BRISBANE CITY COUNCIL

BROWNLEE STREET
PINKENBA
VACUUM SEWERAGE SYSTEM

OPERATIONS & MAINTENANCE MANUAL

JANUARY 2000

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1. VACUUM SEWERAGE TRANSPORT SYSTEM

1.1 System Details

The vacuum sewerage system comprises numerous components that are combined to form a system. The sewage is produced and flows by gravity to a collection sump similar in size to a manhole. In this sump is installed the INAX automatic pneumatic interface valve. This valve is the interface between the gravity flows under normal atmospheric conditions and the vacuum within the sewerage system.

The interface valve opens for about 4 to 6 seconds to admit a mixture of sewage and air from the sump, (about 40 litres of sewage), then closes. This is achieved by the float activated mechanism; no electrical supply is required. The valve may operate for only 3 or 4 times per hour, (but more frequently if required), and for the rest of the time it is closed.

The next component is the vacuum sewer network. The pipes are laid to a sawtooth profile approximately 1.0 to 1.5 metres cover. Polyethylene pipe has proven most effective and robust, particularly when used in conjunction with electrofusion fittings. The diameters of a vacuum sewer are generally smaller than for a conventional sewer due to the much higher velocities achieved; up to 6 metres per second. In this scheme 110, 140 180 and 225 mm O.D. sizes will be used when fully developed.

The next set of components are those forming the collection station. Firstly, the vacuum collection vessel. This tank separates the sewage from the air admitted to the system to provide the motive force for the transportation of the sewage. The sewage falls to the bottom of the vessel and is pumped out by the sewage pumps. The air in the upper part of the vessel is evacuated by the vacuum pumps. The active volume of the vessel is determined by the total number of stops and starts to be made by the sewage pumps. The vessel material is mild steel.

Sewage pumps are of a conventional type but are carefully checked to ensure the NPSH available and NPSH required is satisfactory to ensure efficient operation. Two pumps are provided, each sized to pump at the design peak flow, with one pump operational and the other as standby. To achieve ultimate capacity these units will be replaced by larger capacity units when influent flows require additional capacity.

Vacuum pumps are of the liquid ring type. The capacity of the vacuum pump is determined by the peak sewage flow into the system, ie a small system will require small vacuum pumps, a larger system with many more people being served will require larger pumps. These units have been selected to provide the initial capacity. To achieve the ultimate capacity three units, each of larger capacity will be required.

Isolation valves in the collection station and in the sewer network are provided to allow isolation of particular mains or branches in the event of a problem somewhere in the system with a damaged pipe or valve.

It should be noted that vacuum sewers perform two distinct functions; firstly and most obviously they are the conduit through which the collected sewage is transported from the collection sump to the collection vessel in the vacuum station. However, a second vital function for which the vacuum mains must be designed is the efficient and rapid transfer of vacuum back to the extremities of the network of mains after a valve has fired and admitted sewage and air into the system. At the end of sewer lines, the functions described above become of particular importance.

If the pipes are undersized or insufficient air is admitted to the system via the interface valves, then the performance of the vacuum system as a whole will suffer. In particular the collection sumps at the extremities of the network must have sufficient vacuum after firing at times of peak flow conditions. As a result of balancing the above requirements for vacuum sewer mains, each system is individually designed for optimum performance

1.2 Scheme Details

The initial scheme is to service 15 lots varying in size between 4000m² and 18200m². The Total Area is 18.5 ha.

The system has been designed in accordance with Brisbane City Council's detailed Specification for Vacuum Sewer Systems and Vacuum Pumping Stations - July 1996.

Drawings of the Scheme are attached.

1.3 Basis of Design

The ultimate hydraulic loading applicable to the development has been assessed as 63.0L/s based on the following areas:

Presently proposed site	:	18.5 Nett Ha
Balance of site	:	83.1 Nett Ha
FAC site	:	133.0 Nett Ha
Total	:	234.6 Nett Ha

Based on 30ep/gross Ha (or 27 ep/Nett Ha) for site and half for FAC land
flow contribution 300L/d/ep and peaking factor of 4

Flow from each area:

proposed site	:	18.5 x 27 x 300 x 4	=	6.9L/s
balance of site	:	83.1 x 27 x 300 x 4	=	31.2L/s
FAC	:	133 x 27 x 300 x 4 - 2	=	24.9L/s
Total				63.0L/s

1.4 Component Sizing

1.4.1 Vacuum Main

The hydraulic head in the system is the summation of

- friction losses along the pipeline
- static losses at the "jump-ups" along the pipeline
- static lift losses at the pumping station

The layout proposed is based on achieving:

Minimum vacuum required to operate valve	15Kpa
Vacuum losses available	51Kpa
System operating vacuum range	65 to 80Kpa

The system will therefore work satisfactorily in the range of 65Kpa to 80Kpa.


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1.4.2 Sewage Pumps

Select a sewage pump able to pump at a flow rate of 20L/s at a head of 26.5m.

Calculations of head at duty point:

Vacuum Head	7.5m
Friction losses	14.0m
Static lift	5.0m
Total Head	26.5m

Select Hidrostal pump Model D100-LO1R

NPSHR	2.6m
Sphere size	76mm
Suction dia	100mm
Outlet dia	100mm

1.4.3 Vacuum Pumps

Two vacuum pumps required on a duty and standby basis (Clause 10.1 of Detail Specification)

Vacuum pump capacity is determined by air/liquid ratio. Select A/L ratio of 7.

Vacuum pump capacity	=	500m3/hr
Operating vacuum range (design)	=	65 to 80Kpa

Provide Siemens ELMO-F 2BV 5161 rated at 500m3/hr assuming saturated air @ 20°C with operating liquid @ 15°C at discharge pressure of 1013mbar.

To reduce service liquid requirements add a partial recirculation discharge separator.

1.4.4 Vacuum Vessel Capacity

Assume 10 starts per hour for sewage pumps (CL11.1 of Detail Specification)

Volume of Vacuum Vessel = Vt
Volume of Active Part of Vessel = Va

Maximum number of starts occurs when the inflow is half of the sewage pump capacity.

Time to fill + Time to empty $= \frac{60}{10}$
$= 6$ minutes

$$\frac{Va}{31.5} + \frac{Va}{63 - 31.5} = 360 \text{ seconds}$$

$2Va = 360 \times 31.5 = 11{,}340L$
$Va = 5670L$

$Vt = 3 \times 5670$
$= 17{,}010L$

Adopt a tank of 2400mm diameter by 4000mm.

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SECTION 2 INAX AUTOMATIC VACUUM INTERFACE VALVE

2.1 Description and Specification
2.2 Operation and Maintenance
2.3 Trouble Shooting

2. INAX VACUUM INTERFACE VALVE

2.1 Description and Specification

The vacuum interface valve is vacuum operated on opening and spring assisted on closing. The valve is designed so that the sewer vacuum endures positive seating of the flexible elastomer seat. It is a 90mm outside diameter, 76mm inside diameter valve and is capable of passing solids up to 65mm diameter.

It has a visual flow through area of at least 60%. The conical plunger and its stainless steel shaft are completely out of the flow path when the valve is in its open position.

The valve is equipped with a vacuum operator of the rolling diaphragm type which is of sufficient diameter to overcome all sealing forces and open the valve using sewer vacuum pressure from the downstream side of the valve. The stainless steel shaft is provided with an elastomer wiper/lip seal to prevent sewage from entering the valve lower housing. The valve operator is held in position on the lower housing and the Y body by stainless steel bolts.

The valve is fitted with a two position liquid level float which has a robust mounting that is used to secure the unit.

Sequence of operation of the controller is as follows:
Rising sewage in the pit raises the float and operates the pilot valve which admits sewer main vacuum to the 3 way valve actuator. The 3 way valve then switches allowing sewer line vacuum to enter the upper valve body, which opens the interface valve.

When the sewage level has been lowered, the float falls and the 3 way valve then switches and allows atmospheric air to enter the upper valve body thus closing the interface valve.

The power to operate the INAX interface valve is provided by the sump liquid level and the sewer main vacuum. No mains power supply or batteries are required.

2.2 Operation and Maintenance

The INAX interface valve admits sewage and air into the vacuum main with each valve operation. This is achieved by the admission pipe on the upstream side of the vacuum valve. Certain simple physical checks should also be made in order to ensure the valve is operating correctly. These checks are described below.

Each valve should be checked once each year, using the following procedure.

a) Check the float sensor is correctly set. To ensures the interface valve will operate when the correct level of sewage has accumulated within the collection sump the float should be set as detailed in the following diagram. If the float is lifted or lowered, then too much or too little sewage will be admitted during each valve firing.

b) Check the suction pipe is located as shown on attached sketch. This helps to ensure blockage free operation of the vacuum system and correct emptying of the collection sump.

c) Ensure all stainless steel clips on the valve tubing are in place and fully tightened.

d) Check the air admission pipe is undamaged.

2.3 Trouble Shooting

Symptom	Possible Cause	Remedial Action
Interface valve fails to fire	1. Two way valve in controller sensor broken or stuck in closed position	Manually operate float mechanism. If no clicking sound is heard and valve still does not fire, replace controller unit
	2. 90mm dia suction pipe blocked	Valve will almost invariably be in the open position with nothing passing through it. Dismantle pipework and clear blockage
Interface valve jammed in open position	1. Debris trapped in valve	The blockage may be cleared by removing the interface valve and strip down and clean or replace with spare valve.
	2. Two way valve broken or jammed in open position	Check by manual operation of float mechanism. If no clicking is heard, change controller unit
	3. Tubing on interface valve and controller unit kinked and restricted airflow	Visually check all Tubing. Replace as necessary
Slight continuous vacuum loss at interface valve	Debris trapped under seat	Fire interface valve by manual operation of float unit. If this does not clear trapped item, remove valve for cleaning

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SECTION 3 VACUUM PUMPING EQUIPMENT

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3. VACUUM PUMPING EQUIPMENT

3.1 Vacuum Pumps

There are two Siemens model 2BV 5161 vacuum pumps installed on a duty and stand by basis.

Each pump is capable of operating the system at initial capacity with adequate operating vacuum within the system. As the sewage flows increase over time a third vacuum pump should be installed. With further increase larger pumps will be required.

When the system is operating at design flow rate the vacuum pumps will run continuously. During low flow periods the vacuum pumps will only operate once or twice an hour.

The vacuum pumps are of the liquid ring type. Detail operating and maintenance instructions are attached.

3.2 Frequency of Operation

The vacuum pumps have been sized so that seven times the volume of air is pumped by the vacuum pumps compared to the volume of the sewage pumps.

The vacuum pumps will start very infrequently during the low flow part of the night and will run continuously if the flow into the system is at the initial peak flow rate.

3.3 Trouble Shooting - Vacuum Pumps

Symptom	Possible Cause	Remedial Action
One vacuum pump running continually	1. Interface valve stuck partially open	Identify problem valve Clear blockage, if necessary swap interface valve
	2. Non return valve on discharge side of the other vacuum pump stuck partially open	Strip down check valve and clean
	3. Non-return valves on discharge pipework trapped in open position by debris	Operate sewage pump. If this fails to clear the blockage strip down valve and clean
One vacuum pump running repeatedly	Interface valve malfunctioning	Identify valve by reference to the interface valve fault finding section

SIEMENS

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ELMO-Flüssigkeitsring-Vakuumpumpen / -Kompressoren

(Beschreibung s. Seite 2)

Betriebsanleitung
Instructions

ELMO Liquid-Ring Vacuum Pumps/Compressors

(Description on page 6)

Pompes à vide/compresseurs à anneau liquide ELMO

(Description voir page 11)

Bombas de vacío/compresores hidrorrotativos ELMO

(Descripción en la pág. 16)

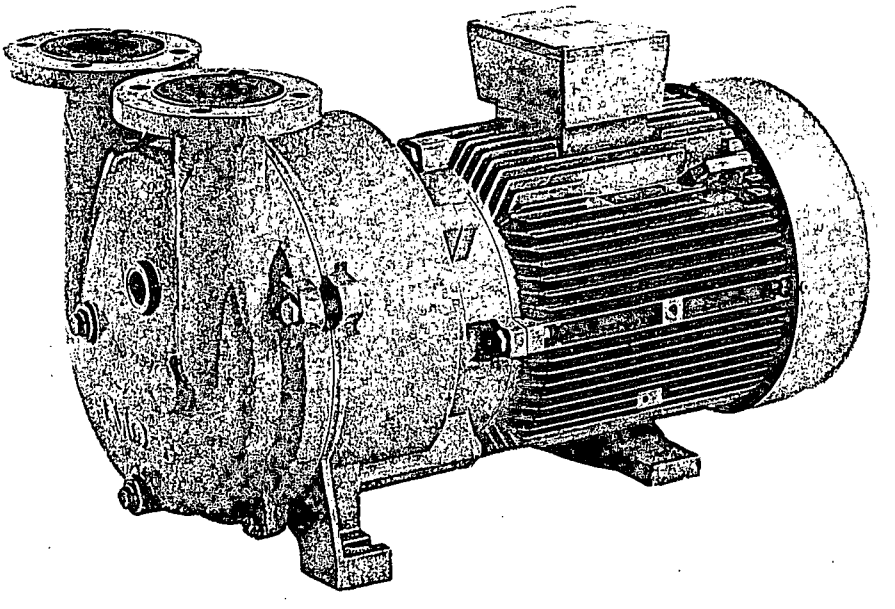
ELMO pompe per vuoto/compressori ad anello liquido

(Descrizione ved. 20)

ELMO vakuumpumpar/kompressorer med vätskering

(Beskrivning se sida 25)

2BV5 161
2BV5 131
2BV5 121
2BV5 111
2BV5 110



Ausgabe / Edition 08.95

Bestell - Nr. / Order No.: 610.44 415.21.a

DEUTSCH / ENGLISH / FRANÇAIS / ESPAÑOL / ITALIANO / SVENSKA

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General notes

Siemens AG

General notes

Units which bear the CE sign conform to the EC directive 89/392/EEC (see EC declaration of conformity, Fig. 19) if they are used for the intended purpose.

⚠ WARNING The information and instructions given in all the operating instructions and other instructions supplied with the equipment must be followed. This is essential in order to avoid **danger** and **damage**.
A supplementary safety bulletin (610.43083.21/yellow) which contains additional information on safety is included.

Special and **modified** versions may differ with regard to technical details ! If anything is unclear, you are urged to contact the manufacturer, quoting the type designation and serial number (No E ..., see rating plate) or to have the repair work carried out by a Siemens service centre.

1 Description

1.1 Validity

These Operating Instructions apply to single-stage ELMO liquid-ring vacuum pumps/compressors (ELMO-F), type 2BV5, in block design with direct-coupled standard and **EEx e** drive motors.

The Operating Instructions contain basic information and instructions which must be observed when the unit is being installed, operated and repaired. It is important, therefore, that these Operating Instructions are read by the fitter and the relevant technical personnel/operators before installation and start-up and that they are available at all times at the place at which the unit/system is being operated.

1.2 Mode of operation and type of construction

The ELMO-F, together with the drive motor, forms a compact and space-saving unit. A level surface is sufficient for installation. Baseplates are not required.

The ELMO-F units operate in accordance with the liquid-ring principle. An impeller is located in a cylindrical pump casing and is offset from the rotor axis. The impeller transmits the driving power to a liquid ring which forms concentrically to the casing when the pump is started up.
As the liquid moves outwards, gas is drawn in through the inlet port in the port plate, compressed and expelled through the discharge port in the port plate.

See Fig. 1 for section through the compression chamber (viewed in the direction of the pump cover).

1.3 Measuring-surface sound-pressure level

See Fig. 13 for details on the measuring surface sound-pressure level.

1.4 Application range

1.4.1 Usage to the intended purpose

The ELMO-F are single-stage, liquid-ring units, which are designed for continuous operation, for generating vacuums or excessive pressure.
The ELMO-F units are used to extract and pump all dry and moist gases, mainly air and air/vapour mixtures, which are not flammable, explosive, poisonous or corrosive.
Units for flammable, explosive, poisonous and corrosive media are supplied in accordance with customer specifications. The relevant safety precautions, must in this case, be taken by the user.

Water is generally used as working liquid.

Stainless steel versions are available for more stringent anti-corrosion and hygiene requirements.

The ELMO-F units are designed for use in the rough vacuum range; the maximum possible vacuum is determined in each case by the vapour pressure of the working liquid used.

The appropriate safety regulations, see 2.1.2.1 Electrical connections, must be observed in the case of ELMO-F units with EEx e- drive motors; these ELMO-F units are approved for use in rooms in which explosive gases occasionally occur.
Explosive gases themselves must, however, not be pumped.
The temperature classes specified on the rating plate must be observed.

1.4.2 Minimum gas suction pressure

The minimum gas suction pressure depends on the temperature and the type of working liquid used.

Please observe that:
- **the pressure does not fall below 80 mbar when the pump is operated without cavitation protection**, when water at 15°C is used as working liquid and when dry air at 20°C is extracted in order to avoid damage caused by cavitation. At higher temperatures, this limit is correspondingly higher in accordance with the vapour pressure of the working liquid used.
- the vacuum pump can be operated until it reaches its maximum vacuum, i.e. up to complete throttling, **when it is operated without cavitation protection.**

Higher temperatures reduce the suction capacity of the ELMO-F unit.

NOTE: Operation of the pump below the minimum permissible suction pressure for a prolonged period of time can result in the ELMO-F unit being damaged.

1.4.3 Maximum discharge pressure for vacuum operation

The maximum discharge pressure for vacuum operation is 1300 mbar absolute for all 2BV5 vacuum pumps if the nominal working-liquid flowrate indicated in 1.4.6, Fig. 5 is maintained.

1.4.4 Maximum differential pressure for compressor operation

At an inlet pressure of 1013 mbar, the maximum differential pressure and the recommended clean working-liquid flowrate for 2BV5 compressors with serial motors are as follows, see Fig. 3:

Maximum permissible pressure inside the ELMO-F unit

$$p_{int\ max} = 8\ bar\ abs.$$

1.4.5 Suction gas or vapour

The gas or gas/vapour mixture to be extracted must be free of solids. Minor quantities of light floating materials or liquids can be entrained.

See Fig. 4 for the maximum permissible quantity of water entrained via the suction flange.

We recommend that the working-liquid flowrate be increased to up to max. 2 times the nominal working-liquid flowrate (see 1.4.6; Fig. 5, cooling-circuit connection) or that an upstream condenser be used if hot gases and vapours from 80°C onwards are to be extracted.

1.4.6 Working liquid

During operation, the ELMO-F unit must be continually supplied with working liquid (Fig. 5) which must be free of solids such as sand. If necessary, connect a filter on the intake side.

The values specified in Fig. 5 apply to dry-air extraction. To ensure that a sufficient quantity of working liquid flows in, adjust the pressure in the feed pipe to approx. 1 bar **above** the necessary suction pressure.

The working liquid supplied is discharged through the delivery branch of the ELMO-F unit together with the extracted gas.
A separator is available as an accessory to separate the gas and liquid. It enables partial recirculation of the working liquid.

2 Operation

2.1 Installation

2.1.1 Mounting

The ELMO-F unit has to be mounted horizontally on a level surface and can be bolted via holes in the feet. A special foundation or baseplate is not required.

Two adapter plates (888E, see Fig. 17) are supplied in each case for types **2BV5 110-....2-.P** and **2BV5 121-....2-.P** for adjusting the height by means of the feet on the pump casing (002A). These must be secured between the pump feet and the packaging. The two adapter plates must be placed underneath the pump feet in order to secure the unit.

If the pump is to be mounted **in any other way**, e.g. with the shaft in a vertical position, the manufacturer should be consulted.

If the ELMO-F unit is transported by crane, we recommend lifting the machine by the pump-side lug of the motor and by a hole in the suction flange.

The load carrying capacity of the hoisting gear must be observed!
See Fig. 14 for details on the respective weights of the ELMO-F units.

2.1.2 Connections

2.1.2.1 Electrical connection

Connect the pump in accordance with the relevant VDE and national standards and the regulations of the utility company which apply to the installation site.
Use motor circuit-breakers for overload protection of the motors. They have to be set to the rated current indicated on the rating plate.

⚠ WARNING **Do not carry out any work unless the machine is dead.**

Before carrying out any work, open the main circuit-breaker and secure against being closed again.
The system voltage and frequency must be the same as those indicated on the rating plate. ±5 % voltage and/or ±2 % frequency deviations are permissible without power reduction. Connect and arrange the terminal links according to the circuit diagram in the terminal box. Connect the protective earth conductor to this terminal ⏚ .

If terminal clamps are used for connection (e.g. as per DIN 46282), make the connections so that the terminal plate is at the same height on each side. Each conductor end must therefore be bent into a U or connected with a cable lug.
This also applies to the protective conductor and the external earth conductor (green/yellow) - see Fig. 2.

The ends of all conductors under external earthing brackets have to be bent into a U.

See Fig. 15 for the tightening torques for screwed electrical connections - terminal board connections (except for terminal strips).

2.1.2.2 Pipe connections (see Fig. 7)

In order to prevent foreign particles from entering the pump, all connection openings are covered for delivery. Do not remove the coverings until piping is connected.

Piping has to be connected free of stress and the weight of the piping has to be supported.

a) Delivery branch connection

for 2BV5 16.:	Flange 80 ND10-DIN 2501 or ANSI-B16.5-3-150, Seal 80 ND6 DIN 2690;
for 2BV513./2BV512.:	Flange 65 ND 10-DIN 2501 or ANSI-B16.5-2 1/2-150, Seal 65 ND 6 DIN 2690;
for 2BV511.:	Flange 50 ND 10 DIN 2501 or ANSI-B16.5-2-150, Seal 50 ND 40 DIN 2690.

If the discharged gas is passed on, ensure that the maximum discharge pressure given in 1.4.3 is not exceeded.

b) Suction flange connection

Same connection as on the delivery branch side (with flange and seal). To prevent installation residues, e.g. welding beads, from entering the ELMO-F unit, it is recommended that a start-up filter be fitted in the suction pipe for the first 100 operating hours.

c) Recommended working-liquid connection (Fig. 8)

2.1.3 Methods of supplying the working liquid (see Fig. 9)

2.1.3.1 Cooling-circuit connection

This is preferred where there is an ample supply of working liquid and where a low suction pressure is required. The working liquid discharged from the pump is completely drained off and replaced by new liquid.

After initial priming, the ELMO-F unit can be operated in a self-priming mode. Ensure that the working liquid is on a level with the working-liquid connection when the ELMO-F unit is switched on.

2.1.3.2 Connection with separator and partial recirculation of working liquid

The connection with separator and partial recirculation of working liquid is used where working liquid must be used sparingly. Part of the working liquid recovered from the discharge in the separator is recirculated to the ELMO-F unit without cooling, the remainder being replaced by new liquid. The necessary pipes are supplied together with the separator.

2.1.4 Working-liquid separator (see Fig. 10)

The working-liquid separator can be supplied as an accessory with the corresponding connection pipe.
It separates the working liquid from the gas handled and permits recirculation of a part of the working liquid.
This enables a considerable reduction in the quantity of working liquid required (see Fig. 5).
The enclosed hose connection (50) must be fitted between the separator and the pump cover (see Fig. 10) for operation with cavitation protection (see 1.4.2).

Fitting the hoses
Hoses must be connected in such a way as to prevent them from twisting. The hoses must be protected against external mechanical damage.

Fitting the cutting-ring screwed connections
The inside taper, external thread and the inside of the union nut must be lubricated beforehand in the case of stainless steel cutting-ring screwed connections.
Loosely screw the union nut once onto the threaded coupling so that the entire thread becomes evenly coated.

2.1.5 Non-return valve

To prevent recirculation of gas and working liquid when the pump is out of operation, a non-return valve with minimum resistance has to be fitted in the suction pipe (see accessories in the catalogue).

2.1.6 Suction pressure between 40 and 10 mbar with ELMO-F unit and gas ejector

When extracting gases in the pressure range 40 to 10 mbar, a gas ejector is connected on the line side of the 2BV5 vacuum pump which compresses the extracted gas to the suction pressure of the 2BV5 vacuum pump.

A suction pressure of 10 mbar is possible with a gas ejector.

The power requirements of the 2BV5 vacuum pump remain within the permissible range with a line-side gas ejector. No special energy source is, therefore, necessary in order to operate gas ejectors. There are no regulations for the mounting position of the gas ejector as the position does not affect operation in any way.

Seals must sit concentrically in order to avoid reducing the flow area. The connecting leads should be short and have a sufficient nominal diameter. A cone-shaped adapter is recommended if the mixing connection of the gas ejector is smaller than the suction connection of the 2BV5 vacuum pump.

⚠ CAUTION **The motive gas (ambient air at 20°C, 1013 mbar) must not contain any drops of liquid.**

When evacuating tanks, the gas ejector acts as a throttle in the range 1000 to approx. 100 mbar. The gas ejector can be bypassed here in order to obtain short evacuating times. The bypass must be closed if the gas ejector is to become active. The optimum switchover point for the gas ejector to become active is approx. 40 mbar (Fig. 12).

2.2 Initial start-up

2.2.1 Preparations

If a shut-off valve is installed in the discharge pipe, make sure that the ELMO-F unit is **not** started or stopped with the shut-off valve closed.

NOTE: Do not run the ELMO-F unit dry!

Before start-up, prime the ELMO-F unit through the suction or delivery branch
- with approx. 8 litres in the case of the 2BV5161
- with approx. 3 litres in the case of the 2BV5131, 2BV5121, 2BV5111, 2BV5110

of working liquid or open the shut-off valve in the bypass (Fig. 8) for approx. 20 s to enable the working liquid to flow into the vacuum pump.

Check the connection of the supply and discharge pipes for tightness.

To check the direction of rotation, switch on the ELMO-F unit briefly. The direction of the gas flow and the direction of rotation of the shaft are marked on the ELMO-F unit with arrows. Compare the direction of rotation of the motor fan with the direction of the arrow on the back of the pump casing (002A, Fig. 17). If necessary, change the direction of rotation by reversing two connection cables when the pump is **electrically isolated**.

2.2.2 Start-up

If the pump is **supplied via converters**, high-frequency current and voltage harmonics in the motor supply leads can cause electromagnetic emitted interference. Screened supply leads are, therefore, recommended.

The noise level and vibrations increase if the **operating speed** (see rating plate) is exceeded and the useful life of the grease and the bearing replacement intervals are reduced as a result.
If necessary, contact the manufacturer to determine the limit speed in order to avoid damage being caused as a result of excessively high speeds.

Switch on the ELMO-F unit. Check the working-liquid flowrate (cf. 1.4.6) and, if necessary, adjust it with the control valve (16, see Fig. 8). The flowmeter (15) is used to regulate the nominal working-liquid flowrate. The liquid flow can also be measured in litres on the discharge side at the overflow (7, see Fig. 9).

2.3 Operating notes

2.3.1 Starting, shutting down

When the pump is controlled automatically (when installed in accordance with 2.1.2.2 c), the clean working-liquid supply is controlled by a solenoid valve (17) which is dependent on the motor operation (see Fig. 8).

ELMO-F on indicates valve open.

ELMO-F off indicates valve closed.

When the pump is not controlled automatically, proceed as follows:

Starting: Start ELMO-F, immediately afterwards open shut-off valve (18) (Fig. 8)

Shutting down: Close shut-off valve (18) and shut down ELMO-F immediately (Fig. 8).

The control valve (16) remains in the closed position when operation is interrupted (Fig. 8).

2.3.2 Draining

⚠ WARNING **ELMO-F units that are operated with working liquids that may be hazardous to persons or the environment must for safety's sake be flushed with the machine running before they are opened up.**

For draining, open all three screw plugs (068A) of the pump cover (061A) to allow the liquid to run out. When draining, rotate the motor occasionally in the **opposite** direction to the running direction (see direction arrow on the pump housing) (002A) by hand at the motor fan (502A) until no more working liquid runs out.

By tilting the ELMO-F unit at an angle of 45 degrees towards the pump cover (061A), the ELMO-F unit can be drained almost completely thus preventing any damage even when the unit is not operated for a prolonged period of time or in the event of frost.

2.3.3 Measures after prolonged standstill

If the ELMO-F unit is out of operation for longer than approx. 4 weeks or in the event of frost, it should be completely drained - in accordance with 2.3.2 - and then conserved (cast-iron version), i.e. 1/2 litre of anti-corrosive oil (e.g. Mobilarma 247 from Mobil Oil) poured into the suction or discharge branch and the pump then briefly switched on.

If the impeller (047A) jams after a prolonged standstill period because hard water has been used, the compression chamber of the ELMO-F unit should be filled with 10 % oxalic acid which is allowed to work in for approx. 30 minutes.

⚠ CAUTION **Oxalic acid can cause damage to health if swallowed or in contact with skin.**

3 Repair

3.1 General

To avoid wear of the impeller (047A) and the pump casing (002A) or jamming of the impeller (047A), fine dirt particles, which enter the compression chamber of the ELMO-F unit together with the gas being handled or the working liquid, can be flushed out during operation through the flushing outlet (3/8" BSP) (see Fig. 7) at the bottom of the pump.

If very hard water is used as working liquid, it must either be softened or the compression chamber of the ELMO-F unit flushed with a solvent at appropriate intervals.

NOTE If the motor design incorporates sealed condensate drain holes (e.g. protection class IP55 or IP56, see rating plate), the latter must be opened from time to time to allow any condensate that has accumulated to drain off.

3.2 Lubrication

Under normal operating conditions at 50 Hz the following applies: After approx. 20,000 operating hours, however after 3 years at the latest, the rolling-contact bearings and the adjacent spaces should have the spent grease and other dirt deposits removed and be recharged with fresh grease. Fill approx. 50 % of the free space in the rolling-contact bearing and approx. 65 % of the volume of the adjacent spaces in the bearing cover with grease. Locked bearings must be replaced and the associated adjacent spaces must remain free of grease.
The relubrication intervals must be shortened accordingly when the pump is operated under **unfavourable conditions**, e.g. different frequencies, converter operation at high speeds.

UNIREX N3 from ESSO or an equivalent grease as per DIN 51825-K3N must be used. Details on the service life of the unit and the useful life of the grease specified in the warranty only apply if UNIREX N3 is used. Different types of grease should not be mixed.

See Fig. 11 for **bearing sizes and lubrication table**.

When using new rolling-contact bearings, heat the bearings uniformly to approx. 80 - 100°C and fit them in place. Avoid sharp knocks (with hammers, for example).

When relubricating or replacing rolling-contact bearings (007A, 008A), we recommend that any sealing elements that have become worn (e.g. V ring (033A)) are also replaced.

NOTE: Observe the location of the side plate when replacing the bearings! The material of the side plate should be stable at temperatures between -20°C and +150°C, e.g. polyacrylic rubber (ACM).
Damaged parts must be replaced.

3.3 Faults and how to eliminate them (see Fig. 16)

3.4 Tightening torques for screwed connections

Unless otherwise specified, the tightening torque values specified in Fig. 15 apply for tightening nuts and bolts:

3.5 Spare parts

3.5.1 General instructions

When ordering spare parts, please state the part designation, the part number, the complete type of ELMO-F unit and the serial number. The type and serial number are indicated on the nameplate. The part designation should correspond to the designation in the spare parts list (Fig. 17).

Ordering example: **2BV5131 - 0KC00-7P**
No E F2 62 2621 04201/95
Impeller 047A

Standard parts can be procured from local suppliers. Ensure that these parts have the same type of construction, dimensions, strength class etc.

3.5.2 Spare parts, standard parts, exploded view of a 2BV5 (see Fig. 17)

3.5.3 Notes on Repair Instructions

Repair Instructions are available in addition to these operating instructions which contains further information for qualified personnel (see DIN VDE 0105 or IEC 364 for definition of qualified personnel) on safety, disassembling and reassembling ELMO-F vacuum pumps/compressors 2BV5110 to 2BV5161.

The Repair Instructions can be obtained from the manufacturer by specifying the

Order number: 610.44 416.02 (German/English)

together with full name and address of the sender.

3.5.4 Repair work/work carried out under warranty

ELMO-F units which are returned in cases of warranty claims must be sealed on delivery. They must be completely drained (see 2.3.2) and their exteriors cleaned prior to shipment. Refer to the protection class indicated on the rating plate for the appropriate cleaning instructions.

⚠ WARNING **Contaminated ELMO-F units which may be hazardous to the environment and persons must be decontaminated before they are sent to the repair workshop.**

A legally-binding declaration (see Fig. 18) must be filled out by authorized personnel and enclosed with the delivery in order to guarantee that the ELMO-F unit to be shipped has not been operated with hazardous substances and that it has been decontaminated accordingly.

If this declaration indicating decontamination in accordance with the appropriate regulations has not been received when the ELMO-F unit arrives at the repair workshop, repair work will be unavoidably delayed until this declaration has been received as the accident prevention regulations must be observed in this case.

4 ELMO-F units with EEx e motors

DIN EN 50014/VDE 0170/0171 Part 1 and
DIN EN 50019/VDE 0170/0171 Part 6

Information printed in italics is additional or special information for these units.
When the unit is mounted vertically, a cover must be fitted in order to prevent foreign bodies falling into the motor fan cowl (see DIN EN 50014/ VDE 0170/0171 Part 1, Section III, 16.1). This cover must not prevent the motor from being cooled by the fan.
The temperature class of the motor indicated on the rating plate must correspond to the temperature class of the flammable gas that might occur. A motor circuit-breaker must be connected on the line side of each unit which must be set to the nominal motor current and must trip within the time t_E indicated on the rating plate when the rotor is locked (test this function against the tripping characteristic enclosed with the motor circuit-breaker). An overload protection device with phase-failure protection must be connected if delta circuits are used.
If overload protection is to be carried out exclusively via a direct temperature monitoring device with the aid of temperature sensors (see DIN EN 50019/ VDE 0170/0171 Part 6, Annex A-A1.b), the design of the motor has to be ordered, tested and certified separately.

Reference should be made to DIN 57165/VDE 0165.

Repair work must be carried out in Siemens workshops or be acceptance-tested by an authorized expert.

Typ Type Tipo	max. Differenzdruck Maximum differential pressure Pression différentielle maxi à Presión diferencial máx. en servicio Pressione differenziale max. Maximalt differenstryck 50 Hz	60 Hz	Empfohlener Frischflüssigkeitsstrom Recommended flowrate of fresh liquid Débit de liquide frais recommandé Caudal recomendado de liquido nuevo Portata raccomandata di liquido fresco Rekommenderat flöde av ny vätska
2BV5 161	550 mbar	650 mbar	2,4 m³/h
2BV5 131	450 mbar	500 mbar	1,8 m³/h
2BV5 121	450 mbar	400 mbar	1,5 m³/h
2BV5 111	500 mbar	550 mbar	1,2 m³/h
2BV5 110	500 mbar	600 mbar	0,9 m³/h

Fig. 3 Maximaler Differenzdruck bei Kompressorbetrieb
Maximum differential pressure for compressor operation
Pression différentielle maximale en fonctionnement en compresseur
Presión diferencial máx. en servicio como compresor
Pressione differenziale max. per funzionamento compressore
Maximalt differenstryck vid kompressordrift

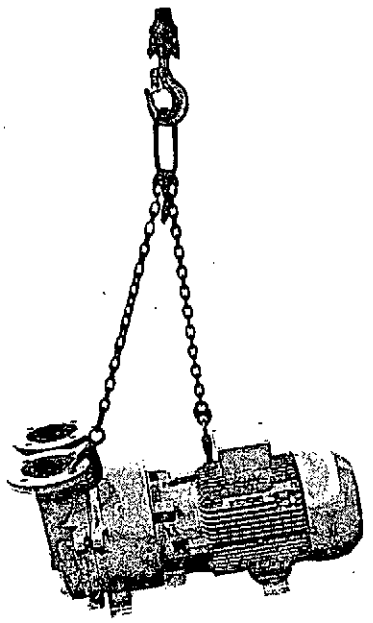
Typ Type Tipo	Max. zulässige Mitförderung von Wasser beträgt über den Ansaugstutzen bei Max. permissible quantity of water entrained via the suction flange Quantité maxi admissible d'eau entrainée à l'aspiration Contenido máx. adm. de agua arrastrada a través de la boca de aspiración Contenuto max. di acqua ammesso tramite il bocchettone di aspirazione Max. tillåten medtransport av vatten via insugningsstutsen Dauerbetrieb / Continuous operation Service continu / En servicio permanente Funzionamento continuo / Kontinuerlig drift	Kurzzeitbetrieb / Short-time operation Service temporaire / En servicio de breve duración Funzionamento brevi periodi / Intermittent drift
2BV5 161 50 Hz	3,0 m³/h	6,0 m³/h
2BV5 161 60 Hz	4,5 m³/h	6,0 m³/h
2BV5 131	5,0 m³/h	5,0 m³/h
2BV5 121	3,5 m³/h	4,5 m³/h
2BV5 111	3,0 m³/h	3,4 m³/h
2BV5 110	2,0 m³/h	2,5 m³/h

Fig. 4 Ansauggas bzw. -dampf
Suction gas or vapour
Aspiration de gaz ou de vapeur
Gas y vapores aspirados
Gas rispettivamente vapore di aspirazione
Insugningsgas/-ånga

Bemessungsbetriebsflüssigkeitsstrom bei Vakuumbetrieb (bei Wasser als Betriebsflüssigkeit von 15°C)
Nominal working liquid flowrate for vacuum operation (using water with a temperature of 15°C as working liquid)
Débit nominal de liquide de fonctionnement en pompe à vide (pour de l'eau à 15 °C)
Caudal asignado del líquido de servicio para operación en vacio (con agua como líquido de servicio a 15 °C)
Portata di taratura del liquido in funzionamento a vuoto (liquido di funzionamento: acqua, 15°C)
Märkflöde av driftvätska vid vakuumdrift (driftvätska = vatten vid 15 °C)

	Betriebsart / Mode of operation Mode fonct. / Clase de servicio Modo di funzionamento / Driftsätt					
	Kühlschaltung Cooling circuit Montage froid Circuito frio Circuito refrigerante Kylkoppling			Schaltung mit Abscheider und Betriebsflüssigkeitsrückführung Circuit with separator and recirculation of working liquid Montage avec séparateur et recyclage du liquide de fonctionnement Circuito con separador y reciclaje del liquido de servicio Circuito con separatore e recupero parziale del liquido di funzionamento Koppling med avskiljare och återflöde av driftvätska		
Typ Type Tipo	33-200 mbar	200-500 mbar	>500 mbar	33-200 mbar	200-500 mbar	>500 mbar
2BV5 161	2,40 m³/h	0,70 m³/h	0,50 m³/h	1,20 m³/h	0,60 m³/h	0,25 m³/h
2BV5 131	1,80 m³/h	0,45 m³/h	0,40 m³/h	0,90 m³/h	0,40 m³/h	0,18 m³/h
2BV5 121	1,20 m³/h	0,40 m³/h	0,35 m³/h	0,60 m³/h	0,30 m³/h	0,12 m³/h
2BV5 111	1,00 m³/h	0,40 m³/h	0,35 m³/h	0,50 m³/h	0,30 m³/h	0,12 m³/h
2BV5 110	0,80 m³/h	0,35 m³/h	0,30 m³/h	0,45 m³/h	0,25 m³/h	0,12 m³/h

Fig. 5 **Betriebsflüssigkeit** (angegebene Werte sind für Trockenluftabsaugung)
Working liquid (the values given in the table apply to dry-air extraction)
Liquide de fonctionnement (les valeurs indiquées s'appliquent à l'aspiration d'air sec)
Líquido de servicio (los valores indicados son para aspiración con aire seco)
Liquido di funzionamento (I valori riportatati in tabella valgono per aspirazione di aria asciutta)
Driftvätska (angivna värden gäller vid utsugning av torr luft)



mit Kette und Haken / with chain and hook
avec chaîne et crochet / con cadena y ganchos
con catena e gancio / med kedja och krok

Fig. 6 **Krantransport / Crane transport**
Manutention par engin de levage / Transporte con grúa
Traporto con gru / Krantransport

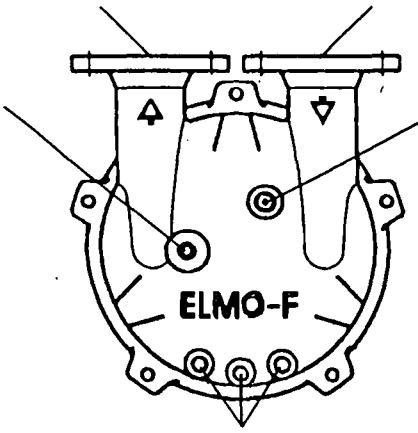
DEUTSCH / ENGLISH / FRANÇAIS / ESPAÑOL / ITALIANO / SVENSKA

Graugußausführung (Pumpenteile aus Grauguß) / Cast-iron version (pump parts made from cast iron)
Exécution en fonte grise (éléments de pompe en fonte grise) / Modelo de fundición gris (piezas de la bomba de fundición gris)
Esecuzione in ghisa grigia (parti della pompa in ghisa grigia) / Gråjärnsutförande (pumpens delar av gråjärn)

Druckstutzen / Delivery branch
Tubulure de refoulement / Tubería de impulsión
Bocchettone di mandata / Tryckstuts

Saugstutzen / Suction branch
Tubulure d'aspiration / Tubería de aspiración
Bocchettone di aspirazione / Sugstuts

Anschluß für Kavitationsschutz G3/8, 11 mm tief
Connection for cavitation protection kit 3/8" BSP, depth 11 mm
Raccord à protection anticavitation G3/8, prof. 11 mm
Conexión protegida contra la cavitación G3/8, prof.11 mm
Collegamento per protezione anticavitazione G3/8, profondità 11mm
Anslutning med kavitationsskydd G3/8, djup 11 mm



Betriebswasseranschluß G3/4, 24 mm tief
Working-liquid connection 3/4" BSP, depth 24 mm
Raccord d'eau de fonctionnement G3/4, prof. 24 mm
Conexión del liquido de servicio G3/4, prof. 24 mm
Collegamento per acqua G 3/4, profondità 24mm
Driftvattenanslutning G3/4, djup 24 mm

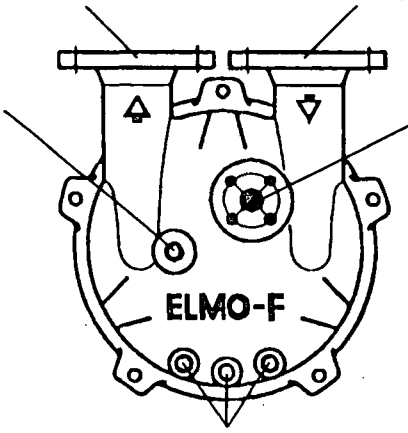
Entleerungsbohrungen G3/8
Discharge outlet 3/8" BSP
Orifice de vidange G3/8
Agujerode desagûe G3/8
Foro di svuotamento G3/8
Tömningshål G3/8

Edelstahlausführung (Pumpenteile aus Edelstahl) / Stainless steel version (pump parts made from stainless steel)
Exécution en acier inoxydable (éléments de pompe en acier inox) / Modelo de acero inoxidable (piezas de la bomba de acero inoxidable)
Esecuzione in acciaio pregiato (parti della pompa in acciaio pregiato) / Specialstålutförande (pumpens delar av specialstål)

Druckstutzen / Delivery branch
Tubulure de refoulement / Tubería de impulsión
Bocchettone di mandata / Tryckstuts

Saugstutzen / Suction branch
Tubulure d'aspiration / Tubería de aspiración
Bocchettone di aspirazione / Sugstuts

Anschluß für Kavitationsschutz G3/8, 11 mm tief
Connection for cavitation protection kit 3/8" BSP, depth 11 mm
Raccord à protection anticavitation G3/8, prof. 11 mm
Conexión para modelo con protección contra cavitación G 3/8, prof. 11 mm
Collegamento per protezione anticavitazione G3/8, profondità 11mm
Anslutning med kavitationsskydd G3/8, djup 11 mm



Betriebswasseranschluß G3/4
Wahlweise: G3/4, 24 mm tief oder für Flansch nach DIN 2633 und ANSI-B16,5-1/2-150

Working-liquid connection 3/4" BSP
Optional: 3/4" BSP, depth 24 mm or for flange to DIN 2633 and ANSI-B16.5-1/2-150

Raccord d'eau de fonctionnement G3/4
Au choix : G3/4, prof. 24 mm ou bride selon DIN 2633 et ANSI-B 16,5-1/2-150

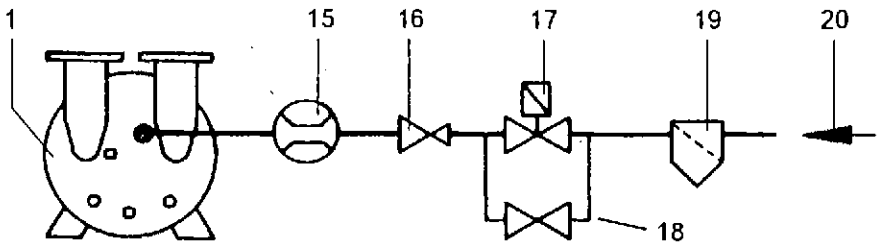
Conexión del liquido de servicio G3/4
Opcionalmente: G3/4, de 24 mm de prof. o para brida según DIN2633 y ANSI-B16,5-1/2-150

Collegamento per acqua G 3/4,
a scelta: G3/4 profondità 24 mm oppure per flangia sec. DIN 2633 e ANSI-B16,5-1/2-150

Driftvätskeanslutning G 3/4,
Valfritt: G3/4, 24 mm djup eller för fläns enl. DIN2633 och ANSI-B16,5-1/2-150

Entleerungsbohrungen G3/8
Discharge outlet 3/8" BSP
Orifice de vidange G3/8
Orificios de purga G 3/8
Foro di svuotamento G3/8
Tömningshål G3/8

Fig. 7 Rohranschlüsse / Pipe connections
Raccords de tuyauterie / Conexión de tuberías
Collegamento delle tubazioni / Röranslutningar



1 ELMO-F
15 Durchflußmesser (Option)
16 Stellventil
17 Magnetventil mit Motor gekoppelt:
(Motor an → Ventil auf)
(Motor aus → Ventil zu)
18 Bypaß mit Absperrventil
19 Schmutzfänger (Option)
20 Betriebsflüssigkeitszuführung
(z. B. Gewinderohr DIN 2440-DN 20)

1 ELMO-F
15 Flowmeter (option)
16 Control valve
17 Solenoid valve, coupled with motor
(Motor on → Valve open)
(Motor off → Valve closed)
18 Bypass with shutoff valve
19 Filter (option)
20 Working-liquid feed pipe
(e. g. threaded pipe DIN 2440-DN 20)

1 ELMO-F
15 Débitmètre (option)
16 Robinet de réglage
17 Electrovanne asservie au moteur
(Moteur en marche → Vanne ouerte)
(Moteur à l'arrêt → Vanne fermée)
18 Bybass avec robinet d'arrêt
19 Crépine (option)
20 Arrivée de liquide de fonctionnement
(tube fileté DIN 2440-DN 20)

1 ELMO F
15 Caudalimetro (opcional)
16 Válvula de regulación
17 Electroválvula acoplada al motor
(Motor en marcha → Válvula abierta)
(Motor parado → Válvula cerrada)
18 Derivación con válvula de cierre
19 Colector de impurezas (opcional)
20 Alimentación del liquido de servicio
(p. ej., tubo roscado DIN 2440-DN 20)

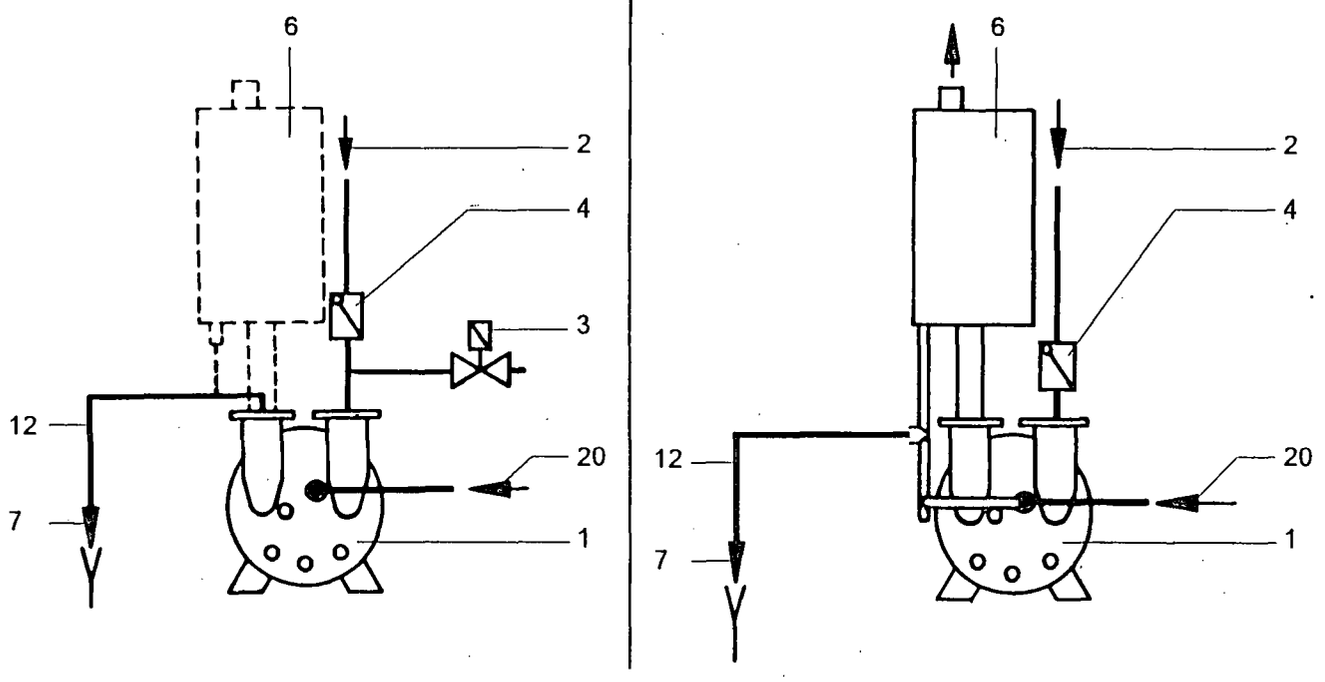
1 ELMO-F
15 Flussometro (opzionale)
16 Valvola di comando
17 Elettrovalvola accoppiata al motore
(Motore acceso → valvola aperta)
(Motore spento → valvola chiusa)
18 By-pass con valvola di intercettazione
19 Filtro (opzionale)
20 Adduzione del liquido di funzionamento
(per es. tubazione filettata DIN 2440-DN20)

1 ELMO-F
15 Genomflödesmätare (valfri)
16 Ställventil
17 Magnetventil kopplad med motorn
(Motor till → Vent. öppen)
(Motor från → Vent. stängd)
18 Shuntkoppling med spärrventil
19 Smutsuppsamlare (valfri)
20 Driftvätsketillförsel
(t. ex. gängat rör DIN 2440-DN 20)

Fig. 8 Empfohlener Betriebsflüssigkeitsanschluß
Recommended working-liquid connection
Raccordement recommandé pour le liquide de fonctionnement
Conexión recomendada del liquido de servicio
Collegamento consigliato per il liquido di funzionamento
Rekommenderad anslutning av driftvätska

Kühlschaltung
Cooling-circuit connection
Montage froid
Circuito frio
Circuito refrigerante
Kylkoppling

Schaltung mit Abscheider und teilweiser Betriebsflüssigkeitsrückführung
Connection with seperator and partial recirculation of working liquid
Montage avec séparateur et recyclage partiel du liquide de foncitionnement
Circuito con separador y reciclaje parcial del liquido de servicio
Circuito con separatoroe e recupero parziale del liquido di funzionamento
Koppling med avskiljare och delvis återmatning av driftvätska



1 ELM0-F
2 Saugleitung
3 Entlüftungsventil (Magnetventil)
4 Rückschlagklappe
6 Flüssigkeitsabscheider
7 Überlauf
12 Druckleitung
20 Betriebsflüssigkeitszuführung (beachte Fig. 8)

1 ELMO-F
2 Suction pipe
3 Vent valve (solenoid valve)
4 Non-return valve
6 Liquid separator
7 Overflow
12 Delivery pipe
20 Working-liquid feed pipe (s. Fig. 8)

1 ELMO-F
2 Conduite d'aspiration
3 Valve de purge (électrovanne)
4 Clapet de non-retour
6 Séparateur de liquide
7 Trop-plein
12 Conduite d'écoulement
20 Arrivée de liquide de fonctionnement (v. Fig. 8)

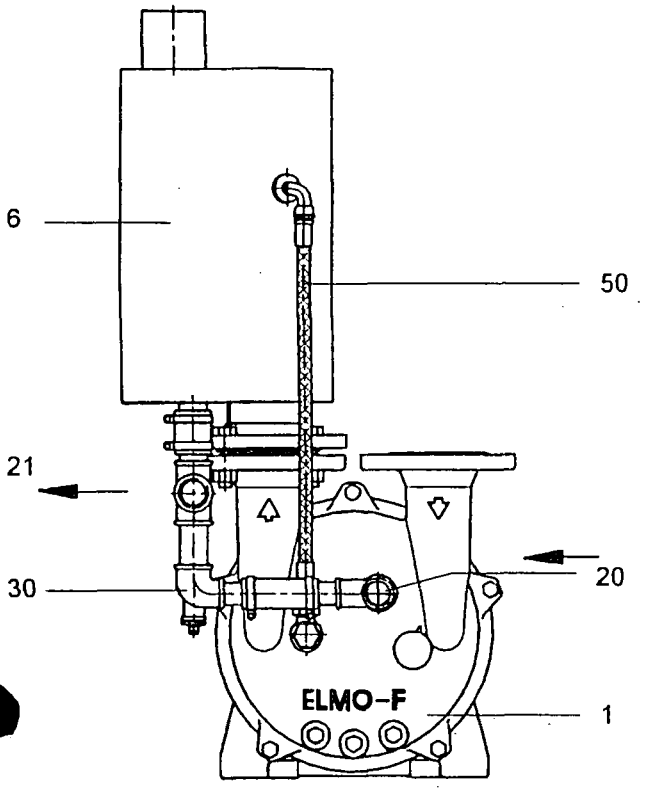
1 ELMO-F
2 Tubería de aspiracón
3 Válvula de purga de aire (magnética)
4 Válvula de retención
6 Separador del líquido
7 Rebose
12 Tubería de impulsion
20 Alimentación del líquido de servicio (vease Fig. 8)

1 ELMO-F
2 Tubo di aspirazione
3 Valvola di disaerazione (elettrovalvola)
4 Valvola di ritegno
6 Separatore del liquido
7 Tubo di supero
12 Tubo di mandata
20 Adduzione del liquido di funzionamento (ved. Fig. 8)

1 ELMO-F
2 Sugledning
3 Avluftningsventil (magnetventil)
4 Backventil
6 Vätskeavskiljare
7 Bräddavlopp
12 Tryckledning
20 Tillförsel av driftvätska (s. Fig. 8)

Fig. 9 **Möglichkeiten zur Zuführung der Betriebsflüssigkeit** (Schematische Aufbauskizzen)
Methods of supplying the working liquid (schematic diagrams of pump designs)
Possibilités d'alimentation en liquide de fonctionnement (représentation schématique)
Posibilidades de alimentación del líquido de servicio (representación esquemática)
Possibilità di adduzione del liquido di funzionamento (schema)
Två sätt att tillföra driftvätskan (schematiska principskisser)

Kunststoffausführung
Plastic version
Exécution en matière plastique
Modelo de plástico
Esecuzione in materia plastica
Plastutförande



1 ELM0-F
6 Betriebsflüssigkeitsabscheider
20 Zufuhr Betriebsflüssigkeit (s. Fig. 8)
21 Ablauf Betriebsflüssigkeit
30 Rohr bzw. Schlauch, vollständig
50 Kavitationsschutz-Anschlußschlauch

1 ELMO-F
6 Working-liquid separator
20 Working-liquid feed pipe (see Fig. 8)
21 Working-liquid discharge
30 Pipe or hose, complete
50 Connection tube for cavitation protection

1 ELMO-F
6 Séparateur de liquide de fonctionnement
20 Arrivée de liquide de fonctionnement (v. Fig. 8)
21 Ecoulement de liquide de fonctionnement
30 Tube ou flexible, complet
50 Tuyau flexible de raccordement de la protection anticavitation

1 ELMO-F
6 Separador del liquldo de servicio
20 Alimentación del liquldo servico (v. Fig. 8)
21 Orificios de purga del liquido de servicio
30 Tuberia o manguera, completa
50 Manguera de unión para la protección contra la cavitación

1 ELMO-F
6 Separatore del liquido di funzionamento
20 Adduzione del liquido di funzionamento (ved. Fig. 8)
21 Scarico del liquido di funzionamento
30 Tubo flessibile (completo)
50 Tubo di raccordo della protezione anticavitazione

1 ELMO-F
6 Driftsvätskefränskiljare
20 Tillförsel av driftsvätska (Fig. 8)
21 Driftvätskeutsläpp
30 Rör eller slang, komplett
50 Anslutningsslang för kavitationsskydd

Edelstahlausführung
Stainless steel version
Exécution en acier inoxydable
Modelo de acero inoxidable
Esecuzionein acciaio pregiato
Specialstålutförande

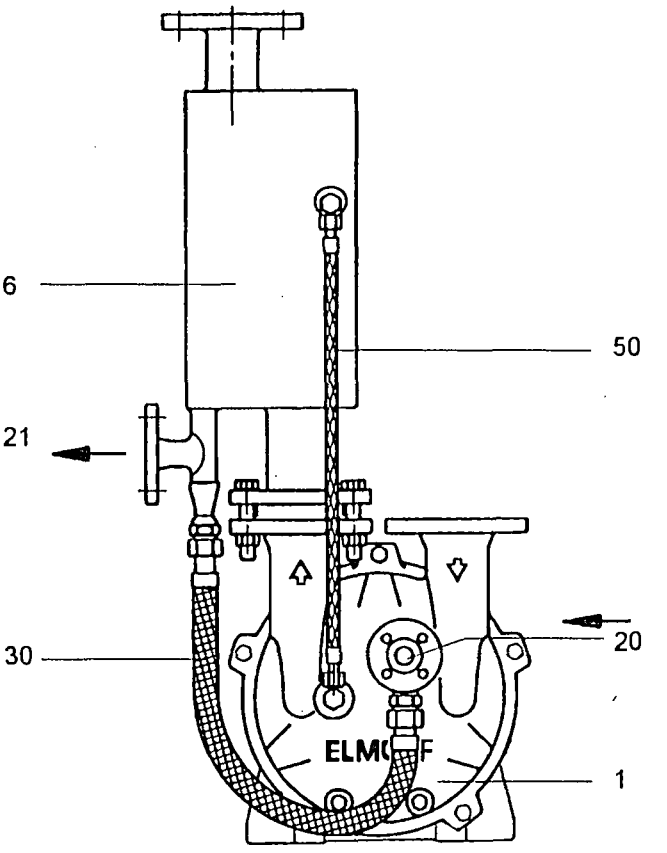
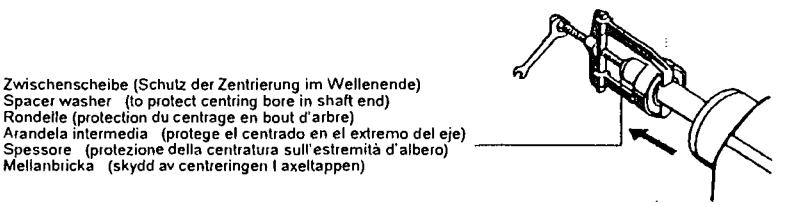


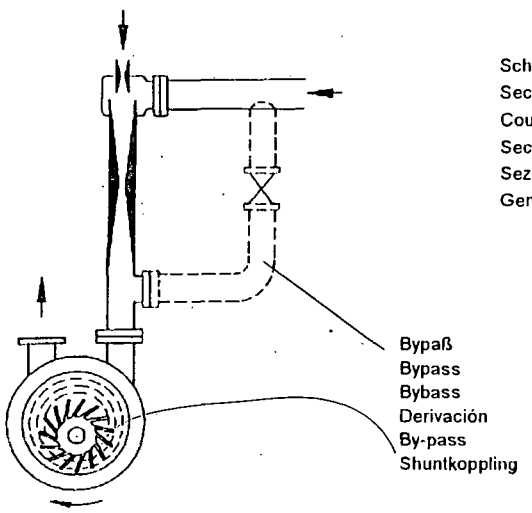
Fig. 10 ELM0-F mit Betriebsflüssigkeitsabscheider und Kavitationsschutz
ELMO-F unit with working-liquid separator and cavitation protection
ELMO-F avec séparateur de liquide et protection anticavitation
ELMO F con separador de liquido de servicio y protección contra cavitación
ELMO-F con separatore di liquido e protezione anticavitazione
ELMO-F med driftvätskeavskiljare och kavitationsskydd

Typ / Type / Tipo	007A DIN 625 Rillenkugellager AS Deep-groove ball bearing, D-end Roulement à billes côté D Rodamientos radiales rígidos LA Cuscinetti a sfere a gola profonda lato A Spårkullager AS		008A DIN 625 Rillenkugellager BS Deep-groove ball bearing, ND-end Roulement à billes côté N Rodamientos radiales rígidos LCA Cuscinetti a sfere a gola profonda lato B Spårkullager BS		027A Lagerdeckel Bearing cap Couvercle de palier Tapa del cojinete Coperchio cuscinetto Lagerlock	450A Lagerschild Endshield Flasque-palier Escudo portacojinetes Scudo del cuscinetto Lagerlock, yttre
	Kurzzeichen Abbreviation Réf. abrégée Código Sigla Förkortn.	Fettmenge Grease filling Qté de graisse Carga de grasa Quantità di grasso Fettmängd [g]	Kurzzeichen Abbreviation Réf. abrégée Código Sigla Förkortn.	Fettmenge Grease filling Qté de graisse Carga de grasa Quantità di grasso Fettmängd [g]	Fettmenge Grease filling Qté de graisse Carga de grasa Quantità di grasso Fettmängd [g]	Fettmenge Grease filling Qté de graisse Carga de grasa Quantità di grasso Fettmängd [g]
2BV5 161-....0 - . 2BV5 161-....2 - .	6313-JC3	45	6209-ZJC3	10	40	22
			6210-ZJC3	12		18
2BV5 131-....0 - . 2BV5 131-....1 - . 2BV5 131-....2 - .	6211-ZJC3	14	6209-ZJC3	10	21	22
2BV5 121-....0 - . 2BV5 121-....1 - .			6208-ZJC3	8		10
2BV5 121-....2 - .			6209-ZJC3	10		22
2BV5 111-....0 - . 2BV5 111-....1 - . 2BV5 111-....2 - .	6209-ZJC3	10	6208-ZJC3	8	18	10
2BV5 110-....0 - . 2BV5 110-....1 - .			6205-ZJC3	3		6
2BV5 110-....2 - .			6208-ZJC3	8		10



Zwischenscheibe (Schutz der Zentrierung im Wellenende)
Spacer washer (to protect centring bore in shaft end)
Rondelle (protection du centrage en bout d'arbre)
Arandela intermedia (protege el centrado en el extremo del eje)
Spessore (protezione della centratura sull'estremità d'albero)
Mellanbricka (skydd av centreringen i axeltappen)

Fig. 11 **Lagergrößen und Schmiertabelle** (Fettmengenangabe gelten nur für Schmierfett UNIREX N3)
Bearing sizes and lubrication table (grease filling values only apply for UNIREX N3)
Tailles de roulements et tableau de graissage (quantités de graisse valables seulement pour de la graisse UNIREX N3)
Tamaño de los rodamientos y tabla de lubrificación (la cantidad indicada rige solo para la grasa UNIREX N3)
Dimensioni dei cuscinetti e tabella lubrificazione (le quantità di lubrificante riportate in tabella valgono solo per il lubrificante UNIREX N3)
Lagerstorlekar och smörjtabell (uppgifter rörande fettmängd gäller enbart smörjfettet UNIREX N3)



Schematischer Schnitt durch den Arbeitsraum (in Richtung Pumpendeckel gesehen)
Section through the compression chamber (viewed in the direction of the pump cover)
Coupe schématisée de la chambre de travail (vue en direction du couvercle)
Sección esquemática de la cámara de operación (visto en dirección hacia la tapa de la bomba)
Sez. schematica della camera di compressione (vista vero il Coperchio della pompa)
Genomskärning av pumpkammaren, (sett mot pumplocket)

Fig. 12 **Betrieb mit Gasstrahler /Operation with gas ejector / Fonctionnement avec éjecteur à gaz Servicio con eyector de gas / Funzionamento con eiettore a gas / Drift med gasejektor**

Typ Type Tipo	Meßflächenschalldruckpegel / Measuring-surface sound-pressure level Niveau de pression acoustique / Nivel de presión acústica Livello di pressione sonora / Ljudtrycksnivå	
	50 Hz [dB (A)]	60 Hz [dB (A)]
2BV5 161	74	75
2BV5 131	73	77
2BV5 121	69	75
2BV5 111	68	74
2BV5 110	63	67

Fig. 13 **Meßflächenschalldruckpegel** nach DIN 45635, T 13 gemessen in 1 m Abstand bei mittlerer Drosselung und angeschlossenen Leitungen

Measuring-surface sound-pressure level to DIN 45635, Part 13 measured at distance of 1 m with average throttling and connected pipes

Niveau de pression acoustique selon DIN 45635, partie 13, mesuré à 1 m de distance pour un étranglement moyen et avec conduites raccordées

Nivel de presión acústica según DIN 45635, parte 13, medido a 1 m de distancia con estrangulamiento mediano y conductores conectados

Livello di pressione sonora sec DIN 45635, T13 misurato a 1m di distanza con strozzamento medio e condotti collegati

Ljudtrycksnivå enl. DIN 45635, T13, mätt på 1 m avstånd, medelstor strypning och anslutna ledningar

Typ Type Tipo	Einzelgewicht [1] ohne Betriebsflüssigkeitsfüllung Individual weight [1] without working liquid Poids [1] sans remplissage en liquide de fonctionnement Peso por unidad [1] sin liquido de servicio Peso singolo [1] (senza liquido di funzionamento) Enhetens vikt [1] utan driftvätska påfylld	
	Graugußausführung Cast-iron version Exécution mat. plastique Modelo de fundición gris Esecuzione in ghisa grigia Gråjärnsutförande	Edelstahlausführung Stainless steel version Exécution acier inox Modelo de acero inoxidable Esecuzione in acciaio pregiato Specialstålutförande
	ca / approx./aprox. [kg]	
2BV5 161	252	272
2BV5 131	185	192
2BV5 121	165	172
2BV5 111	105	111
2BV5 110	83	87

[1] Katalogtypen, bei Sonderausführungen sind höhere Gewichte möglich.

[1] Catalogue types, special versions may weigh more

[1] Types en catalogue ; les modèles spéciaux peuvent peser plus lourd

[1] Tipos según catálogo; los modelos especiales pueden pesar más

[1] Vale per tipi riportati nel catalogo; per esecuzioni speciali sono possibili pesi differenti

[1] Katalogtyper, specialutföranden kan väga mer

Auf Tragfähigkeit der Lastaufnahmemittel und Hebezeuge achten! Die Tragfähigkeit ist entsprechend dem Maschinengewicht auszulegen.
Observe the load carrying capacity of the load suspension devices and hoisting gear! The load carrying capacity must be in accordance with the machine weight.
Veiller à la portance des éléments de suspension et des engins de levage ! La portance devra être adaptée au poids de la machine.
¡Observar la capacidad de carga de los aparatos elevadores! La capacidad de carga se configurará según el peso de la máquina.
Assicurarsi che la capacità degli attrezzi di sollevamento sia sufficiente per il peso della macchina!
Se till att lyftdonen har erforderlig kapacitet! Deras bärförmåga skall räcka för maskinens vikt.

Fig. 14 **Gewichtsangaben**
Pump weights
Poids des machines
Pesos
Indicazione del peso
Viktuppgifter

Gewinde-ø / Thread-ø ø du filetage / ø de la rosca Filetto-ø / Gängdimeter		M4	M5	M6	M8	M10	M12	M16
Festigkeitsklassen / Strength classes Classes de résistance / Clases de resistencia Classi di resistenza / Hållfasthetsklasserna		5.6	5.6	8.8	8.8	8.8	8.8	5.6
Anziehdrehmoment / Tightening torque Couple de serrage / Par de apriete Coppia di serraggio / Åtdragningsmoment	[N m] ± 10%	1,4	3	8	20	40	70	100

Anziehdrehmomente für Schraubenverbindungen (nicht für elektrische Anschlüsse)
Tightening torques for screwed connections (not for electrical connections)
Couples de serrage des assemblages vissés (ne concerne pas les connexions électriques)
Pares de apriete para uniones atornilladas (no para conexiones eléctricas)
Coppie di serraggio per viti di attacco (non per allacciamenti elettrici)
Åtdragningsmoment för skruvförband (ej för elektriska anslutningar)

Gewinde-ø / Thread-ø ø du filetage / ø de la rosca Filetto-ø / Gängdimeter		M4	M5	M6	M8	M10		
Anziehdrehmoment / Tightening torque Couple de serrage / Par de apriete Coppia di serraggio / Åtdragningsmoment	[N m] ± 10%	1,0	2,2	3	7	11		

Anziehdrehmomente für Schraubenverbindungen der elektrischen Anschlüsse - Klemmenbrettanschlüsse (außer Klemmenleisten)
Tightening torques for screwed electrical connections - terminal board connections (except for terminal strips)
Couples de serrage des bornes de la plaque à bornes (ne concerne pas les borniers)
Pares de apriete para uniones atornilladas de las conexiones eléctricas en la placa de bornes (exceptuando las regletas de bornes).
Coppie di serraggio per le viti di attacco di collegamenti elettrici / dei portamorsetti (escluse morsettiere)
Åtdragningsmoment för de elektriska anslutningarnas skruvförband (utom på kontaktrader för hjälpanslutningar)

Fig. 15 **Anziehdrehmomente** (Die obigen Anziehdrehmomente gelten soweit keine anderen Werte angegeben sind!)
Tightening torques (The above tightening torques apply unless other values are specified!)
Couples de serrage (Les couples de serrage indiqués ci-dessus sont valables pour autant qu'aucune valeur spécifique ne soit donnée.)
Pares de apriete (Los pares indicados son válidos mientras no se especifiquen otro!)
Coppie di serraggio (Le coppie di serraggio indicate qui di sopra sono valide se non sono indicati altri valori!)
Åtdragningsmoment (Ovanstående åtdragningsmoment gäller om ej andra värden angivits!)

ENGLISH

Fault	Cause	Remedy
Motor doesn't start; no motor noise	At least two of the power supply leads are interrupted	Check the fuses, terminals and supply leads
Motor doesn't start; humming noise	One of the supply leads is interrupted Motor rotor is jammed Impeller faulty Motor bearing faulty	See "Motor doesn't start; humming noise" Decaleity ELMO-F s. 2.3.3 If necessary, drain and clean ELMO-F s. 2.3.2 Check and, if necessary correct impeller gap s.2.4* Replace impeller s. 2.3* and 2.4* Replace bearing s. 2.3* and 2.4*
Motor circuit-breaker trips when the motor is switched on	Winding short-circuit Motor overloaded Counterpressure in discharge too high Too much liquid compressant entrained ELMO-F stuck	Check the motor winding Reduce the liquid compessant flow Reduce the counterpressure Reduce quantity of compressant See under "Motor doesn't start; humming noise"
Power consumption too high	Lime or other deposits	ELMO-F Clean and remove deposits s. 2.3.3 und 2.1*, 2.2*
ELMO-F doesn't generate vacuum	No liquid compressant Severe leak in the system Wrong direction of rotation	Check supply of compressant is correct Repair any leaks in the system Reverse the direction of rotation by changing over two of the leads
ELMO-F produces to little vacuum	ELMO-F too small Liquid compressant flow too low Liquid compressant too warm (> 15 °C) Erosion Slight leak in the system Sliding ring packing leaking	Use a bigger ELMO-F Increase compressant flow to maximum value (2 times nominal value) Cool the compressant or increase compressant flow Replace relevant parts Repair the leak Check the mechanical seal s. 2.3* und 2.4*
Abnormal screeching noises	ELMO-F cavitation Liquid compressant flow too high	Connect cavitation protection line Check flow of liquid compressant and reduce it
ELMO-F leaking	Gaskets seals faulty	Check all gaskets and seals

Fig. 16 Faults and how to eliminate them (* = s. Repair Instructions 610.44 416.02)

ENGLISH

Spare parts (Fig. 17), available from the works (see order example)

001A	Motor casing, complete
002A	Pump casing
005A	Motor rotor
007A	Deep-groove ball bearing
008A	Deep-groove ball bearing
011A	Centering pin
018A	Spring washer
022A	Washer
026A	Bearing shield, D-end
027A	Bearing cap
030A	Centering pin for 035A
033A	V ring
035A	Mechanical seal
036A	Washer
037A	Centering pin
040A	Rating plate
041A	Bolt
042A	Terminal box, complete
047A	Impeller
048A	Tolerance ring for impeller
048B	Port plate
050A	Valve plate
051A	Intercepting plate
058A	Sealing ring
061A	Pump cover
064A	Plate for pump cover
065A	Protective plug
066A	Cap
068A	Screw plug
068B	Sealing ring
071A	Pipe for cavitation protection
072A	Washer for cavitation protection
078B	Screw plug
080A	Sealing ring
080C	Clamping plate
081A	Earthing screw
083A	Earthing bracket
083C	Foot
084A	Contact bracket
084C	Adhesive tape
085C	Cover
088C	Seal
102A	Washer
164A	V ring
165A	Stud bolt
300A	Washer
450A	Bearing shield, ND-end
455A	Spring strip
500A	Fan cowl
502A	External fan
503A	Screw
504A	Support sleeve
505A	Featherkey for external fan
511A	Terminal board
512A	Rubber plug
513A	Connecting bar
514A	Terminal clip
515A	Bracket
520A	Washer
544A	Terminal box, upper section (with cord seal)
571A	Clamping plate
582A	O-ring
584A	Terminal box, cover (with cord seal)
640A	Terminal board
648A	Adapter
654A	Seal
656A	Upper section
660A	Sealing plug
662A	Earthing
663A	Seal
665A	Cover
667A	Screw for terminal box cover
668A	Mark of conformity
674A	Lead
888E	Adapter plate

Normteile sind nach Abmessung, Werkstoff und Oberfläche im freien Handel zu beziehen.

Standard commercially available parts are to be purchased in accordance with the specified dimensions, material and surface finish.

Les pièces **normalisées** peuvent être obtenues dans le commerce d'après leurs dimensions, le matériau et l'état de surface.

Las piezas **homologadas** pueden adquirirse en el mercado indicando dimensiones, material y superficie.

Le parti di ricambio **normalizzate** circa dimensioni, materiali e superficie sono reperibili in commerico.

Standarddetaljer med önskade dimensioner, material och yta kan erhållas i öppna handeln.

160A 505A **DIN 125**

082A 548A 670A 087C 578A 675A 516A 651A 518A 653A **DIN 128**

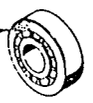
506A **DIN 471**

100A **DIN 580**

DIN 582

007A 008A **DIN 625**

Lagertyp
Type of bearing:
Type de roulement:
Tipo de cojinete:
Tipo di cuscinetto:
Lagertyp:



081C 161A 082C 458A **DIN 934**

006A **DIN 6885**

Siemens AG

Normteile sind nach Abmessung, Werkstoff und Oberfläche im freien Handel zu beziehen.

Standard commercially available parts are to be purchased in accordance with the specified dimensions, material and surface finish.

Les pièces normalisées peuvent être obtenues dans le commerce d'après leurs dimensions, le matériau et l'état de surface.

Las piezas homologadas pueden adquirirse en el mercado indicando dimensiones, material y superficie.

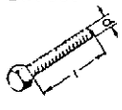
Le parti di ricambio normalizzate circa dimensioni, materiali e superficie sono reperibili in commerico.

Standarddetaljer med önskade dimensioner, material och yta kan erhållas i öppna handeln.

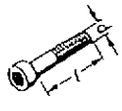
025A 650A
028A 652A
038B 655A
053A
063A
081C
086C
101A
451A
517A
518B
548B
578B
588B

DIN 931

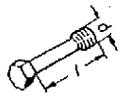
DIN 933



DIN 6912



DIN 7964



DIN 7985

Normteile sind nach Abmessung, Werkstoff und Oberfläche im freien Handel zu beziehen.

Standard commercially available parts are to be purchased in accordance with the specified dimensions, material and surface finish.

Les pièces normalisées peuvent être obtenues dans le commerce d'après leurs dimensions, le matériau et l'état de surface.

Las piezas homologadas pueden adquirirse en el mercado indicando dimensiones, material y superficie.

Le parti di ricambio normalizzate circa dimensioni, materiali e superficie sono reperibili in commerico.

Standarddetaljer med önskade dimensioner, material och yta kan erhållas i öppna handeln.

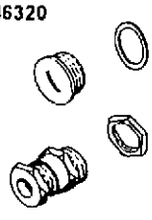
035A

DIN 24960

552A
658B

554A
658A
688D

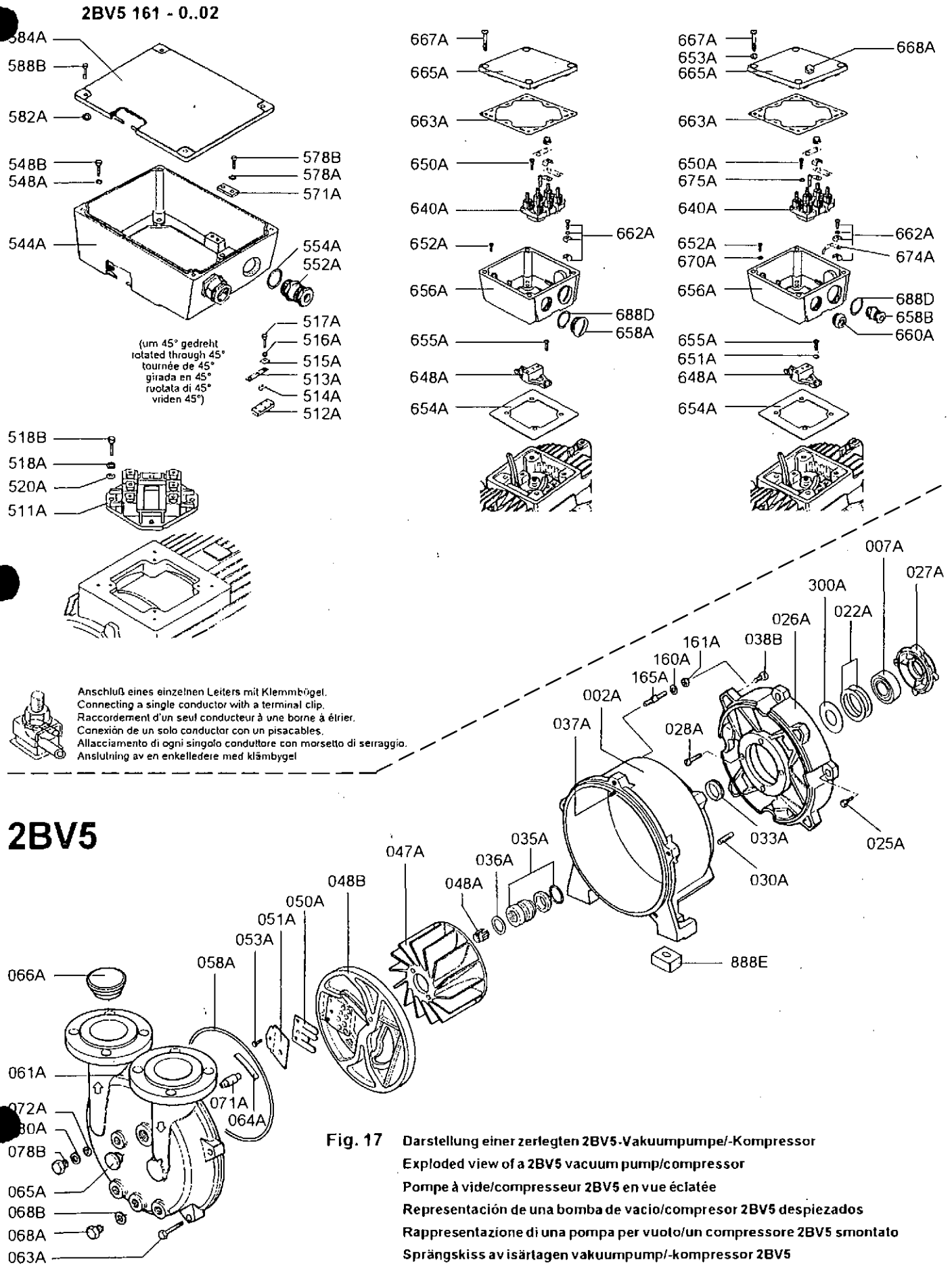
DIN 46320



Klemmenkasten in Normal- und *EEx e* - *Ausführung*
Terminal box in standard and *EEx e* design
Boite à bornes en exécution normale *exécution normale et EEx e*
Caja de bornes en ejecución normal y *EEx e*
Scatola morsetti in esecuzione normale ed *EEx e*
Uttagslåda in normalt och *EEx e* utförande

Klemmenkasten in Normalausführung
Terminal box in standard design
Boite à bornes en exécution normale
Caja de bornes en ejecución normal
Scatola morsetti in esecuzione normale
Uttagslåda in normalt utförande

Klemmenkasten in EEx e-Ausführung
Terminal box in EEx e design
Boite àbornes in exécution EEx e
Caja de bornes de la ejecución EEx e
Scatola morsetti in esecuzione EEx e
Uttagslåda i explosionsskyddat utförande EEx e

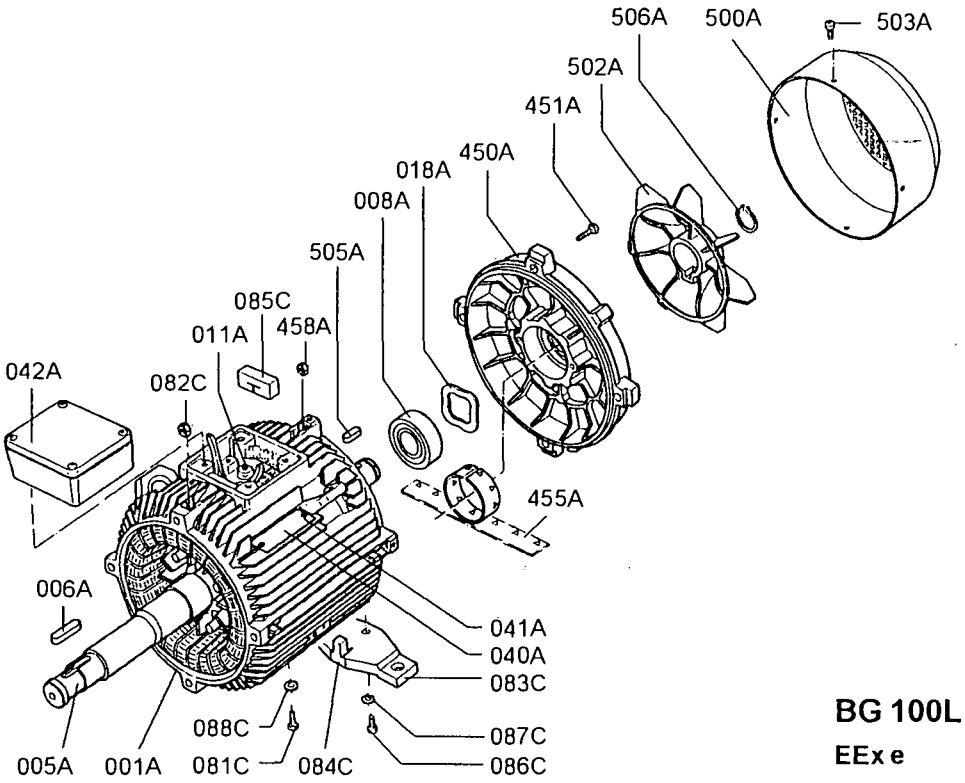


Anschluß eines einzelnen Leiters mit Klemmbügel.
Connecting a single conductor with a terminal clip.
Raccordement d'un seul conducteur à une borne à étrier.
Conexión de un solo conductor con un pisacables.
Allacciamento di ogni singolo conduttore con morsetto di serraggio.
Anslutning av en enkelledare med klämbygel

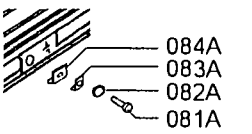
2BV5

Fig. 17 **Darstellung einer zerlegten 2BV5-Vakuumpumpe/-Kompressor**
Exploded view of a 2BV5 vacuum pump/compressor
Pompe à vide/compresseur 2BV5 en vue éclatée
Representación de una bomba de vacío/compresor 2BV5 despiezados
Rappresentazione di una pompa per vuoto/un compressore 2BV5 smontato
Sprängskiss av isärtagen vakuumpump/-kompressor 2BV5

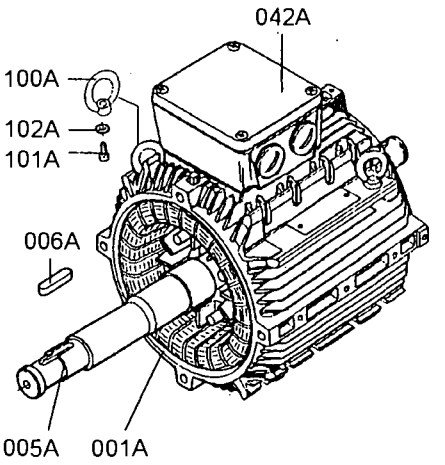
BG 100L ...112M
2BV5 110 - ....0.
- ....1.

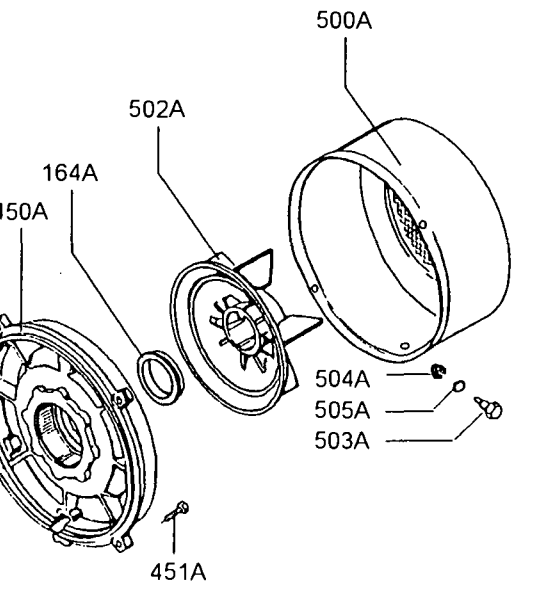


BG 100L ... 160L
EEx e

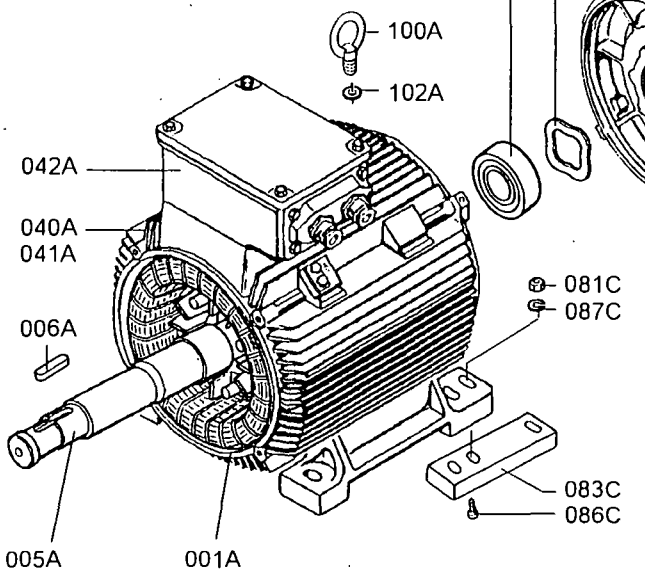


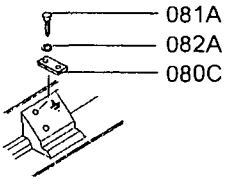
BG 132S ... 160L
2BV5 110 - ....2.
- ....3.
2BV5 111 - ....0.
- ....1.
- ....2.
2BV5 121 - ....0.
- ....1.
- ....2.
2BV5 131 - ....0.
- ....1.
- ....2.
2BV5 161 - ....0.





BG 180M
2BV5 161 - ....2.





BG = Motorbaugröße / Motor size / Dés. de carcasse du moteur / Tamaño del motor / Grandezza del motore / Motorstorlek

ENGLISH

Declaration of Clearance for the disassembly of vacuum pumps/compressors

For the purpose of repair work, we, the undersigned, hereby declare that vacuum pump/compressor:

Type ..... **Serial** (No E) .....

1) ☐ Did not come into contact with hazardous substances

1) ☐ Was located at.....
and came into contact with substances which are subject to identification requirements and detrimental to health. The vacuum pump/ compressor wascleaned thoroughly, both inside and outside and rinsed and completely drained in accordance with the operating instructions

1) ☐ Special safety precautions are not necessary for further handling

1) ☐ The following safety precautions are necessary:

1) ☐ DIN safety sheet(s) to DIN 52900 are enclosed

We assure that the above information is correct and complete and that shipment was carried out in accordance with the relevant statutory provisions.

Company ..... Tel ..... Fax .....

Address ..... Name ..... Position .....
(in block capitals)

Date ..... Company stamp, signature

1) tick where applicable

Fig. 18 Declaration of clearance for the disassembly of vacuum pumps/compressors

SIEMENS

EG-Konformitätserklärung

EC declaration of conformity / Déclaration de conformité CE / Declaración de conformidad CE
Dichiarazione di conformità alle direttive CE / EG-deklaration om överensstämmelse

Hersteller / Manufacturer / Constructeur / Fabricante / Costruttore / Tillverkare

Siemens AG **Geschäftsgebiet Antriebstechnik / Motors and Drive Systems Division**
Geschäftszweig Niederspannungsmotoren / Low-Voltage Motors
D-97615 Bad Neustadt / Saale

Produktbezeichnung / Product name / Désignation du produit / Designación del producto / Denominazione del prodotto / Produktbeteckning

ELMO-Flüssigkeitsring-Vakuumpumpen /-Kompressoren / ELMO-Liquid-ring vaccum pumps /- compressors
Pompes à vide/compresseurs à anneau liquide ELMO / Bombas de vacio / compresores hidrorrotativos para anillo liquido ELMO
ELMO pompe per vuoto/compressori ad anello liquido / ELMO vattenring- vakuumpump/-kompressor

Typ / Type / Tipo 2BV5 110, 2BV5 111, 2BV5 121, 2BV5 131, 2BV5 161

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinie überein:
The named product is in conformity with the requirements of the following European Directive:
Le produit sus-mentionné est conforme aux prescriptions de la Directive Européenne suivante :
El producto designado cumple con las prescripciones de las siguientes directivas europeas:
Il prodotto denominato corrisponde alle normative delle seguenti direttive CE:
Produkten i fråga överensstämmer med följande EU-direktiv:

89/392/EWG	Richtlinie des Rates zur Rechtsangleichung der Rechtsvorschriften der Mitgliedsstaaten für Maschinen geändert durch 91/368/EWG, 93/44/EWG und 93/68/EWG
89/392/EEC	Concil Directive on the approximation of the laws of the Member States relating to machinery amended by 91/368/EEC, 93/44/EEC and 93/68/EEC
89/392/CEE	Directive du Conseil visant l'harmonisation des législations des pays membres relatives aux machines modifiée par 91/368/CEE, 93/44/CEE et 93/68/CEE
89/392/CEE	Directivas del Consejo para la armonización de la legislación de los estados-miembro, relativa a maquinaria modificada por 91/368/CEE, 93/44/CEE y 93/68/CEE
89/392/CEE	Direttiva del Consiglio per l'unificazione delle normative dei paesi CE sulle macchine modif. da 91/368/EWG, 93/44/EWG e 93/68/CEE
89/392/EEC	Rådets direktiv för anpassning av medlemsstaternas rättsföreskrifter, ändrad genom 91/368/EEC, 93/44/EEC och 93/68/EEC

Die Übereinstimmung mit den Vorschriften dieser Richtlinie wird nachgewiesen durch die vollständige Einhaltung folgender Normen:
Conformity with the requirements of this Directive is testified by complete adherence to the following standards:
La conformité aux prescriptions de cette Directive est démontrée par la conformité intégrale avec les normes suivantes :
La conformidad con las prescripciones de estas directivas queda justificada por haber cumplido totalmente las siguientes normas:
La conformità prescritta dalla direttiva è garantita dall'adempimento a tutti gli effetti delle norme seguenti :
Överensstämmelse med dessa direktiv dokumenteras genom att följande standarder gäller utan inskränkning:

Harmonisierte Europ. Normen / Harmonised Europ. Standards / Normes europ. harmonisées
Normas europ. armonizadas / Norma CE omologata / Harmoniserade europ. standarder

EN 292-1 **EN 292-2** **EN 294** **EN 60204-1 /16** **EN 60034-5** **EN 1012-1** **EN 1012-2** **EN563**

Nationale Normen / National Standards / Normes nationales / Normas nacionales / Norme nazionali / Nationella standarder

DIN VDE 0530-1

Siemens AG
Produktionseinheit Strömungsmaschinen
Development and Manufacturing Vacuum Pumps and Compressors

Bad Neustadt / Saale, 9.11.94

(Karlheinz Lottig) — Leiter / Manager / Directeur / Director / Direttore / Chef

(Dr. Norbert Aust) — Technischer Leiter / Technical Manager / Directeur technique / Director técnico / Direttore técnico / Teknisk chef

Diese Erklärung bescheinigt die Übereinstimmung mit der genannten Richtlinie, ist jedoch keine Zusicherung von Eigenschaften im Sinne des Produkthaftungsgesetz.
This Declaration certifies conformity with the above-mentioned Directive, but gives no assurance of properties within the meaning of the Law Concerning Product Liability.
Cette déclaration certifie la conformité avec la Directive sus-mentionnée mais n'est pas une garantie de propriétés au sens de la loi sur la responsabilité du fait du produit.
Esta declaración certifica la conformidad con las directivas nombradas, pero no garantiza características según la ley de responsabilidad sobre productos.
La presente dichiarazione certifica soltanto la conformità alla direttiva sopracitata e non rappresenta una garanzia ai sensi della legge sulla responsibilità del produttore.
Denna deklaration bekräftar överensstämmelse med ovannämnda direktiv men får inte uppfattas som försäkran om egenskaper enligt krav i Lagen om produktansvar.

Fig. 19

SIEMENS

Angaben zur Sicherheit für durch elektrische Motoren angetriebene Vakuumpumpen, Kompressoren, Ventilatoren und Flüssigkeitspumpen.
Informationen - Hinweise - erforderliche Maßnahmen
Safety Aspects for Vacuum Pumps, Compressors, Fans and Fluid Pumps Driven by Electric Motors
Information, notes, required precautions (page 5)
Règles de sécurité applicables aux pompes à vide, compresseurs, pompes à liquides et ventilateurs entrainés par moteurs électriques
Informations, instructions, mesures imposées (page 8)
Indicaciones de seguridad para bombas de vacío, compresores, ventiladores y bombas de líquidos accionados mediante motores eléctricos.
Informaciones, indicaciones, medidas necesarias (pág. 12)
Indicazioni di sicurezza relative a pompe a vuoto, compressori, ventilatori e pompe a liquido azionate da motori elettrici.
Informazioni, avvertenze, provvedimenti necessari (pag. 16)
Säkerhetsuppgifter för vakuumpumpar, kompressorer, fläktar och vätskepumpar som drivs av elektriska motorer.
Informationer, anvisningar, erforderliga åtgärder (sid. 20)

Betriebsanleitung/Operating Instructions **EWN-Bestell-Nr./Order No.: 610.43083/21**

Ausgabe / Edition: 04.92

DEUTSCH

Inhalt:

BEGRIFFE

im Sinne aller mitgelieferten Betriebs- und Reparaturanleitungen und der Warnhinweise auf den Maschinen und Geräten selbst.

Betrieb

beinhaltet Aufstellung, Inbetriebnahme (Bereitstellung zur Nutzung), Bedienung (Betätigung, Ein- und Ausschalten, usw.)

Instandhaltung

beinhaltet Überprüfung und Pflege (Inspektionen, Revisionen), Wartung, Instandsetzung (Fehlersuche mit Reparatur).

⚠ ...WARNHINWEISE

⚠ **GEFAHR** bedeutet, daß Tod, schwere Körperverletzung oder erheblicher Sachschaden eintreten **werden**, wenn die entsprechenden Vorsichtsmaßnahmen nicht getroffen werden.

⚠ WARNUNG bedeutet, daß Tod, schwere Körperverletzung oder erheblicher Sachschaden eintreten **können**, wenn die entsprechenden Vorsichtsmaßnahmen nicht getroffen werden.

⚠ **VORSICHT** bedeutet, daß eine leichte Körperverletzung oder ein Sachschaden eintreten kann, wenn die entsprechenden Vorsichtsmaßnahmen nicht getroffen werden.

HINWEIS bedeutet, daß auf technische Zusammenhänge besonders aufmerksam gemacht wird, weil sie möglicherweise auch für Fachkräfte nicht offensichtlich sind.
Die Beachtung der nicht besonders hervorgehobenen anderen Transport-, Montage-, Betriebs- und Wartungshinweise sowie technischen Daten (in den Betriebsanleitungen, den Produktdokumentationen und an der Maschine selbst) ist jedoch gleichermaßen unerläßlich, um Störungen zu vermeiden, die ihrerseits mittelbar oder unmittelbar schwere Personen- oder Sachschäden bewirken könnten.

Qualifiziertes Personal sind Personen, die aufgrund ihrer Ausbildung, Erfahrung und Unterweisung sowie ihrer Kenntnisse über einschlägige Normen, Bestimmungen, Unfallverhütungsvorschriften und Betriebsverhältnisse, von dem für die Sicherheit der Anlage Verantwortlichen berechtigt worden sind, die jeweils erforderlichen Tätigkeiten auszuführen und dabei mögliche Gefahren erkennen und vermeiden können.
Unter anderem sind auch Kenntnisse in Erste-Hilfe-Maßnahmen erforderlich.

ALLGEMEINER HINWEIS

Diese Betriebs- und Reparaturanleitung enthält aus Gründen der Übersichtlichkeit und wegen der möglichen Vielzahl nicht sämtliche Detailinformationen und kann insbesondere nicht jeden denkbaren Fall des Betriebes oder der Instandhaltung berücksichtigen.

Sollten Sie weitere Informationen wünschen, oder sollten besondere Probleme auftreten, die in den mitgelieferten Betriebs- und Reparaturanleitungen nicht ausführlich genug behandelt werden, können Sie die erforderliche Auskunft über die örtliche Siemens-Niederlassung anfordern.

Wir weisen darauf hin, daß der Inhalt dieser Betriebs- und Reparaturanleitungen nicht Teil einer früheren oder bestehenden Vereinbarung, Zusage oder eines Rechtsverhältnisses ist, oder dieses abändern soll. Sämtliche Verpflichtungen von Siemens ergeben sich aus dem jeweiligen Kaufvertrag, der auch die vollständige und allein gültige Gewährleistungsregelung enthält. Diese vertraglichen Gewährleistungsbestimmungen werden durch die Ausführungen dieser Betriebs- und Reparaturanleitungen weder erweitert noch beschränkt.

ENGLISH

Contents:

TERMINOLOGY

In accordance with all supplied operating and repair manuals and the warnings on the machines and devices themselves.

Operation

encompasses the installation, commissioning (preparation for use) and controls by operator (actuation, switching on and off, etc.).

Servicing

encompasses the testing and preventive maintenance (inspections and overhauls), maintenance, corrective maintenance (troubleshooting with repair).

⚠ ...WARNING NOTICES

⚠ DANGER means that death, grievous injury or extensive damage to property **will** occur if the appropriate precautions are not taken.

⚠ WARNING means that death, grievous injury or extensive damage to property **may** occur if the appropriate precautions are not taken.

⚠ CAUTION means that minor injury or damage to property may occur if the appropriate precautions are not taken.

NOTE means that particular attention is drawn to the interaction of technical processes because they may not be obvious even to qualified personnel.
Even though not specifically mentioned, compliance with transport, assembly, operating and maintenance notes and technical data (in the operating manuals, the product documents or on the machine itself) is, however, equally crucial in order to avoid disruptions which might in turn directly or indirectly cause grievous injury or serious damage to property.

Qualified personnel are persons who, due to their training, experience and instruction and their knowledge of pertinent standards, specifications, accident prevention regulations and operating conditions, have been authorized by the party responsible for the safety of the system to carry out the activities necessary in each case and are capable of recognizing and avoiding possible inherent dangers in doing so. Among other skills, a knowledge of first aid is required.

GENERAL NOTE

In the interest of clarity and in view of the possible wealth of information, these operating and repair manuals do not detail every bit of information and, in particular, cannot discuss every possible operational or servicing-related situation.

If you wish additional information, or if specific problems arise which are not dealt with in sufficient detail in the operating and repair manuals supplied, you can request the information required through your local Siemens office.

The contents of these operating and repair manuals are neither part of, nor are they intended to alter a former or existing agreement, commitment or legal relationship. All obligations on Siemens' part arise from the pertinent purchase agreement, which also contains the complete and sole valid warranty terms. These contractual warranty terms are neither extended nor restricted by the statements made in these operating and repair manuals.

GENERAL INFORMATION, DESCRIPTION

Basic Information about Safety

⚠ DANGER **Due to their function-related electrical and mechanical properties, the machines can cause extremely serious damage to health and property if they are not used, operated and serviced as intended or if they are tampered with. It is therefore assumed that planning and execution of all mechanical and electrical facilities and transport, operation and servicing will be executed and supervised by responsible, qualified personnel.**

⚠ WARNING **When electric machines or devices are running some of their components are conducting dangerous electricity and/or are subjected to mechanical stress. The persons working on the machine and/or the device must be appropriately qualified. They must be thoroughly acquainted with the contents of these and all other operating and repair manuals provided. Correct, safe use of this machine and the device requires proper transport, proper storage, operation as intended and careful servicing. All notes and information on the machines or devices must be observed.**

APPLICATIONS, DESIGN, OPERATING MODE

NOTE: The electrical machines for which these operating manuals are intended are component parts of electrical power installations, units and equipment chiefly for industrial applications and have been constructed in accordance with the information specified on their rating and other plates, in certificates, order documents and catalogs, e.g. VDE 0530, IEC 34-1. Accordingly, the operating manuals contain basically only information pertaining to safety which must be observed when used as intended in industrial applications. The pertinent applicable national, local and system-specific specifications and requirements must also be taken into account.

The machines are also employed in **non-industrial** applications, however, i.e. in commercial or private sectors (e.g. the trades, farming, home and garden, etc.). If the safety precautions according to rating plate data and certificates are not adequate for these or special industrial applications due to special safety regulations or requirements, the operator of this machine or the manufacturer of the system, unit or device in which the machine is installed must make certain that these special safety regulations and requirements are complied with (e.g. by ordering special models of the machines, installing additional protective equipment, appropriate installation, etc.).

TRANSPORT, STORAGE

NOTE: Certain machines must be picked up only at the main lifting fittings provided for this purpose, at lifting lugs for example. Use hoisting tackle appropriate in terms of machine weight. Use suitable cable guides or spreading devices if the machine in the delivery state has any attachments, etc. fitted (see Operating Manual).

OPERATION AND MAINTENANCE

General Safety Notes

⚠ WARNING **To be safe, operation and servicing of the machine or device must be performed properly by qualified personnel who observe the warnings in these and other operating and repair manuals supplied and the notes on the machines and devices.**
In particular, the general standards for installation and safety (DIN and VDE for example), are to be followed for work on power installations, as are the standards for the proper use of lifting tackle and equipment and the use of personal protective equipment such as safety goggles, etc.

⚠ DANGER **Do not reach into the machine through air intake or discharge ports: The rotor is very dangerous. Keep in mind that, due to its rotating mass, the machine may continue to turn several minutes after being shut off. If the gas in the system has not expanded, the machine can start to rotate due to leakage through shut-off units.**

The rotor can cause injury even when the machine is switched off if the rotor is rotated manually.

INSTALLATION

⚠ CAUTION Under unfavourable operating conditions, parts of the housing may reach temperatures of over 80 °C, possibly necessitating the use of a touch guard - depending on the installation conditions. Note, too, that material being handled can be ejected at these temperatures through discharge ports and pressure control valves. Site these openings so that they are not directed towards personnel and flammable or explosive materials. Temperature-sensitive parts such as cables or electronic components are not to be placed next to or attached to parts of the housing or incoming or outgoing piping.
The machines can be installed in a dusty or damp location. The insulation is tropic-proof. Normally, no special protective measures are required to protect the machines against the weather when they are properly stored or installed out of doors. When instlling machines with the shaft in the vertical position, **EEx-e motors** require a cover to prevent foreign bodies from falling into the motor fan cowl (see EN 50 014/VDE 0170/0171, Part 1, Section III, 16.1). This cover must not hinder the cooling of the motor by its fan.
The vacuum pumps and compressors are only suitable for conveying dustfree air and other noncombustible, noncorrosive and nonexplosive gases, vapours or liquids.
Solids and contaminants must be removed before the intake port (intake filter).
The use of machines with **EEx-e drive motors** is permitted in rooms in which explosive gases are occasionally present. However, the conveyance of explosive gases and liquids is not permitted. The temperature class specified on the rating plate must be complied with.
Where machines with cooling by ambient air are involved, there must be unrestricted passage of the cooling air to and from the machines. The re-intake of heated exhausted air is not permitted.

⚠ WARNING **Ensure that water cannot enter the motor.**

Attention is drawn to the general requirements for **protection against contact** with moving parts such as pulleys.

CONNECTIONS

Comply with data in the manuals supplied. Connection cables must be selected according to the type of use and to the voltages and current levels at hand. Connect machine in accordance with the circuit diagram in the terminal box or - if the machine has no terminal box - in accordance with the separate circuit diagram.
Tighten the connection terminals of the machines to the torques stated in the terminal box.

⚠ CAUTION **To avoid danger, the feeder cables in the terminal box must be professionally connected. In particular, this means that:**

- the inside of the terminal box is clean and contains no cable remains
- protective conductor or protective earthing is connected
- all terminal lugs are tight
- the minimum clearances in air are adhered to (beware of protruding wire ends)
- unused penetrations are sealed and the cover elements are screwed in tight
- all sealing surfaces of the terminal box are in a proper state to maintain the type of protection. If tightness of the joints is achieved only with metal sealing surfaces, these have to be cleaned and then lightly lubricated.
- Before the initial start-up, connect liquid pumps and liquid ring pumps to the pipes provided so that no fluid can reach energized components.
- The material and dimensioning of all pipes, containers and fittings must be matched to the pressure and temperature conditions involved and must be suitable for the type of material to be conveyed.

⚠ CAUTION **There is a danger of bursts if the machine is subjected to impermissibly high pressure from the plant. Where applicable, suitable pressure-relief devices must be used to prevent this.**

⚠ CAUTION **Where pumps or compressors are involved which conduct hot or dangerous gases, vapours or liquids, or are operated with dangerous working liquids, or have to be emptied at temperatures over 60°C, all drain connections must be equipped with shut-off fittings and the material conveyed and/or the working liquids must be taken away in closed systems.**

"Dangerous" materials are, for example, materials which are hazardous to the health or the environment. Local statutory regulations are to be observed for their appropriate disposal.

COMMISSIONING

⚠ CAUTION **If the machine is started up without being connected or fastened, for example, for test purposes the initial torque of the motor may cause it to move suddenly and topple over.**

NOTE: For safe operation of the machine the following conditions as a minimum must be observed:

- The machine is assembled and operated in accordance with the data on the plate and, where applicable, with the documentation supplied (voltage, current, frequency, connection, model, type of protection, cooling method).
- When frequency converters are used, operating speeds are not to exceed those permitted according to plate data.
- The machine is properly assembled, aligned and connected to piping or hoses, as appropriate.
- The elevation of the installation location is taken into account when adjusting the pressure control valves.
- The drive elements are adjusted correctly for their type, e.g. belt tension if belt-driven, alignment of couplings.
- The cooling air circuit is not impaired; the cooling effect must also not be impaired by dirt on the cooling surfaces.
- The rotor can be rotated without it touching.
- The direction of rotation of the machine is as specified.
- All fastening screws/bolts, fasteners and electrical connections are tightened as specified in the operating manual or in the terminal box cover.
- The earthing and equipotential bonding connections have been made properly.
- Any supplementary equipment present (thermostat in coil, anti-condensation heater, etc.) are properly connected and operative.
- All measures have been taken to protect against contact with moving or energized parts.
- Any separate fans are ready for operation and are connected for the specified direction of rotation and do not impair the running smoothness of the machine during operation.

⚠ CAUTION **The intake ports must be sited so that no foreign elements can be sucked in and ejected through the discharge port (hazard for eyes and skin, danger of poisoning).**

⚠ CAUTION **When air is sucked in from the atmosphere, the intake ports must be covered with protective devices (gratings or the like) in order to prevent foreign elements including parts of the body and clothing from being sucked in.**

It is not possible for this listing to be exhaustive. Additional tests in accordance with other manuals or system-specific conditions may be required.

NOTE: To ensure that the machine is also permanently safe, the following precautions are recommended for commissioning and then at protracted intervals, initially after about 500 operating hours:

- Check whether all screw/bolt connections are tightened to the torques given in the operating manual.
- Make certain that cables and insulation parts - where accessible - are in good condition and are not discoloured.
- During operation, check for noises or vibrations at the bearings, end shields, covers and housing components.
- Switch off the machine if it is not running smoothly or is making abnormal noises; initiate immediate repair.
- If the machine is running satisfactorily, check the values for voltage, current and performance.
- As far as possible, monitor the temperatures of the bearings, etc., until the steady-state point is reached.

OPERATION

Safety Notes

⚠ WARNING **Covers which prevent contact with active or rotating parts or are required to direct the flow of air for effective cooling are not to be open during operation.**

⚠ WARNING **Sound pressure levels over 85 dB (A) may cause prolonged damage to health. Where applicable, suitable corrective action must be initiated.**

After protracted **machine shutdowns** the measures recommended under "Commissioning" in the section "Operation and Servicing" are to be performed as appropriate, depending on the length of the standstill period.

SERVICING

NOTE: Careful and regular inspections, overhauls and maintenance are required to detect any malfunctions at an early stage and to eliminate them before extensive damage results.

GENERAL SAFETY PRECAUTIONS

⚠ DANGER **Before any work is performed on the machine or equipment, especially covers over energized or moving parts are removed, the machine, item of equipment or system is to be properly disconnected from the supply. Apart from the main electrical circuits, particular attention is to be paid to any supplementary or auxiliary electrical circuits, especially anti-condensation heaters. Wait until the machine is at a standstill (coasting due to flywheel). See note on danger, page 5, 6.**

The standard safety rules, according to VDE 0105 for example, are:

- **disconnect from supply**
- **secure against re-actuation**
- **confirm de-energization**
- **cover or provide barriers for adjacent live components.**

⚠ DANGER **The above measures are not to be reversed until the machine has been completely assembled and the servicing concluded.**

⚠ CAUTION **The operational reliability of the machine can only be maintained if original parts or authorized replacement parts are used during every corrective maintenance and the repair manual is consistently adhered to.**

EWN 610.43083/21

ENGLISH

CORRECTIVE MAINTENANCE

⚠ WARNING **Repairs to EEx-e motors must be carried out in Siemens shops or acceptance-tested by an officially recognized expert.**

DISMANTLING

Sectional diagrams and representations in operating manuals and other manuals contain information regarding the technical design of normal machines and assemblies. However, special models and versions may deviate in technical details. If any uncertainty exists, we strongly recommend that you contact us, stating the machine type and serial number, or that you have the maintenance work performed at a SIEMENS service centre.

⚠ CAUTION **After fastening screws/bolts are removed, some parts are just held in centring fits. Even during proper dismantling it is still possible that some heavy parts may therefore suddenly become loose and drop off, possibly causing injuries and damage. Take suitable measures to secure all parts being worked on.**

ASSEMBLY

Joints that are sealed due to stringent requirements for type of protection must be resealed during assembly with a suitable non-hardening sealant (type: consult the proper operating and repair manuals).

If gaskets and sealing elements are installed to ensure the degree of protection, they must be examined and replaced if they are no longer effective.

⚠ CAUTION **Tightening torques are specified in the terminal box for bolted connections of electrical terminals. If these are not complied with, some cables may become loose and pose a danger.**

BRISBANE CITY COUNCIL

BROWNLEE STREET
PINKENBA
VACUUM SEWERAGE SYSTEM

SECTION 4 SEWAGE PUMPING EQUIPMENT

BRISBANE CITY COUNCIL

BROWNLEE STREET
PINKENBA
VACUUM SEWERAGE SYSTEM

4. SEWAGE PUMPING EQUIPMENT

4.1 Sewage Pumps

There are two Hidrostal model D100 - LO1RE sewage pumps electrical connected on a duty and standby basis.

Each pump is capable of operating the system at initial design capacity. When the sewage pumps are operating at the initial design flow rate they will pump continuously. During low flow periods the vacuum pumps will only operate infrequently, maybe once an hour.

4.2 Trouble Shooting - Sewage Pumps

Symptoms	Possible Cause	Remedial Action
Discharge pump running on after vessel empty	Stop level probe fouled	Remove probe and clean

4.3 Frequency of Operation

If sewage is being generated by the industrial development at the pumping station rated capacity then the sewage pumps will operate continuously. If inflow rates were able to exceed pump flow rate then the vacuum collection tank will fill, with the pump running, until the high sewage level probe stops the vacuum pumps and hence limits the sewage flow to the pumping station. Any excess flows will be temporarily stored in the system until the sewage pumps can pump the sewage to the treatment plant.

The maximum number of starts (per hour) will occur when the inflow to the pumping station is half the pump rate and this has been designed for 10 per hour ie 5 per hour on each sewage pump.

At times of extremely low flow the sewage pumps may only start once or twice per hour.

HIDROSTAL PUMPS

EDWARDS ENVIRONMENTAL ENTERPRISES P/L

CLIENT REF No: 244-20

WEIR/ENVIROTECH JOB No: 203398

WEIR ENGINEERING PTY LTD
A.C.N. 000 373 339
Envirotech

PARTS SERVICE AND SALES

WEIR ENVIROTECH - SOMERSBY
Steve Lenton/Sharon Gains

TELEPHONE (02) 43 49 2999
FACSIMILE (02) 43 49 2900

HIDROSTAL

D100-L01RE+DEXT2-MSSQ+NAB1-10

SERIAL No	TAG No
H2755 H2756	----------

INSTRUCTION MANUAL FOR HIDROSTAL - PUMPS

File BA/BAPM/TITELBL.PM5

TABLE OF CONTENTS

Part I

Hidrostal	INSTRUCTION MANUAL GENERAL	
Dat.: 23.05.96	No: 94-BA 5030E/2a	File: ALLG_E

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

i 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.

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).

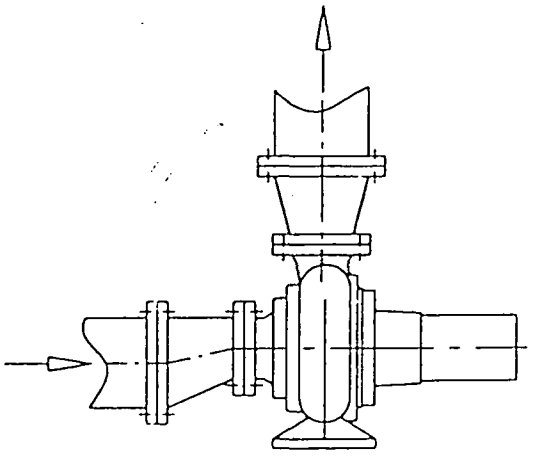


Fig. 1

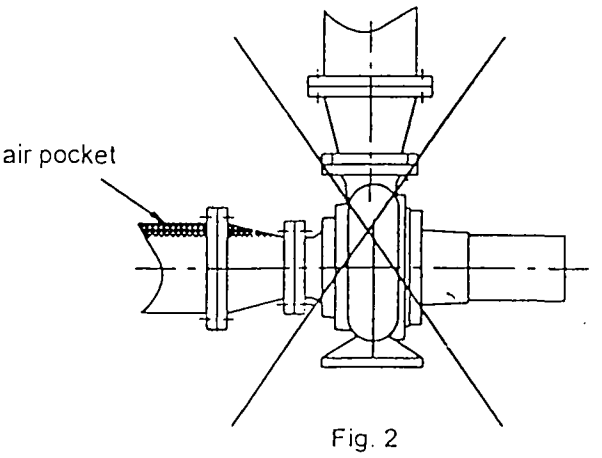


Fig. 2

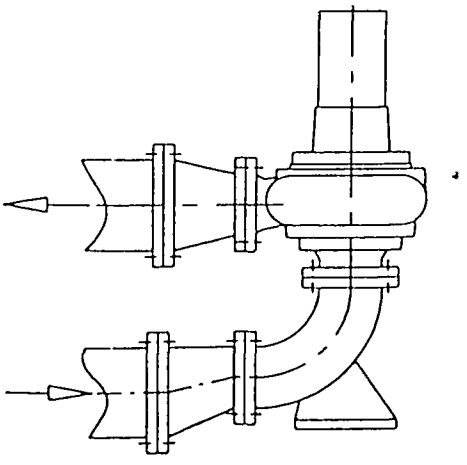


Fig. 3

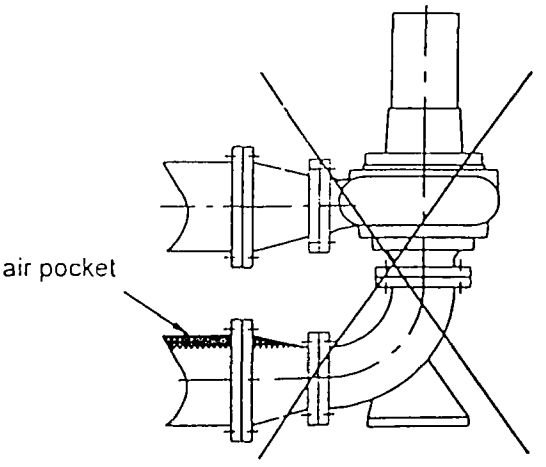


Fig. 4

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.

Midrostal	INSTRUCTION MANUAL IMMERSIBLE PUMPS	
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Part II

Hidrostal	INSTRUCTION MANUAL IMMERSIBLE PUMPS	
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2.0 INTRODUCTION

Each pump unit is equipped with a nameplate (Fig. 1) attached to the motor, containing all motor and pump data (section 2.1). It is essential to give the complete data for any inquiry about parts or service.

On motors approved for explosion-proof application, a special approval plate will be attached (Fig. 2).

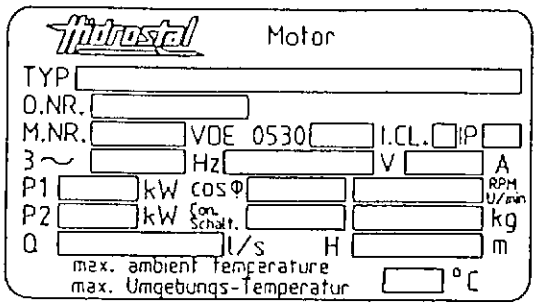

Fig. 1

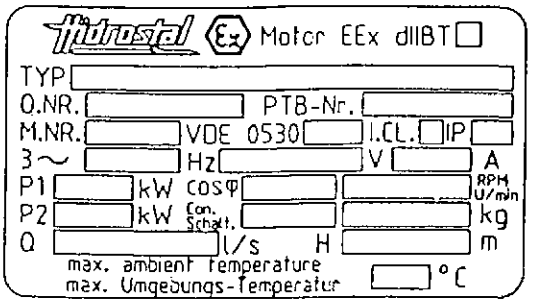

Fig. 2

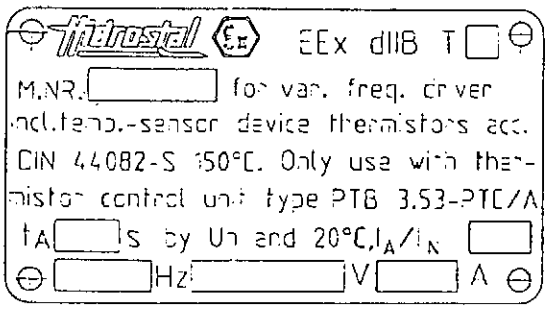

Fig. 3

HIDROSTAL three-phase motors for variable frequency driver, should be equipped with triple-thermistor according DIN - 44082 - S 150° C and will be marked with a separat name plate (Fig. 3).

The HIDROSTAL warranty is void unless the following requirements are met:

1. Temperature protection circuit is wired so as to positively disconnect power to the motor when excessive winding temperature is sensed (section 2.4.1.2f for wiring instructions).

2. Proper extra-quick-trip overload protectors M U S T be used on all three phases of each motor (section 2.4.1.2e).

3. Optional conductivity probe circuit is wired to a special relay for use with these motors. See section 2.4.1.3g for wiring instructions and a list of approved relays.

4. Any repairs must be made exactly as per instructions in this manual, and using only genuine HIDROSTAL replacement parts furnished through the HIDROSTAL distribution organisation. Use of any other parts will void the HIDROSTAL warranty.

Prior to shipment, each pump has been tested by the factory for proper mechanical and electrical operation as well as absolute water-tightness of the motor. Disassembly of the pump by other than official HIDROSTAL service centers may cause loss of any remaining warranty.

2.1 TYPE CODE EXPLANATION

MOTOR CODE

E K Y A 6 - M N E Q

Identification letter of the hydraulic size to which this motor can be assembled.
Die Grössen sind: B, C, D, E, F, H, I, L.

Identification letter of the cooling type of this motor.

K = Convection: aircooled, 100% dry running permissible (*).

E = Internal cooling: forced circulation of internally contained cooling liquid: heat transferred to pumped media (*/**).

F = External cooling: external source of cooling water (*/**).

* = immersible, submergence not required
** = jacketed stator

Motor size, according IEC-norms:

Size:	Z/0	Y/2	X/3	4	5	6	7
IEC:	90	100	132	180	225	280	315

Motor construction classification

Motor speed

		Nominal speed 50 Hz	Nominal speed 60 Hz
2	2 pole motor	3000	3600
3	two speed, 2/4 poles	3000/1500	3600/1800
4	4 pole motor	1500	1800
5	two speed, 4/6-poles	1500/1000	1800/1200
6	6 pole motor	1000	1200
7	two speed, 6/8-poles	1000/750	1200/900
8	8 pole motor	750	900
9	two speed, 8/10-poles	750/600	900/720

Hidrostal

INSTRUCTION MANUAL IMMERSIBLE PUMPS

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MOTOR-CODE, continued:

E K Y A 6 - M N E Q

Lower mechanical seal Pos. 515 (pump side) type

C = Fitted with Carbon-ceramic seal faces. Recommended for handling water, activated sludge and non-abrasive liquids.
M = Tungsten carbide - silicon carbide seal faces, rubber boot around springs. For sludges, slurries and abrasive liquids.
V = Fitted with converted carbon faces, for moderately abrasive liquids only.
N = Fitted with converted carbon faces, rubber boot, for moderately abrasive liquids only.
X = Tungsten carbide - silicon carbide seal faces, stainless steel shell for higher pump pressures and/or higher motor speeds.
G = Silicon carbide seal faces, rubber boot with outside spring.

Electrical classification:

N = Normal, per IEC IP58 norm (motor size 6 + 7: with moisture probes in seal chamber)

S = Normal with moisture probes

X = Explosion proof, per IEC: EEx d II, B T3 (or T4)

Voltage of winding (see nameplate):

A = 230/460 V 60 Hz
E = 400 V 50 Hz
G = 415 V 50 Hz
K = 575 V 60 Hz
1 = 220/230/240 V 50/60 Hz single phase
2 = 220 V 50 Hz
3 = 380/415 V 50 Hz
S = special voltage

Q = Q-hydraulic
K = K-hydraulic

CABLE CODE

N Y A 1 - 1 0

factory code (not important for instruction)

length in metres

2.2 INSTALLATION

WET PIT PUMPS

All building and technical construction work must be finished before the pump will be installed. Make sure that length of cable supplied is sufficient for local conditions.

For installation and servicing it is recommended to install a block and tackle or chain hoist over the pump sump (or at least make sure that it could be installed later on). There should be a water supply of about 4 bar (70 psi) pressure to wash down the pump when removed from the sump.

⚠ During the installation of the pump make sure that the free ends of the cables NEVER CONTACT WATER.

2.2.1 INSTALLATION OF PUMP GUIDE SYSTEM (Fig. 4)

a) Fasten the upper guiderail bracket. Be sure to leave enough space for sliding shoe.

b) Sump floor where the discharge stand is to be placed must be even and level. Fasten the discharge stand to the sump floor with cast-in-place or expansion-type bolts and nuts so that the guide rail pins or recesses on the discharge stand are vertically in line with (i.e. directly below) the guide rail pins on the bracket.

c) The guide rails should be made from galvanized standard (or stainless steel) pipe. Cut pipe to the correct length. Put lower pipe ends in discharge stand guiderail pins or recesses. Unbolt upper guide rail bracket. Insert pins into upper pipe ends and re-bolt it. Check to see that the guide rails are exactly vertical and parallel.

d) The discharge pipe must be connected without stress or misalignment to the discharge stand.

If a check valve is installed close to the pump, air must be vented from the pump casing or discharge piping (before the check valve) during first start-up to ensure priming (Section 2.2.3, Fig. 5).

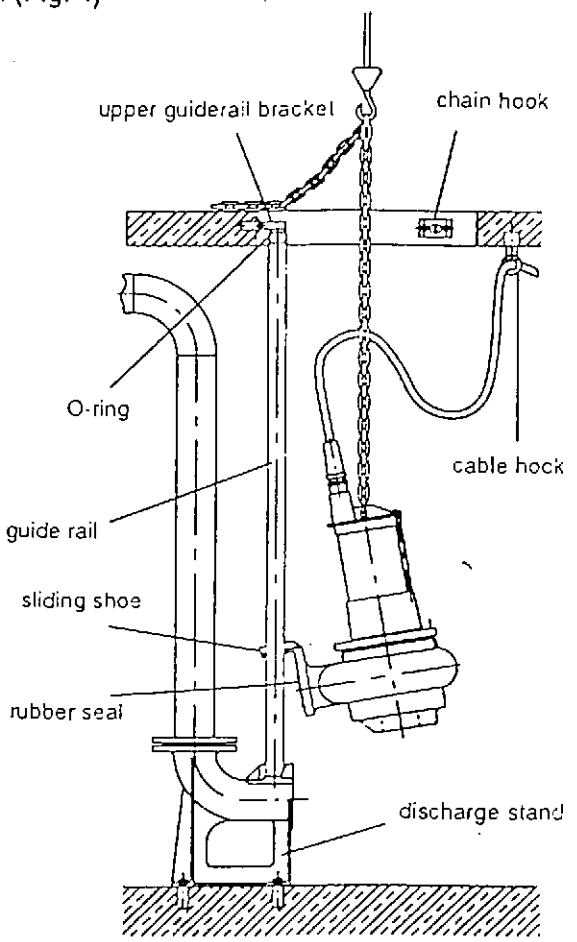


Fig. 4

2.2.2 PREPARATORY CHECKS

⚠ Before lowering the pump into the sump check to see that:

- The lifting chain or steel lifting cable is correctly fastened to the lifting eyes.
- The cable entry assemblies on motor have not been damaged or loosened and that the cables are firmly gripped by the cable entry assemblies.
- The cables have not been damaged during transportation or installation. Look especially for nicks and cuts on insulation; any damage penetrating through the outer layer of the cable will require replacement of them.
- The cables are long enough and that they can follow the pump unhindered.
- The cable ends have never come in contact with water.
- The rubber seal on the pump discharge is correctly seated in its groove, and is not damaged.
- The rubber seal is throughly greased.
- The direction of rotation is correct (Section 2.2.4, Fig. 6).

2.2.3 FLUSHING WATER CONNECTION

Pumps are supplied with a flushing water connection (service connection "F", Fig. 5).
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.

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; frequency of flushing must be established for each different installation.

The quantity of flushing water varies according to pumpsize and application: in most cases, flowrates of 6-8 l/min. will be sufficient.

Connection "F" may be used to manually bleed the air from the casing prior to start-up (Section 2.2.1d), if there is no other place for air to escape through the discharge piping.

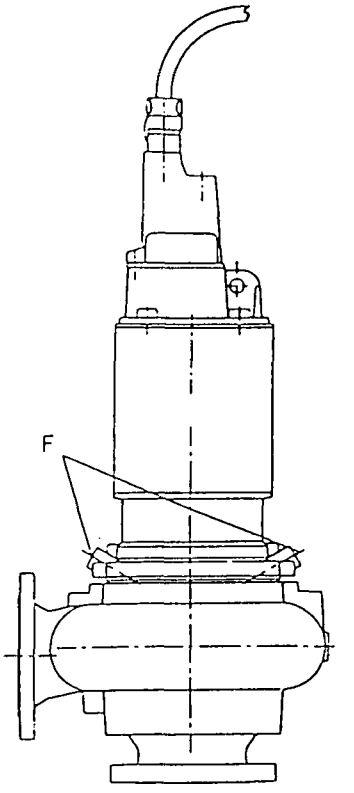


Fig. 5

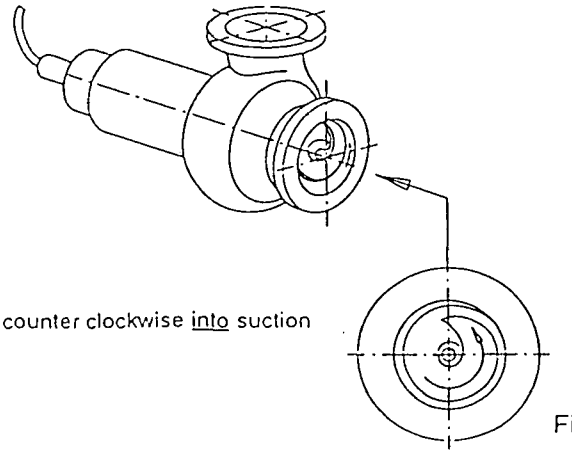
2.2.4 DIRECTION OF ROTATION

Before lowering the pump into the sump, make electrical connections as indicated in Section 2.4.2 and check the direction of rotation. This must be counter-clockwise viewed from suction end. Check impeller rotation by suspending pump from the lifting eyes, resting inclined on the floor, and start up for one second. The starting jerk should be counter-clockwise when viewed from the top of the motor (Fig. 6).

This procedure must be repeated for each speed, if units are multi-speed pumps.

CAUTION:

If rotation is not correct on multi-speed or multi-pump installations, change only the pump 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.



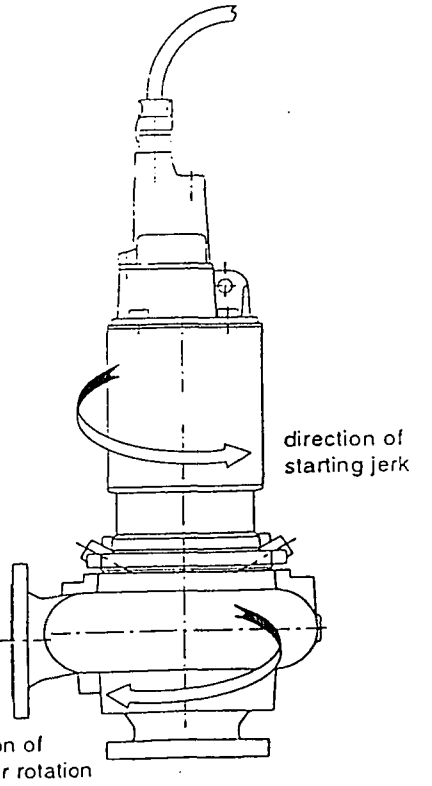
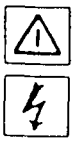


Fig. 6

2.2.5 LOWERING THE PUMP INTO THE SUMP

- Clear the sump bottom carefully of all building debris and other solid particles.
- Lubricate the rubber seal with grease.
- Lift and move the pump to a position directly over the guides until the sliding shoe fits correctly. Lower the pump steadily down to seat against the discharge stand. The sealing of mating faces is accomplished by the rubber seal that is incorporated in the sliding shoe attached to the pump discharge flange. This is pressed to the discharge stand (after the pump is in position) by the pump's own weight.
- When the chain is slack, unfasten it from the lifting device and fasten it to its retaining hook, so that there is as little slack as possible.



WARNING:
The chain and cable must be fastened reliably to their retaining hooks. If they come loose they may be drawn into the pump suction with severe destructive consequences.

2.2.6 DRY INSTALLED IMMERSIBLE PUMPS

HIDROSTAL immersible motors do not require submersion in liquid for cooling. They may be installed in dry locations. This is particularly advantageous for locations where occasional flooding may occur, as these motors will not be harmed thereby.

The electrical controls and pump power cable junction boxes must be placed above any expected water level. They should also be adequately sealed and/or vented to avoid internal condensation.

2.3 START-UP

The pump is ready to start when the following has been completed:

a) All construction debris has been removed from suction well.
b) Base plate or suction elbow is bolted to the foundation.
c) All rotating parts are found to turn freely by hand.
d) Motor has been checked for correct rotation, which is counter-clockwise looking into suction end (section 2.2.4).
e) Suction and discharge valves are OPEN.
f) All level controls are correctly set. The off-level is sufficiently high to prevent air entrance to the pump section.
g) Never run a pump dry, as the liquid in the pump serves as lubricant for close running surfaces. Damage may be caused to the pump if operated dry for extended period of time.
Note:
If installed with suction lift, the pump may be primed by using an ejector or vacuum pump. Vertically installed HIDROSTAL solids handling pumps will prime themselves if impeller tip is submerged in the pumping liquid, and an automatic air vent is connected to the pump casing or discharge pipe work (between pump and non-return valve).

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 pump 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 pressure with low flow or low discharge pressure with high flow. Bearing life is shortened and abrasive wear is accelerated in this operation condition.

OPERATING TROUBLES
See chart, Section 2.5.

2.4 ELECTRICAL CONNECTION

The motor winding leads will be factory-connected according specifications (see nameplate).

Make sure that the power supply to the control panel is the same as on the pump nameplates (tolerance +/- 5 %). From 5 % to 10 % lower voltage, there may be a slight diminishing of hydraulic performance and a slight increase in amperage, but no harm to the motor. For voltages lower than 10 % of rating, severe performance drop and excessive draw (motor overheating and considerable operating problems) can be expected. The motor ratings shown on the nameplate are for ambient temperature (liquid and air) of up to 40° C. For higher temperatures, contact factory.

All electrical connections are made according to electrical diagram.

2.4.1 PANEL CONTROLS

2.4.1.1 OPERATOR SAFETY

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.

2.4.1.2 MINIMUM REQUIREMENTS

The control panel must contain the following components:

a) Isolation switch, preferably lockable.

b) Slow trip fuses or circuit breakers in each incoming phase.

c) Lightning protection. Lightning arrestor on each incoming phase, if there is any possibility of lightning damage.

d) Motor starter. Full-voltage magnetic-contact starter has to be sized according to local electrical code requirements based on motor power rating.

e) Extra quick trip overload protectors. They must be selected according to the amperage indicated on the nameplate. They must trip within 6 seconds on locked rotor condition (approximately 6 times full load amps) in order to adequately protect the motor windings; consult "trip curve" of overload protectors to ensure they meet this requirement.

CAUTION:
Warranty on immersible pump motor is void unless proper extra quick trip overload protectors are used on all motor phases. Claims for warranty repair of motors must include documentation that proper overload protectors have been installed.

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f) Temperature sensor circuit. Each motor is manufactured with temperature limit switches in the winding-head (control leads 1 and 2). They are Bimetal type switches (similar to "Klixon"). They can be connected directly into the motor control circuit, as long as this circuit does not exceed 220/240 volts, 2,5 amps.

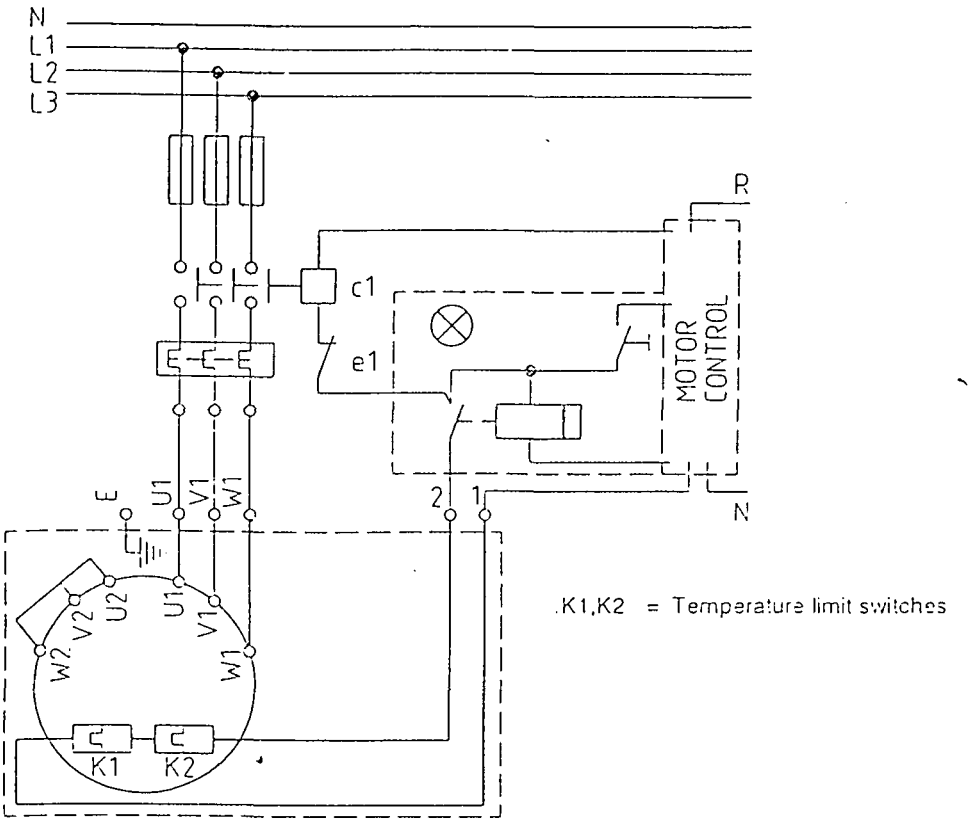
For variable frequency driver (Section 2.0) the motors should be equipped with triple-thermistor according DIN 44082-S 150° C. For Ex-proof motors this is prescribed and may only be used with thermistor control units type PTB 3.53-PTC/A.

As alternative (special order) thermistors can also be used for normal motors. All motors equipped with thermistor have a label at the end of the cable with the following words:

ATTENTION! Semiconductor switch! More than 2.5 Volt destroies the motor winding!

CAUTION:
Warranty is void if these leads are not connected to immediately de-energize the motor when their circuit is opened due to internal motor malfunction or temporary overheating.

g) Connections of the motor



K1,K2 = Temperature limit switches

For all immersible motors, the control lead 1 and 2 (temperature limit sensor) must be connected in such a way that the pump cannot automatically come on again, even after the temperature limit sensor (klixon) have cooled and re-closed the circuit. The cause of overheating must be determined and corrected before the motor is put back into service.

ATTENTION:
Note that the temperature sensors will only de-energize the motor when gradually overheated due to electrical malfunction. These devices are not a protection for quick temperature rise due to overload such as a locked rotor condition. They are not a sufficient substitute for the overload protectors specified in (e) above.

2.4.1.3 RECOMMENDED ADDITIONAL CONTROLS

a) "Hand - Off - Automatic" switch.

b) Low voltage terminals for level switches.

c) Pump-on and pump-failure lamps.

d) Hours run meter: Important to schedule service.

e) Change-over switch for multiple-pump stations.

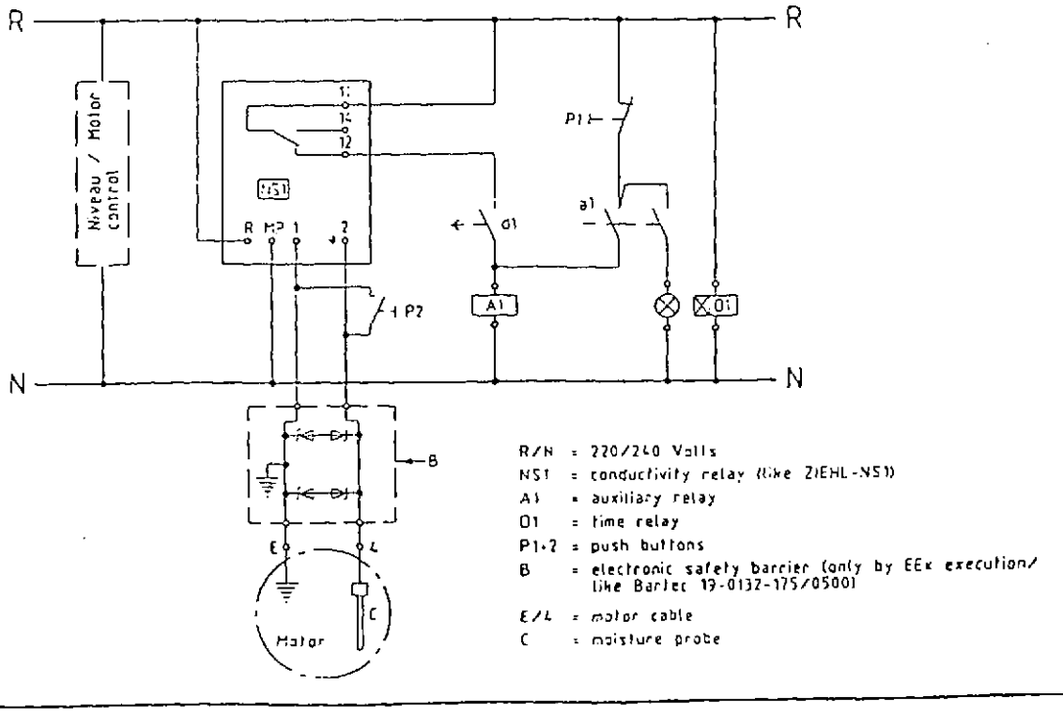
f) Alarm-system for high sump-level: Preferably on a separate power supply, to ensure continued protection in the event of a main power supply failure.

g) Relay for moisture probe fitted in oil chamber casing:
When connected to a suitable resistance-sensitive relay, the moisture probe in the oil chamber between the lower and upper mechanical seal can detect moisture in the oil, which could indicate failure of the lower seal. The relay should activate a suitable alarm to bring seal failure to the attention of the operator, who should then repair the lower seal as soon as possible. The pump will continue to operate even after failure of the lower seal (because the upper seal keeps water out of the motor); therefore, it is not necessary to have this relay shut the pump off.

⚠ CAUTION:
If a motor is fitted with a moisture probe, it must be connected to a suitable relay, otherwise Hidrostal will not accept warranty for additional motor repairs resulting from seal failure.

The following relays have been approved for use with HIDROSTAL motors:
- Ziehl NS1
- Fanal TR003 (NW)
- Schiele ENN
- Warrick 6B1FO or 6B2FO (USA)
- Chromalock-LCA

Suggested wiring diagram for moisture probe in oil chamber casing.



Hidrostal

INSTRUCTION MANUAL
IMMERSIBLE PUMPS

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Description of operation

The moisture detection system works by having a probe in the oil chamber casing. A voltage, not exceeding 24 V. is applied across the probe and the motor body (earth). When the chamber is full of clean oil, the oil acts as an insulator and no current flows.

In the event of a seal failure water will enter the oil chamber casing and mix with the oil until a point is reached whereby the insulation properties of the oil are reduced to a level which permits current to flow between E and 4. Thus, the failure light will be switch on. The electronic relay should ensure the light stays on independent of conditions in the oil chamber casing until reset button P1 is pressed. This is necessary, otherwise the light could be switched on and off as water settles/mixes in the chamber.

In order to avoid getting a false reading on the indicator light at the instant the power is switched-on, we recommend a time delay D1 be incorporated in the indicator light circuit.

NOTES:

If P1 is pressed when the motor is stopped and the light goes out, it indicates only a small amount of water is present in the oil chamber casing and has probably settled to the bottom, however if the light stays on the water quantity is significant and the pump should be attended to as soon as possible.

Reset button P2 is purely to check if the system is operative and should illuminate the indicator light if everything is in order.

WARNING:
This moisture detection system normally operates on an open-circuit and requires closure of the circuit to indicate a failure of the seal system: as a consequence it is NOT A FAIL-SAFE SYSTEM. Should one of the connections become loose or a cable is broken the system would still be an open circuit indicating no water was present in the oil chamber when the opposite could be the case.

2.4.2 CONNECTION TABULATION

Each cable set provides three or six power leads per speed, one earth lead and additional leads for temperature protection and seal failure circuits.

⚠ To connect the motor to the power supply it is not necessary to open it. This should be avoided in order to retain the original factory-hermetic seal.

If the sealing of the motor cover is disturbed, tightness tests must be performed as per Section 2.8.

Power leads of the motor are marked according to the following table:

MOTOR-TYPE	number of speeds	number of conductors (a)	speed (b)	winding connection (c)	markings on cable end, according DIN 42-401 norms
up to 4 kW, direct start	1	3+C+E		Y	U V W
over 4 kW star/delta start	1	6+C+E		Δ	U1 V1 W1 W2 U2 V2
two speed by Dahlander system Y/YY, direct start	2	6+C+E	N H	Y YY	1U 1V 1W 2U 2V 2W
pole change, each speed direct start	2	6+C+E	N H	Y Y	1U1 1V1 1W1 2U1 2V1 2W1
pole change, low speed: direct start, high speed: star/delta start	2	9+C+E	N H	Y 1) Δ	1U1 1V1 1W1 2U1 2V1 2W1 2U2 2V2 2W2
pole change, low and high speed with star/delta start	2	12+C+E	N H	Δ Δ	1U1 1V1 1W1 1U2 1V2 1W2 2U1 2V1 2W1 2U2 2V2 2W2

a) E = earth (yellow-green)
C = control leads

for normal motors: *
temperature protection circuit 1 to 2
seal failure circuit (optional) E to 4

for EEx (explosion proof) motors, with two-level temperature protection circuits: *
lowest, temperature regulator 1 to 3
highest, temperature limit switch 1 to 2
seal failure circuit (optional) see note

NOTE:
On EEx, seal failure circuit will always be in a separate cable originating near bottom of motor.
* If in doubt whether motor is normal or Ex-proof refer to Section 2.1.

b) N = low speed H = high speed

c) Y/YY = direct start (Dahlander) Δ = start possible by star/delta
1) = the starting current at this speed is lower than the starting current at high speed by star/delta.

2.4.3 LEVEL SWITCHES

- It is recommended to use an intrinsically safe circuit for the level controls, for 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.

2.4.4 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)

2.4.5 REQUIRED SUBMERGENCE

HIDROSTAL immersible pumps can work continuously submerged or in a dry environment. The motors do not require submergence in liquid for cooling.

⚠ **In the case of wet pit pumps the "OFF" level can therefore be set below the pump casing.**

However, care should be taken to provide sufficient submergence to avoid vortexing or pulling of air into the pump suction.

Priming of the pump will require the "ON" level to be at least as high as the tip of the impeller.

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2.5 OPERATING TROUBLES

POSSIBLE REASONS \ TROUBLE	No flow	Flow not sufficient	Head not sufficient	Reduction of flow or head after start up	Vibrations	Motor overload	Motor does not start	Noise
1. Pump not filled with water, 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. Not sufficient 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 clearances too high		X	X					
16. Damaged impeller		X	X		X			
17. Thermal overloads tripped; control switch off							X	
18. Motor damage					X	X	X	X
19. Low voltage		X	X			X	X	
20. Attachments loose					X			X
21. Coolant loss						X		
22. Bearings worn out					X			
23. Impeller out of balance					X			
24 On-level switch not overflowed, or damaged							X	
25. Impeller too small			X					
26. Impeller dragging against suction cover					X	X		X
27. Thick sludge and tight impeller clearance						X		
28. Air or gas on impeller backside	X		X					

2.6 MAINTENANCE AND SERVICE

2.6.1 GENERAL

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

The following checks (Section 2.6.3) can be done in the field. When a repair is indicated, send the pump unit to the nearest authorized Hidrostal service station.

CAUTION:
When disconnecting the power cable at the control panel, take care that the cable ends **CANNOT** come in contact with water. Replace the plastic cable-end shipped with the pump (if this is no longer available, wrap the cable ends inside a plastic bag, and seal with tape) for water-tightness during handling and shipping.

2.6.2 COOLING TYPES

HIDROSTAL immersible motors can be operated on continuous duty eigher submerged in the liquid or totally outside of the liquid (as in dry-pit installation).
There are different cooling systems used, depending on motor size and application (second digit of motor code gives cooling type).

KEY FOR SYMBOLS ON FIG. 7,8,9

MOT = Stator housing plug
OIL = Oil drain plug
R = Oil refill plug (cooling outlet, for code "F" only)
F = Flushing connection
X = Cooling inlet (for code "F" only)

CONVECTION COOLING - Code "K"
(Fig. 7)

This type transfers motor heat directly through the stator housing to the surrounding ambient liquid (if submerged) or to the air (if not submerged).

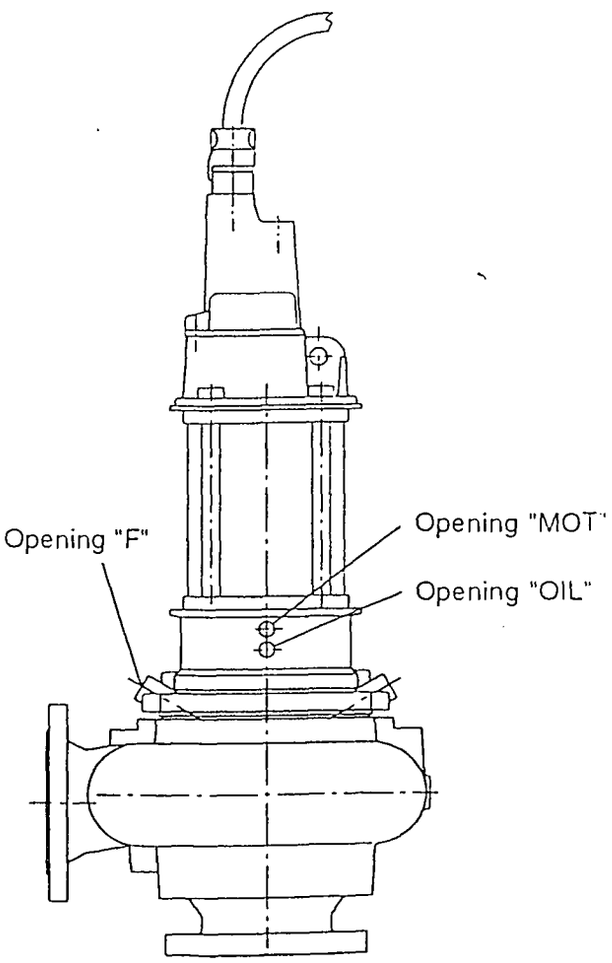

Fig. 7

INTERNAL COOLING - Code "E"
(Fig. 8)

This type transfers motor heat from the stator into a cooling oil which is circulated through a cooling jacket surrounding the stator housing.

The oil then transfers this heat to the pumped media through the motor seal chamber (pump backplate), which acts as a heat-exchanger. The oil is circulated by an impeller on the motor shaft.

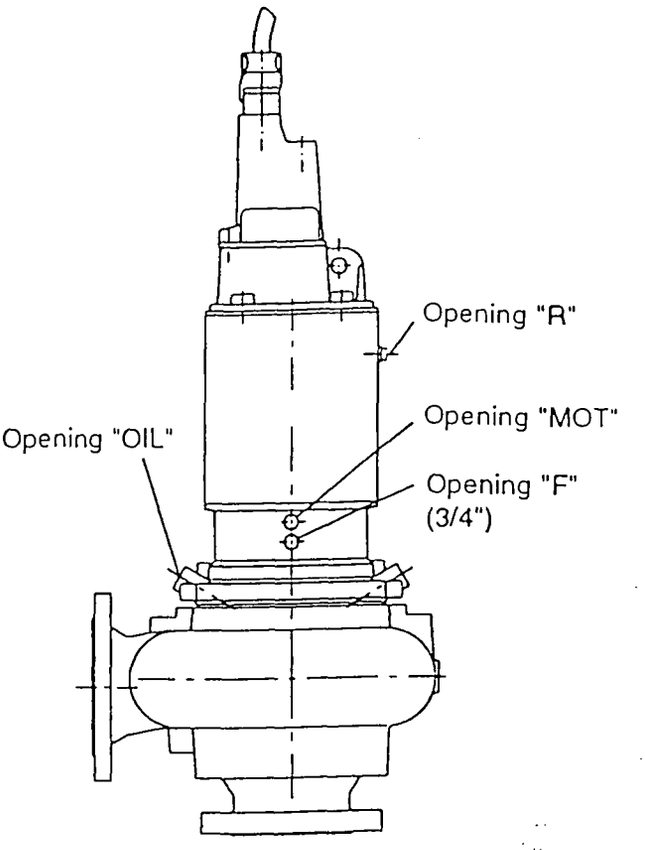

Fig. 8

EXTERNAL COOLING - Code "F"
(Fig. 9)

This type transfers motor heat from the stator into a coolant liquid circulating through a cooling jacket surrounding the stator housing. The coolant transfers this heat to an external heat exchanger, and it must be circulated by an external coolant pumping system.

This type is provided for cases where internal cooling is not sufficient, especially where the temperature of the pumped media is too high for effective cooling.

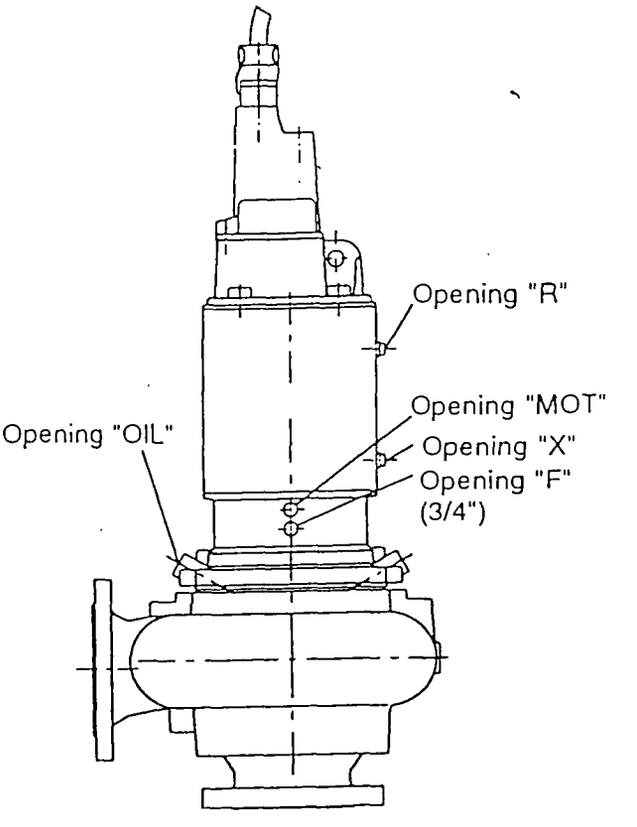

Fig. 9

2.6.3 FIELD TESTS

2.6.3.1 VISUAL CHECKS AFTER PULLING PUMP UNIT FROM SUMP

- Check pump and motor for possible mechanical damage. Pay attention to the cable.
- 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 insulation resistance of motor windings and cables with a high-voltage ohm-meter ("megger"). This initial test should be made from the point where the cables attach to the motor starter. Check from each winding lead to the other two winding leads and to the ground lead.

INSULATION CHART		
CONDITION OF MOTOR AND CABLES	OHM VALUE	MEGOHM VALUE
A new motor.	2'000'000 (or more)	2
A used motor which can be re-installed in the well.	1'000'000 (or more)	1
MOTOR IN PIT. Ohm readings are for cable plus motor. A motor in the pit in reasonable good condition.	500'000 - 1'000'000	0.5 - 1.0
A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.	20'000 - 500'000	0.02 - 0.5
A motor which has wet or damaged cable or windings. The pump should be pulled soon and repairs made to the cable or the motor dried and replaced. The motor will not fail for this reason, but it will probably not operate for long.	10'000 - 20'000	0.01 - 0.02
A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and repaired or the motor replaced. - The motor will probably not operate for long. - The motor will not run in this condition.	Less than 10'000 0	0 - 0.01 0

CAUTION:
Do NOT "Megger test" control leads when thermistors are fitted: Voltages over 2,5 V will cause thermistors to fail, and may destroy the winding.

Any reading less than 1.0 Megohm could indicate failure of cable or winding insulation. If failure is indicated, remove pump with cable and proceed to Section 2:8 for further tests.

2.6.3.2 MOTOR HOUSING TEST

This test consists of a check on the condition of the upper mechanical seal and/or motor housing "O"-rings.

Stand pump vertically on its suction flange. Remove plug "MOT" (Fig. 7, 8 or 9) with copper washer (536) so that any liquid can run out. Do the following repairs according to what comes out of the motor housings:

WATER MIXTURE WATER/OIL	}	General overhaul with change of bearings and seals
OIL	=	Change upper mechanical seal (Pos. 516)
NO LIQUID (DRY)	=	Stator housing is OK. No defect.

CAUTION:
This plug must be completely watertight. Sealing surfaces must be clean and smooth before assembly. Heat new copper ring to dull red and immediately quench in water to soften copper ring for best seal. All copper rings supplied by Hidrostal are pre-softened.

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2.6.3.3 OIL CHECKING ON IMMERSIBLE MOTORS

This is a check on the condition of the lower mechanical seal. For pump units supplied with a moisture probe, total failure of the lower seal will be indicated by activation of the resistance relay. A failure can be detected by the following oil check, even without this circuit.

Oil checking must be done after the first 1'000 hours of operation and once a year thereafter.

Immediately before checking, run the pump for a few minutes to distribute any impurities throughout the oil. Raise the pump out of the sump and clean it with a water hose.

Oil-level check

1. For pumps with cooling type "F" or "K" stand pump with shaft vertical and remove plug "OIL". Coolant level should be close to level of plug "OIL" (Fig 10).

2. For pumps with cooling type "E" stand pump with shaft vertical and remove plug "R". Oil-level should be close to level of plug "R" (Fig. 11).

If coolant-level is far below these levels, the lower mechanical seal may have leaked and may require replacement (section 2.9). If oil-level is only a few inches below these levels, top-up with new oil and re-check in 200 to 500 hours. Now proceed with following oil quality test.

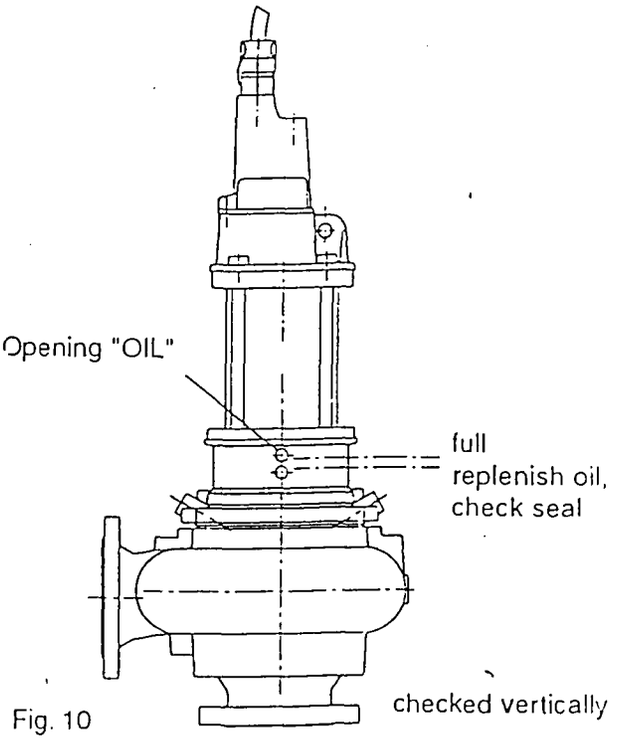

Fig. 10

Oil quality check

Lay pump down horizontally with plug "OIL" (536a) upwards. Insert a tube or rubber hose, place a finger over top of tube and remove it with a small sample. Repeat this procedure until a sufficient quantity has been collected for observation. Evaluation will show one of three conditions:

a) If oil is clear there are no problems with the lower seal. Top up with oil and close opening "OIL" with plug and a new copper seal. The copper sealing washer must be softened.

b) If there is just a little water in the oil but the oil is clear, repair of the pump is not necessary. Remove oil and separate water from oil (Section 2.6.3.4 or 2.6.3.5).

   Pour back the clean oil into the mechanical seal housing and close opening with plug "OIL" with softened copper seal (536). However, check oil quality again after 500 hours of operation.

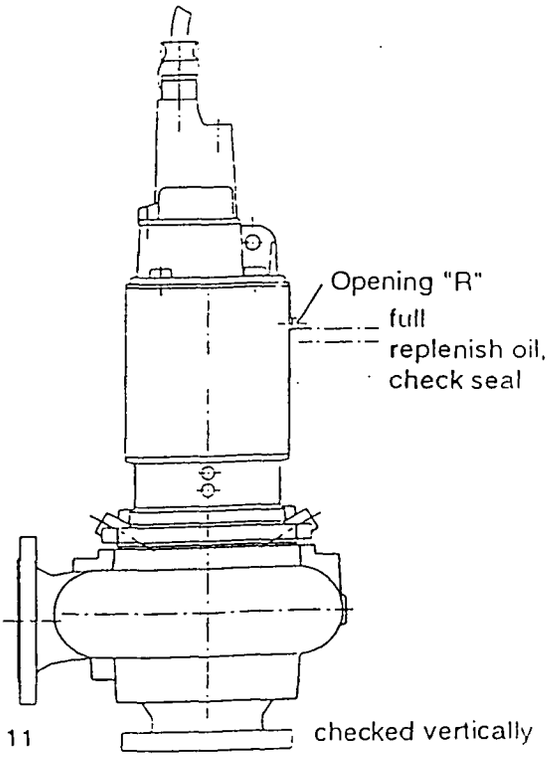

Fig. 11

With a new mechanical seal (515) it is possible that during the run-in period a small amount of water could enter into the oil chamber. Thus, if at the first check after start-up a small quantity of water is detected, it can be neglected.

Oil with a small amount of water will be milky in appearance, but will still be of very low viscosity, that is, it will still run much more freely than motor oil, almost as thin as kerosene.

c) If too much water has entered the oil, the viscosity will be much higher, then oil will be as thick as motor oil or even thicker. In this case, or when sludge or sewage smell are detected in the oil, the lower mechanical seal (515) must be repaired or replaced.

For oil removal as indicated in (b) above or for prior to a major repair, refer to Section 2.6.3.4 for all motors with 2nd letter in motor code "K" or "F". Refer to Section 2.6.3.5 for all motors with 2nd letter of motor code "E".

Replace oil with new oil only if strongly contaminated, otherwise separate water from oil and re-use oil. Required oil must be extremely low viscosity. Factory uses the following oil:

Specific gravity at 20° C	0.812	g/ml
Viscosity at 20° C	6.75	mm2/s (cst)
Viscosity at 40° C	3.52	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	

Other recommended oils:
Shell Pella A or S5585, Gulf mineral seal oil 896 or others with equal specification as above: The specified low viscosity is very important for proper cooling.

2.6.3.4 OIL CHANGE FOR CONVECTION OR EXTERNAL COOLED MOTORS TYPES "K" AND "F" (second letter of motor code)

Remove plug "OIL" (536a) and drain oil chamber casing (504) completely, by turning the pump around slowly until plug "OIL" is upside down (Fig. 12). On motor sizes 3/X, 4 and 5 there may be another plug directly below the "OIL" plug on the back cover (507) Opening this plug will help remove the last bit of oil.

When the oil chamber casing is completly empty stand pump vertically on suction flange and refill with separated or new oil. The correct level is reached when the oil is at the bottom of plug "OIL".

Re-install plug "OIL" with pre-softened copper ring.

2.6.3.5 OIL CHANGE FOR INTERNAL COOLED MOTORS TYPE "E" (second letter of motor code)

Remove plugs "OIL" and "R" (Fig. 13) and drain oil chamber casing and cooling jacket completely by turning the pump around slowly, until plugs "OIL" and "R" are upside down (Fig. 13). When oil has completely drained, re-install plug "OIL" with pre-softened copper ring. Place pump vertically.

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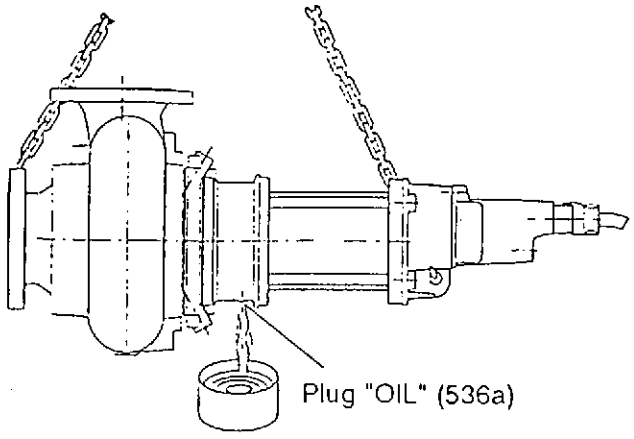

Fig. 12

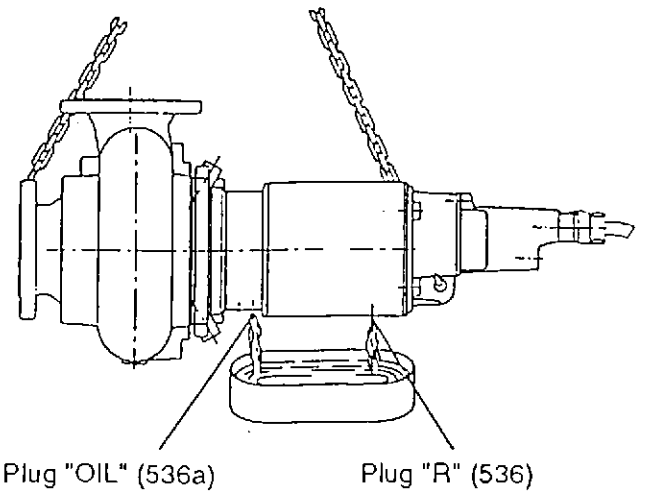

Fig. 13

Re-fill with separated or new oil of correct specification. The pump is full when the oil is flush with opening "R" (536) and the motor is in vertical position. Re-install plug "R", with pre-softened copper ring seal.

2.6.4 LUBRICATION

Hidrostal motors use bearings which are grease lubricated. For re-lubrication, grease is handpacked into the bearings when the motor is disassembled during a major overhaul. Sufficient grease is provided initially and at each overhaul to allow for the number of operating hours between overhauls ("Overhaul Chart", Section 2.8). The overhaul should be done by an authorized Hidrostal service center.

⚠ CAUTION:
The overhaul of Ex-proof-motors must be done in the factory or in an authorized Hidrostal service center, otherwise the Ex-certification will be invalidated.

No other lubrication service is required between overhauls for these motors.

For regreasing we recommend:

STABURAGS NBU 8 EP by Kluber-Lubrication.

This grease is of a mineral oil base containing a barium complex as thickener.

Typical characteristics:

⚠

Colour	beige	
Apparent dynamic visco. (approx.)	6000	mPas
Operating temperature range	-30..150	° C
Max. temperature (short time)	170	° C
Consistency class (NLGI)	2	
Penetration DIN ISO 2137 (0.1 mm)	280	
Dropping point DIN ISO 2176	> 220	° C
Corrosion protection DIN 51802	0	
RPM-parameter (n x d m)	5×10^5	

2.7 MOTOR CABLES

Whenever opening motor housing, it is imperative that all O-rings have to be replaced with new items supplied from HIDROSTAL. O-rings glued-up from bulk stock are totally unsatisfactory for this critical application; the glued joint will inevitably leak water into the motor after a short time.

If tests conducted through the cables in the field (Section 2.6.3.1) showed insufficient insulation resistance, and if humidity relay has not tripped (continuity exists between lead 1 and 2), it can be assumed that the insulation failure is in the cable rather than in the stator. Remove fasteners (509) and carefully lift off cable cover.

Cut the leads between cable and winding and now make a separate "megger" test on cable and winding. If windings are at fault, send the entire motor to the nearest authorized Hidrostal service station. If cable is at fault, a new cable set can be installed.

2.7.1 RE-CONNECTION OF CABLE

Place O-ring (525) into position around the seal face on cover (500). Cables should be re-connected to the winding leads, using new insulated splices. Take care that this insulation is rated for 110° C.

2.7.2 TEST FOR LEAKS

Before putting the pump back into operation after opening of the motor (as when changing cables), a test for leaks should be carried out as follows:

Connect source of dry air (from air compressor or bicycle hand pump) to opening left by removal of plug "MOT" (Fig. 7). Air pressure should be a maximum of 0.5 bar (7 psi). Motor should then be totally submerged in a test tank.

CAUTION:
Do not immerse loose end of cables.

If any continuously escaping bubbles are detected, motor cover is not water-tight. The preceding procedure for cable installation should be repeated to eliminate leaks.

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2.8 OVERHAUL CHART

CAUTION:
The overhaul of Ex-motors must be done in factory or in a authorized Hidrostal service center, otherwise the Ex-certification will be invalidated.

Motor type	motor-side seal	pump-side seal	seal oil ltr.	Hours between regreasing
CEYR2/CEYS2	1 1/2	1 1/8	2	30'000
DEYR2/DEYS2	1 1/2	1 1/8	2	20'000
CEYY2/CEYT2	1 1/2	1 1/8	2	30'000
DEYY2/DEYT2	1 1/2	1 1/8	2	20'000
BKZR2	25	20	1.2	30'000
BKZY2	25	20	1.2	30'000
BEZR2	25	20	2.8	30'000
BEZY2	25	20	3	30'000
CEZR2	25	20	2.8	30'000
CEZY2	25	20	3	30'000
DEXB2/DEXT2	1 1/2	1 1/8	8	25'000
DK3B2/DKXB2	1 1/2	1 1/8	4	25'000
DEXT2	1 1/2	1 1/2	10	25'000
DEXZ2	1 1/2	1 1/2	11	25'000
DEXW2	1 1/2	1 1/2	11	25'000
EE5S2	2	3	31	10'000
CKYX4/CKYT4	1 1/2	1 1/8	1	40'000
CKYY4	1 1/2	1 1/8	1	40'000
DKYX4/DKYT4	1 1/2	1 1/8	1	35'000
DKYY4	1 1/2	1 1/8	1	35'000
DEYR4/DEYS4	1 1/2	1 1/8	2	35000
DEYY4/DEYT4	1 1/2	1 1/8	2	35'000
BKZR4	25	20	1.2	50'000
CKZR4	25	20	1.2	50'000
CKZY4	25	20	1.2	50'000
CEZY4	25	20	3	50'000
DE3A4/DEXA4	1 1/2	1 1/8	8	45'000
DE3B5	1 1/2	1 1/8	8	45'000
DK3A4/DKXA4	1 1/2	1 1/8	4	45'000
EK3A4/EKXA4	1 1/2	1 1/2	5	45'000
EEXA4	1 1/2	1 1/2	9	45'000
EE3AU/EEXAU	1 1/2	1 1/2	9	45'000
EEXR4	1 1/2	1 1/2	10	45'000
EE3R5/EEXR5	1 1/2	1 1/2	10	45'000
FE3T4/FEXT4	2	2	13	40'000
EEXY4	1 1/2	1 1/2	11	40'000
EE3Y5/EEXY5	1 1/2	1 1/2	11	40'000
FEXZ4	2	2	14	40'000
FE4B4/FE4B5	2	2	24	40'000
FE4BU	2	2	24	40'000
FE4C4	2	2	28	40'000
EE4BU/EE4B5	2	2	24	40'000
EEWB4	2 1/2	2	24	40'000
EEWS4/EEWS5	2 1/2	2	24	40'000
FE4S4/FE4S5	2	2	28	40'000
FE4T4	2	2	28	40'000
FE5B4/FE5B5	2	2	38	35'000
HE5C4/HE5T4	3	3	44	35'000
HE6S4	95	3	42	20'000
IE7C4	100	100	94	18'000
IE7T4	100	100	94	18'000

Motor type	motor-side seal	pump-side seal	seal oil ltr.	Hours between regreasing
DKYX6	1 1/2	1 1/8	2	35'000
DKYY6/DKYT6	1 1/2	1 1/8	2	35'000
DEYR6/DEYS6	1 1/2	1 1/8	2	35'000
EEYR6/EEYS6	1 1/2	1 1/8	2	35'000
EEYY6/EEYT6	1 1/2	1 1/8	2	35'000
DK3A6/DKXA6	1 1/2	1 1/8	4	50'000
EK3A6/EKXA6	1 1/2	1 1/2	5	50'000
EK3R7/EKXR7	1 1/2	1 1/2	5	50'000
EEXA6	1 1/2	1 1/2	9	50'000
EE3R6/EEXR6	1 1/2	1 1/2	10	50'000
EE3R7/EEXR7	1 1/2	1 1/2	10	50'000
FEXT6	2	2	13	50'000
EE3Y7/EEXY7	1 1/2	1 1/2	11	50'000
FEXZ6	2	2	14	50'000
FE3Z7/FEXZ7	2	2	14	50'000
FE4A6/FE4A7	2	2	23	50'000
HE4B6	2	2	28	50'000
HE4S6	2	2	32	50'000
FE4S7	2	2	28	50'000
HE4S7	2	2	32	50'000
HE5B6/HE5B7	3	3	44	45'000
HE5S6/HE5S7	3	3	44	45'000
HE6S6/HE6S7	95	3	42	35'000
IE5S6	3	3	47	45'000
IE6SV	95	3	68	35'000
IE6S6	95	3	68	35'000
IE7C6	100	100	94	35'000
LE7T6	100	100	106	35'000
DKYX8/DKYT8	1 1/2	1 1/8	1	35'000
DKYY8	1 1/2	1 1/8	1	35'000
DEYR8/DEYS8	1 1/2	1 1/8	2	35'000
EEYY8/EEYT8	1 1/2	1 1/8	2	35'000
EK3R8/EKXR8	1 1/2	1 1/2	5	50'000
EE3R9/EEXR9	1 1/2	1 1/2	10	50'000
FEXT8	2	2	13	50'000
FK3T8/FKXT8	2	2	8	50'000
FE3Z8/FEXZ8	2	2	14	50'000
FE3Z9/FEXZ9	2	2	14	50'000
FE4A9/FE4B9	2	2	23	50'000
HE4B8/HE4B9	2	2	28	50'000
HE4S8/HE4S9	2	2	32	50'000
HE5B8	3	3	44	45'000
HE5B9/HE5S9	3	3	44	45'000
IE5S8	3	3	47	45'000
IE6SW	95	3	68	30'000
IE6S8	95	3	68	30'000
LE7C8	100	100	106	30'000
LE7T8	100	100	106	30'000

2.9 REPLACEMENT OF MECHANICAL SEAL

2.9.1 REMOVAL OF LOWER MECHANICAL SEAL (515)

a) Eposed-spring seal - type "C" + "V"
(Fig. 14)

Remove snap ring (Seeger, 546). Make sure the Woodruff key groove 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.

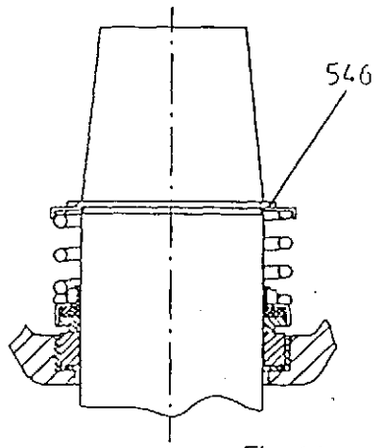


Fig. 14

b) Rubber-boot seal - type "M"
(Fig. 15)

Remove retaining ring "A" from the rubber boot of the seal by gently prying with two screwdrivers on opposite sides, between the rubber boot and the retaining ring (Fig. 16).

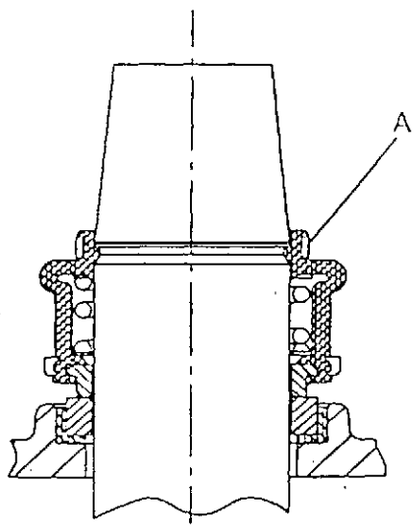


Fig. 15

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

Rather, lay some convenient object onto back cover (backplate), to act as a fulcrum for each screwdriver, and pry ring directly up away from rubber boot (Fig. 16).

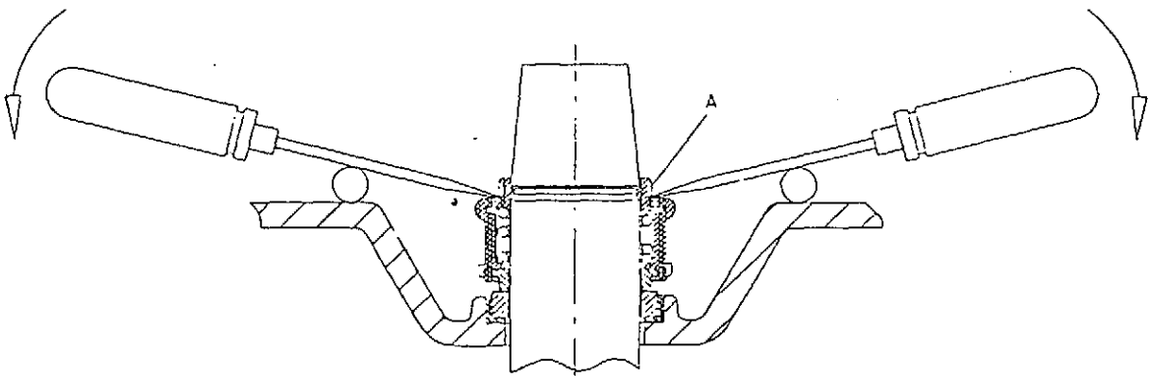


Fig. 16

Make sure the Woodruff key groove has no sharp edges so that the rubber parts cannot be damaged as they are removed. Gently insert a screwdriver between the shaft and the rubber boot.

By lifting and turning the screwdriver around the shaft, the lip of the rubber boot can be lifted out of the shaft groove. Lubrication of the shaft and the boot helps this disassembly. Once the boot is free of the groove, the entire rotating part of the seal with boot can be pulled off the shaft. If necessary, use two screwdrivers deep into the seal to pry the seal face loose (Fig. 17).

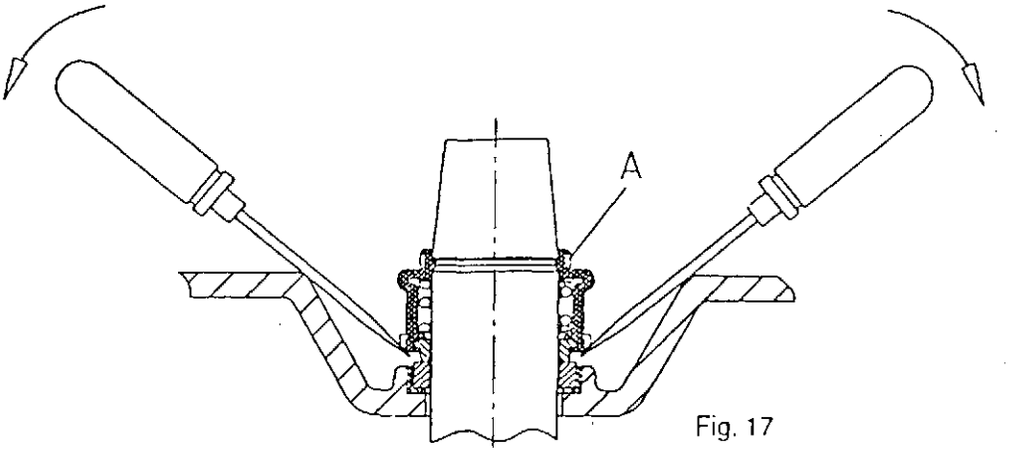


Fig. 17

c) Rubber-boot seal - type "N" (Fig. 18)

Pull out the removable part (A) by hand.

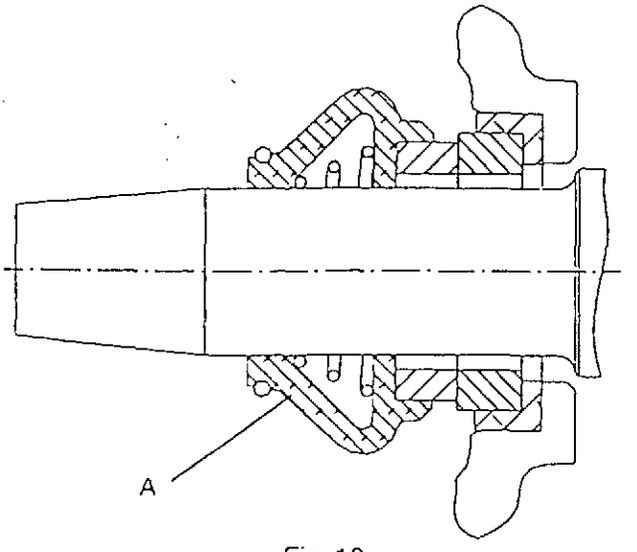


Fig. 18

d) Rubber-boot seal - type "G" (Fig. 19)

Pull out the removable part (A) by hand.

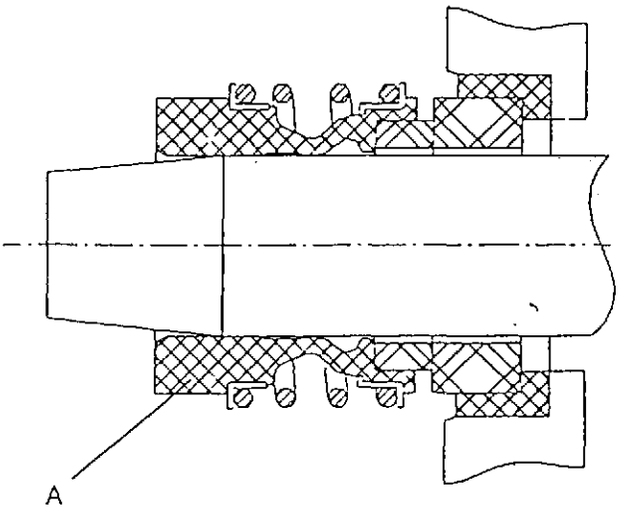


Fig. 19

e) Stainless-steel-shroud seal - type "X" (Fig. 20)

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.

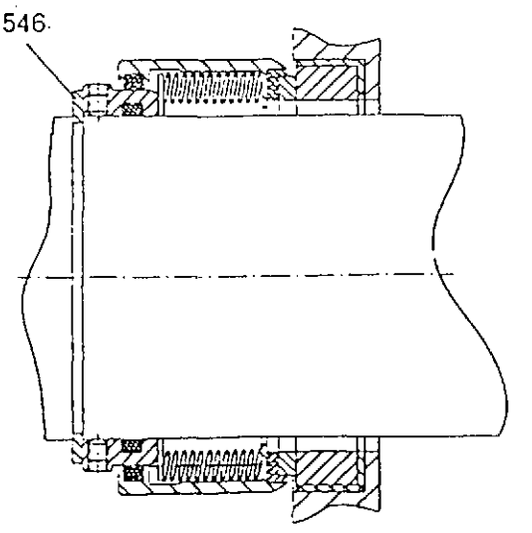


Fig. 20

f) Stationary seat (all types)
(Fig. 21 and 22)

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 it 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.

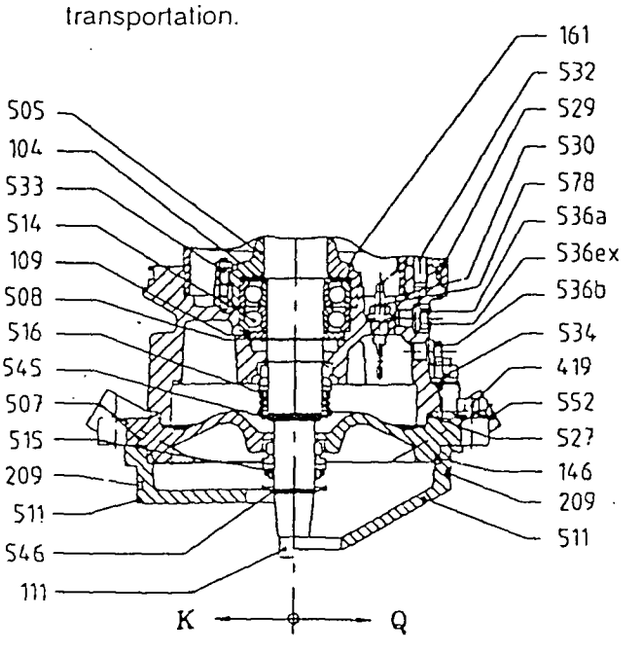


Fig. 21

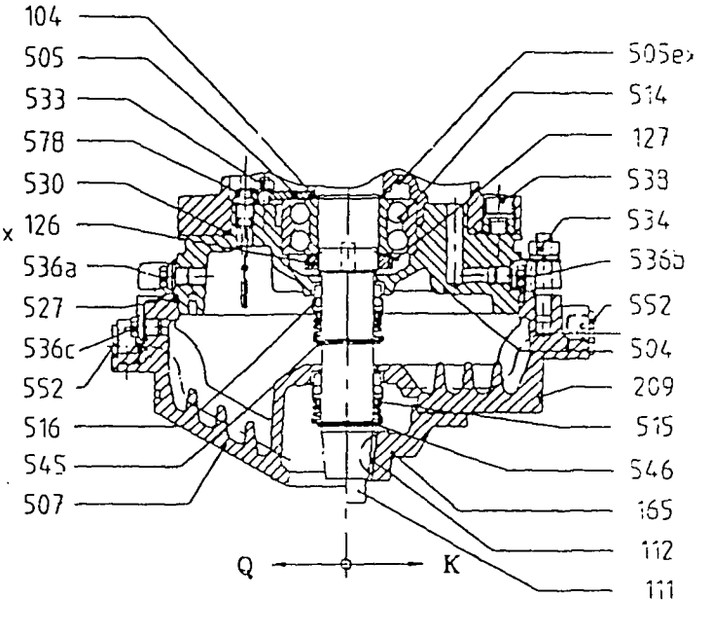


Fig. 22

2.9.2 REMOVAL OF UPPER MECHANICAL SEAL (516)

It is IMPORTANT to note that removal of this seal should not be attempted in the field. If leakage of this seal has been detected from the motor housing test as described in Section 2.6.3.2, the entire motor should be sent to the nearest authorized HIDROSTAL service center for a complete inspection.

2.9.3 ASSEMBLY OF BACK COVER

⚠ **Cleanliness is of utmost importance for this assembly work!** All parts must be washed in solvent prior to assembly. All machined mating surfaces must be clean and free from burrs. All grooves and landings 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.**

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

Place a new "O"-ring 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).

2.9.4 ASSEMBLY OF LOWER 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 se. face during this operation. Examine gap between shaft and inner diameter of seal face; when face correctly installed, gap will be uniform all the way around.

⚠ WARNING:
The seal face is very brittle, and can easily snap unless pressure is uniform during installation. We suggest pushing in with special tool (Fig. 23).

Make sure the Woodruff key groove on the shaft taper has no sharp edges, so that the rubber part or the mechanical seal cannot be damaged. File groove edges if necessary.

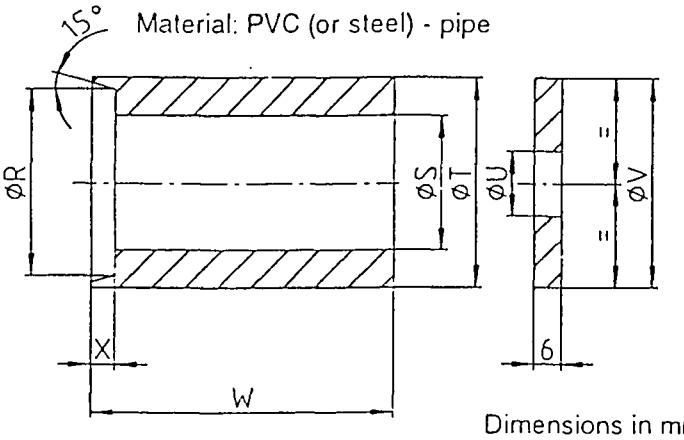


Fig. 23 Dimensions in mm

Seal size	ø R	ø S	ø T	ø U "Q"	ø U "K"	ø V	W	X	Bolt size "Q"	Bolt size "K"
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	14	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

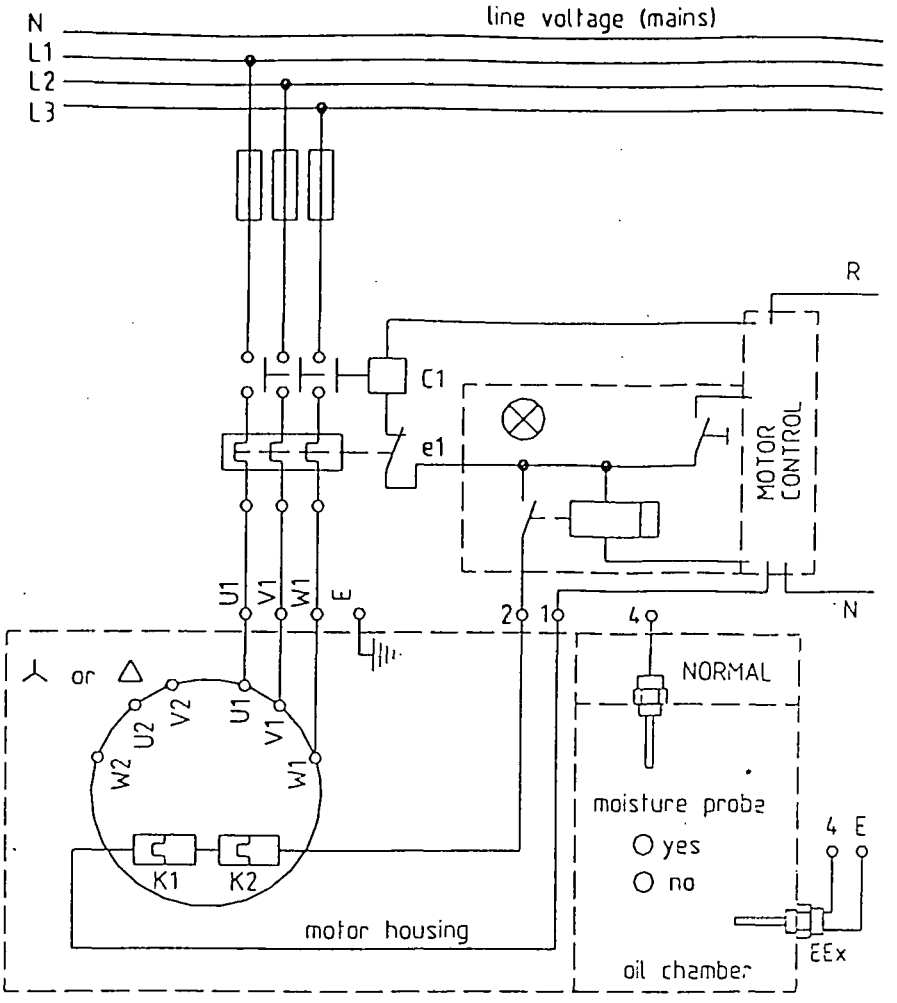
b) Exposed-spring seal - type "C" + "V"

Remove spring and spring retaining ring of mechanical seal. Seal surfaces must be absolutely clear 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 fac It may help to use a small wood "pusher" or a plastic pipe mandrel only slightly larger than shaft diamete., to push directly on the rubber part of the seal (Fig. 23). 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.

Mdrostal

WIRING DIAGRAM: www.ehsible.com 1-SPEED
DIR - START STANDARD + EEx - PROOF



Operate pump with contactor equipped with thermal protector. The protectors must trip within 6 seconds on locked rotor condition.

Do not start until the temperature limit sensors (terminals 1+2) have been connected. When one limit sensor opens, the power supply to the motor must cut out. The circuit has to be laid out in such a way, that the motor cannot automaticly come on again, even after temperature limit sensors have cooled and re-closed the circuit (1+2). The cause of overheating must be determined and corrected before the motor is put back manually into service. After a loss of tension an automatic restart must be possible by return of tension.

C1	=	contactor
e1	=	thermal protector
K1,K2	=	temperature limit sensor ☐ Klixon type 250 V, 2,5 A ☐ thermistor
U1 V1 W1 E	}	motorcable
1+2	=	control cable
* 4	=	moisture probe (standard)
		or
4+E	=	control cable for moisture probe (EEx)

* MOISTURE PROBE
Above indicated moisture probe is only installed as an option. For proper connection inside the control panel see sheet 94-TU 5050E/1 (MOISTURE DETECTION, Section MOTOR, GENERAL INFORMATION).

Client:					
Pump type:				Order No.	
Motor:					
N =	kW	U =	Volts	I =	Amp.
n =	rpm	f =	Cycles	cos φ=	
Cable:		mm²		L =	m
File: SCHEMA_E		Drawn by / Bearb. Dat. Vis.: 07.08.97 ml Approved by / Gepr. Dat. Vis.: 07.08.97 HF		No.: 85-EL 3323E/c	

Hidrostal	INSTRUCTION MANUAL Q-HYDRAULIC	
Dat: 28.05.96	No: 94-BA 5039E/1a	File: Q_HYD_E

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Part III

Hidrostal	INSTRUCTION MANUAL Q-HYDRAULIC	
Dat: 28.05.96	No: 94-BA 5039E/ 2a	File: Q_HYD_E

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 8 0 - L L 3 R D
E 0 5 Q - M L 1 R S
F 2 5 0 - S L 3 R E

- hydraulic size (B,C,D,E,F)
- discharge flange size (in inches) — or mm for Q-type industrial pump
- impeller type (Q)
- impeller size
- material:

1	=	standard pump: all castings of grey iron (GG20), except impeller of nodular iron (GGG60).
2	=	advanced wear resistance: liner of Hi-chrome, other parts as 1.
3	=	improved wear resistance, beat and corrosion: casing and suction casing same as 1, impeller of stainless or rustless steel, liner and wear-ring of Hi-chrome.
4	=	improved wear and corrosion resistance: same as 3, except with Hi-chrome impeller.
5	=	corrosion resistance: all wetted parts of stainless steel.
R	=	"regulable" construction: impeller clearance adjustable by three external screws (Absence of "R" in code implies impeller clearance is adjustable by shims).
S	=	special execution
D	=	bigger or smaller cone size than standard (first digit of code) D < E etc. C = 20, D = 28, E = 38, F = 50 etc.

3.1 SERVICE CONNECTIONS

On Volute

These comprise of a gauge connection (424) on the discharge flange (see table).

When the pump is mounted horizontally with the discharge flange vertical, and drain plug (423) is provided at the lowest part of the volute casing.

When the pump is mounted horizontally with the discharge flange horizonal, additional drain plugs are possible on position "D".

Type / Pos.	423	424	D mm
B02Q	R 1/2"	-	-
B050	R 1/2"	R 1/4"	-
B0BQ/B065	R 1/2"	-	30
C0CQ	-	-	-
C080	R 1/2"	R 1/4"	-
D0DQ	-	-	-
D03Q/D04Q/D080/D100	R 1/2"	R 1/4"	35
E03Q/E080	R 1/2"	R 1/2"	35
E0EQ	-	-	-
E05Q/E125/E08Q/E200	R 1/2"	R 1/2"	50
F100	R 1/2"	R 1/2"	50
F06Q/F150	R 1/2"	R 1/2"	60
F10Q/F250	R 1/2"	R 1/2"	35
H125/H08Q/H200	R 1/2"	R 1/2"	35
H12Q/H300	R 1"	R 1/2"	60
I150/I10Q/I250	R 1"	R 1/2"	60
I16Q/I400	R 1"	R 1/2"	60
L12Q/L300/L20Q/L500	R 1"	R 1/2"	60
M28Q/M700	R 2"	R 1/2"	60

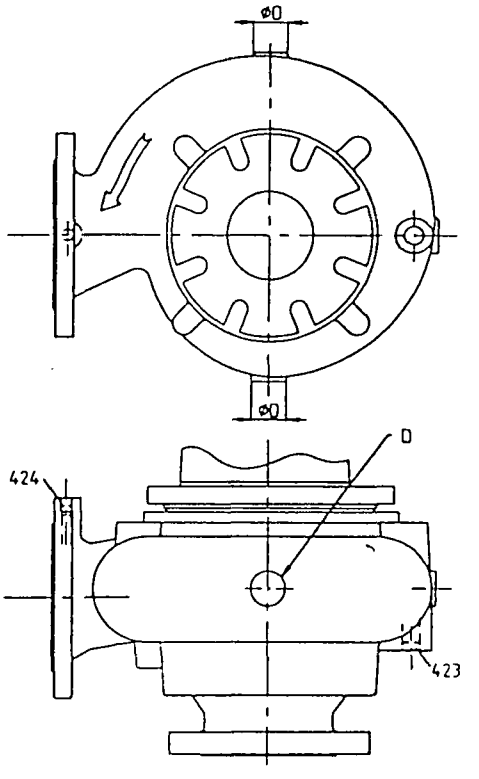

Fig. 1

3.2 IMPELLER CLEARANCE ADJUSTMENT FOR WEAR

- The impeller gap should 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).
- Excessive clearance can cause a drop in performance.
- Less clearance than the minimum listed can overload the motor and/or cause vibration due to a too great friction.
- When pumping thick sludges or high consistency material, it may be necessary to double the clearances in Figure 3.
- Regulable pumps are adjusted by means of a movable liner (421); its position is regulated by three external regulator nuts (422) found on the suction casing (416) or volute casing (400). 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).

3.2.1 IMPELLER CLEARANCE ADJUSTMENT FOR "REGULABLE" PUMPS

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

NOTE: If impeller tip is binding, see section 3.5.

Now back off the threaded regulator nut a bit. Holding each threaded regulator nut from turning, tighten the three hex nuts (413) (this pulls liner (421) away from impeller (401) the required clearance, and also locks the regulator nut in place).

With a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance "C" is significantly different to the table (Fig. 3), it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

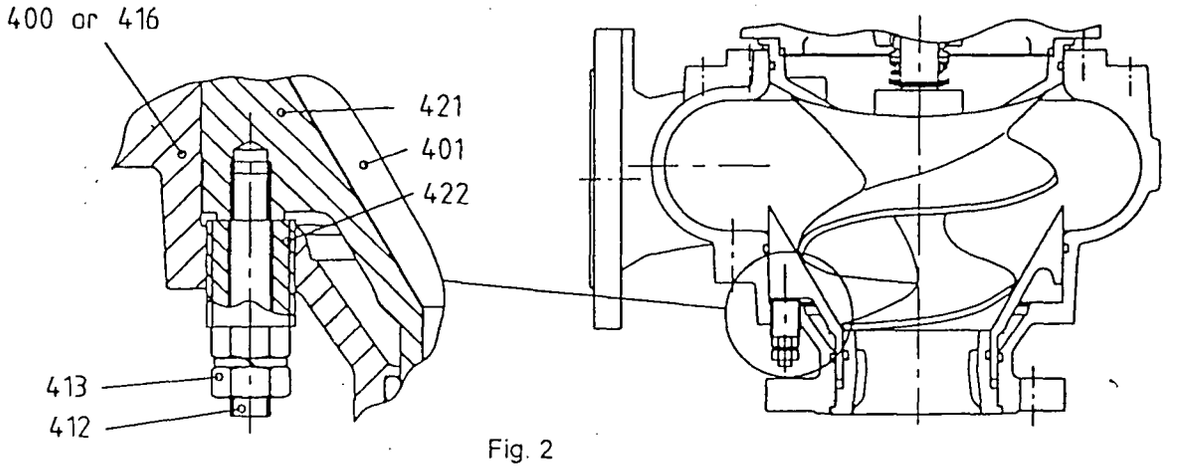

Fig. 2

3.2.2 IMPELLER CLEARANCE ADJUSTMENT FOR "NON-REGULABLE" PUMPS

Move the drive unit toward the volute casing. Place the casing-suction cover assembly with the suction flange flat on the floor or workbench, and lower the drive unit-impeller assembly into place by a suitable hoist.

Loosen all fasteners (419) between drive unit and volute casing. Remove shims.

To estimate correct shim (411) thickness, lower drive unit into casing just until impeller cannot be turned. Measure gap between drive unit and volute casing at several places and take average. Now add the distance "B" (Fig. 3) to the average gap measured; this will be approximate shim thickness required to obtain correct clearance "C" (Fig. 3).

NOTE: If impeller tip is binding, see section 3.5.

Loosen fasteners (419), and place shims of calculated thickness between drive unit and volute casing. Use washers of **uniform thickness**, or U-shaped shimstock. 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.

Tighten fasteners (419) again, and with a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance "C" is significantly different to the table (Fig. 3), it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

If this adjustment procedure does not restore original pump performance, examine wear on impeller or suction cover/liner, and replace worn parts as necessary.

Pump size	Clearance	
	"C" mm	"B" mm
B	0.2	0.2 - 1.0
C	0.3	0.2 - 1.0
D	0.3	0.2 - 1.2
E	0.4	0.2 - 1.5
F	0.6	0.2 - 1.8
H	0.8	0.2 - 1.8
I	1.0	0.2 - 2.5
L / M	1.5	0.2 - 2.5

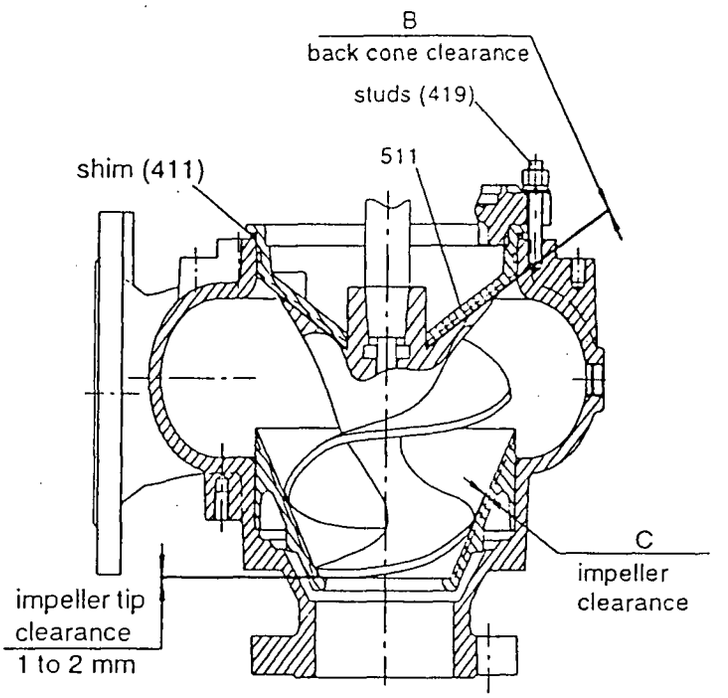

Fig. 3

NOTE: Clearance "C" should be checked along entire impeller edge, and again after rotating impeller 1/4, 1/2 and 3/4 turns.

3.3 DISASSEMBLY OF HYDRAULIC PARTS

3.3.1 DISASSEMBLY FOR INSPECTION

Casing-suction cover assembly should be placed with the suction flange flat on the floor or workbench, and the drive unit-impeller assembly removed or lowered into place from above by a suitable hoist.

Remove nuts (419) around the flange. Lift the rotating assembly including impeller from the pump casing. Areas to be examined for wear will be the impeller surface (especially the edges) and the conical machined surface in the liner or suction cover. 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 the worn parts.

3.3.2 REMOVAL OF IMPELLER

FACTORY FITTED IMPELLER BOLTS		
SIZE	HEXAGON	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, or by a strap wrench, or by locking pliers clamped to the impeller. Inset a hexagonal key wrench into the impeller bolt (415) and with a hammer, tap the wrench counterclockwise to loosen the bolt.

3.3.3 REMOVAL OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 NOT REGULABLE (Fig. 4 + 5)

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

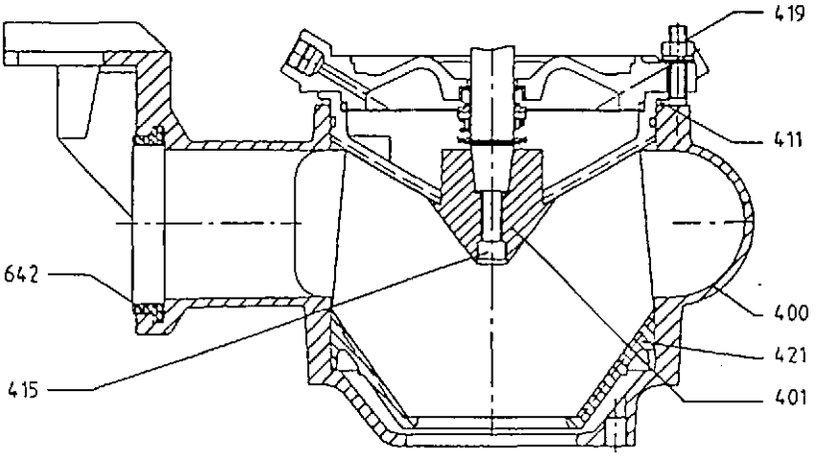

Fig. 4: C0CQ / D0DQ

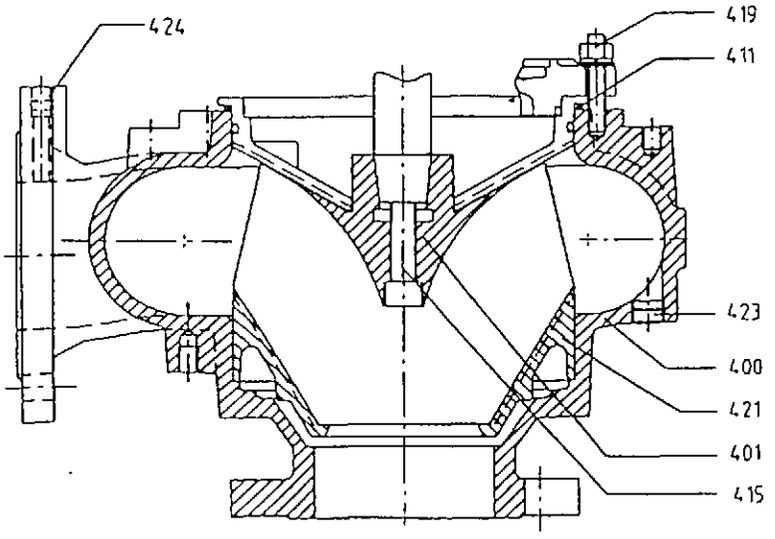

Fig. 5: C080 / D100

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). Adjustment of clearance is by shims (411) between the volute casing and the drive unit.

NOTE:
Certain models may have a spacer ring (414) between mating surfaces of the suction cover and the volute casing. When there is excessive wear on the conical surface, the suction cover (402) should be replaced.

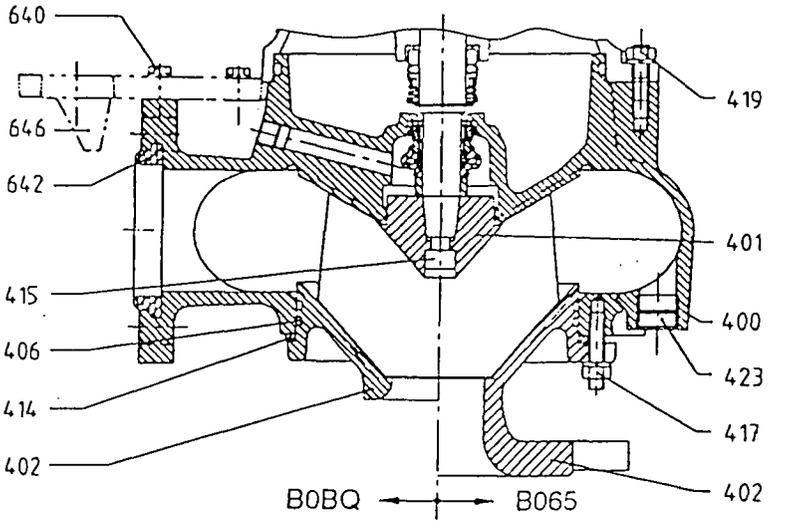

Fig. 6:

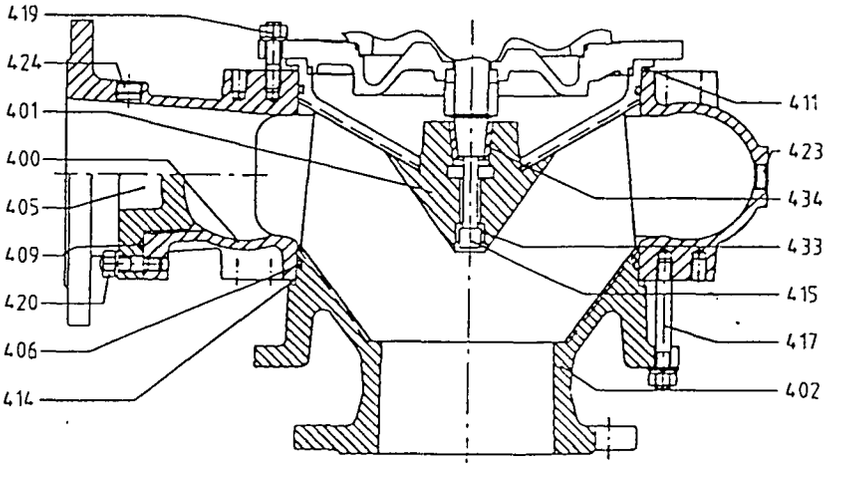

Fig. 7 E03Q - M28Q

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

These pumps have an externally-adjustable liner (421), held in place by the volute casing (400) or the suction casing (416) which is bolted to the volute casing (400) by studs and nuts (417). This construction can be recognized by the presence of three large regulator nuts (422).

If the conical surface is worn, the liner need be replaced. It can be removed while the volute casing or suction casing remain attached to the piping. Alternately, the suction casing may be removed by removing nuts (417).

Removing of liner: completely remove nuts (413). To force the liner out, push the three studs through the holes in the large regulator nuts (422), or the large regulator nuts can be turned all the way into the casing. **Do not yet disassemble the regulator studs (412)! They are loctited in place, and must be heated with a torch to break the locktite bond after removing of the liner.**

The wear ring (408) should only be removed from suction casing or volute casing if badly damaged. Therefore heat the mating surfaces with a torch to destroy the special adhesive between these two parts. Then press out suction ring with a hydraulic press.

Hidrostal	INSTRUCTION MANUAL Q-HYDRAULIC	
Dat: 12.03.98	No: 94-BA 5039E/ 8c	File: Q_HYD_E

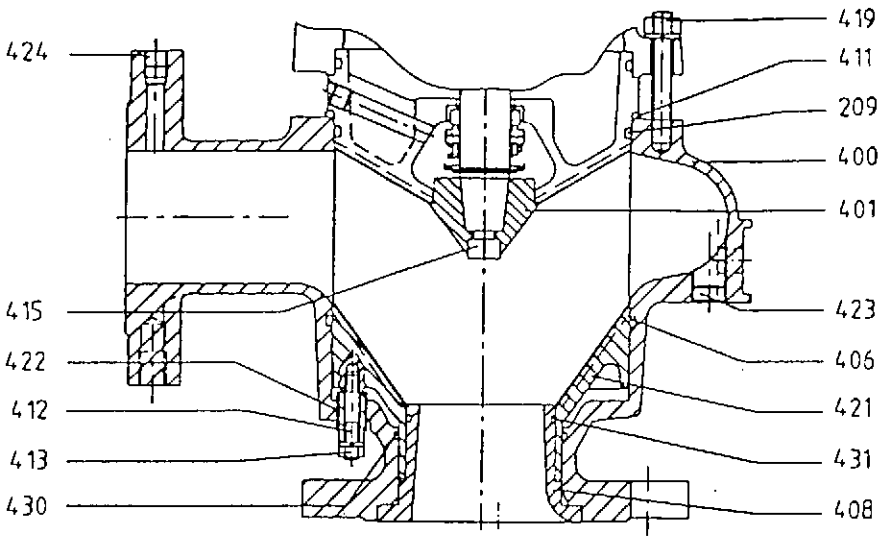

Fig. 8: C080 regulable

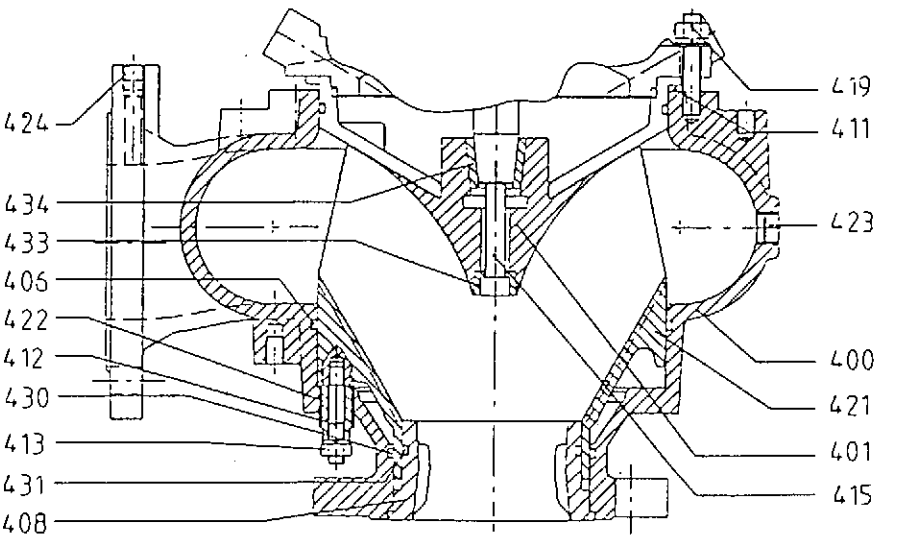

Fig. 9: D080 / D100 regulable

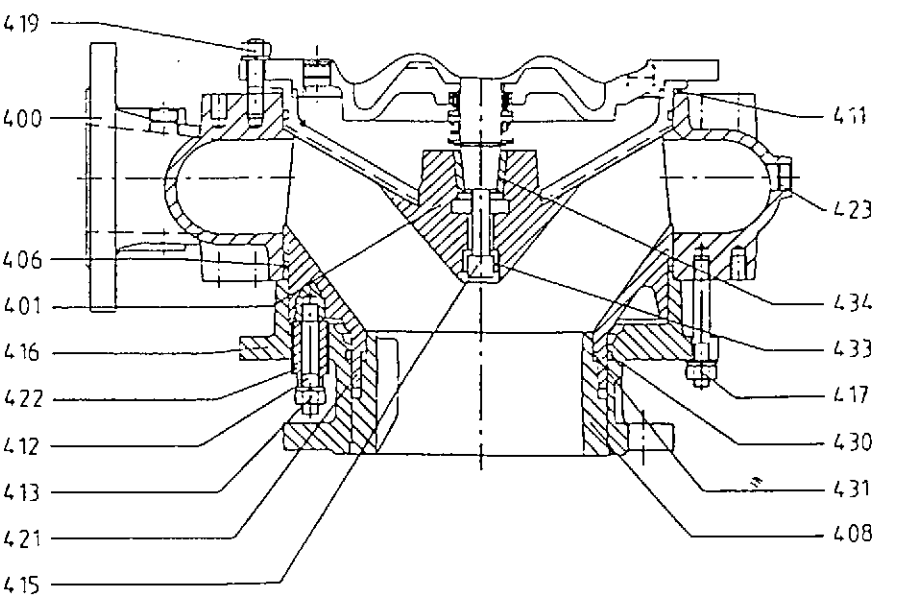

Fig. 10: E080 - M700 regulable

3.4 ASSEMBLY OF HYDRAULIC PARTS

3.4.1 ASSEMBLY OF IMPELLER

Before fitting a new impeller or a new impeller bolt, length "L" of impeller bolt should be checked as follows:

By measuring of the impeller and the impeller bolt, it must be secured that:

1. thread reach "L" is 1.25 x thread diameter, e.g. M16:
   16 x 1.25 = 20 mm.
2. end of thread "G1" on impeller bolt is sufficient (re-cut the thread).
3. end of thread "G2" in the shaft is sufficient (shorten impeller bolt, see point 1.).

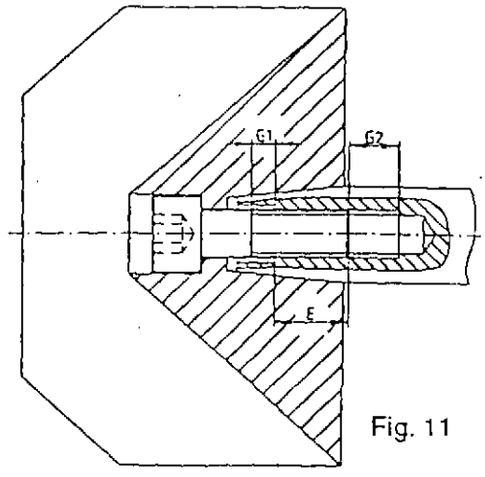

Fig. 11

ATTENTION:
Oil shaft taper slightly with a shred. **NEVER use thick oil, grease or anti-size compound!** Install impeller directly onto shaft. Coat the impeller bolt thread with grease or anti-size compound. Tighten screw with torque according table 3.3.2.

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

3.4.2 ASSEMBLY OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 NOT REGULABLE (Fig. 4 and 5)

Carefully position liner (421) into one-piece casing (400); tap into place with lead hammer, or use hydraulic press (No O-rings are used between liner and casing).

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 down side of the volute casing with fastening set (417).

CAUTION:
Since up-side and down-side of the volute casing are machined identically in some models, it is potentially possible to assemble the pump in a wrong way. 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)

Glue three regulation screws (412) into liner.

Thoroughly grease O-ring (430) and install into grove in suction casing (416) or casing (400, C080/D080/D100). This groove is nearly hidden by the wear ring in some pump models.

If wear ring (408) was removed, glue it firmly back into place. Tap wear ring into suction casing with a lead hammer, until wear ring is flush with flange surface.

On pump types C080/D080/D100 grease and install 0-ring (406) into groove of volute casing (400).

Coat the external threaded portion of large regulator nuts (422), and install these into the suction casing (416) or volute casing (400), hex-side toward the outside (toward the suction flange). Screw these into the casing until they are flush with the inside of the volute casing (400) or the suction casing (416).

Now place liner into suction casing or volute casing, engaging the three studs into the holes through the three regulator nuts.

NOTE:
The three studs are not spaced evenly around the liner, so there is only one orientation of the liner where the studs will correctly fit through the regulator nuts.

Now grease O-ring (431) and install in groove of wear ring (this O-ring is not used on some models).

On pump type E080 - L400 grease and install O-ring (406) into groove between suctin casing (416) and liner (421).

Install suction casing into down-side of the volute casing with fastening set (417).

CAUTION:
Since up-side and down-side of the volute casing are machined identically in some models, it is potentially possible to assemble the volute casing in a wrong way. Form of the volute casing see Fig. 1.

3.5 FINAL ASSEMBLY

When ONLY a new impeller is fitted, the following clearance check must be done: install drive unit-impeller assembly into volute casing.

If the tip of the impeller touches the wear ring (408) or the lip in the liner (or suction cover) or if there is less than 1 mm clearance between the tip and the lip (the spiral edge of the impeller is firmly seated against the conical taper inside the liner or suction cover), then the impeller tip must be ground off, parallel to the suction flange, until 1 to 2 mm clearance is obtained. (Fig. 12)

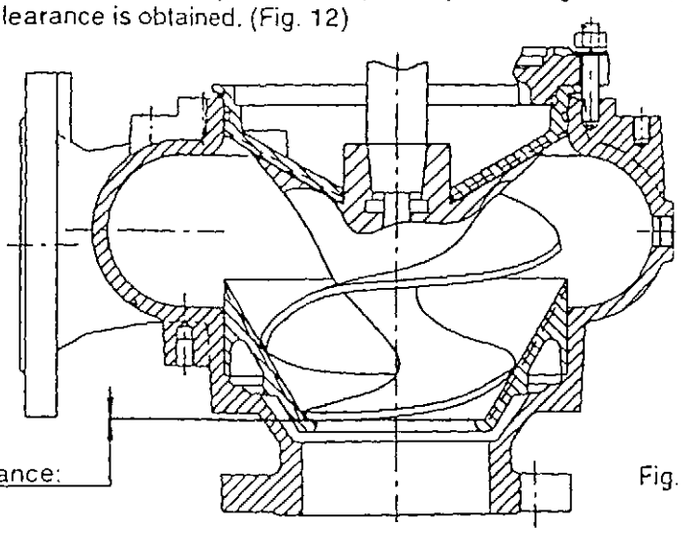

Fig. 12

If (411) is a spacer ring in lieu of shims place it over the spigot of the drive unit.

Grease O-ring (209) and place into groove on spigot of the drive unit.

Now install drive unit-impeller assembly into volute casing. Install and tighten nuts (419).

See Section 3.2 for correct setting of regulator nuts, or for placement of shims (411) for final adjustment of impeller clearance.

Hidrostal	INSTRUCTION MANUAL Q-HYDRAULIC	
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Part III

Hidrostal	INSTRUCTION MANUAL Q-HYDRAULIC	
Dat: 28.05.96	No: 94-BA 5039E/ 2a	File: Q_HYD_E

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 8 0 - L L 3 R D
E 0 5 Q - M L 1 R S
F 2 5 0 - S L 3 R E
```

- hydraulic size (B,C,D,E,F)
- discharge flange size (in inches) — or mm for Q-type industrial pump
- impeller type (Q)
- impeller size
- material:
  - 1 = standard pump: all castings of grey iron (GG20), except impeller of nodular iron (GGG60).
  - 2 = advanced wear resistance: liner of Hi-chrome, other parts as 1.
  - 3 = improved wear resistance, beat and corrosion: casing and suction casing same as 1, impeller of stainless or rustless steel, liner and wear-ring of Hi-chrome.
  - 4 = improved wear and corrosion resistance: same as 3, except with Hi-chrome impeller.
  - 5 = corrosion resistance: all wetted parts of stainless steel.
- R = "regulable" construction: impeller clearance adjustable by three external screws (Absence of "R" in code implies impeller clearance is adjustable by shims).
- S = special execution
- D = bigger or smaller cone size than standard (first digit of code) D < E etc.
  C = 20, D = 28, E = 38, F = 50 etc.

3.1 SERVICE CONNECTIONS

On Volute

These comprise of a gauge connection (424) on the discharge flange (see table).

When the pump is mounted horizontally with the discharge flange vertical, and drain plug (423) is provided at the lowest part of the volute casing.

When the pump is mounted horizontally with the discharge flange horizonal, additional drain plugs are possible on position "D".

Type / Pos.	423	424	D mm
B02Q	R 1/2"	-	-
B050	R 1/2"	R 1/4"	-
B0BQ/B065	R 1/2"	-	30
C0CQ	-	-	-
C080	R 1/2"	R 1/4"	-
D0DQ	-	-	-
D03Q/D04Q/D080/D100	R 1/2"	R 1/4"	35
E03Q/E080	R 1/2"	R 1/2"	35
E0EQ	-	-	-
E05Q/E125/E08Q/E200	R 1/2"	R 1/2"	50
F100	R 1/2"	R 1/2"	50
F06Q/F150	R 1/2"	R 1/2"	60
F10Q/F250	R 1/2"	R 1/2"	35
H125/H08Q/H200	R 1/2"	R 1/2"	35
H12Q/H300	R 1"	R 1/2"	60
I150/I10Q/I250	R 1"	R 1/2"	60
I16Q/I400	R 1"	R 1/2"	60
L12Q/L300/L20Q/L500	R 1"	R 1/2"	60
M28Q/M700	R 2"	R 1/2"	60

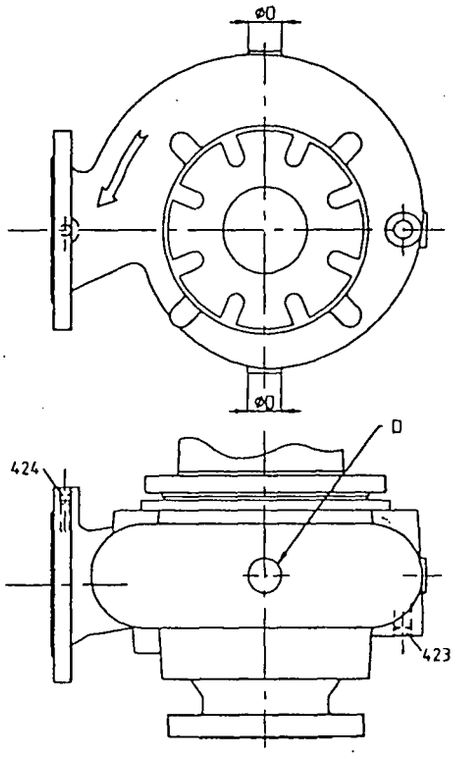

Fig. 1

3.2 IMPELLER CLEARANCE ADJUSTMENT FOR WEAR

- The impeller gap should 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).
- Excessive clearance can cause a drop in performance.
- Less clearance than the minimum listed can overload the motor and/or cause vibration due to a too great friction.
- When pumping thick sludges or high consistency material, it may be necessary to double the clearances in Figure 3.
- Regulable pumps are adjusted by means of a movable liner (421); its position is regulated by three external regulator nuts (422) found on the suction casing (416) or volute casing (400). 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).

3.2.1 IMPELLER CLEARANCE ADJUSTMENT FOR "REGULABLE" PUMPS

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

NOTE: If impeller tip is binding, see section 3.5.

Now back off the threaded regulator nut a bit. Holding each threaded regulator nut from turning, tighten the three hex nuts (413) (this pulls liner (421) away from impeller (401) the required clearance, and also locks the regulator nut in place).

With a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance "C" is significantly different to the table (Fig. 3), it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

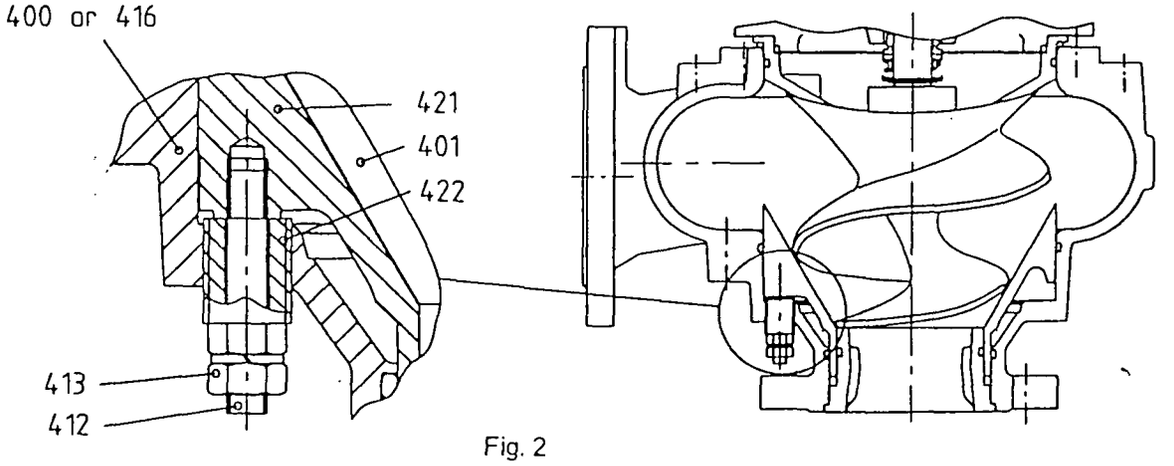

Fig. 2

3.2.2 IMPELLER CLEARANCE ADJUSTMENT FOR "NON-REGULABLE" PUMPS

Move the drive unit toward the volute casing. Place the casing-suction cover assembly with the suction flange flat on the floor or workbench, and lower the drive unit-impeller assembly into place by a suitable hoist.

Loosen all fasteners (419) between drive unit and volute casing. Remove shims.

To estimate correct shim (411) thickness, lower drive unit into casing just until impeller cannot be turned. Measure gap between drive unit and volute casing at several places and take average. Now add the distance "B" (Fig. 3) to the average gap measured; this will be approximate shim thickness required to obtain correct clearance "C" (Fig. 3).

NOTE: If impeller tip is binding, see section 3.5.

Loosen fasteners (419), and place shims of calculated thickness between drive unit and volute casing. Use washers of uniform thickness, or U-shaped shimstock. 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.

Tighten fasteners (419) again, and with a feeler gauge, check the actual clearance between impeller and liner (reaching in through the suction of the pump). If the clearance "C" is significantly different to the table (Fig. 3), it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

If this adjustment procedure does not restore original pump performance, examine wear on impeller or suction cover/liner, and replace worn parts as necessary.

Pump size	Clearance	
	"C" mm	"B" mm
B	0.2	0.2 - 1.0
C	0.3	0.2 - 1.0
D	0.3	0.2 - 1.2
E	0.4	0.2 - 1.5
F	0.6	0.2 - 1.8
H	0.8	0.2 - 1.8
I	1.0	0.2 - 2.5
L / M	1.5	0.2 - 2.5

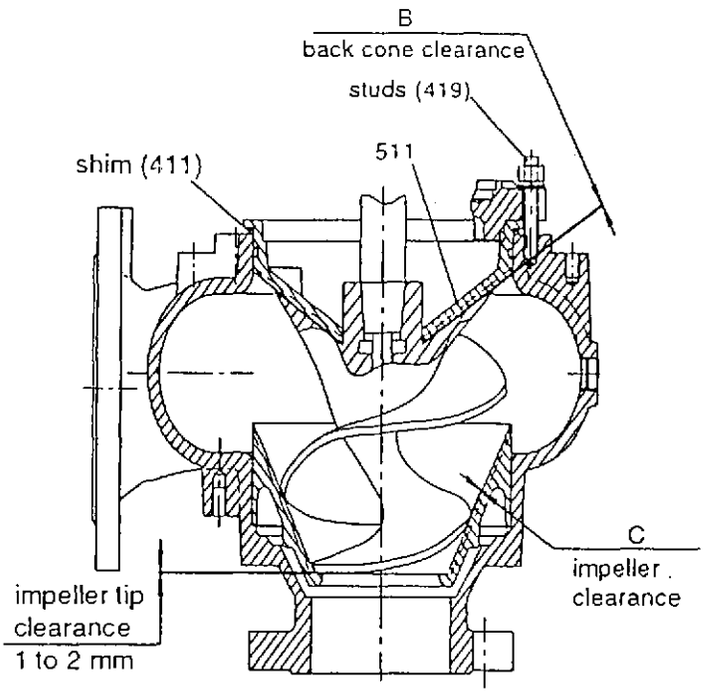

Fig. 3

NOTE: Clearance "C" should be checked along entire impeller edge, and again after rotating impeller 1/4, 1/2 and 3/4 turns.

3.3 DISASSEMBLY OF HYDRAULIC PARTS

3.3.1 DISASSEMBLY FOR INSPECTION

Casing-suction cover assembly should be placed with the suction flange flat on the floor or workbench, and the drive unit-impeller assembly removed or lowered into place from above by a suitable hoist.

Remove nuts (419) around the flange. Lift the rotating assembly including impeller from the pump casing. Areas to be examined for wear will be the impeller surface (especially the edges) and the conical machined surface in the liner or suction cover. 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 the worn parts.

3.3.2 REMOVAL OF IMPELLER

FACTORY FITTED IMPELLER BOLTS		
SIZE	HEXAGON	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, or by a strap wrench, or by locking pliers clamped to the impeller. Inset a hexagonal key wrench into the impeller bolt (415) and with a hammer, tap the wrench counterclockwise to loosen the bolt.

3.3.3 REMOVAL OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 NOT REGULABLE (Fig. 4 + 5)

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

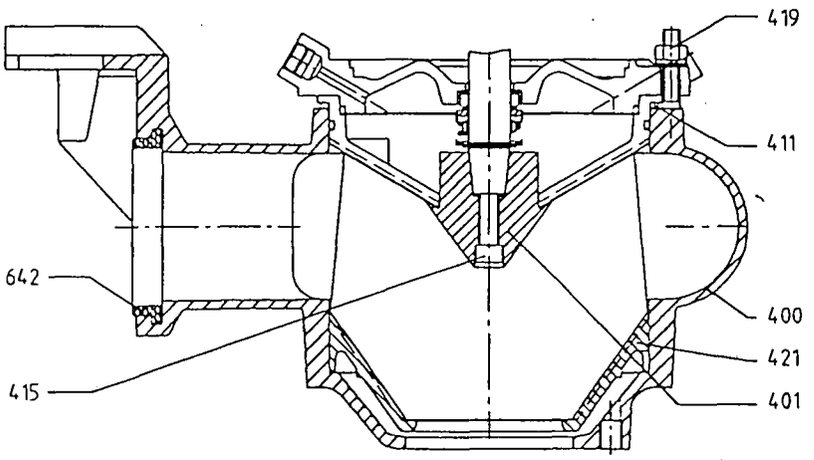

Fig. 4: C0CQ / D0DQ

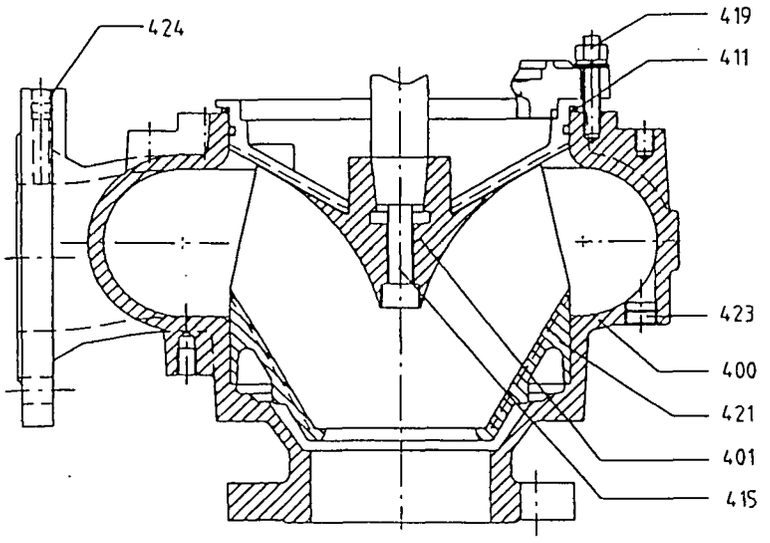

Fig. 5: C080 / D100

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). Adjustment of clearance is by shims (411) between the volute casing and the drive unit.

NOTE:
Certain models may have a spacer ring (414) between mating surfaces of the suction cover and the volute casing. When there is excessive wear on the conical surface, the suction cover (402) should be replaced.

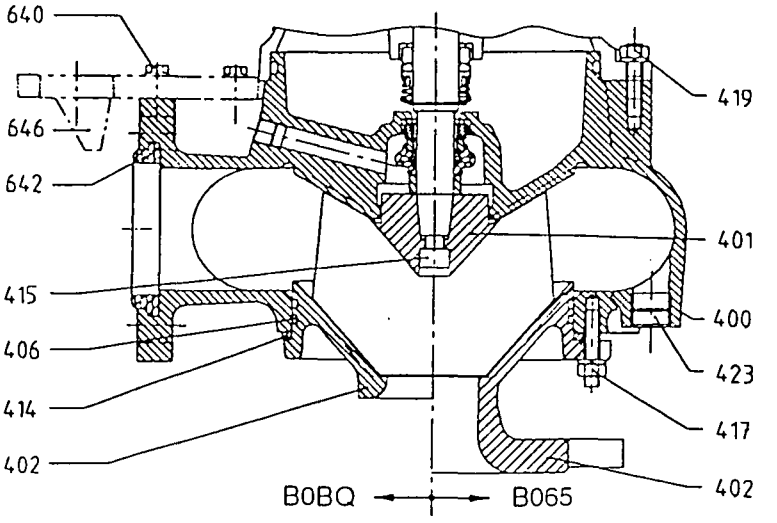

Fig. 6:

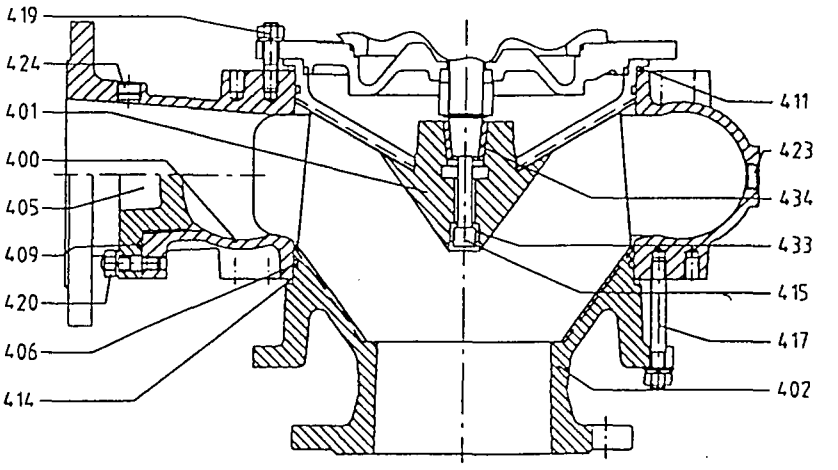

Fig. 7 E03Q - M28Q

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

These pumps have an externally-adjustable liner (421), held in place by the volute casing (400) or the suction casing (416) which is bolted to the volute casing (400) by studs and nuts (417). This construction can be recognized by the presence of three large regulator nuts (422).

If the conical surface is worn, the liner need be replaced. It can be removed while the volute casing or suction casing remain attached to the piping. Alternately, the suction casing may be removed by removing nuts (417).

Removing of liner: completely remove nuts (413). To force the liner out, push the three studs through the holes in the large regulator nuts (422), or the large regulator nuts can be turned all the way into the casing. **Do not yet disassemble the regulator studs (412)! They are loctited in place, and must be heated with a torch to break the locktite bond after removing of the liner.**

The wear ring (408) should only be removed from suction casing or volute casing if badly damaged. Therefore heat the mating surfaces with a torch to destroy the special adhesive between these two parts. Then press out suction ring with a hydraulic press.

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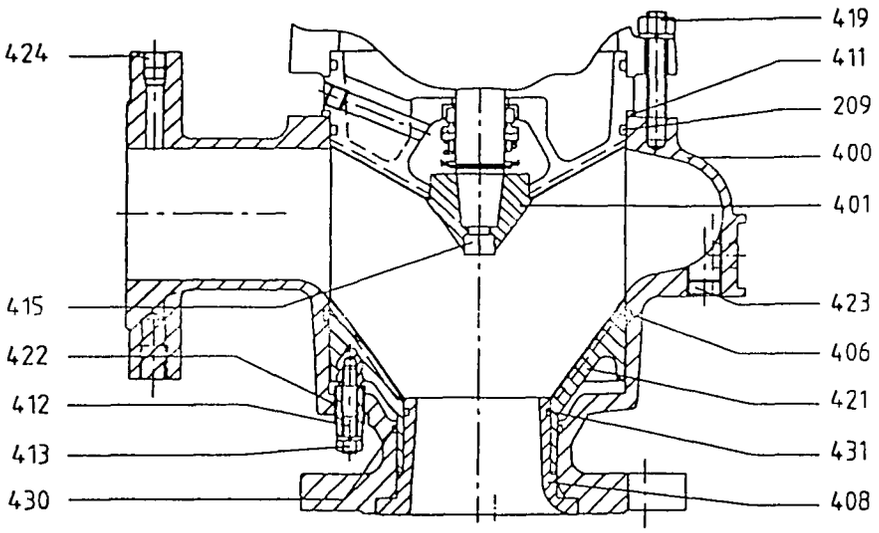


Fig. 8: C080 regulable

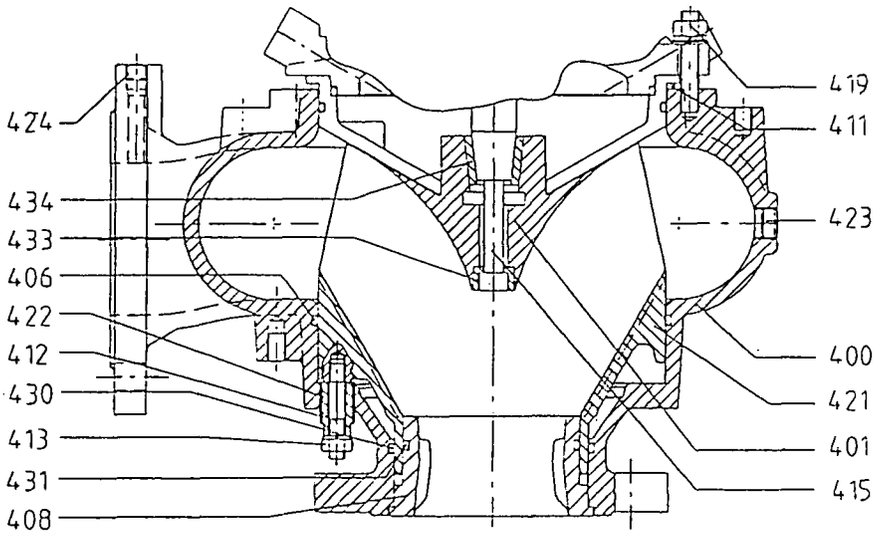


Fig. 9: D080 / D100 regulable

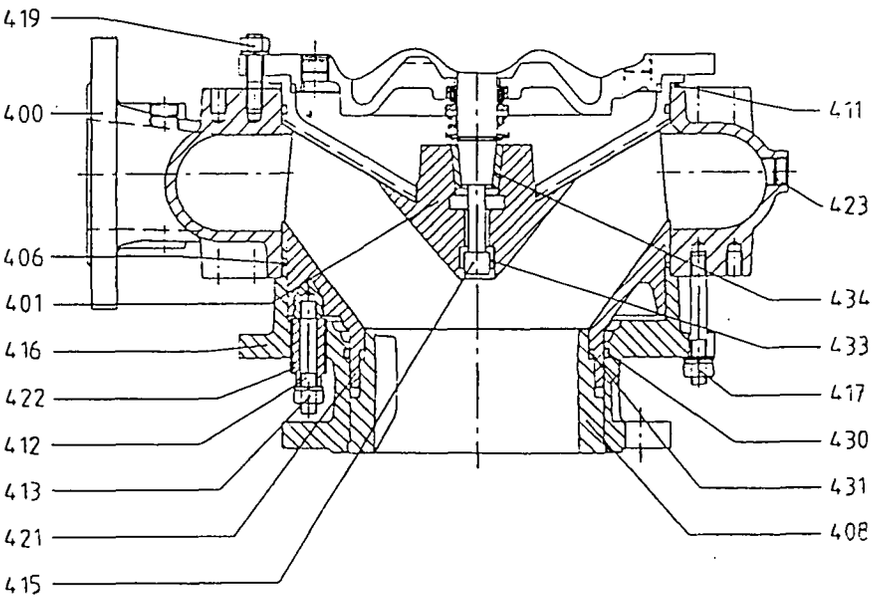
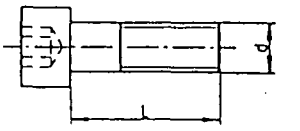


Fig. 10: E080 - M700 regulable

3.4 ASSEMBLY OF HYDRAULIC PARTS



3.4.1 ASSEMBLY OF IMPELLER

Before fitting a new impeller or a new impeller bolt, length "L" of impeller bolt should be checked as follows:

By measuring of the impeller and the impeller bolt, it must be secured that:

1. thread reach "L" is 1.25 x thread diameter, e.g. M16:
   16 x 1.25 = 20 mm.
2. end of thread "G1" on impeller bolt is sufficient (re-cut the thread).
3. end of thread "G2" in the shaft is sufficient (shorten impeller bolt, see point 1.).

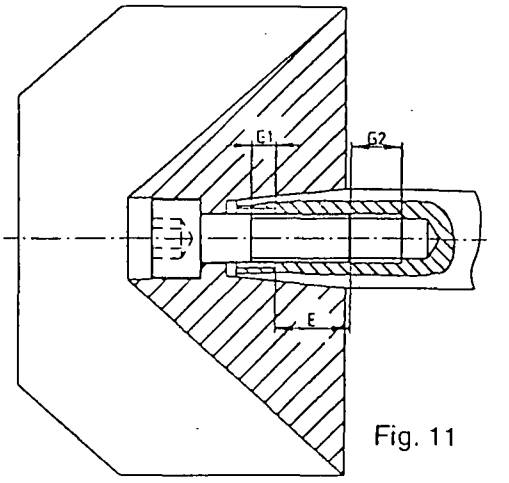


Fig. 11

ATTENTION:
Oil shaft taper slightly with a shred. **NEVER use thick oil, grease or anti-size compound!** Install impeller directly onto shaft. Coat the impeller bolt thread with grease or anti-size compound. Tighten screw with torque according table 3.3.2.

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

3.4.2 ASSEMBLY OF LINER FOR TYPES C0CQ / D0DQ AND C080 / D100 NOT REGULABLE (Fig. 4 and 5)

Carefully position liner (421) into one-piece casing (400); tap into place with lead hammer, or use hydraulic press (No O-rings are used between liner and casing).

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 down side of the volute casing with fastening set (417).

CAUTION:
Since up-side and down-side of the volute casing are machined identically in some models, it is potentially possible to assemble the pump in a wrong way. 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)

Glue three regulation screws (412) into liner.

Thoroughly grease O-ring (430) and install into grove in suction casing (416) or casing (400, C080/D080/D100). This groove is nearly hidden by the wear ring in some pump models.

If wear ring (408) was removed, glue it firmly back into place. Tap wear ring into suction casing with a lead hammer, until wear ring is flush with flange surface.

On pump types C080/D080/D100 grease and install 0-ring (406) into groove of volute casing (400).

Coat the external threaded portion of large regulator nuts (422), and install these into the suction casing (416) or volute casing (400), hex-side toward the outside (toward the suction flange). Screw these into the casing until they are flush with the inside of the volute casing (400) or the suction casing (416).

Now place liner into suction casing or volute casing, engaging the three studs into the holes through the three regulator nuts.

NOTE:
The three studs are not spaced evenly around the liner, so there is only one orientation of the liner where the studs will correctly fit through the regulator nuts.

Now grease O-ring (431) and install in groove of wear ring (this O-ring is not used on some models).

On pump type E080 - L400 grease and install O-ring (406) into groove between suctin casing (416) and liner (421).

Install suction casing into down-side of the volute casing with fastening set (417).

CAUTION:
Since up-side and down-side of the volute casing are machined identically in some models, it is potentially possible to assemble the volute casing in a wrong way. Form of the volute casing see Fig. 1.

3.5 FINAL ASSEMBLY

When ONLY a new impeller is fitted, the following clearance check must be done: install drive unit-impeller assembly into volute casing.

If the tip of the impeller touches the wear ring (408) or the lip in the liner (or suction cover) or if there is less than 1 mm clearance between the tip and the lip (the spiral edge of the impeller is firmly seated against the conical taper inside the liner or suction cover), then the impeller tip must be ground off, parallel to the suction flange, until 1 to 2 mm clearance is obtained. (Fig. 12)

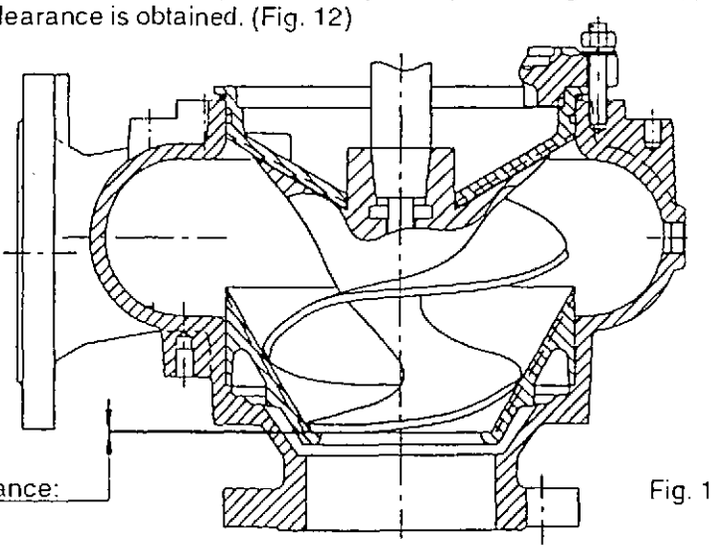


Fig. 12

If (411) is a spacer ring in lieu of shims place it over the spigot of the drive unit.

Grease O-ring (209) and place into groove on spigot of the drive unit.

Now install drive unit-impeller assembly into volute casing. Install and tighten nuts (419).

See Section 3.2 for correct setting of regulator nuts, or for placement of shims (411) for final adjustment of impeller clearance.

Hidrostal

SECTIONAL DRAWINGS Q-HYDRAULIC
C080 / D080 / D100 REGULABLE MAT CODE 1 - 5R

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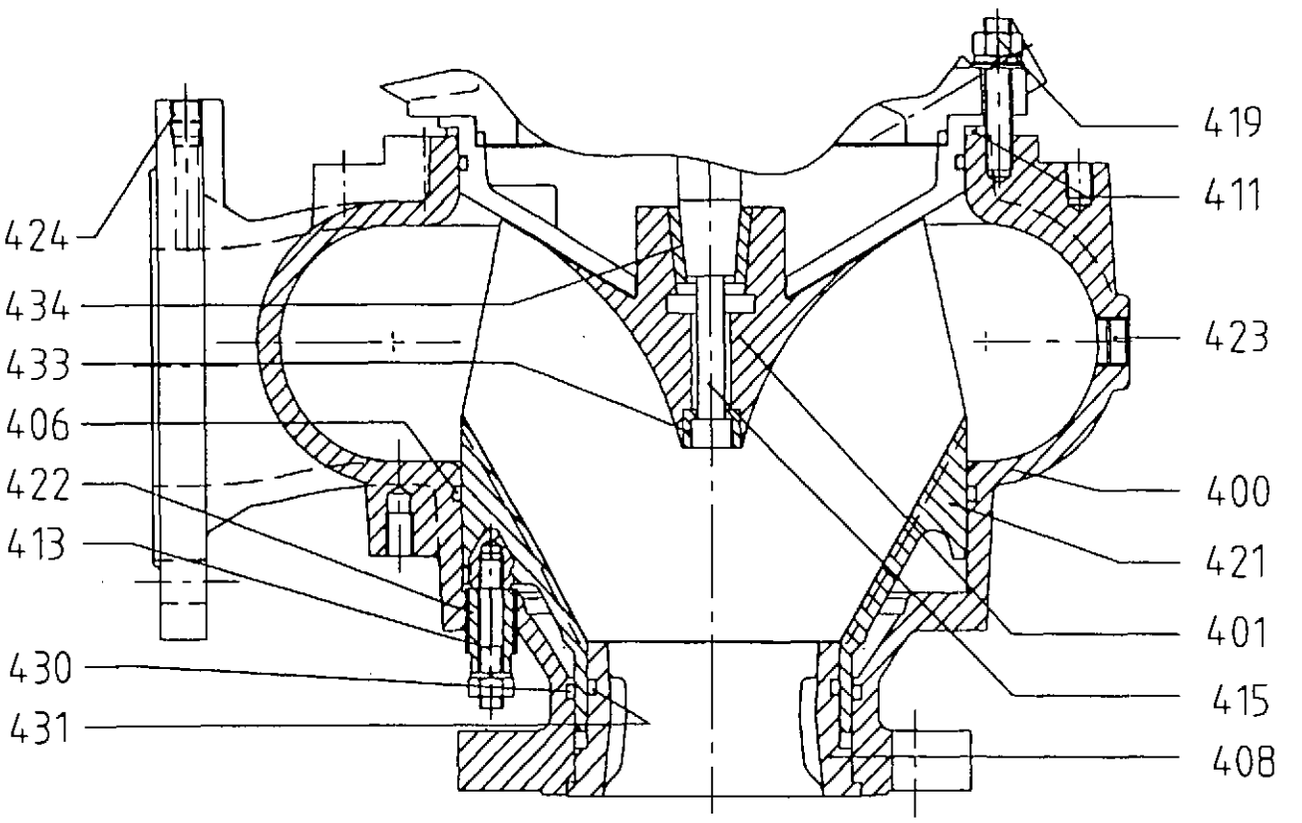


PART	DESCRIPTION	MATERIAL OF CONSTRUCTION 1R	3R	5R
400	VOLUTE	GREY CAST IRON		STAINLESS STEEL A4
401	IMPELLER	NODULAR IRON	STAINLESS STEEL A4	
406	O-RING	NITRILE		
408	WEAR RING	GREY CAST IRON	HIDRO HARD	STAINLESS STEEL A4
411	SHIMS	STEEL		
413	ADJUSTING BOLT	STAINLESS STEEL A4		
415	IMPELLER BOLT	STAINLESS STEEL A4		
419	FASTENING SET	RUSTLESS STEEL		STAINLESS STEEL A4
421	LINER	GREY CAST IRON	HIDRO HARD	STAINLESS STEEL A4
422	REGULATION NUT	STAINLESS STEEL A4		
423	PLUG	STEEL		STAINLESS STEEL A4
424	PLUG	STEEL		STAINLESS STEEL A4
430	O-RING	NITRILE		
431	O-RING	NITRILE		

Hidrostal

LIST OF PARTS FOR Q-MOTORS
POSITIONSNUMMERVERZEICHNIS FUER Q-MOTOREN

POS.	DESCRIPTION	BESCHREIBUNG	CODE	MATERIAL* a	MATERIAL* b/c **
104	Spacer ring P.S.	Stützring (Fettring) P.S.	1RD	K	K
106	Bearing spacer	Distanzring	1RD	K	K
112	Woodruff key	Woodruffkeil	2FK	L	F
121	Angular contact ball bearing	Schrägkugellager	8LW	-	-
126	Lock nut for shaft	Mutter SKF für Welle		L	L
127	Lock washer for 126	Sicherungsblech zu 126		O	O
157	Spacer ring	Stützring aussen	1RD	K	K
165	Impeller flange	Laufradaufnahme	2SF	B	C
166	Impeller nut	Laufradmutter	2FM	K	F
167	Impeller locking washer for 165	Sicherungsblech für 165	2FF	K	F
173	Seal cup	Dichtungsdeckel	1DD	A	-
191	O-ring for 173 and 400	O-Ring zu 173 und 400	8DO	Q	Q
209	O-ring for 511 and 400	O-Ring zu 511 und 400	8DO	Q	Q
400	Volute casing	Gehäuse	4G1	A	C
401	Impeller	Laufrad	411	B/D	C
402	Suction cover	Saugdeckel	421	A	C
403					
404					
405	Inspection opening	Inspektionsöffnung	451	A	-
406	O-ring for 402 or 421	O-Ring zu 402 oder 421		Q	Q
407	O-ring for 421 - 462	O-Ring zu 421 - 462			
408	Wear ring	Verschleissring	4R.	A/D	C
409	O-ring for 405	O-Ring zu 405		Q	Q
410					
411	Set of shims or wire 200-400	Regulierunterlagen 200-400		K	F
412					
413	Adjusting bolt	Regulierschraube		F	F
414	Spacer ring	Distanzring		K	F
415	Impeller bolt	Frontschraube	4B.	H	F
416	Suction casing	Eintrittskappe	4H.	A	C
417	Fastening set	Befestigung		H	F
418					
419	Fastening set	Befestigung		H	F
420	Fastening set	Befestigung		H	-
421	Liner	Eintrittskonus	4K.	A/D	C
422	Regulation nut	Regulierhülse	4V1	F	F
423	Plug	Stopfen		N	F
424	Plug	Stopfen		N	F
425					
426	Fastening set 463-400	Befestigung 463-400			
427					
428					
429					
430	O-ring	O-Ring		Q	Q
431	O-ring	O-Ring		Q	O
432					
433	Bush impeller/impeller bolt	Uebergangsbüchse Laufrad/Frontschraube	4BZ	H	F
434	Bush shaft/impeller	Uebergangsbüchse Welle/Laufrad	4ZW	H	F
462	Guide cone	Leitkonus	4Z1		
463	Guidance sheet	Leitblech	4LB	H	F
464	O-ring	O-Ring	8DO	Q	Q
465	Fastening set 421 - 462	Befestigung 421 - 462			
500	Junction box cover	Kabeldeckel	5DK	A	C
501	Upper motor cover	Motordeckel oben	5DM	A	A
502	Motor stator	Wicklung	5ES	-	-
503	Shaft (Rotor)	Welle (Rotor)	5WO(5ER)	H	F/H
504	Oil chamber casing	Oelkammergehäuse	5GO	A	A/F
505	Lower bearing cap P.S.	Lagerdeckel P.S.	5DL	A	A
506	Retaining ring	Fettring		K	K
507	Back cover/mech. seal plate	Mech.Dichtteil/Dichtplatte	5GD/1PM	A	C
508	Spacer ring	Stützring	5RS	O	O
509	Fastening set 500-501	Befestigung 500-501		H	F
510	O-ring for 557 P.S. ex-proof old type	O-Ring zu 557 P.S. Ex		Q	Q
511	Back cone	Rückkonus	1K.	A/D	C
512	Lower ball bearing P.S.	Lager für Radialbelastung P.S.	8LW	-	-
513	Upper ball bearing cable side	Lager Kabelseite	8LW	-	-
514	Double row angular contact ball bearing	Lager P.S. (für Pumpe bis 5 kW)	8LW	-	-
515	Mechanical seal P.S.	Mech.Dichtung P.S.	8DM	-	-
516	Mechanical seal M.S.	Mech.Dichtung M.S.	8DM	-	-
517	Humidity relay	Feuchtigkeitsschutz-Relais	5EU	-	-
518	Cable	Kabel	5EK	-	-
519	Terminal board	Klemmenbrett		-	-
520	Ground cable connection (earth)	Befestigung für Erdanschlusskabel		K	K
521	Terminal connectors ex-proof	Leitungsdurchführung Ex-Schutz		-	-
522	Terminal connectors	Leitungsdurchführung		-	-
523	Cable entry assembly	Kabeleinführung komplett	5EE	-	-
	(intermittent fitting)	(Zwischenstück)	(5EZ)	-	-
524	O-ring for 501	O-Ring zu 501		Q	Q
525	O-ring for 500	O-Ring zu 500		Q	Q

* For material explanations see sheet of section "ENGINEERING DATA"
** a: Standard material execution
b: All internal wetted parts stainless steel
c: All wetted parts stainless steel depending on size

* Für Materialangaben s. Spezifikationsblatt des Kapitels "ENGINEERING DATEN"
** a: Standardmässige Materialausführung
b: Alle intern benetzten Teile rostfrei
c: Alle benetzten Teile rostfrei, grössenabhängig

File : QTLSTPRT	Drawn by / Bearb. Dat. Vis. : 10.02.98 / ml Approved by / Gepr. Dat. Vis. : 10.02.98 / DB	No. : 93-TU 4531/1c

Hidrostal

LIST OF PARTS FOR Q-MOTORS
POSITIONSNUMMERVERZEICHNIS FUER Q-MOTOREN

POS.	DESCRIPTION	BESCHREIBUNG	CODE	MATERIAL* a	MATERIAL* b/c **
526	O-ring for 558 on top	O-Ring zu 558 oben		Q	Q
526	Steel ring	Stahlring gerollt		J	F
527	O-ring for 200 M.S.	O-Ring zu 200		Q	Q
528	O-ring for 519	O-Ring zu 519		Q	Q
529	O-ring for 558 bottom	O-Ring zu 558 unten		Q	Q
530	O-ring for 504 M.S.	O-Ring zu 504 M.S.		Q	Q
531	O-ring for 505	O-Ring zu 505		Q	Q
532	Fastening set 557-501 (small Motors)	Befestigung 501-557 (kleine Motoren)	5FB	H	F
533	Fastening set 504-505	Befestigung 505-504		H	F
534	Fastening set 507-557/504	Befestigung 507-557/504		H	F
535	Fastening set 501-519	Befestigung für 519		H	F
536	Plug with gasket	Stopfen		F+C	F
537	Fastening set 561	Befestigung für 561		H	F
538	Fastening set 504-557	Befestigung 504-557		H	F
539	Snap ring for 534 (C-Type)	Seegerring für 534 (Typ C)		O	-
540	Distance bolt for 519	Distanzbolzen zu 519		K	K
541	O-ring for 540	O-Ring zu 540		Q	O
542	Grease retaining disc P.S.	Fettscheibe P.S. + Monobloc M.S.	5SF	K	K
543	Holding ring for 519	Halterring zu 519		K	K
544	Snap ring for 553	Seegerring zu 553		O	O
545	Snap ring for 516 = M.S.	Seegerring zu 516 = M.S.		O	O
546	Snap ring for 515 = P.S.	Seegerring zu 515 = P.S.		O	F
547	O-ring for 598 (400-557)	O-Ring zu 598 (400-557)		Q	Q
548	Plug for lubricating hole	Stopfen zu Schmierloch		F+P	F
549	Oil glass	Oelschauglas		-	-
550	Driving pin for 560	Oelradmitnehmer		G	G
551					
552	Plug for flushing connection 581	Stopfen für Spülwasseranschluss 581		N	F
553	Oil seal sleeve	Laufbüchse für Simmerring	5DB	J	J
554	Spacer (if no oil impeller)	Distanzring (wenn kein Kühlrad)	5KD	K	K
555	Oil seal sleeve	Simmerring		Q	Q
556	Ring screw	Ringschraube		N	F
557	Stator housing	Statorgehäuse	5GM	A	A/F
558	Cooling jacket	Kühlmantel	5KG	K	F
559	Spring ring for 558	Sprengring zu 558	5RF	K	F
560	Impeller for circ. of cooling liquid	Kühlrad	5KI	A	A
561	Guidance sheet	Leitblech	5KB	K	K
562	Snap ring for ventilator	Seegerring zu Lüfter		O	O
563	Ventilator cap	Lüfterhaube		-	-
564					
565	O-ring for 566-598	O-Ring zu 566-598		Q	Q
566	Oil elbow	Oelbogen		A	-
567	cable bush	Kabeltülle		Q	Q
568	Fastening set 575	Befestigung 575		H	F
569	Fastening set 577	Befestigung 577		H	F
570	O-ring for 575	O-Ring zu 575		O	Q
571	Temperature probe	Temperatursonde	5ET	-	-
572	Float switch	Schwimmerschalter	5ES	-	-
573	Snap ring 574	Seegerring zu 574		O	O
574	Cover disc Mot. 6 + 7	Deckscheibe Mot. 6 + 75DA		K	K
575	Cable cover (probe, Mot. 6+7)	Kabeldeckel (Sonde, Mot. 6+7)	5DK	A	-
576	Shims for 507-504, 507-511	Regulierunterlagen zu 507-504, 507-511		K	F
577	Probeholding	Sondenblech		K	K
578	Moisture detector	Oelmessonde	8EF	-	-
579	Fastening set 593-300	Befestigung 593-300		M	-
580	O-ring for 593 gear side	O-Ring zu 593,getriebeseitig		Q	Q
581	Pipe for 507 old types	Spülrohr zu 507		N	-
582	Inset for 557 ex-proof old types	Einsatz zu 557, Ex-Schutz		A	A
583	Grease disc M.S.	Fettscheibe M.S.	5SS	K	K
584	Spacer for 503 standard bearing	Distanzring zu 503, normale Lagerung		K	K
585	Spacer for 557 standard bearing	Distanzring zu 557, normale Lagerung		K	K
586	Small plate for ground cable (earth)	Plättchen für Erdanschluss		P	P
587	Spacer P.S.	Distanzring P.S.		K	K
588	Grease disc, cable side	Fettscheibe kabelseitig		K	K
589	Snap ring for 588	Seegerring zu 588		O	O
590	Cable connection	Miniklemme	5EV	-	-
591	Carrying plate for 590	Tragschiene zu 590		-	-
592	Winding	Paket		-	-
593	Motor support	Motor Support		A	-
594	Snap ring for 595	Seegering zu 595		O	-
595	Heat shield	Hitzeschutzschild		-	-
596	Name plate ex-proof	Prüfschild Ex-Schutz		F	F
597	Name plate	Hauptschild		F	F
598	Oil tubes (ellbow for oil)	Oelröhrchen (Anschlussbogen)	5KR/5BO	A/P/K	P/F
599	Fastening set 598	Befestigung von 598		H	F
640	Fastening set 646-400	Befestigung 646-400		H	F
642	Rubber seal	Dichtungsgummi	6AD	Q	Q
646	Gliding shoe	Gleitschuh	6AS	A	C

* For material explanations see sheet of section "ENGINEERING DATA"
** a: Standard material execution
b: All internal wetted parts stainless steel
c: All wetted parts stainless steel depending on size

* Für Materialangaben s. Spezifikationsblatt des Kapitels "ENGINEERING DATEN"
** a: Standardmässige Materialausführung
b: Alle intern benetzten Teile rostfrei
c: Alle benetzten Teile rostfrei, grössenabhängig

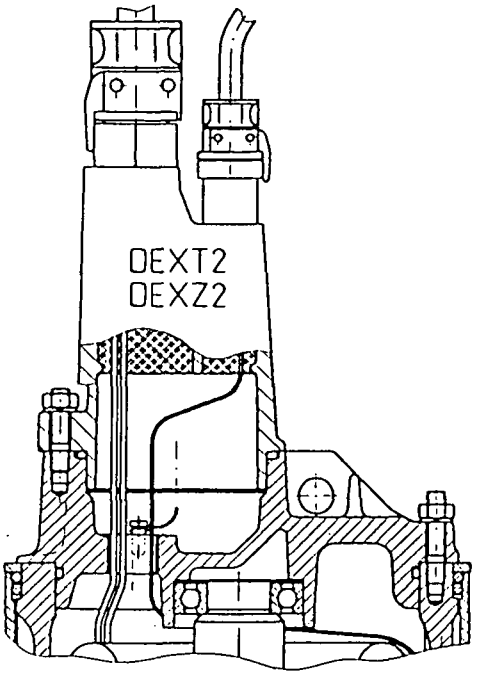
File : QTLSTPRT	Drawn by / Bearb. Dat. Vis. : 10.02.98 / mf	No. : 93-TU 4531/2b
	Approved by / Gepr. Dat. Vis. : 10.02.98 / DB	

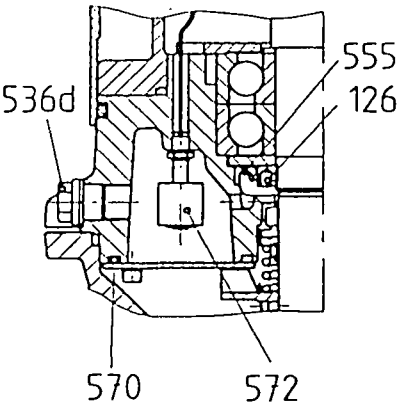
Hidrostal

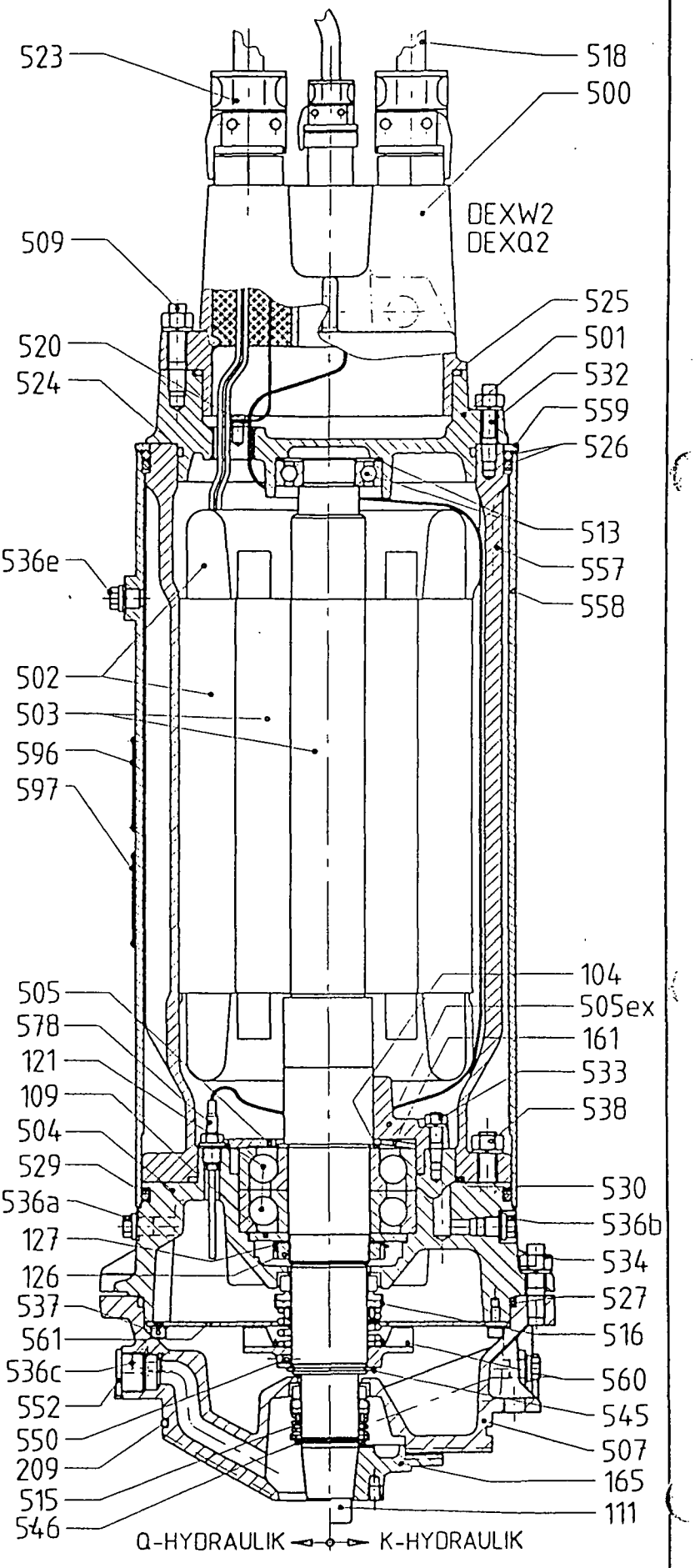
SECTIONAL DRAWING MOTOR

SCHNITTZEICHNUNG MOTOR

DEXT2/DEXW2
DEXZ2/DEXQ2







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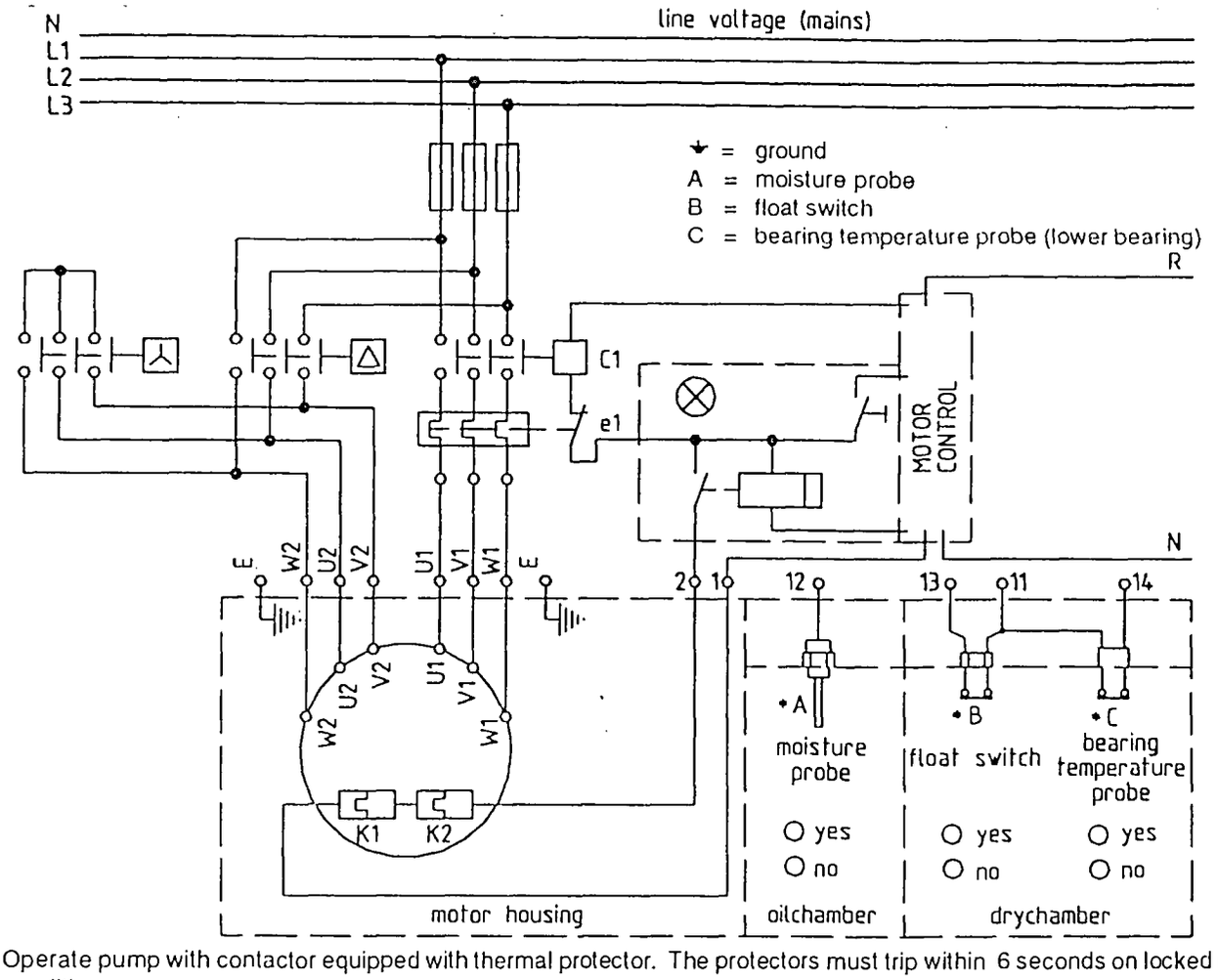
Hidrostal

WIRING DIAGRAM IMMERSIBLE MOTOR 1-SPEED YD - START STANDARD + EEx - PROOF



Operate pump with contactor equipped with thermal protector. The protectors must trip within 6 seconds on locked rotor condition.

Do not start until the temperature limit sensors (terminals 1+2) have been connected. When one limit sensor opens, the power supply to the motor must cut out. The circuit has to be laid out in such a way, that the motor cannot automaticly come on again, even after temperature limit sensors have cooled and re-closed the circuit (1+2). The cause of overheating must be determined and corrected before the motor is put back manually into service. After a loss of tension an automatic restart must be possible by return of tension.

C1	=	contactor
e1	=	thermal protector
K1,K2	=	temperature limit sensor ☐ Klixon type 250 V, 2,5 A ☐ thermistor
U1,U2 V1,V2 W1,W2 E	}	motor cable
1+2	=	control cable for temperature limit sensor
11+14	=	bearing temperature probe
11+13	=	float switch
12+E	=	control cable for moisture probe

} For Ex-proof execution "intrinsically safe circuit"

* ADDITIONAL PROTECTION ELEMENTS
Above indicated elements are installed as an option. For proper connection inside the control panel see sheet 94-TU 5455E.

Client:

Pump type: Order No.

Motor:

N =	kW	U =	Volts	I =	Amp.
n =	rpm	f =	Cycles	cos φ =	

Cable: mm² L = m

File: SCHEMA_E	Drawn by / Bearb. Dat. Vis.: 24.03.98 FW/mf Approved by / Gepr. Dat. Vis.: 24.03.98 FW	No.: 85-EL 3324E/e

Hidrostal AG
Pumpenfabrik
CH-8213 Neunkirch Switzerland

Tel. 052/681 00 87
Telefax 052/681 20 84
Postcheckkonto: 82-5219-9
Banken: BS Bank Schaffhausen, Fil. Neunkirch
Credit Suisse Schaffhausen
MWST-Reg.-Nr. 175915

Weir Engineering Pty Ltd

P.O.Box 461
Gosford,NSW 2250 / AUSTRALIA

INSTRUCTION-MANUAL ==========	17.02.99 16:19	Deliveryweek 11/99
Our order No. 9901125	Cust. Code BPAU	Your No. 34621

NH

	Pc A V F Z	Pos	Code	Anz	Specifications	
					PUMPS	HydVar: C MotVar: B CblVar: .
	MO SCB.A B	10		2	D100-L01RE + DEXT2-MSSQ + NAB1-10 13 kW, 400 Volt, 50 Hz, Start: YD n=ca. 2905 min-1, El-diagram: 85-EL 3324E/e Temperature-control: thermistor PTC cable(s)/pump: 10x1,5mm2 Rheywell L=10 m with internal moisture-probe (F-Sonde) ACHTUNG: KALTLEITER!!	MoNr: 990127 FabNr: 98428-98429
	TX A E	11			ACHTUNG: FUER HORIZONTALE AUFSTELLUNG!! *******	Instruction-Manual-Nr. 94-BA 5030E 85-EL 3324E/e 94-BA 5080E 94-BA 5039E 96-EL 5455/b
						We declare under our sole responsibility that the product to which this declaration relates is in conformity with the following standard(s) or other normative documents: VDMA 24287, DIN 24295, DIN 31000, EN 292-1+2, EN 60204-1, EN 60034-1, -5, -7, EN 23741 following the provisions of Directive: 98/37/EG, 73/23/EWG, 89/336/EWG, 93/31/EWG, (+94/9/EG for Ex-proof) H.P. Haas leader engineering department

Für Auftragsbestätigung: Unstimmigkeiten sind innerhalb 10 Tagen (HIDROPA 5 Tage) zu beanstanden
Für Rechnung: Reklamationen werden nur innerhalb 8 Tagen nach Empfang der Ware berücksichtigt

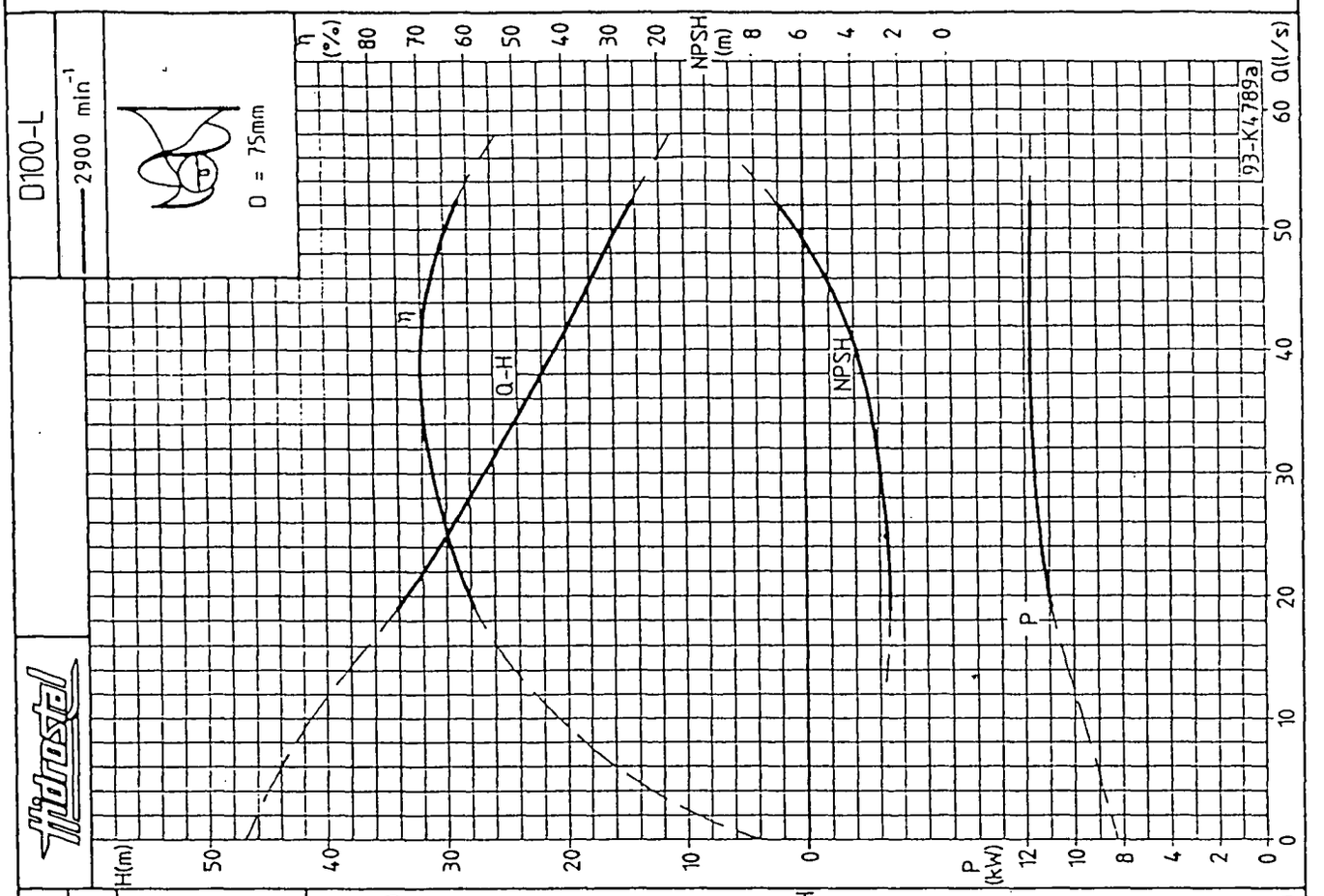
Hidrostal AG

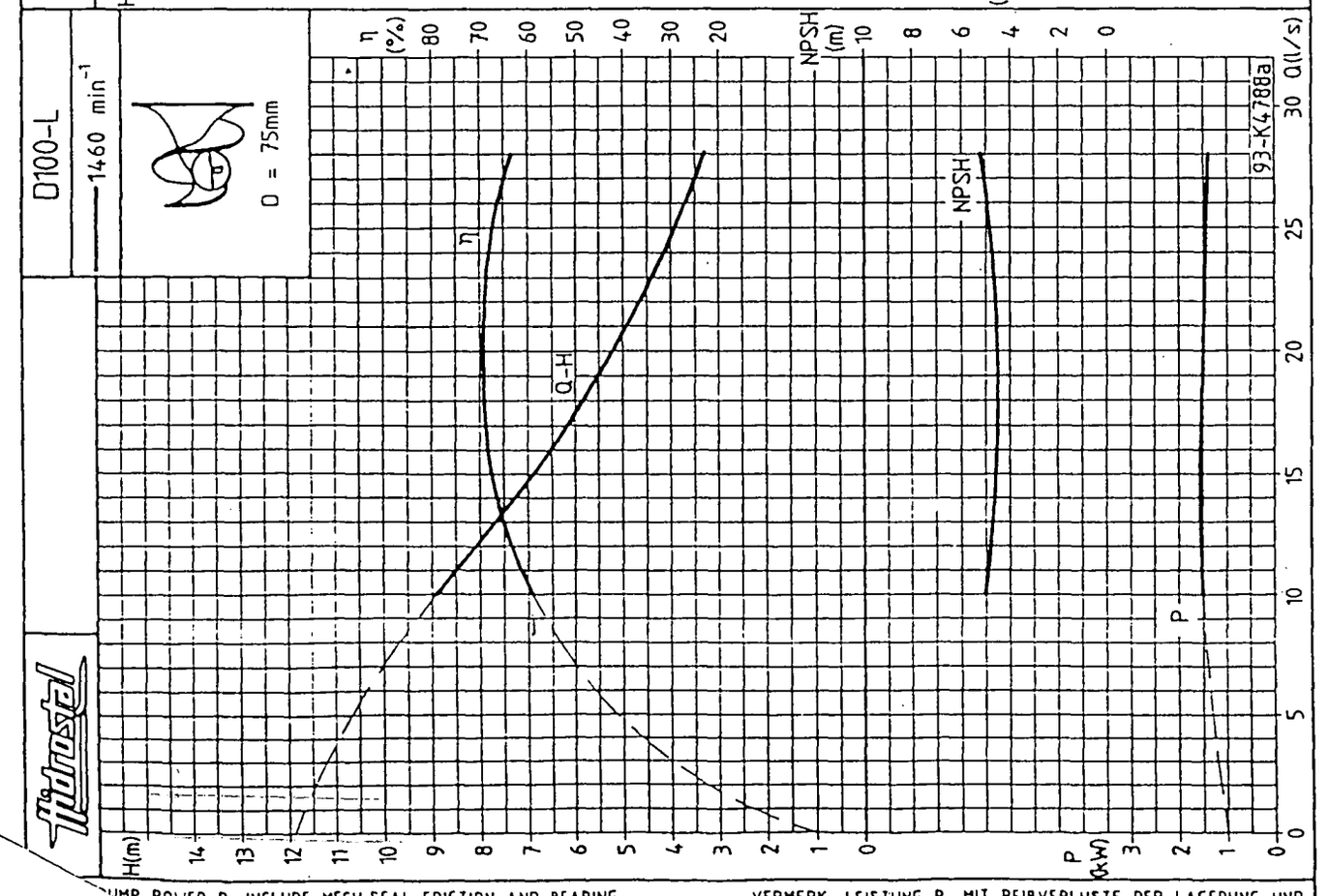
Hidrostal

BEARING FRAME PUMP
LAGERSTUHL PUMPE

D100-L

Dat: 18.03.96 | No: 94-K4900a | File:





UMP POWER P, INCLUDE MECH.SEAL FRICTION AND BEARING
E LOSS, FROM A RUN-IN BEARING FRAME TYPE C

VERMERK, LEISTUNG P, MIT REIBVERLUSTE DER LAGERUNG UND DICHTUNG EINES EINGELAUFENEN LAGERSTUHL TYP C

vacuum sewerage

BRISBANE CITY COUNCIL

BROWNLEE STREET
PINKENBA
VACUUM SEWERAGE SYSTEM

SECTION 5 PUMPING STATION ITEMS

5.1 Vacuum Collection Tank
5.2 Stop Valves
5.3 Check Valves

BRISBANE CITY COUNCIL

BROWNLEE STREET
PINKENBA
VACUUM SEWERAGE SYSTEM

5. PUMPING STATION ITEMS

5.1 Vacuum Collection Tank

The Maxitherm Boilers Pty Ltd fabrication drawing for the Collection Vessel Model 2414H3.01/150 and the manufacturers Data Report are included.

5.2 Stop Valves

The data sheet for the OBE Valves Australia Pty Ltd resilient seated wedge valve is included.

5.3 Aqua-Gas Swing Check Valve

The data sheet on the Aqua-Gas swing check valve is included.

MAXITHERM BOILERS PTY LTD
MANUFACTURER'S DATA REPORT FOR PRESSURE VESSEL

PRESSURE VESSEL- No. MMV938
REGISTRATION - No. _____

Items 1 to 9 inclusive to be completed for all vessels

1 TITLE OF VESSEL/COMPONENT: COLLECTION VESSEL
2 MANUFACTURED BY: MAXITHERM BOILERS PTY LTD. 329 HORSLEY RD. MILPERRA NSW 2214
3 MANUFACTURED FOR: EDWARDS ENVIRONMENTAL ENTERPRICES PTY LTD
PO BOX 82 CASTLECRAIG NSW 2068
4 LOCATION OF INSTALLATION: PUMPING STATION SITE
BROWNLEE STREET @ MAIN BEACH RD
PINKENBA
BRISBANE QLD
5 DESIGN REGISTRATION: STATE No. DATE
6 MANUFACTURER'S SERIAL No. MMV938 INTERNAL VOLUME 16.635 m^3
7 LOCATION OF REGISTRATION No.
8 TYPE 2414H3.01/150 CODE & CLASS AS 1210 CLASS 3 HAZARD LEVEL D
9 DRAWING Nos: 24/397/2 REV B

Items 10 to 16 inclusive to be completed for single wall vessels, jackets or jacketed vessels, or shells of heat exchangers.

10 DESIGN PRESS. 150 kPa DESIGN TEMP. 50 °C max. °C.min. DESIGN LIFE INDEFINITE h.cycles
11 PRESSURISING FLUID (Steam, air, gas, etc) LIQUID
12 SHELL: Diameter 2414 mm Length 3010 mm Thickness 12 mm
Corrosion Allowance 3 mm Material (Spec. & Grade) AS 1548-7-460
Longit. Joint D/BUTT Heat Treat N/A NDT SPOT Joint Eff. 0.70
(Double single, welded, butt, etc) (Temp °C, Time h, Part) (RT, UT, -Full, Spot)
Circum. Joint

13 ENDS:

	Location (Top, bottom, intermed)	Shape (Ellip, Tor, Spher, Coni, Flat)	Side to Pressure (Concave, Convex)	Dia. (mm)	Thickness min.(mm)
a)	TOP	TOR.	CONVCAVE	2414	8
b)	BOT	TOR.	CONVCAVE	2414	8

	Corrosion Allow. (mm)	Crown Radius (mm)	Knuckle Radius (mm)	Cone Apex Angle (degrees)	Material (Spec. & Grade)	Joint Eff.	Method of Attachment
a)	3	-	-	-	AS 1548-7-460	0.70	WELD
b)	3	-	-	-	AS 1548-7-460	0.70	WELD

If removable: Bolting Size & No. Material (Spec. & Grade)
14 QUICK ACTUATING DOOR: Type(Bayonet, etc) Interlock Fitted (Yes, No)
15 JACKET: Type Closure (Ogee, bar etc & Diemsions)
16 STAYS: Size (Diam, thickness)
Material (Spec. & Grade) Attachment

Items 17 to 23 inclusive to completed for all vessels where applicable.

17 BRANCHES:

No.	Size (mm)	Material (Spec & Grade)	No.	Size (mm)	Material (Spec. & Grade)
6	200NB	ASTM A106 G 'B'	3	50BSP	ASTM A106 G 'B'
1	150NB	ASTM A106 G 'B'	1	20BSP	ASTM A106 G 'B'
1	100NB	ASTM A106 G 'B'	2	25BSP	ASTM A106 G 'B'

Flange Spec. TABLE Flange Rating 'C'
18 INSPECTION OPENINGS: Manhole: No 1 Size (mm) 450NB Location SIDE
Handhole:
Sighthole:
19 SUPPORTS: Type FIXED No. 2 Location BOT
SAFETY DEVICES: Safety Valves: No. 1 Size 200NB Type TBL 'C' Location TOP
20 WELDER QUALIFICATION &/OR CERTIFICATION 23525, 23412 (NSW-WCA)
21 TESTS: Production Tests Plates (Yes, No) No Test Pressure 225 kPa
Press. Test Medium (Hydro, Pneum, Combin.) Hydro Test Position (Vert, Horiz.) Horiz.
Max. Permanent Stretch % Location of Max. Stretch

ENG. DEP. REF: S:\ENG\PRESSV\MDR\MMV938.doc
DATE:05/11/99

1 of 1

22 CERTIFICATE OF MANUFACTURER: I cerify the data in this report are correct and that all details of material, manufacturer and workmanship satisfy the requirements of AS 1210

(Manufacture) MANUFACTURED UNDER CERTIFIED (Signed) (Date) 12/04/99

23 Inspection Body QUALITY SYSTEM (REF. AS 3920.1) (Signed) (Date)

MAXITHERM BOILERS Pty. Ltd.

ISO 9001 SAQAS 1740

Items 25 and 26 to be completed for tubeplates and associated tubes

24 TUBE PLATES: Dia (mm) | Nom. Thick. (mm) | Corros. Allow. (mm) | Material (include Cladding) (Spec. & Grade) | Attachment (Welded, bolted)

Stationary:

Floating:

25 TUBES: Diameter mm Nom. Thick mm Number

Material (Spec, & Grade) Type (U or Straight)

Items 27 to 31 inclusive to be completed for inner chambers of jacketed vessels, or channels of heat exchangers.

26 DESIGN PRESS. kPa DESIGN TEMP. °C max. °C min. DESIGN LIFE h. cycles

27 PRESSURISING FLUID (Steam, air, gas, etc)

28 SHELL: Diameter mm Length mm Nom. Thickness mm

Corrosion Allowance mm Material (Spec. & Grade)

Longit. Joint (Double single, welded, butt, etc) Heat Treat. (Temp °C, Time h, Part) NDT (RT, UT, -Full, Spot) Joint Eff.

Circum. Joint

29 ENDS: Location (Top, bottom, intermed) | Shape (Ellip, Tor, Spher, Coni, Flat) | Side to Pressure (Concave, Convex) | Dia. (mm) | Thickness min. (mm)

a)

b)

Corrosion Allow. (mm) | Crown Radius (mm) | Knuckle Radius (mm) | Cone Apex Angle (degrees) | Material (Spec. & Grade) | Joint Eff. | Thickness min. (mm)

a)

b)

If removable: Bolting Size & No. Material (Spec. & Grade)

Other fastenings

31 TESTS: Production Tests Plates (Yes, No) Test Pressure kPa

Press. Test Medium (Hydro, Pneum, Combin.) Test Position (Vert, Horiz)

Max. permanent Stretch % Location of Max. Stretch

---

32 REMARKS (for all vessels) STAMPINGS ON RIM OF 450 NB FLANGE

MMV938

D.P. 150 kPa D.T. 50 °C

T.P. 225 kPa AS1210-3

16/3/99

Items 33 and 34 to be completed for vessels involving field work.

33 CERTIFICATE OF FIELD WORK: I certify the data in this report are correct and that all details of material, construction and workmanship involved in the field work of this vessel satisfy the requirements of AS 1210

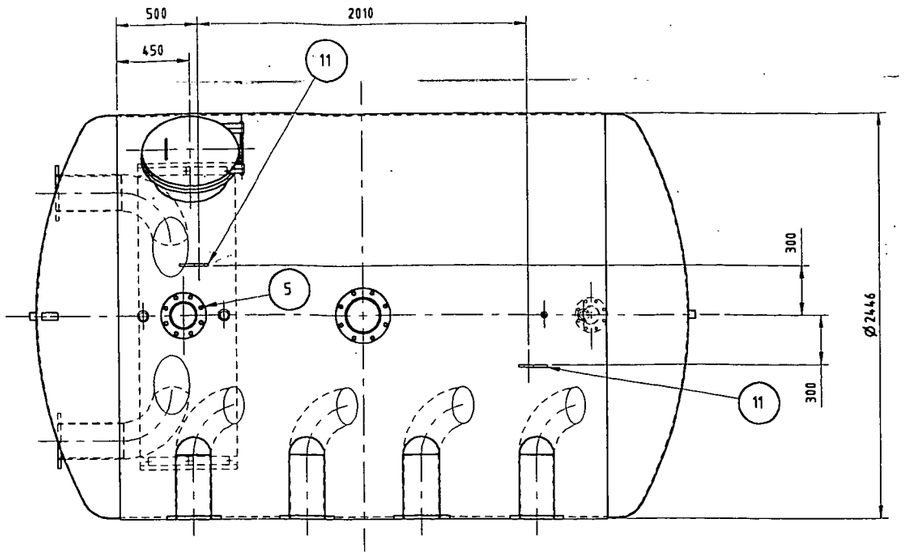
(Erector) (Signed) (Date)

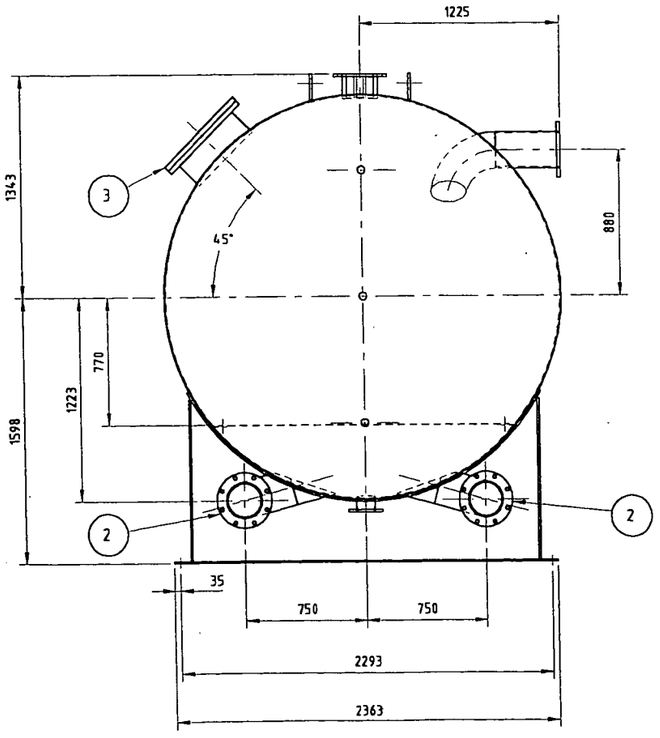
34 Inspection body (Signed) (Date)

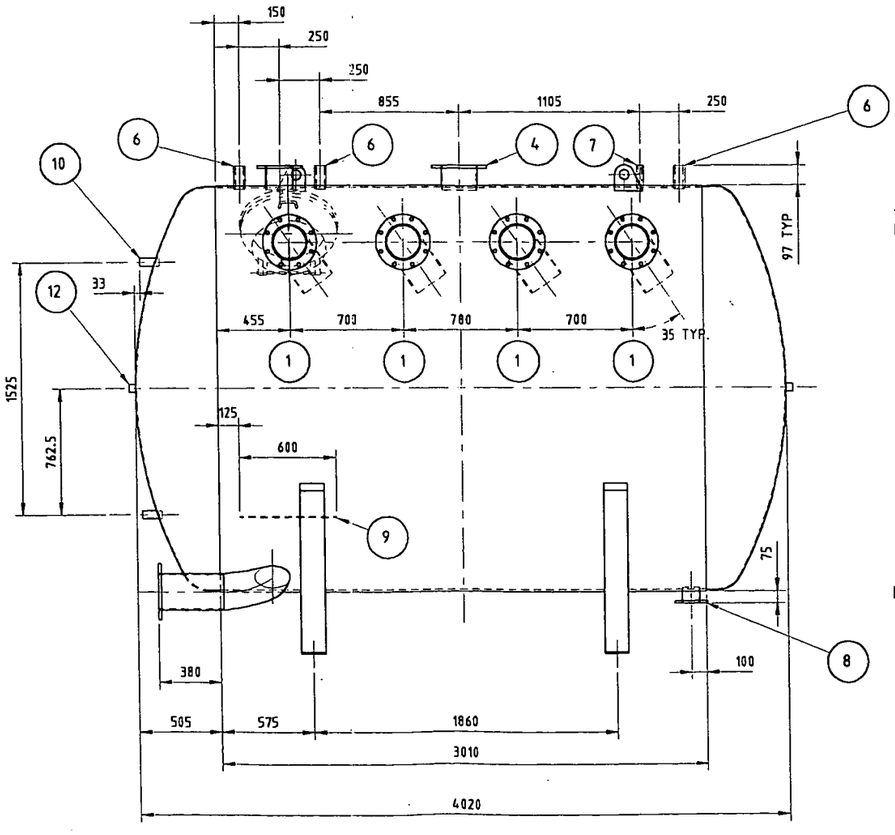
ENG. DEP. REF: S:\ENG\PRESSV\MDR\MMV938.doc 2 of 2

DATE:04/12/99

ITEM NO	DESCRIPTION	SIZE	QTY.
1	ANGLED SEWAGE INLETS	200 ND	4
2	SEWAGE OUTLETS	200 ND	2
3	MANWAY	450 ND	1
4	VACUUM OUTLET	200 ND	1
5	ELECTRICAL MOUNTING	150 ND	1
6	NOZZLE (SOCKETS)	50 BSP	3
7	NOZZLE (SOCKET)	20 BSP	1
8	SCOUR	100 ND	1
9	INTERNAL BAFFLE PLATE		1
10	SOCKETS	25 BSP	2
11	LIFTING LUGS		2
12	SPARE SOCKET	20 BSP	2







NOTES:

DESIGN TO AS1210 CLASS 3
INTERNAL DESIGN PRESSURE = 150 kPa
EXTERNAL DESIGN PRESSURE = 90 kPa
ALL STANDPIPES TO AS 2129 TABLE 'C'
VESSEL CONSTRUCTION DETAILS REF 24/396/2
SURFACE PREP/PAINTING

INTERNAL - ABRASIVE BLAST CLEANING TO AS 1627.4 CLASS 3
- FIRST COAT: CHEMICAL RESISTANT HIGH BUILD PRIMER BASED ON AMINE CURED EPOXY RESINS MINIMUM DRY FILM THICKNESS OF 50 MICROMETRES
- SECOND COAT: HIGH SOLIDS POLYAMINE CURED EPOXY DRY FILM THICKNESS OF 250 MICROMETRES
- THIRD COAT: SAME AS FOR THE SECOND COAT

EXTERNAL - ABRASIVE BLAST CLEANING TO AS 1627.4 CLASS 3
- FIRST COAT: HIGH BUILD POLYAMIDE CURED RECOATABLE EPOXY PRIMER MINIMUM DRY FILM THICKNESS OF 150 MICROMETRES
- SECOND COAT: HIGH BUILD POLYAMIDE CURED RECOATABLE EPOXY COATING, WHITE FINISHED DRY FILM THICKNESS OF 150 MICROMETRES

CLIENT: EDWARDS ENVIRONMENTAL ENTERPRISES PTY LTD

REV.	BY	CHECK	DATE	REVISION DETAILS
/	****	****	--/--/--	/
B	CJB		1/2/99	FLANGES AND SOCKETS REPOSITIONED

DRAWN JM DATE: 22/1/99
CHECK DATE: 22/1/99
SCALE 1:25

GENERAL ARRANGEMENT OF 2414H3.01/150

MAXITHERM BOILERS PTY. LIMITED

FILE No. C30674.30.DWG
DWG.No C3/674/3 REV: B

February 02, 1999 9:30:30 a.m. (by C.B.)
Drawing: S:\W.C3\C30674.30.DWG
Xrefs: A2ORDER.DWG

OBE/Elypso VALVE *flanged ends*

The only resilient seated valve with more than 45 years of service under the severest conditions throughout the world.

FIG No	MATERIAL	RATING	RANGE	FACE TO FACE DIMENSION
406	DUCTILE	16 BAR	DN80–375	AS 2638 ISO 5996 BS 5163
400	DUCTILE	16 BAR	DN50–400	DIN 3202 F4
470	DUCTILE	16 BAR	DN450–500	DIN 3202 F5

Spindle: Stainless Steel. AS 2837 Grade 431. Clockwise or Anti clockwise closing.

Wiper Ring: Nitrile.

'O' Rings: Nitrile. Housed directly into one piece bonnet.

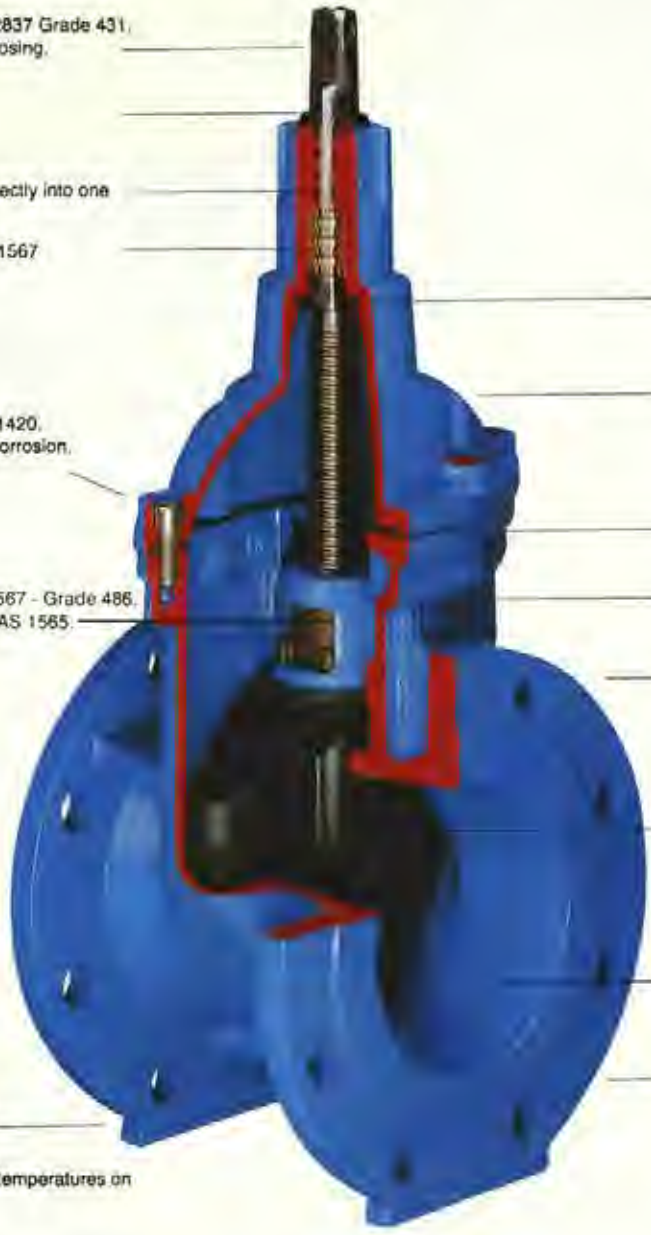
Thrust Collar: DR Brass AS 1567 Grade 486.

Socket Screws: H.T.S. AS 1420. Permanently sealed against corrosion.

Spindle Nut:
Dn 50 to 100 DR Brass AS 1567 - Grade 486.
Dn 150 to 500. Gunmetal to AS 1565.

Feet: This valve stands on its own feet.

Temperature: 70° C. Higher temperatures on request.



Lifting Rings: On request. Central lifting point for larger valves.

Pressure Seal: Nitrile. A positive seal in itself.

Bonnet: Ductile Iron - Coated internally and externally with Rilsan Nylon 11.*

Body Gasket: Nitrile.

Wedge Guide: Differential pressure in the main acting against the wedge is absorbed at its uppermost point by the unique three point guide system.

Body: Ductile Iron - Continuously coated internally and externally with **Rilsan Nylon 11.***

Wedge: Nitrile. Perfectly bonded to ductile iron wedge by vulcanisation. Bottom drain hole. Lined with **Inertol.**

Bore: Clear, unobstructed waterway. No seating recess or debris trap.

Flange Drilling: To AS 4087 or other as specified.

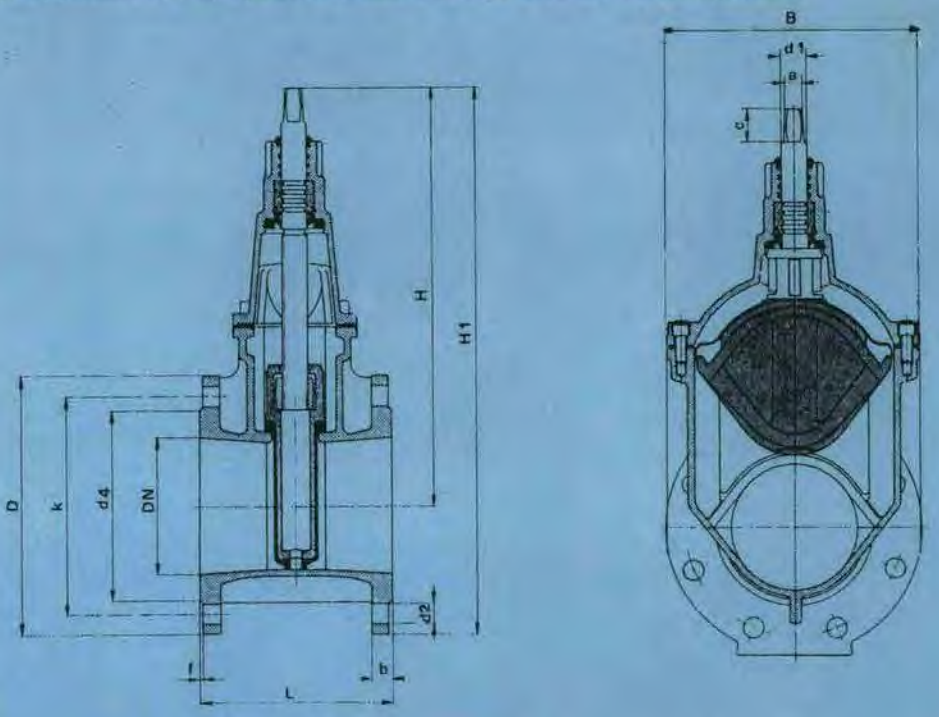
Packaging: Smaller valves are individually packed to protect coating during transport etc.

The **OBE/Elypso Valve** is of a smooth compact design, protected against corrosion and tuberculation by Rilsan Nylon 11* coating. The multiple 'O' ring and pressure seal arrangement in the bonnet spindle housing ensures a permanent seal. To date there is not a recorded failure of the spindle seals in the millions of valves installed throughout the world. In the event of accidental damage, the bonnet, spindle and wedge can be replaced without removing the valve from the pipeline.
* Other coatings available.

UNSURPASSED TECHNOLOGY
PH: (02) 792 3822
OBEVALVES AUSTRALIA PTY LIMITED
FAX: (02) 792 3648

Application: Water, Sewerage,* Air, Natural Oils & Gases (up to 16 Bar) and are suitable for other fluids subject to our confirmation. Valves required for either gas or vacuum should be ordered specifically for the purpose intended as additional tests are applied.
OBE/Elypso valves can be supplied with Handwheel, Spindle Cap, Extension Spindle, Actuators (geared or electric) and positional indicators.

* In sewerage applications the optional Grade 316 spindles are recommended.



Illustrations, technical data, dimensions and weights shown are subject to alterations without notice.

Dn 450 & 500 valves have a reduced port.

DN	PN	VALVE DIMENSIONS									FLANGE DETAILS									WEIGHT		
DIA	CL	FIG														AS 4087		AS 2129		KG		
		400	470	406												C		E				
mm	BAR	L	L	L	H	H1	B	a	c	d1	D	b	k	d4	f	No	d2	No	d2	400	470	406
50	16	165			225	300	118	14.8	30	22	150	18	114	90	3	4	18	4	18	10		
65	16	170			245	328	144	16.3	31	22	165	18	127	103	3	4	18	4	18	12		
80	16	180		203	288	381	160	17.3	35	25	185	18	146	122	3	4	18	4	18	16		17
100	16	190		229	334	442	188	19.3	38	25	215	20	178	154	3	4	18	8	18	22		23
125	16	200			403	528	240	19.3	38	28	250	22	210	183	3	8	18	8	18	28		
150	16	210		267	465	605	280	19.3	38	28	280	23	235	209	3	8	18	8	22	42		44
200	16			292	551	719	348	24.3	48	32	335	23	292	264	3	8	18	8	22			66
225	16			305	551	736	348	24.3	48	32	370	24	324	296	3	8	18	12	22			72
250	16			330	666	869	434	27.3	48	36	405	24	356	328	3	8	22	12	22			111
300	16			356	758	986	512	27.3	48	36	455	33	406	376	4	12	22	12	26			146
350	16	290			882	1112	570	27.3	48	40	520	33	470	427	4	12	26	12	26	188		
375	16			381	882	1157	570	27.3	48	40	550	33	495	463	4	12	26	12	26			288
400	16	310			929	1234	676	32.3	55	44	580	33	521	477	4	12	26	12	26	260		
450	16		650		929	1249	696	32.3	55	44	640	33	584	552	4	12	26	16	26		355	
500	16		700		929	1282	696	32.3	55	44	705	35	641	609	4	16	26	16	26		385	

AQUA-GAS

AQUA-GAS - SWING CHECK VALVE PN 10 OR PN 16 41/25

To BS 5153 : 1974 (1991)
Resilient seated
Face to face dimension to BS 5153 : 1974 (1991) short
Flanges and drilling to BS 4504 (ISO 7005-2, DIN 2501)

Use:

For potable water and sewage to max. 70°C

Tests:

Hydrostatic test to BS 5153 : 1974 (1991)

Seat: 1.1 x PN
Body: 1.5 x PN

Optional extras:

Lever and weight:
Mounted RHS as standard - can be mounted LHS on request

Lever + weight guard

Limit switch actuation kit

Metal faced seats - Series 41/30

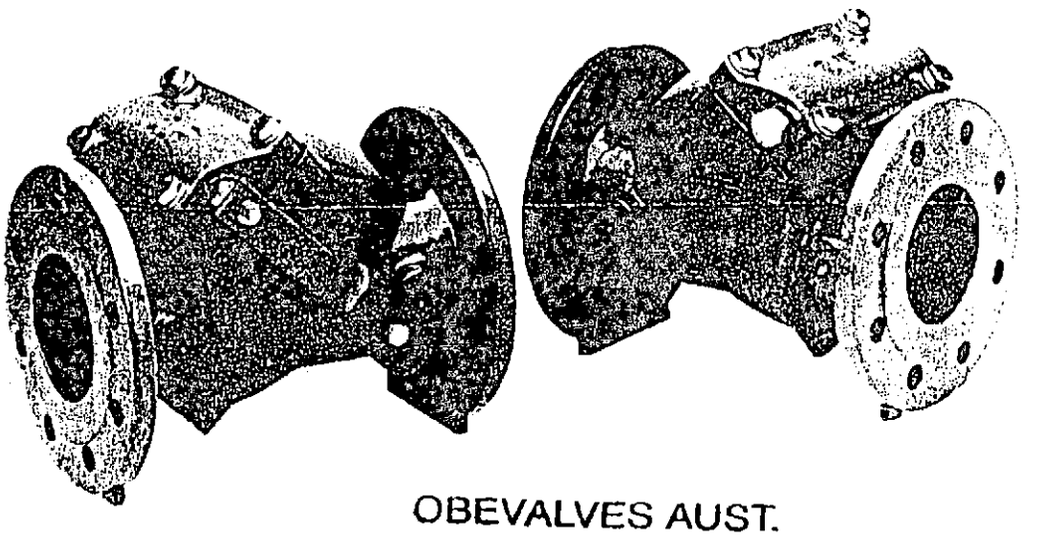
Special Features:

Resilient seated disc with epoxy coated ductile iron body seat.

Easy replacement of bonnet, bonnet gasket and disc.

Materials:

Body, bonnet and hinge	Ductile iron, GGG-50, to BS 2789 grade 500-7
Shaft	Stainless steel
Bonnet gasket	Nitrile rubber
Bushing	DZR brass, CZ 132
Body seat and tapping plug	Gunmetal, to BS 1400 LG2
Bolts and washers	Stainless steel AISI 304
Coating	Electrostatically applied epoxy resin - Internally and externally
Resilient seated disc	EDPM rubber with a steel insert to BS 4360 : 1979 43B
Lever	Steel 43B to BS 4360:1979
Weight	Grey cast iron, GG-25, to BS 1452 grade 250



AVK

For further specifications, see section "Technical information".
The designs, materials and specifications shown are subject to change without notice due to our continuing programme of product development.

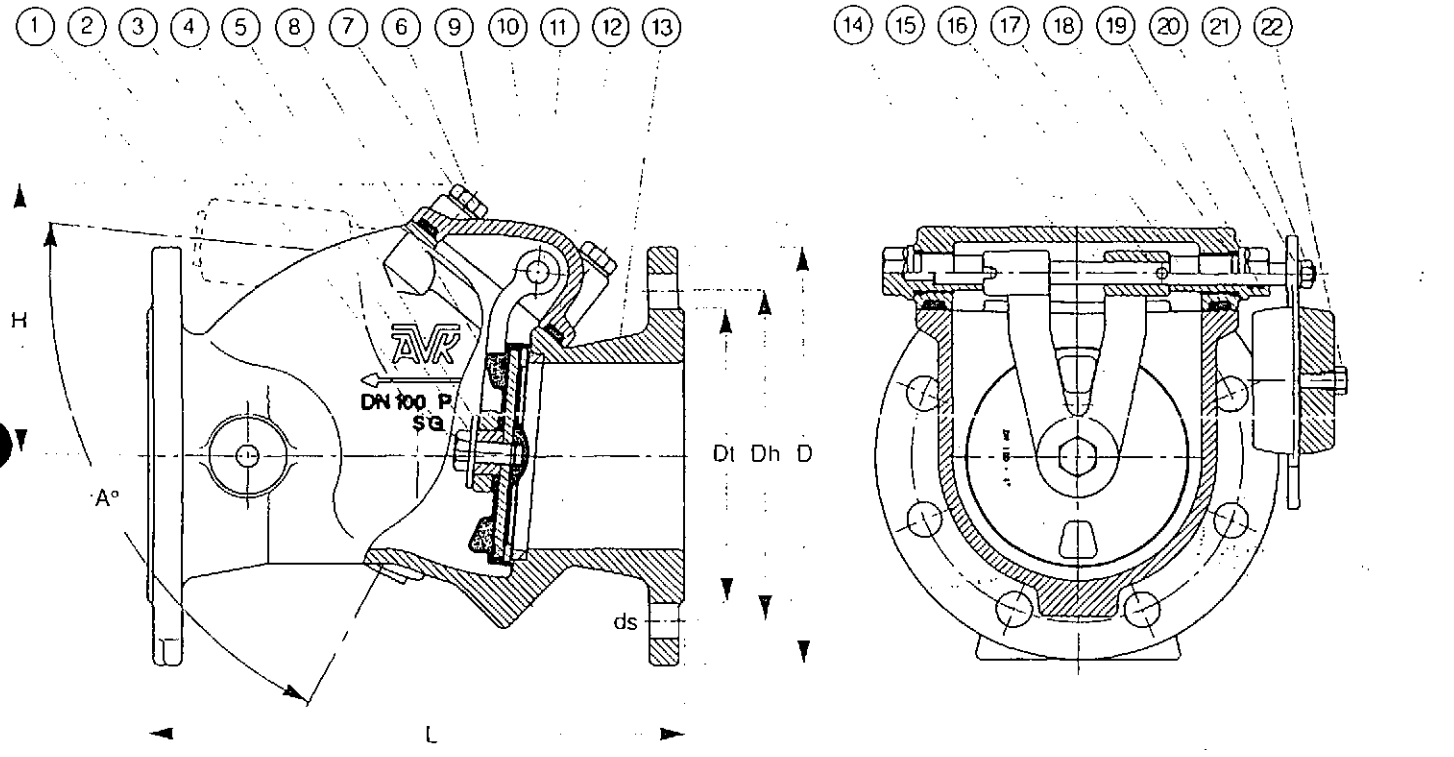
AQUA-GAS - SWING CHECK VALVE PN 10 OR PN 16

41/30

To BS 5153 : 1974 (1991)
Metal seated
Overall length to BS 5153 : 1974 (1991) short
Flanges and drilling to BS 4504 (ISO 2084, DIN 2501)

Component list

1. Lever
2. Weight
3. Hexagon bolt
4. Washer
5. Bushing
6. Hexagon bolt
7. Washer
8. Disc
9. Hinge
10. Bonnet
11. Seat ring
12. Bonnet gasket
13. Body
14. Bushing
15. Hinge pin
16. Pin
17. Bushing
18. O-ring
19. O-ring
20. Washer
21. Hexagon nut
22. Hexagon bolt



Rel. nos.	DN	L mm	H mm	Dt mm	O mm	Dh mm PN 10	Dh mm PN 16	ds mm PN 10	ds mm PN 16	Holes PN 10	Holes PN 16	A°	Weight Kgs Std Vlve	Weight Kgs Vlve + L/W
41-050-308X*)	50	203	110	102	165	125		19		4		60°	*)	*)
41-065-308X*)	65	216	120	122	185	145		19		4		63°	*)	*)
41-080-308X	80	241	140	138	200	160		19		8		66°	16.0	16.5
41-100-308X	100	292	150	158	220	180		19		8		68°	20.0	21.5
41-125-308X*)	125	330	180	188	254	210		19		8		68°	*)	*)
41-150-308X	150	356	195	212	285	240		23		8		70°	38.5	40.5
41-200-308X	200	495	230	268	340	295		23		8	12	73°	64.5	66.5
41-250-308X*)	250	622	270	320	406	350	355	23	28	12		76°	*)	*)
41-300-308X*)	300	698	300	370	482	400	410	23	28	12		80°	*)	*)

X
0 = PN 10
1 = PN 16
*) In preparation

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