

## Wilo-NPG

**GB** Installation and operating instructions

## 1 Introduction and Safety

### 1.1 General



**These instructions must always be kept close to the product's operating location or directly with the product.**

These instructions are intended to facilitate familiarization with the product and its permitted use. Operating the product in compliance with these instructions is important to help ensure reliability in service and avoid risks. The instructions may not take into account local regulations; ensure such regulations are observed by all, including those installing the product. Always coordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.



**These instructions should be read prior to installing, operating, using and maintaining the equipment in any region worldwide. The equipment must not be put into service until all the conditions relating to safety noted in the instructions, have been met.**

### 1.2 CE marking and approvals

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform with the applicable CE Marking Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED).

Where applicable the Directives and any additional Approvals cover important safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. Where applicable this document incorporates information relevant to these Directives and Approvals.

To confirm the Approvals applying and if the product is CE marked, check the serial number plate markings and the Certification. (See section 9, Certification.)

### 1.3 Disclaimer

**Information in these User Instructions is believed to be reliable. In spite of all the efforts to provide sound and all necessary information the content of this manual may appear insufficient and we don't guarantee as to its completeness or accuracy.**

We manufacture products to exacting International Quality Management System Standards as certified and audited by external Quality Assurance organizations. Genuine parts and accessories have been designed, tested and incorporated into the products to help ensure their continued product quality and performance in use.

Damage or failure caused by misuse is not covered by the warranty. In addition, any modification of products or removal of original components may impair the safety of these products in their use.

### 1.4 Copyright

All rights reserved. No part of these instructions may be reproduced, stored in a retrieval system or transmitted in any form or by any means without prior permission.

### 1.5 Duty conditions



**The product must not be operated beyond the parameters specified for the application. If there is any doubt as to the suitability of the product for the application intended, contact us for advice, quoting the serial number.**

If the conditions of service on your purchase order are going to be changed (for example liquid pumped, temperature or duty) it is requested that the user seeks the written agreement of the company before start up.

### 1.6 Safety

#### 1.6.1 Summary of safety markings

These User Instructions contain specific safety markings where non-observance of an instruction would cause hazards. The specific safety markings are:



This symbol indicates electrical safety instructions where non-compliance will involve a high risk to personal safety or the loss of life.



This symbol indicates safety instructions where non-compliance would affect personal safety and could result in loss of life.



This symbol indicates "hazardous and toxic fluid" safety instructions where non-compliance would affect personal safety and could result in loss of life.

**CAUTION!**

This symbol indicates safety instructions where non-compliance will involve some risk to safe operation and personal safety and would damage the equipment or property.

**NOTE:**

This sign is not a safety symbol but indicates an important instruction in the assembly process.

#### 1.6.2 Personnel qualification and training

All personnel involved in the operation, installation, inspection and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided.

### 1.6.3 Safety action

This is a summary of conditions and actions to prevent injury to personnel and damage to the environment and to equipment.



**NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER**



**GUARDS MUST NOT BE REMOVED WHILE THE PUMP IS OPERATIONAL**



**DRAIN THE PUMP AND ISOLATE PIPEWORK BEFORE DISMANTLING THE PUMP**

The appropriate safety precautions should be taken where the pumped liquids are hazardous.



**HANDLING COMPONENTS**

Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 25 kg (55 lb) use a crane appropriate for the mass and in accordance with current local regulations.



**THERMAL SHOCK**

Rapid changes in the temperature of the liquid within the pump can cause thermal shock, which can result in damage or breakage of components and should be avoided.



**NEVER APPLY HEAT TO REMOVE IMPELLER**

Trapped lubricant or vapour could cause an explosion.



**HOT (and cold) PARTS**

If hot or freezing components or auxiliary heating supplies can present a danger to operators and persons entering the immediate area action must be taken to avoid accidental contact. If complete protection is not possible, the machine access must be limited to maintenance staff only, with clear visual warnings and indicators to those entering the immediate area. Note: bearing housings must not be insulated and drive motors and bearings may be hot.

If the temperature is greater than 68 °C (175 °F) or below 5 °C (20 °F) in a restricted zone, or exceeds local regulations, action as above shall be taken.



**HAZARDOUS LIQUIDS**

When the pump is handling hazardous liquids care must be taken to avoid exposure to the liquid by appropriate siting of the pump, limiting personnel access and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied. Gland packing must not be used when pumping hazardous liquids.

**CAUTION!**

**PREVENT EXCESSIVE EXTERNAL PIPE LOAD**

Do not use pump as a support for piping. Do not mount expansion joints, so that their force, due to internal pressure, acts on the pump flange.

**CAUTION!**

**ENSURE CORRECT LUBRICATION**

(See section 5, Commissioning, startup, operation and shutdown.)

**CAUTION!**

**START THE PUMP WITH OUTLET VALVE PARTLY OPENED**

(Unless otherwise instructed at a specific point in the User Instructions.)

This is recommended to minimize the risk of overloading and damaging the pump motor at full or zero flow. Pumps may be started with the valve further open only on installations where this situation cannot occur. The pump outlet control valve may need to be adjusted to comply with the duty following the run-up process. (See section 5, Commissioning start-up, operation and shutdown.)

**CAUTION!**

**NEVER RUN THE PUMP DRY**

**CAUTION!**

**INLET VALVES TO BE FULLY OPEN WHEN PUMP IS RUNNING**

Running the pump at zero flow or below the recommended minimum flow continuously will cause damage to the seal.

**CAUTION!**

**DO NOT RUN THE PUMP AT ABNORMALLY HIGH OR LOW FLOW RATES**

Operating at a flow rate higher than normal or at a flow rate with no backpressure on the pump may overload the motor and cause cavitations. Low flow rates may cause a reduction in pump/bearing life, overheating of the pump, instability and cavitations/vibration.

### 1.7 Noise level

When pump noise level exceeds 85-dBA attention must be given to prevailing Health and Safety Legislation, to limit the exposure of plant operating personnel to the noise. The usual approach is to control exposure time to the noise or to enclose the machine to reduce emitted sound. You may have already specified a limiting noise level when the equipment was ordered, however if no noise requirements were defined then machines above a certain power level will exceed 85 dBA. In such situations consideration must be given to the fitting of an acoustic enclosure to meet local regulations.

Pump noise level is dependent on a number of factors - the type of motor fitted, the operating capacity, pipework design and acoustic characteristics of the building.

The figures in the table below are indicative only,

they are subject to a +3 dB tolerance, and cannot be guaranteed.

The values are based on the noisiest ungeared electric motors which are likely to be encountered. They represent Sound Pressure Levels at 1 m (3.3 ft) from the directly driven pump, for "free field over a reflecting plane".

If a pump only has been purchased, for fitting with your own driver, then the "pump only" noise levels from the table should be combined with the level for the driver obtained from the supplier. If the motor is driven by an inverter, it may show an increase in noise level at some speeds. Consult a Noise Specialist for the combined calculation.

Typical sound pressure level,  
dBA,  $L_{pA}$  at 1 m reference 20  $\sigma Pa$  ( $L_{WA}$  sound power 1 pW where  $L_{pA} > 85$  dBA)

Motor size and speed kW (hp)	3550 r/min		2900 r/min		1750 r/min		1450 r/min	
	Pump and motor dBA	Pump only dBA						
<0.55 (<0.75)	71	66	64	62	64	62	63	62
0.75 (1)	74	66	67	62	67	62	63	62
1.1 (1.5)	74	68	67	64	67	64	65	64
1.5 (2)	77	70	70	66	70	66	66	66
2.2 (3)	78	72	71	68	71	68	68	68
3 (4)	81	74	74	70	74	70	70	70
4 (5)	82	75	75	71	75	71	71	71
5.5 (7.5)	90 (99)	77	83	73	76	73	72	71
7.5 (10)	90 (99)	78	83	74	77	74	73	72
11 (15)	91 (100)	80	84	76	78	76	74	73
15 (20)	92 (101)	83	85 (94)	79	80	79	76	75
18.5 (25)	92 (101)	83	85 (94)	79	80	79	76	75
22 (30)	92 (101)	83	85 (94)	79	81	79	77	75
30 (40)	100 (109)	85 (94)	93 (102)	81	84	80	80	76
37 (50)	100 (109)	86 (95)	93 (102)	82	84	80	80	76
45 (60)	100 (109)	87 (96)	93 (102)	83	84	80	80	76
55 (75)	100 (109)	88 (97)	95 (104)	84	86 (95)	81	82	77
75 (100)	100 (109)	90 (99)	95 (104)	86 (95)	88 (97)	81	83	78
90 (120)	100 (109)	90 (99)	95 (104)	86 (95)	90 (99)	81	85 (94)	78
110 (150)	100 (109)	91 (100)	95 (104)	87 (96)	91 (100)	83	86 (95)	79
150 (200)	101 (110)	92 (101)	96 (105)	88 (97)	91 (100)	83	86 (95)	79

In areas where the staff has to intervene, remember that when the level of the sound pressure is:

**Below 70 dBA:**

It is not necessary to take special precautions.

**Above 70 dBA:**

People working continuously in the machine room must be supplied with protective devices against noise.

**Below 85 dBA :**

No particular measures need to be taken for casual visitors staying in the room during a limited period.

**Above 85 dBA:**

The room must be considered as a dangerous area because of the noise and a warning sign must be fixed at each entry warning the people coming into the room, even for a short period, that they must wear hearing protection.

**Above 105 dBA:**

Special hearing protection adapted to this noise

level and to the spectral noise components must be installed and a warning sign to this effect erected at each entry. The staff in the room must wear ear protection.

Make sure that the noise, which travels through the walls and windows, does not generate too high noise levels in the machine room's surroundings.

## 2 Transport and storage

### 2.1 Consignment receipt and unpacking

Immediately after receipt of the equipment it must be checked against the delivery and shipping documents for its completeness and that there has been no damage in transportation.

Any shortage and or damage must be reported immediately and received in writing within one month of receipt of the equipment. Later claims cannot be accepted.

Check any crate, boxes and wrappings for any accessories or spare parts that may be packed separately with the equipment or attached to

sidewalls of the box or equipment.

Each product has a unique serial number. Check that this number corresponds with that advised and always quote this number in correspondence as well as when ordering spare parts or further accessories.

## 2.2 Handling

### 2.2.1 General instructions concerning handling

Boxes, crates, pallets or cartons may be unloaded using forklift vehicles or slings dependent on their size and construction. See 2.3.1 for positioning of slings.

To lift heavy pieces above 25 kg (55 lb), use a winch adapted to the mass and in accordance with the current local regulations.

To lift machines or pieces with one or several suspension rings, only use hooks and chains in compliance with the local regulations concerning safety. Never put cables, chains or ropes directly on or in the suspension rings. Cables, chains or lifting ropes must never present excessive bending. Never bend the lifting hooks, suspension rings, chains, etc., which should only be made to endure stresses within, calculated limits. Remember that the capacity of a lifting device decreases when the direction of the lifting force direction makes an angle with the device axis.

To increase the safety and the efficiency of the lifting device, all the lifting elements must be as perpendicular as possible. If necessary a lifting beam can be placed between the winch and the load.

When heavy pieces are lifted up, never stay or work under the load or in the area, which could be in the path of the load if it were to swing or fall away. Never leave a load hanging from a winch. The acceleration or the slowing-down of lifting equipment must stay in the safety limits for the staff.

A winch must be positioned in such a way that the load will be raised perpendicularly. Where possible necessary precautions must be taken to avoid the swing of the load, using for example two winches making approximately the same angle, below 30°, with the vertical.

### 2.2.2 Pump masses

Pump type	Pump mass (kg)
NPG 65 – 315	140
NPG 100 – 315	160
NPG 150 – 200	130
NPG 150 – 500	475
NPG 200 – 250	175
NPG 200 – 315	260
NPG 200 – 355	265
NPG 200 – 400	370
NPG 200 – 500	420
NPG 250 – 250	290
NPG 250 – 315	330
NPG 250 – 355	370
NPG 250 – 400	415
NPG 250 – 500	500
NPG 300 – 300	370
NPG 300 – 400	480
NPG 300 – 450	550
NPG 300 – 500	710
NPG 350 – 350	700
NPG 400 – 500	1100
NPG 400 – 650	1250
NPG 500 – 500	1450

All motors (for masses see the motor description plate) must be handled with a winch.



**For masses above 25 kg (55 lb), manual handling is forbidden.**

## 2.3 Lifting

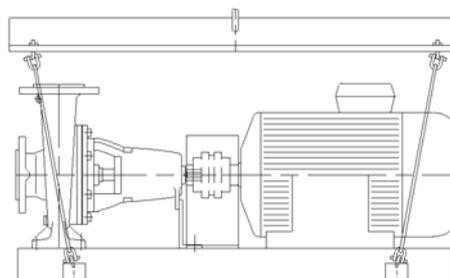
### 2.3.1 Slings of motor pumps units

Use handling means in accordance with motor pump unit mass mentioned on the CE plate. For the masses of the pumps bare end of shaft see table § 2.2.2 and nameplate.

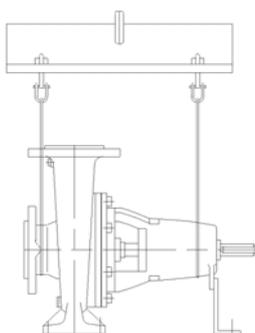
**CAUTION!**

**To avoid distortion, the pump unit should be lifted as shown.**

### Motor pump unit



## Bareshaft pump



**When handling always wear gloves, safety boots and an industrial safety helmet.**



**For masses above 25 kg (55 lb), manual handling is forbidden.**

#### 2.4 Storage

**CAUTION!**

**Store the pump in a clean, dry location away from vibration. Leave piping connection covers in place to keep dirt and other foreign material out of pump casing. Turn pump at intervals to prevent brinelling of the bearings and the seal faces, if fitted, from sticking.**

Do not store pumps starting on the fan guard.

The pump may be stored as above for up to 6 months. Consult us for preservative actions when a longer storage period is needed.

#### 2.5 Recycling and end of product life

At the end of the service life of the product or its parts, the relevant materials and parts should be recycled or disposed of using an environmentally acceptable method and local regulations. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current regulations. This also includes the liquids and or gases that may be used in the "seal system" or other utilities.



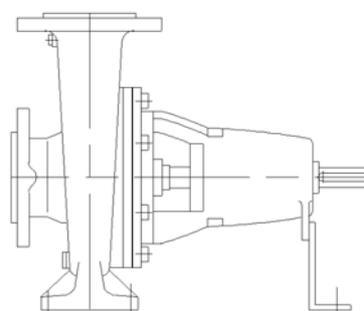
**Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current regulations at all times.**

### 3 Pump Description

#### 3.1 Configurations

The centrifugal motor pump unit is designed for the pumping of cold water or all clear liquids which are not solid and liquid mixtures, corrosive, abrasive or explosive when in contact with the pump motor unit and its working parts (Important: for other liquids consult us for preliminary advice).

The NPG type pump is a single-stage pump with axial suction, support under pump casing (Standard NF EN 733) and tangential vertical discharge. The pumps of this range allow to the removal of the pump rotor whilst leaving the pump casing connected to the suction and discharge pipework.



**The pump must be stored in a non-explosive, ventilated location, sheltered from bad weather, dust and vibrations.**

The reliability of the delivered machine can only be ensured if it is used according to the conditions given in this manual. The maximum values specified in this manual must never be exceeded..

Maximum working pressure at suction:	in the limit of the maximum working pressure at discharge for zero flow according to the pump type
Maximum pumped fluid temperature	
• Gland packing without cooling:	Ω105 °C
• Mechanical seal without cooling:	
• ACS version	Ω80 °C
• Standard version	Ω140 °C
Maximum solid suspension	50 g/m <sup>3</sup>
Density	1
Viscosity	1
Frequency	50 Hz
Maximum speed	
• for all pumps except	1450 min <sup>-1</sup>
• for NPG 400–500, NPG 400–650, NPG 500–500	990 min <sup>-1</sup>
• for NPG 65–315 , NPG 100–315	2900 min <sup>-1</sup>

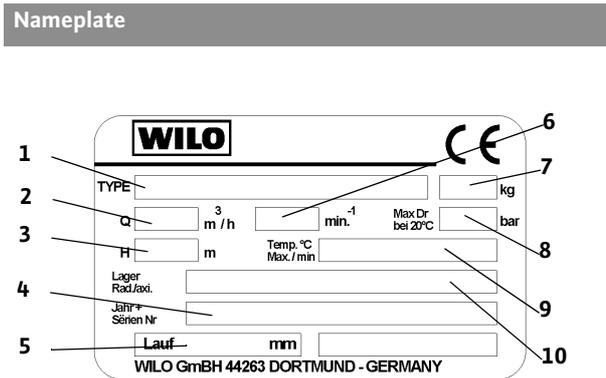
Maximum effective pressure at discharge in bar														
	NPG (cast iron EN-GJL-250) - PN 10							NPG (cast iron EN GJS-400-15) - PN 16 - PN 10						
..#	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN
Impeller	150	200	250	300	350	400	500	150	200	250	300	350	400	500
200	4							6						
250		4	4						6	6				
300				4							6			
315		8	8						12	12				
350					4							6		
355		8	8						12	12				
400		8	8	8					12	12	12			
450				8							12			
500	16	10	10	10		6.5	4		15	15	15		10	6
650						6.5							10	

### 3.2 Nomenclature

Designation of pump:

NPG 200 / 315 - 37 / 4-12 - ...	
NPG	Type of pump WILO
200	Nominal width of pipe mount
315	Diameter of impeller
37	Power of motor
4	2 or 4 poles motor
12	05 Mechanical seal-standard coupling
	12 Mechanical seal-coupling with spacer
	01 Packing gland-standard coupling
	02 Packing gland-coupling with spacer
XX	Other design
...	Options

Each pump is supplied with the following nameplate:

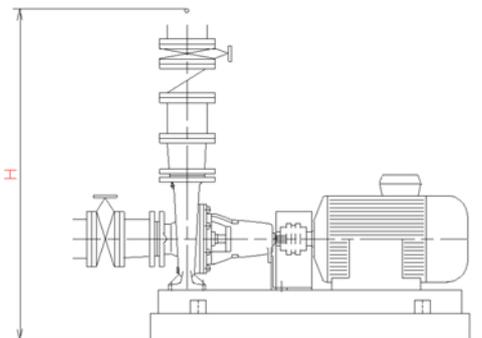


- 1 Type of pump
- 2 Flow rate
- 3 Head
- 4 Date of construction and article number
- 5 Diameter of impeller
- 6 Speed of rotation
- 7 Mass
- 8 Maximum admissible pressure at 20 °C
- 9 Maxi/Mini temperature
- 10 Radial/Thrust bearing

### 4 Installation

#### 4.1 Location

The pump should be located to allow room for access, ventilation, maintenance and inspection with ample headroom for lifting and should be as close as practicable to the supply of liquid to be pumped.



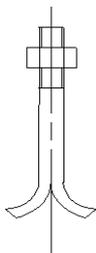
## 4.2 Foundation

**CAUTION!**

There are many methods of installing pump units to their foundations. The correct method depends on the size of the pump unit, its location and noise vibration limitations. Non-compliance with the provision of correct foundation and installation may lead to failure of the pump and, as such, would be outside the terms of the warranty.

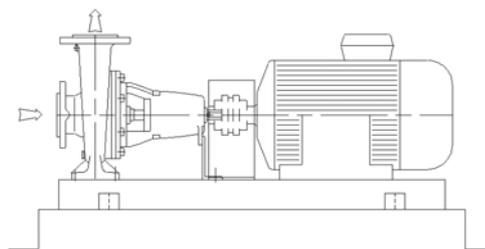
The base plate should be mounted onto a firm foundation, either an appropriate thickness of quality concrete or sturdy steel framework. It should NOT be distorted or pulled down onto the surface of the foundation, but should be supported to maintain the original alignment. Anchor bolts must be in accordance with the foot bolt holes. Use anchor bolts of accepted standards and sufficient to ensure seave fitting in the foundation.

Type of base	Article number	Length mm	∴ mm	Length thread mm
4	740707	300	20	60
5	740708			
6	740709			
7	740710	300	24	100
8	740711			
9	740712			
10	4084125			



Provide sufficient space in the foundation to accommodate the anchor bolts. If necessary, provide concrete risers. Usually the pump and its drive are mounted on a

common base plate.

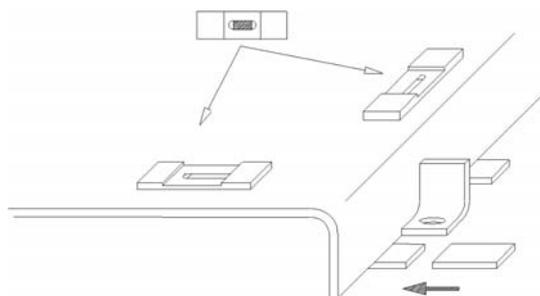


### 4.2.1 Setting the base plate for anchoring

- Clean the foundation surface thoroughly.
- Put shims on the foundation surface (approx 20–25 mm thick), one on each side of the bolt hole (as an alternative, leveling screws can be used).



- Lay the base plate and level in both directions with extra shims. The base plate should be level to within 0.5 mm per 1 m.



If anchor bolts have been pre-cast in the foundation slightly tighten the anchor bolts. Otherwise let them hang in the foundation holes.

### 4.3 Initial alignment

**CAUTION!**

Before connecting the couplings verify the motor rotation direction.

### 4.3.1 Thermal expansion

**CAUTION!**

The pump and motor will normally have to be aligned at ambient temperature and should be corrected to allow for thermal expansion at operating temperature. In pump installations involving high liquid temperatures, the unit should be run at the actual operating temperature, shut down and the alignment checked immediately.

### 4.3.2 Alignment methods



Ensure pump and driver are isolated electrically and the half couplings are disconnected. Ensure that the pump pipework, suction and discharge, is disconnected.

**CAUTION!**

The alignment **MUST** be checked.

Although the pump will have been aligned at the factory it is most likely that this alignment will have been disturbed during transportation or handling. If necessary, align the motor to the pump, not the pump to the motor.

#### Alignment

##### Parallelism and concentricity check:

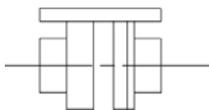
**CAUTION!**

Check the alignment at three or four points, before pipeworks assembly.

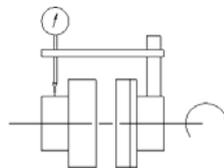
If necessary, improve the machine alignment: Complete unit mounted on common base plate: The machines are first aligned accurately in our workshops. Usually, any misalignment observed on-site is due to a wrong adjustment under the base plate (disturbed during transport or because of forces exerted by the pipework). It is only necessary to rectify the adjustment under base plate. If it proves to be insufficient, modify the motor and the pipeworks adjustment.



**Never connect the electric motor before the setting has been completely finished.**

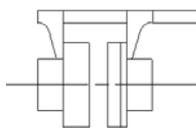


with a rule

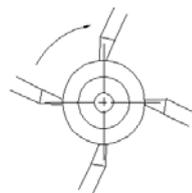


with a comparator

Admissible margin for a motor with roller bearings:  
 = 0.15 mm parallel checking  
 = 0.1 mm angular checking



with a sliding rule



with a caliper gauge

**CAUTION!**

The alignment will be definitive only after pipework connection (see § 4.4.4.).

## 4.4 Piping

### CAUTION!

Protective covers are fitted to the pipe connections to prevent foreign bodies entering during transportation and installation. Ensure that these covers are removed from the pump before connecting any pipes.

### 4.4.1 Suction and discharge pipework

The dimensions of the pipes do not directly depend on suction and discharge diameters of the pump.

- First, choose a flow speed  $< 2$  m/s at suction, and about 3 m/s at discharge.
- Take into account the available NPSH, which must be superior to the required NPSH of the pump.

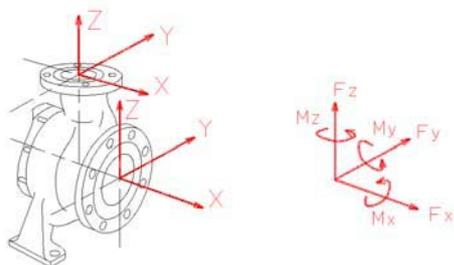
Never use pump as a support for piping. Do not mount expansion joints in such a way that their force, due to internal pressure, may act on the pump flange.

Maximum forces and moments allowed on the pump flanges vary with the pump size and type. These external strains may cause misalignment, hot bearings, worn couplings, vibrations and the possible failure of the pump casing.

When designing the pipes (§ 4.4.2.1, § 4.4.2.2, § 4.4.3.1) take necessary precautions in order not to exceed maximum allowed strains.

Forces and moments applied to the pump flanges must never exceed the values shown in the table below:

	DN Flange	Forces (daN)				Moments (m.daN)			
		F <sub>y</sub>	F <sub>z</sub>	F <sub>x</sub>	—F	M <sub>y</sub>	M <sub>z</sub>	M <sub>x</sub>	—M
Vertical Discharge	150	160	200	180	310	45	60	80	110
	200	215	265	240	415	85	100	125	180
	250	270	335	300	520	125	145	180	260
	300	320	400	360	625	170	200	240	355
	350	375	465	420	730	220	255	310	455
	400	430	530	480	835	275	320	390	570
	450	485	600	540	940	340	390	480	705
	500	540	665	600	1040	410	470	580	850
Horizontal Suction	150	180	160	200	315	45	60	80	110
	200	240	215	265	415	85	100	125	180
	250	300	270	335	520	125	145	180	260
	300	360	320	400	625	170	200	240	355
	350	420	375	465	730	220	255	310	455
	400	480	430	530	835	275	320	390	570
	450	540	485	600	940	340	390	480	705
	500	600	540	665	1040	410	470	580	850



Forces and moments values are applied to the whole flanges and not flange-by-flange. For their sharing out on the pump flanges, refer to standard NFCR 13 931.

### CAUTION!

Ensure piping and fittings are flushed before use.

### CAUTION!

Ensure piping for hazardous liquids is arranged to allow pump flushing before removal of the pump.

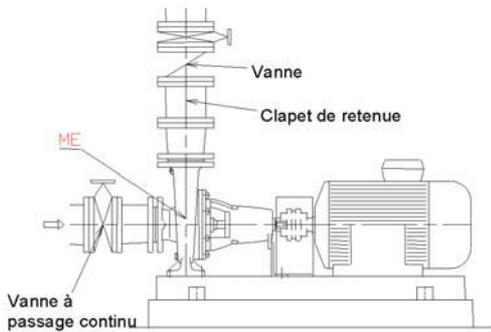
## 4.4.2 Suction piping

### 4.4.2.1 Design of a flooded suction line

The suction line must be as short and direct as possible, never mount an elbow directly on the

inlet flange of the pump.

### Flooded suction configuration



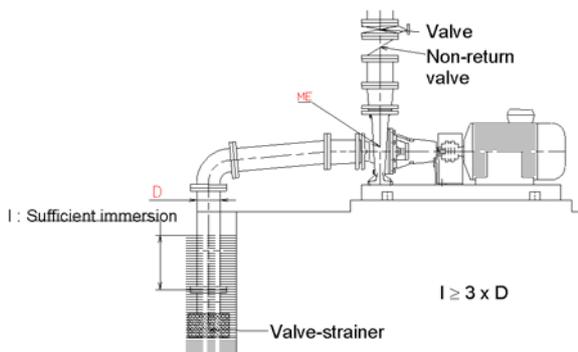
- Avoid sharp elbows or sudden narrowing. Use convergent  $\Omega 20^\circ$  (total angle).
- Arrange the pipework so that there are no air pockets (no bulges).
- If high points cannot be avoided in suction line, provide them with air relief cocks.
- If a strainer is necessary, its net area should be three or four times the area of the suction pipe.
- If an inlet valve is necessary, choose a model with direct crossing.

**CAUTION!**

**Do not tighten flanges before the final check (see § 4.4.4).**

#### 4.4.2.2 Design of a suction lift line

The inlet pipe must be as short and as direct as possible, never place an elbow directly on the pump inlet nozzle.



- Avoid sharp elbows or sudden narrowings. Use convergents  $20^\circ$  (total angle) with upright generating.
- Arrange that the suction pipework is inclined upwards towards the pump ensuring that there are no peaks.
- If a foot valve is necessary, do not oversize it because it would generate pulsations (valve beating).

**CAUTION!**

**Do not tighten flanges before the final check (see § 4.4.4).**

#### 4.4.3 Discharge piping

##### 4.4.3.1 Design of a discharge line

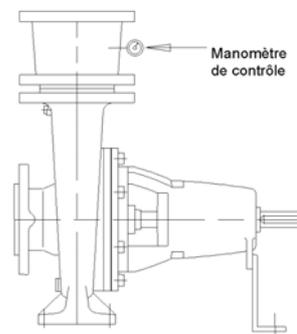
a) If discharge line is provided with a divergent, its total angle will be between  $7^\circ$  and  $12^\circ$ .

b) Install the discharge valve after the non-return valve downstream.

The non-return valve will be set in the discharge pipe to protect the pump from any excessive pressure surge and from reverse rotation.

If necessary, a control manometer can be connected on the pipework.

#### Installation of the control manometer



**CAUTION!**

**Do not tighten flanges before the final check (see § 4.4.4).**

#### 4.4.4 Final checks

- Check the tightening of anchor bolts. Tighten them if necessary.
- Check that protective covers on suction and discharge flanges are removed.
- Check that holes of pipework flanges are parallel and correspond to those of the pump.
- Tighten suction and discharge flanges.

#### 4.5 Electrical connections



**Electrical connections must be made by a qualified Electrician in accordance with relevant local national and international regulations. This includes any grounding.**



**It is important to be aware of the EUROPEAN DIRECTIVE on electromagnetic compatibility when wiring up and installing equipment on site. Attention must be paid to ensure that the techniques used during wiring/installation do not increase electromagnetic emissions or decrease the electromagnetic immunity of the equipment, wiring or any connected devices.**



**The motor must be wired up in accordance with the motor manufacturer's instructions (normally supplied within the terminal box) including any temperature, earth leakage, current and other protective devices as appropriate. The**

**identification nameplate should be checked to ensure the power supply is appropriate.**

A device to provide emergency stopping shall be fitted.

Carry out the ground connections according to the current local regulations.

**CAUTION!**

**To avoid any risk of jamming, the direction of rotation will be checked after priming of the pump (§ 5.3.1, § 5.3.2) and before the first start (§ 5.4.2).**

#### 4.6 Final shaft alignment check

- a) Check the alignment pump–motor according to the procedure § 4.3.2. Rectify if necessary by adjusting the motor only.
- b) Check by hand that the pump turns freely. A binding indicates a distortion of the pump, which is due to excessive pipes strains. If necessary the pipework design must be re-examined.
- c) If it provided, connect auxiliary pipe systems (hydraulic, pneumatic, sealing system).
- d) Control tightness and functionality of auxiliary piping.

#### 4.7 Protection systems

If there is any possibility of the system allowing the pump to run against a closed valve or below minimum continuous safe flow a protection device should be installed to ensure the temperature of the liquid does not rise to an unsafe level. If there are any circumstances in which the system can allow the pump to run dry, or start up empty, a power monitor should be fitted to stop the pump or prevent it from being started. This is particularly relevant if the pump is handling a flammable liquid.

If leakage of product from the pump or its associated sealing system can cause a hazard it is recommended that an appropriate leakage detection system is installed.

To prevent excessive surface temperatures at bearings it is recommended that temperature or vibration monitoring are carried out. See sections 5.5.4 and 5.5.5.

If a defect of cooling can lead to temperature higher than those acceptable a system of cooling surveillance must be installed.

Except when explicitly required by the customer in the specifications, when a possibility of reverse rotation exists the customer must install a reverse rotation protection device.

The customer must install all equipment required to avoid water hammer.

## 5 Commissioning, start-up, operation and shutdown



**These operations must be carried out by fully qualified personnel.**

### 5.1 Direction of rotation

**CAUTION!**

**Starting or operating pumps with the wrong direction of rotation can be harmful to the pumps. Ensure that the pump rotation is the same as the arrow on the pump casing.**

It is preferable to check the direction of rotation before installing the coupling. If not, the pump must be filled in with the liquid before start-up.

**CAUTION!**

**If maintenance work has been carried out to the site's electricity supply, the direction of rotation should be re-checked as above in case the supply phasing has been altered.**

### 5.2 Guarding



**Guarding is supplied fitted to the pump set. If this has been removed or disturbed ensure that all the protective guards around the pump coupling and exposed parts of the shaft are securely fixed.**

### 5.3 Priming and auxiliary supplies

**CAUTION!**

**Ensure all electrical, hydraulic, pneumatic, sealant and lubrication systems (as applicable) are connected and operational.**

**CAUTION!**

**Ensure the inlet pipe and pump casing are completely full of liquid before starting continuous duty operation.**

These operations must be carried out by personnel with approved qualifications.

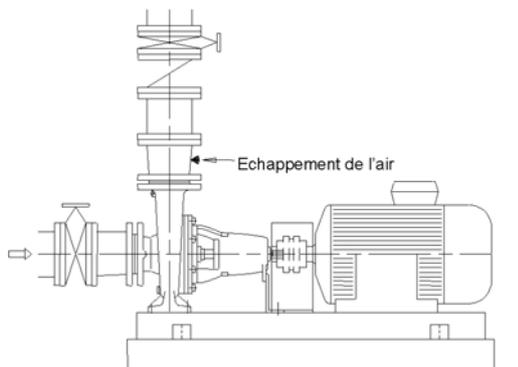
### 5.3.1 Priming of a flooded pump

Close the discharge valve; fill the pump by opening the suction valve. Let air escape by removing the plug located on the pipework.

The discharge pipe is headed and there is a by-pass valve on the check valve, open slightly the discharge valve and the by-pass of the check valve.

When the pump is totally free of air bubbles, replace the plugs.

#### Priming of a flooded suction pump



### 5.3.2 Priming of a sump suction pump

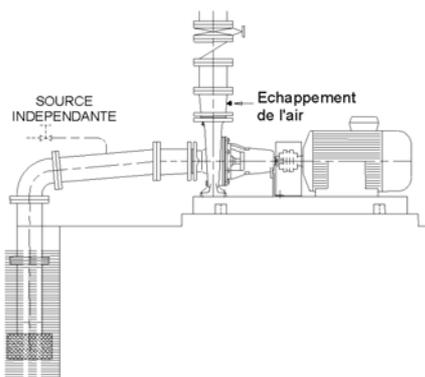
\* With foot valve:

Fill suction pipe and casing with liquid from an independent source (pressure 1 to 2 bars).

Let air escape by removing the plugs located on the pipework.

When the pump is totally free of air bubbles, replace the plugs.

#### Priming of a suction pump configuration with foot valve



\* Without foot valve:

Priming may be accomplished by means of venting system.

#### NOTE:

Foot valves are not recommended when the pumped liquid has suspended solid particles. They may lodge between foot valve seat and shutter.

### 5.4 Starting the pump

#### 5.4.1 Bring controls and preparation before the first starting and after each service call

##### Necessarily:

- Check the tightening of the different plugs.
- Check that the gland lightly tightens the packing rings.

#### CAUTION!

**Risk of seal ring overheating. Check the direction of rotation of the motor. Refer to the rotation arrow of the pump.**



**Install all protection systems and more particularly the coupling guard and the shield grid (reference [7450]) of the bearing.**

- Open all suction valves (if existing).
- Close the outlet valve and the bypass valve.
- Ensure inlet pipe and pump casing are completely full of liquid.

#### 5.4.2 First pump start-up

#### CAUTION!

**Suction valves must be fully open when pump is running. Never run the pump dry, it will cause damage.**

- Start motor and check outlet pressure.
- If pressure is satisfactory, slowly OPEN outlet valve.
- Do not run the pump with the outlet valve closed for a period longer than 30 seconds.
- If NO pressure, or LOW pressure, STOP the pump. Refer to faultfinding chart for fault diagnosis.
- The pump should run smoothly and without vibration.
- The pump must never run at a capacity of less than 40 % of that at the best efficiency.

**Never remove a plug when the pump is running.**



### 5.5 Running the pump

#### 5.5.1 Venting the pump



**Vent the pump to enable all trapped air to escape taking due care with hot or hazardous liquids.**

**Under normal operating conditions, after the pump has been fully primed and vented, it should be unnecessary to re-vent the pump.**

#### 5.5.2 Pump fitted with a stuffing box

If the pump has a packed gland there must be some leakage from the gland. Gland nuts should initially be finger tight only. Leakage should take place soon after the stuffing box is pressurized. If no leakage takes place the packing will begin to overheat. If overheating takes place the pump should be stopped and allowed to cool before being restarted.

When the pump is restarted it should be checked to ensure leakage is taking place at the packed gland.

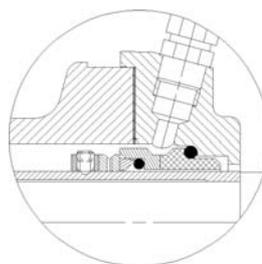


**When adjusting an operating stuffing box (shield grids removed for this operation) the operator must be very careful. Safety gloves are compulsory and loose clothes are not allowed (above all to the arms) to avoid being caught by the pump shaft.**

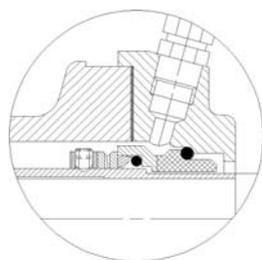
The pump should be run for ten minutes with steady leakage and the gland nuts tightened by 10 degrees at a time until leakage is reduced to an acceptable level.

The temperature of the gland should be checked after each round of tightening. If the temperature starts to climb rapidly then back off the gland nuts until the temperature drops down. Wait for the temperature to stabilize before tightening again. The leakage must not be reduced below a rate of 20 drops per minute.

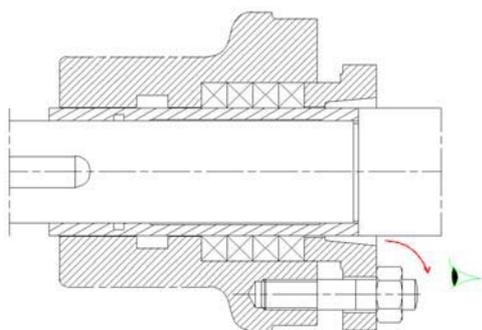
Bedding in of the packing may take several hours.



Simple mechanical seal  
Other NPG



Balanced mechanical seal  
Other NPG



**CAUTION!** Never run a mechanical seal dry, even for a short while.

**Safety instructions when the pump is running.**

If hot or freezing components of the machine can present a danger to operators, they must be shielded to avoid accidental contact. If a 100 % protection is not possible, the machine access must be confined to the maintenance staff only.



**If the temperature is greater than 80 °C, a warning plate must be clearly placed on the pump.**

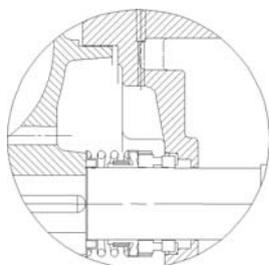
It is strictly forbidden to open switch cupboards, switch boxes, or all other live electric equipment. If it is necessary to open them in order to take readings, to carry out tests or adjustments for example, only a skilled technician may do them with adapted tools. Make sure that physical protections against electrical risks are used.



**Shield grids being removed during installation of the gland packing, it must be ensured that they are replaced as soon as this operation is completed.**

**5.5.3 Pump fitted with mechanical seal**

A mechanical seal ensures a seal without leakage and does not need any adjustment. Nevertheless if a light leakage occurs during start-up, it should disappear after the initial running in of the friction faces.



Mechanical Seal  
For NPG 150-200,  
200-250, 200-315  
200-355, 250-250  
250-315, 300-300,  
65-315A, 100-315A

**5.5.4 Bearings**

It is important, particularly with grease lubrication, to keep a check on bearing temperatures. After start up the temperature rise should be gradual, reaching a maximum after approximately 1.5 to 2 hours. This temperature rise should then remain constant or marginally reduce with time.

**5.5.5 Normal vibration levels, alarm and trip**

For guidance, pumps generally fall under a classification for rigid support machines within the International rotating machinery standards and the recommended maximum levels below are based on those standards.

Vibration velocity - unfiltered		mm/s (in./s)r.m.s.
Normal	<b>N</b>	Ω5.6 (0.22)
Alarm	<b>N x 1.25</b>	Ω7.1 (0.28)
Shutdown trip	<b>N x 2.0</b>	Ω11.2 (0.44)

**CAUTION!**

**Alarm and trip values for installed pumps should be based on the actual measurements (N) taken on site on the bearing housings of the pump in the fully commissioned as new condition. Measuring vibration at regular intervals will then show any deterioration in pump or system operating conditions.**

The example (N) value is given for the preferred operating flow region (typically this may extend to 70 to 120 % of the pump best efficiency point); outside the preferred flow region the actual vibration experienced may be multiplied by up to 2. These standard values can vary with the rotational speed and the power absorbed by the pump. For any special case, do not hesitate to consult us.

### 5.5.6 Stop/start frequency

Pump sets are normally suitable for the number of equally spaced stop/starts per hour shown in the table below. Check actual capability of the driver and control/starting system before commissioning.

Motor rating kW (hp)	Maximum stop/starts per hour
Up to 15 (20)	15
Between 15 (20) and 90 (120)	10
90 (120) to 150 (200)	6
Above 150 (200)	Refer

Where duty and standby pumps are installed it is recommended that they are run alternately every week.

## 5.6 Stopping and shutdown

### 5.6.1 Stopping and restarting in continuous running

According to hydraulic conditions of the installation and its automation degree, stop and restart procedures can have different forms. Nevertheless all of them must respect imperatively the following rules:

#### Stopping:

- Avoid that the unit turns in the opposite direction to the normal running.
- Make sure that the discharge line pressure does not reach the foot valve.
- Avoid a continuous running below the authorized flow rate (see § 5.4.2).

#### Restart:

- Ensure that the pump is completely full of liquid.
- Ensure a continuous supply with a sufficient available NPSH.
- Ensure a backpressure so that the motor power is not in excess.

**CAUTION!**

**Respect the starting frequency imposed by the motor manufacturer.**



**Protect the pump against water hammer when stopping or starting**

**Shutdown:**

**CAUTION!**

**Close the outlet valve and stop the motor. Eventually close the inlet valve.**

**CAUTION!**

**For prolonged shutdowns and especially when ambient temperatures are likely to drop below freezing point, the pump and any cooling and flushing arrangements must be drained or otherwise protected.**

### 5.7 Hydraulic, mechanical and electrical duty

This product has been supplied to meet the performance specifications of your purchase order, however it is understood that during the life of the product these may change. The following notes may help the user decide how to evaluate the implications of any change.

#### 5.7.1 Specific gravity (SG)

Pump capacity and total head in meters (feet) do not change with SG, however pressure displayed on a pressure gauge is directly proportional to SG. Power absorbed is also directly proportional to SG. It is therefore important to check that any change in SG will not overload the pump driver or overpressurize the pump.

#### 5.7.2 Viscosity

For a given flow rate the total head reduces with increased viscosity and increases with reduced viscosity. Also for a given flow rate the power absorbed increases with increased viscosity, and reduces with reduced viscosity.

#### 5.7.3 Pump speed

Changing pump speed effects flow, total head, power absorbed, NPSHR, noise and vibration. Flow varies in direct proportion to pump speed, head varies as speed ratio squared and power varies as speed ratio cubed.

The new duty, however, will also be dependent on the system curve. If increasing the speed, it is important therefore to ensure the maximum pump working pressure is not exceeded, the driver is not overloaded,  $NPSHA > NPSHR$ , and that noise and vibration are within local requirements and regulations.

#### 5.7.4 Pumped flow

Flow must not fall outside the minimum and maximum continuous safe flow shown on the pump performance curve and or data sheet.

### 5.8 Pumps for Food Use or Potable Water (ACS range)

If the pump has not been specifically ordered for a food or drinking water application it must not be used for these types of applications. If it has been ordered for this type of application the following

recommendations are to be followed.

### 5.8.1 Cleaning prior to operation

Pumps that are to be used for a food or drinking water application should be cleaned before being put into initial operation and after the installation of spare parts that are in contact with the liquid. Cleaning once the pump has been commissioned will depend on the application and operating conditions. The user must ensure that the cleaning procedures are suitable for the application and operating conditions, and local regulations.

## 6 Maintenance

### 6.1 General



**It is the plant operator's responsibility to ensure that all maintenance, inspection and assembly work is carried out by authorized and qualified personnel who have adequately familiarized themselves with the subject matter by studying this manual in detail (see also section 1.6.2.).**

Any work on the machine must be performed when it is at a standstill. It is imperative that the procedure for shutting down the machine is followed, as described in section 5.6.

On completion of work all guards and safety devices must be re-installed and made operative again.

Before restarting the machine, the relevant instructions listed in section 5, Commissioning, start up, operation and shut down must be observed.



**Oil and grease leaks may make the ground slippery. Machine maintenance must always begin and finish by cleaning the ground and the exterior of the machine.**

Before working on the pump, take measures to prevent an uncontrolled start. Put a warning board on the starting device with the words:

**"Machine under repair: do not start".**

With electric drive equipment, lock the main switch open and withdraw any fuses. Put a warning board on the fuse box or main switch with the words:

**"Machine under repair: do not connect".**

Never clean equipment with inflammable solvents or carbon tetrachloride. Protect yourself against toxic fumes when using cleaning agents.

### 6.2 Maintenance schedule

#### 6.2.1 Standard maintenance

Roller bearing

##### 6.2.1.1 For NPG 150-200, 200-315, 200-355, 250-250, 250-315, 300-300, 65-315A, 100-315A

The bearing housings are provided with sealed for life ball bearings. No maintenance is required.

##### 6.2.1.2 For other NPG

The bearings fitted are prepacked with grease at the factory. When the regressing period is reached it is necessary to remove as much of the old grease as possible with a clean lint free cloth and repack the bearings with fresh grease.

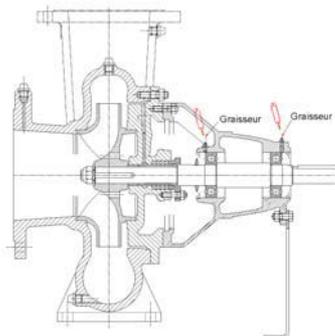
Pump type	Lubrication in hours frequency* of operation		Added quantity in cm <sup>3</sup>	
	Coupling side	Pump side	Coupling side	Pump side
NPG 150 - 500	4 000	4 000	30	30
NPG 200 - 250	6 000	6 000	15	15
NPG 200 - 400	8 000	8 000	25	25
NPG 200 - 500	4 000	4 000	30	30
NPG 250 - 355	8 000	8 000	25	25
NPG 250 - 400	8 000	8 000	25	25
NPG 250 - 500	4 000	4 000	30	30
NPG 300 - 400	8 000	8 000	25	25
NPG 300 - 450	4 000	4 000	30	30
NPG 300 - 500	3 500	3 500	50	50
NPG 350 - 350	4 000	4 000	40	40
NPG 400 - 500	3 500	3 500	50	50
NPG 400 - 650	3 500	3 500	50	50
NPG 500 - 500	3 500	3 500	50	50

\*At least once a year

The grease used in factory for first filling is:  
SHELL ALVANIA R2

Its equivalents:

- MOBIL: Mobilux EP 2,
- TOTAL: Multis 2,
- ELF: ELF MULTI



### 6.2.2 Routine inspection (daily/weekly)

#### CAUTION!

The following checks should be made and the appropriate action taken to remedy any deviations:

- Check operating behavior. Ensure noise, vibration and bearing temperatures are normal.
- Check that there are no abnormal fluid or lubricant leaks (static and dynamic seals) and that any sealant systems (if fitted) are full and operating normally.
- Pump fitted with a stuffing box: leakage of 20 drops per minute.
- Pump fitted with a mechanical seal: no leakage.
- Check the level and condition of oil lubricant. On grease lubricated pumps, check running hours since last recharge of grease or complete grease change.

### 6.2.3 Periodic inspection (six monthly)

#### CAUTION!

a) Check foundation bolts for security of attachment and corrosion.

- Check pump-running records for hourly usage to determine if bearing lubricant requires changing.
- The coupling should be checked for correct alignment and worn driving elements.

#### NOTE:

If a check shows a bad running of the motor pump unit, the user must: Refer to the "fault finding chart" chapter 7 of this leaflet to apply the recommended solutions.

Ensure that your equipment corresponds to the arrangements of this leaflet.

### 6.2.4 Mechanical seals

The current maintenance is limited to seal control. It is necessary to detect any small leakage which announces the beginning of the deterioration of friction faces or secondary seal elements (rings, bellows, synthetic membranes). It is advisable to stop the pump as soon as possible. Have an approved seal vendor replace or repair the seal.

### 6.2.5 Gland packing

#### 6.2.5.1 Pump fitted with a packed gland

A well run in and correctly adjusted packing gland requires little maintenance.

If, after some time, the leakage becomes too great, the gland should be tightened again in order to return these to a normal level.

If re-tightening is not possible, new packing must be installed.

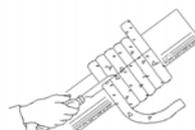
#### 6.2.5.2 Gland packing inspection and removal

- Remove the shield guards
- Slide back the gland
- Remove the packing rings with an extractor designed for this purpose (including the lantern ring if it exists; note its position and its direction of rotation).
- Inspect the state of the sleeve surface; the presence of many marked grooves will indicate that it must be replaced.
- Carefully clean the different pieces of the packing gland.

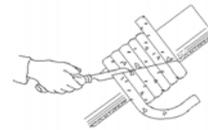
#### 6.2.5.3 Gland packing fitting

If the packing is supplied as cord the packing must be cut so that the external diameter is lightly tightened and there is an initial gap between the sleeve and the packing ring.

For that purpose, wind the packing helically around the shaft sleeve or a chuck of the same diameter. (Take precautions to avoid damaging sleeve)



Exemple de coupe droite



Exemple de coupe biaisé

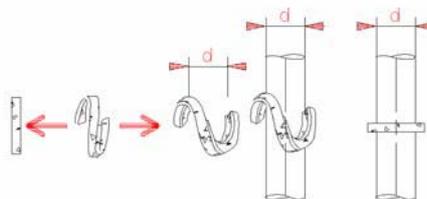
#### CAUTION!

Ensure a tightening on the stuffing box housing and not on the sleeve.

#### Setting of packing

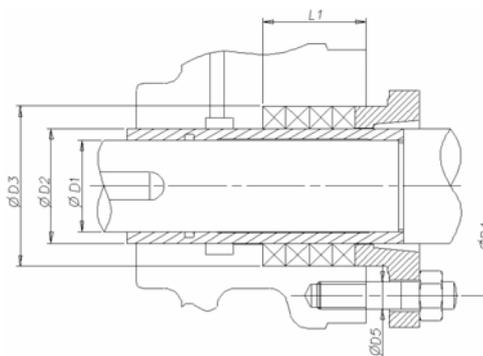
Follow the instructions:

- Assemble of the packing in S.
- Stagger by about 90° between two rings.
- Assemble packing after packing.



After setting the last packing ring, secure the packing with the gland and tighten the nut by hand.

After tightening, the shaft should turn by hand as easily as before the setting of the packing.



Pump	Dimensions in millimeters						Gland packing		
	Stuffing box size	D1	D2	D3	D4	D5	L1	Qty	mm
NPG 150–200	44/64	38	44	64	86	M12	45	4	10
NPG 150–500	55/90	55	65	90	120	M16	65	5	12
NPG 200–250	44/64	38	44	64	86	M12	45	4	10
NPG 200–315	56/76	50	56	76	86	M12	45	4	10
NPG 200–355	56/76	50	56	76	86	M12	45	4	10
NPG 200–400	49/85	49	60	85	110	M14	65	5	12
NPG 200–500	55/90	55	65	90	120	M16	65	5	12
NPG 250–250	56/76	50	56	76	86	M12	45	4	10
NPG 250–315	56/76	50	56	76	86	M12	45	4	10
NPG 250–355	49/85	49	60	85	110	M14	65	5	12
NPG 250–400	55/90	55	65	90	120	M16	65	5	12
NPG 250–500	55/90	55	65	90	120	M16	65	5	12
NPG 300–300	56/76	40	56	76	86	M12	45	4	10
NPG 300–400	55/90	55	65	90	120	M16	65	5	12
NPG 300–450	55/90	55	65	90	120	M16	65	5	12
NPG 300–500	74/120	74	90	120	150	M16	64	4	14
NPG 350–350	55/90	55	65	90	120	M16	65	5	12
NPG 400–500	74/120	74	90	120	150	M16	64	4	14
NPG 400–650	74/120	74	90	120	150	M16	64	4	14
NPG 500–500	80/132	80	100	132	180	M16	72	4	16

### 6.3 Spare parts

#### 6.3.1 Ordering of spares

When ordering spares the following information should be quoted:

- 1 Pump serial number.
- 2 Pump size.
- 3 Part name
- 4 Part number
- 5 Number of parts required.

The pump size and serial number are shown on the pump nameplate.

To ensure continued satisfactory operation, replacement parts to the original design specifica-

tion should be of our supply. Any change to the original design specification (modification or use of a non-standard part) will invalidate the pump's safety certification.

#### 6.3.2 Storage of spares

Spares should be stored in a clean dry area away from vibration. Inspection and re-treatment of metallic surfaces (if necessary) with preservative is recommended at 6 monthly intervals.

#### 6.4 Recommended spares and consumable items

[1500], [2250], [3011], [3012], [4130], [4610]

Destroy all the gaskets after dismantling, replace them when reassembling.

**It is recommended that bearings are not reused after any removal from the shaft.**

After serving during two years, replace the gland packing.

### 6.5 Disassembly



Refer to section 1.6, Safety, and section 6 Maintenance, before dismantling the pump.

#### CAUTION!

Before dismantling the pump for overhaul, ensure genuine replacement parts are available. Refer to sectional drawings for part numbers and identification.



#### Repair of the pump

If the pump presents abnormalities or a persistent malfunction, contact immediately the After-sales Service.

According to the After-sales Service instructions, disassembly will be limited to the dismantling of the pump.



#### Disconnect the unit from power

- Close the inlet valve (if fitted) and outlet valve.
- Wait for the moment when the pump casing is cooled and at ambient temperature.



#### Drain pump

Dismantle inlet and outlet pipeworks as well as all pipeworks.



REMOVE PUMP TAKING INTO ACCOUNT SAFETY (§ 1) AND HANDLING (§ 2.2) PROCEDURES.



ANY DISASSEMBLY, REPAIR OR REASSEMBLY WILL BE CARRIED OUT UNDER FLOWSERVE' RESPONSABILITY, EITHER DIRECTLY BY THE AFTER-SALES SERVICE OR BY OTHER FLOW-SERVE-AGENTS WHO WILL GET THE REQUIRED INSTRUCTIONS AND APPROVALS. THIS IS THE CASE OF AUTHORIZED REPAIRERS WHOSE ADDRESSES AND TELEPHONE NUMBERS WILL BE GIVEN ON REQUEST.

## 7 Faults, Causes and Remedies

Trouble	Possible Causes	Solutions
Insufficient flowrate	Pump or suction pipe not completely filled	Check and complete filling
	Air bubbles in pipes	Check and desecrate the pipes
	Suction level too low	<ul style="list-style-type: none"> <li>• Check: the available NPSH &gt; the required NPSH</li> <li>• Reduce geometrical suction lift</li> <li>• Reduce head losses in pipes and in fittings (diameter increase and appropriate fitting positions)</li> <li>• Check valves and strainers</li> <li>• Check the immersion head of the suction valve</li> </ul>
	Wrong rotation	Reverse 2 phases on motor terminal boxes
	The motor is running on 2 phases only	Check and control the motor electrical power supply
	Motor running too low	Check the connection in the terminal box according to the voltage
	Total manometric head system higher than pump differential head	<ul style="list-style-type: none"> <li>• Check the discharge head</li> <li>• Check the head losses in discharge pipes (partly closed valve, foreign particles, back pressure too high)</li> <li>• Modify the installation or change the pump set</li> </ul>
	Pipes (valves, filter...)	Control, dismantle and clean
	Worn wear-ring surfaces	Foresee pump mending
Irregular pump running	Pump or suction pipe not completely filled	Check and complete filling
	Air bubbles in pipes	Check and desecrate the pipes
	The motor is running on 2 phases only	Check and control the motor electrical power supply
	Seizure, jamming	CONSULT US
	Excessive strains on flanges	Check the flange connections and eliminate strains (pipe positioning or elastic sleeves mounting)
	Defective motor bearings	CONSULT US

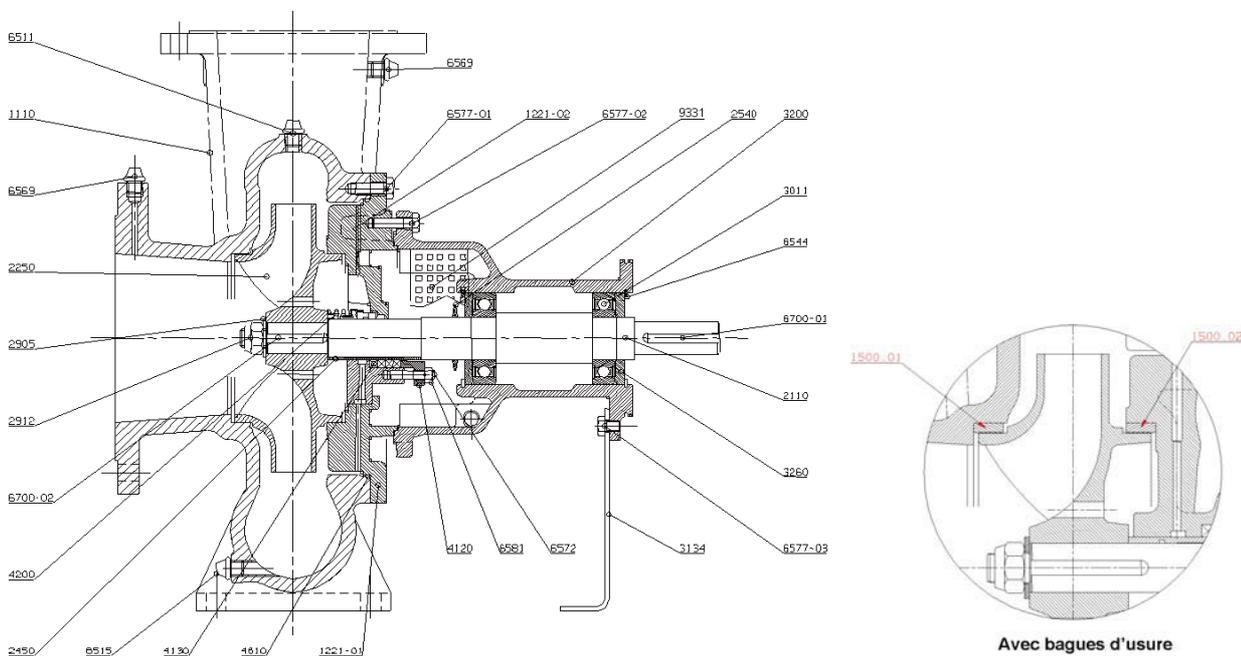
Trouble	Possible Causes	Solutions
Driver overload	The motor is running on 2 phases only	Check and control the motor electrical power supply
	Total manometric head system lower than pump differential head	Throttle at discharge valve or trim the impeller (contact our local agent)
	Seizure, jamming	CONSULT US
	Excessive strains on flanges	Check the flange connections and eliminate strains (pipe positioning or elastic sleeves mounting)
	Defective motor bearings	CONSULT US
	Specific gravity or viscosity of liquid too high	Consult our local agent to analyze the problem
Mechanical seal leak	Seizure, jamming	CONSULT US
	Excessive strains on flanges	Check the flange connections and eliminate strains (pipe positioning or elastic sleeves mounting)
	Defective gland packing on the shaft	<ul style="list-style-type: none"> <li>• Check and replace all the gland packing parts</li> <li>• Mechanical seal</li> </ul>
	Defective motor bearings	CONSULT US
Equipment vibration	Pump or suction pipe not completely filled	Check and complete filling
	Air bubbles in pipes	Check and desecrate the pipes
	Suction level too low	<ul style="list-style-type: none"> <li>• Check: the available NPSH &gt; the required NPSH</li> <li>• Reduce geometrical suction lift</li> <li>• Reduce head losses in pipes and in fittings (diameter increase and appropriate fitting positions)</li> <li>• Check valves and strainers</li> <li>• Check the immersion head of the suction valve</li> </ul>
	Total manometric head system higher than pump differential head	<ul style="list-style-type: none"> <li>• Check the discharge head</li> <li>• Check the head losses in discharge pipes (partly closed valve, foreign particles, back pressure too high)</li> <li>• Modify the installation or change the pump set</li> </ul>
	Total manometric head system lower than pump differential head	Throttle at discharge valve or trim the impeller (contact our local agent)
	Pipes (valves, filter...)	Control, dismantle and clean
	Insufficient flow rate	Check the suction and discharge pipes (valves, back pressure)
	Seizure, jamming	CONSULT US
	Excessive strains on flanges	Check the flange connections and eliminate strains (pipe positioning or elastic sleeves mounting)
	Defective motor bearings	CONSULT US
	Misalignment	Check the alignment of the pump and of its driver
	Foundations not sufficiently rigid	Check the setting of base plates: tightening, bad adjustment, seal

Trouble	Possible Causes	Solutions
Excessive pump casing temperature	Pump or suction pipe not completely filled	Check and complete filling
	Suction level too low	<ul style="list-style-type: none"> <li>• Check: the available NPSH &gt; the required NPSH</li> <li>• Reduce geometrical suction lift</li> <li>• Reduce head losses in pipes and in fittings (diameter increase and appropriate fitting positions)</li> <li>• Check valves and strainers</li> <li>• Check the immersion head of the suction valve</li> </ul>
	Wrong rotation	Reverse 2 phases on motor terminal boxes
	Pipes (valves, filter...)	Control, dismantle and clean
	Insufficient flow rate	Check the suction and discharge pipes (valves, back pressure)
	Specific gravity or viscosity of liquid too high	Consult our local agent to analyze the problem
	Mechanical defects	CONSULT US
Insufficient pressure	Rotation speed too low (check the driver)	Check the connection in the terminal box according to the voltage
	Presence of air	Check and de-aerate
	Suction pressure insufficient	Check: the available NPSH > the required NPSH
	Mechanical defects	CONSULT US
Pump loses prime after starting	Presence of air	Check and de-aerate
	Air leak in the suction pipe	Check suction pipe is airtight
	Restriction in suction pipe	Check diameter of suction pipe
	Suction level too low	<ul style="list-style-type: none"> <li>• Check the NPSH &gt; NPSH</li> <li>• Reduce geometrical suction lift</li> <li>• Reduce head losses in pipes and in fittings (diameter increase and appropriate fitting positions)</li> <li>• Check valves and strainers</li> <li>• Check the immersion head of the suction valve</li> </ul>
	Obstruction of suction pipe	Check condition of pipe
	Defective gland packing on the shaft	<ul style="list-style-type: none"> <li>• Check and replace all the gland packing.</li> <li>• Mechanical seal</li> </ul>
	Defective gasket	CONSULT US
	Mechanical defects	CONSULT US

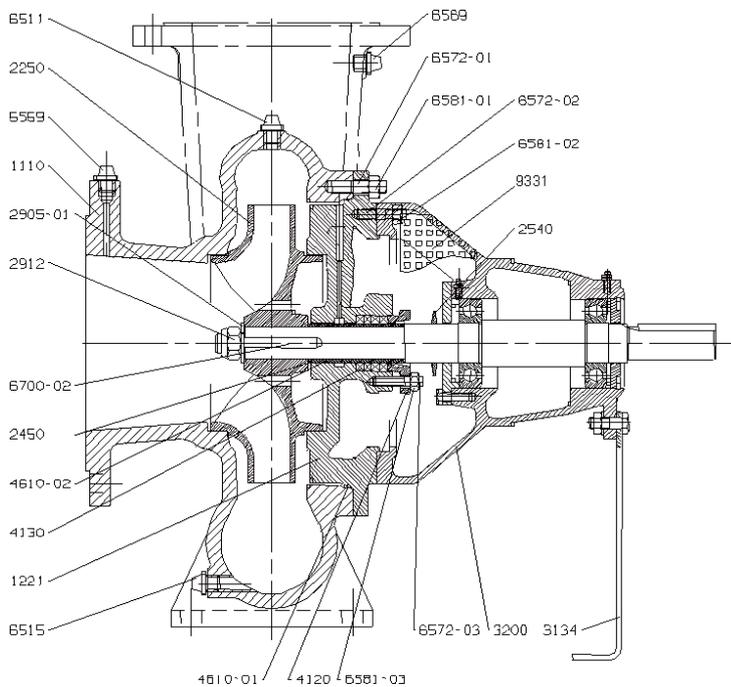
## 8 Parts list and drawings

### 8.1 Sectional drawings

#### Pump NPG Bearing Size 32/42

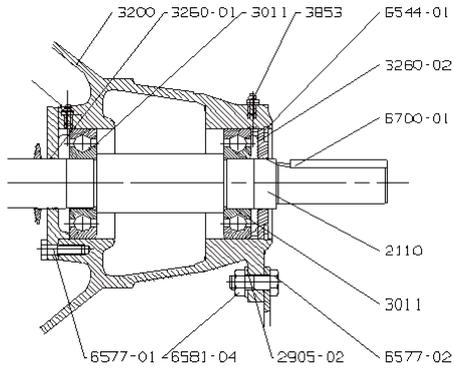


#### Pump NPG Bearing Size 55

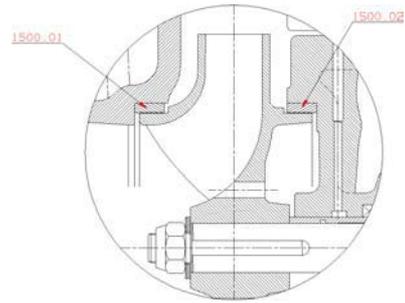
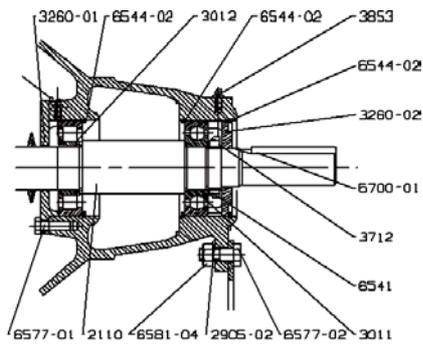


**Bearing 55a and 55b**

**Palier de 55A**

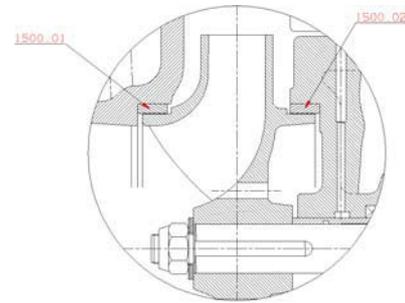
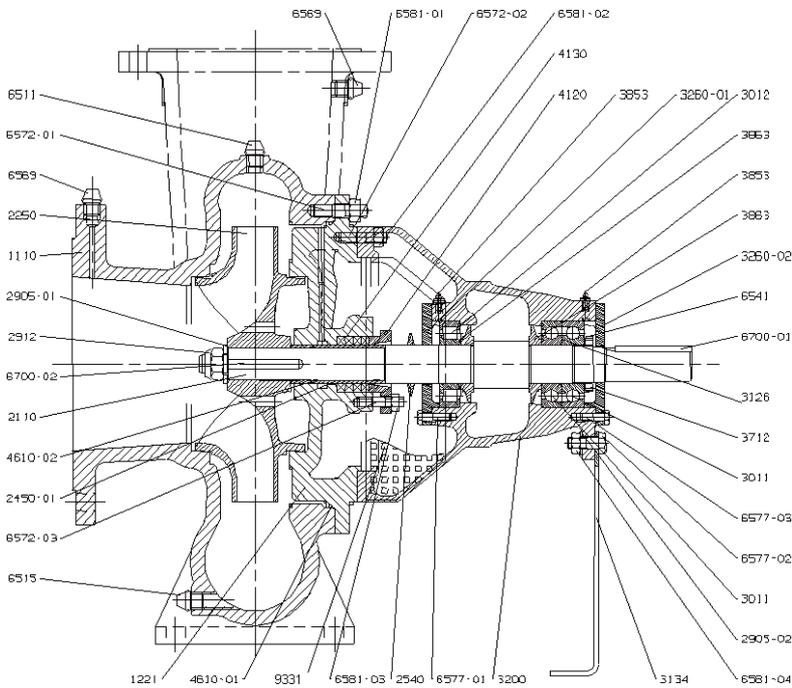


**Palier de 55B**



**Avec bagues d'usure**

**Pump NPG Bearing Size 70**



**Avec bagues d'usure**

## 8.2 Sectional drawings part list

Parts list	
N°	Designation
1110	Pump casing
1221	Casing cover
1221-01	Casing cover
1221-02	Casing cover
1500-01	Wear ring
1500-02	Wear ring
2110	Pump shaft
2250	Impeller
2450	Shaft sleeve
2450-01	Shaft sleeve
2540	Thrower
2905	Washer
2905-01	Washer
2905-02	Washer
2912	Impeller nut
3011	Radial ball bearing
3012	Radial roller bearing
3126	Shim
3134	Support foot
3200	Bearing housing
3260	Bearing cover
3260-01	Bearing cover
3260-02	Bearing cover
3712	Bearing nut
3853	Grease nipple
3863	Grease regulator
4120	Gland
4130	Gland packing
4200	Mechanical seal
4590-01	Gasket
4590-02	Gasket
4590-03	Gasket
4610-01	O-ring
4610-02	O-ring
6511	Priming plug
6515	Drain plug
6541	Lockwasher
6544	Circlip
6544-01	Circlip
6544-02	Circlip
6569	Screwed plug
6572	Stud
6572-01	Stud
6572-02	Stud
6572-03	Stud
6577-01	Hexagon head bolt
6577-02	Hexagon head bolt
6577-03	Hexagon head bolt
6581	Hexagon nut
6581-01	Hexagon nut
6581-02	Hexagon nut
6581-03	Hexagon nut
6581-04	Hexagon nut
6700-01	Coupling key
6700-02	Impeller key
7450	Various protection

## 8.3 General arrangement drawing

The typical general arrangement drawing and any specific drawings required by the contract will be sent to the Purchaser separately unless the contract specifically calls for these to be included into the User Instructions. If required, copies of other drawings sent separately to the Purchaser should be obtained from the Purchaser and retained with these User Instructions.

## 9 Certification

Certificates determined from the Contract requirements are provided with these instructions where applicable. Examples are certificates for CE marking, ATEX marking etc. If required, copies of other certificates sent separately to the Purchaser should be obtained from the Purchaser for retention with these User Instructions.

## 10 Other relevant documentation and manuals

### 10.1 Supplementary User Instructions

Supplementary instructions such as for a driver, instrumentation, controller, seals, sealant system etc are provided as separate documents in their original format. If further copies of these are required they should be obtained from the supplier for retention with these User Instructions.

**D** **EG – Konformitätserklärung**  
**GB** ***EC – Declaration of conformity***  
**F** ***Déclaration de conformité CE***

Hiermit erklären wir, dass die Bauarten der Baureihe : **NPG**  
*Herewith, we declare that this product:*  
*Par le présent, nous déclarons que cet agrégat :*

in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:  
*in its delivered state comply with the following relevant provisions:*  
*est conforme aux dispositions suivants dont il relève:*

**EG-Maschinenrichtlinie** **98/37/EG**  
**EC-Machinery directive**  
**Directives CE relatives aux machines**

**Elektromagnetische Verträglichkeit – Richtlinie** **2004/108/EG**  
**Electromagnetic compatibility – directive**  
**Compatibilité électromagnétique- directive**

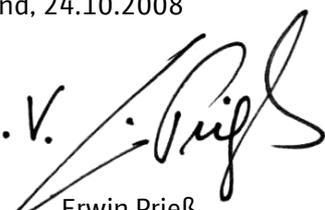
**Niederspannungsrichtlinie** **2006/95/EG**  
**Low voltage directive**  
**Directive basse-tension**

und entsprechender nationaler Gesetzgebung.  
*and with the relevant national legislation.*  
*et aux législations nationales les transposant.*

Angewendete harmonisierte Normen, insbesondere: **EN 809**  
*Applied harmonized standards, in particular:* **EN 60034-1**  
*Normes harmonisées, notamment:*

Bei einer mit uns nicht abgestimmten technischen Änderung der oben genannten Bauarten, verliert diese Erklärung ihre Gültigkeit.  
If the above mentioned series are technically modified without our approval, this declaration shall no longer be applicable.  
Si les gammes mentionnées ci-dessus sont modifiées sans notre approbation, cette déclaration perdra sa validité.

Dortmund, 24.10.2008

i. V.   
Erwin Prieß  
Quality Manager



WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
Germany

<p><b>NL EG-verklaring van overeenstemming</b> Hiermede verklaren wij dat dit aggregaat in de geleverde uitvoering voldoet aan de volgende bepalingen:</p> <p>EG-richtlijnen betreffende machines 98/37/EG Elektromagnetische compatibiliteit 2004/108/EG EG-laagspanningsrichtlijn 2006/95/EG Gebruikte geharmoniseerde normen, in het bijzonder: <b>1)</b></p>	<p><b>I Dichiarazione di conformità CE</b> Con la presente si dichiara che i presenti prodotti sono conformi alle seguenti disposizioni e direttive rilevanti:</p> <p>Direttiva macchine 98/37/CE Compatibilità elettromagnetica 2004/108/EG Direttiva bassa tensione 2006/95/EG Norme armonizzate applicate, in particolare: <b>1)</b></p>	<p><b>E Declaración de conformidad CE</b> Por la presente declaramos la conformidad del producto en su estado de suministro con las disposiciones pertinentes siguientes:</p> <p>Directiva sobre máquinas 98/37/CE Directiva sobre compatibilidad electromagnética 2004/108/EG Directiva sobre equipos de baja tensión 2006/95/EG Normas armonizadas adoptadas, especialmente: <b>1)</b></p>
<p><b>P Declaração de Conformidade CE</b> Pela presente, declaramos que esta unidade no seu estado original, está conforme os seguintes requisitos:</p> <p>Directivas CEE relativas a máquinas 98/37/CE Compatibilidade electromagnética 2004/108/EG Directiva de baixa voltagem 2006/95/EG Normas harmonizadas aplicadas, especialmente: <b>1)</b></p>	<p><b>S CE- försäkran</b> Härmed förklarar vi att denna maskin i levererat utförande motsvarar följande tillämpliga bestämmelser:</p> <p>EG-Maskindirektiv 98/37/EG EG-Elektromagnetisk kompatibilitet – riktlinje 2004/108/EG EG-Lågspänningsdirektiv 2006/95/EG Tillämpade harmoniserade normer, i synnerhet: <b>1)</b></p>	<p><b>N EU-Overensstemmelseserklæring</b> Vi erklærer hermed at denne enheten i utførelse som levert er i overensstemmelse med følgende relevante bestemmelser:</p> <p>EG-Maskindirektiv 98/37/EG EG-EMV-Elektromagnetisk kompatibilitet 2004/108/EG EG-Lavspenningsdirektiv 2006/95/EG Anvendte harmoniserte standarder, særlig: <b>1)</b></p>
<p><b>FIN CE-standardinmukaisuusseloste</b> Ilmoitamme täten, että tämä laite vastaa seuraavia asiaankuuluvia määräyksiä:</p> <p>EU-konedirektiivit: 98/37/EG Sähkömagneettinen soveltuvuus 2004/108/EG Matalajännite direktiivit: 2006/95/EG Käytetyt yhteensovitettut standardit, erityisesti: <b>1)</b></p>	<p><b>DK EF-overensstemmelseserklæring</b> Vi erklærer hermed, at denne enhed ved levering overholder følgende relevante bestemmelser:</p> <p>EU-maskindirektiver 98/37/EG Elektromagnetisk kompatibilitet: 2004/108/EG Lavvolts-direktiv 2006/95/EG Anvendte harmoniserede standarder, særligt: <b>1)</b></p>	<p><b>H EK. Azonossági nyilatkozat</b> Ezennel kijelentjük, hogy az berendezés az alábbiaknak megfelel:</p> <p>EK Irányelvek gépekhez: 98/37/EG Elektromágneses zavarás/tűrés: 2004/108/EG Kisfeszültségű berendezések irány-Elve: 2006/95/EG Felhasznált harmonizált szabványok, különösen: <b>1)</b></p>
<p><b>CZ Prohlášení o shodě EU</b> Prohlašujeme tímto, že tento agregát v dodaném provedení odpovídá následujícím příslušným ustanovením:</p> <p>Směrnícím EU–strojní zařízení 98/37/EG Směrnícím EU–EMV 2004/108/EG Směrnícím EU–nízké napětí 2006/95/EG Použité harmonizační normy, zejména: <b>1)</b></p>	<p><b>PL Deklaracja Zgodności CE</b> Niniejszym deklarujemy z pełną odpowiedzialnością że dostarczony wyrób jest zgodny z następującymi dokumentami:</p> <p>EC–dyrektywa dla przemysłu maszynowego 98/37/EG Odpowiedniość elektromagnetyczna 2004/108/EG Normie niskich napięć 2006/95/EG Wyroby są zgodne ze szczegółowymi normami zharmonizowanymi: <b>1)</b></p>	<p><b>RUS Декларация о соответствии Европейским нормам</b> Настоящим документом заявляем, что данный агрегат в его объеме поставки соответствует следующим нормативным документам:</p> <p>Директивы ЕС в отношении машин 98/37/EG Электромагнитная устойчивость 2004/108/EG Директивы по низковольтному напряжению 2006/95/EG Используемые согласованные стандарты и нормы, в частности : <b>1)</b></p>
<p><b>GR Δήλωση προσαρμογής της Ε.Ε.</b> Δηλώνουμε ότι το προϊόν αυτό σ' αυτή την κατάσταση παράδοσης ικανοποιεί τις ακόλουθες διατάξεις :</p> <p>Οδηγίες EG για μηχανήματα 98/37/EG Ηλεκτρομαγνητική συμβατότητα EG–2004/108/EG Οδηγία χαμηλής τάσης EG–2006/95/EG Εναρμονισμένα χρησιμοποιούμενα πρότυπα, ιδιαίτερα: <b>1)</b></p>	<p><b>TR CE Uygunluk Teyid Belgesi</b> Bu cihazın teslim edildiği şekliyle aşağıdaki standartlara uygun olduğunu teyid ederiz:</p> <p>AB-Makina Standartları 98/37/EG Elektromanyetik Uyumluluk 2004/108/EG Alçak gerilim direktifi 2006/95/EG Kisimden kullanılan standartlar: <b>1)</b></p>	<p><b>1) EN 809 EN 60034-1</b></p>

i. V.   
Erwin Priels  
Quality Manager



WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
Germany



WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
Germany  
T +49 231 4102-0  
F +49 231 4102-7363  
wilo@wilo.de  
www.wilo.com

## Wilo – International (Subsidiaries)

### Argentina

WILO SALMSON  
Argentina S.A.  
C1270ABE Ciudad  
Autónoma de Buenos Aires  
T +54 11 43015955  
info@salmon.com.ar

### Austria

WILO Handelsges. m.b.H.  
1230 Wien  
T +43 507 507-0  
office@wilo.at

### Azerbaijan

WILO Caspian LLC  
1065 Baku  
T +994 12 5962372  
info@wilo.az

### Belarus

WILO Bel OOO  
220035 Minsk  
T +375 17 2503393  
wilobel@wilo.by

### Belgium

WILO SA/NV  
1083 Ganshoren  
T +32 2 4823333  
info@wilo.be

### Bulgaria

WILO Bulgaria Ltd.  
1125 Sofia  
T +359 2 9701970  
info@wilo.bg

### Canada

WILO Canada Inc.  
Calgary, Alberta T2A 5L4  
T +1 403 2769456  
bill.lowe@wilo-na.com

### China

WILO China Ltd.  
101300 Beijing  
T +86 10 80493900  
wilobj@wilo.com.cn

### Croatia

WILO Hrvatska d.o.o.  
10090 Zagreb  
T +38 51 3430914  
wilo-hrvatska@wilo.hr

### Czech Republic

WILO Praha s.r.o.  
25101 Cestlice  
T +420 234 098711  
info@wilo.cz

### Denmark

WILO Danmark A/S  
2690 Karlslunde  
T +45 70 253312  
wilo@wilo.dk

### Estonia

WILO Eesti OÜ  
12618 Tallinn  
T +372 6509780  
info@wilo.ee

### Finland

WILO Finland OY  
02330 Espoo  
T +358 207401540  
wilo@wilo.fi

### France

WILO S.A.S.  
78390 Bois d'Arcy  
T +33 1 30050930  
info@wilo.fr

### Great Britain

WILO (U.K.) Ltd.  
DE14 2WJ Burton-  
Upon-Trent  
T +44 1283 523000  
sales@wilo.co.uk

### Greece

WILO Hellas AG  
14569 Anixi (Attika)  
T +302 10 6248300  
wilo.info@wilo.gr

### Hungary

WILO Magyarország Kft  
2045 Törökbálint  
(Budapest)  
T +36 23 889500  
wilo@wilo.hu

### Ireland

WILO Engineering Ltd.  
Limerick  
T +353 61 227566  
sales@wilo.ie

### Italy

WILO Italia s.r.l.  
20068 Peschiera  
Borromeo (Milano)  
T +39 25538351  
wilo.italia@wilo.it

### Kazakhstan

WILO Central Asia  
050002 Almaty  
T +7 727 2785961  
in.pak@wilo.kz

### Korea

WILO Pumps Ltd.  
621-807 Gimhae  
Gyeongnam  
T +82 55 3405800  
wilo@wilo.co.kr

### Latvia

WILO Baltic SIA  
1019 Riga  
T +371 67 145229  
mail@wilo.lv

### Lebanon

WILO SALMSON  
Lebanon  
12022030 El Metn  
T +961 4 722280  
wsl@cyberia.net.lb

### Lithuania

WILO Lietuva UAB  
03202 Vilnius  
T +370 5 2136495  
mail@wilo.lt

### The Netherlands

WILO Nederland b.v.  
1948 RC Beverwijk  
T +31 251 220844  
info@wilo.nl

### Norway

WILO Norge AS  
0901 Oslo  
T +47 22 804570  
wilo@wilo.no

### Poland

WILO Polska Sp. z o.o.  
05-090 Raszyn  
T +48 22 7026161  
wilo@wilo.pl

### Portugal

Bombas Wilo-Salmson  
Portugal Lda.  
4050-040 Porto  
T +351 22 2080350  
bombas@wilo.pt

### Romania

WILO Romania s.r.l.  
077040 Com. Chiajna  
Jud. Ilfov  
T +40 21 3170164  
wilo@wilo.ro

### Russia

WILO Rus ooo  
123592 Moscow  
T +7 495 7810690  
wilo@orc.ru

### Saudi Arabia

WILO ME – Riyadh  
Riyadh 11465  
T +966 1 4624430  
wshoula@watanaiind.com

### Serbia and Montenegro

WILO Beograd d.o.o.  
11000 Beograd  
T +381 11 2851278  
office@wilo.co.yu

### Slovakia

WILO Slovakia s.r.o.  
82008 Bratislava 28  
T +421 2 45520122  
wilo@wilo.sk

### Slovenia

WILO Adriatic d.o.o.  
1000 Ljubljana  
T +386 1 5838130  
wilo.adriatic@wilo.si

### South Africa

Salmson South Africa  
1610 Edenvale  
T +27 11 6082780  
erro.l.cornelius@  
salmson.co.za

### Spain

WILO Ibérica S.A.  
28806 Alcalá de Henares  
(Madrid)  
T +34 91 8797100  
wilo.iberica@wilo.es

### Sweden

WILO Sverige AB  
35246 Växjö  
T +46 470 727600  
wilo@wilo.se

### Switzerland

EMB Pumpen AG  
4310 Rheinfelden  
T +41 61 83680-20  
info@emb-pumpen.ch

### Taiwan

WILO-EMU Taiwan Co. Ltd.  
110 Taipei  
T +886 227 391655  
nelson.wu@  
wiloemutaiwan.com.tw

### Turkey

WILO Pompa Sistemleri  
San. ve Tic. A.Ş.  
34530 Istanbul  
T +90 216 6610211  
wilo@wilo.com.tr

### Ukraine

WILO Ukraina t.o.w.  
01033 Kiev  
T +38 044 2011870  
wilo@wilo.ua

### Vietnam

Pompes Salmson Vietnam  
Ho Chi Minh-Ville Vietnam  
T +84 8 8109975  
nkm@salmson.com.vn

### United Arab Emirates

WILO ME – Dubai  
Dubai  
T +971 4 3453633  
info@wilo.com.sa

### USA

WILO-EMU USA LLC  
Thomasville,  
Georgia 31792  
T +1 229 5840097  
info@wilo-emu.com

### USA

WILO USA LLC  
Melrose Park, Illinois 60160  
T +1 708 3389456  
mike.easterley@  
wilo-na.com

## Wilo – International (Representation offices)

### Algeria

Bad Ezzouar, Dar El Beida  
T +213 21 247979  
chabane.hamdad@salmson.fr

### Armenia

375001 Yerevan  
T +374 10 544336  
info@wilo.am

### Bosnia and Herzegovina

71000 Sarajevo  
T +387 33 714510  
zeljko.cvjetkovic@wilo.ba

### Georgia

0177 Tbilisi  
T +995 32317813  
info@wilo.ge

### Macedonia

1000 Skopje  
T +389 2 3122058  
valerij.vojneski@wilo.com.mk

### Moldova

2012 Chisinau  
T +373 2 223501  
sergiu.zagurean@wilo.md

### Rep. Mongolia

Ulaanbaatar  
T +976 11 314843  
wilo@magicnet.mn

### Tajikistan

734025 Dushanbe  
T +992 37 2232908  
farhod.rahimov@wilo.tj

### Turkmenistan

744000 Ashgabad  
T +993 12 345838  
wilo@wilo-tm.info

### Uzbekistan

700046 Taschkent  
sergej.arakelov@wilo.uz

August 2008



WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
Germany  
T 0231 4102-0  
F 0231 4102-7363  
wilo@wilo.de  
www.wilo.de

## Wilo-Vertriebsbüros in Deutschland

### G1 Nord

WILO SE  
Vertriebsbüro Hamburg  
Beim Strohhouse 27  
20097 Hamburg  
T 040 5559490  
F 040 55594949  
hamburg.anfragen@wilo.de

### G3 Sachsen/Thüringen

WILO SE  
Vertriebsbüro Dresden  
Frankenring 8  
01723 Kesselsdorf  
T 035204 7050  
F 035204 70570  
dresden.anfragen@wilo.de

### G5 Südwest

WILO SE  
Vertriebsbüro Stuttgart  
Hertichstraße 10  
71229 Leonberg  
T 07152 94710  
F 07152 947141  
stuttgart.anfragen@wilo.de

### G7 West

WILO SE  
Vertriebsbüro Düsseldorf  
Westring 19  
40721 Hilden  
T 02103 90920  
F 02103 909215  
duesseldorf.anfragen@wilo.de

### G2 Ost

WILO SE  
Vertriebsbüro Berlin  
Juliusstraße 52-53  
12051 Berlin-Neukölln  
T 030 6289370  
F 030 62893770  
berlin.anfragen@wilo.de

### G4 Südost

WILO SE  
Vertriebsbüro München  
Landshuter Straße 20  
85716 Unterschleißheim  
T 089 4200090  
F 089 42000944  
muenchen.anfragen@wilo.de

### G6 Rhein-Main

WILO SE  
Vertriebsbüro Frankfurt  
An den drei Hasen 31  
61440 Oberursel/Ts.  
T 06171 70460  
F 06171 704665  
frankfurt.anfragen@wilo.de

### Kompetenz-Team Gebäudetechnik

WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
T 0231 4102-7516  
T 01805 R•U•F•W•I•L•O\*  
7•8•3•9•4•5•6  
F 0231 4102-7666

Erreichbar Mo-Fr von 7-18 Uhr.

- Antworten auf
  - Produkt- und Anwendungsfragen
  - Liefertermine und Lieferzeiten
- Informationen über Ansprechpartner vor Ort
- Versand von Informationsunterlagen

### Kompetenz-Team Kommune Bau + Bergbau

WILO EMU GmbH  
Heimgartenstraße 1  
95030 Hof  
T 09281 974-550  
F 09281 974-551

### Werkkundendienst Gebäudetechnik Kommune Bau + Bergbau Industrie

WILO SE  
Nortkirchenstraße 100  
44263 Dortmund  
T 0231 4102-7900  
T 01805 W•I•L•O•K•D\*  
9•4•5•6•5•3  
F 0231 4102-7126

Erreichbar Mo-Fr von  
7-17 Uhr.  
Wochenende und feiertags  
9-14 Uhr elektronische  
Bereitschaft mit  
Rückruf-Garantie!

- Kundendienst-Anforderung
- Werksreparaturen
- Ersatzteilfragen
- Inbetriebnahme
- Inspektion
- Technische Service-Beratung
- Qualitätsanalyse

\* 14 Cent pro Minute aus dem deutschen Festnetz der T-Com. Bei Anrufen aus Mobilfunknetzen sind Preisabweichungen möglich.

### Wilo-International

#### Österreich

Zentrale Wien:  
WILO Handelsgesellschaft mbH  
Eitnergasse 13  
1230 Wien  
T +43 507 507-0  
F +43 507 507-15

Vertriebsbüro Salzburg:  
Gnigler Straße 56  
5020 Salzburg  
T +43 507 507-13  
F +43 507 507-15

Vertriebsbüro Oberösterreich:  
Trattnachtalstraße 7  
4710 Grieskirchen  
T +43 507 507-26  
F +43 507 507-15

#### Schweiz

EMB Pumpen AG  
Gerstenweg 7  
4310 Rheinfelden  
T +41 61 83680-20  
F +41 61 83680-21

### Standorte weiterer Tochtergesellschaften

Argentinien, Aserbajdschan,  
Belarus, Belgien, Bulgarien,  
China, Dänemark, Estland,  
Finnland, Frankreich,  
Griechenland, Großbritannien,  
Irland, Italien, Kanada,  
Kasachstan, Korea, Kroatien,  
Lettland, Libanon, Litauen,  
Niederlande, Norwegen,  
Polen, Portugal, Rumänien,  
Russland, Saudi-Arabien,  
Schweden, Serbien und  
Montenegro, Slowakei,  
Slowenien, Spanien,  
Südafrika, Taiwan,  
Tschechien, Türkei, Ukraine,  
Ungarn, Vereinigte Arabische  
Emirate, Vietnam, USA

Die Adressen finden Sie unter  
[www.wilo.de](http://www.wilo.de) oder  
[www.wilo.com](http://www.wilo.com).

Stand August 2008