# Chapter 34

# PUMP, FUEL, MB022 SERIES

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## LIST OF ILLUSTRATIONS



## LEADING PARTICULARS

| | |
|---|---|
| *Pump* ... ... ... ... ... | *Single stage spur gear positive displacement pump incorporating integral relief valve controlling delivery pressure* |
| *Motor* ... ... ... ... ... | *24V d.c., flame-proof, self contained and bolted to the pump unit* |
| *Current consumption* ... ... ... | ... ... *19 A at 24V d.c. on normal load* |
| | ... ... ... *25 A at 29V d.c. on full load* |
| *Weight of unit* ... ... ... ... | ... ... ... ... *4·25 lb approx* |

### Introduction

**1.** The Plessey MB 022, fig. 1, is an electric ally driven booster pump used for engine priming and for starting gas turbine engines. The pump supplies fuel to the engine until sufficient speed has been attained for the main engine driven pumps to take over, at which point it is switched off.

## DESCRIPTION

**2.** The unit comprises a single-stage spur gear, positive displacement type pump coupled to a 24V .dc. compound motor. A relief valve assembly, which forms the pump cover, permits setting of the maximum delivery pressure .Each unit is supplied with a saddle mounting bracket and strap to facilitate attachment of the unit to the aircraft.

**3.** There are several Mark numbers of the pump, but only one major difference. Mks. 1 to 7, 9, 32 and 33 employ a single face type gland assembly (drive shaft assembly), whilst an improved duplex arrangement (gland assembly) is used in Mks. 23, 26, 27, 29, 30, 34, 35 and 39.

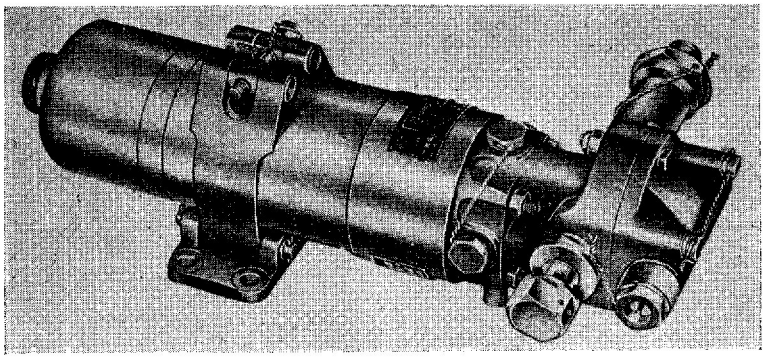


**Fig. 1. General view of pump**

**4.** The remaining differences are concerned with the non-return valve, if fitted, external fittings to suit aircraft installation and variation in relief valve setting.

**Pump unit**

**5.** The pump unit, fig. 2, consists of an aluminium alloy body which houses a drive shaft assembly or gland assembly, two shaft mounted spur gears and the relief valve assembly (pump cover). Two bronze bushes form the journal bearings for the gear shafts, and the pump gears are located on the shafts by steel balls. The gear end of each shaft abuts a steel ball housed in the pump cover to prevent axial movement. A gland drain connection is provided at one of four alternative positions 90 degrees apart.

**Drive shaft assembly (gland seal)**

**6.** The drive shaft assembly, fig. 3, comprises a spring loaded gland seal and thrust plate, located on a drive shaft which is supported by a ball bearing in a housing. A gland sleeve, which houses the gland seal and thrust plate, is secured to the drive shaft with which it rotates. The thrust plate is driven by projections on the sleeve and is sealed by a carbon faced seal in the pump body. A coupling, secured to the drive shaft, transmits the drive from the motor spindle through the drive shaft to the pump driving shaft. The gland seal, spring loaded against the thrust plate, seals the annular space between the gland sleeve and the drive shaft. This spring loading also maintains contact between the thrust plate and the carbon seal.

**Gland assembly**

**7.** The gland assembly, fig. 4, comprises basically a spring loaded, carbon faced seal (thrust washer assembly) which seals on the flanged face of a coupling shaft mounted coaxially within the carbon seal. The carbon seal and the coupling shaft, located in a gland housing, are spring loaded against a P.T.F.E. impregnated thrust plate secured in the pump end of the gland housing. A drive coupling, fitted in the coupling shaft, transmits the drive to the pump driving shaft. A lip-type seal, fitted at the motor end of the coupling shaft prevents leakage to the motor.

**Relief valve assembly**

**8.** The relief valve assembly consists of a cover which houses a spring loaded valve and adjusting screw. The relief valve can be adjusted through a limited range of pressures up to 150 lb/in$^2$. The relief valve is set during manufacture or reconditioning and will not require any further adjustment.

**Non-return valve**

**9.** The non-return valve, fitted to the delivery side of the pump, comprises an aluminium body, threaded internally to accept the inlet and outlet unions, and a spring loaded disc valve. The outlet union provides a seating for the spring, and the valve disc seats on the externally chamfered end of the inlet union. An arrow on the valve body indicates the direction of flow.

**Lubrication**

**10.** Lubrication is provided by the passage of fuel through the pump.

**Motor**

**11.** The 24V d.c. driving motor, fig. 7 is of the flame-proof, totally-enclosed type, having a long shunt compound winding. It is designed to give its rated output on 25V supply

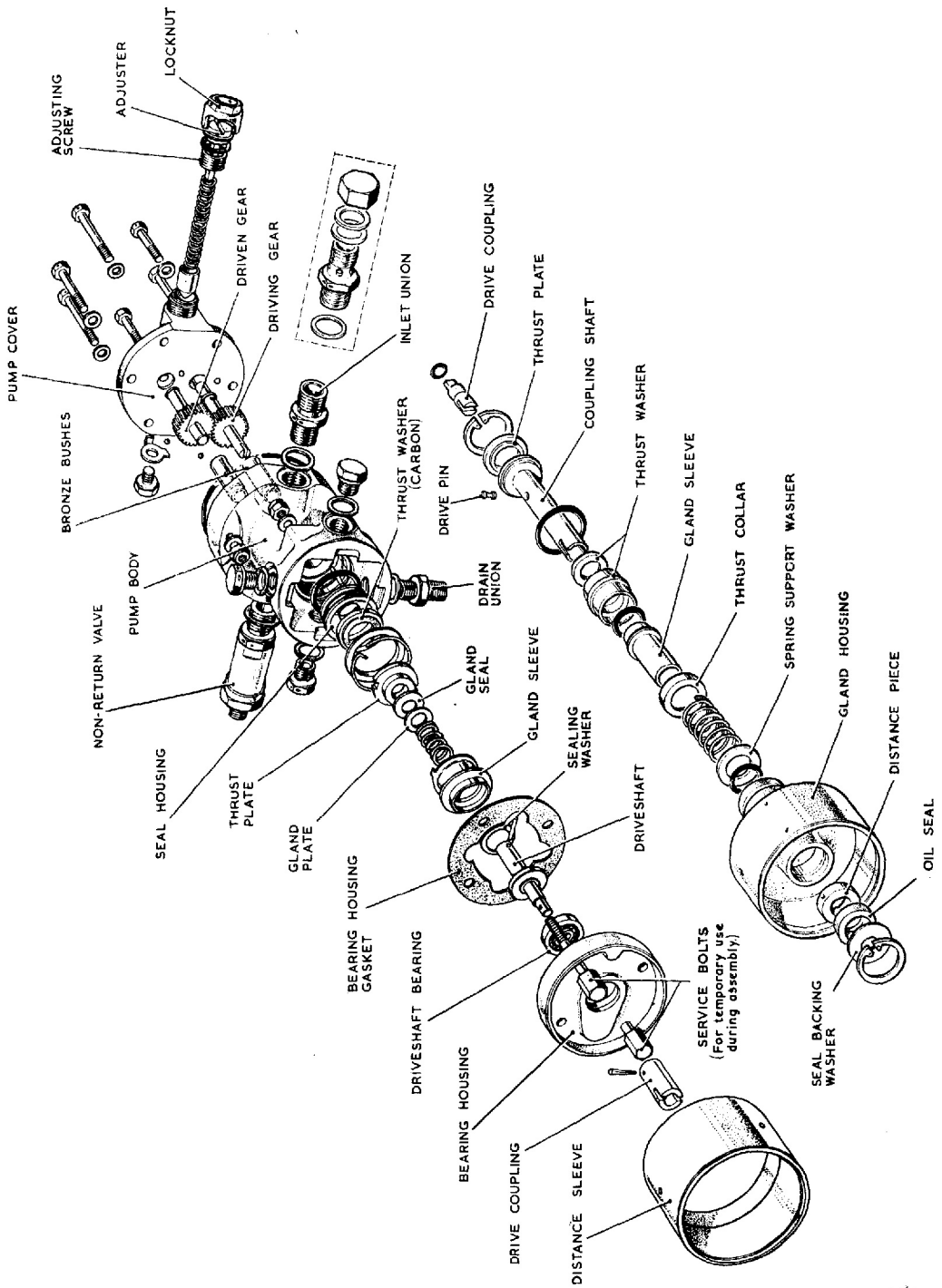



**Fig. 2. Exploded view of pump**

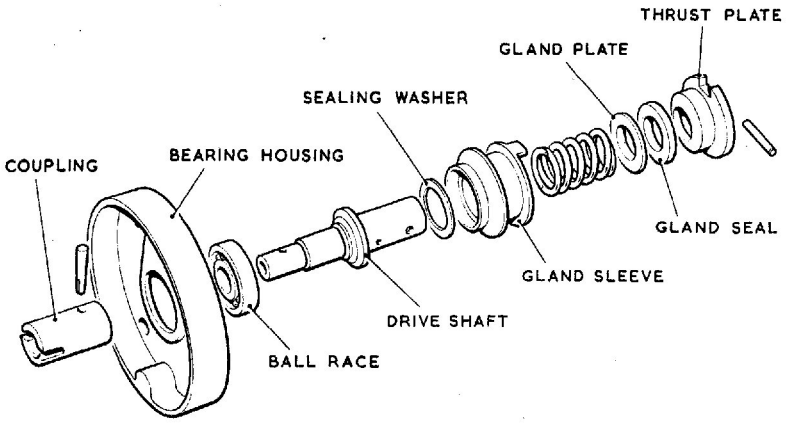



**Fig. 3. Exploded view of drive shaft assembly (gland seal)**

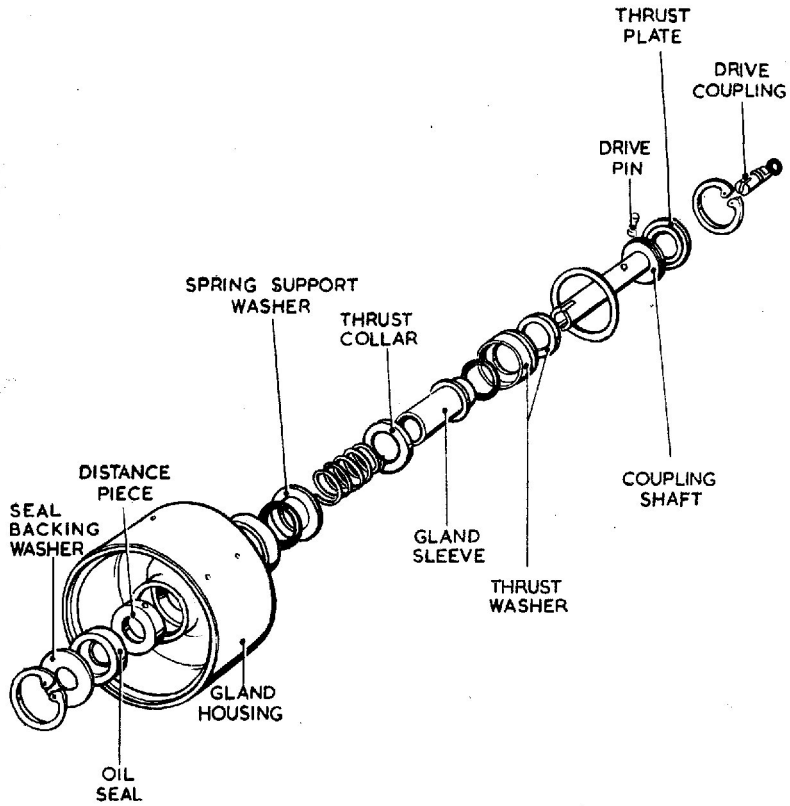
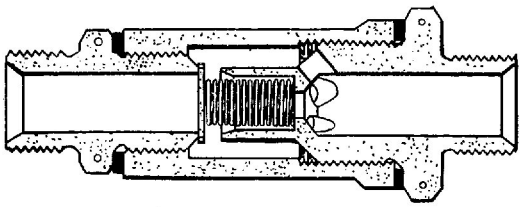
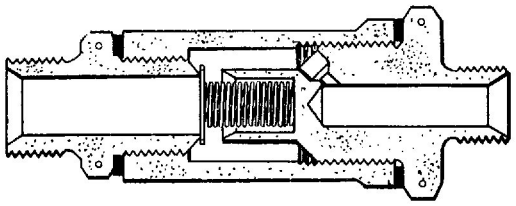



**Fig. 4. Exploded view of gland assembly**



NON-RETURN VALVE
(UNRESTRICTED TYPE)



NON-RETURN VALVE
(RESTRICTED TYPE)

**Fig. 5. Sectional view of alternative non-return valves**

at 13,000 rev/min. It will, however, operate the pump satisfactory at any voltage between 18 and 29V with a maximum current consumption of 25 amperes.

**12.** The machine is constructed with die-cast end plates, the central portion comprising the laminated field coil and magnet assembly. The end plates house two pre-packed ball bearings.

**13.** Electrical supply to the motor is by means of a four-pin Breeze plug connection, projecting through the centre of the end cover. Only plug pins 1 and 2 are used as live connections. A circuit diagram is shown in fig. 6.

**14.** The pump locates on a spigot formed on the motor end plate and is secured by studs, washers and nuts. The drive is transmitted from the drive pin, fitted in the motor spindle shaft coupling (drive shaft assembly) or the coupling shaft (gland assembly).

### Principle of operation

**15.** Pressure is built up within the pump by rotation of the spur gears. When the delivery pressure has been reached, as set by the relief valve, the valve lifts and fluid is allowed to flow back to the inlet side of the pump, thus keeping the pressure constant.

## INSTALLATION

**16.** Install the unit in accordance with instructions contained in the aircraft manual.

**17.** The unit may be fitted in the aircraft in any attitude from the horizontal to the vertical, motor uppermost. The disposition of the inlet and outlet ports may be altered as required by rotating the pump or moving it longitudinally in the saddle strap bracket. In all attitudes of the pump, ensure that the lowest drain port of the four is the one used, transferring the union connection as necessary.

**18.** The drain pipe should fall away continuously from the pump to its point of discharge, to avoid any possibility of a fuel trap and a build up of pressure in the drive shaft housing.

**19.** Using a 24V insulation resistance tester, measure the insulation resistance between live parts and the frame; when a new unit is installed this should not be less than 2 megohms.

## SERVICING

**20.** Check the unit for security.

**21.** Check all pipe connections and wire-locking; correct as necessary.

**22.** Check for excessive gland leakage; this must not exceed 5 c.c. per minute.

**23.** Using a 250V insulation resistance tester, measure the insulation resistance between live parts and the frame; this must not be less than 50,000 ohms.

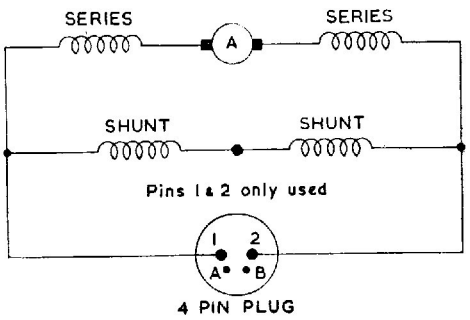



**Fig. 6. Circuit diagram**

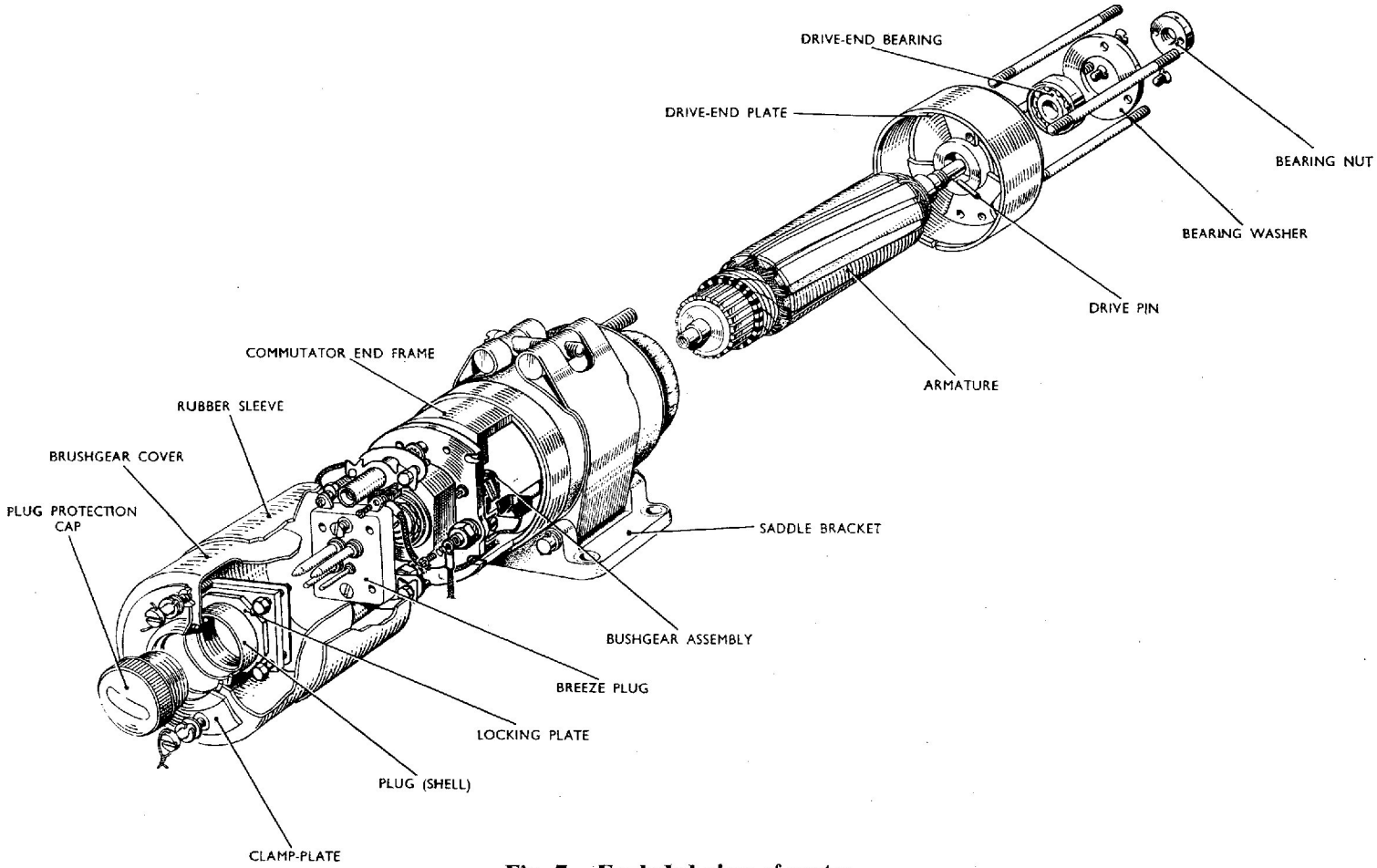



**Fig. 7. Exploded view of motor**

# Appendix 1

# PUMP, FUEL, PLESSEY, MB022 MK. 6

## LEADING PARTICULARS

| | |
|---|---|
| *Pump, Fuel, Plessey, MBO22 Mk. 6* ... ... ... ... ... | *Ref. No. 5UE/6314* |
| *Performance rating of pump* ... ... | 100 *gal/h at* 100 *lb/in²* *max. at* 24*V d.c. using kerosine to Spec. D.Eng.R.D.*2489 |
| *Motor* ... ... ... ... ... | 24*V d.c. flame-proof, self contained and bolted to the pump unit. Intermittent rating* 1 *min. at* 24*V d.c. full load* |
| *Current consumption* ... ... ... ... ... | 19 *amp. at* 24*V d.c. normal load* |
| ... ... | 25 *amp at* 29*V d.c. full load* |
| *Relief valve setting* ... ... ... ... ... ... ... | 130 *to* 150 *lb/in²* |
| *Drive shaft assembly (gland seal)* ... ... ... ... ... ... | *Part No. CV.*8019 |
| *Non-return valve (restrictor type)* ... ... ... ... ... | *Part No. CA.*1072 |
| *Union restrictor* ... ... ... ... ... ... ... ... | *Part No. A.*1073 |
| *Banjo pivot* ... ... ... ... ... ... ... ... | *Part No. V.*10542 |
| *Weight of unit* ... ... ... ... ... ... ... ... | 4·25 *lb approx* |

The MBO22 series of pumps are fully described and illustrated in the main chapter. The Mk. 6 unit employs a restrictor type non-return valve on the delivery side of the pump.

# Appendix 2

# PUMP, FUEL, PLESSEY, MB022, MK. 7

## LEADING PARTICULARS

| | |
|---|---|
| *Pump, Fuel, Plessey, MB022 Mk. 7* | *Ref. No. 5UE/6596* |
| *Performance rating of pump* | 100 *gal/h at* 100 *lb/in²* *max. at* 24*V d.c. using kerosine to Spec. D.Eng.R.D.*2489 |
| *Motor* | 24*V d.c. flame-proof, self contained and bolted to the pump unit. Intermittent rating* 1 *min. at* 24*V d.c. full load* |
| *Current consumption* | 19 *amp. at* 24*V d.c. normal load* |
| | 25 *amp at* 29*V d.c. full load* |
| *Relief valve setting* | 130 *to* 150 *lb/in²* |
| *Drive shaft assembly (gland seal)* | *Part No. CV.*8019 |
| *Inlet union* $\frac{3}{8}$ *in* × $\frac{3}{8}$ *in B.S.P.* | *Part No. V.*8972 |
| *Outlet union* $\frac{1}{4}$ *in* × $\frac{3}{8}$ *in (special)* | *Part No. A.*1100 |
| *Weight of unit* | 4·25 *lb approx* |

The MBO22 series of pumps are fully described and illustrated in the main chapter. The Mk. 7 unit has no requirement for a non-return valve and a saddle bracket is not fitted.

# Appendix 3

# PUMP, FUEL, PLESSEY, MB022 MK. 35

## LEADING PARTICULARS

| | |
|---|---|
| *Pump, Fuel, Plessey, MB022 Mk. 35* | *Ref. No. 5UE/6711* |
| *Performance rating of pump* | 100 *gal/h at* 100 *lb/in²* *max. at* 24*V d.c. using kerosine to Spec. D.Eng.R.D.*2489 |
| *Motor* | 24*V d.c. flame-proof, self contained and bolted to the pump unit. Intermittent rating* 1 *min. at* 24*V d.c. full load* |
| *Current consumption* | 19 *amp. at* 24*V d.c. normal load* |
| | 25 *amp at* 29*V d.c. full load* |
| *Relief valve setting* | 115 *to* 120 *lb/in²* |
| *Gland assembly (duplex)* | *Part No. CA.*1204 |
| *Non-return valve (free-flow)* | *Part No. CA.*2642 |
| *Union* $\frac{1}{2}$ *in B.S.P.* × $\frac{1}{2}$ *in U.N.F.* | *Part No. A.*2644 |
| *Weight of unit* | 4·25 *lb approx* |

The MBO22 series of pumps are fully described and illustrated in the main chapter. The Mk. 35 unit employs a free-flow type non-return valve on the delivery side of the pump.

# Appendix 4

# PUMP, FUEL, PLESSEY, MB022 MK. 39

## LEADING PARTICULARS

| | |
|---|---|
| *Pump, Fuel, Plessey, MB022 Mk. 39* | *Ref. No. 5UE/6753* |
| *Performance rating of pump* | 120 *gal/h at* 40 *lb/in² max. at* 24*V d.c. using kerosine to Spec. D.Eng.R.D.*2482 |
| *Motor* | 24*V d.c. flame-proof, self contained and bolted to the pump unit. Intermittent rating* 1 *min. at* 24*V d.c. full load* |
| *Current consumption* | 19 *amp. at* 24*V d.c. normal load* |
| | 25 *amp at* 29*V d.c. full load* |
| *Relief valve setting* | 68 *to* 73 *lb/in²* |
| *Gland assembly (duplex)* | *Part No. CA.*1204 |
| *Non-return valve (free-flow)* | *Part No. CA.*2642 |
| *Union* $\frac{1}{2}$ *in B.S.P.* × $\frac{1}{2}$ *in U.N.F.* | *Part No. A.*2644 |
| *Weight of unit* | 4·25 *lb approx* |

The MBO22 series of pumps are fully described and illustrated in the main chapter. The Mk. 39 unit employs a free-flow type non-return valve on the delivery side of the pump.



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