



Ingersoll-Dresser Pumps

**CLOSE COUPLED PUMPS
TYPE WB, WJ, WJE, MK, WK and WKE**

Instruction Manual C939KH001

Ingersoll-Dresser Pumps (UK) Limited

DECLARATION OF CONFORMITY

SECTION 1.0 MACHINE DESCRIPTION

SECTION 2.0 APPLICABLE DIRECTIVES/REGULATIONS

Machinery Directive 89/392/EEC, 91/368/EEC, 93/44/EEC and 93/68/EEC
EMC Directive 89/336/EEC and 92/31/EEC

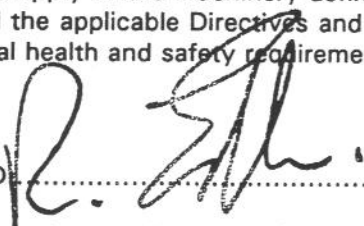
SECTION 3.0 APPLICABLE STANDARDS/SPECIFICATIONS

EN.292, EN.60204-1, EN.50081, EN.50082 and EN.29001

SECTION 4.0 DECLARATION

We, Ingersoll-Dresser Pumps (UK) Limited, declare that under our sole responsibility for the supply of the machinery defined in SECTION 1.0 above, the said machinery complies with all the applicable Directives and Regulations set out in SECTION 2.0 above and with all essential health and safety requirements applying to it.

SIGNED



DATE

2 / 5 / 96








Authorised/Responsible Person

1 **NAMEPLATE & WARNING LABELS**

1.1 **Nameplate**

For details of Nameplate, see the Declaration of Conformity

1.2 **Warning label**

 Ingersoll-Dresser Pumps		LABEL : J21BJZ25D	
WARNING			
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.		
	ENSURE CORRECT DIRECTION OF ROTATION.		FULLY PRIME UNIT AND SYSTEM. DO NOT RUN UNIT DRY.
			FAILURE TO FOLLOW THESE PROCEDURES MAY RESULT IN PERSONAL INJURY AND/OR EQUIPMENT DAMAGE.

2 **SAFETY**

2.1 **Duty Conditions**

2.1.1 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.

2.1.2 If there is any doubt as to the suitability of the pump for the application intended, contact Ingersoll-Dresser Pumps for advice, quoting the pump serial number.

2.2 **Safety Action**

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

2.2.2 **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.

2.2.3 **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 **NEVER RUN THE PUMP DRY**

2.2.4.1 **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.

2.2.5 **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.

2.2.6 **NEVER DO MAINTENANCE WORK WHILST THE UNIT IS CONNECTED TO POWER.**

2.2.7 **DRAIN PUMP AND ISOLATE PIPEWORK BEFORE DISMANTLING THE PUMP.**

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

2.2.8 **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.

2.2.9 **HOT (and cold) PARTS**

When the pumped products are hot, require auxiliary heating supplies, or are below freezing, the site installation shall be designed to prevent accidental contact with the hot (or cold) parts and pipework. Note that drive motors may also become hot during operation.

2.2.10 **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.

3 **CONTENTS**

NAMEPLATE & WARNING LABELS	1
Nameplate	1
Warning label	1
SAFETY	2
Duty Conditions	2
Safety Action	2
CONTENTS	3
PUMP TECHNICAL DATA	5
Performance	5
Noise Level	5
Pressure Limits	6
Recommended screw torques	6
Flange Loads	6
PRODUCT DESCRIPTION	7
General	7
Pump casing	7
Impeller	7
Shaft	7
Pump bearings and lubrication	7
Seal Housing	7
Shaft Seal	7
Driver	7
STORAGE	7
INSTALLATION	7
Unpacking and Inspection	7
Handling	7
Location	7
Foundation	8
Grouting	8
Electrical Connections	8
Pipework Connections	8
Final piping check	9
Auxiliary Piping	9
MAKING READY FOR OPERATION	9
Lubrication	9
Direction of Rotation	9
Primary and Auxiliary Supplies	9
Filling and Priming	9
STARTING THE PUMP	9
RUNNING	10
Stop/Start Frequency	10
STOPPING AND SHUTDOWN	10

PREVENTATIVE MAINTENANCE AND SERVICING	10
Routine Inspection (daily/weekly)	10
Periodic inspection (6 Monthly)	10
Mechanical seals	10
DISMANTLING AND ASSEMBLY	10
Dismantling	10
Examination of Parts	11
Casing, Seal Housing and Impeller	11
Shaft and Sleeve (if fitted)	11
Gaskets and O-Rings	11
Assembly	11
OPERATING DIFFICULTIES	12
SPARE PARTS	14
Ordering of Spares	14
Storage of Spares	14
COPYRIGHT	14
GENERAL ARRANGEMENT DRAWING	14
SECTIONAL ARRANGEMENT DRAWING AND PARTS LIST	15
TYPE WB	15
TYPES WJ, WJE, MK, WK and WKE	16
CERTIFICATION	17
SUPPLEMENTARY	17

4 PUMP TECHNICAL DATA

4.1 Performance

4.1.1 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

4.2.1 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 therefore give a general guide to the level to expect.

MOTOR SIZE kW	2900 RPM		1450 RPM	
	PUMP & MOTOR dBA	PUMP ONLY dBA	PUMP & MOTOR dBA	PUMP ONLY dBA
<0.55	64	62	63	62
0.75	67	62	63	62
1.1	67	64	65	64
1.5	70	66	66	66
2.2	71	68	68	68
3	74	70	70	70
4	75	71	71	71
5.5	83	73	72	71
7.5	83	74	73	72
11	84	76	74	73
15	85	79	76	75
18.5	85	79	76	75
22	85	79	77	75
30	93	81	80	76
37	93	82	80	76
45	93	83	80	76
55	95	84	82	77
75	95	86	83	78
90	92	86	85	78
110	95	87	86	79
150	96	88	86	79

The dBA values are based on the noisiest ungeared electric motors which are likely to be encountered. They are Sound Pressure levels at 1 metre 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

4.2.2 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

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

4.3.2

PUMP TYPE	MAXIMUM WORKING PRESSURE (Bar)	TEST PRESSURE (Bar)	RECOMMENDED MAXIMUM SUCTION PRESSURE - bar		LIQUID TEMPERATURE LIMITS °C
			1450 & 1750 rpm	2900 & 3600 rpm	
WB	5	10	3.4	2.75	-20 to 110
WJ	12	18	5.2	2.75	-20 to 110
WJE	16	24	5.2	2.75	-20 to 110
MK	12	18	5.2	2.75	-20 to 110
WK					
WKE					

4.4 Recommended screw torques

Screw size	Torque Nm (lbf ft)
M8	16 (21)
M10	25 (18)
M12	35 (26)
M16	80 (59)
M20	130 (96)

4.5 Flange Loads

4.5.1 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.

4.6 Ambient Temperature

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

5 PRODUCT DESCRIPTION

5.1 General

5.1.1 This is a robust centrifugal pump design for a wide range of applications.

5.2 Pump casing

5.2.1 For ease of maintenance, the pump is constructed so that pipe connectors do not have to be disturbed when internal maintenance is required.

5.3 Impeller

5.3.1 A shrouded impeller with hub rings is fitted.

5.4 Shaft

5.4.1 The pump shaft or sleeve can be removed from the motor for maintenance or replacement.

5.5 Pump bearings and lubrication

5.5.1 The pump uses the driver's bearings to give primary support and positioning to the input shaft. See the driver's instruction book for lubrication details.

5.6 Seal Housing

5.6.1 The seal housings designs provide improved performance of mechanical seals.

5.7 Shaft Seal

5.7.1 The mechanical seal(s), attached to the drive shaft, seals the pumped liquid from the environment.

5.8 Driver

5.8.1 The pump is driven by a close coupled electric motor.

6 STORAGE

6.1 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.

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

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

7 INSTALLATION

7.1 Unpacking and Inspection

7.1.1 The pump should be checked against the delivery advice note and any damage or shortage reported immediately to Ingersoll-Dresser Pumps. Any crate/carton/wrappings should be checked for any spare parts or accessories which may be packed with the pump.

7.2 Handling

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

7.2.2 No specific lifting points are provided for this complete machine (unless so identified). Any lifting points which 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

7.3.1 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

7.4.1 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.

7.4.1.1 Pumps should not be mounted with the motor below the pump casing.

7.4.2 Pumps with in-line branches may be fitted directly into a pipeline. On sizes larger than those combinations listed below it is essential that the pump is supported under the casing. A bolt-on pump foot is available if required.

Pump Branch Size	Motor Power kW
32	2.2
40	3.0
50/65/80	7.5

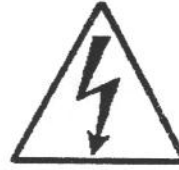
7.4.3 Consider using screws (not studs) to hold down pump feet to permit pump removal from the pipework.

7.4.4 The pump shall be fixed to the floor or supporting structure by bolting through the fixing holes provided in the foot/feet.

7.5 Grouting

7.5.1 Where applicable, grout in the foundation bolts.

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 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.

7.6.3 A device to provide emergency stopping shall be fitted.

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

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

7.6.6 WARNING:

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 these forces and moments which 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 The inlet pipe should be one or two sizes larger than the pump inlet bore and pipe bends should be as large a radius as possible. On suction lift the piping should be inclined up towards the pump inlet with eccentric reducers incorporated to prevent air locks. On positive suction, the inlet piping must have a constant fall towards the pump.

7.7.4 Allow a minimum of two pipe diameters of straight section between the elbow and inlet flange. Inlet strainers, when used, should have a net 'free area' of at least three times the inlet pipe area.

7.7.5 Fitting an isolator and non-return valves can allow easier maintenance. Never throttle pump on suction side and never place a valve directly on the pump inlet nozzle.

7.7.6 Piping and fittings should be flushed before use.

7.8 Final piping check

7.8.1 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 Mechanical Seals.

7.9.1.1 The conical design of the single internal seal housing provides excellent liquid circulation around the seal and will not normally require a separate flush.

8 MAKING READY FOR OPERATION

8.1 Lubrication

8.1.1 Grease lubricated pumps and electric motors are supplied pre-greased.

8.2 Direction of Rotation

8.2.1 Ensure the pump is given the same rotation as the pump direction arrow.

8.2.2 If maintenance work has been carried out to the site's electricity supply, the direction of rotation should be re-checked as above in case the supply phasing has been altered.

8.3 Primary and Auxiliary Supplies

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

8.4 Filling and Priming

8.4.1 Ensure inlet pipe and pump casing are completely full of liquid before starting continuous duty operation.

9 STARTING THE PUMP

9.1 CLOSE the outlet valve.

9.2 OPEN all inlet valves.

9.3 Prime the pump.

9.3.1 Ensure all vent valves are closed before starting.

9.4 Start motor and check outlet pressure.

9.5 If pressure is satisfactory, slowly OPEN outlet valve.

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

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

10 RUNNING

10.1 Stop/Start Frequency

10.1.1 The number of starts should be limited to a maximum of 15 per hour with a minimum run duration of 2 minutes between stops.

10.1.2 STANDBY PUMPS SHOULD BE RUN ALTERNATELY.

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 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 Routine Inspection (daily/weekly)

12.1.1 Check operating behaviour; ensure noise, vibration and bearing temperatures are normal.

12.2 Periodic inspection (6 Monthly)

12.2.1 Refer to the manuals of any associated equipment for periodic checks needed.

12.3 Mechanical seals

12.3.1 When leakage becomes unacceptable the seal will need replacement.

13 DISMANTLING AND ASSEMBLY

13.1 Dismantling

13.1.1 **WARNING** Refer to safety section before dismantling the pump.

13.1.2 Before dismantling the pump for overhaul, ensure genuine Ingersoll-Dresser Pumps replacement parts are available.

13.1.3 Remove the bolts or setscrews which secure the pump casing to the mounting bracket and then prise apart. On type WB pumps the casing joint is visible externally and may be damaged unless care is taken

13.1.4 The impeller of type WB pumps is removed by unscrewing bodily anti-clockwise after first removing the impeller screw. On pumps with D80/D90 frame size motors, a hole or slot is provided in the mounting bracket through which the shaft keyway can be engaged with a steel rod or similar tool. With D71 frame motors, it is necessary to remove the fan cowl to allow the motor shaft to be gripped.

13.1.5 For pump sizes 32WK100 and 32MK100, the impellers are removed by the same procedure as for type WB pumps in above paragraph.

13.1.6 The impellers of types WJ and WJE pumps are keyed to their shafts and can be pulled or levered off, after first removing the impeller screw.

13.1.7 On types WB, WJ, MK and WK, removal of the outer circlip will allow the seal to be withdrawn. In the event of difficulty, work a small quantity of liquid soap or olive oil under the seal. Separation of the motor and bracket will further assist in pulling off the seal.

13.1.8 On types WJE and WKE, push back the seal spring to allow the shaft sleeve, complete with seal, to be pulled off.

13.1.9 On types WB, WJ, MK and WK, do not remove the pump shaft unless a replacement or motor repairs is indicated.

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

13.2.2.1 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)

13.2.3.1 Replace if grooved, pitted or worn.

13.2.4 Gaskets and O-Rings

13.2.4.1 After dismantling, discard and replace.

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 Clean all joint faces and ensure that the parts on which the seal is to fit are free from burrs. The use of an anti-scuffing lubricant, such as molybdenum disulphide, under the impeller and sleeve, is recommended. Use liquid soap or olive oil when fitting the seal. The impeller screw has a plastic insert and should preferably be renewed.

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 not primed.	●										●
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.		●	●	●							
Air or vapour pocket in suction line.	●	●	●								
Air leaks into suction line.		●	●								
Air leaks into pump through mechanical seal, sleeve joints, casing joint or pipe lugs.		●	●								
Foot valve too small.		●									●
Foot valve partially clogged.		●									●
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.				●					●	●	●

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																			
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						●													●	●

15 SPARE PARTS

15.1 Ordering of Spares

15.2 Ingersoll-Dresser Pumps keep 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.

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

15.4 To ensure continued satisfactory operation, replacement parts to the original design specification should be obtained from Ingersoll-Dresser Pumps. Any change to the original design specification (modification or use of a non-standard part) will invalidate the pumps safety certification.

15.5 Storage of Spares

15.5.1 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.

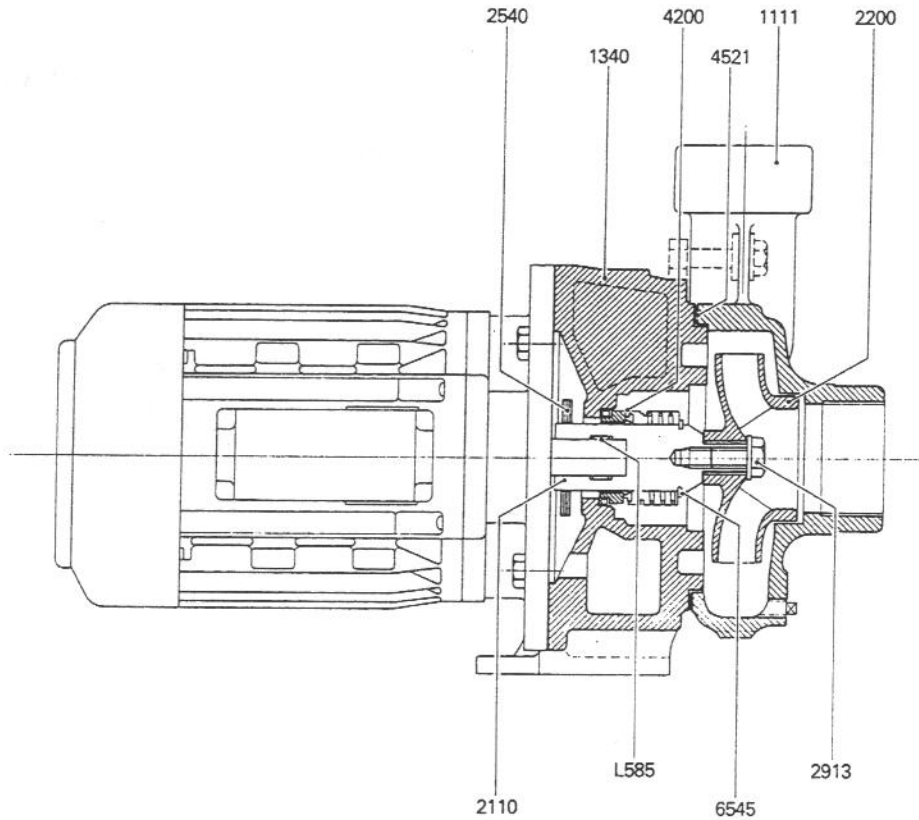
16 COPYRIGHT

16.1 No part of this publication may be reproduced in any form without the prior permission in writing of Ingersoll-Dresser Pumps (UK) Limited, P.O. Box 17, Newark, Notts. NG24 3EN.

17 GENERAL ARRANGEMENT DRAWING

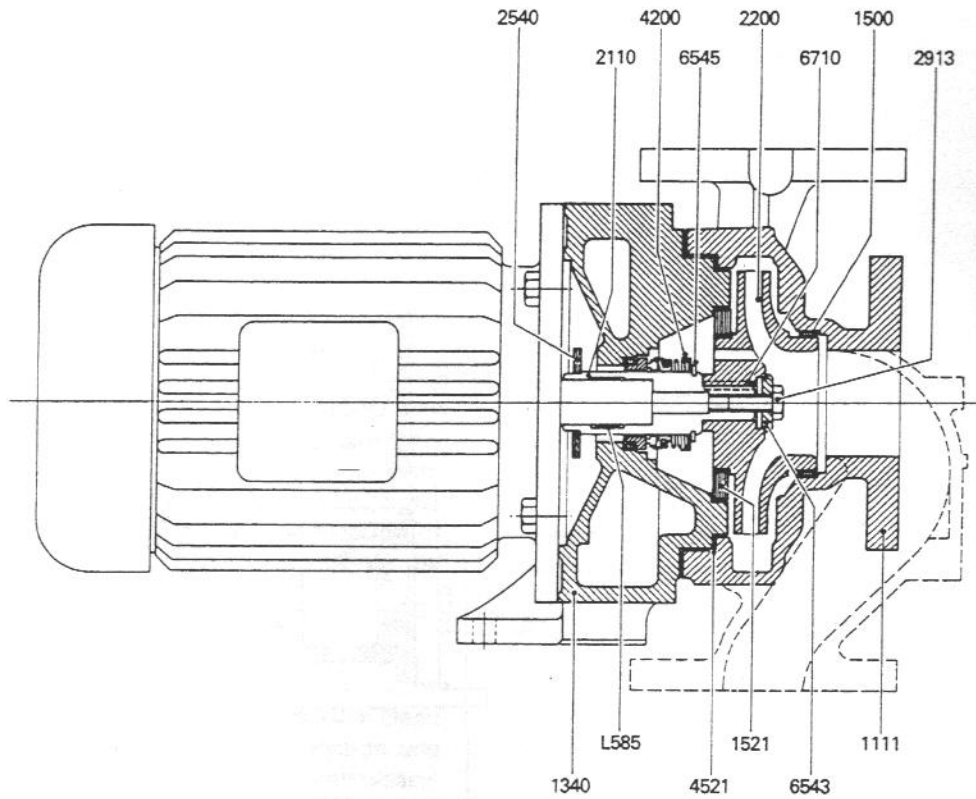
17.1 The typical general arrangement drawing and any specific drawings required by the Contract will be sent to the Purchaser separately. If required these should be obtained from the Purchaser and retained with this manual.

SECTIONAL ARRANGEMENT DRAWING AND PARTS LIST
TYPE WB

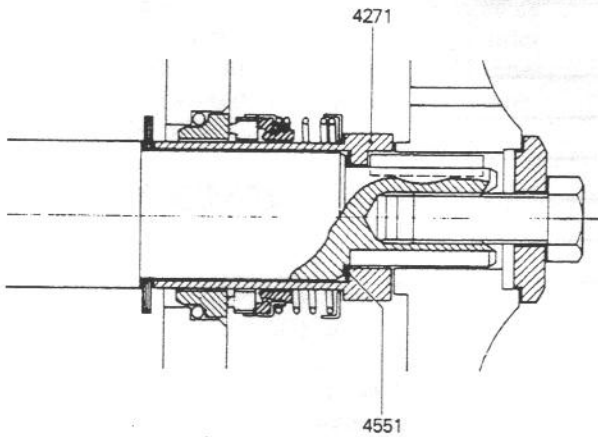


REF. NO.	NAME OF PART	NO. OFF
1111	PUMP CASING	1
1340	MOUNTING BRACKET	1
2110	PUMP SHAFT	1
2200	IMPELLER	1
2540	LIQUID THROWER	1
2913	IMPELLER SCREW	1
4200	MECHANICAL SEAL	1
4521	CASING JOINT	1
6545	OUTER CIRCLIP	1
L585	STAR RING	1
-	BOLT, CASING/MOUNTING BRACKET	4
-	SCREW, MOUNTING BRACKET/MOTOR	4
-	NAMEPLATE	1

SECTIONAL ARRANGEMENT DRAWING AND PARTS LIST
TYPES WJ, WJE, MK, WK and WKE



TYPES WJE, WKE



REF. NO.	NAME OF PART	NO. OFF
1111	PUMP CASING	1
1340	MOUNTING BRACKET	1
1600	CASING RENEWABLE RING	1
1521	STUFFING BOX COVER RENEWABLE RING	1
2110	PUMP SHAFT	1
2200	IMPELLER	1
2540	LIQUID THROWER	1
2913	IMPELLER SCREW	1
4200	MECHANICAL SEAL	1
4521	CASING JOINT	1
6543	IMPELLER WASHER	1
6545	OUTER CIRCLIP	1
6710	IMPELLER KEY	1
L585	STAR RING	1
-	SCREW, CASING/ MOUNTING BRACKET	4 or 8
-	SCREW, MOUNTING BRACKET/MOTOR	4
-	NAMEPLATE	1
4271	SHAFT SLEEVE	1
4551	SHAFT SLEEVE JOINT	1

20 **CERTIFICATION**

20.1 Any certificates eg. materials, hydraulic tests, conformities, BASEEFA, 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.

21 **SUPPLEMENTARY
INSTRUCTION MANUALS**

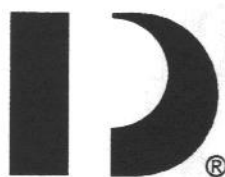
21.1 See also the supplementary instruction manuals supplied with this manual eg. for electric motors, controllers, engines, gearboxes, sealant systems, etc.

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