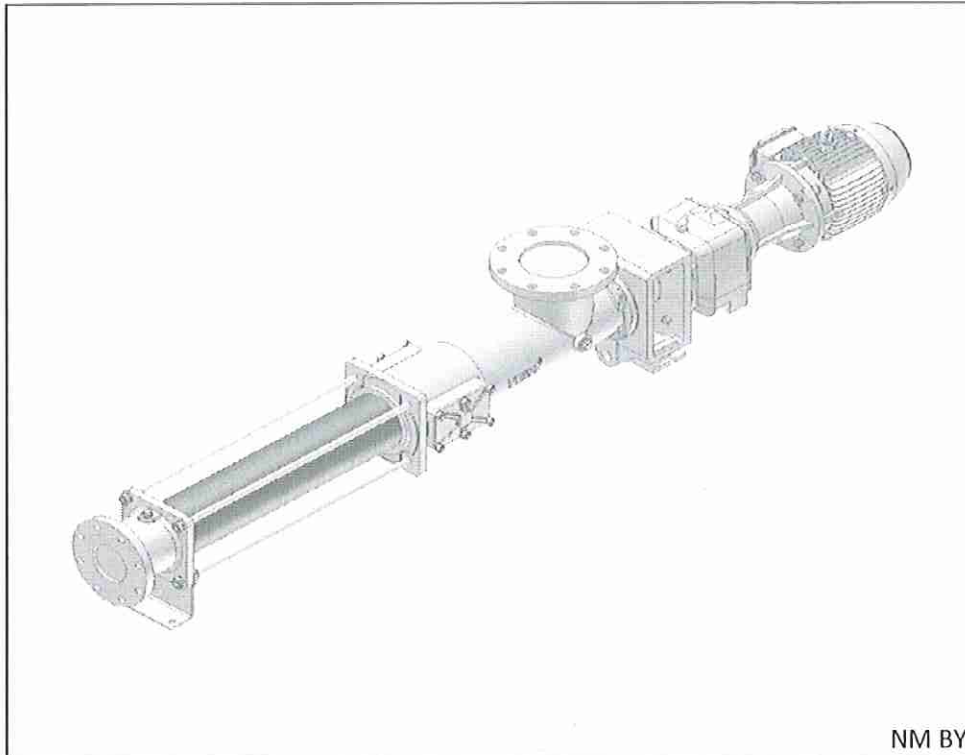


109076

# NETZSCH

## Operating and Maintenance Instructions



### NEMO<sup>®</sup> Pump

Model Number

NM021BY04S24B-999

Sales Order/Job Number

MAC2011154509

Machine Number

USB 82087

Date of Issue

2010

#### **Important Note**

*These operating instructions are designed to familiarize the user with the machine and its designated use.*

#### **The Instruction Manual**

• Contains important information on how to operate the machine safely, properly and efficiently. Observing these instructions help to avoid danger to reduce repair costs and downtimes and to increase the reliability and life of the machine.

• Must always be available

wherever the machine is in use.

• Must be read and applied by any person in charge of carrying out work with and on the machine. Such as:

**Operation** including setting up, troubleshooting in the course of work, evacuation of production waste, care and disposal of fuels and consumables.

**Maintenance** (servicing, inspection, and/or repair)

**Transport;** shall be completed by the end user and authorized personnel with the national requirements in force for the prevention of accidents and the environmental protection.

In addition to the operating instructions and to the mandatory rules and regulations for accident prevention and environmental protection in the country and place of use of the machine, the generally recognized technical rules for safe and proper working must be observed.

Material 021BY04S24B-999  
 Plant/Usage/Alt. 0032 / 1 / 01  
 Description 4401-4401-4401 80 DEG-S45-CARTEX-P-SM  
 Base Qty (ST ) 1  
 Reqd Qty (ST ) 1

Lv	Item	Object	Object ID	Object description	Ovfl	Quantity	Un	Asm
1	0085	#	NDB4914248	STOOL DRIVER NM031B 0.6025 160mm PP		1	PC	-
1	1030	#	NMP5067630	PIN 8.0h8*33 1.4401 NM031 PP WN0148F1		1	PC	-
1	1035	#	NMP50666416	THROWER 32.5*65*29 PERBUNAN NM031B PP		1	PC	-
1	1050	#	NMP50666794	EXT SHAFT NM031BY 1.4401 19mm PP		1	PC	-
1	1998	#	955510	CONN ROD NM031-12B P 1.4401 GA135		1	PC	-
1	1999	#	NMP5070657	ROTOR		1	PC	-
1	2005	#	NMP5064078	DISCH CSTG NM021-24 1.4401 2"-300# ANSI		1	PC	-
1	2010	#	NDB4909049	SUCT HSG NM031-Y-12 1.4571 2"-150# ANSI		1	PC	-
1	2015	#	595372	PLUG DRAIN 0.75NPT ANSI 1.4571		3	PC	-
1	2016	#	595370	PLUG DRAIN SQ 0.50NPT ANSI 1.4571		1	PC	-
1	2020	#	593673	STUD M8*30 D938 A4		4	PC	-
1	2025	#	502198	WASHER LOCK A8MM D127 A4 SS		4	PC	-
1	2030	#	501356	NUT HEX M8 D934 A2-304SS		4	PC	-
1	2035	#	955466	SUCT HSG SPRT NM031-12 ST		1	PC	-
1	2115	#	941655	REDUCTION RING NM031-NM021 WN003 F11		1	PC	-
1	3005	#	NMP5026936	STATOR		1	PC	-
1	3010	#	NDB4971458	THRU BOLT		4	PC	-
1	3015	#	502198	WASHER LOCK A8MM D127 A4 SS		4	PC	-
1	3020	#	501356	NUT HEX M8 D934 A2-304SS		6	PC	-
1	3070	#	502081	WASHER FLAT A8.4 A2SS D125 SUB502306		4	PC	-
1	5065	#	512277	RING RTNR 1.4401 NL20		2	PC	-
1	5075	#	864407	CONN ROD PIN NL20 1.3505 10.0M6*32		2	PC	-
1	5115	#	861394	PIN RTNR 1.4571 NL20A		2	PC	-
1	5425	#	878238	RING CLAMPING NE20A 1.4571		2	PC	-
1	7010	#	NMP5164936	MECH SEAL		1	PC	-
1	8015	#	684398	O-RING 75*3 EPDM D3770		1	PC	-
1	8060	#	590994	O-RING 30*3 EP70 D3770		4	PC	-
1	8210	#	NDB4038519	O-RING 50*3		1	PC	-
1	8235	#	883069	PIN JOINT SM SEAL NM031/NL20A 1.4401/EP		2	PC	-

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<p>Remark: Because of data transfer the text sheet printouts of our operating instructions do not contain a personal signature.</p>	

## 1 Safety Instructions

This manual contains basic instructions which must be observed when installing, operating and servicing the machine / equipment. It is essential therefore for the user / installer or responsible technician to read the manual thoroughly prior to installation and operation.

A copy of the manual must always be at hand where the machine / equipment is being used. In addition to the general safety instructions listed in this main section on safety, it is

necessary to observe the special safety rules included in other sections of the manual, eg. for private use.

### 1.1 Safety Signs

The signs below are printed in the manual as general hazard / danger symbols to mark those safety instructions whose non-observance can result in danger to personnel or to the machine / equipment. These signs are:



Hazard sign DIN 4844 - W9  
Danger to general public



Hazard sign DIN 4844 - W8  
Risk of electric shock



Risk of injury from machinery



Danger from suspended loads



Damage to machinery



Risk of injury to your eyes: goggles required.

Continued Page 1.0R



Warning plates located directly on the pump/equipment showing for example the correct direction of rotation or the fluid connections used must always be observed and kept completely legible.

### 1.2 Personnel Qualifications and Training

Operating, maintenance, inspection and installation staff must possess the correct qualifications for their work. Areas of responsibility, scope of authority and staff supervision must be exactly defined by the user. If personnel do not have the necessary knowledge they must receive due training and instruction. If necessary, the user of the machine / equipment can arrange for such training and instruction to be provided by the manufacturer / supplier. The user must also make sure that the content of the manual is fully understood by the staff concerned.

#### Responsibilities

All work on and operation of the pump/equipment should be carried out by trained/competent and qualified operators, tradesmen and / or engineers as appropriate.

Any person responsible for or in charge of

- **working with lifting gear** and ropes when moving a pump / equipment will have to be duly instructed prior to doing the transportation job;
- **mounting a drive** to a pump / equipment must be qualified / trained as an industrial mechanic / technician;

- **setting up installations into a plant** must be qualified / trained as an industrial mechanic/ technician and must be familiar with the design and functioning of the plant in which the pump / equipment is being installed;

- **doing work on starting up, operation and maintenance** must gain knowledge of the pump / equipment principle prior to performing such works and must study the safety instructions and the manual thoroughly;

- **doing repair works**, and prior to doing such works, must be trained and skilled in the job. He must have due knowledge of the pump/equipments specific details set up in the repair instructions. Unskilled personnel must be trained and repair works checked.

### 1.3 Dangers arising from Non-Observance of the Safety Instructions

Non-observance of the safety instructions can result in danger to personnel as well as to the environment and the machine. Non-observance of the safety instructions can result in the loss of claims for compensation.

Non-observance of the safety instructions can have, for example, the following consequences:

- ▲ Failure of essential functions of the machine / equipment
- ▲ Failure of mandatory maintenance and servicing methods

- ▲ Danger to personnel from electricity, machinery and chemicals
- ▲ Danger to the environment from leakage of hazardous substances.

#### 1.4 Safety Conscious Working

In addition to the safety instructions listed in the manual, it is essential to observe the national accident prevention directives currently in force and any of the users own internal regulations concerning work and safety.

#### 1.5 Safety Instructions for the User / Operator

- ▲ If there is a risk of danger from any hot or cold machine component, the user must fit protective guards to prevent such components from being touched (according to Standard EN 563).
- ▲ Protective guards fitted to prevent contact with moving parts (eg. couplings) must be in position when the machine / equipment is in use.
- ▲ Leakages (eg. from a shaft seal) of hazardous materials (eg. explosive, toxic, hot material) must be discharged in such a way that neither personnel nor the environment are placed at risk. Legal directives must be observed.

- ▲ All possible danger from electricity must be eliminated (for details see eg. the regulations of your local power supply company).

#### 1.6 Safety Instructions for Maintenance, Inspection and Installation

The user must ensure that all maintenance, inspection and installation work is carried out by authorized and qualified personnel who understand the operating instructions and are adequately trained.

Work on a pump / equipment must only be carried out with the machine stopped and electrical power supply turned off. The pump/equipment must not be under any pressure and must have cooled off. All procedures detailed in these operating instructions on the stoppage of the machine must always be adhered to.

Pumps / equipment which convey harmful media must be decontaminated.

Immediately after the maintenance work is finished all safety devices and guards must be re-installed and the safety trips must be tested.

Before putting the machine back into operation the points detailed in section "Start-up" should be observed.

### 1.7 Unauthorized Modifications and Manufacture of Spares

Modifications or changes to machines / equipment are only permissible with the manufacturer's agreement. Original spare parts and accessories authorized by the manufacturer ensure safety.

The use of other components revokes any liability for consequences which may result.

### 1.8 Improper Application

Delivered machinery / equipment is only guaranteed safe for the use specified.

This machine / equipment was designed in accordance with the prescribed conditions of use.

The limits of use are laid down in the conditions of use and should in no way be exceeded.

### 1.9 Specific Points for the Use of a NEMO® Pump

A NEMO® pump must be used for the **purpose only** for which it was sold.

If you change or wish to change the process medium, you must check with either the supplier or manufacturer that the pump is suitable for the new medium. This is especially important with aggressive, poisonous or otherwise hazardous substances.

Pump criteria include:

1. Compatibility with the medium

2. Suitability for seal design / material, especially the shaft seal

3. Resistance to pressure and temperature of the medium.

Please note that NEMO® pumps are progressing cavity pumps and as such can generate very high pressure.

A blockage or the chance closure of a valve in the discharge line can cause a pressure rise **manifold as high as can be tolerated by the installation**. This can result in the bursting of pipes, which must be avoided especially in the case of dangerous media.

Corresponding safety equipment must therefore be installed, for example an emergency stop button, a pressure relief valve with return pipe or a bursting disc.

During maintenance and repair work on the pump please note the following:

1. Ensure that the pump drive **can not** be turned on without authorization.
2. When opening the pump follow the instructions for handling the medium (eg. protective clothing, no smoking etc).
3. Before putting the pump back into operation ensure that all guards and other safety devices (eg. drive-belt protection, coupling protection) are properly re-installed.

**Always bear in mind your safety during operation, maintenance and installation of equipment. Please adhere to the EC-Directive for Machinery including the national regulations and follow the European Standard EN 292 with the accident prevention rules laid down by the trade unions and other appropriate technical institutions.**



**1.10 Notes on Inspection and Repair**

The legal regulations for safety at work, such as regulations for the workplace, regulations governing dangerous materials, accident prevention, environmental protection eg. regulations on disposal and water balance obligate all commercial business to protect their employees and / or people and the environment from adverse effects caused by contact with dangerous materials.

**Important:**

Inspection / repair of machinery and its parts only takes place when a safety conformity certificate has been completed by an

authorized and qualified specialist. Please use a copy and leave the original in the operation and maintenance manual.

Where special safety precautions are necessary in spite of careful emptying and cleaning of the machinery, the necessary information must be given.

Machinery operating with radio-active media will only be repaired or inspected by one of our specialist engineers under the safety of the owner.

The safety conformity certificate is part of the inspection / repair service. We reserve the right to refuse acceptance of this order / service for other reasons.

**1.11 Instructions concerning explosion protection**

The instructions below are to be considered and kept to when using pumps in potentially explosive areas in order to guarantee durable explosion protection of the pumps and avoid any danger of ignition.

In accordance with the regulations 94 / 9 / EC, the pumps are admitted for use in the area II 2G IIB T 4 or II 2G IIB T 3 (pls. see manufacturer's declaration or declaration of conformity).

It is to be taken into account that in case of aggregates the components (e.g. gears, couplings) mounted on the pumps must comply with the regulations 94 / 9 / EC as well. The relevant documentation concerning these components is to be considered.

The application area of aggregates is determined by the application area of the mounted component with the lowest approval and thus may deviate from the allowed application area of the pump.

Temperature category	Max. temperature of the conveying product
T 4	100 °C
T 3	165 °C
T 2	265 °C
T 1	415 °C

The maximum conveying product temperatures apply when mechanical seals of Messrs. Burgmann with carbide – carbide and carbide – carbon as sliding material combinations are used.

In the case of other manufacturers or other sliding material combinations it is necessary to consult the manufacturer.

**1. Assembly and repair in potentially explosive areas**

When performing assembly and repair work, it is to be seen to it that no dangers of ignition arise especially during heating up the pump parts. This means e.g. heating up by explosion-proof heating devices or exclusively in non-explosive areas. The temperature of the heated part and the ignition temperature of the materials by which the danger of explosion may be caused are to be considered.

**2. Dry-running protection**

Under no circumstances is the pump to run dry. The pump is to be equipped with an appropriate dry-running protection device.



The device for dry-running protection should be self-regulating. This means that this device can give alarm signals and/or switch off the pump also in case of failures in its own control system.

**Dry-running protection concerning stationary immersion pumps (with mounting plate)**

Operation is only permitted with redundant or self-regulating automatic devices to guarantee dry-running protection as well as to control the pump capacity.

**Dry-running protection concerning movable immersion pumps (drum pumps)**

The filling with liquid during the operation is to be ensured by specific requirements of behavior:

- Drum pumps may only be introduced in and removed from the container in switched-off condition
- Drum pumps, after being introduced in the container to be discharged, may only be started after they have immersed in the fluid.
- Drum pumps are to be switched off before they run dry or are to be switched off at once when specific noises ("slurping" or speed rise) suggest that dry running may or will immediately occur.

**3. Overpressure protection**

The pump must not be loaded over the maximum allowable pressure. The pump is to be equipped with an appropriate overpressure protection device. The pump must not convey against a closed slide valve. The overpressure protection device should be self-regulating.

**4. Drives**

The drives must be adjusted to the performance of each pump. In the case of a blocking of the pump, the drives must be turned off automatically by means of a motor protection unit.

**5. Alignment of the drive (concerning the pump types SY / SH / SA / SO / SF / SP)**

It is absolutely necessary that the drive be aligned within the maximum allowable tolerances. Incorrect alignment causes damage to the seals and the shaft bearings.

**6. Potential equalization concerning immersion pumps**

The immersion pumps are to be integrated in the potential equalization of the installation. Hand-operated movable immersion pumps are to be grounded before being introduced in the container.

The connection to ground is to be maintained until the pump has been completely pulled out of the container.

There must not be any potential difference between the pump and a conductive container. This means that container and pump are to be connected at a common grounding point and thus be conductively connected with each other.

(see information brochure "Statische Elektrizität, Zündgefahren und Schutzmaßnahmen" (Static electricity, dangers of ignition and preventive measures); Publisher: "Internationale Sektion für die Verhütung von Arbeitsunfällen und Berufskrankheiten in der chemischen Industrie der IVSS" (International section for the prevention of employment accidents and occupational diseases in the chemical industry of the ISSA (International Social Security Association)), Heidelberg 1995).

The hand-operated movable immersion pumps are to be provided with an indication referring to the grounding measure (pay attention to grounding).

## 7. Potential equalization concerning all other pump types (no immersion pumps)

All conductive parts of the pump are to be integrated in the potential equalization of the pumping set unless the conductive connection to the ground potential is guaranteed by the drive or connecting shafts or otherwise.

## 8. Stator

The stator is to be regularly checked for wear. When the allowable wear limit is reached, the stator is to be replaced. Before exchanging the conveying product, the pump operator has to consult the manufacturer concerning the durability of the stator unless the stator has already been confirmed for the intended application.

**Inspection and maintenance interval of the stator:**

- in the case of an operating time of > 16 h/day, at least twice a year
- in the case of an operating time of < 16 h/day, at least once a year.

## 9. Joints / joint lubrication

The sealing and the lubrication of the joints are to be regularly checked. If necessary, the seals and the lubricants are to be replaced.

**Inspection and maintenance interval of the joints:**

- in the case of an operating time of > 16 h/day, at least twice a year
- in the case of an operating time of < 16 h/day, at least once a year.

## 10. Inspection after initial startup

The aspects relevant for ensuring the explosion protection (such as lubrication and wear check) are to be checked six months after the initial startup of the pump at the latest.

**11. Shaft bearings**

**(concerning the pump types SY / SH / SA / SO / SF / SP)**

Replacement of the bearings after 14,500 operating hours (according to prEN 13463-5: replacement after 90 % of the designated service life).

**12. Materials**

Although being allowed as material for the pumps, aluminum should be avoided in potentially explosive areas.

The pumps may only be used if, under the particular operating conditions, the materials are resistant to mechanical and/or chemical influences or corrosion such that the explosion protection will be maintained.

**13. Noise development**

**(concerning the pump types SO / BO / SF / BF / SP / BP)**

As soon as unusual noises (such as knocking or rubbing) are realized, the pump is to be switched off. The cause of the failure is to be eliminated before the pump is reoperated.

Regular check of the paddle equipment.

**14. Direction of flow of immersion pumps**

The direction of flow of immersion pumps always has to be from the end connection piece to the pressure nozzle at the top. The reverse direction of flow is not allowed.

**15. Mechanical seal of immersion pumps**

Before the initial startup and after a prolonged shutdown, the mechanical seal is to be lubricated from outside before the pump is started. In this connection, the compatibility of the lubricant with the sealing material is to be considered.

**16. Impurities in immersion pumps**

Especially in the case of hand-operated movable immersion pumps it is to be seen to it that no impurities can get into the pump. The pumps are to be deposited only on clean and solid ground or else to be suspended. In case of unusual noises or power losses, the immersion pumps are to be switched off immediately.

**17. Gland**

If a gland packing is applied it has to be observed that the permitted temperature corresponding to the temperature category is not exceeded. Recommendation: fasten the screws of the stuffing box gland only with low torque (approx. 5 Nm).

Safety Conformity Certificate

The machinery and its accessories together with this safety conformity certificate relating to repair / inspection services given to the undersigned by ourselves

Machine Type .....
Number .....
Delivery Date ..... Delivery Note No. ....

was carefully emptied and cleaned both inside and out in preparation for shipment [ ] yes [ ] no

Special safety precautions with regard to health or media endangered by water are to be implemented [ ] necessary [ ] unnecessary

The machinery is set up to transport materials dangerous to health or water and came in contact with media containing harmful substances [ ] yes [ ] no

The following safety precautions are necessary with regard to irrigation media, overflow liquid and waste management:
.....
.....

We confirm that the above mentioned details are correct and complete and that despatch will follow in accordance with the legal requirements:

Company Telephone .....
..... Fax .....
..... Telex .....

Address
.....
.....

Name ..... Position .....

.....
Date

.....
Company Stamp / Signature



## 2 Description

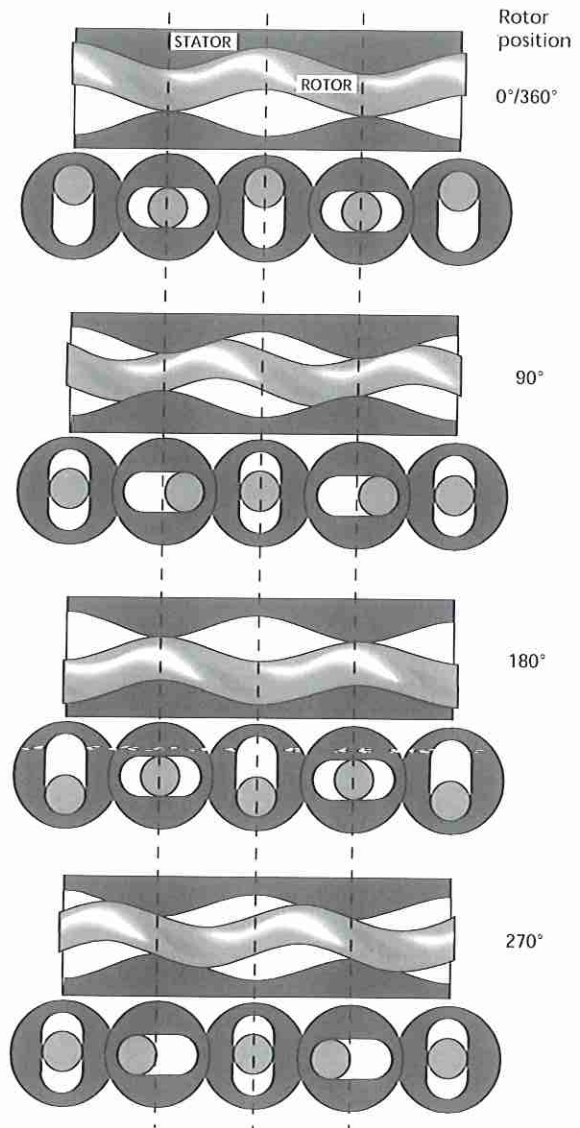
The NEMO<sup>®</sup> pump is a progressing cavity pump.

The main components which determine the system discovered by Professor René Moineau are a rotating part, called the rotor and a static part, called the stator.

The rotor is a helical screw with an extremely large pitch, large thread depth and small centre diameter with round cross-section for 1/2-geometry and elliptical cross-section for 2/3-geometry. The stator has a two start or resp. 3 start thread and is double or resp. 1.5 the pitch length of the rotor. This provides space for the medium between the rotor and stator. When the rotor turns round inside the stator the medium moves continuously from the inlet to the outlet.

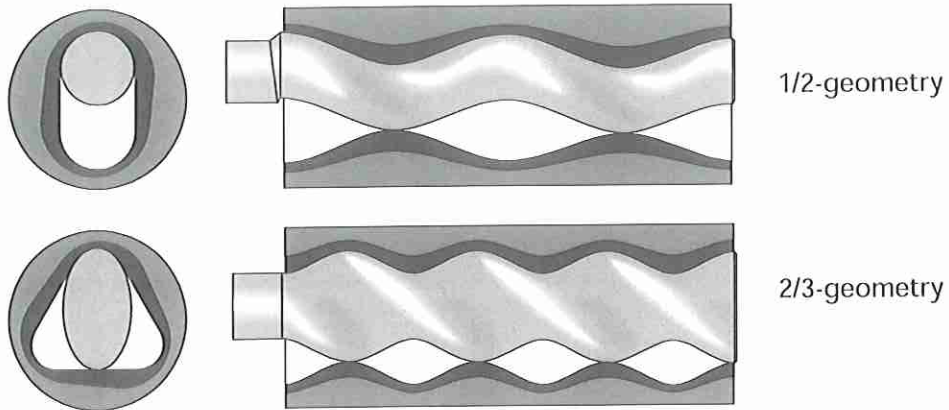
The universal NEMO<sup>®</sup> pump system unifies many positive characteristics of other pump types:

- Like centrifugal pumps NEMO<sup>®</sup> pumps have no suction or pressure valves, but do have a stable flow rate in proportion to the number of revolutions.
- Like piston pumps NEMO<sup>®</sup> pumps have a suction capability of up to 8.5 m vacuum metric.
- Like membrane and peristaltic pumps the NEMO<sup>®</sup> pump can transport every type of inhomogenous, gaseous and abrasive media, as well as those that are not of a liquid consistency or contain solids and/or fibrous material.
- Like gear pumps and screw pumps the NEMO<sup>®</sup> pump is capable of coping with high medium viscosities.
- Like piston, membrane, gear or screw pumps the NEMO<sup>®</sup> pump can perform dosing operations.



Length and cross-sections through the rotor and stator with 1/2-geometry during a rotation.

Continued Page 2.0R



Length and cross-sections through the stator with rotor  
with reduced stator wall thickness

## 2.2 General Data

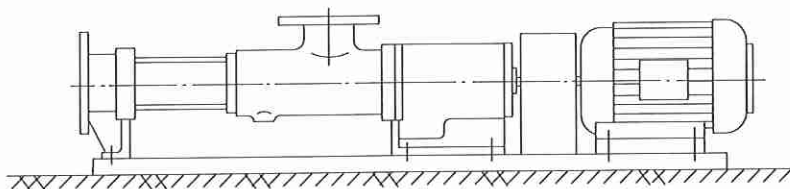
### Noise emissions:

The maximum permitted noise emission level at a work place is 70 dB (A).

The noise level was measured in accordance with DIN Standard 45635-24-01-KL2 to assure that the pump does not exceed 70 dB (A).

Noises generated by the drive and pipes are not included in the above emission value.

A prerequisite for the noise emission level of  $\leq 70$  dB (A) is that the pump is operated in a cavity free regime and is bolted to a concrete base.





### 3 Packaging, Transportation, Storage

#### 3.1 Packaging and Transportation

NEMO® pumps are shipped in railroad containers or crates unless the customer specifies otherwise.

The packings are labelled and symbols give the handling instructions in accordance with DIN 55402.

On receipt check for any transport damages.

Transport damages should be reported to the transporter immediately.

The pumps should be transported as closely as possible to the location of installation and only there should they be uncrated.

Uncrated horizontal pumps should be lifted by using a shackle which can be attached to the baseplate. The bolt holes of the frame or the lifting lugs attached to the baseplate could be used as shown on the installation drawing.

Vertical pumps should be lifted by using the bolt down holes, lifting lugs or shackles attached to the baseplate. This is shown on the installation drawing. For most applications, the drive is mounted on top of the pump.



Be careful when lifting top heavy pumps. The centre of gravity may be above the points where the lifting gear is attached to. If the case, secure additionally against tipping over!

Vertical pumps should not be deposited unless they are secured vertically. **Hazards of tipping!** Deposit only in horizontal position!



It is essential to avoid that the total pump unit be suspended with eye bolts of the motor or gear box. These eye bolts should be used for lifting the motor and/or the gear box **only**.

**The Accident Prevention Rules, Section 18.4 relating to lifting accessories for the lifting of loads (VBG 9a) must be strictly adhered to.**

Because of the variety of possible pump designs and applications, only general instructions can be given here. These should be good enough for experienced assemblymen or transportation experts.

When in doubt, please ask for detailed information on the pump unit concerned.

When moving the pump or unit on **wheels** strictly attend to the following:

- Pad lock the motor drive and secure against unintended starting up.
- Move the pump unit carefully and slowly, especially where the ground is uneven. **Hazards of tipping!**
- Ensure a stable position of the pump or unit at the operating/storage place and secure it by actuating **all** clamping devices on **all** the wheels or rollers against voluntary moving away.
- Where fitted loosely, carefully watch the pipe bends when pumping. **Power of repulsion!**
- Where necessary, secure the pump unit additionally with support blocks.

### 3.2 Storage

The pumps are preserved for transport unless specified otherwise. In cases of longer storage the pumps should be handled as follows until installation:

#### ■ Stator:

If the pump is not to be used immediately, then the elastomer along the contact line between rotor and stator may become permanently distorted (compression-set). This will increase the break away torque. Therefore, the stator should be removed and kept separately in a clean, cool and dry environment.

**Standard DIN 7716** summarizes detailed information on the storage of rubber products, some of which is gathered here, and the following notice applies to a storage for a period of up to six months.

#### *General*

*Most of the rubber products may change their physical properties under unfavourable conditions or if treated improperly, which will result in a shorter lifetime.*

*Or they may become useless through excessive hardening, aging, regenerating or permanent deformation, also because of blistering, cracking or other damages appearing on the surfaces.*

*The changes may occur under the influence of oxygen, ozone, heat, light, humidity, solvents or because of storing the products under tension.*

*If stored and treated properly, the rubber products will keep their properties, even over a long period of time (some years), almost unchanged.*

*This does, however, not apply to uncured rubber compounds.*

*Store room*

*The environment in which rubber products are being kept must be cool, dry, free of dust and rather airy, and they must not be stored in the open, not even in a weather sheltered space.*

*Rubber products should be kept in surroundings not having less than minus 10 °C and not more than plus 15 °C.*

*Store rooms should not be damp, and it must be ensured that there will be no condensation.*

*Most favourable is an environment offering a relative humidity under 65 %.*

*Rubber products must be protected against light, particularly direct sunlight or artificial light when having a high UV portion.*

*They should furthermore be kept away from ventilation, especially draught, by wrapping them up.*

*As ozone is very aggressive and harmful there should be no store room used which houses equipment likely to produce ozone, e.g. electric motors or other equipment which might bring about sparks or other electrical discharges.*

*There must be no solvents, oil, grease, lubricants or any chemicals kept in a store room.*

**■ Rotor**

Please support with wooden blocks and cover up against harm from mechanical impact.

For rotors of RCC (material number 1.2436):

coat the surfaces with protective grease to avoid rusting.

**■ Shaft Sealing by packing gland**

Remove the gland and coat the exposed shaft surface with grease.

**■ Pump parts in stainless steel**

No grease coating necessary.

**■ Other, non-coated pump parts**

Protect with grease.

**■ Drives**

Please observe the drive supplier's instructions.



## 4 Mounting and Installation

If the NEMO<sup>®</sup> pump was stored and the rotor grease protected:  
Remove the grease before installing the stator.  
Clean the rotor thoroughly in order to avoid unsuitability of  
the grease with the stator material and the pumping medium.

Screw the pump at all fixing points (bearing housing / drive  
stool, end stud, support feet) using all fixing bores securely  
down to the sub-structure (ground plate, machine frame,  
foundation etc.).

### 4.1 Direction of Rotation

The direction of rotation of the pump is given on the model plate  
and in the order confirmation. The direction of delivery of the  
NEMO<sup>®</sup> pump is a function of the direction of rotation.

Changes must be agreed upon and confirmed by the supplier.

### 4.2 Pressure

If not explicitly confirmed otherwise in the order confirmation,  
the maximum permissible pressure (e.g. when turning clockwise)  
inside the pump housing (A)

- for models with pump housing of cast iron                      6 bar
- for models with welded pump housing                              10 bar.

The maximum permissible pressures inside the end flange (B)  
is a function of the design applied for connections

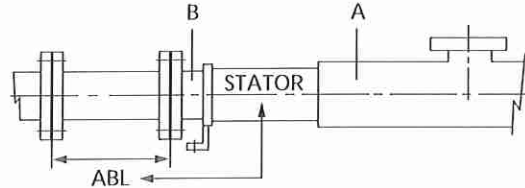
- with flange: maximum nominal pressure (e.g. PN 16)
- with threaded internal socket: maximum 25 bar
- with DIN 11851 "dairy" thread up to DN 100 for one or two  
stage pumps: max. 12 bar, for multi stage pumps: max. 25 bar
- for other versions: maximum permissible pressure of the socket  
connection, but not more than 6 bar per pump stage, depending  
on the stator installed.

### 4.3 Piping System

- Arrange suction and pressure pipes so that when the pump is not  
running, the medium is still present before and after the pump.  
Sufficient media should remain inside in order to lubricate the  
pump during restart.

## 4 INSTALLATION INSTRUCTIONS

- The installation of a removable distance piece between the end flange (B) and the pipe work is recommended in order to make the dismantling of the stator easy. The distance piece (see sketch) needs to have a minimum "ABL" disassembly length the values of which are shown in the table below, depending on the pump size and the number of stages.



Disassembly length ABL in mm:

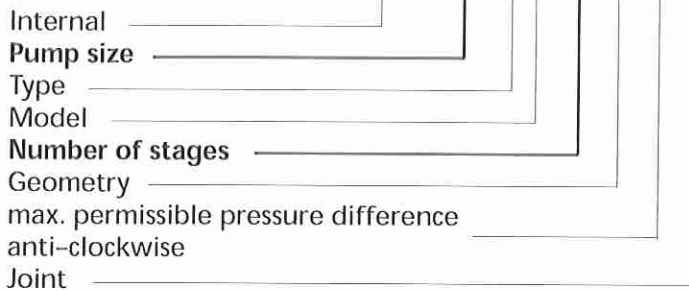
Pump size	Number of stages			
	1 *)	2	3	4
0 1 5	90	160	230	310
0 2 1	130	230	340	450
0 3 1	170	310	450	590
0 3 8	230	430	630	830
0 4 5	270	500	730	960
0 5 3	320	600	880	1170
0 6 3	370	690	1010	1330
0 7 6	420	800	1170	1540
0 9 0	500	950	1390	1840
1 0 5	630	1180	1740	-
1 2 5	740	1400	-	-

\*) for one stage pumps with L or P geometry the ABL values of 2 stage pumps are valid

### Type key

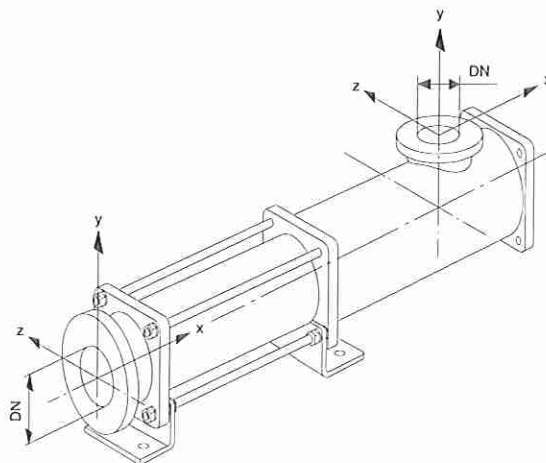
Example:

**N M 0 9 0 B Y 0 2 S 1 2 B**



The disassembly length "ABL" is also shown in the arrangement drawings in accordance with our Standard QSH V - TB 01 - 002.

- Clean the pipe work and rinse thoroughly before installing the pump.
- Connect the pipe work ensuring that no external stress attacks the pump body. The installation of compensators between the pump and the pipework is recommended:
  - No risk of damage to the pump housing from pipelines "resting" on the pump.
  - No risk of damage to the pump housing through vibrating pipelines.
- The twisting loads ( $F_x, F_y, F_z$ ) and bending loads ( $M_x, M_y, M_z$ ) permitted to be put on the suction/discharge flange comply with the requirements of API 676 and exceed the requirements of EN ISO 14847. They are shown in the table below.



Continued Page 4.1R



Pump type NM	Standard nominal diameter DN	$F_x, F_y, F_z$ N	$M_x, M_y, M_z$ Nm	
015 021	(32) G 1 1/4"	550	(300)	Screwed joints must not be charged with loads which may result in tightening or loosening these joints
31	50	780	420	
38	65	990	530	
45 53	80	1160	620	
63	100	1490	800	
76	125	1820	980	
90 105	150	2190	1180	
125	200	2850	1530	

#### 4.4 Shaft Sealing

- Where applicable, ensure that adequate supply lines for the buffer, flushing or quenching fluid for the shaft seals are connected **before** the pump is put into **operation**.  
For more details see Section 7.4!

#### 4.5 Electrical Connection



All work relating to electricity shall only be made by **authorized and qualified personnel** and it should be in compliance with the requirements of the relevant national regulations!

In particular for control systems should the latest version of the **EC-Directive for Machinery 98/37/EEC, Annex I, Section 1.2 Controls** be carefully observed!

**Note for frequency converter operation:**

It is absolutely necessary to connect the PTC-resistors of the drive in case of frequency converter operation to protect the drive against overheating.

## 5 Start-up

The NEMO<sup>®</sup> pump design requires strict attention to the following:



**Never run the NEMO<sup>®</sup> pump dry!  
A few rotations in dry condition  
will damage the stator!**

- Before starting up for the first time, fill the pump with medium. In the case of high viscosity media fill with a liquid. Pump priming is vital to ensure lubrication of the rubber stator. Fill the piping on the pump suction side. In anti-clockwise rotation only: Fill the pump housing.

The NEMO<sup>®</sup> pump is a progressing cavity pump which can produce pressures that may cause the bursting of vessels or pipes.



The power transmission train (shaft, coupling rod, joints, rotor) of the pump may be overloaded thus resulting in damage or breakage.

Also the pump housing parts with their connections may be overloaded and break. There is a table in Section 4 of these Maintenance and Operating Instructions showing the pressure resistance of the pump housing parts.

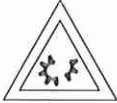


**Never run the pump against a closed inlet or outlet valve!**

- Open valves and vents before starting the pump!
- Check the direction of rotation by briefly switching on the pump motor.

## 6 Temporary Shutdown

- After stopping the pump empty and if necessary rinse it if



- the medium might freeze due to the temperature surrounding the pump. Especially where there is a danger of frost if the pump is installed outside a building
- the medium tends to solidify or harden
- the medium tends to glue up the shaft seal.

- Stator:

When stored for a long period, the elastomer along the contact line between the rotor and stator may become permanently distorted (compression-set).

This will increase the break away torque. For this reason, the stator should be removed (please observe Section 9!), and stored in a cool, dry place in air tight package to give protection against light and air.

- Rotor:

Remove **ceramic rotors** (please observe Section 10!) and store away, safe in the original packing.

Support **other rotors** on wooden blocks and cover to protect them from mechanical damage, after the stator has been removed.

Rotors made of RCC (material number 1.2436):

Protect the rotor surfaces against corrosion with protective grease.



**Remove the grease before re-installing the stator and clean the rotor thoroughly in order to avoid unsuitability of the grease with the pumping medium or the stator material.**

- Stand-by pump:

A stand-by pump is sometimes used as a back-up for the main pump and, when standing idle for longer periods, should be operated from time to time. The pump may otherwise become seized when being started up. This is due to compression set i.e. distortion of the stator against the surface of the rotor.

## 7 Maintenance

### 7.1 Pumps in General

- The pumps should be regularly rinsed or cleaned if deposits of medium are likely to build up (sedimentation).



If the pump needs to be opened to do this, ensure that the pump and motor are switched off and cannot be turned on accidentally (eg. by removing the fuse).

Periodical standstill to allow for cleaning during operation depends on the medium and type of operation.

- The pump can be cleaned:
  - through the cleaning ports provided in the pump housing
  - manually by dismantling the pump
  - automatically (CIP cleaning) for special housings with a flushing section (important instructions for CIP procedures are given in Section 5 (START UP)).

## 7.2 Lubrication

The NEMO<sup>®</sup> pump does not require frequent lubrication.

- Maintenance of the drive should be carried out according to the drive manufacturers instructions.
- Maintenance
  - where no manufacturers instructions are available and
  - when normal conditions of use exist:
    - Strip down the drive unit
    - Remove the bearings
    - Clean all parts
    - Renew the lubricant

**every 5000 operating hours or at least every two years.**



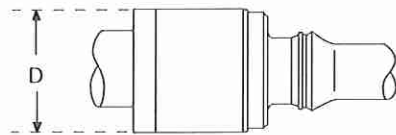
Special lubricants are often specified for mechanically controlled variable speed drives. It is therefore important to follow the drive manufacturers maintenance instructions.

**7.3 Lubricating the Pin Joints with SM-Pin Joint Seals**

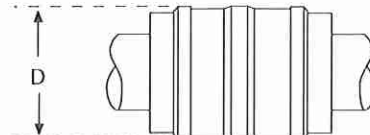
- It is advisable to change the oil and check the seals of the pin joints:
  - when renewing worn joint parts
  - when opening the pump for any reason.

The quantity of oil added per pin joint is a function of the joint external diameter D:

Joint external diameter D in mm (see sketch)	Basic joint size	Quantity of oil per joint in cm <sup>3</sup>
28	NM 015	1,5
30	NM 021	2
40	NM 031	5
54	NM 038	15
65	NM 045	22
76	NM 053	36
83	NM 063	78
102	NM 076	165
125	NM 090	205
148	NM 105	450
162	NM 125	470
Journal cross joint 175	NM125	1650



Pin joint




Journal cross joint

Continued Page 7.2R



Lubricating Oil:

Industrial application	Designation DIN 51502	Permitted Product
Food and Beverage Industry only	Authorized for use in foodstuffs <span style="border: 1px solid black; padding: 2px;">CLP HC 460</span>	"KLÜBER" KLÜBEROIL 4 UH 1 - 460 authorized under USDA H1
<div style="display: flex; align-items: center;">  <p>This synthetic oil meets both the German "Arzneimittelbuch" requirements and the still stricter US American FDA regulations. Nevertheless, it is not quite harmless if swallowed in more than minor quantities!</p> <p>At a sudden break in a joint up to 450 ml of lubricating oil together with metal rubbings may enter the pumping medium. It is therefore of essential importance to regularly check the state of the joint seals and renew in time, if necessary.</p> <p>If the pin joints operate without lubricating oil or seals, there will be no risk of contaminating the medium with oil. This operation, however, results in a higher amount of rubbed off metal parts through wear on the joints. These metal rubbings will inevitably and continuously come into contact with the pumping medium.</p> </div>		
General Industry	<span style="border: 1px solid black; padding: 2px;">CLP 460</span>	"SHELL" Omala 460
	with SM-pin joint seal (8235) of EPDM <span style="border: 1px solid black; padding: 2px;">CLP PG 320</span>	prescribed: KLÜBERSYNTH GH 6-320

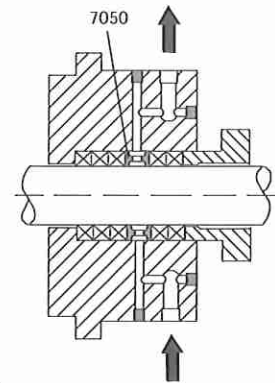
## 7.4 Shaft Sealing through Stuffing Box

### 7.4.1 Putting Into Operation

Before operation, it should be found out by visual check or on the order confirmation whether the stuffing box housing is fitted with buffer fluid connections and equipped with a buffer ring (7050).

With a buffer ring (7050) fitted between the packing rings and suitable connection bores provided in the stuffing box housing, it will be possible to proceed as follows:

- Adding a clear liquid as buffer medium under slight excess pressure. This applies for dirty or dangerous media or for the exclusion of air at suction operation of the pump.
- Adding a lubricant.
- Adding a cooling or warming fluid or steam.



For a) and b) it is usually enough to just add the buffer medium. However, the second connection in the stuffing box housing should then be closed off.

For c) it is necessary to feed in and carry away the medium via the two connection bores.

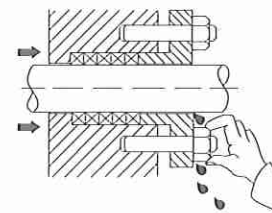
If for a compelling reason a stuffing box with buffer ring has to be operated without a medium as described in a) to c), it is essential to ensure that all the connection bores in the stuffing box are tightened with plugs (please note the material resistance!). This is especially important when the pump has to prime as otherwise air will be drawn in through the bores.

Stuffing box packings have the function of **minimizing, but not totally eliminating** the escape of medium. A lubricant or liquid coating is required to reduce the shaft wear to a minimum and dissipate the heat caused by friction.

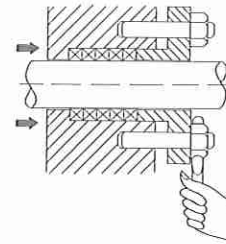


**Avoid touching the rotating shaft.**  
**Risk of injury where the pin is visible!**

The stuffing box gland should therefore be tightened only gently by hand prior to putting into operation. A high initial rate of leakage should be permitted, particularly with PTFE or PTFE-impregnated packings; 50 – 200 drops/min depending on the medium and sliding velocity.



During the 30 minute running-in time the minimum leakage rate should be set by tightening the gland nuts in steps approx. 1/6th of a turn each. The stuffing box temperature should not rise above normal, about 20 – 60 °C above the temperature of the medium is permissible.



If there is a sudden jump in temperature and a notable reduction in leakage, the gland must be slacked immediately and running-in repeated.

The attainable leakage amounts depend, among other things, on the medium, pressure, temperature, leakage gap, sliding velocity, shaft movement and the packing material used.

In the event of increased peripheral leakage i.e. around the stuffing box outer edges, the pump should be stopped and the packing rings briefly compressed. Then the gland should be slacked and running-in repeated.

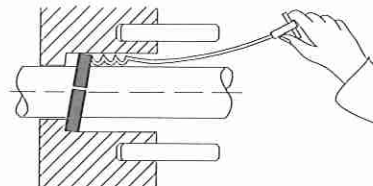
#### 7.4.2 Replacement



Please observe Safety Precautions 1.5, 1.6 und 1.8 !

##### Removal of old packing

After releasing the pressure on the unit and removing the gland, use the packing extractor to remove all the old packing rings and debris right down to the bottom of the stuffing box.



##### Preparation of the stuffing box area

Thoroughly clean the stuffing box area and the shaft surface. Replace corroded or worn shafts or sleeves. Check the shaft bearing and the shaft concentricity. Examine the gap in the gland and stuffing box base. To reduce an excessively large gap, insert a washer or disc in order to prevent the packing material from being extruded into the gap. An alternative is to use extrusion-resistant packing material for the first and last packing ring.

**Selection of grade and size of packing**

Before installing the packing, check once again whether you have chosen a packing suitable for the operating conditions required.

**Cutting the packing rings**

Exactly cut rings are required: a packing cutter ensures exactly cut rings. If no cutter is available, proceed as follows:

The ring cutting length  $L_M$  is determined by the shaft diameter  $d$  and the packing width  $s$  under the following formula:

$$L_M = (d+s) \cdot X \cdot \pi \text{ (mm)}$$

$X$  = allowance factor:

$X = 1.10$  for shaft dia  $\leq 60$  mm

$X = 1.07$  for shaft dia  $\leq 100$  mm

$X = 1.04$  for shaft dia  $> 100$  mm

These are mean values which may vary with specific packing grades and types of application.

Example:

Shaft diameter  $d = 60$  mm

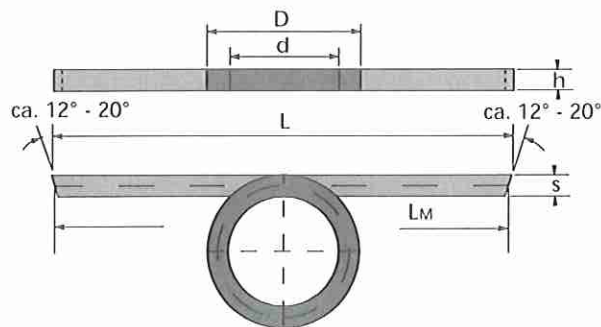
Stuffing box diameter  $D = 80$  mm

Packing width  $s$ :

$$s = (D - d) / 2 = (80 - 60) / 2 = 10 \text{ mm}$$

Cutting length  $L_M$ :

$$L_M = (d + s) \cdot 1.10 \cdot \pi = (60 + 10) \cdot 1.10 \cdot \pi = 242 \text{ mm}$$

**Straight cuts**

For rotating shafts we generally recommend cutting the packing straight and at right angles to the shaft. In order to achieve parallel contact of the cut ends without a gap when closing the packing ring, the cutting angle on both ends should be about  $12^\circ$ – $20^\circ$ .

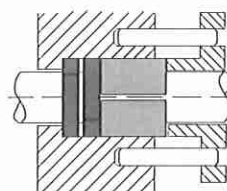
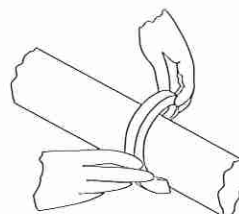
By applying the above formula or using the packing cutter, the cut ring will be slightly overlong.



In conjunction with the straight cut this results in a slight bracing of the rings against the stuffing box outer diameter, thus preventing co-rotation of the packing rings on the product side as well as leakage to the outside.

**Installation**

- Carefully twist open the die-pressed rings in axial and radial direction just far enough to enable them to be easily slipped over the shaft. Excessive bending of the rings can cause structural damage through kinking.
- Install each ring separately as follows:
  - insert into stuffing box with cut ends first
  - place around shaft with each next cut ends turned by 90°
  - push into stuffing box compartment by means of assembly shells or gland.



**Never use pointed objects for this operation!**  
Risk of damaging the shaft and deforming the packing material!

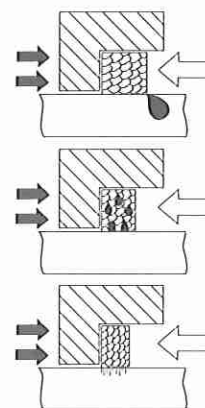
- Only continue inserting rings into the stuffing box until the gland projects for guidance into the stuffing box compartment by at least approx. 1/2 of the packing width "s".
- Now press the rings home with the gland and tighten the nuts by hand. Where a buffer ring is fitted, check that it is correctly positioned to the connection even after the gland has been tightened.

**7.4.3 Important Notes**

**Correct:**  
Lubrication through liquid or lubricant.

**Not correct:**  
Lack of lubrication by liquid due to excessive tightening of the gland nuts; impregnation squeezing.

**Consequences**  
due to excessive gland compression:  
Dry running, burning of packing; heavy wear on the seals and therefore high leakage.



Source reference:  
This material (abridged and adapted) is taken with kind approval from the catalogue of Burgmann / Wolfpatshausen. It is also valid for other gland packing manufacturers.

## 7.5 Shaft Sealing through Single Mechanical Seal

There are various constructions of mechanical seals. Especially advantageous is the use of standard mechanical seals according to DIN 24960. These seals have regardless of their brand the same fitting dimensions which makes them interchangeable. Mechanical seals with a coil spring can only be used for pumps which are run in one direction of rotation.

- The seal specification of a NEMO<sup>®</sup> pump is recorded on the order confirmation sheet.
- Pumps fitted with direction dependent seals should **never** be run in the opposite direction of the rotation arrow.
- If excessive leakages occur the spring tension and the seal surfaces should be checked, and the seal be replaced, if necessary.

Single mechanical seals usually work without any additional equipment. Their application range can be increased by operating them with a rinsing or cooling system.

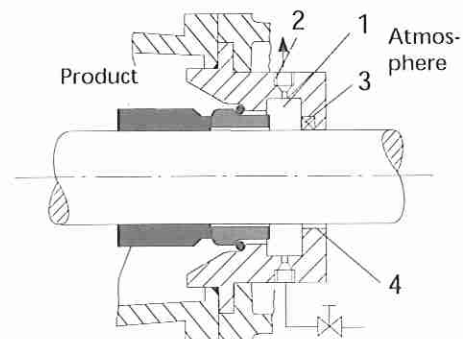
a) **Quench**, in accordance with ISO 5199, Appendix E, Plan Nos. 08, 09, 10 or 13 or API 610, Appendix D, Plan No. 62.

Quench is the designation commonly used in sealing engineering for an arrangement that applies a non pressurized external fluid to the atmospheric side of a mechanical seal. The quench is used when

- a single mechanical seal will not work or only to a limited extent without auxiliary measures or
- a double mechanical seal with pressurized buffer fluid is not necessary.

Recommended for the following applications:

- Low temperature (danger of freezing)
- Operation in a vacuum (dry running)
- Media which must be isolated from the atmosphere (eg. due to build up of solid deposits or because of less severe damage to the environment, like smell).



Continued Page 7.5R

Leakages will be transported away by the quenching liquid. In vacuum operation dry running of the seals is avoided.



No pressure higher than that of the pumped medium **in front** of the mechanical seal is allowed to build up in the quenching area (1) **behind** the mechanical seal. Otherwise the counter ring will be pushed out of the housing. **Free discharge** from (2) is necessary!

Closing off the quenching area from the atmosphere can be done in three ways:

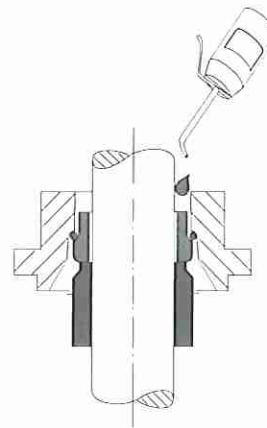
1. In the case that high emission levels can be tolerated:  
Through a throttle bush (4). Cooling liquid not permanently used, only released from time to time.
2. In the case that medium emission levels can be tolerated:  
By a radial shaft seal ring (3). Permanent radial shaft seal lubrication through quenching liquid is necessary.

#### b) Top lubrication

**Attention: For vertically installed pumps with overhead drive as type NT:**

On initial start-up the mechanical seal has not come in contact with the medium. It runs therefore dry for a short period of time until the air is displaced from the pump housing.

- On first start-up and if stood idle for longer periods lubricate the mechanical seal before switching on the pump.
- Apply water, glycerine or oil depending on their compatibility with the pumping medium and the elastomer of the mechanical seal.
- Fill the quench cup of the mechanical seal housing.



## 8 Trouble-Shooting and Remedying

### 8.1 Trouble Chart

The chart overleaf lists possible problems

- the type
- the likely reason / cause
- the remedy.

- A problem may have various causes: Several boxes in the vertical column are marked with a cross.
- A reason/cause may result in various problems: Several boxes in the horizontal column are marked with a cross.

### 8.2 How do you trace the kind of problem to find the possible cause ?

- The column describing a possible problem shows one or several boxes marked with a cross.
- On the corresponding lines you will find the possible reasons/cause and some hints how to handle the problem . Thus the actual cause of the problem can be narrowed down and eventually detected.
- If you find further cross-marked boxes on one of the lines and should there appear corresponding problems as well, then the likely cause of the problem has been detected.
- The table helps in finding the root of the problem and will give you the remedy if it is straight forward. For more complicated problems the manufacturer has to be consulted.





Remedy
Fill the pump up, then pump through manually using a suitable appliance; if necessary use glycerine as lubricant in the stator.
Check order information. Examine electrical installation (possibly 2 phase operation).
Measure the pressure with a manometer and check against order details. Reduce the pressure or change the drive.
Remove foreign bodies and eliminate possible damage.
If the liquid medium temperature cannot be lowered, use a reduced diameter rotor.
Check whether the liquid medium agrees with the order requirements. Possibly change stator material..
Increase the liquid part of the medium.
Clean the pump and rinse through after each run.
Increase the suction liquid level, prevent turbulence and air bubbles at the inlet.
Check seals and tighten pipe connections.
Stuffing box : tighten or renew. Mechanical seal : renew seals, eliminate solid deposits.
In the case of adjustable drives : increase the rpm. If necessary change the drive.
Warm up the pump (stator) to operating temperature first of all.
Decrease suction resistance, lower the temperature of the liquid medium, install the pump at a lower location.
Fill up the pump, provide for dry running protection, move the pipes.
Replace with a new stator or ensure correct liquid temperature.
Fit a new stator. Check the liquid medium agrees with order details; if necessary change the stator material.
Change rotor, establish the cause. Wear and tear, corrosion, cavitation; if necessary change to a different material or coating.
Replace relevant parts, carefully reseal and lubricate.
Re-align the unit.
Use a new connection and re-align the pump.
Replace roller bearings, lubricate, reseal. At higher temperatures observe the lubricant and the bearings.
In the case of adjustable drives : lower the rpm.
Measure the viscosity and compare with order details. If necessary adjust viscosity or change the drive.
Measure specific weight and compare with order details. If necessary adjust specific weight or change the drive.
Service stuffing box according to page 7.4, if necessary renew worn shaft.
Replace fitted packing with another packing type.
Change electrical connection.
Replace relevant rings with new ones.
Replace elastomers. Check whether the liquid medium agrees with order details, if necessary change material.

## 9 Removal and Fitting of End Stud, Stator and Pump Housing



The pump with attached pipework should be empty and must have cooled off!  
Disconnect the pipework on the suction side and pressure side of the pump.

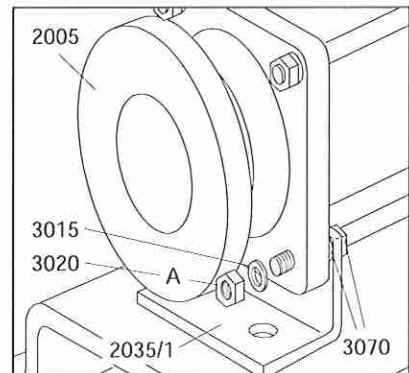
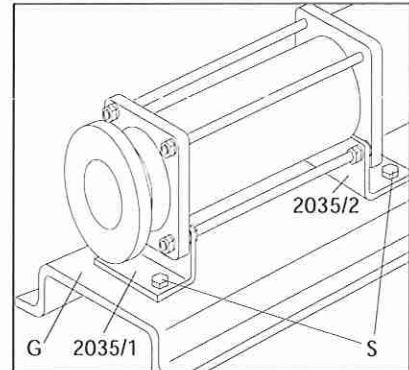
### Caution for pumps with ceramic rotors!



Where a pump is fitted with a **ceramic** rotor (1999) the following operations should be carried out **with great care**.  
Do not use any force or sharp tools! Special care must be taken to prevent heavy strokes, vibrations or impact by a hammer.

### Dismantling

- Remove the securing screws (S) from support feet (2035) to baseplate (G).
  
- Unscrew the hex nuts A (3020) and remove with spring washers (3015), then withdraw the end stud (2005) and first support foot (2035/1) with washers (3070).

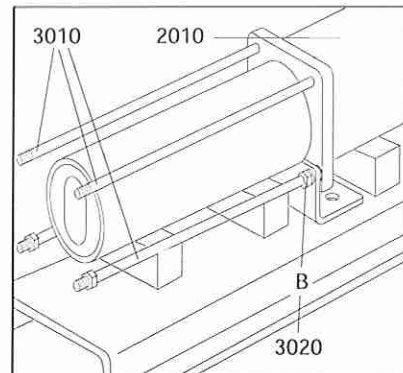


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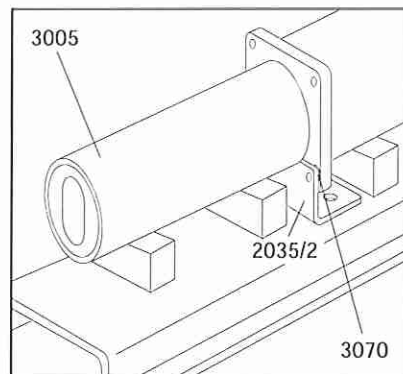


## 9 DISMANTLING AND ASSEMBLY OF THE PUMP HOUSING

- Support pump housing (2010) and stator (3005) with wooden blocks.
- Loosen the hex nuts B (3020), where fitted, and remove the thru bolts (3010).

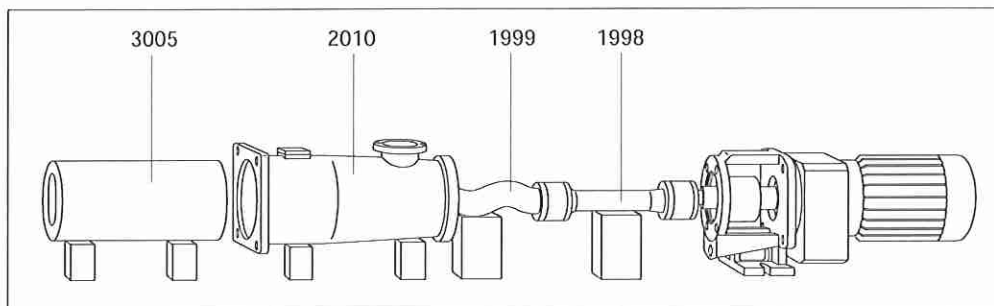


- Where fitted, remove the second support foot (2035/2) and the washers (3070).



### Caution for pumps with ceramic rotors!

When the stator (3005) is removed from the **ceramic** rotor (1999), the stator must be supported to prevent it from suddenly tilting away downwards. The same applies to the rotor (1999) as soon as it is disengaged from the stator (3005). Removing the stator (3005) from the **ceramic** rotor (1999) is easier by using an extractor. This should be done slowly and with care in a rotating movement. When sliding pump housing (2010) over **ceramic** rotor (1999), both coupling rod (1998) and rotor (1999) should be lifted as the **ceramic** rotor (1999) must not knock onto the pump housing (2010).





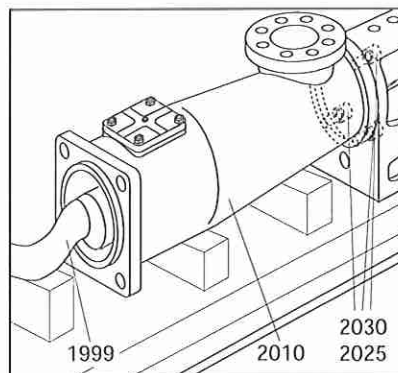
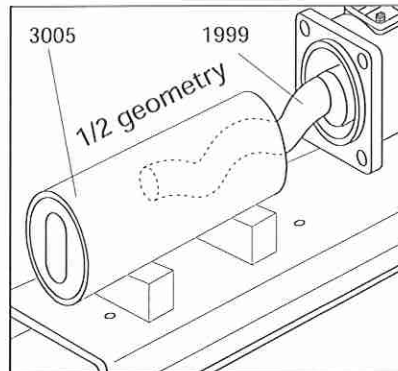


### Caution for pumps with tubular rotors:

Where the walls of tubular rotors are worn in the wear zones, pumping medium may occur inside the rotor and may come out when pulling off the stator.

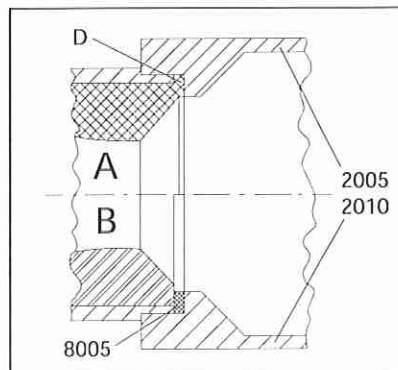
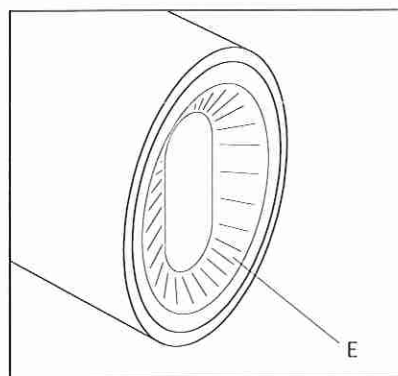
Ensure that protective measures have been taken when pumping dangerous media!

- Pull the stator (3005) out forward.  
A stator extractor can be supplied as special accessory.
- Remove the hex nuts (2030) with spring washers (2025).
- Pull the pump housing (2010) off forward.



### Assembly

- Refitting is a simple reversal of this procedure.  
When refitting the stator (3005) check direction of stator (3005) is correct! The funnel-shaped inflow side (E) of the stator (3005) must show to
  - the pump housing (2010) when rotation is **anti-clockwise**
  - the end stud (2005) when rotation is **clockwise**
 when viewed on pump shaft end.
- **Elastomer stators (A)** have integrated front side sealing profiles (D). They don't need additional gaskets for sealing off the end stud (2005) and the pump housing (2010).
- **Solid stators (B)** have **no** integrated front side sealing profiles. Therefore additional gaskets (8005) should be installed to seal off the end stud (2005) as well as the pump housing (2010).



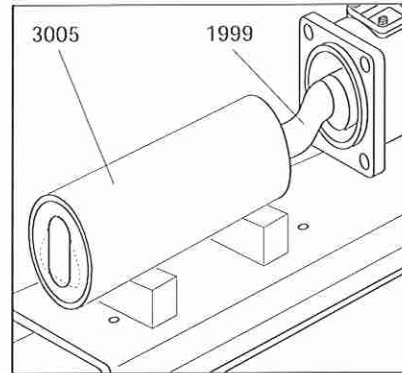
Continued Page 9.1R

## 9 DISMANTLING AND ASSEMBLY OF THE PUMP HOUSING



Be careful when engaging the stator (3005) and rotor (1999). Do not trap your fingers!  
Do not reach inside the stator!

- Push the stator (3005) with a rotating movement on to rotor (1999).  
Apply an assembly device and some glycerine to ease engaging the stator (3005) and rotor (1999).



- When tightening hex nuts (2030) a gap will remain between drive stool (0085) and pump housing (2010).



**Please do not try to close this gap by overtightening the nuts!**  
**Drive stool (0085) may break!**

Torque values for hex nuts (2030):

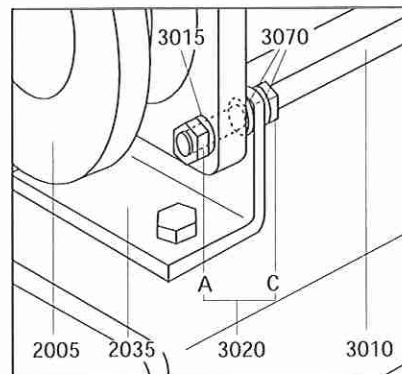
Size	M6	M8	M10	M12	M16	M20	M24	M30
Required torque Nm	8	15	30	45	75	80	100	120

- Fastening the end stud (2005):

Screw the hex nuts C (3020) down into the thru bolts (3010) as far as possible.

Slip on the first washers (3070), the support foot (2035), the second washers (3070), the end stud (2005) and tighten with spring washers (3015) and hex nuts A (3020).

Finally, fasten the support foot (2035) from behind with the two hex nuts C (3020).



Ensure during refitting that the O-ring (8015) or, where a heating jacket (3025) is installed, the O-rings (8030) are in perfect condition and will sit correctly.



Ensure that the drain plug (2015) is not screwed too tightly into the pump housing (2010), since otherwise its conical thread may break the pump housing (2010).

The torque should be about 40 - 50 Nm.

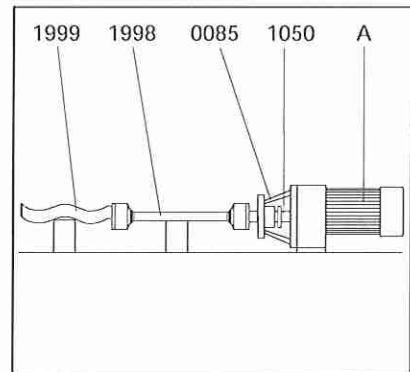
## 10 Dismantling and Assembly of the Rotating Parts with Pin Joints with SM-Pin Joint Seal (basic joint size NM015 - NM125)

### 10.1 Removal of Rotor and Coupling Rod

Where a pump is fitted with a ceramic rotor (1999) the following operations should be carried out **with great care**. Do not use any force or sharp tools! Special care must be taken to prevent heavy strokes, vibrations or impact by a hammer.

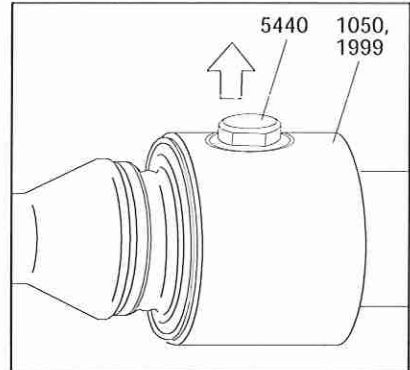
For removal of the rotor (1999) and coupling rod (1998) the pin joints should be dismantled as follows:

- Place the dismantled unit – consisting of drive stool (0085) with drive (A) and connecting shaft (1050), coupling rod (1998) and rotor (1999) – on the work-bench with a wooden block supporting the rotor (1999).



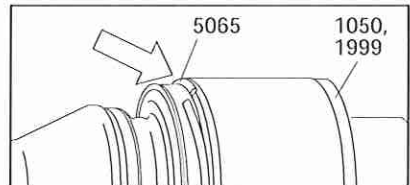
#### Basic joint size NM125:

- Unscrew the wear sleeves (5440) from the head of rotor (1999) or connecting shaft (1050)



#### Basic joint size NM021 - NM105:

- Push circlip (5065) out of its groove and slip off over the head of rotor (1999 or connecting shaft (1050).



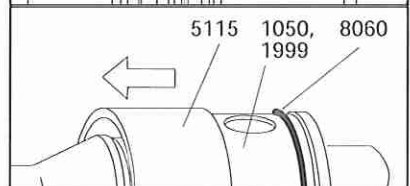
#### Pumps fitted with a ceramic rotor (1999):

- **Carefully** turn safety sleeve (5115) with a squeeze belt wrench, and remove.

The following method should **not** be employed for pumps fitted with a ceramic rotor.

#### Pumps fitted with a metallic rotor (1999):

- If necessary hit the edge of sleeve (5115) at an angle with the help of a wooden block and a plastic hammer. Taking care not to damage the O-rings (8060)!



Continued Page 10.0R



## 10 DISMANTLING AND ASSEMBLY OF THE ROTATING PARTS

### Basic joint size NM021 - NM125:

- Press the pin (5075) out of the head of rotor (1999) or connecting shaft (1050). If necessary use a hammer and a thin cylindrical pin (DIN 6450 C). Drain the oil into a receptacle.

### Caution for pumps with ceramic rotors!

Where a pin (5075) may not come out easily, the metallic head of rotor (1999) should be supported on wooden blocks. Then the pin (5075) can be driven out with the help of a pin punch (DIN 6450 C). This should be done **with care**, holding the ceramic rotor with your hands.

Please dispose of this oil in the proper manner.

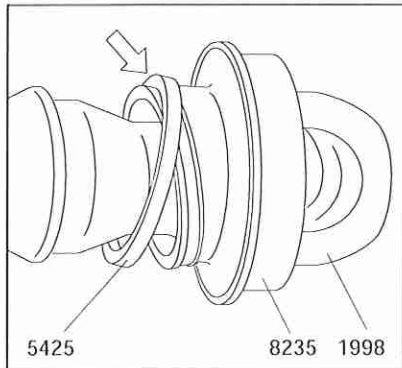
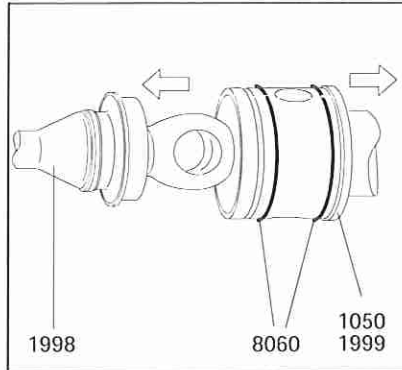
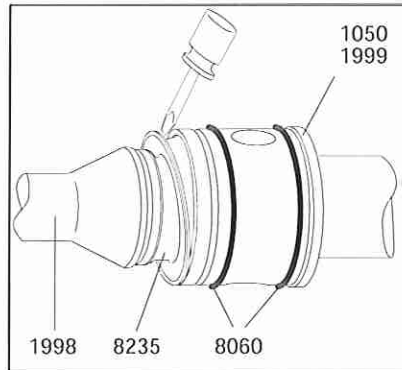
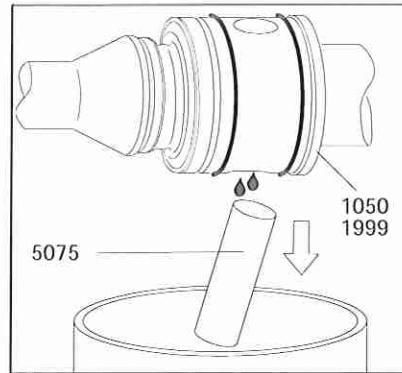
- Using a screwdriver, carefully lever the SM-pin joint seal (8235) out of the head of rotor (1999) or connecting shaft (1050).



Taking care not to damage the SM-pin joint seal (8235)!

- Pull apart the rotor (1999)/ coupling rod (1998) / connecting shaft (1050) assembly. Remove the O-rings (8060).

- Push the SM-pin joint seal (8235) towards the head of coupling rod (1998). In the narrow coupling rod section press the clamp ring (5425) out of the groove of the seal. Then slip the SM-pin joint seal (8235) and clamp ring (5425) off over the head of the coupling rod (1998).

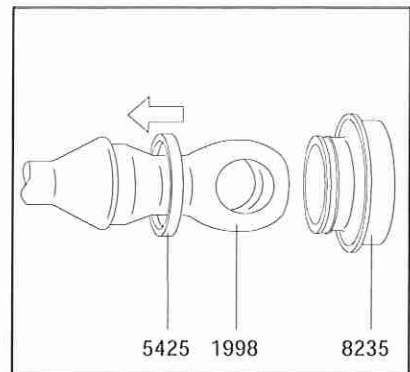




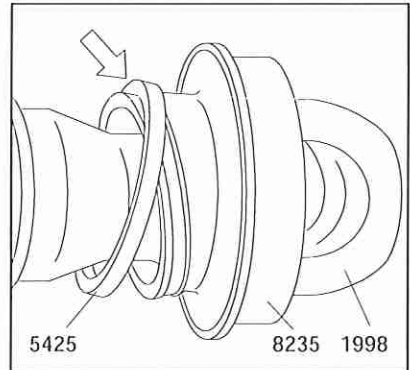
### 10.2 Fitting the Rotor and Coupling Rod

For fitting the rotor (1999) with coupling rod (1998), the two pin joints should be assembled as follows:

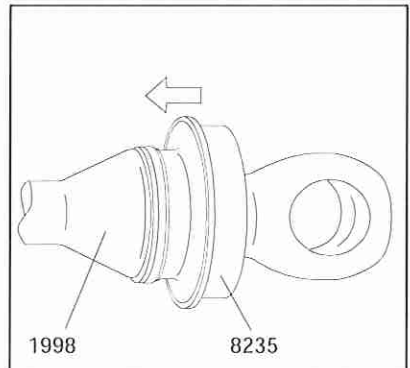
- Slip the clamp ring (5425) over the head of coupling rod (1998).



- Push the SM-pin joint seal (8235) over the head of coupling rod (1998) towards its narrow section, there squeezing the clamp ring (5425) into the groove of the SM-pin joint seal (8235).



- Push the SM-pin joint seal (8235) with the correctly placed clamp ring (5425) up to the shoulder of coupling rod (1998).

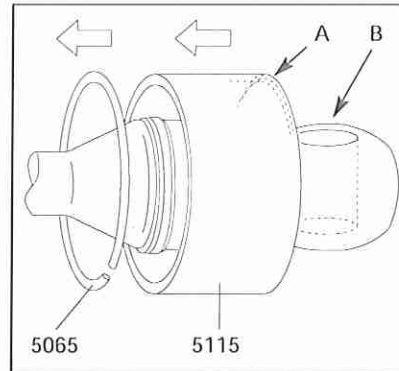


Continued Page 10.1R

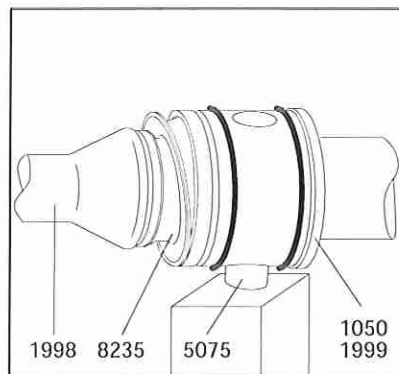
## 10 DISMANTLING AND ASSEMBLY OF THE ROTATING PARTS

### Basic joint size NM021 - NM105:

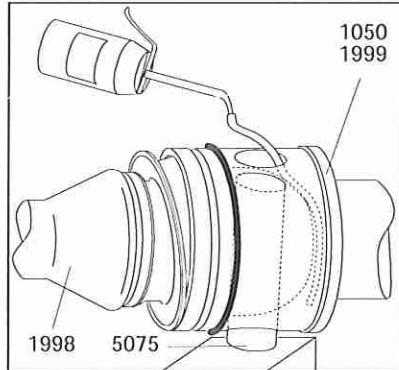
- Slip the circlip (5065) on to the coupling rod (1998). Slide the sleeve (5115) on to coupling rod (1998) so the inside diameter of chamfering (A) is being placed towards the coupling rod (1998) extension. Chamfering (A) will later on ease the installation over the O-rings (8060). Orient the head of coupling rod (1998) until it is in vertical position for the bore (B) for the pin (5075).



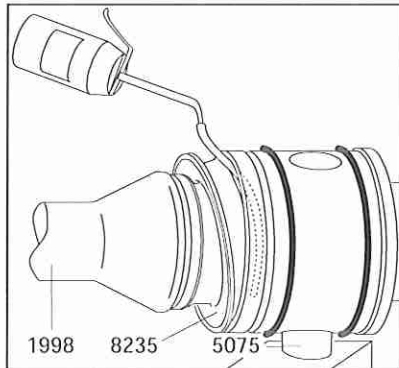
- Slide the coupling rod (1998) with SM-pin joint seal (8235) into the bore of rotor (1999) or connecting shaft (1050) and insert the pin (5075) from below and push up to the upper edge of coupling rod (1998). Support the pin (5075) against dropping out. Slide the SM-pin joint seal (8235) into the rotor (1999) or connecting shaft (1050) only from below, and in a slightly slanted position.



- For lubrication, use an oil can which should be fitted with a thin plastic hose having an outside diameter of not more than 4 mm. Insert this hose into the upper oil port opening in the rotor (1999) or connecting shaft (1050). Then slide the hose end past the coupling rod (1998) all the way down to the bottom section of the rotor head (1999) or connecting shaft (1050). Slowly fill with lubricating oil up to the filling port.

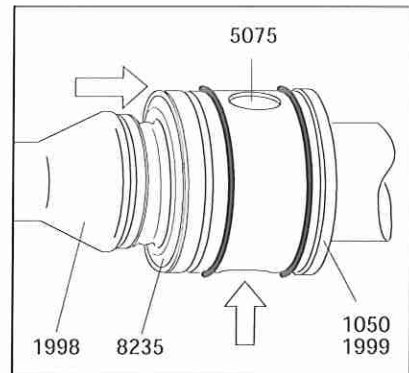


- Pull the hose out. Then insert the hose end through the small gap on the topside of SM-pin joint seal (8235) and guide it down to the bottom of the hollow space between coupling rod (1998) and SM-pin joint seal (8235). Slowly fill with lubricating oil up to the gap.

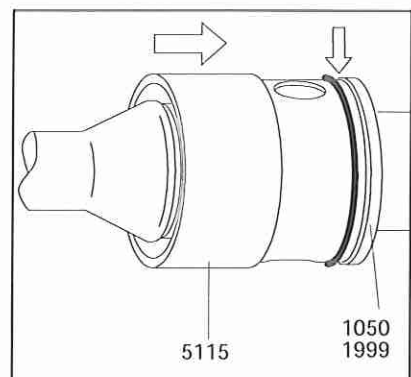


Continued Page 10.2

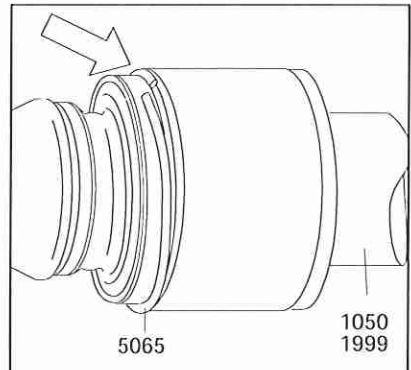
- Pull the hose out.  
Push the pin (5075) entirely into the bore of head of rotor (1999) or connecting shaft (1050) and retain in place.  
Only now, press the SM-pin joint seal (8235) into the bore of head of rotor (1999) or connecting shaft (1050) and push up to the shoulder. In doing so the SM-pin joint seal (8235) should be slightly bulbous around the outer surface. Wipe off overflow oil. Use this oil for lubricating the O-rings (8060).



- Slip the sleeve (5110) or (5115), with its chamfering (A) forward, on to the head of rotor (1999) or connecting shaft (1050) and push up to the shoulder.

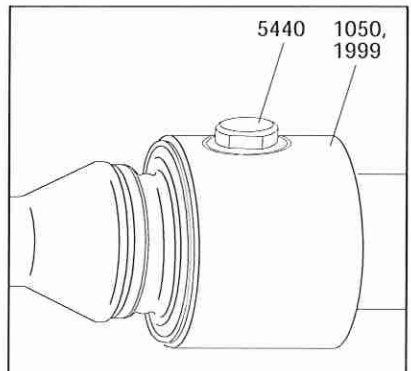


- Place the circlip (5065) into its groove on the rotor head (1999) or connecting shaft (1050) and carefully snap in place all around.



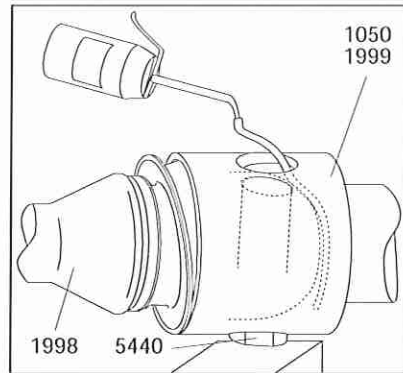
### ■ Basic joint size NM125:

- Slide the coupling rod (1998) into the bore of the head of rotor (1999) and connecting shaft (1050) and insert the pins (5075).
- Insert the SM-pin joint seal (8235) into the head of rotor (1999) and connecting shaft (1050).
- Only then screw in one wear sleeve (5440) with O-ring (8060) into the head of rotor (1999) and connecting shaft (1050) and turn upside down.

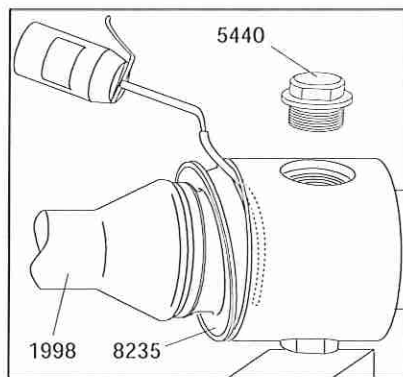


## 10 DISMANTLING AND ASSEMBLY OF THE ROTATING PARTS

- For lubrication, use an oil can which should be fitted with a thin plastic hose having an outside diameter of not more than 4 mm. Insert this hose into the upper oil port opening in the rotor (1999) or connecting shaft (1050). Then slide the hose end past the coupling rod (1998) all the way down to the bottom section of the rotor head (1999) or connecting shaft (1050). Slowly fill with lubricating oil up to the filling port.

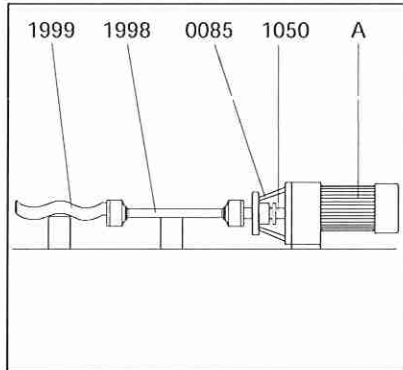


- Pull the hose out. Then insert the hose end through the small gap on the topside of SM-pin joint seal (8235) and guide it down to the bottom of the hollow space between coupling rod (1998) and SM-pin joint seal (8235). Slowly fill with lubricating oil up to the gap.
- Screw in the second wear sleeve (5440) with O-ring (8060) into the head of rotor (1999) and connecting shaft (1050).



- **Basic joint size NM021 - NM125:**

Drive connecting shaft (1050), coupling rod (1998) and rotor (1999) are now joined by means of the two pin joints. Pump housing (2010), stator (3005) and end stud (2005) may now be fitted.



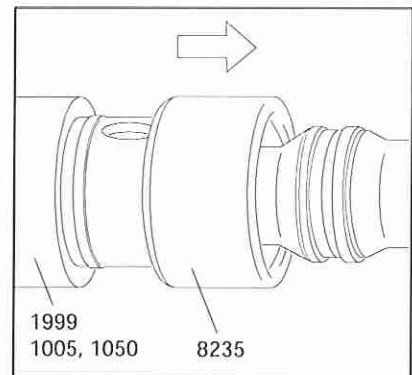


**10.3 Dismantling and Assembly of the Rotating Parts  
with Pin Joints with SM-Pin Joint Seal  
(joint basic size NM015)**

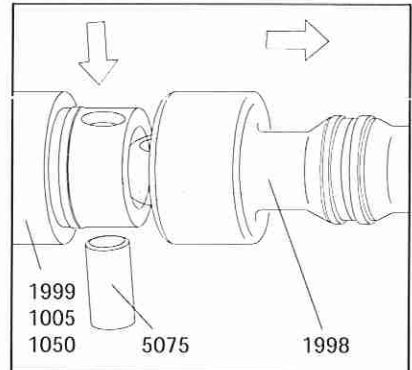
For removal and refitting of the rotor (1999) and coupling rod (1998)  
the pin joints should be dismantled and re-assembled as follows:

**Dismantling:**

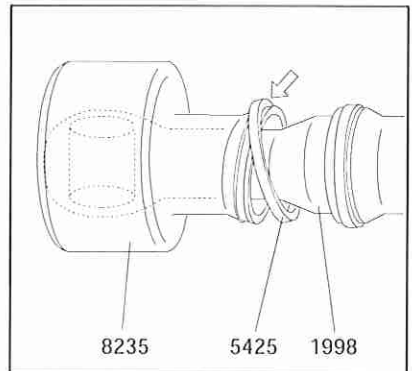
- Push the SM-pin joint seal (8235) away from the rotor (1999), drive shaft (1005) or connecting shaft (1050) so the bore for the pin (5075) comes free.



- Press the pin (5075) out of the rotor (1999), connecting shaft (1050) or drive shaft (1005). Then withdraw the coupling rod (1998) from the bore of rotor (1999), connecting shaft (1050) or drive shaft (1005).



- Push the SM-pin joint seal (8235) towards the head of coupling rod (1998). In the narrow coupling rod section press the clamp ring (5425) out of the groove of the seal. Then slip the SM-pin joint seal (8235) and clamp ring (5425) off over the head of the coupling rod (1998).

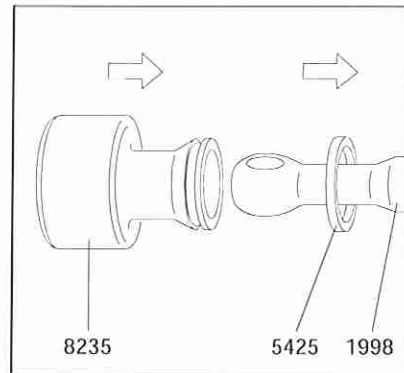


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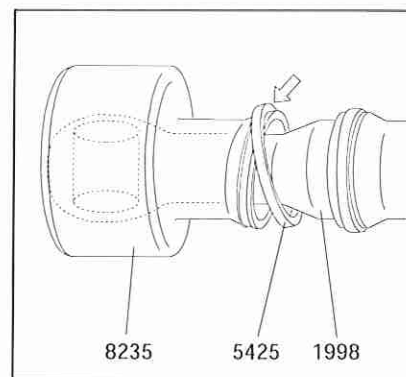


**Re-Assembly:**

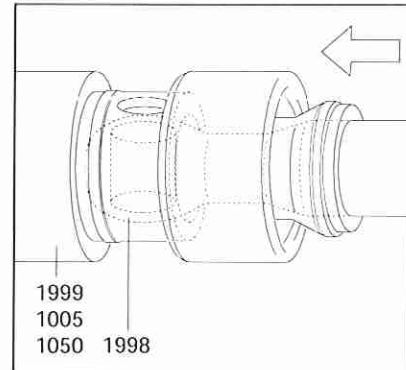
- Slip the clamp ring (5425) and the SM-pin joint seal (8235) on over the head of the coupling rod (1998).



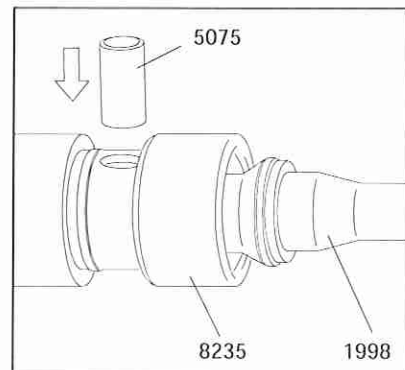
- Push the SM-pin joint seal (8235) towards the narrow section on the head of coupling rod (1998) and place the clamp ring (5425) back into the groove of the SM-pin joint seal (8235). Then move the SM-pin joint seal (8235) up to the coupling rod (1998) shoulder.



- Place the head of coupling rod (1998) into the bore of the rotor (1999), drive shaft (1005) or connecting shaft (1050).



- Join the rotor (1999), drive shaft (1005) or connecting shaft (1050) and coupling rod (1998) by the pin (5075). Then push the SM-pin joint seal (8235) up to the shoulder of the rotor (1999), drive shaft (1005) or connecting shaft (1050).

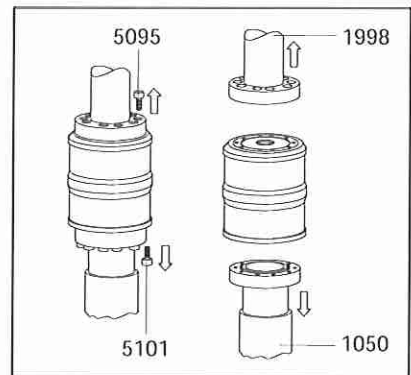


Re-assemble the second pin joint in the same manner.

10.4 Dismantling and Assembly of the Journal Cross Joints  
(joint basic size NM125)

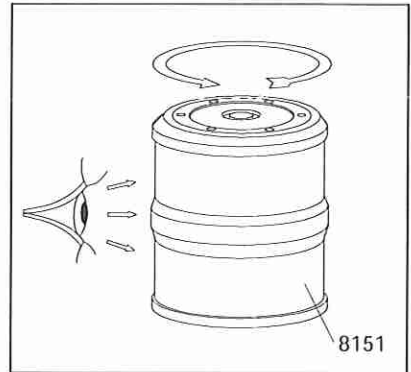
- Remove the cylindrical head screws (5095 and 5101), then separate the coupling rod (1998) and connecting shaft (1050) from each other.

Every journal cross joint should remain closed and full of lubricant.



- If the outer rubber seal sleeve (8151) is undamaged, the joint can generally be used again. Before refitting, change the joint oil as described later on.

If damaged, remove the rubber seal sleeves (8151, 8150) and check the condition of the joints.  
Procedure: see Page 10.5, Section 10.5.



## 10 DISMANTLING AND ASSEMBLY OF THE ROTATING PARTS

**Attention when draining off the oil:**

The oil inside the journal cross joint may be under pressure.

**Wear goggles!**

- Remove the drain plug (5172) and lubricator (5450) with gasket (5240) and drain the oil into a vessel. Please dispose of this oil in the proper manner.
- Screw in the lubricator (5450) with a new gasket (5240).
- Remove the drain plug (5051) with gasket (5245).

Fill with fresh oil from below through the R 1/8" bore in the lubricator (5450) until only oil without air bubbles comes out of the screw tap on the drain plug (5172).

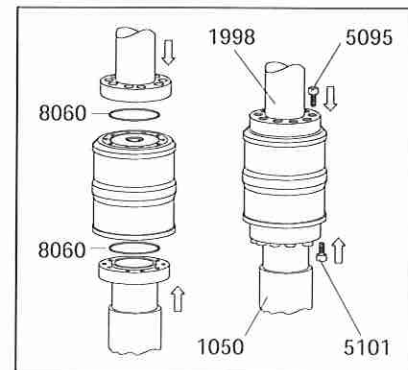
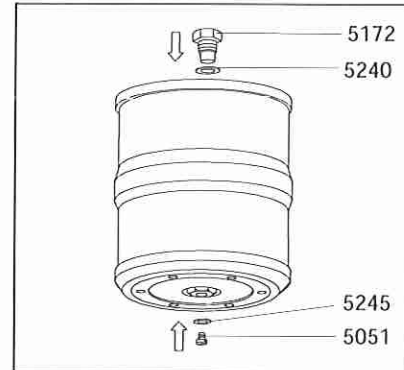
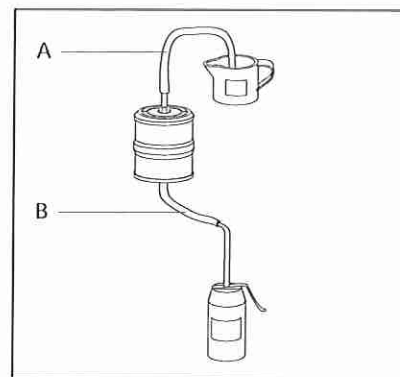
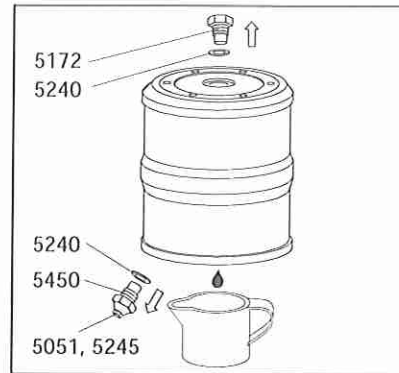
Now move the joint about a little so air bubbles can rise. If necessary, fill again with oil from below.

- When the joint is completely filled with oil, remove the discharge pipe (A) and screw in a drain plug (5172) with new gasket (5240). The built-in check valve on the lubricator (5450) avoids oil leakage and flow back. Add some more oil under slight pressure until the seals (8150, 8151) are ball shaped.

- Now remove the feeding pipe (B). Close filler R 1/8" opening in the lubricator (5450) with plug (5051) and new gasket (5245).

- Replace the O-rings (8060).
- With cylindrical head screws (5095 and 5101) mount the rotor (1999), coupling rod (1998) and connecting shaft (1005) on to the joints. The cylindrical head screws (5095 and 5101) do not have the same length; they should not be mixed up! Use a torque key. The torque should correspond to sectional drawing G... . Secure screws with Loctite\*.

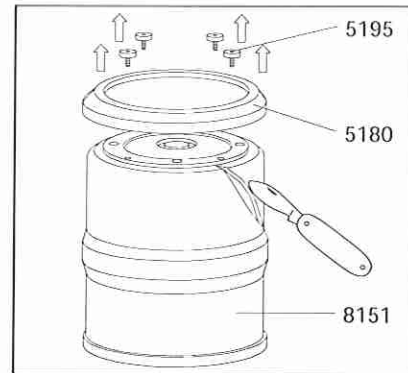
\*For Loctite type see sectional drawing G... .



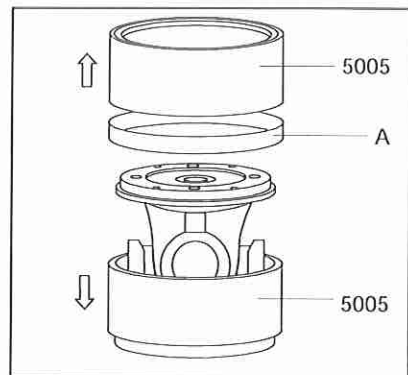
Continued Page 10.5

10.5 Removal and Fitting of the Rubber Seal Sleeves

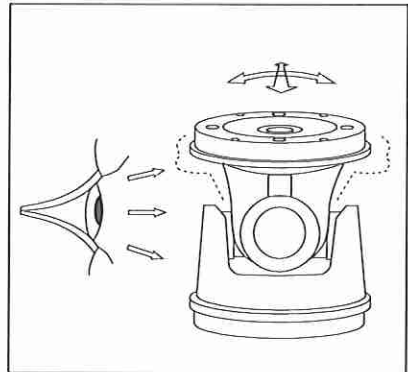
- For replacement of the rubber seal sleeves (8150, 8151) the oil should be drained off first. Procedure: See Page 10.4R, Section 10.4. Remove cylindrical head screws (5195) and pull off clamp rings (5180). Worn or damaged rubber seal sleeves (8150, 8151) can be cut up for better removal.



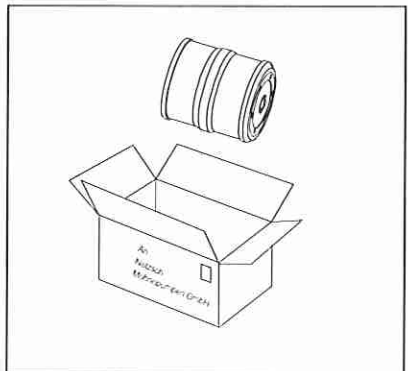
- Slide out the joint shells (5005). Remove the vulcanized metal spacer ring (A) from inner rubber seal sleeve (8150).



- Check the condition of the joints. The complete joint should be replaced when it is worn or damaged, when there is stiffness in movement and excessive slack or a corroded inner part because of ruined rubber sleeves (8150, 8151).



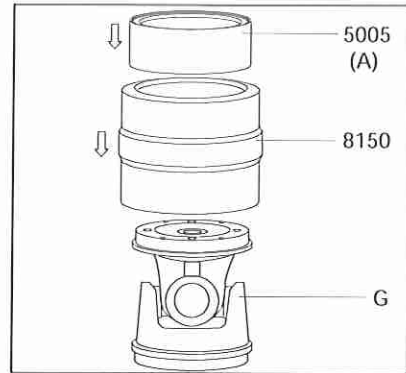
- Please send a worn or damaged joint to our address for repair as special tools are necessary for replacing or repairing the joint items.



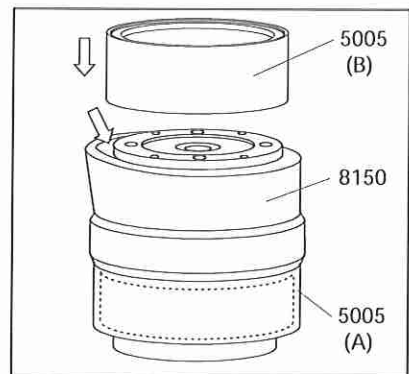


## 10 DISMANTLING AND ASSEMBLY OF THE ROTATING PARTS

- Oil joint shell A (5005) and insert into the new inner rubber seal sleeve (8150). Please observe correct orientation. See also sectional drawing G...
- Slide inner rubber seal sleeve (8150) on to joint G.

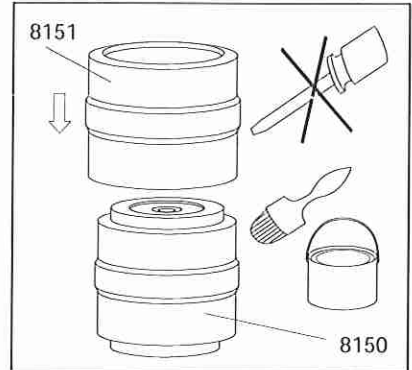


- Turn joint G with rubber seal sleeve (8150) upside down. Oil joint shell B (5005) and slide under inner rubber seal (8150) as far as it will go.



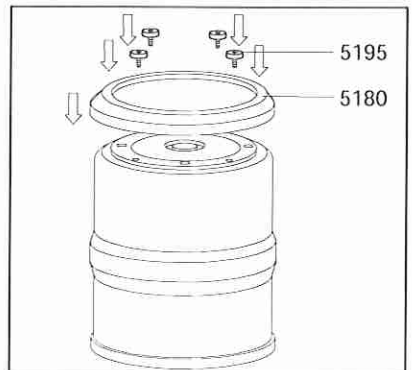
Do not use a tool especially pointed tools like screw drivers etc. so that no harm is done to the rubber seal sleeve (8150).

- Apply some glycerine on the outer lip of the inner rubber seal sleeve (8150).
- Slide outer rubber seal sleeve (8151) carefully on to inner rubber seal sleeve (8150).



Do not use a tool especially pointed tools like screw drivers etc. so that no harm is done to the rubber seal sleeves (8150, 8151).

- Secure a clamp ring (5180) with 2 respectively 4 cylindrical head screws (5195), number of screws depending on the type of joint, and screw down with 2 opposed screws simultaneously. Ensure the clamp ring (5180) does not tilt.



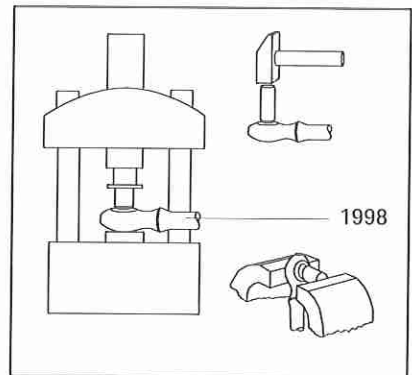
Lubricant: See Page 10.4R, Section 10.4.

10.6 Replacing the Wear Sleeves of Adapter,  
Rotor and Coupling Rod  
(Basic joint size NM045 - NM125)



Basic joint size NM045-NM105:

The wear sleeves (5435, 5440) have a very tight fit. A **press** should be used to remove or refit them. It may be possible though to drive the damaged sleeves out with a suitable mandrel. A rigid vice however is needed at the least for pressing new sleeves (5435, 5440) in again.

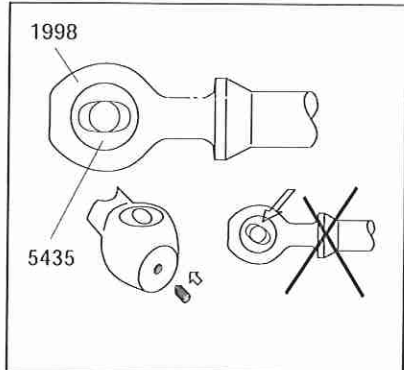


Orient the wear sleeves (5435) so that their oval bore agrees with the longitudinal axis of the coupling rod (1998).

Basic joint size NM125:

Orient the centering bores at the sides of wear sleeves (5435) so that they are visible through the bores of the head of the coupling rod after their insertion.

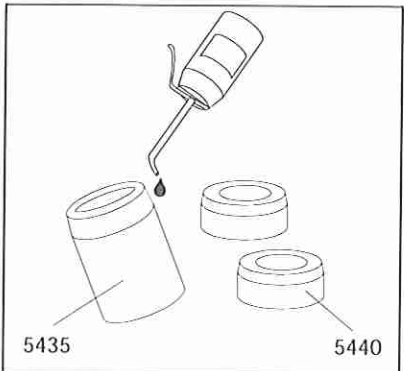
No tool is necessary inserting the wear sleeves. Fix the wear sleeves (5435) with set screws (5049) in the correct position and secure them with Loctite.



- Generously oil the wear sleeves (5435, 5440).

Basic joint size NM045-NM105:

- Every wear sleeve (5435, 5440) has got one smaller outer diameter on one end for better insertion into the bores of the coupling rod. Ensure the sleeves are placed in the correct orientation to the coupling rod (1998).



## **11 Removal and Fitting of the Connecting Shaft with Shaft Seal**

### **Removal:**

- Push the circlip (1035) in the direction to the mechanical seal.
- Remove pin (1030).
- Remove the shaft seal housing (7005) and mechanical seal (7010) together with connecting shaft (1050) and set ring (1035) from drive stool (0085) and the drive shaft.  
The thread of cylindrical head screw (1040) can be used as forcing screw.
- If a mechanical seal is installed, see description  
"Removal and Fitting of Mechanical Seal" after Page 12.0.

### **Fitting:**

- Apply grease into the bore of the connecting shaft (1050) to avoid rust (e.g. TCE-Metallic 600).
- Assemble the shaft seal housing (7005) and mechanical seal (7010) together with connecting shaft (1050) and set ring (1035) with drive stool (0085) and push connecting shaft (1050) on to the drive shaft.  
At this please observe the installation direction of set ring (1035) (please see mark).
- If a mechanical seal is installed, see description  
"Removal and Fitting of Mechanical Seal" after Page 12.0.
- Connect the connecting shaft (1050) and the drive shaft by pin (1030).  
Push set ring (1035) on pin (1030).

### 12.1 Removal and Fitting of the Single Mechanical Seal

- **Carefully** slide out mechanical seal housing (7005) together with the parts of the mechanical seal contained in it from connecting shaft (1050).
- **Carefully** push mechanical seal (7010) stationary seat out of mechanical seal housing (7005).

Refitting is a simple reversal of the above procedure.

- To reduce frictional forces during seal assembly, apply some glycerine to the shaft and the seal housing in the area of the gaskets.
- Special care must be taken when fitting double PTFE-coated gaskets: the **joint** of the outer coating must point away from the seal assembly direction, otherwise the coating may open or be pulled off!

Ensure that the distribution of pressure is uniform when inserting the pressure sensitive counter rings. When inserting larger rings, use a suitable mandrel.



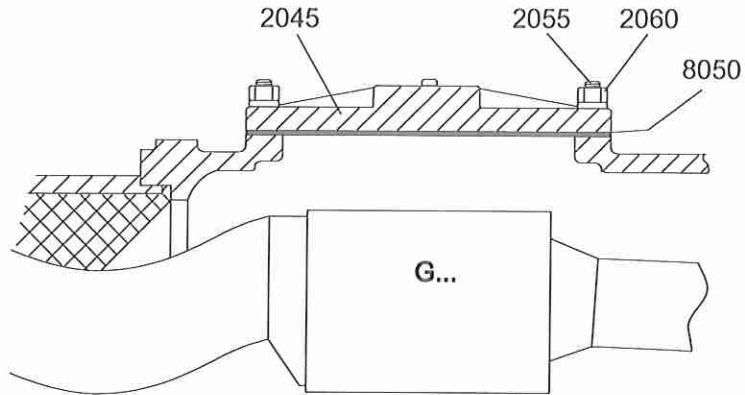
Do not allow any foreign bodies to get between the sliding surfaces.

- Exactly keep to the seal installation dimensions and ensure that the sealing faces are correctly pressed together (see table on sectional drawing W 209.000 or W 210.000).
- Insert mechanical seal (7010) stationary seat into mechanical seal housing (7005).
- Insert mechanical seal housing (7005) together with the stationary seat into the drive stool **without the installed connecting shaft (1050)**.
- If necessary take the installation dimension from the table and add the thickness S of the set ring (7086) when existing.
- Mark this installation dimension on the connecting shaft (1050).
- Fix the rotating unit of the mechanical seal (7010) on the connecting shaft (1050) depending on the installation dimension so that the rotating unit of the mechanical seal (7010) or the set ring (7086) is at the mark.
- Insert connecting shaft (1050) with the rotating unit of the mechanical seal (7010) into drive stool (0085) and install lip seal (7091, if existing). Push the set ring (1035) on to connecting shaft (1050) and observe at this the installation direction (see mark). Push connecting shaft (1050) on to the drive shaft and connect with pin (1030). Push the set ring (1035) on pin (1030).

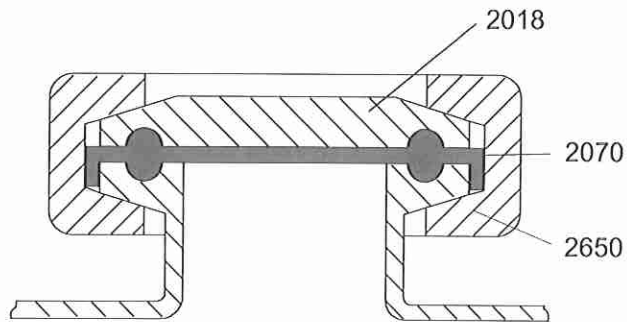


### Inspection Opening at the Pump Housing

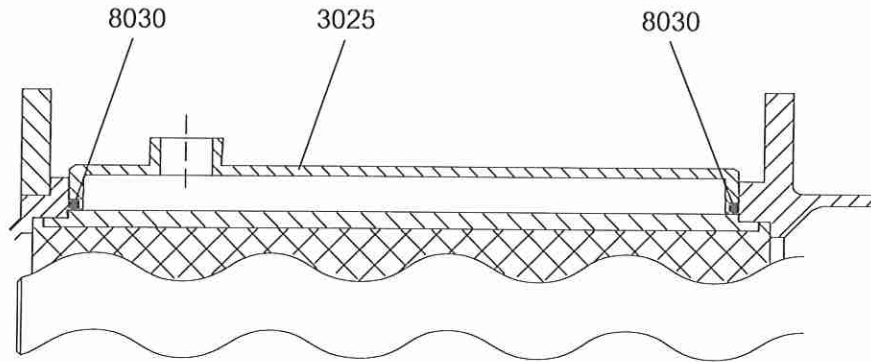
gray cast iron model on from size NM045



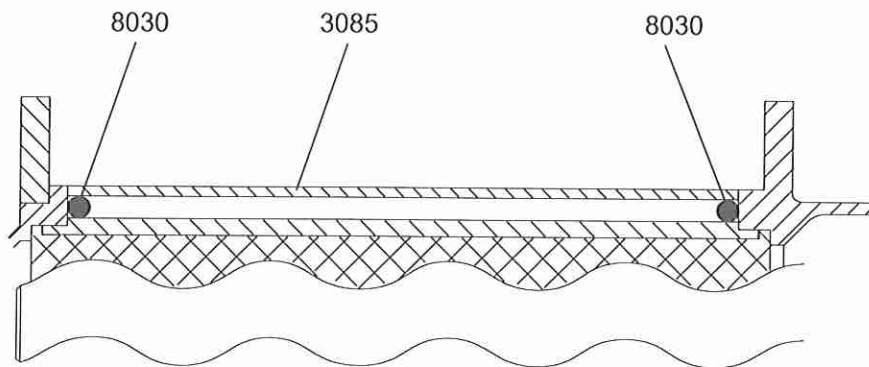
design for welded housings – nominal size DN 76,1 – ISO 2852



**Stator heating jacket**



**Stator protecting tube**



**Additional accessories, if fitted, pls. see after section 15.**

## 14 Recommended Spare Parts

In general, we have all spare parts in stock. Our subsidiaries and exclusive representatives also hold a certain stock. For special cases and when short waiting periods are not acceptable, we recommend to keep an amount of spare parts, corresponding to the pump, in stock on site (please see table below).

- Rotor
- Stator
- Elastomer parts as O-rings and sleeves
- joint parts
- shaft seals.

To avoid mistakes in delivery, please identify the parts by their position number shown in the spare parts list or on the sectional drawing.

For placing a spare parts order, it is absolutely necessary to give the following details:

Pieces                    -                    Designation                    -                    Identification Number  
 (see column 2)                    (see column 3)                    (see column 4)

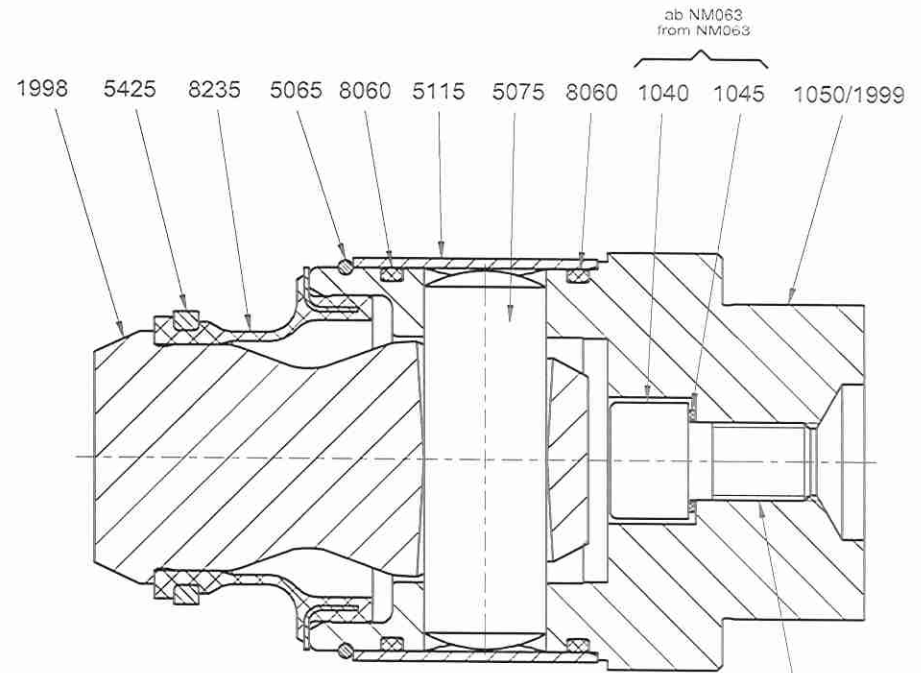
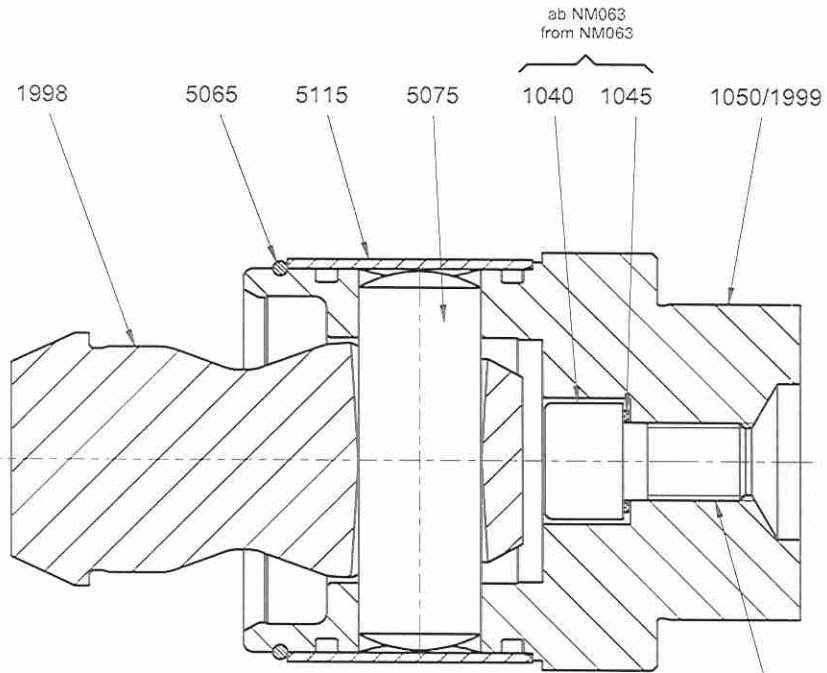
The column details are taken from the spare parts list. See example.

Example:

1		2		3		4
PART		Quantity	Unit	Designation		Ident-Number
EURO	POS.			Size - Norm - Material/Surface		
3410	0005	1,000	pc	bearing housing		850221
2910	0010	1,000	pc	distance sleeve		850220
3520	0015	1,000	pc	bearing cover		850222

**15 Sectional Drawings and List of Spare Parts**

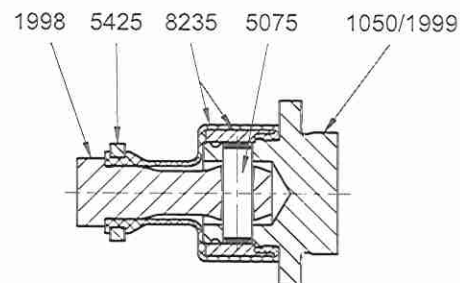
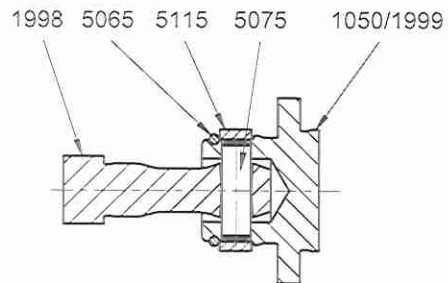




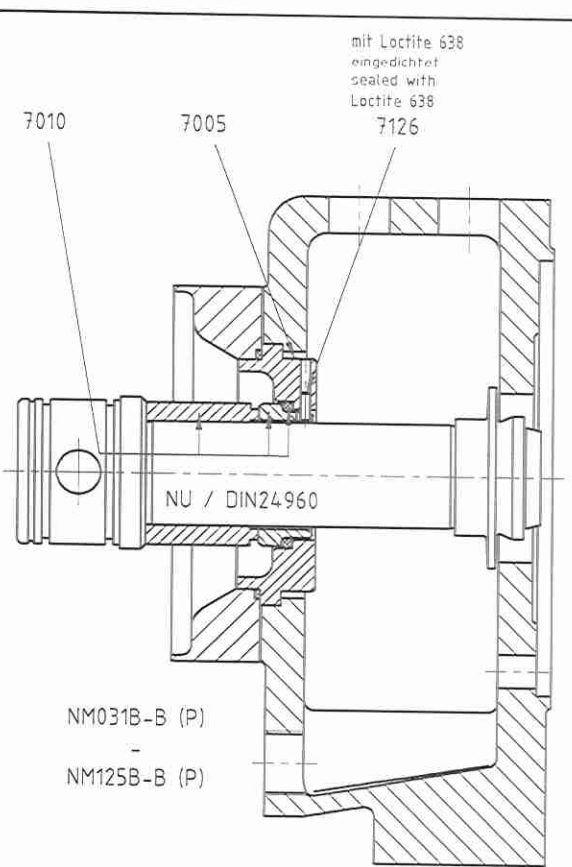
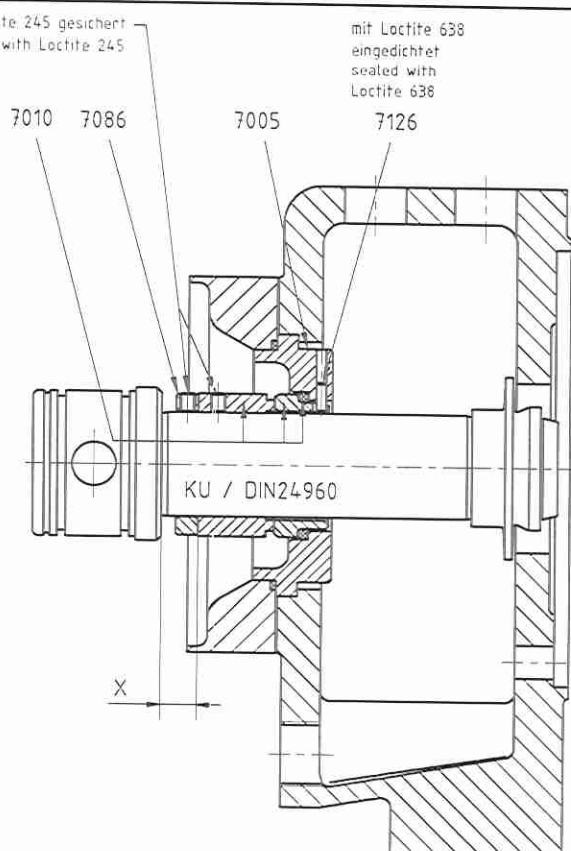
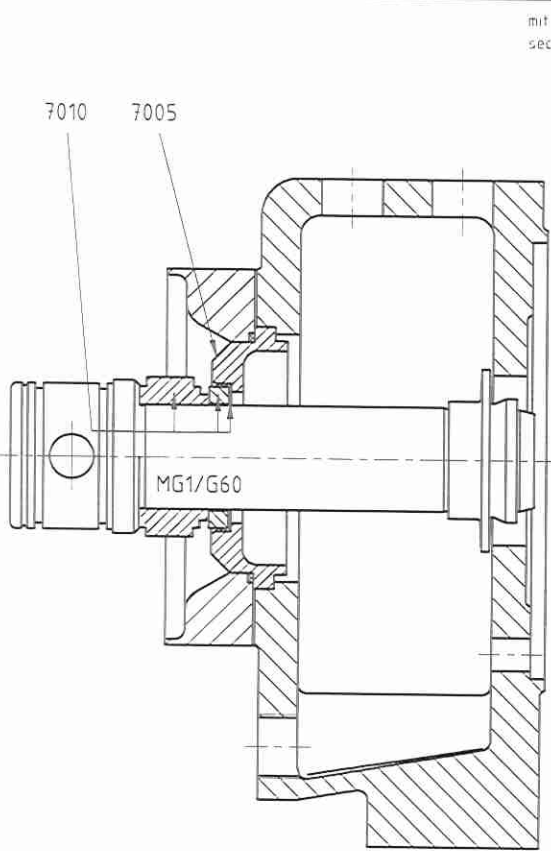
mit Loctite 245 gesichert  
secured with Loctite 245

mit Loctite 245 gesichert  
secured with Loctite 245

nur/only NM015B- (P)



<b>NETZSCH</b> The heart of your process:	Zeichnung-Nr.: Drawing No.:	Bolzen Gelenk ohne/mit SM-Bolzenabdichtung Pin Joint without/with SM-Pin Joint Seal	Type: NM015B- (P) - NM105B- (P)
	G146.000		
Maßst./Scale: 1 : X	Datum / date	Name / name	Unterschrift/Signature
gezeichnet / drawn	14.10.2003	Preintner	
geprüft / checked	14.10.2003	Thoma	
freigegeben / released	14.10.2003	Thoma	
Verteiler: Distributor:	2 / 3 / 50 / 51 / 52 / 58 / 98		
Revision: 1			Ersatz für Ausgabe vom: Replacement for Version of: 23.05.2003



Type	Einstellmaß "X" setting
NM015B	0
NM021B	0
NM031B	12,5
NM038B	10
NM045B	15
NM053B	22,5
NM063B	27,5
NM076B	20
NM090B	30
NM105B	25
NM125B	25

<b>NETZSCH</b> The heart of your process	Zeichnung-Nr.: Drawing No.: W209.000	Einf. wirk. GLRD Single Mechanical Seal	Type: NM015B-B (P) - NM125B-B (P)
	Maßst./Scale: 1 : X	Datum / date: 09.03.2006	Name / name: Preintner
gezeichnet / drawn		Unterschrift/Signature: Denk	
geprüft / checked		Revision: 2	
freigegeben / released		Ersatz für Ausgabe vom: Replacement for Version of:	
Verteiler: Distributor: 2 / 3 / 50 / 51 / 52 / 58 / 95 / 98 / 49		23.10.2003	

