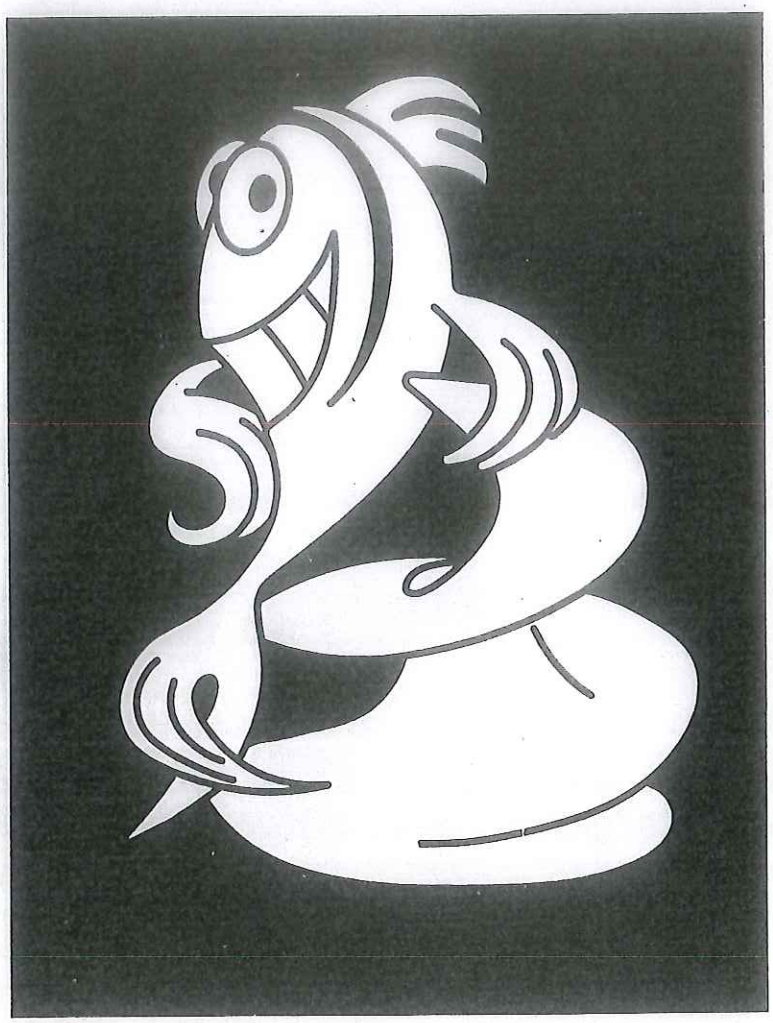
Hidrostal

INSTRUCTION MANUAL FOR HIDROSTAL - PUMPS



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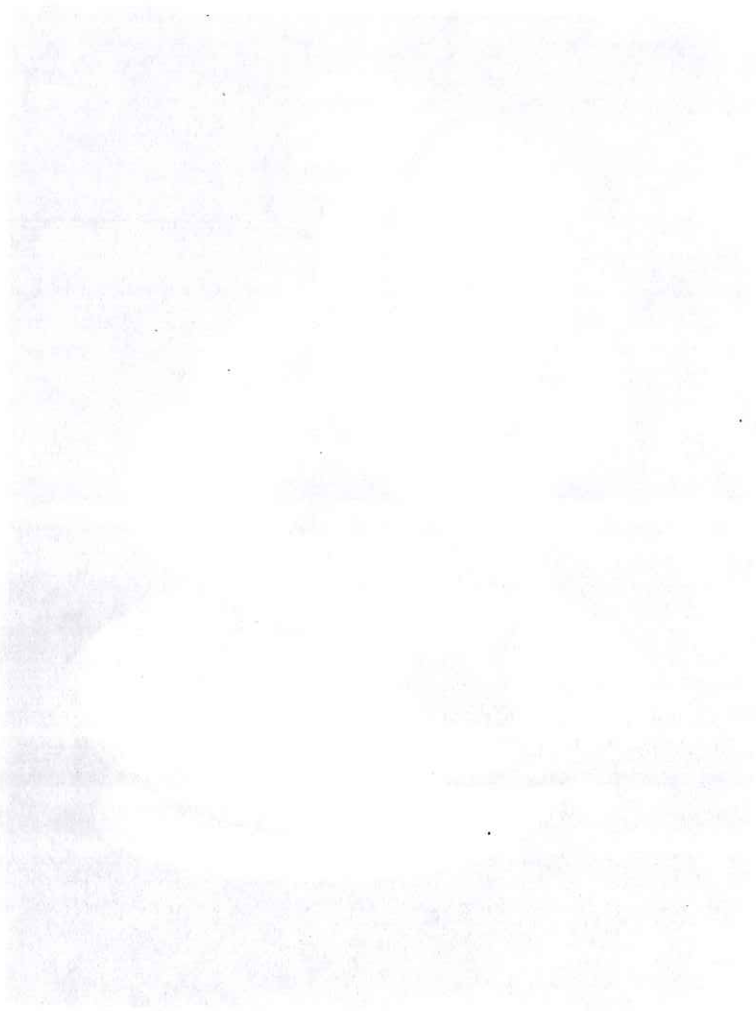

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Rüstschein Dokumente

Nr. 12003900

22.11.2011

Auftragsbestätigung Nr. 12003900

Lieferadresse

IMPULSE BV
Arendserweg 9
NL 7021 PC Zelhem
Niederlande

Pos.	Teilenummer Bezeichnung	Liefertermin	Menge	Mengeneinheit
10			6	

Seriennummer: 206604 – 206614

94-BA5030E
94-BA5083E
94-BA5039E

Bearing frame pump

E125-M01R + EFM1W-MQ

Motor data unknown!

Installation:	unknown
	Dimension N-Spigot on Shaft End unpainted **(Durchmesser N, unterhalb Lagerdeckel ungespritzt)**
Prices gross:	Hydraulic E125-M01R Bearing frame EFM1W Additional charge M-seal pos. 515
Weights:	Hydraulic Bearing Frame

Having removed all the old oil, flush with a little clean oil and refill with clean oil up to the opening 536a.

ATTENTION:
It is important to use opening 536a to refill oil. 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.

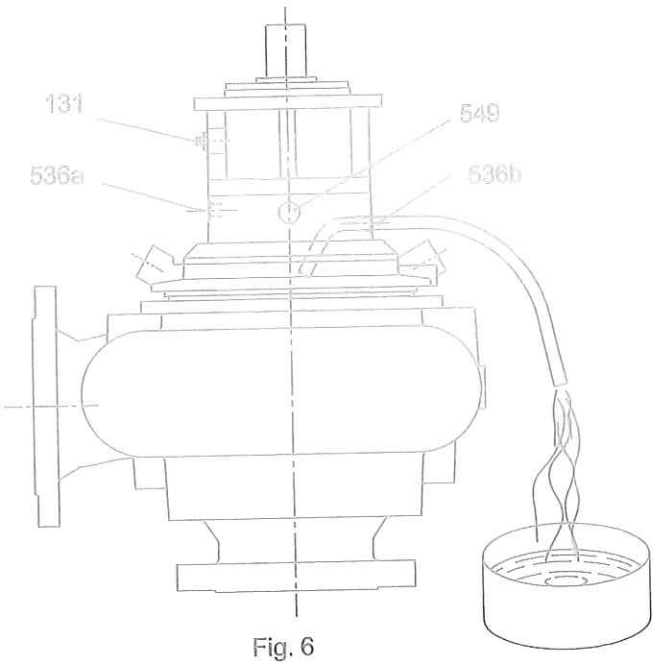


Fig. 6

SEAL OIL SPECIFICATIONS

General

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

TYPICAL ANALYSIS

Specific gravity at 20°C	0.812 g/ml
Viscosity at 40°C	3.5 mm²/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.

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 .W - . IM .W	. LM .W + . MM .W
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 ($n \times d_m$):	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.

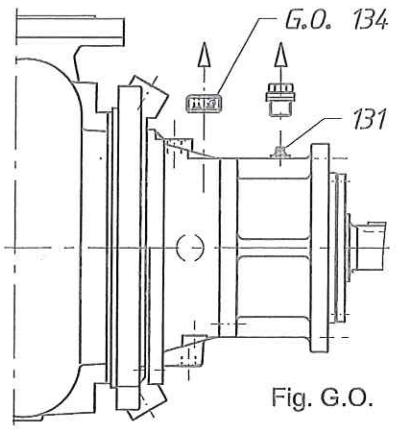


Fig. G.O.

Example to read bearing lubrication chart 2.7.1 (the fields in the table are marked grey): Bearing frame type **DDM1W** 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**.

HIDROSTAL 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 seperate instruction manual.

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.

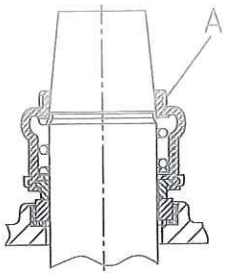


Fig. 15

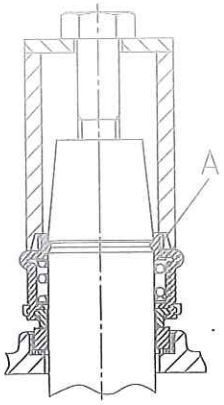


Fig. 16

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).

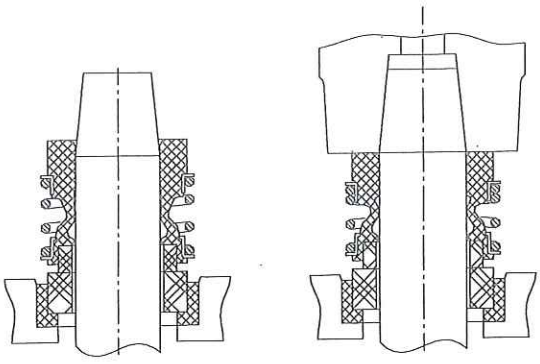


Fig. 17

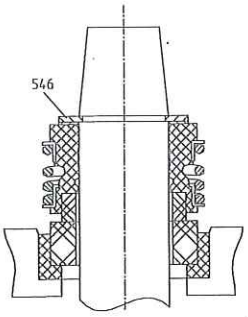


Fig. 18

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 snapring 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.

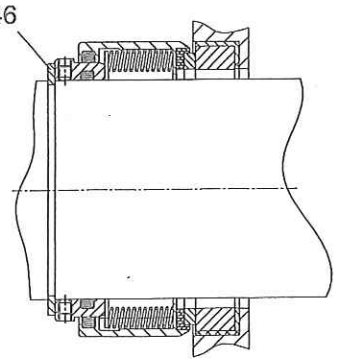


Fig. 19

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 IMMERSE 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 tightness test remove pressure connection hose and fill with oil according to Section 2.6.5.

2.9 ALIGNMENT AND MOUNTING OF THE PUMP ON BASE PLATE

The motor, if supplied, is correctly aligned on the baseplate at the factory. However, a certain amount of misalignment is possible during transit, and it is therefore necessary to check the alignment between the pump and the driver before putting the unit in operation. The pump shaft should be checked for angular and for parallel alignment (Fig. 20). Inaccurate alignment results in vibration and excessive wear on bearings and mechanical seals. The check for angular alignment must be made by inserting a taper gauge at four points 90° apart, between the coupling faces. The variance in readings must not exceed 0,3 mm. To check for parallel alignment, place a straight edge across the coupling rim at the top, bottom and sides. The unit will be in parallel alignment when a straight edge rests evenly on the coupling rim at all positions.

2.9.1 MOUNTING OF BASE PLATE

The permissible ground load has to be compared with the total weight of the pump. The concrete foundation must correspond to the guidelines of the strength of foundation and the resistance to pressure.
Foundation screws: ***HIDROSTAL AG*** recommends the use of chemical anchor screws which are secured with a 2-part Epoxy resin.

Align pump and base plate horizontally and check the correct position!

ATTENTION:
The base plate has to be supported on all 4 edges. If necessary, differences of dimension could be compensated by 2–part flow concrete epoxy resin (self leveling epoxy grout)!

Mark and drill the holes for the foundation screws. Place the foundation screws. Pay attention to the correct length of the threaded rod. Allow the required length of time for the epoxy to harden! Screw down the base plate.

ATTENTION:
Tighten the foundation screws with the prescribed torque according to specifications of producers! Check this torque during operation occasionally!

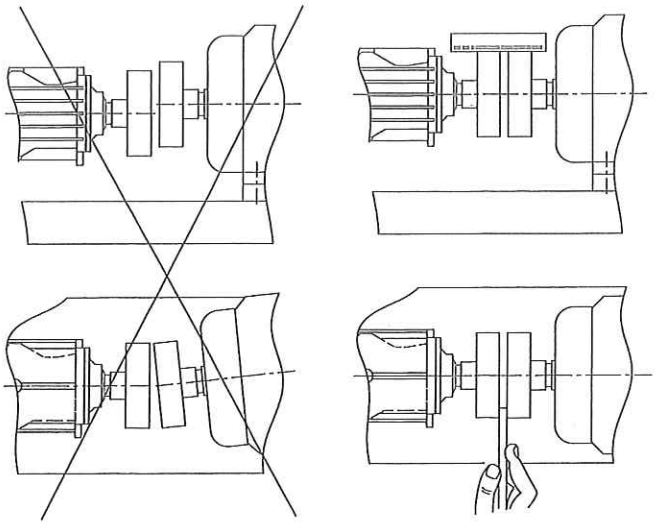


Fig. 20

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

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

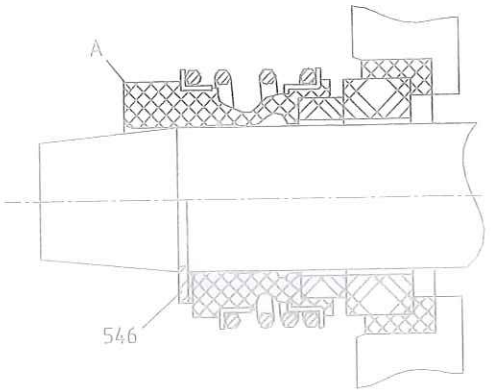


Fig. 11

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

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

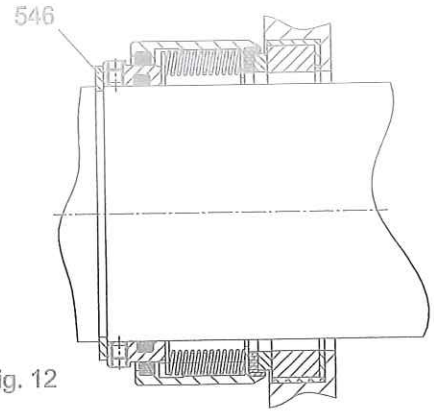


Fig. 12

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.

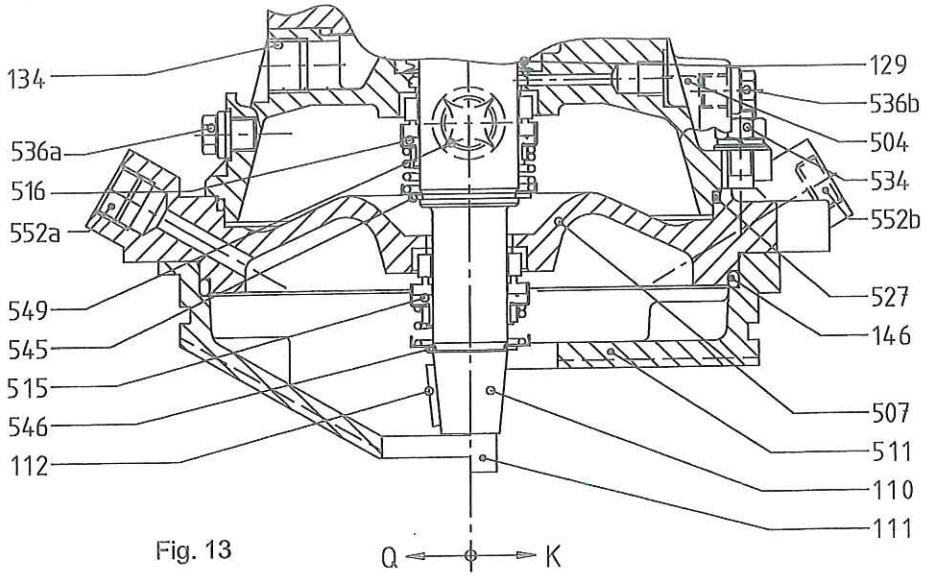


Fig. 13

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.

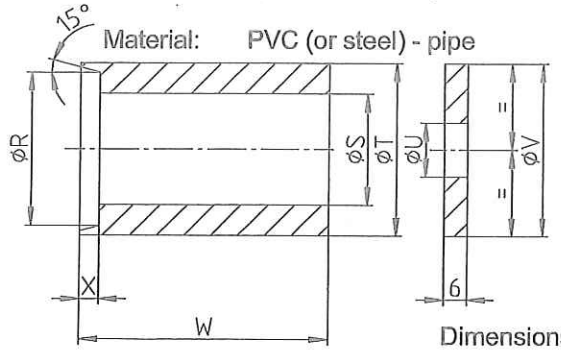
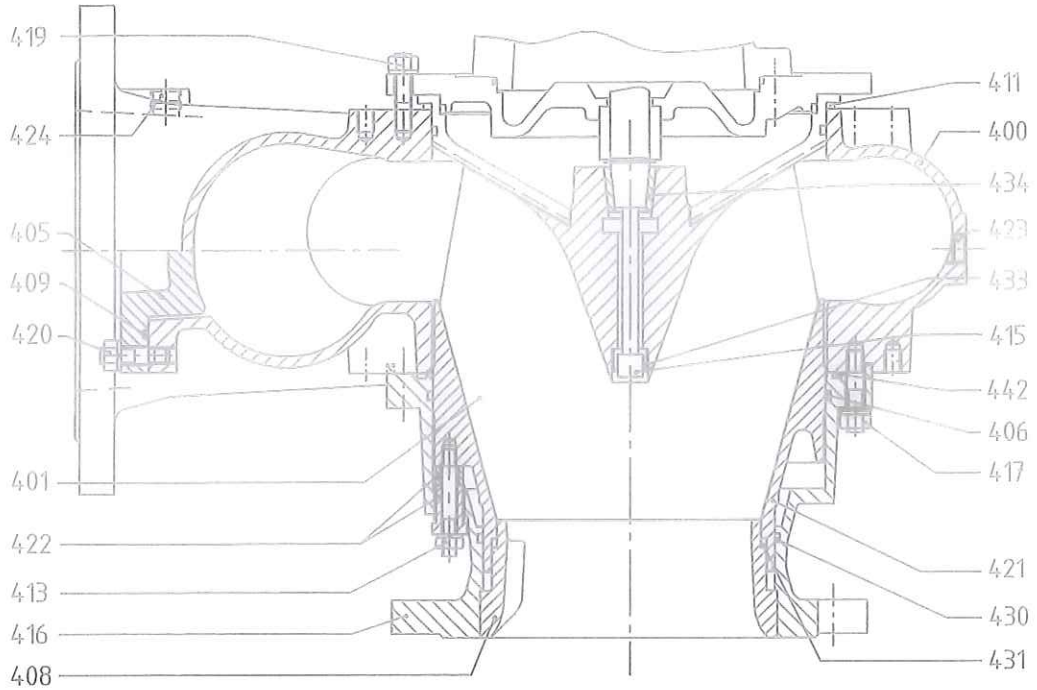


Fig. 14

Dimensions in mm

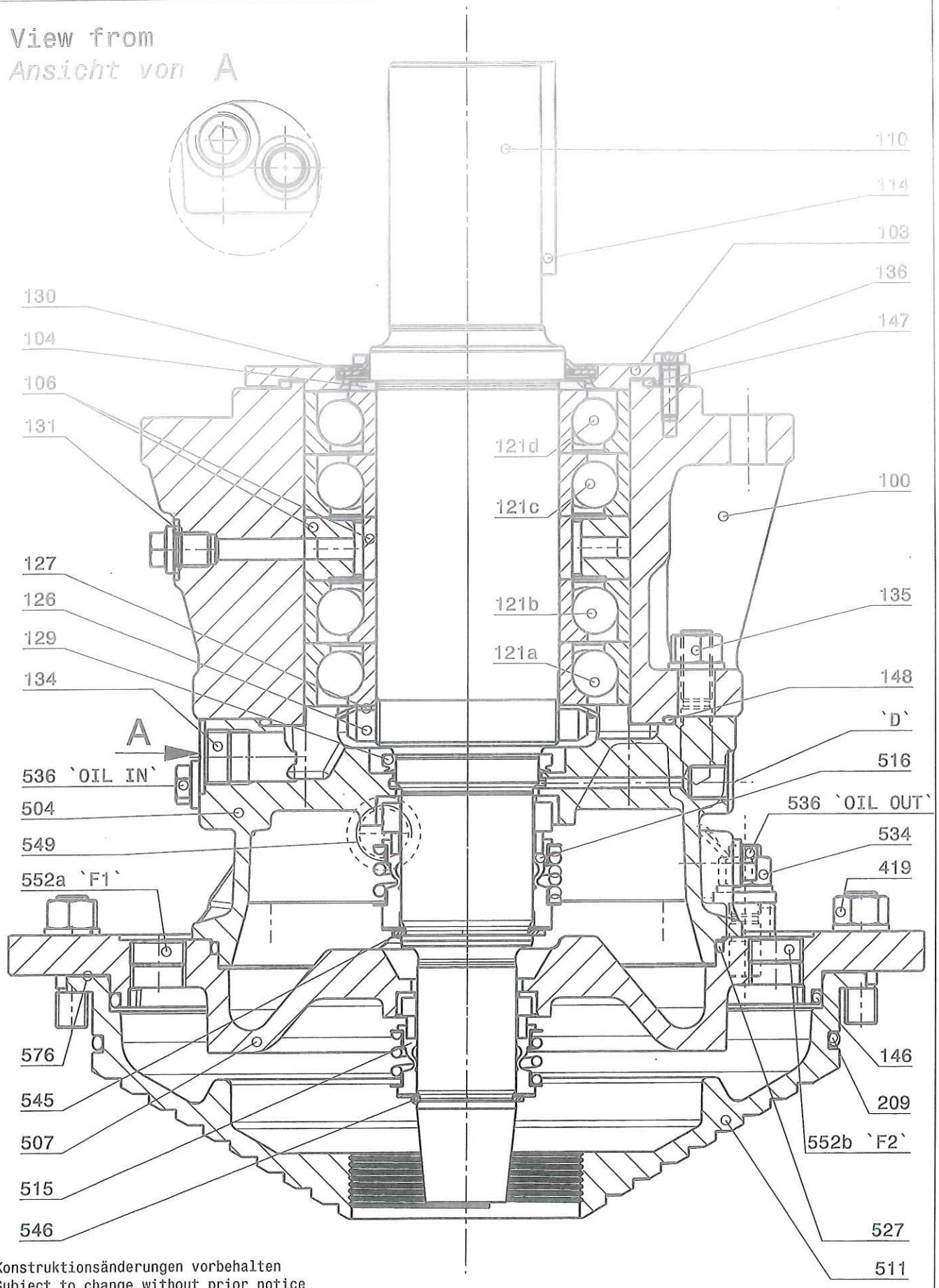
Seal size	ϕ R	ϕ S	ϕ T	ϕ U "Q"	ϕ U "K"	ϕ V	W	X	Bolt size "Q"	Bolt size "K"
20	32 +/-1	21 +1/-0	38 +/-1	12	-	40	60	5	M10	-
1 1/8"	40 +/-1	29 +1/-0	45 +/-1	14	12	50	65	5	M12	M10
1 1/2"	50 +/-1	39 +1/-0	55 +/-1	18	16	60	75	5	M16	M12
2"	65 +/-1	51 +1/-0	70 +/-1	22	18	80	95	5	M20	M16
2 1/2"	80 +/-1	64 +1/-0	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	-



PART	DESCRIPTION	MATERIALS OF CONSTRUCTION			
		1R	2R	3R	5R
400	VOLUTE CASING	GREY CAST IRON			STAINLESS STEEL A4
401	IMPELLER	NODULAR IRON		STAINLESS STEEL	STAINLESS STEEL A4 OR DUPLEX STEEL
405	INSPECTION HOLE	GREY CAST IRON			STAINLESS STEEL A4
406	O-RING	NITRILE			
408	WEAR RING	GREY CAST IRON	HIDRO HARD		STAINLESS STEEL A4
409	O-RING	NITRILE			
411	SHIMS	STEEL			STAINLESS STEEL A4
413	ADJUSTING BOLT	STAINLESS STEEL A4			
415	IMPELLER BOLT	RUSTLESS STEEL			STAINLESS STEEL A4
416	SUCTION CASING	GREY CAST IRON			STAINLESS STEEL A4
417	FASTENING SET	RUSTLESS STEEL			STAINLESS STEEL A4
419	FASTENING SET	RUSTLESS STEEL			STAINLESS STEEL A4
420	FASTENING SET	RUSTLESS STEEL			STAINLESS STEEL A4
421	LINER	GREY CAST IRON	HIDRO HARD		STAINLESS STEEL A4
422	REGULATING NUT	STAINLESS STEEL A4			
422a	DISTANCE BUSH	STEEL			STAINLESS STEEL A4
423	PLUG	STEEL			STAINLESS STEEL A4
424	PLUG	STEEL			STAINLESS STEEL A4
430	O-RING	NITRILE			
431	O-RING	NITRILE			

Hidrostal

SECTIONAL DRAWINGS SHORT BEARING FRAME
SCHNITTZEICHNUNGEN KURZER LAGERSTUHL
EFM1W/EFM5W



Konstruktionsänderungen vorbehalten
Subject to change without prior notice
Modifications réservées sans préavis

File: .	Drawn by/Bearb. Dat. Vis.: 16.12.2010 crr Approved by/Gepr. Dat. Vis.: 16.12.2010 db	No: 10-S7700

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www.hidrostal.ch

EC-Declaration of Conformity

We declare in exclusive responsibility that the construction of the Hidrostal Screw Centrifugal Pumps to which this declaration relates are in conformity with the following health and safety standards:

EC-Directive:	2006/42/EC	Machinery directive
	2006/95/EC	Electrical Apparatus for use within specified voltage limitations. Low Voltage Directive (LVD)
	2004/108/EC	Electromagnetic compatibility EMC

Hydraulic-sizes:

A...-..., B...-....., C...-....., D...-....., E...-....., F...-....., H...-....., I...-....., L...-....., M...-....., X...-....

Assembled with the units "Three-phase current motor"

..B..-...., ..S..-..., ..T..-...., ..U..-...., ..V..-...., ..W..-...., ..X..-...., ..Y..-...., ..Z..-....
..002..-.... ,..003..-...., ..004..-...., ..006..-...., ..007..-...., ..011..-...., ..014..-...., ..020..-...., ..030..-....,
..050..-...., ..090..-...., ..130..-...., ..190..-...., ..300..-...., B02...-...., B03...-....

or the units "Bearing frame" mechanical seal

.BM..-...., .CM..-...., .DM..-...., .EM..-...., .FM..-...., .GM..-...., .HM..-...., .IM..-....
.LM..-...., .MM..-...., .XM..-....

or the units "Bearing frame" stuffing box seal

.BZ..-...., .CZ..-...., .DZ..-...., .BS..-...., .CS..-...., .DS..-...., .ES..-...., .FS..-...., .GS..-....,
.HS..-...., .IS..-...., .LS..-...., .MS..-...., .XS..-....

Authorized person for compiling the technical file:
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Neunkirch, 07.04.2010

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Leiter Tech. Büro, CTO

Urs Eckmann
Quality manager

Rev. 6; 10

Reg.No.: 08 – QF 7416Ea

TABLE OF CONTENTS

0. GENERAL DIRECTIONS

0.1 GENERAL SAFETY DIRECTIONS

0.1.1 SAFETY AND WARNING DIRECTIONS

The following symbols and names will be used in this manual as safety and warning directions:

WARNING TO A PLACE OF DANGER!
If the handling instructions, with this symbol, are not strictly adhered to then serious injuries or even fatal accidents could occur.

Warning symbols must be **strictly observed.**

ATTENTION!
If the handling instructions, with this symbol, are not strictly adhered to then serious damage to the machine and/or other equipment could occur.

Directions marked with "Attention" must be **strictly observed.**

DIRECTION!
Work will be more effective if these instructions are followed. Directions make the work easier.

EXPLOSION PROOF DIRECTIONS IN RELATION TO THE PRODUCT

WARNING TO EXPLOSIVE ATMOSPHERE

WARNING TO DANGEROUS ELECTRICAL VOLTAGE

ISOLATE BEFORE STARTING TO WORK

LEGAL DIRECTIONS

1.0 PUMP CODE EXPLANATION

The pump-code is a combination of joined-together in series construction groups. The "plus sign" is the separation between these groups, and the "dash" is the separation between general and specific description of each construction group.

PUMP CODE

	CONSTRUCTION GROUPS				
	Group 1		Group 2		Group 3
EXAMPLES:	F10K-HD1R	+	FE4S4-MNGK	+	N3B4-10
	D04Q-L010E	+	DNXT2-MXEQ	+	X2B1-15
	F10D-L01	+	FE3Z7-CNEK	+	N2E1-10
			A2QR2-CC3	+	A01-10
	F150-S03R	+	FFM1O-XM.Q		
	H06F-M01	+	H2S10-L		
	E05K-M01	+	EDM1F-MM.K		
	Hydraulic		Hidrostal-Motor or Bearing Frame		Cable Set

1.1 DELIVERY

§ **HIDROSTAL** will not assume responsibility for damage to the pump that has been caused due to not following instructions in this manual, nor for consequential damages of any kind.

1.1.1 RECEPTION OF PUMP UNIT

Inspect the shipment for shortages or damage. Report any discrepancies to the carrier, note them on the shipping documents and sign them with date together with the carrier.

1.1.2 NAMEPLATE DATA

! Each pump is equipped with a nameplate showing all technical data of the pump. It is essential to give the complete data when enquiring about parts or service.

An explanation of the meaning of this code can be found under Section 1.0 "Pump Code Explanation".

1.1.3 STORAGE

If the unit is not to be installed immediately, note:

- Store in a dry and clean place without extreme changes in temperature (storage room temperature - 10° to +40°C (14° to 104°F).
- Rotate the shaft by turning the impeller once every two weeks to ensure positive coating on the lubricated surfaces and to prevent sticking of surfaces due to rust or oxidation.
- Do not store in a location where the pump would be subject to vibrations, otherwise brinelling of the bearings could occur.

1.2 INSTALLATION

The pump should be placed as near to the liquid source as possible, and as low as possible, to provide the maximum possible suction head, avoiding elbows and excessive pipe lengths wherever possible.

Provide adequate ventilation of pump room.

WARNING:
If the pump can be exposed to temperatures at or below the freezing point of the media, the pump should be drained when not in use (formation of ice within the pump can cause cracking and other damage to the construction.

1.2.1 MOUNTING

- General:
  The pump can be mounted in a horizontal or vertical position.

- Fastenings:
  When mounted horizontally pumps should be mounted using the feet provided on the volute or use a bracket attached to the rear of the volute.

  When mounted vertically the pump can be stood using a special suction elbow on its suction flange or using a bracket bolted to the volute casing.

1.3 PIPING

The suction and discharge piping should be independently supported near the pump and be installed in such a manner so as not to impose stresses and strains on the pump casing.

1.3.1 SUCTION PIPING

To obtain maximum available suction head, the suction line should be as direct and as short as possible, avoiding elbows. If elbows must be used, a long radius type is preferred. It is important to avoid any sagging in a suction line in which air may accumulate and cause loss of prime. For the same reason, it is important to have the suction line airtight when suction lift exists.

The suction pipe must be such that no air pockets can form, and must slope upward to the pump intake.

1.3.2 SIZING OF SUCTION PIPEWORK

The losses of the suction side should be kept to a minimum, the pipework should never be less than the suction diameter of the pump and preferably be one pipe size larger. When larger diameter pipework is required the transition should be made close to the pump using flat-topped tapers (Fig. 1 + 3). Concentric tapers should never be used, as air pockets could result (Fig. 2 + 4).

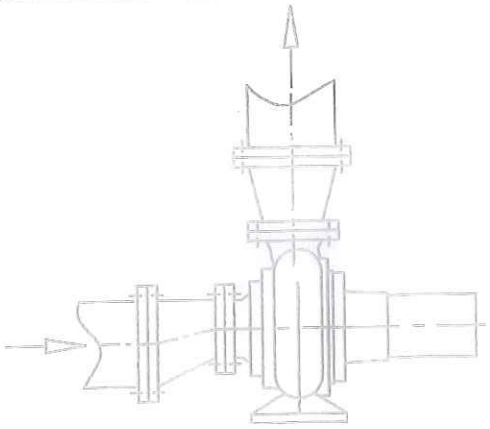

Fig. 1

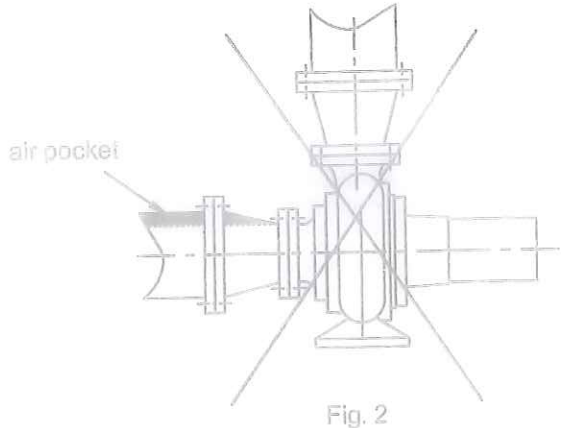

Fig. 2

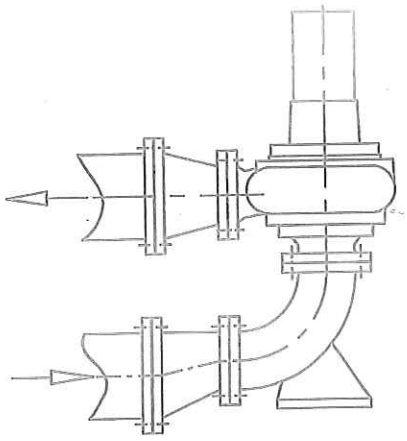

Fig. 3

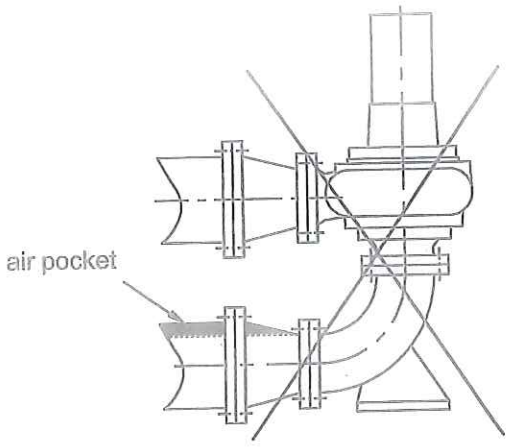

Fig. 4

Unusual suction conditions such as high liquid temperature, altitude above sea level and high specific gravity or viscous liquids should be compensated for, by proper engineering of a sufficiently sized suction pipe.

WARNING:
The pump should not operate on a suction lift when pumping liquids with entrained air or gas. Non-return valves should not be used in the suction line. Gate valves should preferably be installed with the spindle horizontal to prevent trapping air or gas. Suction valves must be fully open during operation.

1.3.3 DISCHARGE PIPING

Use as few fittings as possible and when elevating to any height, go vertically upward from the pump, then horizontal to the point of discharge.

When using non return valves in the discharge line it is important the maximum permitted velocity specified by the manufacturer is not exceeded. For single-flap valves operating on dirty liquids a typical maximum velocity is 3.5 m/second.

If these values are exceeded shock waves can result when the valve closes, which may cause the face of mechanical seals to open and allow material to become trapped between the faces resulting in premature seal failure and contamination/loss of the seal oil.

WARNING:
Does the pump work with closed or blocked up suction or discharge piping, there is a danger of overheating in the volute casing. It is possible to dry out the medium occluding gas bubbles. They could cause damages on person or machine if they will be eliminated inexpert.

1.3.4 CONNECTION OF PIPING

This should only be undertaken after the grout (if used) has thorough set and holding down bolts have been tightened.

The pipework should be connected to the pump flanges with gaskets in place and the bolts properly tightened. Make sure the pipe flanges are parallel and in line.

WARNING:
For all pumps in cast iron, great care must be used in connecting these flanges. Tighten evenly and adjust to a snug fit. Under no circumstances should the casing be subjected to piping strains. Such strains could result in structural failure leading to operator injury.

1.4 SPECIAL APPLICATIONS

If the pump is used for production or further processing of food, please check the following points:

- Observe the relevant guidelines.
- Replace the coolant and sealing liquids mentionned in the manuals by a media, allowable with the requested characteristics for food.
  (e.g. vegetable oil)
- Pay attention to extremely cleanness.
  (Evacuating and cleaning of pump and systems)
- After cleaning pay attention to the correct mounting of pump and systems.

1.5 USE IN POTENTIALLY EXPLOSIVE ATMOSPHERE

Pumps with Ex-proof are to be installed for handling non-combustible liquids.

Explosion proof class: CE Ex **II 2G EEx d IIB T4** **resp.** CE Ex **II 2G EEx d [ib] IIB T4**

(for Hidrostal pumps with electrical motor)

or CE Ex **II2G C T4** (for Hidrostal pumps with bearing frame)

1.6 OPERATING INTERRUPTION

If the machine is not in operation for more than 14 days, the pump must be drained completely. This is to avoid seizure of the pump due to corrosion.

The machine must be turned every 14 days (by hand or by a switching pulse) to lubricate the mechanical seal faces.

TABLE OF CONTENTS

Part II

2.0 TYPE CODE EXPLANATION

S	=	Special construction/execution
K	=	for K-Hydraulic
Q	=	for Q-Hydraulic
F	=	for F-Hydraulic
.	=	Filling point
M	=	Standard (for C,G,M,X-seal)
T	=	Special construction/execution (for T-seal)
S	=	Standard for stuffing box bearing frame
C	=	Stuffing box bearing frame with cartridge seal
0	=	Without mech. seal (Pos. 515) / without packing (seal / packing specified by customer)
C, G, M, X, T		Pump side mechanical seal specification (bearing frame with mech. seal, details see page 3)
L	=	Packing standard (only bearing frame with stuffing box)
W	=	Short bearing frame
1	=	Normal, for hydraulic material 1,2 and 3
5	=	Wetted parts stainless steel, for hydraulic mat. 5
S	=	Bearing frame with stuffing box seal (not ex-proof)
M	=	Bearing frame with mechanical seal
B	=	smallest size
C	=	larger than B
D	=	larger than C
F	=	larger than D
G	=	larger than F
etc.		

See type code explanation for Hydraulic code

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 applications (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 lower mechanical seal (515), providing periodic removal of accumulated solids.

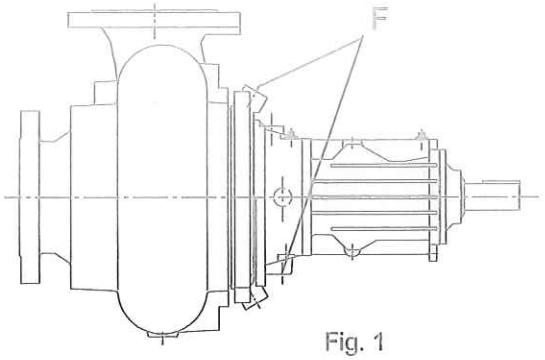

Fig. 1

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 pumpsize and application: in most cases, flow rates of 6-8 litres per minute will be sufficient.

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.

WARNING:
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.

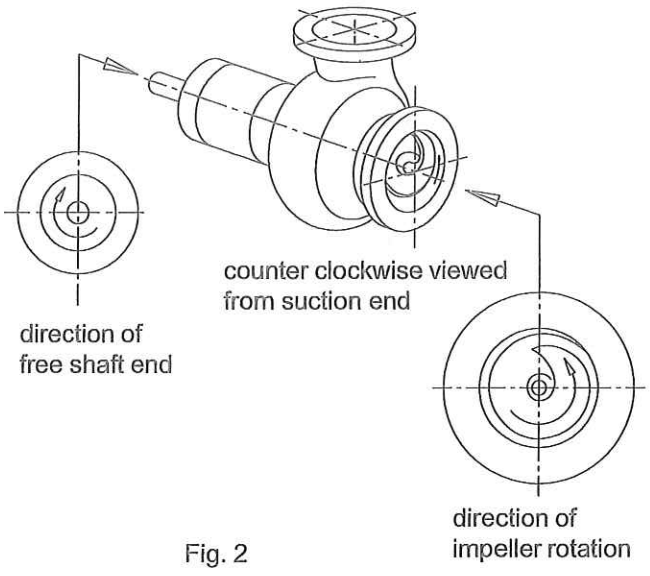

Fig. 2

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 malfuction 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:

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

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

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 / TROUBLES		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.	Pump and motor not aligned					X	X	X	
21.	Bearings worn out					X			X
22.	Impeller out of balance					X			
23.	Impeller too small			X					
24.	Impeller dragging against suction cover					X	X	X	
25.	Thick sludge and tight impeller clearance						X		
26.	Air or gas on impeller backside	X			X				

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.
- Check alignment of coupling according Section 2.9.
- 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 sectional drawing Fig. 3.

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.

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.

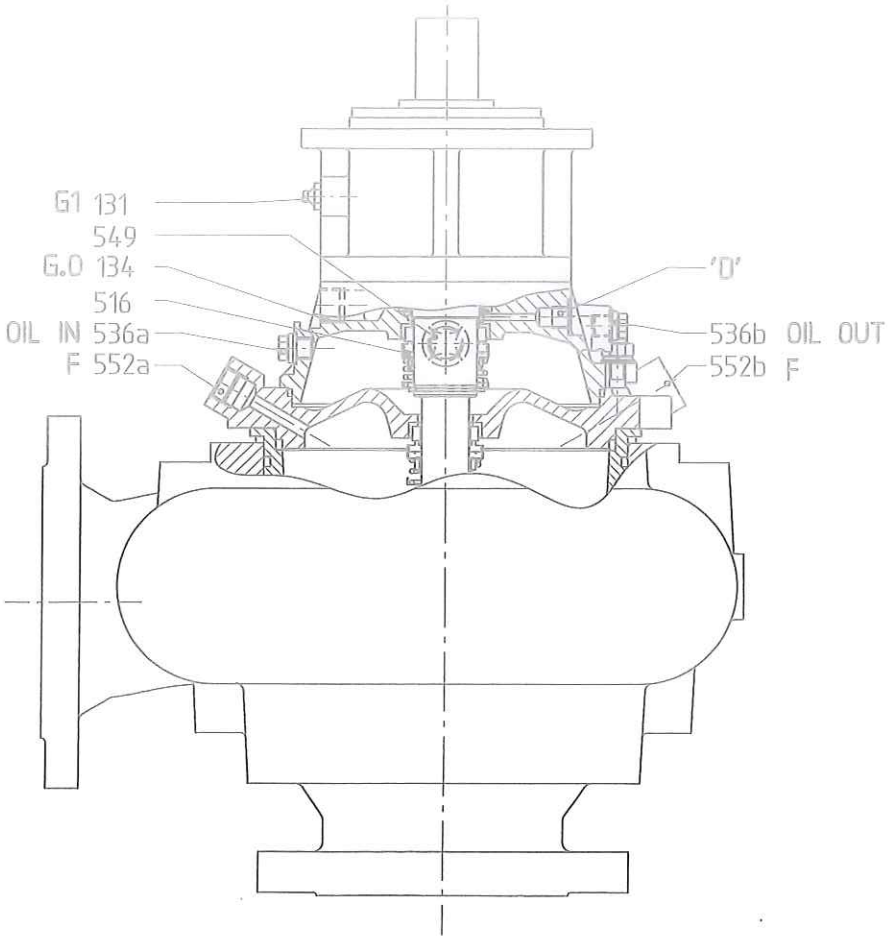

Fig. 3

2.6.4 SEAL-OIL CHECKING ON BEARING FRAMES

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.

2.7.1 BEARING LUBRICATION CHART CONNECTION 131

Bearing frame size	Shaft speed rpm	Interval hours	Amount of grease grams
BBM . W CBM . W BCM . W CCM . W DCM . W	4800	3000	12
	4200	3500	
	3600	5000	
	3000	5500	
	1800	8500	
	1500	9500	
	1200	10500	
	1000	11000	
	900	12000	
	750	13000	
BDM . W CDM . W DDM . W EDM . W	4800	2200	28
	4200	3000	
	3600	3500	
	3000	5000	
	1800	7500	
	1500	8500	
	1200	9500	
	1000	10500	
	900	11000	
	750	12000	
DFM . W EFM . W FFM . W HFM . W	3500	2000	48
	3000	3000	
	1800	5500	
	1500	6500	
	1200	8000	
	1000	9000	
	900	9500	
	750	10000	
EGM . W FGM . W HGM . W	3000	2000	60
	1800	5000	
	1500	5500	
	1200	7000	
	1000	8000	
	900	8500	
	750	9500	
HHM . W IHM . W	1800	3500	90
	1500	5000	
	1200	5500	
	1000	7000	
	900	7500	
	750	8500	
	600	9500	
IIM . W LIM . W	1700	2500	120
	1500	3000	
	1200	4000	
	1000	5000	
	900	5500	
	750	6000	
	600	7500	
	500	8000	
ILM . W LLM . W MLM . W	1500	1500	160
	1200	2000	
	1000	2500	
	900	3000	
	750	3500	
	600	5000	
	500	6000	
LMM . W MMM . W	1500	1500	240
	1200	2500	
	1000	3000	
	900	3500	
	750	4000	
	600	5500	
	500	6500	

2.7.2 CONVERSION TABLE

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

Greasing interval hours	Running time in hours per day: Equivalent greasing interval in months			
	0 - 2	2 - 6	6 - 12	12 - 18	18 - 24
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	More than 12 months (1 year)			12
9000				
10000				
11000				
12000				
13000				

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 ring. 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.

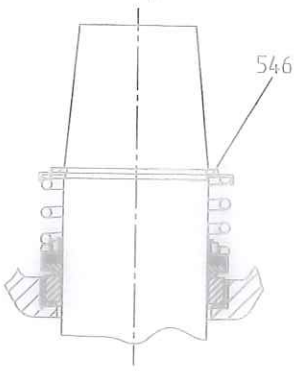

Fig. 7

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 seal plate, to act as a fulcrum for each screwdriver, and pry ring directly up away from rubber bellows (Fig. 9).

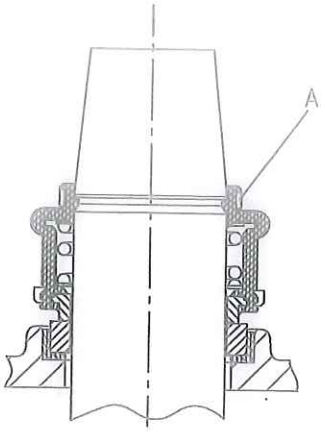

Fig. 8

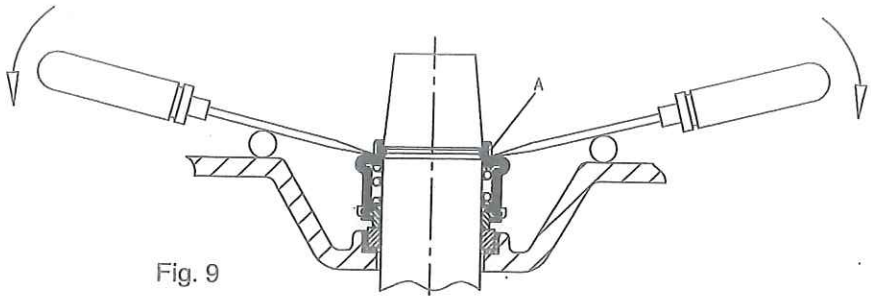

Fig. 9

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).

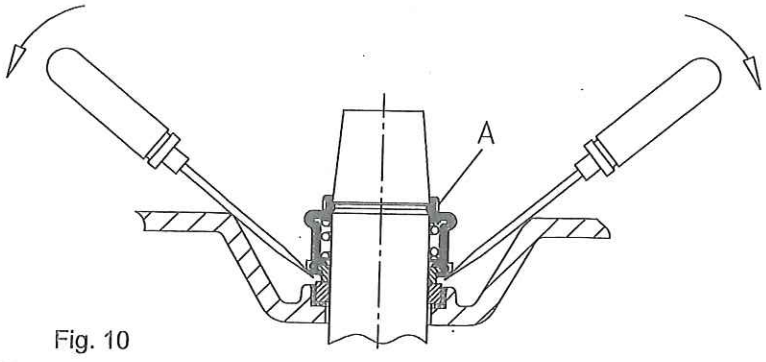

Fig. 10

TABLE OF CONTENTS

Part III

TABLE OF CONTENTS

Part III

3.0 TYPE CODE EXPLANATION

The type code is found on the first line of the pump name plate.

Example: E05Q-ML10D

hydraulic code

HYDRAULIC CODE:

D 0 D Q - S 0 1
D 0 8 0 - L L 3 R S
D E 4 M - L M N 3 0 E
D 0 6 U - H L N 1 0 C

hydraulic size (B,C,D,E,F,H,I,L,M)

discharge flange size: - in inches for non-regulable hydraulics
- in mm for C/D and regulable hydraulics

0C/0D/0E: submersible pump casing for lowering devices
E3/E4: D-casing with diameter 'E' - centering

Construction (Q/M/U/H/R) or part of discharge flange size in mm

Impeller size

Material:

1 = Standard pump: All castings of grey cast iron (GG20), except impeller = nodular iron (GGG60)

2 = Increased wear resistance: Materials as 1, except liner and wear ring or suction cover = Hi-chrome

3 = Improved resistance to wear, impact and corrosion: Casing and suction casing same as 1, impeller = stainless steel, liner and wear-ring (or suction cover) = Hi-chrome

4 = Improved wear and corrosion resistance: Same as 3, except impeller = Hi-chrome

5 = Corrosion resistance: All wetted parts of stainless steels

R = "Regulable" design: Impeller clearance adjustable by three external screws (absence of 'R' in code implies that impeller clearance is adjustable by shims).

0 = Filling point

D
E
.. = Impeller cone size, if deviating from standard (see hydraulic size): C=20, D=28, E=38, F=50, H=75, I/L=100, M=120mm

S = Special execution (always last digit of code)

3.1 SERVICE CONNECTIONS

On volute casing (see fig. 1)

The connection (424) is found on the discharge flange. Size of threaded connection see table 1.

For horizontal mounted pumps with **vertical discharge flange**, connection (423) at lowest point of volute casing can be used as a drain hole.

For horizontal mounted pumps with **horizontal discharge flange**, additional connections are possible to be drilled at points marked with "D" (see Fig. 1 and Table 1).

Table 1

Type / Pos.	423	424	D mm
B02Q	G 1/2"	-	-
B050	G 1/2"	G 1/4"	-
B0BQ/B065	G 1/2"	-	30
C0CQ	-	-	-
C080/C03Q	G 1/2"	G 1/4"	-
D0DQ	-	-	-
D03Q/D04Q/D080/D100	G 1/2"	G 1/4"	35
D03R/DE3R/D04R/DE4R	G 1/2"	G 1/4"	40
D03H/DE3H/D03M/DE3M/D04M/DE4M	-	G 1/4"	40
D03U/DE3U/D04U/DE4U	G 1/2"	G 1/4"	40
D06M	-	G 1/2"	40
D06U/E03Q/E080	G 1/2"	G 1/2"	35
E0EQ	-	-	-
DE5Q/E05Q/E125/E08Q/E06U/E08U/E200	G 1/2"	G 1/2"	50
E06M/E08M	-	G 1/2"	40
F06Q/F150	G 1/2"	G 1/2"	60
H125/H08Q/H200	G 1/2"	G 1/2"	35
L12Q/L300/L20Q/L500	G 1"	G 1/2"	60
M16Q/M400	G 1"	G 1/2"	60
M28Q/M700	G 2"	G 1/2"	60

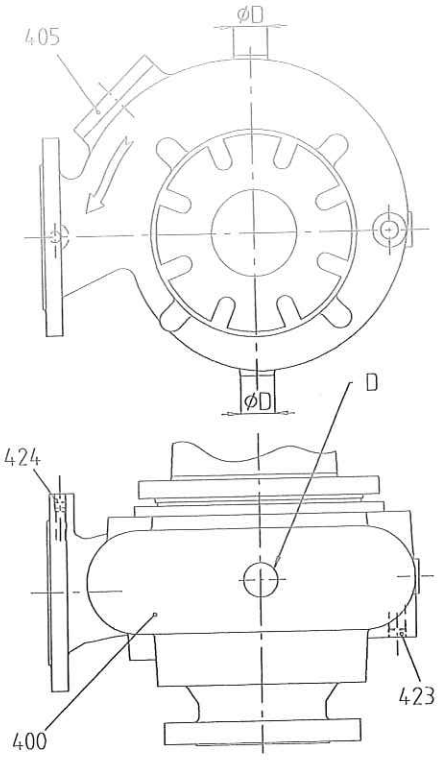

Fig. 1

From (and including) hydraulic size E05Q/E125 upwards (except F04Q/F100), an inspection hole is existing in the pump casing. By removing the inspection cover (405), visual control of the hydraulic parts inside of the pump casing is possible.

3.2 IMPELLER CLEARANCE ADJUSTMENT

WARNING! Before carried out any work on the pump, ensure that the power supply is isolated and locked off. See also corresponding references in the Section 2 of this instruction (Drive unit).

3.2.1 WEAR OF WEARING PARTS

- Excessive impeller clearance "C" can cause a drop in hydraulic performance.
- The impeller gap must be checked and readjusted whenever a significant decrease in pump performance is noticed, or at least once every year (until experience indicates how often this will be required).
- If after readjustment of the impeller clearance the required hydraulic performance is not recovered, the degree of wear on the impeller and suction cover / liner must be checked. Replacing parts where appropriate

3.2.2 GENERAL NOTES TO ADJUSTMENT OF CLEARANCE "C"

For the following explanations and descriptions under 3.2.3 / 3.2.4 / 3.2.5 see Fig. 2 + 3.

- **Regulable pumps** are adjusted by means of a movable liner (421), see Section 3.2.3. These pumps include the letter 'R' in the pump code (Section 3.0).
- **Other pumps** have a one-piece suction cover (402), or in **pumps C0CQ and D0DQ** a fixed liner (421); these pumps are adjusted by changing the thickness of the shims (411) between the drive unit and the volute casing (400).
- Less clearance "C" than the minimum as given in Table 2 can overload the motor and/or cause vibration due to a excessive friction.
- When pumping thick sludges or high viscosity material, it may be necessary to double the clearance "C" shown in Table 2.

Measuring of clearance 'C': Measure existing clearance between impeller (401) and suction liner (421) or suction cover (402) with a **feeler gauge** (access through the suction - opening of pump) and compare with the prescribed value in accordance with Table 2.

ATTENTION: Measure impeller clearance 'C' along the whole impeller blade, followed by checks at 0, 1/4, 1/2 and 3/4 turns of the impeller.

3.2.3 IMPELLER CLEARANCE ADJUSTMENT FOR "REGULABLE" PUMPS

Pump types L500 and M700 have two additional fixing screws next to the regulation nuts. These must be loosened before, and retightened after clearance adjustment.

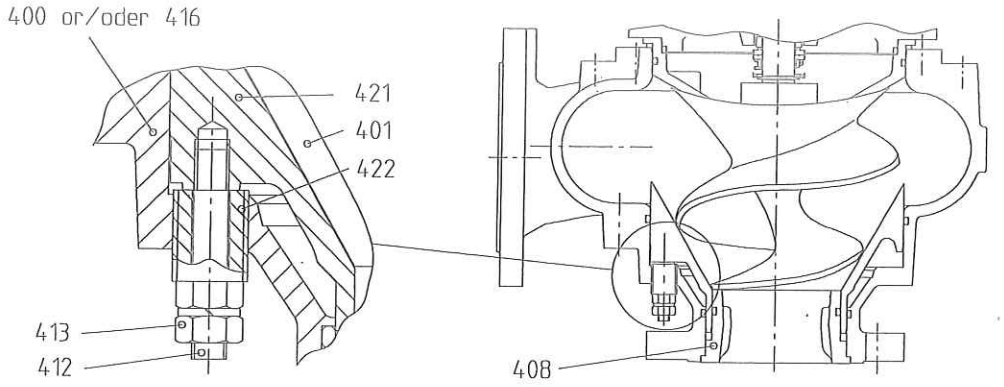

Fig. 2

Loosen and back off hex nuts (413) on end of each regulator nut (422). Now slowly and evenly screw in each threaded regulator nut (422) just until clearance between the impeller (401) and liner (421) is eliminated (pump shaft cannot be turned). Be sure to take the same number of turns on each threaded regulator nut; this keeps the liner concentric to the impeller.

ATTENTION: If the impeller tip touches on the wear ring (408) before clearance between impeller (401) and liner (421) is eliminated, see Section 3.5.

Now back off - with small steps - the threaded regulator nut (422) slowly and evenly (e.g. 1/3 turns). Holding each threaded regulator nut from turning, tighten the three hex nuts (413). This pulls liner (421) away from impeller (401) to the required clearance, and also locks the regulator nut in place. Measuring impeller clearance in accordance with Section 3.2.2.

If the existing clearance "C" deviates from value given in Table 2: **A)** With regular clearance, to loosen or tighten all three regulating nuts (422) with same numbers of turns until the desired clearance is reached. Or **B)** Wear exists (too large or uneven clearance, it is recommended to dismantle the pump and to check the wearing parts; see Section 3.3).

3.2.4 IMPELLER CLEARANCE ADJUSTMENT FOR "NON-REGULABLE" PUMPS

1. **Adjustment (final assembly):** Place the hydraulic (already assembled) with the suction flange on a flat and hard underground. Lower the drive unit - impeller assembly into casing (400) using a suitable hoist.
2. **Wear adjustment:** Loosen all fasteners (419) between drive unit and volute casing (400). Remove shims and lower the drive unit - impeller assembly into casing using a suitable hoist. **Exception:** Hydraulic-types B065/B0BQ: Loosen fasteners (417) between casing (400) and suction cover (402), remove spacing ring (414) and lower drive unit into suction cover.

ATTENTION: Clearance between impeller (401) and suction liner (421) or suction cover (402) must be eliminated now. If the impeller tip touches before clearance is eliminated, see Section 3.5.

Table 2

Pump size	clearance	
	"C" mm	"B" mm
B	0.2	0.2 - 0.5
C	0.3	0.2 - 0.5
D	0.3	0.2 - 0.5
E	0.4	0.2 - 0.5
F	0.6	0.3 - 0.8
H	0.8	0.3 - 0.8
I	1.0	0.5 - 1.5
L / M	1.5	0.5 - 1.5

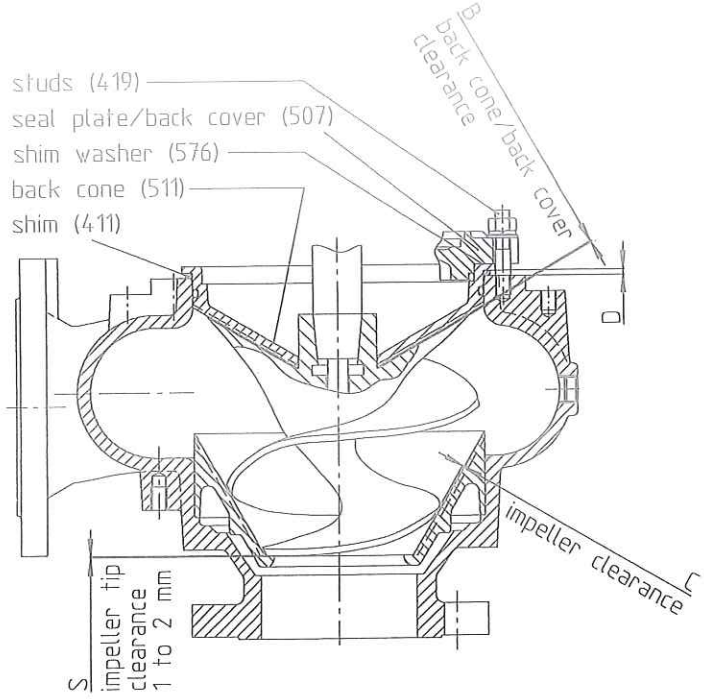

Fig. 3

Determining thickness of shims (411) (Fig.3):

All types, except for B0BQ/B065: Measure the existing gap 'D' between drive unit and casing in several places and calculate the average value. Add approx. 0.5 - 1.0mm to this value. The result is the required thickness of the shims (411) required to obtain the clearance 'C' (Table 2).
Types B0BQ/B065: Measure gap between drive unit and suction cover in several places and calculate the average value. Add approx. 0.5 - 1.0mm to this value. The result is the required thickness of the spacing ring (414) required to obtain the clearance 'C' (Table 2).

Raise drive unit and at every fastener (419; 417 at B0BQ/B065) place shims (411; 414 at B0BQ/B065) of the calculated thickness between drive unit and casing (between casing and suction cover at B0BQ/B065). Lower drive unit. Tighten fasteners (419 or 417). Measure impeller clearance in accordance with section 3.2.2. If the existing clearance "C" deviates from value given in Table 2: **A)** With regular clearance, loosen fastenings (417 or 419) again and change thickness of shims (411 or 414) until the desired clearance is reached. Use washers of **uniform thickness**, or U-shaped shims. These must be placed under **each** fastener (419). Thin shims may be a single piece of steel wire (diameter = calculated thickness), wrapped all the way around drive unit under the studs (419); ends can be bent outward around last studs (419) to avoid overlapping. Tightening all fasteners (419 or 417). Or **B)** Wear exists (too large or uneven clearance, it is recommended to dismantle the pump and to check the wearing parts; see Section 3.3).

3.2.5 CLEARANCE ADJUSTMENT IMPELLER - BACK CONE OR BACK COVER

Clearance 'B' between impeller (401) and back-cone (511) or back-cover (507) must be held in a maximally small way (Table 2) in order to complicate entry of fuzz or solid matters into the seal room. Because of abrasive medium the clearance with time can enlarge itself. With new assembly of impeller, clearance 'B' can get too small or too large (impeller could touch at back-cone / back-cover). Measuring of clearance 'B' with mounted impeller (401) as follows: Clamping back-cone with self-grip wrenches at seal plate (507). Insert feeler gauge in gap between impeller and back-cone or back-cover at several places and note the measured values. Compare smallest measured value with table 2. If clearance is too small, remove existing shim (576). If the clearance is too big, add shims until correct clearance is reached.

3.3 DISASSEMBLY OF HYDRAULIC PARTS

3.3.1 DISASSEMBLY FOR INSPECTION

Place pump with suction flange on a flat and hard surface. Loosen all hexagon head nuts (419). Drive unit-impeller assembly to be removed (lifted) from pump casing (400) using a suitable hoist.
Areas to be examined for wear: Complete impeller surface (especially blade edges) and the conical machined surface of liner (421) or suction cover (402). Uniform wear on any of these surfaces can be compensated by re-shimming or adjusting according to Section 3.2. However, **excessive or uneven wear will require replacement of worn parts** (see also Section 3.2.1).

3.3.2 REMOVAL OF IMPELLER

Table 3

FACTORY FITTED IMPELLER BOLTS		
SIZE	HEXAGON SW	TORQUE Nm
M8	6	17.5
M10	8	35.5
M12	10	61.5
M16	14	147.0
M20	17	285.0
M27	19	380.0
M33	24	700.0
M42	32	1100.0
M56	41	1700.0

Hold the impeller (401) from turning by hand, by a strap wrench, by locking pliers clamped to the impeller or a piece of wood. Loosen impeller bolt (415) with hexagonal key wrench (size see Table 3). To remove the impeller from the shaft taper gently hit the impeller with a soft mallet (from the drive side), use increasingly heavier strokes of the mallet as required.

3.3.3 REMOVAL OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 / D03M / D04M / D03U / D04U "NON REGULABLE"

(Fig. 4 ÷ 5)

These pumps have a non-adjustable liner (421) held in a fixed position inside a one-piece volute casing (400). Liner can be pressed out of the casing from suction opening.

3.4 ASSEMBLY OF HYDRAULIC PARTS

- Use only cleaned and controlled parts. Testing threads for easy running.
- Ensure that all O-ring mating faces are free of damage, smooth, and of the correct form.
- O - rings to be checked for damage, replace if necessary. Grease O - Rings and seal faces of O - Rings before assembly.
- IMPORTANT: Use correct sectional drawings and corresponding parts lists for assembly.
- With Non-thread Locked fasteners; completely lubricate the thread with assembly paste and also **the contact surface of nut or screw-head!**
- If thread lock is recommended, to put adhesive all around and on the whole length of thread.

3.4.1 ASSEMBLY OF IMPELLER

With new assembly of impeller (401) or impeller bolt (415), the length 'L' of the impeller bolt must be checked. To guarantee, by measuring of impeller and impeller bolt, that:

1. length of thread engagement 'E' is minimum 1.25 x thread diameter
   e.g. M16: E = 1.25 x 16mm = 20 mm
2. end of thread 'G1' on impeller bolt is sufficient
3. end of thread 'G2' in the shaft is sufficient (shorten impeller bolt if necessary, see point 1.).

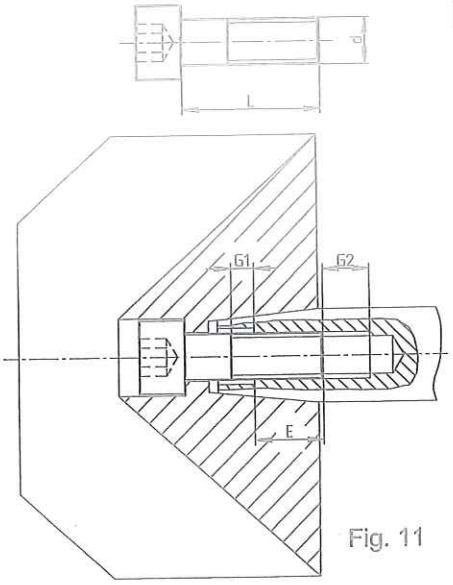

Fig. 11

ATTENTION:
Oil shaft taper slightly with a cloth. **NEVER use thick oil, mounting paste, other greases or anti-size compound!** Place impeller onto shaft. Coat impeller bolt thread with mounting paste or anti-size compound. Tighten screw to the torque specified in table 3.

NOTE:
If torque wrench is not available, torque can be approximated with an extension pipe and weight.

ATTENTION:
Clearance adjustment between impeller (401) and back cover (507) / back-cone (511) see section 3.2.5.

3.4.2 ASSEMBLY OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 "NON REGULABLE" (Fig. 4 and 5)

Lightly spread mounting paste or anti-size compound onto the mating surface of liner (421). If existing, place spacer ring (414) into casing. Carefully position liner into one-piece volute casing (400), tap into place with soft mallet, or use press (no O-rings are used between liner and casing). **Impeller clearance adjustment** (see Section 3.2.4) by using shims (411) between casing (400) and drive unit.

Impeller clearance adjustment see Section 3.2.4.

3.4.3 ASSEMBLY OF SUCTION COVER FOR "NON-REGULABLE" PUMPS (Fig. 6 + 7)

Place spacer ring (414) over spigot of suction cover (402), then grease and install O-ring (406) into groove on suction cover. Install suction cover into lower side of volute casing with fastening set (417). **Impeller clearance adjustment** (see Section 3.2.4) by using shims (411) between casing (400) and drive unit. **Exception**: Impeller clearance adjustment for types **B0BQ / B065** by using shims (414) between casing and suction cover.

ATTENTION:
Since the upper and lower sides of the volute casing are machined identically in some models, it is potentially possible to assemble the pump in a wrong way. For the form of the volute casing see Fig. 1.

3.4.4 ASSEMBLY OF LINER, WEAR RING AND SUCTION CASING FOR "REGULABLE" PUMPS (Fig. 8 - 10)

Screw in all three studs (412) into liner, lock with high-strength adhesive. If existing, place spacer rings for regulation nuts (422) onto studs (412).

Grease the external threaded portion of regulator nuts (422), and install these into suction casing (416) or volute casing (400), hex-side toward the outside, direction to the suction flange. Screw these into the casing until they are flush with the inside of volute casing (400) or suction casing (416). To place O-Ring (406), with types C080 / D080 / D100 into groove of (400), with types E080 - M700 into groove between (416) and (421). Set in liner (421) in casing (400) or suction cover (416), studs (412) must fit into holes of regulation nuts (422).

NOTE:
Studs (412) are arranged at irregular distances in the liner (421). Thus, there is only one correct position setting liner (421) into casing (400) or suction casing (416).

If wear ring (408) was removed, place O - Ring (430) into casing (400) or suction casing (416). Insert O - Ring (431) in groove of wear ring. Cover wear ring **ONLY** at the designated places (see fig. 8 - 10) with high-strength adhesive. Tap wear ring into volute or suction casing with soft mallet until end face of wear ring is flush with flange face of volute or suction casing.

ATTENTION:
Pay close attention to correct position of wear ring (408) with model **C080!** The suction aperture enlargement must be on the lower side of the pump (opposite of discharge flange).

Install suction casing into downside of volute casing (400) with fastening set (417).

Impeller clearance adjustment see Section 3.2.3.

ATTENTION:
Since the upper and lower sides of the volute casing are machined identically in some models, it is potentially possible to assemble the volute casing in a wrong way. For the form of the volute casing see Fig. 1.

3.5 FINAL ASSEMBLY

If (411) is a spacer ring instead of shims, place it over spigot of drive unit. Insert O ring (209) into groove of back-cover (507) or back-cone (511) of drive unit. Now install drive unit-impeller assembly into volute casing (400) using a suitable hoist.

ATTENTION:
Impeller – clearance adjustment in accordance with section 3.2.

When new hydraulic parts have been installed (volute casing, impeller, liner, suction casing or wear ring), or impeller clearance is reduced through changing of adjusting-shims (411), the following clearance check must be carried out:

With correctly adjusted impeller - clearance 'C' (Table 2), clearance between impeller-tip and wear ring (408), liner (421) or suction cover (402) has to be at least the minimum of 1 mm (fig. 3). In case, that this clearance is too small, grind off the impeller tip, parallel to suction flange, until approx. 1 to 2 mm clearance is achieved.

Tightening fasteners (419).

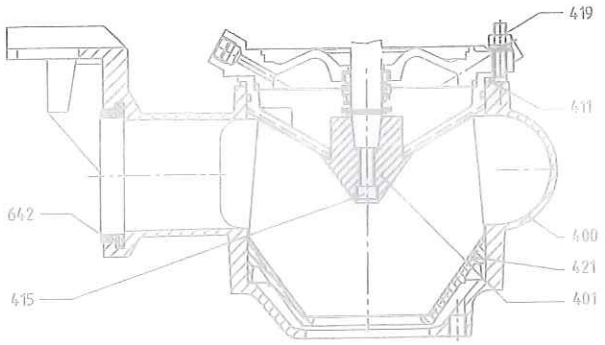

Fig. 4: C0CQ/D0DQ / D03H/DE3H / D03M/D04M

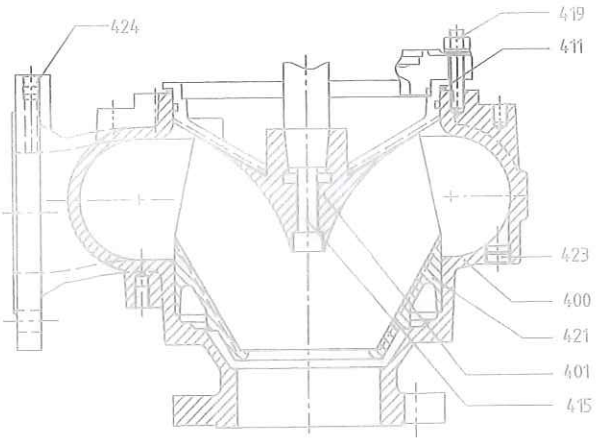

Fig. 5: C080 / D100

3.3.4 REMOVAL OF SUCTION COVER FOR "NON-REGULABLE" PUMPS (Fig. 6 + 7)

These pumps have a one-piece suction cover (402), which is bolted to the volute casing (400) by studs and nuts (417). Certain models may have a spacer ring (414) between mating surfaces of the suction cover and the volute casing.

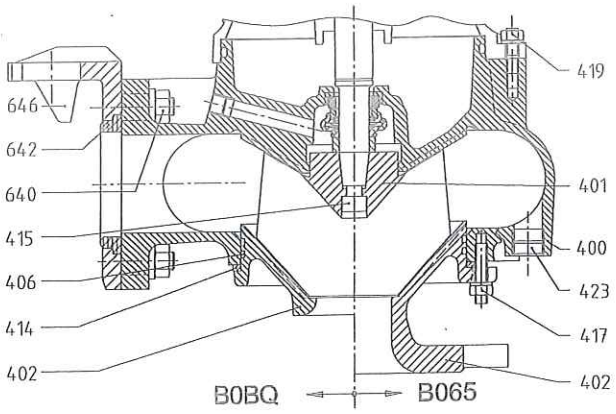

Fig. 6:

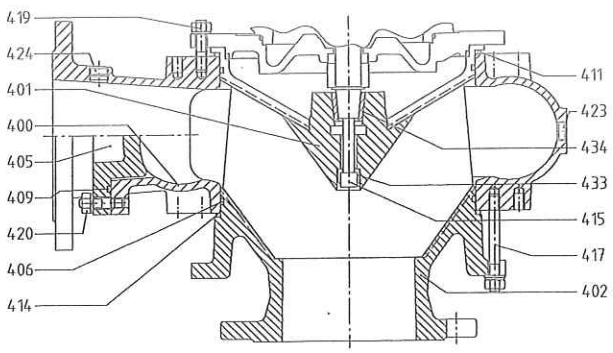

Fig. 7: E03Q - M28Q

3.3.5 REMOVAL OF LINER, WEAR RING AND SUCTION CASING FOR "REGULABLE" PUMPS (Fig. 8 - 10)

These pumps feature three large regulator nuts (422) which are visible on the suction side of the volute casing (400) or suction casing (416).

If liner (421) needs to be replaced, it can be removed while the volute casing or suction casing remain attached to the piping. **Removal of liner**: Completely remove nuts (413). To press out liner, push the three studs (412) through holes in the large regulator nuts (422) or, all three large regulator nuts can be screwed all the way into the casing. Studs (412) are locked into liner with thread-lock adhesive. Removal of studs after liner removal from casing: Studs to be heated to 150-200° C to break bond. Suction casing (416) can be removed by loosening and removing nuts (417).

Replace wear ring (408) if damaged. To achieve this, heat the mating surfaces with a torch to 150-200° C to destroy the special adhesive between these two parts. Then press out wear ring with press.

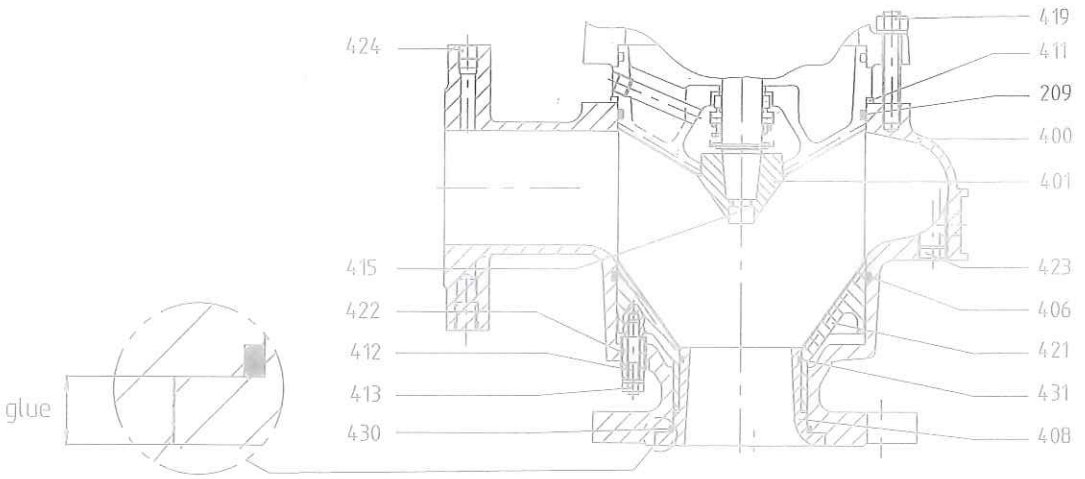

Fig. 8: C080 regulable

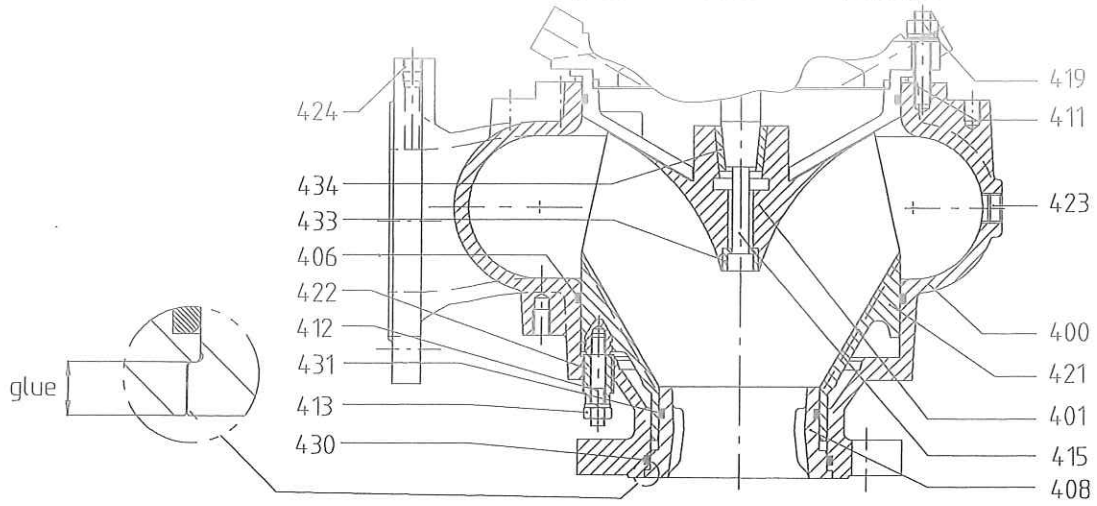

Fig. 9: D080 / D100 regulable

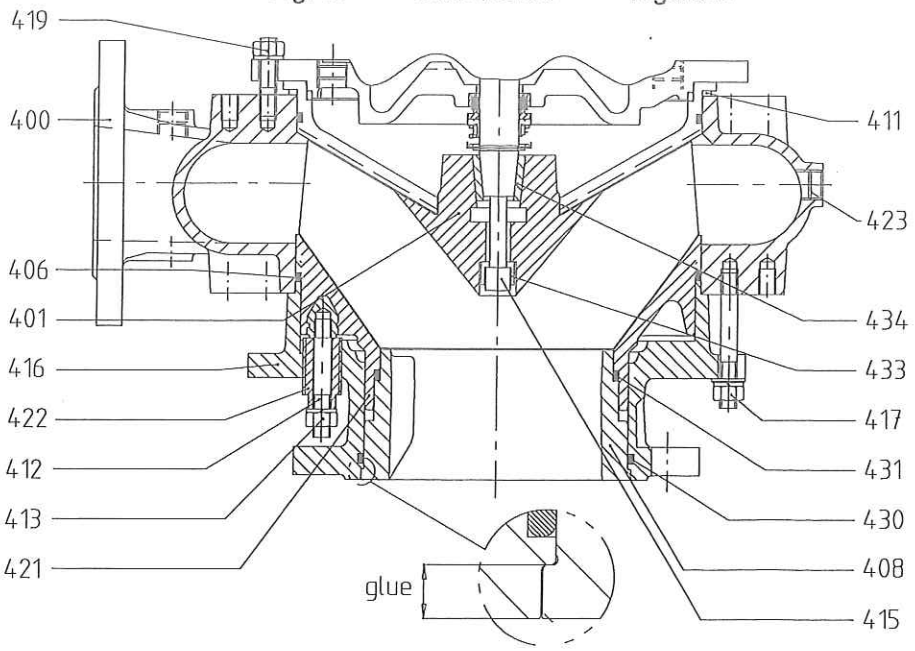

Fig. 10: DE5Q / E080 - M700 regulable

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.

OIL CONDITION	ACTION	EXECUTION
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

The following oil quantities can be used as a guide; if the kind of mounting is not known, the factory will fill in the quantity of "vertical".

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

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

* (up to Var. D:3.3 l)

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).

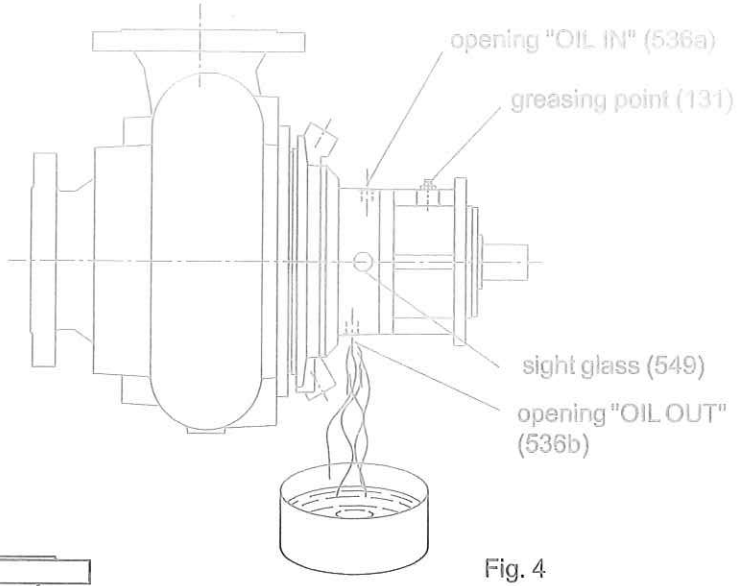

Fig. 4

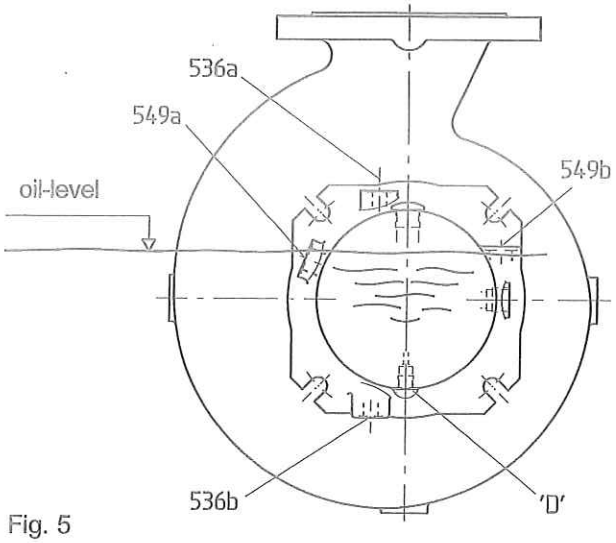

Fig. 5

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 plug 536a (to let air in) 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.