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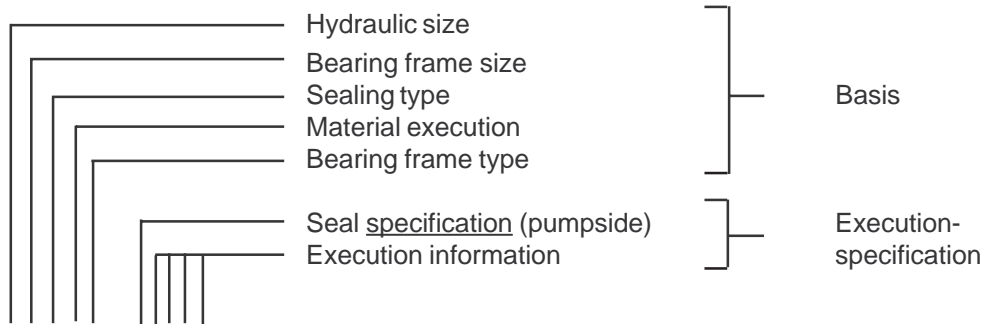
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2.0 TYPE CODE EXPLANATION



DDM1X - TT3K
 EDS 1X - A225
 EGM 5X - C132S

S	=	Special construction/execution
K	=	for K-Hydraulic
F	=	for F-Hydraulic
0,2,5	=	Standard Q-Hydraulic, part of motor size
0,1,2,3,5,6,8,9	=	Part of Motor size
1,2,3	=	Standard (C,G,M,X-seal and stuffing box)
T	=	Special construction/execution (for T-seal)
C	=	stuffing box bearing frame with cartridge seal
0	=	Without mech. seal (Pos. 515) / without packing (seal / packing specified by customer)
C	}	Pump side mechanical seal specification (for bearing frame with mechanical seal, details see page 3)
G		
M		
X		
T		
L	=	Soft packing standard (only for bearing frame with stuffing box)
X	=	Bearing frame with flexible-direct-coupled motor
1	=	Normal, for hydraulic material 1,2 and 3
5	=	Wetted parts stainless steel, for hydraulic mat. 5
S	=	Bearing frame with stuffing box (not ex-proof)
M	=	Bearing frame with mechanical seal
B	=	for Motor 90/100/112
C	=	for Motor 100/112
D	=	for Motor 132/160/180/200
F	=	for Motor 160/180/200/225
G	=	for Motor 225/250/280
H	=	for Motor 250/280/315
I/L	=	for Motor 315/355
See type code explanation Hydraulic code		

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Pump side mechanical seal Pos. 515 type:

- C = Fitted with Carbon-ceramic seal faces. Recommended for handling water, activated sludge and non-abrasive liquids.
- G = Silicon carbide seal faces, rubber bellows with external spring.
- M = Tungsten carbide - silicon carbide seal faces, rubber bellows with internal springs. For sludges, slurries and abrasive liquids.
- X = Tungsten carbide - silicon carbide seal faces, stainless steel shell for higher pump pressures and/or higher motor speeds.
- T = Silicon carbide seal faces, for special application (special construction)

2.1 FLUSHING WATER CONNECTION

Pumps are supplied with a flushing water connection (service connection "F", Fig. 1).

For normal sewage application this connection is not used. However, in special cases when pumping high concentrations of sludge or mud, it should be connected. It will conduct cleaning water between impeller and pump side mechanical seal (515), providing periodic removal of accumulated solids.

Flushing water must be pressure-regulated between 0,5 to 1 bar (7 to 14 psi) above pump discharge pressure. Water is controlled by a solenoid valve on a time clock. Adequate duration of each flushing is 60 seconds; frequently of flushing must be established for each different installation.

The quantity of flushing water varies according to pump size and application: in most cases, flowrates of 6-8 litres per minute will be sufficient.

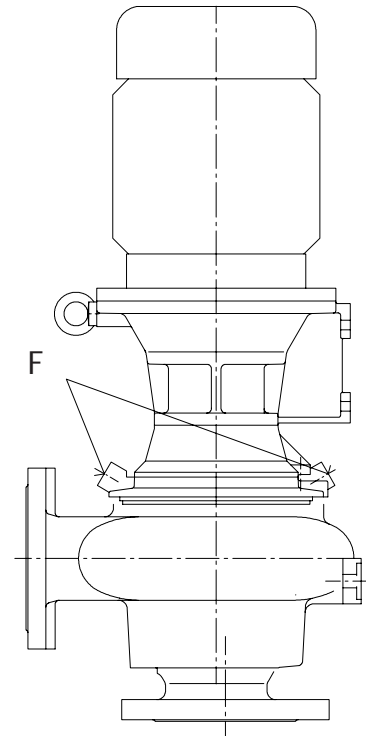


Fig. 1

2.2 DIRECTION OF ROTATION

Before start up the pump, power connections must be made as indicated in section 2.4. Check that the direction of rotation is correct by giving the unit a starting impulse for one second and noting impeller rotation.

Rotation must be counter-clockwise viewed from suction end, and clockwise viewed from driving side.



CAUTION:

If rotation is not correct on multi-speed or multi-pump installations, **only change the cable leads of the pump or speed with wrong rotation at its starter in the control panel. DO NOT** change the primary power leads coming into the control panel: This would change the rotation of all pumps or speeds.

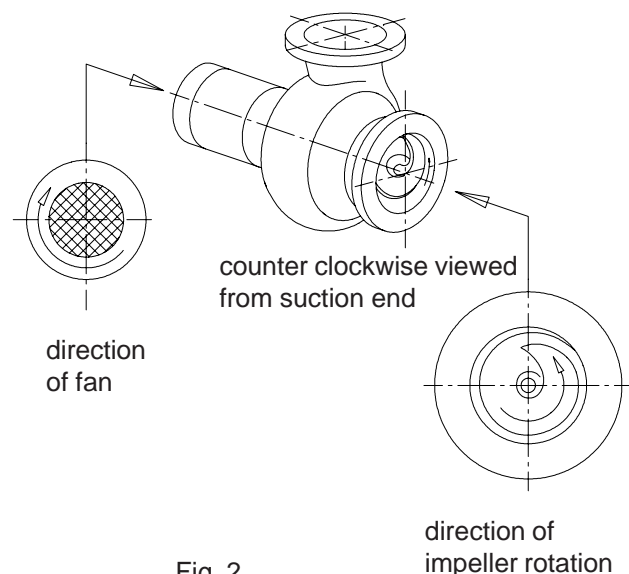


Fig. 2

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2.3 LEVEL CONTROL SYSTEM



Prior to any work on the pump, the power supply must be disconnected either by means of a locked isolator or by removing the fuses from the panel. It is not safe enough to switch off the control switch. A wiring mistake or a control system malfunction could put the motor back into operation.



2.3.1 LEVEL SWITCHES

- Remark: Observe the relevant instructions for level controls in explosion proof installations.
- For the on and off levels, use control systems that are appropriate for the pumped liquid.
- Use a floating-ball type switch for the high-level alarm, even when there is another type used for the pump control (this has proven to be the most fail-safe type).
- The floating ball for the alarm should be placed at a reasonable distance above the highest pump start level to avoid false alarms.

2.3.2 LEVEL CONTROL

"ON" and "OFF" levels must be set in such a way as to provide sufficient sump capacity between "ON" and "OFF" so that the pump cannot be switched on more than 10 times per hour. Higher starting frequency may damage the motor control devices in the panel and will cause excessive power consumption. The following formula will calculate the required minimum sump capacity:

$$V = \frac{0.9 \times Q_p}{Z}$$

V = sump capacity or volume, between on and off levels (in cubic meters)

Q_p = pump flow for one pump, in litres/second

Z = number of starts per hour (Z = 10, maximum)

2.4 START - UP



- Prior to starting, check that:
- Electrical connections of the motor are according to name plate
 - Level controls are correctly set
 - Off-level is sufficiently high to prevent air entrance to the pump suction
 - Suction and discharge gate valves are completely open
 - Flood pump sump
 - The pump may not be started if potentially explosive atmosphere is present



STARTING OF PUMP

Never start pump against closed valves (except non-return valves).

Start the pump using manual operation. **Measure the amperage** drawn on each phase leg. Record and **verify** these **readings** with the **nameplate ratings**. If amperage is more than 5 % higher, stop unit and check probable causes according to "Operating Troubles" chart, Section 2.5.

Once preliminary checks are complete, place the pump into automatic operation. Cycle the system through several wetwell pumpdowns to observe that level controls are properly set and functioning correctly. **Observe** that the **alarm system** and change over switch (if included in control panel) **are working properly**.

Log date and hours meter reading, and set pump for automatic operation. Perform maintenance according to Section 2.6.

GENERAL OPERATING CONDITIONS

The pump should not be allowed to operate continuous-duty outside of performance curve: high discharge pressures with low flow or low discharge pressure with high flow. Bearing life is shortened and abrasive wear is accelerated in these operating conditions.

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2.5 OPERATING TROUBLES



Instructions for pumps in potentially explosive atmosphere must be observed.



Ensure, that no work is carried out in a potentially explosive atmosphere.

POSSIBLE REASONS	TROUBLE							
	No flow	Flow not sufficient	Head not sufficient	Reduction of flow or head after start up	Vibrations	Motor overloaded	Noise	Bearing temperature > 90° C
1. Pump not sufficient submerged, not vented	X							
2. RPM too low	X		X					
3. RPM too high					X	X	X	
4. Air entrance into suction line	X	X		X	X		X	
5. Discharge line clogged / valve closed	X				X	X		
6. Air or gas in pumped liquid	X	X	X	X	X		X	
7. TDH too high (higher than calculated)	X	X			X			
8. Suction head too high				X	X		X	
9. Insufficient suction head on hot liquids		X			X		X	
10. Insufficient submergence of suction	X	X	X	X	X		X	
11. Sludge concentration higher than assumed		X	X			X		
12. Specific weight of medium higher than assumed						X		
13. Impeller or suction line clogged	X	X			X			
14. Wrong direction of rotation	X	X	X					
15. Impeller clearance too high		X	X					
16. Damaged impeller		X	X		X			
17. Motor damage					X	X	X	
18. Unsuitable lubrication								X
19. Attachments loose					X		X	
20. Bearings worn out					X			X
21. Impeller out of balance					X			
22. Impeller too small			X					
23. Impeller dragging against suction cover					X	X	X	
24. Thick sludge and tight impeller clearance						X		
25. Air or gas on impeller backside	X			X				

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2.6 MAINTENANCE AND SERVICE



2.6.1 GENERAL

Pay attention to the relevant instructions.



Before doing any work on the pump unit, switch off main isolator switch and remove fuses from panel.

The following checks can be done in the field. When a repair is indicated, send the pump unit to the nearest authorized Hidrostal service station.

2.6.2 VISUAL CHECKS OF PUMP UNIT

- Check pump and motor for possible mechanical damage.
- If pump volume or pressure are not acceptable, check impeller clearance (see manual for hydraulic).
- Check overload relay, fuses and time relays (if any) for correct setting.
- Check correct function of level control.
- Annual check for wear of the coupling.



2.6.3 SERVICE CONNECTIONS

The service connections that are built into all pumps as standard are listed below. Please refer to Fig. 3 and sectional drawings.

552a/552b Seal Flushing Connections "F"

Alternatively or even in addition to the function described in section 2.1, this connection may be used to manually bleed the air from the casing prior to start-up, if there is no other place for air to escape through the discharge piping. In most cases the connection 552b will be closed and flushing water mixes with product pumped. In cases where the solids accumulate, could form lumps, or be fibrous flushing out via 552b would be the preferred solution. Connection 552b also permits complete draining of product from horizontal bearing frames if required.

536a Connection "OIL IN"

Opening to refill seal oil.

536b Connection "OIL OUT"

Opening to remove seal oil.



DIRECTION:
SEE SECTION DESCRIBING "OIL CHECKING" (2.6.4) AND "OIL CHANGE" (2.6.5) FOR DETAILED INFORMATION.

131 Greasing point "G1"

Greasing instructions see Section 2.7.

134 Plug "G.O."

Possibility to remove old, excessive grease.

Connection "D":

At this connection tapped G 1/4" any leakage through the motor side mechanical seal (516) will be noted. Thus preventing contamination of bearing grease and premature failure of bearing.

This drain must be left open. As soon as excessive leakage (more than 0,1 l per year) via "D" is noted in the collecting basin the pump should be removed for inspection.

On horizontal units: Connection "D" must always be at the bottom of the bearing frame. The factory build pumps with drain "D" on the opposite side to pump discharge flange, as most horizontally mounted pumps have the discharge flange vertically. If it is in any other position the bearing frame must be unbolted from the hydraulic end and re-positioned so drain is vertically down.

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On vertical units the drain can be in any position relative to the discharge nozzle.

When installed in dry environment, the drain can be left open. In a situation where water could spray onto the bearing frame, i.e. when washing down, an elbow can be fitted to prevent ingress of water.

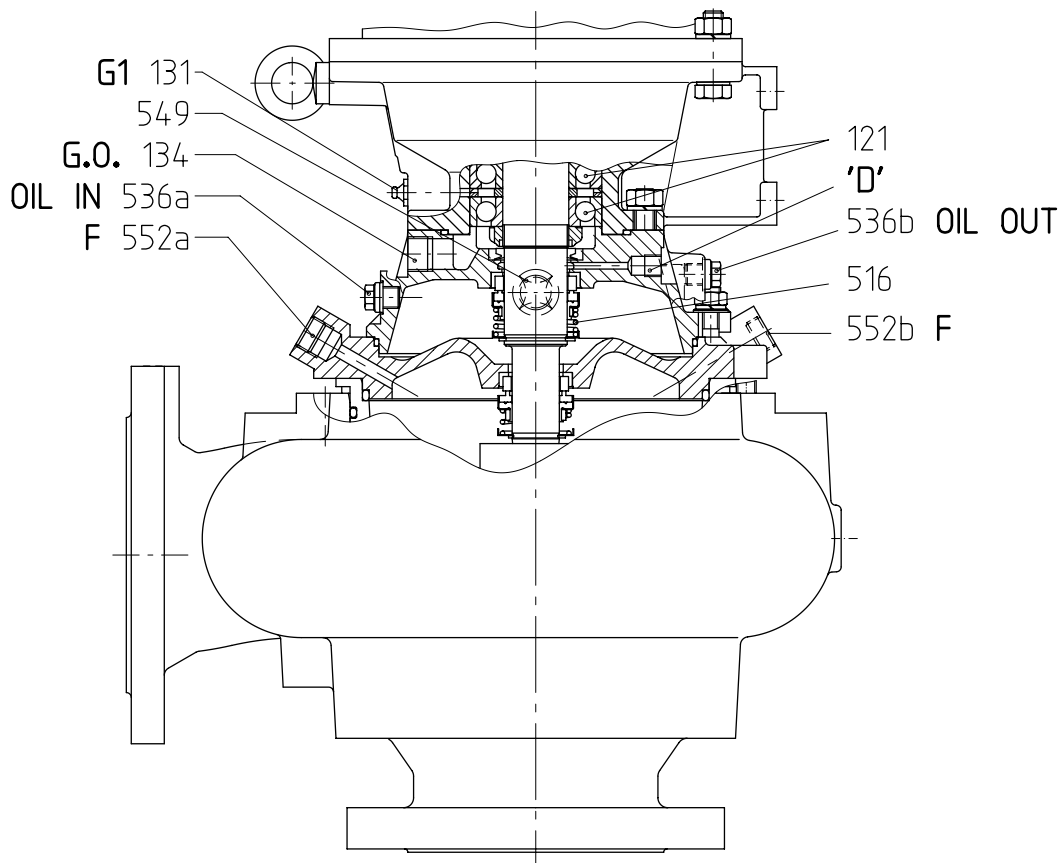


Fig. 3

2.6.4 SEAL-OIL CHECKING ON FLEXIBLE-DIRECT-COUPLED PUMPS

This is a direct indication of the condition of the pump side mechanical seal (515).

An oil condition check must be made after the first 1,000 hours of operation and once a year thereafter.

Immediately before checking the oil, run the pump for a few minutes to distribute any impurities through the oil.



ATTENTION: Before proceeding with the oilcheck, carefully clean the area around the oil-sight-glass (549) and the screw plugs 536a and 536b.

IMPORTANT: When a bearing frame is fitted with an oil-sight-glass it should **only** be used to obtain a quick visual indication of the oil condition, it **is not** an indication of the correct oil level.

The correct oil level is above the level of the sight-glass for both horizontally and vertically mounted pumps. As long as oil level surface cannot be seen through the sight glass it can be regarded as having sufficient oil for satisfactory operation.

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OIL CONDITION	ACTION	
Level below oil-sight-glass	Top up to correct level * CHECK AGAIN AFTER 500 HOURS If leakage is large, replace pump side mechanical seal (515)	PUMP IN-SITU IN AUTHORISED WORKSHOP
Clean	Top up to correct level if necessary *	PUMP IN-SITU
Milky	Drain completely, separate oil from water, top up to correct level * CHECK AGAIN AFTER 500 HOURS	PUMP IN-SITU
Slightly dirty	Small amount of water in oil, drain completely, flush out and top up to correct level * CHECK AGAIN AFTER 500 HOURS	PUMP IN-SITU
Very dirty	Large amount of water and dirt in oil, replace pump side mechanical seal (515)	IN AUTHORISED WORKSHOP

* SEE SECTION OIL CHANGE 2.6.5.



DIRECTION: When re-installing screw plugs 536a and 536b always use a new copper sealing washer. It will be softened as follows:

Heat until red and quench immediately in cold water.

SEAL OIL QUANTITIES

To refill oil the following oil quantities can be used as a guide:

Type	Oil quantity	
	horizontal	vertical
BBM.X	1.0 litres	1.1 litres
BCM.X	0.4 litres	0.45 litres
BDM.X	0.4 litres	0.45 litres
CBM.X	1.0 litres	1.1 litres
CCM.X	0.4 litres	0.45 litres
CDM.X	0.4 litres	0.45 litres
DCM.X	0.8 litres	0.9 litres
DDM.X		
DFM.X	0.9 litres	1.0 litres
EDM.X		
EFM.X	1.1 litres	1.3 litres
EGM.X	3.1 litres	3.5 litres
FFM.X	2.5 litres	2.8 litres
FGM.X		

Type	Oil quantity			
	"K"		"Q"	
	horizontal	vertical	horizontal	vertical
FHM.X	3.0 litres	3.3 litres	3.0 litres	3.3 litres
HFM.X	2.5 litres	2.8 litres	2.5 litres	2.8 litres
HGM.X				
HHM.X	14.5 litres	16.3 litres *	14.5 litres	16.3 litres *
IHM.X	18 litres	23 litres	-	-
IIM.X	28 litres	31 litres	29.5 litres	33 litres
ILM.X				
LIM.X	38.5 litres	43 litres	29.5 litres	33 litres
LLM.X				
LMM.X				
MLM.X				
MMM.X			28.5 litres	32 litres

* (bis Var. E: 3.3 litres)

2.6.5 OIL CHANGE

2.6.5.1 FOR HORIZONTAL MOUNTED PUMPS

Drain oil through opening 536b
 Remove screw plug and seal ring 536b (Fig. 4).

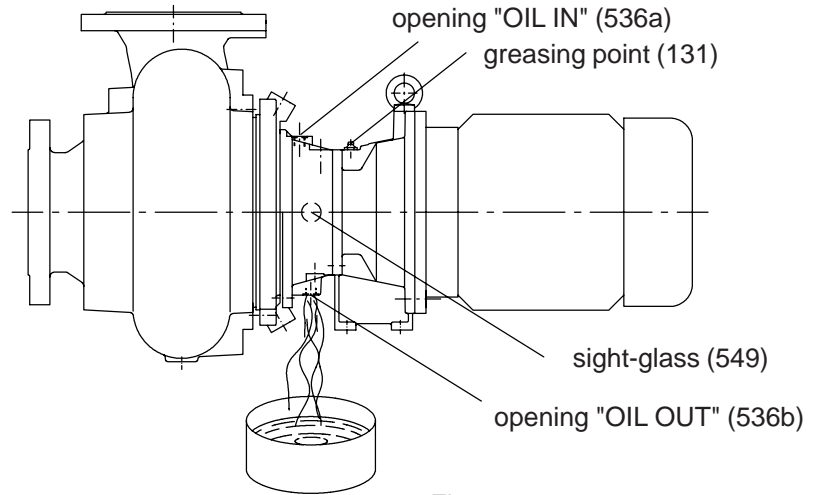


Fig. 4

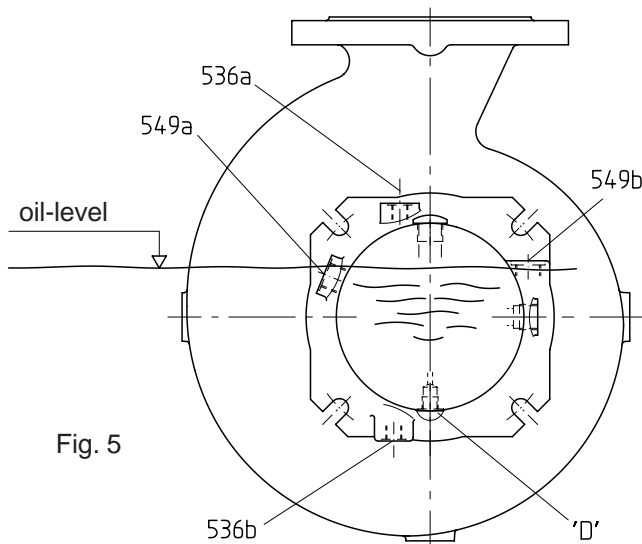


Fig. 5

Refill oil through opening 536a (Fig. 5)

With the following indications the oil chamber casing is approximately 85-90 % filled with oil and leaves the required air space. If the installation position of the sight-glass is according Pos. 549a the level should be approximately at the top of the glass, if the installation position is according Pos. 549b the approximate level is reached when the oil becomes visible. For correct filling quantity see table 'SEAL OIL QUANTITIES' on page 8.

Re-install screw plugs 536 using new softened copper seal rings. Continue to monitor seal oil condition by visual inspection through the sight-glass.

2.6.5.2 FOR VERTICAL MOUNTED PUMPS (Fig. 6)

Remove screw plugs 536a (to let in air) and 536b. The oil must be removed through opening 536b. The remaining oil could be removed by either using a rubber tube as a syphon or by employing some form of suction device.

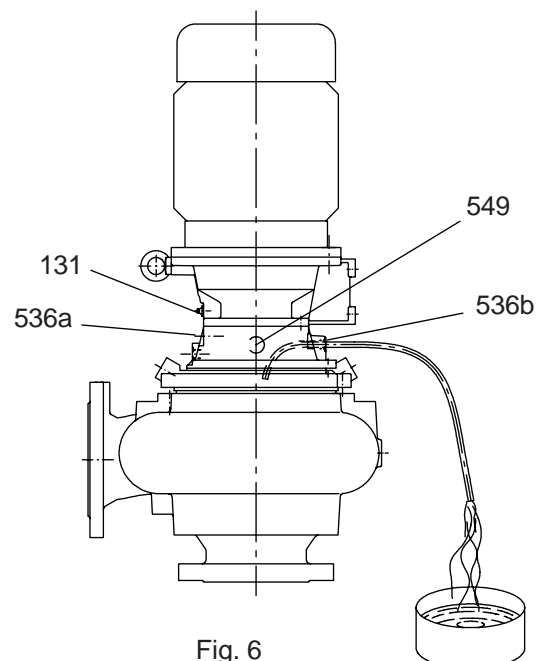


Fig. 6

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Having removed all the old oil, flush with a little clean oil and refill with clean oil up to the opening 536a.
ATTENTION EXCEPTION: By types DCM.X / DDM.X / EDM.X refill up to the opening 536b.



ATTENTION:

It is important to use opening 536a to refill oil (see above exception). Refilling by this opening ensures the correct air space is left above the oil and the oil level covers the sight-glass. If connection 536b is used, this would not be the case.

Openings 536a and 536b should be closed using new softened copper seal rings.

Continue to monitor seal oil condition by visual inspection through sight-glass.

SEAL OIL SPECIFICATIONS

General

The factory fill the seal oil chamber on bearing frame pumps with low viscosity oil.

OIL ANALYSIS

Specific gravity at 20°C	0.812	g/ml
Viscosity at 40°C	3.5	mm ² /s (cst)
Solidification point	-38.0	°C
Flash point	132.0	°C
Burning Point	142.0	°C
Evaporation energy	251.0	kJ/kg
Solubility in water	none	

For installations which are exposed to temperatures below freezing point (e.g. outdoor installations), the solidification point is very important.

IMPORTANT FEATURES FOR APPLICATION OF SEAL OIL IN PUMPS

If another oil or even another liquid will be used, the following features must be considered:

- Check the consistency with the used elastomers
- The viscosity may not be higher than indicated by ISO VG.
- Emulsification with water is not acceptable, as water penetration could not be detected.
- Corrosion resistance and non-aging quality are required.
- Following temperatures must be considered:
 - Solidification point and lowest surrounding temperature
 - Boiling point and highest temperature of pumped liquid.
- If bearing frame is equipped with moisture probe, it is important that the liquid has good electric insulation qualities.

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2.7 GREASING INSTRUCTIONS

For greasing intervals and amounts see bearing lubrication chart (Section 2.7.1). For regreasing bearing frames, we recommend grease according to following specifications (from **KLÜBER LUBRICATION**):

FOR BEARING FRAME TYPE:	. BM . X - . IM . X	. LM . X + . MM . X
BEARING GREASE:	STABURAGS NBU 8 EP Mineral-oil based, Barium-complex as thickener.	ISOFLEX TOPAS NB 52 Synthetic oil based, Barium - complex as thickener.
Typical characteristics:		
Colour:	beige	beige
Apparent dynamic viscosity (approx.):	6000 mPas	5000 mPas
Operating temperature range:	-30 .. +150 °C	-60 .. +160 °C
Consistency class (NLGI)	2	2
Penetration DIN ISO 2137 (0.1 mm):	280	280
Dropping point DIN ISO 2176:	> 220 °C	> 240 °C
Corrosion protection DIN 51802:	0	0 / 1
RPM - parameter (n x d _m):	500 000	1 000 000



Greasing amount: Overgreasing can cause **excessive operating temperature** and premature **bearing failure**.

Greasing intervals can be used for **Horizontal Installation**. They should be halved for **Vertical Installation** or if the following conditions apply: High **humidity** or **contamination**, **ambient temperature of more than 40°C** or with increased loads which could influence the Bearings. With greasing intervals of **more than 12 months (1 year)** pump **must** be regreased at that time.

Regreasing (whole operation can be done whilst pump is running; see Fig. G.O.): **Remove plug 134** to drain old grease. **Remove plug 131** (if available; see section 2.6.3; Service connections). Put fresh grease (with suitable device) into greasing connection 131, take care to **avoid contamination**. When regreasing is finished, greasing connection 131 and grease relief connection 134 to be closed again with plug.

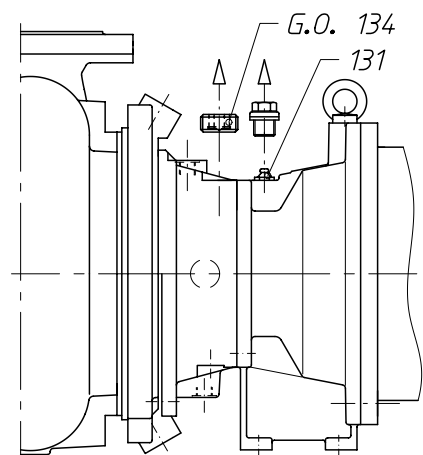


Fig. G.O.

Example to read bearing lubrication chart 2.7.1 (the fields in the table are marked grey): Bearing frame type **DDM1X** with a shaft speed of **1500 rpm** has a greasing interval of **8500 hours** and needs a grease amount of **28 grams**. **Converting** the greasing interval from hours to months see table 2.7.2. It means for our example: For an assumed running time of the pump of **18 hrs. / day**, it gives an equivalent greasing interval of **12 months**.

HIDROSTAT AG recommends **continious regreasing** with an automatic, electronic grease dispenser and offers such a product for sale. These can be connected to the potential free contact within the starter contactor by extending the included contact wire. With this it is guaranteed that pump is greased only during running time (if needed). Overgreasing is not possible. Grease dispensers are factory refillable. If lubricators are ordered from the factory, please indicate correct bearing frame type

Parts identification	:	8SB - 125STABU	or	8SB - 125ISOFLEX
Content approx.	:	120 gramms		
Running time	:	2 weeks	to	18 months

For **description, installation and operation** of this grease dispenser see separate instruction manual.



INSTRUCTION MANUAL FLEXIBLE-DIRECT-COUPLED PUMPS, MECH. SEAL

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2.7.1 BEARING LUBRICATION CHART CONNECTION 131

Bearing frame size	Shaft speed rpm	Interval hours	Amount of grease grams	Bearing frame size	Shaft speed rpm	Interval hours	Amount of grease grams	Bearing frame size	Shaft speed rpm	Interval hours	Amount of grease grams	
BBM . X CBM . X BCM . X CCM . X DCM . X	4800	3000	12	DFM . X EFM . X FFM . X HFM . X	3500	2000	48	IIM . X LIM . X	1700	2500	100	
	4200	3500			3000	3000			1500	3000		
	3600	5000			1800	5500			1200	4000		
	3000	5500			1500	6500			1000	5000		
	1800	8500			1200	8000			900	5500		
	1500	9500			1000	9000			750	6000		
	1200	10500			900	9500			600	7500		
	1000	11000			750	10000			500	8000		
	900	12000			3000	2000			1500	1500		160
	750	13000			1800	5000			1200	2000		
BDM . X CDM . X DDM . X EDM . X	4800	2200	28	EGM . X FGM . X HGM . X	1500	5500	60	ILM . X LLM . X MLM . X	1000	2500	240	
	4200	3000			1200	7000			900	3000		
	3600	3500			1000	8000			750	3500		
	3000	5000			900	8500			600	5000		
	1800	7500			750	9500			500	6000		
	1500	8500			1800	3500			1500	1500		
	1200	9500			1500	5000			1200	2500		
	1000	10500			1200	5500			1000	3000		
	900	11000			1000	7000			900	3500		
	750	12000			750	8500			600	5500		
		600	9500	500	6500							

2.7.2 CONVERSION TABLE

With conversion table right, greasing interval from table 2.7.1 can be converted from hours to months.

Greasing interval hours	Running time in hours per day				
	0 - 2	2 - 6	6 - 12	12 - 18	18 - 24
Equivalent greasing interval in months					
2000		11	6	4	3
2500		12	7	5	3.5
3000			8	6	4
3500			10	6.5	5
4000			11	7	5.5
4500			12	8	6.5
5000				9	7
5500				10	7.5
6000				11	8
6500				12	9
7000					9.5
7500					10
8000					11
8500					12
9000					
10000					
11000					
12000					
13000					

More than 12 months (1 year)

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2.8 REPLACEMENT OF MECHANICAL SEAL

2.8.1 REMOVAL OF PUMP SIDE MECHANICAL SEAL (515)

a) Exposed-spring seal - type "C" (Fig. 7)

Remove snap ring (546, Seeger), then remove spring. Make sure that the shaft is free of burrs and has no sharp edges so that the rubber parts of the seal cannot be damaged as they are removed. Oil the shaft for ease of disassembly. Now the seal rotating parts can be pulled off the shaft by hand.

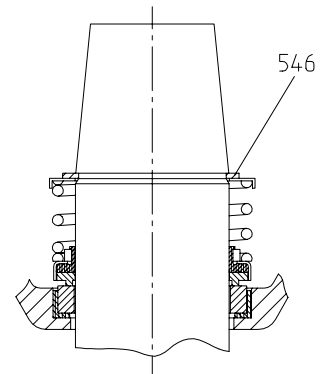


Fig. 7

b) Rubber-bellows seal, internal spring - type "M" (Fig. 8)

Remove retaining ring "A" from the rubber bellows of the seal by gently prying with two screwdrivers on opposite sides, between the rubber bellows and the retaining ring (Fig. 9).



WARNING:

Use only dull-edged screwdrivers since sharp edges could cut the rubber bellows. Do not twist screwdriver, as this can puncture rubber bellows.

Rather, lay some convenient object onto back cover or sealing plate, to act as a fulcrum for each screwdriver, and pry ring directly up away from rubber bellows (Fig. 9).

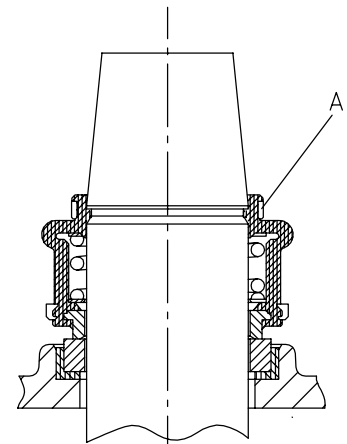


Fig. 8

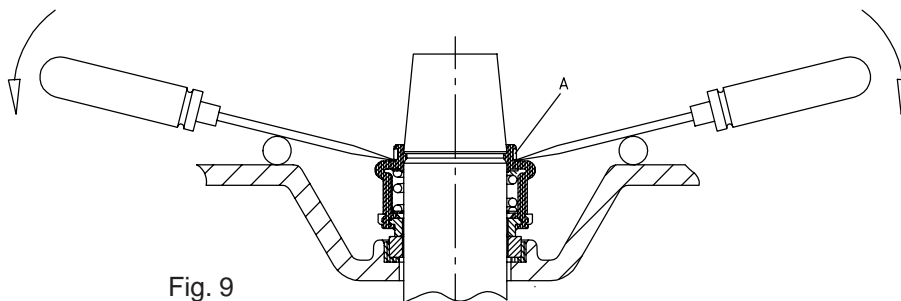


Fig. 9

Make sure that the shaft is free of burrs and has no sharp edges so that the rubber parts of the seal cannot be damaged as they are removed. Oil shaft and bellows for ease of disassembly. Gently insert a screwdriver between the shaft and the rubber bellows. By lifting and turning the screwdriver around the shaft, the lip of the rubber bellows can be lifted out of the shaft groove. Once the bellows is free of the groove, the entire rotating part of the seal with bellows can be pulled off the shaft. If necessary, use two screwdrivers deep into the seal to pry the seal face loose (Fig. 10).

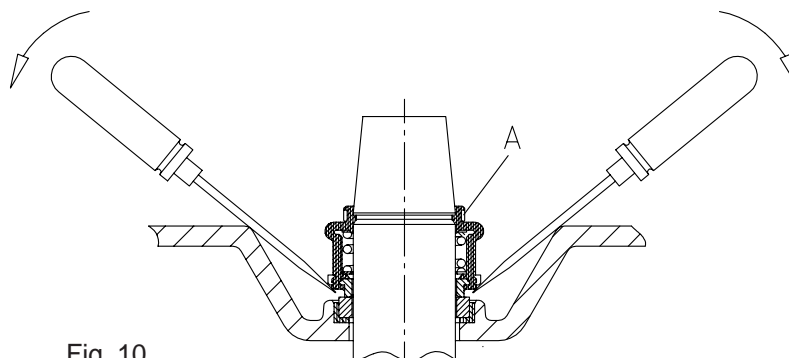


Fig. 10

c) Rubber-bellows seal, external spring - type "G" (Fig. 11)

Remove snap ring (546), if existing. Pull out the removable part (A) by hand.

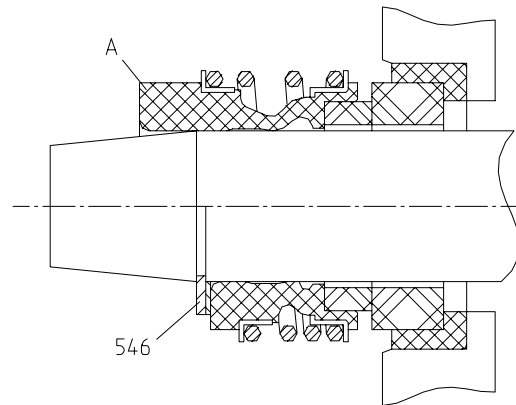


Fig. 11

d) Stainless-steel-shroud seal - type "X" (Fig. 12)

Remove all three small setscrews from outer body of rotating part. Remove snapping (546). Oil the shaft for ease of disassembly. Now the seal rotating part can be pulled off the shaft by hand.

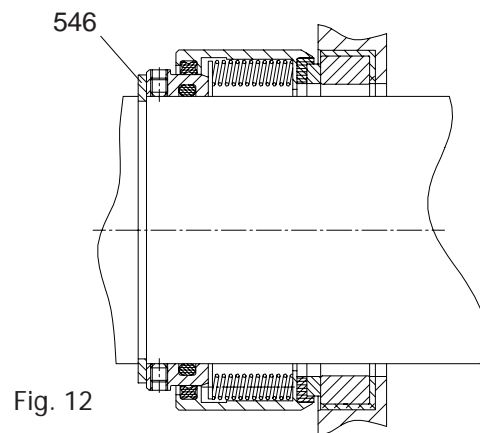


Fig. 12

e) Stationary seat (all types) (Fig. 13)

Remove static part of the mechanical seal as follows:

Unfasten nuts (534) and carefully remove back cover or mechanical seal plate (507) from oil chamber casing. Make sure that the static part of the seal (515) does not hit the shaft so that the ring can't be damaged.

Now the static part of the seal can be carefully pushed out of the chamber from the back side.

Some HIDROSTAL seals can be repolished or repaired (Consult nearest service center). When sending a seal for inspection or repair, it is important to thoroughly protect the seal faces to prevent damage during transportation.

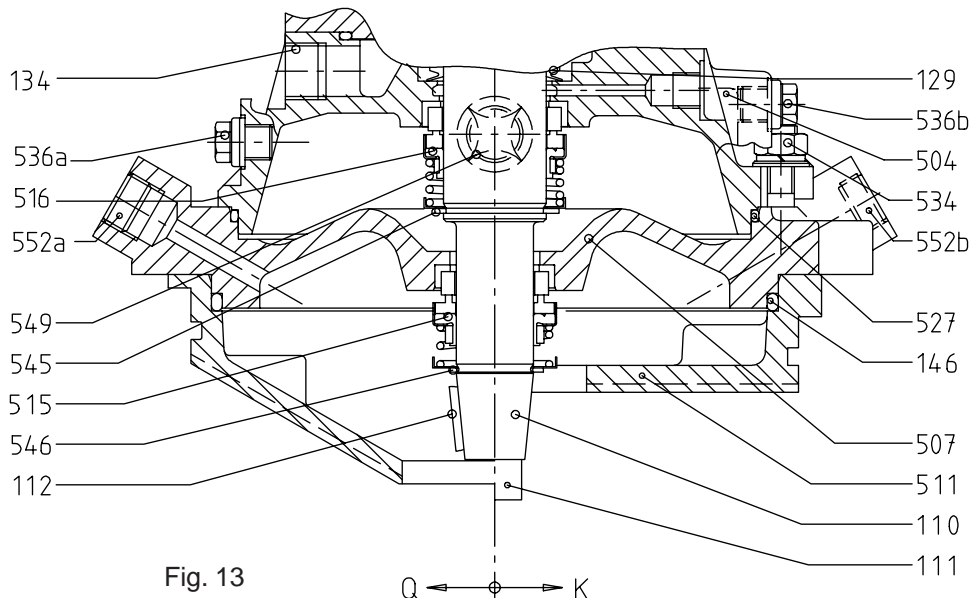


Fig. 13

2.8.2 MAINTENANCE OF MOTOR SIDE MECHANICAL SEAL (516)

If increased leakage via connection "D" is noted (see Section 2.6.3), eventually the mechanical seal (516) has to be replaced.

2.8.3 ASSEMBLY OF BACK COVER

Cleanliness is of utmost importance for this assembly work! All parts must be washed in solvent before assembly. All machined mating surfaces must be clean and free from burrs. All grooves and seatings for "O"-rings and other static seals must be inspected for nicks or scratches. All threads must be clean especially those in holes for studs. **All "O"-rings MUST be replaced with new ones and they should be lubricated with light oil prior to assembly.**



ATTENTION:

Never use "O"-rings glued from "O"-ring stock. Our experience is that this glue joint will inevitably leak.

Place a new "O"-ring (527) on the oil chamber casing (504). Carefully assemble back cover or mechanical seal plate (507) to the oil chamber casing and fasten with fastening set (534).

2.8.4 ASSEMBLY OF PUMP SIDE MECHANICAL SEAL

a) Stationary seat (all types)

Lubricate the rubber circumference of the static mechanical seal part and carefully press all the way into its seat in the back cover or mechanical seal plate (507). The ring must fit tightly in place. Protect the seal face during this operation. Examine gap between shaft and inner diameter of seal face; when face is correctly installed, gap will be uniform all the way around.



ATTENTION:

The seal face is very brittle, and can easily snap unless pressure is uniform during installation. We suggest pushing in with special tool (Fig. 14).

Make sure that the shaft is free of burrs and has no sharp edges, so that the rubber part or the mechanical seal cannot be damaged. File groove edges if necessary.

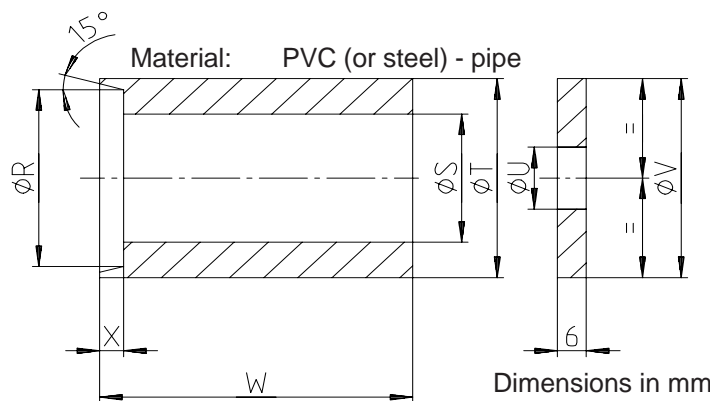


Fig. 14

Seal size	φ R	φ S	φ T	φ U		φ V	W	X	Bolt size	
				"Q"	"K"				"Q"	"K"
20	32 +/-1	21 +1/-0	38 +/-1	12	-	40	60	5	M10	-
1 1/8"	40 +/-1	29 +1/-0	45 +/-1	14	12	50	65	5	M12	M10
1 1/2"	50 +/-1	39 +1/-0	55 +/-1	18	16	60	75	5	M16	M12
2"	65 +/-1	51 +1/-0	70 +/-1	22	18	80	95	5	M20	M16
2 1/2"	80 +/-1	64 +1/-0	85 +/-1	29	-	90	150	5	M27	-
3"	92 +/-1	77 +1/-0	100 +/-1	28	29	110	170	5	M33	M27
100	110 +/-1	102 +1/-0	120 +/-1	44	38	130	350	5	M42	M36
120	-	122 +1/-0	140 +/-1	58	-	150	350	-	M56	-

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b) Exposed-spring seal - type "C"

Remove spring and spring retaining ring of mechanical seal. **Seal surfaces must be absolutely clean!** Place a few drops of light oil on the rotating (carbon) face of the mechanical seal, then lubricate inner bore of rubber part of the seal with oil and put a small amount of oil onto shaft. Install rotating face (with its rubber part) over shaft, and press gently down length of exposed shaft until carbon face touches stationary face. It may help to use a small wood "pusher" or a plastic pipe mandrel only slightly larger than shaft diameter, to push directly on the rubber part of the seal (Fig. 14). Be sure rubber part sits uniformly on shaft, and has **NOT** rolled out from under the metal part of the seal. Put on seal spring, and spring retaining ring.

Install snap ring (Seeger, 546) and turn shaft by hand to check for free running.

c) Rubber-bellows seal, internal spring - type "M"

Lubricate the rotating part of the mechanical seal, position the retaining ring "A" on the rubber bellows (Fig. 15). Push the whole assembly by hand over the shaft as far as possible. Mount the special tool over the shaft tip (Fig. 16), and compress the mechanical seal until the lip of the rubber bellows is engaged in the shaft groove. Remove special tool. Turn the shaft by hand and watch that the retaining ring turns perfectly in line with the rubber bellows and that it is not cocked. Then try to pull the rubber bellows off shaft by hand to make sure that the lip has reliably engaged in the shaft groove.

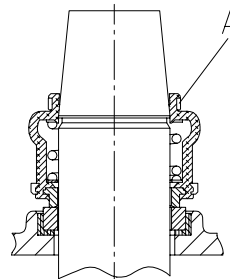


Fig. 15

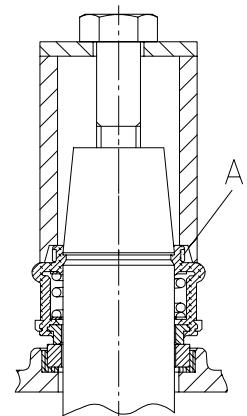


Fig. 16

d) Rubber-bellows seal, external spring - type "G"

Wet the rotating part of the mechanical seal with soapy water. Push the whole assembly by hand over the shaft as far as possible. On size 20 mm (Fig. 17) final assembly by installing of impeller. On other sizes (Fig. 18) secure with snap ring (546).

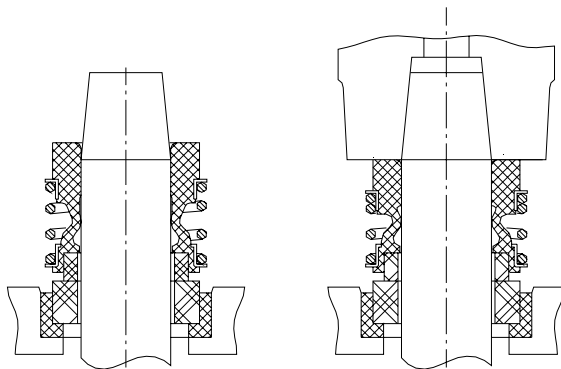


Fig. 17

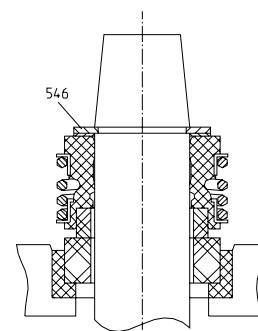


Fig. 18

e) Stainless-steel-shroud seal - type "X"

Lubricate inner rubber O-rings of seal and put a small amount of oil onto shaft. Install entire seal over shaft, and press gently down shaft until rotating face touches stationary face. Now install snapping over shaft, and push until it snaps into its groove. If necessary use the special tool (Fig. 14). Then re-install the three small setscrews into the seal rotating part, and tighten firmly.

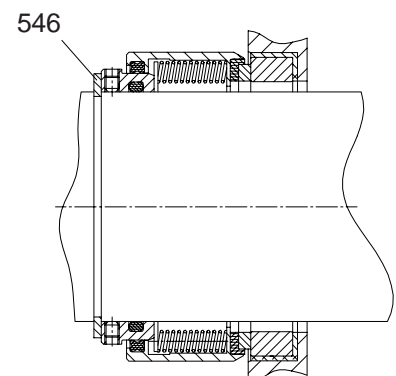


Fig. 19

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2.8.5 LEAKAGE TEST FOR PUMP SIDE MECHANICAL SEAL (All Types)

Remove screw plug "OIL" (536) and drain the oil from the bearing frame. Connect dry compressed air source such as bicycle tyre pump to the opening. Use a pressure reducing valve and relief valve set to 0.5 bar (7 psi).



WARNING:

- Make sure that the pressure never exceeds 1 bar. This could displace the seal.
- **DO NOT IMMERSER THE MOTOR AND BEARING FRAME INTO WATER.** Only the back cover or seal plate up to connection "D" have to be checked under water for continuously escaping bubbles. This would indicate leakage passed the seal or associated "O"-ring.
- Correct failure if leakage has been found. After finishing test remove pressure connection hose and fill with oil according to Section 2.6.5.

2.9 INSTRUCTIONS FOR FITTING MOTORS TO FLEXIBLE-DIRECT-COUPLED PUMPS

Prior to fitting of motor rotate impeller by hand to ascertain the degree of drag due to bearing and mechanical seals. This will assist in checking no increase in drag has occurred due to a badly fitted motor.

The motor can be assembled to the pump with the shaft vertical or horizontal.

- Prior to assembling carefully degrease and deburr motor shaft and key way. Change the key of motor to the new, shorter key (114) delivered with coupling side for motor shaft. Assemble coupling (631) to motor shaft (see drawing and table).
- Fix coupling with set screws (605).
- The motor should be lowered slowly into the pump until the coupling is partially engaged, ensure that the two parts slide freely together, that no undue force is necessary.
- Continue to lower the motor until the spigot on motor flange engages, then fix motor with fastening set (621) to pump.



ATTENTION: NEVER PUSH OR FORCE MOTOR COUPLING INTO PUMP COUPLING!



CHECK DIMENSION i2 FOR CORRECT LENGTH!

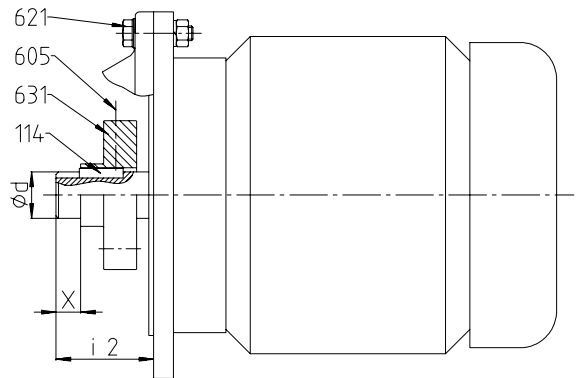


Fig. 20

Type	Motor		d	i2	X		
	Size	Pole					
. BM.X - .090	90	2-8	24	50	4		
. BM.X - .112	100/112		28	60	8		
. CM.X - .112			38	80	20		
. DM.X - .132	132		42	110	6.2		
CDM.X - .160	160		48		55	0	
DDM.X - .160							13.2
EDM.X - .160							
. DM.X - .180							180
. DM.X - .200	200		55		6.5		
. FM.X - .16.	160		42		140	36.5	
. FM.X - .18.	180	48					
. FM.X - .20.	200	55					
. FM.X - .22.	225	2					
. FM.X - .22.		4-8					

Type	Motor		d	i2	X	
	Size	Pole				
EGM.X - .22.	225	2	55	110	7	
EGM.X - .25.	250		60		15	
EGM.X - .28.	280		65			
F/HGM.X - .22.	225	4-8	60	140	37	
F/HGM.X - .25.	250		65		15	
F/HGM.X - .28.	280		75		17	
. HM.X - .25.	250		4-12		75	170
. HM.X - .28.	280	80				
. HM.X - .31.	315	90		26		
. IM.X - .31.		26				
. IM.X - .35.	355	90		19		
. IM.X - .40.	400	100		59		
. LM.X - .31.	315	4-12	80	170	23	
. LM.X - .35.	355		90			
. LM.X - .40.	400		100			63