

A View of KBL Dewas Manufacturing Plant



Enriching Lives

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A Kirloskar Group Company

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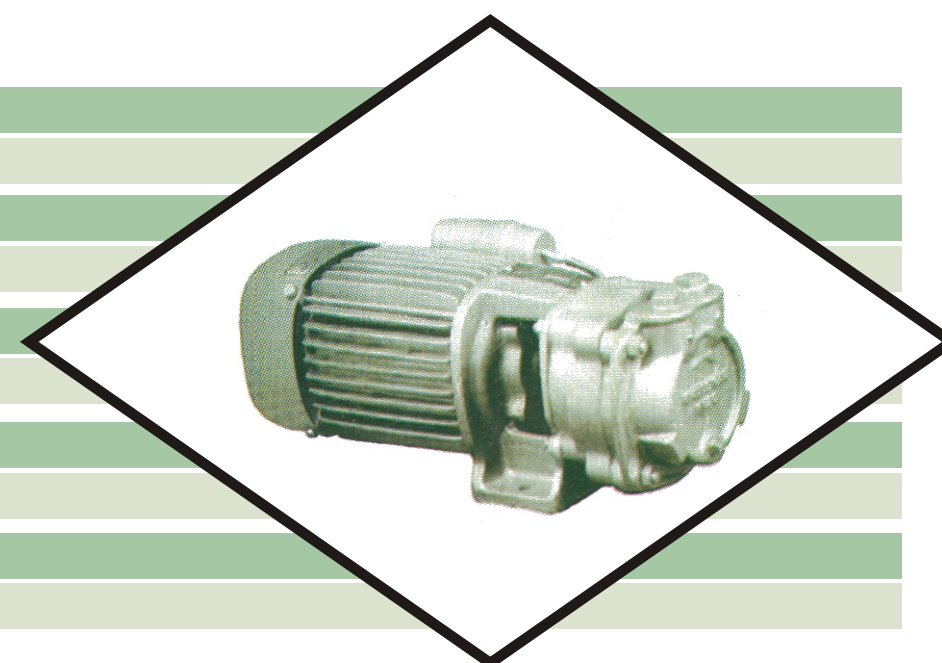
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Enriching Lives

**TECHNICAL
MANUAL**



KV SERIES

KIRLOSKAR BROTHERS LIMITED
A Kirloskar Group Company

TM 0902

Our products are meant for pumping water and they do not have any significant effect on environment during their use, if properly selected and used as per instructions given in this manual.

Customers are advised to dispose unusable components through appropriate disposal agencies to avoid the impact on work environment.

SPECIAL INSTRUCTION

“Purchasers are cautioned to go through the detailed instructions given for proper installation, use and servicing of the product and genuine spare parts as detailed in company's published literature, manuals, pamphlets or other official publications. Any deviations, if made by the customers, will void the warranty obligation and / or manufacturer's liability, if any, for any compensation consequential or otherwise. Use of trained mechanics will get you better results”.

Technical Manual

FOR

KV Series

FOR PROMPT SERVICE & SPARES
Register on our web : www.kirloskarpumps.com

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GENERAL

1.1 PRINCIPLE OF WORKING

The Kirloskar Vacuum Pump “KV” is a water ring type pump of particularly of simple design. The rotor casing of the pump which is during operation partly filled with water, accommo dates the eccentrically mounted rotor.

The rotation of the rotor forces the water to the periphery of the casing thus forming a rotating ring of water along the rotor surfaces. The inner surface of the water ring seals off the gas compartments which are formed between the rotor blades.

Due to eccentric rotation of the rotor, the gas compartments increase in size for part of the rotation and decrease in size for rest of the rotation. The action of these gas compartments formed between the blades of the rotor is thus, similar to that of many pistons working together in a cylinder block.

During the rotation, some of the gas compartments act as outward stroke and draw the gas through suction port. The same gas compartments when rotate further act as inward stroke, compress the gas due to decrease in volume and force it out from the delivery port. The cycle repeats for every rotation of the rotor.

1.2 WORKING FLUID

The clear and cold water fed through sealing connection plays an important role as the 'Working Fluid" The uninterrupted water supply at the pressure of 0.15 Kg/cm² is essential since it has the following functions :

- 1.2.1 The water forms a ring due to centrifugal force and seals the lateral gaps between the rotor and the casing . This ring makes the gas compartments air tight.
- 1.2.2 When the gas or air is compressed, heat is generated. The sealing water dissipates this heat of compression and keeps all the components free from getting hot. if this heat is not removed, the suction volume will decrease due to temperature rise of sealing water.
- 1.2.3 During operation some of the water escapes with the air/gas through the delivery. The water ring, therefore, requires replenishment, which is achieved by supplying fresh water.
- 1.2.4 Lubrication to mechanical seal.

If this heat is not removed, the suction volume will decrease due to temperature rise of sealing water.

The quantity of water to be supplied as working fluid depends on various factors as under :-

- a) Temperature of the air/gas to b expelled out.
- b) The amount of heat generated due to compression of gas/air which in turn depends on compression ratio (ratio between suction port & delivery port).
- c) Temperature of the sealing water itself.
- d) Clearance between rotor & rotor casting.

There are no established formulae for determnig the quantity of working fluid. However,

Following table may be used as a general guide line for supplying approximate quantity of water at 30° C & at various working suction pressures :-

Vacuum in mm of Hg.

100	200	300	400	500	600	650
-----	-----	-----	-----	-----	-----	-----

Service water in l/m

2	3.5	5	7	9	12	14
---	-----	---	---	---	----	----

1.3 SPECIAL INSTRUCTION :

Do not run the pump without clear & cold water. Dry running of the pump will damage the mechanical seal. It is also essential for sealing water ring.

1.4 INFLUENCE OF TEMPERATURE OF WORKING FLUID ON DELIVERY :

During the compression of the gas/air in the rotor compartments, greater portion of the heat of compression is absorbed by the working fluid and thus compression is practically isothermic. The pressure of gas/air depends upon the temperature of the water. For higher tempera ture of working fluid (i.e.water) suction pressure of gas/air will be more and consequently vacuum created by pump will be less.

2. INSTALLATION

2.1 LOCATION

- 2.1.1 The pump should be installed as near to the source as possible in order to reduce the friction losses in suction pipe & to achieve better performance.
- 2.1.2 Ample space should be provided around the pump for ease in inspection & maintenance.

2.2 FOUNDATION

- 2.2.1 The foundation should be rigid in order to absorb the vibrations.

2.3 PIPING

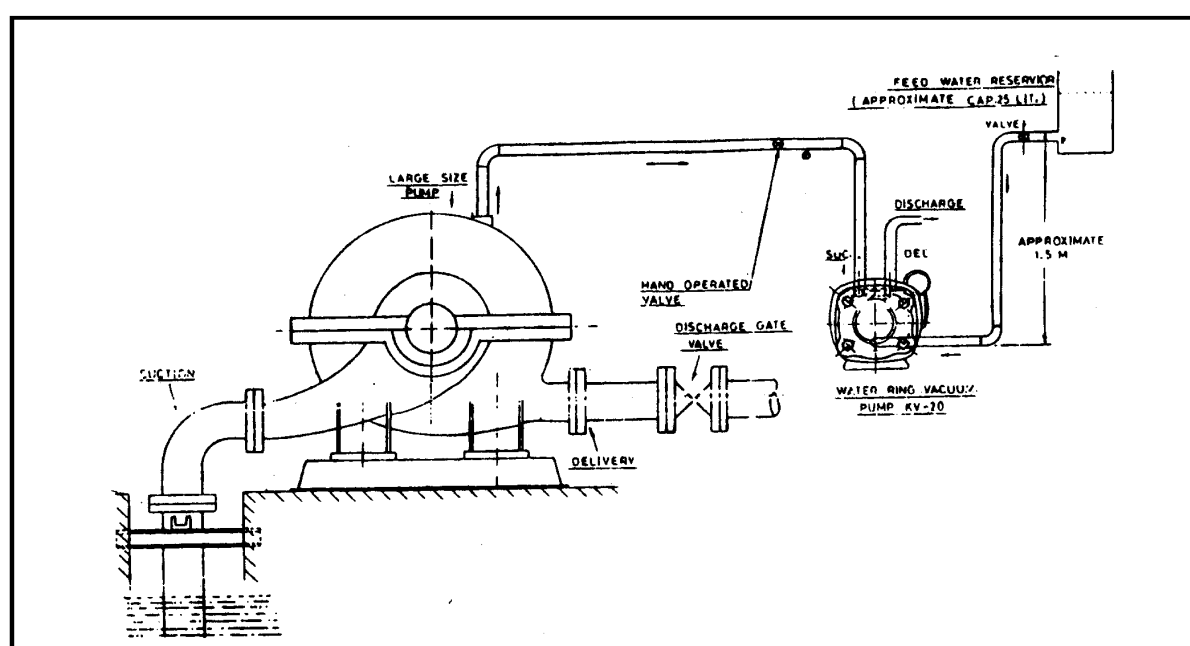
- 2.3.1 Pipe size should be as per the flange (in KV 30) or as per the thread size (in KV 20) to get the higher discharge. It is not recommended to reduce the pipe size.
- 2.3.2 No. of bends & other fittings should be as minimum as possible to reduce frictional losses.
- 2.3.3 Adequate support should be provided to pipes, so that its dead weight could not fall on delivery casing completely.

2.4 ELECTRICAL

- 2.4.1 Proper earthing connection should be made at the bolts provided for earthing.
- 2.4.2 Proper size of cable should be used between supply and motor terminals to minimize voltage drop.
- 2.4.3 Nuts at terminal should be tightened properly (to avoid any chance of motor burning).
- 2.4.4 No. of joints in cable should be as minimum as possible. Preferably joints should be avoided.
- 2.4.5 Wires and connection should be properly insulated. If not, it may lead to fatal shock.

2.5 INSTALLATION OF VACUUM PUMP FOR PRIMING APPLICATION

When the vacuum pump is to be used for priming a large size pump as shown in the drawing, following procedure should be adopted : (Ref : Fig. 1)



- Suction branch of vacuum pump should be connected to the top of the delivery casing of the large size pump and the discharge branch of vacuum pump should be left open to the atmosphere.
- Initially the discharge gate valve of the large size pump is closed and the hand operated valve of vacuum pump is kept open.
- The feed water valve is opened and the rotor casing of the vacuum pump is filled with water from the feed water reservoir. When the rotor is started water ring is formed which is essential. Vacuum pump is to be started only after getting ensured that water is coming out from the delivery branches of vacuum pump.
- Vacuum pump removes all the air from the large size pump and the air is discharged to the atmosphere via the suction and delivery branches of vacuum pump.
- Water is then sucked into the large size pump and due to the closure of discharge gate valve, water enters the suction branch of vacuum pump.
- When a steady flow is observed, hand operated valve & feed water valve of vacuum pump are closed and discharge gate valve of large size pump is opened. Simultaneously large size pump is to be started and vacuum pump is stopped.

For other applications following precautions must be taken :

- Feed water reservoir should be kept above the discharge pipe of the vacuum pump. Height of feed water reservoir should be approximately 1.5 m from the pump centre line.
- Before operating the vacuum pump, ensure that all openings of the system (where the vacuum pump is to be used must be closed.)

3. OPERATION

- 3.1 Before starting the pump, check the following :
 - 3.1.1 The pump rotates freely by hand.
 - 3.1.2 Open the cock of the service water connection.

- 3.1.3 Lubricate the bearings if not done earlier.
- 3.2 DURING RUNNING CHECK THE FOLLOWING :
 - 3.2.1 The direction of rotation should be in clock wise direction, when viewed from the driving end of the pump.
 - 3.2.2 The pump is running smoothly.
 - 3.2.3 The flow of service water is uninterrupted.
 - 3.2.4 The bearings are not getting heated up excessively.
 - 3.2.5 Power consumption is within the limit.
 - 3.2.6 Ensure that there is no mechanical friction.
 - 3.2.7 Stop the pump immediately if any defect is noticed. Do not start the pump unless defects are rectified. Report immediately to the supplier if it is not possible to rectify the defect.
- 3.3 DURING STOPPING OF THE PUMP
 - 3.3.1 Stop the motor.
 - 3.3.2 Stop the service water.
 - 3.3.3 If the pump is not required to be operated for long time, then drain the casing completely through drain plug provided at the bottom of the casing.

4. TECHNICAL DATA

- 4.1 DIRECTION OF ROTATION :
- The pump rotates in clockwise direction when viewed from the driving end of the pump.
- 4.2 BALL BEARINGS :
- For KV 20 pump :
- SKF 6304 or equivalent (for Driving End)
- SKF 6302 z or equivalent (for Non Driving End)
- For KV 30 pumps :
- SKF 6306 or equivalent (for Driving End)
- SKF 6305 or equivalent (for Non Driving End)
- 4.3 RECOMMENDED GREASE FOR LUBRICATION :
- Indian oil make servogem 3 or equivalent.
- 4.4 REGREASING PERIOD :
- The bearing should be regreased with correct quantity of grease during overhauling (normally after 2 years of service) :
- For KV 20 : SEALOL MAKE 19.05mm (SPACER SIZE 19.5 X 28.0 X 11.0 mm)
- For KV 30 : SEALOL MAKE 28.00mm (SPACER SIZE 28.5 X 46.0 X 8.5 mm)
- 4.6 CLEARANCE BETWEEN THE ROTOR & PORT PLATE :
- The lateral clearance between the port plate & rotor is 0.1 to 0.2 for KV 20 and 0.1 to 0.3 for KV 30 . This clearance must be maintained otherwise there will not be effective formation of water ring and hence performance of the pump will get deteriorated.
- 4.7 PIPE SIZE :
- For KV 20 20 X 20 mm
- For KV 30 30 X 30 mm

5. MAINTENANCE

5.1 DAILY CHECKS :

- 5.1.1 Vacuum gauge readings.
- 5.1.2 Bearing temperature.
- 5.1.3 Noise & Vibration.
- 5.1.4 Voltage & Current.
- 5.1.5 Constant flow of service water.

5.2 PERIODICAL MAINTENANCE

- 5.2.1 Replenish the grease.
- 5.2.2 Calibrate the measuring instruments.
- 5.2.3 Check the service water connection for pressure and leakage.

6. ASSEMBLY & DISMANTLING PROCEDURE

6.1 DISMANTLING PROCEDURE (Refer Cross Sectional Fig. No. 3 and 5).

- 6.1.1 Remove the suction and delivery pipe lines from the pump.
- 6.1.2 Remove the water tube from the plug . Remove the foundation bolts of the pump.
- 6.1.3 Loosen nut (1037) from stud (1026) (in KV20). Remove the suction & delivery chamber (105) and port plate (465). In case of KV30, loosen nut (1037) from tie rod (1036) remove the suction & delivery chamber & port plate (465).
- 6.1.4 Unscrew the impeller nyloc nut (330) and take out the washer (621). Screw two M10 nuts from the mounting casing (296.1) (where two holes are provided). As the screw rotates, the rotor casing (130) along with the rotor (163) comes out from the mounting casing. Then pull out the rotor casing along with the rotor. (For KV30 only). Pull out the impeller (163) by using impeller puller (in case of KV 20). Take out the impeller key (320) from keyway.
- 6.1.5 Loosen nut (1037) from stud (1061). Take out the rotor casing (in KV20). Take out the spacer (209) & mechanical seal (230).
- 6.1.6 Remove the fan cover (1001), cotter pin (1111) and the fan (1000) from the shaft (189).
- 6.1.7 Unscrew nuts (1172) from tie rod (1171) and take out the cover N.D.E (909) (in KV 20). Take out the screw (1118). Loosen nut (1115) from stud (1114), take out the cover N.D.E. (909) (in KV30)
- 6.1.8 Loosen tie rod (1171) from mounting casing (296.1) and take out motor body (130) from mounting casing (296.1) (in KV 20). Loosen nut (1113) from stud (1112), take out the motor body (130) (in KV30)
- 6.1.9 Loosen screw (1117) Loosen inside bearing cap (1130) also.
- 6.1.10 Hammer the Shaft (189) with plastic hammer from the impeller end and take it out along with bearing. Simultaneously water deflector (236) and D.E. inside bearing cap (1103) will come out. N.D.E. inside bearing cap (1104) will also come out (in KV30).

6.2 ASSEMBLY PROCEDURE OF THE PUMP

Before assembling, all the parts should be thoroughly cleaned to remove the dirt & dust.

After cleaning all the parts, they should be thoroughly checked for wear and tear and should be replaced if necessary.

- 6.2.1 Insert inside bearing cover (1103 & 1104). (In case of KV20 only 1103). Fit ball bearings (1106 & 1107) on the shaft (189) by shrink fit or by light hammering. Fill sufficient quantity of grease in the bearings. Note that shielded face of N.D.E. ball bearing (1107) (in case of KV20) should be towards rotor side.
- 6.2.2 Insert the shaft (189) in the brackets (296.1). Pass through water deflector (236).Slightly hammer the shaft so that ball bearing will get their proper position.
- 6.2.3 Fit the inside bearing cap D.E. (1103) on bracket (296.1) with the help of screws.
- 6.2.4 Fit the motor body (130) to bracket (296.1). Tighten tie rods (1171) on brackets (296.1) (in case of KV20). Tighten nuts (1113) & studs (1112) (in case of KV30)
- 6.2.5 Place the wavy washer (1195) in cover N.D.E. (909) and tighten the cover N.D.E. (909) on motor body with the help of the tie rod (1171) & nuts (1172). (In case of KV20). In case of KV30, tighten the cover N.D.E. (909) on motor body with the help of stud. (1114) and nuts (1115), Tighten the inside bearing cap (1104) (in KV30).
- 6.2.6 Fit fan (1000) on shaft by cotter pin (1111). Fit fan cover (1001) by pressing & then screw it by screws.
- 6.2.7 Fit the mechanical seal (230) on shaft (189) after applying soap solution on the diameter of the stationary portion. Place the spacer (209) on the shaft. Put CAF packing on the mount ing casing (296.1) & place the rotor casing (in KV30)
- 6.2.8 Place impeller key (320) in the keyway on the shaft (189).Fit impeller (163) on the shaft. Place the washer (621) and tighten the nyloc nut (330) on shaft.
- 6.2.9 Place CAF packing on the stud of the rotor casing (130) and tighten the rotor casing to mounting casing (296.1) with the help of stud (1061) & bolt (1037). (In case of KV20 only).
- 6.2.10 Place CAF packing & place the port plate (465). Note that packing thickness must be ad justed to maintain the 0.1 to 0.2 mm clearance between port plate (465) & rotor (KV20). In case of KV30, place 0.35 mm CAF packing & port plate. Match the groove in the port plate & in the rotor casing for proper positioning of the port plate.
- 6.2.11 Place CAF packing & tighten the suction & delivery chamber by stud (1026) & bolts (1037) (in case of KV20). Place CAF packing & tighten the suction & delivery chamber by the tie rod (in KV30).
- 6.2.12 Put 0.2 mm thick packing on suction & delivery side of the suction & delivery chamber (105).
- 6.2.13 Tighten the suction flange & delivery flange (490) with the help of nuts (580) & bolts (570).
- 6.2.14 Screw drain plug (1216) in the rotor casing (130).
- 6.2.15 Screw G.I. plug (601) on the suction & delivery chamber (105).

7. MATERIAL SPECIFICATION LIST FOR KV20 & KV30 PUMPSETS

Sr. No.	Description	Part No.	Material
1.	Suction and delivery chamber	105	C.I. G.R. FG 200 of IS:210
2.	Nyloc Nut for rotor	330	Nyloc ST42S, CAD, plated
3.	Washer for rotor nut	621	MS carbon steel FE-330 of IS:1570
4.	Plug for feed water supply	601	GI
5.	Key for motor	320	EN-3A Carbon Steel 20C8 of IS:1570, Far
6.	Spacer	209	Delrin
7.	Rotor Casing	130	C.I.GR. FG 200 of IS:210-78
8.	Rotor (Impeller)	163	BRONZE as per IS:318 GR.2
9.	Port plate	465	C.I. GR. FG 200 OF IS:210
10.	Packing for port plate and Suction & Delivery chamber	519	NAM - 37
11.	Mechanical Seal	230	
12.	Packing for mounting casing & rotor casing	687	DALMIA/DUPLEX
13.	Packing for port plate & rotor casing	519.1	NAM - 37
14.	Mounting casing	296.1	C.I. GR. FG 200 of IS:210
15.	Stud for suction & del. chamber & port plate	1026	Carbon steel FE-410 of IS:1570 Part-2
16.	Hex. nut for suction & del. chamber & Port plate	1037	Carbon steel FE-410 of IS:1570 Part-2
17.	stud. for mounting casing & rotor casing	1061	Carbon steel FE-410 of IS:1570 Part-2
18.	Hex. nut for mounting casing & rotor casing	1037	Carbon steel FE-410 of IS:1570 Part-2
19.	Tie rod for suction & delivery chamber chamber & mounting casing	1036	Carbon steel FE-410 of IS:1570 Part-2
20.	Hex. nut for tie rod	1037	Carbon steel FE-410 of IS:1570 Part -2
21.	Delivery flange	490	C.I. GR. FG 200 of IS:210
22.	Suction flange	490.1	C.I. GR. FG 200 of IS:210
23.	Bolt for flange	570	Carbon steel FE-410 of IS:1570 Part -2
24.	Hex. nut for flange	580	Carbon steel FE-410 of IS:1570 Part -2

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Sr.No.	Description	Part No.	Material
25.	Screw for inside bearing cap	1117	Carbon steel FE-410 of IS:1570 Part -2
26.	Rotor	164
27.	Stator	911
28.	Motor Body	130	C.I. GR. FG 200 of IS:210-78
29.	Shaft	189	Carbon steel 40C8 of IS:1570 Part-1
30.	Cover NDE	909	C.I. GR. FG 200 of IS:210-78
31.	wavy Washer	1195	Steel C-75, IS:2507-65
32.	Split cotter pin for fan	1111	MS
33.	Fan Cover	1001	Carbon steel FE-330 of IS:1570,Part1
34.	Fan	1000	Polypropylene
35.	Ball Bearing NDE	1107	Bearing Steel
36.	Tie rod for Bracket/Motor Body Cover NDE	1171	Carbon Steel FE-410 of IS:1570Part1
37.	Hexagonal Nut for Bracket/Motor body & Cover NDE	1172	CarbonSteel FE-410 of IS:1570Part1
38.	Capacitor	1022	Run Capacitor
39.	Clamp for capacitor	1141	Carbon steel FE-330 of IS:1570,Part
40.	Cap for capacitor	1073	HDPE (White)
41.	Mounting Casing	296.1	C.I. GR.FG 200 of IS:210-78
42.	Ball Bearing DE	1106	Bearing steel
43.	Water Deflector	236	Natural Rubber
44.	Flange	490	C.I. GR. FG200 of IS:210
45.	Packing for port plate & rotor casing		NAM - 37
46.	Inside bearing cap (N.D.E.)	1104	C.I. GR. FG 200 of IS:210
47.	Terminal box	999	C.S. GR. FG 330 of IS:1570 Part 1
48.	Stud for mounting casing & Motor Body	1112	Carbon steel FE-410 of IS:1570 Part1
49.	Hex. nut for mounting casing & Motor Body	1113	Carbon steel FE-410 of IS:1570 Part1
50.	Stud for cover N.D.E. & motor body	1114	Carbon steel FE-410 of IS:1570 Part1
51.	Hex. nut for cover N.D.E. & motor body	1115	Carbon steel FE-410 of IS:1570 Part1
52.	Drain Plug	1216	Brass

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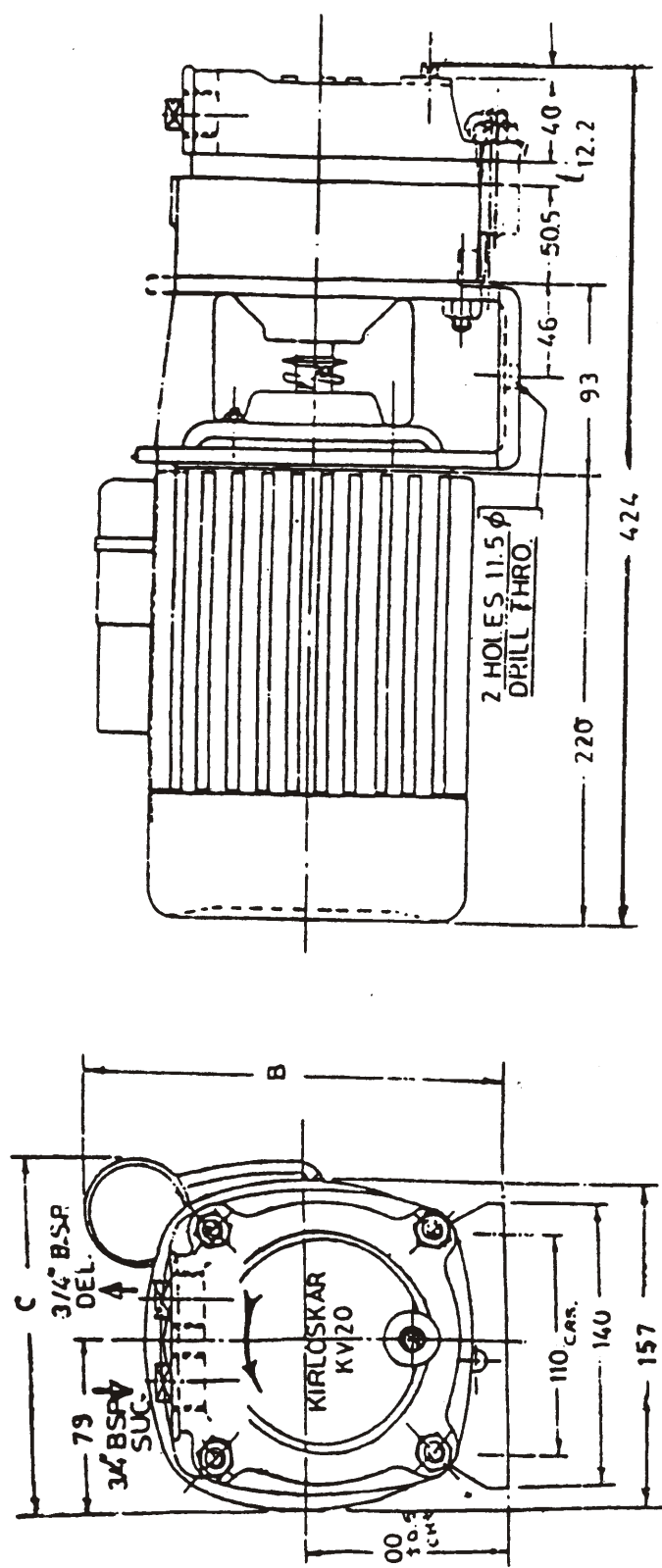


FIG NO. 2 OUT LINE DRG. FOR KV 20 PUMP

OUT LINE DRG. FOR KV 20 PUMP

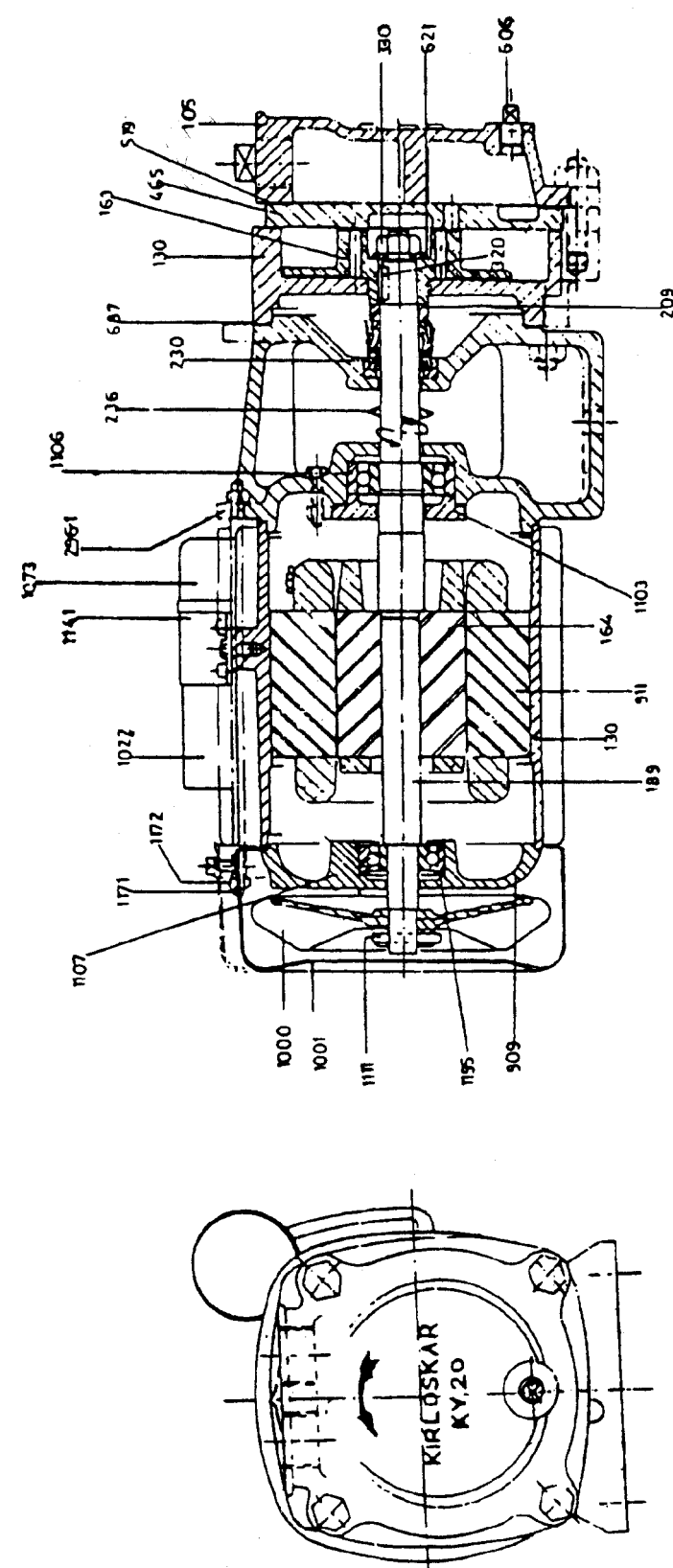


FIG NO. 3 CROSS SECT. ASSEMBLY FOR KV 20 PUMP

CROSS SECT. ASSEMBLY FOR KV 20 PUMP

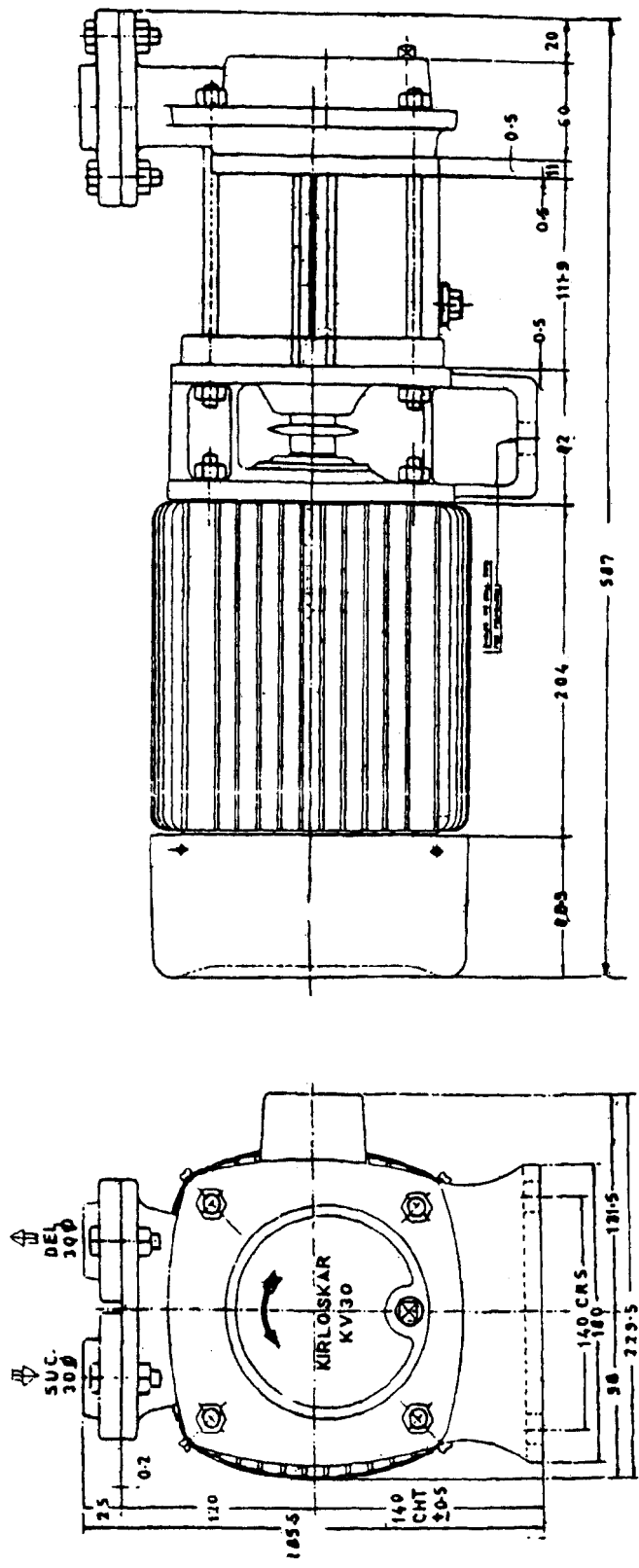


FIG NO. 4 : LINE DRG. FOR KV 30 PUMP

OUT LINE DRG. FOR KV 30 PUMP

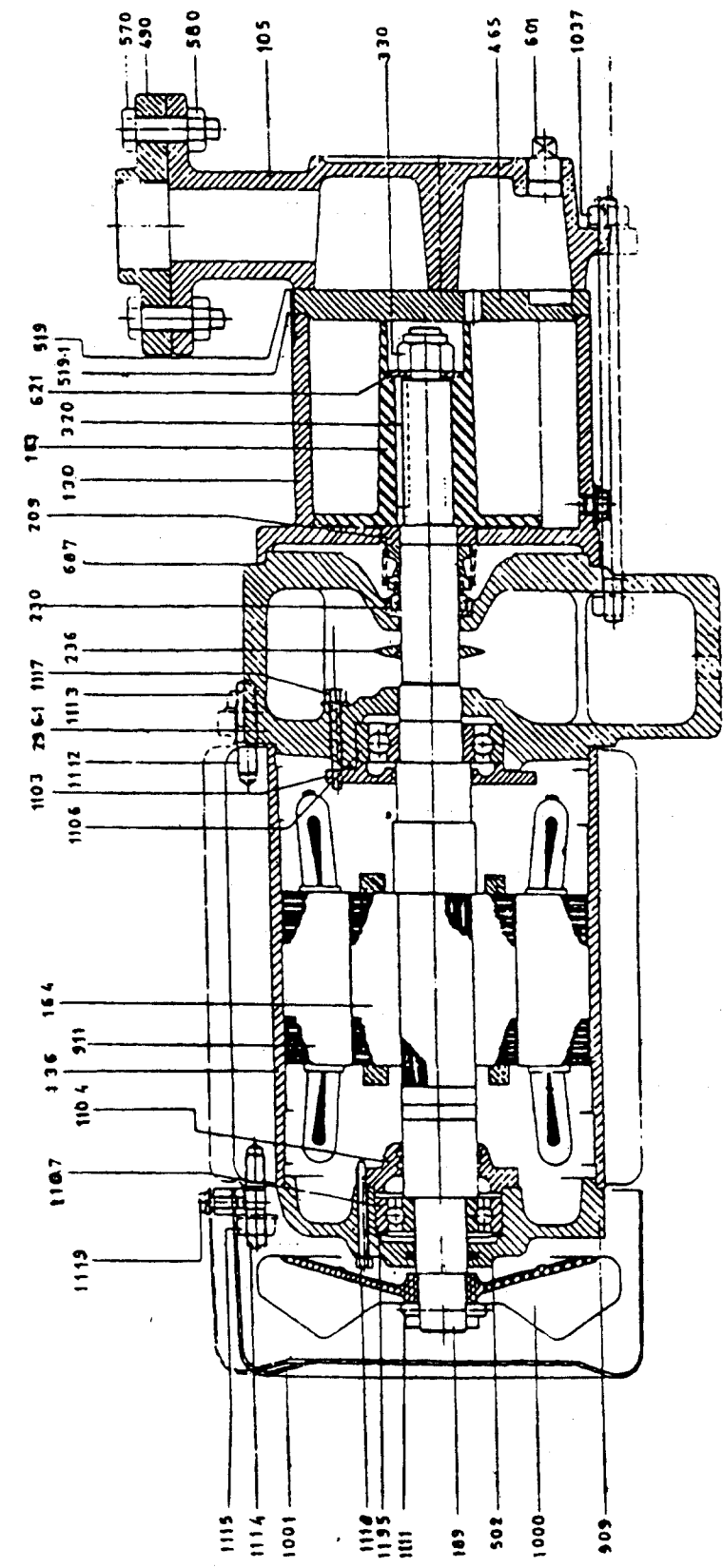


FIG NO. 5 : CROSS SECT. ASSEMBLY FOR KV 30 PUMP

CROSS SECT, ASSEMBLY FOR KV 30 PUMP

Product range manufactured by Kirloskar Brothers Limited, Dewas

Pump Series	Construction Feature	Drive Unit	Power Rating
KDS+/++	Monobloc	Electric Motor (1 and 3 Phase)	1.5 HP - 30.0 HP
KDT+	Monobloc	Electric Motor (1 and 3 Phase)	1.0 HP - 20.0 HP
KS+	Monobloc	Electric Motor (1 and 3 Phase)	3.0 HP - 10.0 HP
KOS	Monobloc	Electric Sub. Motor (1 and 3 Phase)	0.5 HP - 10.0 HP
SP	Monobloc/Coupled	Electric Motor (Monobloc)	0.5 HP - 5.0 HP
KJV/H,KJ+	Monobloc	Electric Motor (1 and 3 Phase)	0.5 HP - 3.0 HP
MINI,DC,DHX	Monobloc	Electric Motor (1 and 3 Phase)	0.25 HP - 1.0 HP
Submersible Ku4 Winner	-----	Electric Sub. Motor (1 and 3 Phase)	0.5 HP - 75.0 HP
NW,KE,KH KHDT+,SR	Coupled	Engine / Motor	-----
KV, DV	Monobloc/Coupled	Electric Motor	-----
Alternator	-----	-----	2 KVA - 50 KVA
Motor	-----	-----	0.5 HP - 120 HP

For details contact the dealer

Warranty Certificate

This product is warranted against manufacturing defects and workmanship under normal use and service for the period of 24 months from the date of manufacturing OR 12 months from date purchase of the end user whichever is earlier.

We undertake to repair or replace the product at our discretion or any part thereof, for which we are satisfied that it was originally defective in material or workmanship, provided that product or its parts are returned to our nearest regional office / dealer on freight paid basis, within the warranty period. This warranty does not cover any consequential damage of any nature.

This warranty excludes every condition, whether statutory or otherwise, whatsoever is not expressly set out here.

Product Model:_____

Sr. No. :_____

Date of Purchase :_____

Bill/Cash Memo No. :_____

SPECIAL INSTRUCTIONS: “ Customers are advised to go through the product manual carefully for proper installation, use and servicing product & genuine spare parts. It is also advisable to go through the company’s published literature, catalogue or other official publication. Any deviation, if made by the customers will void the warranty obligations. Repair by trained mechanics will get you better results.”

This card must be produced at the time of claiming the warranty along with purchase documents.

Dealer’s stamp and signature :_____