



# Operating Manual

## Contra I / II Bloc

BA.10A.BYY.001.01.10.GB  
- Translation of the original operating manual -

## Declaration of conformity

Declaration of conformity as per EC Directive 2006/42/EC, Appendix II A

The declaration refers to complete pump units (with and without motor).

We,

**HILGE GmbH & Co. KG**

Hilgestraße 37-47  
D-55294 Bodenheim

hereby declare that the complete machine

- Type: Contra I / II
- Design: Bloc, Bloc-SUPER, Bloc-V

is in compliance with the following requirements:

- Directive 2006/42/EC  
(Machine Directive, Appendix II A)
- Directive 2004/108/EC  
(EMC Directive)

Harmonised standards employed:

- DIN EN ISO 12100-1, Safety of machines; basic terms, general principles of design – Part 1: Basic terminology
- DIN EN ISO 12100-2, Safety of machines; basic terms, general principles of design – Part 2: Basic technical principles
- EN 809 / A1, Pumps and pump units for liquids
- DIN EN 60204-1, Safety of machines – electrical equipment of machines

The signatory is authorised to compile the documentation.

Bodenheim, January 1, 2010

A handwritten signature in black ink, reading "i.V. B. Kneip", followed by a vertical line.

Dr. Boris Kneip, Director of Design

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# 1. Introduction

**Overview**

This section describes the requirements which are important for reading and understanding this manual. You will learn the symbols and formats that make the reading easier.

## 1.1 Target group

This operating manual is intended for:

- the operators of the pump and
- maintenance and repair personnel.

It is assumed that all such personnel will have the basic technical background required for the start-up, maintenance, and repair of pump systems.

Sections aimed only for specially authorised personnel are indicated by a preceding notation to this effect.

## 1.2 Symbols and formatting

The following symbols and formats are intended to make it easier to read this document:

- Listed items

Instructions

Instructions that must be carried out in a specific sequence are numbered in the corresponding order.



*Important information and helpful tips are identified with the index finger symbol.*

Safety instructions

The system used to identify safety instructions is described in section 2.3.

## 1.3 References to the document

Copyright

This document may not be copied, translated into other languages, or made available to third parties without our explicit written approval.

Technical changes

Design variants, technical data, and spare part numbers are subject to technical change.

The right to make changes for the sake of further technical development is reserved.

## 2. Safety

### Overview

This section describes what you have to consider for your own safety. You will learn the structure and identification of safety instructions. Read this important section attentively!

### 2.1 Instructions for the operator

#### 2.1.1 General information

All our pumps are professionally packed before they leave our warehouse to avoid damage during transport.

##### Unpacking

If, after carefully unpacking and inspecting the shipment, you however find damage, you must promptly inform the shipping agent (railway, post office, lorry driver, shipping line, etc.).

Your claim should be filed with the shipping agent. The shipping risk passes to the customer as soon as the shipment leaves our warehouse.

##### Storage

If the pump is not put into service immediately, it is important that it is stored properly to ensure that it will function correctly later. This is just as important as proper installation and maintenance.

The pump must be protected from cold, moisture, and dust as well as from mechanical influences.

Specially trained personnel is required to install and maintain the pump properly.

### 2.2 Safety instructions in the operating manual

#### Read safety instructions!

The operating manual contains all the basic information required for the set-up, operation, and maintenance of the pump. The installer as well as the technical personnel or operator responsible for the pump must therefore read this manual before installing and starting the pump. The operating manual must always be available at the site where the machine/system is being used. Not only the general safety instructions presented in this section but also the specific safety instructions in later sections must be followed.

## 2.3 Identification of instructions in the operating manual

Symbol The safety instructions presented in this operating manual are identified as shown below.



Fig. 1 Symbol for safety instructions

Signal words In order to classify the safety labels they are distinguished by the following signal words:

- **DANGER**  
Characterises an imminent hazard with a high risk which can cause death or grievous bodily harm.
- **WARNING**  
Characterises a possible hazard with medium risk which can cause death or bodily harm if it is not avoided.
- **CAUTION**  
Characterises a hazard with minor risk which can causes minor or medium bodily harm if it is not avoided.

Don't remove instructions from machine

Instructions attached directly to the machine, such as Rotational direction arrow must be noted and kept in completely legible condition.

Damaged or illegible instructions must be replaced.

## 2.4 Qualifications and training of personnel

The employees operating, maintaining, inspecting, and installing the pump must have the appropriate qualifications for this work. The operator must define in detail the tasks for which the employees are responsible, the tasks of which they are in charge, and the manner in which they are supervised.

If the employees do not have the necessary knowledge, they must be instructed and trained accordingly. This can be done, if necessary, by the manufacturer/supplier under contract to the operator. The operator must also guarantee that the employees fully understand the contents of the operating manual.

## 2.5 Hazards upon failure to follow the safety instructions

If these safety instructions are not followed employees, the machine itself and the environment will be in danger.

Failure to follow the safety instructions can lead to the loss of the right to file claims for damages.

Failure to follow instructions can, for example, lead in particular to the following hazards:

- Breakdown of important functions of the machine/system
- Failure of recommended methods of maintenance and repair
- Endangerment of personnel by electrical, mechanical, and chemical hazards
- Endangerment of the environment by leakage of hazardous materials.

## 2.6 Safety-conscious work

The safety instructions given in this operating manual, the existing national regulations for accident prevention, and any applicable internal working, operating, and safety instructions of the operator must be followed.

## 2.7 Safety instructions for the operator / user



Burn hazard from hot or cold mechanical components.

Cold or hot mechanical components can cause severe injury.

- Take structural measures to prevent contact with them!



Trapping hazard!

Danger from rotating components. Rotating parts can cause death, serious injury or damage to the equipment.

- Do not remove protection against contact with moving parts (e.g. coupling guard) while the machine is operating.
- Replace defect safety equipment immediately!



Danger generated by contact with or by inhaling hazard liquids, exhalations or steams.

Inhaling hazardous liquids, condensates or sprays can cause death, serious injury or damage to the equipment.

- Drain away leakage of hazardous pumping media in such a way that there is no danger to personnel or to the environment!
- Follow legal regulations!
- If shaft seal fail switch off the pump. Replace seal before next start-up!



Tripping hazard from electric power cable.

- Route the electric power cable in such a way that no one can trip over it. (In case of portable pumps).



Electrical hazard! Danger of electrical shock from contact of energised components

An electric shock can cause death or bodily harm.

- Only use acceptable electric cables and plugs!



## 2.8 Unauthorized modifications and production of spare parts

No modifications or changes to the machine may be made without written approval of the manufacturer. In the interest of safety, only original spare parts and accessories authorized by the manufacturer may be used. The use of other parts can exempt the manufacturer from liability for damage which may thus be caused.

## 2.9 Improper operation

The operational reliability of the delivered machine can be guaranteed only when it is used properly as indicated in the following sections.



*The given limit values may not be exceeded under any circumstances.*

## 2.10 Transport



Falling loads are dangerous!

Falling loads may cause death, severe bodily injuries or property damage.

- Transport work must only be performed by persons qualified to do so, and all safety instructions must be observed.
- Use suitable load carrying equipment with sufficient capacity to transport the pump.
- Make certain there are no persons under the suspended load.
- Make certain the pump is aligned horizontally when it is lifted!



Using incorrect lifting points is dangerous!

Unsuitable lifting points may cause damage to the pump.

- Fasten the rope to suitable lifting points.
- Never fasten a rope to the pump casing or intake/discharge branch!
- In case of SUPER design<sup>1</sup>: Remove shroud before transporting!

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1. Option

## 2.11 Cleaning



CIP and SIP methods must be in accordance with the latest current guidelines of the EC.

When special cleaning agents and methods are used, the supplier must confirm that they are safe for the materials involved.

Danger from pressure surge! Liquids under high pressure can be forcibly ejected from the pump.

Pressure surge can cause bodily injury or damage to the plant and pump.

- Before sterilisation always evacuate the system completely!

## 2.12 Repair contract

The duty to follow the legal regulations on work safety and the regulations on environmental protection means that all commercial enterprises must protect their employees, the public at large, and the environment from the harmful effects of hazardous materials.

Examples of legal regulations on work safety:

- the Workplace Act (ArbStättV)
- the Hazardous Materials Act (GefStoffV)
- the accident prevention regulations (BGV A1)
- and all applicable laws, rules, guidelines, regulations etc. in the country of operation.

Examples of regulations on environmental protection:

- the Recycling and Waste Law (KrW/AbfG)
- the Water Economy Law (WHG)
- and all applicable laws, rules, guidelines, regulations etc. in the country of operation.

Certificate of non-objection

The certificate of non-objection attached to the shipment is a component of the inspection/repair contract. This does not affect our right to refuse acceptance of this contract for other reasons.

The certificate of non-objection can be found on 54.

HILGE products and their parts will only be inspected/repaired if the certificate of non-objection is present and has been correctly completed by authorized and qualified technical personnel.

Pumps which have been operated in media exposed to radiation will not be accepted.

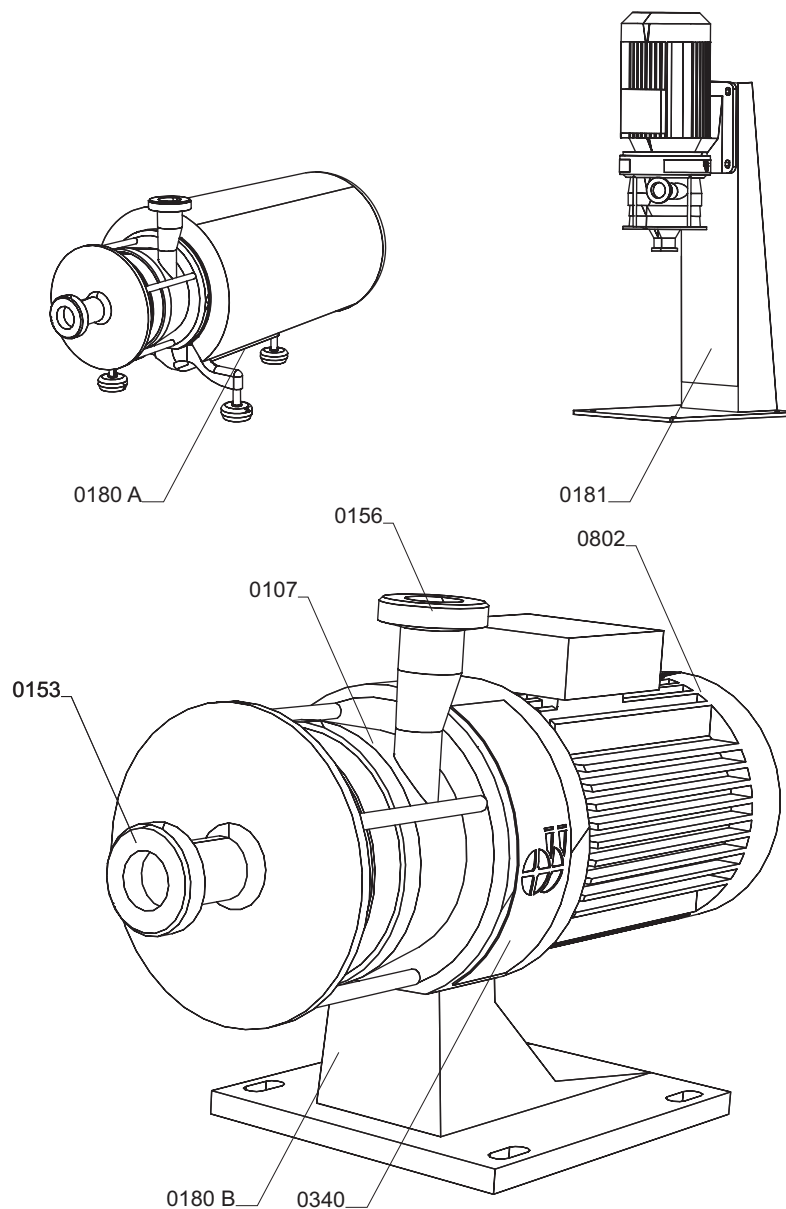
If any additional safety measures are required even after the careful draining and cleaning of the pump, the necessary information must be provided.

### 3. Description

#### Overview

This section describes the pump as well as its design and application. Section „Technical Data“ describes limits for application. You must know and keep these limits.

#### 3.1 Pump Overview



K.0223V1

**Fig. 2** Overview Contra

- 0107 - discharge branch
- 0153 - suction branch
- 0156 - discharge branch
- 0180 A - foot (combi foot design)
- 0180 B - foot (cast iron design)
- 0181 - foot (vertical stand design)
- 0340 - lantern
- 0802 - close coupled motor

### 3.2 Description

The pump is a single-stage centrifugal pump of end-suction type with a modular design. All parts which come in contact with the medium are in accordance with „hygienic design“ guidelines. Material No. 1.4404 or No. 1.4435 with  $\text{Fe} \leq 1\%$  and the associated design standard 3A are used as specified on the order documents and certified on request from beginning to end.

Code	Application	Material	Surface finish
3A0.01	industrial	Cr-Ni-Mo-steel	
3A1.02	hygienic	Cr-Ni-Mo-steel	$\text{Ra} \leq 3,2 \mu\text{m}$
3A2.03	sterile	1.4404 / 1.4435 (316 L)	$\text{Ra} \leq 0,8 \mu\text{m}$
3A1.04	pharmaceutical	1.4435 $\text{Fe} \leq 3 \%$	$\text{Ra} \leq 3,2 \mu\text{m}$
3A2.05	sterile	1.4435 $\text{Fe} \leq 1 \%$	$\text{Ra} \leq 0,8 \mu\text{m}$
3A3.06	sterile	1.4435 $\text{Fe} \leq 1 \%$	$\text{Ra} \leq 0,4 \mu\text{m}$
3A3.07	sterile	1.4404 / 1.4435 (316 L)	$\text{Ra} \leq 0,4 \mu\text{m}$
3A2.33	sterile	1.4404 / 1.4435 $\text{Fe} \leq 3 \%$ (316 L)	$\text{Ra} \leq 0,8 \mu\text{m}$
3A3.37	sterile	1.4404 / 1.4435 $\text{Fe} \leq 3 \%$ (316 L)	$\text{Ra} \leq 0,4 \mu\text{m}$

Tab. 1 HILGE design standards

#### 3.2.1 Areas of application

##### Standard design

Pumps of the standard design are used for:

- industrial application
- CIP processes
- all systems and processes involved in the food product, dairy, and beverage industries

##### Hygienic Design

Because of the consistent hygienic design and the use of materials which are free of both pores and inclusions, the pump is highly suitable for use in:

- pharmaceutical Industry
- medical technology
- processes in bioengineering

Special areas of application can be found in the delivery of ultrapure water and water for injection and in systems for the production of FDA-approved parenteral and infusion solutions.

### 3.3 Proper usage



Improper usage is dangerous.

Operating the pump in a manner that differs from the information provided in the order may result in death, severe bodily injury, or damage to property.

- Pump only media that are specified in the order. The pump has been specially designed for that purpose!
  - Operate the pump only in the electrical network specified in the order!
- 

#### 3.3.1 Pumped liquids

Only pure or slightly contaminated liquids with a maximum particle size of 0.4 mm may be pumped. These liquids may not chemically or mechanically attack the pump materials or lower their strength. If liquids with a viscosity greater than that of water are to be pumped, make sure that the motor will not be overloaded. The pump may not be operated beyond the maximum allowable values. Even short periods of pressure overload (e.g., as a result of a pressure surge) should be avoided.

#### 3.3.2 Minimum flow rate

Do not operate the pump below minimum flow rate of  $Q_{\min} = 10 - 15 \% Q_{\text{opt}}$ .

#### 3.3.3 Connections and pipelines

The nominal diameters of the system pipelines should be equal to or greater than the nominal diameters of the pump, i.e., DNE (suction side) and DNA (pressure side), and the connecting elements to the pump must conform exactly to the design standard/specification of the mating connector piece installed on the pump. The suction line must be absolutely leak-tight and laid in such a way that no air pockets can form. Avoid tight elbows and do not install valves immediately upstream of the pump. The suction head of the system may not be greater than the suction head guaranteed by the pump.

#### 3.3.4 Motor activation

Do not start and stop the motor more than 15 times per hour.

#### 3.3.5 Design

All information and descriptions in this Operating Manual concerning the use and operation of the pumps are based exclusively on the standard designs.

These rules do not apply to special designs, to customer specific modifications, or to random external influences which may occur during use and operation.

3.4 Technical data



Danger of overloading the pump!

Overloading can cause death, grievous harm or damage to the plant.

- Use the pump only under the indicated operating conditions!
- Also avoid short overpressure situation (e.g. caused by pressure surge)!

3.4.1 Pump denomination

The HILGE pump denomination is structured as shown below:

<b>Contra</b>	<b>I</b>	<b>Bloc</b>	<b>40/40</b>	<b>3</b>	<b>2</b>
pump type					
size					
design					
nominal diameter DN <sub>s</sub> / DN <sub>D</sub>					
power [kW]					
number of poles					

Tab. 2 HILGE pump denomination (example)

3.4.2 Pump serial number

The pump can be identified by the pump serial number. When ordering spare parts give always the pump serial number.

Pump serial number (example) 101 / 07 / 1248


The pump serial number includes:

- pump type (101)
- year of manufacture (07)
- reg. number (1248)

3.4.3 Nameplate

The nameplate is shown in fig. 3 and contains the following data:

HILGE GmbH & Co. KG  
Hilgestraße - D - 55294 Bodenheim

  
A Grundfos Company

K 0109/2

Pump-Type ①

No. ②

Q ③ m3/h H ④

P ⑤ kW n ⑥ min-1

Doc.-No. ⑦

MADE BY HILGE

Fig. 3 HILGE nameplate, example

- 1 - pump type
- 2 - pump serial number
- 3 - capacity Q
- 4 - head H
- 5 - motor power P
- 6 - drive speed n
- 7 - number of operating manual

NOTE: The nameplate can deviate from the one shown.

3.4.4 Performance data

The performance data of the pump, namely, its head and delivery rate, are determined in accordance with DIN EN ISO 9906 - appendix A , class 2 and are documented on the acceptance records.

### 3.5 Weights

Design features of the described standard pumps:

**Caution:**

The weights can - depending on design and accessories - differ from those presented. The manufacturer gives you when given the pump / order number precise information.

- Combi foot mounting
- Single mechanical seal
- SIEMENS motor

Contra I	Stage	Motor power [kW]	Motor size	Weight [kg]
	1	0,75	080Y	20
	1	1,1	080Y	21
	1	1,5	090S	21
	1	2,2	090L	29
	2	1,5	090S	23
	2	2,2	090L	24
	2	3	100L	26
	3	1,5	090S	30
	3	2,2	090L	47
	3	3	100L	30
	4	2,2	090L	42
	4	3	100L	34
	4	4	112M	38
	4	5,5	112M	42
	5	3	100L	60
	5	4	112M	51
	5	5,5	112M	60
	6	5,5	112M	60

**Table 3** Weights Contra I Bloc

Contra II	Stage	Motor power [kW]	Motor size	Weight [kg]
	1	3	100L	48
	1	4	112M	47
	1	5,5	112M	52
	1	7,5	132S	80
	2	4	112M	51
	2	5,5	112M	74
	2	7,5	132S	87
	2	11	132M	103
	3	5,5	112M	79
	3	7,5	132S	92
	3	11	132M	100
	3	15	160M	109
	4	7,5	132S	106
	4	11	132M	114
	4	15	160M	191
	4	18,5	160L	139
	5	11	132M	109
	5	15	160M	142
	5	18,5	160L	140

**Table 4** Weights Contra II Bloc



## 3.5.1 Noise emissions

Measured values according to DIN EN ISO 3746 for pump units; uncertainty of measurement 3dB (A).

Contra I / II	Motor power kW	L <sub>pfa</sub> [dB (A)]					
		1. Stage	2. Stage	3. Stage	4. Stage	5. Stage	6. Stage
	0,75	61	62	62	64	65	65
	1,1	61	62	62	65	67	69
	1,5	61	62	63	65	68	70
	2,2	60	62	62	64	68	71
	3	64	64	65	66	72	74
	4	68	68	70	74	76	76
	5,5	70	70	72	73	75	76
	7,5	71	71	72	74	75	77
	11	74	75	76	76	77	78
	15	75	76	77	77	78	79
	18,5	75	77	77	78	79	80

Table 5 Noise emissions Contra I/II 2-pole

Contra I / II	Motor power kW	L <sub>pfa</sub> [dB (A)]					
		1. Stage	2. Stage	3. Stage	4. Stage	5. Stage	6. Stage
	0,55	52	54	54	55	55	56
	0,75	54	56	56	57	58	58
	1,1	56	57	58	58	59	61
	1,5	60	61	62	63	63	64
	2,2	62	63	64	65	65	66
	3	64	66	66	68	69	70
	4	66	67	68	70	70	72
	5,5	68	69	71	73	75	76
	7,5	69	72	73	74	76	78

Table 6 Noise emissions Contra I/II 4-pole

Noise emissions caused by a pump are significantly affected by its application and construction. For this reason, no guarantee of accuracy is given for the values indicated here.

### 3.5.2 Maximum operating temperature



It is dangerous to exceed the maximum operating temperature!

Exceeding the maximum operating temperatures may cause the seals to be destroyed. Hot pumped medium may escape!

- Never exceed the specified operating temperatures!

Tabelle 7 lists the maximum permissible operating temperatures.

Design	Temp. [°C]
Standard design	95
Special design	150
Sterilisation	140

**Tab. 7** Operating temperatures

### 3.5.3 Maximum operating pressure



Pressure overload is dangerous!

Exceeding the maximum operating pressure may cause the pump to be destroyed.

- The pump must be operated according to the order data.
- Never exceed the specified maximum operating pressures!

Pump operating pressure

The maximum permitted operating pressure depends on various factors:

- pump type
- design of connections
- design of mechanical seal.

For the values that apply to your pump, please refer to the order documents.

## 4. Mounting, installation and connection

### Overview

**This chapter is intended for the maintenance and repair personnel.**

This section describes how to mount, adjust and install the pump. You get to know what to consider when you connect the pump to the electric mains supply and how to improve the flow in order to avoid dry running of the shaft seals.

### 4.1 Inspection before pump installation

#### 4.1.1 Check failure-free running of the impeller

**Check the failure-free impeller running in this way:**

1. Remove motor shroud<sup>1</sup>.
2. Remove fan cover of motor.
3. Consider direction of rotation (arrow).
4. Rotate shaft slowly by hand via the fan.

The shaft must rotate easily. If the impeller rubs against the pump casing (for example due to transport damage) it has been damaged.

When the impeller rubs against the casing: Contact HILGE Service.

When the impeller runs failure free:

5. Re-fit fan cover of the motor.
6. Re-fit motor shroud<sup>1</sup>.

### 4.2 Set-up and alignment of the pump assembly



Danger of misalignment of the pump due to an improper foundation.

A misaligned pump due to an improper foundation can cause death, grievous bodily harm or damage to the plant.

- Ensure that the foundation on which the pump is set up is clean and flat and has sufficient load capacity.
- Mount the pump – especially when it is to be set up vertically<sup>2</sup> – with the use of suitable heavy-duty anchors. As the centre of gravity is higher, the pump can tip.



Electrical danger due to short circuit!

Short circuits can cause death, bodily injury or damage to the plant.

- In case of a vertical installation: Under no circumstances the motor should be positioned underneath the pump. If there is leakage the motor could be damaged.

1. SUPER design only

2. not applicable for F&B-HYGIA®, SIPLA, NOVALobe and for all base plate design (CN)

**Align the pump in this way:**

1. Use an engineer's spirit level laid across the machined surface of the discharge branch connection to align the assembly.
2. After aligning the assembly, tighten the mounting bolts uniformly in a crosswise manner.

For base plate design (CN)<sup>1</sup>: The pump assembly is aligned with steel shims, which are placed directly adjacent to each mounting bolt, under the lugs. The shims may be placed only under the lugs for alignment. The base plate must rest flush on the lugs before the bolts are tightened.

**4.3 Installation in the pipeline**

Danger of mechanical overload!

A mechanical overload can cause death, bodily harm or damage to the plant. Pumped liquid can leak under high pressure.

- Do not use the pump or its connecting sleeves to support the pipeline. (EN809 5.2.1.2.3 and EN ISO 14847)
- In addition to the general rules of machine-building and plant construction, also follow the instructions provided by the manufacturer of the connecting elements used (e.g., flanges) when installing the pump in the pipeline or plant.  
These specifications will contain data on torques, maximum allowable angular offset and tools / auxiliary materials to be used.
- It is absolutely necessary to avoid twisting the pump!
- After connecting the pipes, check the alignment of the coupling<sup>2</sup>.



Danger of mechanical overload due to closing caps or foil!

An overload can cause damage to pump or plant.

- The suction and delivery ports are sealed with sheets of plastic, the flushing and drain lines with plastic caps. These must be removed before the pump is installed in the system.

Details about dry running

What is dry running?

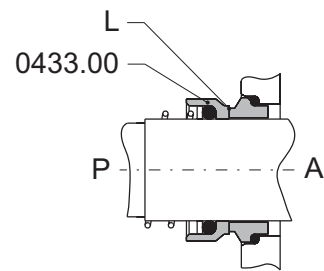
To seal the pump shaft against the pump casing the mechanical seal needs lubrication between its rotating faces.

This lubrication is provided by the pumped liquid. If the pump is fitted with a quench the lubrication for the quench must be provided from an external source.

Dry running occurs when the lubrication fails. Dry running destroys the mechanical seal in few seconds.

1. not available for F&B-HYGIA®  
2. For base plate design (CN) only

For example see fig. 4.



**Fig. 4** Lubrication between sliding surfaces

- P - pump side
- 0433.00 - mechanical seal
- L - lubrication
- A - atmosphere side

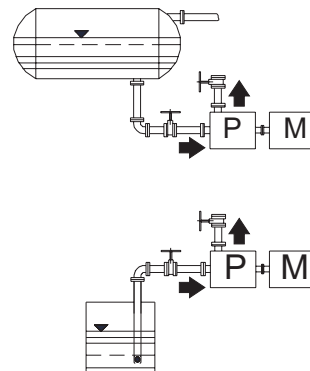
**Danger of dry running!**



Dry running causes damage to the pump and plant.

When installing the pump take following into account:

- The suction line must be absolutely leakproof and laid in such a way that no air pockets can form.
- Avoid tight elbows and valves immediately upstream of the pump. They interfere with the incoming flow to the pump and thus with the NPSH of the system.
- The head of the system may not be greater than the head guaranteed by the pump.
- The nominal pipeline diameters of the system should be equal to or greater than the DNS or DND connectors of the pump.
- A foot valve should be used in suction mode.
- To prevent air pockets from forming, the suction line must be laid so that it rises to the pump; a gravity feed line must be laid with a slight downward gradient to the pump.
- If local conditions do not allow the suction line to ascend continuously, install a venting device at the highest point of the line.
- A shut off valve should be installed in the suction line near the pump. This valve must be completely open during operation and may never be used as a control valve.
- A shut off valve should be installed in the discharge line, near the pump, to control the delivery rate.



K.0076V2

**Fig. 5** Installation in the pipeline

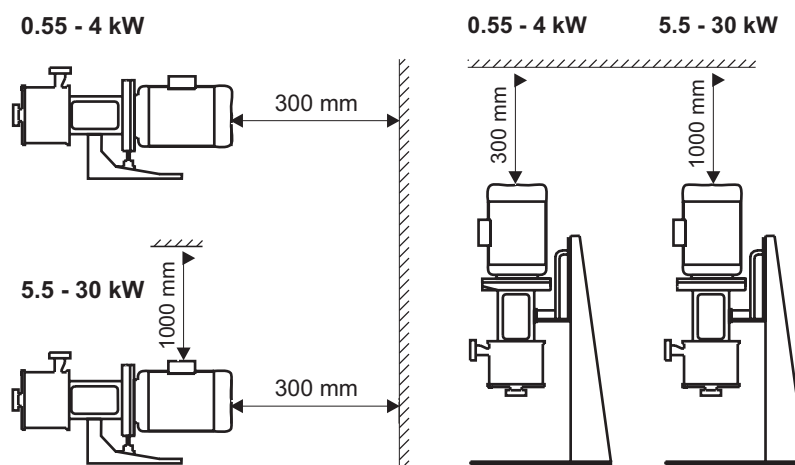
- above: gravity feed mode
- below: suction mode
- P - pump
- M - motor

#### 4.3.1 Space requirements

##### Overheating!

- ▲ Damage to property.
- ▷ Ensure sufficient ventilation.
- ▷ Make sure not to re absorb warm cooling air. Consider other heat sources in the area.
- ▷ Keep min. distances.

**Pay attention to motor power. Keep the minimum distances.**

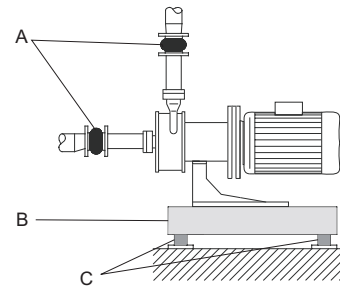


K.0317V1

**Fig. 6** Minimum distances

### 4.3.2 Reduction of noise and vibration

Noise and vibration are generated by the pulsating flow of the rotors and by the flow in pipes and fittings. The effect on the environment is subjective and depends on correct installation and the state of the remaining system. One way of reducing noise and vibrations is by installing expansion joints.



K0346V1

**Fig. 7** Expansion

- A - Expansion joints
- B - Foundation
- C - vibration absorber

#### Function of expansion joints:

- Absorbability of expansions/contractions in the pipework caused by changing the temperature of the pumped medium.
- Reduction of mechanical strains in connection with pressure surges in the pipework.
- Insulation of mechanical structure-borne noise in the pipework (only rubber bellows expansion joints).



*Do not install expansion joints to compensate for inaccuracies in the pipework such as centre displacement of flanges. Fit expansion joints at a distance of minimum 1 to 1½ times the nominal flange diameter away from the pump on the suction as well as on the discharge side. This will prevent the development of turbulence in the expansion joints, resulting in better suction conditions and a minimum pressure loss on the pressure side. At high viscosity or velocities, we recommend you to install larger expansion joints corresponding to the pipework.*

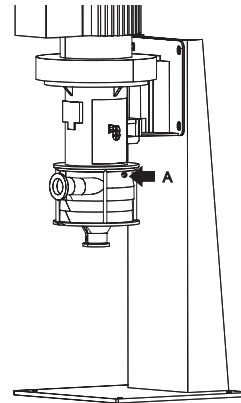


## 4.3.3 Mechanical seal leakage drain for vertical installation

Contra pumps which are set up vertically are equipped with an mechanical seal leakage drain.

If the pumped medium starts to escape through this drain, check the mechanical seal to make sure that it is working properly and replace if necessary.

The drain has a G1/4" thread. Attach a pipeline here to direct the discharge of the leaked liquid.



K.0239V1

Fig. 8 Leakage drain (A)

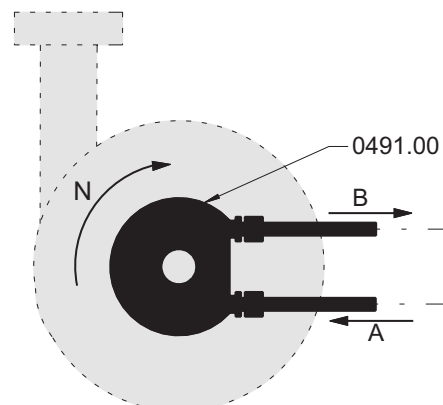
## 4.4 Connections for flushing system

### 4.4.1 Double mechanical seal

HILGE pumps with double mechanical seal are equipped with a seal cartridge.

Depending on the seal design the barrier or flushing fluid flows inside this seal cartridge.

The connection must be carry out as shown in fig. 9. So you can ensure that the fluid can flush the mechanical seal effectively.



K.0082V1

Fig. 9 Flushing connection

- N - rotating direction of the pump
- 0491.00 - seal cartridge
- B - outlet line
- A - feed line



Danger of dry running!

Dry running will destroy the mechanical seal within seconds!

- Connect the lines of the flushing system in that way that a liquid supply is guaranteed.
- Always keep the fill level in the liquid pot between the upper and lower marks.

**Connect the flush in this way:**

1. Connect feed line A  
Note the dependence between arrangement and rotating direction N. See fig. 9
2. Connect outlet line B
3. Check tightness of connection.

#### 4.4.2 Double mechanical seal - back-to-back arrangement

Barrier liquid

In order to continue functioning, the mechanical seals require a barrier liquid, some of its purposes being:

- Pressurisation in the sealing space
- Prevent the feed liquid from penetrating into the sealing gap
- Dry-run protection
- Lubrication and cooling of the mechanical seals.

A pure liquid, compatible with the pumped liquid, serves as a sealing liquid.

**Ensure the functioning in this way:**

1. Open feed line of barrier liquid
2. Bleed seal cartridge
3. Ensure liquid is circulating at required barrier pressure.

The barrier pressure should be at least 1.5-2 bar above the highest pressure to be sealed. The sealing liquid should not be above 60°C on exit and should on no account exceed the boiling point.

A pure liquid, compatible with the pumped liquid, serves as a sealing liquid.

#### 4.4.3 Double mechanical seal - tandem arrangement

Flushing liquid

In order to continue functioning, the mechanical seals require a flushing liquid, some of its purposes being:

- Preventing leaks
- Dry-run protection
- Lubrication and cooling of the mechanical seals
- cutting off the air from substances which react unfavourably with oxygen.

A pure liquid, compatible with the pumped liquid, serves as a flushing liquid.

**Ensure the functioning in this way:**

1. Open feed line for flushing liquid
2. Bleed seal cartridge
3. Ensure unpressurised circulation.

A pure liquid, compatible with the pumped liquid, serves as a flushing liquid.

In case of abrasive media provide a „lost“ flushing, i.e. where the flushing liquid is discharged directly.

## 4.5 Electrical connections



Danger of electric shock!

Electric shock can cause death or bodily harm.

- The electrical connections must be made by a qualified electrician.
- VDE specifications and any local regulations must be followed, especially those pertaining to safety measures!



Danger of capacity overload!

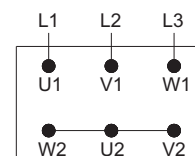
Electrical overloading can cause death, bodily harm or damage to plant or motor.

- Check the voltage stated on the rating plate of the motor against the operating voltage!
- Install an electrical circuit breaker!

### 4.5.1 Star connection

Star-connection 3-phase system for high voltage.

Connect the pump as specified in the order documents. The figure below shows the scheme for star connection.



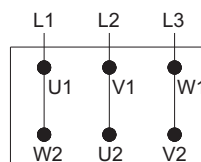
K.0079V1

**Fig. 10** Star connection

### 4.5.2 Delta connection

Delta-connection for low voltage.

Connect the pump as specified in the order documents. The figure below shows the scheme for delta-connection.



K.0080V1

Fig. 11 Delta connection

### 4.5.3 Checking the direction of rotation after connection



Danger of dry running!

Dry running causes damages to pump and plant!

- Before checking of the direction of rotation: fill and vent the pump.
- Connect the motor and briefly (for about 2 seconds) check the direction of rotation.  
Note the directional arrow (red) on the pump. If the pump is turning in the wrong direction the mechanical seal can be destroyed

#### Check the rotating direction in this way:

1. After electrical connection: Mount all safety equipment again.
2. Check tightness of hydraulic connection.
3. Fill pump (plant).
4. Observe arrow of rotation.
5. Switch on motor short-time (1-2 seconds).
6. Compare directions (motor / arrow).
7. Correct connection if need be.

Operation with frequency inverter

See documentation of manufacturer.

## 5. Start-up / shut-down

### Overview

This section describes how to start up and shut down the pump. You get to know which inspections contribute to failure-free operation and increased life of the pump.

### 5.1 Start-up

#### 5.1.1 Check application conditions

#### Check the application conditions of the pump in this way:

1. Compare the data of the following documents with the provided application condition of the pump:
  - purchasing documents (confirmation of the order)
  - nameplate
  - operating manual.
2. Make sure that the pump will operate under the mentioned conditions only. These conditions apply to (e. g.) pressure, temperature, liquid pumped.

#### 5.1.2 Starting up the pump

#### Start up the pump in this way:

1. Check tightness of connection.
  2. Make sure that all safety equipment is installed.
  3. Make sure that all electrical connections are correct.
  4. Open the check valves in the system.
  5. Fill the pump together with the system.
  6. Vent the pump and system.
  7. Fully open the check valve on the suction side.
  8. Close the check valve on the discharge side.
  9. Start the pump.
  10. Slowly open the check valve on discharge side.
- Danger of overheating and pressure overloading!



Continues operation against a shut-off device causes a quick heating of the liquid pumped and a pressure increase.

- Never operate the pump against a closed shut-off device. Operation with a shut-off device must on no account continue for longer than 30 seconds.

---

#### If delivery head does not rise after the pump has been turned on:

1. Switch off the pump.
2. Vent the pump (system) again.
3. Repeat steps 7. to 10.

**5.1.3 Functional check of mechanical seal****Check the function of the mechanical seal in this way:**

1. Watch the pump and check the mechanical seal for flawless functioning (leak test).  
An intact mechanical seal works virtually without leakage.

**If liquid pumped or flushing liquid leak:**

1. Switch off the pump.
2. Renew the mechanical seal.  
Observe section 6.4.4, page 37.

**5.2 Shut-down****5.2.1 Shutting down the pump**

Danger of pressure surge!

Pressure surge can cause damage to pump or plant. Quick closing of shut-off devices on discharge side can cause a pressure surge.

- Always close shut-off devices (gates, valves) slowly!

What is a pressure surge?

A pressure surge is an abruptly pressure increasing in the system. This pressure increasing can - among other causes - be caused by a quick blocking of the flow in the discharge pipe. In case of a pressure surge, the maximum permitted pump pressure is temporarily exceeded manyfold.

**Shut down the pump in this way:**

1. Close the check valve on the discharge side.
2. Switch off the pump.
3. Close the check valve on the suction side.
4. Switch off the flushing system<sup>1</sup>.
5. Make sure that the pump is depressurised.
6. Switch off pressure in barrier system<sup>2</sup>.

**5.2.2 Cleaning pump after shut-down**

Danger of jamming.

Sticky or highly viscous liquids can damage the pump after shut down.

- Clean the pump appropriately after shut down.

See section 2.11 on page 10.

---

1. only for double mechanical seal or quench design  
2. only for back-to-back arrangement

## 6. Maintenance / servicing

### Overview

**This chapter is intended for the maintenance and repair personnel.**

This section gives important information concerning maintenance and servicing of the pump. Read this section before you carry out maintenance work or troubleshooting measures!

### 6.1 Safety instructions for maintenance, inspection and installation work



Danger of unprofessional work!

Unprofessional work can cause bodily injury or damage to the plant and pump!

- The operator must ensure that all maintenance, inspection, and installation work is carried out by authorised and qualified technical personnel, who have acquired the required knowledge through study of the operating instructions.



Danger of electrical shock if electrical parts are touched.

Electrical shock can cause death, bodily injury.

- Always turn off the electrical supply at the pump before eliminating any breakdown!



Danger of pressurized spray.

Pressurized components can cause death, bodily injury or damage to the plant and pump.



Danger of hot components.

Hot components can cause death, bodily injury or damage to the plant and pump.

- Always allow to cool down before eliminating any breakdown!



Danger of unintentional switching of the pump!

Unintentional switching of the pump can cause death, bodily injury or damage to the plant and pump.

- Take appropriate measures to ensure that the machine cannot be unintentionally turned on again.



Danger of contact or inhaling of hazardous substances!

Contact or inhaling of hazardous substances can cause death, bodily injury or damage to the plant and pump!

- Pumps or systems which convey hazardous media must be decontaminated!



Danger of missing protection and safety equipment.

Missing protection and safety equipment can cause death, bodily injury or damage to the plant and pump.

- Immediately after completing the work install the protection and safety equipment and make sure it functions!



Danger of improper tools!

Improper tools can cause damage to the pump and plant.

- In accordance with the design standard (3A0.01 to 3A3.37), all tools, possible support surfaces, and other auxiliary materials must ensure that all parts of the pump can be assembled without damage (e.g. scratches). See section 6.7, page 53.



Danger of frost!

Frost causes damage to the plant and pump.

- When there is danger of frost drain the pump completely.
- 

## **6.2 Maintenance of the pump**

The pump is a low-maintenance pump. In addition to cleaning, the only point to be kept in mind is the wear of the rotating mechanical seal.

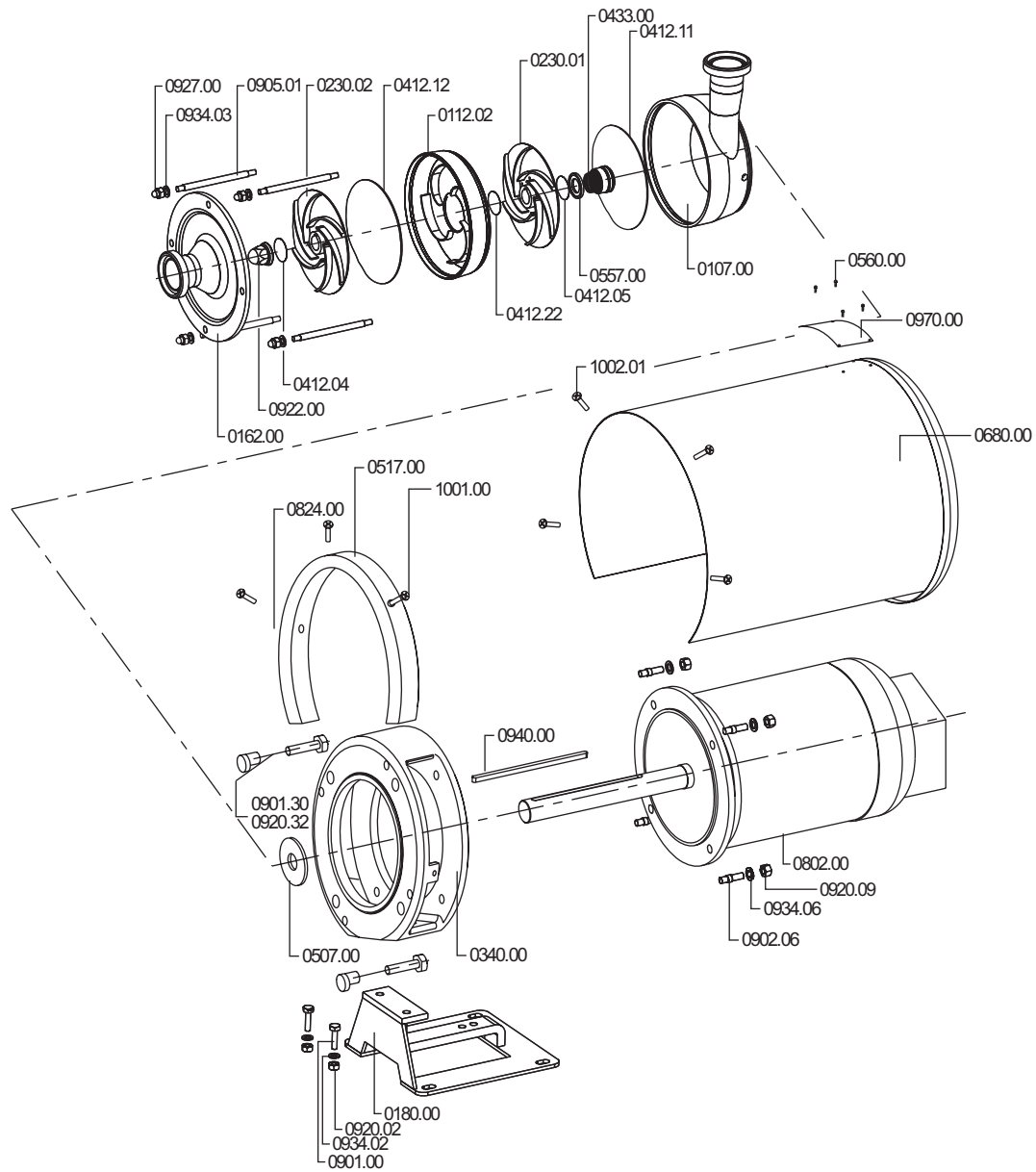
## **6.3 Maintenance of the motor**

See operating manual of the motor manufacturer.



## 6.4 Assembly

### 6.4.1 Parts overview



K.022V1

Fig. 12 Parts overview

See parts list on page 34.

Qty.	Part No.	Description
1	0107.00	discharge casing
1	0112.02	diffusor casing
1	0112.03	diffusor casing <sup>b</sup>
1	0112.04	diffusor casing
1	0112.05	diffusor casing
1	0112.06	diffusor casing
1	0162.00	suction cover
1	0180.00	foot (stainless steel design) <sup>c</sup>
1	0230.01	impeller
1	0230.02	impeller
1	0230.03	impeller
1	0230.04	impeller
1	0230.05	impeller
1	0230.06	impeller
1	0340.00	lantern
1	0412.01	O-ring
1	0412.02	O-ring
4	0412.03	O-ring
1	0412.04	O-ring
1	0412.05	O-ring
1	0412.11	O-ring
1	0412.12	O-ring
1	0412.13	O-ring
1	0412.14	O-ring
1	0412.15	O-ring
1	0412.16	O-ring
1	0412.22	O-ring
1	0412.23	O-ring
1	0412.24	O-ring
1	0412.25	O-ring
1	0412.26	O-ring
1	0433.00	mechanical seal

Qty.	Part No.	Description
1	0433.01	mechanical seal <sup>a</sup>
1	0471.00	seal cover
1	0491.00	seal cartridge
1	0507.00	deflector / V-ring
1	0516.00	locating ring
1	0517.00	shroud support ring
1	0557.00	seal spacer
4	0560.00	pin / lock against rotation
4	0560.00	round head grooved pin
1	0680.00	shroud
1	0802.00	close coupled motor
1	0824.00	cable
2	0901.00	hexagon head screw
4	0902.06	stud
2	0904.02	grub screw
4	0905.01	tie bolt
4	0918.00	hexagon head sterile screw
2	0920.02	hexagon nut
4	0920.09	hexagon nut
1	0922.00	impeller nut
4	0927.00	domed nut
2	0934.02	spring washer
4	0934.03	spring washer
4	0934.06	spring washer
1	0940.00	key
1	0970.00	sense of rotation arrow
1	0970.00	plate
1	0970.01	sense of rotation arrow
1	0970.01	plate
3	1000.00	phillips screw
2	1000.03	phillips screw
3	1001.00	self tapping screw

Tab. 8 Parts list

- a. Parts which are depending on double mechanical design seal are shown from page 34.
- b. Parts which are depending on number of stages are partially without figure.
- c. Foot design and fixing elements can vary.

### 6.4.2 Instructions for assembly

---

**DANGER**

Maintenance or assembly work can be dangerous if important instructions are disregarded.

- Before you maintenance or assemble the pump note section 6.1 on 31.
- 

**CAUTION**

For pump assembly important aspects have to be taken into account:

A wrong assembly of the pump can cause damages to the pump. Therefore follow the instructions for the assembly listed here.

- Use tools from HILGE assembly tool kit in order to assemble the pump without damages and scratches.
  - To guarantee a good seal, use only O-ring seals with the original dimensions.
  - Never use grease which contains mineral oil when assembling the wet end parts<sup>1</sup>.
  - Replace mechanical seals always in complete assembly.
  - As the impeller nut is being fitted, it must be possible to feel the self-locking action<sup>2</sup>. It must be possible to tighten the nut without any problems. Tighten manually for the first two turns, so that the thread insert sits correctly on the shaft.
  - To tighten impeller nut 0922.00, use either a screw device or the impeller nut installing device because the torque applied to tighten must be absolutely concentric. Otherwise there is the danger that the pump shaft 0211.00 will be bent.
- 

---

1. Parts which come in contact with the pumped medium.  
2. Only apply to impeller nut with Helicoil thread insert.

**6.4.3 Assembly of Bloc lantern****Assemble the Bloc lantern and the motor in this way:**

1. Join Bloc lantern 0340.00 and cast iron foot 0180.00.<sup>a</sup>  
Use the studs 0902.05, the spring washers 0934.02 and the hexagon nuts 0920.02.  
Torque M10 - 37 Nm.

**Fig. 13** Bloc lantern

MF-648

2. Join motor 0802.00 and Bloc lantern 0340.00.  
Use studs 0902.06, spring washers 0934.06 and hexagon nuts 0920.09.<sup>b</sup>  
Torques: M10 - 37 Nm | M12 - 65 Nm | M16 - 150 Nm

**Fig. 14** Motor

MF-649

3. Grease the seat of the component adjoining backplate 0161.00.  
Use Klüberpaste UH1 84-201 from HILGE assembly tool kit (pos. 6, fig. 76).

**Fig. 15** Contact surface drive end part / backplate

MF-420

4. Push deflector 0507.00 onto the shaft 0211.00.

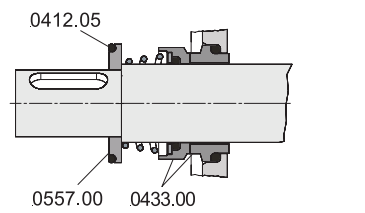
**Fig. 16** Deflector

MF-421

- a. Pump foot and fixing elements may vary.
- b. Fixing elements may vary.

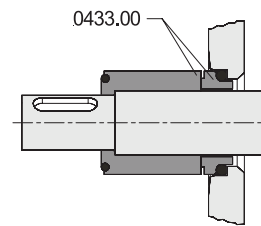
### 6.4.4 Mechanical seal arrangements

The following mechanical seal arrangements are available



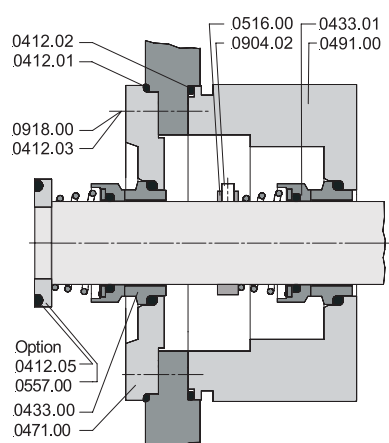
**Fig. 17** Single mechanical seal (spiral spring)

K.0101V1



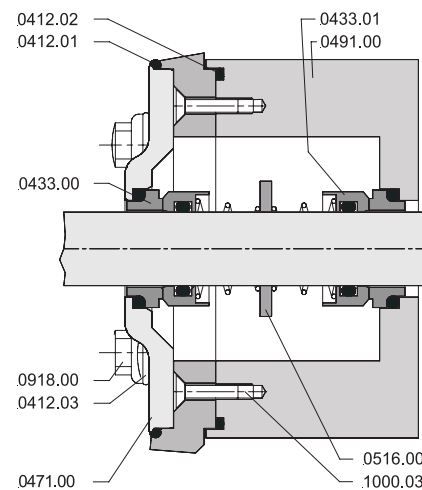
**Fig. 18** Single mechanical seal (enclosed spring)

K.0102V1



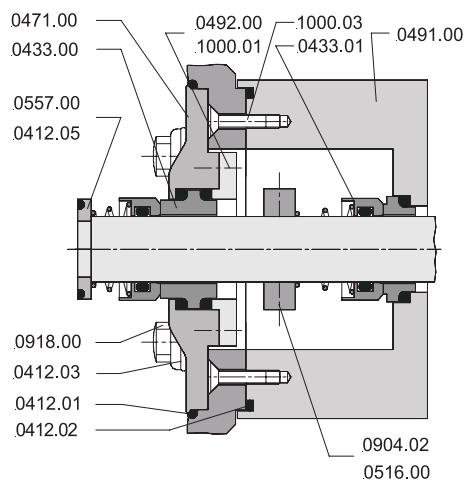
**Fig. 19** Double mechanical seal, tandem

K.0071V1



**Fig. 20** Double mechanical seal, back to back

K.0072V1



**Fig. 21** Double mechanical seal, tandem (B3 seat)

K.0070V1



Parts can differ insignificantly from the shown picture.



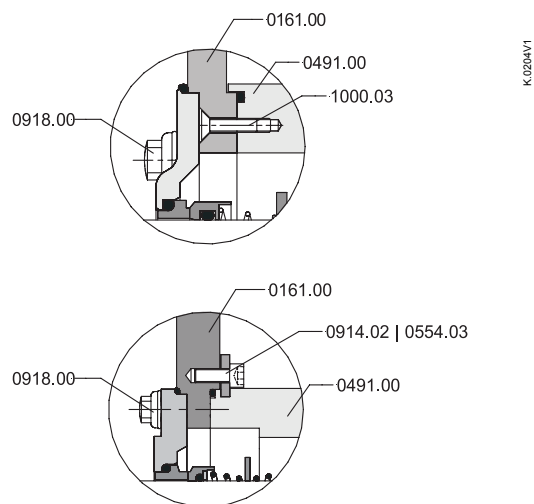
For further descriptions of mechanical seals, see supplementary sheet.

Mechanical seal type	Fig.	Description on page
Single mechanical seal (spiral spring)	17	39
Single mechanical seal (enclosed spring)	18	supplementary sheet
Double mechanical seal, tandem	19	41
Double mechanical seal, back to back	20	45
Double mechanical seal, tandem (B3 seat, double flexibly mounted)	21	supplementary sheet

### 6.4.5 Different fixing of seal cartridge Contra I / II

The assembly of the seal cartridge used for the double mechanical seal is very similar between Contra I and Contra II.

The differences are shown in fig. 22.



**Fig. 22** Fixing of seal cartridge

- above: Contra I
- below: Contra II

### 6.4.6 Assembly of the single mechanical seal

Assemble the single mechanical seal in this way:

1. Coat the thread of the tie bolts 0905.01 with Loctite type 243 (HILGE assembly tool kit, pos. 10, fig. 76).
2. Hand-screw the tie bolts 0905.01 into the drive part<sup>a</sup>.



**Fig. 23** Tie bolts

MF-553

3. Grease the back side of the discharge casing 0107.00. Use Klüberpaste UH1 96-402 from HILGE assembly tool kit for this (pos. 6, fig. 76 on 53).



**Fig. 24** Discharge casing back side

MF-672

4. Assemble the discharge casing 0107.00 onto the shaft 0211.00.



*Contra II: Use the assembly screws for assembling the discharge casing 0107.00 to prevent it for falling onto the shaft..*



**Fig. 25** Fitting the discharge casing

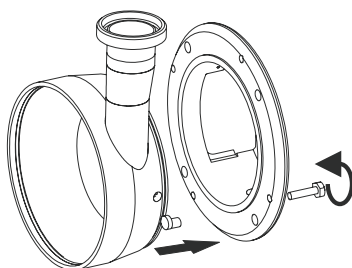
MF-554

5. Spray the stationary ring of the mechanical seal 0433.00 and the shaft 0211.00 with clean water. Use spray bottle from HILGE assembly tool kit (pos. 2, fig. 76).



**Fig. 27** Stationary ring of the mechanical seal

MF-653

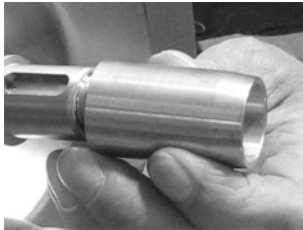


**Fig. 26** Assembly screws (Contra II)

6. Slide the assembly sleeve from HILGE assembly tool kit (pos. 3, fig. 76) onto the shaft extension.



*HILGE assembly tools avoid damages of the mechanical seal during the further assembly.*



**Fig. 28** Assembly sleeve

MF-654

8. Slide the rotating part of the mechanical seal 0433.00 in complete assembly onto the shaft 0211.00 up to the stop.  
Use installation sleeve from HILGE assembly kit (pos. 12, fig. 76) to do this.



**Fig. 30** Rotary ring of mechanical seal

MF-556

7. Push the stationary ring of the mechanical seal 0433.00 into the seat of the discharge casing 0107.00.  
Use installation sleeve from HILGE assembly kit (pos. 12, fig. 76) to do this.



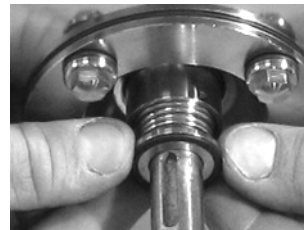
**Fig. 29** Stationary ring of the mechanical seal

MF-555



*For spiral spring mechanical seal only:*

9. Insert O-ring 0412.05 into seal spacer 0557.00.
10. Slide seal spacer 0577.00 onto the shaft 0211.00.



**Fig. 31** Seal spacer with O-ring

MF-551

- a. Components which are used for mounting and drive of the pump. They do not come in contact with the medium

For assembly of the impellers and casings read on at page 46.



**6.4.7 Assembly of the double mechanical seal****Assemble the double mechanical seal in this way:**

The assembly aids listed here may be found on page 53.

- 
1. Carry out step 1. to 2. described on page 39.
  2. Insert the O-ring 0412.01 into the seal cartridge 0491.00.
- 



MF-428

**Fig. 32** Seal cartridge with O-ring

- 
3. Press the seal cartridge 0491.00 into the seat of the discharge casing 0107.00.



MF-631

**Fig. 33** Discharge casing with seal cartridge

- 
4. Join the seal cartridge 0491.00 and the discharge casing 0107.00.  
Contra I: Mounting from the front by using counter sunk screws 1000.03 -torque M4: 1,5 - 2 Nm.  
Contra II: Mounting from behind by using socket head cap screws 0914.02, washer 0554.03 - torque M6: 8 Nm (see section 6.4.5).



MF-633

**Fig. 34** Discharge casing

5. Grease the back side of the discharge casing 0107.00.  
Use Klüberpaste UH1 96-402 from HILGE assembly tool kit for this (pos. 6, fig. 76).



Fig. 35 Contact surface drive end part / discharge casing

MF-634

6. Assemble the discharge casing 0107.00 onto the shaft 0211.00.



Fig. 36 Discharge casing / bearing housing

MF-554



*Contra II: Use assembly screws in order to fix the discharge casing 0107.00 while mounting. So you avoid that the casing falls on the shaft.*

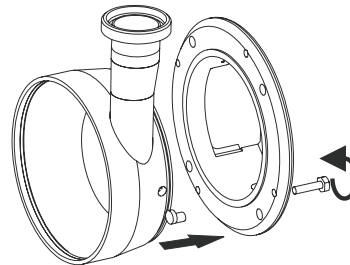


Fig. 37 Assembly screw

7. Spray the stationary ring of the mechanical seal 0433.01 and the shaft 0211.00 with clean water.  
Use spray bottle from HILGE assembly tool kit (pos. 2, fig. 76).



Fig. 38 Stationary ring of the mechanical seal

MF-653

8. Push the stationary ring of the mechanical seal 0433.01 into the seat of the seal cartridge 0491.00.  
Use installation sleeve from HILGE assembly kit (pos. 12, fig. 76) to do this.



Fig. 39 Stationary ring of mechanical seal

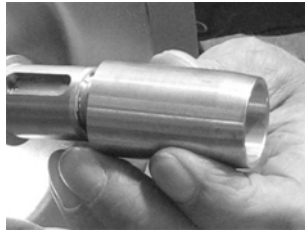
MF-632

9. Slide the assembly sleeve from HILGE assembly tool kit (pos. 3, fig. 76) onto the shaft extension.



*That way you avoid damages to the mechanical seal during the further assembly.*

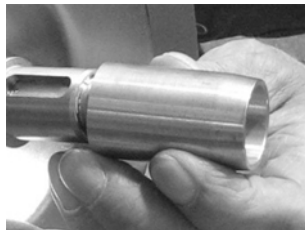
10. Spray the assembly sleeve with clean water.  
Use spray bottle from HILGE assembly tool kit (pos. 2, fig. 76).



**Fig. 40** Assembly sleeve

MF-654

12. Remove the assembly sleeve.



**Fig. 42** Assembly sleeve

MF-656

13. Screw the studs 0904.02 one to two turns into the locating ring 0516.00.  
14. Coat the studs 0904.02 with a screw locking.  
Use Loctite type 243 (HILGE assembly tool kit, pos. 10, fig. 76) for this.



**Fig. 43** Locating ring

MF-411

11. Slide the rotating part of the mechanical seal 0433.01 in complete assembly onto the shaft 0211.00 up to the stop.  
Use installation sleeve from HILGE assembly kit (pos. 12, fig. 76) to do this.



**Fig. 41** Rotary part of mechanical seal

MF-635

#### Further mechanical seal assembly

- tandem seal arrangement: read on at step 13.
- back to back seal arrangement: read on at step 1. on page 46.

15. Slide the locating ring 0516.00 into the right position on the shaft.  
Use a proper measuring tool to do this.  
16. Adjust and fix locating ring 0516.00 in position by means of the studs 0904.02.



**Fig. 44** Position of location ring

MF-636

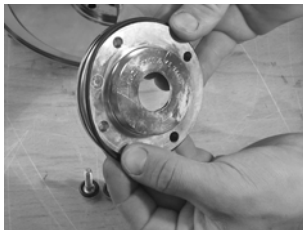
17. Unload the spring of the mechanical seal 0433.01 against the locating ring 0516.00. Use the ejector (HILGE assembly tool kit, pos. 5, fig. 76).



**Fig. 45** Spring of mechanical seal

MF-637

19. Insert the O-ring 0412.01 into the seal cover 0471.00.



**Fig. 47** Seal cover

MF-655

18. Insert the O-rings 0412.03 into the hexagon head sterile screws 0918.00.



**Fig. 46** Hexagon head sterile screw

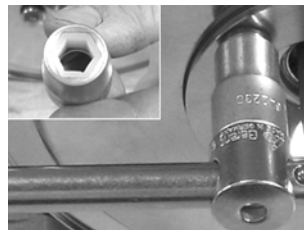
MF-412

20. Fix the seal cover 0471.00 to the discharge casing 0107.00 by means of the hexagon head sterile screws 0918.00.



*For tightening the hexagon head sterile screws 0918.00: Use socket wrench with insert (HILGE assembly tool kit, fig. 76).*

Torque M6: 8 Nm



**Fig. 48** Seal cover

MF-644

For assembly of the mechanical seal on product side 0433.00 read on from step 5. on page 39.

**6.4.8 Assembly of the double mechanical seal, back to back**

**Assemble the double mechanical seal back to back in this way:**

The assembly aids listed here may be found on 53.

Carry out step 1. to 12. described on page 39.

1. Slide locating ring 516.00 onto the shaft 0211.00.



MF-414

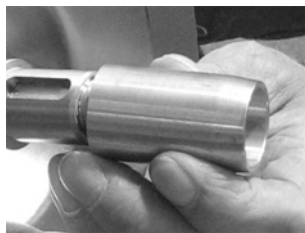
**Fig. 49** Rotating part of mechanical seal

2. Slide the assembly sleeve from HILGE assembly tool kit (pos. 3, fig. 76) onto the shaft extension.



*That way you avoid damages to the mechanical seal during the further assembly.*

3. Spray the assembly sleeve with clean water. Use spray bottle from HILGE assembly tool kit (pos. 2, fig. 76).



MF-654

**Fig. 50** Assembly sleeve

4. Slide the rotating part of the mechanical seal 0433.00 in complete assembly onto the shaft 0211.00 up to the stop. Use installation sleeve from HILGE assembly tool kit (pos. 12, fig. 76) to do this.



MF-635

**Fig. 51** Rotating part of mechanical seal

5. Insert the stationary ring of the mechanical seal 0433.00 into the seat of the seal cover 0471.00.



MF-437

**Fig. 52** Stationary ring of the mechanical seal

6. Insert the O-ring 0412.01 into the seal cover 0471.00.



MF-655

**Fig. 53** Seal cover

7. Insert the O-rings 0412.03 into the hexagon head sterile screws 0918.00.



Fig. 54 Hexagon head sterile screw

MF-412

8. Fix the seal cover 0471.00 to the discharge casing 0107.00 by means of the hexagon head sterile screw 0918.00.
9. For tightening the hexagon head sterile screw 0918.00: Use socket wrench with insert (HILGE assembly tool kit, fig. 76).  
Torque M6: 8 Nm

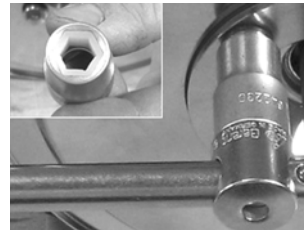


Fig. 55 Seal cover

MF-644

For assembly of the impeller and casing read section on at page 46.

#### 6.4.9 Assembly of impellers and casings

##### CAUTION



Danger that the pump shaft will be bent because of a non concentrically torque!

▲ Damage of property!

- ▷ To tighten impeller nut 0922.00, use either a screw device or the impeller-fastening-aid which is mentioned below. The torque applied to tighten must be absolutely concentric.

##### Assemble the impellers and the casings in this way:

- Insert key 0940.00.



Fig. 56 Key

MF-614

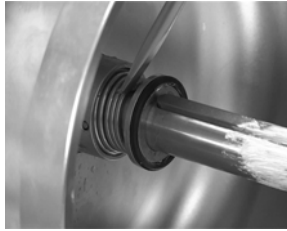
10. Grease the pump shaft 0211.00.  
Use Klüberpaste UH1 96-402 from HILGE assembly tool kit for this, pos. 6, fig. 76.



Fig. 57 Pump shaft

MF-557

11. Unload the spring of the mechanical seal 0433.00 against the seal spacer 0557.00. Use the ejector from HILGE assembly tool kit, pos 5., fig. 76.



**Fig. 58** Spring

MF-642

12. Insert the O-ring 0412.11 into the discharge casing 0107.00.



**Fig. 59** O-ring

MF-613

13. Fit the impeller 0230.01.



**Fig. 60** Impeller

MF-646

14. Insert the diffuser casing 0112.02.



**Fig. 61** Diffuser casing

MF-416

15. Insert the O-ring 0412.12 into the diffuser casing 0112.02.

**Fig. 62** Second O-ring

MF-559



16. Insert the O-ring 0412.22 into the impeller 0230.02.



**Fig. 63** Impeller O-ring

MF-417

17. Fit the second Impeller 0230.02



**Fig. 64** Second impeller

MF-677

To mount the following pump stages follow steps 6 to 9.

Take the different part numbers of impellers, diffuser casings and O-rings for impellers and diffuser-casings into account.



The pump can be equipped with two different types of impeller nuts:

- impeller nut with threaded insert
- impeller nut with lock washers

This manual describes the procedure to mount the **impeller nut with lock washers**.

If the pump is equipped with an **impeller nut with a threaded insert** take the following into account:

- As the impeller nut is being fitted, it must be possible to feel the self-locking action. It must be possible to tighten the nut without any problems. Tighten manually for the first two turns, so that the helicoil insert sits correctly on the shaft.
- The O-ring seal 0412.04 of the impeller nut 0922.00 must be wetted with water during assembly so that it is not squeezed out of the groove when the nut is tightened.
- Tightening torques:  
M10 - 20 Nm (Contra I)  
M20 - 150 Nm (Contra II)

18. Grease the Nord-Lock washer 0930.00 by using Klüberpaste UH1 96-402 from the HILGE assembly tool kit pos. 6 Fig. 76.

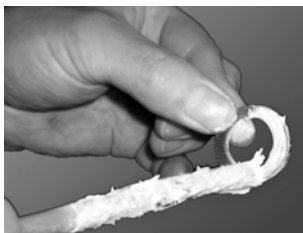


Fig. 65 Nord-lock washer

MF-366

Grease Nord-Lock washers as shown in fig. 66.

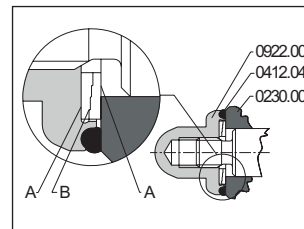


Fig. 66 Schema of Nord-Lock washer greasing

- 0230.00 impeller
- 0412.04 O-ring
- 0922.00 impeller nut
- A - fine toothings greased
- B - thick toothings against each other - greased

19. Insert the Nord-Lock washer 0930.00 into the impeller nut 0922.00.



Fig. 67 Nord-Lock washer in impeller nut

MF-367

20. Tighten the impeller nut 0922.00 by hand. Let about 5 mm space for the O-ring 0412.04.

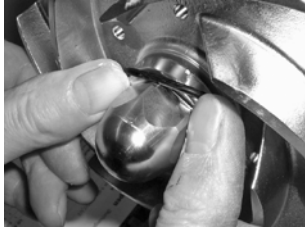


Fig. 68 Impeller nut

MF-617



21. Slide the O-ring 0412.04 on the impeller nut 0922.00 into the gap between the impeller nut 0922.00 and the impeller 0230.02.



**Fig. 69** O-ring

MF-621

To tighten the impeller nut 0922.00 properly use the impeller-fastening-aid from the HILGE assembly tool kit, fig 76.

- Contra II position 13 a/b
- Contra I position 13 c/d

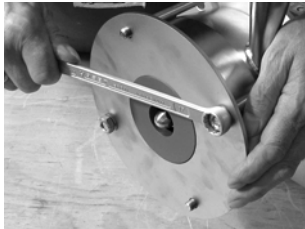
Place the plastic insert first followed by the metal plate.



**Fig. 70** Impeller-fastening-aid

MF-629

22. Tighten the metal plate of the fastening-aid to the pump casing 0112.02.



**Fig. 71** Fastening-aid metal plate

MF-616

23. Tighten the impeller nut 0922.00 using the following adjustments:

Torques:

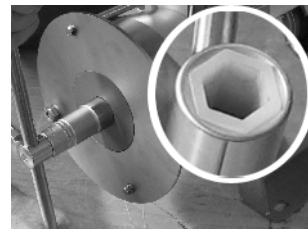
M10x1.5: 20 Nm

M20x1.5: 100 - 120 Nm.



*Use the socket wrench with insert from HILGE assembly tool kit, pos. 7 or 9 (depending on the size of the nut) fig 76. That way you avoid damage to the impeller nut 0922.00 and shaft 0211.00.*

24. Disassemble the impeller-fastening-aid.



**Fig. 72** Socket with insert

MF-418

25. Fit the suction cover 0162.00.

26. Grease threads of the tie bolts 0905.01 using Klüberpaste UH1 96-402 from HILGE assembly tool kit, pos. 6 fig 76.



**Fig. 73** Suction cover

MF-562

27. Fit the washers 0934.03 and the hexagon nuts 0927.00. Tighten the nuts 0927.00.

To tighten the nuts properly use a torque adjustment of 20 Nm.



**Fig. 74** Suction cover nuts

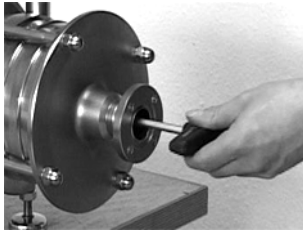
MF-640



*Tighten the domed nuts again 30 minutes after their first tightening. Because the O-rings and joints require this much time to set.*

---

28. Make sure the pump shaft turns smoothly.



**Fig. 75** Pump shaft check

MF-382

## 6.5 Troubleshooting

Problem	Cause	Remedy
<b>Pump does not deliver or delivers at a reduced rate.</b>	<ol style="list-style-type: none"> <li>1. Incorrect electrical hook-up (2 phases).</li> <li>2. Wrong rotational direction.</li> <li>3. Air in the suction line or in the pump.<sup>a</sup></li> <li>4. Back pressure too high.</li> <li>5. Suction head too high, NPSH feed too low.</li> <li>6. Lines clogged or foreign material in the impeller.</li> <li>7. Air inclusions as a result of a defective seal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the electrical connections and correct them if necessary.</li> <li>2. Reverse the phases of the power supply (reverse the polarity).</li> <li>3. Vent the suction line or the pump and refill.</li> <li>4. Reset the operating point according to the data sheet. Check system for contamination.</li> <li>5. Raise the liquid level on the suction side. Open the shut-off valve in the suction line all the way. Produce the conditions described in section 5.1.1. Consult manufacturer.</li> <li>6. Open the pump and fix the problem.</li> <li>7. Check the pipeline seals, the pump housing seals, and the shaft seals. Replace if necessary.</li> </ol>
<b>Motor safety switch turns motor off. Motor is overloaded.</b>	<ol style="list-style-type: none"> <li>1. Pump jammed because of clogging.</li> <li>2. Pump jammed by contact because pump body was twisted by the pipelines. (Check for damage).</li> <li>3. Pump continues to run beyond the rated operating point.</li> <li>4. The density or viscosity of the pumping medium is higher than the value stated in the order.</li> <li>5. Motor safety switch not properly adjusted.</li> <li>6. Motor running on 2 phases.</li> </ol>	<ol style="list-style-type: none"> <li>1. Open the pump and fix the problem.</li> <li>2. Install the pump so that there is no stress on it. Support the pipelines at fixed points.</li> <li>3. Set the operating point according to the data sheet.</li> <li>4. If it is acceptable for the performance to be lower than that stated, decrease the delivery rate on the pressure side. Otherwise, use a more powerful motor. Consult manufacturer.</li> <li>5. Check the setting. Replace the safety switch if necessary.</li> <li>6. Check the electrical connections. Replace defective fuses.</li> </ol>
<b>Pump produces too much noise. Pump runs roughly and vibrates.</b>	<ol style="list-style-type: none"> <li>1. Suction head too high, NPSH feed too low.</li> <li>2. Air in the suction line or in the pump.<sup>a</sup></li> <li>3. Back pressure lower than stated.</li> <li>4. Impeller out of balance.</li> <li>5. Internal parts worn.</li> <li>6. Pump is twisted (causing contact noises). Check for damage.</li> <li>7. Bearings are defective.</li> <li>8. Bearings have too little, too much, or the wrong kind of lubricant.</li> <li>9. Motor cooling fan defective.</li> <li>10. Gear ring of the coupling (power transmission) defective.<sup>b</sup></li> <li>11. Foreign material in the pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Raise the liquid level on the suction side. Open the shut-off valve in the suction line all the way. Produce the conditions described in section 5.1.1. Consult manufacturer.</li> <li>2. Vent the suction line or the pump and refill.</li> <li>3. Set the operating point according to the data sheet.</li> <li>4. Clean, inspect, and rebalance the impeller.</li> <li>5. Replace parts.</li> <li>6. Install the pump so that there is no stress on it. Support the pipelines at fixed points.</li> <li>7. Replace the bearings.</li> <li>8. Add more lubricant, decrease the amount, or replace the lubricant.</li> <li>9. Replace the motor cooling fan.</li> <li>10. Replace the gear ring of the coupling. Realign the coupling.</li> <li>11. Open the pump and clean it (install a screen in front of self-priming pumps, if necessary).</li> </ol>

Tab. 9 Troubleshooting

Problem	Cause	Remedy
<b>Leakage at the pump body, at the connections, at the mechanical seal and at the stuffing box or gland seal.</b>	<ol style="list-style-type: none"> <li>1. Pump is twisted (causing leaks at the pump body or at the connections).</li> <li>2. Housing seals and seals at the connections are defective.</li> <li>3. Rotating mechanical seal dirty or stuck.</li> <li>4. Rotating mechanical seal worn.</li> <li>5. Stuffing box packing worn out.</li> <li>6. Surface of shaft or shaft safety sleeve worn down.</li> <li>7. Elastomer unsuitable for the pumping medium.</li> </ol>	<ol style="list-style-type: none"> <li>1. Install the pump so that there is no stress on it. Support the pipelines at fixed points.</li> <li>2. Replace the housing seals or the seals of the connections.</li> <li>3. Inspect and clean the rotating mechanical seal.</li> <li>4. Replace mechanical seal.</li> <li>5. Tighten the stuffing box packing, add more packing, or replace the packing.</li> <li>6. Replace the shaft or the shaft safety sleeve. Repack the stuffing box.</li> <li>7. Use an elastomer suitable for the pumping medium and the temperature.</li> </ol>
<b>Unallowable temperature increase at the pump, bearing housing, or motor.</b>	<ol style="list-style-type: none"> <li>1. Air in the suction line or in the pump.<sup>a</sup></li> <li>2. Bearings have too little, too much, or the wrong kind of lubricant.</li> <li>3. Pump and bearing housing are twisted.</li> <li>4. Axial thrust too high.</li> <li>5. Motor safety switch is defective or not properly adjusted.</li> <li>6. Pressure valve closed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Vent the suction line or the pump and refill.</li> <li>2. Add more lubricant, decrease the amount, or replace it.</li> <li>3. Install the pump so that there is no stress on it. Support the pipelines at fixed points. Check the alignment of the coupling.</li> <li>4. Inspect the relief holes in the impeller and the split rings at the inlet.</li> <li>5. Check the adjustment. Replace the motor safety switch if necessary.</li> <li>6. Open the pressure valve.</li> </ol>

Tab. 9 Troubleshooting

- a. Applies not to self priming pumps.
- b. Applies to CN baseplate design.

## 6.6 Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Hilge/Grundfos company or service workshop.

6.7 HILGE assembly tool kit

Remove and install the mechanical seals safely and reliably by using tools of the HILGE assembly tool kit.

Content of tool kit

Fig. 76 shows the tools of the assembly kit.

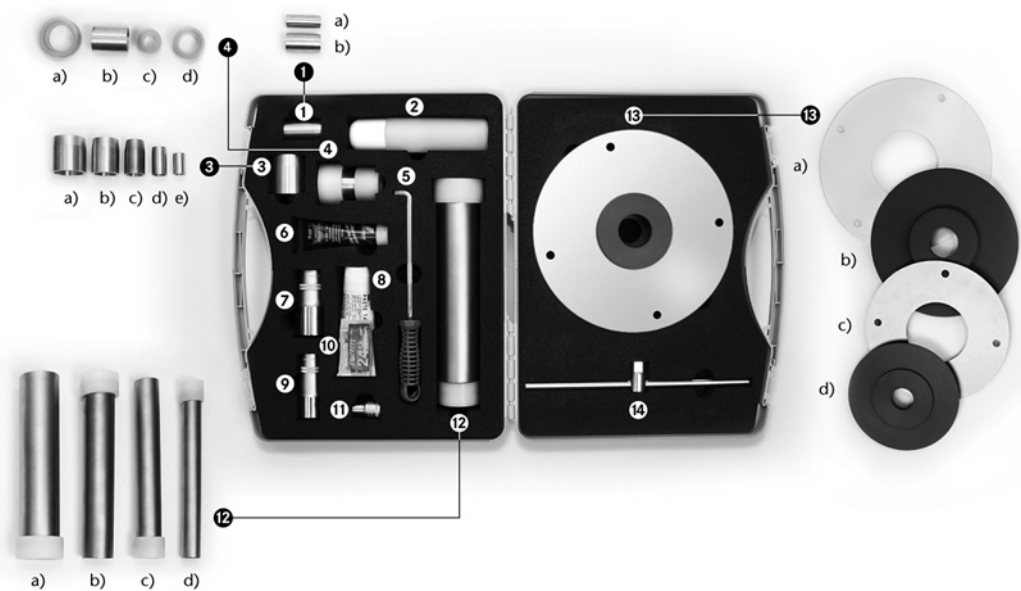


Fig. 76 HILGE Assembly Tool Kit

6.7.1 Content and use

The list below specifies the tools of the kit:

item (fig.)	description	Contra I	Contra II	item (fig.)	description	Contra I	Contra II
1a	assembly sleeve Ø 19	●		11	socket spanner insert SW 10	●	●
1b	assembly sleeve Ø 28		●	12c	mechanical seal installation sleeve Ø 28 and Ø 30		●
2	spray bottle	●	●	12c	plastic adapter Ø 28		●
5	ejector for mechanical seal - stationary ring	●	●	12d	mechanical seal installation sleeve Ø 19 and Ø 22	●	
6	Klüber paste UH1 84-201	●	●	12d	plastic adapter Ø 19	●	
7	socket spanner SW 32		●	13a	impeller fastening aid Contra II		●
7	socket spanner insert SW 27		●	13b	impeller fastening aid Contra II, plastic		●
8	Optimol Paste TA	●	●	13c	impeller fastening aid Contra I	●	
9	socket spanner SW 24	●		13d	impeller fastening aid Contra I, plastic	●	
9	socket spanner insert SW 17	●		14	cross handle with 1/2" rectangle	●	●
10	screw locking Loctite Typ 243	●	●		HILGE assembly tool kit	●	●
11	socket spanner SW 14	●	●				

Tab. 10 HILGE-assembly tool kit, tools for Contra

## 7. Certificate of non-objection

### Overview

This section contains a certificate of non-objection. In case of inspection or repairing send the pump including these certificate to HILGE.

### 7.1 Certificate of non-objection

The following pump and its accessories, together with this certificate of non-objection, are herewith contracted out by the undersigned for inspection/repair:

Pump data

- Model:
- No.:
- Delivery Date:

Reason for inspection / repair contract:

---



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The pump (please mark with a cross)

\_\_\_ was not used in media hazardous to health

\_\_\_ was used for the following: \_\_\_\_\_

Please state the last medium to be pumped, if known:

---

The pump was carefully drained and also cleaned inside and out before it was shipped/made available. (please mark with a cross)

\_\_\_ No special safety measures are required in the course of further handling.

\_\_\_ The following safety measures pertaining to flushing media, residual liquids, and disposal are required:

---



---



---



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We confirm that the information given above is correct and complete and that shipment is in compliance with legal regulations.

Company (address):

Telephone, fax, email

Name (please print), title

Date

---



---



---



---

Company stamp / signature

## 8. Service addresses

### Overview

For questions and comments, please contact the service addresses of the companies below.

### 8.1 HILGE

#### Germany

HILGE GmbH & Co. KG  
Hilgestrasse  
55294 Bodenheim  
GERMANY  
Telephone + 49 - 6135 / 75-0  
Fax + 49 - 6135 / 17 37  
E-Mail hilge@hilge.de  
Internet www.hilge.com

### 8.2 GRUNDFOS

#### Denmark

GRUNDFOS DK A/S  
Martin Bachs Vej 3  
DK-8850 Bjerringbro  
Tlf.: +45-87 50 50 50  
Telefax: +45-87 50 51 51  
E-mail: info\_GDK@grundfos.com  
www.grundfos.com/

#### Argentina

Bombas GRUNDFOS de Argentina S.A.  
Ruta Panamericana km. 37.500 Lote 34A  
1619 - Garin  
Pcia. de Buenos Aires  
Phone: +54-3327 414 444  
Telefax: +54-3327 411 111

#### Australia

GRUNDFOS Pumps Pty. Ltd.  
P.O. Box 2040  
Regency Park  
South Australia 5942  
Phone: +61-8-8461-4611  
Telefax: +61-8-8340 0155

#### Austria

GRUNDFOS Pumpen Vertrieb Ges.m.b.H.  
Grundfosstraße 2  
A-5082 Grödig/Salzburg  
Tel.: +43-6246-883-0  
Telefax: +43-6246-883-30

#### Belgium

N.V. GRUNDFOS Bellux S.A.  
Boomsesteenweg 81-83  
B-2630 Aartselaar  
Tel.: +32-3-870 7300  
Télécopie: +32-3-870 7301

#### Belorussia

Представительство ГРУНДФОС в Минске  
220090 Минск ул.Олешева 14  
Телефон: (8632) 62-40-49  
Факс: (8632) 62-40-49

#### Bosnia/Herzegovina

GRUNDFOS  
Sarajevo  
Paromlinska br. 16,  
BiH-71000 Sarajevo  
Phone: +387 33 713290  
Telefax: +387 33 231795

#### Brazil

GRUNDFOS do Brasil Ltda.  
Rua Tomazina 106  
CEP 83325 - 040  
Pinhais - PR  
Phone: +55-41 668 3555  
Telefax: +55-41 668 3554

#### Bulgaria

GRUNDFOS Pumpen Vertrieb  
Representative Office - Bulgaria  
Bulgaria, 1421 Sofia  
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105-107 Arsenalski blvd.  
Phone: +359 2963 3820, 2963 5653  
Telefax: +359 2963 1305

#### Canada

GRUNDFOS Canada Inc.  
2941 Brighton Road  
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Telefax: +1-905 829 9512

#### China

GRUNDFOS Pumps (Shanghai) Co. Ltd.  
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PRC  
Phone: +86-512-67 61 11 80  
Telefax: +86-512-67 61 61 67

#### Croatia

GRUNDFOS predstavništvo Zagreb  
Cebini 37, Buzin  
HR-10000 Zagreb  
Phone: +385 1 6595 400  
Telefax: +385 1 6595 499

#### Czech Republic

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Ěapkovského 21  
779 00 Olomouc  
Phone: +420-585-716 111  
Telefax: +420-585-716 299

#### Estonia

GRUNDFOS Pumps Eesti OÜ  
Peterburi tee 44  
11415 Tallinn  
Tel.: +372 606 1690  
Fax: +372 606 1691

#### Finland

OY GRUNDFOS Pumput AB  
Mestarintie 11  
FIN-01730 Vantaa  
Phone: +358-3066 5650  
Telefax: +358-3066 56550

#### France

Pompes GRUNDFOS Distribution S.A.  
Parc d'Activités de Chesnes  
57, rue de Malacombes  
F-38290 St. Quentin Fallavier (Lyon)  
Tél.: +33-4 74 82 15 15  
Télécopie: +33-4 74 94 10 51

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Schlüterstr. 33  
40699 Erkrath  
Tel.: +49-(0) 211 929 69-0  
Telefax: +49-(0) 211 929 69-3799  
e-mail: infoservice@grundfos.de  
Service in Deutschland:  
e-mail: kundendienst@grundfos.de

#### Greece

GRUNDFOS Hellas A.E.B.E.  
20th km. Athinon-Markopoulou Av.  
P.O. Box 71  
GR-19002 Peania  
Phone: +0030-210-66 83 400  
Telefax: +0030-210-66 46 273

#### Hong Kong

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68 King Lam Street, Cheung Sha Wan  
Kowloon  
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Telefax: +852-27858664

#### Hungary

GRUNDFOS Hungária Kft.  
Park u. 8  
H-2045 Törökbálint,  
Phone: +36-23 511 110  
Telefax: +36-23 511 111

#### India

GRUNDFOS Pumps India Private Limited  
118 Old Mahabalipuram Road  
Thoraiakkam  
Chamiers Road  
Chennai 600 096  
Phone: +91-44 2496 6800

#### Indonesia

PT GRUNDFOS Pompa  
Jl. Rawa Sumur III, Blok III / CC-1  
Kawasan Industri, Pulogadung  
Jakarta 13930  
Phone: +62-21-460 6909  
Telefax: +62-21-460 6910 / 460 6901

#### Ireland

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Unit A, Merrywell Business Park  
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Telefax: +353-1-4089 830

#### Italy

GRUNDFOS Pompe Italia S.r.l.  
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Telefax: +39-02-95309290 / 95838461

#### Korea

GRUNDFOS Pumps Korea Ltd.  
6th Floor, Aju Building 679-5  
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