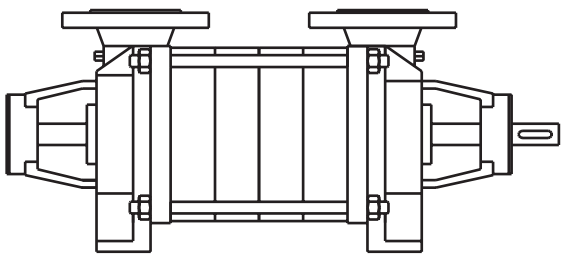
CE

Instruction manual

MCH(W)(S)

Horizontal multistage pump



MCH/EN (0402) 4.0

JOHNSON PUMP

EC Declaration of conformity

(Directive 98/37/EC, appendix II-A)

Manufacturer
Johnson Pump Water B.V.
Dr. A.F. Philipsweg 51
P.O. Box 9
9400 AA Assen
Netherlands

hereby declares that the pump, in case it is delivered as an assembly with drive (last position of serial number = A), is in conformity with the provisions of Directive 98/37/EC (as altered most recently) and the following directives and standards:

- EC directive 73/23/EEC, "Electric equipment for use within certain voltage limits"
- standards EN 292 part 1 & 2, EN 809

The pump to which this declaration refers may only be put into operation after it has been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which this pump forms part, has been made to fulfil the requirements of Directive 98/37/EC (as altered most recently).

Manufacturer’s declaration

(Directive 98/37/EC, appendix II-B)

Manufacturer
Johnson Pump Water B.V.
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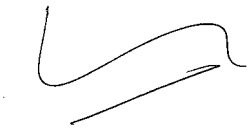
Netherlands

hereby declares that the pump, in case it is delivered without drive (last position of serial number = B), is in conformity with the following standards:

- EN 292 parts 1 & 2, EN 809

and that this pump is meant to be incorporated in or combined with another machine (electric motor, combustion engine) and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, Janary 1st 2004



P. Ressenaar
Director

Instruction manual MCH

Johnson Pump Water BV (hereafter called Johnson Pump) is part of Johnson Pump International AB. The core activities of Johnson Pump International AB are the development, production, sale and maintenance of pumps and pump units.

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MCH/EN (0402) 4.0

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1 Introduction

1.1 Introduction

This manual contains important and useful information for the proper operation and maintenance of this pump. It also contains important instructions to prevent potential accidents and damage, and to ensure safe and fault-free operation of this pump.

! **Read this manual carefully before commissioning the pump, familiarize yourself with the operation of the pump and strictly obey the instructions!**

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

Johnson Pump reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

1.2 Safety

This manual contains instructions for working safely with the pump. Operators and maintenance staff must be familiar with these instructions.

Below is a list of the symbols used for those instructions and their meaning:

⚠ ***Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative!***

! **Risk of damage or poor operation of the pump. Follow the corresponding instruction to avoid this risk.**

➢ *Useful instruction or tip for the user.*

Items which require extra attention are shown in **bold print**.

This manual has been compiled by Johnson Pump with the utmost care. Nevertheless Johnson Pump cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking any additional and/or deviating safety measures.
Johnson Pump reserves the right to change safety instructions.

1.3 Guarantee

Johnson Pump shall not be bound to any guarantee other than the guarantee accepted by Johnson Pump. In particular, Johnson Pump will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the products supplied.

The guarantee will be cancelled immediately and legally if:

- service and/or maintenance is not undertaken in strict accordance with the instructions.
- the pump is not installed and operated in accordance with the instructions.
- necessary repairs are not undertaken by our personnel or are undertaken without our prior written permission.
- modifications are made to the products supplied without our prior written permission.
- the spare parts used are not original Johnson Pump parts.
- additives or lubricants used are other than those prescribed.
- the products supplied are not used in accordance with their nature and/or purpose.
- the products supplied have been used amateurishly, carelessly, improperly and/or negligently.
- the products supplied become defective due to external circumstances beyond our control.

All wearing parts are excluded from the guarantee. Furthermore, all deliveries are subject to our "General conditions of delivery and payment", which will be forwarded to you free of charge on request.

1.4 Service and support

This manual is intended for engineering and maintenance staff and for those who are in charge of ordering spare parts.

1.4.1 Ordering spare parts

This manual contains the spare parts recommended by Johnson Pump as well as the instructions for ordering them. A fax-order form is included in this manual. If you have any questions or require further information with regard to specific subjects then do not hesitate to contact Johnson Pump.

1.4.2 Pump number

The pump number is stamped on the type-plate of the pump.
For correspondence and when ordering spare parts you should always state this number and the other information on the type plate.

➢ *The pump information is also stated on the label in the front of this manual*

1.5 Checking goods delivered

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

1.6 Transport instruction

1.6.1 Dimensions and weight

The pump units in the MCH range are usually too heavy to be moved be manually. Therefore, use the correct transport and lifting equipment. The weight of this pump (unit) is shown on the label in the front of this manual. You can find the dimensions in chapter 8.

1.6.2 Use of pallets

The MCH is packed on a pallet. Leave the pump on the pallet as long as possible. This prevents unnecessary damage and makes transporting the pump easier if the pump has to be moved again for installation.

! Use of a forklift truck: always set the forks as far apart as possible and lift the pallet using both forks.

1.6.3 Hoisting

When lifting a pump or complete pump units the straps must be fixed in accordance with figures 1 and 2

⚠ ***Never stand underneath a hoisted pump!***

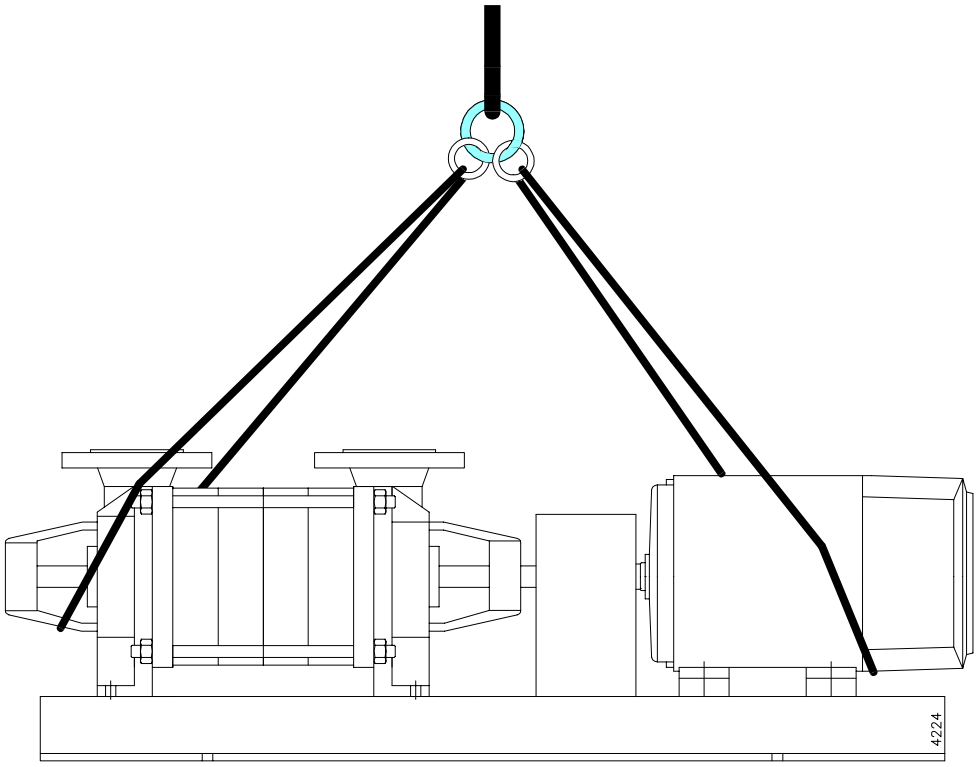

figure 1: Lifting instructions pump unit.

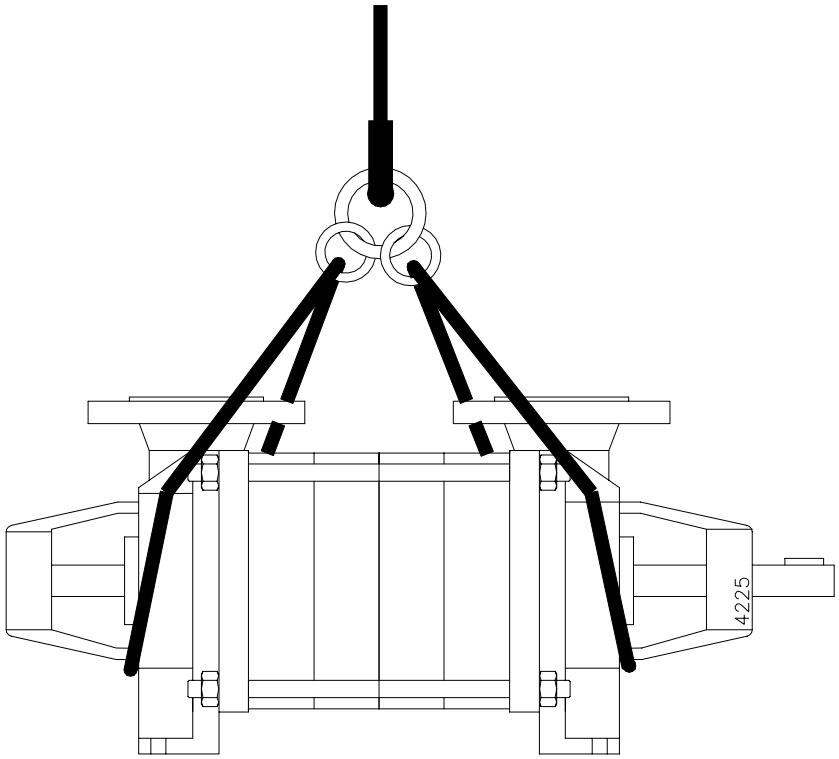

figure 2: Lifting instructions pump.

1.7 Storage

If the pump is not to be used immediately the pump shaft must be turned twice per week by hand.

2 General

2.1 Pump description

The MCH is a range of horizontal high-pressure stage pumps with closed impellers. The range consists of the following 7 basic types:

- MCH 10
- MCH 12,5
- MCH 14a
- MCH 14b
- MCH 16
- MCH 20a
- MCH 20b

Each basic type can be designed with one or more pressure stages.

Flange dimensions, bolt circle and number of holes are according DIN 2535 ND 40.

The pump is driven by a standard IEC foot motor. The power is transmitted through a flexible coupling.

An exception to the above is the MCH 10, which has connections with internal screw thread and is driven by an electric *flange* motor.

Due to the modular design of the construction parts there is a high level of interchangeability, even with other types of multistage pumps, such as the MCV or the MCHZ.

2.2 Type code

Various designs of pumps are available in the MCH range. The main features of the pump are shown in the type code.
See the examples on the next page.

MC	H		12,5 x	4 -	3,2

3,2 = suction and pressure connection in cm

4 = number of pressure stages

12,5 = impeller diameter in cm

= stuffing box
S = mechanical seal
W = water-cooled stuffing box

H = horizontal

MC = name of pump range (Multi-stage centrifugal pump)

MC	H	S	20	a x	1,7 -	8

8 = suction and pressure connection in cm

1,7 = 2 impellers, of which the first has a reduced diameter

a = narrow impeller
b = wide impeller

20 = impeller diameter in cm

= stuffing box
S = mechanical seal
W = water-cooled stuffing box

H = horizontal

MC = name of pump range (Multi-stage centrifugal pump)

2.3 Applications

The MCH can be used for the following applications:

- warm and hot water supply systems.
- air-conditioning.
- cooling for land and marine installations.
- water supply for industry, water supply companies, agriculture and horticulture.
- spraying installations.
- washing and condensing installations.
- pressure increasing installations.
- in the process industry, general industry, road and marine construction.

2.4 Liquids

In general the MCH pumps are suitable for pumping clean liquids, such as:

- springwater, cold and hot water.
- various cooling liquids.
- caustic soda.
- petrol, kerosene, petroleum.

These liquids must not affect the materials used. For the materials used see the parts list in chapter 9.

⚠ ***We advise against using the pump for an application which differs from that for which the pump was orginally supplied, without discussing this with your supplier first! Using a pump in a system or under system conditions (liquid, system pressure, temperature, etc.) for which it has not been designed can create danger for the user!***

2.5 Construction

2.5.1 Pump section

The pump section is assembled from an inlet and outlet casing and a number of sections or stage casings with cast vanes. The inlet and outlet casings are fitted with a cast suction and pressure flange, except for the MCH 10 series. For the MCH 10 the inlet and outlet casings are provided with holes with an internal screw thread.
The support for the inlet and outlet casings are in a vertical centre line with the suction and the pressure pipes.
The inlet and outlet casings are fitted with connections for pressure gauge, balance pipe, possible barrier liquid and drain.
By using guide blades the radial forces on the rotor can be disregarded over the entire capacity curve.
The stage casings are fitted with exchangeable wear rings. To prevent turbulence and for the benefit of the required NPSH values, there is a suction cover with 2 anti-rotation partitions located in front of the first impeller.

The MCH 10 has no connections for barrier liquid, no drain, no wear rings and no suction cover. The inlet casing is equipped directly with a suction aperture and anti-rotation partitions.

2.5.2 Impellers

All types of MCH pumps, with the exception of the MCH 10, are fitted with closed impellers, designed with 2 sealing edges and balance holes. As a result of this the axial forces on the rotor are reduced to a minimum. The remaining forces are taken up by an axially mounted bearing. The impellers are held on the shaft by 2 stainless steel external circlips.

The MCH 10 is fitted with closed impellers which are made of glass reinforced plastic. Both parts are ultrasonically welded and have a very smooth surface, so that growth development is restricted. The light weight and the accurate design guarantee long and noise-free operation.

2.5.3 Shaft seal

The shaft seal for the MCH is available in 2 variants:

1 MCH and MCHW
Standardized stuffing box packing rings.
Pumps for which the pressure in the gland becomes too high are designed with a balance pipe.

2 MCHS
Mechanical seal with bellows
Cooling and lubrification of this seal is undertaken by circulation of the pumped liquid via a balance pipe.

2.5.4 Bearing construction

- All MCH/MCHW/MCHS pumps, with the exception of the MCH(S) 10, are designed with 2 grease-lubricated deep-groove ball bearings.
- Depending on the number of pressure stages, the MCH(S) 10 is fitted with either 1 or 2 single-row angular contact bearings on the pressure side.
  A slide bearing is fitted in the inlet casing on the suction side and this is lubricated by the pumped liquid.
- For the types MCH/MCHW/MCHS 20a and 20b a double-row angular contact bearing is used on the pressure side.
- Pumps with heavy bearing constructions - used for MCH/MCHW/MCHS 14a and 14b - are fitted with 2 single-row angular contact bearings on the pressure side.
- MCH(S) 12,5, 14a/b (with standard bearings) and 20a/b are provided with 2RS1-bearings.
- The MCH 16 and MCHS 16, MCHW 14a/b, MCHW 16 and MCHW 20a/b are fitted with grease nipples so that these bearings can be greased periodically.
- MCH(S) 10: The ball bearings and the ball bearing housing are filled with a quantity of grease on delivery which is sufficient for the life of the bearing.
- MCH**W**: The ball bearings and the ball bearing housings are filled on delivery with a quantity of special grease suitable for high temperatures.
- The bearing housings are fitted with 2 holes so that the gland housing is easy to access.
- The bearing on the pressure side is axially fixed.
- The bearing is sealed by means of rubber V-rings.

2.6 Application area

2.6.1 Q-H field

	Maximum
Capacity	100 m^3/h
Head	340 m

Tolerances according to DIN 1944 - class III

2.6.2 Pressure and temperature

The maximum permitted pressures and temperatures are stated in paragraph 10.2.

2.7 Re-use

The pump may only be used for other applications after prior consultation with Johnson Pump or your supplier. Because the medium which was pumped last is not always known, the following instructions should be observed:

1 Flush the pump properly.
2 Make sure the flushing liquid is discharged safely (environment!).

⚠ ***Take adequate safety measures (collection trough) and use the correct personal protection equipment (rubber gloves, spectacles)!***

2.8 Scrapping

If it is decided to scrap a pump, then the same steps as 2.7 must be followed first.

3 Installation

3.1 General

! **Read this manual carefully prior to installation and commissioning. Non-observance of these instructions can result in serious damage to the pump and this will not be covered under the terms of our guarantee. Follow the instructions given step by step.**

- Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded.
- Depending on the design the pumps are suitable for liquids with a temperature of up to 150°C. When installing the pump unit to work at 70°C and above the user should ensure that appropriate protection measures and warnings are fitted to prevent contact with hot pump parts.
- If there is danger of static electricity, the entire pump unit must be earthed.
- If the liquid being pumped can cause danger for man or the environment, measures must be taken to drain the pump in a safe way!
  Any leakage of liquid from the seal must be disposed of in a safe way.

3.2 Preservation

In order to prevent corrosion, the inside of the pump is treated with a preserving agent before leaving the factory. Before commissioning the pump remove any preserving agents and flush the pump thoroughly with hot water.

3.3 Precautions

- The area in which the pump is installed must be sufficiently ventilated. An ambient temperature or air humidity which is too high, or a dusty environment, can have a detrimental effect on the operation of the electric motor.
- Behind the cooling air inlet of the motor there must be a free area of at least 1/4 of the electric motor diameter, to ensure unobstructed air supply.
- The foundation must be hard, level en flat.
- There should be sufficient space around the pump unit to operate and if necessary repair it.
- For models with a gland, check that the gland nuts have not been over-tightened. If necessary slacken the gland nuts and re-tighten them by hand.

3.4 Piping

Thought should be given to the following points with regard to the pipes and connection points of the pump:

- The suction and pressure pipes must connect perfectly and be free of tension during operation.
- The suction pipe bore must be adequately dimensioned. This pipe must be as short as possible and led to the pump in such a way that no air pockets can be created. If this is not possible, a venting facility must be fitted at the highest point. If the suction pipe has a larger bore than the suction connection on the pump then an eccentric reducer must be used, so that no turbulence can be created, see figure 3.

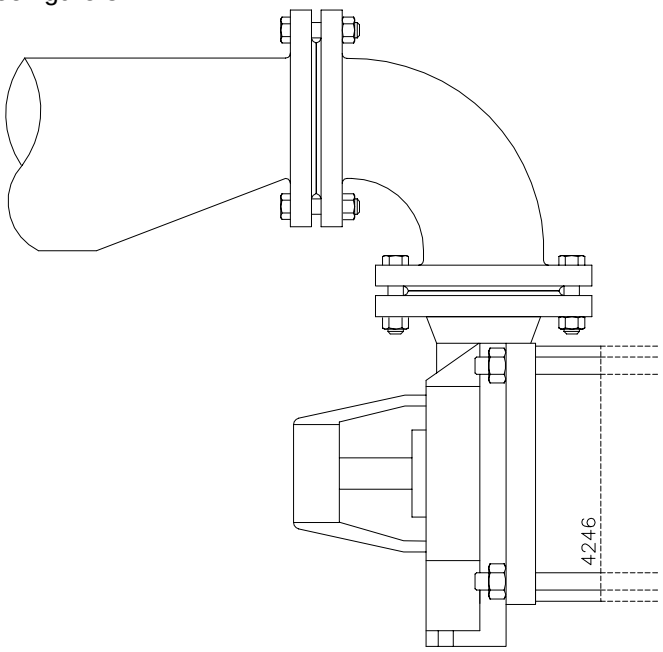

figure 3: Excentric reducer to suction flange.

- Before the pump is installed thoroughly flush the pipe first in order to remove dirt, grease or any particles which are present in the pipes. We recommend that you fit a fine gauze temporarily in front of the pump inlet
- Assemble any loose components.If the liquid is not flowing to the pump then fit a foot valve. It may be possible to combine this with a strainer if the liquid to be sucked contains solid particles.

3.5 Installation

⚠ ***Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded!***

3.5.1 Positioning

The pump shaft and motor shaft of complete units are fitted accurately together in the factory. For permanent installation use shims to ensure that the base plate is level on the foundation. Then carefully tighten the nuts on the foundation bolts. After that, check the setting of the pump and motor shaft and readjust as required.

If the pump and the electric motor still have to be assembled, proceed as follows:

1 Fit both halves of the coupling to the pump shaft and the motor shaft respectively.
2 Position the pump on the foundation and secure it with bolts.

3 Place the electric motor on the foundation. Place the copper shims under the feet of the electric motor. Secure the electric motor with bolts and ensure there is a gap of 3 mm between both coupling halves.

4 Align the coupling in accordance with the instructions below.

3.5.2 Align the coupling

1 Place a ruler (A) on the coupling. The straight edge must touch both coupling halves over their entire width, see figure 4.

2 Repeat the same check on both sides of the coupling at the height of the shaft.

3 To de certain the check is also undertaken using external calipers (B) at 2 diametrically opposed points of the sides of the coupling halves, see figure 4.

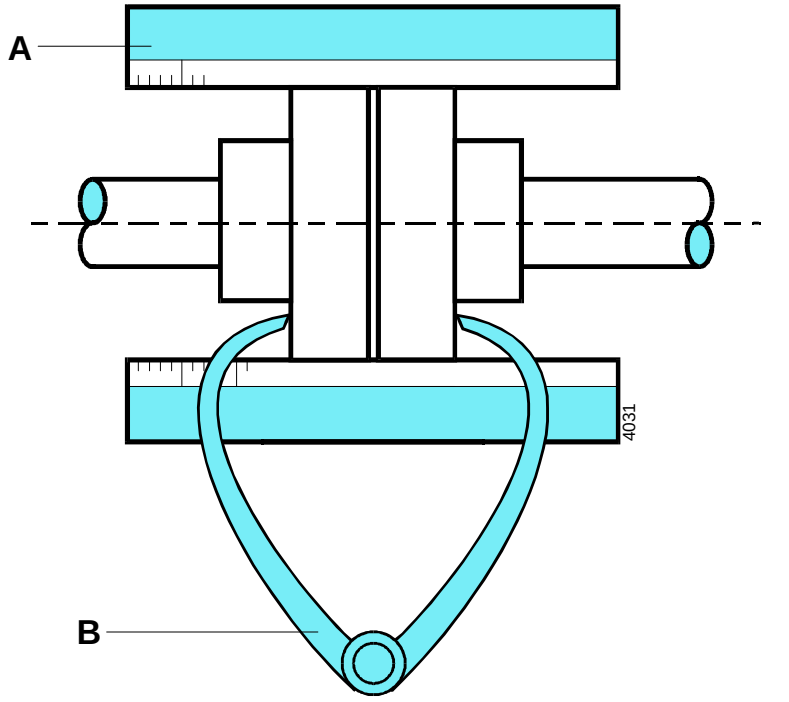

figure 4: Alignment of the coupling.

When adjusting the coupling halves the maximum permissible tolerances can be determined by using figure 5 and the associated table.

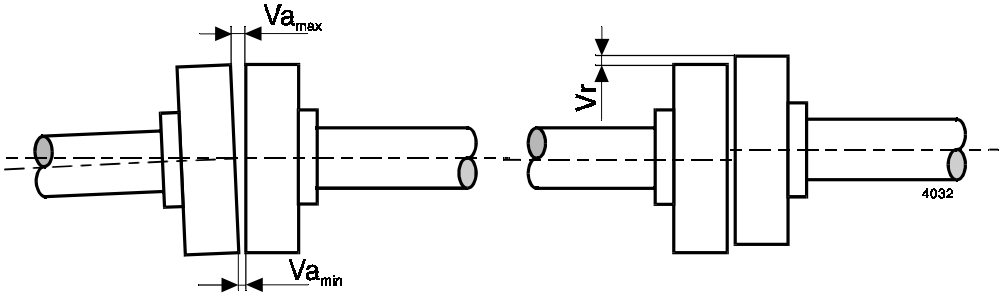

figure 5: Aligning tolerances.

External diameter of coupling [mm]	Va		Va_{max} - Va_{min} [mm]	Vr_{max} [mm]
	min [mm]	max [mm]		
81-95	2	4	0,15	0,15
96-110	2	4	0,18	0,18
111-130	2	4	0,21	0,21
131-140	2	4	0,24	0,24
141-160	2	6	0,27	0,27
161-180	2	6	0,30	0,30
181-200	2	6	0,34	0,34
201-225	2	6	0,38	0,38

3.5.3 Piping

1 Fit the packings between the flanges and connect the pressure and the suction pipes to the pump.
2 Fit the cooling water pipe for the MCHW.
3 Check the alignment of the coupling once more.
4 Fit the protecting guard.

3.6 Connection of the electric motor

⚠ ***The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.***

- Refer to the instruction manual belonging to the electric motor.
- If possible, mount a working switch as close as possible to the pump.

4 Commissioning

4.1 Check

- Check that the shaft can rotate freely. Do this by turning the shaft end at the coupling a few times by hand.
- Check if the fuses are fitted.
- Check that the pressure and suction connections have been fitted to the correct positions.

4.2 Preparing the pump

Proceed as follows, both when the unit is put into operation for the first time and after the pump has been repaired:

1 Fully open the stop valve in the suction pipe. Close the delivery stop valve.
2 Fill the pump and the suction pipe with the liquid to be pumped.
3 Rotate the pump shaft a few times by hand. Top up the pump as required.

4.3 Checking the direction of rotation

⚠ ***When checking the direction of rotation look out for any unguarded rotating parts!***

1 The direction of rotation of the pump is shown by an arrow on the bearing housing. Check that the direction of rotation of the motor corresponds with that of the pump
2 Only switch the motor on for a brief period and check the direction of rotation.
3 If the sense of rotation is not correct, alter the sense of rotation. See the the instructions in the user manual belonging to the electric motor.

4.4 Switching on the pump

1 Switch on the pump.
2 Once the pump is up to pressure, slowly open the pressure cock until the working pressure is reached.

⚠ ***Make sure that the rotating parts are always sufficiently guarded when the pump is running!***

4.5 Adjusting the seal

4.5.1 Gland packing

After the pump is started, the gland will show a certain amount of leakage. This leakage gradually decreases as the fibres of the packing swell up. **Make sure that the packing never runs dry!** If this occurs slacken the gland nuts so that the gland has a drip leak.
Once the pump has reached operating temperature the gland must be set to its final position:

1 Turn both gland nuts a quarter turn one at a time.
2 Repeat this after 15 minutes.
3 Continue in this way until an acceptable leakage (10 to 20 cm^3/h) is obtained.

4.5.2 Mechanical seal

A mechanical seal (MCHS) must not show any visible leakage.

4.6 Check

If a pump is in operation pay attention to the following:

! The pump should never run dry.

- Check that the system pressure always remains below the maximum permissible working pressure. For the correct values see chapter 10.
- The delivery from the pump must never be controlled by using the stop cock in the suction pipe. This must always be fully open.
- Check that the differential pressure between the suction and the pressure connections corresponds with the specifications of the working point of the pump.
- Check that the absolute inlet pressure is sufficient so that no condensation can form in the pump. This can result in cavitation.

! Cavitation must always be prevented, since this is very harmful for the pump.

4.7 Noise

The noise generated by a pump depends to a large extent on the operating conditions. The values stated in paragraph 10.8 are based on normal use of the pump, driven by an electric motor. When used outside of the normal area of application or in the event of cavitation the noise level can exceed 85 dB(A). Preventative measures must then be taken, such as fitting noise insulation around the pump unit or wearing ear protectors.

5 Maintenance

⚠ ***If the pump chamber is sprayed clean, water must not enter the terminal box of the electric motor!***
Never spray water on hot pump parts! These parts can burst if subject to sudden cooling and the hot pump liquid can then come out.

5.1 Shaft sealing

5.1.1 Gland packing

Do not tighten the gland nuts any more after the running-in period and adjustment. If in time the gland packing starts to leak excessively, new gasket rings have to be fitted rather than tightening the gland nuts further.

5.1.2 Mechanical seal

A mechanical seal generally requires no maintenance, however, it should never be allowed to run dry. If there are no problems it is not advisable to dismantle. Because the facing surfaces are running in on one another dismantling always means replacement of the seal. When the seal is leaking it has to be replaced.

5.2 Environmental influences

- Regularly clean the filter in the suction pipe or the suction strainer at the bottom of the suction pipe, because the inlet pressure may become too low if the filter or the suction strainer is blocked.
- If the unit is out of operation and there is the danger that the pumped liquid will expand as a result of solidifying or freezing, it should be drained and if neccessary be flushed.
- If the pump is to be put out of operation for a longer period it should be treated with a preserving agent and periodical the pump shaft has to be turned several times.

5.3 Noise

If, after some time, the pump starts making a noise this may indicate that something is wrong with the pump. A crackling noise in the pump may indicate cavitation or excessive motor noise can be an indication of decreasing bearing quality.

5.4 Lubrification of the bearings

The necessity for post-greasing the ball bearings depends upon the bearing type being applied. See the table below for bearings that require post-greasing. The recommended lubricating schedule is as follows:

Pump type	Bearings	Lubricate after number of operating hours [h]	Quantity of grease [gram] per bearing	Remarks:
MCH(S)10	all bearings	The ball bearings are filled with a quantity of grease on delivery which is sufficient for the duty life of the bearing		In case the pump is overhauled, the bearings and bearing chambers have to be cleaned and provided with new grease
MCH(S)14 a/b with reinforced bearing	drive-end bearing	8000	5	
MCH(S)16	all bearings	8000	5	
MCH**W**14 a/b	all bearings	8000	5	
MCH**W**16	all bearings	8000	5	
MCH**W**20 a/b	suction-side bearing	8000	10	
MCH**W**20 a/b	drive-end bearing	8000	16	
MCH(S)12,5	all bearings	**2RS1** bearings, do not require maintenance, post-greasing is not necessary		
MCH(S)14 a/b	all bearings			
MCH(S)14 a/b with reinforced bearing	suction-side bearing			
MCH(S)20 a/b	all bearings			

The recommended types of grease are listed in paragraph 10.6.

5.5 Fault

⚠ ***If you want to find the nature of a fault, remember that the pump may be under pressure or that the contents may be hot. Take the correct safety measures and protect yourself (gloves, safety goggles,..)***

! The cause of electrical faults can also be in the wiring. In that case call in a recognized electrical contractor.

If you are sure that the problem is with the pump, then proceed as follows:

1 Switch off the power supply to the pump. Secure the operating switch using a lock or remove the fuses.
2 Close the stop cocks.
3 Take a note of the nature of the fault.
4 Using chapter 6 try to trace the cause. Then take the appropriate measures, or:
Contact your installer!

6 Problem solving

Faults in a pump installation can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

In general, breakdowns in a pump installation are attributable to the following causes:

1 Faults with the pump.
2 Breakdowns or faults in the pipe system.
3 Faults due to incorrect installation or commissioning.
4 Faults due to incorrect choice of pump.

A number of the most frequently occurring failures as well as their possible causes are shown in the table below.

Most common faults	Possible causes
Pump delivers no liquid	1 2 3 4 5 6 7 8 9 10 11 13 14 17 19 20 21 29
Pump has insufficient volume flow	1 2 3 4 5 6 7 8 9 10 11 13 14 15 17 19 20 21 28 29
Pump has insufficient head	2 4 5 13 14 17 19 28 29
Pump cuts out after start up	1 2 3 4 5 6 7 8 9 10 11
Pump has higher power consumption than normal	12 15 16 17 18 22 23 24 25 26 27 32 34 38 39
Pump has lower power consumtion then normal	13 14 15 16 17 18 20 21 28 29
Gland leaks too much	6 7 23 25 26 30 31 32 33 43
Gland or mechanical seal has to be replaced too often	6 7 23 25 26 30 32 33 34 35 36 41
Pump vibrates or is noisy	1 9 10 11 15 18 19 20 22 23 24 25 26 27 28 29 37 38 39 40
Bearings wear too much or become hot	23 24 25 26 27 37 38 39 40 42
Pump running rough,hot or seizes	23 24 25 26 27 34 37 38 39 40 42

	Possible causes
1	Pump or suction pipe not sufficiently filled or vented
2	Gas or air coming from the liquid
3	Air lock in the suction pipe
4	Suction pipe leaks air
5	The pump sucks in air through the gland
6	The sealing or flush-water pipe to the gland is not connected or is blocked
7	The lantern ring in the gland has been mounted wrongly
8	The manometric suction head is too high
9	Suction pipe or suction strainer is blocked
10	Insufficient immersion of foot valve or suction pipe during operation of the pump
11	NPSH available too low
12	Speed too high
13	Speed too low
14	Wrong direction of rotation
15	Pump does not work at the correct duty point
16	Liquid density differs from the calculated density
17	Liquid viscosity differs from the calculated viscosity
18	Pump operates with too low liquid flow
19	Wrong pump selection
20	Obstruction in impeller or pump housing
21	Obstruction in the pipe system
22	Wrong installation of the pump unit
23	Pump and motor not correctly aligned
24	Rotating part running out of true
25	Rotating parts out of balance, i.e. impellers, pump shaft
26	Pump shaft is running out of true
27	Bearings faulty or worn
28	Seals faulty or worn
29	Impeller is damaged
30	Pump shaft or shaft sleeve at position of shaft packing or running surfaces of the mechanical seal are worn or damaged
31	Worn or dried out shaft packing
32	Incorrectly packed gland or incorrect mounting of the mechanical seal
33	Packing type or mechanical seal not suitable for the liquid used or operating conditions
34	Gland or seal cover has been tightened too much or at an angle
35	No water cooling of gland at high temperatures
36	The sealing or flushing liquid to the gland or the mechanical seal is polluted
37	Axial retaining of impeller or pump shaft is defective
38	The bearings have been fitted incorrectly
39	Too much or too little bearing lubrication
40	Wrong or polluted lubricant
41	Pollutants from the liquid get into the gland
42	Too high axial force due to worn back blades or excessive inlet pressure
43	Excessive pressure in packing chamber due to too much play in the throttling bush

7 Disassembly and assembly

7.1 Special tools

Special tools can make certain jobs easier. When this is the case it will be stated in the instructions.

7.2 Precautions

Before the pump can be repaired it must first be dismantled. The following measures are required for this:

7.2.1 Switch off the power supply

1 Switch off the power supply to the pump by placing the pump switch on the control box to the "off" position, or if an operating switch is fitted by turning this "OFF".
2 Remove the fuses.
3 Fit a warning board onto the control box.

7.2.2 Pipe support

If the entire pump has to be removed check that the pipes are supported. If this is not the case, then ensure sufficient support and fixing points for the pipes first.

7.2.3 Draining the MCHW

⚠ ***Allow the pump to cool down first!***

1 Close the cooling water supply.
2 Slacken the drain and supply pipes to the cooling water covers and allow the cooling water chamber to empty.

7.2.4 Draining the liquid

⚠ ***If the liquid being pumped is hot, then allow the pump to cool down futher before proceeding. Make sure you do not come into contact with the pumped liquid if this is hot or of an unknown composition!***

1 Close any relevant stop cocks.
2 Drain the pump until no more liquid flows out.

⚠ ***An MCH(W)(S) pump can not be drained fully in the horizontal position. If possible place the pump vertically on the bearing cover (0110) and allow it to drain further (MCH(S)10: Place the pump on the inlet casing).***

7.3 Dismantling the MCH(S)10

1 Open the cover on the terminal box on the motor.
2 Disconnect the mains leads. Mark the wires and the associated terminals. This makes it easier when re-connecting.
3 Slacken the foundation bolts and the inlet and outlet pipes and remove the pump from the pipes.

7.4 Disassembly MCH(S)10

If there is no illustration with the instruction, the item numbers used relate to the illustrations in the parts list for this pump, in chapter 9.

7.4.1 Disassembly of the lantern piece

1 Disassemble the supports (1020), the pump can now be placed on the inlet casing (0010) to ease further disassembly.
2 Slacken the protective sleeve for the coupling, slide it up and remove the rubber damping strip from between both coupling halves.
3 Slacken the bolts and nuts (0690) and remove the electric motor (0680) from the lantern piece (0030).
4 Slacken the coupling half (0660) from the pump shaft (0620) and remove the key (0150).
5 Remove the upper splash ring (0100) from the pump shaft and slide the lower splash ring down.
6 Slacken both bearing covers (0110). Remove the upper bearing cover from the pump shaft, the lower bearing cover will now be free from the shaft.
7 Remove the external circlip (0290) and the filling ring (0160) from the pump shaft.
8 Using pliers slacken the tie rods (0610) from the lantern piece.
9 Lift the lantern piece (0530) vertically from the pump stage. This will draw the bearings from the pump shaft, for 2 up to and including 8 impellers: 1 bearing.
10 Remove the bearing cover and the splash ring from the pump shaft.

7.4.2 Disassembling the ball bearings

1 Remove the internal circlip (0130) from the bearing housing.
2 Push the bearings from the bearing housing using a suitable bush which rests on the outer ring.

7.4.3 Disassembling the gland packing

Proceed as follows if only the packing rings need to be replaced:

1 Slacken the gland nuts and remove the gland (0190).
2 Remove the packing rings from the packing housing. Use the special packing puller for this, see figure 6.

If the reason for disassembly was replacement of the gland packing the new packing can now be fitted. See from point 7.5.4 for this.

If the pump is to be further disassembled then removal of the packing rings will be easier if the outlet casing (0020) is removed from the stage set and the shaft end.

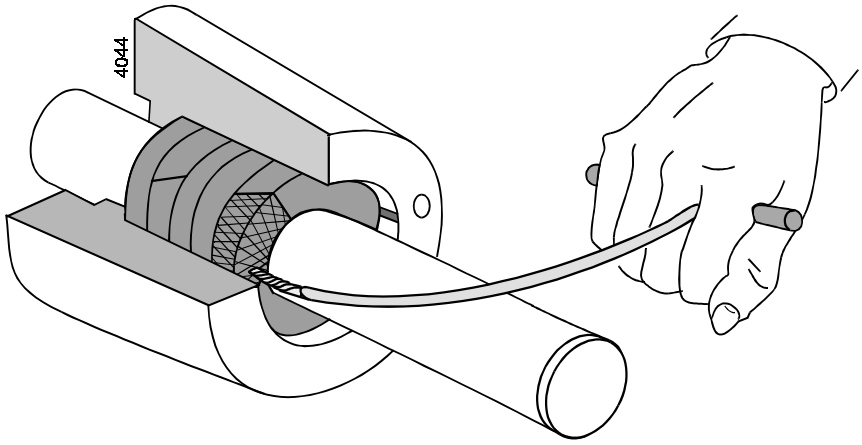

figure 6: Removing gland packing rings.

7.4.4 Disassembling the mechanical seal

Before the mechanical seal can be disassembled the lantern piece will have to be removed. See from point 7.4.1 for this.

1 Remove the outlet casing (0020) from the pump shaft and remove the static ring from the mechanical seal (0180).
2 Slide the rotating ring for the mechanical seal (0180) off the pump shaft.

If the reason for disassembly was to replace the mechanical seal, the new mechanical seal can now be fitted. See from point 7.5.3 for this.

7.4.5 Disassembly of the pump stage

1 Only for MVHS10: Measure the distance from the set ring to the reduction in diameter on the shaft. Slacken the lock screw (0170) and remove the set ring (0090).
2 Remove the upper stage casing (0510) and the upper impeller (0520). Repeat this operation until all stage covers and impellers have been disassembled. If there are 11 or more impellers there is also an external circlip (0560) and a support ring (0570) on the half of the impeller set.
3 Remove the keys (0630, 0640 and if there are 16 impellers: 0650) from the pump shaft.
4 Remove the pump shaft from the pump casing and remove the lower external circlip (0560) and the support ring (0570). Remove the tie rods from the inlet casing.
5 Unscrew the plug (0220) from the inlet casing and, if replacement is necessary, tap the slide bearing (0060) from the inlet casing (0010) using a bar.
6 Remove any residual packing and clean all parts.

7.5 Assembly MCH(S)10

7.5.1 Preparation for assembly

- For the correct torque settings see 10.4.
- For the correct lubricants and locking agents see 10.6 and 10.7.
- For assembly all relevant parts should always be clean and undamaged.
- Leave bearings and seals for as long as possible in the packing.

7.5.2 Pump assembly

1 Place a little locking agent (Loctite 270 green) in the bearing seat and press the slide bearing (0060) into the inlet casing (0010) using a suitable assembly bush.
2 Screw a nut (0160) on one end of all tie rods (0610). Tilt the inlet casing and push the tie rods into the inlet casing from below through the apertures.
3 Then place the inlet casing with the foot onto the work surface. Fit a packing ring (0600) and fit a stage cover (0510).
4 Fit a key (0630) to the end of the pump shaft (0620), on the slide bearing side, and slide an impeller (0520) over the bottom end of the shaft, with the impeller opening pointing to the bottom.
5 Fit the support ring (0570) and fix the external circlip (0560) to the bottom of the shaft (0620).
6 Place the pump shaft in the slide bearing (0060) into the inlet casing (0010).
7 Fit a packing ring (0600) to the edge and place a stage casing (0510) on the pressure bracket.
8 Fit an impeller (0520), the inlet opening of the impeller must be pointing down.

! If the impellers have different diameters then those with the largest diameters are fitted in the bottom of the pump

9 If required for the impeller set, fit the keys (0640 and 0650). If the pump is designed with 11 impellers or more, the impeller set is divided by an extra support ring (0570) and an external circlip (0560).
10 Repeat the steps 7 and 8 until all impellers and stage covers have been fitted.
11 If mechanical seals have to be fitted then proceed with point 7.5.4
12 Fit the set ring (0090), adjust this to X mm from the underside of the set ring to the reduction in diameter in the pump shaft. Lock the set ring with the lock screw (0170).
13 Fit a packing ring (0600) and place the outlet casing (0020) on the stage set. Place the outlet opening in the correct position with regard to the suction opening, see dimensional sketch in chapter 8.

! For an MCHS type pump slide the outlet casing vertically over the pump shaft in order not to damage the mechanical seal.

14 Fit the internal circlip (0130) and the lower bearing cover (0110) into the lantern piece (0030).
15 Place the lantern piece (0030) over the shaft end on the inlet casing. Watch the position of the tie rods.
16 Screw the tie rods (0610) into the lantern piece.

7.5.3 Assembling the mechanical seal MCHS

! When assembling the mechanical seal pay good attention to the following points:

- A mechanical seal is a vulnerable component, leave the seal in the original packing until you start with the actual assembly.
- Ensure that the working environment is dust free and that the parts and tools are clean.
- Remove any paint from the pump shaft and the bearing seat.
- **Never place the slide rings on the slide surfaces!** Proceed as follows:

1 Fit the set ring (0090), adjust this to the distance from the bottom of the set ring to reduction in the shaft diameter of the pump shaft measured in point 1 of 7.4.5. Lock the set ring with the lock screw (0170).

2 Fit the rotating part of the seal (0180) with the sliding surface pointing upwards. When fitting this watch out for sharp edges on the groove for the external circlip (0120). Lightly grease the O-ring with acid-free grease.

! Grease must not be allowed to get on the sliding surfaces!

3 Fit the static ring of the mechanical seal (0180) into the outlet casing (0020), with the sliding surface pointing outward.

4 Assemble the outlet casing and the lantern piece, see from point 13 of 7.5.2.

7.5.4 Assembling the gland packing MCH

1 Grease the packing rings and the packing housing with graphite grease or silicone grease.

2 Bend the packing rings axially open, see figure 7 and fit these around the pump shaft. Ensure that the cuts are always at 90° with regard to each other.

3 Press the packing rings well home. Use a suitable gland for this.

4 Place some assembly grease on the screwthread and fit the studs (0200), the gland (0190) and the gland nuts (0210). **Do not tighten the gland nuts to much!**

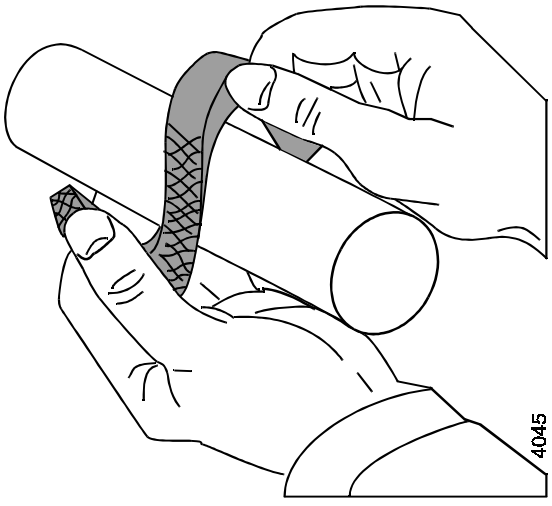

figure 7: Bending open of a gland packing ring.

7.5.5 Assembling the bearing construction

! **If the bearing does not need to be replaced, the bearing and the bearing housing will still have to be cleaned and provided with new grease.**

1 Fit the splash ring (0100) over the pump shaft.
2 Grease the bearings on both sides with ball bearing grease. For the correct type of grease see paragraph 10.6.
3 Fit the bearings (0210) one by one using a suitable assembly bush, which rests on both the inner and outer rings of the bearing. Up to and including 8 impellers there is only 1 ball bearing.

! **Make sure the bearings are in the correct position: the inner ring of the ball bearing must be fitted with the smallest diameter on the bottom, see figure 8.**

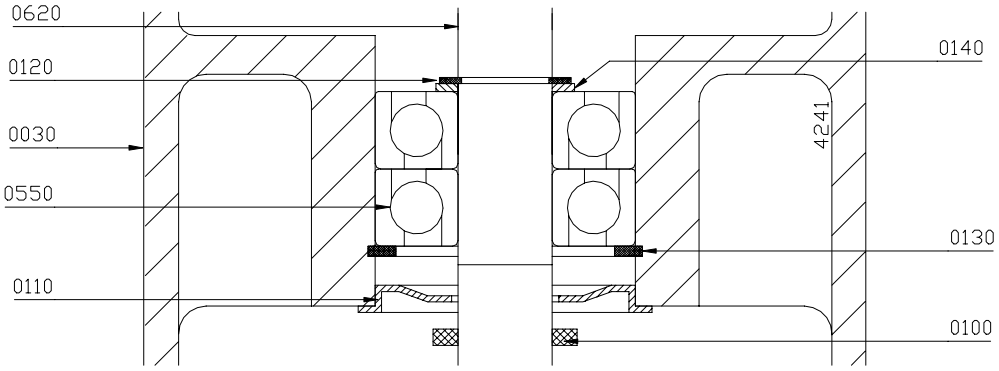

figure 8: Mounting the ball bearings.

4 Fit the filling ring (0140) and the external circlip (0120) to the pump shaft.
5 Fit the outermost bearing cover (0110) and the splash ring (0100).
6 Secure the tie rods in their final position by tilting the pump and tightening the nuts (0160) on the bottom.

7.6 Fitting the electric motor MCH(S)10

Proceed as follows:

1 Fit the key (0150) and fix the lower part of the coupling (0660) to the pump shaft.
2 Slide the sleeve over the motor shaft and then fix the other part of the coupling (0670) to the motor shaft.
3 Place the electric motor on the lantern piece. Make sure that the face of the electric motor fits correctly into the lantern piece. There must be a gap of **3 mm** between both coupling halves.
Secure the coupling halves.
4 Fit the rubber damping ring between both coupling halves.
5 Slide the sleeve over the lower coupling half and secure it.
6 Secure the electric motor to the lantern piece using the nuts and bolts (0690). Alignment is not required due to the fitted joints.
7 Fit the support (1020)

7.7 Disassembling the MCH(W)(S)12,5-14a/b-16

⚠ ***Make sure that the power supply to the pump is switched off and that no one can switch the pump on again unintentionally!***

If there is no illustration with the instruction, the item numbers used relate to the illustrations in the parts list for this pump, in chapter 9.

7.7.1 Replacing the gland packing MCH-MCHW

If the pump has to be further dismantled then replacement of the packing rings will be easier if the bearing housings (0010) are removed.

If only the packing rings have to be replaced then the pump does not need to be disconnected from the pipe work and it can remain on the foundation.
Proceed as follows, this applies for both sides of the pump:

1 Remove the gland nuts (0280) and pull the gland (0120) backwards.
2 Remove the packing rings (0140) from the gland. Use the special packing puller for this, see figure 6.
3 Clean the gland and then grease it with graphite grease or silicone grease. Also grease the new packing rings.
4 Bend open the first packing ring as shown in figure 7 and fit it around the shaft. Thoroughly press the ring home using a suitable piece of halved tube.
5 Fit the other rings. Press these well home one by one. Ensure that the cuts are at 90° with regard to each other.
6 Press the gland against the last packing ring and tighten the gland nuts one-by-one by hand.

7.7.2 Replacing the mechanical seal MCHS

If only a mechanical seal has to be replaced the pump will have to be disassembled first. Then the relevant bearing housing will have to be removed. For this see 7.7.4 and 7.7.8. Then see 7.7.6 for disassembly of the mechanical seal.

7.7.3 Disassembling the pump

1 Uncouple the inlet and outlet pipes. Make sure that they are sufficiently supported.
2 Slacken the foundation bolts and remove the pump from the pipe work.

7.7.4 Disassembling the bearing housing on the drive side

1 Uncouple the coupling halve from the pump shaft (0570) and remove the key (0200).
2 Only for MCHS: Slacken the balance pipe (0670).
3 Place the pump vertically in a support, with the shaft end up.
4 Remove the rubber V-ring and the bearing cover (0100).
5 Slide the inner rubber V-ring over the shaft and slacken the inner bearing cover (0100). This is now free from the pump shaft.
6 Remove the outer external circlip (0220) and the filling ring (0090) from the pump shaft.
7 Slacken the bolts (0270) and pull the bearing housing (0010) vertically from the pump section. The bearing will be pulled from the pump shaft.
8 Remove the lower external circlip (0220) and the filling ring (0090) from the pump shaft.
9 Remove the bearing cover and the rubber V-ring from the pump shaft.
10 Only for MCH: Disassemble the gland (0120).

11 Only for MCHW: Disassemble the cooling water cover (0030) together with the gland (0120).

7.7.5 Disassembly of the ball bearing

1 Remove both internal circlips (0230) from the bearing bracket.
2 Using a suitable bush which rests on the outer ring, press the bearing out of the bearing bracket.

7.7.6 Disassembling the mechanical seal MCHS

1 Remove the seal cover (0030) from the pump shaft and remove the static ring from the mechanical seal.
2 Slide the rotating ring for the mechanical seal (0130) off the pump shaft.

If the reason for disassembly was to replace the mechanical seal, the new mechanical seal can now be fitted. See from point 7.8.6 for this.

7.7.7 Disassembling the set of stage casings

1 Uncouple the balance pipe (0720) if fitted.
2 Only for MCHS: Slacken the adjustment screw (0280) and remove the set ring (0060).
3 Remove the nuts (0750) (MCH14a/bx4: (0770) from the tie rod (0740) (MCH14a/bx4: bolts (0770)).
4 Remove the pump casing (0020) from the stage set. Using a suitable bush, press or tap the throttling bush (0050) out of the inlet casing.
5 Remove the external circlip (0080) and any throttling sleeve (0600) from the pump shaft.
6 Remove the upper stage casing (0510) and the upper impeller (0520). Remove the key (0730) from the shaft. Repeat this operation until all stage covers and impellers have been disassembled.
7 Remove the suction cover (0020) from the pump casing (0500).

7.7.8 Disassembling the bearing housing on the suction side

1 Position the pump casing with the shaft horizontally.
2 Remove the rear bearing cover (0110).
3 Continue from point 5 of 7.7.4.

7.7.9 Disassembling the ball bearing on the suction side

See 7.7.5, with the exception of point 1.

7.7.10 Disassembling the mechanical seal on the MCHS suction side

See 7.7.6

7.8 Assembly

7.8.1 Preparation for assembly

For the correct torque settings see paragraphs 10.4 and 10.5.
For the correct lubricants and locking agents see paragraphs 10.6 and 10.7.

! For assembly all relevant parts should always be clean and undamaged. Leave bearings and seals for as long as possible in the packing. If the bearing does not need to be replaced, the bearing and the bearing housing will have to be cleaned and provided with new grease.

7.8.2 Sub-assembly of stage casings

Use a suitable assembly bush for inserting the wear rings. The flat side of the wear rings must be positioned equally with the flat side of the cover, see figure 9.

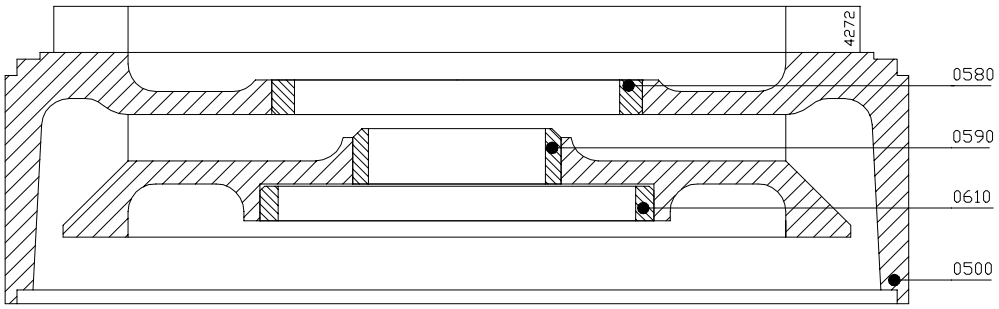

figure 9: Fitting the wear rings.

1 Fit the small wear rings (0590) into the covers (0510).
2 Fit a wear ring (0580) into the suction cover (0500).
3 Fit the wear rings (0580) and (0610) into the covers (0510).

! The wear rings (0580) and (0590) are NOT fitted for the cover which is directly behind the pressure bracket (0020, on the drive side): Wear ring (0580) is not fitted, because there is no impeller on that side of the cover. The throttling bush (0050) which is fitted into the pressure bracket is fitted into the edge for the wear ring (0590).

7.8.3 Pump assembly

1 Place a little Loctite 270 Studlock on the fitting face of the throttling bush (0050) and fit the throttling bush into the pump casing (0020) for the drive side.
2 Fit the external circlip (0080) to the shaft (0570).
3 Fix the throttling sleeve (0600) to the shaft with a few drops of liquid locking agent. The throttling sleeve is not used on all models, see below for a list:

Pump type	Throttling sleeve used on:
MCH(W)(S) 12,5 MCH(W)(S) 14a and 14b	for 8 stages and higher
MCH (W)(S) 16	from 5 stages and higher

4 Push the pump shaft (0570) with the drive side from the inside out through the pressure bracket (0020).

7.8.4 Assembling the gland packing MCH

1 Fit the 5 packing rings.
Place the packing rings with the openings offset.
The packing rings may only be bent open axially, see figure 11.

2 Fit the gland (0120). Tighten the nuts (0280) by hand.
3 Proceed with point 7.8.7.

7.8.5 Assemble the water-cooled gland packing MCHW

1 First of all see points 1 and 2 under paragraph 7.8.4.
2 Fit the O-rings (0300) into the covers (0030).

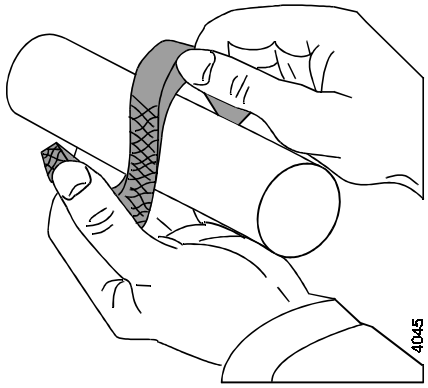

figure :11 Bending open of a gland packing ring.

3 Fit the packing (0150) and place the cooling water cover (0030) in the pump bracket.
4 Proceed with point 7.8.7

7.8.6 Assembling the mechanical seal MCHS

! **A mechanical seal is a vulnerable precision component. Leave the seal in the original packing until you start with the actual assembly. Ensure that the working environment is dust free and that the parts and tools are clean. Remove any paint from the components. Never place the slide rings on the slide surfaces!**

1 Fit the set ring (0060) and lock this by using the adjustment screw (0280). For the correct distance see the value **mj** in the table below:

Type	**mj** (=drive side)
MCHS 12,5 x n - 3,2	49,5
MCHS 14 a x n - 5	51
MCHS 14 b x n - 5	51
MCHS 16 x n - 6,5	56

2 Before fitting check whether the grooves for the external circlips (0220) have any sharp edges.

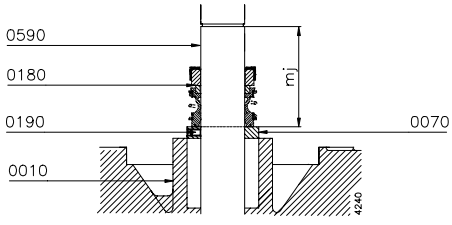

figure 10 Distance mj.

3 Wet the clean shaft with some low-surface-tension water (add detergent) and feed the bellows part of the seal (0140) with a slight twist in clockwise direction onto the shaft. **Apply pressure or tension during assembly via the rear end of the spring only.** The sliding surface must face towards the shaft end, drive side.
4 Wet the seal chamber with some low-surface-tension water (add detergent) and fit the static ring of the mechanical seal (0140) into the seal cover (0030), with the sliding surface pointing out.
5 Fit the packing (0120) en fit the cover (0030) into the pressure bracket.
6 Proceed with point 7.8.7.

7.8.7 Assembling the bearing construction

See figure 12.

1 Fit the bearing cover (0100) to the inside of the bearing housing for the drive side, this is the part which has the arrow for the direction of rotation.
2 Fit an internal circlip (0230) into the inner groove in the bearing housing.
3 Fix this bearing housing (0010) to the pressure bracket using the bolts (0290).
4 Fit the rubber V-ring (0240) over the pump shaft, with the narrow opening pointing to the inside of the pump.
5 Fit the external circlip (0220) into the rear of the 2 grooves on the pump shaft and fit the filling ring (0090).
6 Grease the bearing on both sides with ball bearing grease. For the correct type of grease see paragraph 10.6.
7 Fit the bearing (0210) over the pump shaft and into the seat of the bearing housing using a suitable assembly bush which rests on both the inner and outer rings of the bearing.
8 Fit the other filling ring (0090) and external circlip (0220) to the pump shaft.
9 Fit the internal circlip (0230) into the bearing housing.
10 Fit the outermost bearing cover (0100) and the rubber V-ring (0240), with the narrow opening pointing to the outside of the pump.

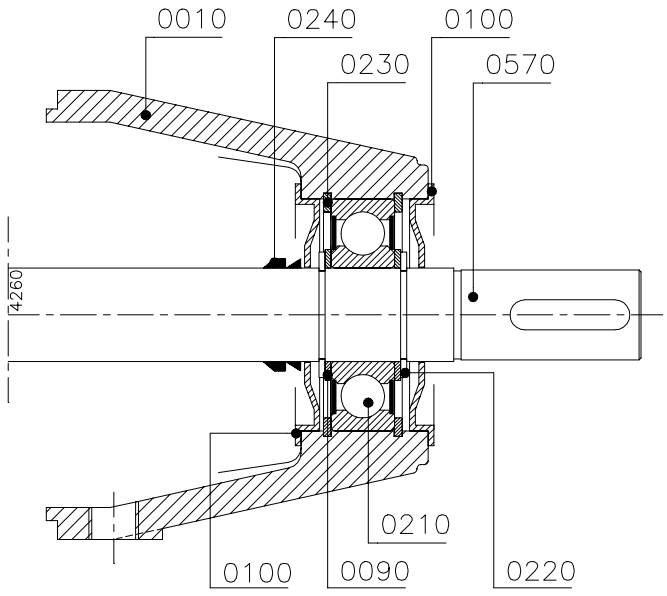

figure 12: Bearing construction

7.8.8 Assembling the stage set

1 Fit the sub-assembly which you have just assembled with the shaft vertically, drive side down.
Use a support for this with an opening to provide space for the shaft end.
2 Fit the packing ring (0660) and fit a stage casing (0510) on the pressure bracket.
3 Fit a key (0730) in the pump shaft and fit an impeller (0520), the inlet opening of the impeller must point up.
4 Repeat steps 2 and 3 until the last impeller has been fitted.
5 Secure the impeller set by fitting an external circlip (0080) to the pump shaft.
6 Fit a packing (0660) and place the suction cover (0500) on the stage set.
7 Fit a packing (0660) to the inlet casing using assembly grease. Place the inlet casing (0020) over the shaft end on the stage set.
8 Fit the tie rods (0740) by using the nuts (0750) (MCH14a/bx4: bolts and nuts (0770)).
9 For the remaining operations see point 7.8.4. With the exception of the following points:

- The value **mj** from step 1 of paragraph 7.8.6 is replaced by the value **mh**, for which the correct values are shown in the table below:

Pump type	**mh** (=non-drive side)
MCHS 12,5 x n - 3,2	20,2
MCHS 14 a x n - 5	18,7
MCHS 14 b x n - 5	18,7
MCHS 16 x n - 6,5	14

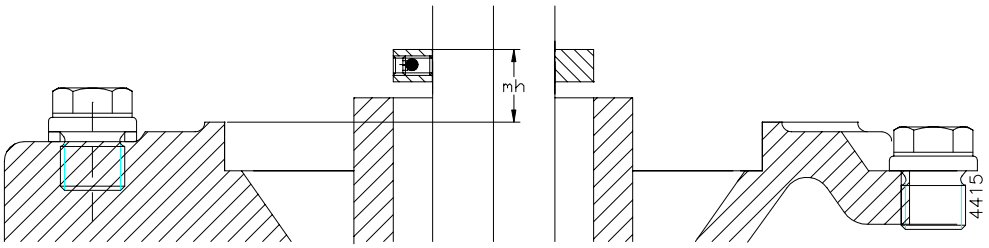

*figure 13: Distance **mh.***

- Steps 9 and 10 of paragraph 7.8.7 replaced by: Fit the closed bearing cover (0110)

10 Fit the by-pass pipe (0670) if present.

7.9 Disassembling MCH(W)(S) 14a/b heavy bearing construction

⚠ ***Make sure that the power supply to the pump is switched off and that no one can switch the pump on again unintentionally!***

If there is no illustration with the instruction, the item numbers used relate to the illustrations in the parts list for this pump, in chapter 9.

7.9.1 Replacing the gland packing MCH-MCHW

If the pump has to be dismantled further then replacement of the packing rings will be easier if the bearing housings (0020 and 0010) have been removed.

If only the packing rings have to be replaced then the pump does not need to be disconnected from the pipe work and it can remain on the foundation.
Proceed as follows, this applies for both sides of the pump:

1 Remove the gland nuts (0280) and pull the gland (0140) backwards.
2 Remove the packing rings (0160) from the gland. Use the special packing puller for this, see figure 6.
3 Clean the gland and then grease it with graphite grease or silicone grease. Also grease the new packing rings.
4 Bend open the first packing ring as shown in figure 7 and fit it around the shaft. Thoroughly press the ring home using a suitable piece of halved tube.
5 Fit the other rings. Press these well home one by one. Ensure that the cuts are at 90° with regard to each other.
6 Press the gland against the last packing ring and tighten the gland nuts one-by-one by hand.

7.9.2 Replacing the mechanical seal MCHS

If only a mechanical seal has to be replaced the pump will have to be disassembled first. Then the relevant bearing housing will have to be removed. For this see 7.9.4 and 7.9.8. Then see 7.9.6 for disassembly of the mechanical seal.

7.9.3 Disassembling the pump

1 Uncouple the inlet and outlet pipes. Make sure that they are sufficiently supported.
2 Slacken the foundation bolts and remove the pump from the pipe work.

7.9.4 Disassembling the bearing housing on the drive side

1 Uncouple the coupling halve from the pump shaft (0570) and remove the key (0200).
2 Only for MCHS: Slacken the balance pipe (0670).
3 Place the pump vertically in a support, with the shaft end up.
4 Remove the rubber V-ring(0250) and the bearing cover (0080).
5 Slide the inner rubber V-ring over the shaft and slacken the inner bearing cover (0120). This is now free from the pump shaft.
6 Remove the outer external circlip (0230) and the filling ring (0110) from the pump shaft.
7 Slacken the bolts (0300) and pull the bearing housing (0020) vertically from the pump section. The bearings will be pulled from the pump shaft.
8 Remove the lower external circlip (0230) and the filling ring (0110) from the pump shaft.
9 Remove the bearing cover and the rubber V-ring from the pump shaft.
10 Only for MCH: Disassemble the gland (0140).

11 Only for MCHW: Disassemble the cooling water cover (0040) together with the gland (0140).

7.9.5 Disassembling the ball bearings

1 Remove both internal circlips (0240) from the bearing bracket.
2 Using a suitable bush, resting on the outer ring of the bearing, press the bearings out of the bearing bracket.

7.9.6 Disassembling the mechanical seal MCHS

1 Remove the seal cover (0040) from the pump shaft and remove the static ring from the mechanical seal.
2 Slide the rotating ring for the mechanical seal (0160) off the pump shaft.

If the reason for disassembly was to replace the mechanical seal, the new mechanical seal can now be fitted. See from point 7.10.6 for this.

7.9.7 Disassembling the set of stage casings

1 Uncouple the balance pipe (0670) if fitted.
2 Only for MCHS: Slacken the adjustment screw (0330) and remove the set ring (0090).
3 Unscrew the nuts (0750) from the tie rods (0740).
4 Remove the pump casing (0030) from the stage set. Using a suitable bush, press or tap the throttling bush (0060) out of the inlet casing.
5 Remove the external circlip (0100) and any throttling sleeve (0600) from the pump shaft.
6 Remove the upper stage casing (0510) and the upper impeller (0520). Remove the key (0730) from the shaft. Repeat this operation until all stage covers and impellers have been disassembled.
7 Remove the suction cover (0030) from the pump casing (0500).

7.9.8 Disassembling the bearing housing on the suction side

1 Position the pump casing with the shaft horizontally.
2 Remove the rear bearing cover (0130).
3 Continue from point 5 of 7.9.4.

7.9.9 Disassembling the ball bearing on the suction side

See 7.9.5, with the exception of point 1.

7.9.10 Disassembling the mechanical seal on the MCHS suction side

See 7.9.6, for which item no. (0160) now becomes: item no. (0150).

7.10 Assembling the MCH(W)(S)14a/b heavy bearing construction

7.10.1 Preparation for assembly

For the correct torque settings see paragraphs 10.4 and 10.5.
For the correct lubricants and locking agents see paragraphs 10.6 and 10.7.

! For assembly all relevant parts should always be clean and undamaged. Leave bearings and seals for as long as possible in the packing.
If the bearing does not need to be replaced the bearing and the bearing housing will have to be cleaned and provided with new grease. The bearing at the non-drive end is a 2RS1 type bearing and does not require any maintenance.

7.10.2 Sub-assembly of stage casings

Use a suitable assembly bush for inserting the wear rings. The flat side of the wear rings must be positioned equally with the flat side of the cover, see figure 9.

Points 2 and 3 are only applicable for design Q (= with bronze impellers)

1 Fit the small wear rings (0590) into the covers (0510).
2 Fit a wear ring (0580) into the suction cover (0500).
3 Fit the wear rings (0580) and (0610) into the covers (0510).

! **The wear rings (0580) and (0590) are NOT fitted for the cover which is directly behind the pressure bracket (0030, on the drive side): Wear ring (0580) is not fitted, because there is no impeller on that side of the cover. The throttling bush (0060) which is fitted into the pressure bracket is fitted into the edge for the wear ring (0590).**

7.10.3 Pump assembly

1 Place a little Loctite 270 'Studlock' on the fitting face of the throttling bush (0050) and fit the throttling bush into the pump casing (0030) for the drive side.
2 Fit the external circlip (0100) to the shaft (0570).
3 Fix the throttling sleeve (0600) to the shaft with a few drops of liquid locking agent. This throttling sleeve is used from 8 stages and higher.
4 Push the pump shaft (0570) with the drive side from the inside out through the pressure bracket (0030).

7.10.4 Assembling the gland packing MCH

1 Fit the 5 packing rings.
Place the packing rings with the openings offset.
The packing rings may only be bent open axially, see figure 14.
2 Fit the gland (0140). Tighten the nuts (0290) by hand.
3 Proceed with point 7.10.7.

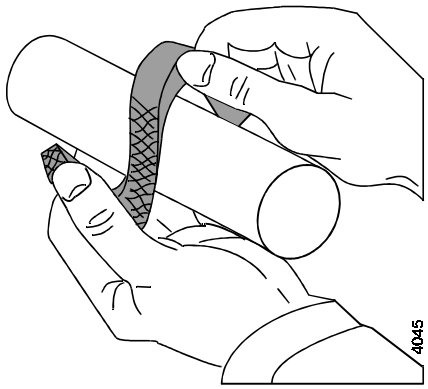

figure :14 Bending open of a gland packing ring.

7.10.5 Assemble the water-cooled gland packing MCHW

1 See points 1 and 2 under paragraph 7.10.4.
2 Fit the O-rings (0330) into the covers (0040).
3 Fit the packing (0180) and place the cooling water cover (0040) in the pomp bracket.
4 Proceed with point 7.10.7.

7.10.6 Assembling the mechanical seal MCHS

! **A mechanical seal is a vulnerable precision component. Leave the seal in the original packing until you start with the actual assembly. Ensure that the working environment is dust free and that the parts and tools are clean. Remove any paint from the components. Never place the slide rings on the slide surfaces!**

1 Fit the set ring (0090) and lock this by using the adjustment screw (0330). The distance **mj** from the top of the set ring to the bottom of the external circlip groove must be **54 mm**.
2 Before fitting check whether the grooves for the external circlips (0220) have any sharp edges.
3 Wet the clean shaft with some low-surface-tension water (add detergent) and feed the bellows part of the seal (0160) with a slight twist in clockwise direction onto the shaft. **Apply pressure or tension during assembly via the rear end of the spring only.** The sliding surface must face towards the shaft end, drive side.
4 Wet the seal chamber with some low-surface-tension water (add detergent) and fit the static ring of the mechanical seal (0160) into the seal cover (0040), with the sliding surface pointing out.
5 Fit the packing (0140) en fit the cover (0040) into the pressure bracket.
6 Proceed with point 7.10.7

7.10.7 Assembling the bearing construction on the drive side

See figure 15.

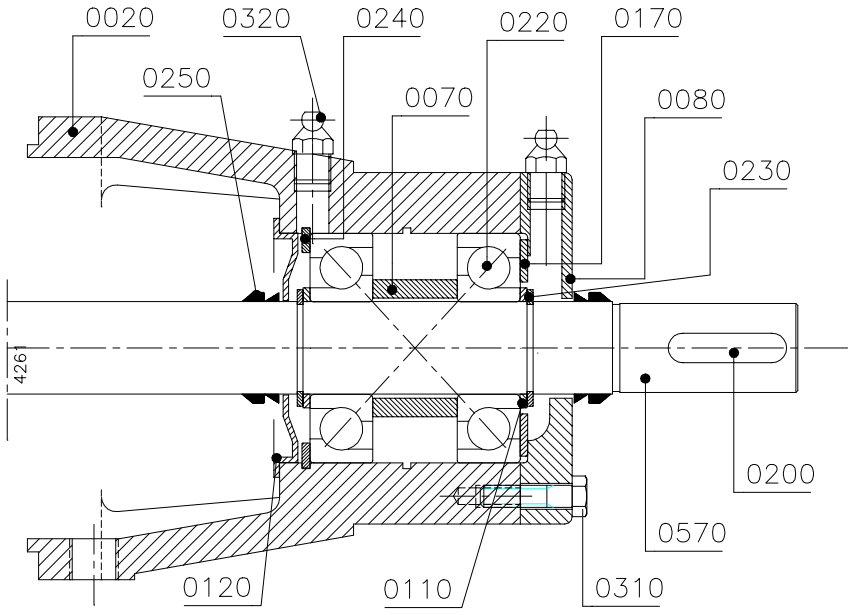

figure 15: Assembly of the reinforced bearing.

1 Fit the rubber V-ring (0250) over the pump shaft on the drive side, with the narrow opening pointing to the inside of the pump.
2 Fit an internal circlip (0240) into the inner groove in the long bearing housing (0020) and fit the bearing cover (0120) to the inside of this bearing housing.
3 Fix the bearing housing (0020) to the pressure bracket using the bolts (0300).
4 Fit the external circlip (0230) into the inner of the 2 grooves on the pump shaft on the drive side and then fit the filling ring (0110).

5 Grease the bearings on both sides with ball bearing grease. For the correct type of grease see paragraph 10.6.

! **Attention: Both bearings have to be fitted in X-arrangement. This means that both bearings have to be turned with the largest diameters facing each other.**

6 Fit the first of the two bearings (0220) over the pump shaft and into the seat of the bearing housing using a suitable assembly bush which rests on both the inner and outer rings of the bearing.
7 Fit the spacer sleeve (0070) and fit the second of the two bearings (0220).
8 Fit the other filling ring (0110) and external circlip (0230) to the pump shaft.
9 Fit the waved ring (0170) into the bearing housing.
10 Fit the outer bearing cover (0080) by using bolts (0310). Fit the rubber V-ring (0240), with the narrow opening pointing to the outside of the pump.

7.10.8 Assembling the stage set

1 Fit the sub-assembly which you have just assembled with the shaft vertically, drive side down. Use a support for this with an opening to provide space for the shaft end.
2 Fit the packing ring (0660) and fit a stage casing (0510) on the pressure bracket.
3 Fit a key (0730) in the pump shaft and fit an impeller (0520), the inlet opening of the impeller must point up.
4 Repeat steps 2 and 3 until the last impeller has been fitted.
5 Secure the impeller set by fitting an external circlip (0080) to the pump shaft.
6 Fit a packing (0660) and place the suction cover (0500) on the stage set.
7 Fit a packing (0660) to the inlet casing using assembly grease. Place the inlet casing (0030) over the shaft end on the stage set.
8 Fit the tie rods (0740) using the nuts (0750).
9 For assembly of the other seal see paragraphs 7.10.4 up to and including 7.10.6. With the exception of the following point:

- The value **mj** from step 1 of paragraph 7.10.6 now becomes **18,7**.

7.10.9 Assembling the bearing construction on the suction side

1 Fit the rubber V-ring (0250) over the pump shaft, with the narrow opening pointing to the inside of the pump.
2 Fit the bearing cover (0120) to the inside of the small bearing housing (0010).
3 Fix the bearing housing (0010) to the pressure bracket using the bolts (0300).
4 Fit the external circlip (0230) into the inner of the 2 grooves on the pump shaft and fit a filling ring (0110).
5 *For MCH**W** only:* Grease the bearing on both sides with ball bearing grease. For the correct type of grease see paragraph 10.6.
6 Fit the bearing (0210) using a suitable mounting bush which rests on both the inner and outer rings of the bearing.
7 Fit the second filling ring (0110) and fit the external circlip (0230) onto the pump shaft.
8 Fit the outer bearing cover (0130).
9 Fit the by pass pipe (0670) if present.

7.11 Disassembling the MCH(W)(S)20a/b

⚠ ***Make sure that the power supply to the pump is switched off and that no one can switch the pump on again unintentionally!***

If there is no illustration with the instruction, the item numbers used relate to the illustrations in the parts list for this pump, in chapter 9.

7.11.1 Replacing the gland packing MCH-MCHW

If the pump has to be further dismantled then replacement of the packing rings will be easier if the bearing housings (0010) are removed.

If only the packing rings have to be replaced then the pump does not need to be disconnected from the pipe work and it can remain on the foundation.

Proceed as follows, this applies for both sides of the pump:

1 Remove the gland nuts (0350) and pull the gland (0170) backwards.
2 Remove the packing rings (0190) from the gland. Use the special packing puller for this, see figure 6.
3 Clean the gland and then grease it with graphite grease or silicone grease. Also grease the new packing rings.
4 Bend open the first packing ring as shown in figure 7 and fit it around the shaft. Thoroughly press the ring home using a suitable piece of halved tube.
5 Fit the other rings. Press these well home one by one. Ensure that the cuts are at 90° with regard to each other.
6 Press the gland against the last packing ring and tighten the gland nuts one-by-one by hand.

7.11.2 Replacing the mechanical seal MCHS

If only a mechanical seal has to be replaced the pump will have to be disassembled first. Then the relevant bearing housing will have to be removed. For this see 7.7.4 and 7.7.8. Then see 7.7.6 for disassembly of the mechanical seal.

7.11.3 Disassembling the MCH(W)(S)

1 Uncouple the inlet and outlet pipes. Make sure that they are sufficiently supported.
2 Slacken the foundation bolts and remove the pump from the pipe work.

7.11.4 Disassembling the bearing housing on the drive side

1 Uncouple the coupling halve from the pump shaft (0550) and remove the key (0260).
2 Only for MCHS: Slacken the balance pipe (0620).
3 Place the pump vertically in a support, with the shaft end up.
4 Remove the rubber V-ring (0310) and the bearing cover (0140).
5 Slide the inner rubber V-ring over the shaft and slacken the inner bearing cover (0140). This is now free from the pump shaft.
6 Remove the outer external circlip (0290) and the filling ring (0160) from the pump shaft.
7 Slacken the bolts (0360) and pull the bearing housing (0010) vertically from the pump section. The bearing will be pulled from the pump shaft.
8 Remove the lower external circlip (0290) and the filling ring (0090) from the pump shaft.
9 Remove the bearing cover and the rubber V-ring from the pump shaft.
10 Only for MCH: Disassemble the gland (0170).

11 Only for MCHW: Disassemble the cooling water cover (0030) together with the gland (0170).

7.11.5 Disassembly of the ball bearing

1 Remove both internal circlips (0300) from the bearing bracket.
2 Using a suitable bush which rests on the outer ring of the bearing, press the bearing (0280) out of the bearing bracket.

7.11.6 Disassembling the mechanical seal MCHS

1 Remove the seal cover (0040) from the pump shaft and remove the static ring from the mechanical seal.
2 Slide the rotating ring for the mechanical seal (0230) off the pump shaft.

If the reason for disassembly was to replace the mechanical seal, the new mechanical seal can now be fitted. See from point 7.12.6 for this.

7.11.7 Disassembling the set of stage casings

1 Uncouple the balance pipe (0650) if fitted.
2 Only for MCHS: Slacken the adjustment screw (0400) and remove the set ring (0120).
3 Unscrew the nuts (0690) from the tie rods (0670 and 0680).
4 Remove the pump casing (0020) from the stage set. Using a suitable bush press or tap the throttling bush (0100) from the pump casing.
5 Remove the external circlip (0130) and any throttling sleeve (0110) from the pump shaft.
6 Remove the upper stage casing (0510) and the upper impeller (0520). Remove the key (0660) from the shaft. Repeat this operation until all stage covers and impellers have been disassembled.
7 Remove the suction cover (0500) from the pump casing (0020) on the suction side.

7.11.8 Disassembling the bearing housing on the suction side

1 Position the pump casing with the shaft horizontally.
2 Remove the rear bearing cover (0150).
3 Continue from point 5 of 7.11.4.

7.11.9 Disassembling the ball bearing on the suction side

See 7.11.5, with exception of point 1 and whereby item no. (0280) now becomes: item no. (0270).

7.11.10 Disassembling the mechanical seal on the MCHS suction side

See 7.11.6, whereby item no. (0230) becomes item no. (0220).

7.12 Assembling the MCH(W)(S) 20a/b

7.12.1 Preparation for assembly

For the correct torque settings see paragraphs 10.4 and 10.5.
For the correct lubricants and locking agents see paragraphs 10.6 and 10.7.

! For assembly all relevant parts should always be clean and undamaged. Leave bearings and seals for as long as possible in the packing. If the bearings does not need to be replaced, for pumptype MCHW the bearings and the bearing housings will have to be cleaned and provided with new grease.

7.12.2 Sub-assembly of stage casings

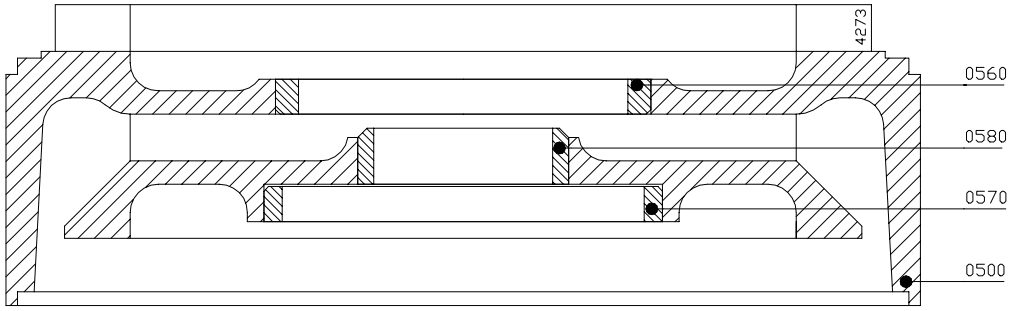

figure 16: Fitting the wear rings

Use a suitable assembly bush for inserting the wear rings. The flat side of the wear rings must be positioned equally with the flat side of the cover (see figure 16).

1 Fit the small wear rings (0580) into the covers (0510).
2 Fit a wear ring (0560) into the suction cover (0500).
3 Fit the wear rings (0560) and (0570) into the covers (0510).

! The wear rings (0560) and (0580) are NOT fitted for the cover which is directly behind the pressure bracket (0020, on the drive side): Wear ring (0560) is not fitted, because there is no impeller on that side of the cover. The throttling bush (0100) which is fitted into the pressure bracket is fitted into the edge for the wear ring (0580).

7.12.3 Pump assembly

1 Place a little Loctite 270 Studlock on the fitting face of the throttling bush (0100) and fit the throttling bush into the pump casing (0020) for the drive side.
2 Fit the external circlip (0130) to the shaft (0550).
3 Fix the throttling sleeve (0110) to the shaft with a few drops of liquid locking agent.
4 Push the pump shaft (0550) with the drive side from the inside out through the pressure bracket (0020).

7.12.4 Assembling the gland packing MCH

1 Fit the 5 packing rings.
Place the packing rings with the openings offset.
The packing rings may only be bent open axially, see figure 17.
2 Fit the gland (0170). Tighten the nuts (0350) by hand.
3 Proceed with point 7.12.7.

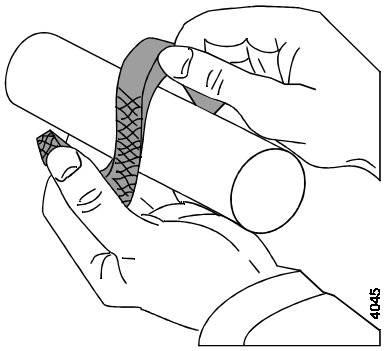

figure 17: Bending open of a gland packing ring.

7.12.5 Assemble the water-cooled gland packing MCHW

1 First of all see points 1 and 2 under paragraph 7.12.4.
2 Fit the O-rings (0390) into the covers (0030).
3 Fit the packing ring (0200) and place the cooling water cover (0030) into the pump casing.
4 Proceed with point 7.12.7.

7.12.6 Assembling the mechanical seal MCHS

! **A mechanical seal is a vulnerable precision component. Leave the seal in the original packing until you start with the actual assembly. Ensure that the working environment is dust free and that the parts and tools are clean. Remove any paint from the components. Never place the slide rings on the slide surfaces and never touch the slide surfaces with ones fingers!**

1 Fit the set ring (0120) and lock this by using the adjustment screw (0400). The distance between the set ring and the nearest external circlip groove must be **64,5 mm**.
2 Before fitting check whether the grooves for the external circlips (0220) have any sharp edges.
3 Wet the clean shaft with some low-surface-tension water (add detergent) and feed the bellows part of the seal (0230) with a slight twist in clockwise direction onto the shaft. **Apply pressure or tension during assembly via the rear end of the spring only.** The sliding surface must face towards the shaft end, drive side.
4 Wet the seal chamber with some low-surface-tension water (add detergent) and fit the static ring of the mechanical seal (0230) into the seal cover (0030), with the sliding surface pointing out.
5 Fit the packing (0200) en fit the cover (0040) into the pressure bracket.
6 Proceed with point 7.12.7

7.12.7 Assembling the bearing construction

See figure 18.

1 Fit the bearing cover (0140) to the inside of the bearing housing for the drive side, this is the part which has the arrow for the direction of rotation.
2 Fit an internal circlip (0300) into the inner groove in the bearing housing.
3 Fix this bearing housing (0010) to the pressure bracket using the bolts (0360).
4 Fit the rubber V-ring (0310) over the pump shaft, with the narrow opening pointing to the inside of the pump.
5 Fit the external circlip (0290) into the inner of the 2 grooves on the pump shaft and fit the filling ring (0160).

6 *For MCH**W** only:* Grease the bearings on both sides with ball bearing grease. For the correct type of grease see paragraph 10.6.
7 Fit the bearing (0280) over the pump shaft and into the seat of the bearing housing using a suitable assembly bush which rests on both the inner and outer rings of the bearing.
8 Fit the other filling ring (0160) and external circlip (0290) to the pump shaft.
9 Fit the internal circlip (0300) into the bearing housing.
10 Fit the outermost bearing cover (0140) and the rubber V-ring (0310), with the narrow opening pointing to the outside of the pump.

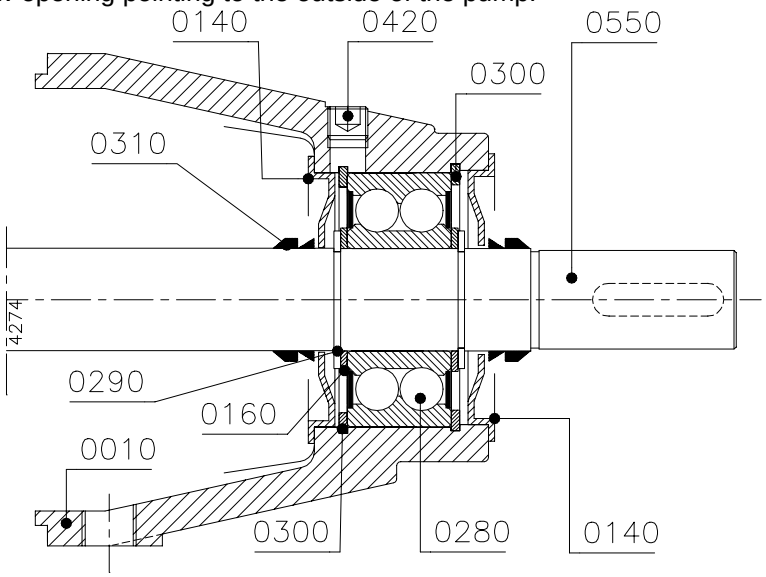

figure 18: Assembly of the double-row ball bearing.

7.12.8 Assembling the stage set

1 Fit the sub-assembly which you have just assembled with the shaft vertically, drive side down.
Use a support for this with an opening to provide space for the shaft end.
2 Fit the packing ring (0600) and fit a stage casing (0510) on the pressure bracket.
3 Fit a key (0660) in the pump shaft and fit an impeller (0520), the inlet opening of the impeller must point up.
4 Repeat steps 2 and 3 until the last impeller has been fitted.
5 Secure the impeller set by fitting an external circlip (0130) to the pump shaft.
6 Fit a packing ring (0600) and place the suction cover (0500) on the stage set.
7 Fit a packing ring (0600) into the inlet casing using assembly grease. Place the pump casing suction side (0020) over the shaft end on the stage set.
8 Fit the tie rods (0670 and 0680) using the nuts (0690).
9 For the remaining operations see point 7.12.4. With the exception of the following points:

- The set ring must be fitted with a distance of **8 mm** between the top of the set ring and the edge of the packing chamber in the pump casing.
- Steps 9 and 10 of paragraph 7.12.7 replaced by: Fit the closed bearing cover (0150).

10 Fit the by pass pipe (0650) if present.

8 Weight and dimensions

8.1 Weight

The weight of the pump is stated on the label in the front of this manual and on a similar label on the packaging.

8.2 Dimensions MCH(S) 10

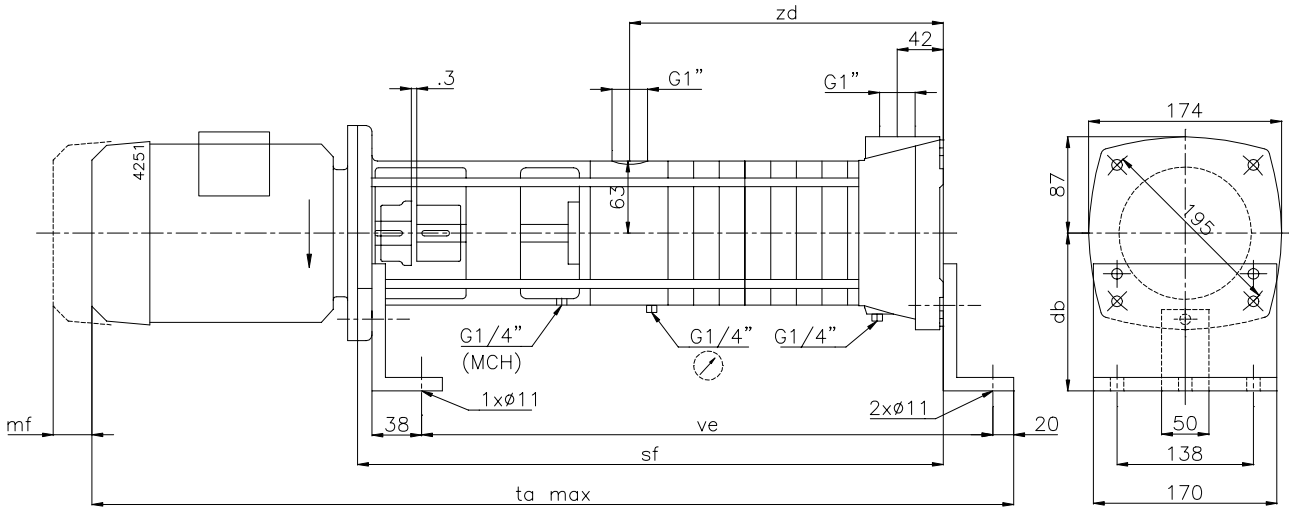

figure 19: Dimensions sketch MCH 10 - MCHS 10

MCH MCHS	IEC motor	db	mf	sf	ta_{max}	ve	zd
10 x 2	80 - F 165	120	70	425	689	404	180
10 x 3	80 - F 165	120	70	425	689	404	180
10 x 4	80 - F 165	120	70	448	712	427	203
10 x 4	90S - F 165	120	80	448	731	427	203
10 x 5	80 - F 165	120	70	471	735	450	226
10 x 5	90S - F 165	120	80	471	754	450	226
10 x 5	90L - F 165	120	80	471	771	450	226
10 x 6	90S - F 165	120	80	494	777	473	249
10 x 6	90L - F 165	120	80	494	794	473	249
10 x 8	90L - F 165	120	80	563	863	542	318
10 x 8	100L - F 215	145	90	573	909	550	318
10 x 9	90L - F 165	120	80	563	863	542	318
10 x 9	112M - F 215	145	90	573	961	550	318
10 x 11	100L - F 215	145	90	666	1002	643	411
10 x 11	112M - F 215	145	90	666	1054	643	411
10 x 12	100L - F 215	145	90	666	1002	643	411
10 x 12	112M - F 215	145	90	666	1054	643	411
10 x 14	112M - F 215	145	90	712	1100	689	457
10 x 16	112M - F 215	145	90	759	1147	736	504

8.3 Dimensions MCH(S) 12,5

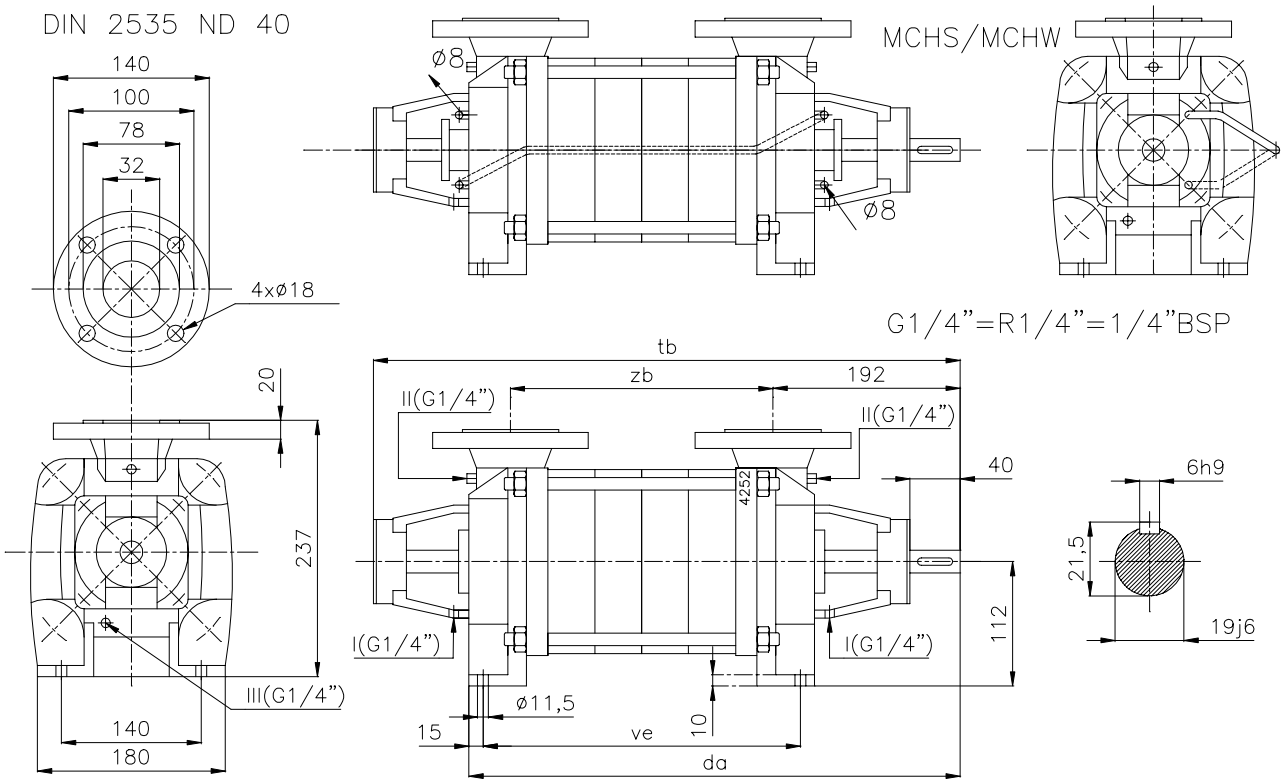

figure 20: Dimensions sketch MCH(W)(S) 12,5.

I = leakage water drain
II = pressure gauge connection
III = drain plug

MCH - MCHW - MCHS	da	tb	ve	zb
12,5 x 1	405	507	227	169
12,5 x 2	405	507	227	169
12,5 x 3	450	552	272	214
12,5 x 4	495	597	317	259
12,5 x 5	540	642	362	304
12,5 x 6	585	687	407	349
12,5 x 7	630	732	452	394
12,5 x 8	675	777	497	439
12,5 x 9	720	822	542	484
12,5 x 10	765	867	587	529

8.4 Dimensions MCH(S) 14a/b

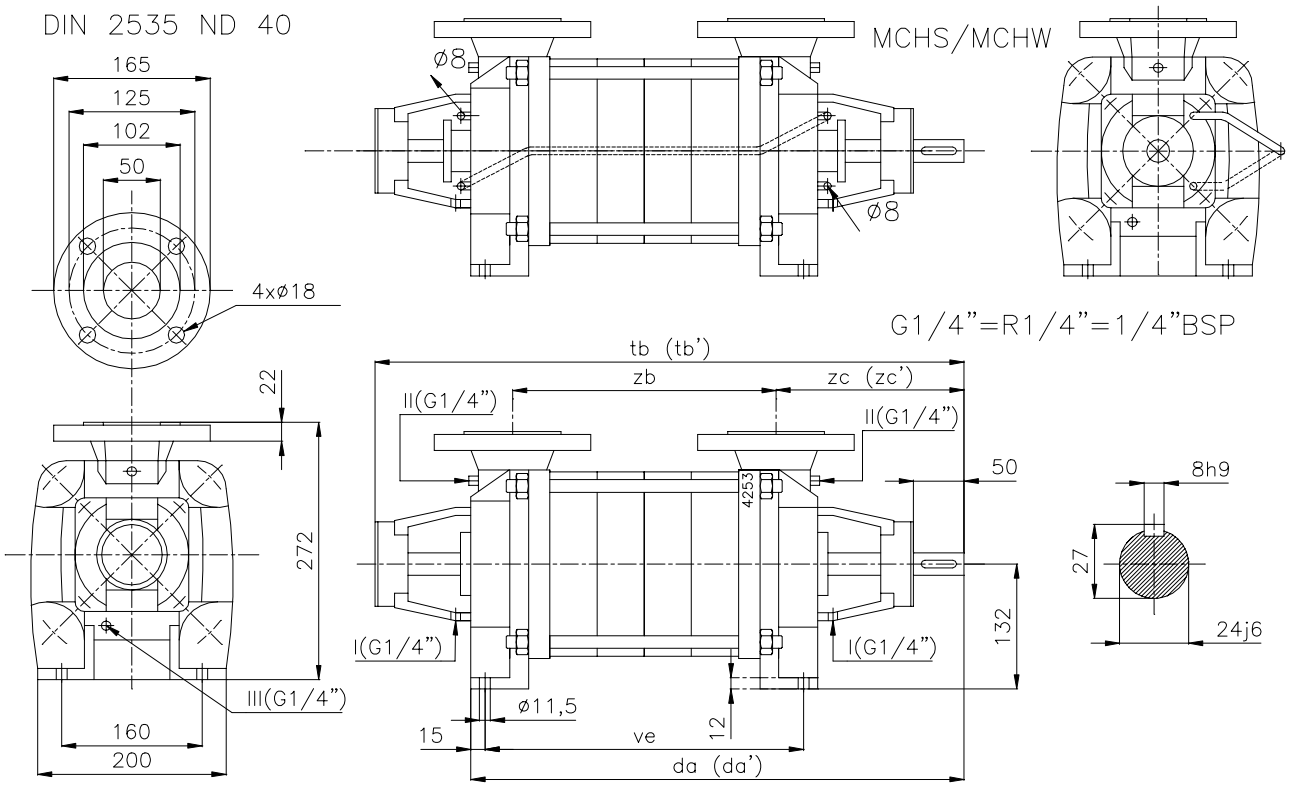

figure 21: Dimensions sketch MCH(W)(S) 14a/b.

I = leakage water drain
II = pressure gauge connection
III = drain plug

MCH - MCHW - MCHS	da	da'	tb	tb'	ve	zb	zc	zc'
14a/b x 1	425		527		237	179	202	
14a/b x 2	425		527		237	179	202	
14a/b x 3	475		577		287	229	202	
14a/b x 4	525		627		337	279	202	
14a/b x 5	575	621	677	723	387	329	202	248
14a/b x 6	625	671	727	773	437	379	202	248
14a/b x 7	675	721	777	823	487	429	202	248
14a/b x 8		771		873	537	479		248
14a/b x 9		821		923	587	529		248
14a/b x 10		871		973	637	579		248

Pump with heavy bearing construction

8.5 Dimensions MCH(S) 16

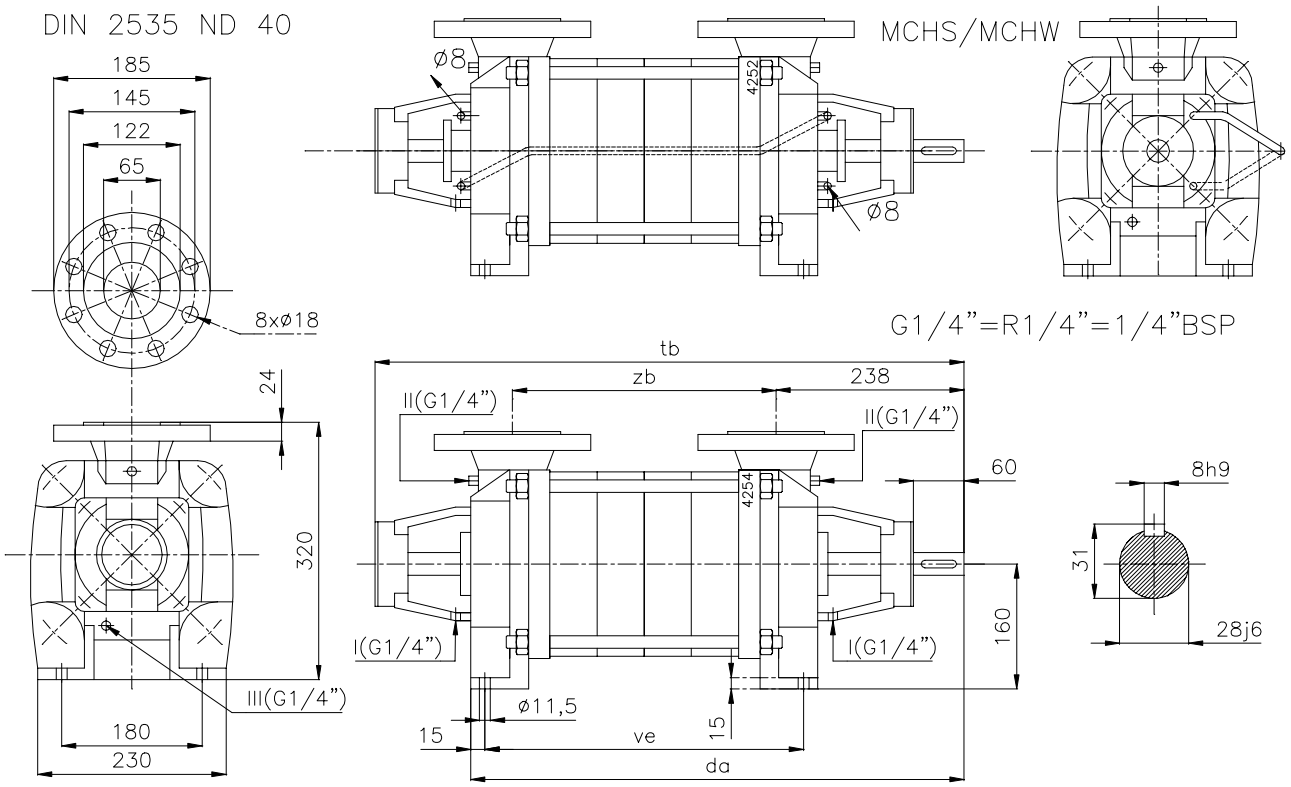

figure 22: Dimensions sketch MCH(W)(S) 16.

I = leakage water drain
II = pressure gauge connection
III = drain plug

MCH - MCHW - MCHS	da	tb	ve	zb
16 x 1 - 6,5	495	624	267	217
16 x 2 - 6,5	495	624	267	217
16 x 3 - 6,5	555	684	327	277
16 x 4 - 6,5	615	744	387	337
16 x 5 - 6,5	675	804	447	397
16 x 6 - 6,5	735	864	507	457
16 x 7 - 6,5	795	924	567	517
16 x 8 - 6,5	955	984	627	577
16 x 9 - 6,5	915	1044	687	637
16 x 10 - 6,5	975	1104	747	697

8.6 Dimensions MCH(S) 20

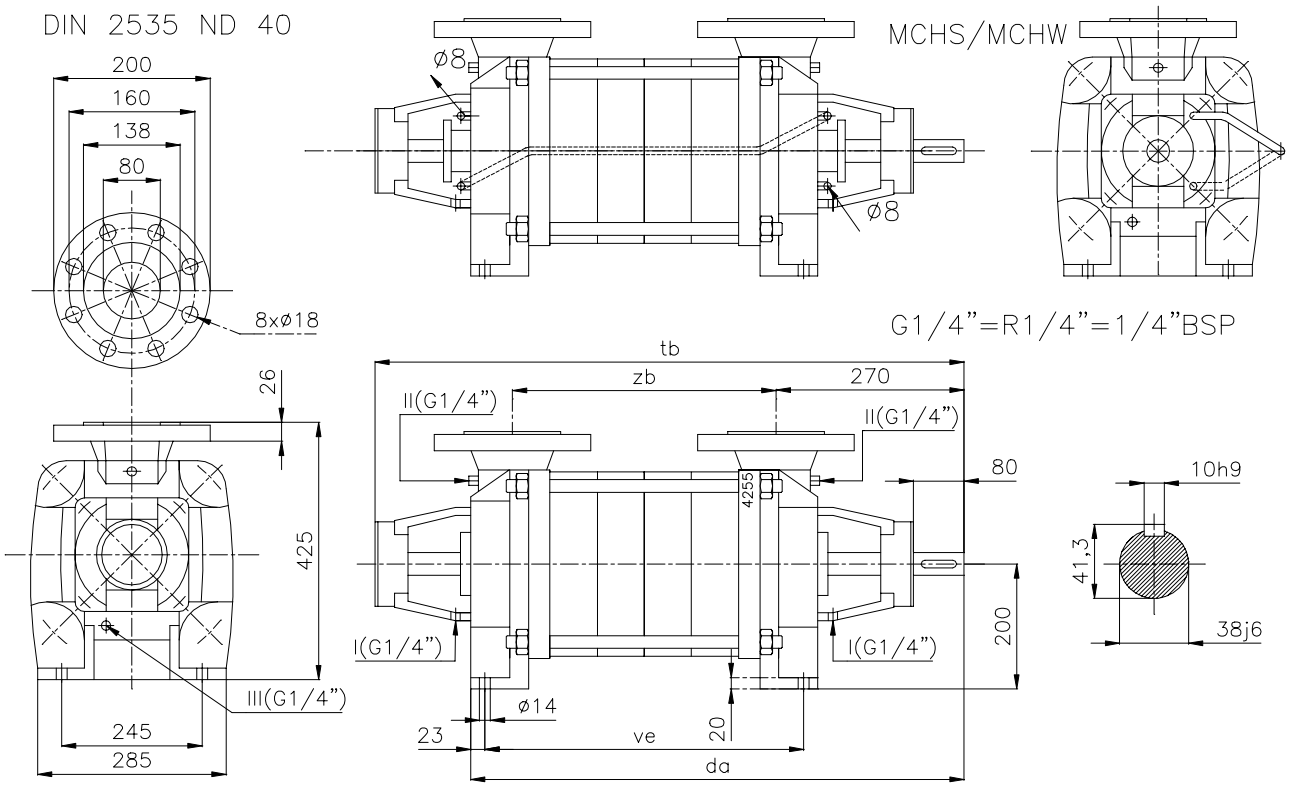

figure 23: Dimensions sketch MCH(W)(S) 20a/b.

I = leakage water drain
II = pressure gauge connection
III = drain plug

MCH - MCHW - MCHS	da	tb	ve	zb
20a/b x 1	525	652	257	207
20a/b x 2	600	727	332	282
20a/b x 3	675	802	407	357
20a/b x 4	750	877	482	432
20a/b x 5	825	952	557	507
20a/b x 6	900	1027	632	582

8.7 Dimensions of unit MCH(W)(S) 12,5

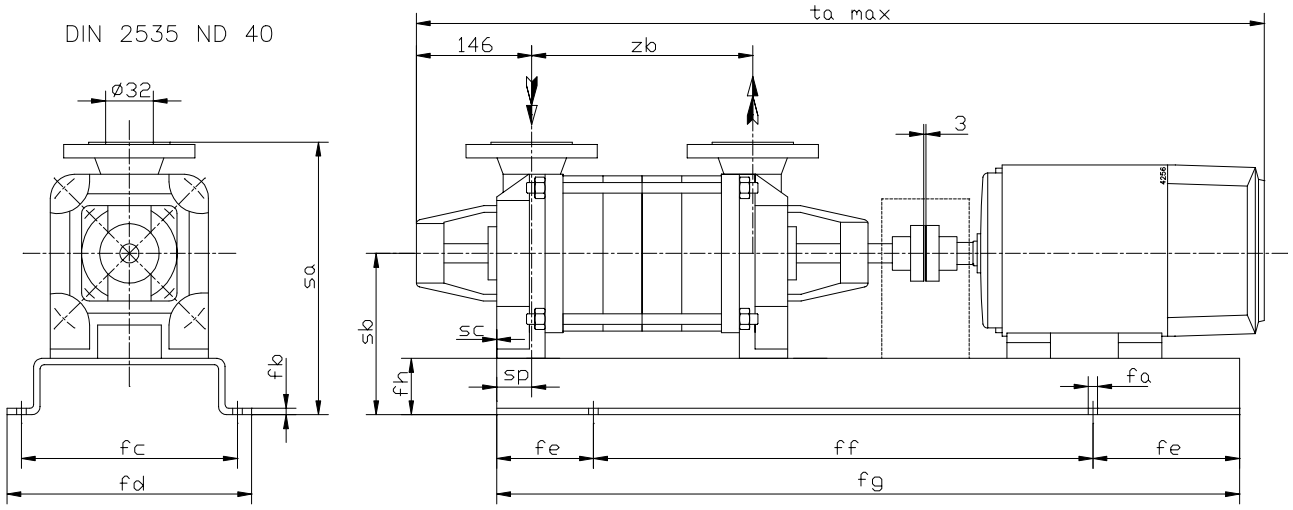

figure 24: Dimensions sketch unit MCH(W)(S) 12,5.

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
12,5 x 1	71	15	5	290	334	105	500	710	40	277	152	0	44	755	169
	80	15	5	290	334	105	500	710	40	277	152	0	44	787	169
12,5 x 2	71	15	5	290	334	105	500	710	40	277	152	0	44	752	169
	90S	15	5	290	334	105	500	710	40	277	152	0	44	812	169
	90L	15	5	290	334	105	500	710	40	277	152	0	44	837	169
12,5 x 3	71	15	5	290	334	105	500	710	40	277	152	0	44	797	214
	90S	15	5	290	334	105	500	710	40	277	152	0	44	857	214
	90L	19	5	300	348	120	560	800	40	277	152	0	44	882	214
	100L	19	5	300	348	120	560	800	40	277	152	0	44	927	214
12,5 x 4	71	15	5	290	334	105	500	710	40	277	152	0	44	842	259
	80	19	5	300	348	120	560	800	40	277	152	0	44	877	259
	90L	19	5	300	348	120	560	800	40	277	152	0	44	927	259
	100L	19	6	350	398	135	630	900	50	287	162	0	44	972	259
	112M	19	6	350	398	135	630	900	50	287	162	0	44	992	259

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
12,5 x 5	71	19	5	300	348	120	560	800	40	277	152	0	44	887	304
	80	19	5	300	348	120	560	800	40	277	152	0	44	922	304
	100L	19	6	350	398	135	630	900	50	287	162	0	44	1017	304
	112M	19	6	350	398	135	630	900	50	287	162	0	44	1037	304
	132S	19	6	350	398	135	630	900	50	307	182	0	44	1108	304
12,5 x 6	71	19	5	300	348	120	560	800	40	277	152	0	44	932	349
	80	19	6	350	398	135	630	900	50	287	162	0	44	967	349
	112M	19	8	425	473	145	710	1000	63	300	175	0	44	1082	349
	132S	19	8	425	473	145	710	1000	63	320	195	0	44	1153	349
12,5 x 7	80	19	6	350	398	135	630	900	50	287	162	0	44	1012	394
	90S	19	6	350	398	135	630	900	50	287	162	0	44	1037	394
	112M	19	8	425	473	145	710	1000	63	300	175	0	44	1127	394
	132S	19	8	425	473	145	710	1000	63	320	195	0	44	1198	394
12,5 x 8	80	19	8	420	473	145	710	1000	63	300	175	0	44	1022	439
	90S	19	8	425	473	145	710	1000	63	300	175	0	44	1082	439
	132S	19	10	425	475	160	800	1120	70	327	202	0	44	1243	439
12,5 x 9	80	19	8	425	473	145	710	1000	63	300	175	0	44	1102	484
	90S	19	8	425	473	145	710	1000	63	300	175	0	44	1127	484
	132S	19	10	425	475	160	800	1120	70	327	202	0	44	1288	484
12,5 x 10	80	19	10	425	475	160	800	1120	70	307	182	0	44	1147	529
	90S	19	10	425	475	160	800	1120	70	307	182	0	44	1172	529
	132S	24	10	435	495	175	900	1250	70	327	202	0	44	1333	529

8.8 Dimensions of unit MCH(W)(S) 14a

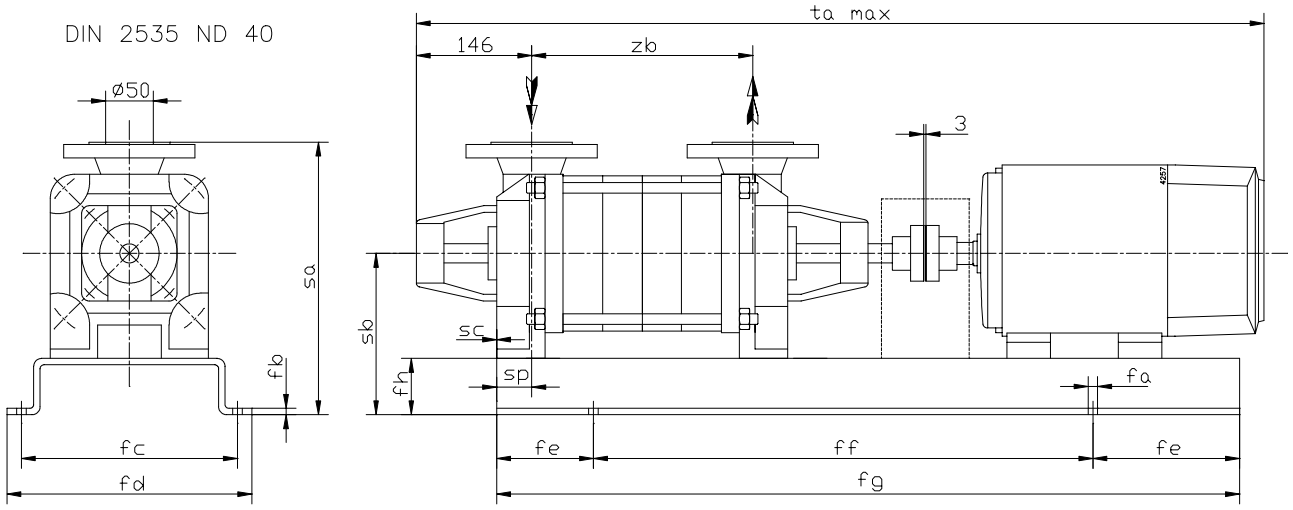

figure 25: Dimensions sketch unit MCH(W)(S) 14a/b.

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
14a x 1	71	15	5	290	334	105	500	710	40	312	172	0	44	775	179
	90S	15	5	290	334	105	500	710	40	312	172	0	44	835	179
	90L	15	5	290	334	105	500	710	40	312	172	0	44	860	179
14a x 2	71	15	5	290	334	105	500	710	40	312	172	0	44	775	179
	80	15	5	290	334	105	500	710	40	312	172	0	44	810	179
	100L	19	5	300	348	120	560	800	40	312	172	0	44	905	179
	112M	19	5	300	348	120	560	800	40	312	172	0	44	925	179
14a x 3	80	19	5	300	348	120	560	800	40	312	172	0	44	860	229
	90S	19	5	300	348	120	560	800	40	312	172	0	44	885	229
	112M	19	5	300	348	120	560	800	40	312	172	0	44	975	229
	132S	19	6	350	398	135	630	900	50	322	182	0	44	1046	229
14a x 4	80	19	5	300	348	120	560	800	40	312	172	0	44	910	279
	90S	19	5	300	348	120	560	800	40	312	172	0	44	935	279
	132S	19	6	350	398	135	630	900	50	322	182	0	44	1096	279
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1249	279

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
14a x 5	80	19	6	350	398	135	630	900	50	322	182	0	44	1006	329
	90S	19	6	350	398	135	630	900	50	322	182	0	44	1031	329
	90L	19	6	350	398	135	630	900	50	322	182	0	44	1056	329
	132S	19	8	425	473	145	710	1000	63	335	195	0	44	1192	329
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1345	329
14a x 6	90S	19	6	350	398	135	630	900	50	322	182	0	44	1035	379
	90S	19	8	425	473	145	710	1000	63	335	195	0	44	1081	379
	90L	19	8	425	473	145	710	1000	63	335	195	0	44	1106	379
	132S	19	8	425	473	145	710	1000	63	335	195	0	44	1196	379
	132S	19	10	425	475	160	800	1120	70	312	172	0	44	1242	379
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1349	379
	160M	24	10	435	495	175	900	1250	70	370	230	0	44	1395	379
14a x 7	90S	19	8	425	473	145	710	1000	63	335	195	0	44	1131	429
	90L	19	8	425	473	145	710	1000	63	335	195	0	44	1156	429
	100L	19	8	425	473	145	710	1000	63	335	195	0	44	1155	429
	100L	19	10	425	475	160	800	1120	70	312	172	0	44	1201	429
	160M	24	10	435	495	175	900	1250	70	370	230	0	44	1445	429
14a x 8	90L	19	10	425	475	160	800	1120	70	312	172	0	44	1206	479
	100L	19	10	425	475	160	800	1120	70	312	172	0	44	1251	479
	160M	24	10	435	495	200	1000	1400	80	380	240	0	44	1495	479
	160L	24	10	435	495	200	1000	1400	80	380	240	0	44	1539	479
14a x 9	90L	19	10	425	475	160	800	1120	70	312	172	0	44	1256	529
	100L	24	10	435	495	175	900	1250	70	342	202	0	44	1301	529
	160M	24	10	435	495	200	1000	1400	80	380	240	0	44	1545	529
14a x 10	90L	24	10	435	495	175	900	1250	70	342	202	0	44	1306	579
	100L	24	10	435	495	175	900	1250	70	342	202	0	44	1351	579
	160M	24	10	435	495	200	1000	1400	80	380	240	0	44	1595	579

Pump with heavy bearing construction

8.9 Dimensions of unit MCH(W)(S) 14b

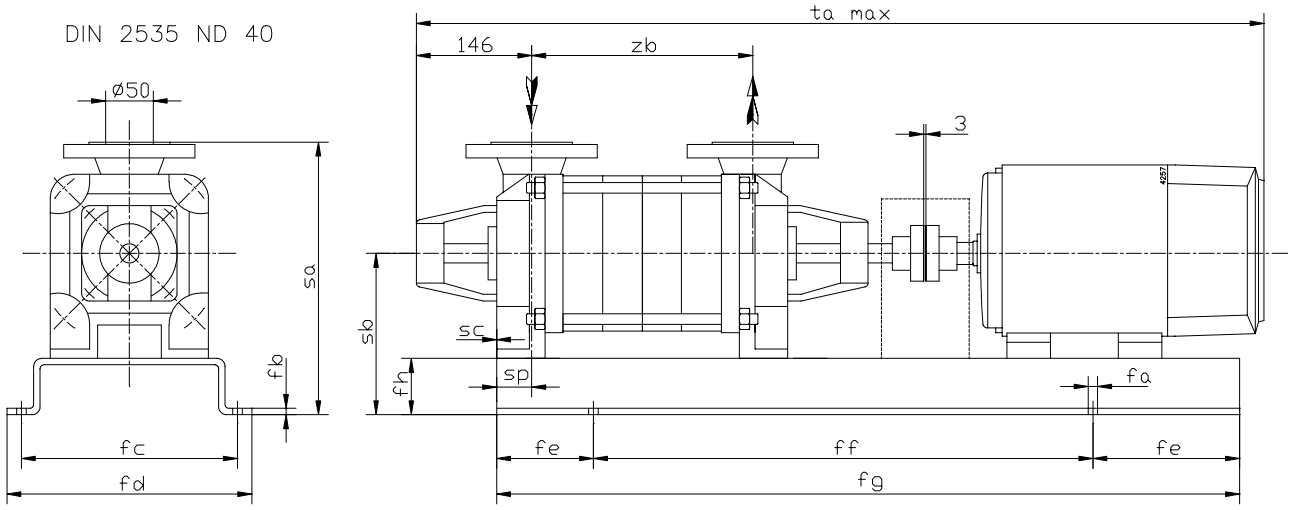

figure 26: Dimensions sketch unit MCH(W)(S) 14b.

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
14b x 1	71	15	5	290	334	105	500	710	40	312	172	0	44	775	179
	90L	15	5	290	334	105	500	710	40	312	172	0	44	860	179
	100L	19	5	300	348	120	560	800	40	312	172	0	44	905	179
14b x 2	80	15	5	290	334	105	500	710	40	312	172	0	44	810	179
	112M	19	5	300	348	120	560	800	40	312	172	0	44	925	179
	132S	19	6	350	398	135	630	900	50	322	182	0	44	996	179
14b x 3	80	19	5	300	348	120	560	800	40	312	172	0	44	860	229
	90S	19	5	300	348	120	560	800	40	312	172	0	44	885	229
	132S	19	6	350	398	135	630	900	50	322	182	0	44	1046	229
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1199	229
14b x 4	90S	19	5	300	348	120	560	800	40	312	172	0	44	935	279
	90L	19	6	350	398	135	630	900	50	322	182	0	44	960	279
	132S	19	6	350	398	135	630	900	50	322	182	0	44	1096	279
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1249	279

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
14b x 5	90S	19	6	350	398	135	630	900	50	322	182	0	44	1031	329
	90L	19	6	350	398	135	630	900	50	322	182	0	44	1056	329
	100L	19	6	350	398	135	630	900	50	322	182	0	44	1055	329
	100L	19	8	425	473	145	710	1000	63	335	195	0	44	1101	329
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1345	329
14b x 6	90L	19	8	425	473	145	710	1000	63	335	195	0	44	1106	379
	100L	19	8	425	473	145	710	1000	63	335	195	0	44	1151	379
	160M	19	8	425	473	145	710	1000	63	363	223	0	44	1349	379
	160M	24	10	435	495	175	900	1250	70	370	230	0	44	1395	379
	160L	24	10	435	495	175	900	1250	70	370	230	0	44	1439	379
14b x 7	90L	19	8	425	473	145	710	1000	63	335	195	0	44	1156	429
	100L	19	8	425	473	145	710	1000	63	335	195	0	44	1155	429
	100L	19	10	425	475	160	800	1120	70	342	202	0	44	1201	429
	160M	24	10	435	495	175	900	1250	70	370	230	0	44	1445	429
	180M	24	10	485	545	175	900	1250	80	400	260	0	44	1460	429
	180M	24	10	435	495	200	1000	1400	80	400	260	0	44	1506	429
14b x 8	100L	19	10	425	475	160	800	1120	70	342	202	0	44	1251	479
	160M	24	10	435	495	200	1000	1400	80	380	240	0	44	1495	479
	160L	24	10	435	495	200	1000	1400	80	380	240	0	44	1539	479
	180M	24	10	435	495	200	1000	1400	80	400	260	0	44	1556	479
	200L	24	10	535	595	200	1000	1400	90	430	290	0	44	1670	479
14b x 9	100L	24	10	435	495	175	900	1250	70	342	202	0	44	1301	529
	112M	24	10	435	495	175	900	1250	70	342	202	0	44	1321	529
	160M	24	10	435	495	200	1000	1400	80	380	240	0	44	1545	529
	160L	24	10	435	495	200	1000	1400	80	380	240	0	44	1589	529
14b x 10	100L	24	10	435	495	175	900	1250	70	342	202	0	44	1351	579
	112M	24	10	435	495	175	900	1250	70	342	202	0	44	1371	579
	160L	24	10	435	495	200	1000	1400	80	380	240	0	44	1639	579
	180M	24	10	590	658	240	1120	1600	100	420	280	0	44	1656	579

Pump with heavy bearing construction

8.10 Dimensions of unit MCH(W)(S) 16

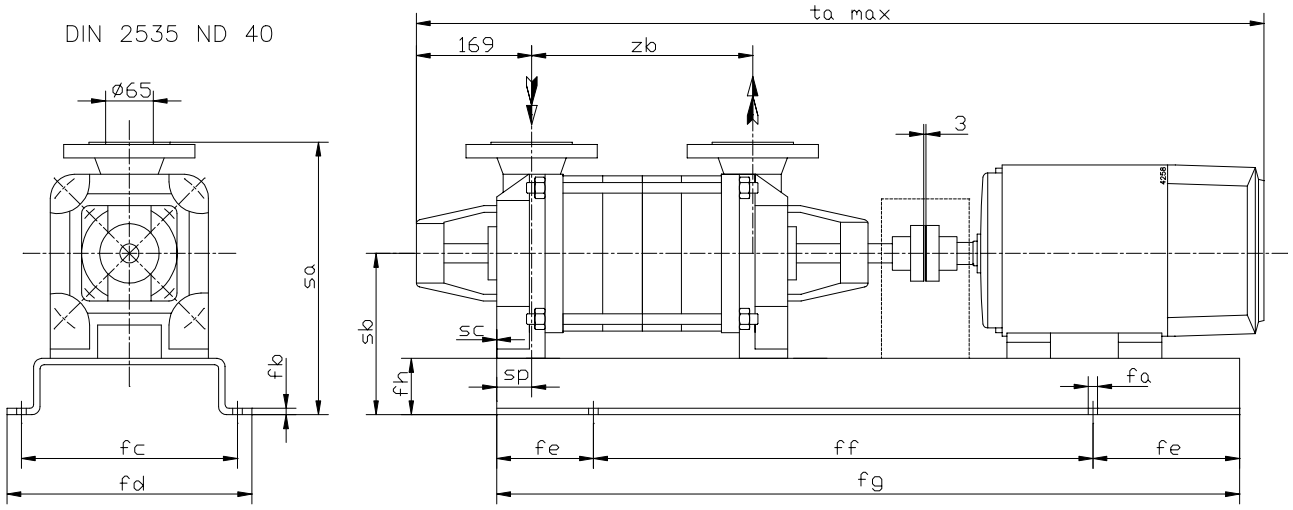

figure 27: Dimensions sketch unit MCH(W)(S) 16.

MCH(W)(S)	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
16 x 1	71	19	6	350	398	135	630	900	50	370	210	0	40	872	217
	80	19	6	350	398	135	630	900	50	370	210	0	40	907	217
	112M	19	6	350	398	135	630	900	50	370	210	0	40	1022	217
	132S	19	6	350	398	135	630	900	50	370	210	0	40	1093	217
16 x 2	80	19	6	350	398	135	630	900	50	370	210	0	40	907	217
	90S	19	6	350	398	135	630	900	50	370	210	0	40	932	217
	90L	19	6	350	398	135	630	900	50	370	210	0	40	957	217
	132S	19	6	350	398	135	630	900	50	370	210	0	40	1093	217
	160M	19	8	425	473	145	710	1000	63	383	223	0	40	1246	217
16 x 3	90S	19	6	350	398	135	630	900	50	370	210	0	40	992	277
	90L	19	6	350	398	135	630	900	50	370	210	0	40	1017	277
	100L	19	6	350	398	135	630	900	50	370	210	0	40	1062	277
	160M	19	8	425	473	145	710	1000	63	383	223	0	40	1306	277
	160L	19	8	425	473	145	710	1000	63	383	223	0	40	1350	277
16 x 4	90L	19	6	350	398	135	630	900	50	370	210	0	40	1077	337
	100L	19	8	425	473	145	710	1000	63	383	223	0	40	1122	337
	160M	19	8	425	473	145	710	1000	63	383	223	0	40	1366	337
	160L	24	10	435	495	175	900	1250	70	390	230	0	40	1410	337

MCH MCHW MCHS	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
16 x 4	180M	24	10	485	545	175	900	1250	80	420	260	0	40	1427	337
	200L	24	10	535	595	200	1000	1400	90	450	290	0	40	1541	337
16 x 5	100L	19	8	425	473	145	710	1000	63	383	223	0	40	1182	397
	112M	19	8	425	473	145	710	1000	63	383	223	0	40	1202	397
	160L	24	10	435	495	175	900	1250	70	390	230	0	40	1470	397
	180M	24	10	485	545	175	900	1250	80	420	260	0	40	1487	397
	200L	24	10	535	595	200	1000	1400	90	450	290	0	40	1601	397
16 x 6	100L	19	10	425	475	160	800	1120	70	390	230	0	40	1242	457
	112M	19	10	425	475	160	800	1120	70	390	230	0	40	1262	457
	132S	19	10	425	475	160	800	1120	70	390	230	0	40	1333	457
	180M	24	10	435	495	200	1000	1400	80	420	260	0	40	1547	457
	200L	24	10	535	595	200	1000	1400	90	450	290	0	40	1661	457
16 x 7	100L	19	10	425	475	160	800	1120	70	390	230	0	40	1302	517
	112M	19	10	425	475	160	800	1120	70	390	230	0	40	1322	517
	132S	24	10	435	495	175	900	1250	70	390	230	0	40	1393	517
	200L	24	10	590	658	240	1120	1600	100	460	300	0	40	1721	517
	225M	24	10	590	658	240	1120	1600	100	485	325	0	40	1827	517
16 x 8	100L	24	10	435	495	175	900	1250	70	390	230	0	40	1362	577
	112M	24	10	435	495	175	900	1250	70	390	230	0	40	1382	577
	132S	24	10	435	495	175	900	1250	70	390	230	0	40	1453	577
	132M	24	10	435	495	200	1000	1400	80	400	240	0	40	1489	577
	200L	24	10	590	658	240	1120	1600	100	460	300	0	40	1781	577
16 x 9	112M	24	10	435	495	175	900	1250	70	390	230	0	40	1442	637
	132S	24	10	435	495	200	1000	1400	80	400	240	0	40	1513	637
	132M	24	10	435	495	200	1000	1400	80	400	240	0	40	1549	637
	200L	24	10	590	658	240	1120	1600	100	460	300	0	40	1841	637
16 x 10	112M	24	10	435	495	200	1000	1400	80	400	240	0	40	1502	697
	132S	24	10	435	495	200	1000	1400	80	400	240	0	40	1573	697
	132M	24	10	435	495	200	1000	1400	80	400	240	0	40	1609	697
	200L	24	10	590	658	240	1120	1600	100	460	300	0	40	1901	697
	225M	24	10	720	788	240	1120	1600	130	515	355	0	40	2007	697

8.11 Dimensions of unit MCH(W)(S) 20a

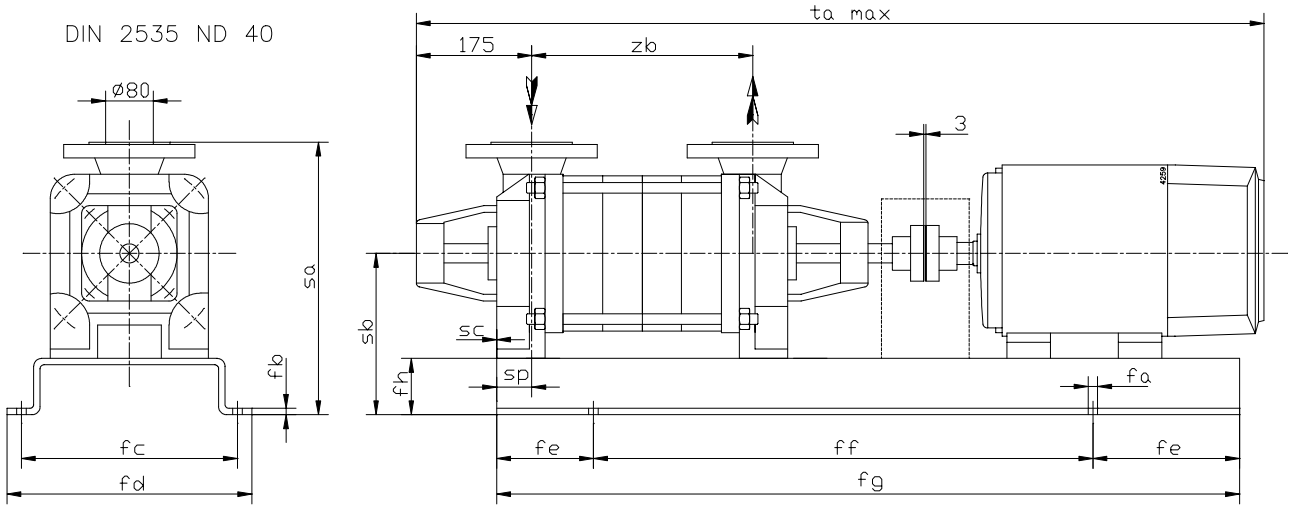

figure 28: Dimensions sketch unit MCH(W)(S) 20a.

MCH(W)(S)	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
20a x 1	90S	19	8	425	473	145	710	1000	63	488	263	0	48	960	207
	90L	19	8	425	473	145	710	1000	63	488	263	0	48	985	207
	100L	19	8	425	473	145	710	1000	63	488	263	0	48	1030	207
	132S	19	8	425	473	145	710	1000	63	488	263	0	48	1121	207
	160M	19	8	425	473	145	710	1000	63	488	263	0	48	1274	207
20a x 2	100L	19	8	425	473	145	710	1000	63	488	263	0	48	1105	282
	112M	19	8	425	473	145	710	1000	63	488	263	0	48	1125	282
	160M	19	8	425	473	145	710	1000	63	488	263	0	48	1349	282
	160L	24	10	435	495	175	900	1250	70	495	270	0	48	1393	282
	180M	24	10	485	545	175	900	1250	80	505	280	0	48	1410	282
	200L	24	10	535	595	200	1000	1400	90	515	290	0	48	1524	282
20a x 3	100L	19	8	425	473	145	710	1000	63	488	263	0	48	1180	357
	112M	19	8	425	473	145	710	1000	63	488	263	0	48	1200	357
	132S	19	8	425	473	145	710	1000	63	488	263	0	48	1271	357
	132M	19	8	425	473	145	710	1000	63	488	263	0	48	1307	357
	200L	24	10	535	595	200	1000	1400	90	515	290	0	48	1599	357
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1705	357

MCH(W)(S)	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
20a x 4	112M	19	8	425	473	145	710	1000	63	488	263	0	48	1275	432
	132S	19	8	425	473	145	710	1000	63	488	263	0	48	1346	432
	132M	24	10	435	495	175	900	1250	70	495	270	0	48	1382	432
	200L	24	10	535	595	200	1000	1400	90	515	290	0	48	1674	432
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1780	432
20a x 5	132S	24	10	435	495	175	900	1250	70	495	270	0	48	1421	507
	132M	24	10	435	495	175	900	1250	70	495	270	0	48	1457	507
	160M	24	10	435	495	200	1000	1400	80	505	280	0	48	1574	507
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1855	507
	250M	24	10	720	788	240	1120	1600	130	605	380	0	48	1920	507
20a x 6	132M	24	10	435	495	200	1000	1400	80	505	280	0	48	1532	582
	160M	24	10	435	495	200	1000	1400	80	505	280	0	48	1649	582

8.12 Dimensions of unit MCH(W)(S) 20b

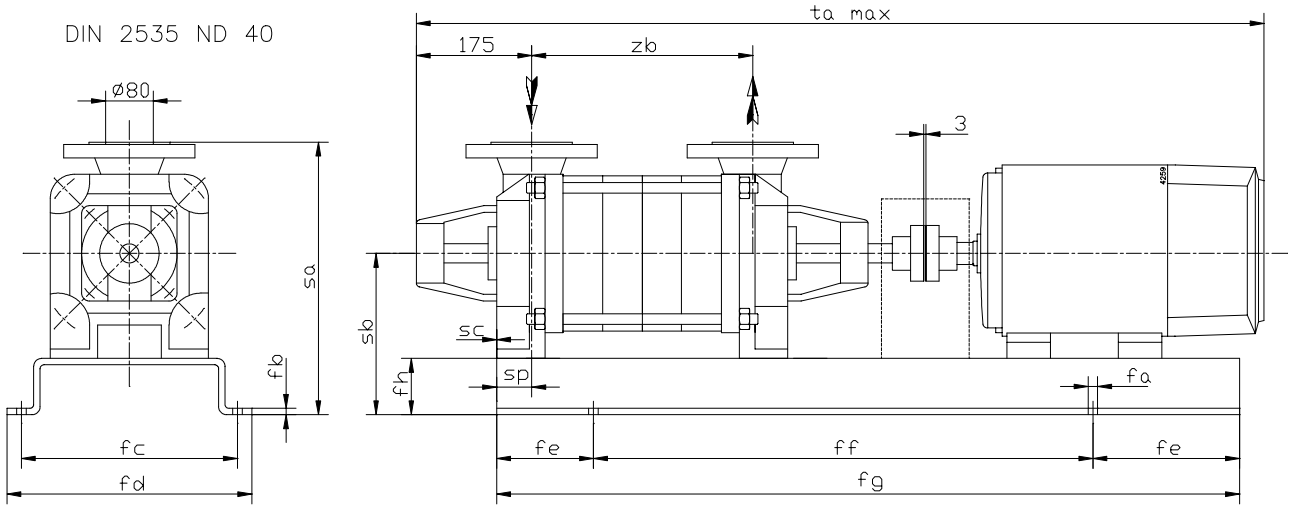

figure 29: Dimensions sketch unit MCH(W)(S) 20b.

MCH(W)(S)	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
20b x 1	90L	19	8	425	473	145	710	1000	63	488	263	0	48	985	207
	100L	19	8	425	473	145	710	1000	63	488	263	0	48	1030	207
	160M	19	8	425	473	145	710	1000	63	488	263	0	48	1274	207
	160L	19	8	425	473	145	710	1000	63	488	263	0	48	1318	207
20b x 2	100L	19	8	425	473	145	710	1000	63	488	263	0	48	1105	282
	112M	19	8	425	473	145	710	1000	63	488	263	0	48	1125	282
	132S	19	8	425	473	145	710	1000	63	488	263	0	48	1196	282
	180M	24	10	485	545	175	900	1250	80	505	280	0	48	1410	282
	200L	24	10	535	595	200	1000	1400	90	515	290	0	48	1524	282
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1630	282
20b x 3	132S	19	8	425	473	145	710	1000	63	488	263	0	48	1271	357
	132M	19	8	425	473	145	710	1000	63	488	263	0	48	1307	357
	160M	24	10	435	495	175	900	1250	70	495	270	0	48	1424	357
	200L	24	10	535	595	200	1000	1400	90	515	290	0	48	1599	357
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1705	357
	280S	24	10	720	788	240	1120	1600	130	635	410	0	48	1825	357

MCH(W)(S)	IEC motor	fa	fb	fc	fd	fe	ff	fg	fh	sa	sb	sc	sp	ta max	zb
20b x 4	132M	24	10	435	495	175	900	1250	70	495	270	0	48	1382	432
	160M	24	10	435	495	175	900	1250	70	495	270	0	48	1499	432
	225M	24	10	590	658	240	1120	1600	100	550	325	0	48	1780	432
	250M	24	10	720	788	240	1120	1600	130	605	380	0	48	1845	432
	280S	24	10	720	788	240	1120	1600	130	635	410	0	48	1900	432
20b x 5	132M	24	10	435	495	175	900	1250	70	495	270	0	48	1457	507
	160M	24	10	435	495	200	1000	1400	80	505	280	0	48	1574	507
	160L	24	10	435	495	200	1000	1400	80	505	280	0	48	1618	507
	250M	24	10	720	788	240	1120	1600	130	605	380	0	48	1920	507
	280S	24	10	720	788	240	1120	1600	130	635	410	0	48	1975	507
20b x 6	160M	24	10	435	495	200	1000	1400	80	505	280	0	48	1649	582
	160L	24	10	590	658	240	1120	1600	100	525	300	0	48	1693	582

9 Parts list

9.1 Ordering parts and spare parts

9.1.1 Order form

You can use the order form included in this manual for ordering parts.

You must always state the following on the order:

1 Your **address information**.
2 The **quantity**, the **item number** and the **description** of the part.
3 The **pump number**.
4 In the event of different voltages for the electric motor you should state the correct voltage.

9.1.2 Pump number

When ordering parts for a pump, please quote the pump reference number on your order.

You can find the **pump number** on the **type plate** on the pump and on the label **on the first page of these operating instructions**.

9.1.3 Recommended spare parts

Parts marked with a ***** are recommended spare parts.

9.2 Designs

The following designs are possible in the parts list below (with the exception of the MCH(S)10):

Cast iron:

- Design P: cast iron pump casings, stage casings and impellers
- Design Q: cast iron pump casings and stage casings, bronze impellers.

Bronze:

- Design Q: bronze pump casings, stage covers and impellers

9.3 MCH(S)10

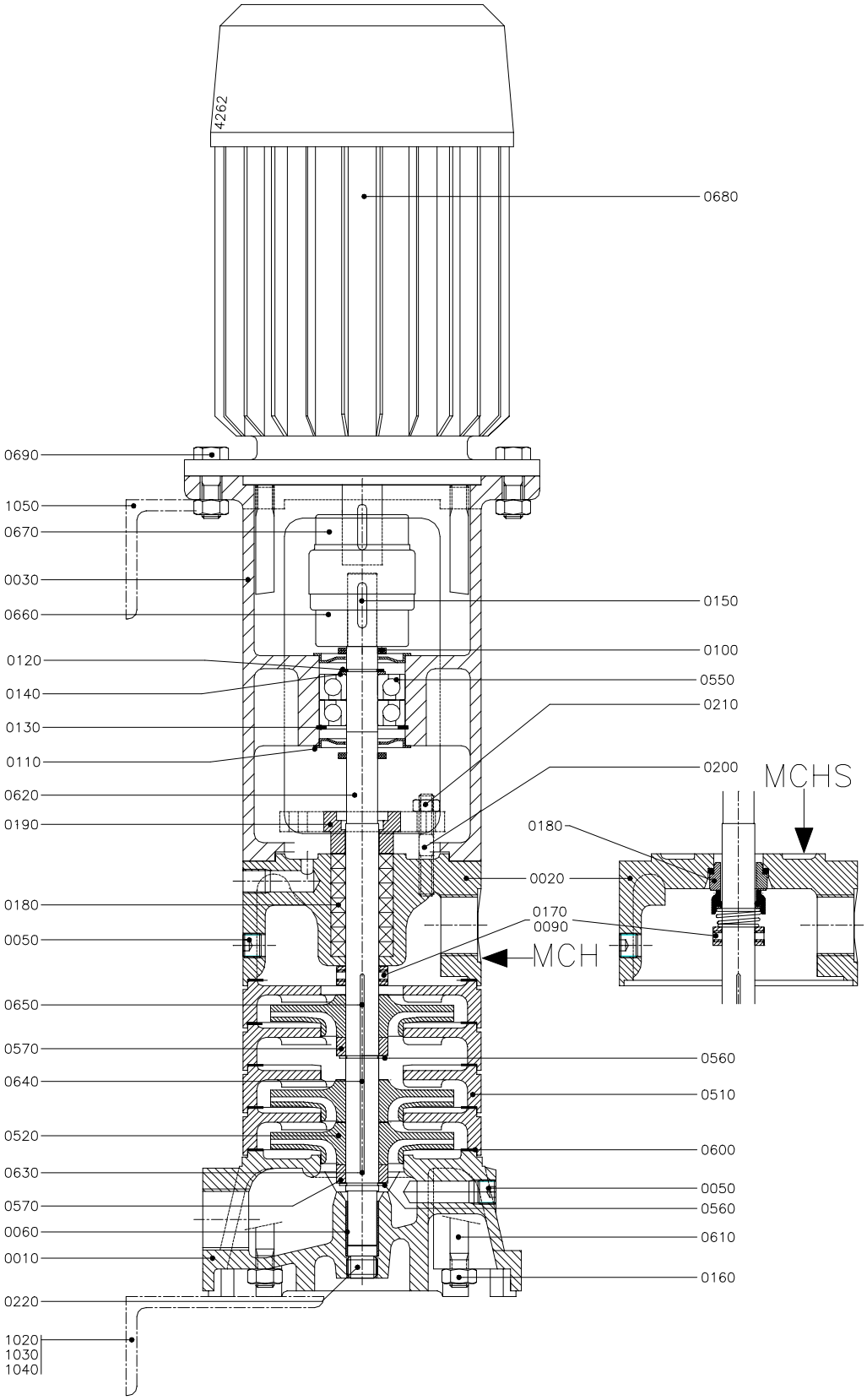

figure 30: MCH(S) 10.

MCH 10 x 2-9				see figure 30
item no.	**quantity**	**description**	**material**	**remarks**
0010	1	inlet casing	cast iron	
0020	1	outlet casing	cast iron	
0030	1	lantern piece	cast iron	
0050	2	plug	steel	
0060*	1	slide bearing	bronze / PTFE	
0090	1	set ring	bronze	
0100*	2	splash ring	rubber	
0110	2	bearing cover	steel	
0120*	1	external circlip	steel	
0130*	1	internal circlip	steel	
0140*	1	filling ring	steel	
0150*	1	key	steel	
0160	4	nut	steel	
0170	2	adjustment screw	alloyed steel	
0180*	7	gland packing ring	--	
0190	1	gland	cast iron	
0200	2	gland stud	alloyed steel	
0210	2	nut	brass	
0220	1	plug	steel	
0510	n	stage casing	cast iron	for 2-stage and 8-stage design: n+1
0520*	n	impeller	noryl	
0550*	1	ball bearing	--	for 9-stage design: 2
0560*	1	external circlip	alloyed steel	
0570*	1	support ring	bronze	
0600*	n+1	packing ring	--	for 2-stage and 8-stage design: n+2
0610*	4	stud	alloyed steel	
0620*	1	shaft	alloyed steel	
0630*	1	key	alloyed steel	
0660	1	coupling half pump side	cast iron	
0670	1	coupling half motor side	cast iron	
0680	1	flange motor	--	
0690	4	bolt + nut	steel	
1020	1	support	steel	
1030	3	bolt	steel	
1040	3	nut	steel	
1050	1	support	steel	

MCH 10 x 11-16				see figure 30
item no.	**quantity**	**description**	**material**	**remarks**
0010	1	inlet casing	cast iron	
0020	1	outlet casing	cast iron	
0030	1	lantern piece	cast iron	
0050	2	plug	steel	
0060*	1	slide bearing	bronze / PTFE	
0090	1	set ring	bronze	
0100*	2	splash ring	rubber	
0110	2	bearing cover	steel	
0120*	1	external circlip	steel	
0130	1	internal circlip	steel	
0140	1	filling ring	steel	
0150	1	key	steel	
0160	4	nut	steel	
0170	2	adjustment screw	alloyed steel	
0180*	7	gland packing ring	--	
0190	1	gland	cast iron	
0200	2	gland stud	alloyed steel	
0210	2	nut	brass	
0220	1	plug	steel	
0510	n+1	stage casing	cast iron	for 11-stage: n+2
0520*	n	impeller	noryl	
0550*	2	ball bearing	--	
0560*	2	external circlip	alloyed steel	
0570*	2	support ring	bronze	
0600*	n+2	packing ring	--	for 11-stages: n+3
0610*	4	stud	alloyed steel	
0620*	1	shaft	alloyed steel	
0630*	1	key	alloyed steel	
0640*	1	key	alloyed steel	
0650*	1	key	alloyed steel	only for 16-stage design
0660	1	coupling half pump side	cast iron	
0670	1	coupling half motor side	cast iron	
0680	1	flange motor	--	
0690	4	bolt + nut	steel	
1020	1	support	steel	
1030	2	bolt	steel	
1040	2	nut	steel	
1050	1	support	steel	

MCHS 10 x 2-9				see figure 30
item no.	**quantity**	**description**	**material**	**remarks**
0010	1	inlet casing	cast iron	
0020	1	outlet casing	cast iron	
0030	1	lantern piece	cast iron	
0050	2	plug	steel	
0060*	1	slide bearing	bronze / PTFE	
0090	1	set ring	bronze	
0100*	2	splash ring	rubber	
0110	2	bearing cover	steel	
0120*	1	external circlip	steel	
0130	1	internal circlip	steel	
0140	1	filling ring	steel	
0150	1	key	steel	
0160	4	nut	steel	
0170	2	lock screw	alloyed steel	
0180*	1	mechanical seal	--	
0220	1	plug	steel	
0510	n	stage cover	cast iron	for 2 and 8-stage design: n+1
0520*	n	impeller	noryl	
0550*	1	ball bearing	--	for 9-stage design: 2
0560*	1	external circlip	alloyed steel	
0570*	1	support ring	bronze	
0600*	n+1	packing ring	--	for 2 and 8-stage design: n+2
0610*	4	stud	alloyed steel	
0620*	1	shaft	alloyed steel	
0630*	1	key	alloyed steel	
0660	1	coupling half pump side	cast iron	
0670	1	coupling half motor side	cast iron	
0680	1	flange motor	--	
0690	4	bolt + nut	steel	
1020	1	support	steel	
1030	3	bolt	steel	
1040	3	nut	steel	
1050	1	support	steel	

MCHS 10 x 11-16				see figure 30
item no.	**quantity**	**description**	**material**	**remarks**
0010	1	inlet casing	cast iron	
0020	1	outlet casing	cast iron	
0030	1	lantern piece	cast iron	
0050	2	plug	steel	
0060*	1	slide bearing	bronze / PTFE	
0090	1	set ring	bronze	
0100*	2	splash ring	rubber	
0110	2	bearing cover	steel	
0120*	1	external circlip	steel	
0130	1	internal circlip	steel	
0140	1	filling ring	steel	
0150	1	key	steel	
0160	4	nut	steel	
0170	2	lock screw	alloyed steel	
0180*	1	mechanical seal	--	
0200*	1	O-ring	rubber	
0220	1	plug	steel	
0510	n+1	stage casing	cast iron	for 11-stage design: n+2
0520*	n	impeller	noryl	
0550*	2	ball bearing	--	
0560*	2	external circlip	alloyed steel	
0570*	2	support ring	bronze	
0600*	n+2	packing ring	--	for 11-stage design: n+3
0610*	4	stud	alloyed steel	
0620*	1	shaft	alloyed steel	
0630*	1	key	alloyed steel	
0640*	1	key	alloyed steel	
0650*	1	key	alloyed steel	only for 16-stage design
0660	1	coupling half pump side	cast iron	
0670	1	coupling half motor side	cast iron	
0680	1	flange motor	--	
0690	4	bolt + nut	steel	
1020	1	support	steel	
1030	2	bolt	steel	
1040	2	nut	steel	
1050	1	support	steel	

9.4 MCH 12,5 - 14a/b - 16

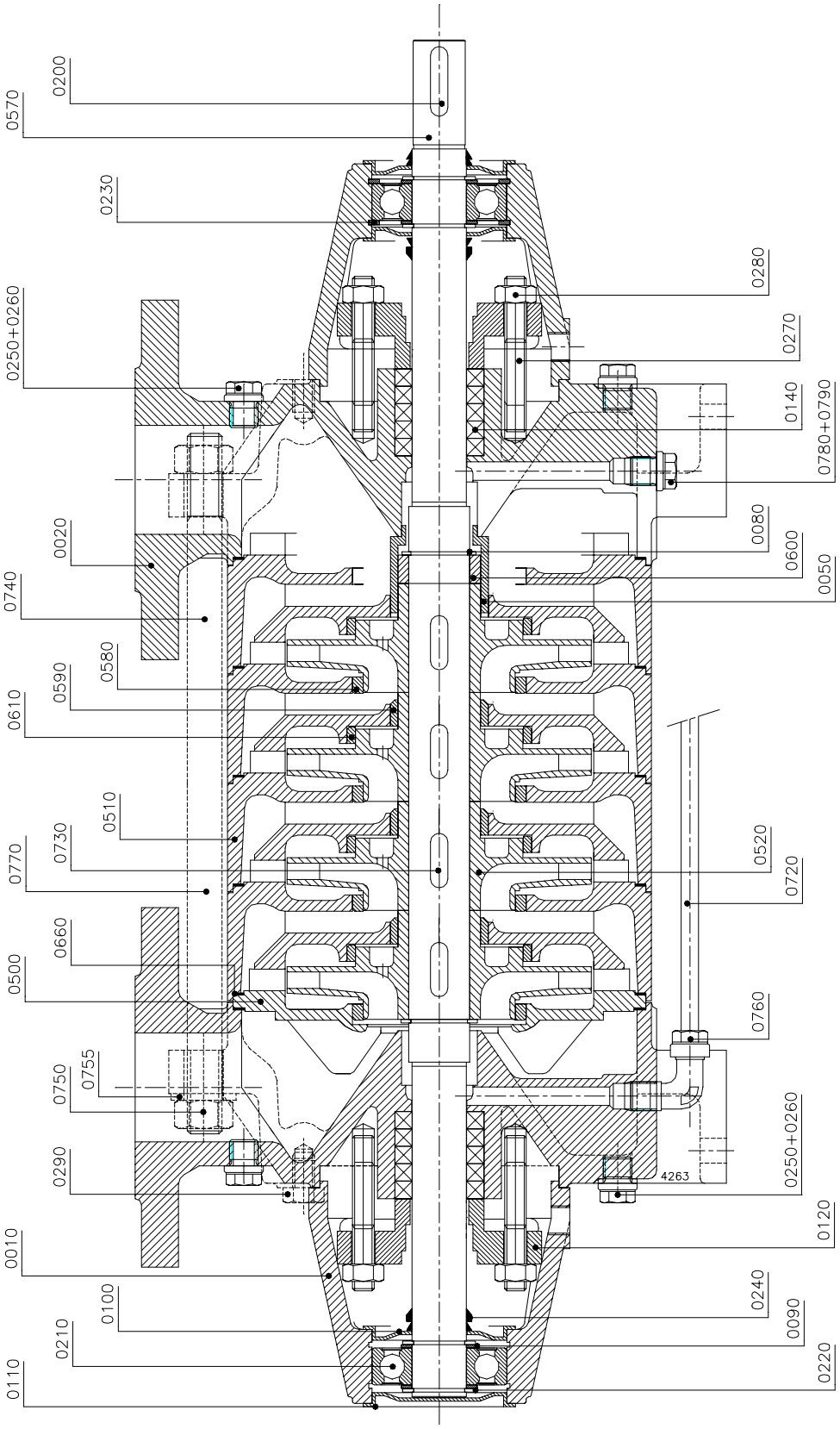

figure 31: MCH 12,5 - MCH 14a/b- MCH 16.

MCH 12,5 / MCH 14a/b / MCH 16 see figure 31			cast iron	cast iron + bronze impeller	bronze	remarks
item no	quantity	description	design P	design Q		
0010	2	bearing housing	cast iron			
0020	2	pump casing	cast iron		**bronze**	
0050*	1	throttling bush	bronze			
0080*	2	external circlip	alloyed steel			
0090	4	filling ring	steel			
0100	3	bearing cover	steel			
0110	1	bearing cover	steel			
0120	2	gland	cast iron		**bronze**	
0140*	10	gland packing ring	--			
0200*	1	key	alloyed steel			
0210*	2	ball bearing	--			
0220*	4	external circlip	steel			
0230	2	internal circlip	steel			
0240*	3	V-ring	rubber			
0250	4	plug	steel		**brass**	
0260	4	sealing ring	copper			
0270	4	gland stud	alloyed steel			
0280	4	nut	brass			
0290	8	tap bolt	steel			
0500	1	suction cover	cast iron		**bronze**	
0510	n	stage casing	cast iron		**bronze**	quantity n + 1 for 1-stage design
0520*	n	impeller	cast iron	**bronze**		
0570*	1	shaft	alloyed steel			
0580*	n	wear ring	bronze			
0590*	n-1	wear ring	bronze			
0600	1	throttling sleeve	alloyed steel			only for MCH12,5 x 8-10 MCH 14a/b x 4-7 and MCH16 x 5-10
0610*	n	wear ring	bronze			
0660*	n+2	packing ring	--			quantity n + 3 for 1-stage design
0720	1	balance pipe	copper			only for MCH12,5 x 5-10 MCH 14a/b x 4-7 and MCH16 x 3-10
0730*	n	key	alloyed steel			
0740	4	tie rod	alloyed steel			only for MCH12,5 x 5-10 MCH 14a/b x 5-7 and MCH16 x 3-10
0750	8	nut	steel			only for MCH12,5 x 5-10 MCH 14a/b x 5-7 and MCH16 x 3-10
0755	4	washer	stainless steel			
0760	2	angle pipe union	brass			only for MCH12,5 x 5-10 MCH 14a/b x 4-7 and MCH16 x 3-10
0770	4	bolt with nut	steel			only for MCH12,5 x 1-4 MCH 14a/b x 1-3 and MCH16 x 1-2
0780	2	plug	steel		**brass**	only for MCH12,5 x 1-4 MCH14a/b x 1-3 and MCH16 x 1-2
0790	2	sealing ring	copper			only for MCH12,5 x 1-4 MCH 14a/b x 1-3 and MCH16 x 1-2

9.5 MCHW 12,5 - 14a/b - 16

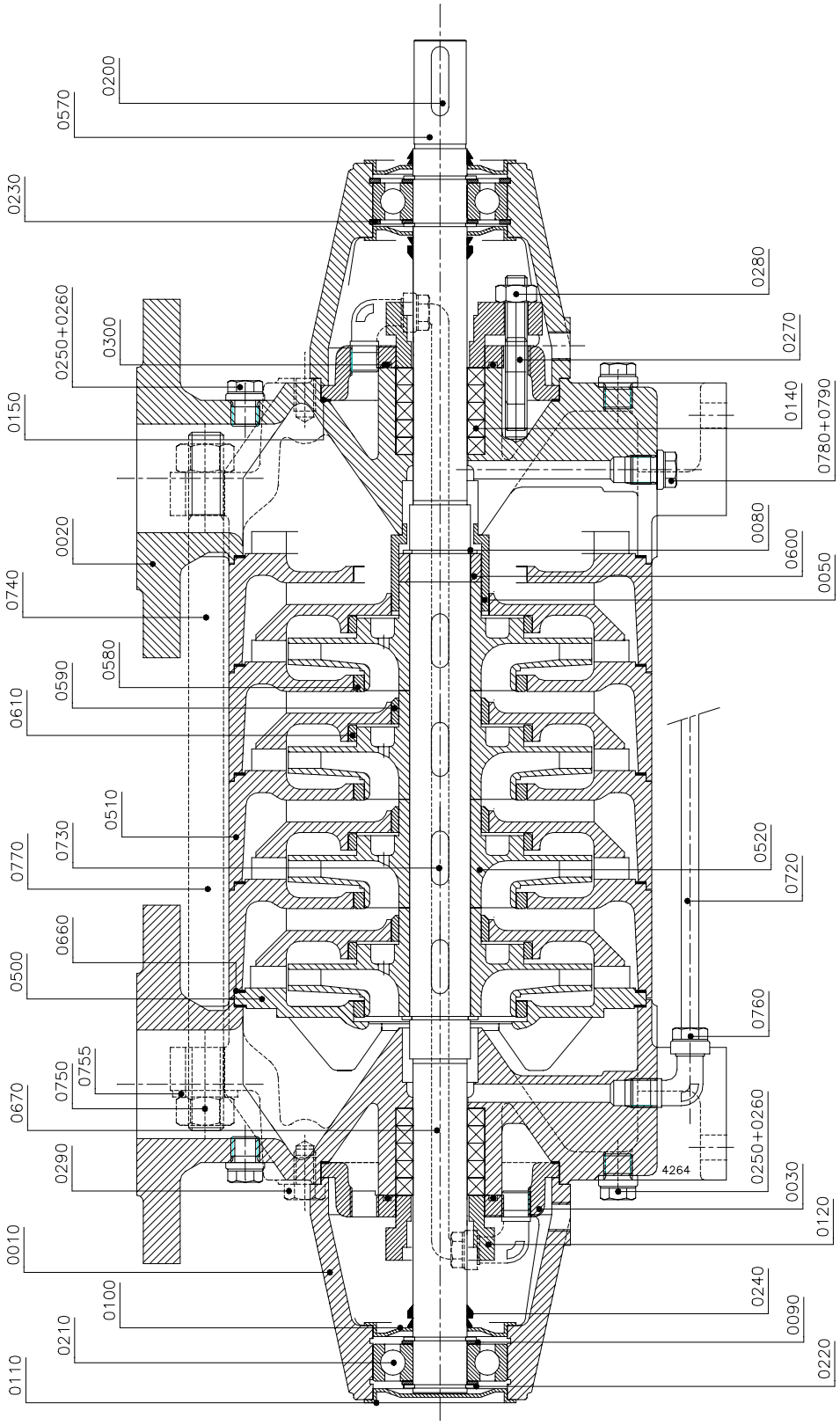

figure 32: MCHW 12,5 - 14a/b - 16.

MCHW 12,5 / MCHW 14a/b / MCHW 16 see figure 32			cast iron	cast iron + bronze impeller	bronze	remarks
item no	quantity	description	design P	design Q		
0010	2	bearing housing	cast iron			
0020	2	pump casing	cast iron		**bronze**	
0030	2	cooling water cover	cast iron			
0050*	1	throttling bush	bronze			
0080*	2	external circlip	alloyed steel			
0090	4	filling ring	steel			
0100	3	bearing cover	steel			
0110	1	bearing cover	steel			
0120	2	gland	cast iron		**bronze**	
0140*	12	gland packing ring	--			
0150*	2	packing ring	--			
0200*	1	key	alloyed steel			
0210*	2	ball bearing	--			
0220*	4	external circlip	steel			
0230	2	internal circlip	steel			
0240*	3	V-ring	rubber			
0250	6	plug	steel		**brass**	
0260	6	sealing ring	copper			
0270	4	gland stud	alloyed steel			
0280	4	nut	brass			
0290	8	tap bolt	steel			
0300*	2	O-ring	rubber			
0310	4	angle pipe union	brass			
0500	1	suction cover	cast iron		**bronze**	
0510	n	stage casing	cast iron		**bronze**	quantity n + 1 for 1-stage design
0520*	n	impeller	cast iron	**bronze**		
0570*	1	shaft	alloyed steel			
0580*	n	wear ring	bronze			
0590*	n-1	wear ring	bronze			
0600	1	throttling sleeve	alloyed steel			only for MCH12,5 x 8-10 MCH 14a/b x 4-10 and MCH16 x 5-10
0610*	n	wear ring	bronze			
0660*	n+2	packing ring	--			quantity n + 3 for 1-stage design
0670	1	pipe	copper			
0720	1	balance pipe	copper			only for MCHW12,5 x 5-10 MCHW14a/b x 4-10 and MCHW16 x 3-10
0730*	n	key	alloyed steel			
0740	4	tie rod	alloyed steel			not for MCH14a/b x 4
0750	8	nut	steel			not for MCHW14a/b x 4
0755	4	washer	stainless steel			
0760	2	angle pipe union	brass			only for MCHW12,5 x 5-10 MCHW14a/bx 4-10 and MCHW16 x 3-10
0770	4	bolt with nut	steel			only for MCHW14a/b x 4
0780	2	plug	steel		**brass**	only for MCHW12,5 x 1-4 MCHW14a/b x 1-3 , MCHW16 x1-2
0790	2	sealing ring	copper			only for MCHW12,5 x 1-4 MCHW14a/b x 1-3 , MCHW16 x 1-2

9.6 MCHS 12,5 - 14a/b - 16

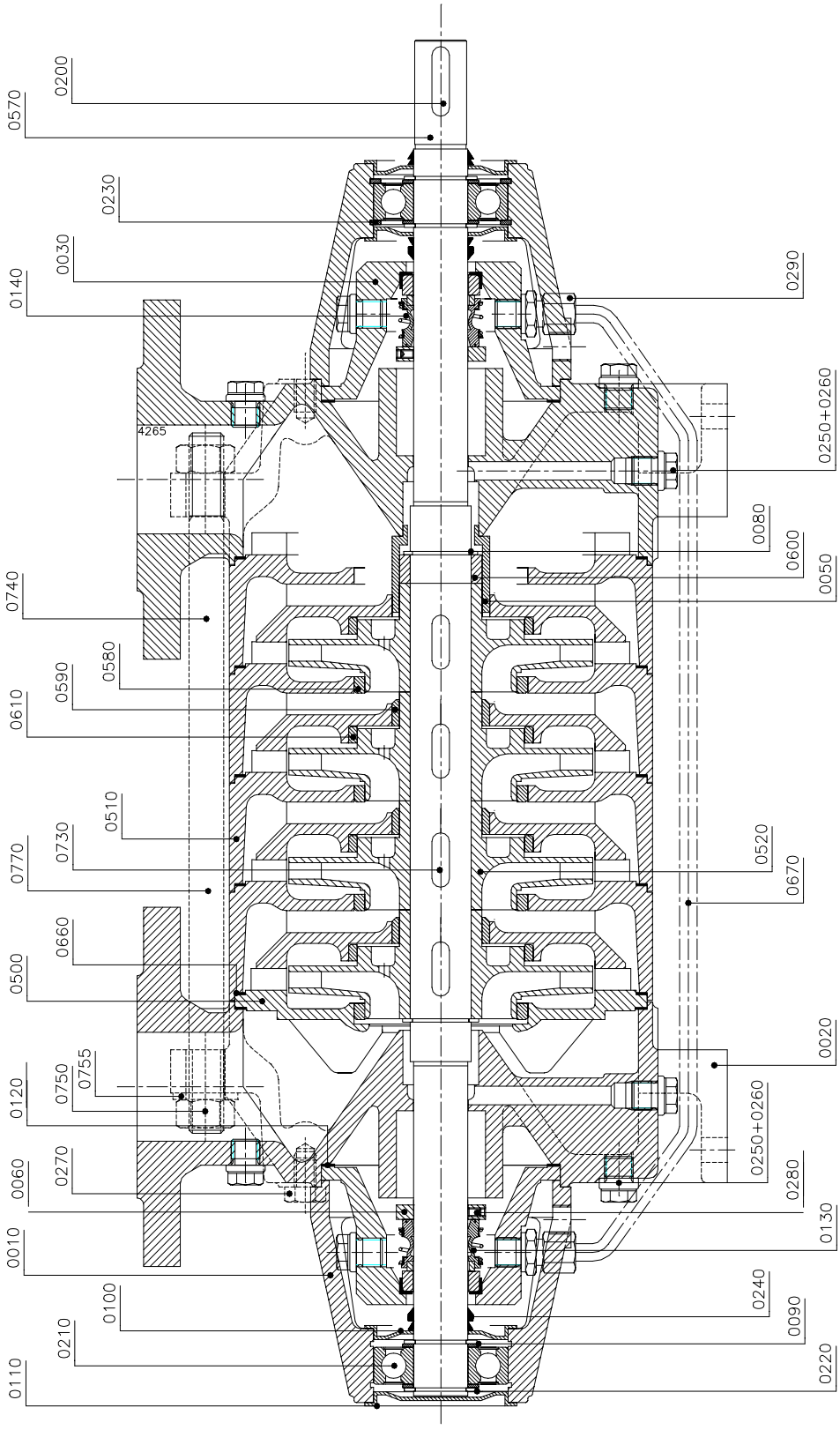

figure 33: MCHS 12,5 - 14a/b - 16.

MCHS 16 / MCHS 14a/b / MCHS 12,5 see figure 33			cast iron	cast iron + bronze impeller	bronze	remarks
item no	quantity	description	design P	design Q		
0010	2	bearing housing	cast iron			
0020	2	pump casing	cast iron		**bronze**	
0030	2	cover for mechanical seal	cast iron		**bronze**	
0050*	1	throttling bush	bronze			
0060*	2	set ring	alloyed steel			
0080*	2	external circlip	alloyed steel			
0090	4	filling ring	steel			
0100	3	bearing cover	steel			
0110	1	bearing cover	steel			
0120*	1	packing ring	--			
0130*	1	mechanical seal	--			
0140*	1	mechanical seal	--			
0200*	1	key	alloyed steel			
0210*	2	ball bearing	--			
0220*	4	external circlip	steel			
0230	2	internal circlip	steel			
0240*	3	V-ring	rubber			
0250	4	plug	steel		**brass**	
0260	4	sealing ring	copper			
0270	4	tap bolt	steel			
0280	2	adjustment screw	alloyed steel			
0290	2	pipe union	brass			
0500	1	suction cover	cast iron		**bronze**	
0510	n	stage casing	cast iron		**bronze**	quantity n + 1 for 1-stage design
0520*	n	impeller	cast iron	**bronze**		
0570*	1	shaft	alloyed steel			
0580*	n	wear ring	bronze			
0590*	n-1	wear ring	bronze			
0600*	1	throttling sleeve	alloyed steel			only for MCHS12,5 x 8-10 ,MCHS16 x 5-10
0610*	n	wear ring	bronze			
0660*	n+2	packing ring	--			quantity n + 3 for 1-stage design
0670	1	balance pipe	copper			
0730*	n	key	alloyed steel			
0740	4	tie rod	alloyed steel			only for MCHS12,5 x 5-10 MCHS14a/b x5-7 ,MCHS16 x 3-10
0750	8	nut	alloyed steel			only for MCHS12,5 x 5-10 MCHS14a/b x 5-7 ,MCHS16 x 3-10
0755	4	washer	stainless steel			
0770	4	bolt + nut	alloyed steel			only for MCHS12,5 x 1-4 MCHS14a/bx 1-4 ,MCHS16 x 1-2

9.7 MCH 14a/b with heavy bearing construction

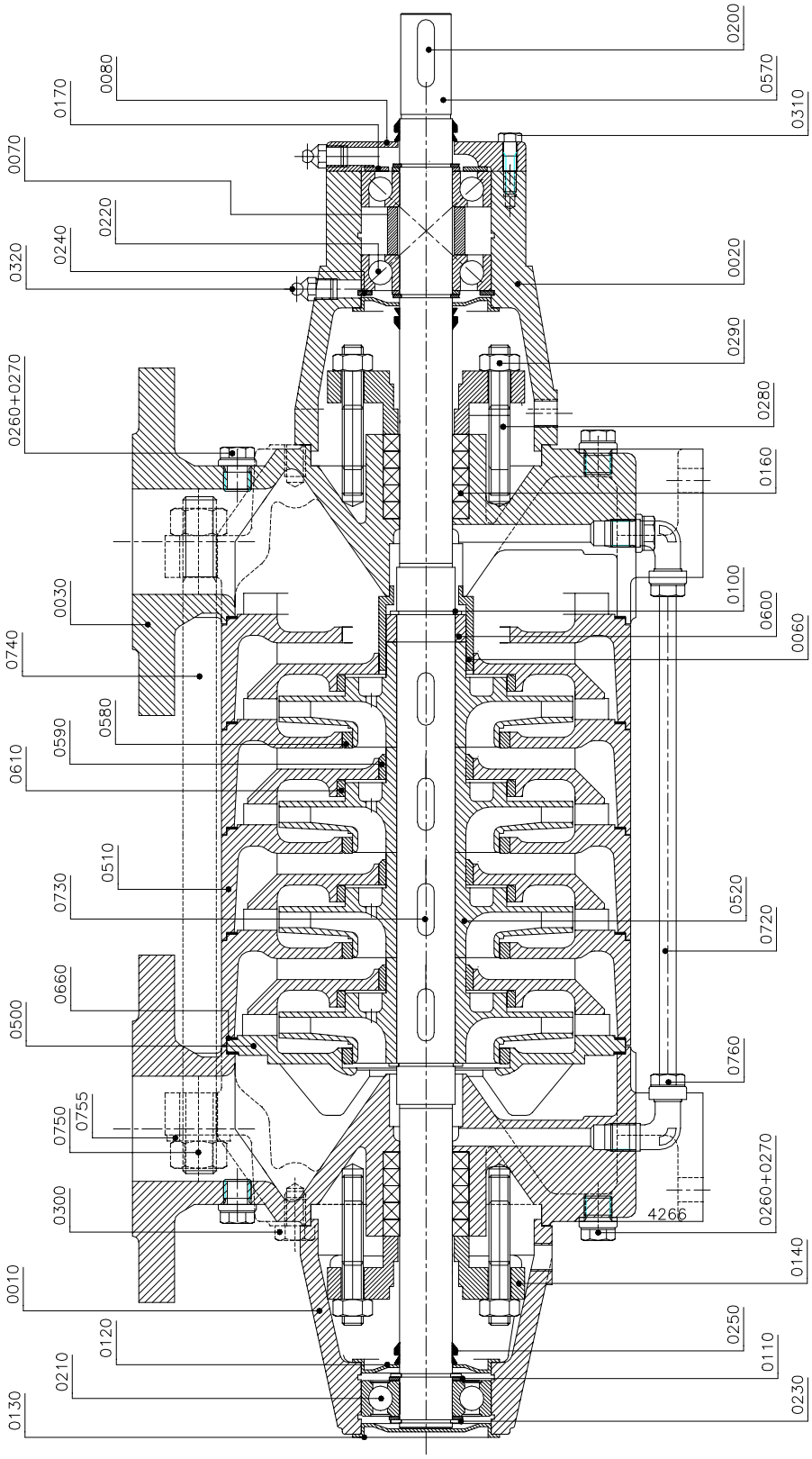

figure 34: MCH 14a/b with heavy bearing construction.

MCH 14a/b with heavy bearing construction see figure 34			cast iron	cast iron + bronze impeller	bronze
item no	**quantity**	**description**	**design P**	**design Q**	
0010	1	bearing housing	cast iron		
0020	1	bearing housing	cast iron		
0030	2	pump casing	cast iron		**bronze**
0060*	1	throttling bush	bronze		
0070	1	spacer sleeve	steel		
0080	1	bearing cover	steel		
0100*	2	external circlip	alloyed steel		
0110	4	filling ring	steel		
0120	2	bearing cover	steel		
0130	1	bearing cover	steel		
0140	2	gland	cast iron		**bronze**
0160*	10	gland packing ring	--		
0170*	1	waved ring	alloyed steel		
0200*	1	key	alloyed steel		
0210*	1	ball bearing	--		
0220*	2	ball bearing	--		
0230*	4	external circlip	steel		
0240	1	internal circlip	steel		
0250*	3	V-ring	rubber		
0260	6	plug	steel		**brass**
0270	6	sealing ring	copper		
0280	4	gland stud	alloyed steel		
0290	4	nut	brass		
0300	4	tap bolt	steel		
0310	4	tap bolt	steel		
0320	3	grease nipple	steel		
0360	4	tap bolt	steel		
0500	1	suction cover	cast iron		**bronze**
0510	n	stage casing	cast iron		**bronze**
0520*	n	impeller	cast iron	**bronze**	
0570*	1	shaft	alloyed steel		
0580*	n	wear ring	bronze		
0590*	n-1	wear ring	bronze		
0600*	1	throttling ring	alloyed steel		
0610*	n	wear ring	bronze		
0660*	n+2	packing ring	--		
0720	1	pipe	copper		
0730*	n	key	alloyed steel		
0740*	4	stud	alloyed steel		
0750	8	nut	steel		
0755	4	washer	stainless steel		
0760	2	angle pipe union	brass		

9.8 MCHW 14a/b with heavy bearing construction

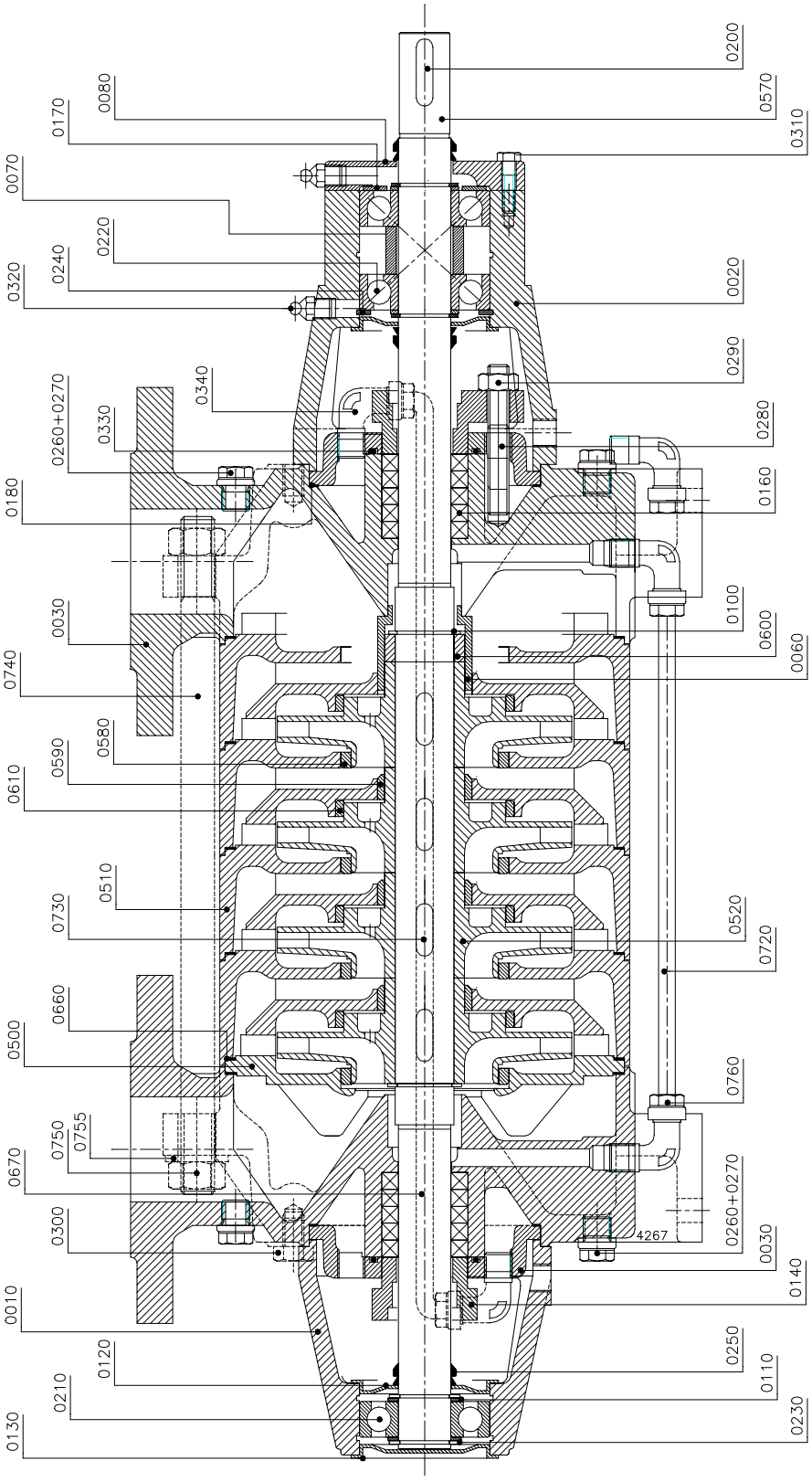

figure 35: MCHW 14a/b with heavy bearing construction.

MCHW 14a/b with heavy bearing construction see figure 35			cast iron	cast iron + bronze impeller	bronze
item no	**quantity**	**description**	**design P**	**design Q**	
0010	1	bearing housing	cast iron		
0020	1	bearing housing	cast iron		
0030	2	pump casing	cast iron		**bronze**
0040	2	cooling water cover	cast iron		
0060*	1	throttling bush	bronze		
0070	1	spacer sleeve	steel		
0080	1	bearing cover	steel		
0100*	2	external circlip	alloyed steel		
0110	4	filling ring	steel		
0120	2	bearing cover	steel		
0130	1	bearing cover	steel		
0140	2	gland	cast iron		**bronze**
0160*	12	gland packing ring	--		
0170*	1	waved ring	alloyed steel		
0180*	2	packing ring	--		
0200*	1	key	alloyed steel		
0210*	1	ball bearing	--		
0220*	2	ball bearing	--		
0230*	4	external circlip	steel		
0240	1	internal circlip	steel		
0250*	3	V-ring	rubber		
0260	4	plug	steel		**brass**
0270	4	sealing ring	copper		
0280	4	gland stud	alloyed steel		
0290	4	nut	brass		
0300	4	tap bolt	steel		
0310	4	tap bolt	steel		
0320	3	grease nipple	steel		
0330*	2	O-ring	rubber		
0340	4	angle pipe union	brass		
0360	4	tap bolt	steel		
0500	1	suction cover	cast iron		**bronze**
0510	n	stage casing	cast iron		**bronze**
0520*	n	impeller	cast iron	**bronze**	
0570*	1	shaft	alloyed steel		
0580*	n	wear ring	bronze		
0590*	n-1	wear ring	bronze		
0600*	1	throttling ring	alloyed steel		
0610*	n	wear ring	bronze		
0660*	n+2	packing ring	--		
0670	1	pipe	copper		
0720	1	by-pass pipe	copper		
0730*	n	key	alloyed steel		
0740*	4	stud	alloyed steel		
0750	8	nut	steel		
0755	4	washer	stainless steel		
0760	2	angle pipe union	brass		

9.9 MCHS 14a/b with heavy bearing construction

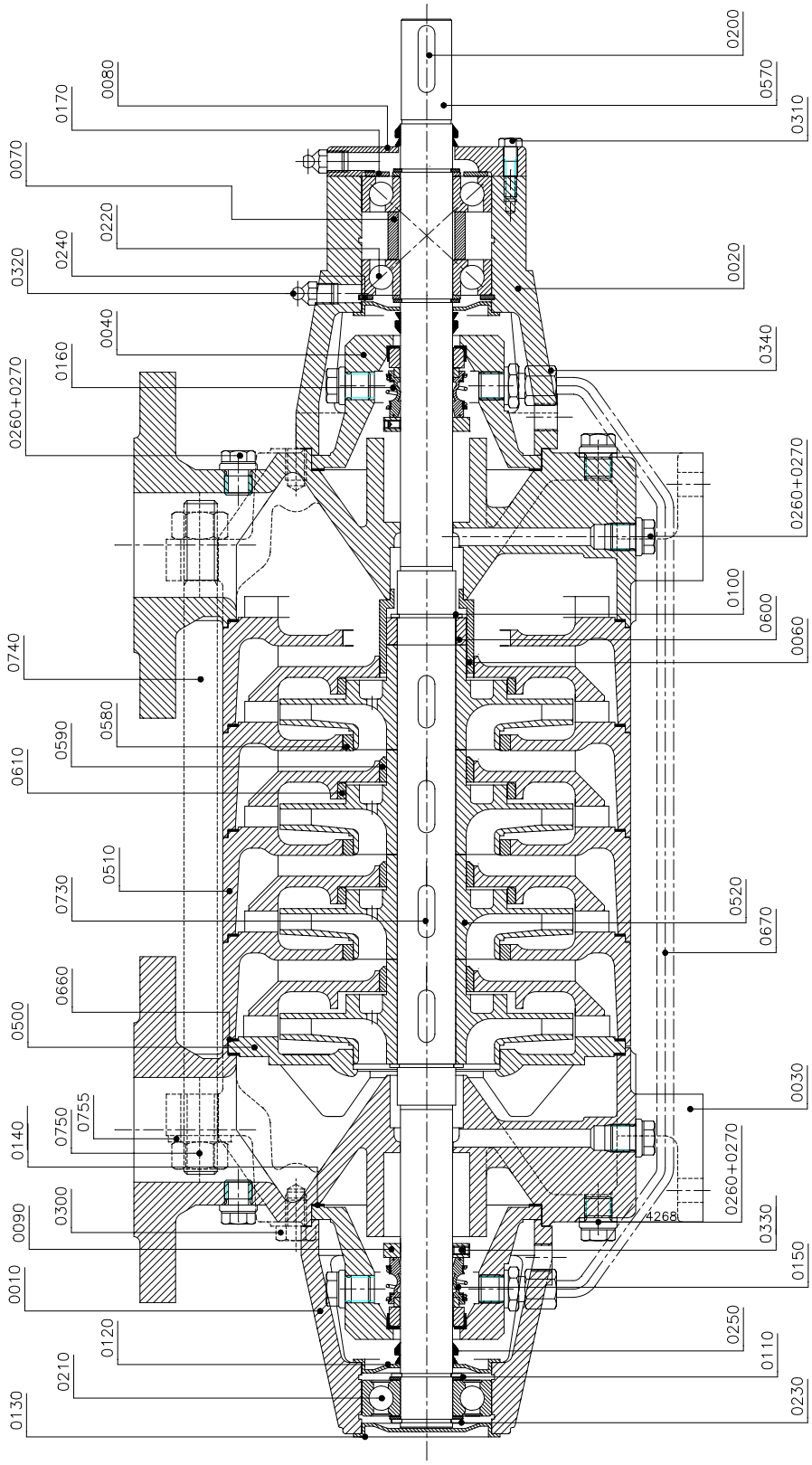

figure 36: MCHS 14a/b with heavy bearing construction.

MCHS 14a/b with heavy bearing construction see figure 36			cast iron	cast iron + bronze impeller	bronze
item no	**quantity**	**description**	**design P**	**design Q**	
0010	1	bearing housing	cast iron		
0020	1	bearing housing	cast iron		
0030	2	pump casing	cast iron		**bronze**
0040	2	cover for mechanical seal	cast iron		**bronze**
0060*	1	throttling bush	bronze		
0070	1	spacer sleeve	steel		
0080	1	bearing cover	steel		
0090*	2	set ring	alloyed steel		
0100*	2	external circlip	alloyed steel		
0110	4	filling ring	steel		
0120	2	bearing cover	steel		
0130	1	bearing cover	steel		
0140*	2	packing ring	--		
0150*	1	mechanical seal	--		
0160*	1	mechanical seal	--		
0170*	1	waved ring	alloyed steel		
0200*	1	key	alloyed steel		
0210*	1	ball bearing	--		
0220*	2	ball bearing	--		
0230*	4	external circlip	steel		
0240	1	internal circlip	steel		
0250*	3	V-ring	rubber		
0260	10	plug	steel		**brass**
0270	10	sealing ring	copper		
0300	4	tap bolt	steel		
0310	4	tap bolt	steel		
0320	3	grease nipple	steel		
0330	2	adjustment screw	alloyed steel		
0340	2	pipe union	brass		
0360	4	tap bolt	steel		
0500	1	suction cover	cast iron		**bronze**
0510	n	stage casing	cast iron		**bronze**
0520*	n	impeller	cast iron	**bronze**	
0570*	1	shaft	alloyed steel		
0580*	n	wear ring	bronze		
0590*	n-1	wear ring	bronze		
0600*	1	throttling ring	alloyed steel		
0610*	n	wear ring	bronze		
0660*	n+2	packing ring	--		
0670	1	by pass pipe	copper		
0730*	n	key	alloyed steel		
0740*	4	stud	alloyed steel		
0750	8	nut	steel		
0755	4	washer	stainless steel		

9.10 MCH 20a/b

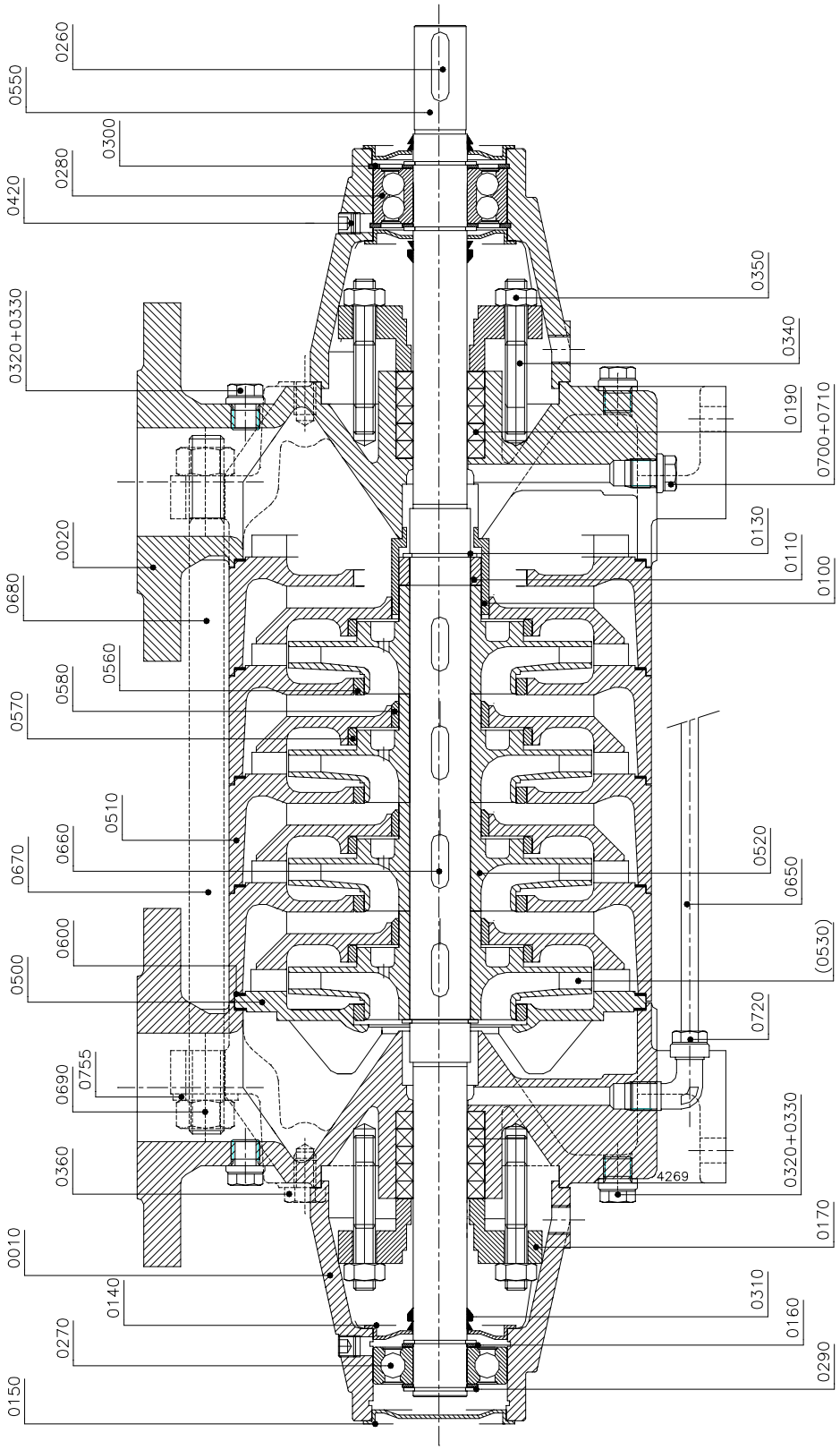

figure 37: MCH 20 a/b.

MCH 20 a/b see figure 37				
item no.	**quantity**	**component**	**material**	**remarks**
0010	2	bearing housing	cast iron	
0020	2	pump casing	cast iron	
0100*	1	throttling bush	bronze	
0110*	1	throttling ring	alloyed steel	
0130*	2	external circlip	alloyed steel	
0140	3	bearing cover	steel	
0150	1	bearing cover	steel	
0160	4	filling ring	steel	
0170	2	gland	cast iron	
0190*	10	gland packing ring	--	
0260*	1	key	alloyed steel	
0270*	1	ball bearing	--	
0280*	1	ball bearing	--	
0290*	4	external circlip	steel	
0300	2	internal circlip	steel	
0310*	3	V-ring	rubber	
0320	6	plug	steel	
0330	6	sealing ring	copper	
0340	4	stud	alloyed steel	
0350	4	nut	brass	
0360	8	tap bolt	steel	
0420	2	plug	steel	
0500	1	suction cover	cast iron	
0510	n	stage casing	cast iron	
0520*	n	impeller	cast iron / bronze	
0550*	1	shaft	alloyed steel	
0560*	n	wear ring	bronze	
0570*	n	wear ring	bronze	
0580*	n-1	wear ring	bronze	
0600*	n+2	packing ring	--	
0650	1	balance pipe	copper	only for MCH 20a/b x 2 to 6
0660*	n	key	alloyed steel	
0670*	2	stud	alloyed steel	
0680*	6	stud	alloyed steel	
0690	16	nut	steel	
0700	2	plug	steel	only for MCH 20a/b x 1
0710	2	sealing ring	copper	only for MCH 20a/b x 1
0720	2	angle pipe union	brass	only for MCH 20a/b x 2 to 6
0755	8	washer	stainless steel	

9.11 MCHW 20A/B

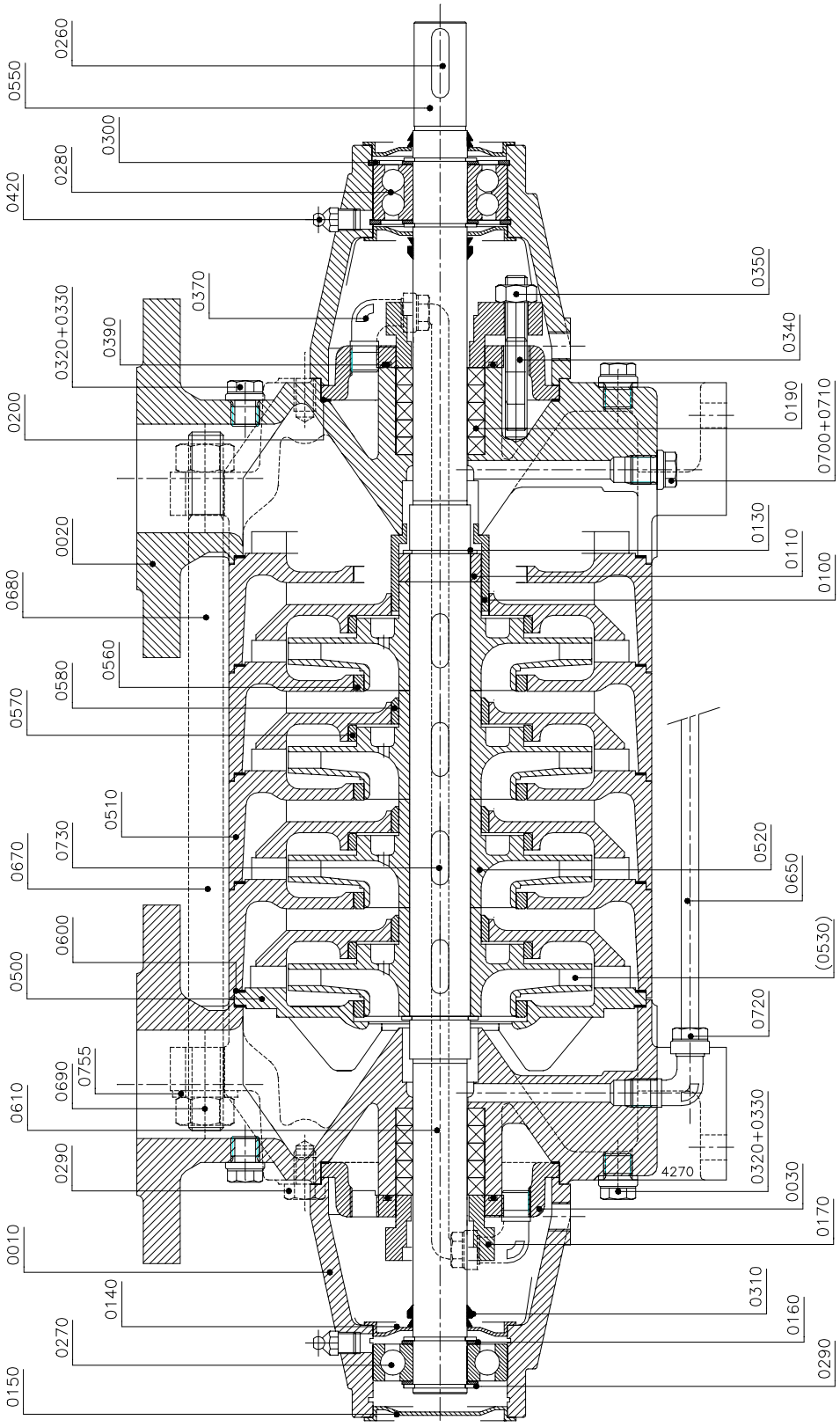

figure 38: MCHW 20 a/b.

MCHW 20 a/b see figure 38				
item no.	**quantity**	**component**	**material**	**remarks**
0010	2	bearing housing	cast iron	
0020	2	pump casing	cast iron	
0030	2	cooling water cover	cast iron	
0100*	1	throttling bush	bronze	
0110*	1	throttling ring	alloyed steel	
0130*	2	external circlip	alloyed steel	
0140	3	bearing cover	steel	
0150	1	bearing cover	steel	
0160	4	filling ring	steel	
0170	2	gland	cast iron	
0190*	10	gland packing ring	--	
0200*	2	packing ring	--	
0260*	1	key	alloyed steel	
0270*	1	ball bearing	--	
0280*	1	ball bearing	--	
0290*	4	external circlip	steel	
0300	2	internal circlip	steel	
0310*	3	V-ring	rubber	
0320	4	plug	steel	
0330	4	sealing ring	copper	
0340	4	stud	alloyed steel	
0350	4	nut	brass	
0360	8	tap bolt	steel	
0370	4	angle pipe union	brass	
0390*	2	O-ring	rubber	
0420	2	grease nipple	steel	
0500	1	suction cover	cast iron	
0510	n	stage casing	cast iron	
0520*	n	impeller	cast iron / bronze	
0550*	1	shaft	alloyed steel	
0560*	n	wear ring	bronze	
0570*	n	wear ring	bronze	
0580*	n-1	wear ring	bronze	
0600*	n+2	packing ring	--	
0610	1	pipe	copper	
0650	1	balance pipe	copper	only for MCH 20a/b x 2 to 6
0660*	n	key	alloyed steel	
0670*	2	stud	alloyed steel	
0680*	6	stud	alloyed steel	
0690	16	nut	steel	
0700	2	plug	steel	only for MCH 20a/b x 1
0710	2	sealing ring	copper	only for MCH 20a/b x 1
0720	2	angle pipe union	brass	only for MCH 20a/b x 2 to 6
0755	8	washer	stainless steel	

9.12 MCHS 20a/b

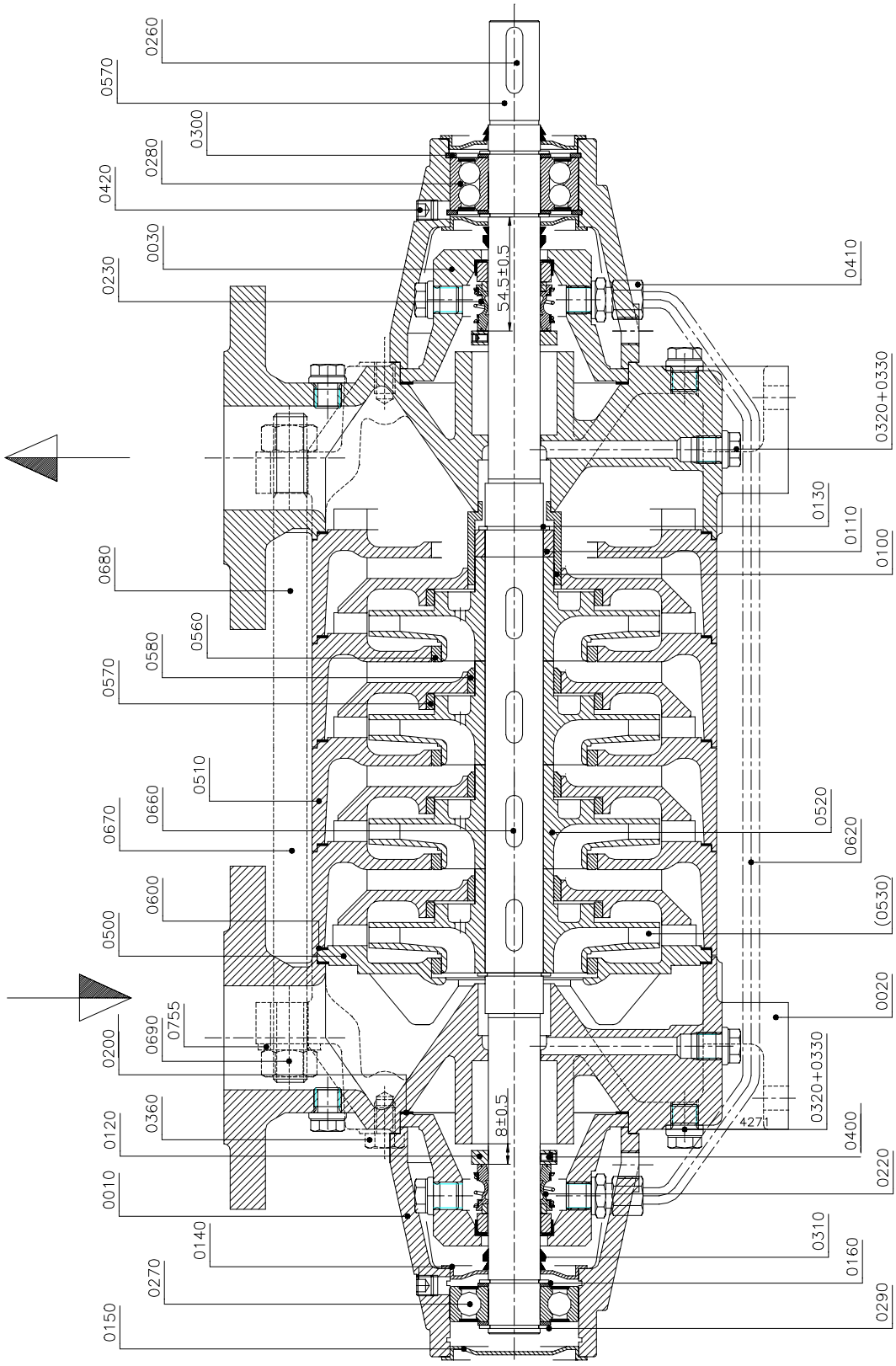

figure 39: MCHS 20 a/b.

MCHS 20 a/b see figure 39				
item no.	**quantity**	**component**	**material**	**remarks**
0010	2	bearing housing	cast iron	
0020	2	pump casing	cast iron	
0040	2	cover for mech. seal	cast iron	
0100*	1	throttling bush	bronze	
0110*	1	throttling ring	alloyed steel	
0130*	2	external circlip	alloyed steel	
0140	3	bearing cover	steel	
0150	1	bearing cover	steel	
0160	4	filling ring	steel	
0200*	2	packing ring	--	
0220*	1	mechanical seal	--	
0230*	1	mechanical seal	--	
0260*	1	key	alloyed steel	
0270*	1	ball bearing	--	
0280*	1	ball bearing	--	
0290*	4	external circlip	steel	
0300	2	internal circlip	steel	
0310*	3	V-ring	rubber	
0320	6	plug	steel	
0330	6	sealing ring	copper	
0360	8	tap bolt	steel	
0400	2	adjustment screw	alloyed steel	
0410	2	pipe union	brass	
0420	2	plug	steel	
0500	1	suction cover	cast iron	
0510	n	stage casing	cast iron	
0520*	n	impeller	cast iron/bronze	
0550*	1	shaft	alloyed steel	
0560*	n	wear ring	bronze	
0570*	n	wear ring	bronze	
0580*	n-1	wear ring	bronze	
0600*	n+2	packing ring	--	
0620	1	balance pipe	copper	
0660*	n	key	alloyed steel	
0670*	2	stud	alloyed steel	
0680*	6	stud	alloyed steel	
0690	16	nut	steel	
0755	8	washer	stainless steel	

10 Technical data

10.1 Maximum r.p.m.

MCH - MCHS	n_{max} [min^{-1}]
10 x 2 - 12	3600
10 x 14 - 16	3000
12,5 x 1 - 10	3600
12,5 x 11 - 12	3000
14a x 1 - 7	3600
14a x 8 - 10	3000
14a x 11 - 12	1800
14b x 1 - 7	3600
14b x 8 - 10	3000
14b x 11 - 12	1800
16 x 1 - 7	3600
16 x 8 - 10	3000
20a x 1 - 3	3600
20a x 4	3000
20a x 5 - 6	1800
20b x 1 - 2	3600
20b x 3	3000
20b x 4 - 6	1800

10.2 Permissible pressure and temperature

MCH(W)(S)	MCH 10	MCH 12,5	MCH 14a	MCH 14b	MCH 16	MCH 20a	MCH 20b
max. capacity [m^3/h]	8	8	16	26	42	65	100
max. head [m]	180	275	250	255	350	250	160
max. inlet pressure [bar]	5	10					
test pressure [bar]	1,5 x working pressure						
min. test pressure [bar]	15						
max. test pressure [bar]	1,5 x working pressure	50					
max. permitted working pressure*) [bar]	10 *(1 - 9 impellers)* 25 *(11-16 impellers)*	40 - (3x inlet pressure)					
temperature range MCH [°C]	-15°C to +105°C						
temperature range MCH**S** [°C]	-20°C to +120°C						
temperature range MCH**W** [°C]	-20°C to +150°C						

*) Working pressure is the manometric head for Q=0, increased by the pre-pressure.

10.3 Overview graphics MCH programme

10.3.1 Overview graphics 3000 min^{-1}

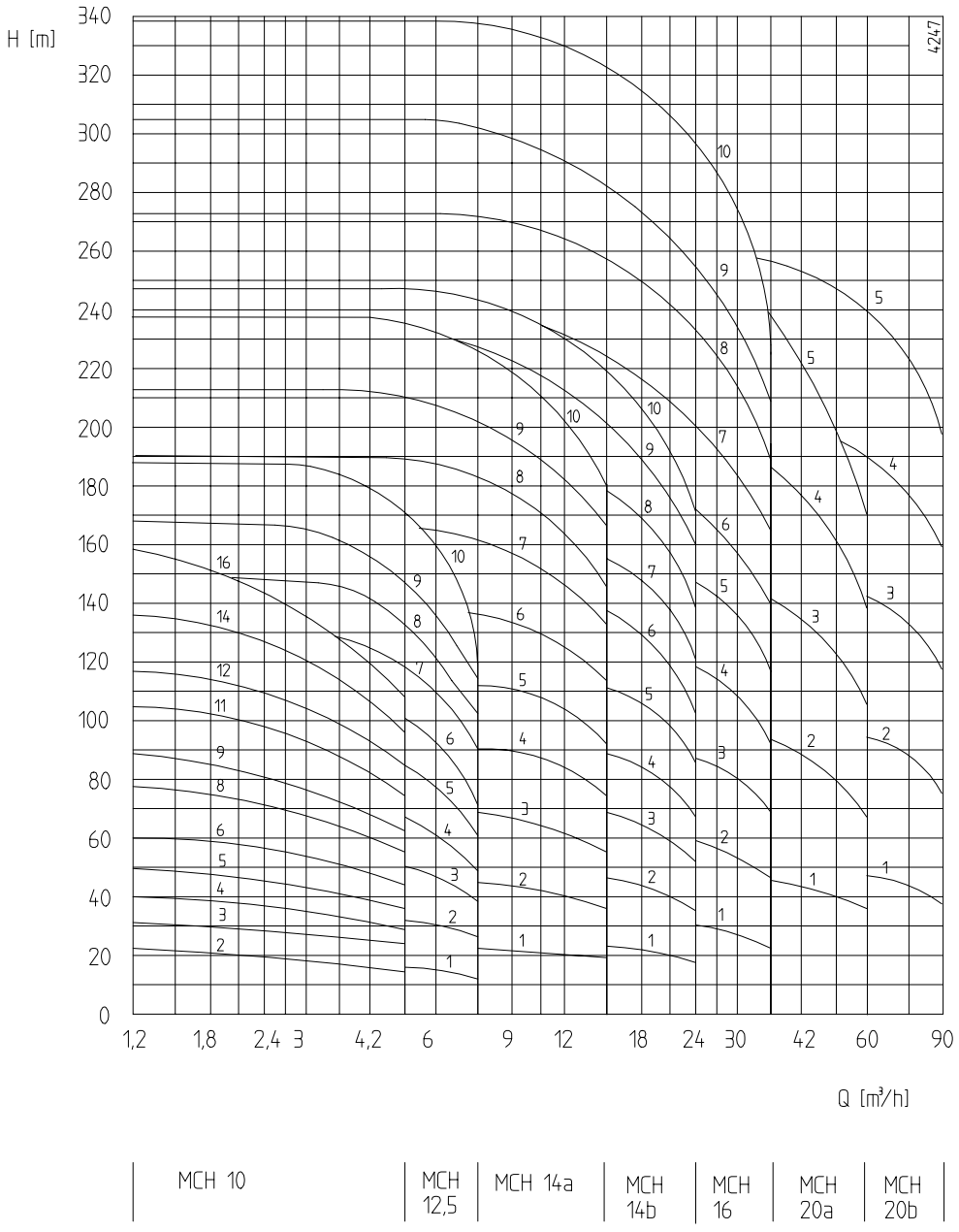

figure 40: Survey curves 3000 min^{-1}.

10.3.2 Overview graphics 1500 min^{-1}

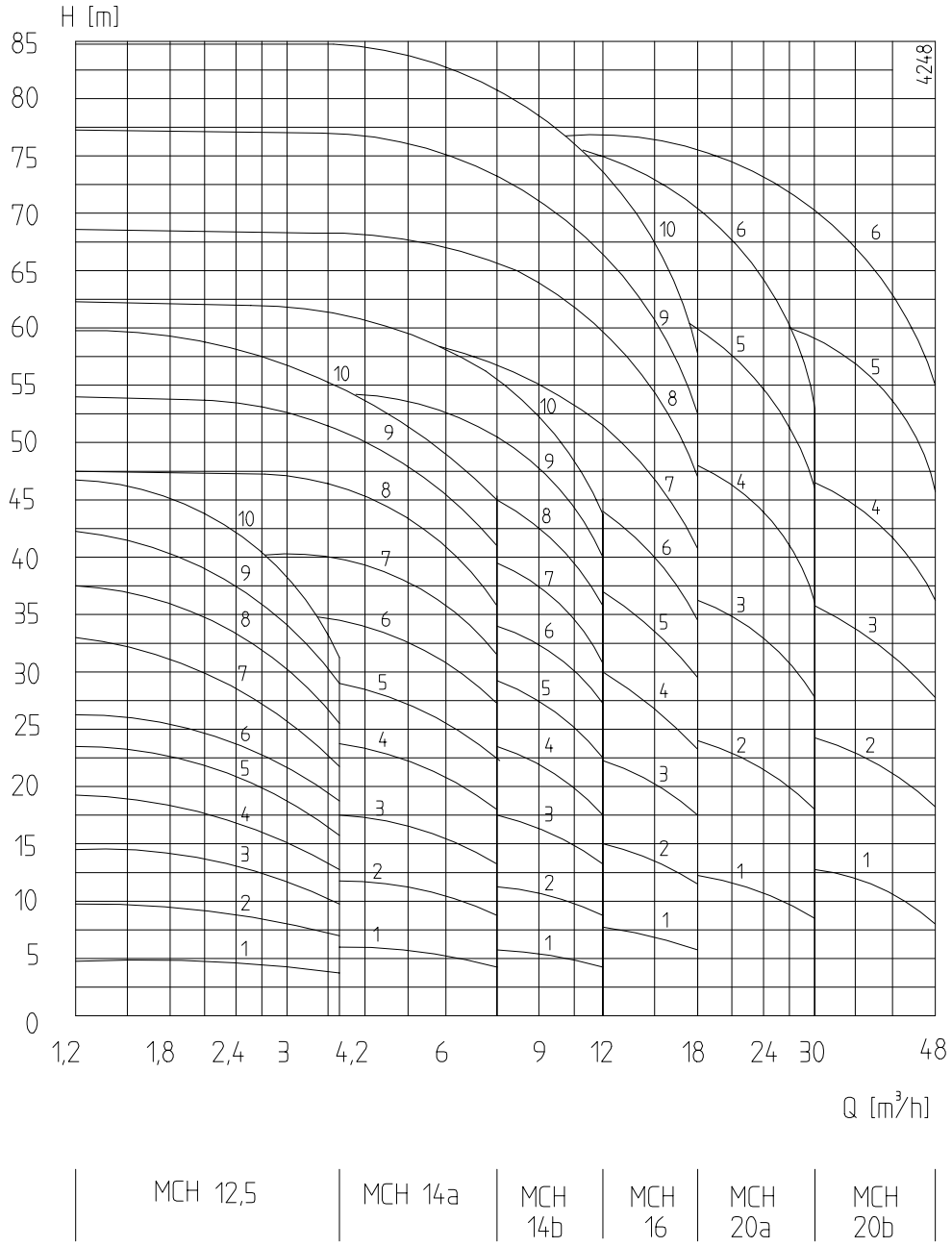

figure 41: Survey curves 1500 min^{-1}.

10.3.3 Overview graphics 3600 min^{-1}

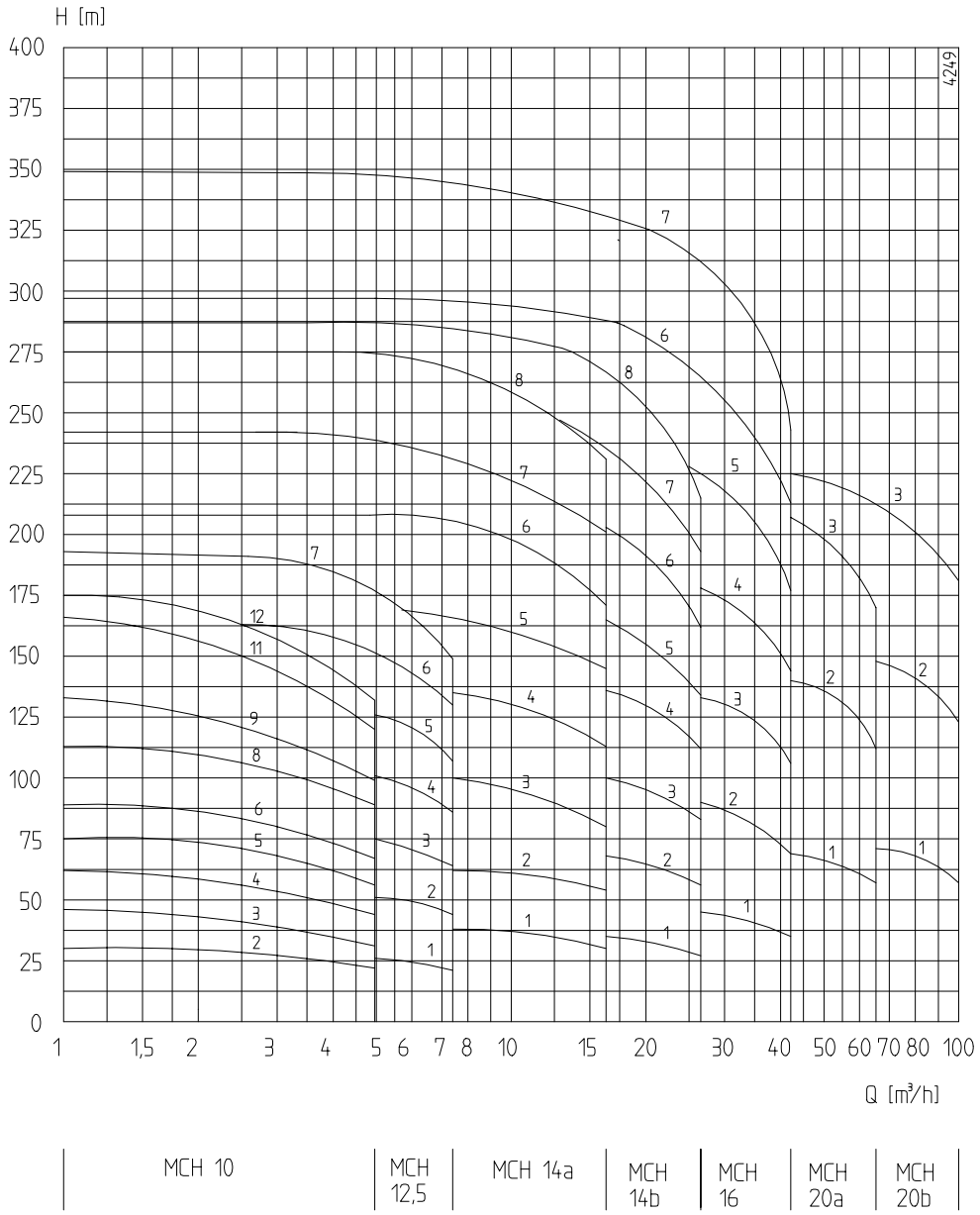

figure 42: Survey curves 3600 min^{-1}.

10.3.4 Overview graphics 1800 min^{-1}

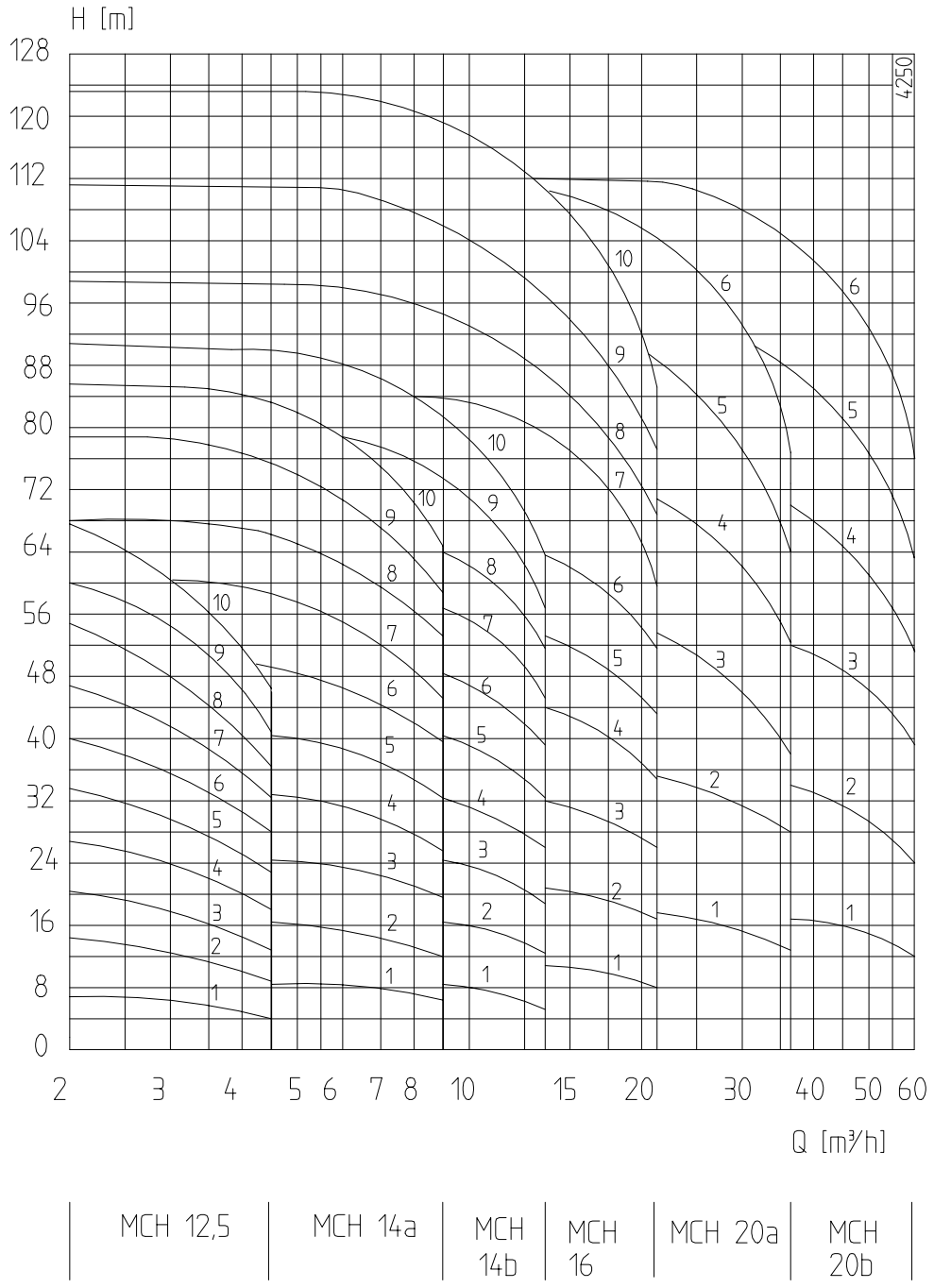

figure 43: Survey curves 1800 min^{-1}.

10.4 Torques settings

Screwthread	Torque [Nm]	
Material	8.8	A2, A4
M6	8,3	5,8
M8	20	14,09
M10	40	25
M12	68,8	43
M16	167,3	104,6

10.5 Tie rod torque

Pump type	Torque [Nm]	Screwthread	Material
MCH(W)(S) 10	40 - 54	M10	40CrMo4
MCH(W)(S) 12,5	89 - 118	M16	
MCH(W)(S) 14a/b	99 - 133	M16	
MCH(W)(S) 16	200 - 267	M20	
MCH(W)(S) 20a/b	137 - 183	M20	

10.6 Post-greasing of ball bearings

See the table below for bearings that require post-greasing and the appropriate type of grease.

Pump type	Bearings	Post-grease with one of the following types of grease (classification acc. to NLGI-2)
MCH(S) 14 a/b with reinforced bearing	**suction side bearing**	BP Energrease LS2, Gulf Crown Grease nr 2, Chevron Polyurea EP Grease 2, Mobil Mobilux EP2, Esso Beacon 2, Shell Alvania R2, Fina Marson L2, Total Multis EP22, Texaco Multifak EP2, SKF Alfalub LGMT 3
MCH(S) 16	**all bearings**	
MCH**W** all types	**all bearings**	SKF Alfalub LGHT 3, or a similar type of grease suitable for temperatures upto 150°C

10.7 Recommended liquid locking agents

Component	Locking agent
slide bearing MCH(S)10	Loctite 270 'Studlock'
throttling bush	Loctite 270 'Studlock'
wear rings	Loctite 270 'Studlock'

10.8 Noise data

10.8.1 Noise as a function of pump power

The following data are based on normal use of the pump, driven by an electric motor

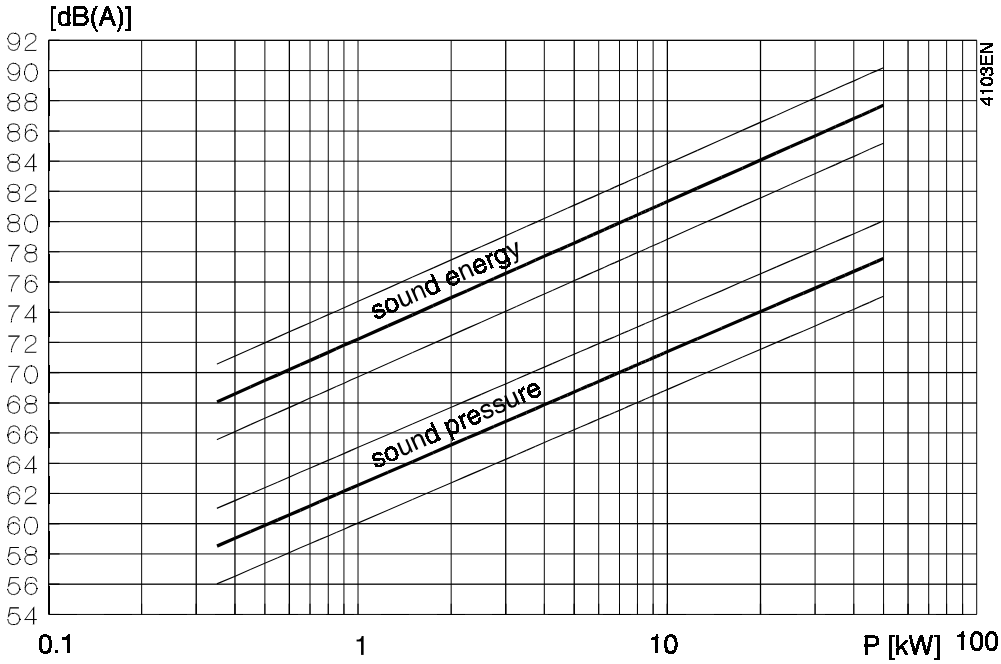

figure 44: Noise as a function of pump power at 1500 min^{-1}.

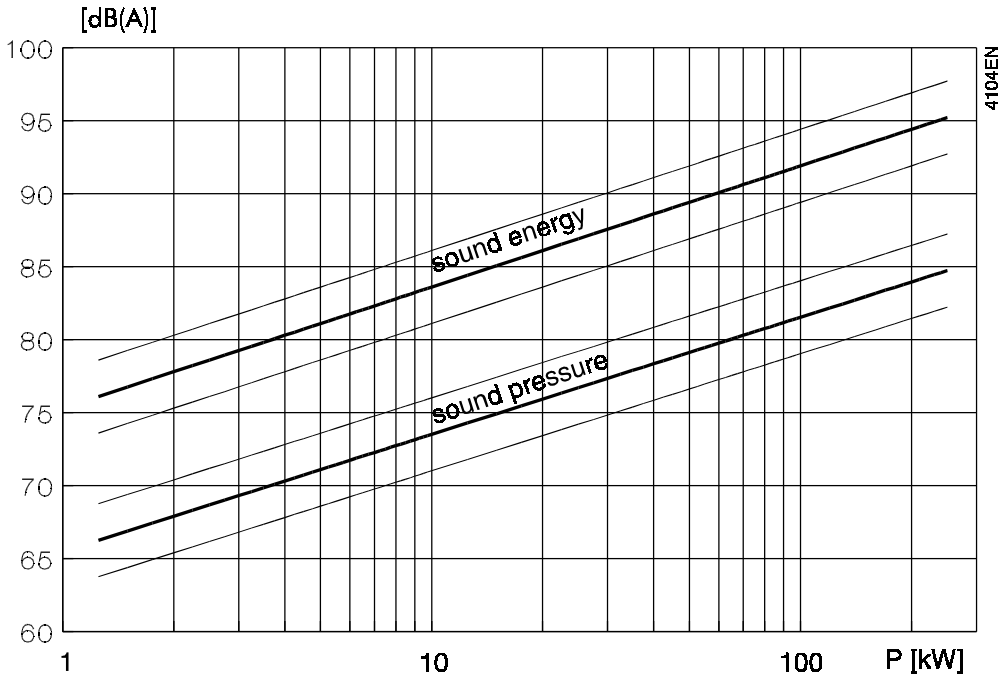

figure 45: Noise as a function of pump power at 3000 min^{-1}.

10.8.2 Noise

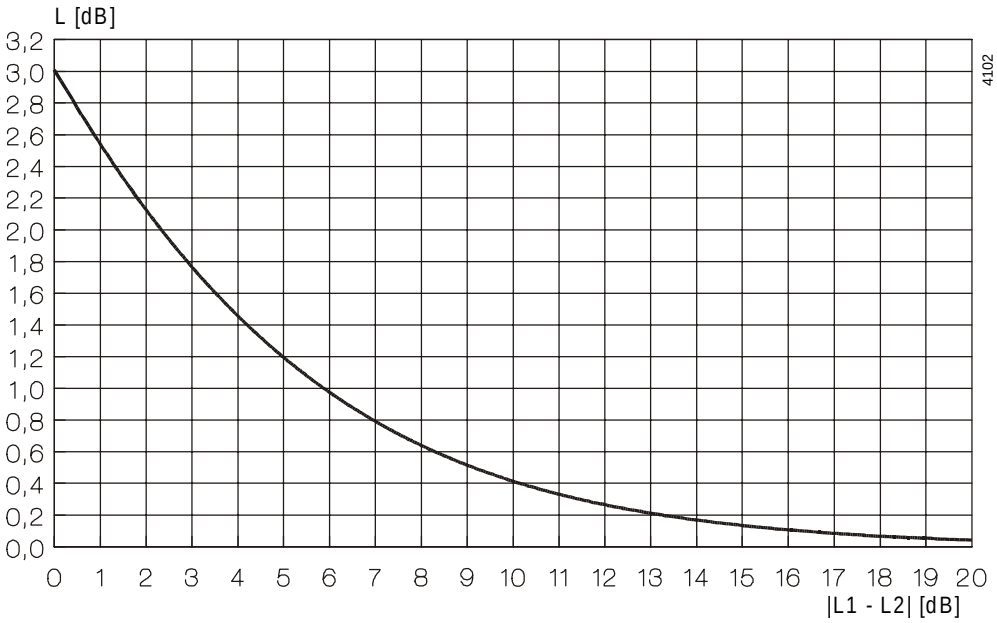

figure 46: Noise graph.

To determine the noise level of the entire set the noise level of the motor must be added to the noise level of the pump. This can simply be done by means of the graph printed above.

1 Determine the noise level of the pump (L1, see graph) and the motor (L2).
2 Calculate the absolute difference between both levels |L1 - L2|.
3 Find this value on the X-axis.
4 Go straight up to the curve.
5 Go left to the Y-axis.
6 Read the value on this Y-axis.
7 Add this value to the highest noise level (L1 or L2).

Example:

1. Pump 75 dB; motor 78 dB
2. |75 - 78| = 3 dB
3. 3 dB on X-axis = 1,75 dB on Y-axis
4. Highest noise level + 1,75 dB = 78 + 1,75 = 79,75 dB

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