



Flowserve Pump Division



I.O.M. Installation, Operation and Maintenance

**IDP[®] Pumps
Models CPXV & CPXRV**

VERTICAL SUMP PUMPS

INTRODUCTION

Flowserve

Flowserve's products and brands are the leading names in their fields: the CPX range of process pumps specifically focus on demanding chemical process applications. The pumps are manufactured at modern facilities, utilising state of art equipment and sophisticated quality control techniques. Flowserve is proud of earning preferred supplier status to many of world's leading processing companies. Engineered, manufactured, sold and serviced to ISO 9001 quality certification, Flowserve pumps are truly world class products.

With more than 120 years of experience in servicing the needs of world-wide process industries, Flowserve has become the unchallenged leader in hydraulic design engineering, materials expertise and application know-how. Committed to continuous quality improvement, Flowserve controls the complete product life cycle - from application engineering, design, melting and casting, to cellular manufacturing, to assembly and testing, to the supply of aftermarket products, repair and diagnostic services.

Flowserve is on hand to provide technical support and special services specific to the needs of its customers.

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CE Mark System

It is a legal requirement that machinery and equipment put into service within the European Union shall conform with the applicable European Union Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED) and Equipment for Potentially Explosive Atmospheres (ATEX).

Where applicable the European Union Directives cover important Safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. This document incorporates information relevant to these Directives.



The Manual should be read prior to installing, operating, using and maintaining the equipment. The equipment must not be put into service until all the conditions relating to safety noted in the Manual have been met.

Disclaimer








Flowserve manufactures products to exacting International Quality Management System Standards (ISO 9001). Genuine parts and accessories have been designed, tested and incorporated into the products to ensure their continued product quality and performance in use. As Flowserve cannot test parts and accessories sourced from other vendors the incorrect incorporation of such parts and accessories may adversely affect the performance and safety features of the products. The failure to properly select, install or use authorised Flowserve parts and accessories is considered to be misuse. Damage or failure caused by misuse is not covered by Flowserve's warranty. In addition, any modification of Flowserve products or removal of original components may impair the safety of these products in their use.

1 NAMEPLATE & WARNING LABELS

1.1 Nameplate


For details of nameplate, see the Declaration of conformity.

1.2 Warning labels

FLOWSERVE		WARNING	J218JZ250
ESSENTIAL PROCEDURES BEFORE STARTING:			
	INSTALL AND OPERATE EQUIPMENT IN ACCORDANCE WITH THE INSTRUCTION MANUAL SUPPLIED SEPARATELY.		ENSURE ALL EXTERNAL CONNECTIONS TO THE PUMP / SHAFT SEALING AND DRIVER ARE CONNECTED AND OPERATIONAL.
	ENSURE GUARDS ARE SECURELY IN PLACE.		FULLY PRIME UNIT AND SYSTEM. DO NOT RUN UNIT DRY.
	ENSURE CORRECT DIRECTION OF ROTATION.		
			FAILURE TO FOLLOW THESE PROCEDURES MAY RESULT IN PERSONAL INJURY AND / OR EQUIPMENT DAMAGE 

		J218JZ265	
	ENSURE CORRECT DRIVER DIRECTION OF ROTATION WITH COUPLING ELEMENT / PINS REMOVED: OTHERWISE SERIOUS DAMAGE MAY RESULT.	KONTROLLE VORGESCHRIEBENER DREHRICHTUNG ! HIERZU KUPPLUNGSZWISCHENSTÜCK / KUPPLUNGSBOLZEN ENTFERNEN. ANDERENFALLS ERNSTHAFTE SCHÄDEN !	
	VERIFIER LE SENS CORRECT DE ROTATION DU MOTEUR. POMPE DESACCOUPLEE / ENTRETOISE DEMONTEE. NE PAS SUIVRE CETTE RECOMMANDATION PEUT CONDUIRE A DE GRAVES DOMMAGES POUR LA POMPE	ZORG VOOR JUISTE ROTATIERICHTING VAN DRIJFAS WAARBIJ DE KOPPELELEMENTEN / PENNEN VERWIJDERD ZIJN: VERZUM KAN ERNSTIGE SCHADE TOT GEVOLG HEBBEN.	
CDC: 603 604 610 612 621 623 624			

Oil lubricated units only.

		J218JZ262	
	WARNING	THIS MACHINE MUST BE FILLED WITH OIL BEFORE STARTING	
	ATTENTION	CETTE MACHINE DOIT ÊTRE REMPLIE D'HUILE AVANT LA MISE EN MARCHÉ	
	ACHTUNG	DIESE MASCHINE IST VOR DEM STARTEN MIT ÖL ZÜ FULLEN	
	WAARSCHUWING	DEZE MACHINE MOET VOOR HET STARTEN MET OLIE GEVULD WORDEN	
CDC: 603 604 610 612 621 623 624			

2 SAFETY

2.1 Duty conditions

This pump has been selected to meet the duty and service conditions advised on your order. The acknowledgement of these conditions has been sent separately to the Purchaser. A copy should be kept with this manual.

If there is any doubt as to the suitability of the pump for the application intended, contact Flowserve for advice, quoting the pump serial number.

2.2 Safety action

Always co-ordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws/regulations.

THIS IS A SUMMARY OF CONDITIONS AND ACTIONS TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.



This sign indicates safety instructions where non-compliance would affect personal safety.



This symbol indicates electrical safety instructions where non-compliance would affect personal safety.

ATTENTION

This symbol indicates safety instructions where non-compliance would affect the safe operation or protection of the pump or pump unit.

2.2.1 **ATTENTION** PREVENT EXCESSIVE EXTERNAL PIPE LOAD

Do not use pump as a support for piping. Do not mount expansion joints so that their force, due to internal pressure, acts on the pump flange.

2.2.2 **ATTENTION** ONLY CHECK DIRECTION OF MOTOR ROTATION WITH COUPLING ELEMENT/PINS REMOVED

Starting in reverse direction of rotation will damage the pump.

2.2.3 **ATTENTION** START THE PUMP WITH OUTLET VALVE CLOSED

This is recommended to avoid the risk of overloading and damaging the pump motor at full flow. Pumps may be started with the valve open only on installations where this situation cannot occur.

2.2.4 **ATTENTION** ENSURE CORRECT LUBRICATION

(See: *Making ready for operation - Lubrication.*)

2.2.5 **ATTENTION** NEVER RUN THE PUMP DRY

ATTENTION

2.2.6 INLET VALVES TO BE FULLY OPEN WHEN PUMP IS RUNNING

Running the pump at zero flow or below the recommended minimum flow continuously will cause the shaft, packing or mechanical seal to run hot and fail within a short time.

ATTENTION

2.2.7 DO NOT RUN THE PUMP AT ABNORMALLY HIGH OR LOW FLOW RATES

Operating at a flow rate higher than normal or at a flow rate with no back pressure on the pump may overload the motor and cause cavitation. Low flow rates may cause a reduction in pump/bearing life, overheating of the pump, instability and cavitation/vibration.



2.2.8 NEVER DO MAINTENANCE WORK WHILST THE UNIT IS CONNECTED TO POWER



2.2.9 NEVER APPLY HEAT TO REMOVE IMPELLER

Trapped lubricant or vapour could cause an explosion.



2.2.10 HANDLING COMPONENTS

Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 30kg (66lbs) use a crane corresponding to the mass and in accordance with current local regulations.



2.2.11 DRAIN PUMP AND ISOLATE PIPEWORK BEFORE DISMANTLING THE PUMP

The appropriate safety precautions should be taken where the pumped liquids are hazardous.



2.2.12 FLUORO-ELASTOMERS (when fitted to high temperature units).

When a pump has experienced temperatures over 250°C (482°F), partial decomposition of fluoro-elastomers (eg viton) will occur. In this condition these are extremely dangerous and skin contact must be avoided.



2.2.13 THERMAL SHOCK

Rapid changes in the temperature of the liquid within the pump can cause thermal shock, which can result in damage or breakage of components. Thermal shock should be avoided, particularly so where the material of the pump is not resistant to such loading.



2.2.14 HOT (and cold) PARTS

If hot or freezing components or auxiliary heating supplies can present a danger to operators, they must be shielded to avoid accidental contact. If complete protection is not possible, machine access must be limited to maintenance staff only. Note: drive motors and bearings may be hot.

IF THE TEMPERATURE IS GREATER THAN 80°C (175°F) OR BELOW 5°C (20°F), A VISUAL WARNING INDICATOR SUCH AS A WARNING PLATE MUST BE PLACED CLEARLY ON THE EQUIPMENT.



2.2.15 HAZARDOUS LIQUIDS

When the pump is handling hazardous liquids care must be taken to avoid liquid contact using the appropriate health and safety procedures. Pump location and personnel access/training should consider and address these site dangers.

2.3 Potentially explosive atmospheres

Always check that the driver, drive coupling assembly and pump equipment are suitably rated and/or certified for the classification of the specific atmosphere in which they are to be installed. See section 17, *Certification*.

3 CONTENTS

	PAGE		PAGE
INTRODUCTION	2	11 STOPPING AND SHUTDOWN	11
1 NAMEPLATE & WARNING LABELS	3	12 PREVENTATIVE MAINTENANCE AND SERVICING	
2 SAFETY		Maintenance schedule	11
Duty conditions	4	Routine inspection (daily/weekly)	11
Safety action	4	Periodic inspection (6 monthly)	12
Potentially explosive atmospheres	5	Lubrication data	12
3 CONTENTS	6	Gland packing	12
4 PUMP TECHNICAL DATA		Mechanical seals	12
Performance	7	Setting impeller clearance	12
Noise level	7	13 DISMANTLING AND ASSEMBLY	
Pressure limits	7	Dismantling	13
Flange loads	7	Examination of parts	13
Ambient temperature	7	Assembly	14
Pump lubricants	8	Casing and seal housing screw torque	15
5 PRODUCT DESCRIPTION		14 SPARE PARTS	
General	8	Ordering of spares	16
Pump casing	8	Storage of spares	16
Impeller	8	Recommended spares	16
Shaft	8	15 SUPPLEMENTARY INSTRUCTION MANUALS	16
Bearing housing	8	16 CHANGE NOTES	16
Pump bearings and lubrication	9	17 CERTIFICATION	16
Soleplate seal	9	18 GENERAL ARRANGEMENT DRAWING	16
Driver	9	19 OPERATING DIFFICULTIES	17
Accessories	9	20 SECTIONAL ARRANGEMENT DRAWINGS AND PARTS LISTS	18-22
6 STORAGE	9	21 PARTS INTERCHANGEABILITY	23
7 INSTALLATION			
Unpacking and inspection	9		
Handling	9		
Location	9		
Foundation	9		
Grouting	9		
Electrical connections	9		
Pipework connections	10		
Final piping check	10		
Auxiliary piping	10		
8 MAKING READY FOR OPERATION			
Lubrication	10		
Direction of rotation	10		
Guarding	10		
Open impeller clearance	10		
Primary and auxiliary supplies	11		
Filling and priming	11		
9 STARTING THE PUMP	11		
10 RUNNING			
Pumps fitted with packed glands	11		
Pumps fitted with mechanical seals	11		
Stop/start frequency	11		

4 PUMP TECHNICAL DATA

4.1 Performance

For performance parameters see the paragraph on *Safety - Duty conditions*. When specified by the contract, performance data has been supplied separately to the purchaser and should be obtained and retained with this manual if required.

4.2 Noise level

When pump noise level exceeds 85dBA attention must be given to prevailing Health and Safety Legislation, to limit the exposure of plant operating personnel to the noise. The usual approach is to control exposure time to the noise or to enclose the machine to reduce emitted sound.

You may have already specified a limiting noise level when the equipment was ordered, however if no noise requirements were defined then machines above a certain power level will exceed 85dBA.

Pump noise level is dependent on a number of factors - the type of motor fitted, the operating capacity, pipework design and acoustic characteristics of the building. The levels specified in the table below are estimated and not guaranteed.

The dBA values are based on the noisiest ungeared electric motors that are likely to be encountered. They are Sound Pressure levels at 1m (3.3ft) from the directly driven pump, for "free field over a reflecting plane".

If a pump unit only has been purchased, for fitting with your own driver, then the "pump only" noise levels from the table should be combined with the level for the driver obtained from the supplier. Consult a Noise Specialist for this calculation.

For units driven by equipment other than electric motors or units contained within enclosures, see the accompanying information sheets and manuals.

4.3 Pressure limits

The operating pressure has been selected to meet your specified requirements. See the paragraph on *Safety - Duty conditions* for details.

The pressure and temperature operating limits for the flanges are in accordance with the relevant National or International standards unless advised otherwise.

4.4 Flange loads

The permissible flange loading is dependent on a number of factors such as dimensions, flange rating, pressure, temperature, material, pump configuration, etc. The recommendations contained in the section on pipework connections should be followed to eliminate these loads.

When requested the permissible flange loading will have been supplied separately to the purchaser and should be obtained and retained with this manual.

If in doubt contact Flowserve for information.

4.5 Ambient temperature

These pumps are generally fitted with TEFC motors with an ambient temperature limit of 40°C (104°F). Specific pumps may be fitted with motors to suit clients' requirements with other ambient temperature limits - see motor nameplate for details.

Motor size		3550 rpm		2900 rpm		1750 rpm		1450 rpm	
		Pump & motor dBA	Pump only dBA	Pump & motor dBA	Pump only dBA	Pump & motor dBA	Pump only dBA	Pump & motor dBA	Pump only dBA
kW	(hp)								
<0.55	(<0.75)	71	66	64	62	64	62	63	62
0.75	(1)	74	66	67	62	67	62	63	62
1.1	(1.5)	74	68	67	64	67	64	65	64
1.5	(2)	77	70	70	66	70	66	66	66
2.2	(3)	78	72	71	68	71	68	68	68
3	(4)	81	74	74	70	74	74	70	70
4	(5)	82	75	75	71	75	75	71	71
5.5	(7.5)	90	77	83	73	76	75	72	71
7.5	(10)	90	78	83	74	77	76	73	72
11	(15)	91	80	84	76	78	77	74	73
15	(20)	92	83	85	79	80	79	76	75
18.5	(25)	92	83	85	79	80	79	76	75
22	(30)	92	83	85	79	81	79	77	75
30	(40)	100	85	93	81	84	80	80	76
37	(50)	100	86	93	82	84	80	80	76
45	(60)	100	87	93	83	84	80	80	76
55	(75)	102	88	95	84	86	81	82	77
75	(100)	100	90	95	86	88	81	83	78
90	(120)	97	90	92	86	90	81	85	78
110	(150)	100	91	95	87	91	83	86	79
150	(200)	101	92	96	88	91	83	86	79

4.6 Pump lubricants

4.6.1 Recommended oil lubricants

Centrifugal pump lubrication	Oil	Splash lubrication		Force feed lubrication
	Viscosity mm ² /s 40°C	32	68	46
	Temp. maximum °C (°F)	65 (149)	80 (176)	-
	Designation according to DIN51502 ISO VG	HL/HLP 32	HL/HLP 68	HL/HLP 46
Oil companies and lubricants	BP	BP Energol HL32 BP Energol HLP32	BP Energol HL68 BP Energol HLP68	BP Energol HL46 BP Energol HLP46
	DEA	Anstron HL32 Anstron HLP32	Anstron HL68 Anstron HLP68	Anstron HL46 Anstron HLP46
	Elf	OLNA 32 HYDRELEF 32 TURBELF 32 ELFOLNA DS32	TURBELF SA68 ELFOLNA DS68	TURBELF SA46 ELFOLNA DS46
	Esso	TERESSO 32 NUTO H32	TERESSO 68 NUTO H68	TERESSO 46 NUTO H46
	Mobil	Mobil DTE oil light Mobil DTE13 MobilDTE24	Mobil DTE oil heavy medium Mobil DTE26	Mobil DTE oil medium Mobil DTE15M Mobil DTE25
	Q8	Q8 Verdi 32 Q8 Haydn 32	Q8 Verdi 68 Q8 Haydn 68	Q8 Verdi 46 Q8 Haydn 46
	Shell	Shell Tellus 32 Shell Tellus 37	Shell Tellus 01 C 68 Shell Tellus 01 68	Shell Tellus 01 C 46 Shell Tellus 01 46
	Texaco	Rando Oil HD 32 Rando Oil HD-AZ-32	Rando Oil 68 Rando Oil HD C-68	Rando Oil 46 Rando Oil HD B-46
	Wintershall (BASF Group)	Wiolan HN32 Wiolan HS32	Wiolan HN68 Wiolan HS68	Wiolan HN46 Wiolan HS46

4.6.2 Bearing sizes and grease/oil capacities

Shaft size	1	2	3	4
Medium duty thrust bearing duplex back-to-back AC	3306C3	3309C3	3311C3	3313C3
Heavy duty thrust bearing duplex back-to-back AC	7306 pair	7309 pair	7311 pair	7313 pair
Approximate oil fill quantities	600 ml	950ml	1000ml	-
Grease quantities	75 cm ³	150 cm ³	300 cm ³	450 cm ³

Note: The bearing sizes do not constitute a purchasing specification.

4.6.3 Recommended grease lubricants

Grease	Grease nipples	
	NLGI 2 *	NLGI 3 **
Temp. range °C (°F)	-20 to +100 (-4 to +212)	-20 to +100 (-4 to +212)
Designation according to DIN	K2K-20	K2K 30
BP	Energrease LS2	Energrease LS3
DEA	Glissando 20	Glissando 30
Elf	Elfmulti 2	Elfmulti 3
Esso	Beacon 2	Beacon 3
Mobil	Mobilux 2	Mobilux 3
Q8	Rembrandt 2	Rembrandt 3
Shell	Alvania Fett G2 Alvania Fett R2	Alvania R3
Texaco	Multilak 20 Multilak EP2	Multilak 30 Multilak EP3
Wintershall (BASF Group)	Wiolub LFK 2	-
SKF	LGMT 2	LGMT 3
Silkolene	G55/T	G56/T

* NLGI 2 is an alternative grease and is not to be mixed with other grades.

** Factory packed bearings for the temperature range with grease nipples.

5 PRODUCT DESCRIPTION

5.1 General

This is a robustly designed sump pump.

5.2 Pump casing

The pump casing is designed for operation when submerged in the sump liquid.

5.3 Impeller

An open impeller is fitted. (On the CPXRV the impeller is recessed within the back of the casing and the impeller setting is to the rear backvanes.)

5.4 Shaft

The shaft has a keyed drive coupling and screwed drive in the liquid end. It is supported by rolling bearing(s) above the soleplate and journal bearing(s) below.

5.5 Bearing housing

The bearing housing enables adjustment of impeller face clearance on the open impeller via the bearing carrier jacking screws.

5.6 Pump bearings and lubrication

The pump is fitted with a thrust type ball bearing that may be configured differently dependent on use.

The thrust bearing(s) may be grease or oil lubricated.

The journal bearings may be lubricated by product or from an external source.

5.7 Soleplate seal

The modular design enables one of a number of sealing options to be fitted.

5.8 Driver

The pump is driven by a flange mounted electric motor.

The position of the terminal box can be changed by rotating the complete motor. To do this, remove the fasteners from the motor flange, rotate the motor and re-fit the fasteners.

5.9 Accessories

Accessories may be fitted when specified by the customer.

6 STORAGE

Store the pump in a clean, dry location away from vibration. Leave piping connection covers in place to keep dirt and other foreign material out of pump casing. Turn pump at intervals to prevent brinelling of the bearings and the seal faces, if fitted, from sticking.

The pump may be stored as above for up to 6 months. Consult Flowserve for preservative actions when a longer storage period is needed.

Warranty for the pumps will normally be for 12 months. Extension of this period can only be achieved with the prior agreement of Flowserve and would necessitate inspection, prior to putting the pump into service.

7 INSTALLATION

7.1 Unpacking and inspection

The pump should be checked against the delivery advice note and any damage or shortage reported immediately to Flowserve. Any crate or carton or wrappings should be checked for any spare parts or accessories that may be packed with the pump.

7.2 Handling

Boxes, crates, pallets or cartons may be unloaded using fork lift vehicles or slings dependent on their size and construction.

No specific lifting points are provided for this complete machine (unless so identified). Any lifting points that can be seen are provided only for dismantling parts for servicing. Slings, ropes and other lifting gear should be positioned where they cannot slip and where a balanced lift is obtained.

7.3 Location

The pump should be located to allow room for access, ventilation, maintenance and inspection with ample headroom for lifting and should be as close as practicable to the supply of liquid to be pumped.

7.4 Foundation

There are many methods of installing pump units to their foundations. The correct method depends on the size of the pump unit, its location and noise vibration limitations. Non-compliance with the provision of correct foundation and installation may lead to failure of the pump and as such, would be outside the terms of the warranty.


The sump pump mounting plate should have concrete or metal to support it around its edge. Packing pieces evenly spaced and adjacent to the foundation bolts shall be used to avoid distorting the mounting plate. On larger units, it will be necessary to fit the motor after installing the pump. The sump pump mounting plate should be level so that the pump column hangs vertically.

7.5 Grouting


Where applicable, grout in the foundation bolts.


Grouting provides solid contact between the pump unit and foundation, prevents lateral movement of vibrating equipment and dampens resonant vibrations.

7.6 Electrical connections

7.6.1  Electrical connections should be made by a qualified Electrician in accordance with the relevant local national and international regulations.

7.6.2 It is important to be aware of the EUROPEAN DIRECTIVE on electromagnetic compatibility when wiring up and installing equipment on site. Attention must be paid to ensure that the techniques used during wiring and installation do not increase electromagnetic emissions or decrease the electromagnetic immunity of the equipment, wiring or any connected devices. If in any doubt contact Flowserve for advice.

7.6.3  The motor must be wired up in accordance with the motor manufacturer's instructions (normally supplied within the terminal box) including any temperature, earth leakage, current and other protective devices as appropriate. The identification nameplate should be checked to ensure the power supply is appropriate.

7.6.4  A device to provide emergency stopping shall be fitted.

7.6.5 If not supplied pre-wired to the pump unit the controller/starter electrical details will also be supplied within the controller/starter.

7.6.6 For electrical details on pump sets with controllers see the wiring diagram.

ATTENTION

7.6.7 See paragraphs on *Direction of rotation* before connecting the motor to the electrical supply.

7.7 Pipework connections

7.7.1 Protective covers are fitted to the pipe connections to prevent foreign bodies entering during transportation and installation. Ensure that these covers are removed from the pump before connecting any pipes.

7.7.2 Maximum forces and moments allowed on the pump flanges vary with the pump size and type. To minimise the forces and moments that may cause misalignment, hot bearings, worn couplings, vibration and the possible failure of the pump casing, the following points should be strictly followed:

- Prevent excessive external pipe load.
- Never draw piping into place by applying force to pump flange connections.
- Do not mount expansion joints so that their force, due to internal pressure, acts on the pump flange.

7.7.3 A non-return valve should be located in the discharge pipework to protect the pump from excessive back pressure and/or excess reverse rotation when the unit is stopped.

7.7.4 Piping and fittings should be flushed before use.

7.7.5 Piping for corrosive liquids should be arranged to allow pump flushing before removal of a unit.

7.8 Final piping check

After connecting piping to the pump, rotate the shaft several times by hand to ensure there is no binding and all parts are free.

7.9 Auxiliary piping

7.9.1 *Pumps fitted with a soleplate packed gland*

- Ensure liquid is supplied to the gland packing.

7.9.2 *Pumps fitted with mechanical seals*

- Seal housings/covers having an auxiliary quench connection, require connection to a suitable source of liquid flow, low pressure steam or static pressure from a header tank. (Recommended pressure is 0.35 bar [5 psi] or less).
- Double seals require a barrier liquid between the seals, compatible with the pumped liquid.
- With back-to-back double seals, the barrier liquid should be at a minimum pressure of 1 bar above the maximum pressure on the pump side of the inner seal. The barrier liquid pressure must not exceed limitations of the seal on the atmospheric side. For toxic service the barrier liquid supply and discharge must be in a safe area.
- Special seals may require modification to auxiliary piping described above. Consult Flowserve if unsure of correct method or arrangement.

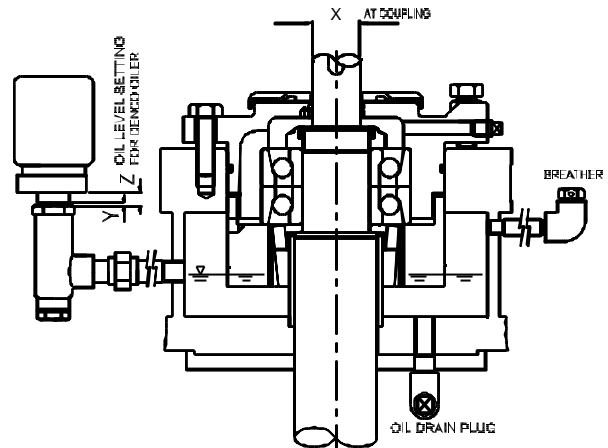
8 MAKING READY FOR OPERATION

8.1 Lubrication

8.1.1 Determine the mode of lubrication of the pump set, eg grease, oil, product lubrication, external clean liquid etc.

ATTENTION

8.1.2 For oil lubricated pumps, fill the bearing housing with correct grade of oil to the correct level shown.



Shaft		Oiler setting	
Size	Dia X (mm)	Y (mm)	Z (mm)
1	24	14.5	21.5
2	32	16.5	23.5
3	42	17.0	24.0
4	48	-	-

8.1.3 Pumps with grease lubricated thrust bearings and electric motors, are supplied with pre-greased bearings.

8.1.4 In the case of product lubricated bearings the source of product supply should be checked against the order; there may be requirements for an external clean supply, particular supply pressure or the commencement of lubrication supply **before** pump start-up.

ATTENTION

8.2 Direction of rotation

Serious damage can result if the pump is started or run in the wrong direction of rotation.

The pump is shipped with the coupling element removed. Ensure the direction of rotation of the motor is correct **before** fitting the coupling element. Direction of rotation must correspond to the direction arrow.



8.3 Guarding

Guarding is supplied fitted to the pump set. If this has been removed or disturbed ensure that all the protective guards are securely refitted.

8.4 Open impeller clearance

The impeller clearance is set in the factory. This may require adjustment because of piping attachment or increase in temperatures. For setting instructions refer to the *Preventative maintenance and servicing* section of this book.

ATTENTION**8.5 Primary and auxiliary supplies**

Ensure all electrical, hydraulic, pneumatic, sealant and lubrication systems (as applicable) are connected and operational.

ATTENTION**8.6 Filling and priming**

The pump end needs to be completely submerged in the product.

9 STARTING THE PUMP**ATTENTION**

9.1 Ensure flushing and/or cooling/heating liquid supplies are turned ON, before starting pump.

9.2 CLOSE the outlet valve.

ATTENTION

9.2.1 Ensure that the liquid level in the sump is above the minimum pump casing submergence level.

ATTENTION

9.2.2 Ensure all vent valves are closed before starting.

9.3 Start motor and check outlet pressure.

9.4 If pressure is satisfactory, slowly OPEN outlet valve.

ATTENTION

9.5 Do not run the pump with the outlet valve closed for a period longer than 30 seconds.

9.6 If NO pressure, or LOW pressure, STOP the pump. Refer to fault finding chart for fault diagnosis.

10 RUNNING**10.1 Pumps fitted with packed glands**

10.1.1 Packed glands must not be run dry. If overheating takes place, the pump should be stopped and allowed to cool before re-starting. Gland nuts should be finger tight only. When the pump is re-started it should be checked to ensure that adequate lubrication is being supplied to the gland packing and that leakage is taking place.

Grease lubricated packed gland units will be fitted with packing greased on initial assembly. If no grease leakage takes place the packing will overheat.

External liquid flushed gland units should have leakage taking place soon after the stuffing box is pressurised otherwise the packing will begin to overheat.

10.1.2 The pump should be run for ten minutes with steady leakage or until leakage is at an acceptable level. Bedding in of the packing may take another 15 minutes.

10.2 Pumps fitted with mechanical seals

10.2.1 Mechanical seals require no adjustment. Any slight initial leakage will stop when the seal is run in. Seals will always leak in operation and emissions should be checked against permitted levels.

10.2.2 Before pumping dirty liquids, it is advisable, if possible, to 'run in' the pump using clean liquid to safeguard the seal face.

ATTENTION

10.2.3 External flush or quench should be started before the pump is run and allowed to flow for a period after the pump has stopped.

10.3 Stop/start frequency

Generally 6 stop/starts per hour may be satisfactory. Refer frequent stop/starting to the motor manufacturer.

11 STOPPING AND SHUTDOWN

11.1 Close the outlet valve, but ensure that the pump runs in this condition for no more than a few seconds.

11.2 Stop the pump.

11.3 Switch off flushing and/or cooling/heating liquid supplies at a time appropriate to the process.

ATTENTION

11.4 For prolonged shut-downs and especially when ambient temperatures are likely to drop below freezing point, the pump and any cooling and flushing arrangements must be drained or otherwise protected.

12 PREVENTATIVE MAINTENANCE AND SERVICING**12.1 Maintenance schedule**

Our specialist service personnel can help with preventative maintenance records and provide condition monitoring for temperature and vibration to identify the onset of potential problems.

12.2 Routine inspection (daily/weekly)

The following checks should be made and the appropriate action taken to remedy any deviations:

- Check operating behaviour; ensure noise, vibration and bearing temperatures are normal.
- Check that there are no abnormal fluid or lubricant leaks (static and dynamic seals) and that any sealant systems (if fitted) are full and operating normally.
- Check that shaft seal leaks are within acceptable limits.
- Check the level and condition of oil lubricant. On grease lubricated pumps, check running hours since last recharge of grease or complete grease change.
- Check that any auxiliary supplies eg heating/cooling (if fitted) are functioning correctly.
- Refer to the manuals of any associated equipment for routine checks needed.

12.3 Periodic inspection (6 monthly)

- Check foundation bolts for security of attachment and corrosion.
- Check pump running records for hourly usage to determine if bearing lubricant requires changing.
- The coupling should be checked for correct alignment and worn driving elements.
- Refer to the manuals of any associated equipment for periodic checks needed.

12.4 Lubrication data

12.4.1 Oil lubricated bearings

- Normal oil change intervals are 2000 operating hours. For pumps on hot service or in severely damp or corrosive atmosphere, the oil will require changing more frequently. Lubricant and bearing temperature analysis can be useful in optimising lubricant change intervals.
- The lubricating oil should be a high quality oil having oxidation and foam inhibitors, or synthetic oil.
- The bearing temperature may be allowed to rise to 50°C above ambient, but should not exceed 82°C (API 610 limit). A continuously rising temperature, or an abrupt rise, indicates a fault.
- Pumps which handle high temperature liquids may require their bearings to be cooled to prevent bearing temperatures exceeding their limits.

12.4.2 Grease lubricated bearings

- When grease nipples are fitted, one charge between grease changes is advisable for most operating conditions (ie 2000 hours interval).
- Normal intervals between full grease changes are 4000 hours. The characteristics of the installation and severity of service will determine the frequency of lubrication. Lubricant and bearing temperature analysis can be useful in optimising lubricant change intervals.
- For most operating conditions, a quality grease having a lithium soap base and NLGI consistency of No.2 or No.3 is recommended. The drop point should exceed 175°C.

ATTENTION

Never mix greases containing different bases, thickeners or additives.

12.5 Gland packing

The stuffing box is normally supplied with a lantern ring to enable a clean or pressurised flush to the centre of the packing. If not required, this can be replaced by an extra 2 rings of packing.

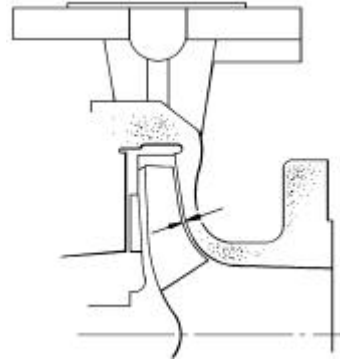
12.6 Mechanical seals

When leakage becomes unacceptable the seal will need replacement.

12.7 Setting impeller clearance

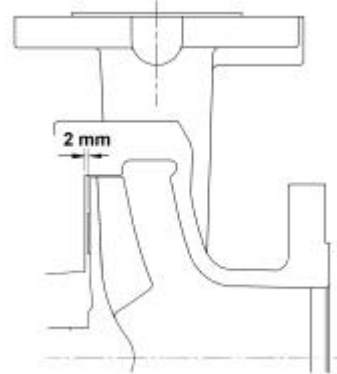
This procedure may be required after the pump has been dismantled or a different clearance is required.

For the CPXV the front impeller clearance setting is as shown in the table.



Temp. °C (°F)	CPXV impeller front clearance: mm (inches)			
	Impellers up to 210mm	Impellers 211mm to 260mm	Impellers over 260mm*	*150CPXV400 *200CPXV400 *150CPXV500
50 (122)	0.3 (0.012)	0.4 (0.016)	0.5 (0.020)	1.0 (0.040)
100 (212)	0.4 (0.016)	0.5 (0.020)	0.6 (0.024)	1.0 (0.044)
150 (302)	0.5 (0.020)	0.6 (0.024)	0.7 (0.028)	1.1 (0.044)
200 (392)	0.6 (0.024)	0.7 (0.028)	0.8 (0.032)	1.2 (0.048)
250 (482)	0.7 (0.028)	0.8 (0.032)	0.9 (0.036)	1.3 (0.052)

For the CPXRV the back impeller clearance is the setting. Set the back clearance to 2mm, as shown:





- Before carrying out this procedure on CPXV or CPXRV ensure that any mechanical seal(s) fitted can tolerate a change in their axial setting, otherwise it will be necessary to dismantle the unit and reset the seal axial position after adjusting the impeller clearance.
- Disconnect the coupling if it has limited axial flexibility.
- Record the gap between the bearing carrier (3240) and stool (3160/1) using feeler gauges.
- Loosen the bearing carrier setscrews (9906/2) and back off the bearing carrier adjusting screws (9906/3) by 2mm. **(CAUTION: some mechanical seal types may be impaired if moved more than 0.5mm from their nominal setting.)**
- Tighten the bearing carrier screws evenly, drawing the bearing carrier towards the soleplate, until the impeller contacts the pump casing. Turn the shaft, during this procedure, until a detectable rub is obtained. This is the zero clearance position. **(Note: The shaft must be turned in the direction indicated on the casing and soleplate.)**
- Set a dial indicator to zero on the shaft end or measure the bearing carrier (3240) to stool (3160/1) gap and record the measurement.

- Slacken the bearing carrier setscrews (9906/2).
- Tighten adjusting screws (9906/3) evenly (about one flat at a time) until the dial indicator or feeler gauge shows the correct impeller clearance from the zero clearance position. This clearance should be between 0.3 and 2mm depending on the nature of the pumped fluid.
- Evenly tighten the bearing carrier setscrews (9906/2) keeping the dial indicator or feeler gauges reading the correct setting. Then tighten the hexagon nuts (9923/1) to lock the jacking screws in position.
- Compare the original and final gaps between the bearing carrier and soleplate to check if the movement of the shaft has exceeded the seal capability (over/under compression of the seal). Re-position the seal to correct this.
- Check that the shaft can turn freely without binding.
- If a cartridge seal is fitted it should be reset at this point.
- Ensure the coupling distance between shaft ends (DBSE) is correct. Reset/re-align if necessary.

13 **DISMANTLING AND ASSEMBLY**

13.1 **Dismantling**

13.1.1  Refer to *Safety* section before dismantling the pump.

13.1.2  Before dismantling the pump for overhaul, ensure genuine Flowserve replacement parts are available.

13.1.3 *Pump disassembly*

- Disconnect all auxiliary pipes and tubes as applicable.
- Disconnect all discharge and auxiliary pipework.
- Remove coupling guard, disconnect coupling and remove motor.
- If oil lubricated unit, drain oil.
- Remove nuts securing soleplate to foundations and lift the complete unit clear.
- Record the gap between bearing carrier and soleplate so that this setting can be used during workshop assembly.
- Remove suction pipe and/or strainer if fitted.
- Remove all flushing lines as appropriate, casing screws and discharge flange bolts.
- Remove pump casing.
- Remove pump casing and discharge flange gaskets and discard. (A replacement gasket will be required for assembly.)
- Clean the gasket mating surfaces.

13.1.4 *Impeller removal*



NEVER APPLY HEAT TO REMOVE THE IMPELLER. TRAPPED OIL OR LUBRICANT MAY CAUSE AN EXPLOSION.

- Remove impeller locking nut complete with O-ring, which should be discarded. (A new O-ring will be required for assembly.)
- Pull impeller off shaft.
- Remove impeller key.
- Remove impeller sealing gasket and discard. (A new sealing gasket will be required for assembly.)

13.1.5 *Support columns, shafts and bearings*

- Remove the two screws which fix the lower bearing carrier to the lower support column.
- Remove the lower bearing carrier. (**Note:** if silicon carbide or carbon bearings are fitted extreme care should be taken to avoid chipping or cracking these relatively brittle components.)
- Unbolt and remove support column(s).
- Unscrew the overhanging shaft section prior to removing the next section of support column.
- Any long length of shaft should be temporarily supported to avoid bending or damage whilst removing the muff coupling(s).

13.1.6 *Bearings, seals and upper shaft*

- If a seal is fitted in the soleplate, determine its type and remove the seal cover screws and any accessible seal to shaft clamp screws as appropriate.
- Remove the bearing housing screws.
- Drive out the labyrinth disk from the soleplate (if fitted).
- Pull the bearing housing and upper shaft assembly out of the soleplate. Take care to support the long shaft to avoid bending or damage to it and any attached components.
- Pull off the coupling and remove the coupling key.
- Unscrew the bearing outer nut (left hand thread).
- Remove the drive side flinger and or labyrinth seal (if fitted) from the shaft.
- Slide the bearing carrier off of the bearing(s).
- Remove the bearing nut.
- Pull off the bearing(s).
- Loosen any remaining seal to shaft clamp screws and slide the seal(s) and seal covers off the shaft. Any bearings or sleeves can then be pressed out/off as required after first removing any retaining screws.

13.2 **Examination of parts**

13.2.1 Used parts must be inspected before assembly to ensure the pump will subsequently run properly. In particular, fault diagnosis is essential to enhance pump and plant reliability.

13.2.2 *Casing, seal housing and impeller*

Inspect for excessive wear, pitting, corrosion, erosion or damage and any sealing surface irregularities. Replace as necessary.

13.2.3 Shaft and sleeve (if fitted)

Obtain and fit a new shaft or sleeve if grooved, pitted or worn.

13.2.4 Gaskets and O-rings

After dismantling, discard and replace.

13.2.5 Bearings

It is recommended that bearings are not re-used after any removal from the shaft.

The plain bearings may be re-used if both the bearing bush and bearing sleeve show no sign of wear, grooving or corrosion attack. It is recommended that both the bush and sleeve are replaced at the same time.

13.3 Assembly

13.3.1 To assemble the pump consult the sectional drawings.

13.3.2 Ensure threads, gasket and O-ring mating faces are clean. Apply thread sealant to non-face sealing pipe thread fittings.

13.3.3 Mechanical seal or gland packing seal

(If there is no mechanical seal or gland packing at the soleplate, go to the section *Thrust bearing carrier and shaft sub-assembly*.)

Where a mechanical seal is used, extreme cleanliness is required during assembly. In many instances a pre-assembled cartridge seal will be used. Where this is not the case the sealing faces must be checked to be free from scratches or other damage.

- Use olive oil for fitting elastomers.
- Where an anti-rotation pin is fitted ensure that correct engagement with the slot is achieved.
- Carefully press stationary mechanical seal seat(s) into their housing such that these are not deformed or damaged. (**Note:** Work to the specific manufacturer's instructions for the mechanical seal.)

Where a packed stuffing box is fitted, pack the stuffing box cover before fitting on to the shaft as follows:

- Position each ring into the box individually, evenly and firmly.
- Check that the shaft sleeve freely rotates after fitting the first ring.
- Stagger the 45 degree scarf joints by 90 degrees from each other in the box.
- Insert the inner two packing rings.
- Insert lantern ring halves (if required).
- Insert the remaining packing rings.
- Position the gland squarely against the last ring, tighten the gland nuts finger-tight only and install on to bearing housing assembly.

13.3.4 Thrust bearing carrier and shaft sub-assembly

- Clean the inside of the bearing carrier and bores for the bearings.
- On grease lubricated bearings fill bearing carrier outer nut internal slot with the appropriate grease. The three grease retaining rings may now be inserted.
- The sub-assembly should be placed over the shaft before fitting the thrust bearing and the thrust bearing carrier outer nut must have the C spanner slots facing the impeller end. (**Note 1:** On units fitted with a proprietary soleplate mechanical seal, this and any additional housing should be passed over the shaft before the thrust bearing outer nut.) (**Note 2:** In the case of a proprietary PTFE vapour seal, this is fitted into the locking ring as a subassembly. Place the thrust bearing on to the shaft. If an optional pair of thrust bearings are to be fitted, these must be mounted back-to-back, as described below.)
- Press the thrust bearing onto the shaft using equipment that can provide a steady, even load to the inner race.
- Oil bath lubricated thrust bearing is an option. If grease lubrication as standard, use a spatula to fill sides of the bearing with grease of NLGI 3 grade. (**Note:** On aggressive solvent/acid vapour service a special fluoro-silicone grease (Molykote FS3451) may be required. In such instance, pack the bearing fully by hand as no grease nipple is used in the design.)
- Fit the self locking thrust bearing nut onto the shaft and tighten with a C spanner.
- Fit O-ring on the bearing carrier and lubricate the bearing carrier bore and O-ring with oil.
- Ensure the shaft coupling keyway edges are free of burrs. If optional proprietary labyrinth type bearing housing seals are used the O-rings should be oiled to assist assembly.
- Install the bearing carrier onto the shaft/bearing assembly and screw the bearing carrier locking ring into the bearing carrier. Tighten up the bearing carrier locking ring using a C spanner. (**Note:** LH thread.)
- Check shaft for free rotation.
- To fit an inter bearing shaft sleeve, slide it over the shaft from the impeller end and tighten up the sleeve drive screw.
- To fit the pump end sleeve, slide it over the shaft; this is driven by the impeller.

13.3.5 Bearing bushes

- If the pit depth and pump speed are such that an intermediate bearing is fitted, this is pressed into the upper support column. The pump end bush is fitted into the pump end bush carrier (3245).
- When fitting the intermediate bearing bush or pump end bearing bush these must be pressed in such that the chamfered end goes in first. (**Note:** The orientation must be checked such that locking pegs (9905/2) correctly line up.)

13.3.6 *Installing the shaft sub-assembly*

- Prior to assembling the shaft sub-assembly into the soleplate, first fasten on the upper suspension pipe/bearing bush sub-assembly to the soleplate.
- If the sump is short there may only be a lower suspension pipe. In this case, the lower suspension pipe and the pump end bearing carrier/bush will need to be fitted to the soleplate to support the shaft subassembly.

(**Note:** If there is an upper suspension pipe, the lower suspension pipe and pump end bearing bush carrier should only be fitted after the shaft sub-assembly. Install the shaft assembly into the motor stool and soleplate until the gap, (above), is approximately 4mm.)

- Install the bearing carrier hexagon screws and the hexagon adjustment screws and hexagon nuts but do not tighten.
- Press the flinger onto the shaft, where applicable. This should be set between 0.5 and 2mm from the bearing carrier.
- Turn the shaft to check for freedom from rubbing.
- Refit the coupling

13.3.7 *Impeller and casing assembly*

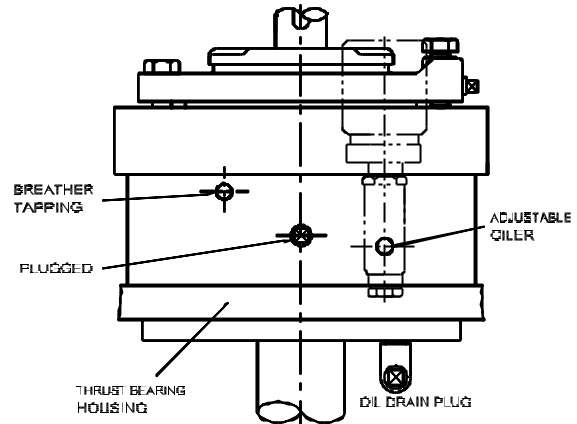
- Fit a new impeller sealing gasket against shaft shoulder.
- Fit impeller key.
- Assemble impeller onto the shaft.
- Fit a new O-ring into the impeller locking nut groove.
- Apply anti-galling compound (which does not contain copper) to the impeller nut threads to help any subsequent removal.
- Fit impeller nut onto the shaft and torque up.
- Clean the casing spigot and gasket position mating surfaces.
- Fit a new casing gasket.
- Install the pump casing with a new casing to discharge gasket.
- Install casing hexagon screws to the specified torques.
- Check impeller front clearance against original setting, or process requirement and adjust as necessary. (See the section *Setting impeller front clearance.*)
- Check freedom to rotate within pump casing.

13.3.8 *Cartridge seal assembly (if fitted)*

- To set, or reset, a cartridge seal having a PTFE setting ring-throttle and no separate setting clips, finger tighten the seal cover stud nuts, then fully torque up the sleeve screws.
- Torque up the seal cover stud nuts.

13.3.9 *Coupling, motor and ancillaries*

- Reconnect pump ancillary fittings and piping.
- Install pump into sump and connect up remaining fittings and piping.
- Re-check freedom of shaft to rotate by hand.
- If pump has an oil lubricated thrust bearing, ensure the oil breather and oiler are assembled in their correct tappings as shown below and fill with the correct grade and quantity of oil through the oiler.



- Re-install motor (check for correct rotation) and then fit coupling drive element and guards.
- If all is correct continue with the procedure described under the heading *Starting the pump.*
- Proceed then as described in the sections on *Installation and Commissioning.*

13.4 **Casing and seal housing screw torque**

Screw size	Torque Nm (lbf ft)
M8	16 (12)
M10	25 (18)
M12	35 (26)
M16	80 (59)
M20	130 (96)

14 SPARE PARTS**14.1 Ordering of spares**

Flowserve keeps records of all pumps that have been supplied. When ordering spares the following information should be quoted:

- 1) Pump serial number
- 2) Pump size
- 3) Part name
- 4) Part number
- 5) Number of parts required

14.2 The pump size and serial number are shown on the pump nameplate.

14.3 To ensure continued satisfactory operation, replacement parts to the original design specification should be obtained from Flowserve. Any change to the original design specification (modification or use of a non-standard part) will invalidate the pump's safety certification.

14.4 Storage of spares

Spares should be stored in a clean dry area away from vibration. Inspection and retreatment of metallic surfaces (if necessary) with preservative is recommended at 6 monthly intervals.

14.5 Recommended spares for 2 years operation (as per VDMA 24296)

Part no.	Designation	Number of pumps (including stand-by)						
		2	3	4	5	6/7	8/9	10(+)
2100	Shaft	1		2		3		30%
2200	Impeller	1		2		3		30%
2912	Impeller nut with O-seal ring	1		2		3		30%
6700	Impeller key	1		2		3		30%
2450	Shaft sleeve - pump end	2		3		4		50%
3041	Bearing - thrust	1		2		3		50%
3300	Bearing - pump end	1		2		3		50%
3320	Bearing - lineshaft*	1		2		3		50%
3420	Shaft sleeve - intermediate*	2		3		4		50%
3712	Bearing nut	1		2		3		50%
4120	Lantern halves*	1		2		3		30%
4130	Gland packing -complete set*	2		3		4		40%
4200	Mechanical seals*	1		2		3		30%
4271	Sleeve - mechanical seal*	2		3		4		50%
4300	Lip seal*	4	6	8		9	10	100%
4476	Shaft sleeve screw for 3420*	2		3		4		50%
4590/1	Pump casing gasket	4	6	8		9	12	150%
4590/2	Discharge flange gasket	4	6	8		9	12	150%
4610/1	O-ring impeller	4	6	8		9	12	150%
4610/2	O-ring carrier	2		3		4		50%
4610/3	O-ring mechanical seal sleeve*	2		3		4		50%
-	Power end	-	-	-	-	-	1	2

* When required due to being fitted as part of the original build specification.

15 SUPPLEMENTARY INSTRUCTION MANUALS

See also the supplementary instruction manuals supplied with this manual, eg for electric motors, controllers, engines, gearboxes, sealant systems etc.

16 CHANGE NOTES

Change notes and errata (if any) will be included on a separate page(s) within the manual. If changes are made to the pump after supply, this manual will require updating.

17 CERTIFICATION

Any certificates eg materials, hydraulic tests, conformities, Ex protection for an explosive atmosphere, performance test curves etc as determined by the contract requirements, will be sent to the Purchaser separately. If required, copies of these should be obtained from the Purchaser for retention with this manual.

18 GENERAL ARRANGEMENT DRAWING

The typical general arrangement drawing and any specific drawings required by the Contract will be sent to the Purchaser separately. If required these should be obtained from the Purchaser and retained with this manual.

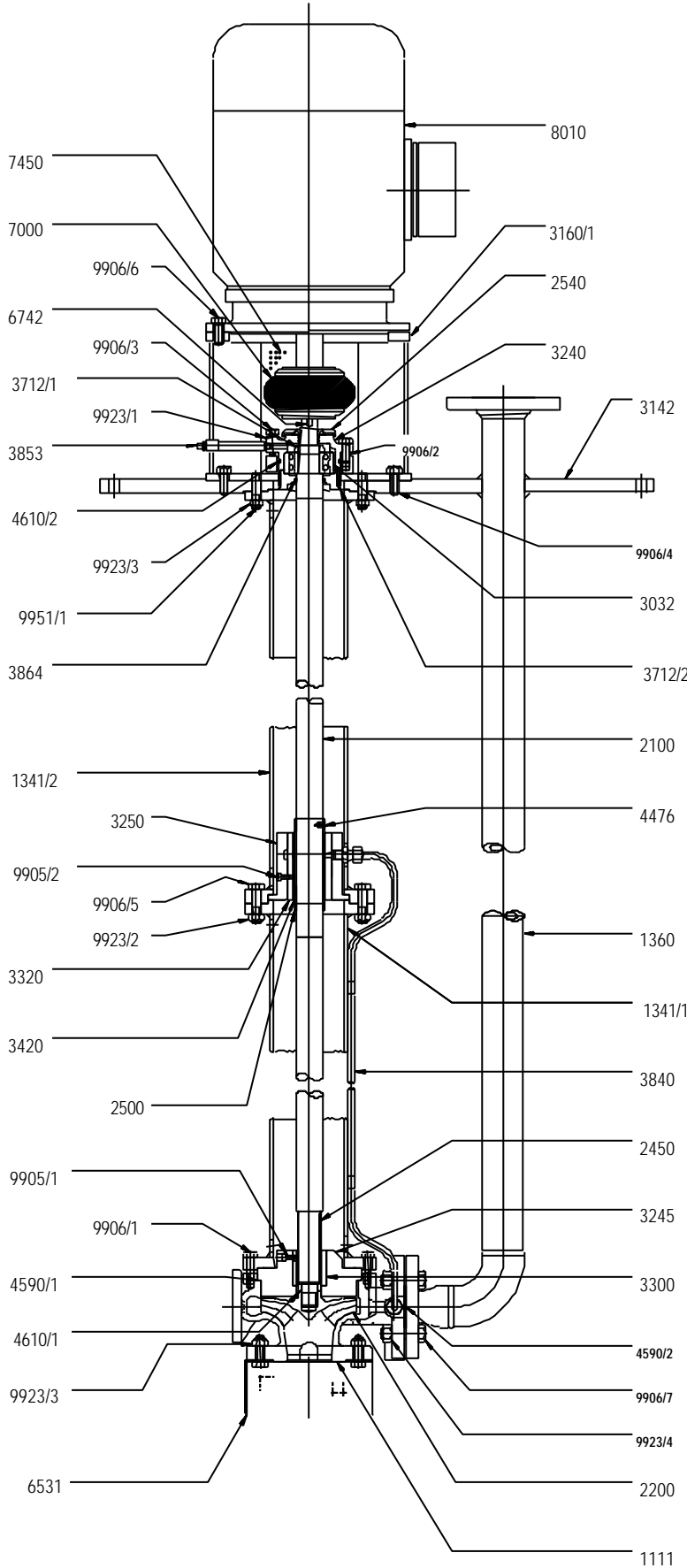
19 OPERATING DIFFICULTIES

SYMPTOMS

	PUMP OVERHEATS AND SEIZES									
	BEARINGS HAVE SHORT LIFE									
	PUMP VIBRATES OR IS NOISY									
	MECHANICAL SEAL HAS SHORT LIFE									
	MECHANICAL SEAL LEAKS EXCESSIVELY									
	PUMP REQUIRES EXCESSIVE POWER									
	PUMP LOSES PRIME AFTER STARTING									
	INSUFFICIENT PRESSURE DEVELOPED									
	INSUFFICIENT CAPACITY DELIVERED									
	PUMP DOES NOT DELIVER LIQUID									
SUCTION TROUBLES										
Pump or suction pipe not completely filled with liquid.	•	•		•					•	
Suction lift too high.	•	•		•					•	
Insufficient margin between suction pressure and vapour pressure.	•	•							•	•
Excessive amount of air or gas in liquid.		•	•	•						
Inlet of suction pipe insufficiently submerged.	•	•		•					•	
SYSTEM TROUBLES										
Speed too low.	•	•	•							
Speed too high.					•					
Total head of system higher than head of pump.	•	•	•							
Total head of system lower than pump design head.					•					
Specific gravity of liquid different from design.					•					
Viscosity of liquid differs from that for which designed.		•	•		•					
Operation at very low capacity.									•	•
Operation at high capacity.					•				•	•
MECHANICAL TROUBLES										
Misalignment due to pipe strain.					•	•	•	•	•	•
Improperly designed foundation.									•	
Shaft bent.					•	•	•	•	•	
Rotating part rubbing on stationary part internally.					•				•	•
Bearings worn									•	•
Wearing ring surfaces worn.		•	•		•					
Impeller damaged or eroded.		•	•						•	
Leakage under sleeve due to joint failure.								•		
Shaft sleeve worn or scored or running off centre.								•	•	
Mechanical seal improperly installed.								•	•	
Incorrect type of mechanical seal for operating conditions.								•	•	
Shaft running off centre because of worn bearings or misalignment.								•	•	•
Impeller out of balance resulting in vibration.								•	•	•
Abrasive solids in liquid pumped.					•	•	•			
Internal misalignment of parts preventing seal ring and seat from mating properly.								•	•	
Mechanical seal was run dry.								•	•	
Internal misalignment due to improper repairs causing impeller to rub.								•	•	
Excessive thrust caused by a mechanical failure inside the pump.									•	•
Excessive grease in ball bearings.									•	•
Lack of lubrication for bearings.									•	•
Improper installation of bearings (damage during assembly, incorrect assembly, wrong type of bearing etc).									•	•
Damaged bearings due to contamination.									•	•
MOTOR ELECTRICAL PROBLEMS										
Wrong direction of rotation.		•	•		•				•	
Motor running on 2 phases only.		•			•					
Motor running too slow, check terminal box.		•							•	•

20 SECTIONAL ARRANGEMENT DRAWINGS AND PARTS LISTS

20.1 CPXV



Reference	Name of part
1111	Pump casing
1341/1	Lower support column
1360	Discharge pipe
2100	Shaft
2200	Impeller
2450	Shaft sleeve
2540	Flinger (liquid)
2912	Impeller nut
3032	Double thrust bearing
3142	Motor stool & soleplate
3240	Bearing carrier
3245	Bearing carrier (pump end)
3300	Bearing bush
3712/1	Bearing nut
3712/2	Bearing outer nut
3840	Lubricating pipe
3853	Grease nipple
3864	Grease retainer rings
4590/1	Pump casing gasket
4590/2	Discharge flange gasket
4590/3	Impeller gasket
4610/1	O-ring (impeller)
4610/2	O-ring (bearing carrier)
6710	Impeller key
6742	Coupling key
7000	Coupling
7450	Coupling guard
8010	Motor
9905/1	Capscrew (bearing retaining)
9906/1	Screws (column/casing)
9906/2	Screws (bearing carrier)
9906/3	Screws (adjusting)
9906/4	Screws (column/soleplate)
9906/6	Screws (motor/stool)
9906/7	Screws (strainer)
9923/1	Nuts (locking)

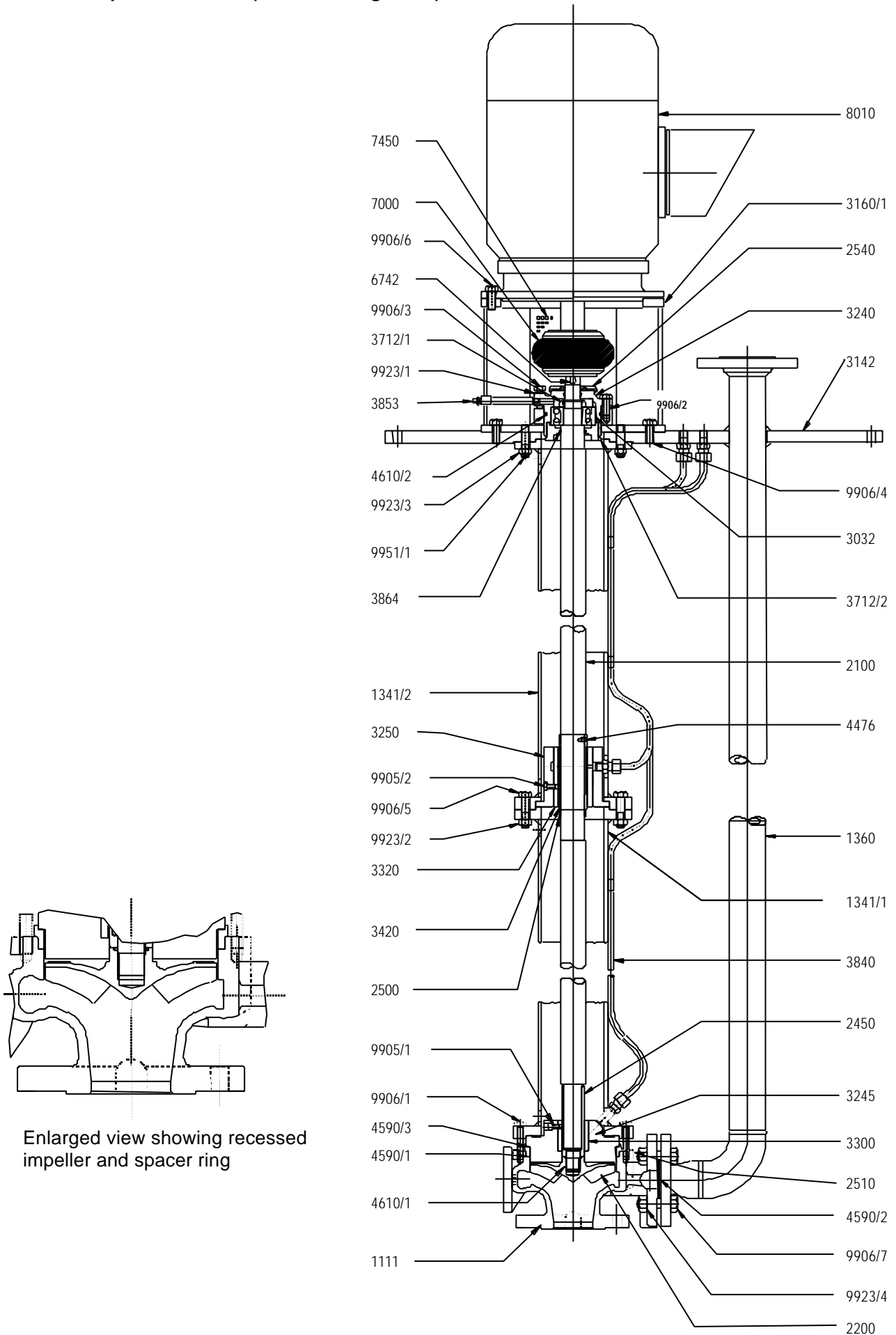
Inter bearing parts (when required)

1341/2	Upper support column
2500	Shaft collar
3320	Intermediate bearing bush
3420	Intermediate bearing sleeve
4476	Sleeve drive screw
9905/2	Capscrew (bearing retaining)
9906/5	Bolts (column)
9923/2	Nuts (column)

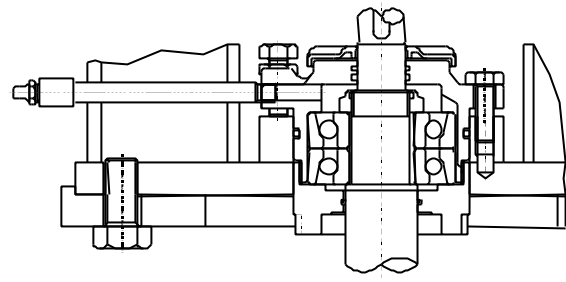
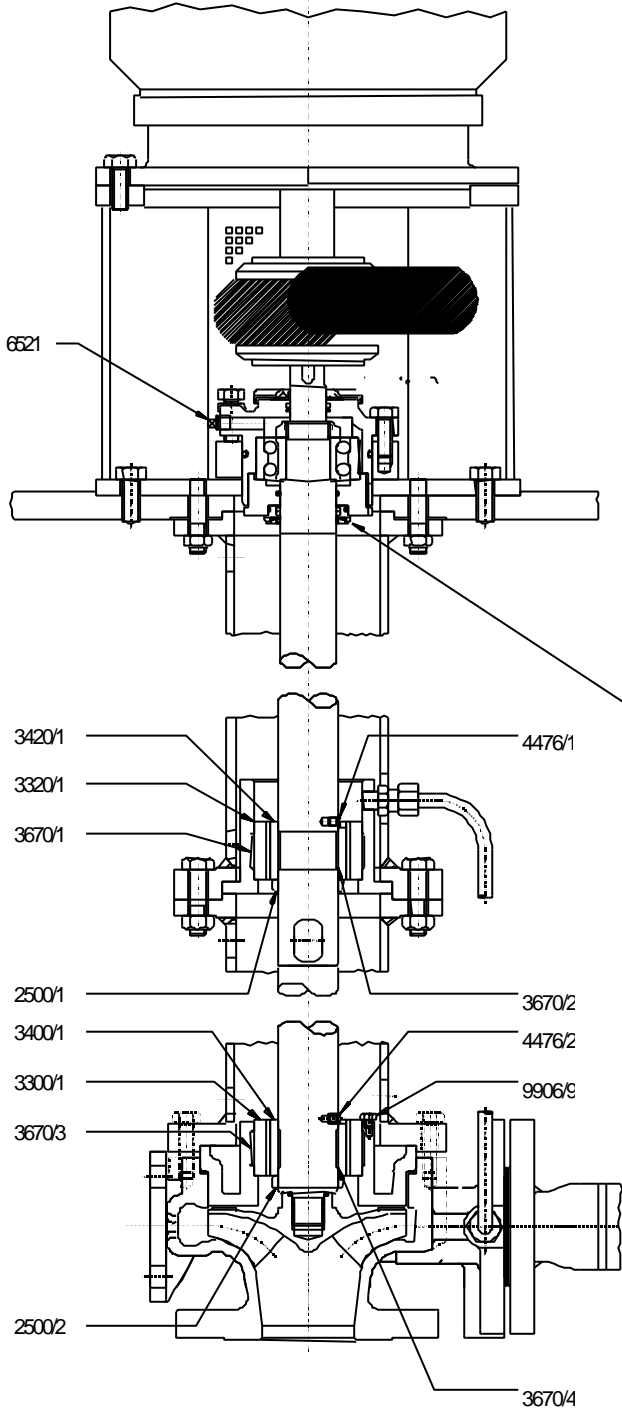
Optional item

6531	Suction strainer
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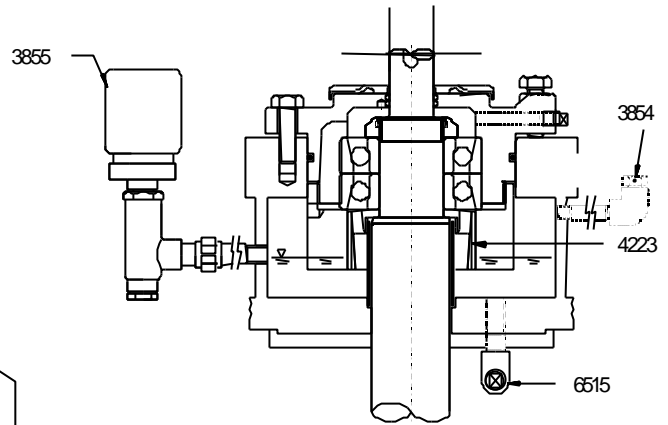
20.2 CPXV optional features (CPXRV arrangement)



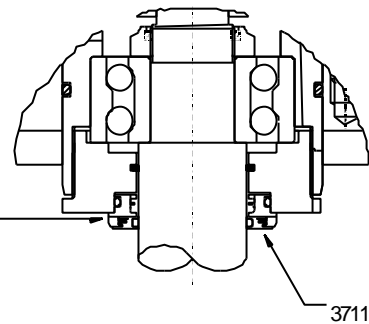
20.3 CPXV optional features (continued)



Pair of 40° angular contact bearings, grease lubricated.
(No sleeve fitted on shaft sizes 1 & 2).



Pair of 40° angular contact bearings, oil lubricated.
(No sleeve fitted on shaft sizes 1 & 2).



Standard double row angular contact bearings, grease lubricated (shown with proprietary labyrinth seal fitted into bearing outer nut).

Reference	Name of part
2500/1	Shaft collar
2500/2	Shaft collar
3300/1	Bearing bush
3320/1	Intermediate bearing bush
3400/1	Bearing sleeve
3420/1	Intermediate bearing sleeve
3670/1	Bearing ring (inter-bush)
3670/2	Bearing ring (inter-sleeve)
3670/3	Bearing ring (bush)
3670/4	Bearing ring (sleeve)
4476/1	Sleeve drive screw
4476/2	Sleeve drive screw
6521	Plug
9906/9	Screw (bush retaining)

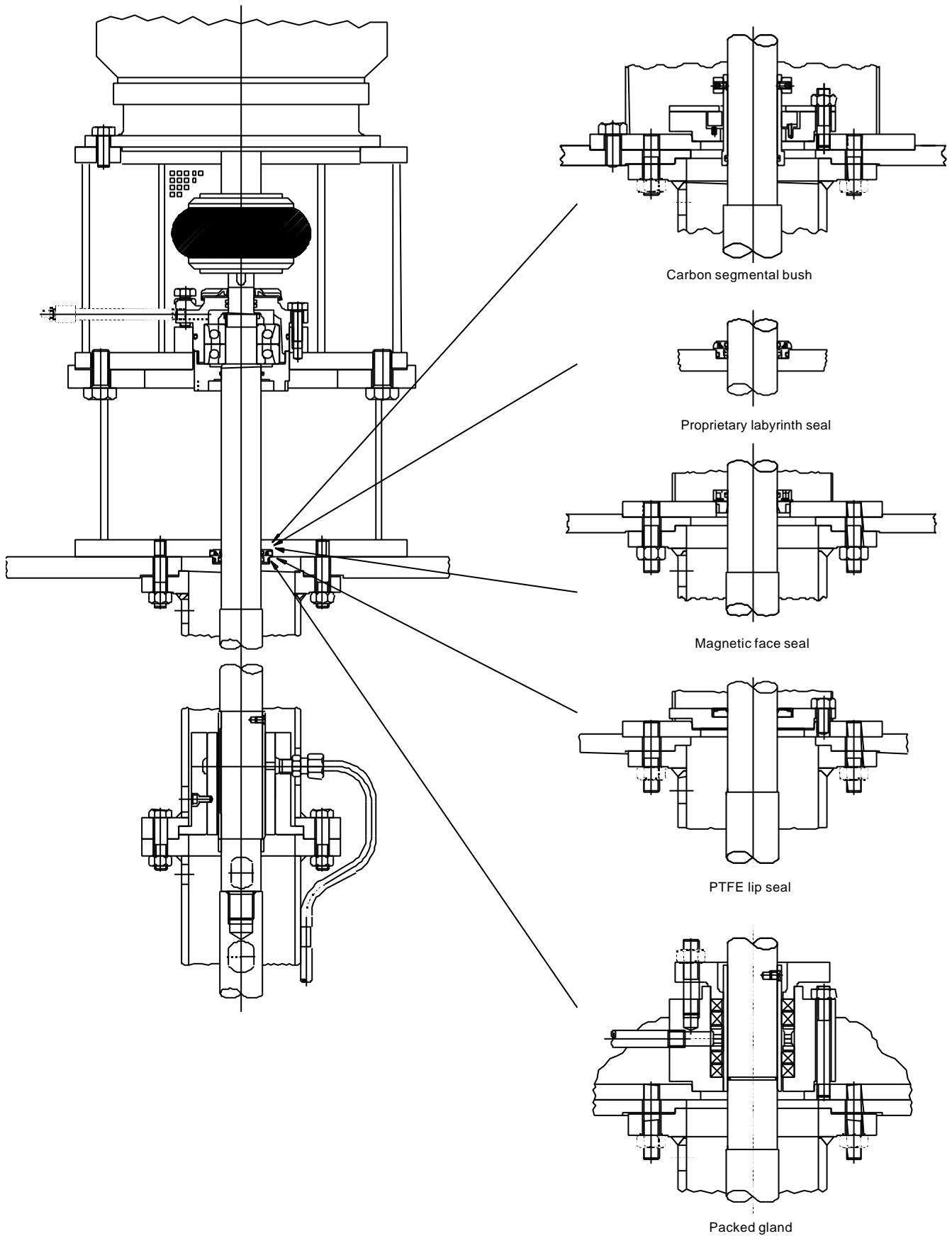
Special build parts, when required

3711	Labyrinth disc
3854	Breather
3855	Constant level oiler
4223	Pumping ring
6515	Drain plug

CPXV special build parts shown

- fluorosilicon greased thrust bearing with proprietary labyrinth
- silicon carbide long life bearings

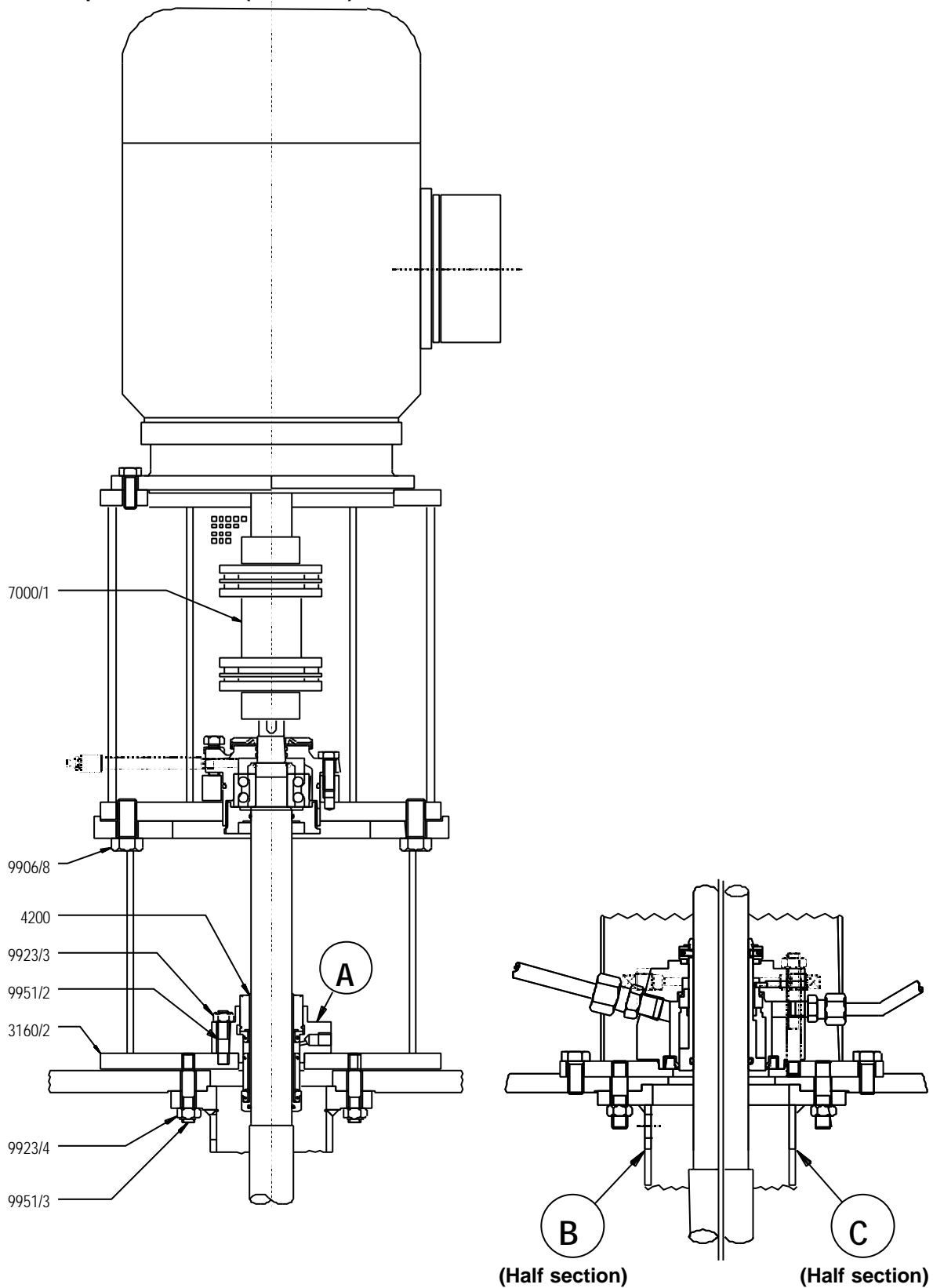
20.4 CPXV optional features (continued)



CPXV sealing options shown

- soleplate/vapour seal options (see 21.5 for mechanical seal)

20.5 CPXV optional features (continued)



Reference	Name of part
3160/2	Spacer stool
4200	Mechanical seal
7000/1	Coupling, spacer type
9906/8	Screws (spacer/motor stool)
9923/3	Nuts (seal cover)
9923/4	Nuts (column/soleplate)
9951/2	Studs (seal cover)
9951/3	Studs (column/soleplate)

CPXV special build parts shown

- spacer coupling
- cartridge mechanical seal
 - A. proprietary
 - B. IDP unbalanced
 - C. IDP balanced (when fitted)

21 PARTS INTERCHANGEABILITY

CPXV pump size	Bearing carrier	Casing gasket	Line bearing fluorosint	Line bearing silicon carbide
40-25CPXV125	1	1	1	1
50-32CPXV125	1	1	1	1
65-40CPXV125	1	1	1	1
80-50CPXV125	1	1	1	1
100-80CPXV125	1	1	1	1
32-20CPXV160	1	2	1	1
40-25CPXV160	1	2	1	1
50-32CPXV160	1	2	1	1
65-40CPXV160	1	2	1	1
80-50CPXV160	1	2	1	1
100-65CPXV160	2	2	2	1
125-100CPXV160	2	2	2	1
32-20CPXV200	1	3	1	1
40-25CPXV200	1	3	1	1
50-32CPXV200	1	3	1	1
65-40CPXV200	1	3	1	1
80-50CPXV200	1	3	1	1
100-65CPXV200	2	3	2	1
125-100CPXV200	2	3	2	1
40-25CPXV250	2	4	2	1
50-32CPXV250	2	4	2	1
65-40CPXV250	2	4	2	1
80-50CPXV250	2	4	2	1
100-65CPXV250	2	4	2	1
125-100CPXV250	3	4	2	2
150-125CPXV250	3	4	2	2
200-150CPXV250	3	4	2	2
50-32CPXV315	2	5	2	1
65-40CPXV315	2	5	2	1
80-50CPXV315	2	5	2	1
100-65CPXV315	3	5	2	2
125-80CPXV315	3	5	2	2
150-125CPXV315	3	5	2	2
200-150CPXV315	4	5	3	2
100-65CPXV400	3	6	2	2
125-80CPXV400	3	5	2	2
150-125CPXV400	3	6	2	2
200-150CPXV400	4	6	3	2
250-200CPXV400	4	6	3	2
200-150CPXV500	4	7	3	2



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