZW2201G06A	Washer, plain, 3/16 in. id	1
9	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
10	BMMZ30272-1	Microswitch sub-assy (pre final shutdown)	1
11	ZMMZ0247-36	Cable gland	1
12 +	MFSZ11-2066	Plug, M20	1
13	BMSZ30270	Link	1
14	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
15	BMPZ30271	Bush	1
16	ZW2201G08A	Washer, plain, 1/4 in. id	1
17 +	ZT8001E0308A	Tension pin, 3/32 in. dia x 1/2 in. lg	1
18 +	MFCZ10-4122	Lever	1
19 +	ZW2201G06A	Washer, plain, 3/16 in. id	1
20 +	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
21 +	ZMMZ0247-36	Cable gland	1
22 +	MFSZ11-2066	Plug, M20	1
23	BMMZ30272	Microswitch sub-assy (final shutdown)	1
24	ZS3228E0814A	Screw, hex hd, 1/4 in. UNF x 7/8 in. lg	3
25	ZW8205G08A	Washer, ext s/proof, 1/4 in. id	3
26	ZS3228E1008A	Screw, hex hd, 5/16 in. UNF x 1/2 in. lg	4
27	ZW8205G10A	Washer, ext s/proof, 5/16 in. id	4
28	BMSZ33106	Bracket	1

* = Suggested spare part





Note:

Refer to Page 49 for Single Microswitch and Bracket Assembly parts.

Fig 8.11 Microswitch and bracket assembly

SINGLE MICROSWITCH AND BRACKET ASSEMBLY

Fig/ Item No.	Part No.	Description	Qty
8.11-			
1 +	BMMZ30268	Single microswitch assembly, direct mounted or extended drive (optional alt. to BMMZ30268-1)	1
13	BMSZ30270	Link	1
14	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
15	BMPZ30271	Bush	1
16	ZW2201G08A	Washer, plain, 1/4 in. id	1
17 +	ZT8001E0308A	Tension pin, 3/32 in. dia x 1/2 in. lg	1
18 +	MFCZ10-4122	Lever	1
19 +	ZW2201G06A	Washer, plain, 3/16 in. id	1
20 +	ZT2206E0208A	Split pin, 1/16 in. dia x 1/2 in. lg	1
21 +	ZMMZ0247-36	Cable gland	1
22 +	MFSZ11-2066	Plug, M20	1
23	BMMZ30272	Microswitch sub-assy (final shutdown)	1
24	ZS3228E0814A	Screw, hex hd, 1/4 in. UNF x 7/8 in. lg	2
25	ZW8205G08A	Washer, ext s/proof, 1/4 in. id	2
26	ZS3228E1008A	Screw, hex hd, 5/16 in. UNF x 1/2 in. lg	2
27	ZW8205G10A	Washer, ext s/proof, 5/16 in. id	2
29	BMSZ30269	Bracket	1

* = Suggested spare part

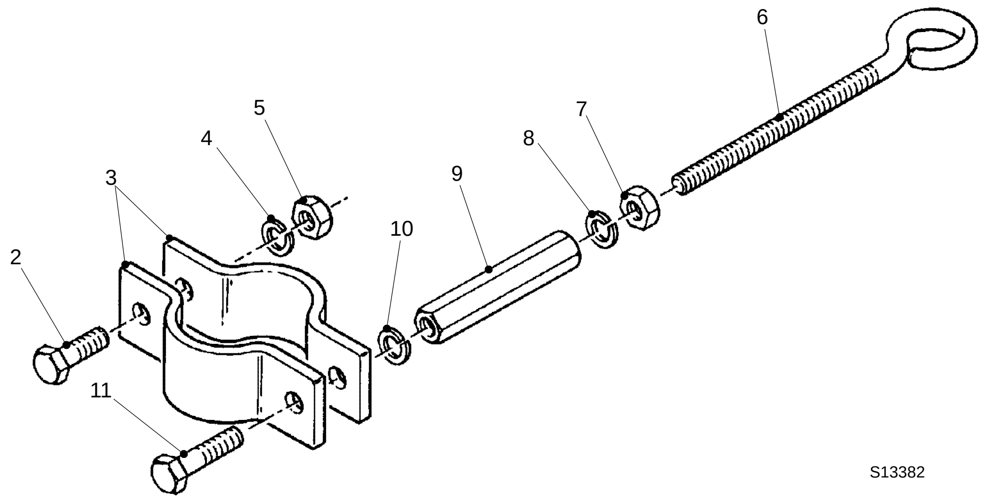


Fig 8.12 Rod guide assembly

ROD GUIDE ASSEMBLY

Fig/ Item No.	Part No.	Description	Qty
1 +	BMMZ19384	Rod guide assembly (standard supply on BMMZ31435 and BMMZ31436 F-9F/K-9K, otherwise special order)	REF
2	ZS3226D1216A	Bolt, hex hd, 3/8 in. UNC x 1 in. lg	1
3	BMSZ10302	Clamp	2
4	ZW8207G12A	Washer, S/Coil spring, 3/8 in. id	1
5	ZN2201D12A	Nut, hex, 3/8 in. UNC	1
6	BMSZ10303	Eye bolt	1
7	ZN2201D12A	Nut, hex, 3/8 in. UNC	1
8	ZW8207G12A	Washer, S/Coil spring, 3/8 in. id	1
9	BMSZ19385	Extension nut	1
10	ZW8207G12A	Washer, S/Coil spring, 3/8 in. id	1
11	ZS3226D1224A	Bolt, hex hd, 3/8 in. UNC x 1 1/2 in. lg	1

* = Suggested spare part

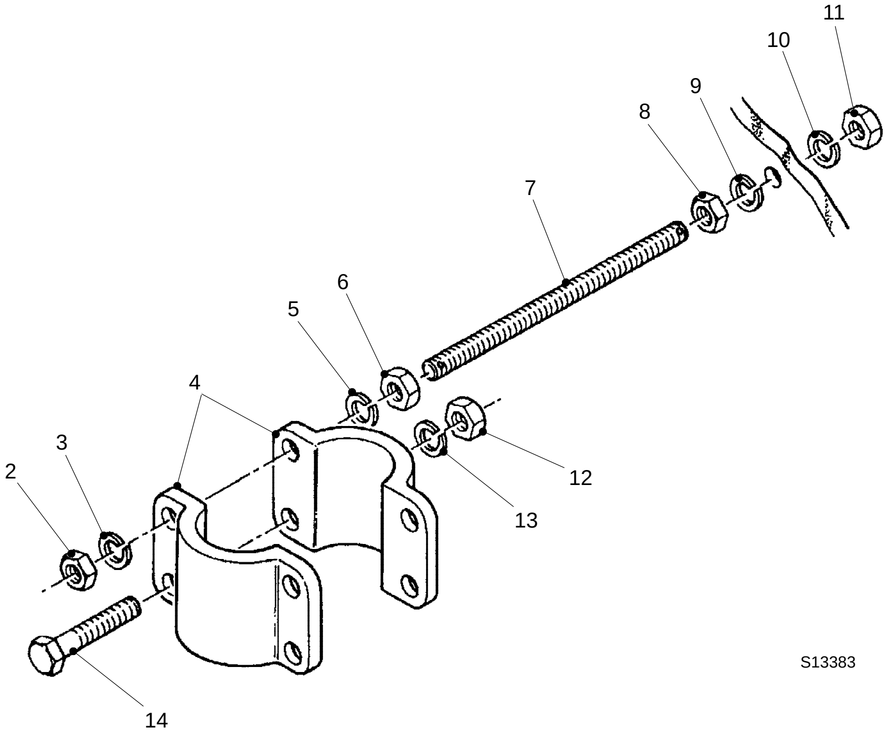


Fig 8.13 Gantry support clamp sub-assembly

GANTRY SUPPORT CLAMP SUB-ASSEMBLY

Fig/ Item No.	Part No.	Description	Qty
1 +	BMMZ16362	Gantry support clamp sub-assembly	REF
2	ZN2201D12A	Nut, hex, 3/8 in. UNC	2
3	ZW8207F12A	Washer, C/Coil spring, 3/8 in. id	2
4	BMAZ5724	Clamp	2
5	ZW8207G12A	Washer, C/Coil spring, 3/8 in. id	2
6	ZN2201D12A	Nut, hex, 3/8 in. UNC	2
7	BMSZ2664	Sealing stud	2
8	ZN2201D12A	Nut, hex, 3/8 in. UNC	2
9	AW8207G12A	Washer, S/Coil spring, 3/8 in. id	2
10	ZW8207G12A	Washer, S/Coil spring, 3/8 in. id	2
11	ZN2201D12A	Nut, hex, 3/8 in. UNC	2
12	ZN2201D12A	Nut, hex, 3/8 in. UNC	2
13	ZW8207G12A	Washer, S/Coil spring, 3/8 in. id	2
14	ZS3226D1232A	Screw, hex hd, 3/8 in. UNC x 2 in. lg	2

* = Suggested spare part

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