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Assembling and Operating Instructions

Multi-Stage Centrifugal Pumps

MKH / MKE / MKV

in horizontal and vertical construction

1 General instructions

1.1 Information on the operating instructions

Before start-up the operating instructions have to be read carefully because OSNA is not liable for any damages or failures resulting from the disregard of these operating instructions.

For the initial operation and for all maintenance work please pay special attention to chapter 2 “Safety Regulations”.

The symbols used in this documentation are explained in chapter 2. Only with the knowledge of these operating instructions can mistakes be avoided and trouble-free and safe operation be ensured.

The operating instructions do not take into consideration the local safety regulations that the operator has to comply with.

The nameplate on the pump indicates the type, size, and execution of the pump as well as all relevant data.

1.2 Appropriate usage

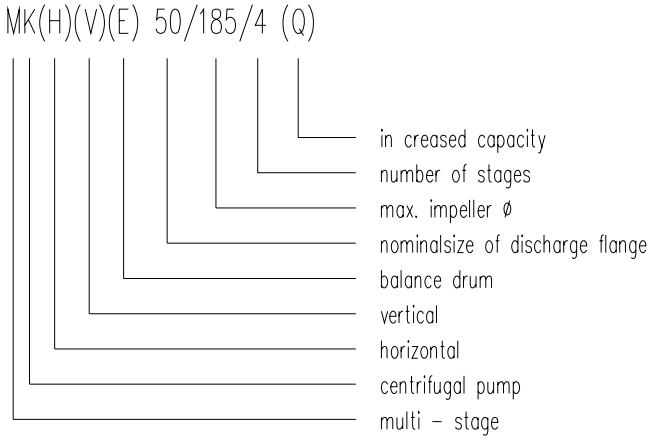
This aggregate must not be used above the limit given by the nameplate as to the capacity, speed, or other instructions in the manual. Preset values with regard to electronic connections as well as assembly and maintenance instructions must be strictly observed. The usage of the aggregate beyond the above-mentioned conditions will lead to overload which the pump will not withstand. Disregard of this warning may result in injuries to persons or damage to property.

Liquids: Clean cold water and the liquids specified in this sales contract. The water must not contain abrasive or long-fibrous substances that might corrode the pump materials. For other media please ask for further particulars.

The pump must not be operated without any liquid. Otherwise it will run dry and thus be damaged. It has to be ensured that the foot valve is always covered by water.

Any use not mentioned above is improper. OSNA is not liable for any damage caused by improper usage. The operator alone bears the risk.

1.3 Model code



1.4 Range of supply

The pump is available

– with free shaft extension, i. e . without motor and without foundation (Illustration 1)
– as a complete unit, i. e. ready assembled on abase plate with driving motor, coupling, and coupling guard. 2 (Illustrations 2 + 3)

1	Pump
2	Driving motor
3	Base plate
4	Coupling
5	Coupling guard

The amount of goods delivered is in accordance with to the quantity ordered. .
On receipt please check if the delivery is complete.

Immediately inform the seller about any damages incurred during the transport.

For further information please refer to our terms and conditions of sale.

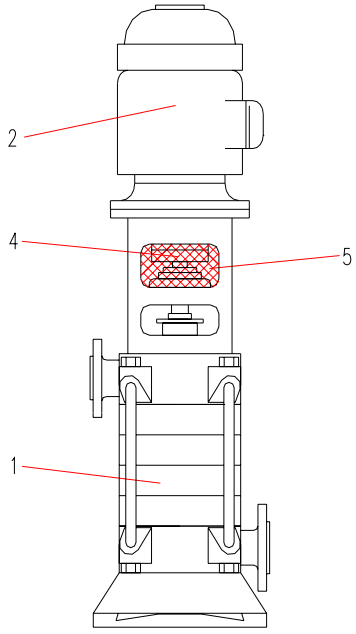
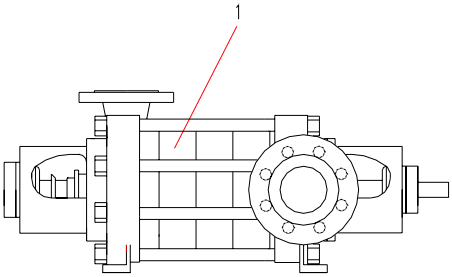


Illustration 3

Illustration 1



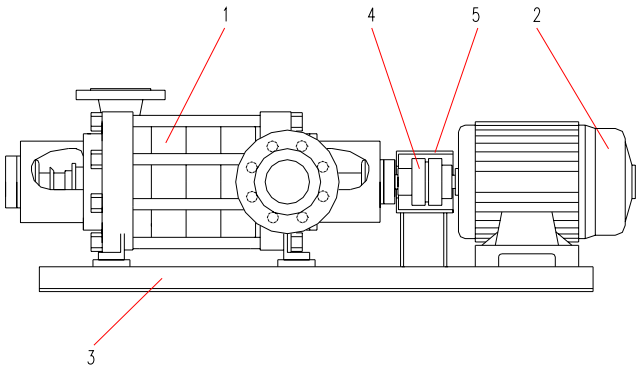


Illustration 2

2 Safety Regulations

2.1 General information

These operating instructions contain basic advice on the assembly, operation, and maintenance and have thus to be read by the operator before starting. They must be available at the plant at all times. The general „safety regulations“ mentioned in this chapter have to be followed. Additionally, the special safety regulations stated in other chapters have to be complied with, too.

2.2. Identification of advice

The safety requirements given in the operating instructions the disregard of which might cause injuries to people and damage to the environment and pumps are marked by the sign

safety sign acc. to
DIN 4844-W9

Warning of electric tension is marked by

safety sign acc. to
DIN 4844-W8

Safety regulations the disregard of which might cause damage to the pump and its functions contain the word

Attention

Indications signs that are directly attached to the pump such as

- rotation direction arrows
- labelling of fluid joints

have to be complied with by all means and have to be kept in readable condition.

Attention

Technical stickers must not be removed.

2.3 Qualification and training of the personnel

The personnel carrying out maintenance, inspection, and assembly must have the proper qualification for their job.
In case the operator does not have sufficient knowledge a specialist firm has to be engaged.

2.4. Danger by disregard of the safety regulations

Disregard of the safety regulations may result in endangering people as well as the environment and the plant. This disregard may result in the loss of any claims for damages.

Disregard might cause:

- breakdown of important functions of the plant
- injuries to people by electric and mechanical influence.

2.5. Safety conscious working

The safety regulations given in this brochure as well as the respective national instructions on accident prevention and other internal working, operating, and safety regulations by the operator have to be complied with.

2.6. Safety regulations for the operator

Any shock-proof protection covering moving parts must not be removed during the operation of the plant.

Endangerment by electric energy has to be ruled out (for details see the regulations by VDS and those of the respective local energy supply companies).

2.7. Safety regulations for maintenance, inspection, and assembly

The operator has to ensure that all maintenance, inspection, and assembly work is carried out by authorized and qualified specialized staff who are well acquainted with the operating instructions.

Any work on the plant must always be done during standstill. The plant has to be shut down in exactly the same way as described in the operating instructions. Immediately after the completion of the work all safety and protective devices have to be attached and/or put into function. Before re-commissioning all the items mentioned in chapter “Starting” have to be observed.

2.8. Unauthorized alterations and spare part production

Alterations to the unit may only be carried out with prior consultation with the seller.
Genuine spare parts and accessories authorized by the manufacturer contribute to safety.
The use of different parts excludes any liability for the ensuing consequences.

2.9. Inadmissible modes of operation

Operational safety can only be guaranteed if the delivered plant is used acc. to chapter 1.2 of the operating instructions.

The limiting values given in the technical data must by no means be exceeded.

3. Transport and Interim Storage

3.1. Transport

The pumps have to be transported and safeguarded with care in order to avoid damages.

- Horizontal pumps will be transported as complete units by means of ropes as described in Illustration 1. (Do not fasten the ropes to the ring bolts of the motor.)
- The transport of vertical pumps will be effected as described in Illustration 2.

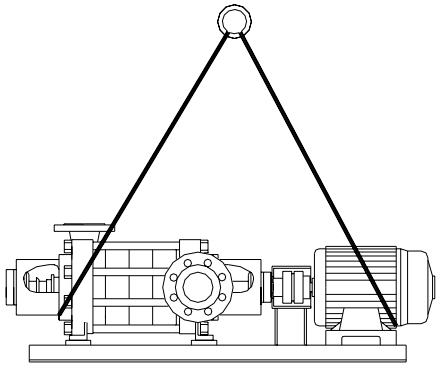


Illustration 4

3.2. Interim storage

During interim storage the pump must not be exposed to atmospheric conditions for longer periods of time.

In case the pump is put out of operation for a longer period (up to 2 or 3 months) it must be drained completely (see chapter 6.2 “Putting out of operation”).

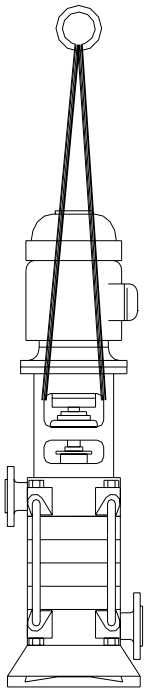


Illustration 5

4. Assembly and Mode of Operation

4.1. Mode of operation

The pumps of series MKH / MKE / MKV are non-selfpriming, multistage high pressure centrifugal pumps in horizontal and vertical design that have proved their worth by smooth running and long operating life.

4.2. Function and operation elements

Shaft seal

The pumps are available with gland packing (Illustration 6)or mechanical seals (Illustration 7).

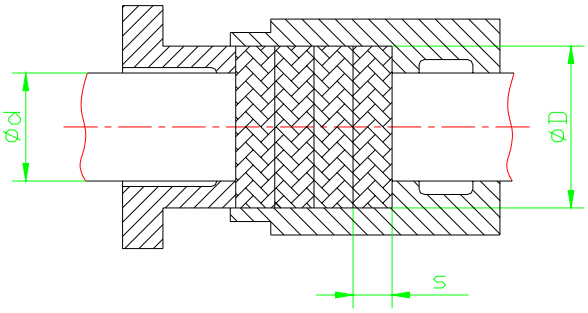


Illustration 6
Gland packing = means a number of compression moulded rings in the respective gland space (adjustable by hand)

	Pumps - Type							
	MKH 25	**MKH 32**	**MKH 40**	**MKH 50**	**MKH 65**	**MKH 80**	**MKH 100**	**MKH 125**
D	51	60	65	65	70	82	89	98
d	35	40	45	45	50	58	65	70
s	8	10	10	10	12	12	12	14

Gland packing dimenssions : MKH = MKE

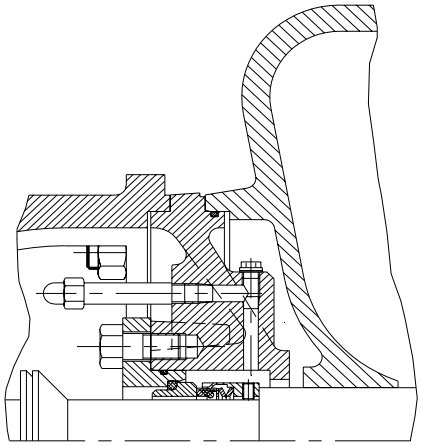


Illustration 7
Mechanical seals(GLRD) = mechanical shaft seals with internal cleaning of the mechanical seals (self-adjustable)

4.3. Operating data

In order to achieve the operating data it may be necessary to furnish the pump with various impeller blade diameters. Thus, for orders of spare parts the impeller blade diameter or the position on the shaft has to be stated (1st, 2nd etc. impeller starting on the suction side of the pump).
In case of any queries, spare part orders etc. please always name the pump type and the order number.

5. Installation/Mounting

5.1. Installation

Before the installation the packing (if there is any) has to be removed and the pump has to be checked as to possible transport damage. The pump has to be installed in a frost-protected and dry area.

The pump must not be operated in hazardous areas. It has to be installed and connected in accordance with the local regulations.

When placed on the foundation the complete unit has to be aligned (at the pump shaft/discharge flange) by means of a water level. The distance between the coupling halves has to be observed according to the installation plan (Illustration 10/11). Always place sheet metals left and right close to the fastening material between the base plate/base frame and the foundation.

Should the distance of the fastening material be > 800 mm additional sheet metals will have to be provided centrically. All sheet metals must be fully supported. (Illustration 8)

After fastening base plates with a width of more than 400 mm must be set in shrink-proof concrete up to the top surface of the frame

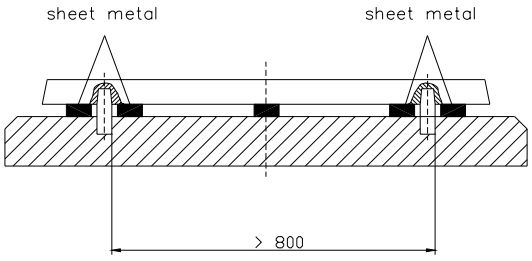


Illustration 8 Tighten the fastening material smoothly and firmly.

If the pump and motor are delivered separately, the pump has to be placed on the foundation without the motor, aligned by means of a water level (on the top flange of the motor stool) and then to be tightened.

For alignment sheet metals always have to be placed left and right close to the fastening material between pump and foundation. (Illustration 9) All sheet metals must be fully supported.

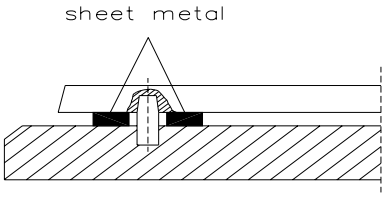


Illustration 9 Tighten the fastening material smoothly and firmly.

Should the pump have two fixed points or more (see the overall drawing or layout plan) it is essential to take care that it will not be braced in the axial or radial direction.

5.1.1 Motor assembly

Clean the pump shaft its from rust preventing agent. Fit coupling halves on the pump and motor shaft. Prior to the motor assembly it is advisable to check the direction of rotation acc. to section 6.1.2.

Install the motor on the base plate. Exactly adjust the difference in height of both shafts by supports. The distance between the shafts should not be less than 3 mm.

Errors in alignment of the shafts will cause increased wear of the bearings, wear rings, shaft seals, and the flexible elements of the coupling and will result in unsteady operation of the pumping unit.

The pumping unit has been properly aligned when a ruler placed axially on both coupling halves has the same distance to each shaft at the circumference. It is important to turn the measuring point by hand at the same time. Furthermore, both coupling halves must have the same distance to each other anywhere at the circumference. Please check by callipers or gauge.

The centre lines of the pump and motor have to be aligned acc. to their

a) position
b) direction.

Both conditions can be achieved by placing or removing sufficiently strong sheet metals under the pump or motor feet.

Tighten the fastening screws of the pump and motor firmly.

a) Position
A ruler placed on the coupling must fully lie upon both halves when being displaced at the circumference by 90° (Illustration 10).

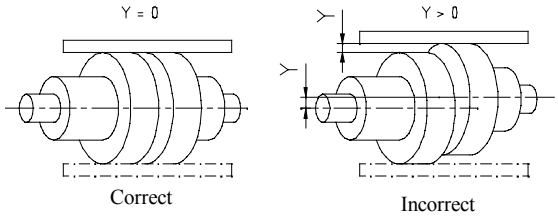


Illustration 10

b) Direction
The axial distance (x) between the coupling halves must be the same anywhere at the circumference.
Adjust the coupling distance x to 4 – 5 mm and secure it against axial shifting (Illustration 11).

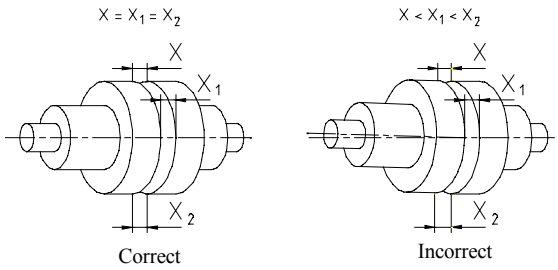


Illustration 11

After the alignment of the coupling it is absolutely essential to assemble the coupling guard.

5.2. Pipe lines

The pipe lines have to be pressure-proof and without tension so that via the connections no power or moments will be transmitted to the pump.

The pump must by no means be used as a fix point for the pipe line.

Lay the suction pipe ascending – in case of inlet pressure inclining – to the pump in order to avoid air cushions.
The pipes have to be supported directly in front of the pump for connection without tension. Their weight must not burden the pump.

The nominal width of short pipe lines should at least correspond to the pump connections. For longer pipe lines the most economical width has to be ascertained from case to case.

Transition pieces of a bigger nominal width should be executed with an enlarged angle of about 8° in order to avoid increased pressure loss.

We recommend the installation of check valves and fittings according to the type of plant and pump.

Expansion of pipe lines caused by temperature must be compensated for by appropriate measures in order not to charge the pump.

Attention

Before the initial operation of new plants the vessels, pipe lines and connections have to be thoroughly cleaned, flushed, and blown through. Often welding residues, forging scales and other contaminations become loose after some time. They have to be kept away from the pump by the installation of a strainer in the suction pipe.

The free cross section of the strainer must be three times the cross section of the pipe line in order to avoid that too much resistance will be caused by conveyed foreign matters.

Suction and inlet pressure pipe

Run the suction pipe as short as possible, steadily ascending – the inlet pressure pipe steadily inclining towards the pump.

When operating with inlet pressure make provisions for a free drain at the lowest point of the inlet pressure pipe.

5.2.1. Dimensioning of the suction pipe

The nominal width of the pump´s suction flange is not decisive for the fixation of the nominal width of the strainer with foot valve and suction pipe. The suction pipe should be dimensioned in such a way that – if possible - the loss of flow does not exceed 1,5 m/s.

In case the nominal width of the suction flange is smaller than the suction pipe an eccentric transition piece will have to be used in order to avoid air cushions.

Transition pieces – (Illustration 12 , Pos 1)
eccentric for suction pipes (never conic), with horizontal installation eccentricity downwards.

For inlet pressure pipes use conic or eccentric tranisition pieces.

Shut-off fittings – (Illustration 12 , Pos 2)
for shutting off the suction pipe during assembly work, must not be used for adjustment and has to be fully opened during the operation.

Elbows- (Illustration 12, Pos 4)
Avoid elbows with radii smaller than DN+100 mm (4“).

Foot valve - (Illustration 12, Pos 5)
keeps the suction pipe filled with the pumping liquid.

Inlet strainer or inlet screen (Illustration 12, Pos 5)
protects the pump against coarse contaminations.

Check fittings
to be provided for the control of suction and inlet pressure.

The pipe lines have to be determined by calculations taking into consideration the local conditions. In order to keep the loss of flow low, avoid sudden contractions and sharp elbows. Clean the pipe lines from welding residues and other contaminations.

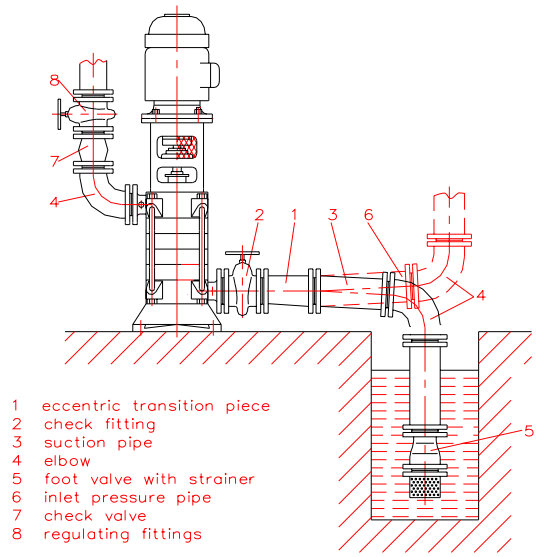


Illustration 12

Pressure pipe

Regulating fittings – (Illustration 12 , Pos. 8)
always necessary for regulating the pump capacity and cutting off the pipe during the assembly.

Check valve – (Illustration 12 , Pos 7
always needed for protecting the pump.

Check fittings -
for controlling the technical data.

Supplementary pipe lines
Supplementary pipe lines have to be installed according to their nominal flange diameter unless they are internally pressurized by the pump. The connections are marked on the pump. Supplementary pipe lines always have to be furnished with regulating fittings and a check valve.

Rinsing of the shaft seal-
advisable for contaminated liquids. It stops the entry of dirt into the shaft seal and thus prevents excessive wear.

Pressure for shut-off and rinsing purposes -
about 1 bar above the working pressure of the pump.

Blocking of the shaft seal-
prevents the entry of air at huge suction lifts.

Leakage -
to be drained by pipes or hoses.

5.3. Electrical connection

The electrical connection has to be executed by a specialist in accordance with the regulations of the local energy supplying company resp. VDE.

For the protection of the motor a protective motor switch is indispensable.

For three-phase A. C. motors with star-delta starters it has to be guaranteed that the switchover points between star and delta are succeeding each other very closely. Longer switching times will result in pump damages.

Adjustment of the time lag relay for star-delta connections:

Motor capacity	Y-time to be adjusted
≤ 30 kW	3 secs ± 30%
> 30 kW	5 secs ± 30%

6. Starting/Putting out of Operation

6.1. Starting

6.1.1. Shaft seals

Gland packing

Every pump is furnished with an adequate number of compression moulded rings. The quality of the gland packing corresponds to the operating conditions. Alterations of these conditions require a checking of the packing quality.

Assembling of the stuffing box

Remove the old packing completely and clean the stuffing box chamber. Check the quality of the running surface. Put ring after ring around the shaft and insert them separately with the gland. Arrange the joints displaced by 90 degrees.
After inserting the last ring tighten the stuffing box screws slightly and alternately by hand and make sure that the pump shaft can easily be turned.

Cutting of the gland packing

With piece goods the dimensions of the cross section have to correspond to those of the stuffing box chamber. Do not adjust the cross section of the packing by pressing or knocking. The cutting is done by means of a cutting device or mandrel. Turn the gland packing around the mandrel in narrow windings.

The plaited packing can be cut bluntly (Illustration 14), a folded one must be cut under 45° (Illustration 13).

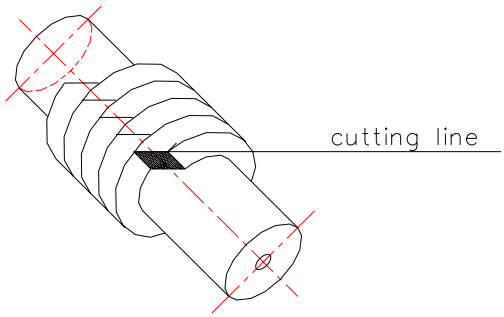


Illustration 13

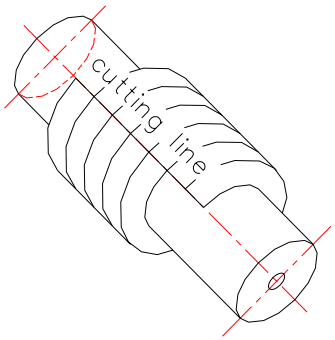


Illustration 14

Mechanical seal

Mechanical seal are self-adjusting mechanical shaft seals which are maintenance-free. They are decided on according to the order.
The mechanical seals must never run dry. Therefore before starting the pumps have to be filled up acc. to paragraph 6.1.3.
After having been dismantled for inspection or attendance mechanical seals must not be assembled again. They have to be replaced by new mechanical seals or the sliding surfaces have to be re-lapped.

6.1.2. Checking the direction of rotation

Attention

The arrow fixed to the pump indicates the stipulated direction of rotation which has always to be checked filled up.
In case of gland packing the direction of rotation can be checked by a short-term switch-on (just a few revolutions of the motor).
For pumps with mechanical seals, however, the checking requires a complete separation from the prime mover. Flexible parts of the mechanical seal dependent on the direction of rotation might be damaged by a false direction.

Coupling guard
According to the accident prevention rules the pump is only to be operated with a coupling guard or a sheathing of the motor stool.

If on the customer`s special request this coupling guard/sheathing is not delivered by us it has to be delivered by the operator.

6.1.3. Filling up

Fill up the pump and suction/inlet pressure pipe with the liquid. During the filling up see to a good de-aeration (by turning the motor, opening the ventilating screws or checking the fittings on the discharge side). In case of hot liquids fill up the pump slowly in order to avoid bracing by thermal shocks.

Filling up for suction service
a) by means of a screwed plug at the suction casing
b) with a filled pressure pump by opening the check fittings.

Filling up for water feed service
In case of sufficient inlet pressure the check fittings of the inlet pressure pipe will be opened for filling.

6.1.4. Starting the pump

Open the check fittings in the suction or inlet pressure pipe and close those in the pressure pipe. Open all external supplementary pipe lines, i.e. for blocking and rinsing.

The prime mover having been switched on, the pump pressure must rise steadily with the increasing pump speed. If this is not the case, stop the pumping unit immediately and repeat the filling up. When the operating speed has been obtained, slowly open the check fittings on the discharge side and adjust them in accordance with the technical data.

Attention

Avoid a long-lasting operation against closed check fittings in the pressure pump, which might result in a destruction of the rotating internal pump parts.

6.1.5. Minimum capacities

If an operation against closed check fittings is possible with the unit, the following minimum capacities have to be provided:

t		-10 up to +100°C (+ 14 up to + 212°F)	15% of Q_{opt}
t	>	+100 bis +140°C (+212 up to +284°F)	20% of Q_{opt}

6.2 Putting out of operation

Close the check fittings in the pressure pipe. If a check valve is fitted into the pressure pipe the check fittings may remain open in case there is counter-pressure.

Stop the prime mover. Take care that the slow down is smooth.

For a longer standstill period the check fittings in the inlet pressure pipe have to be closed. Close supplementary connections.

For pumps that receive liquids under a vacuum the stuffing box has to be provided with the sealing liquid during the standstill period, too.

6.2.1 Draining the pump and frost protection

In case of frost danger drain the pump. A pump drained for a longer period must be preserved.

6.2.2 Starting the pump again

Before starting the pump again check the free movement of the pump.

Remove the gland packing because of the danger of drying up. Dried-up and thus hard packing will damage the shaft sleeve or shaft during the re-start of the pump.

If the pump was preserved after being stopped it must be flushed before its re-start.

7. Attendance/Maintenance

7.1. Maintenance

During the period of maintenance the electric power supply must be switched off and must be protected from being put in circuit throughout this time.

7.1.1. Maintenance of electric motors

Maintenance on the electric devices of the mover may be done by specialists only.

Prior to the maintenance and cleaning of the electric devices the power supply must be switched off and protected from being put in circuit until the work is finished.

7.2. Maintenance and lubrication

7.2.1. Operating control

The pump should always run quietly and smoothly. The max. admissible room temperature is 40° C. The temperature of the bearings may be up to 50° C higher than the room temperature but should not exceed 90° C (measured on the outside of the bearing housing).

Attention

Dry running of the pump has to be avoided by all means. Any long lasting operation against a shut-off valve is inadmissible.

A pump with gland packing must slightly drip while operating. The gland may only slightly be tightened.

A pump with a pure-graphite packing ring must always be leaking while operating.

Should after a longer period of time the leakage be too much, the nuts of the gland must be equally tightened by 1/6 turn; afterwards watch the leakage. If it is impossible to tighten the gland any further, an additional packing ring has to be put in. A replacement of the whole packing set is usually not necessary.

Pumps with mechanical seals have only a little or an invisible leakage (vapour state). They are maintenance-free.

Stand-by pumps must be operated once per week by being turned on and then by being immediately turned off again to ensure their readiness for service. The functioning of the additional connections has to be checked.

When in the course of time signs of wear show on the flexible elements of the coupling, these elements will have to be replaced.

	Bearings			
pump size	suction side		discharge side	
	pces	size	pces	size
MKH 25	1	NU305EC	1	6305
MKH 32	1	NU306EC	1	6306
MKH 40	1	NU307EC	1	6307
MKH 50	1	NU307EC	1	6307
MKH 65	1	NU308EC	1	6308
MKH 80	1	NU309EC	1	6309
MKH 100	1	NU310EC	1	6310
MKH 125	1	NU311EC	1	6311
MKH 125Q	1	NU311EC	1	6311
MKH 150	1	NU312EC	2	7312BG
MKH 200	1	NU313EC	2	7313BG
MKH 200Q	1	NU314EC	2	7314BG
MKH 200	1	NU315EC	2	7315BG
MKE 25	1	NU305EC	2	7305BG
MKE 32	1	NU306EC	2	7306BG
MKE 40	1	NU307EC	2	7307BG
MKE 50	1	NU307EC	2	7307BG
MKE 65	1	NU308EC	2	7308BG
MKE 80	1	NU309EC	2	7309BG
MKE 100	1	NU310EC	2	7310BG
MKE 125	1	NU311EC	2	7311BG
MKE 125Q	1	NU311EC	2	7311BG
MKV 32	1	plain bearing	1	3207
MKV 40	1	plain bearing	1	3207
MKV 50	1	plain bearing	1	3209
MKV 65	1	plain bearing	1	3209
MKV 80	1	plain bearing	1	3211
MKV 100	1	plain bearing	1	3211
MKV 125	1	plain bearing	1	3211

7.2.2. Lubrication

7.2.2.1. Grease change

- Horizontal pumps MKH: grease lubricated radial ball bearings
- Vertical pumps MKV: grease lubricated radial ball bearings and bearing bush greased by the liquid

7.2.2.2. Grease quality / grease change

The bearings are supplied with high-quality lithium-saponified grease. On normal operating conditions the filling will last for 7.500 working hours or for 1 year.

On unfavourable operating conditions such as high room temperature, high humidity, dusty air, aggressive industrial atmosphere etc. the bearings should be checked sooner and if necessary be cleaned and newly lubricated.
A lithium-saponified grease should be used. The grease should be resin- and acid-free; it must not become brittle and should be rust-preventing. The melting point should be below 175° C.
The voids of the bearings may only be half filled with grease. If necessary the bearings may also be lubricated by grease of other soap bases. Since the greases of different bases must not be mixed, the bearings will have to be rinsed thoroughly. The necessary lubrication periods will have to be adjusted accordingly.

7.2.2.3. Oil lubrication

- Horizontal pumps MKE: oil lubricated ball bearing .

7.2.2.4. Oil quality

The bearings have to be greased with quality oil. We recommend the following sorts of oil:

AGIP	ACER 46
ESSO	TERESSO 68
MOBIL	D.T.E. mittleres Öl
SHELL	TELLUS 68

Oil characteristics acc. to ISO VG kinematic viscosity at 40° C :

min. 40 mm² / s

max. 70 mm² / s

7.2.2.5. Oil change

The oil has to changed after 300 operating hours the first time, subsequently after 4.000 operating hours. At the latest, however, the oil must be replaced after 6 months.

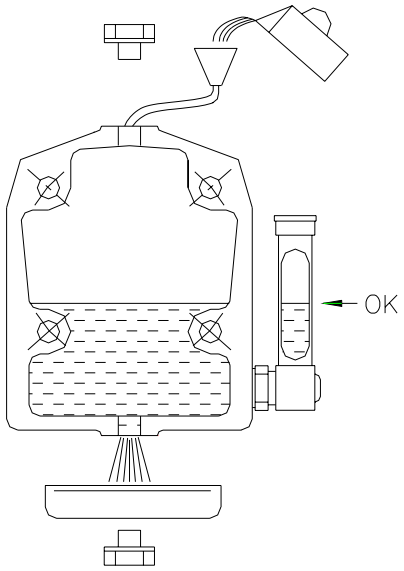


Illustration 15

Oil filling

Unscrew the filler pipe. Fill in the oil up to the marker line on the oil level regulator.

(Illustration 15)

8. Faults / Reasons / Removal

Capacity of pump too low	Overload of motor	Pump end pressure too high	Increased bearing temperature	Leakage at the pump	Too strong leakage of shaft sealing	Unsteady running of pump	Unallowable temperature increase in the pump	Reason	Removal [1)]
o								Pump operates against too high pressure	Operation point has to be re-adjusted
o								Counterpressure too high	Check plant concerning contaminations Assembly of a bigger impeller / bigger impellers [2)] Increase speed (turbine, combustion engine)
o						o	o	Pump resp. pipe lines not de-aerated completely resp. not filled up	De-aerate resp. fill up
o								Feeding pipe or impellers clogged	Remove sediments in the pump and/or in the pipe lines
o								Air cushion in the pipe line	Modify pipe line Install a vent valve
o						o	o	Suction lift too high / NPSH-plant (water feed) too low	Correct liquid level Open check fittings in the inlet pressure pipe fully Possibly modify the pressure inlet pipe if resistance in the pressure inlet pipe is too high Check installed strainer/aspirating hole Keep admissible pressure decrease speed
o								Sucking of air at the shaft sealing	Clean sealing liquid, possibly furnish foreign sealing liquid, resp. increase its pressure Replace shaft sealing
o								Wrong direction of rotation	Exchange 2 phases of current supply
o								Speed too low [2)]	Increase the speed

Capacity of pump too low	Overload of motor	Pump end pressure too high	Increased bearing temperature	Leakage at the pump	Too strong leakage of shaft sealing	Unsteady running of pump	Unallowable temperature increase in the pump	Reason	Removal [1]
o						o		Wear of internal parts	Replace worn parts
	o					o		Counterpressure of pump is lower as stated in the order	Adjust operation point precisely
	o							Higher specific gravity or higher viscosity of pumping medium as stated in the order	[2]
	o				o			Gland tightened too firmly or angular bevelled	Correct
	o	o						Speed too high	Reduce the speed [2]
				o				Tie bolts / Gaskets	Tighten the tie bolts Replace the gaskets
					o			Shaft sealing worn	Replace the shaft sealing Check sealing liquid pressure
o					o			Striation or roughness of shaft sleeve	Replace shaft sleeve Replace shaft sealing
					o			Unsteady running of the pump	Correct the suction conditions Align the pump Balance the rotor again Increase the pressure at the suction flange of the pump
			o		o	o		Aggregate aligned badly	Align
			o		o	o		Pump braced or sympathetic vibrations in the pipe lines	Check pipe connections and fastening of pump, possibly reduce the distances between the pipe clamps; Fasten the pipe lines via vibration absorbing materials

Capacity of pump too low	Overload of motor	Pump end pressure too high	Increased bearing temperature	Leakage at the pump	Too strong leakage of shaft sealing	Unsteady running of pump	Unallowable temperature increase in the pump	Reason	Removal [1]
			o					Increased axial thrust [2]	Clean the relief bores of the impeller
			o			o		Too little, too much or unsuitable grease	Add, reduce resp. replace lubricant
			o					Coupling distance not kept	Correct distance acc. to installation plan
o	o							Operation on 2 phases	Replace defective fuse Check the current supply connections
						o		Rotor unbalanced	Balance the rotor
						o		Bearing worn	Replace
						o	o	Capacity too low	Increase the min. capacity
					o			Faults in furnishing of circulation liquid	Increase the free cross section

[1] For removal of faults on parts which are under pressure the pump has to be made unpressurized.

[2] Further inquiry necessary.

Service, Spare Parts, Accessories

We expressly draw your attention to the fact that spare parts and accessories not delivered by us have not been controlled and approved of by us either.

The installation and/or the utilization of such products may possibly affect characteristic features of the centrifugal pump in a negative way and thus impair safety.

For damages resulting from the use of not genuine spare parts and accessories OSNA does not assume any liability and warranty.

Breakdowns that you cannot repair yourself must only be remedied by the OSNA service technicians or a specialised company.

Please give us an exact description of the damage thus enabling our technicians to prepare and provide themselves with the respective spare parts.

You can contact our Service Department by the address mentioned on the last page.

Spare parts can be ordered directly.

The model designation is given on the data plate.

The following spare part drawings only serve the purpose of identifying the spare parts and their respective procurement.

The exploded views must not be used as assembly instructions.

Comments on spare part orders:

In order to avoid faulty deliveries we kindly ask you for exact order instructions

- order number of the pump
- part designation
- quantity required
- method of dispatch (e. g. parcel post, freight, express goods, express, courier service)
- exact delivery address