Publication No. 9-UH1

PUMA PUMP

SERIES III & IV

MACHINERY WORLD

USER HANDBOOK

THE A.P.V. COMPANY LIMITED · MANOR ROYAL · CRAWLEY · SUSSEX
Telephone CRAWLEY 27777 : Telex 87237 : Telegrams ANACLASTIC CRAWLEY TELEX

A.P.V. PUMA PUMP

Customer :

Order No. :

A.P.V. W/O No.

Size & Type :

Connections : Suction : Discharge :

Type of seal :

Impeller Size : Code No:

Motor : Code No:

H.P.
Voltage:
Phase:
Cycles:

Pump Code No: Duty :

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AMENDMENT RECORD SHEET

Incorporation of an amendment in this publication is to be recorded by signing in the appropriate column and inserting the date of making the amendment.

A.L.	Amended by	Date	A.L.	Amended by	Date
-	Initial Issue	1/11/70	16		
1	Incorporated in reprint	31/3/72	17		
2			18		
3			19		
4			20		
5			21		
6			22		
7			23		
8			24		
9			25		
10			26		
11			27		
12			28		
13			29		
14			30		
15			31		

NOTE TO READERS

GENERAL

1. This handbook is designed to provide all the information necessary to maintain the Puma pump in a serviceable condition. It should be used in conjunction with the relevant component manufacturer's manuals.

AMENDMENT SERVICE

2. An Amendment List (A.L.) system will maintain the technical accuracy of this handbook. Each leaf of an A.L. will bear the A.L. serial number and date of issue.

3. Amendments to this handbook will be supplied by our Technical Publications Department to A.P.V. Co. agents and associated companies.

ASSOCIATED PUBLICATIONS

4. For technical literature pertaining to components not manufactured by the A.P.V. Company Limited, reference should be made to the handbooks issued by the applicable component manufacturers.

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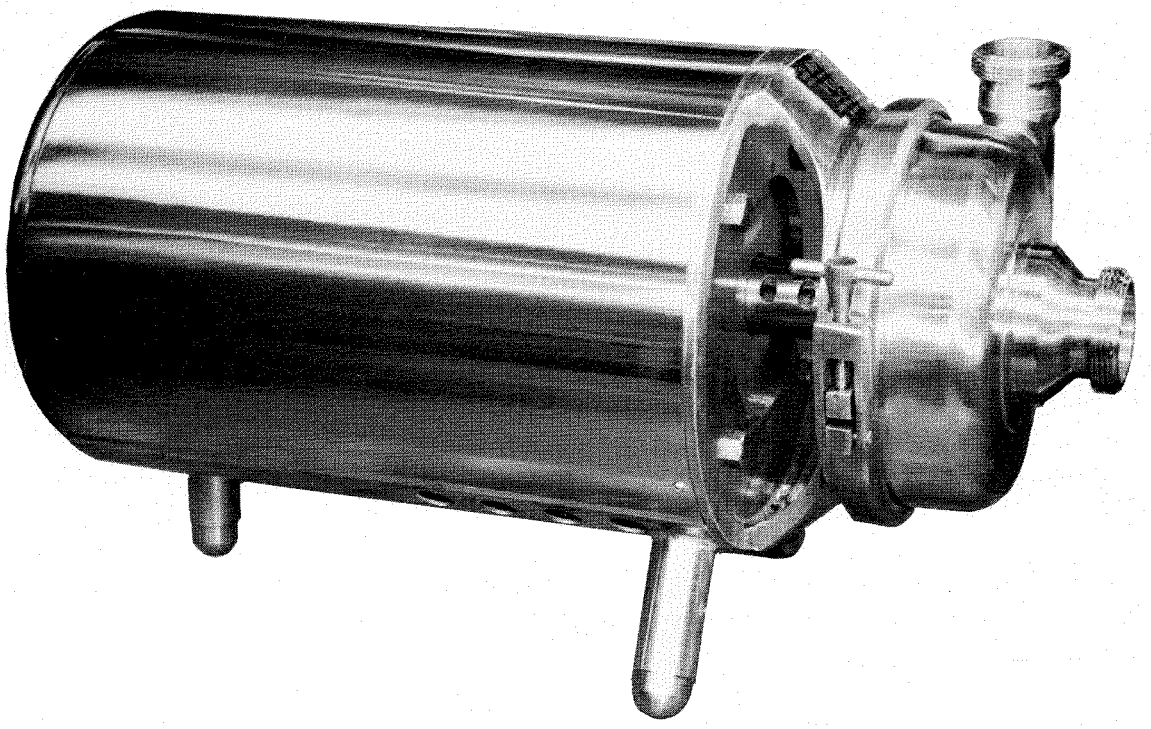
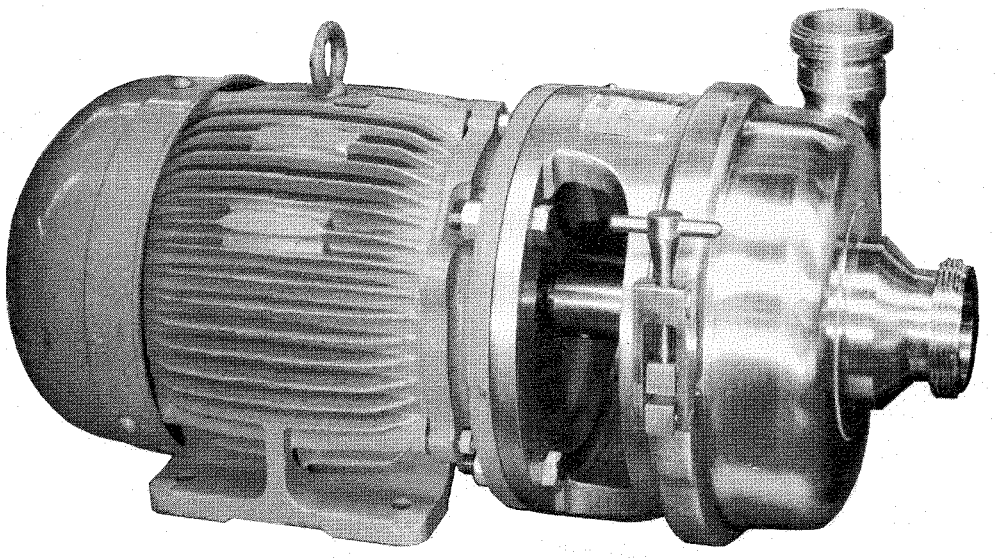


SHROUDED PUMP



UNSHROUDED PUMP

Frontispiece

(9-UH1/11-70)

INTRODUCTION

MANUAL CONTENT

1. The information contained in this handbook applies equally to Series III and IV Puma pumps except where specifically stated, and comprises description, operation, installation and maintenance instructions, together with illustrated parts lists.

PUMP SIZES

2. A Puma pump is designated by figure groups, for example 2/3/9, which refers to the nominal diameter in inches of discharge connection, suction connection and pump body respectively. Each size of pump can accommodate motors of alternative power ratings, while pump capacity alterations are effected by fitment of different diameter impellers.

PUMP ORDERING

3. A Puma pump comprises three basic coded units, i.e. pump, impeller and motor. Therefore to order a complete pump three separate code numbers must be quoted. Code numbers for ordering purposes are quoted in the parts lists at the rear of this handbook.

DATA

4. For technical data pertaining to pumps, associated components and systems, refer to Leading Particulars at the front of this handbook.

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SECTION 4 - ILLUSTRATED PARTS LISTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (contd)

LEADING PARTICULARS

PUMP

Type	Hygienic, centrifugal, direct-coupled, motor driven
Performance	See separately published Data Sheets for applicable pump
Operating temperature	Normal continuous operation up to 90°C (194°F) subject to product and sealing ring material
Water cooled (Series III)	
Water flow rate	13 to 23 l/h (3 to 5 gal/h)
Water pressure	0·7 kgf/cm^2 (10 lbf/in^2) MAX
Steam sterilized (Series IV)	
Steam pressure	2·1 kgf/cm^2 (30 lbf/in^2)
Dimensions, Weights, Case sizes	see pages 18 to 23

SEALS

Flexibox (Series III)	
Type	Mechanical
Operating temperature	-50° to 204°C (-58° to 400°F)
Crane stuffing box (Series III)	
Type	Gland
Cyclam water (Series III)	
Type	Mechanical, short working length
Cyclam aseptic (Series IV)	
Type	Mechanical, short working length

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LEADING PARTICULARS (contd)

MOTOR

Brook

Type	.. ..	Totally enclosed, fan-cooled, squirrel-cage

Specifications

B.S.3979 } Metric	.. ..	Dimensions
B.S.2613 } Series	.. ..	Performance
B.S.2757 }	.. ..	Insulation - class E

Voltage range	.. .. ..	220/380 - 420V 220/380V 380/420V } 50 or 60 cycles, 3-phase a.c. supply
Starting	.. ..	Direct-on-line (D.O.L.) or Star-delta (S.D.)
Rating	.. ..	Continuous maximum
Synchronous speed	.. ..	3000/3600 rev/min
Direction of rotation	.. ..	Counter-clockwise (viewed from impeller end of pump)
Operating temperature	.. ..	75°C (167°F) MAX

Measured by resistance method in ambient temperature not exceeding 40°C (104°F) at altitudes up to 1000 m (3 300 ft) above sea level.

Weights and case sizes are shown on page 24

STARTER UNIT

Crabtree type	.. .. ..	Air break, compensated overload release units, no-volt protection
B.15	.. .. ..	Direct-on-line (D.O.L.)
B.26	.. .. ..	Star-delta (S.D.)

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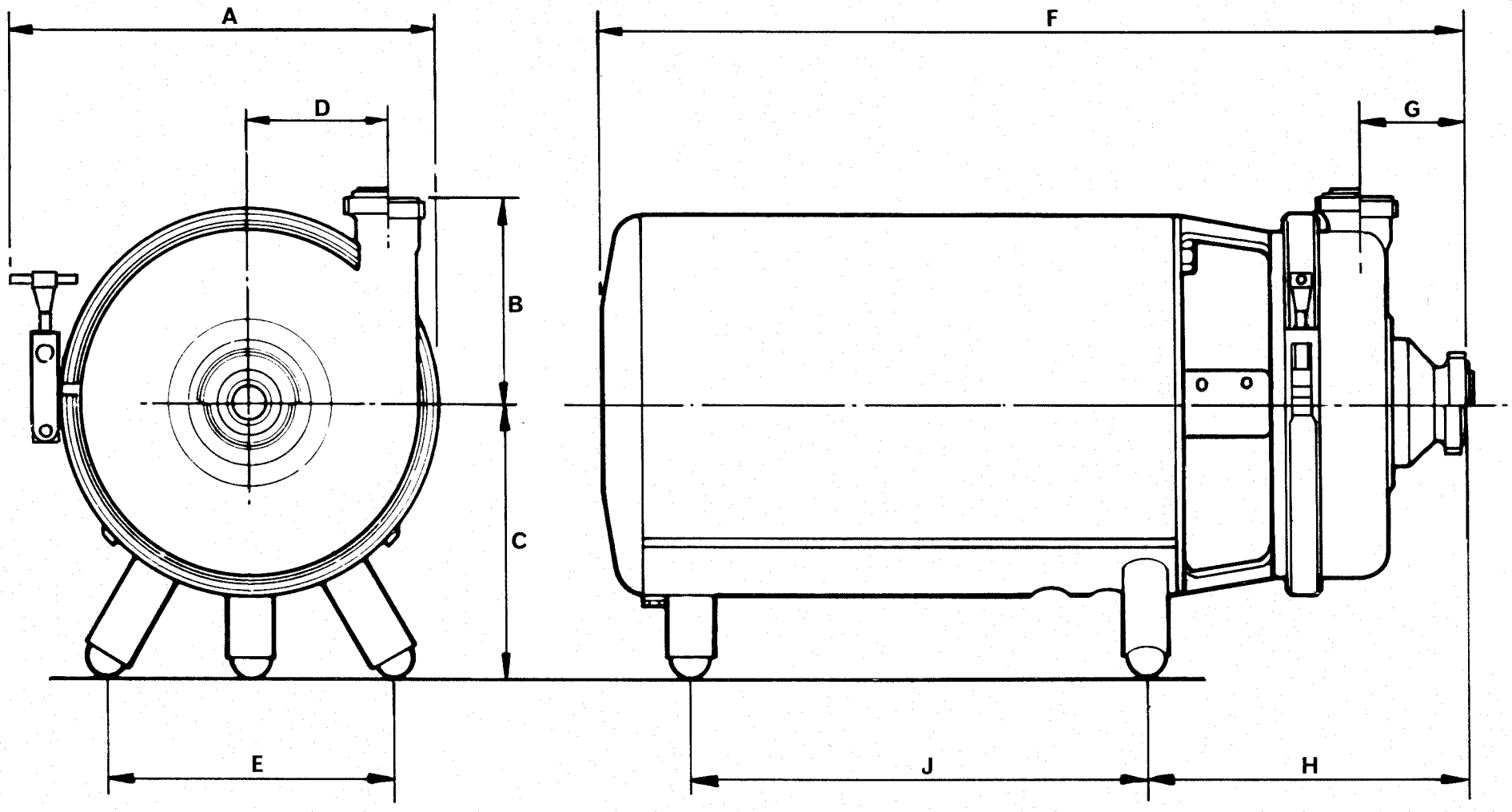


SHROUDED PUMP

General arrangement (1)

(9-UH1/11-70)

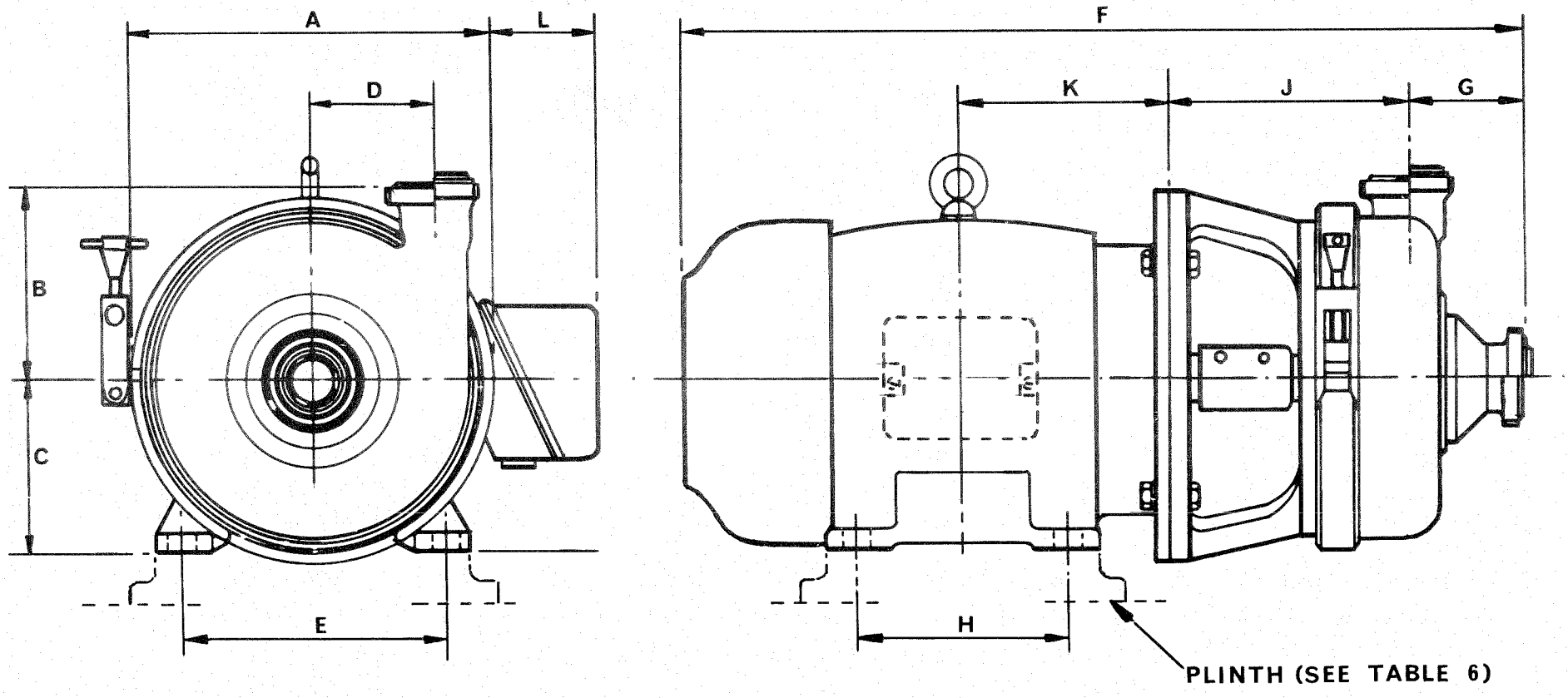
LEADING PARTICULARS (contd)

TABLE 1 DIMENSIONS - SHROUDED PUMP (General arrangement 1)

Pump size	Motor h.p.	Dimensions - mm approx. (in.)									
		A	B	C		D	E (ctrs)	F	G	H	J (ctrs)
				min	max						
2/2/9	3, 5·5	322 (12 11/16)	151 (5 15/16)	229 (9)	254 (10)	97 (3 13/16)	244 (9 5/8)	714 (28 1/8)	87 (3 7/16)	254 (10)	394 (15 1/2)
2/2½/9	3, 5·5	322 (12 11/16)	151 (5 15/16)	229 (9)	254 (10)	97 (3 13/16)	244 (9 5/8)	714 (28 1/8)	87 (3 7/16)	254 (10)	394 (15 1/2)
	7·5, 10	322 (12 11/16)	151 (5 15/16)	229 (9)	254 (10)	97 (3 13/16)	244 (9 5/8)	741 (29 5/32)	87 (3 7/16)	280 (11 1/32)	394 (15 1/2)
2/3/9	3, 5·5	322 (12 11/16)	151 (5 15/16)	229 (9)	254 (10)	94 (3 11/16)	244 (9 5/8)	714 (28 1/8)	87 (3 7/16)	254 (10)	394 (15 1/2)
	7·5, 10	322 (12 11/16)	151 (5 15/16)	229 (9)	254 (10)	94 (3 11/16)	244 (9 5/8)	741 (29 5/32)	87 (3 7/16)	280 (11 1/32)	394 (15 1/2)
2/3/11	5·5	322 (12 11/16)	176 (6 15/16)	229 (9)	254 (10)	122 (4 13/16)	244 (9 5/8)	714 (28 1/8)	87 (3 7/16)	254 (10)	394 (15 1/2)
	7·5, 10	322 (12 11/16)	176 (6 15/16)	229 (9)	254 (10)	122 (4 13/16)	244 (9 5/8)	741 (29 5/32)	87 (3 7/16)	280 (11 1/32)	394 (15 1/2)

Note...

Where appropriate, dimensions are for pumps with ISS type fittings ; for pumps with alternative fittings, dimensions will vary slightly.



UNSHROUDED PUMP

General arrangement (2)

(9-UH1/11-70)

LEADING PARTICULARS (contd)

TABLE 2 DIMENSIONS - UNSHROUDED PUMP (General arrangement 2)

Pump size	Motor h.p.	Dimensions - mm approx. (in.)										
		A	B	C	D	E (ctrs)	F	G	H (ctrs)	J	K	L
2/2/9	3	268 (10 9/16)	151 (5 15/16)	89 (3 1/2)	97 (3 13/16)	140 (5 1/2)	520 (20 1/2)	87 (3 7/16)	125 (4 15/16)	157 (6 3/16)	119 (4 11/16)*	-
	5·5	268 (10 9/16)	151 (5 15/16)	112 (4 13/32)	97 (3 13/16)	190 (7 1/2)	573 (22 9/16)	87 (3 7/16)	140 (5 1/2)	157 (6 3/16)	140 (5 1/2)	63 (2 1/2)
2/2½/9	3	268 (10 9/16)	151 (5 15/16)	90 (3 9/16)	97 (3 13/16)	140 (5 1/2)	521 (20 1/2)	87 (3 7/16)	125 (4 15/16)	157 (6 3/16)	119 (4 11/16)*	-
	5·5	268 (10 9/16)	151 (5 15/16)	112 (4 13/32)	97 (3 13/16)	190 (7 1/2)	573 (22 9/16)	87 (3 7/16)	140 (5 1/2)	157 (6 3/16)	140 (5 1/2)	63 (2 1/2)
	7·5, 10	300 (11 13/16)	151 (5 15/16)	132 (5 3/16)	97 (3 13/16)	216 (8 1/2)	648 (25 1/2)	87 (3 7/16)	140 (5 1/2)	183 (7 7/32)	159 (6 1/4)	54 (2 1/8)
2/3/9	3	268 (10 9/16)	151 (5 15/16)	90 (3 9/16)	94 (3 11/16)	140 (5 1/2)	521 (20 1/2)	87 (3 7/16)	125 (4 15/16)	157 (6 3/16)	119 (4 11/16)*	-
	5·5	268 (10 9/16)	151 (5 15/16)	112 (4 13/32)	94 (3 11/16)	190 (7 1/2)	573 (22 9/16)	87 (3 7/16)	140 (5 1/2)	157 (6 3/16)	140 (5 1/2)	63 (2 1/2)
	7·5, 10	300 (11 13/16)	151 (5 15/16)	132 (5 3/16)	94 (3 11/16)	216 (8 1/2)	648 (25 1/2)	87 (3 7/16)	140 (5 1/2)	183 (7 7/32)	159 (6 1/4)	54 (2 1/8)
	15, 20	350 (13 25/32)	151 (5 15/16)	160 (6 5/16)	94 (3 11/16)	254 (10)	806 (31 3/4)	87 (3 7/16)	210 (8 9/32)	223 (8 25/32)	213 (8 3/8)	86 (3 3/8)
2/3/11	5·5	317 (12 1/2)	176 (6 15/16)	112 (4 13/32)	122 (4 13/16)	190 (7 1/2)	573 (22 9/16)	87 (3 7/16)	140 (5 1/2)	157 (6 3/16)	140 (5 1/2)	38 (1 1/2)
	7·5, 10	317 (12 1/2)	176 (6 15/16)	132 (5 3/16)	122 (4 13/16)	216 (8 1/2)	648 (25 1/2)	87 (3 7/16)	140 (5 1/2)	183 (7 7/32)	159 (6 1/4)	45 (1 25/32)
	15,20	350 (13 25/32)	176 (6 15/16)	160 (6 5/16)	122 (4 13/16)	254 (10)	806 (31 3/4)	87 (3 7/16)	210 (8 9/32)	223 (8 25/32)	213 (8 3/8)	86 (3 3/8)

Note...

(1) Where appropriate, dimensions are for pumps with Brook motors and ISS type fittings; for pumps with alternative motors and/or fittings, dimensions will vary slightly.

(2) Eyebolt not fitted to motors marked thus * in column K.

TABLE 3 WEIGHTS AND CASE SIZES - SHROUDED PUMP

Pump size	Motor h.p.	Weight - kg (lb)		Case dimensions mm (in.)		
		Net	Gross	Length	Width	Height
2/2/9	3	65 (143)	104 (229)	813 (32)	406 (16)	508 (20)
	5·5	87 (191)	125 (276)	813 (32)	406 (16)	508 (20)
2/2½/9	3	66 (145)	105 (231)	864 (34)	456 (18)	508 (20)
	5·5	87 (192)	126 (277)	864 (34)	456 (18)	508 (20)
	7·5	93 (206)	140 (308)	914 (36)	456 (18)	508 (20)
	10	101 (222)	152 (336)	914 (36)	456 (18)	508 (20)
2/3/9	3	67 (147)	106 (233)	864 (34)	456 (18)	508 (20)
	5·5	88 (193)	126 (278)	864 (34)	456 (18)	508 (20)
	7·5	99 (218)	145 (320)	914 (36)	456 (18)	508 (20)
	10	105 (232)	155 (342)	914 (36)	456 (18)	508 (20)
2/3/11	5·5	94 (207)	132 (292)	864 (34)	456 (18)	559 (22)
	7·5	105 (232)	151 (334)	914 (36)	456 (18)	559 (22)
	10	112 (246)	161 (356)	914 (36)	456 (18)	559 (22)

Note...

(1) Weights and case sizes are approximate.

(2) Gross weights include packing and case.

LEADING PARTICULARS (contd)

TABLE 4 WEIGHTS AND CASE SIZES - UNSHROUDED PUMP

Pump size	Motor h.p.	Weight kg (lb)		Case dimensions mm (in.)		
		Net	Gross	Length	Width	Height
2/2/9	3	54 (118)	92 (203)	660 (26)	508 (20)	432 (17)
	5·5	75 (166)	114 (251)	711 (28)	508 (20)	432 (17)
2/2½/9	3	54 (120)	93 (206)	660 (26)	508 (20)	432 (17)
	5·5	76 (167)	114 (252)	711 (28)	508 (20)	432 (17)
	7·5	84 (186)	131 (288)	762 (30)	508 (20)	432 (17)
	10	93 (206)	143 (316)	762 (30)	508 (20)	457 (18)
2/3/9	3	55 (122)	94 (207)	660 (26)	508 (20)	432 (17)
	5·5	76 (168)	114 (252)	711 (28)	508 (20)	432 (17)
	7·5	90 (198)	136 (300)	762 (30)	508 (20)	432 (17)
	10	101 (223)	146 (322)	762 (30)	508 (20)	457 (18)
	15	166 (365)	213 (470)	965 (38)	610 (24)	508 (20)
	20	178 (392)	228 (503)	965 (38)	610 (24)	508 (20)
2/3/11	5·5	83 (182)	121 (266)	711 (28)	508 (20)	432 (17)
	7·5	96 (212)	143 (315)	762 (30)	508 (20)	457 (18)
	10	108 (237)	152 (335)	762 (30)	508 (20)	457 (18)
	15	172 (380)	220 (485)	965 (38)	610 (24)	508 (20)
	20	184 (406)	235 (517)	965 (38)	610 (24)	508 (20)

Note...
(1) Weights and case sizes are approximate.
(2) Gross weights include packing and case.

TABLE 5 MOTOR WEIGHTS AND CASE SIZES

Frame size and h.p.	Weight kg (lb)		Case dimensions mm (in.)		
	Net	Gross	Length	Width	Height
D 90 LD (3 h.p.)	20·86 (46)	22·22 (49)	381 (15)	228 (9)	254 (10)
D 112 MD (5·5 h.p.)	49·89 (110)	51·70 (114)	457 (18)	330 (13)	330 (13)
D 132 SD (7·5 and 10 h.p.)	65·31 (144)	70·76 (156)	584 (23)	406 (16)	330 (13)
D 160 MD (15 and 20 h.p.)	128·82 (284)	137·89 (304)	736 (29)	508 (20)	406 (16)

Note: Weights and case sizes are approximate.

TABLE 6 PLINTH DIMENSIONS (unshrouded pump)

Pump size	Motor h.p.	Plinth dimensions mm (in.)			Holding down bolts nominal size mm (in.)
		Height (min)	Width (approx)	Length (approx)	
2/2/9	3	70 (2 3/4)	305 (12)	254 (10)	10 (3/8)
	5·5	51 (2)	330 (13)	254 (10)	12 (15/32)
2/2½/9	3	70 (2 3/4)	305 (12)	254 (10)	10 (3/8)
	5·5	51 (2)	330 (13)	305 (12)	12 (15/32)
	7·5, 10	44 (1 3/4)	381 (15)	305 (12)	12 (15/32)
2/3/9	3	70 (2 3/4)	305 (12)	254 (10)	10 (3/8)
	5·5	51 (2)	330 (13)	254 (10)	12 (15/32)
	7·5, 10	44 (1 3/4)	381 (15)	305 (12)	12 (15/32)
	15, 20	38 (1½)	432 (17)	356 (14)	15 (9/16)
2/3/11	5·5	76 (3)	330 (13)	254 (10)	12 (15/32)
	7·5, 10	51 (2)	381 (15)	305 (12)	12 (15/32)
	15, 20	38 (1½)	432 (17)	356 (14)	15 (9/16)

dia x 38 mm (1½ in) long

SECTION 1 - DESCRIPTION AND OPERATION

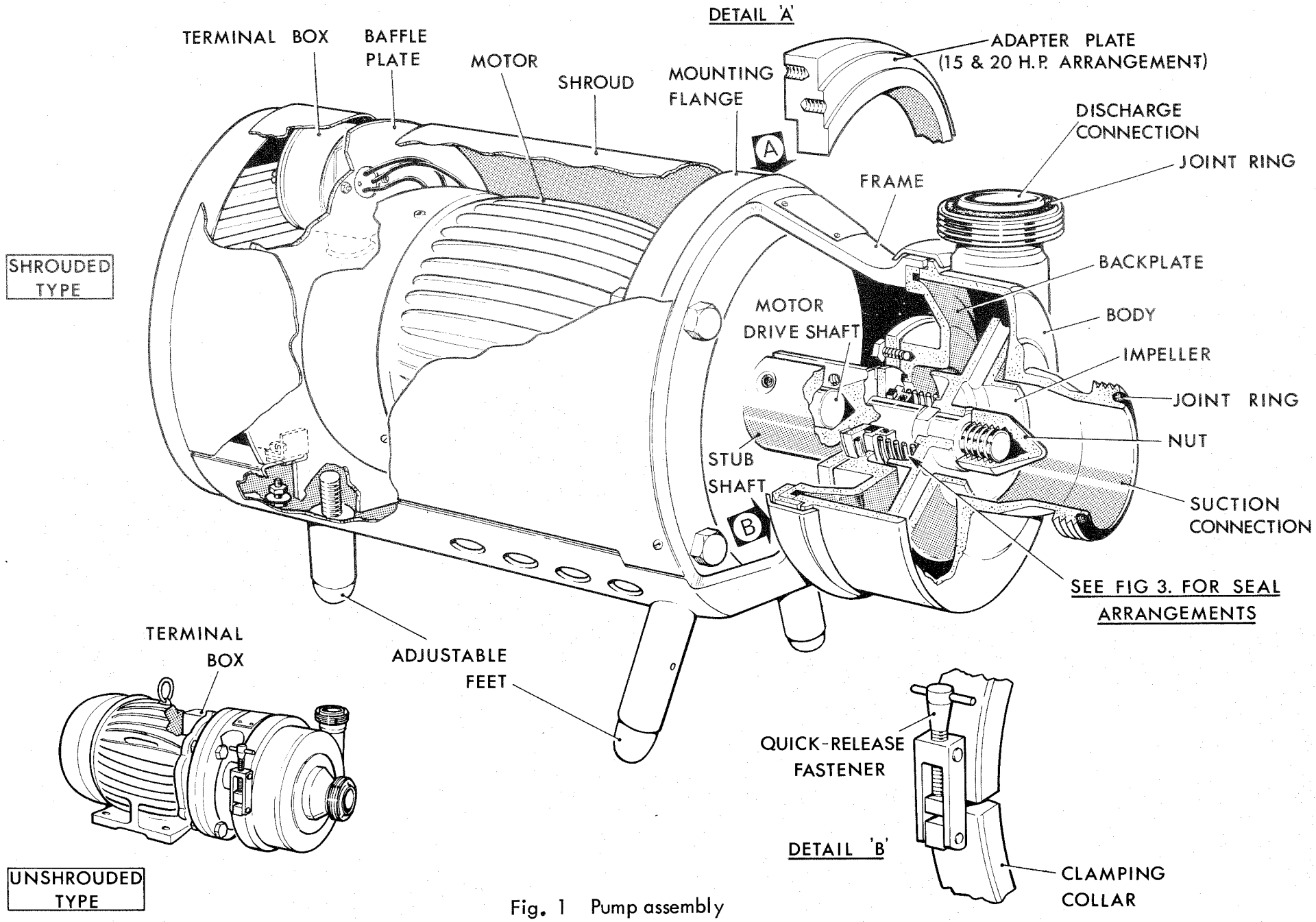


Fig. 1 Pump assembly

(9-UH1/11-70)

SECTION 1 - DESCRIPTION AND OPERATION

INTRODUCTION

1. The Series III Puma pump is a hygienic, motor driven, direct-coupled, centrifugal pump unit with either shrouded or unshrouded motor, and with either water cooled or non-water cooled seal arrangement. The Series IV pump is similar to a shrouded Series III but is fitted with an aseptic seal arrangement which can be steam sterilized on the atmospheric side of the product seal.

PUMP

General (Fig. 1)

2. The pump is of crevice free design with all product contact surfaces of stainless steel or synthetic rubber construction. A pumping chamber is formed by a body and a backplate which are attached by a quick-release clamping collar to an open-sided support frame bolted to a mounting flange on an electric motor.

3. The pumping chamber contains a disc type impeller mounted on a stub shaft which passes through the backplate and is clamped, by a split muff type of end fitting, to the motor drive shaft. The impeller is secured to the stub shaft by a dog coupling and a cap nut. A rotary face type standard product seal (para. 9), a seal face plate and associated housing are fitted on the stub shaft where it passes through the backplate. The pump body incorporates integral suction and discharge connections, the discharge connection being tangential to the body diameter. By rotating the body, the discharge connection can be angled to suit system piping.

Shrouded pump

4. The motor is fully enclosed by a readily removable shroud, and three adjustable feet mounted on the base of the pump supporting frame allow the pump to be placed directly onto the floor. A baffle plate and terminal box assembly is located on the pump frame at the rear of the motor.

Unshrouded pump

5. The unshrouded pump is of similar construction but the motor with standard terminal box, is exposed and the pump unit is bolted down via the integral feet on the motor casing to a suitably constructed concrete plinth or similar raised mounting pad (see Section 2 and Leading Particulars Table 6).

Impeller (Fig. 2)

6. The impeller incorporates a mounting boss, a suction eye and tangential discharge holes. The impeller normally embodies pressure balancing holes, which are drilled through the impeller to ensure the pump seal is subjected to a pressure lower than discharge pressure.

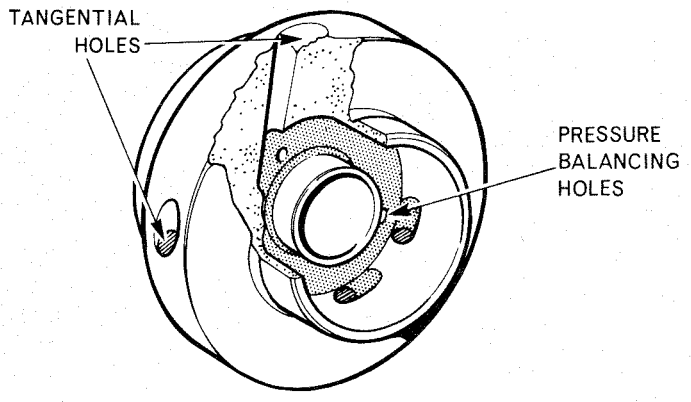


Fig. 2 Impeller

An impeller without pressure balancing holes should be fitted when pumping with negative suction head, in order that adequate working pressure is applied to the seal.

Pump connections

7. A range of male threaded suction and discharge connections can be supplied to International Sanitary Standard (Type ISS), British Standard - Ring Joint Type (RJT), American Standard (3A) or German Standard (DIN). Flanged type connections are also available.

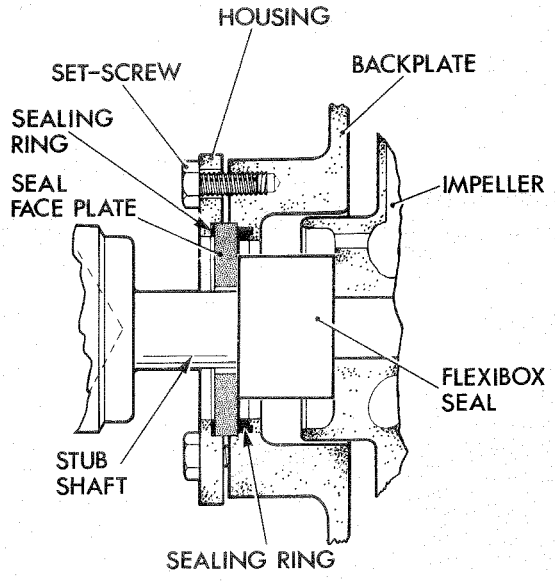
Operation

8. It is extremely important to ensure that the pump is never run empty. Always make certain that the supply lines are full and that the supply cocks to the pump are fully open before starting the motor. It is equally important to ensure that the motor is stopped immediately upon completion of pumping duty, and that the pump is not operated 'open ended' as this could overload the motor.

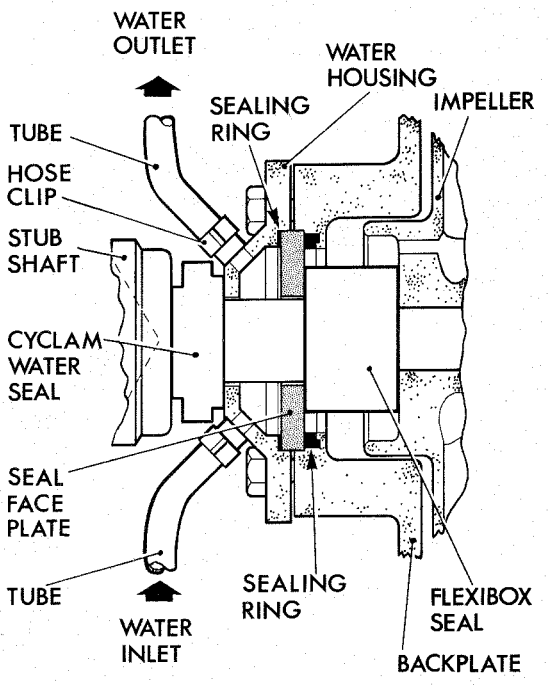
SEALS (Fig. 3)

Standard product - Series III

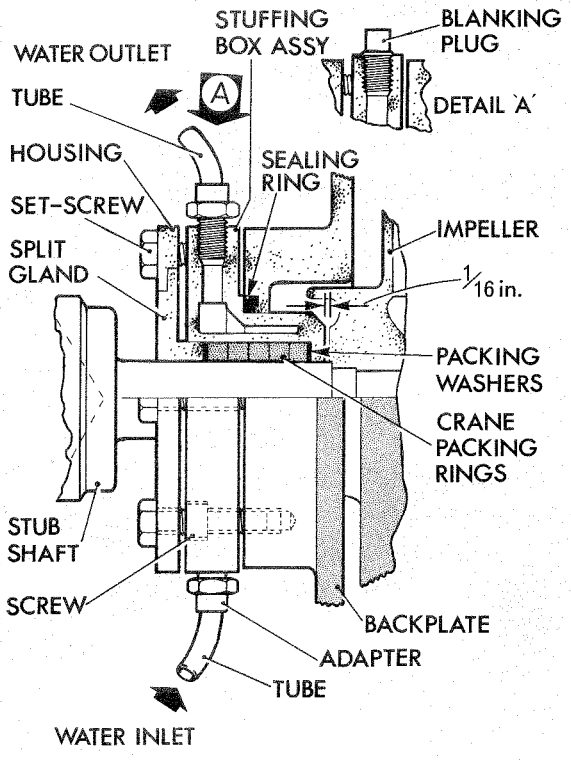
9. The Flexibox rotary face standard product seal comprises a spring-loaded body fitted with a carbon ring operating against the reversible hardened stainless steel seal face plate. Leakage along the stub shaft is prevented by an O-ring seal fitted into the bore of the seal body.



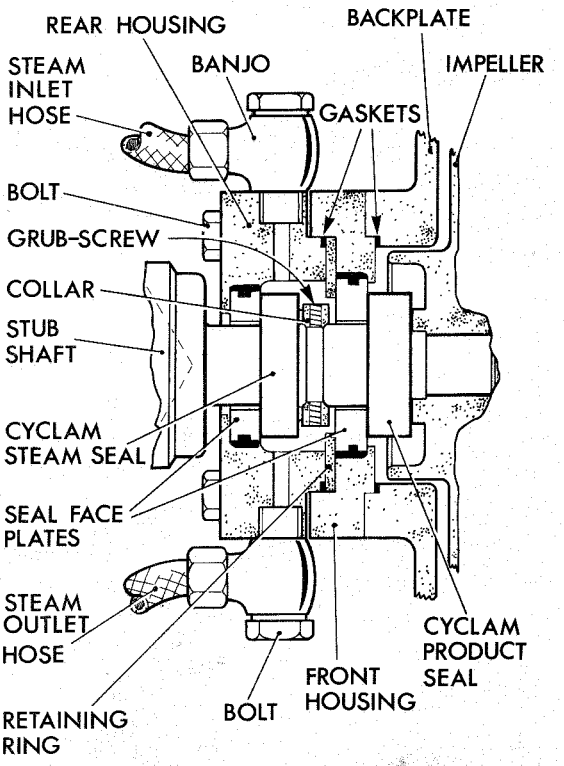
NON-WATER COOLED
FLEXIBOX (SERIES III)



WATER COOLED
FLEXIBOX (SERIES III)



CRANE STUFFING BOX
(SERIES III)



CYCLAM ASEPTIC
(SERIES IV)

Fig. 3 Seal arrangements

(9-UH1/11-70)

Water cooled standard product - Series III

10. A water cooled product seal arrangement, as an alternative for special duties, consists of the standard Flexibox product seal assembly but with a water cooling housing and an external Cyclam mechanical type water seal fitted on the stub shaft. Water inlet and outlet tubes are connected to the housing.

11. Water cooling system. A supply of low pressure, cool clean water, filtered if necessary, is required, with the pressure controlled by a pressure regulator to give a constant supply rate (see Leading Particulars) to the housing. The water supply must enter the housing through the lower connection to ensure the housing is always full of water, while the water outlet should flow through the shortest possible length of hose to obviate any back pressure in the housing.

Caution...

A pump with a water cooled standard product seal must never be allowed to run without water circulating through the housing.

Stuffing box - Series III

12. An alternative seal arrangement for a Series III pump is a water cooled or non-water cooled stuffing box seal comprising a housing and stuffing box fitted with split gland type packing rings, a split gland and a retaining ring. To convert a water cooled stuffing box seal into a non-water cooled type, fit $\frac{1}{8}$ in. BSP blanking plugs in the housing. The water cooling system is similar to that described in para. 11.

Aseptic - Series IV

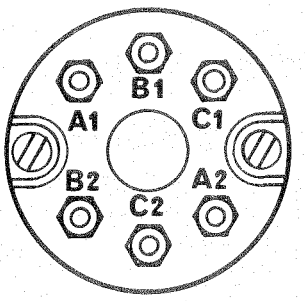
13. An aseptic seal arrangement comprises a pair of Cyclam aseptic mechanical type seals, acting against Cyclam face plates and fitted on the stub shaft, one acting as a product seal and the other as a steam seal within a housing. This arrangement permits steam sterilization of the atmospheric side of the product seal and pump stub shaft. Steam pressure should be as quoted in Leading Particulars.

MOTOR

General

14. The range of Metric Series Brook motors supplied as standard are of the totally enclosed, squirrel-cage, fan-cooled, horizontal drive, flange mounted type, of continuous maximum rating. The motors are for operation on 220/380-420V, 220/380V or 380/420V, 50 or 60 cycles, 3-phase a.c. supply. The 220/380V motors can be started direct-on-line (D.O.L.) on either voltage, or star-delta (S.D.) started on 220V. The 380/420V motors can be started either D.O.L. or S.D.

MOTOR TERMINAL BOX



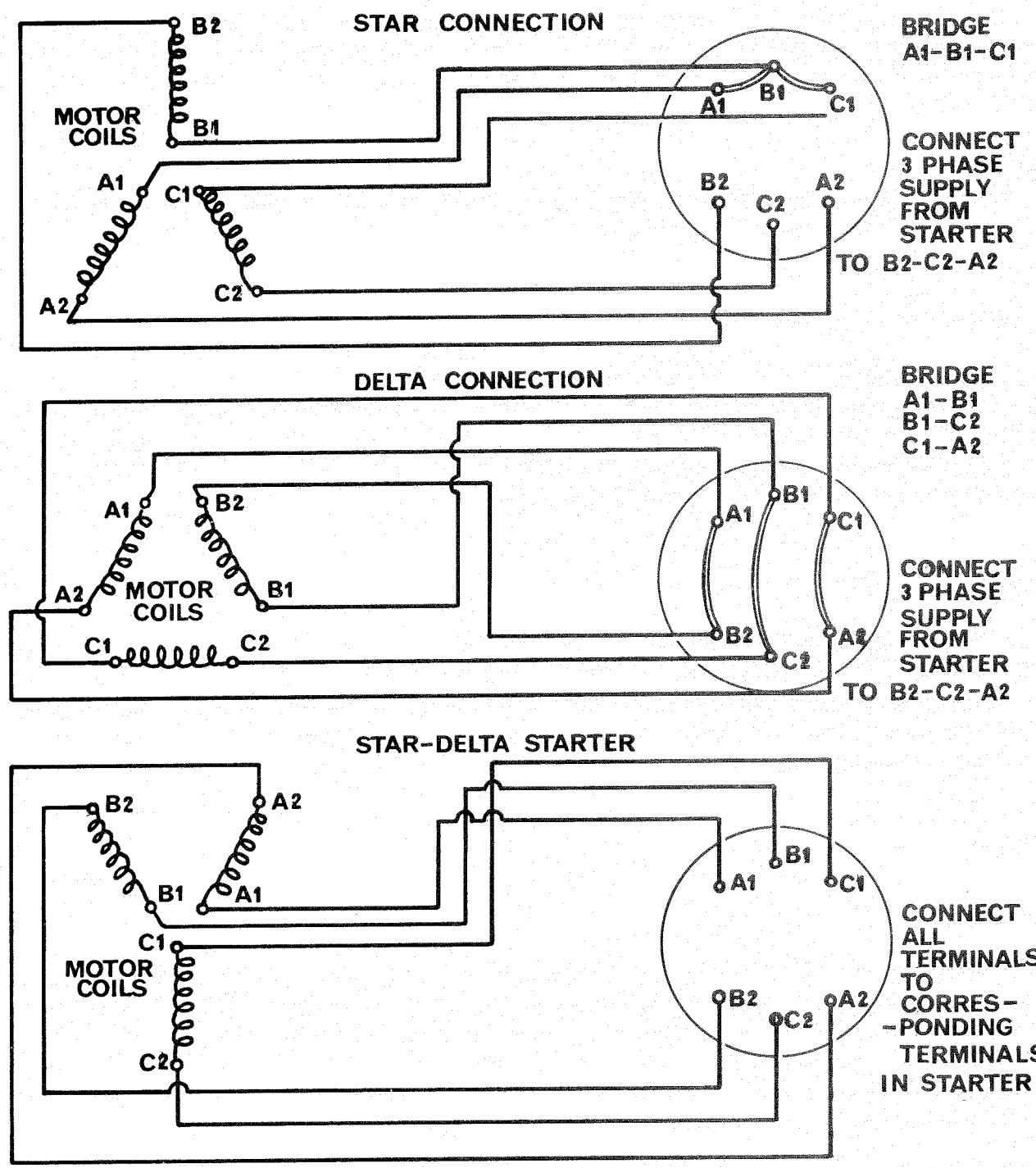


Fig. 4 Wiring diagram

(9-UH1/11-70)

Tropicalisation

15. The standard motors enumerated in the Parts List are suitable for most tropical conditions provided they are installed in an industrial environment and satisfy temperature and altitude requirements (see Leading Particulars).

16. For pumps installed in conditions other than above, motors are required with special insulation characteristics and an additional treatment (tropicalisation) applied by the motor manufacturer.

Locally manufactured motors

17. Locally manufactured motors can be fitted to a Puma pump, but reference must be made to the itemized list of motor requirements, shown in Section 2 of this handbook, before any installation work is commenced.

STARTER UNIT

General

18. The Crabtree starter units recommended for use with Puma pumps are of the air-break type and incorporate compensated overload release units, no-volt protection, auxiliary contacts for remote control and are supplied in weatherproof, hoseproof cases. The B. 15 type unit is for D.O.L. starting while the B.26 type is for S.D. starting. Magnetic coils and overload release units are available to suit a range of operating voltages and supply frequencies respectively.

19. For comprehensive description, operation, servicing and circuitry information also a full range of starter units available see relevant Crabtree manuals.

SECTION 2 - INSTALLATION

SECTION 2 - INSTALLATION

GENERAL

1. Ensure pump installation is carried out in as clean and dry an environment as possible. Do not leave a motor for prolonged periods without running and do not start a motor which has been inadvertently stored in damp conditions until it has been thoroughly dried out. Before and after installation of pump assembly ensure that all pertinent test requirements have been carried out (see Section 3 of this handbook).

Note...
Ensure system piping is adequately supported at pump suction and discharge connections.

SHROUDED PUMP

2. To install a shrouded pump assembly proceed as follows:-

(1) Check pump test record card for :-

(a) Duty

(b) Type of seal

(c) Type of pipe connections

(d) Type of motor

(e) Motor voltage, phase, cycles and horse power

(2) Place pump in required position, and adjust feet to set pump level and to correct height. Tighten feet grub screws.

Note...
There is approximately 25 mm (1 in.) adjustment of vertical height.

(3) Couple up suction and discharge connections.

(4) On pump with water cooled seal, connect lower tube to water supply and route upper tube to drain.

(5) On pump with aseptic seal, connect upper hose to steam supply and route lower hose to safe atmospheric venting position.

(6) Connect motor electrical supply leads as follows :-

(a) Remove shroud.

(b) Feed leads through grommet in pump frame and connect to terminal box on pump baffle plate, referring to wiring diagram (Fig. 4) and to motor manufacturer's instructions.

(c) Install shroud.

(7) Carry our motor direction of rotation check (see Section 3 of this handbook).

UNSHROUDED PUMP

3. The installation procedure for an unshrouded pump assembly is similar to that for a shrouded pump (para. 2) but with the following exceptions :-

(1) Construct a concrete plinth, complete with 75 mm (3 in.) square holes to correspond with bolt holes in motor feet, in position required and in accordance with dimensions given in Leading Particulars Table 6. Set motor level and grout in bolts. When grouting has set, tighten bolts and check level of motor.

Note...
When an unshrouded pump is supplied without a standard motor, providing the motor fitted conforms to IEC Publication 72 or to British Specification B.S. 3979, a dimensionally standard plinth height is required.

(2) Connect motor electrical supply leads to terminal box on motor casing referring to Fig. 4 and to motor manufacturer's instructions.

SEAL ASSEMBLY

4. Detailed instructions for installation of a seal assembly form part of the applicable pump reassembly procedure in Section 3 of this handbook.

MOTOR

5. For installation of a standard motor into a Puma pump refer to pump reassembly procedure in Section 3 of this handbook.

Locally manufactured motors

6. Before attempting installation of a locally manufactured motor the following requirements must be given full consideration :-

(1) British Specifications quoted in Leading Particulars.

(2) Motor dimensions must conform to IEC Publication 72 and British Specification B.S. 3979.

(3) Existing plinths and hold down bolts for unshrouded pumps.

(4) On shrouded pumps, the motor terminal box must be removed and aperture blanked off with a plate incorporating a rubber grommet.

(5) Maximum motor dimensions are 378 mm (14·87 in.) long and 270 mm (10·63 in.) dia.

Note...
Puma pumps will not normally accept motors to NEMA/CEMA standards.

STARTER UNIT

General

7. Ensure that starter unit is of the correct type and is fitted with the appropriate magnetic coils and overload release units.

Note...
For comprehensive installation instructions see applicable starter unit manufacturer's manuals.

SECTION 3 - MAINTENANCE

SECTION 3 - MAINTENANCE

GENERAL

1. The Puma pump requires the minimum amount of maintenance, and is confined to disassembly and cleaning, replacement of seals, sealing rings and motors. The frequency with which this will be necessary depends on the product being pumped, the operational hours and whether the pump is connected to a cleaning-in-place (C.I.P.) circuit. Detailed servicing of the motor and starter unit is covered in the relevant manufacturer's manuals. A list of special tools is included at the back of each parts list.

LUBRICATION

Pump

2. As a general rule no oil or grease should be used on the pump mechanism. However, the following exceptions are permissible :-

(1) Water or mild soap solution to facilitate assembly of seal(s).

(2) A silicone grease applied sparingly to stub shaft to ease assembly of stuffing box type seal.

Motor

3. Motor lubrication should be carried out in strict accordance with the appropriate motor manufacturer's lubrication chart.

INSPECTION

Pump

4. Periodically inspect seal(s) for leakage. If leakage is apparent, firstly check that seal housing retaining screws are fully tightened then if necessary disassemble pump and check seal(s) for cause as follows :-

Note...
The open sides of the pump frame permit inspection of the rear of the seal arrangement.

(1) Foreign matter between seal running faces.

(2) Cracked carbon ring, usually caused by damage during installation or thermal shock.

(3) Worn rubbing faces of carbon ring and seal face plate, due to long life or excessive wear caused by abrasives in product.

(4) Broken spring.

(5) Charred, cracked or worn O-ring in product seal.

(6) Charred, cracked or collapsed bellows in water cooling seal.

CLEANING

Pump

5. The Puma pump should only be cleaned in a hygienic, dustfree environment, and pump components should be handled with extreme care during the cleaning and reassembly process. When disassembly and cleaning of the pump is necessary proceed as follows :-

(1) Isolate electrical supply.

(2) Disconnect pump from system piping and cooling water or steam connections.

(3) Release clamping ring, remove pump body, impeller nut and impeller.

(4) Carefully disassemble seal assembly, do NOT attempt to clean carbon seal face, rinse only.

(5) Thoroughly clean all pump components individually, using bristle or plastic type brushes and warm water. Treat stubborn areas with mild detergent solution which must be compatible with pump materials.

Note...
Do NOT use steel wool, wire brushes or abrasives.

(6) Rinse all parts with clean water and wipe dry with chamois leather.

(7) Check condition of all components for serviceability and ease of reassembly.

(8) Reassemble pump (see Section 3).

(9) Clean outside of pump with soft cloth.

(10) Connect pump to system piping.

(11) Connect electrical supply.

Note...
Ensure regular rinsing and cleaning of pump body and shroud where potentially corrosive liquids are being handled.

6. Cleaning-in-place (C.I.P.) Puma pumps used in plants coupled to C.I.P. circuits are thoroughly cleaned and sterilized by this technique and the instructions for cleaning the complete plant should be followed. C.I.P. cleaning techniques do not fall within the scope of this manual.

7. It should be noted that Puma pumps used in C.I.P. circuits, whilst being basically standard pumps, may have their bodies modified by the addition of a drain valve, the reason being that the body is the lowest point of the pump discharge line and is usually lower than the pump suction line.

Motor

8. The motor casing should be kept free from oil, dust and moisture, while the cooling fins, ventilation holes and ducts should be kept free from obstruction. Internal cleanliness of the motor and its components should also be ensured (see motor manufacturer's manual).

TESTING

General

9. Assembled pumps and components are fully tested at the manufacture stage but after certain routine maintenance or fitment of replacement parts it will be necessary to carry out the following tests as applicable. Should further testing of pump be required reference should be made to the relevant separately published Data Sheets.

Motor

10. Direction of rotation. To check for correct rotation of motor, remove pump body, impeller securing nut and withdraw impeller and seal from stub shaft. Observe stub shaft, switch motor on and then immediately off. Correct rotation is indicated by arrow on pump body, i.e. counter-clockwise viewed from impeller end of pump. If direction of rotation is incorrect, reverse any one pair of supply leads in motor terminal box.

Note...
Do not run motor in reverse for more than a few seconds.

11. Operating temperature. To check that motor operating temperature is within limits (see Leading Particulars), place open bulb type thermometer adjacent to motor windings. If a lifting bolt hole is present, this is a convenient place to insert thermometer bulb.

DISASSEMBLY

Note...
All components must be handled with extreme care during disassembly procedure.

Pump with Flexibox seal - Series III (Fig. 1 and 3)

12. To disassemble a Series III pump fitted with standard Flexibox product seal proceed as follows :-

(1) Isolate electrical supply.

(2) Disconnect pump from :-

(a) System piping.

(b) Water cooling system (if fitted).

(3) Release clamping ring, remove pump body, impeller attachment nut, impeller, seal and backplate assembly.

(4) Remove set-screws, housing, seal face plate and sealing rings from backplate.

(5) Withdraw water cooling seal (if fitted) from stub shaft.

(6) Release and withdraw stub shaft from motor drive shaft.

(7) Release and withdraw motor shroud (if fitted).

(8) Disconnect electrical supply leads at motor terminal box.

(9) Remove baffle plate assembly (if fitted).

(10) Remove motor attachment bolt assemblies and separate motor from pump frame.

Pump with stuffing box seal - Series III (Fig. 1 and 3)

13. The disassembly procedure for a Series III pump fitted with a stuffing box seal is similar to that for a Series III pump with standard product seal (para. 12).

Pump with aseptic seal - Series IV (Fig. 6)

14. To disassemble a Series IV pump proceed as follows :-

(1) Isolate electrical supply.

(2) Disconnect system piping and steam hoses.

(3) Release clamping ring, remove pump body, impeller attachment nut and impeller.

(4) Carefully withdraw seal (5).

(5) Remove bolts (12) and backplate.

(6) Carefully withdraw housing (1), seal face plate (4), and retaining ring (13).

(7) Release grub screws (9) and withdraw collar (7) from stub shaft.

(8) Carefully withdraw seal (10), seal face plate (11) and housing (8) from stub shaft.

(9) Release and withdraw stub shaft.

(10) Remove motor shroud, disconnect electrical supply leads at terminal box and remove baffle plate assembly.

(11) Remove motor attachment bolt assemblies and separate motor from pump frame.

REASSEMBLY

Pump with Flexibox seal - Series III (Fig. 1 and 3)

15. The following procedure covers the complete reassembly of a Series III pump with Flexibox standard product seal. To install the pump see Section 2 of this handbook.

Note...

(a) All pump components should be scrupulously clean and damage free, and must be handled with extreme care during the assembly procedure.

(b) To facilitate assembly of seal(s), a lubricating solution of water + 10% Teepol may be used. Do NOT use oil or grease.

(1) On shrouded pump, install adjustable feet and electrical supply lead grommet in frame.

(2) Place motor on bench, drive shaft uppermost, locate pump frame on motor mounting flange spigot and secure with nut and bolt assemblies.

Note...
Bolt heads should face towards pumping chamber.

(3) On 15 or 20 h.p. unshrouded pump, insert adapter plate between motor mounting flange and pump frame. Secure motor flange, adapter plate and frame together with two sets of set-screws.

(4) On shrouded pump, install terminal box on baffle plate, with terminal A.1 uppermost, and clamp baffle plate to frame cradle hard up against motor ventilating cowl. Pass motor leads through back of terminal box and connect to terminals (Fig. 4). Install terminal box gasket and cover plate. Remove lifting eye (if fitted) from top of motor and close hole with suitable screw and washer. Install motor shroud.

(5) For unshrouded pump, feed motor leads into terminal box on motor casing and connect to applicable terminals (Fig. 4).

(6) Remove any protective coating from motor drive shaft.

(7) Using new securing screws, lightly coat threads with anti-scuffing paste and assemble to stub shaft.

(8) Locate shaft on motor drive shaft, lining up slot in stub shaft coupling with spline in drive shaft and lightly tighten stub shaft screws.

(9) Fit body joint and seal face plate sealing rings to backplate.

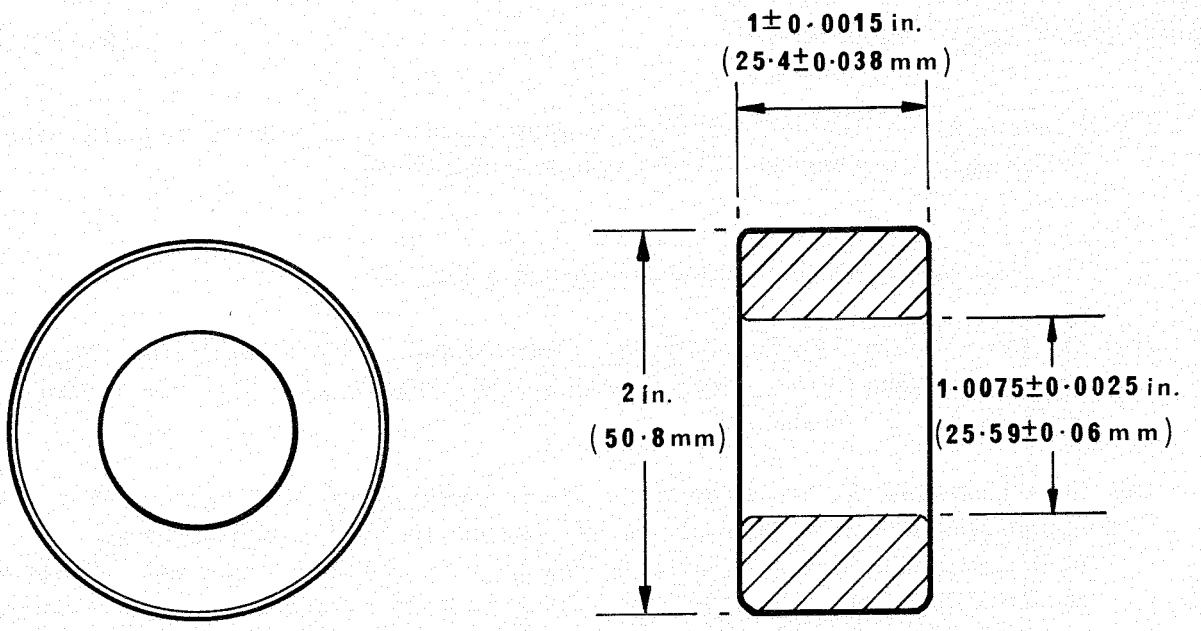
(10) Assemble seal face plate (this may be fitted either way round) to backplate.

Note...
When fitting replacement seal face plate, remove protective coating.

(11) Locate housing sealing ring and plate housing on backplate, and fit set-screws. Assemble each of the three screws finger tight, then using appropriate size spanner, further tighten each screw just sufficient to lightly bed down the seal face plate and prevent leakage from the seal face plate sealing ring. Uneven or overtightening of these screws will cause distortion of seal face plate sealing ring, seal face plate or housing.

Note...
On water cooled pump, if fitting replacement plate housing, remove protective coating and install housing with water connections in vertical position.

(12) Carefully locate backplate assembly in pump frame and on stub shaft, and push fully home. Locate spacer (Code No. 347651) on stub shaft or locally manufacture spacer to Fig. 5.



Note:
Manufacture from mild steel bar

Fig. 5. Spacer for installation of stub shaft

(13) Fit impeller and securing nut to stub shaft, and tighten nut.

(14) Ensure that backplate is pushed fully home into pump frame recess, and tighten stub shaft screws with hexagonal key.

(15) Remove impeller nut, impeller, spacer and backplate assembly.

(16) Working from open end of pump frame, torque tighten $\frac{1}{4}$ in. BSF stub shaft screws to 13·4 kg/m (9 lbf/ft) or $\frac{5}{16}$ in. BSF screws to 26·8 kg/m (18 lbf/ft) using hexagonal key with a 230 mm (9 in.) extension tube.

(17) On water cooled pump, install Cyclam water seal on stub shaft with carbon ring facing away from motor.

(18) Refit backplate assembly and ensure it is fully pushed home into pump frame.

(19) Locate spring end of Flexibox seal on impeller boss, and carefully slide seal and impeller onto stub shaft.

(20) Ensure correct location of seal and impeller on shaft, install impeller nut, hold impeller by means of round bar inserted through tangential discharge hole and FULLY tighten nut.

(21) Check that sealing ring in backplate is correctly positioned, rotate backplate to give required orientation of water cooling connections, assemble body to backplate, fit clamping collar and tighten.

(22) Manually check that pump stub shaft assembly rotates freely.

(23) On water cooled pump, connect water cooling tubes to plate housing.

Pump with stuffing box seal - Series III (Fig. 1 and 3)

16. The reassembly procedure for a Series III pump with stuffing box seal is similar to that for a Series III pump fitted with standard product seal (para. 15) but with the following exceptions:-

(1) Insert packing washer (1 off), split gland packing rings (5 off) and packing washer (1 off), in that order, into stuffing box.

Note...
Orientate packing rings so that splits do not coincide.

(2) Apply a film of silicone grease to stub shaft, to facilitate assembly of stuffing box, locate stub shaft on motor drive shaft and lightly tighten stub shaft securing screws.

(3) Slide retaining ring, split gland and stuffing box assembly onto stub shaft.

(4) Insert backplate complete with sealing rings into pump frame, push fully home, assemble seal details to backplate with set-screws and socket head cap screws. Fully tighten screws.

(5) Locate suitable locally manufactured $\frac{1}{16}$ in. thick spacer on stub shaft, install impeller, securing nut and tighten nut.

Note...
Fitment of above spacer enables dimension, between rear face of impeller and stuffing box, shown on Fig. 3 to be obtained.

(6) Remove impeller nut, impeller, spacer and backplate assembly, and torque tighten stub shaft securing screws as described in para 15 (16).

(7) Then proceed with assembly sequence as described in para. 15 (18) and 15 (20) to (23).

Pump with aseptic seal - Series IV (Fig. 6)

17. The following procedure itemizes the complete reassembly of a Series IV pump with aseptic seal arrangement. To install the pump see Section 2 of this handbook.

Note...
(a) All pump components should be scrupulously clean and damage free, and must be handled with extreme care during the assembly procedure.

(b) To facilitate assembly of seals, a lubricating solution of water + 10% Teepol may be used. Do NOT use oil or grease.

(1) Install adjustable feet and electrical supply lead grommet in pump frame.

(2) Place motor on bench, drive shaft uppermost, locate pump frame on motor mounting flange spigot and secure with nut and bolt assemblies.

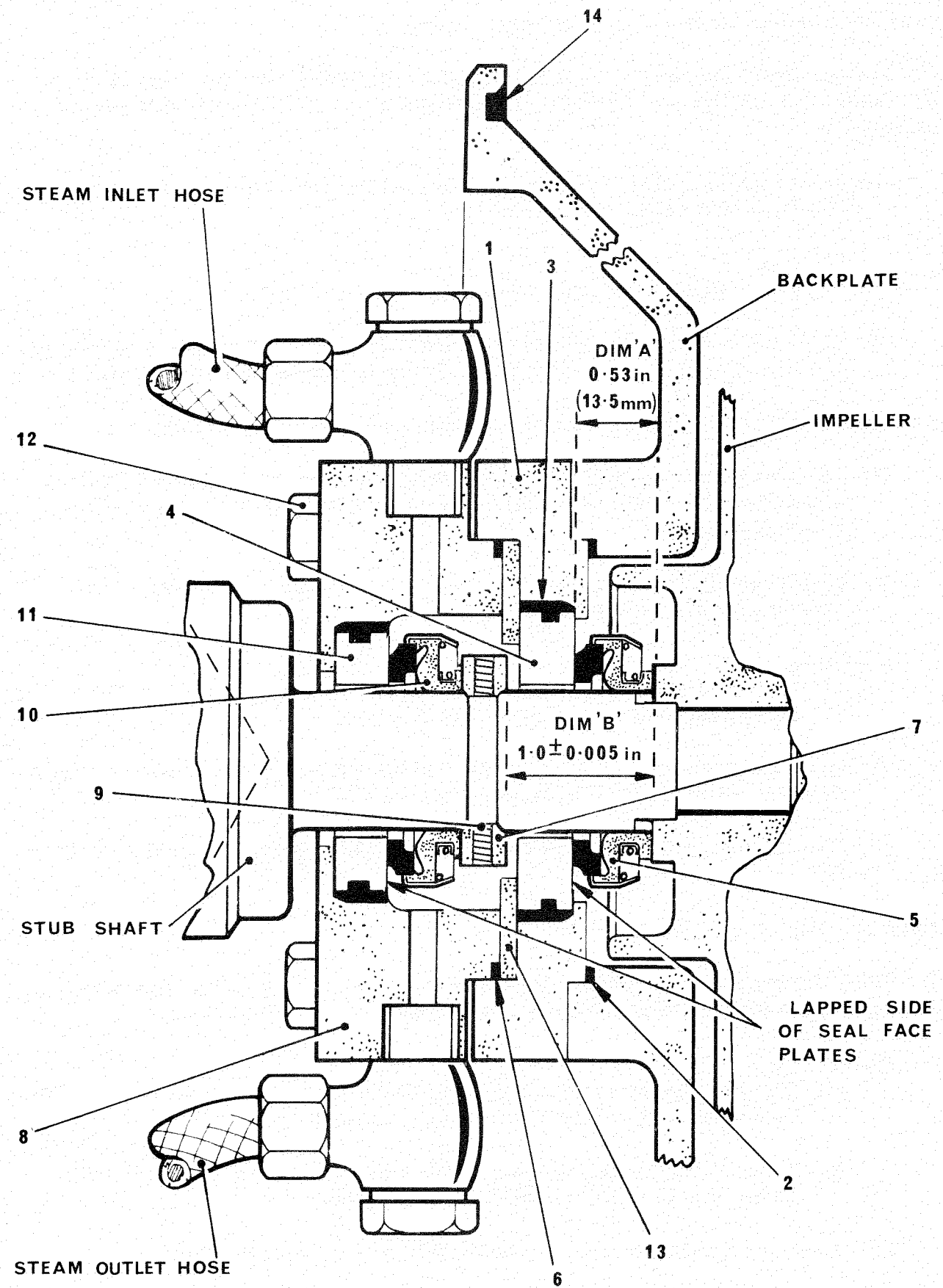


Fig. 6 Cyclam aseptic seal arrangement

(9-UH1/11-70)

Note...
Bolt heads should face towards pumping chamber.

(3) Install terminal box on baffle plate, with terminal A.1 uppermost, and clamp baffle plate to frame cradle, hard up against motor ventilating cowl. Pass motor leads through back of terminal box and connect to terminals (Fig. 4). Install terminal box gasket and cover plate.

(4) Remove lifting eye (if fitted) from top of motor and close hole with suitable screw and washer.

(5) Install motor shroud.

(6) Remove any protective coating from motor drive shaft.

(7) Using new securing screws, lightly coat threads with anti-scuffing paste and assemble to stub shaft.

(8) Locate shaft on motor drive shaft, lining up slot in stub shaft coupling with spline in drive shaft and lightly tighten stub shaft screws.

(9) Ensure that chamferred edge of sealing ring (3) on seal face plate (4) is adjacent to lapped face of plate, if not, reverse sealing ring (3) on seal face plate.

(10) Using fitting tool (Code No. 353319) and O-ring (Code No. 426515) insert seal face plate (4) into front housing (1) so that lapped side of face plate is towards impeller.

(11) Using bolts (12), assemble front housing assembly (1), retaining ring (13) and rear housing (8) to backplate.

(12) Locate backplate assembly in pump frame recess.

Note...
If motor can be placed on bench with drive shaft uppermost, assembly is made easier. However, if this is impracticable, clamp backplate assembly to frame.

(13) Fit suitable locally manufactured 13·5 mm spacer to stub shaft, install impeller and securing nut. Tighten nut.

Note...
Fitment of above spacer enables dimension 'A', between rear face of impeller and seal face plate (4), shown on Fig. 6 to be obtained.

(14) Ensure that backplate is pushed fully home into pump frame recess, and tighten stub shaft screws with hexagonal key.

(15) Remove impeller nut, impeller, spacer, backplate assembly, and disassemble items (12), (8), (13) and (1) from backplate.

Note...

Do not remove seal face plate (4) from front housing (1).

(16) Working from open end of pump frame, torque tighten $\frac{1}{4}$ in. BSF stub shaft screws to 13·4 kg/m (9 lbf/ft) or $\frac{5}{16}$ in. BSF screws to 26·8 kg/m (18 lbf/ft) using hexagonal key with a 230 mm (9 in.) extension tube.

(17) Using fitting tool (Code No. 353319) and O-ring (Code No. 426509) insert seal face plate (11) into rear housing (8) so that lapped side of face plate is towards impeller.

(18) Slide rear housing (8) and associated face plate assembly onto stub shaft.

(19) Using special tools - tapered ring (Code No. 353321) and sleeve (Code No. 353320) - slide seal (10) onto stub shaft so that carbon face of seal is towards seal face plate.

(20) Loosely assemble grub screws (9) in collar (7) and slide collar onto stub shaft. Fit suitable locally manufactured 1 in. long spacer to stub shaft, install impeller, securing nut, and tighten. Grub screws (9) may now be fully tightened.

Note...

Fitment of above spacer enables dimension 'B', between rear face of impeller and collar (7), shown on Fig. 6 to be obtained.

(21) Remove impeller and spacer, fit gasket (6) into recess in rear housing (8), locate ring (13) and housing (1) with associated seal face plate on stub shaft.

(22) Fit gasket (2) into recess in backplate, and locate backplate in pump frame.

(23) Insert bolts (12) through seal assembly details and fully tighten.

(24) Using special tools detailed in para. 17 (19), slide seal (5) onto stub shaft so that carbon face of seal is towards seal face plate (4).

(25) Install impeller, securing nut, hold impeller by means of round bar inserted through tangential discharge hole and FULLY tighten nut.

(26) Fit sealing ring (14) in backplate, rotate backplate to give required orientation of steam connections, assemble pump body to backplate with clamping collar and tighten in position.

(27) Manually check that pump stub shaft assembly rotates freely.

(28) Connect steam hoses to rear housing (8).

FAULT DIAGNOSIS CHART

The following chart lists possible causes of faults that may be rectified during in-situ servicing. For any causes not listed and involving the motor or starter unit, refer to the relevant manufacturer's operating manual.

FAULT	POSSIBLE CAUSE	REMEDY
1. Impeller fouling body	a. Incorrect assembly	a. Strip and reassemble in correct sequence
	b. Foreign matter	b. Strip, clean and reassemble
	c. Burrs between mating faces	c. Replace affected component(s)
	d. Impeller nut not tight	d. Fully tighten nut
	e. Loose stub shaft	e. Tighten to correct dimension
2. Product leakage from rear of seal assembly	a. Foreign matter between face of seal and seal face plate	a. Strip, clean and reassemble
	b. Defective seal component(s)	b. Replace. Never allow pump to run dry
	c. Defective seal face plate	c. Replace
	d. Defective sealing ring(s)	d. Replace
	e. Uneven tightening of seal housing screws	e. Tighten screws evenly
3. Leakage from water seal	a. Defective water seal	a. Replace
	b. Defective face on water housing	b. Replace housing
	c. Defective sealing ring	c. Replace
4. Pump delivery rate below normal	a. Incorrect connection of motor supply leads at terminal box	a. Reverse any one pair of leads
	b. Restriction in suction pipeline	b. Check that system control valves are fully open. Strip, clean and reassemble suction pipeline

MAINTENANCE SCHEDULE

INTRODUCTION

1. The maintenance schedule for the Puma pump assembly refers to those items which are likely to fail or deteriorate over a period of time, and the information contained therein is conditional upon the pump being used within the limitations of its design rating.

2. As the pump may be used for widely differing products, processes and running times, it is not possible to give a specific time scale to the various maintenance operations. They are however sub-divided on a relative basis, into short, medium and long periods of operation and it will be necessary for the operator implementing this schedule to establish a time scale to suit the operating conditions. It is important to note that the short, medium and long intervals are relative only to a typical pump installation and that what is 'short' on one installation may in actual time, be the same as 'long' on another installation.

3. The indicated 'spares requirements' are based on an average duty and an 8 hour daily run.

4. Where a number of identical pumps are installed at the same location it will obviously not be necessary to carry complete sets of spares for the total number of pumps.

5. It should be noted that the majority of the items recommended as spares are of rubber or synthetic rubber construction and can be prone to deterioration when stored. Care should be taken not to expose rubber components to extremes of temperature, strong sun light, outdoor air, atmospheres containing ozone, corrosive gases, chlorine etc.

NOTES...

Seal arrangements

(i) The carbon face of the mechanical type seal(s) should be carefully examined for wear (i.e. thinning of carbon) crazing, cracking or other damage.

(a) With the Flexibox type seal the carbon rubbing face can wear sufficiently to allow the rotary seal ring body to come in contact with the static seal face plate. Check seal O-ring for hardening, cracking, displacement or damage.

(b) The Cyclam seals, aseptic and water cooling types, should be examined for similar defects to those mentioned above.

(c) The life of a seal obviously depends so much upon its duty and to the product being pumped that it is difficult to generalize. It is however, possible to say that a product seal on light duty, dealing with low temperature, low viscosity products, can give satisfactory service for twelve months, whereas a seal being used with hot sticky liquids may only give good service for three months. The examination period therefore should be adjusted to suit the conditions, e.g. six monthly intervals for light duties or six weeks for more arduous duties.

(ii) The stuffing box seal is an alternative product seal for chemical applications. The periods at which this seal should be examined varies considerably, dependent upon the product being pumped, the shortest period being about eight weeks with a possible replacement period of about three to four months.

(iii) On a Series III pump with a hardened seal face plate, the plate is lapped on both sides and can be reversed once, providing the unused surface is not damaged or corroded. On a Series IV pump there are two seal face plates, which are not reversible or interchangeable.

(iv) In a pump with a stuffing box seal arrangement, one sealing ring comprises a seal set, while in pumps with a Flexibox or aseptic seal arrangement two sealing rings comprise a seal set.

Motor

(v) The standard motors used with Puma pumps require little maintenance but attention to the following points will effectively prolong service life.

Note...
Detailed maintenance instructions are contained in the relevant motor manufacturer's manuals.

(a) Ball and roller bearings should have their grease renewed every twelve months. Ensure that a film of grease is in the rolling elements and that the housing is almost filled with grease in close contact with the bearing faces. Do not pack the bearings solid with grease. Use 'Shell Alvania' No. 3 grease or equivalent. On larger motors, where lubrication points are provided, the manufacturer's lubrication instructions must be adhered to.

(b) Check bearings each month for temperature and smooth running, bearings usually run between 38°C (100°F) and 60°C (140°F) in normal ambient temperature of 15°C (60°F).

(c) Check motor drive shaft for end-float. Evidence of end-float would indicate bearing wear.

(d) Monthly inspection of cooling fins, ventilation holes and ducts is recommended, cleaning as necessary.

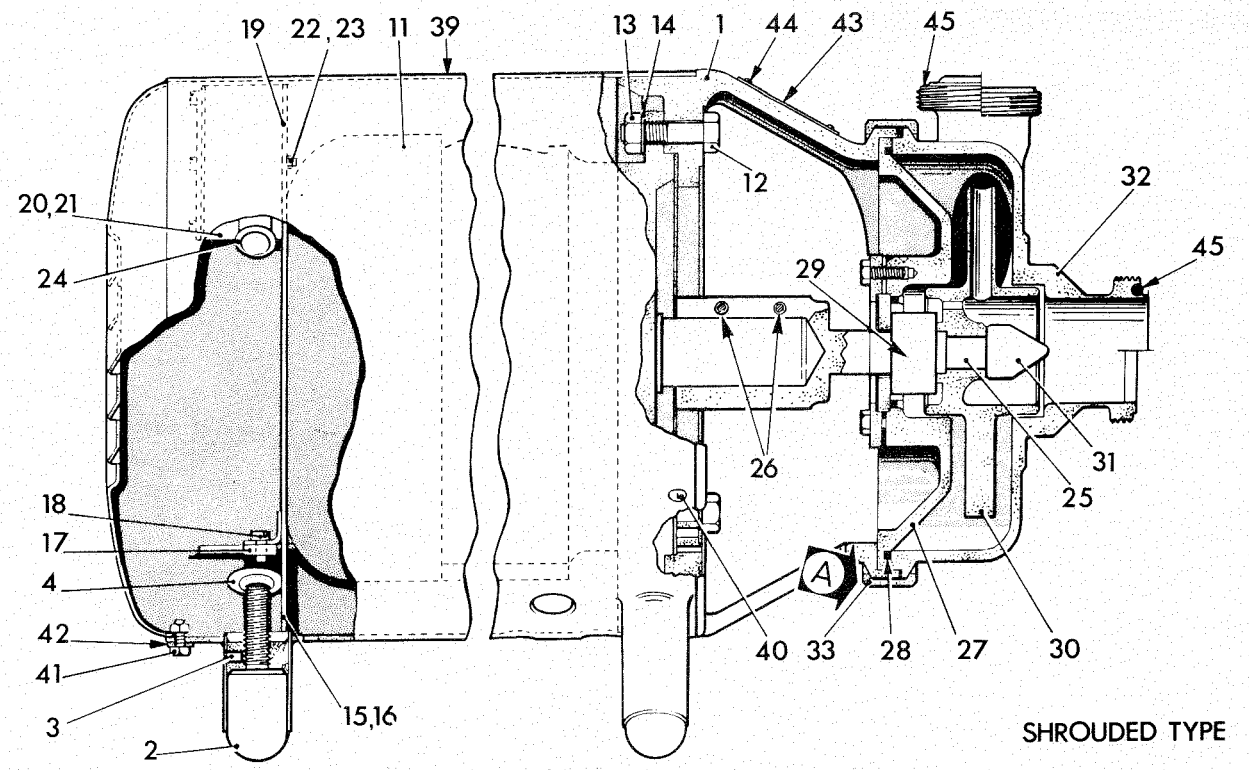
(e) Periodically check terminal box connections for tightness, and insulation of leads for hardening, cracking or chafing. Overheating, from whatever cause, is a serious fault, high temperatures can cause deterioration of the motor insulation. Test the temperature of the motor by using an open bulb type thermometer located as close as possible to the windings.

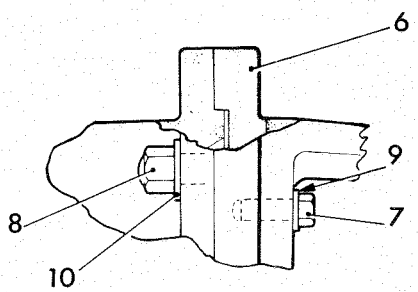
(f) Consideration should be given to taking the motor out of service at extended periods of 3 to 5 years, dependent on duty, and having the motor overhauled by a recognised electrical engineering company or motor manufacturer's agent.

MAINTENANCE CHART

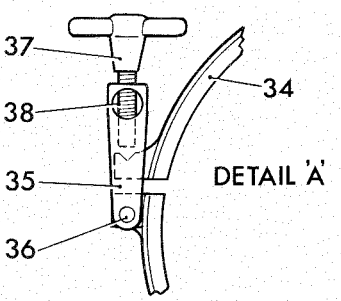
Description of item	Interval between checks			Spares requirement	
	Short	Medium	Long	One year	Two years
Seals :-					
Flexibox (see Note (i))	Examine for wear or damage	Replace	-	2	4
Cyclam aseptic (see Note (i))			-	4	8
Stuffing Box (see Note (ii))			-	2 sets	4 sets
Cyclam water cooling (see Note (i))	Examine for wear or damage at 6 monthly intervals	Replace at yearly intervals	-	1	2
Plate(s), seal face:- (see Note (iii))					
Series III	Examine for damage when seals are examined	-	Replace	-	1
Series IV		-		1	1
Rings, sealing (see Note (iv)	Examine for damage or hardening when seals are examined	-	Replace when seal face plate is replaced or if damaged	1 set	2 sets
Impeller	Check tangential and pressure balance holes are free from blockage	-	-	-	-
Motor (see Note (v)	-	-	-	-	-
Starter Unit	-	Check that overload release unit in starter has been reset correctly and that operating conditions are within pump capabilities	-	-	-
Process conditions	-		-	-	-

SECTION 4 - ILLUSTRATED PARTS LISTS





DETAIL 'B'- 15 & 20 H.P. ARRANGEMENT ONLY



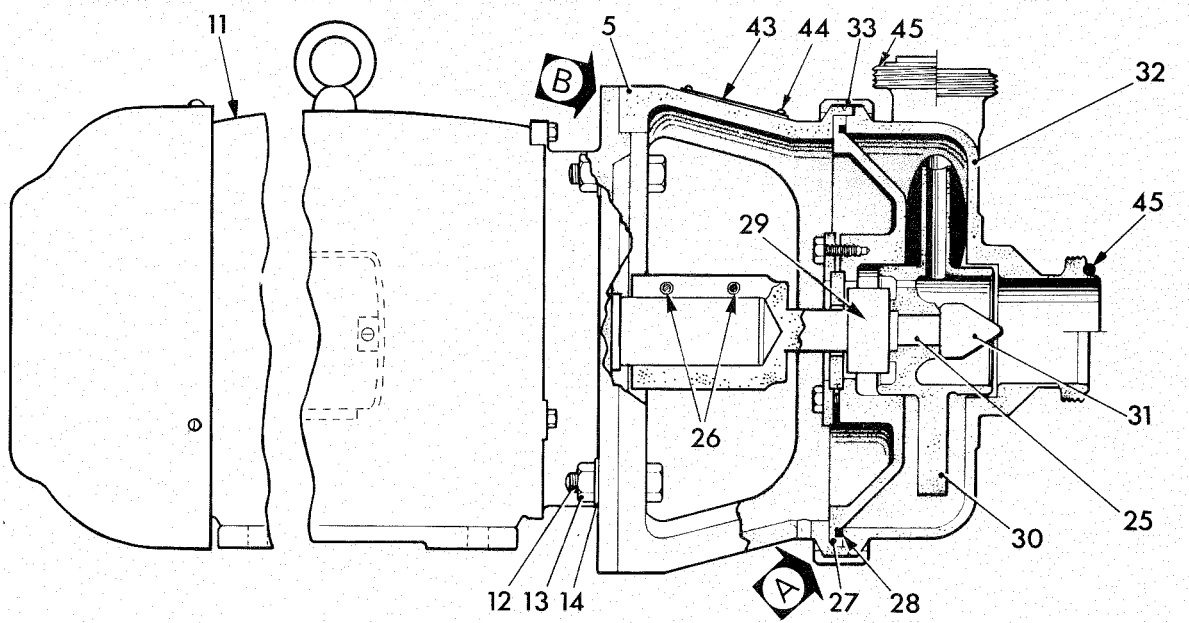


Fig. 7 Pump assembly (Series III)

(9-UH1/11-70)

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES III

Fig. 7 Item	Description	No. off	Code No. 2/2/9 SHR'D	2/2/9 UNSHR'D	2/2½/9 SHR'D	2/2½/9 UNSHR'D	2/3/9 SHR'D	2/3/9 UNSHR'D	2/3/11 SHR'D	2/3/11 UNSHR'D
	PUMP COMPLETE	-	-	-	-	-	-	-	-	-
1	Frame assy, supporting									
	3 h.p. motor	1	206552	-	206552	-	206552	-	-	-
	5·5 h.p. motor	1	206554	-	206554	-	206554	-	206558	-
	7·5 and 10 h.p. motor	1	-	-	206556	-	206556	-	206560	-
	Frame sub-assy, welded, comprising base 226241, frame 321985, cover plate 339177 for 3 h.p. motor with 9 in. body	1	-	-	-	-	-	-	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321986, cover plate 339178 for 5·5 h.p. motor with 9 in. body	1	-	-	-	-	-	-	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321988, cover plate 339178 for 5·5 h.p. motor with 11 in. body	1	-	-	-	-	-	-	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321987, cover plate 339179 for 7·5 and 10 h.p. motor with 9 in. body	1	-	-	-	-	-	-	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321989, cover plate 339179 for 7·5 and 10 h.p. motor with 11 in. body	1	-	-	-	-	-	-	-	-
2	Foot, adjustable	3	337600	-	337600	-	337600	-	337600	-
3	Grub-screw 2 BA x ½ in. lg. slot. hd.	3	434110	-	434110	-	434110	-	434110	-
4	Grommet, 1¼ in. o.d. x ¾ in. i.d.	1	410500	-	410500	-	410500	-	410500	-
5	Frame, extension									
	3 h.p. motor	1	-	321990	-	321990	-	321990	-	-
	5·5 h.p. motor	1	-	321991	-	321991	-	321991	-	321993
	7·5 ,10, 15 and 20 h.p. motor	1	-	-	-	321992	-	321992	-	321994
6	Plate, adapter, 15 and 20 h.p. motor	1	-	-	-	-	-	338811	-	338811
	Set-screw									
7	½ in. BSW x 1¼ in. lg. hex. hd.	4	-	-	-	-	-	431663	-	431663
8	⅝ in. BSW x 1½ in. lg. hex. hd.	4	-	-	-	-	-	453378	-	453378
	Washer, plain									
9	½ in. i.d.	4	-	-	-	-	-	443820	-	443820
10	⅝ in. i.d.	4	-	-	-	-	-	443521	-	443521
11	Motor, Brook, 3-phase 50 or 60 c/s A.C.									
	3 h.p. (2·2 kw) 220/380-420V	1	457132	-	457132	-	457132	-	-	-
	terminal box with continental conduit thread	1	-	457108	-	457108	-	457108	-	-
	terminal box with Brit. Std. conduit thread	1	-	457109	-	457109	-	457109	-	-
	5·5 h.p. (4·0 kw) 220/380V	1	457102	457110	457102	457110	457102	457110	457102	457110
	380/420V	1	457103	457111	457103	457111	457103	457111	457103	457111

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES III (contd)

Fig. 7 Item	Description	No. off	Code No. 2/2/9 SHR'D	2/2/9 UNSHR'D	2/2½/9 SHR'D	2/2½/9 UNSHR'D	2/3/9 SHR'D	2/3/9 UNSHR'D	2/3/11 SHR'D	2/3/11 UNSHR'D
	7·5 h.p. (5·5 kw) 220/380V	1	-	-	457104	457112	457104	457112	457104	457112
	380/420V	1	-	-	457105	457113	457105	457113	457105	457113
	10 h.p. (7·5 kw) 220/380V	1	-	-	457106	457114	457106	457114	457106	457114
	380/420V	1	-	-	457107	457115	457107	457115	457107	457115
	15 h.p. (11·0 kw) 220/380V	1	-	-	-	-	-	457116	-	457116
	380/420V	1	-	-	-	-	-	457117	-	457117
	20 h.p. (15·0 kw) 220/380V	1	-	-	-	-	-	457118	-	457118
	380/420V	1	-	-	-	-	-	457119	-	457119
12	Set-screw									
	⅜ in. BSW x 1¾ in. lg. hex. hd.	4	431645	431645	431645	431645	431645	431645	-	-
	½ in. BSW x 2 in. lg. hex. hd.	4	431666	431666	431666	431666	431666	431666	431666	431666
13	Nut, hex.									
	⅜ in. BSW	4	417865	417865	417865	417865	417865	417865	-	-
	½ in. BSW	4	417867	417867	417867	417867	417867	417867	417867	417867
14	Washer, motor/extension frame attachment									
	⅜ in. i.d.	4	-	443518	-	443518	-	443518	-	-
	½ in. i.d.	4	-	443520	-	443520	-	443520	-	443520
15	Plate assy, baffle and terminal box	1	241070	-	241070	-	241070	-	241070	-
16	Plate sub-assy, baffle	1	241071	-	241071	-	241071	-	241071	-
17	Clip, attachment	2	314253	-	314253	-	314253	-	314253	-
18	Set-screw O BA x ½ in. lg. ch. hd.	2	452601	-	452601	-	452601	-	452601	-
19	Gasket, Brook	1	322512	-	322512	-	322512	-	322512	-
20	Box, terminal, c/w cover plate	1	201239	-	201239	-	201239	-	201239	-
21	Board, Brook c/w terminal nuts and washers	1	402000	-	402000	-	402000	-	402000	-
22	Set-screw, 2 BA x 1 in. lg. ch. hd.	2	454115	-	454115	-	454115	-	454115	-
23	Nut, hex. 2 BA	2	419053	-	419053	-	419053	-	419053	-
24	Bush, insulating	1	404362	-	404362	-	404362	-	404362	-
25	Shaft, stub									
	3 h.p. motor	1	354300	354300	354300	354300	354300	354300	-	-
	5·5 h.p. motor	1	354301	354301	354301	354301	354301	354301	354301	354301
	7·5 and 10 h.p. motor	1	-	-	354302	354302	354302	354302	354302	354302
	15 and 20 h.p. motor	1	-	-	-	-	-	354303	-	354303
26	Screw, cap									
	¼ in. BSF x ¾ in. lg. skt. hd.	2	445244	445244	445244	445244	445244	445244	445244	445244
	5/16 in. BSF x 1 in. lg. skt. hd.	2	-	-	445245	445245	445245	445245	445245	445245
27	Backplate	1	338815	338815	338815	338815	338815	338815	338816	338816
28	Ring, sealing, body joint	1	413800	413800	413800	413800	413800	413800	413858	413858
29	Seal arrangements (See Fig. 8)	Ref								

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES III (contd)

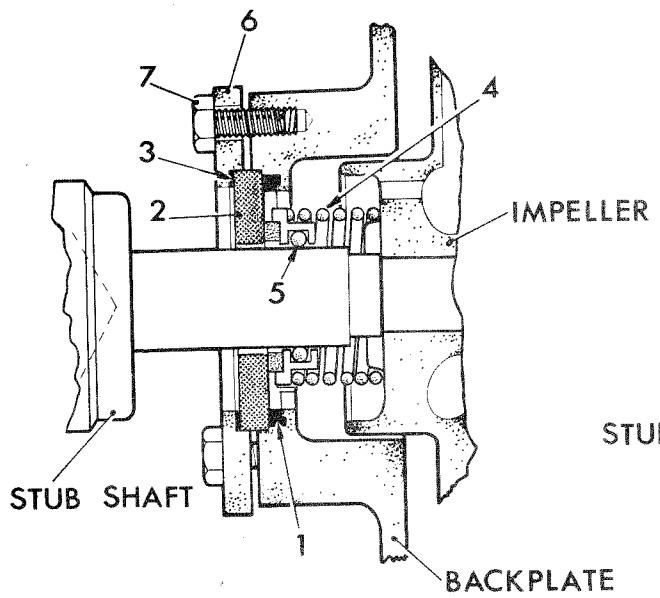
Fig. 7 Item	Description	No. off	Code No. 2/2/9 SHR'D	2/2/9 UNSHR'D	2/2½/9 SHR'D	2/2½/9 UNSHR'D	2/3/9 SHR'D	2/3/9 UNSHR'D	2/3/11 SHR'D	2/3/11 UNSHR'D
30	Impeller, with ¾ in. dia. (19 mm) discharge holes									
	5 in. (127 mm)	1	325840	325840	325840	325840	-	-	-	-
	5½ in. (140 mm)	1	325839	325839	325839	325839	-	-	-	-
	6 in. (152 mm)	1	325838	325838	325838	325838	-	-	-	-
	6½ in. (165 mm)	1	325837	325837	325837	325837	-	-	-	-
	7 in. (178 mm)	1	325836	325836	325836	325836	-	-	-	-
	7½ in. (191 mm)	1	325835	325835	325835	325835	-	-	-	-
	Impeller, with ⅞ in. dia. (22 mm) discharge holes									
	5 in. (127 mm)	1	-	-	-	-	325864*	325864*	-	-
		1	-	-	-	-	325852†	325852†	-	-
	5½ in. (140 mm)	1	-	-	-	-	325863*	325863*	-	-
		1	-	-	-	-	325851†	325851†	-	-
	6 in. (152 mm)	1	-	-	-	-	325862*	325862*	-	-
		1	-	-	-	-	325850†	325850†	-	-
	6½ in. (165 mm)	1	-	-	-	-	325861*	325861*	-	-
		1	-	-	-	-	325849†	325849†	-	-
	7 in. (178 mm)	1	-	-	-	-	325860*	325860*	-	-
		1	-	-	-	-	325848†	325848†	-	-
	7½ in. (191 mm)	1	-	-	-	-	325859*	325859*	325859*	325859*
		1	-	-	-	-	325847†	325847†	325847†	325847†
	8 in. (203 mm)	1	-	-	-	-	-	-	325858*	325858*
		1	-	-	-	-	-	-	325845†	325845†
	8½ in. (216 mm)	1	-	-	-	-	-	-	325857*	325857*
		1	-	-	-	-	-	-	325844†	325844†
	9 in. (229 mm)	1	-	-	-	-	-	-	325856*	325856*
		1	-	-	-	-	-	-	325843†	325843†
	9½ in. (241 mm)	1	-	-	-	-	-	-	325885*	325885*
		1	-	-	-	-	-	-	325842†	325842†
31	Nut, impeller	1	334739	334739	334739	334739	334739	334739	334739	334739
32	Body assy									
	with ISS fittings	1	200764	200764	200770	200770	200799	200799	207101	207101
	with RJT fittings	1	200763	200763	200769	200769	200798	200798	207100	207100
	without fittings	1	308439	308439	308442	308442	308454	308454	308464	308464
33	Collar assy, clamping	1	228717	228717	228717	228717	228717	228717	228718	228718
34	Collar	1	228713	228713	228713	228713	228713	228713	314638	314638
35	Fork	1	321814	321814	321814	321814	321814	321814	321814	321814

* with pressure balance holes

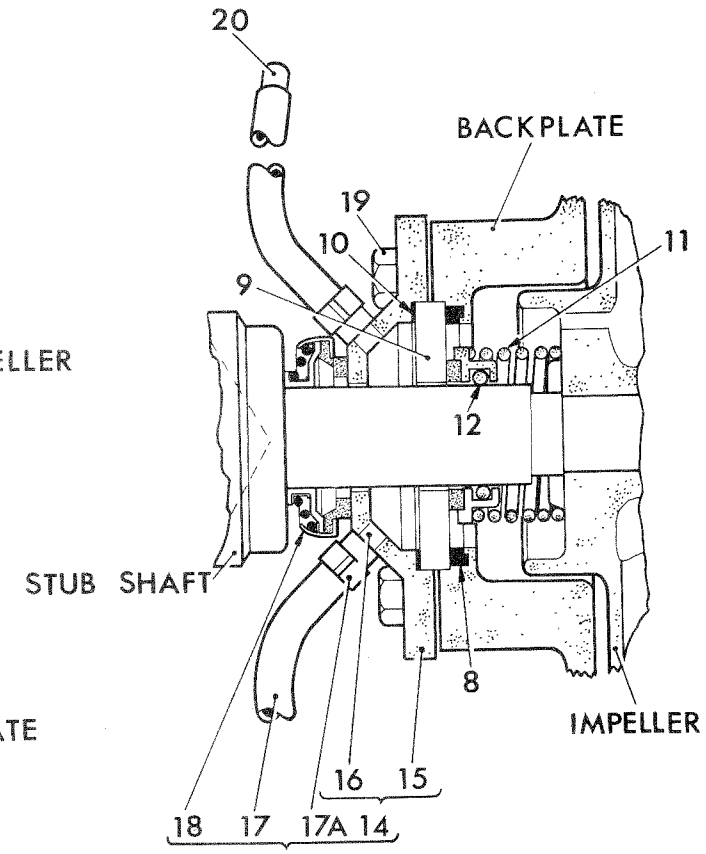
† without pressure balance holes

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES III (contd)

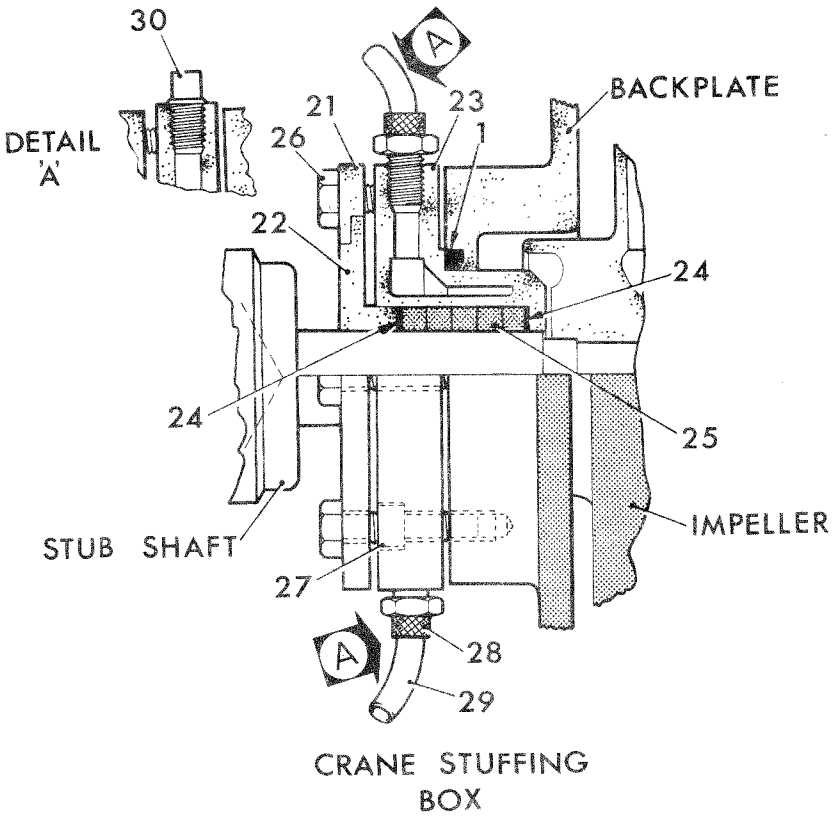
Fig. 7 Item	Description	No. off	Code No. 2/2/9 SHR'D	2/2/9 UNSHR'D	2/2½/9 SHR'D	2/2½/9 UNSHR'D	2/3/9 SHR'D	2/3/9 UNSHR'D	2/3/11 SHR'D	2/3/11 UNSHR'D
36	Pin	1	338611	338611	338611	338611	338611	338611	338611	338611
37	T-bolt	1	310177	310177	310177	310177	310177	310177	310177	310177
38	Pin, cross	1	338350	338350	338350	338350	338350	338350	338350	338350
39	Shroud assy	1	227417	-	227417	-	227417	-	227417	-
40	Set-screw, 2 BA x $\frac{3}{8}$ in. lg. rd. hd.	2	432410	-	432410	-	432410	-	432410	-
41	Bolt, $\frac{1}{4}$ in. BSW x $\frac{1}{2}$ in. lg. hex. hd.	1	431625	-	431625	-	431625	-	431625	-
42	Washer, plain, $\frac{1}{4}$ in. i.d.	1	443816	-	443816	-	443816	-	443816	-
43	Nameplate	1	423483	423483	423483	423483	423483	423483	423483	423483
44	Screw, hammer drive, No. 4 x $\frac{5}{16}$ in. lg. rd. hd.	1	457811	457811	457811	457811	457811	457811	457811	457811
45	Ring, joint 2 in.	4	434261	434261	434261	434261	434261	434261	434261	434261
	Ring, joint, $2\frac{1}{2}$ in RJT body only	1/2 **	413510 **	413510 **	413510	413510	413510	413510	413510	413510
	Ring, joint, 3 in.	1	-	-	413512	413512	-	-	-	-
		1	-	-	-	-	413514	413514	413514	413514
	Special tools									
	Spanner, for impeller nut	1	438928	438928	438928	438928	438928	438928	438928	438928
	Key, hex. wrench, $\frac{3}{16}$ in. A/F, for stub shaft securing screws on 3 and 5·5 h.p. motors	1	414105	414105	414105	414105	414105	414105	414105	414105
	Key, hex. wrench, $\frac{7}{32}$ in. A/F, for stub shaft securing screws on 7·5, 10, 15 and 20 h.p. motors	1	-	-	414106	414106	414106	414106	414106	414106
	Spacer, stub shaft, No. 22088	1	347651	347651	347651	347651	347651	347651	347651	347651



NON-WATER COOLED
FLEXIBOX



WATER COOLED
FLEXIBOX



CRANE STUFFING
BOX

Fig. 8 Seal arrangements (Series III)

(9-UH1/11-70)

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES III (contd)

Fig. 8 Item	Description		No. off	Code No.
	SEAL ARRANGEMENTS		-	-
	NON-WATER COOLED FLEXIBOX SEAL		-	-
1	Ring, sealing, seal face plate		1	413812
2	Plate, seal face		1	320303
3	Ring, sealing, housing		1	444000
4	Seal assy, Flexibox type R 2540 - 57R		1	427840
5	O-ring		1	426573
6	Housing, plate		1	344394
7	Set-screw, 5/16 in. BSF x 3/4 in. lg. hex. hd.		3	431724
	WATER COOLED FLEXIBOX SEAL		-	-
8	Ring, sealing, seal face plate	*	1	413812
9	Plate, seal face	*	1	320303
10	Ring, sealing housing	*	1	444000
11	Seal assy, Flexibox type R 2540-57R	*	1	427840
12	O-ring	*	1	426573
13	Seal assy, water cooling		1	244026
14	Housing assy		1	208836
15	Housing		1	325099
16	Tube, 1/4 in. o.d. x 20 swg x 1·0 in. lg.		2	134209
17	Tube, 3/8 in. o.d. x 1/4 in. i.d. x 18 in. lg.		2	182615
17A	Clip		2	406208
18	Seal, Cyclam type AD N1B 254713 PR		1	427866
19	Set-screw, 5/16 in. BSF x 3/4 in. lg. hex. hd.	*	3	431724
20	Adapter, 3/8 in. o.d. tube x 1/8 in. BSP		2	406418
	STUFFING BOX SEAL (Special order only)		-	-
21	Housing		1	344394
22	Gland, split		1	322612
23	Box assy, stuffing		1	201238
24	Washer, packing		2	444024
25	Ring, gland packing, Crane		5	426637
26	Set-screw, 5/16 in. BSF x 3/4 in. lg. hex. hd.		3	431724
27	Screw, skt. hd. cap. 5/16 in. BSF x 3/4 in. lg.		3	445236
28	Adapter, 3/8 in. o.d. tube x 1/8 in. BSP		4	406418
29	Tube, 3/8 in. o.d. x 1/4 in. i.d. x 18 in. lg.		2	182615
30	Plug, blanking, 1/8 in. BSP		2	424343

* Common to non-water cooled Flexibox seal arrangement

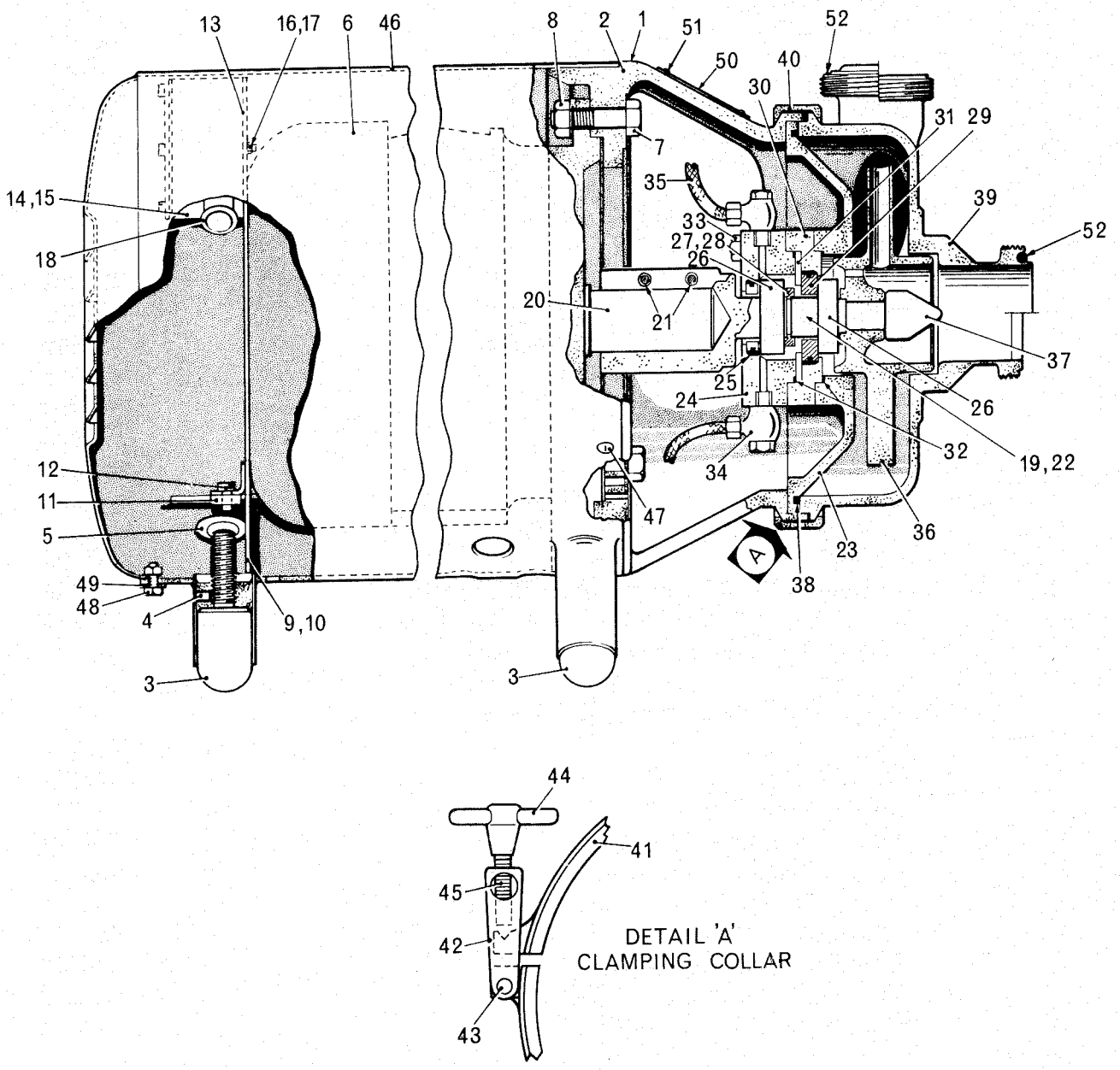


Fig. 9 Pump assembly (Series IV)

(9-UH1/11-70)

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES IV

Fig. 9 Item	Description	No. off	Code No. 2/3/9 Shrouded	Code No. 2/3/11 Shrouded
	PUMP COMPLETE	-	-	-
1	Frame assy, supporting			
	3 h.p. motor	1	206552	-
	5·5 h.p. motor	1	206554	206558
	7·5 and 10 h.p. motor	1	206556	206560
2	Frame sub-assy, welded, comprising base 226241, frame 321985, cover plate 339177 for 3 h.p. motor	1	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321986, cover plate 339178 for 5·5 h.p. motor with 9 in. body	1	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321988, cover plate 339178 for 5·5 h.p. motor with 11 in. body	1	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321987, cover plate 339179 for 7·5 and 10 h.p. motor with 9 in. body	1	-	-
	Frame sub-assy, welded, comprising base 226241, frame 321989, cover plate 339179 for 7·5 and 10 h.p. motor with 11 in. body	1	-	-
3	Foot, adjustable	3	337600	337600
4	Grub-screw, 2 BA x $\frac{1}{2}$ in. lg. slot hd.	3	434110	434110
5	Grommet, $1\frac{1}{4}$ in. o.d. x $\frac{3}{4}$ in. i.d.	1	410500	410500
6	Motor, Brook, 3-phase 50 or 60 c/s A.C.			
	3 h.p. (2·2 kw) 220/380-420V	1	457100	-
	5·5 h.p. (4·0 kw) 220/380V	1	457102	457102
	380/420V	1	457103	457103
	7·5 h.p. (5·5 kw) 220/380V	1	457104	457104
	380/420V	1	457105	457105
	10 h.p. (7·5 kw) 220/380V	1	457106	457106
	380/420V	1	457107	457107
7	Set-screw			
	$\frac{3}{8}$ in. BSW x $1\frac{3}{4}$ in. lg. hex. hd.	4	431645	-
	$\frac{1}{2}$ in. BSW x 2 in. lg. hex. hd.	4	431666	431666
8	Nut, hex.			
	$\frac{3}{8}$ in. BSW	4	417865	-
	$\frac{1}{2}$ in. BSW	4	417867	417867
9	Plate assy, baffle, and terminal box	1	241070	241070

Fig. 9 Item	Description	No. off	Code No. 2/3/9 Shrouded	Code No. 2/3/11 Shrouded
10	Plate sub-assy, baffle	1	241071	241071
11	Clip, attachment	2	314253	314253
12	Set-screw, O BA x $\frac{1}{2}$ in. lg. ch. hd.	2	452601	452601
13	Gasket, Brook	1	322512	322512
14	Box, terminal, c/w cover plate	1	201239	201239
15	Board, Brook, c/w terminal nuts and washers	1	402000	402000
16	Set-screw, 2 BA x 1 in. lg. ch. hd.	2	454115	454115
17	Nut, hex, 2 BA	2	419053	419053
18	Bush, insulating	1	404362	404362
19	Seal assy, Cyclam Aseptic, 3 h.p. motor	1	244049	-
	Seal assy, Cyclam Aseptic, 5·5 h.p. motor	1	244050	244046
	Seal assy, Cyclam Aseptic, 7·5 and 10 h.p. motor	1	244051	244047
20	Shaft, stub			
	3 h.p. motor	1	354309	-
	5·5 h.p. motor	1	354307	354307
	7·5 and 10 h.p. motor	1	354308	354308
21	Screw, cap			
	$\frac{1}{4}$ in. BSF x $\frac{3}{4}$ in. lg. skt. hd.			
	3 and 5·5 h.p. motor	2	445244	445244
	$\frac{5}{16}$ in. BSF x 1 in. lg. skt. hd.			
	7·5 and 10 h.p. motor	2	445245	445245
22	Seal sub-assy	1	244048	-
23	Backplate	1	338818	338817
24	Housing rear	1	324904	324904
25	Plate assy, seal face, Cyclam type AD2550 10 TANX14	1	459150	459150
26	Seal assy, Cyclam Aseptic type AD254713PRN14K	2	459149	459149
27	Collar	1	314682	314682
28	Grub-screw, 2 BA x $\frac{1}{4}$ in. lg. slot. hd.	2	434106	434106
29	Plate assy, seal face, Cyclam type AD255710TBNX14	1	459151	459151
30	Housing, front	1	324903	324903
31	Ring, retaining	1	345088	345088
32	Gasket	2	449115	449115
33	Bolt hex. hd. $\frac{5}{16}$ in. BSF x $2\frac{1}{4}$ in. lg.	3	403219	403219
34	Banjo and bolt assy, $\frac{1}{4}$ in. BSP	2	400146	400146
35	Hose, $\frac{1}{4}$ in. i.d. x 18 in. lg. c/w end fittings	2	410922	410922

ILLUSTRATED PARTS LIST - PUMA PUMP SERIES IV (contd)

Fig. 9 Item	Description	No. off	Code No. 2/3/9 Shrouded	Code No. 2/3/11 Shrouded
36	Impeller, with $\frac{7}{8}$ in. dia. (22 mm) discharge holes			
	5 in. (127 mm)	1	325864*	-
		1	325852†	-
	$5\frac{1}{2}$ in. (140 mm)	1	325863*	-
		1	325851†	-
	6 in. (152 mm)	1	325862*	-
		1	325850†	-
	$6\frac{1}{2}$ in. (165 mm)	1	325861*	-
		1	325849†	-
	7 in. (178 mm)	1	325860*	-
		1	325848†	-
	$7\frac{1}{2}$ in. (191 mm)	1	325859*	325859*
		1	325847†	325847†
	8 in. (203 mm)	1	-	325858*
		1	-	325845†
	$8\frac{1}{2}$ in. (216 mm)	1	-	325857*
		1	-	325844†
	9 in. (229 mm)	1	-	325856*
		1	-	325843†
	$9\frac{1}{2}$ in. (241 mm)	1	-	325855*
		1	-	325842†
37	Nut, impeller	1	334739	334739
38	Ring, sealing, body joint	1	413800	413858
39	Body assy			
	with RJT fittings	1	200798	207100
	with ISS fittings	1	200799	207101
	without fittings	1	308454	308464
40	Collar assy, clamping	1	228717	228718
41	Collar	1	228713	228713
42	Fork	1	321814	321814
43	Pin	1	338611	338611
44	T-Bolt	1	310177	310177
45	Pin, cross	1	338350	338350
46	Shroud assy	1	227417	227417
47	Set-screw, 2 BA x $\frac{3}{8}$ in. lg. rd. hd.	2	432410	432410

* with pressure balance holes
† without pressure balance holes

Fig. 9 Item	Description	No. off	Code No. 2/3/9 Shrouded	Code No. 2/3/11 Shrouded
48	Bolt, $\frac{1}{4}$ in. BSW x $\frac{1}{2}$ in. lg. hex. hd.	1	431625	431625
49	Washer, plain $\frac{1}{4}$ in. i.d.	1	443816	443816
50	Nameplate	1	457808	457808
		1	457812	457812
51	Screw, hammer drive, No. 4 x $\frac{5}{16}$ in. lg. rd.hd.	4	434261	434261
52	Ring, joint, 2 in.	1	413510	413510
	Ring, joint, 3 in.	1	413514	413514
	Special tools			
	Spanner, for impeller nut	1	438928	438928
	Key, hex. wrench, $\frac{3}{16}$ in. A/F, for stub shaft securing screws on 3 and 5·5 h.p. motors	1	414105	414105
	Key, hex, wrench, $\frac{7}{32}$ in. A/F, for stub shaft securing screws on 7·5, 10, 15 and 20 h.p. motors	1	414106	414106
	Fitting } for installation of Cyclam seal face plate into housings	1	353319	353319
	O-ring } for installation of Cyclam seal face plate into housings	1	426515	426515
	O-ring } for installation of Cyclam seal face plate into housings	1	426509	426509
	Sleeve } for assy of Cyclam seals onto stub shaft	1	353320	353320
	Ring, tapered } for assy of Cyclam seals onto stub shaft	1	353321	353321

COMPLETE PUMP AND MOTOR RANGE

Size	Complete pump (less motor & impeller) - Code No.						Motor		
	WATER COOLED SEAL			NON-WATER COOLED SEAL			Specification		Code No.
	RJT	ISS	without fittings	RJT	ISS	without fittings			
SERIES III							Brook B.S. 3979 Metric, 3-phase, 50 or 60 c/s, A.C.		
2/2/9 Shrouded	224828	224829	224830	224831	224832	224833	3 h.p. (2·2 kw)	220/380-420V	457132
	224834	224835	224836	224837	224838	224839	5·5 h.p. (4·0 kw)	220/380V	457102
								380/420V	457103
2/2/9 Unshrouded	224972	224973	224974	224975	224976	224977	3 h.p. (2·2 kw)	220/380-420V*	457108
								220/380-420V**	457109
	224978	224979	224980	224981	224982	224983	5·5 h.p. (4·0 kw)	220/380V	457110
								380/420V	457111
2/2½/9 Shrouded	224840	224841	224842	224843	224844	224845	3 h.p. (2·2 kw)	220/380-420V	457132
	224846	224847	224848	224849	224850	224851	5·5 h.p. (4·0 kw)	220/380V	457102
								380/420V	457103
	224852	224853	224854	224855	224856	224857	7·5 h.p. (5·5 kw)	220/380V	457104
								380/420V	457105
							10 h.p. (7·5 kw)	220/380V	457106
								380/420V	457107
2/2½/9 Unshrouded	224984	224985	224986	224987	224988	224989	3 h.p. (2·2 kw)	220/380-420V*	457108
								220/380-420V**	457109
	224990	224991	224992	224993	224994	224995	5·5 h.p. (4·0 kw)	220/380V	457110
								380/420V	457111
	224996	224997	224998	224999	225400	225401	7·5 h.p. (5·5 kw)	220/380V	457112
								380/420V	457113
							10 h.p. (7·5 kw)	220/380V	457114
								380/420V	457115
2/3/9 Shrouded	224858	224859	224860	224861	224862	224863	3 h.p. (2·2 kw)	220/380-420V	457132
	224864	224865	224866	224867	224868	224869	5·5 h.p. (4·0 kw)	220/380V	457102
								380/420V	457103
	224870	224871	224872	224873	224874	224875	7·5 h.p. (5·5 kw)	220/380V	457104
								380/420V	457105
							10 h.p. (7·5 kw)	220/380V	457106
								380/420V	457107

* terminal box with continental conduit thread
** terminal box with Brit. Std. conduit thread

COMPLETE PUMP AND MOTOR RANGE (contd)

Size	Complete pump (less motor & impeller) - Code No.						Motor		
	WATER COOLED SEAL			NON-WATER COOLED SEAL			Specification		Code No.
	RJT	ISS	without fittings	RJT	ISS	without fittings			
SERIES III (contd)									
2/3/9 Unshrouded	225402	225403	225404	225405	225406	225407	3 h.p. (2·2 kw)	220/380-420V*	457108
								220/380-420V**	457109
	225408	225409	225410	225411	225412	225413	5·5 h.p. (4·0 kw)	220/380V	457110
								380/420V	457111
	225414	225415	225416	225417	225418	225419	7·5 h.p. (5·5 kw)	220/380V	457112
								380/420V	457113
							10 h.p. (7·5 kw)	220/380V	457114
								380/420V	457115
	225420	225421	225422	225423	225424	225425	15 h.p. (11·0 kw)	220/380V	457116
								380/420V	457117
							20 h.p. (15·0 kw)	220/380V	457118
								380/420V	457119
2/3/11 Shrouded	224876	224877	224878	224879	224880	224881	5·5 h.p. (4·0 kw)	220/380V	457102
								380/420V	457103
	224882	224883	224884	224885	224886	224887	7·5 h.p. (5·5 kw)	220/380V	457104
								380/420V	457105
							10 h.p. (7·5 kw)	220/380V	457106
								380/420V	457107
2/3/11 Unshrouded	225426	225427	225428	225429	225430	225431	5·5 h.p. (4·0 kw)	220/380V	457110
								380/420V	457111
	225432	225433	225434	225435	225436	225437	7·5 h.p. (5·5 kw)	220/380V	457112
								380/420V	457113
							10 h.p. (7·5 kw)	220/380V	457114
								380/420V	457115
	225438	225439	225440	225441	225442	225443	15 h.p. (11·0 kw)	220/380V	457116
								380/420V	457117
							20 h.p. (15·0 kw)	220/380V	457118
								380/420V	457119

* terminal box with continental conduit thread
** terminal box with Brit. Std. conduit thread

COMPLETE PUMP AND MOTOR RANGE (contd)

Size	Complete pump (less motor & impeller) - Code No.						Motor	
	WATER COOLED SEAL			NON-WATER COOLED SEAL			Specification	Code No.
	RJT	ISS	without fittings	RJT	ISS	without fittings		
SERIES IV								
2/3/9 Shrouded	230806	230807	230808	-	-	-	3 h.p. (2·2 kw) 220/380-420V	457100
	230809	230810	230811	-	-	-	5·5 h.p. (4·0 kw) 220/380V	457102
							380/420V	457103
	230812	230813	230814	-	-	-	7·5 h.p. (5·5 kw) 220/380V	457104
							380/420V	457105
							10 h.p. (7·5 kw) 220/380V	457106
							380/420V	457107
2/3/11 Shrouded	230800	230801	230802	-	-	-	5·5 h.p. (4·0 kw) 220/380V	457102
							380/420V	457103
	230803	230804	230805	-	-	-	7·5 h.p. (5·5 kw) 220/380V	457104
							380/420V	457105
							10 h.p. (7·5 kw) 220/380V	457106
							380/420V	457107

SERVICE

The A.P.V. Service Department is staffed and equipped to provide advice and assistance at all times. To avoid delays when making enquiries, please quote the Serial Number of your machine/equipment (where applicable) and the Code Number of any part referred to.

Telephone: CRAWLEY 27777 (*ask for "Service"*)
Telegrams: ANACLASTIC CRAWLEY TELEX
Telex: 87237

Printed in England P.P. 1/71