



VOGEL PUMPEN

a xylem brand

de	VOGEL-Spiralgehäusepumpen Baureihe: L, LN	Einbau-, Betriebs- und Wartungsanleitung Originalbetriebsanleitung
fr	VOGEL-Pompes à volute Série: L, LN	Instructions de montage, de service et de maintenance Traduction de la notice d'exploitation originale
en	VOGEL-Volute Casing Pumps Model: L, LN	Installation, Operation and Maintenance Instruction Translation of the Original Operation Manual
	de Für künftige Verwendung aufbewahren ! Diese Betriebsanleitung vor dem Transport, dem Einbau, der Inbetriebnahme usw. genau beachten!	
	fr Conserver soigneusement ces instructions pour consultations ultérieures ! Lire attentivement ces instructions de service avant le transport, le montage, la mise en service etc. !	
	en Keep for further use ! Pay attention to this operating instruction before the delivery, installation, start-up a.s.o.!!	

EC Declaration of Conformity (valid only for ITT Austria aggregate supplied in its entirety)
(according to **EC Directive on Machinery 2006/42/EC, Annex II A**)



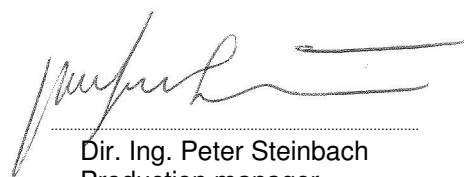
The manufacturer,
Xylem Water Solutions Austria GmbH
Ernst Vogel-Strasse 2
2000 Stockerau
Austria

of the pumps from the standard product line hereby declares:

L65-315, L80-315, L80-400, L100-160, L100-200, L100-250, L100-315, L100-400, L125-200, L125-250, L125-270, L125-315, L125-400, L150-250, L150-315, L150-400, LN32-125, LN32-160, LN32-200, LN40-125, LN40-160, LN40-200, LN40-250, LN50-125, LN50-160, LN50-200, LN50-250, LN65-125, LN65-160, LN65-200, LN65-250, LN80-160, LN80-200, LN80-250

- The supplied aggregates meet the relevant regulations of the EC Directive on Machinery, 2006/42/EC.
- The three-phase electric motor supplied at the same time meets the relevant regulations of Directive 2004/108/EC.
- Special technical documentation has been prepared, in accordance with Annex VII A.
- If necessary, we can submit the above-listed special technical documentation, in electronic form on a data storage medium, to the relevant authorities.
- The above-listed special documentation can be requested at the following address:
Dipl. Ing. Gerhard Fasching
Abtlg. Research & Development
Xylem Water Solutions Austria GmbH
Ernst Vogel-Strasse 2
2000 Stockerau
Austria
- Among others, the following harmonised standards have been applied:
EN 809 :1998+A1:2009+AC:2010(D)
EN 953 :1997+A1:2009(D)
EN ISO 12100 :2010(D)
EN 60204-1 :2006/A1:2009 D
- A change to an aggregate which was not approved by us invalidates this declaration. This also applies in the case that the aggregate is installed in equipment that does not have the declaration of conformity in accordance with the Directive on Machinery, 2006/42/EC.

Stockerau, 02.05.2011



Dir. Ing. Peter Steinbach
Production manager

TABLE of CONTENTS	
Pump Name Plate ...	42
1. General.....	43
1.1 Guarantee	43
2. Safety Regulations	43
2.1 Marking of References in the Operating Instructions	43
2.2 Dangers of non-observance of the Safety Instructions	44
2.3 Safety Instructions for the Operator / Worker .	44
2.4 Safety Instructions for Maintenance, Inspections and Mounting Work	44
2.5 Unauthorized Alteration and Spare Parts Production	44
2.6 Undue Operation	44
2.7 Use acc. to Regulations	44
3. Description	45
3.1 Design	45
3.2 Maximum permitted working pressure and temperature	45
3.3 Shaft Sealing	46
3.4 Bearings	47
3.5 Approximate Value for Sound Pressure Level	47
3.6 Permitted Nozzle Loads and Torques at the Pump Nozzles ...	48
4. Transport, Handling, Storage	48
4.1 Transport, Handling.....	48
4.2 Storage / Conservation.....	49
5. Mounting / Installation	49
5.1 Mounting of Pump / Unit.....	49
5.2 Connection of Pipings to the Pump.....	50
5.3 Coupling	51
5.4 Drive	53
5.5 Electric Connection.....	53
5.6 Final Control	53
6. Start-up, Operation, Shut down.....	53
6.1 Initial start-up	53
6.2 Switch on drive	53
6.3 Restarting	53
6.4 Limits of Operation	54
6.5 Grease lubrication.....	54
6.6 Monitoring	54
6.7 Shutting down	54
6.8 Storage / longer periods of non-operation	54
7. Servicing, Maintenance	55
7.1 General remarks	55
7.2 Mechanical seals	55
7.3 Coupling.....	55
7.4 Cleaning of pump	55
8. Dismantling and repair of pump.....	55
8.1 General remarks.....	55
8.2 General.....	56
9. Recommended Spare Parts, Spare Pumps	56
9.1 Spare Parts.....	56
9.2 Stand-by pumps.....	56
10. Faults - Causes and Solutions.....	56
11. Motor Operating Instructions.....	58
Sectional drawing Type L	60
Sectional drawing Type LN	62
Weights	64

Pump Name Plate

Type	<input type="text"/>		
S/N	<input type="text"/>	Year	<input type="text"/>
Q	<input type="text"/> m ³ /h	P	<input type="text"/> kW
H	<input type="text"/> m	n	<input type="text"/> min ⁻¹
P _{all w c}	<input type="text"/> bar at t _{max op}		<input type="text"/> °C
Item No	<input type="text"/>	Imp ϕ	<input type="text"/> mm

Sch. 44.03

- Type *) Type of pump
 S/N *) Serial number
 Year Year of construction
 Q Rated capacity at the operating point
 P Rated power at the operating point
 H Head (Energy head) at the operating point
 n Speed
 P_{all w c} Max. permitted casing-operation-pressure
 (=highest discharge pressure at the rated
 operating temperature to which the pump
 casing can be used).
 t_{max op} Maximum permitted operating temperature of
 pumped liquid
 Item No Customer related order number
 Imp ϕ Outer diameter of the impeller

*) All details of design and materials are defined with this information. They must be stated on all inquiries to the manufacturer resp. orders of spare.

1. General

This product corresponds with the requirements of the Machine directive 2006/42/EG.



The staff employed on installation, operation, inspection and maintenance must be able to prove that they know about the relevant accident prevention regulations and that they are suitably qualified for this work. If the staffs do not have the relevant knowledge, they should be provided with suitable instruction.

The operation safety of the delivered pump resp. unit (= pump with motor) can only be guaranteed on designated use according to the attached data sheet and / or order confirmation resp. chapter 6 "Start-up, Operation, Shut down".

The operator is responsible for following the instructions and complying with the safety requirements given in these Operating Instructions.

Smooth operation of the pump or pump unit can only be achieved if installation and maintenance are carried out carefully in accordance with the rules generally applied in the field of engineering and electrical engineering.

If not all the information can be found in these Operating Instructions, please contact us.

The manufacturer takes no responsibility for the pump or pump unit if the Operating Instructions are not followed.

These Operating Instructions should be kept in a safe place for future use.

If this pump or pump unit is handed on to any third party, it is essential that these Operating Instructions and the operating conditions and working limits given in the Confirmation of Order are also passed on in full.

These Operating Instructions do not take into account all design details and variants nor all the possible chance occurrences and events which might happen during installation, operation and maintenance.

We retain all copyright in these Operating Instructions; they are intended only for personal use by the owner of the pump or the pump unit. The Operating Instructions contain technical instructions and drawings which may not, as a whole or in part, be reproduced, distributed or used in any unauthorised way for competitive purposes or passed on to others.

1.1 Guarantee

The guarantee is given in accordance with our Conditions of Delivery and/or the confirmation of order.

Repair work during the guarantee period may only be carried out by us, or subject to our written approval. Otherwise the guarantee ceases to apply.

Longer-term guarantees basically only cover correct handling and use of the specified material. The guarantee shall not cover natural wear and tear and all parts subject to wear, such as impellers, shaft sealing, shafts, shaft sleeves, bearings, wear rings etc. or damage caused by transport or improper handling.

In order for the guarantee to apply, it is essential that the pump or pump unit is used in accordance with the operating conditions given on the name plate, confirmation of order and in the data sheet. This applies particularly for the endurance of the materials and smooth running of the pump and shaft sealing.

If one or more aspects of the actual operating conditions are different, we should be asked to confirm in writing that the pump is suitable.

2. Safety Regulations

These Operating Instructions contain important instructions which must be followed when the pump is assembled and commissioned and during operating and maintenance. For this reason, these Operating Instructions must be read by the skilled staff responsible and/or by the operator of the plant before it is installed and commissioned, and they must be left permanently available at the place where the pump or pump unit is in use.

These Operating Instructions do not refer to the General Regulations on Accident Prevention or local safety and/or operating regulations. The operator is responsible for complying with these (if necessary by calling in additional installation staff).

Equally, instructions and safety devices regarding handling and disposal of the pumped media and/or auxiliary media for flushing, lubrication a.s.o., especially if they are explosive, toxically, hot a.s.o., are not part of this operating instruction.

For the competent and prescribed handling only the operator is responsible.

2.1 Marking of References in the Operating Instructions

The safety regulations contained in these Operating Instructions are specially marked with safety signs acc. to DIN 4844:



Safety reference!

Non-observance can impair the pump and its function.



General Symbol for Danger!

Persons can be endangered.



Warning of electric voltage!

Safety instructions attached directly to the pump resp. unit must be followed under any circumstances. Further they must be kept in good readable condition.

In the same way, as these Operating Instructions of the pump, all possibly attached Operating Instructions of accessories (e.g. motor) must be noticed and kept available.

2.2 Dangers of non-observance of the Safety Instructions

Non-observance of the Safety Instructions can lead to loss of any claim for damages.

Further, non-observance can lead to following risks:

- Failure of important functions of the machine or facility.
- Failure of electronic appliances and measuring instruments by magnetic fields.
- Endangering of persons and their personal property by magnetic fields.
- Endangering of persons by electric, mechanic and chemical influences.
- Endangering of environment through leakage of dangerous substances.

2.3 Safety Instructions for the Operator / Worker

- Depending on the operating conditions, wear and tear, corrosion or age will limit the working life of the pump/pump unit, and its specified characteristics. The operator must ensure that regular inspection and maintenance are carried out so that all parts are replaced in good time, which would otherwise endanger the safe operation of the system. If abnormal operation or any damage are observed, the pump must cease operation immediately.
- If the breakdown or failure of any system or unit could lead to people being hurt or property being damaged, such system or unit must be provided with alarm devices and/or spare modules, and they should be tested regularly to ensure that they function properly.
- If there is any risk of injury from hot or cold machine parts, these parts must be protected against contact by the user, or suitable warning signs must be affixed.
- Contact protection on moving parts (e.g. coupling guards) must not be removed from systems that are in operation.
- If the sound level of a pump or pump unit is above 85 dB(A) an ear protection has to be used when staying near the pump for some time.
- If dangerous media (e.g. explosive, toxic, hot) leak out (e.g. from shaft seals), these must be directed away so that there is no danger to people or the environment. The provisions of the law must be observed.
- Measures should be taken to exclude any danger from electricity (e.g. by complying with the local regulations on electrical equipment). If work is carried out on live electrical components, they should be unplugged from the mains or the main switch turned off and fuse unscrewed. A motor protection switch is to be provided.

2.4 Safety Instructions for Maintenance, Inspections and Mounting Work

- The operator is responsible that any maintenance, inspections and mounting work is made by authorized competent personnel, which must be informed by having read the Operating Instructions.
- Basically, all work on the pump or pump unit should only be carried out when the pump is stationary and not under pressure. All parts must be allowed to return to ambient temperature. Make sure that no-one can start the motor during such work. It is essential that the procedure for stopping the system described in the Operating Instructions is observed. Pumps or pump systems that carry media that are dangerous to health must be decontaminated before being taken apart. Safety Data Sheets for the various liquids handled. Immediately after finishing work, all safety and protective devices must be replaced or restarted.

2.5 Unauthorized Alteration and Spare Parts Production

Alteration or changes of the machine are permitted after agreement with the manufacturer.

Original spare parts and accessory authorized by the manufacturer are serving the safety.

The use of other parts can lead to loss of liability for there from resulting consequences.

2.6 Undue Operation

The operating safety of the delivered machine can only be guaranteed by designated use acc. to the following chapters of the Operating Instructions. The limits stated in the data sheet and / or order confirmation must not be exceeded under any circumstances.

2.7 Use acc. to Regulations

2.7.1 Speed, Pressure, Temperature



Suitable safety measures must be taken at the plant to ensure that the speed, pressure and temperature of the pump and the shaft sealing do not exceed the limit values given in the data sheet and / or order confirmation. The given admission pressures (system pressures) must also be sufficiently high.

Further, pressure shocks, as can occur on too fast shut down of the facility, must be kept away from the pump (e.g. by non-return valve at pressure side, fly wheel, air tanks). Quick temperature changes must be avoided. They could cause a temperature shock and lead to damage or impair the function of single components.

2.7.2 Permitted Nozzle Loads and Torques



Basically the suction and discharge piping must be designed in such way, that as little forces as possible are effective to the pump. If that is not possible, the values shown in chapter 3.5 must not be exceeded under any circumstances. This is valid for the operation as well as for the standstill of the pump and therefore for all possible pressures and temperatures of the unit.

2.7.3 NPSH



The pumped liquid must have a min. pressure NPSH at the impeller inlet; so that cavitations free work is secured resp. a "break off" of the pump flow is prevented. This condition is fulfilled, when NPSH-value of the system (NPSHA) lies above NPSH-value of the pump (NPSHR) under all operating conditions.

Attention must especially be paid to the NPSH-value on pumping liquids near the vapour pressure. If the NPSH-value of the pump remains under, this can lead from damage of the material due to cavitations to destruction by overheating.

The NPSH-value of the pump (NPSHR) is shown in the curves of every pump type.

2.7.4 Back Flow

In systems where pumps are operating in closed circuits under pressure (gas cushions, steam pressure), the pressure of the gas cushion must not be reduced via the pump, since the back flow speed may be much higher than the operating speed, which would destroy the unit.

3. Description

3.1 Design

The pumps of **Model L** and **LN** are single-stage volute casing pumps acc. DIN EN 733.



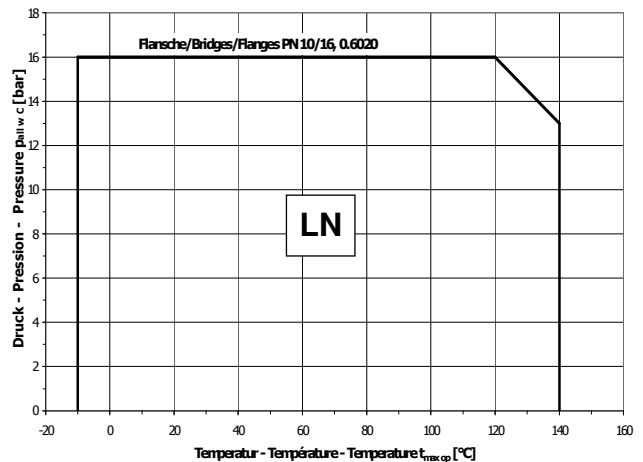
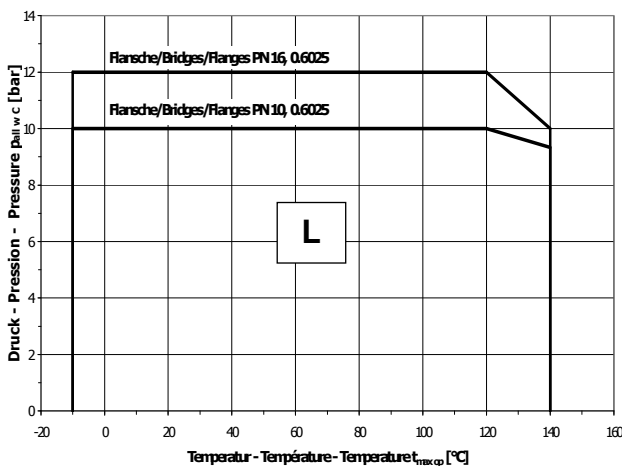
These pumps are not qualified for dangerous or inflammable fluids. Not qualified for the operation in areas subject to explosion hazards.

Maximum working pressure: see chapter 3.2 "Maximum permitted working pressure and temperature".

The permitted application conditions and design details of the delivered pump are shown in the attached data sheet and / or the order confirmation.

The appropriate sectional drawing of the supplied pump as well as the pump weight and the complete pump unit weight are shown in the appendix.

3.2 Maximum permitted working pressure and temperature



3.3 Shaft Sealing

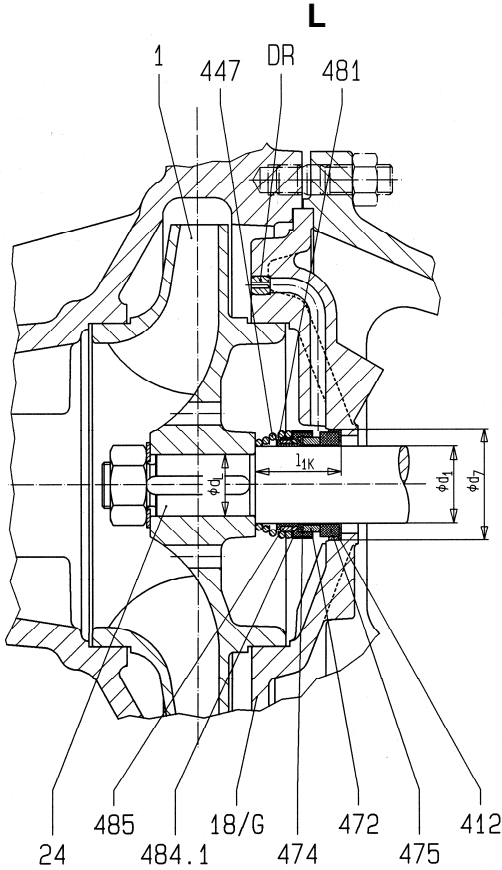
3.3.1 Structure of the mechanical seal

This shaft seal is a single mech. seal with installation dimensions according to EN 12756 (DIN 24960) design "K". API plan 02 / ISO plan 00.

No additional flushing of the seal chamber is necessary. The seal casing where the mechanical seal is located must always be filled with liquid.

For a description of materials and operational ranges of the mech. seals supplied, please refer to the data sheet in the Operation Instructions and order confirmation.

For the internal structure of the mechanical seal see the following sectional drawings.



Index of parts:

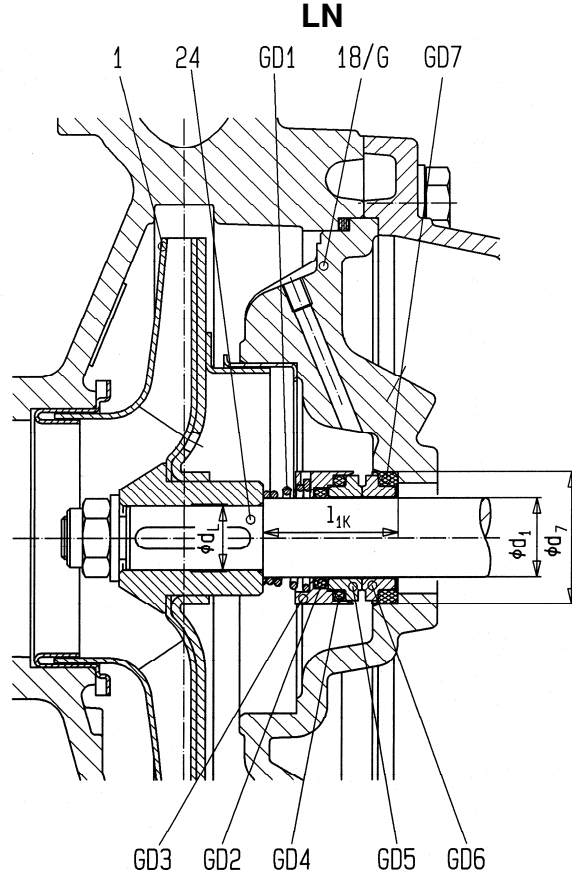
- 3 Impeller
- 18/G Casing cover
- 24 Shaft
- 412 Elbow sleeve
- 447 Spring
- 472 Rotating seal ring
- 474 Disc
- 475 Stationary seal ring
- 483 Balg
- 484.1 Elbow ring
- 487 Towing
- DR Orifice

Pump size	Bearing bracket	d ₁	d ₇	d _L	l _{1k}
L 65-315, L 80-315 L 100-160, L 100-200 L 100-250, L 100-315 L 125-250	32L	40	58	32	45
L 125-200, L 125-270 L 125-315, L 150-250 L 150-315	42L	50	70	42	47,5
L 80-400, L 100-400 L 125-400, L 150-400	42L	50	70	42	118*)

*) ... At these pump sizes l_{1k}+spacer sleeve is 70,5mm.

The mentioned dimensions refer to mechanical seals acc. EN 12756 with length l_{1k}.

Dimensions in mm without obligation! - This leaflet is subject to alteration without notice!



Index of parts:

- 1 Impeller
- 18/G Casing cover
- 24 Shaft
- GD1 Spring with towing effect
- GD2 O-ring (Shaft)
- GD3 Rotating seal ring socket
- GD4 O-ring (Rotating seal ring)
- GD5 Rotating seal ring
- GD6 Stationary seal ring
- GD7 O-ring (Stationary seal ring)

Pump size	Bearing bracket	d ₁	d ₇	d _L	l _{1k}
LN 32-125, LN 32-160 LN 32-200, LN 40-125 LN 40-160, LN 40-200 LN 40-250, LN 50-125 LN 50-160, LN 50-200 LN 50-250, LN 65-125 LN 65-160, LN 65-200 LN 80-160	24LN	22	37	18	37,5
LN 65-250, LN 80-200 LN 80-250	32LN	28	43	24	42,5

3.3.2 General informations



The reuse of mech. seals that have already been used for a longer time can lead to leaking at the seal faces after reinstallation. Therefore the replacement of the mech. seal with a new one is recommended. The removed mechanical seal can be reconditioned by the manufacturer and serve as a replacement mech. seal.

3.3.3 Informations for the mounting



Pay attention to the utmost cleanness! Especially the seal faces must be clean, dry and undamaged. Don't apply lubrication on the seal faces of the mech. seal.

- If a lubricant is provided with the replacement mech. seal, you should use this.



Use mineral grease or oil only if you are completely sure that the elastomers of the mech. seal are oil resistant. Use no silicone.



Use only lubricants with which you are certain that no dangerous reaction can occur between the lubricant and the pumped medium.



Have all required parts prepared so that assembly can be completed quickly. The lubricants are only effective for a short time. After that, the axial mobility and thus the automatic adjustment of the elastomers is lost.



Never push elastomers over sharp edges. If necessary, use mounting devices.



During installation, push the mech. seals with a bellows in such a way that the bellows is compressed and not stretched (danger of tearing apart!).

Pump size LN	Bearing bracket	Bearing type	
		drive side	pump side
LN 32-125/121 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 32-125/136 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 32-160/150 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 32-160/168 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 32-200/188 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 32-200/205 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-125/112 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-125/126 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-125/143 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-160/159 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-160/171 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-200/190 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-200/209 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-250/218 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-250/233 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 40-250/251 U.VN	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 50-125/119 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-125/130 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-125/139 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-160/158 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-160/174 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-200/197 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-200/209 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 50-250/224 U.VN	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 50-250/237 U.VN	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 50-250/250 U.VN	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-125/121 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 65-125/129 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 65-125/140 U.VN	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 65-160/161 U..N	24LN	6305 2Z/C3-WT	6305 2Z/C3-WT
LN 65-160/168 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-160/178 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-200/180 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-200/187 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-200/198 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-200/210 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 65-250/220 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 65-250/241 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 65-250/258 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 80-160/152 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 80-160/163 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 80-160/173 U..N	24LN	6305 2Z/C3-WT	6306 2Z/C3-WT
LN 80-200/189 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 80-200/209 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 80-250/225 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 80-250/238 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT
LN 80-250/256 U..N	32LN	6308 2Z/C3-WT	6308 2Z/C3-WT

3.4 Bearings

The ball bearings of the pump are greased for life and are thus maintenance-free.

3.4.1 Used bearings

The exact designation of your pump is shown in the data sheet and / or order confirmation.

Pump size L	Bearing bracket	Bearing type	
		drive side	pump side
L 65-315, L 80-315 L 100-160, L 100-200 L 100-250, L 100-315 L 125-250	32L	6308 2Z/C3	6308 2Z/C3
L 80-400, L 100-400 L 125-200, L 125-270 L 125-315, L 125-400 L 150-250, L 150-315 L 150-400	42L	6310 2Z/C3	6310 2Z/C3

3.5 Approximate Value for Sound Pressure Level

Nominal power P _N in kW	Sound pressure level L _{pA} in dB(A)					
	Pump alone			Pump + Motor		
	2950 min ⁻¹	1450 min ⁻¹	975 min ⁻¹	2950 min ⁻¹	1450 min ⁻¹	975 min ⁻¹
0,55	50,5	49,5	49,0	58,0	52,0	51,5
0,75	52,0	51,0	50,5	59,0	54,0	53,0
1,1	54,0	53,0	52,5	60,0	55,5	54,5
1,5	55,5	55,0	54,5	63,5	57,0	56,0
2,2	58,0	57,0	56,5	64,5	59,0	58,5
3,0	59,5	58,5	58,0	68,5	61,0	62,0
4,0	61,0	60,0	59,5	69,0	63,0	63,0
5,5	63,0	62,0	61,5	70,0	65,0	65,0
7,5	64,5	63,5	63,0	70,5	67,0	67,0
11,0	66,5	65,5	65,0	72,0	69,0	68,5
15,0	68,0	67,0	66,5	72,5	70,0	70,5
18,5	69,0	68,5	68,0	73,0	70,5	74,0
22,0	70,5	69,5	69,0	74,5	71,0	74,0
30,0	72,0	71,0	70,5	75,0	72,0	73,0
37,0	73,0	72,0	71,5	76,0	73,5	73,5
45,0	74,0	73,0	72,5	77,0	74,5	73,5
55,0	75,5	74,5	74,0	78,0	75,5	75,0
75,0	77,0	76,0	75,5	80,0	76,5	76,0
90,0	78,0	77,0	--	80,5	77,5	--
110,0	79,0	78,0	--	82,5	78,5	--
132,0	80,0	79,0	--	83,0	79,5	--
160,0	81,0	80,0	--	83,5	80,5	--

Sound pressure level L_{pA} measured in 1 m distance from pump surface acc. to DIN 45635, part 1 and 24. Room and foundation influences are not considered.

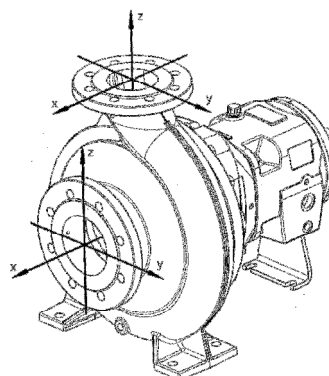
The tolerance for these values is ± 3 dB(A).

Addition with 60 Hz-operation:

Pump alone: –

Pump with motor: +4 dB(A)

All values for forces and torques refer to standard materials EN-GJL-200 (Model LN) and EN-GJL-250 (Model L).



3.6 Permitted Nozzle Loads and Torques at the Pump Nozzles ...

... following the Europump-Recommendation for pump acc. to ISO 5199.

The data for forces and torques are only valid for static piping loads and for the pump unit with grouted standard baseplate.


Sizes	ØDN	Suction nozzle								ØDN	Discharge nozzle							
		Forces in N				Torques in Nm					Forces in N				Torques in Nm			
		F _x	F _y	F _z	ΣF	M _x	M _y	M _z	ΣM		F _x	F _y	F _z	ΣF	M _x	M _y	M _z	ΣM
LN 32-125	50	578	525	473	910	490	350	403	718	32	315	298	368	578	385	263	298	560
LN 32-160	50	578	525	473	910	490	350	403	718	32	315	298	368	578	385	263	298	560
LN 32-200	50	578	525	473	910	490	350	403	718	32	315	298	368	578	385	263	298	560
LN 40-125	65	735	648	595	1155	525	385	420	770	40	385	350	438	683	455	315	368	665
LN 40-160	65	735	648	595	1155	525	385	420	770	40	385	350	438	683	455	315	368	665
LN 40-200	65	735	648	595	1155	525	385	420	770	40	385	350	438	683	455	315	368	665
LN 40-250	65	735	648	595	1155	525	385	420	770	40	385	350	438	683	455	315	368	665
LN 50-125	65	735	648	595	1155	525	385	420	770	50	525	473	578	910	490	350	403	718
LN 50-160	65	735	648	595	1155	525	385	420	770	50	525	473	578	910	490	350	403	718
LN 50-200	65	735	648	595	1155	525	385	420	770	50	525	473	578	910	490	350	403	718
LN 50-250	65	735	648	595	1155	525	385	420	770	50	525	473	578	910	490	350	403	718
LN 65-125	80	875	788	718	1383	560	403	455	823	65	648	595	735	1155	525	385	420	770
LN 65-160	80	875	788	718	1383	560	403	455	823	65	648	595	735	1155	525	385	420	770
LN 65-200	80	875	788	718	1383	560	403	455	823	65	648	595	735	1155	525	385	420	770
LN 65-250	80	875	788	718	1383	560	403	455	823	65	648	595	735	1155	525	385	420	770
L 65-315	80	875	788	718	1383	560	403	455	823	65	648	595	735	1155	525	385	420	770
LN 80-160	100	1173	1050	945	1838	613	438	508	910	80	788	718	875	1383	560	403	455	823
LN 80-200	100	1173	1050	945	1838	613	438	508	910	80	788	718	875	1383	560	403	455	823
LN 80-250	100	1173	1050	945	1838	613	438	508	910	80	788	718	875	1383	560	403	455	823
L 80-315	100	1173	1050	945	1838	613	438	508	910	80	788	718	875	1383	560	403	455	823
L 80-400	100	1173	1050	945	1838	613	438	508	910	80	788	718	875	1383	560	403	455	823
L 100-160	125	1383	1243	1120	2170	735	525	665	1068	100	1050	945	1173	1838	613	438	508	910
L 100-200	125	1383	1243	1120	2170	735	525	665	1068	100	1050	945	1173	1838	613	438	508	910
L 100-250	125	1383	1243	1120	2170	735	525	665	1068	100	1050	945	1173	1838	613	438	508	910
L 100-315	125	1383	1243	1120	2170	735	525	665	1068	100	1050	945	1173	1838	613	438	508	910
L 100-400	125	1383	1243	1120	2170	735	525	665	1068	100	1050	945	1173	1838	613	438	508	910
L 125-200	150	1750	1575	1418	2748	875	613	718	1278	125	1243	1120	1383	2170	735	525	665	1068
L 125-250	150	1750	1575	1418	2748	875	613	718	1278	125	1243	1120	1383	2170	735	525	665	1068
L 125-270	150	1750	1575	1418	2748	875	613	718	1278	125	1243	1120	1383	2170	735	525	665	1068
L 125-315	150	1750	1575	1418	2748	875	613	718	1278	125	1243	1120	1383	2170	735	525	665	1068
L 125-400	150	1750	1575	1418	2748	875	613	718	1278	125	1243	1120	1383	2170	735	525	665	1068
L 150-250	200	2345	2100	1890	3658	1138	805	928	1680	150	1575	1418	1750	2748	875	613	718	1278
L 150-315	200	2345	2100	1890	3658	1138	805	928	1680	150	1575	1418	1750	2748	875	613	718	1278
L 150-400	200	2345	2100	1890	3658	1138	805	928	1680	150	1575	1418	1750	2748	875	613	718	1278

4. Transport, Handling, Storage

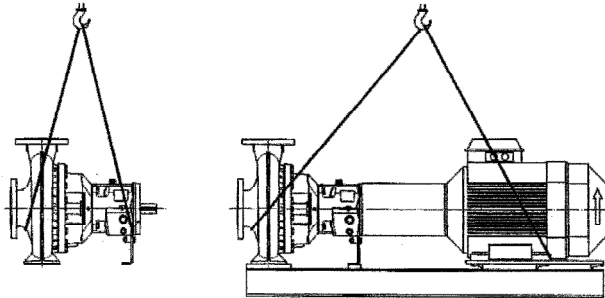
4.1 Transport, Handling

- Check the pump / pump unit immediately upon delivery / receipt of despatch for damage or missing parts.
- The pump / pump unit must be transported carefully and by competent personnel. Avoid serious impacts.

- Keep the pump/pump unit in the same position in which it was supplied from the factory. Take note of the instructions on the packaging.
- The suction and discharge side of the pump must be closed with plugs during transport and storage.

 Dispose of all packing materials in accordance with local regulations.

- Lifting devices (e.g. fork-lift truck, crane, crane device, pulleys, sling ropes, etc.) must be sufficiently strong and must only be used by authorized persons. The weight of the pump / pump unit is given in the data sheet.
- The pump / pump unit may only be lifted by solid points such as the casing, flanges or frame. Picture 2 shows the correct method of carrying by crane.



pic 2



Do not stand underneath suspended loads. Take note of the general regulations on prevention of accidents. The pump / pump unit must be secured against tipping over and slipping until it has been fixed in its final location.



Sling ropes must not be fixed to ends of shafts or the ring loops of the motor.



Slipping out of the pump / pump unit of the transport lifting device can cause damages to persons and things.

4.2 Storage / Conservation

Pumps or units, which are stored over a longer period before start-up (max. 6 months), must be protected from moisture, vibrations and dirt (e.g. by wrapping in oil paper or plastic). Pumps must basically be stored in a place where they are protected from the weather, e.g. under dry cover. During this time, all suction and discharge branches and all other intakes and outlets must be closed with dummy flanges or plugs.

Drained pumps

- Turn shaft at least 1x week (do not switch on because of dry running).
- Replace bearings after 4 years.

For longer periods of storage conservation measurements at machined surfaces and packing with moisture protection can be necessary!

5. Mounting / Installation

5.1 Mounting of Pump / Unit

5.1.1 Mounting of pump on a base frame

The pump and motor (= pump unit) must be provided with a base frame made of steel or cast iron or a fabricated (welded) frame, where this does not exist already if it is not included in the delivery. This base frame must be placed on a foundation which can withstand all loads that arise during operation (see chapter 5.1.2).

When mounting the pump onto the base frame the following must be noticed:

- The base frame must be solid, so that there won't occur any twists or vibrations during the operation (resonance).
- The mounting surfaces of the pump feet and the motor on the base frame must be flat (machining is recommended). Bracing of the pump leads to premature breakdown of the pump and to a loss of warranty.
- The drillings for the pump mounting must be in such a way, that safe fastening is guaranteed.
- Between pump and motor shaft an adequate space must be left depending on the used coupling, refer to chapter 5.3.
- Between pump and base frame there must be an adequate shimming, so that in the case of replacement of the pump the equal height between bottom and centerline can be adjusted (recommended vertical adjustment 4-6 mm).
- Align pump and motor, refer to chapter 5.3, as well.

5.1.2. Mounting the unit to a foundation

The place, where the pump is mounted must be prepared acc. to the dimensions of the dimensional drawings. The concrete foundations should have sufficient firmness acc. to DIN 1045 or equal standard (min. BN 15), to ensure a secure, functional mounting. The concrete foundation must have set, before the unit is erected. Its surface must be horizontal and even.



Sufficient space must be provided for maintenance and repair work, especially for replacing the drive motor or the complete pump unit. The motor fan must be able to take in enough cool air, and the intake grille must therefore be at least 10 cm away from any wall, etc.

- For the set of anchor bolts according recesses must be provided. If that is not the case, concrete expansion bolts resp. epoxy capsule anchor bolts can be used.
- When mounting the pump unit on the foundation it must be adjusted at the discharge nozzle by means of a spirit-level. The permitted deviation is 0,2 mm/m. After inserting the foundation bolts they must be cast in the foundation with concrete. After setting of the grout the coupling alignment must be checked according chapter 5.3.1 and possible misalignments must be corrected by adjusting foundation frame in the area of the drive motor. The smoothness of the base frame must be 0,2 mm/m before it is filled up resp. fastened. For adjustment levelling shims or levelling screws


(optional, not delivered standard wise) can be used. Levelling shims must be inserted next to the foundation anchors and must lie plainly. After that fasten foundation bolts symmetrically but only slightly. Fill in base frame with non shrinking grout.

Notice:


- Avoid air bubbles (e.g. by vibrating).
- Check that the grout has properly set and hardened.
- Take care for the after-treatment of the concrete acc. to DIN 1045.

After setting, tighten the foundation anchor evenly and firmly. Check alignment of coupling according chapter 5.3.1 and re-adjust, if necessary. Further check that all screws between pump / motor and the base frame fit snugly.

- If vibrations are transmitted to the foundation from adjoining components, it must be guarded through adequate vibration damping padding (vibrations from outside can impair the bearing).
- To prevent vibrations being transmitted to adjoining components, the foundation should be laid on a suitable insulating base.

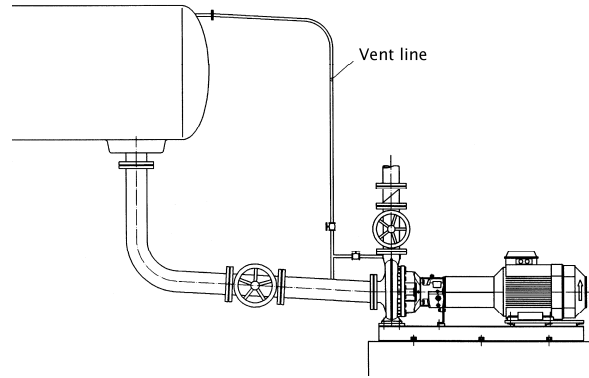
 The size of these insulating pads will vary, depending on circumstances, and should therefore be determined by an experienced specialist.

5.2 Connection of Pipings to the Pump

 The pump must not be used as fixed point for the piping. The permitted piping loads must not be exceeded, refer to chapter 3.6.

5.2.1 Suction and discharge pipe

- The pipes must be of a size and design that liquid can flow freely into the pump and that the pump functions without problems. Particular attention is to be paid to ensuring that suction pipes are airtight and that the NPSH values are observed. Under suction lift condition lays the suction pipe in the horizontal section towards the pump so that it is slightly inclined upwards so that no air traps occur. Under positive suction head condition install the suction pipe work slightly declined towards the pump. Do not install fittings or elbows right before the suction nozzle.
- If the suction supply is under vacuum and entrained gas may be present in the liquid, it is recommended that a vent line be considered upstream of the pump suction with return to the suction supply, above the max liquid level.
- An additional flushed piping - discharge branch-vent line - makes it easier to de-aerate the pump before start-up (pic 3).



pic 3

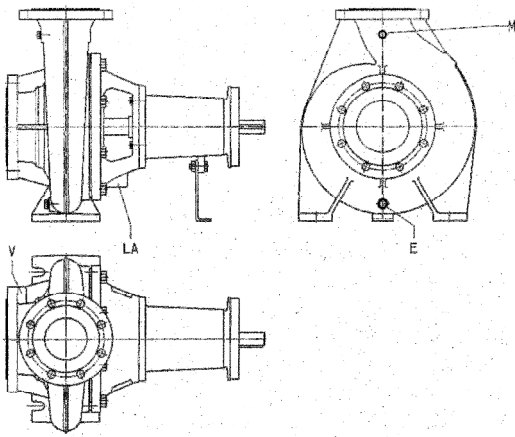
- When laying the pipes, make sure that the pump is accessible for maintenance, installation and disassembly.
- Notice "Permitted Forces on Flanges" (chapter 3.5).
- If expansion joints are used in the pipes, they have to be supported in such a way that the pump is not loaded unduly high because of the pressure in the pipes.
- Before connecting up to pump: remove protective coverings from suction and discharge branches.
- Before starting up, the pipe system, fittings and equipment must be cleaned to remove weld spatter, scale etc. Any pollutants are to be completely removed from pump units that are directly or indirectly connected to drinking water systems before being installed and taken into use.
- To protect the shaft sealing (especially mechanical seals) against foreign impurities, it is recommended that a sieve, 800 micron, is installed in the suction/intake pipe when the motor is being started up.
- If the pipe system is tested with the pump installed, do not exceed the maximum permitted casing pressure of the pump and/or shaft sealing (see data sheet).
- When emptying the pipe after the pressure test, make sure that the pump is treated properly (danger of rust and problems when starting up).
- In the case of pumps with stuffing boxes, replace packing after pressure test (packing may be over-compressed and thus no longer suitable for use).

5.2.2 Additional connections

The following additional connections are available:

Connection	Description	Dimension
E	Pump drain	R3/8"
LA	Leakage	R1/2"
M	Pressure gauge	R1/4"
V*)	Vacuum gauge*)	R1/4"

*) ... optional, drilled on request



5.3 Coupling



Make sure that nobody can start the motor during work on the coupling. According to Accident Prevention Regulations, the pump unit may only be operated when the coupling guard is mounted.

5.3.1 Installation of Coupling

If the pump unit is not completely assembled until it reaches its place of use and no separate operating instructions have been supplied by the manufacturer, you should proceed according to the following points:

- Before starting installation, carefully clean shaft ends and coupling components.
- Pull coupling onto shaft end, do not hit. The coupling may be heated beforehand in an oil bath to approx. 100°C (pulling on is then easier). Remove rubber packs from coupling section first.
- The coupling sections must be flush with the shaft end surfaces.
- Secure coupling hubs against axial sliding using a pin screw.

5.3.2 Alignment of coupling



The alignment of the coupling must be carried out with the utmost care and attention, so that the unit will operate without failure. If you do not pay attention to this hint you will lose your warranty!

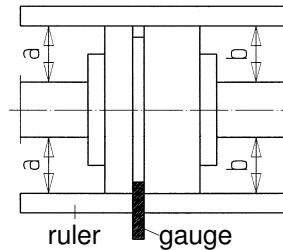


After mounting onto the foundation and the connection of the piping the coupling must be adjusted again, even, if the unit was delivered completely mounted on the frame.

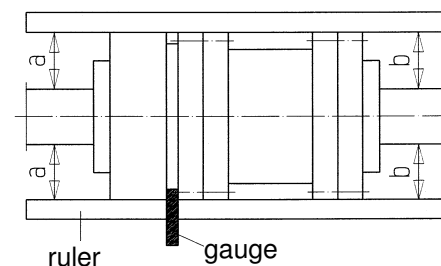
- Before adjusting the coupling unfasten screws (S7) between bearing bracket (10) and casing foot (80/F) and only fasten again after the adjustment. Repeat measurement after fastening of screws (S7).
- The unit is properly aligned, when a ruler, which is laid axially over both coupling halves, has the same distance to the particular shaft everywhere on the circumference. Further, both coupling halves must have the same distance to one another on every of the circumference. This must

be checked by means of a tracer, gauge or dial gage; refer to pic. 4 and 5.

- The permitted tolerances for your coupling are shown in chapter 5.3.3 "Permitted displacement for flexible couplings". For the exact characterization of your coupling refer to data sheet and / or order confirmation.



pic 4 - Alignment of coupling with gauge and ruler



pic 5 - Alignment of coupling with spacer



Control alignment of coupling again in operation warm condition and on system pressure (if available) and correct, if necessary. Pay attention to chapter 6 beforehand! It must be possible to turn the unit easily and harmoniously by hand.

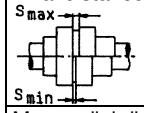
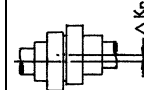
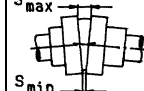


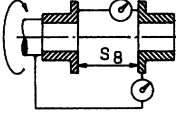
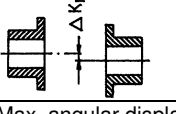
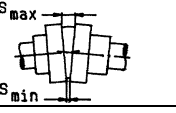
Improper alignment of the unit can lead to damages at coupling and unit!



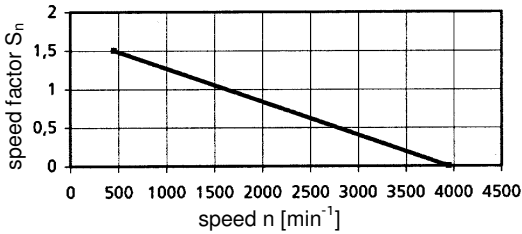
Mount coupling guard after alignment and before start-up.

5.3.3 Permitted displacement for flexible couplings


Coupling size	H80FK	H95FK	H110FK	B125KF	H125FK	B140FK	H140FK	B160FK	H160FK	B180FK	H180FK	B200FK	H200FK
Outer diameter of coupling [mm]	80	95	110	125	140	160	180	200					
Axial distance S 	S _{max}		3				6						
	S _{min}		2										
Max. radial displacement ΔK _r 	0,1				0,2								
Max. angular displacement S _{max} · S _{min} ΔK _w = S _{max} - S _{min} 	0,1				0,2								

Coupling size	NHN160FK	NHN180FK	NHN200FK
Outer diameter of coupling [mm]	168	180	200
Axial distance 	±0,3	±0,4	
Max. radial displacement ΔK_r 	0,2		
Max. angular displacement $S_{max} \cdot S_{min}$ $\Delta K_w = S_{max} - S_{min}$ 	0,2		

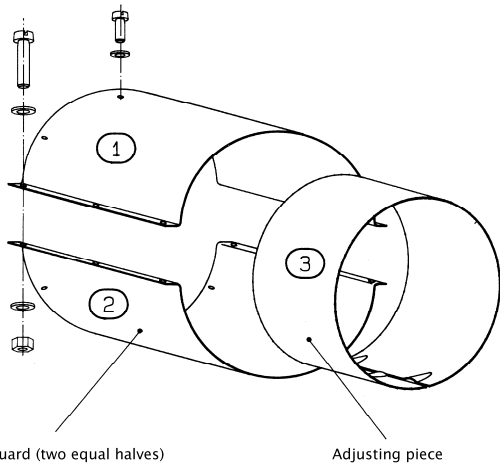
S_8 = nominal length of the spacer coupling
 The given values ΔK_r and ΔK_w apply for 1500 min⁻¹.
 For all other speeds the following applies:
 $\Delta K_w \cdot S_n$ bzw. $\Delta K_r \cdot S_n$



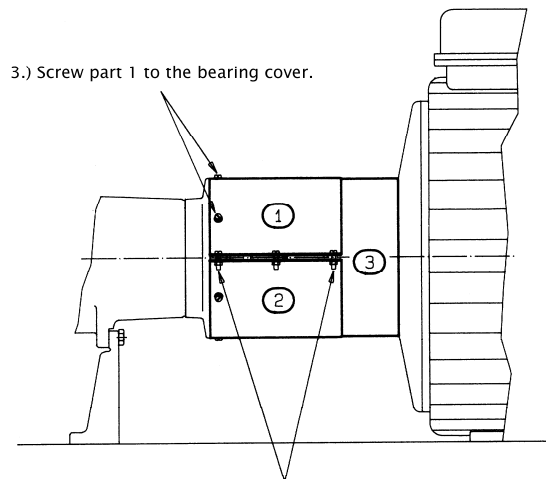
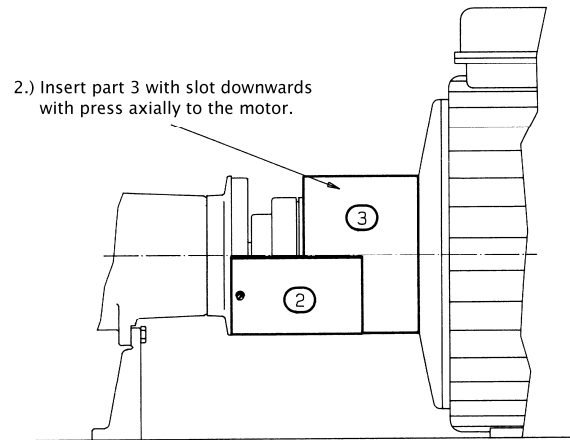
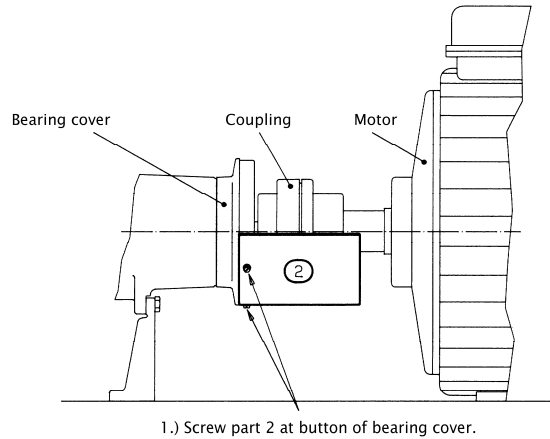
5.3.4 Coupling guard model L

 According to Accident Prevention Regulations, the pump unit may only be operated when the coupling guard is mounted.

Parts:




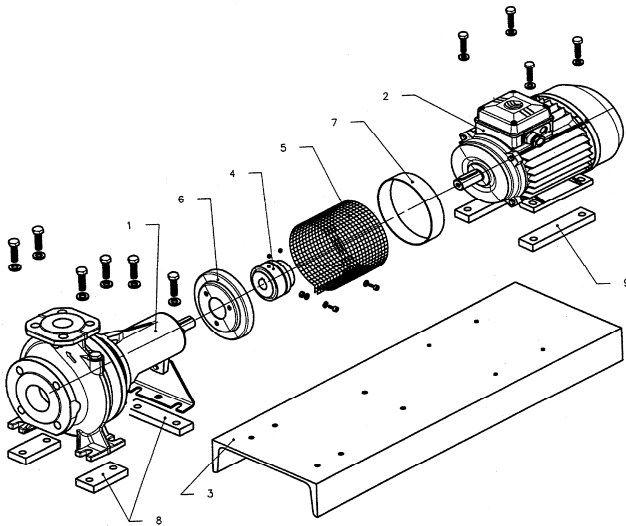
Assembly:



4.) Screw part 1 and part 2 together, which fixes the adjusting piece.

5.3.5 Coupling guard model LN

 According to Accident Prevention Regulations, the pump unit may only be operated when the coupling guard is mounted.



The coupling guard (5) is clamped by fastening the two lower screws on the pumpside coupling disc (6) and the motorside coupling ring (7).

5.4 Drive

On selecting the motor size care has to be taken, that the requirements acc. to ISO 5199 are fulfilled. **Note the Operating Instructions of the motor manufacturer.**

5.5 Electric Connection



Electrical connection work may only be carried out by an authorised professional. The rules and regulations valid for electrical technology, especially those concerned with safety measures, must be observed. The regulations of the national power supply companies operating in that area must also be observed.

Before starting work, check that the information on the motor name plate is the same as the local mains network. The power supply cable of the coupled drive motor must be connected up in accordance with the wiring diagram produced by the motor manufacturer. A protective motor switch must be provided.



Care must be taken that the base frame (2x M10-thread available for earthing screws) is earthed by means of corresponding measures.



The direction of rotation must only be checked when the pump is full. Dry running will cause damage to the pump.

5.6 Final Control

Check alignment of coupling acc. to chapter 5.3.1 again. It must be possible to turn the unit easily by hand at the coupling.

6. Start-up, Operation, Shut down



The plant may only be started up by people who are familiar with the local safety regulations and with these Operating Instructions (especially with the safety regulations and safety instructions given here).

6.1 Initial start-up

Before starting up the pump, check, if the following points were controlled and carried out:

- Pump and suction pipe must be filled completely with liquid when starting up.
- Turn pump unit once again by hand and check that it moves smoothly and evenly.
- Check that coupling guard is installed and that all safety devices are operational.
- Open valve in suction /intake pipe.
- Set discharge side valve to approx. 25% of rated flow quantity. With pumps with a discharge branch rated width less than 200, the valve can remain closed when starting up.
- Secure, that unit is electrically connected acc. to all regulations and with all safety devices.
- Check direction of rotation by switching on and off briefly. It must be the same as the directional arrow on the bearing frame.

6.2 Switch on drive

- Immediately (max. 30 seconds on 50 Hz resp. max. 20 seconds on 60 Hz currency feed) after

reaching normal operating speed open discharge valve adjust the required operating point. The pumping data shown at the type plate resp. in the data sheet and / or the order confirmation must be met. Every change is only permitted after talking with the manufacturer!



In order that the shaft sealing can be monitored and maintained unhindered, no protection cover is provided in this area. Therefore special attention is required when pump is working (no long hair, loose clothes, a.s.o.).



Operation with closed valve in the suction and / or discharge piping is not permitted.



On starting-up without back-pressure, the back-pressure must be produced through throttling at the discharge side. After reaching full back-pressure open valve.



If pump does not reach attended head or if atypical sounds or vibrations do occur: Switch off pump (see chapter 6.7) and seek for causes (see chapter 10).

6.3 Restarting

Basically, the same procedure should be followed as for starting up for the first time. However, there is no need to check the direction of rotation and the accessibility of the pump unit.

The pump should only be automatically restarted if it has been made sure that the pump has remained filled whilst stand by.



Be particularly careful not to touch hot machine parts and when working in the unprotected shaft seal area. Remember that automatically controlled systems may switch themselves on suddenly at any time. Suitable warning signs should be affixed.

6.4 Limits of Operation



The operating limits of the pump / unit regarding pressure, temperature, performance and speed are shown in the data sheet and / or order confirmation and must be observed under any circumstances!

- Do not exceed the output given on the motor name plate.
- Avoid sudden changes in temperature (temperature shocks).
- The pump and motor should run evenly and without vibrations; check at least once a week.

6.4.1 Flow min. / max.

If no other data are given in the curves or data sheets, the following is valid:

$$Q_{\min} = 0,1 \times Q_{\text{BEP}} \text{ for for short time operation}$$

$$Q_{\min} = 0,3 \times Q_{\text{BEP}} \text{ for continuous operation}$$

$$Q_{\max} = 1,2 \times Q_{\text{BEP}} \text{ for continuous operation *)}$$

Q_{BEP} = Flow in efficiency optimum

*) on condition that $\text{NPSH}_{\text{facility}} > (\text{NPSH}_{\text{pump}} + 0,5 \text{ m})$

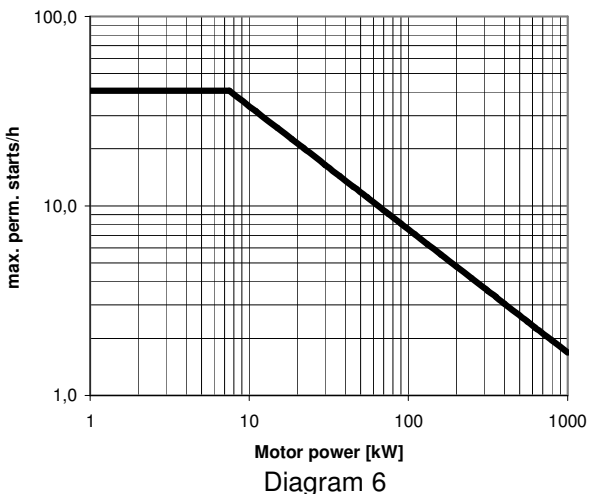
6.4.2 Abrasive Media



On pumping liquids with abrasive components an increased wears at hydraulic and shaft sealing must be expected. The intervals of inspection should be reduced compared to the usual times.

6.4.3 Permitted number of starts

The permitted number of starts of the pump must not be exceeded, see diagram 6.



With electric motors, the permitted number of starts is given in the attached motor operating instructions. If two different figures are given, the lower figure is valid.

6.5 Grease lubrication

The pump is equipped with bearings greased for lifetime. Regreasing of the bearings is neither possible nor necessary.

6.6 Monitoring



Regular monitoring and maintenance will extend the life of your pump or pump system.

Pumps which are exposed to corrosive chemicals or to wear through abrasion must be inspected periodically for corrosion or wear and tear. The first inspection should be carried out after six months. All further inspection intervals should be determined on the basis of the state of the pump.

6.7 Shutting down

- Close the valve in discharge pipe right before (max. 10 seconds) switching off the motor. This is not necessary if there is a spring-loaded check valve.
- Switch off motor (make sure it runs down quietly).
- Close the valve on suction side.
- If there is any risk of freezing, empty pump, cooling areas and pipes completely.

6.8 Storage / longer periods of non-operation

6.8.1 Storage of new pumps

If the putting into operation shall happen a longer period after the delivery, we recommend the following measures for the storage of the pump:

- Store pump at a dry place.
- Rotate pump by hand at least once a month.

6.8.2 Measures for longer putting out of operation

Pump remains installed and in ready for operation:

- Test runs of 5 min. duration must be made in regular intervals. The span between the test runs is depending on the plant. However, it should be made once a week, at least.

6.8.3 Longer periods of non-operation



After long stationary periods, packing may have hardened; these must be replaced before start-up.

When starting up, follow the instructions for starting up for the first time (see chapter 6)!

a) Filled pumps

- Switch stand-by pumps on and immediately off again once a week. Possibly use as main pump.
- Replace bearings after 4 years.

b) Drained pumps

- Turn shaft at least 1x week (do not switch on because of dry running).
- Replace bearings after 4 years.

7. Servicing, Maintenance

7.1 General remarks



Maintenance and servicing work must only be carried out by trained, experienced staff who are familiar with the contents of these Operating Instructions, or by the Manufacturer's own service staff.



Work should only be carried out on the pump or pump unit when it is not in operation. You must observe chapter 2.

7.2 Mechanical seals



Before opening the pump, it is essential that you note chapter 2 and chapter 3.2.

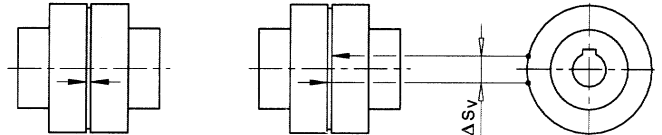
If the liquid being handled leaks out at the mechanical seal, it is damaged and must be replaced.

7.3 Coupling

Check the clearance in the coupling components regularly approx. every 1000 operating hours, but at least 1x year, the radial clearance in the coupling parts must be checked.

For couplings with rubber pads the following applies: Unless a clearance in the couplings is necessary, the coupling pads may wear out to approximately 1/4 of their usual thickness, before they have to be changed. To measure the clearance in the coupling place a

mark on the O.D. of each coupling hub (see following pic). Then fixing one hub, turn the opposite hub as far as possible. Then measure the distance (ΔS_v) between the marks of the coupling. If this measure exceeds the value given in the chart, the packings must be replaced. They must be replaced in sets.



Size	80	95	110	125	140	160	180	200	225	250	280	315	350	400
ΔS_v [mm]	5,0	6,0	7,0	8,0	8,5	8,0	8,0	8,5	9,0	10,0	11,5	10,5	11,5	13,0



If wear is heavy, it must be assumed that the motor is not properly aligned with the pump or that the distance between the coupling sections has changed. Replace worn elements and re-install or adjust coupling, as described in chapter 5.3.

7.4 Cleaning of pump



The pump must not be cleaned with pressurised water - water will get into the bearings.

Dirt on the outside of the pump has an adverse effect on transmission of heat. The pump should therefore be cleaned with water at regular intervals (depending on the degree of dirt).

8. Dismantling and repair of pump

8.1 General remarks



Repair to the pump or pump system may only be carried out by authorised skilled personnel or by the manufacturer's specialist staff.



When disassembling the pump pay attention to chapter 2 and chapter 4.1.

For mounting and repair you can order specialized personnel if you want.



If dangerous liquids are pumped the appropriate disposal of the handled liquid is necessary before the disassembly of the pump. Pay attention to the fact, that even in drained pumps there are remainders of the handled liquid. If necessary the pump must be flushed or decontaminated. Laws must be observed, otherwise danger to health is existing!

- Before the disassembly the pump has to be secured in such a way, that it can't be started.

- The pump casing must be drained and without pressure.
- All locking devices in the suction- and discharge-pipe must be closed.
- All parts must have taken on the temperature of the environment.



Secure disassembled pumps, units or single parts against tipping over or rolling off.



While disassembling the pump use of an open flame (blowlamp, etc.) only, when there is no danger of setting fire, cause an explosion or cause injurious vapours. Never apply heat to remove the impeller nut. Use of heat may result in severe physical injury and property damage.



Use original spare parts only. Pay attention to the right materials and the matching design.

8.2 General

Carry out disassembly and mounting according to the appropriate sectional drawing (at the appendix). You will only need common tools.


Before disassembly check if required parts are ready. Disassemble the pump only so far, as required for the replacement of the repair part.

9. Recommended Spare Parts, Spare Pumps

9.1 Spare Parts


Spare parts should be selected to last for two-year continuous operation. If no other guidelines are applicable, we recommend that you stock the number of parts listed below (in accordance with DIN 24296).

Spare Parts	Number of pumps (incl. stand-by pumps)						
	2	3	4	5	6/7	8/9	10/+
	Number of Spare Parts						
Impeller	1	1	1	2	2	2	20%
Shaft with key and nuts	1	1	1	2	2	2	20%
Ball Bearing set	1	1	2	2	2	3	25%
Joints for pump casing sets	4	6	8	8	9	12	150%
other joints sets	4	6	8	8	9	10	100%
Mech. Seals set	1	1	2	2	2	3	25%
Bearing (lantern with bearing bracket, complete with shaft, bearings, aso.)	-	-	-	-	-	-	2


 To ensure optimum availability, we recommend that suitable quantities of spare parts are held in stock, especially if these are made from special materials and in the case of mechanical seals, because of the longer delivery times.


- Type: _____
- S/N (Order No.): _____
- Part name: _____
- Sectional Drawing _____

All the information is given in the data sheet and the relevant sectional drawing.

 Store spare parts in dry and clean rooms!

9.2 Stand-by pumps

 It is essential that a sufficient number of stand-by pumps are kept ready for use in plants where failure of a pump could endanger human life or cause damage to property or high costs. Regular checks should be carried out to ensure that such pumps are always ready for use (see chapter 6.8).

 Store stand-by pumps according to chapter 6.8.

Spare Parts Order

When ordering spare parts, please supply the following information:

10. Faults - Causes and Solutions

The following notes on causes of faults and how to repair them are intended as an aid to recognising the problem. The manufacturer's Customer Service Department is available to help repair faults that the operator cannot or does not want to repair. If the operator repairs or changes the pump, the design data on the Data Sheet and chapter 2 of these Operating Instructions should be particularly taken into account. If necessary, the written agreement of the manufacturer must be obtained.

Discharge too low	Discharge stops after a time	Head too low	Head too high	Drive mechanism overloaded	Pump not running quietly	Temperature in pump too high	Temperature in shaft sealing too high	Temperature at the bearing too high	Pump leaking	Leakage rate at shaft sealing too high	Cause	Solution
■											Back-pressure too high	check facility for pollution, open discharge valve reduce resistance in discharge pipe (e.g. clean filter if necessary) use larger impeller (note available motor power)
		■		■				■			Back-pressure too low, discharge too low	throttle discharge valve
			■	■							Speed too high	reduce speed compare speed of motor with specified pump speed (rating plate) when adjusting speed (frequency transformer) check reference value setting
■	■										Speed too low	increase speed (check available motor power) compare speed of motor with specified pump speed (rating plate) when adjusting speed (frequency transformer) check reference value settings
	■	■		■	■						Flow too little	increase min. flow (open discharge valve, bypass)
								■			Flow too big	reduce flow (throttle discharge valve)
			■	■							Impeller diameter too big	use smaller impeller
■	■	■									Impeller diameter too small	use larger impeller (check available motor power)
■	■	■		■	■						Pump and/or pipes not completely filled with liquid	fill vent
■	■	■									Pump or suction/intake pipe blocked	clean
■	■	■									Air pocket in pipeline	vent improve course of pipe
■	■	■		■	■						Suction height too big / NPSH of system too small	increase liquid level and admission pressure reduce resistance in the intake/suction pipe (change course and rated width, open shut-off valves, clean filters)
■	■	■									Air being sucked in	increase liquid level check if suction pipe is vacuum-tight
■	■	■									Air being sucked in through shaft sealing	clean sealing pipe increase sealing pressure replace shaft sealing
■	■	■									Direction of rotation is wrong	swap over two phases of power supply (to be done by an electrician)
■	■	■		■				■			Inner components suffering from wear	replace worn parts
■	■	■		■							Density and/or viscosity of liquid handled is too high	seek assistance
									■	■	Lines and roughness on shaft or shaft sleeve	replace parts
										■	Deposits on mechanical seal	clean replace mechanical seal if necessary if necessary provide additional rinsing or quench
				■						■	Impeller out of balance	remove blocks/deposits replace impeller if broken or unevenly worn check shafts to ensure that they are running true
				■				■		■	Coupling not aligned	align pump unit better
				■				■			Coupling distance too small	change
			■	■				■	■	■	Forces in pipeline too high (pump unit under strain)	change (support pipes, use compensators, etc.) is foundation plate/frame properly cast in place?
								■			Too much, too little or the wrong type of lubricant	change
			■								Electricity supply not right (2-phase running)	check voltage of all phases check cable connections and fuses
										■	Sealing insufficient	tighten screws replace sealing
				■				■			Bearing damaged	replace check lubricant and bearing space for pollutants (rinse oil area)
								■			Relief fittings insufficient	clean relief openings in impeller replace worn parts (impeller, split rings) adjust in line with the system pressure/intake pressure given on ordering
				■							System-related vibrations (resonance)	seek assistance

11. Motor Operating Instructions



The following instructions must be followed exactly, to guarantee the safety at the installation, at the operation and at the maintenance of the motor. All persons should be directed to the present manual which are performing these tasks. The neglect of the instructions can cause the loss of the guarantee.

Electrical connections



Make sure that the rated voltage corresponds to the supply voltage.



Ground the pump before making any other connection.

We recommend that a high sensitivity differential switch (30 mA) be installed as extra protection against lethal electric shocks in the event of faulty grounding.

Connect the pump to the mains using a multiple-pole switch or other device ensuring multiple-pole disconnection (interruption of all the supply wires) from the mains, with a contact separation of at least 3 mm. Remove the terminal board cover by first removing the screws.

Carry out the connections as indicated on the back of the terminal board cover, and as shown in fig. 3 - 4.

The single-phase version has a built-in overload protection; the three-phase version must be equipped by the user with a magneto-thermal switch or magnetic starter with overload and undervoltage protection, a thermal relay and fuses installed upstream.

The overload relay must be set to the motor current rating. The thermal relay may be set to a current value slightly lower than the full load value when the electric pump is definitely underloaded, but the thermal overload protection must not be set to current values higher than the full load values.

Checking the rotation direction of electric pumps with three-phase motors.

The direction of rotation may be checked before the pump is filled with the liquid to be pumped, provided it is run for very short starts only.



The pump must not be run until it is filled with liquid.

Continuous dry running will damage the mechanical seal beyond repair.

If the direction of rotation is not anti-clockwise when facing the pump from the suction side interchange two supply leads.

Fault finding chart

PROBLEM	PROBABLE CAUSE	POSSIBLE REMEDIES
1. The pump doesn't start	A) No electrical power B) Blown fuses: B1 Because inadequate (blowing current too low) B2 Because the motor or the supply cable are damaged C) Overload protection previously tripped	A) Supply electrical power B1 Replace fuses with adequate ones B2 Repair the motor or replace the cable C) Reset the protection (if it trips again see problem 2)
2. Overload protection trips: – accidentally – systematically	A) Momentary loss of a phase C) Incorrect setting of the motor switch D) The pump's delivery is higher than the rated one E) Dense and viscous liquid	C) Set to rated current D) Close the delivery valve until the capacity returns to the rated value E) Determine the actual power requirements and replace the motor accordingly

Machines with permanently greased bearings

Machines up to frame size 180 are normally fitted with permanently greased bearings of either 2RS or 2Z types.

Machines fitted with grease nipples for the frame size 200 – 355

Lubricate the machine while running with a grease gun on the grease nipple. The grease nipple must be cleaned before lubrication.

The quantity of grease for regreasing or change are shown in the table.

If a grease outlet plug is fitted, remove temporarily when lubricating, or permanently with automatic lubrication.

If the machine is fitted with a lubrication information plate, follow the values given, otherwise use values as follows.

Speed [rpm]	lubrication Interval [h]	time [months]
max. 1800	1.500	6
above 1800	750	3

Speed [rpm]	lubrication Interval [h]	time [months]
max. 1800	10.000	24
above 1800	5.000	12

The maintenance intervals are based on standard ambient conditions.

Life time of roller bearings

approx. 20.000 hours for the frame size 56-180.

FIG. - ABB - KUWA - رسم - EİK. - ŞEKİL - РИС. - RYS. - 3

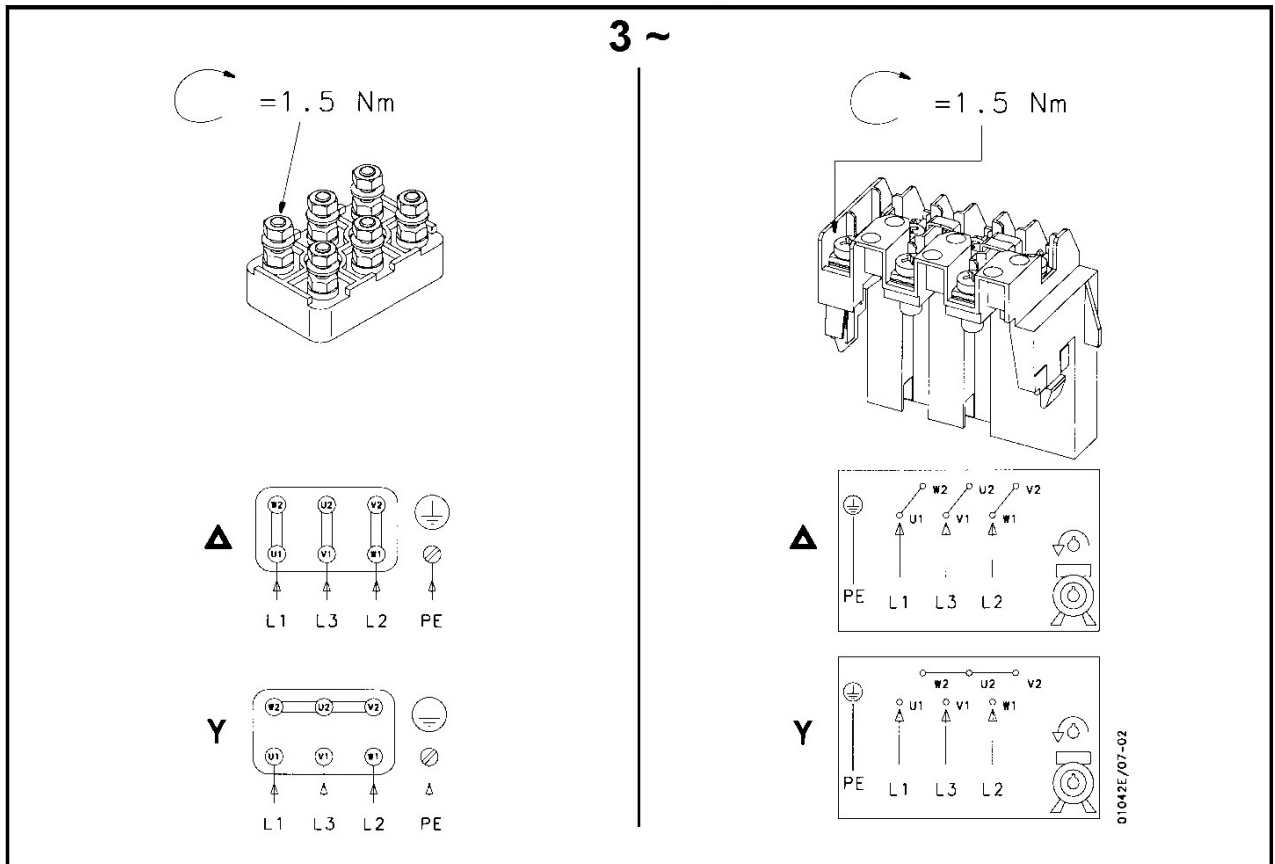
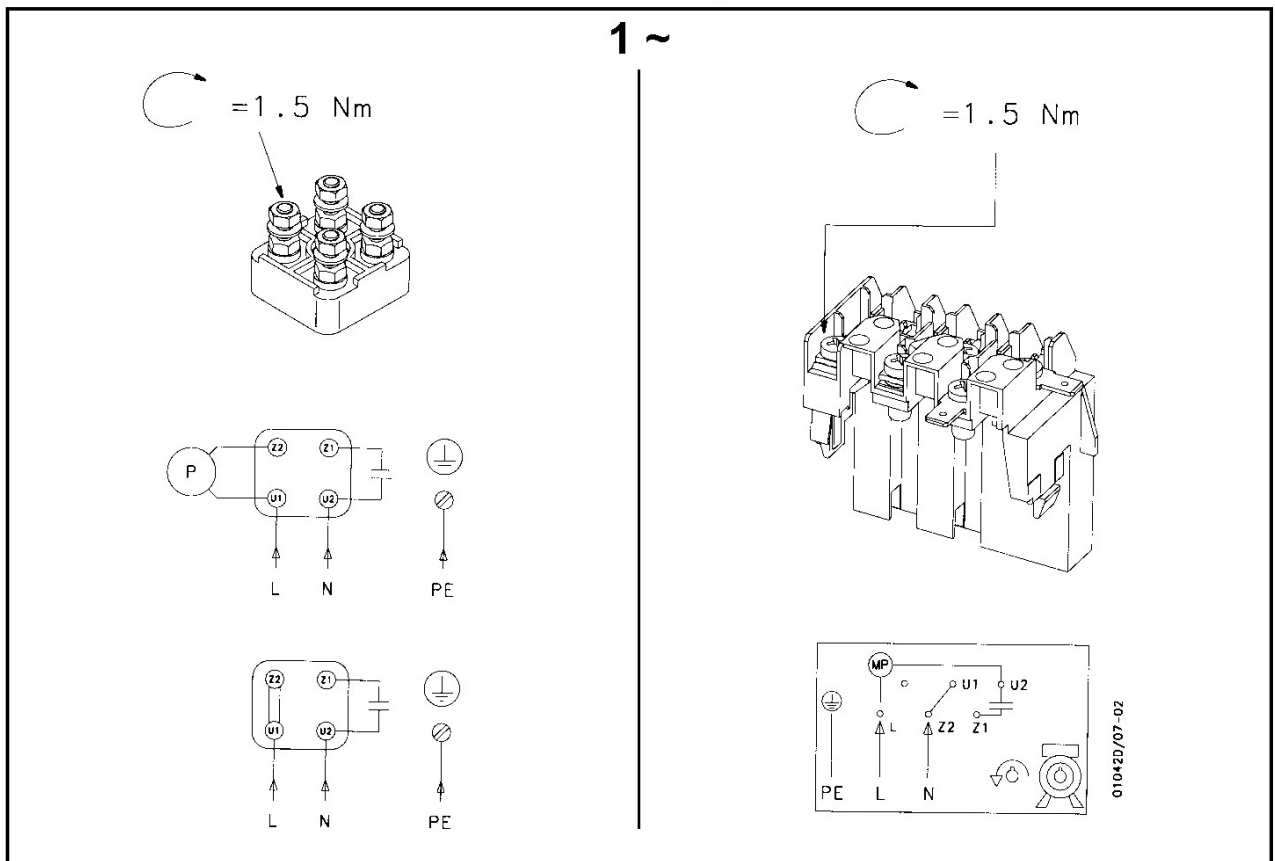
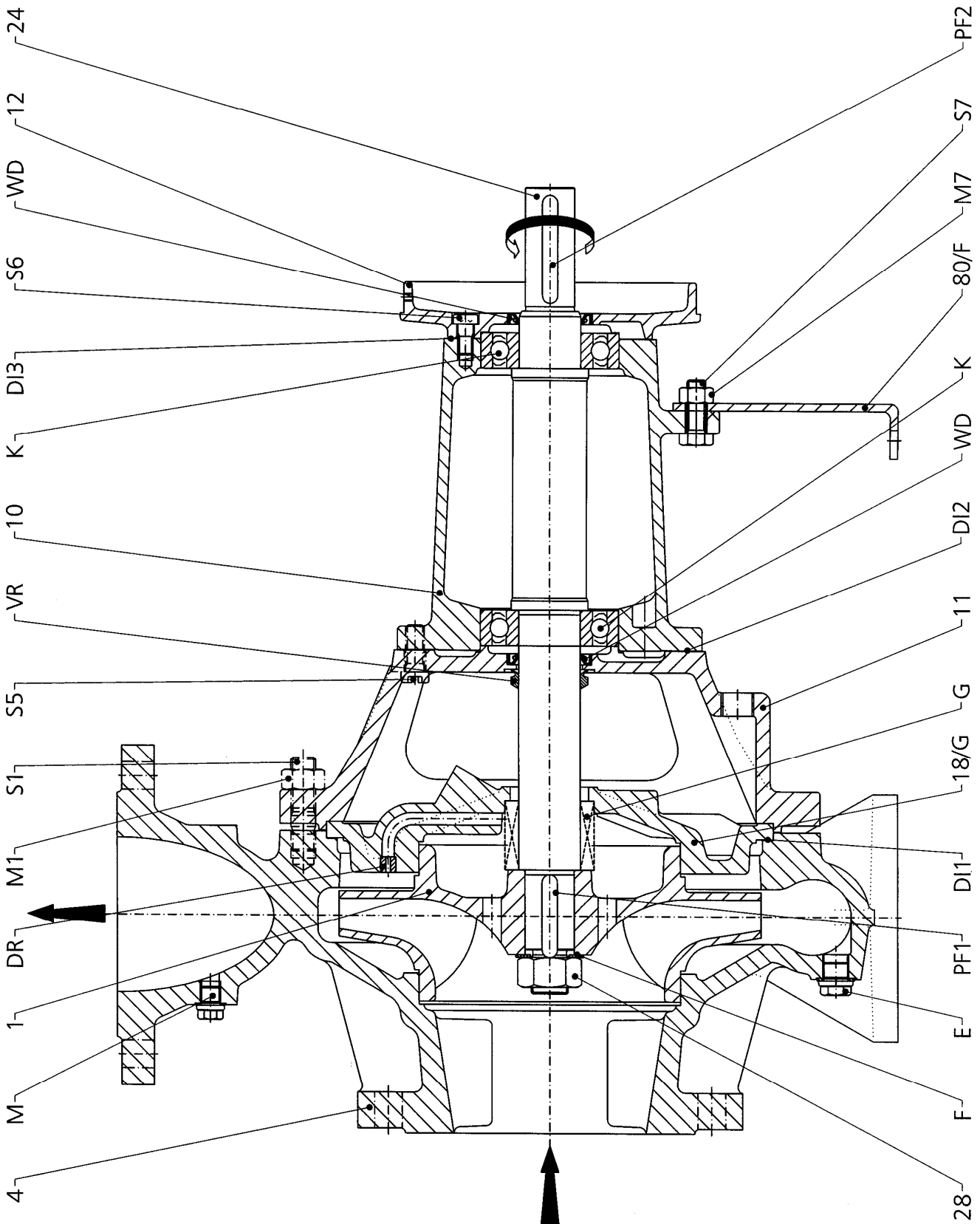


FIG. - ABB - KUWA - رسم - EİK. - ŞEKİL - РИС. - RYS. - 4



Schnittzeichnung Bauart L - Einzel-Gleitringdichtung, nicht entlastet, Fettschmierung
Plan coupe série L - Garniture mécanique simple, non équilibrée, lubrification à la graisse
Sectional drawing Type L - Single-mechanical seal, unbalanced, grease lubrication

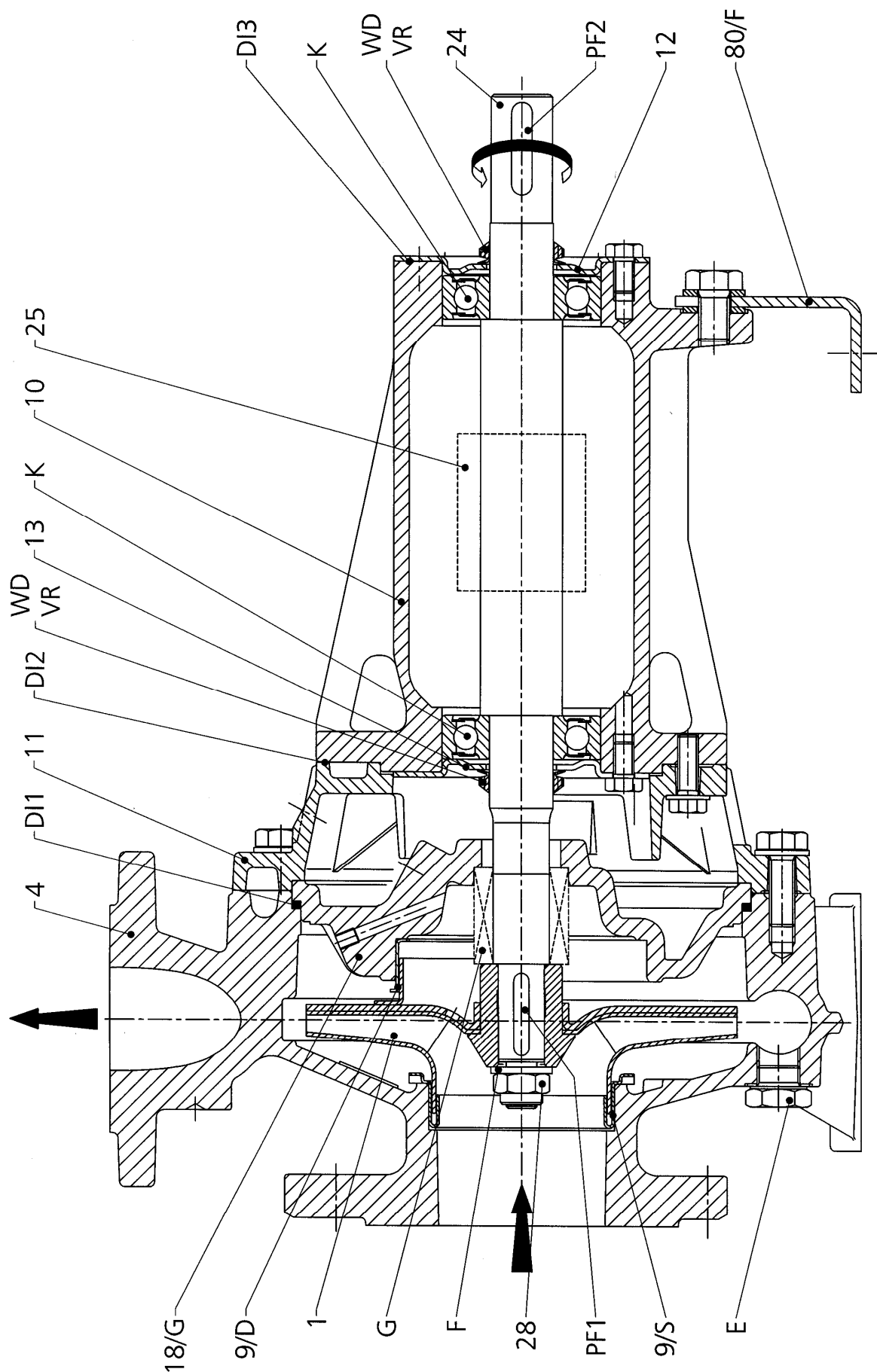


Nr.	Teilebezeichnung	Désignation des pièces	Index of parts
1	Laufrad	Roue mobile	Impeller
4	Pumpengehäuse	Corps de pompe	Pump casing
10	Lagerträger	Corps de palier	Bearing bracket
11	Laterne	Lanterne	Lantern
12	Lagerdeckel, motorseitig	Chapeau de palier, côté moteur	Bearing cover, motor side
18/G	Zwischenwand	Paroi intermédiaire	Intermediate flange
24	Welle	Arbre	Shaft
28	Laufradmutter	Ecrou de la roue mobile	Impeller nut
80/F	Stützfuß	Béquille	Support feet
D11	Dichtung für Zwischenwand	Joint pour paroi intermédiaire	Joint for intermediate flange
D12	Dichtung für Lagerträger	Joint pour corps de palier	Joint for bearing bracket
D13	Dichtung für Lagerdeckel	Joint pour chapeau de palier	Joint for bearing cover
E	Entleerungsschraube	Bouchon de purge	Drain plug
F	Federscheibe	Disque de ressort	Spring washer
G	Gleitringdichtung	Garniture mécanique	Mechanical seal
K	Rillenkugellager	Roulement rainuré à billes	Grooved ball bearing
M1	Sechskantmutter	Vis à six pans	Hexagonal nut
M7	Sechskantmutter	Vis à six pans	Hexagonal nut
PF1	Passfeder für Laufrad	Clavette pour roue mobile	Impeller key
PF2	Passfeder für Kupplung	Clavette pour accouplement	Coupling key
S1	Stiftschraube	Goujon fileté	Stud bolt
S5	Innensechskantschraube	Vis à six pans creux	Hexagonal socket screw
S6	Innensechskantschraube	Vis à six pans creux	Hexagonal socket screw
S7	Sechskantschraube	Vis à six pans	Hexagonal screw
VF	V-Ring	Joint en V	V-ring
WD	Radialwellendichtring am Lager	Bague à lèvres avec ressorts au niveau du palier	Radial shaft seal

Gültig für Type:	L65-315	L100-200	L125-200	L125-400
Valable pour type:	L80-315	L100-250	L125-250	L150-250
Valid for type:	L80-400	L100-315	L125-270	L150-315
	L100-160	L100-400	L125-315	L150-400

Technische Änderungen vorbehalten! - Nicht maßstäblich!
 Sous réserve de modifications techniques ! - Non à l'échelle !
 Subject to techn. alterations! - Not to scale!

Schnittzeichnung Bauart LN - Einzel-Gleitringdichtung, nicht entlastet, Fettschmierung
Plan coupe série LN - Garniture mécanique simple, non équilibrée, lubrification à la graisse
Sectional drawing Type LN - Single-mechanical seal, unbalanced, grease lubrication



Nr.	Teilebezeichnung	Désignation des pièces	Index of parts
1	Laufrad	Roue mobile	Impeller
4	Pumpengehäuse	Corps de pompe	Pump casing
9D	Spaltring druckseitig	Bague d'étanchéité côté refoulement	Wear ring, drive side
9S	Spaltring saugseitig	Bague d'étanchéité côté aspiration	Wear ring, suction side
10	Lagerträger	Corps de palier	Bearing bracket
11	Laterne	Lanterne	Lantern
12	Lagerdeckel, motorseitig	Chapeau de palier, côté moteur	Bearing cover, drive side
13	Lagerdeckel, pumpenseitig	Chapeau de palier, côté moteur	Bearing cover, suction side
18/G	Zwischenwand	Paroi intermédiaire	Intermediate flange
24	Welle	Arbre	Shaft
25	Leistungsschild	Plaque signalétique	Pump name plate
28	Laufradmutter	Ecrou de la roue mobile	Impeller nut
80/F	Stützfuß	Béquille	Support feet
D11	Dichtung für Zwischenwand	Joint pour paroi intermédiaire	Joint for intermediate flange
D12	Dichtung für Lagerträger	Joint pour corps de palier	Joint for bearing bracket
D13	Dichtung für Lagerdeckel	Joint pour chapeau de palier	Joint for bearing cover
E	Entleerungsschraube	Bouchon de purge	Drain plug
F	Federscheibe	Disque de ressort	Spring washer
G	Gleitringdichtung	Garniture mécanique	Mechanical seal
K	Rillenkugellager	Roulement rainuré à billes	Grooved ball bearing
M1	Sechskantmutter	Vis à six pans	Hexagonal nut
M7	Sechskantmutter	Vis à six pans	Hexagonal nut
PF1	Passfeder für Laufad	Clavette pour roue mobile	Impeller key
PF2	Passfeder für Kupplung	Clavette pour accouplement	Coupling key
VF	V-Ring	Joint en V	V-ring
WD	Radialwellendichtring am Lager	Bague à lèvres avec ressorts au niveau du palier	Radial shaft seal

Gültig für Type:	LN32-125	LN40-200	LN50-250	LN80-160
Valable pour type:	LN32-160	LN40-250	LN65-125	LN80-200
Valid for type:	LN32-200	LN50-125	LN65-160	LN80-250
	LN40-125	LN50-160	LN65-200	
	LN40-160	LN50-200	LN65-250	

Technische Änderungen vorbehalten! - Nicht maßstäblich!
 Sous réserve de modifications techniques ! - Non à l'échelle !
 Subject to techn. alterations! - Not to scale!

Gewichte - Poids - Weights:

Pumpe allein Pompe seule Pump	Gewicht [kg] Poids [kg] Weight [kg]	Pumpe allein Pompe seule Pump	Gewicht [kg] Poids [kg] Weight [kg]
LN 32-125	20	L 65-315	100
LN 32-160	22	L 80-315	116
LN 32-200	25	L 80-400	153
LN 40-125	21	L 100-160	67
LN 40-160	25	L 100-200	79
LN 40-200	26	L 100-250	94
LN 40-250	43	L 100-315	118
LN 50-125	25	L 100-400	162
LN 50-160	28	L 125-200	113
LN 50-200	29	L 125-250	115
LN 50-250	43	L 125-270	132
LN 65-125	33	L 125-315	143
LN 65-160	35	L 125-400	173
LN 65-200	37	L 150-250	147
LN 65-250	44	L 150-315	166
LN 80-160	38	L 150-400	195
LN 80-200	40		
LN 80-250	47		

LN - 2900 min ⁻¹		
kopl. Aggregat Groupe complet Complete unit	Motorleistung [kW] Puissance du moteur [kW] Motor power kW	Gewicht [kg] Poids [kg] Weight [kg]
LN 32-125 U 072	0,75	67
LN 32-125 U 112	1,1	69
LN 32-160 U 152	1,5	71
LN 32-160 U 222	2,2	73
LN 32-200 U 302	3,0	92
LN 32-200 U 402	4,0	96
LN 40-125 U 112	1,1	72
LN 40-125 U 152	1,5	74
LN 40-125 U 222	2,2	77
LN 40-160 U 302	3,0	91
LN 40-160 U 402	4,0	97
LN 40-200 U 552	5,5	112
LN 40-200 U 752	7,5	120
LN 40-250 U 1102A	9,2	178
LN 40-250 U 1102	11,0	178
LN 40-250 U 1502	15,0	188
LN 50-125 U 222	2,2	85
LN 50-125 U 302	3,0	92
LN 50-125 U 402	4,0	97
LN 50-160 U 552	5,5	111
LN 50-160 U 752	7,5	115
LN 50-200 U 1102A	9,2	173
LN 50-200 U 1102	11,0	173
LN 50-250 U 1502	15,0	179
LN 50-250 U 1852	18,5	199
LN 50-250 U 2202	22,0	219
LN 65-125 U 402	4,0	135
LN 65-125 U 552	5,5	141
LN 65-125 U 752	7,5	147
LN 65-160 U 1102A	9,2	164
LN 65-160 U 1102	11,0	164
LN 65-160 U 1502	15,0	180
LN 65-200 U 1502	15,0	187
LN 65-200 U 1852	18,5	197
LN 65-200 U 2202	22,0	215
LN 65-250 U 2202	22,0	223
LN 65-250 U 3002	30,0	300
LN 65-250 U 3702	37,0	315
LN 80-160 U 1102	11,0	202
LN 80-160 U 1502	15,0	212
LN 80-160 U 1852	18,5	233
LN 80-200 U 2202	22,0	245
LN 80-200 U 3002	30,0	285
LN 80-250 U 3702	37,0	305
LN 80-250 U 4502	45,0	365
LN 80-250 U 5502	55,0	400

LN - 1450 min ⁻¹		
kopl. Aggregat Groupe complet Complete unit	Motorleistung [kW] Puissance du moteur [kW] Motor power kW	Gewicht [kg] Poids [kg] Weight [kg]
LN 32-125 U 024A	0,25	74
LN 32-125 U 024	0,25	74
LN 32-160 U 024	0,25	76
LN 32-160 U 034	0,37	78
LN 32-200 U 034	0,37	80
LN 32-200 U 054	0,55	82
LN 40-125 U 024A	0,25	61
LN 40-125 U 024	0,25	61
LN 40-125 U 034	0,37	64
LN 40-160 U 034	0,37	65
LN 40-160 U 054	0,55	66
LN 40-200 U 074	0,75	73
LN 40-200 U 114	1,1	76
LN 40-250 U 114	1,1	103
LN 40-250 U 154	1,5	106
LN 40-250 U 224	2,2	119
LN 50-125 U 034A	0,37	64
LN 50-125 U 034	0,37	64
LN 50-125 U 054	0,55	66
LN 50-160 U 074	0,75	73
LN 50-160 U 114	1,1	76
LN 50-200 U 114	1,1	87
LN 50-200 U 154	1,5	90
LN 50-250 U 224A	2,2	121
LN 50-250 U 224	2,2	121
LN 50-250 U 304	3,0	125
LN 65-125 U 054	0,55	90
LN 65-125 U 074	0,75	91
LN 65-125 U 114	1,1	95
LN 65-160 U 114	1,1	100
LN 65-160 U 154	1,5	110
LN 65-160 U 224	2,2	119
LN 65-200 U 154	1,5	112
LN 65-200 U 224	2,2	123
LN 65-200 U 304	3,0	126
LN 65-250 U 304	3,0	150
LN 65-250 U 404	4,0	162
LN 65-250 U 554	5,5	180
LN 80-160 U 154	1,5	130
LN 80-160 U 224	2,2	136
LN 80-200 U 304	3,0	155
LN 80-200 U 404	4,0	159
LN 80-250 U 404	4,0	165
LN 80-250 U 554	5,5	180
LN 80-250 U 754	7,5	193

L - 2900 min ⁻¹		
kompl. Aggregat	Motorleistung [kW]	Gewicht [kg]
Groupe complet	Puissance du moteur [kW]	Poids [kg]
Complete unit	Motor power kW	Weight [kg]
L 100-160 U 1852	18,5	243
L 100-160 U 2202	22,0	261
L 100-160 U 3002	30,0	396
L 100-160 U 3702	37,0	416
L 100-200 U 1852	18,5	273
L 100-200 U 2202	22,0	408
L 100-200 U 3002	30,0	428
L 100-200 U 3702	37,0	502
L 100-200 U 4502	45,0	577
L 100-200 U 5502	55,0	577
L 100-250 U 3702	37,0	443
L 100-250 U 4502	45,0	517
L 100-250 U 5502	55,0	592
L 100-250 U 7502	75,0	735
L 100-250 U 9002	90,0	805
L 100-250 U 11002	110,0	920
L 125-200 U 3002	30,0	442
L 125-200 U 3702	37,0	462
L 125-200 U 4502	45,0	536
L 125-200 U 5502	55,0	626
L 125-200 U 7502	75,0	754
L 125-270 U 5502	55,0	718
L 125-270 U 7502	75,0	848
L 125-270 U 9002	90,0	908
L 125-270 U 11002	110,0	993
L 125-270 U 13202	132,0	1053
L 125-270 U 15202	152,0	993
L 125-270 U 16002	160,0	1053

L - 1450 min ⁻¹		
kompl. Aggregat	Motorleistung [kW]	Gewicht [kg]
Groupe complet	Puissance du moteur [kW]	Poids [kg]
Complete unit	Motor power kW	Weight [kg]
L 65-315 U 404	4,0	164
L 65-315 U 554	5,5	180
L 65-315 U 754	7,5	185
L 65-315 U 1104	11,0	217
L 65-315 U 1504	15,0	233
L 80-315 U 554	5,5	196
L 80-315 U 754	7,5	204
L 80-315 U 1104	11,0	233
L 80-315 U 1504	15,0	249
L 80-315 U 1854	18,5	292
L 80-400 U 1504	15,0	321
L 80-400 U 1854	18,5	364
L 80-400 U 2204	22,0	382
L 80-400 U 3004	30,0	421
L 80-400 U 3704	37,0	456
L 100-160 U 304	3,0	127
L 100-160 U 404	4,0	131
L 100-160 U 554	5,5	147
L 100-200 U 304	3,0	139
L 100-200 U 404	4,0	143
L 100-200 U 554	5,5	159
L 100-200 U 754	7,5	167
L 100-250 U 554	5,5	174
L 100-250 U 754	7,5	182
L 100-250 U 1104	11,0	211
L 100-250 U 1504	15,0	227
L 100-315 U 754	7,5	206
L 100-315 U 1104	11,0	235
L 100-315 U 1504	15,0	251
L 100-315 U 1854	18,5	294
L 100-315 U 2204	22,0	312
L 100-315 U 3004	30,0	386
L 100-400 U 1504	15,0	330
L 100-400 U 1854	18,5	373
L 100-400 U 2204	22,0	391
L 100-400 U 3004	30,0	430
L 100-400 U 3704	37,0	465
L 100-400 U 4504	45,0	483
L 125-200 U 404	4,0	180
L 125-200 U 554	5,5	198
L 125-200 U 754	7,5	206
L 125-200 U 1104	11,0	230
L 125-250 U 554	5,5	195
L 125-250 U 754	7,5	203
L 125-250 U 1104	11,0	232
L 125-250 U 1504	15,0	248
L 125-250 U 1854	18,5	291
L 125-250 U 2204	22,0	309
L 125-270 U 754	7,5	225
L 125-270 U 1104	11,0	249
L 125-270 U 1504	15,0	265
L 125-270 U 1854	18,5	343
L 125-270 U 2204	22,0	361
L 125-315 U 1504	15,0	311
L 125-315 U 1854	18,5	354
L 125-315 U 2204	22,0	372
L 125-315 U 3004	30,0	411
L 125-315 U 3704	37,0	446
L 125-315 U 4504	45,0	464
L 125-400 U 2204	22,0	402
L 125-400 U 3004	30,0	441
L 125-400 U 3704	37,0	476
L 125-400 U 4504	45,0	509
L 125-400 U 5504	55,0	560
L 125-400 U 7504	75,0	730
L 150-250 U 1504	15,0	323
L 150-250 U 1854	18,5	358
L 150-250 U 2204	22,0	376
L 150-250 U 3004	30,0	415
L 150-315 U 1504	15,0	290
L 150-315 U 1854	18,5	342
L 150-315 U 2204	22,0	395
L 150-315 U 3004	30,0	434
L 150-315 U 3704	37,0	469
L 150-315 U 4504	45,0	487
L 150-315 U 5504	55,0	538
L 150-400 U 3004	30,0	463
L 150-400 U 3704	37,0	498
L 150-400 U 4504	45,0	516
L 150-400 U 5504	55,0	582
L 150-400 U 7504	75,0	752
L 150-400 U 9004	90,0	805
L 150-400 U 11004	110,0	871

Xylem Water Solutions Austria GmbH

Ernst Vogel-Straße 2

A-2000 Stockerau

Telefon: +43 (0) 2266 / 604

Fax: +43 (0) 2266 / 65311

E-Mail: info.austria@xyleminc.com

Internet: www.xylemaustria.com