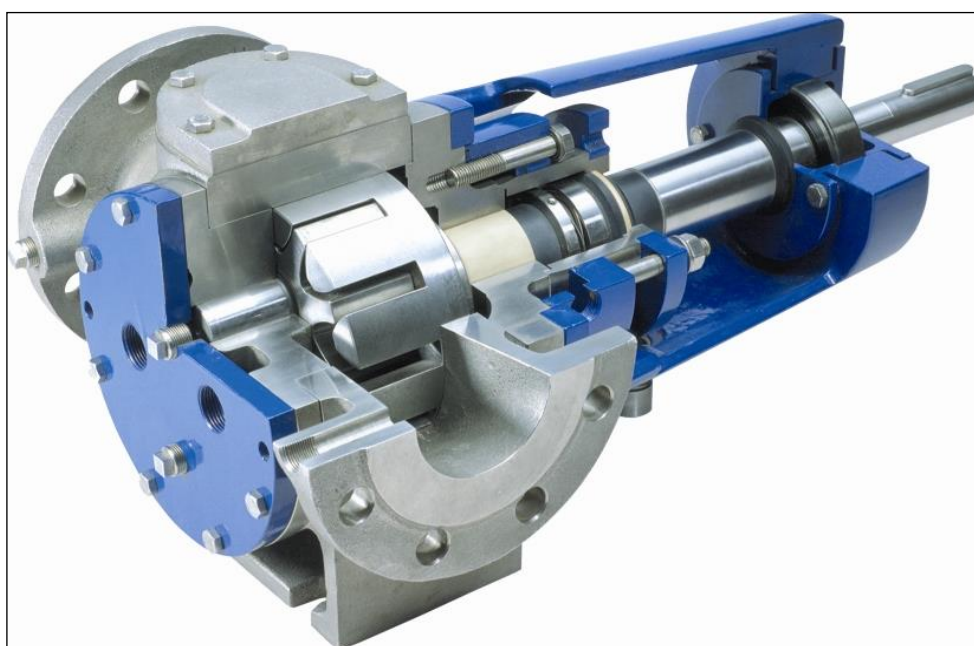


User Manual – incl. ATEX/English

ROTAN PUMP

Types GP – HD - PD - CD - CC - ED*



DESMI PUMPING TECHNOLOGY A/S

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T1456UK-V9.7



EC Declaration of Conformity The Machinery Directive 2006/42/EC

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in
the

DESMI A/S hereby declares that the product in question has been produced
accordance with the following essential health and safety requirements of
Machinery Directive 2006/42/EC Annex I.

Product: ROTAN pumps complete with motor
Type: HD, CD, PD, GP, CC, ED(MD)
Serial No: From 10000-xx-xx to 999999-xx-xx

The following harmonized standards have been applied:

EN 809 + A1/AC:2010	Pumps and pump units for liquids
DS/EN 12162 + A1:2009	Procedures for hydrostatic testing of liquid pumps

Nørresundby 2022



Henrik Mørkholt Sørensen
Managing Director
DESMI Pumping Technology A/S

Declaration of Incorporation”

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in DESMI A/S hereby declares that the product in question has been produced
accordance with the following essential health and safety requirements of
the Machinery Directive 2006/42/EC Annex I:

Product: ROTAN pumps complete with motor
Type: HD, CD, PD, GP, CC, ED(MD)
Serial No: From 10000-xx-xx to 999999-xx-xx

The following harmonized standards have been applied:

EN 809 + A1/AC:2010 Pumps and pump units for liquids
DS/EN 12162 + A1:2009 Procedures for hydrostatic testing of liquid pumps

The pump must not be put into service until the final machinery into which the pump has been incorporated into, is declared in conformity with the provisions of the machinery directive 2006/42.

Nørresundby 2022



Henrik Mørkholt Sørensen
Managing Director
DESMI Pumping Technology A/S

EU Declaration of Conformity ATEX – 2014/34/EU

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Product: ROTAN pumps
Type: HD, CD, PD, GP, CC, ED(MD)
Size: DN25 – DN200 / 1" – 8"

which are marked: Ⓜ category 2 or 3, "c" X, with temperature class, and installed and applied in conformity with DESMI Pumping Technology A/S' user manual

The entire user manual must be read thoroughly before a ROTAN ATEX pump is installed and put into use

DESMI Pumping Technology A/S hereby declares that the product in question has been produced in accordance with ATEX Directive 2014/34/EU.

The following harmonised standards have been applied:
ISO 80079-36:2016
ISO 80079-37:2016

The product is designed for connection to an electric motor with the aim of making a complete unit. The conformity also applies to complete pumps with motor if, according to the manufacturer, the motor conforms to a corresponding category and temperature class and it has been fitted in conformity with DESMI Pumping Technology A/S' user guide.

If the pump and electric motor are supplied by DESMI Pumping Technology A/S as a complete unit, the EU Declaration of Conformity and user manual for the electric motor will be attached.

The technical file is stored at: PTB(Physikalisch – Technische Bundesanstalt) Braunschweig und Berlin, Reg. number 03 ATEX D052.

Nørresundby, 2018

A handwritten signature in blue ink, appearing to be 'Henrik Mørkholt Sørensen', written over a horizontal line.

Henrik Mørkholt Sørensen
Managing Director
DESMI Pumping Technology A/S

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Name plate

ROTAN® PUMP			
SX.		NO.	
VALVE		SEAL	
		THE DESMI GROUP www.desmi.com	
MADE BY DESMI		YEAR:	

The above shows the name plate fixed on the ROTAN pump.

If the pump's and the motor's name plate bears an  and the designation group II, zone 2 or 3, G or GD, c X and T-class – e.g. II 3 GD c T4 X -, the unit is prepared for use in a potentially explosive environment. As a standard ROTAN pump units are not prepared for use in a potentially explosive environment.



The name plate must never be removed from the pump.

If the name plate is removed, the pump cannot be identified immediately, and therefore warnings in this manual cannot be compared with the specific pump application.

The pump's order number and serial number are displayed on the flange.

1. General information

This user manual relates to ROTAN internal gear pumps.

The entire user manual must be read thoroughly before the pump is transported, lifted, installed, assembled and any other activity described in this user manual.

Everyone who is to work with this pump must read this user manual before it is taken into operation.

Upon receipt, check that the delivery is complete and undamaged. Any deficiencies or damage must be reported immediately to the transport company and the supplier, in order that a claim may be valid.

The user is responsible for compliance with the safety requirements described in this user manual.

If people who are expected to have a need to refer to the user manual are of a different linguistic origin than the language in which the user manual has been supplied, it is recommended that the user manual is translated into the language in question.

In addition to the instructions contained in this user manual, we also refer to the prevailing local national laws and regulations. The user is responsible for compliance with these.

The owner of the pump is responsible for ensuring that everyone who works with the pump has the necessary background.

In the event that this user manual or other regulations recommend the use of personal protective equipment or limitations on the use of labour and the pump, such instructions must be observed.

The pump may only be used under the operating conditions specified when the order was placed. Any deviation from this requires DESMI's consent.

The owner or user of the pump must ensure that this manual is updated if there are any modifications to the pump. Especially the description of safety must be emphasised.

In the event that the pump is transferred to a third party, this user manual with any updated amendments and the operating conditions defined when the order was submitted *must* accompany the pump.

DESMI assumes no liability for any personal injury or damage to the pump or other material damage resulting from:

- any amendments to the pump not approved by DESMI PUMPING TECHNOLOGY A/S
- a failure to observe the safety regulations or other instructions in this user manual
- the use of non-original spare parts that do not satisfy precisely the same, strict quality requirements as original DESMI spare parts
- any fault, blockage or breakdown in the pipe system

The owner or user is responsible for protecting the pipe system against faults, blockages and explosions.

Quality management system:

ROTAN pumps are manufactured in accordance with DESMI's quality management system, which is certified by BVQI in accordance with the requirements of ISO 9001.



Testing of pumps:

All ROTAN pumps have been *statically* and *dynamically* tested in the factory except pump versions "CHD" and "EPDM".

All bypass valves have been *statically* tested in the factory.

Static pressure testing is conducted to ensure that the pumps do not leak, and that they can maintain the specified maximum operating pressure.

The dynamic test is conducted to ensure that the pump can deliver the specified volume of liquid at the specified pressures.

The pumps are tested and preserved with oil type GOYA 680 transmission oil (Q8) with a viscosity of about 70 cSt. Pumps in versions "CHD" and "EPDM" are preserved in the factory using vegetable oil.

Pumps fitted with a heating jacket/cooling jacket are also specially tested to achieve extra safety to ensure that the heating liquid in the front cover and the cooling jacket on the rear cover cannot pass into the pump liquid.

After testing the pump is emptied, but it has not been cleaned for test oil in the factory.

All pumps are supplied with a signed test certificate.

The tests described are conducted in accordance with the procedures set out in DESMI's quality management system and in accordance with international classification companies.

Explosion-proof pumps:

DESMI produces pump units for potentially explosive environments, but as a standard ROTAN pump units are not prepared for use in potentially explosive environments, and therefore they must not be used in such contexts without DESMI's consent. The information on the pump's name plate will define whether it can be used in a potentially explosive environment.

DESMI can supply pump units for potentially explosive environment within the areas indicated in Figure 1: Shows the group (G=Gas/D=Dust), the categories, zones and temperature classes (T1/T2/T3/T4) for which DESMI PUMPING TECHNOLOGY A/S can supply pump units within potentially explosive environments.

Atex			
Group II - G/D			
Category 2		Category 3	
Zone 1	Zone 21	Zone 2	Zone 22
Gas / steam / mist	Dust	Gas / steam / mist	Dust
T1 / T2 / T3 / T4 /			

Figure 1: Shows the group (G=Gas/D=Dust), the categories, zones and temperature classes (T1/T2/T3/T4) for which DESMI PUMPING TECHNOLOGY A/S can supply pump units within potentially explosive environments.

If the pump is required to be used in a potentially explosive environment, this must be stated when ordering so that the pump unit can be supplied especially for such conditions.

DESMI PUMPING TECHNOLOGY A/S can supply the following control equipment to pumps in a potentially explosive environment:

Control equipment	Protection
Thermal sensor	For registration of surface temperature (to be connected to control)
Temperature labels	Temperature labels indicate the max. temperature reached
Bypass valve	The bypass valve protects pumps and motors in the event of brief pulsating excess pressures in the system. The bypass valve does not give protection against the pipe system
Liquiphant™	The Liquiphant™ provides protection against dry running



All pump types and pump sizes must always be protected against dry running either by means of a Liquiphant™ or other comparable devices



Pumps supplied with a soft stuffing box must always be fitted with a thermal sensor or other comparable devices



Pump type ED must always be fitted with a thermal sensor

Temperature labels can be used as extra control together with the thermal sensor. However, the thermal sensor cannot be replaced by temperature labels. When using temperature labels, the manufacturer's instructions must be observed.

Any other issues in connection with purchase of pump units for potentially explosive environments are to be clarified with our sales department when ordering.

Before ordering, you must first as a customer fulfil the minimum requirements in the current, relevant EF ATEX Directive concerning improvement of safety and health protection for employees who may be exposed to danger resulting from potentially explosive environments and have prepared an overall risk assessment in conformity with the mentioned directive in collaboration with the local fire authorities. This risk assessment must be in conformity with the ATEX labelling DESMI PUMPING TECHNOLOGY A/S has stated on the name plate of the supplied pump – before start-up of the pump is allowed.



Prepare an overall risk assessment must be in conformity with the current relevant EC Directives on potentially explosive atmosphere in collaboration with the local fire authorities – if the pump is to be used in a potentially explosive atmosphere – and check that this risk assessment against the labelling DESMI PUMPING TECHNOLOGY A/S has stated on the supplied pump before commissioning of the pump is allowed.

Special protective measures for ROTAN pump units in connection with potentially explosive environments to be considered and observed appear continuously from this manual under the relevant sections – see these!

□

Flow:

The sketch below shows a cross section of the ROTAN pump seen from the front end – see Figure 2: Shows the liquid flow through the ROTAN pump – seen from the front end.

The sketch shows the principle of the liquid flow through the ROTAN pump.

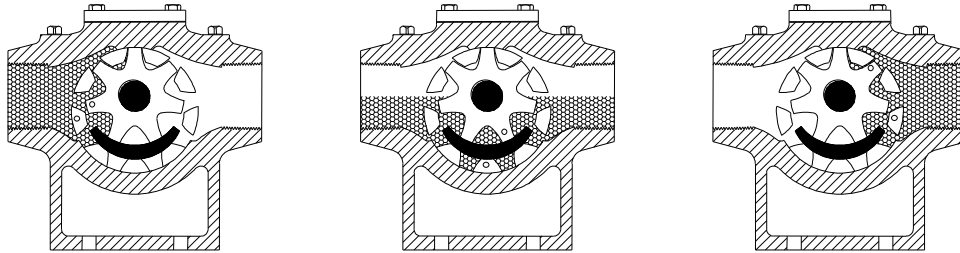


Figure 2: Shows the liquid flow through the ROTAN pump – seen from the front end.

Pump versions:

This user guide covers all standard versions of the ROTAN pump.

It applies to pump types described in Figure 4: A list of the various pump types, their designation and application.

Pump sizes described in Figure 5: A list of pump sizes based on the internal diameter of the pump's inlet/outlet in inches and millimetres.

Pump versions described in the section entitled "Pump models", and the versions shown in Figure 8: The codes of the various pump versions together with an explanation of what they mean.

In this manual the front and the rear ends of the ROTAN pump are referred to Figure 3: Shows which end is called front and which is called rear.

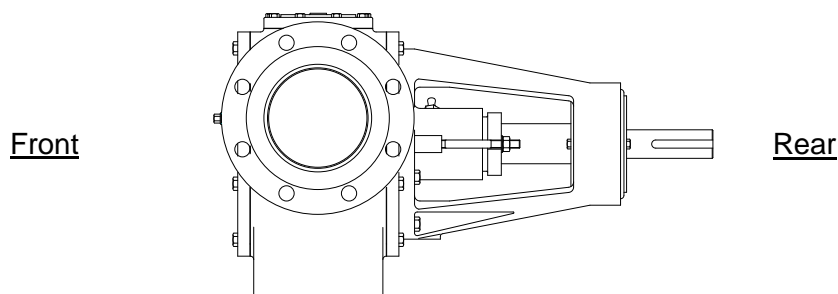


Figure 3: Shows what is designated as front and rear of the ROTAN pump.

The ROTAN pump has a modular construction, and can be supplied in a great number of options.

Because of the large number of possible combinations, it is not possible to cover all models or special versions available in this user manual.

If the user manual proves to be incomplete with regard to the above or to the item supplied, you are of course welcome to contact DESMI.

This user manual differentiates between the terms:

- pump types
- pump sizes
- pump models
- pump versions

Pump types:

The Rotan pump is supplied in the following pump types:

Pump types - application		
Pump type:	Designation:	Application:
GP	General Purpose	Mainly pumping of clean oils
HD	Heavy Duty	Mainly pumping of highly viscous liquids <u>Typical applications:</u> oils, asphalt, chocolate, paint, lacquer, molasses, soap and similar liquids <u>Used for processes in:</u> process industry
PD	Petrochemical Duty	<u>Typical applications:</u> lubricating oil, petrol, lubricants and other hydrocarbons. <u>Used for processes in:</u> refineries and the petrochemical industry
CD	Chemical Duty	To pump corrosive liquids <u>Typical applications:</u> organic acids, fatty acids, alkalis, caustic soda, polymer solutions, soap, shampoo, animal fat, vegetable fat, chocolate and other special liquids <u>Used for processes in:</u> chemical industry, food industry and the cosmetic industry
ED	Environmental Duty	Used to pump all the above liquids ED pumps are particularly environment-friendly, and provide a 100% guarantee against liquid or air leakage
CC	Closed Coupled	Particularly for pumping oil products <u>Used for processes in:</u> engineering industry

Figure 4:: A list of the various pump types, their designation and application.

Pump sizes:

The ROTAN pump is supplied in various pump sizes.
The pump size is defined on the basis of the pump's inlet/outlet.

By measuring the internal diameter of the pump's inlet/outlet, you can find the pump size in the table below.

Pump size		
Pump sizes	Nominal diameter i mm.	Internal diameter in inches
26	25	1"
33	32	1 1/4"
41	40	1 1/2"
51	50	2"
66	65	2 1/2"
81	80	3"
101	100	4"
126	125	5"
151*	150	6"
152*	150	6"
201*	200	8"
202*	200	8"

Figure 5: A list of pump sizes based on the internal diameter of the pump's inlet/outlet in inches and millimetres.

*Pump sizes 151 and 152, 201 and 202 are pumps of different displacements, but with the same size inlet/outlet.

The various pump types are available in the pump sizes listed in Figure 6: A list of the various pump sizes together with the pump types available in the various pump sizes.

Pump types/sizes						
Pump size	Pump types					
	GP	HD	PD	CD	ED	CC
26						
33						
41						
51						
66						
81						
101						
126						
151						
152						
201						
202						

Figure 6: A list of the various pump sizes together with the pump types available in the various pump sizes. Fields that are shaded grey indicate the sizes available in the pump types listed.

The pump's inlet/outlet can be supplied with internal threads or flanges.

All pump types and pump sizes can be supplied with flanges to match connecting objects.
 Pump sizes \leq size 66 can be supplied with an internal thread in as listed(Figure 7).

Pump size	Pumps with internal thread						
	GP	HD	PD	Pump types		ED	CC
				CD	stainless		
26							
33							
41							
51							
66							
81							
101							
126							
151							
152							
201							
202							

Figure 7: A list of the various pump sizes and pump types supplied with an internal thread.

Fields that are shaded grey indicate the pump types and pump sizes supplier with an internal thread.

Heating/cooling jackets:

Rotan pumps can be fitted with a heating jacket or a cooling jacket on the front cover and/or the rear cover. Heating jackets are used to keep the pump liquid fluid, and are often necessary when pumping highly viscous liquids or liquids that tend to coagulate. The heating jacket on the rear cover can also be used to heat liquid-lubricated shaft seals.

The jacket can also be used as a cooling jacket for the shaft seal on the rear cover or a cooling jacket to cool the pump liquid on the front cover.

We recommend that the pump be heated before operation.

The heating/cooling chambers are heated or cooled by connecting a separate circulatory system that circulates heating liquids such as water, steam or oil.



The pressure in the heating jacket on the front cover and the cooling jacket on the rear cover may not exceed 10 bar.



The liquid in the heating chambers must have an ignition temperature of at least 50°C above the pump's maximum surface temperature.

2. EC Declaration of Conformity

ROTAN pumps are CE-labelled from the factory and supplied with an EC Declaration of Conformity or an EC Component Declaration – depending on whether the pump has been bought with or without a motor.

When fitting a ROTAN pump in an existing system and connecting pumps and motors, we would point out that the whole plant/combination of motor and pump must be assessed and given a new CE label in order to ensure that the combination represents no new hazards with regard to health and safety.



Please note that pumps supplied by DESMI without a motor must be connected using an explosion-proof motor if you intend to use the pump in a potentially explosive atmosphere.

A ROTAN pump may not be put into operation until this CE labelling procedure has taken place. The manufacturer that ultimately assembles the final system is responsible for ensuring that such compliance is achieved. DESMI is not responsible for this compliance.

The above requirement is valid within the EC.



3. Safety warnings – in general

- The pressure in the heating jacket on the front cover and the cooling jacket on the rear cover may not exceed 10 bar.
- Lift the pump mechanically, if the pump's weight is more than the permitted number of kilos that people may lift.
- Do not place fingers in the pump's ports when lifting or handling the pump.
- Motors fitted with lifting eyes must not be used to lift the whole pump, but only to lifting the motor separately.
- Lift of the pump should be performed in stable suspension points so that the pump is balanced and the lifting straps are not placed over sharp edges
- Lift of the pump shall be performed in conformity with the lifting instructions in Figure 10 – Figure 16
- Carefully shield the coupling between the pump and motor
- Bolt the pump securely to the foundation.
- Clean out any impurities from the pipe system before the pump is connected to it
- Remove the protective plugs from the pump ports before connecting the pipes.
- Flange couplings must always be undertaken by skilled professionals.
- Achieve parallelism between the flanges and observe the maximum tightening torque to prevent tension in the pump casing
- Threaded couplings must always be made by skilled professionals
- Connecting a pump with an internal thread to a pipe with a conical thread can cause the pump casing to burst if the coupling is over-tightened.
- Fit the pump unit with an emergency stop
- Connect and adjust any monitoring and safety systems – controls, manometers, flowmeters, etc. – according to the operating condition for safe operation
- Clean the pump for test oil before operation
- Use suitable safety equipment when aerating the pump such as gloves, protective goggles etc. – depending on the pump liquid
- Never bleed the pump in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure
- The pipe system must be secured against excess pressure in other ways than using the ROTAN bypass valve
- In the event of liquid properties which may block the bypass valve in its function, other comparable devices should be used instead of the ROTAN bypass valve.
- Pumps without a ROTAN bypass valve must use another equivalent safety device which protects pump and motor

- Any change to the pump's max. operating pressure must be followed by a change to the valve's setting - the working pressure must however not exceed the maximum allowable pressure of the pump/valve – see Figure 52.
- Check daily that the max. allowed temperature is observed
- The pump must be shielded when pumping hot liquids that create a surface temperature on the pump of more than +80° C
A warning sign must be displayed in a clearly visible location!
- When pumping hot liquids, the pipes must be fitted with compensators to prevent tensions in the pump casing
- ROTAN pumps may not be used to pump liquids at a temperature higher than the liquid's ignition temperature, and with reference to the maximum temperatures specified in the table Figure 31 and no higher than the temperature in the table Figure 32 – depending on the type of elastomer used – and for pumps with bypass valve max. 150°C. The lowest +temperature identified of the four mentioned constitutes the maximum temperature.
- The ED pump may not be used to pump liquids at a temperature that is higher than the liquid's ignition temperature, and with reference to the maximum temperatures specified in the table Figure 31 depending on the magnetic material, and no higher than the temperature stated in the table – Figure 32 – depending on the type of elastomer used - and for pumps with bypass valve max. 150°C.
The lowest +temperature identified of the four mentioned constitutes the maximum temperature.
The maximum temperature limit identified must be further reduced by the temperature increase generated by the magnets.
- ROTAN pumps are not approved for pumping foods requiring FDA and 3 A – approval
- Use appropriate hearing protection if necessary!
If necessary, display a sign stating that hearing protection must be worn!
- The shaft seal must not be adjusted during operation
- Ball/roller bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C.
- Slide bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C.
- The lubricant for chocolate pumps must not be harmful. The lubricant must be compatible with the chocolate mix
- Observe the safety instructions in the data sheet for the liquid in question and use the specified safety equipment in the form of protective clothing, a breathing mask or similar necessary safety equipment
- Use suitable safety equipment with pump liquids at temperatures of more than +60°C.
- When pumping hazardous liquids, circulate neutralising liquid before emptying the pump.
- The system must be depressurised before emptying the pump.
- The safety instructions in the data sheet for the liquid in question must be observed, and the safety equipment specified must be used.



4. Safety warnings – electricity

- Electrical couplings must always be established by authorised professionals, in accordance with the prevailing standards and directives.

Set the protective motor switch maximum to the motor's rated current



5. Safety warnings – ATEX

- All pump types and pump sizes must always be protected against dry running either by means of a Liquiphant™ or other comparable devices
- Pipe systems after the pump (the pressure side) must be secured with a safety/pressure relief valve which can return the whole liquid quantity to the tank in accordance with the pressure equipment directive 97/23/EC
- If the pump is not protected by the pipe system's safety valve/pressure relief valve or is protected in any other way, a bypass valve must be fitted on the pump
- If the pump is fitted with Rotan bypass valve, a thermal sensor must be fitted to ensure that the pump stops at 80% of the max. allowed surface temperature unless this is secured on other ways.
- Prepare an overall risk assessment in conformity with the current, relevant EC directives on potentially explosive atmosphere in collaboration with the local fire authorities
- The liquid in the heating chambers must have an ignition temperature of at least 50°C above the pump's maximum surface temperature
- Use only instruments and help systems approved by ATEX – such as gears, motors, liquid blocking systems etc. in connection with ROTAN pumps to function in potentially explosive environments
- If you intend to use the pump in a potentially explosive environment, the pump must be connected to an explosion-proof motor
- Use coupling approved by ATEX
- Set the axial clearance to prevent heat generation and the subsequent risk of explosion
- Position and fit vertical pumps in conformity with DESMI's instructions in order to avoid dry running and the subsequent risk of explosion in Ex pumps
- Pump type ED and pumps supplied with a soft stuffing box must always be fitted with a thermal sensor if they are positioned in potentially explosive environments
- Connect the control in conformity with the instructions from the control supplier
- Connect and pre-set the thermal sensor before starting up the pump
- Do not set the control – coupled to the thermal sensor – to a higher temperature than the one specified in the table in Figure 23
- Observe the inspection and maintenance instructions contained in this manual to achieve explosion protection for Ex-labelled pumps.

- Ball/Roller bearings must be lubricated to ensure explosion protection.
- Ball/Roller bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C – to guarantee explosion protection.
- Ball/Roller bearings must be replaced as indicated in Figure 38 to ensure explosion protection
- Slide bearings must be lubricated to guarantee explosion protection.
- Slide bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C – to guarantee explosion protection.
- Use spark-free tools when assembling and dismantling the pump and pump parts in potentially explosive atmospheres
- Pumps must not be used in a potentially explosive environment unless the pump's name plate is labelled EEx II 2GD c X – see the pump's name plate!

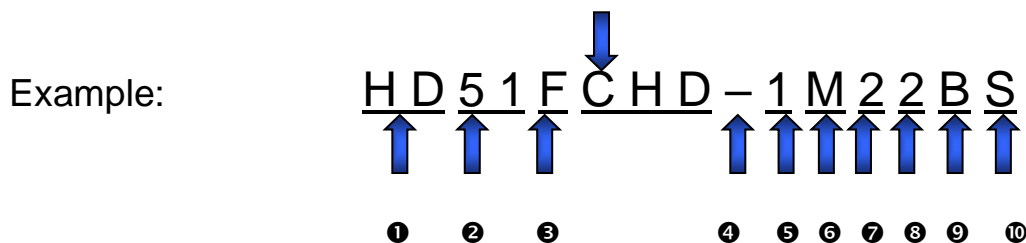
6. Pump models

The ROTAN pump has a modular construction, and can be supplied in a large number of models.

The pump's designation is made up of a series of codes which describe various features of the pump.

Below is an example of some of the codes.

Pump versions – see section: "6.2 Pump versions"



The numbers in the above example refer to the numbers on the next page.

This particular pump's designation is displayed on the pump's name plate – refer to that!

6.1 Pump models

1) Pump types

GP	"General Purpose"	monoblock pump in cast iron
HD	"Heavy Duty"	cast iron pump
PD	"Petrochemical Duty"	steel pump
CD	"Chemical Duty"	stainless steel pump
ED	"Environmental Duty"	pump with magnetic coupling, made of cast iron, Steel and stainless steel

2) Pump sizes

26	DN25	- 1"
33	DN32	- 1¼"
41	DN40	- 1½"
51	DN50	- 2"
66	DN65	- 2½"
81	DN80	- 3"
101	DN100	- 4"
126	DN125	- 5"
151	DN150	- 6"
152	DN150	- 6"
201	DN200	- 8"
202	DN200	- 8"

3) Configurations

E	Straight-through pump
B	Angle pump (not standard)
F	Flange
	Other versions, see next page
R	Bypass valve
	Additional options, see next page

4)

- Hyphen

5) Material codes for main parts

<u>Code</u>	<u>Type</u>	<u>Pump casing/Covers</u>	<u>Rotor/St.wheel</u>	<u>Shaft</u>
1	GP/HD	GG-25	GG-25	St.60.2
3	CD	G-X 6 CrNiMo 18 10	X 8 CrNiMo 27 5X8	CrNiMo 27 5
4	PD	GS-52.3	GG-25	St.60.2
5	HD	GGG42	GGG42	St.60.2

All material codes can be used for ED pumps.

6) Lubrication

U	Idler bearing and main bearing lubricated by pump liquid.
M	Externally lubricated idler bearing and main bearing.

7) Material codes for idler bearing

<u>Code</u>	<u>Idler Bush</u>	<u>Idler Pin:GP-HD-PD</u>	<u>Idler pin: CD</u>
1	Cast iron	Hardened 16 MnCr 5	X 8 CrNiMo 27 5
2	Bronze	Hardened 16 MnCr 5	X 8 CrNiMo 27 5
3	Carbon	Hardened 16 MnCr 5	X 8 CrNiMo 27 5
4	Al.oxide	Cr.oxide coated 16 MnCr5	Cr.oxide coated X 8 CrNiMo 27 5
5	Carbon	Al.oxide, polished	Al.oxide, polished
7	Tungsten carbid	TC coated St60.2	TC coated X 8 CrNiMo 27 5
8	Tungsten carbid	Tungsten carbide	Tungsten carbide

8) Material codes for main bearing

<u>Code</u>	<u>Bearing Bush</u>	<u>Shaft: GP-HD-PD</u>	<u>Shaft: CD</u>
1	Cast iron	St.60.2	X 8 CrNiMo 27 5
2	Bronze	St.60.2	X 8 CrNiMo 27 5
3	Carbon	St. 60.2	X 8 CrNiMo 27 5
4	Al.oxide	Cr.oxide coated St.60.2	Cr.oxide coated X 8 CrNiMo 27 5
8	Tungsten carbide	TC Coated St.60.2	TC Coated X 8 CrNiMo 27 5
B	Ball/roller bearing	St.60.2	Not available

9) Shaft seal

B	Packing cord, - 15 -eflon-impregnated
2	Mechanical shaft seal, EN12756-KU, with O-ring or bellows
22	Double mechanical shaft seal, EN12756-KU, O-ring type

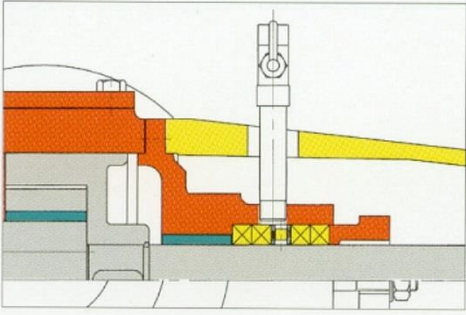
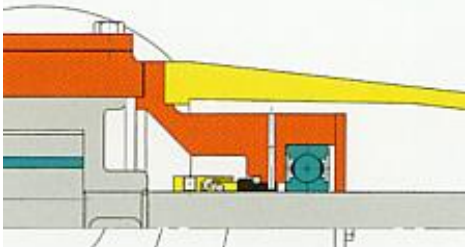
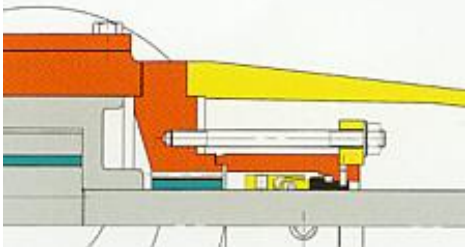
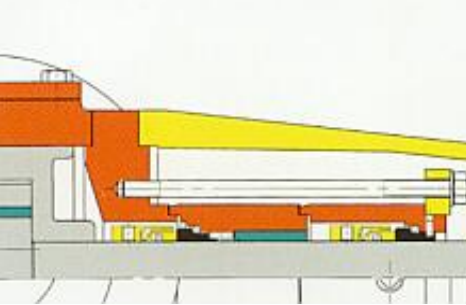
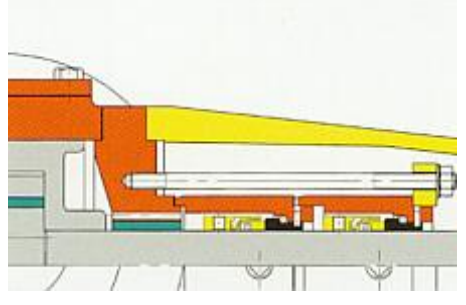
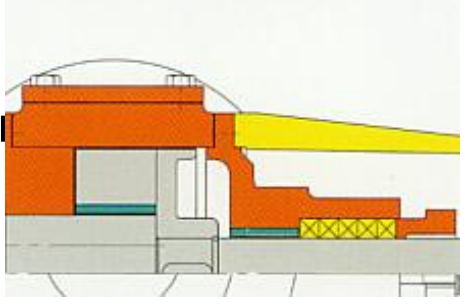
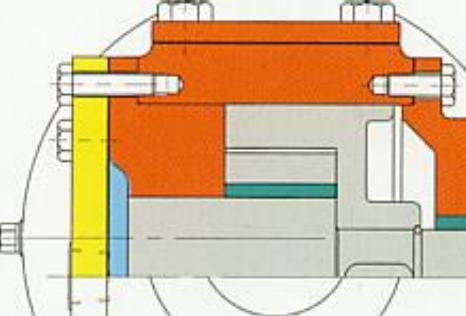
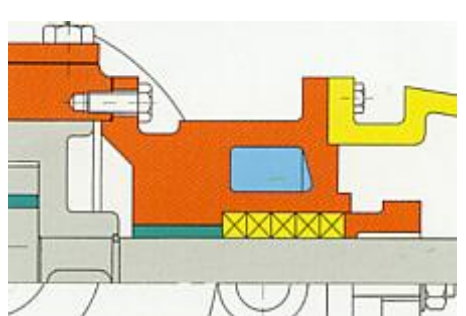
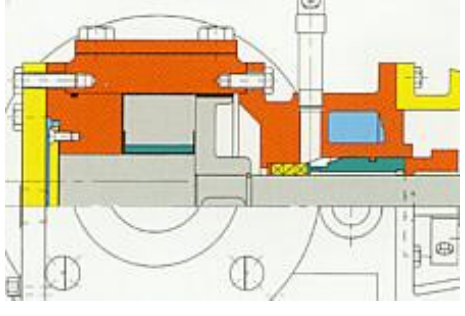
For ED pumps only:

/XX	Magnet length: XX cm.
N	Magnet material: Neodymium-iron-boron
C	Magnet material: Samarium cobalt

10) Special configurations

S	All special configurations are marked with "S"
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6.2 Pump versions

		
<p>Sealing with packing coil, with or without lantern ring for external lubrication. Used for liquids with high viscosities and where leaking is allowed.</p>	<p>M – GP/HD Sealing with single mechanical shaft seal, DIN 24960/EN 1275-KU, together with ball/roller bearing as main bearing. Used where only minor leaking can be accepted.</p>	<p>M – PD/CD Sealing with single mechanical shaft seal, DIN 24960/EN 12756-KU, together with media-lubricated slide bearing as main bearing. Used where only minor leaking can be accepted.</p>
		
<p>MM (tandem) - MMP (back to back) Double mechanical shaft seal, DIN 24960/EN 12756-KU, in tandem or back-to-back, with main bearing in the blocking liquid. Used where no leaking is allowed. A differential pressure of up to 6 bar above the pump is allowed.</p>	<p>MMW (tandem) - MMPW (back to back) Double mechanical shaft seal, DIN 24960/EN 12756-KU, in tandem or back-to-back, with main bearing in the liquid. Used where no leaking is allowed. A differential pressure of up to 16 bar above the pump is allowed.</p>	<p>T Special tolerances. Increased tolerances are used for liquids with viscosity above 7500 cSt or at temperature above 150°C.</p>
		
<p>D Heating jackets on front cover is often necessary when pumping highly viscous liquids or liquids that tend to coagulate.</p>	<p>K Heating jacket on the rear cover is often necessary when pumping highly viscous liquids or liquids that tend to coagulate. Can also be used as cooling jacket for shaft sealing.</p>	<p>CHD Combination of special tolerances and heating jackets together with external lubrication of main bearing. Used in the chocolate industry.</p>

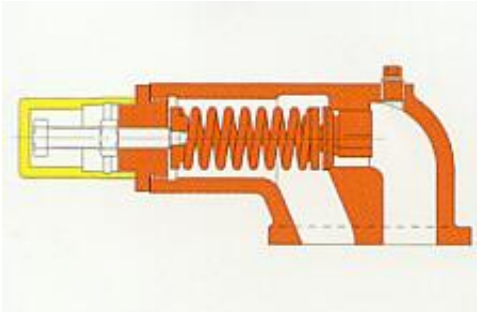
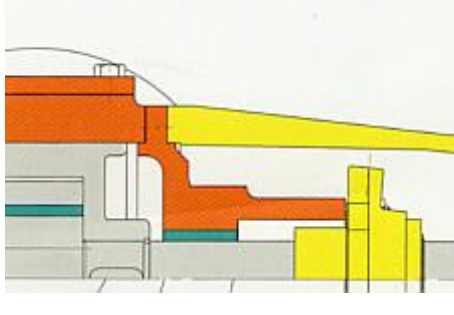
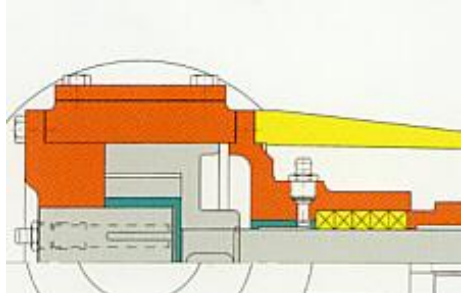
		
<p>R Bypass valve. Single-acting (one direction). Used to protect the pump against brief excess pressures.</p>	<p>S - Special configurations Example: Construction of a cartridge sealing is possible.</p>	<p>Lubrication Externally lubricated idler bearing and main bearing. Used when pumping non-greasing media or media with high viscosity.</p>

Figure 8: The codes of the various pump versions together with an explanation of what they mean.

7. Transporting the pump

The pump must be secured properly on pallets or similar before transport and shipment.

The pump should be transported in such a way that it is not damaged by impacts or blows during transit.

8. Lifting the pump

If the pump's weight is more than the permitted number of kilos that people may lift in accordance with the prevailing national rules at the location, it must be lifted mechanically.

We refer to the prevailing national rules at the location!

The table below – Figure 9 - shows the weight in kg of the various pump types in the various pump.

Pump weight excl. /incl. valve					
Pump size	Pump type				
	GP/CC	HD	PD	CD	ED
26	11 (13)	5,5 (7,5)	7 (9)	7 (9)	29 (31)
33	12 (14)	6 (8)	10 (12)	10 (12)	30 (32)
41	20 (22)	14 (16)	18 (20)	18 (20)	40 (42)
51	50 (56)	35 (41)	36 (42)	36 (42)	90 (96)
66	55 (61)	40 (46)	43 (49)	43 (49)	95 (101)
81	80 (90)	65 (75)	70 (80)	70 (80)	180 (190)
101	105 (115)	90 (100)	96 (106)	96 (106)	200 (210)
126	-	140 (160)	152 (172)	152 (172)	350 (370)
151	-	190 (210)	205 (225)	205 (225)	400 (420)
152	-	280 (340)	335 (395)	335 (395)	-
201	-	460 (520)	500 (560)	500 (560)	-
202	-	900(1172)	960 (1060)	960 (1060)	-

Figure 9: Table showing the weight in kg of the various pump types in the various pump sizes. Weights are excl. valve – the figures in brackets are incl. valve. Weights are excl. motor/gear and base frame (if any).



Lift the pump mechanically, if the pump's weight is more than the permitted number of kilos that people may lift.



Do not place fingers in the pump's ports when lifting or handling the pump.



Motors fitted with lifting eyes must not be used to lift the whole pump, but only to lifting the motor separately.



Lift of the pump should be performed in stable suspension points so that the pump is balanced and the lifting straps are not placed over sharp edges



Lift of the pump shall be performed in conformity with the lifting instructions in Figure 10 – Figure 16

Lifting instructions for pumps

Pump with free shaft end / with flange

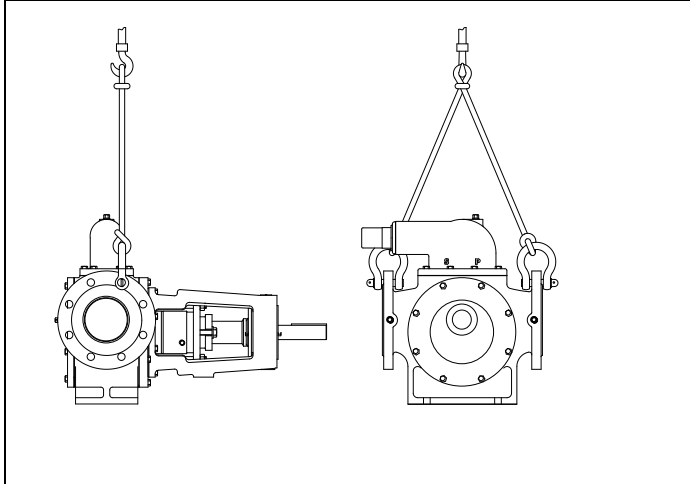


Figure 10:
Lifting instructions for pump with free shaft end with flange.
(Not applicable for HD202)
Attach 2 shackles to the flanges on the pump for lifting straps.
The shackles must be placed in the flanges at the pump's centre of gravity.

Pump with free shaft end / with thread

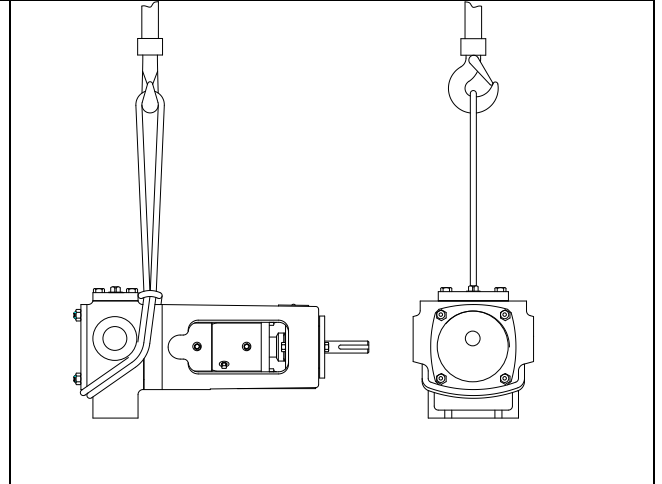


Figure 11
Lifting instructions for pump with free shaft end with thread.

Pump type GP with thread

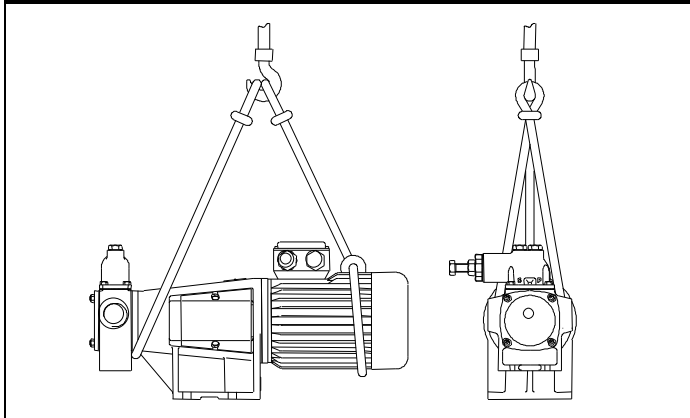


Figure 12:
Lifting instructions for GP pump type with thread.

Pump type GP with flange

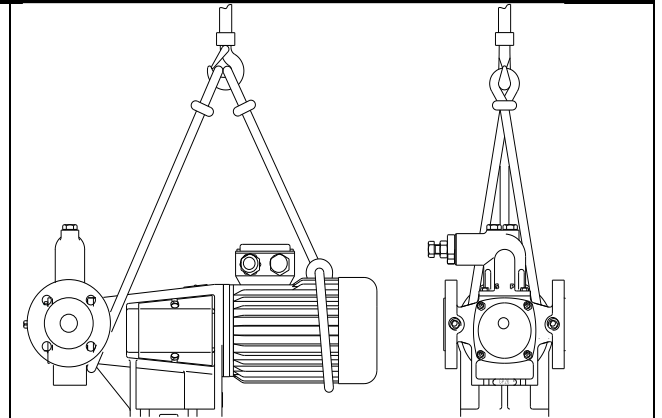
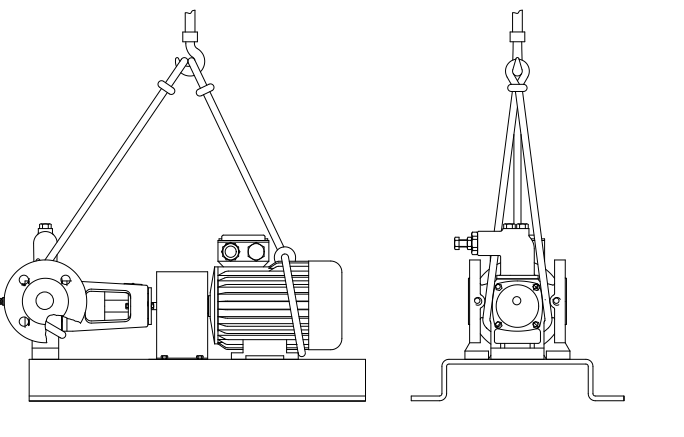
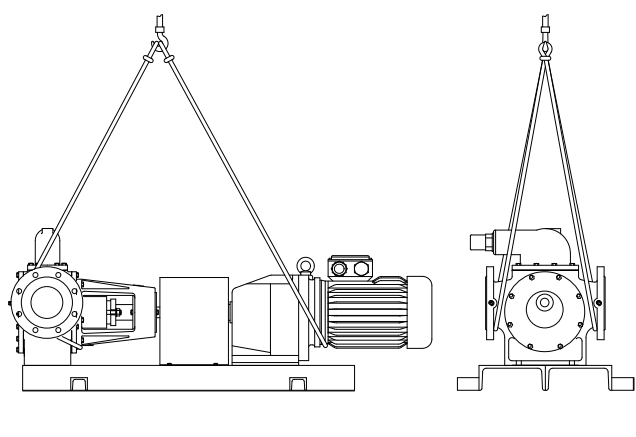


Figure 13:
Lifting instructions for GP pump type with flange.

Pump with motor	Pump with gear motor
	
<p>Figure 14: Lifting instructions for pump with motor.</p>	<p>Figure 15: Lifting instructions for pump with gear motor.</p>

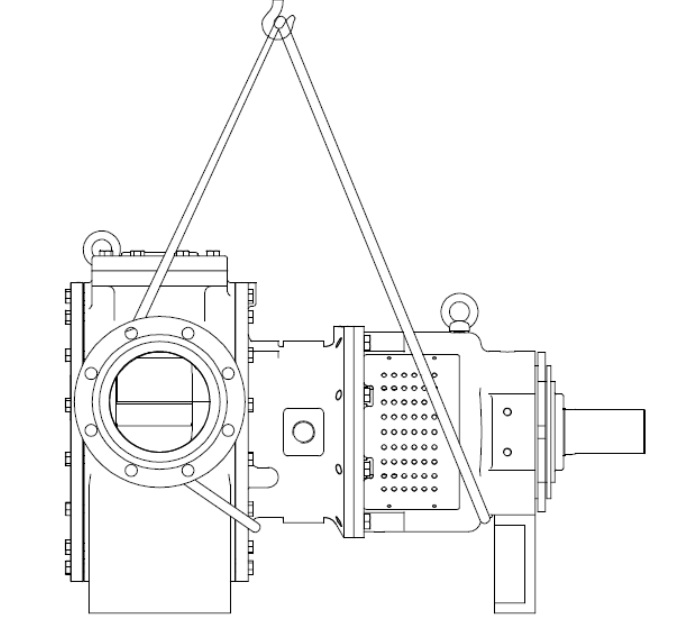
Pump with free shaft end / with flange

<p>Figure 16: HD202 Lifting instructions for pump with free shaft end .</p>

Figure 10:Lifting instructions for pump with free shaft end with flange. (Not applicable for HD202)

Figure 11:Lifting instructions for pump with free shaft end with thread.

Figure 12:Lifting instructions for GP pump type with thread.

Figure 13:Lifting instructions for GP pump type with flange.

Figure 14:Lifting instructions for pump with motor.

Figure 15:Lifting instructions for pump with gear motor.

Figure 16:HD202 Lifting instructions for pump with free shaft end .

9. Storage, long-term preservation and frost protection of the pump

Rotan pumps are protected against corrosion at the factory.

The pumps are preserved internally using oil, and pumps for the food industry are preserved using vegetable oil.

External, non-stainless surfaces are covered with primer and protective paint – except the shaft.

Flanges and pipe couplings are closed using plastic plugs.

This protection will last for approximately six months, on the condition that the pump is stored indoors in a dry, dust-free, non-aggressive atmosphere.

9.1 Storage

When stored for a longer period of time, the pump must be inspected after no more than six months – depending on the storage conditions. The pump shaft must however be turned manually approx. every 4 weeks to avoid standstill damages to bearings and seals.

Avoid storage:

- in an environment containing chloride
- on foundations with continuous vibrations as the bearings may be damaged
- in unventilated rooms

Recommended storage:

- indoors in a dry, dust-free, non-aggressive atmosphere
- in well-ventilated rooms to prevent condensation
- flanges and pipe couplings using plastic plugs
- pump packed if necessary in plastic film with moisture-absorbing Silica Gel bags

9.2 Preservation procedure

Make sure that the pump does not corrode or dry out, as drying out between the sliding surfaces of the bearings can cause them to become damaged when the pump is put into operation.

Preservation of the pump is necessary on untreated surfaces – both external and internal. Rustproof surfaces do not require any special protection.

1. If the pump has been in operation it must be emptied – see section entitled: “Emptying and cleaning the pump”!
2. Rinse the pump with clean, hot water, then empty it and dry it.
The pump must not be left with damp surfaces on the inside.
3. Spray on an anti-corrosion oil, such as: Q8 Ravel D/EX, Mobilarma 777 or equivalent.
Alternatively, it is also possible to use acid-free oil, such as hydraulic oil.
Pumps fitted with EPDM rubber seals do not tolerate mineral oil-based oils and certain food oils. As an alternative, in this instance you can use silicon oil or a fire-resistant type of polyglycol-based hydraulic oil.

Pumps for the food industry are preserved with vegetable oil.

This can be applied by spraying in through both the inlet and outlet ports – if necessary by means of compressed air.

4. For pumps intended for integration in an existing pipe system, the anti-corrosion oil can be sprayed in through the manometer holes in the inlet and outlet ports, or through the bore that has been provided to connect a manometer.
5. Fill the pump with sufficient oil for the oil to start running out of the pump.
6. Then rotate the pump shaft manually so that all internal surfaces are lubricated.
7. This process must be repeated every six months.
8. In addition, the pump shaft should be rotated about 1/1 turn every month during the whole preservation period
9. If the pump is to be stores outside the pipe system, pipe plugs should be fitted on the pump ports during the whole preservation period

9.3 Frost protection

Pumps that are out of operation during periods of frost must be emptied of liquid to avoid frost damage. You can use anti-frost liquids, but you must make sure that the elastomers used in the pump will not be damaged by the liquid used.

10. Installation

All items in this section must be read and observed when installing ROTAN pumps.

10.1 Selecting the motor etc.

All instruments and help systems used in connection with the ROTAN pump in potentially explosive environments such as gears, motors and blocking liquid systems etc. should all be approved by ATEX.

Use only instruments and help systems approved by ATEX – such as gears, motors, liquid blocking systems etc. in connection with ROTAN pumps to function in potentially explosive environments

The flange motor in and GP pumps must have a locked bearing at the end of the shaft end – as well as vertically positioned pumps, to ensure that the pump's axial clearance falls within permitted parameters.

CC pump must have a angle bearing in non-drive end and wave springs in drive end



10.2 Connecting the motor and the pump



If you intend to use the pump in a potentially explosive environment, the pump must be connected to an explosion-proof motor/gear



Use coupling approved by ATEX



Carefully shield the coupling between the pump and motor

1. Before connecting the motor and the pump, check that the pump shaft can revolve easily and regularly.
2. When connecting the motor with the pump, you must make sure that the pump shaft and the motor shaft are on precisely the same centre line and that there are a few mm between the shaft ends
3. Pump types HD, CD, PD and ED must be connected to the motor by means of an elastic coupling.
4. If a ROTAN standard coupling is used, the pump and the motor are aligned as described in the following section.
Other couplings are fitted and aligned in accordance with the coupling supplier's instructions – refer to these!

10.3 Aligning the motor and the pump

If a ROTAN standard coupling is used, the motor and the pump are aligned as follows. Other couplings are aligned in accordance with the coupling supplier's instructions with regard to the maximum permitted tolerances for eccentricity and non-parallelism.

1. Check the centring between the pump shaft and the motor shaft by means of a straightedge. Place the straightedge over the two coupling pieces 2-3 places on the circumference – 90° apart. Any misalignment will become evident in the form of a gap of light between the straightedge and the coupling hub.
2. Centring may deviate by a maximum of 0.05 mm when both halves of the coupling rotate.
3. Check the parallelism/gap between the halves of the coupling, using an air gap gauge.

The gap may be a maximum of 0.5° – or when both halves rotate the gap deviation may not exceed 0.05 mm on the same point.

4. Alignment is corrected by inserting suitable intermediate layer of material between the pump's or the motor's base and base frame.

Insufficient alignment between pump and motor causes increased wear on the coupling elements.

10.4 Axial clearance



Set the axial clearance to prevent heat generation and the subsequent risk of explosion

After coupling and alignment between motor and pump has been completed, the pump's axial clearance must be set correctly, see section entitled: "Setting the axial clearance".

The axial clearance does not have to be set for pumps purchased with a motor, as this is set in the factory.

10.5 Horizontal/vertical positioning of the pump

The standard position is for the pump to be horizontal to the foundation, i.e. with a horizontal pump shaft and the valve/blank flange on top and the suction port along. Normally other positions are not recommended.

In special cases the ROTAN pump may however be placed horizontally with the suction port upwards or downwards, or the pump could be placed vertically, but only if it is designed especially for this purpose and the instructions below are observed.

The pump is fitted so that the shaft is horizontal. Point "A" shows the top point of the water trap which must be above the upper flange of the pump.

10.5.1 Horizontal positioning of the pump



Position and fit horizontal pumps required to be positioned with the suction port upwards or downwards as described below to avoid dry running and the subsequent risk of explosion in **Ex** pumps

If the pump is positioned with the suction port upwards or downwards instead of horizontally, a water trap must be used – see Figure 17. The water trap must be used to ensure that the pump does not lose the sealing liquid and in this way its priming ability and to prevent dry running as dry running is not allowed – see section 10. 8 – Dry running

In this context water trap is defined as an "S"-shaped duct run – see Figure 17 or an "U"-shaped duct run – see Figure 18. When using a water trap, the pump must be placed at the lowest point in the pipe system, so that it retains its priming ability – dry running is not permitted. In addition, ensure that the system's liquid container on the suction side does not run dry.

The top point of the water trap – see point A, Figure 17 - must be above the level of the pump. Point A must be at a higher level than the uppermost flange of the pump to ensure that the pump is full of liquid. If point A is not above the level of the pump, the function of the water trap will be abolished.

The pump "housing" itself can be located on the side where it is most expedient.

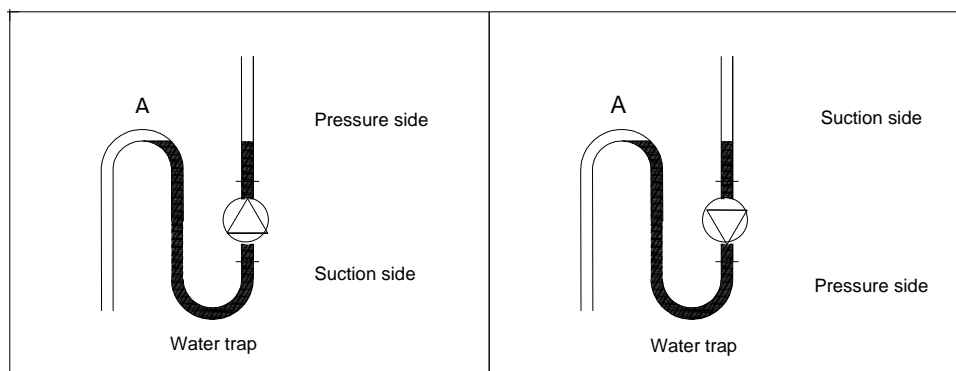


Figure 17: Shows a simplified sketch of a pump (the circle) fitted in a water trap.

The pump is fitted so that the shaft is **horizontal**. Point "A" shows the top point of the water trap which must be above the upper flange of the pump.

10.5.2 Vertical positioning of the pump



The ROTAN pump may only be positioned vertically if it has been produced especially for this purpose at the factory.



ATEX

Position and fit vertical pumps as described below, to avoid dry running and the subsequent risk of explosion in Ex pumps.

A ROTAN pump should as a rule *not* be positioned vertically, i.e. with a vertical pump shaft and the motor on top. A pump may only be positioned vertically if it has been produced *especially* for this purpose at the factory.

In the event of vertical positioning of the pump, it must be placed at the lowest point in the pipe system so that it retains its priming ability as dry running is not permitted – see section 10.8 – Dry running

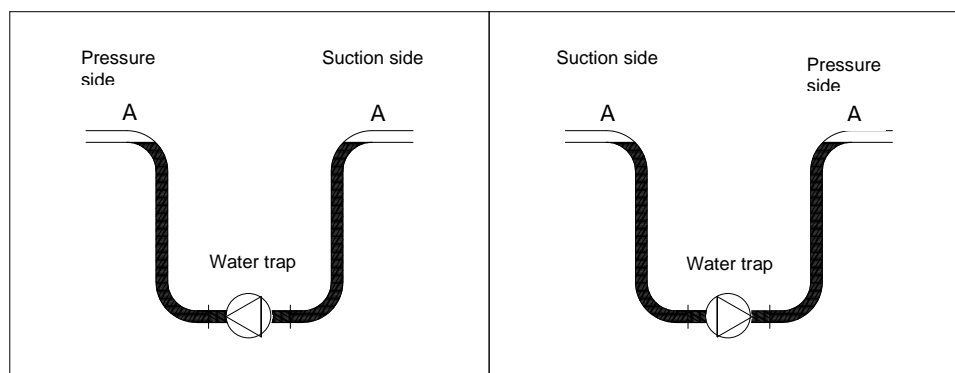
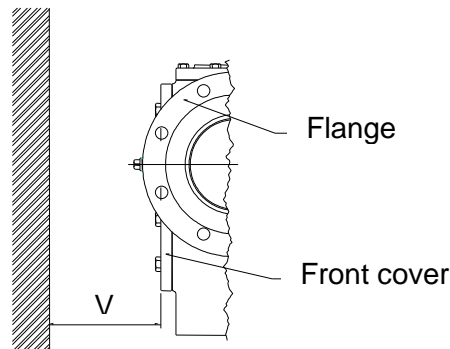


Figure 18: Shows a simplified sketch of a pump (the circle) fitted in a water trap.

The pump is fitted so that the shaft is **vertical**. Point “A” shows the top point of the water trap which must be higher up than the pump.

10.6 Positioning of the pump on foundation

There must, to the extent possible, be plenty of room around the pump to allow for repairs and maintenance.



Distance between pump and wall												
Pump size	26	33	41	51	66	81	101	126	151	152	201	202
W-dist. in mm	50	60	65	70	80	100	115	140	165	180	215	360

Figure 19: The minimum distance to the wall – V-dist. in mm – to enable removal of the front cover. The table shows the size of the W-dist. for the various pump types. This distance must be observed for both horizontally and vertically positioned pumps.

The pump must be placed on a sturdy, vibration-free foundation with a level surface and bolted firmly to the foundation. If the surface is not level, compensation must be made for this using a suitable intermediate layer so that preloads are avoided.

Bolt the pump securely to the foundation.

You must also take into account the pump's suction lift – see section entitled: "Suction lift" under "Technical specifications".

If the pump has a soft shaft seal, a drainage pipe must be connected to the bracket's drainage hole.

Vertical pumps are bolted securely to an existing wall or a vertically cast foundation. The minimum distance between front cover and floor appears from Figure 19.

10.7 Before connecting the pipes

In order that the pump is able to draw, it must be filled with liquid before it is started. Before the pipes are fitted, the pump is filled with a volume of liquid that enables the liquid to start running out of the pump.

Vertically positioned pumps are filled with liquid after the pipes are connected.



Clean out any impurities from the pipe system before the pump is connected to it



Remove the protective plugs from the pump ports before connecting the pipes.

The pump must be installed so that there is no tension between the pipe and the pump casing. The permitted loads on the pump flanges are described in the following section: "External loads on pump flanges".

10.7.1 External loads on pump flanges

There must be no tensions between the pipe and the pump casing when the pump is installed. Tension in the pump casing as a result of preloaded pipes will create a significant increase in the rate of wear.

Pipes and wires must be supported as close to the pump casing as possible.

The diagram below shows the maximum permitted external force and torque that can be applied to the pump flanges.

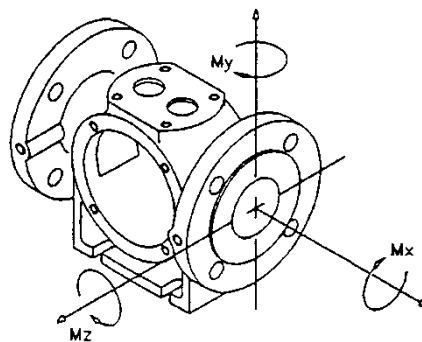


Figure 20: The location of forces and torque on the pump casing.

Max. external force and torque loads				
Pump size	Forces		Torque	
	$F_{(x,y,z)}$ N	$F_{(Total)}$ N	$M_{(x,y,z)}$ Nm	$M_{(Total)}$ Nm
26	190	270	85	125
33	220	310	100	145
41	255	360	115	170
51	295	420	145	210
66	360	510	175	260
81	425	600	215	315
101	505	720	260	385
126	610	870	325	480
151 / 152	720	1020	385	565
201	930	1320	500	735
202	1722	2982	926	1603

Figure 21: The maximum permitted external forces and torque that may be applied to pump flanges for the various pump sizes.

x, y and z appear from Figure 20: The location of forces and torque the pump casing.

The forces F (Total) in N and torque M (Total) in Nm are calculated as follows:

$$F_{(total)} = \sqrt{F_x^2 + F_y^2 + F_z^2}$$

$$M_{(total)} = \sqrt{M_x^2 + M_y^2 + M_z^2}$$

- on the condition that the x, y and z components cannot all have the maximum value at the same time.

If the maximum permitted force and torque loads specified cannot be observed, compensators must be built into the pipe system.

When pumping hot liquids, the pipes must always be fitted with compensators so that the pipes and the pump are able to expand.

If a ROTAN pump with belt drive is required, the permitted power on the outlet shaft is provided on request.

10.7.2 Flange coupling



Flange couplings must always be undertaken by skilled professionals.



Achieve parallelism between the flanges and observe the maximum tightening torque to prevent tension in the pump casing

1. Before connecting the flange, check that the flanges are parallel, as any variance in parallelism will create tension in the pump casing. Parallelism is achieved by aligning the pipe system or fitting compensators.
 2. Select the bolt size for the flanges on the basis of the pump size in the table in Figure 22. You should not use bolts with a yield stress of more than 240 N/mm², corresponding to quality 4.8 – for pumps manufactured in grey cast iron, material code “1”.
 3. Find the maximum tightening torque in the table in Figure 22. Please note that the table contains the maximum tightening torque. The necessary tightening torque depends on: packing, form, material and the pump liquid’s temperature.
The values in column A are valid for pumps manufactured in grey cast iron – material code “1”.
The values in column B are valid for pumps manufactured in steel – material codes “3” or “4”.
3. Cross-tighten the bolts using the uniform tightening torque shown in the table below.

Bolt size / max. tightening torque			
Pump size	Bolt *	Max. tightening torque	
		A	B
26	M12	30 Nm	80 Nm
33-126	M16	75 Nm	200 Nm
151-202	M20	145 Nm	385 Nm

Figure 22: The bolt sizes available for connecting flanges, together with the maximum tightening torque depending on the pump size and material stated.

Column A contains the maximum tightening torque for pumps manufactured in grey/nodular cast iron – material code “1”/“5”.

Column B contains the maximum tightening torque for pumps manufactured in steel – material codes “3” or “4”.
*You should not use bolts with a yield stress of more than 240 N/mm², corresponding to quality 4.8, for pumps manufactured in grey cast iron – material code “1”.

10.7.3 Threaded coupling



Threaded couplings must always be made by skilled professionals



Connecting a pump with an internal thread to a pipe with a conical thread can cause the pump casing to burst if the coupling is over-tightened.

We recommend that you connect pumps with an internal thread to pipes with a cylindrical thread.

10.8 Dry running

The pump should be secured against dry running as otherwise it will result in unnecessary wear or destruction. Dry running results in heat development and potential spark formation at pump casing, bearings and shaft sealings.

Pump supplied for potentially explosive environments must therefore always be secured against dry running as otherwise there is a risk of explosion on account of overheating and spark formation.

Pumps for potentially explosive environments must be secured against dry running either by means of fitting a Liquiphant™ or other comparable devices with at least the same safety effect. The Liquiphant™ should be fitted to the inlet pipe according to the manufacturer's installation instructions.

The Liquiphant™ may normally be used for liquids up to 10,000 cSt and a pressure up to 64 bar. However, the manufacturer's technical data shall apply if they deviate from what is mentioned.

See the supplier's technical data!

For pumps used for pumping of liquids with a higher viscosity and/or operating under a higher pressure than mentioned – such as pump types HD, PD, CD – another device comparable to the Liquiphant™ should be used. Dry running may for example be secured in the pipe construction, at the inlet on the suction side of the pump so that it is ensured that there is always liquid in the pump, and at the same time it may be secured that the system's liquid tank on the suction side does not run dry for liquid.



All pump types and pump sizes must always be protected against dry running either by means of a Liquiphant™ or other comparable devices

10.9 Thermal sensor

Pump type ED and pumps supplied with a soft stuffing box must always be fitted with a thermal sensor if the pump is designed for use in a potentially explosive environment. The sensor is fitted to secure that the pump's max. allowed surface temperature is not exceeded during operation.



Pump type ED and pumps supplied with a soft stuffing box must always be fitted with a thermal sensor if they are installed in a potentially explosive environment.

Pumps not designed for potentially explosive environments are only supplied with thermal sensor according to customer requests.

When installing the pump, the thermal sensor must always be connected to a control, and the control must be connected before starting to use the pump. The control is to be connected in conformity with the supplier's instructions.



Connect the control in conformity with the supplier's instructions

The thermal sensor must always be connected to the control, and the control must be set according to the temperature class for which the pump is approved and according to the environment in which the pump is to operate. It appears from the ATEX labelling on the pump's name plate for which environment and which temperature class the pump is approved. See the pump's name plate!



Connect the thermal sensor to the control, and set it before starting up the pump

The table below shows which temperature the control should be set to on the basis of the temperature class and whether it is an environment containing gas or dust.

Setting of control for thermal sensor		
T-class	Gas	Dust
T1 (450°C)	360°C	300°C
T2 (300°C)	240°C	200°C
T3 (200°C)	160°C	133°C
T4 (135°C)	108°C	90°C
T5 (100°C)	80°C	66°C
T6 (85°C)	68°C	56°C

Figure 23: The table shows which temperature the control should be set to on the basis of the determined T-class – which appears from the name plate – and if it is environment containing gas or dust.

The control connected to the thermal sensor must not be set to a temperature exceeding the one stated in the table – Figure 23.



Do not set the control – connected to the thermal sensor – to a temperature exceeding what is stated in the table in Figure 23

It, however, it is deemed necessary to set the control to a higher temperature than indicated in the table, special approval has to be obtained from DESMI PUMPING TECHNOLOGY A/S, and a separate, unique assessment should be prepared. As a customer, you should also be able to present documentation that no sparks are formed in the area in question in the event a deviation is requested from the temperatures prescribed in the table. The documentation is to be submitted to DESMI PUMPING TECHNOLOGY A/S, and together with DESMI's assessment/approval it will be submitted for filing with an approved, authorised authority!

10.10 Emergency stop



Fit the pump unit with an emergency stop

If the pump is fitted as part of a total system, this must be provided with an emergency stop. The emergency stop is not included in DESMI's delivery.

When installing the pump, the emergency stop must be:

- Designed, set up and installed, and function in accordance with the prevailing standards and directives
- Positioned within easy reach, so that it is accessible to the operator/engineer during repairs, adjustment and maintenance of the pump
- Be tested regularly to check that it is in full working order

10.11 Electrical coupling



Electrical couplings must always be established by authorised professionals, in accordance with the prevailing standards and directives



Set the protective motor switch maximum to the motor's rated current.

When installing the pump, check:

- That the local mains voltage is the same as stated on the motor's name plate.
- That the motor's direction of rotation corresponds with the desired pump direction. When the pump unit is viewed from the motor end, and you require the pump direction to the left, the pump shaft rotation must be clockwise

10.12 Monitoring



Connect any monitoring and safety systems that are necessary for safe operation



Connect and adjust any monitoring and safety systems – manometers, flowmeters, etc. – according to the operating condition

11. Before starting the pump

The pumps are tested and preserved with oil type GOYA 680 transmission oil (Q8) with a viscosity of about 70 cSt. Pumps in versions "CHD" and "EPDM" are preserved in the factory using vegetable oil. The pump is emptied for oil, but it has not been cleaned for test oil from the factory.

The pump must be cleaned for test oil before starting up the pump if the test oil is not compatible with the pump liquid. In each individual case it is to be estimated the degree of cleaning which is deemed necessary. The cleaning should be of such a magnitude that no damage to humans, animals, materials or pump liquid occurs.



Clean the pump for test oil before start-up

Before starting the pump, check:
• That the pump shaft can be turned around freely
• That the pump is connected to an explosion-proof motor, if the pump is set up in a potentially explosive atmosphere That the pump's and the motor's name plates are labelled with explosion protection
• That the pump and motor are aligned precisely – see section entitled: "Alignment between motor and pump"
• That the bearings – if they have lubrication nipples – are lubricated
• That the ball/roller bearings' maximum service life is observed
• That the thread of the thermal sensor has not broken off during transportation, handling or installation – if the pump is fitted with thermal sensor (applies to ATEX pumps)
• That the thermal sensor is connected – if the pump is fitted with thermal sensor
• That all isolating valves in the suction and pressure pipe are fully open, to avoid the pressure being too high and the pump running dry
• That any by-pass valve is fitted correctly – see section entitled: "Positioning of valve"
• That any bypass valve is adjusted to the correct opening pressure – see section entitled: "Setting of bypass valve"
• That the pump casing is filled with liquid to ensure the ability to self-prime – see section entitled: "Before connecting the pipes"
• That there is no coagulated liquid in the pump or the pipe system – after the last operation – that may cause blockage or breakdown
• That the necessary monitoring and safety systems are connected and adjusted according to the operating conditions/instructions in this manual

11.1 Before starting after preservation

If the pump has been in storage for a long period of time, you must also check the following:

Before starting - after preservation - check:	
<ul style="list-style-type: none">• That the pump is not corroded or dried out – see section entitled: “Storage and protection of pump”. Check that the pump shaft rotates freely	
<ul style="list-style-type: none">• That any preservative or anti-frost liquid is cleaned off before starting the pump – if these are not compatible with the pump liquid	
<ul style="list-style-type: none">• That elastomers are replaced if they have been damaged by the anti-frost liquid used	
<ul style="list-style-type: none">• That ball/roller bearings and any elastomers are replaced if the pump has been in storage for more than 6 years, as the lubricating grease used for elastomers and ball/roller bearings has a limited service life	

12. After starting the pump

ROTAN pumps may only run without liquid flow for the short period required for self-priming – with regard to the slide bearings and shaft seals.

After starting the pump, check:
• That the pump is drawing the liquid
• That there is no cavitation in the pump casing
• That the speed is correct.
• That the direction of rotation is correct. Viewed from the motor side, liquid is pumped to the left when the pump shaft rotates clockwise.
• That the pump is not vibrating or emitting a jarring sound
• That the stuffing box and bearings are not becoming hot. If the pump has been fitted with lip seals, these will normally cause the shaft to heat up during the ring's running-in period, which lasts approx. 2 hours.
• That there are no leaks by the pump
• That the mechanical shaft seal is fully sealed Stuffing boxes with packing rings may, however, permitted a low level of leakage – 10-100 drops of leakage per minute – see section entitled: "Adjustment of soft shaft seal"
• That the operating pressure is correct
• That the by-pass valve opens at the correct pressure
• That the pressure in the heating jacket does not exceed 10 bar – if the pump has one
• That the magnetic clutch (type ED) is not slipping and thus causing an inadequate flow, and that the temperature in the magnetic clutch does not exceed the permissible value
• That the power consumption is correct
• That all monitoring equipment is in full working order
• That any pressurised water pipes, heating/cooling systems and lubricating systems, etc. are operating and in full working order
• Running in the soft shaft seal – see section entitled: "Running in the soft shaft seal"

12.1 Cavitation

There must be no cavitation in the pump casing as this results in extensive damage to the pump. The cause of cavitation should be found and the problem solved.

Cavitation is defined as formation and deflation of steam-filled bubbles. This process may exist in areas within the pump where the pressure falls to a level below the steam pressure of the liquid. Always ensure that there is adequate pressure at the pump inlet to avoid cavitation so that the liquid does not boil or evaporate. Always check that the pump suction pressure is greater than the liquid's steam pressure irrespective of the temperature.

Cavitation can be ascertained in the form of vibrations and jarring sound from the pump. It may sound as if gravel was running through the pump. Cavitation arises when the vacuum in the pipe on the suction side is too high.

The increased vacuum may be caused by the following:

- That any filters in front of the pump are blocked or too narrow
- That the liquid viscosity is too high
- That the suction pipe is too long
- That the suction pipe is too narrow

Check if any filters fitted in front of the pump are blocked. If so, clean the filter thoroughly. If there is feed flow to the pump, you should bleed the pump before starting again. If there is no feed flow to the pump, the pump should be filled with liquid before start-up to avoid dry running as no dry running is allowed – see section 10.8 - Dry running.

If this does not solve the problem, you should check some of the other options.

If cavitation is due to too high viscosity, the problem may be remedied by fitting a suction pipe with a larger diameter or by heating the pump liquid so to increase the fluidity of the liquid and in this way a lower viscosity.

If cavitation is due to the suction pipe being too long, this may be remedied by moving the pump closer to the tank from which the pump is drawing or by fitting a suction pipe with a larger diameter.

After this, bleed the pump of fill in liquid before starting again.

Bleed the pump by turning the screw on top of the bypass valve fitted on the pump. Bleeding of the pump is completed when excess liquid flows out above.

Never bleed the pump in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure.



Use suitable safety equipment when bleeding the pump– such as gloves, protective goggles etc. – depending on the pump liquid



Never bleed the pump in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure

If the pump is not fitted with a valve, you may bleed the pump casing by removing the blank flange on top of the pump.

12.2 Running in the soft shaft seal – when starting the pump



A soft shaft seal may only be used on pumps in potentially explosive environments if the soft shaft seal is equipped with thermal sensors to control the temperature.

When starting a new pump, the shaft seal must be run in as described below:

1. Once the pump has started, the shaft seal must leak more than 200 drops per minute to saturate the rings.
2. When the shaft seal is saturated – after approx. 30 minutes' operation – the packing gland screws must be tightened gradually, so that the leakage is reduced.
3. Check that the stuffing box does not become hot.
If the stuffing box becomes hot, loosen the packing rings slightly, after which you must check that the temperature is falling.
4. When the leakage is between 10 – 100 drops per minute, do not tighten the screws any more.
The number of drops per minute depends on the pump size, pressure and speed.
5. The soft shaft seal must not be tightened so much that there is no leakage.
The soft shaft seal must leak continuously.
6. The leakage rate must be checked at regular intervals, see section entitled "Maintenance"

If necessary, see also the section entitled: "Adjustment of soft shaft seal"

13. Bypass valve

The section below uses both the designations *bypass valve* and *safety valve*.

Safety valve is defined as a valve fitted on the pressure pipe in the pipe system and which secures the whole pipe system in the event of constant pressure increase. The safety valve has return flow to the liquid tank.

Bypass valve is defined as the valve supplied by DESMI PUMPING TECHNOLOGY A/S and which is fitted on the ROTAN pump – see Figure 26. The bypass valve secures only pump and motor. The bypass valve does not secure the whole pipe system. The bypass valve protects pumps in the event of brief pulsating excess pressures and not in the event of constant pressure increase. The function of the valve is described in detail under the section: 13.3 Operating principle - valve.

ROTAN pumps are supplied both *with* and *without* a bypass valve.



The bypass valve is not approved for protection of the pipe system, and therefore it must not be used for this purpose



The pipe system must be protected against excess pressure in other ways than by use of the ROTAN bypass valve

If a pipe system contains a facility to block the pump's pressure line, the pressure line must be fitted with a bypass valve to take the full liquid volume - as pumping up against a blocked outlet line causes rapid pressure increase and results in heat accumulation inside the pump. This heat accumulation inside the pump is transferred to the pump surface and therefore constitutes a risk of explosion as for pumps functioning in a potentially explosive environment.



If the possibility exists to block the pump's pressure line, the pressure line must be fitted with a bypass valve to take the full liquid volume - as otherwise there is a risk of explosion

The ROTAN bypass valve must not be used for constant pressure control – such as "keep-pressure valve".

If a need for constant pressure control exists, another solution should be found leading to the same result - such as frequency converter or gear.



Do not use the valve for constant pressure control – such as "keep-pressure valve"



The liquid volume may not circulate through the bypass valve for a long period of time. Circulation over a long period of time through the bypass valve causes a significant heating up of the pump and pump liquid, and this may result in destruction of the pump



The liquid volume may not circulate through the bypass valve for a long period of time. Circulation over a long period of time through the bypass valve causes a significant heating up of the pump and pump liquid, and this can create a risk of explosion.



Fit equipment preventing against bypass.

The ROTAN bypass valve is also supplied as a double-action bypass valve.

If there is a need to pump in both directions, the pump may be fitted with a double-action bypass valve.



If there is a need to pump in both directions, fit a double-action bypass valve.

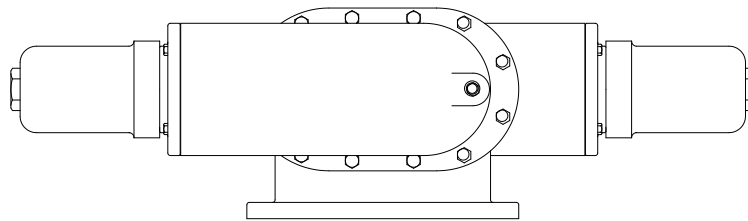


Figure 24: A double-action bypass valve.

Please note that certain liquids' properties or heated liquids may block the bypass valve's function, e.g. paint, chocolate, asphalt, etc.

Blocking of the valve may be caused by the liquid containing particles or the liquid being heated and subsequently coagulating in connection with bypass in the valve.

In such cases it is recommended not to use a ROTAN bypass valve, but another device instead.

If liquids possess properties which may block the bypass valve and prevent it from working, you must use another equivalent device rather than a ROTAN by-pass valve.

However, in some cases a special ROTAN bypass valve can be supplied with heating jacket for connection to heating to prevent coagulation of the liquid – see Figure 25.

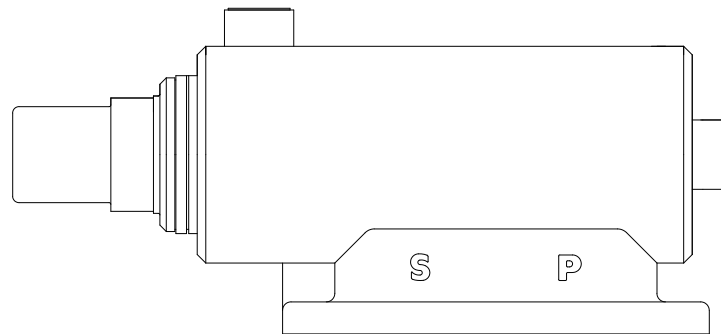


Figure 25: A ROTAN bypass valve with heating jacket for connection to heating.

If you wish to have the pump supplied without a ROTAN bypass valve, another equivalent safety device must be used, so that you can still ensure that the pump cannot generate a pressure that is higher than the maximum specified when placing the order and the max. pressure which appears from Figure 52.



Pumps without a ROTAN bypass valve must use another equivalent safety device which protects pump and motor.

If a pump is supplied without a ROTAN bypass valve, it will be fitted with a blind cover.

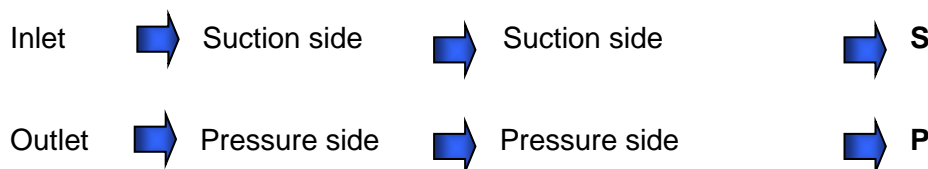
A ROTAN bypass valve is always provided with a bore for connection of manometer. The bore is covered by a pipe plug.

13.1 Valve configurations

For pumping liquids at high temperatures, the valve can be supplied with a heating jacket. The heating jacket prevents the pump liquid from coagulating when passing through the valve.

13.2 Positioning the valve

The bypass valve is fitted with an inlet and an outlet. The inlet and outlet are named as follows:



The suction side and pressure side are indicated on the valve by the letters **S** and **P** – see below:

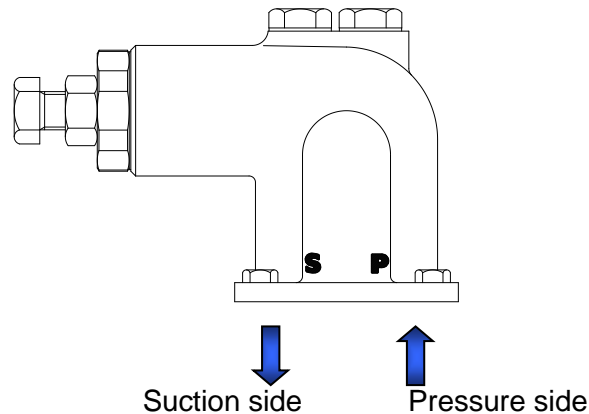


Figure 26:: Shows how S for suction side and P for pressure side are indicated on the valve.

If the pump has been bought with a valve, it is always fitted to the pump in the factory.

Before the pump is installed in a pipe system, the valve must be positioned correctly with regard to the desired direction of circulation, as incorrect positioning of the valve will stop it from working.

The valve's **S** inlet must be placed by the pump's suction side, so that the regulating screw points towards the suction side.



Position the valve correctly, with **S** over the inlet/suction side and **P** over the outlet/pressure side.

13.3 Operating principle – valve

When the pressure increases in the pump, the pump liquid is forced into the valve's pressure side – **P**.

If the valve's preset pressure is exceeded, the internal spring is depressed, after which the pump liquid is forced out of the outlet side of the valve and down into the pump again. In this way recirculation of the pump liquid is created.

This recirculation may not last for a long period of time, as this will cause the liquid and the pump to heat up significantly.



The pump must not pump with the valve open for a long period of time.



Recirculation through the bypass valve over a long period of time causes the liquid and the pump to heat up significantly



Recirculation through the bypass valve over a long period of time can destroy the pump.

13.4 Setting the by-pass valve

The by-pass valve is set by adjusting the regulating screw which is located on the end of the valve, see figure 27.

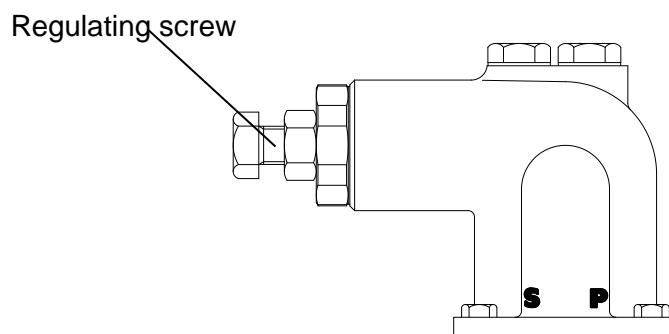


Figure 27: The location of the regulating screw on the ROTAN bypass valve

The bypass valve is always set at the factory.
The valve is set in accordance with either

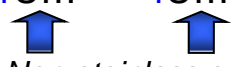
- customer instructions
- or DESMI's default setting


If the valve has been set in accordance with customer instructions, this setting must correspond with the other instructions prescribed in this user manual, in the section entitled "Bypass valve".

If the setting is DESMI's default setting, this has been made on the basis of the tables – Figure 29 or Figure 30. Figure 29 covers valves fitted with a *non-stainless spring* and Figure 30 covers valves fitted with a *stainless spring*.

It appears from the pump designation on the pump's name plate if the valve is supplied with a stainless or non-stainless spring.

Example

Pump designation: HD/PD/GP/ED 26-202 - "1U..." + "4U..." + "5U..."

Non-stainless spring

Pump designation: CD/ED 26-201 - "3U..."

Stainless spring



All settings of the regulating screw must be made on the basis of the tables – Figure 29 – or Figure 30 – or by means of pressure gauge.

As a default, the valve is always set to an operating pressure of 8 bar from the factory.

The default setting of the valve has been made as follows:

1. The valve has a number, and this number can be read on the pump's name plate
2. The obtained valve number is found in the table Figure 29 or Figure 30
3. If the valve number obtained cannot be found in the table, go in under pump type and pump size at the extreme left in the table Figure 29 or Figure 30
4. Pump type and pump size can be read on the pump's name plate
5. It appears from the pump designation on the pump's name plate if the valve is supplied with a stainless or non-stainless spring – see above! Use figure 29 for non-stainless springs and figure 30 for stainless springs
6. Next to the valve number or pump type/pump size there are several different setting measurements. The A-value corresponding to 8 bar in the table is selected.

Example

HD26/Valve no.: 8300 (*non-stainless spring*)  Operating pressure: 8 bar 
 A-value = 23.9 mm.

In the case of valves that have been set in accordance with customer instructions, you can identify the operating pressure to which the valve has been set as follows:

The operating pressure to which the valve has been set:

1. The valve has a number, and this number can be read on the pump's name plate
2. The obtained valve number is found in the table Figure 29 (non-stainless spring) or Figure 30 (stainless spring)
3. If the valve number obtained cannot be found in the table, go in under pump type and pump size at the extreme left in the table Figure 29 or Figure 30
4. Pump type and pump size can be read on the pump's name plate
5. Measure the valve's setting value as shown in Figure 28.
6. The value can be seen in the table on the basis of the valve number obtained, and the operating pressure is read off according to this

Example:

HD26 / Valve no.: 8300 (*non-stainless spring*) → A-value: 23.9 mm →

Operating pressure = 8 bar.

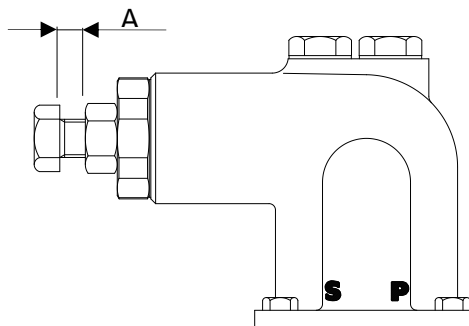


Figure 28: The setting value "A" for ROTAN valves.

Setting of valve											
Type HD / GP / PD / ED (non-stainless)											
Pump type	Pump size	Valve no.	A-value w/non-compressed spring	Operating pressure / bar							
				2	4	6	8	10	12	14	16
				Setting value A/mm.							
HD/PD/ GP/ED	26/33/41	8300, 8301 8302, 8303 8304	27,2	26,6	25,7	24,7	23,9	23,0	22,2	21,3	20,3
	51/66	8308, 8309	31,8	31,4	31,2	30,4	28,8	27,5	26,7	25,3	23,6
	81	8311, 8312	34,5	33,1	31,6	30,2	28,7	27,3	25,7	24,7	23,2
	101	8311, 8312	34,5	33,1	31,6	30,2	28,7	27,3	25,7		
	126/151	8313, 8315	46	44,4	42,0	40,4	38,3	36,1	32,8		
	152/201	8316, 8318	63,3	62,1	59,6	57,6	55,3	53,7	51,6		
	202(8bar)	9409	50	44,0	35,0	24,0	17,0				
	202(14bar)	9708	38	37,8	33,4	29,1	24,9	20,6	16,3	12,1	

Figure 29: Setting value "A" in mm, based on the valve number or on pump type/pump size and the valve's operating pressure in bar.

The shaded field indicates that the pump sizes 101 + 126 + 151 + 152 + 201 + 202 cannot operate with an operating pressure exceeding 12/14 bar – see figure 52.

The table applies to valves fitted with a non-stainless spring.

Setting of valve											
Type CD / ED (stainless)											
Pump type	Pump size	Valve no.	A-value w/non-compressed spring	Operating pressure/bar							
				2	4	6	8	10	12	14	16
				Setting value A / mm							
CD/ED	26/33/41	8305, 8306	26,1	25,7	24,8	23,8	22,9	22,0	21,1	20,1	19,3
	51/66	8307	32	31,5	31,2	30,2	28,4	27,3	26,2	24,8	23,3
	81	8310	34,55	33,5	31,7	30,2	28,7	26,9	25,2	23,6	21,9
	101	8310	34,55	33,5	31,7	30,2	28,7	26,9	25,2		
	126/151	8314	45,6	43,6	41,3	38,9	36,9	34,6	32,2		
	152/201	8317	62,3	60,4	57,9	55,6	52,4	50	47,7		

Figure 30: Setting value "A" in mm, based on valve number or pump type/pump size and the valve's operating pressure in bar. The table applies to valves fitted with a stainless spring.



Any change to the pump's operating pressure must be followed by a change to the valve's setting - the working pressure must however not exceed the maximum allowable pressure of the pump/valve - see Figure 52.

If the valve is not reset, this will mean either

- that the valve's safety function fails so that there is a risk of pressure accumulation
- or that the valve remains open permanently, creating a significant heating up of the pump and pump liquid – which must **not** last for a long period of time



The liquid volume may **not** circulate through the bypass valve for a long period of time

Circulation over a long period of time through the bypass valve causes a significant heating up of the pump and pump liquid, and this can create a risk of explosion



The liquid volume may **not** circulate through the bypass valve for a long period of time.

Recirculation through the bypass valve over a long period of time can cause destruction of the pump.



Never set or adjust the bypass valve in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure



Whenever the valve is set or readjusted, the regulating screw **must** be repacked with thread tape.

14. Pump liquids

14.1 Hot liquids

When pumping hot liquids at high temperatures, suitable procedures must be drawn up to prevent any danger of injury caused by touching or standing close to the pump.



Check daily that the max. allowed temperature is observed



The pump must be shielded when pumping hot liquids that create a surface temperature on the pump of more than +80°C

A warning sign must be displayed in a clearly visible location!



When pumping hot liquids, the pipes must be fitted with compensators to prevent tensions in the pump casing

There are various maximum temperatures for ROTAN pumps, depending on the pump type and the type of elastomer used, see Figure 31 and Figure 32.



ROTAN pumps may not be used to pump liquids at a temperature that is higher than the liquid's ignition temperature, and with reference to the maximum temperatures specified in the table below – Figure 32 - depending on the type of elastomer used - and for pumps with bypass valve max. 150°C.

The lowest +temperature identified of the four mentioned above constitutes the maximum temperature.

The maximum liquid temperature for ED pumps also depends on the magnetic material used, see Figure 31.

The temperature of the liquid also increases during operation, through the heat generated by the magnets, depending on the liquid's flow rate and viscosity.

The temperature increases up to 30°C.



The ED pump may not be used to pump liquids at a temperature that is higher than the liquid's ignition temperature, and with reference to the maximum temperatures specified in the table in Figure 31 depending on the magnetic material, and no higher than the temperature stated in the table below – Figure 32 – depending on the type of elastomer used – and for pumps with bypass valve max. 150°C.

The lowest +temperature identified of the four mentioned above constitutes the maximum temperature.

The maximum temperature limit identified must be further reduced by the temperature increase generated by the magnets.

Max. liquid temperature	
Pump type	Temperature
GP	Max. 150°C
HD/PD/CD*	Max. 250°C
ED	Max. 130°C (Magnetic material: Neodym-Iron-Bor)
	Max. 250°C (Magnetic material: Samarium – Cobalt)
CC	Max. 80°C

Figure 31: The pump liquid's maximum permitted temperature for the various pump types.

For pumps with a bypass valve the temperature is limited to a maximum of 150°C due to the valve spring.

However, the valve can be supplied with a different spring, enabling the pump's temperature range to be fully utilised.

The ED pump's maximum temperature depends on factors such as the magnetic material.

* Pump types HD, CD and PD – designed with special tolerances – may in certain cases be use dup to 300° C.

Min./max. elastomer temperature		
Elastomer type	Elastomer brand	Temperature
FPM	Viton®	About –20°C / +200°C
FEP	Teflon® with Viton core	About –60°C / +205°C
EPDM	Ethylene-propylene	About –65°C / +120°C
FFKM	Kalrez®	About –50°C / +316°C
NBR	Nitril	About –30°C / +70°C
PTFE	Teflon	About –15°C / +170°C

Figure 32: The pump liquid's minimum/maximum temperature limits for the various elastomers used in ROTAN pumps.



Extra shielding may be purchased from DESMI

14.2 Foods



ROTAN pumps must not be used to pump foods requiring FDA or 3A approval.

15. Noise

The noise level of ROTAN pumps depends on various parameters.

The different parameters that can influence the sound pressure level are: differential pressure, viscosity, installation conditions, pump size and flow.

The curves shown in Figure 33 denote standard units with ROTAN pumps' A-weighted sound pressure levels, in relation to pump size and flow.

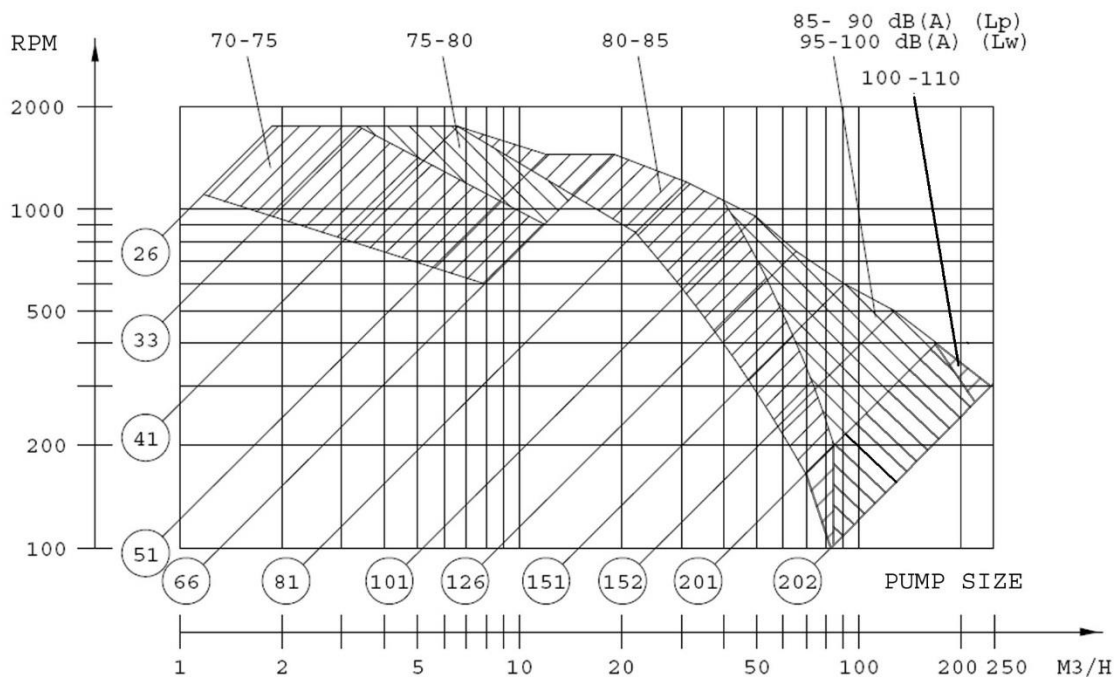


Figure 33: The maximum A-weighted sound pressure level in dB(A)(Lp) for the various pump sizes in relation to the pumps' flow. The range above 85 dB(A) is also expressed as sound power level (Lw).

The sound pressure curves shown are measured at a distance of 1 metre from the pump's surface and at a height of 1.60 metres above the floor. The dB(A) curves shown are calculated on the basis of measurements taken when pumping mineral oil with a viscosity of 70 cSt at a differential pressure of 5 bar. The curves are based on normal industrial use, and not on laboratory conditions.

If people are working by the pump, we refer to the prevailing local national laws and regulations on noise limits at the workplace.

We refer to the prevailing local national laws and regulations on noise limits at the workplace.

Appropriate noise reduction measures must be implemented in accordance with the aforementioned local national laws and regulations, if so required.



Use appropriate hearing protection if necessary!
If necessary, display a sign stating that hearing protection must be worn!

16. Storing the user manual

This user manual must be retained throughout the pump's full service life, and must always accompany the pump.

The user manual must be available to operators, repair engineers and any maintenance staff or other people who may be considered to have a need to refer to it.

The user manual must also be stored visible, in the immediate vicinity of the pump. If this is not possible, there must be a prominent sign by the pump stating where the user manual is kept.

It is also recommended that a copy of the user manual is stored somewhere else.

If people who are expected to have a need to refer to the user manual are of a different linguistic origin than the language in which the user manual has been legally supplied, it is recommended that the user manual is translated into the language in question.

17. Maintenance

The pump must be inspected and maintained on an ongoing basis in accordance with the schedule below – Figure 34.

Compliance with regular maintenance in accordance with the schedule below is particularly important for explosion-proof pumps (ATEX), as inspection and maintenance of the pump constitutes a part of the explosion protection.



Observe the inspection and maintenance instructions contained in this manual to achieve explosion protection for Ex-labelled pumps.

Maintenance	
During daily inspection, check:	Solution:
That the pump does not vibrate or emit jarring sounds	
That there is no cavitation inside the pump casing	
That lubricated slide bearings are lubricated	
That open ball/roller bearings are lubricated	
That there is liquid in connection with liquid-greased slide bearing	
That any lubricating devices are in working order	
That any circulation pipes – cooling, heating or pressurised water pipes are in working order	
That power output and power consumption are correct	
That flow and operational pressure is correct	
That the max. allowed temperature is observed	
During weekly inspection, check:	
That any filters and drainage holes are clean	
That the soft stuffing box is leaking 10-100 drops per minute	
That mechanical shaft seals are not leaking	
That the surroundings of the stuffing box and bearings are free from dirt	
Whether flexible connecting elements are worn	To be replaced if worn
During inspection every 2 months, check:	
That the bearings do not have too much play	
That the bypass valve, if any, functions correctly and opens at the right pressure	
That the stuffing box is intact	To be after-packed or repacked
In connection with service work, check:	
All parts for wear and tear	Replace worn parts
That all parts are located correctly in connection with assembly	

Figure 34: The figure shows which parts or what must be checked and maintained on the pump, and at what intervals this must be undertaken.

17.1 Adjusting the soft shaft seal



The shaft seal must not be adjusted during operation

It is important that the soft shaft seal leaks during operation, as this provides lubrication and also releases the frictional heat that is generated.

The shaft seal with packing coil requires continuous adjustment, to make sure that the volume of leakage by the stuffing box is correct.

Depending on the speed, pressure, pump size and viscosity, the stuffing box must leak 10-100 drops per minute to remove the frictional heat that is generated between the shaft and the packing rings. If there is insufficient leakage, the heat generated can cause the gasket rings to harden and create increased wear on the shaft.

The leakage described above is achieved by tightening the packing rings axially, so that they apply a pressure against the shaft. This pressure restricts the flow of the liquid, as the play between the shaft and the packing ring is in the order of a few thousandths of a millimetre. Soft shaft seal:

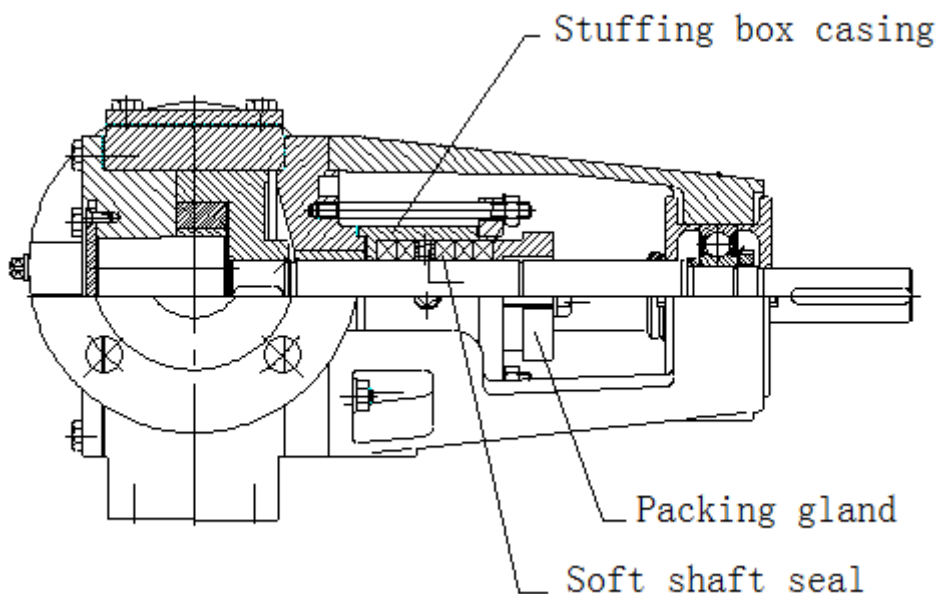


Figure 35: The location of the soft shaft seal, the shaft seal casing and the packing gland on the pump. The design of the shaft seal casing, does, however, depend on the individual pump application.

17.1.1. Repacking – soft shaft seal

1. Pull the packing gland back on the shaft once the screws have been removed.
2. The packing rings can now be pulled out using a packing extractor.
3. Check the shaft and the shaft seal housing thoroughly for wear, scratches and deposits.
4. Replace worn parts and remove deposits with care.
5. Always conduct a control measurement of the shaft and the shaft seal housing before specifying the packing dimension.

!! Never use old packing rings when measuring

The packing dimension is defined on the basis of the following:

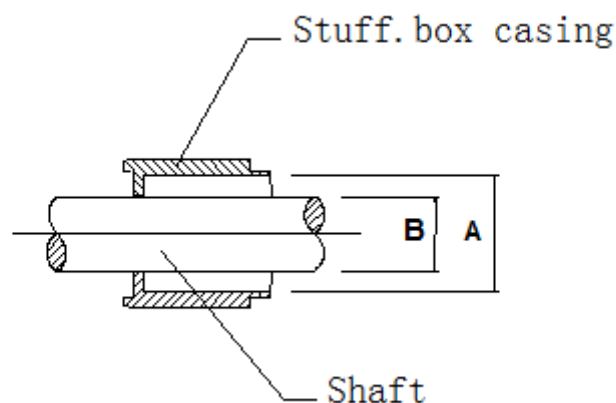


Figure 36: The A and B dimensions on the shaft and the shaft seal housing

The A and B dimensions obtained are inserted in the following formula to determine the packing dimension.

$$\frac{A - B}{2} = \text{packing dimensioning}$$

6. New packing rings are bought as spare parts or produced as described in step 7.
7. Trim the new packing rings on the shaft or a mandrel of the same diameter as the shaft. Wrap the packing around the shaft/mandrel the number of times that packing rings are to be used, and cut through with a sharp knife.
8. If the packing rings are difficult to move into position, they can be rolled with a pipe or similar item.

Never strike a gasket, as the fibres in the material will be destroyed and the sealing property will be significantly worsened.

9. Lubricate the individual rings with a little oil to facilitate installation.
10. Turn the ring openings so that the two rings lying alongside one another are diametrically offset.
11. Finally, tighten the packing gland gently by hand, and restart the pump.

17.2 Ball/Roller bearings

The pump is fitted with a ball/roller bearing – pos. CU – at the pump's free shaft end. Some pumps are fitted with two ball/roller bearings – pos. CU + BC – see the position numbers on the spare part drawings.

ED pumps are fitted with two ball bearings – pos. NB – on pumps with a free shaft end. See ED manual T1386

The bearings are model 63 deep-groove ball bearings, and 31 conical roller bearing fitted with two rubber seal rings, no seal rings or one single seal ring.

17.2.1 Lubrication of ball/roller bearings



Ball/roller bearings must be lubricated to ensure explosion protection



Ball/roller bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C – to guarantee explosion protection.



Ball/roller bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C.

Ball bearings with two seal rings do not require re-lubrication, as they are filled with a suitable amount of grease in the factory.

Ball/roller bearings with *one single* seal ring or *no* seal ring require re-lubrication via the lubrication nipple.

If the ball/roller bearings require lubrication, they are fitted with a lubrication nipple.

The bearings must be lubricated at the lubrication intervals and using the volume of grease as stated in the table in Figure 37.

The re-lubrication interval is halved for every 15°C that the temperature exceeds 70°C.

Example: Temperature: up to 70°C = 3,500 hours
85°C = 1,750 hours

Lubrication of ball/roller bearings				
Pump sizes	Pump type	Ball/roller bearing type	Relubrication interval in hours at max. 70°C (Hours)	Amount of grease required per relubrication in grams (g)
41	HD	6305*	3,500	6
51	CD	6306	3,500	7
	HD	6307*	3,500	9
66	CD	6306	3,500	7
	HD	6307	3,500	9
81	HD	6310	3,500	15
101	CD	6308**	3,500	11
	HD			
126	CD	6310	3,000	15
	HD			
151	CD	6310	2,500	15
152	HD	6312	2,500	21
201	HD	6315	2,500	30
		6317	2,500	40
202	HD	31319 J2/DF	1,500	70

Figure 37: Shows ball/roller bearing types, relubrication interval in hours at max. 70°C, and the amount of grease required per relubrication in grams for the pump types and sizes indicated.

* = C3 bearing

** = bracket bearing

*** = main bearing

17.2.2 Service life – ball/roller bearings



Ball/roller bearings must be replaced as indicated below, to ensure explosion protection.

Ball bearings with two seal rings have a limited service life, after which they must be replaced. The ball/roller bearings' minimum service life is shown in the tables in Figure 38 – Figure 39 The ball/roller bearings' service life is reduced to 90% of the value indicated if the pump is to be used in a potentially explosive environment.

Example: Ball/roller bearing's service life = 10,000 hours (non-ATEX)
 = 9,000 hours (ATEX)

The bearing's service life is also halved for every temperature increase of 15°C above 70°C – for both Atex pumps and non-Atex pumps.

Example: Temperature: up to 70°C = 9000/10,000 hours (ATEX/non-ATEX)
 85°C = 4500/5,000 hours (ATEX/non-ATEX)

Service life of ball/roller bearings in ROTAN pumps @ 1000 cSt				
Pump type	Pump size	Ball/Roller bearing type	Min. service life in hours at 70°C (Hours)	Max. operating pressure (Bar)
GP HD PD CD	26 / 33	6302 2RS1	10,000	16
		6304 2RS1	27,000	16
	41	6304 2RS1	12,000	16
		6305 2RS1	18,000	16
	51 / 66	6306 2RS1	8,000	16
		6307 2RS1	8,000	16
	81	6308 2RS1	7,000	16
		6310 2RS1	9,000	16
	101	6308 2RS1	17,000	12
		6310 2RS1	36,000	12
	126	6310 2RS1	20,000	12
		6312 2RS1	32,000	12
	151	6310 2RS1	7,400	12
		6312 2RS1	11,000	12
	152	6312 2RS1	6,300	12
		6314 2RS1	10,000	12
	201	6315 2RS1	6,300	12
		6317 2RS1	7,600	12
	202	31319 J2/DF	28,000	14

Figure 38: Ball/Roller bearing types and the minimum service life in hours for the various pump types and sizes.

The service life is calculated on the basis of a temperature of 70°C and a viscosity of 1000 cSt., and based on the maximum operating pressure of the various pump types.

The bearings' service life is reduced at temperatures above 70°C and in ATEX pumps – see section above.

Service life of ball bearings in ROTAN high-pressure pumps @ 1000 cSt				
Pump type	Pump size	Ball bearing type	Min. service life in hours at 70°C (Hours)	Max. operating pressure (Bar)
GP	27 / 34	6304 2RS1	12,000	25
	42	6305 2RS1	13,000	25
	52 / 67	6307 2RS1	8,000	25
	82	6310 2RS1	8,000	25

Figure 39: Ball bearing types and the minimum service life in hours for pump type GP in the sizes indicated. The service life is calculated on the basis of a temperature of 70°C and a viscosity of 1000 cSt., and based on the maximum operating pressure of ROTAN high-pressure pumps. The bearings' service life is reduced at temperatures above 70°C and in ATEX pumps – see above.

17.3 Lubrication of slide bearings



Slide bearings must be lubricated to guarantee explosion protection



Slide bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C – to guarantee explosion protection



Slide bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C

The ROTAN pump is designed with an idler bushing and a main bearing.

The idler bushing is a slide bearing, and the main bearing can be either a slide bearing or a ball bearing.

The table below shows what the various pump types are equipped with. The position numbers refer to the section entitled “Spare parts drawings”.

Type HD: Idler bushing* pos. AD/main bearing pos. BC
 Main bearing = slide bearing at soft shaft seal
 Main bearing = ball bearing at mechanical shaft seal (HD202-slide bearing)

Type CD, PD: Idler bushing* pos. AD/main bearing pos. BC
 Main bearing = slide bearing

<u>Type GP:</u>	Idler bushing* pos. AD/main bearing pos. BC Main bearing = slide bearing at soft shaft seal Main bearing = ball bearing at mechanical shaft seal
<u>Type ED:</u>	Idler bushing* pos. AD/main bearing pos. BC Main bearing = slide bearing
<u>Type CC:</u>	Idler bushing pos. AD Main bearing = none

* The idler bushing is, however, not fitted to pump sizes 26 + 33, where the idler is made of bronze or cast iron. The idler is instead fitted with a plate, so that the idler/idler pin can be lubricated.

The pump can be supplied with internal or external lubrication. If the pump liquid itself has a lubricating effect or is of sufficiently high viscosity, the bushing/bearings are lubricated by the pump liquid – otherwise the bushing/bearings must be lubricated via the lubrication nipple.

If the pump is supplied with an idler bushing and a main bearing for external lubrication, the pump designation will include an “**M**” – see the pump’s name plate! – if not, there is a “**U**” in the place indicated.

Example: HD51BDK-1**M**22BS = External lubrication

 HD51BDK-1**U**22BS = Internal lubrication

The bushing/bearings must be lubricated in accordance with the table in Figure 40, but the relubrication intervals and grease volumes are only guidelines, as the re-lubrication interval in particular is largely dependant on the conditions. Contact the supplier for correct guidance!

The bushing/bearings must be lubricated with a grease type suitable for the liquid and liquid temperature.

Contact the supplier for selection of the correct grease type!

In connection with chocolate pumps – pump version “CHD” – a vegetable fat type must be used which is compatible with the chocolate mass so that no harmful substances are transferred to the chocolate. Contact the supplier for selection of the correct grease type!



“CHD” pumps with lubrication connection in the back cover must not be pressure-lubricated with more than 20 bar



The lubricant for chocolate pumps must not be harmful. The lubricant must be compatible with the chocolate mass

Lubrication of slide bearings			
Pump type: HD, GP, CD, PD, ED, CC	Relubrication interval in hours	Fat quantity in grams	
		Main bearing	Idler bearing
26	8 hours	1	1
33		1	1
41		1	1
51		1.5	1.5
66		1.5	1.5
81		2	2
101		2	2.5
126		2.5	4
151		2.5	6
152		4	10
201		8	14
202		14	17

Figure 40: Re-lubrication intervals and amounts of grease in grams for lubrication of slide bearings – main bearing and idler bearing.

18. Troubleshooting

Problem:								
8. Lack of co-ordination between pressure and capacity								
7. The pump cannot self-prime								
6. The pump loses liquid after self-priming								
5. The capacity is too low								
4. The pump is making a noise								
3. The motor is overloaded								
2. The pump has jammed								
1. The pump wears quickly								
Cause:	1	2	3	4	5	6	7	8
1. Too great a vacuum				X	X	X	X	
2. Cavitation				X	X	X		
3. Viscosity too high			X	X	X		X	X
4. Temperature too high		X	X				X	
5. The pump is drawing air				X	X	X	X	X
6. Pressure too high	X	X	X		X			
7. Defective valve			X	X	X			
8. The pump is corroded	X				X		X	
9. The pump is worn					X		X	
10. Impurities in the pump	X	X	X					
11. The stuffing box is over-tightened*	X		X					
12. Fault in the motor			X					
13. Pipe too constricted or blocked					X		X	
14. Wrong speed							X	
15. The pump runs without liquid	X	X					X	
16. Liquid temp. too high – lack of lubricant	X	X						
17. Speed too low					X			
18. Speed too high				X				X
19. Suction line not dipped in liquid							X	
20. Liquid being fed above liquid level				X				
21. Valve incorrectly adjusted					X			
22. The pump's shaft end is bent	X			X				
23. Coupling incorrectly aligned	X			X				
24. Pump twisted in relation to pipe system	X	X	X	X				
25. Leaking pipes/assemblies							X	

Figure 41: Various problems that can arise and possible causes of the problems.

*Point 11 does not apply for pump type ED.

Because of the ROTAN pump's large number of possible combinations and the many pump liquids used, it is not possible to provide instructions on the rectification of the problems in this manual.

If the pump has been bought in Denmark, we therefore refer to DESMI's service centres at the back of this manual. If the pump was bought outside Denmark, we refer to the relevant distributor.

19. Emptying and cleaning the pump

If the liquid being pumped is inflammable, toxic, corrosive or hazardous in any other way, or if the liquid has a temperature of more than 60°C, special safety measures must be implemented before the pump is emptied.

The liquid's safety data sheet must be obtained and read before emptying the pump.

Please refer to the relevant liquid's safety data sheet.



Observe the safety instructions in the data sheet for the liquid in question and use the specified safety equipment in the form of protective clothing, a breathing mask or similar necessary safety equipment



Use suitable safety equipment with pump liquids at temperatures of more than +60°C



When pumping hazardous liquids, circulate neutralising liquid before emptying the pump



The system must be depressurised before emptying the pump.



Use spark-free tools when removing the front cover/dismantling the pump in potentially explosive atmospheres



1. When pumping hazardous liquids, circulate a liquid that has a neutralising effect in relation to the pump liquid.
We recommend the use of thin neutralising liquids to facilitate drainage.
2. Empty the pipe system.
Note that there is still liquid in the bottom of the pump casing and in the shaft seal housing, even if the pipe system is empty, and in the case of the ED pump there will also be liquid in the magnetic coupling's canister.

3. Stop the unit.
4. Close the valves on the suction side and the pressure side, if the system is equipped with these, so that the system is depressurised.
5. Place a collecting tank under the pump to take the volume of liquid contained in the part of the system to be emptied.
6. Remove the front cover and the heating jacket
7. Remove the pump and place it with the ports pointing up/down, and then rotate the shaft manually to empty

Please note that the drainage time is longer for highly-viscous liquids, as these find it difficult to make their way from the stuffing box house through the chamber between the rotor and the rear cover to the pump casing.

Some special versions of the pump are fitted with one or more draining plugs, to facilitate the drainage of highly-viscous liquids.

20. Disposal of liquid

The safety data sheet for the liquid used must be obtained, and the liquid must be disposed of in accordance with the safety data sheet's instructions.

Please refer to the relevant liquid's safety data sheet!



The safety instructions in the data sheet for the liquid in question must be observed, and the safety equipment specified must be used.

21. Repairs



Use spark-free tools when assembling and dismantling the pump and pump parts in potentially explosive atmospheres.

Pumps that are sent to DESMI for repair must have been emptied and cleaned before our factory can accept them, and the pumps must be accompanied by information about the pump liquid used.

Cleaning and emptying of the pump must be undertaken with due regard to the safety of our repair engineers.

We would point out that certain liquids coagulate and harden before arrival at our factory, which makes any repairs fully or partly impossible if the pump has not been emptied and cleaned before shipment.

In such cases, inadequate emptying and cleaning will generate increased repair costs, or in the worst case mean that the pump has to be scrapped.

ROTAN pumps must be emptied and cleaned in accordance with the instructions in the section “Emptying and cleaning the pump” – see this!

21.1 Reinstallation of thermal sensor

If the thermal sensor has been dismantled during repair work, the sensor must be reinstalled.

1. Check that the sensor is intact
2. Apply heat-conducting paste to the tip of the sensor in order to secure good heat transmission
3. Check that the thermal sensor is fitted correctly – see installation instructions for the thermal sensor
4. Control/see to it that the thermal sensor is connected to the control
5. Control/see to it that the control is connected
6. Check that the thermal sensor/control functions correctly.



Remember to connect the thermal sensor to the control and reconnect the control again after finishing repairs

21.2 Axial clearance

The axial clearance is the distance between the rotor/idler and the front cover.

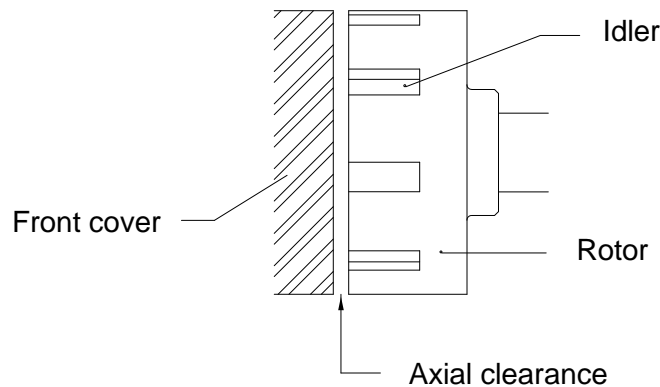


Figure 42: The axial clearance between the rotor/idler and the front cover.

The axial clearance is set in the factory in accordance with the section entitled “Setting of axial clearance”.

The axial clearance must be reset after the pump has been repaired or if the pump is worn.

There are various ways of setting the axial clearance, depending on the pump type and whether or not the pump is installed in a pipe system. See the section entitled: “Setting of axial clearance”.

21.1.1 Checking the axial clearance

The axial clearance can be checked as described below:

Non-installed pump:

The pump's axial clearance can be checked with an air gap gauge which is passed in through one of the pump's ports between the rotor/idler and the front cover.

The axial clearance identified must correspond to the values in the table in Figure 43.

Installed pump:

The axial clearance cannot be checked when the pump is installed in a pipe system.

The play must therefore be reset as described in the section entitled: "Setting of axial clearance".

Axial clearance									
Pump size		26/33	41	51/66	81/101	126/151	152	201	202
Normal axial clearance*	Min.	0.10	0.10	0.15	0.20	0.30	0.35	0.40	0.60
	Max.	0.125	0.15	0.20	0.25	0.375	0.45	0.50	0.70
Pumps with spec. tolerances**	Min.	0.20	0.20	0.30	0.40	0.60	0.70	0.80	1.0
	Max.	0.25	0.30	0.40	0.50	0.75	0.90	1.0	1.2
Stainless pumps*	-	To be set with 0.10 mm more play than specified above							

Figure 43: The axial clearance in mm for the various pump sizes for standard pumps and pumps with special tolerances respectively. This table applies to pump types HD, CD, PD, GP, CC and ED.

The pump size appears from the pump designation. Example: CD26EFMDK-3U332.

* Pumps made of stainless steel are set with 0.10 mm more play than specified. Pumps made of stainless steel are characterised by the figure "4" in the pump designation. Example: CD26EFMDK-3U332

** Pumps with special tolerances are identified by the inclusion of a "T" or "CHD" in the designation. Example: HD/CD41EFCHD-1M22B or GP101EDT-1U22B – see also the section "Pump versions".

21.2.2 Setting the axial clearance

The axial clearance is set by means of the regulating screws:

<u>Type HD, CD, PD:</u>	Adjusting screws pos. CT/bearing covers pos. CS/CR Adjusting bearing house(HD202) pos.CR
<u>Type GP:</u>	Adjusting screws pos. KX/KY/sleeve coupling pos. DB
<u>Type ED:</u>	Adjusting screws pos. E/NM/front cover pos. AA
<u>Type CC:</u>	Adjusting screws pos. E/NM/front cover pos. AA <u>or</u> Adjusting screws pos. E/front cover pos. AA/shim ring(s) pos AS

See position numbers under the section: "Spare part drawings"/"Spare part list"!

As for pumps installed in a pipe system, the axial clearance is set by turning the pump's adjusting screw (for pumps excluding HD202) to a specific angle. Find the angle in the table below.

*For axial clearance adjustment of HD202, please refer to Figure 46.

Pump type		Version	Adjusting screws' min./max. angle turn in degrees									
			26/3	41	51/6	81/101	126	151	152	201	202	
HD (cast iron)	Standard	Min.	45°	36°	54°	58°	86°	86°	84°	82°	100°	
	Special tolerance	Max.	56°	54°	72°	72°	108°	108°	108	103°	110°	
PD (steel)	Standard	Min.	90°	72°	108°	115°	173°	173°	168	165°	120°	
	Special tolerance	Max.	113°	108	144°	144°	216°	216	216	206°	145°	
CD (stainless steel)	Standard	Min.	90°	72°	90°	86°	115°	115	108	103°	110°	
	Special tolerance	Max.	101°	90°	108°	101°	137°	137	132	123°	120°	
GP (cast iron)	Standard	Min.	90°	72°	108°	115°	173°	173	168	165°	140°	
	Special tolerance	Max.	113°	108	144°	144°	216°	216	216	206°	160°	
ED (cast iron/steel)	Standard	Min.	36°	29°	43°	58°						
	Special tolerance	Max.	45°	43°	58°	72°						
ED (stainless steel)	Standard	Min.	72°	58°	86°	115°						
	Special tolerance	Max.	90°	86°	115°	144°						
CC (cast iron)	Standard	Min.	36°	36°	43°	58°	72°	72°	96°			
	Special tolerance	Max.	45°	54°	72°	72°	90°	90°	114			
	Standard	Min.	72°	72°	86°	115°	144°	144	144			
	Special tolerance	Max.	90°	108	115°	120°	180°	180	180			
	Standard	Min.	72°	72°	72°	86°	96°	96°	96°			
	Special tolerance	Max.	81°	90°	86°	101°	114°	114	114			
	Standard	Min.	72°	72°	86°	115°	144°	144	144			
	Special tolerance	Max.	90°	108	115°	144°	180°	180	180			
	Standard	Min.	36°	36°	54°							
	Special tolerance	Max.	45°	54°	72°							
	Standard	Min.	72°	72°	108°							
	Special tolerance	Max.	90°	108	144°							

Figure 44: Adjusting screws' min./max. angle turn in degrees – when setting the axial clearance – for the shown pump types, in the specified materials and versions.

* Pumps with special tolerances are identified by the inclusion of a "T" or "CHD" in the designation.

Example: HD/CD41EFCHD-1M22B or GP101EDI-1U22B – see also the section "Pump versions".

The pump's adjusting screws are turned in pairs to the ascertained angle – appearing from Figure 43 – to ensure straight fitting. The size of the adjusting screw angle appears from Figure 44.

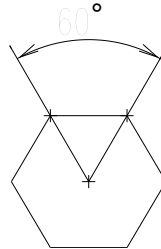


Figure 45: The size of the angle for a single surface on the hexagonal bolt head on the adjusting screws.

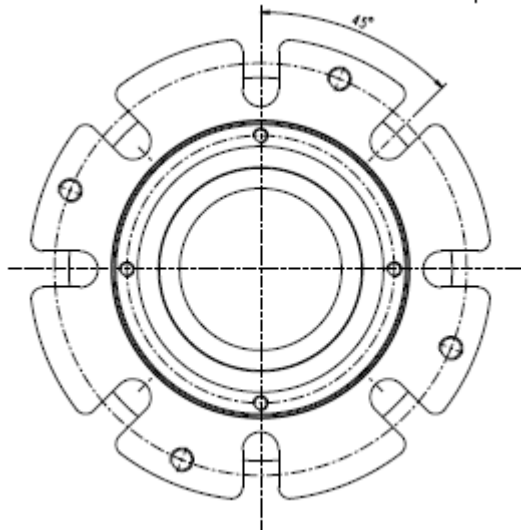


Figure 46: HD202 axial clearance adjustment - adjust the bearing housing(pos. CR) .

The procedure for setting the axial clearance in the various pumps for installed and non-installed pumps respectively. – appears from Figure 47.

Setting of axial clearance	
Non-installed pump:	Installed pump:
Type HD, CD, PD:	Type HD, CD, PD:
<ol style="list-style-type: none"> 1. Loosen bearing covers pos. CS/CR so that the shaft can be pushed axially 2. The pump's axial clearance can be found in the table Figure 43 3. Insert an air gap gauge between the front cover and the rotor/idler 4. Push the shaft towards the front cover until the air gap gauge becomes jammed 5. Tighten the bolts in pairs so that the bearing covers do not force the ball bearing to one side 6. When adjustment is complete, make sure that the pump shaft turns easily and regularly, and that no jarring noises can be heard. 	<ol style="list-style-type: none"> 1. Loosen bearing cover pos. CS 2. Tighten bearing cover pos. CR. 3. Loosen bearing cover pos. CR in accordance with the number of degrees obtained in the formula – Figure 44: 4. Tighten bearing cover pos. CS Tighten the bolts in pairs so that the bearing covers do not force the ball bearing to one side 5. When adjustment is complete, make sure that the pump shaft turns easily and regularly, and that no jarring noises can be heard *For HD202 which needs a special way of setting, the above is not applicable. please refer to Figure 48
Type CC (with shim rings):	Type CC (with shim rings):
<ol style="list-style-type: none"> 1. Remove set screws pos. E 2. Remove front cover pos. AA 3. Remove shim ring(s) pos. AS 4. Loosely attach front cover and set screws 5. The pump's axial clearance is obtained from the table in Figure 43 6. Insert an air gap gauge between the front cover and the rotor/idler 7. Tighten the front cover until the air gap gauge becomes jammed 8. Measure the distance between the pump casing pos. A and the front cover pos. AA: _____ 9. The figure obtained is the thickness of the new shim ring 10. Requisition and fit the shim ring or shim rings pos. AS according to the above! 11. When adjustment is complete, make sure that the pump shaft turns easily and regularly, and that no jarring noises can be heard 	<ol style="list-style-type: none"> 1. Remove set screws pos. E 2. Remove front cover pos. AA 3. Remove shim ring(s) pos. AS 4. Re-attach the front cover and set screws, and screw the front cover to the idler 5. Check that the pump shaft <u>cannot</u> be turned (If the pump shaft can turn, this is because the front cover and/or rotor/idler are worn, and the play can thus not be set correctly. Worn items must then be replaced before resetting the axial clearance) 6. Measure the distance between the pump casing pos. A and the front cover pos. AA: _____ 7. The pump's axial clearance can be seen in the table in Figure 43: _____ 8. The two figures obtained together define the thickness of the new shim ring: _____ 9. Requisition and fit the shim ring or shim rings pos. AS according to the above! 10. When adjustment is complete, make sure that the pump shaft turns easily and regularly, and that no jarring noises can be heard

Non-installed/installed pump:	
Type ED, CC (with set screws):	
<ol style="list-style-type: none"> 1. Loosen set screws pos. NM 2. Tighten adjusting screws pos. E until the front cover is positioned against the rotor/idler. 3. Check that the pump shaft <u>cannot</u> be turned 4. (If the pump shaft can turn, this is because the front cover and/or rotor/idler are worn, and the play can thus not be set correctly. Worn items must then be replaced before resetting the axial clearance) 5. Loosen adjusting screw pos. E according to the number of degrees obtained in the formula in Figure 44 6. Tighten set screws pos. NM. 7. In non-installed pumps, once adjusted the play must be checked with an air gap gauge in at least 3 different points, to ensure that the front cover is parallel with the rotor. <p>Finally, make sure that the pump shaft can turn easily and regularly and that no jarring sound can be heard. Finally, make sure that the pump shaft can turn easily and regularly and that no</p>	
Type GP:	
<ol style="list-style-type: none"> 1. Loosen set screw pos. DC on sleeve coupling pos. DB 2. Loosen the short set screws pos. KY 3. Tighten the long set screws pos. KX until the rotor is positioned against the front cover 4. Loosen the long set screws pos. KX according to the no. of degrees obtained in the formula in Figure 44 5. Tighten the short set screws pos. KY 6. Tighten set screw pos. DC 7. When adjustment is complete, make sure that the pump shaft turns easily and regularly, and that no jarring noises can be heard. (The flange motor in GP pumps must have a locked bearing at the end of the shaft end, to ensure that the pump's axial clearance falls within permitted parameters) 	

Figure 47: The procedure for setting the axial clearance in the various pumps for installed and non-installed pumps respectively.

HD202 adjustment of axial clearance after installed pump

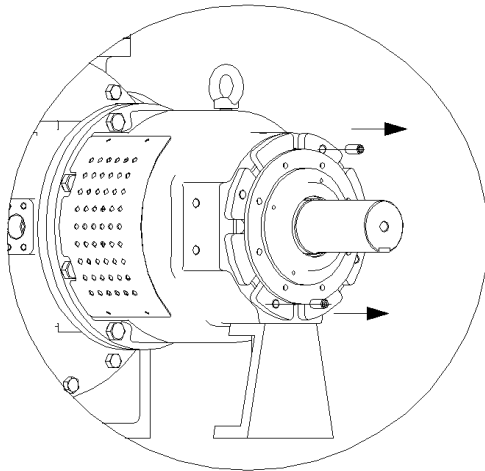


Figure a: Loose the socket set screws pos. FN

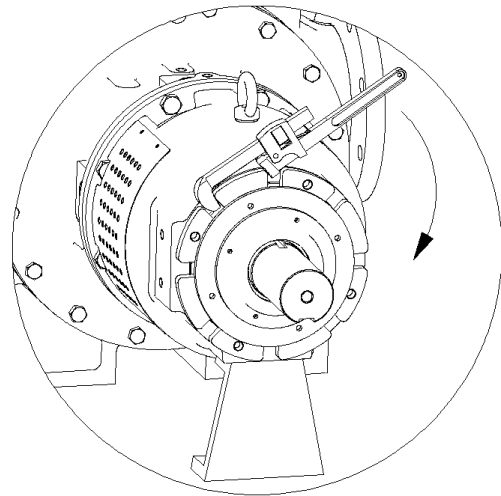


Figure b: Rotate the bearing housing in direction as clockwise indicated by a wrench to move the rotor until it is positioned against the front cover.

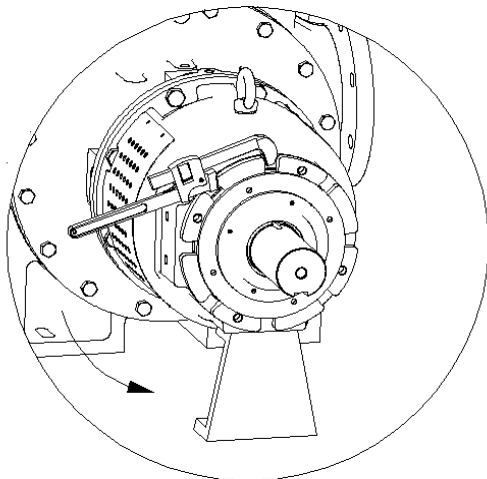


Figure c: Rotate the bearing housing in counter clockwise direction to the number of degrees obtained in the form in figure 44. as indicated by a wrench to move the rotor to backwards.

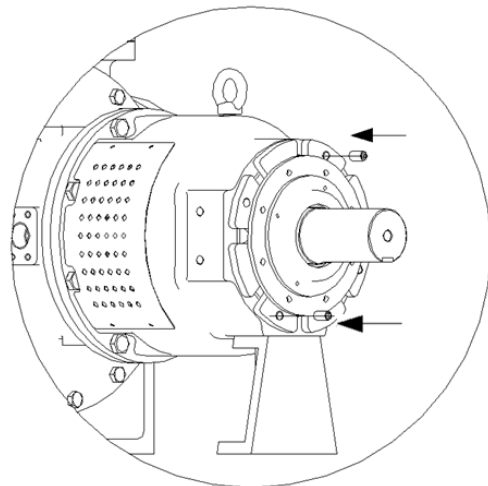


Figure d: Tighten the socket set screws position FN to lock the position.

Figure 48: The procedure for setting the axial clearance on installed and non-installed HD202 pumps.

22. Spare parts

We recommend that you use original spare parts.

DESMI accepts no liability for any personal injury or damage to the pump as a consequence of the use of non-original spare parts that do not satisfy precisely the same strict quality requirements as original DESMI spare parts.

23. Ordering spare parts

When ordering spare parts, the following information must be provided:

- The pump's serial number	252756
- The pump's SX no.	5310
- The pump type	HD81ERM-1U332
- If relevant, the code of the mechanical shaft seal	AD
- If relevant, the number of the magnetic coupling (seal)	-
- If relevant, the number of the bypass valve	-
- The spare part's position designation	Pos. CJ
- The spare part's designation	Mechanical shaft seal

The above information may be found on the pump's name plate – Figure 49. The serial number is also embossed on the pump's left port.

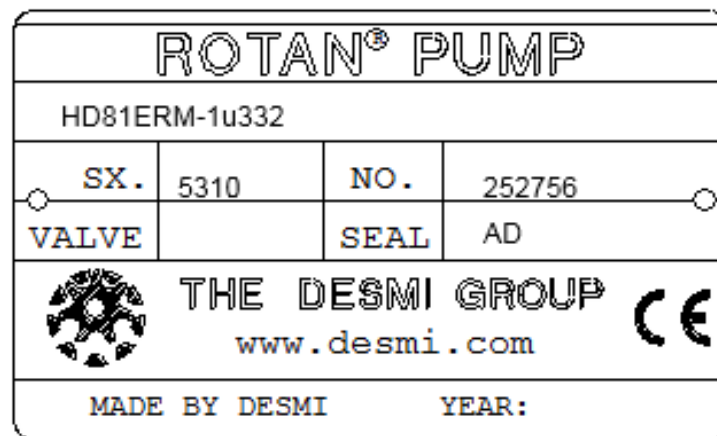
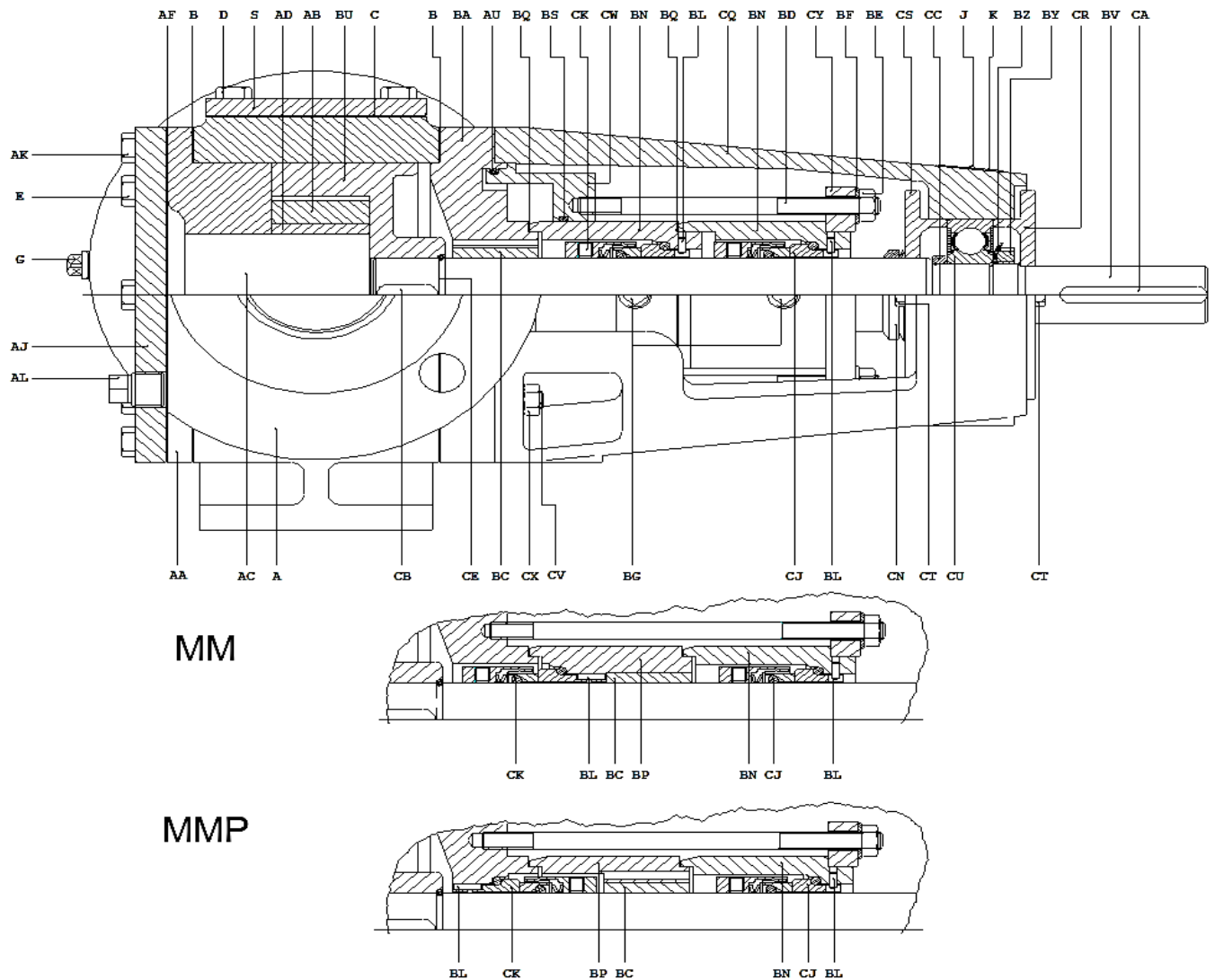


Figure 49: An example of a pump's name plate.

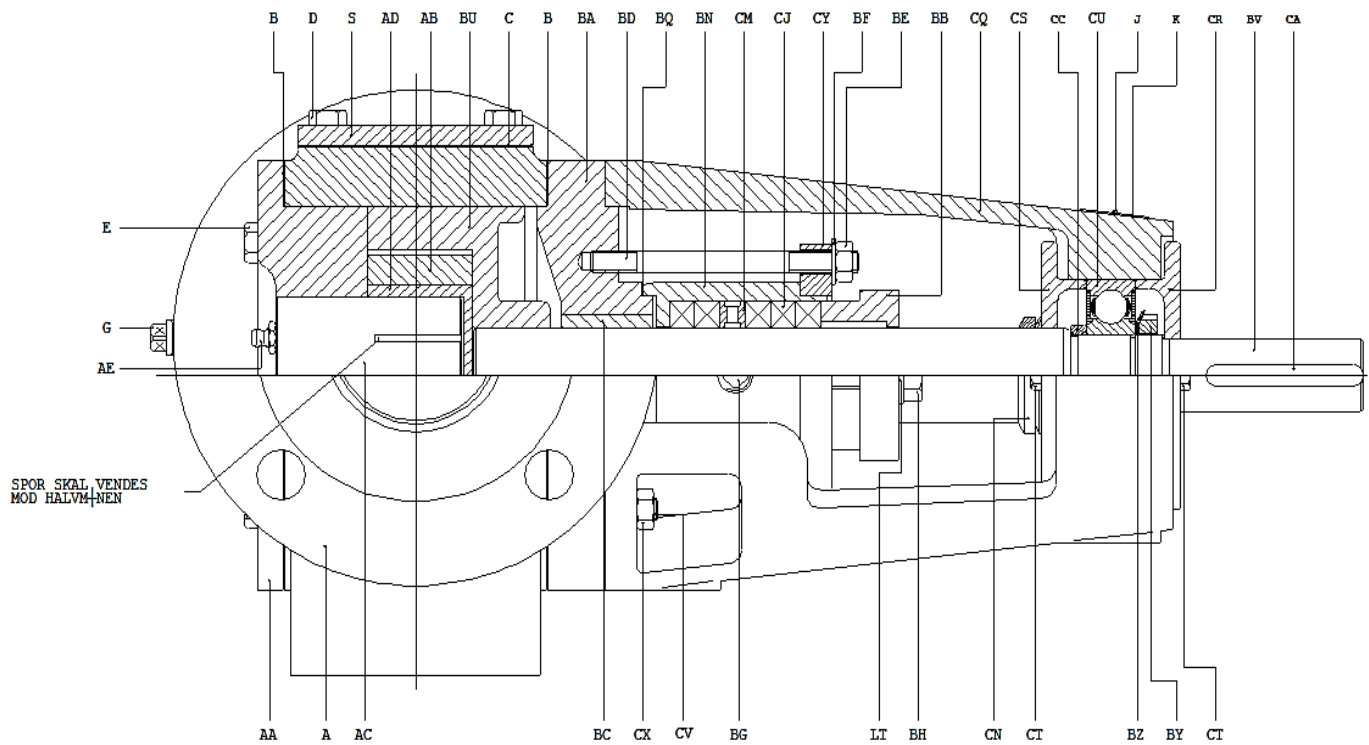
23.1 Spare parts drawings

This section contains a representative selection of ROTAN sectional drawings. Not all pump configurations are included, but taken together the drawings selected show the most common position designations and designs.

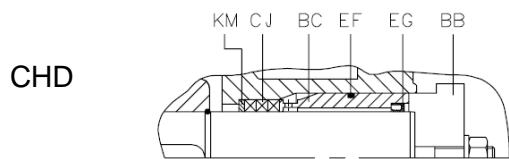
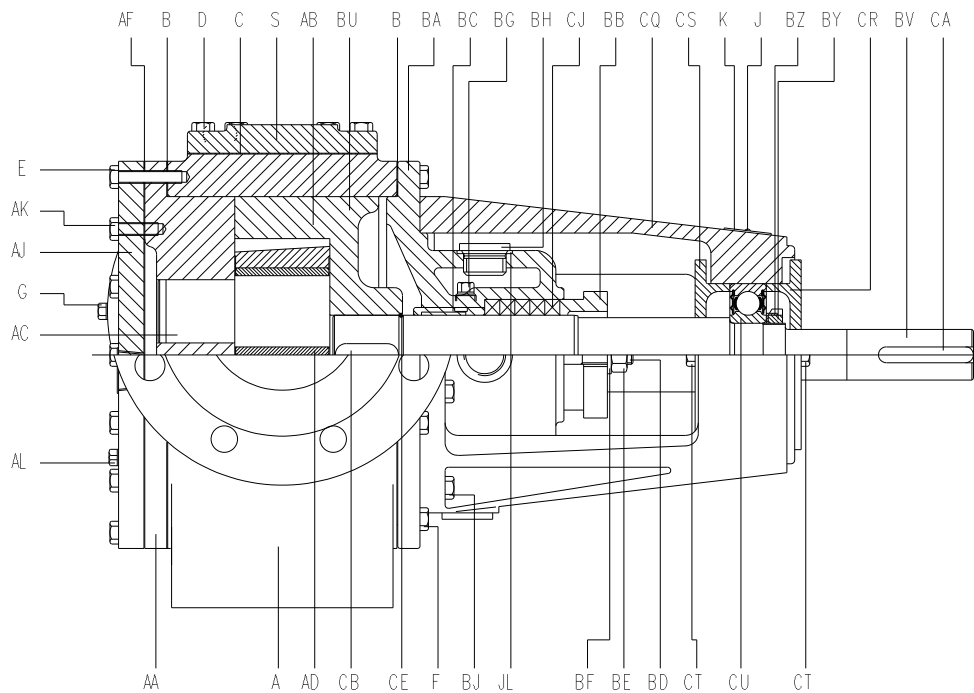
CD/PD..EFDKMMW – (CD/PD..EFMM) – (CD/PD..EFMMP)



CD/PD..EF

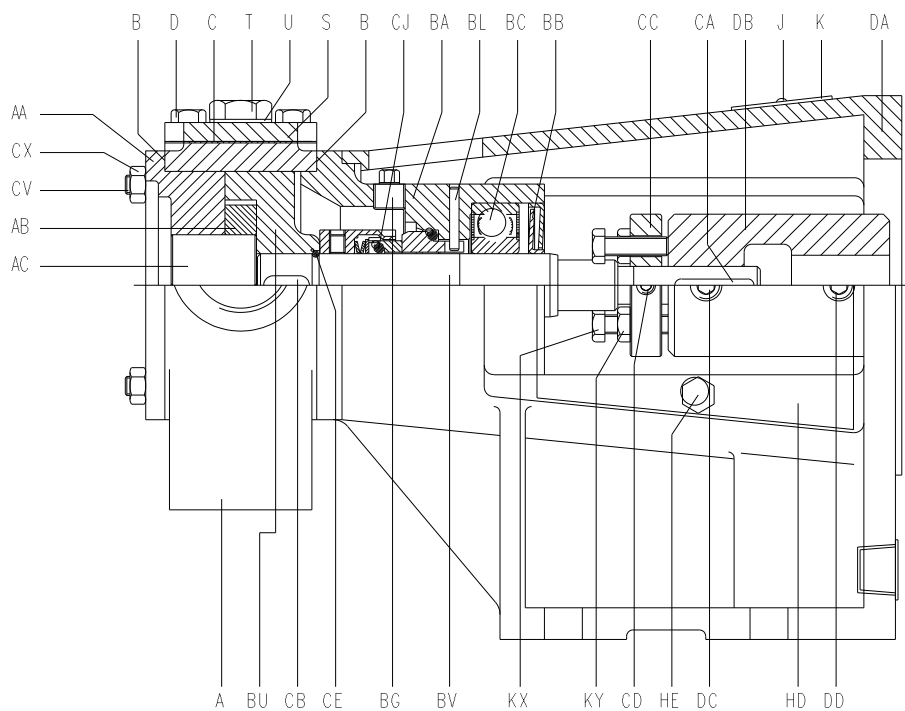


HD..EDK
(GP..E)
(HD..ECHD)

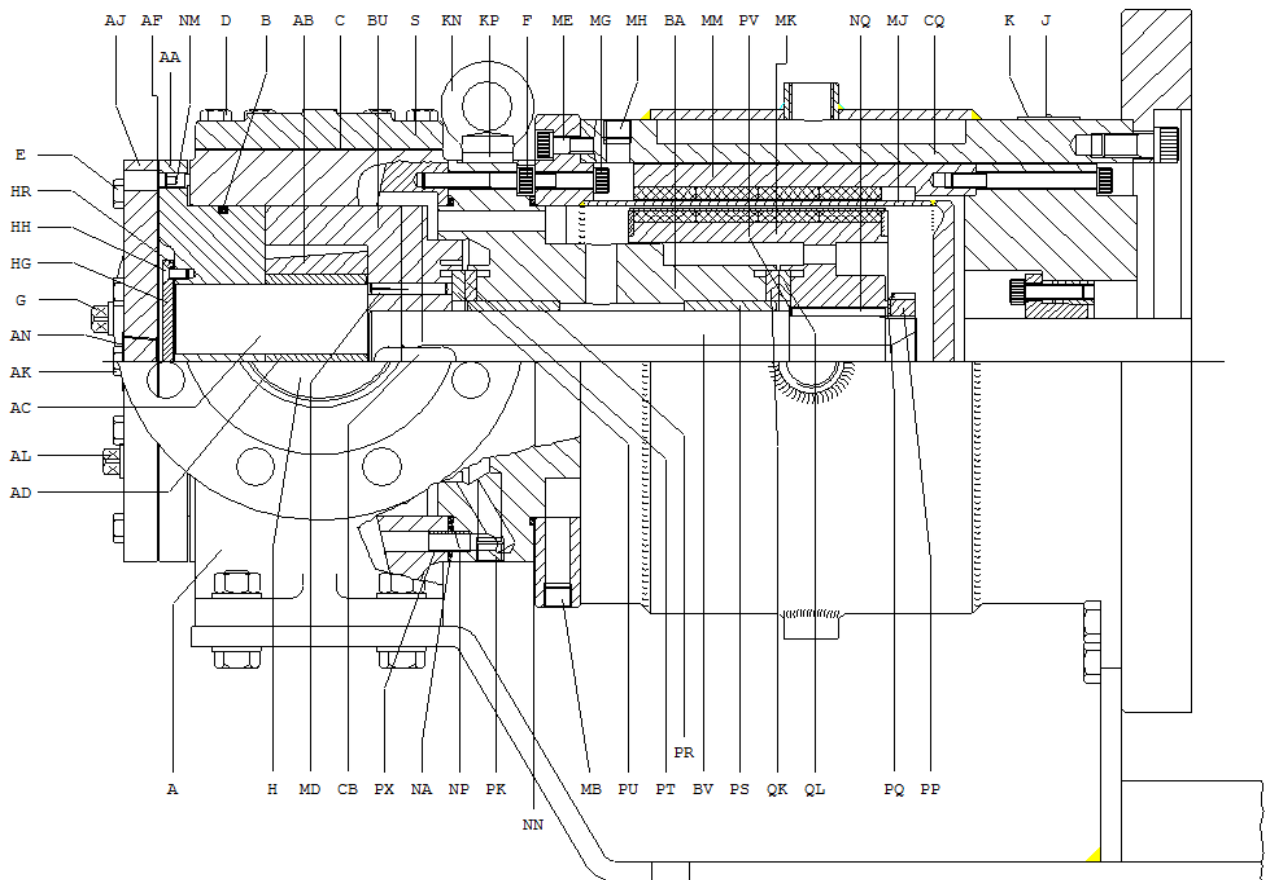


GP..EM
(HD..EM)

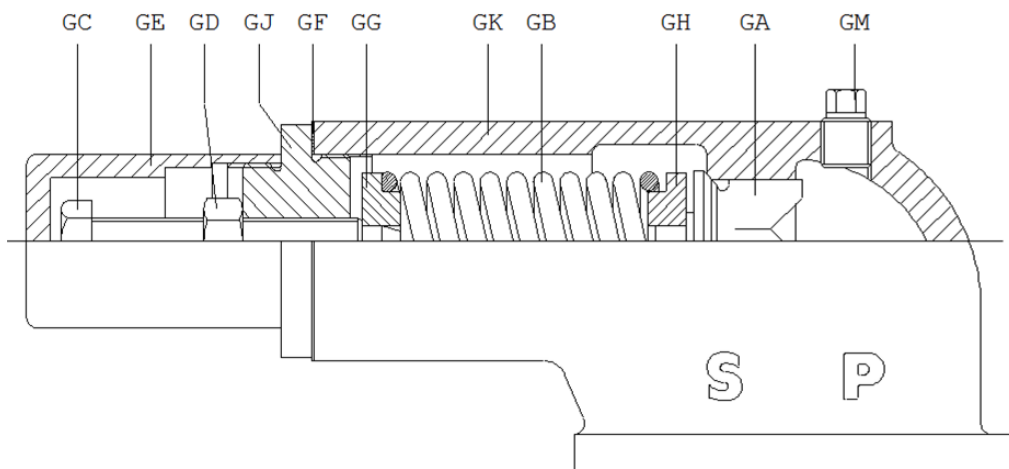
Grove must
face
crescent



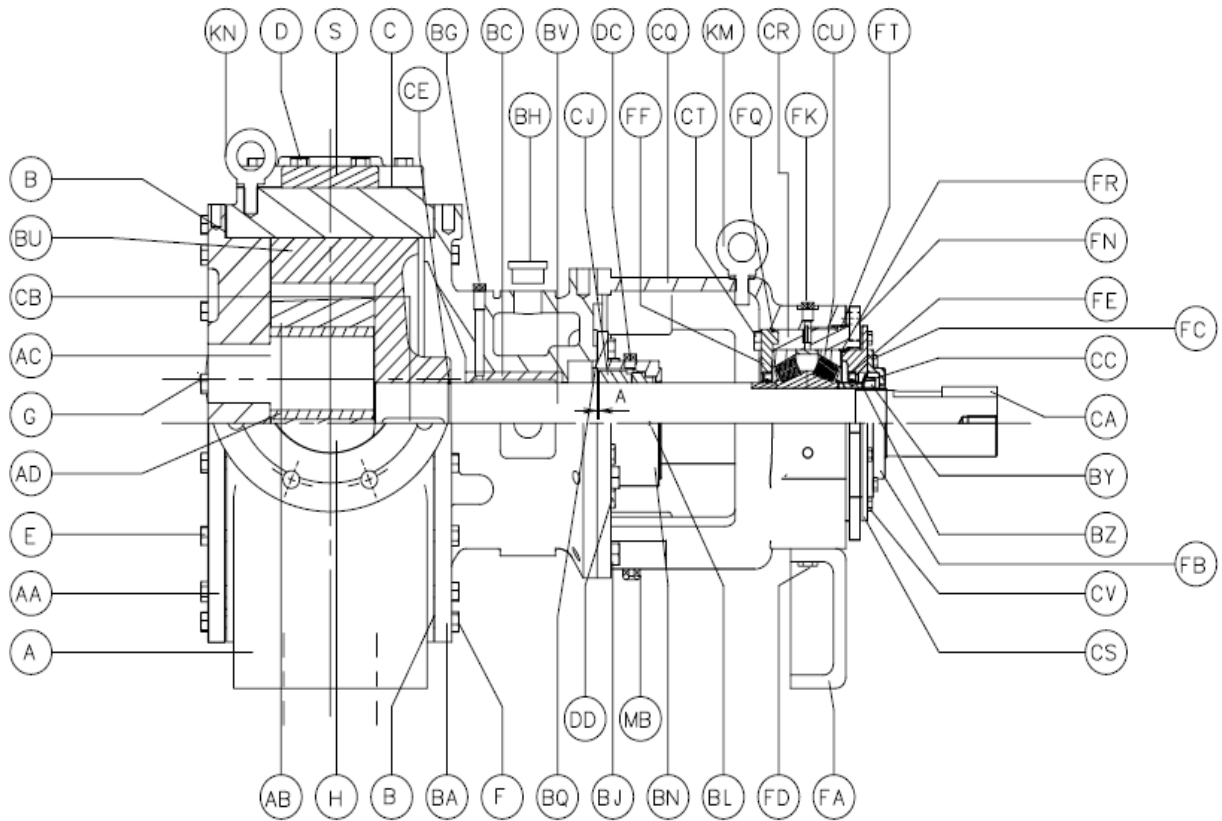
ED...EFDK



Bypass valve for HD,GP (CD,PD,ED)



HD202EM



24. spare part list

<u>Pos.</u>	<u>Designation</u>	<u>Pos.</u>	<u>Designation</u>
A	Pump casing	AB	Idler
B	Gasket/O-ring	AC	Idler pin
C	Gasket	AD	Idler bushing
D	Bolt	AE	Lubrication nipple/pipe plug
E	Bolt	AF	Gasket
F	Bolt	AJ	Heating jacket
G	Pipe plug	AK	Bolt
H	Plastic cap	AL	Pipe plug
J	Drive screw	AU	O-ring
K	Name plate	BA	Rear cover
S	Blind cover	BB	Packing gland/bearing cover
T	Pipe plug	BC	Main bearing bush/Ball bearing
U	Gasket	BD	Stud bolt/bolt
AA	Front cover	BE	Nut
<u>Pos.</u>	<u>Designation</u>	<u>Pos.</u>	<u>Designation</u>
BF	Washer	EG	Seal ring
BG	Pipe plug/lubrication nipple	EJ	Bolt
BH	Bolt/pipe plug	FA	Support
BJ	Bolt	FB	Cover for bearing nut
BL	Priming pin	FC	Set screw
BN	Shaft seal housing	FD	Set screw
BP	Intermediate bearing	FE	Oil seal
BQ	Gasket	FF	Bearing housing cover
BR	Spacer ring	FK	Lubrication nipple
BS	O-ring	FN	Socket set screw
BU	Rotor	FQ	O-ring
BV	Shaft	FR	O-ring
BY	Ball/Roller bearing nut	FT	O-ring
BZ	Ball/Roller bearing lock ring	GA	Valve cone
CA	Key	GB	Spring
CB	Key	GC	Adjusting screw
CC	Fixing ring/spacer ring	GD	Nut
CD	Threaded screw	GE	Canister

CE	Snap ring	GF	Gasket
CJ	Packing coil/mechanical shaft seal	GG	Pressure plate
CK	Mechanical shaft seal	GH	Pressure plate
CM	Lantern ring	GJ	Valve cover
CN	V-ring	GK	Valve casing
CQ	Bearing bracket	GM	Pipe plug
CR	Bearing cover/housing	GN	Gasket
CS	Bearing cover	GQ	Bolt
CT	Bolt	GR	Washer
CU	Ball bearing/Roller bearing	HD	Shield
CV	Stud bolt	HE	Bolt
CW	Heating jacket	JL	Gasket
CX	Nut	KX	Bolt
CY	Retaining flange	KY	Bolt
DA	Motor bracket	KM	Eye bolt
DB	Coupling	KN	Eye bolt
DC	Threaded screw/Plug	LT	Washer
DD	Threaded screw	MA	O-ring
EF	O-ring	MB	Pipe plug
<u>Pos.</u>	<u>Designation</u>	<u>Pos.</u>	<u>Designation</u>
MD	Roll pin	MZ	O-ring
ME	Bolt	NA	O-ring
MF	Bolt	NB	Ball bearing
MG	Bolt	NC	Thermal sensor
MJ	Canister	ND	Bearing cover
MK	Inner magnetic rotor	NE	Shaft
ML	Bolt	NF	Cover
MM	Outer magnetic rotor	NG	Disc spring
MN	Washer	NJ	Bolt
MP	Bolt	NK	O-ring
MQ	Bolt	NM	Set screw
MR	Lock ring	NN	O-ring
MS	Key	NP	O-ring
MT	Seal ring	NQ	Key
MU	Connecting flange	NS	Intermediate piece
MV	Complete main bearing	NT	Thread fitting
MW	Spacer ring	NU	O-ring
MX	Bolt	NZ	Draining plug
MY	Cylindrical pin		

25. Technical specifications

Because of the ROTAN pump's large number of possible combinations and the many pump liquids used, the following values should be viewed as guideline maximum values, as an individual ROTAN pump may have further limitations due to the pump liquid, the shaft seal selected and in particular the motor selected.

If the pump was bought in Denmark, we therefore refer to DESMI's service centres at the back of this manual.

If the pump was bought outside Denmark, we refer to the relevant distributor.

The technical specifications of the motor are contained in the manual supplied by the motor manufacturer.

25.1 Capacity

Pump type	Max.Capacity (m ³ /h)
GP	50
ED	90
HD/PD/CD	260
CC	6,8

Figure 50: The maximum capacity in m³/h for the various pump types.

25.2 Speed

Pump size	Max. Speed (rpm)
26 / 33 / 41	1,750
51 / 66	1,450
81	1,200
101*	950
126	750
151	600
152	500
201	400
202	300

Figure 51: The maximal speed per minute for the various pump sizes – for pump liquids with viscosities under 400 cSt. Reduce the speed in the event of higher viscosities in order to avoid cavitation.

*For HD101, when differential pressure is above 10 bar and viscosity is above 3500 cSt, reduce more speed in order to avoid damage of pump.

The table applies to all pump types: GP/HD/PD/CD/ED/CC.

25.3 Operational pressure

Pump type/size	Operat. pressure – pump casing	Operat. press. – heating
GP*/HD/PD/CD/ED 26 / 33 / 41 / 51 / 66 / 81	Max. 16 bar (max. 25 bar*)	Max. 10 bar
GP*/PD/CD/ED 101 / 126 / 151 / 152 / 201	Max. 10 bar (max. 25 bar*)	Max. 10 bar
HD 101 / 126 / 151 / 152 / 201	Max. 12 bar**	Max. 10 bar
HD202	Max. 14 bar***	Max. 10 bar
CC	Max. 10 bar	

Figure 52: Maximum operational pressure in bar for the various pump types.

The stated max. operational pressure depends on the inlet pressure to the pump and the pump size.

* Pump type GP is also supplied in a special high-pressure version which manages a max. of 25 bar.

The high-pressure version is available in pump sizes: 27 / 34 / 42 / 52 / 67 / 82 / 102.
It appears from the pump size on the name plate if the pump can manage max. 25 bar.

System pressure + differential pressure must not exceed 25 bar, and the differential pressure must not exceed 4 bar.

** For HD101, when differential pressure is above 10 bar, the max. viscosity is 10000cSt. For HD126 to HD201, when differential pressure is above 10 bar, the max. viscosity is 17000cSt.

Attention to the speed of HD101, when differential pressure is above 10 bar.

*** Max allowed differential pressure for HD202 with cast iron bushing (material code 1) is 6 bars.

25.4 Suction height

Pump type	Suction height
GP/HD/PD/CD/ED/CC	Max. 0.5 bar priming vacuum Max. 0.8 bar vacuum in operation

Figure 53: The max. suction height in bar for priming vacuum and operational vacuum.

25.5 Viscosity

Pump type	Viscosity
GP	Max. 7,500 cSt
ED	Max. 10,000 cSt
HD/PD/CD	Max. 250,000 cSt
CC	Max. 1,000 cSt

Figure 54: States the max. allowed viscosity in cSt. of the pump liquid – for standard versions of the various pump types.

25.6 Temperature

Pump type	Temperature
GP	Max. 150°C
HD/PD/CD*	Max. 250°C
ED	Max. 130°C (Magnetic material: Neodym-Iron-Bor)
	Max. 250°C (Magnetic material: Samarium-Cobalt)
CC	Max. 80°C

Figure 55: The pump liquid's minimum/maximum temperature limits for the various pump types.

For pumps with bypass valve the temperature is limited to 150°C on account of the valve spring. The valve may however be supplied with another spring so that the temperature span of the pump can be utilised fully.

As or additional temperature limits, see the section: "Hot liquids".

* Pump types HD, CD and PD – designed with special tolerances – may in certain cases be use dup to 300°C.

ED pump		
Elastomer type	Elastomer brand	Temperature
FPM	Viton®	Ca. -20°C / +200°C
FEP	Teflon® med Viton core	Ca. -60°C / +205°C
EPDM	Ethylene-propylene	Ca. -65°C / +120°C
FFKM	Kalrez®	Ca. -50°C / +316°C

Figure 56: The pump liquid's minimum/maximum temperature limits for the various elastomers used in an ED pump.

26. Installation of ATEX pumps with PT100 sensor

To ensure that a ROTAN ATEX pump is safe to use in an ATEX-defined area the following instructions must be followed.

ED pumps and pumps with soft shaft seal, must always be installed with a PT100 sensor according to DESMI PUMPING TECHNOLOGY A/S instructions.

If the ROTAN ATEX pump is fitted with a bypass valve, a PT100 sensor has to be mounted on the bypass valve.

If a ROTAN ATEX pump is ordered with PT100 sensor, the PT100 sensor is not mounted from the factory, due to the risk of damaging it during transport.

Before the first startup of the pump the PT100 sensor must be mounted in accordance with DESMI PUMPING TECHNOLOGY A/S instructions.

26.1 Installation of the PT100 sensor

26.1.1 PT100 sensor installed in an intrinsically safe electrical circuit

If the PT100 sensor is installed in an intrinsically safe electrical circuit, it is not required that the PT100 sensor is ATEX certified. It is a simple apparatus which is accordance with EN60079-14:2004 §3.4.5

The intrinsically safe electrical circuit is to be installed according to EN 60079-14:2004.

DESMI PUMPING TECHNOLOGY A/S recommends mounting of intrinsically safe electrical circuit

26.1.2 PT100 sensor installed as an intrinsically safe equipment

The PT100 sensor must be classified according to the same ATEX zone as the pump. The PT100 sensor must be certified according to the ATEX zone in which it is installed. The installation is to be made in accordance with the requirements set up in EN 60079-14:2004.

When ordering a ROTAN ATEX pump, it is important to state whether the pump is to be delivered with or without PT100 sensor.

If DESMI is to deliver the PT100 sensor it is important that it is informed whether the PT100 sensor is installed in a intrinsically safe electrical circuit or not. If this information not can be given, DESMI will deliver a PT100 sensor according to 26.1.1

26.2 Mounting the PT100 sensor to the pump

The following mounting instruction must be followed to insure that the ROTAN ATEX pump is safe to use in an ATEX zone.

ROTAN ATEX pumps that are to be installed with PT100 sensors are always factory prepared for this. If a pump is ordered without PT100 sensors, the factory prepared threaded holes must be used for possible subsequent PT100 mounting.

26.2.1 Pumps with soft shaft seal

When mounting the PT100 sensor in the pump, apply a small amount of heating conductive paste on the tip of the sensor, in order to ensure good heat transfer between the soft seal, the rear cover, and the sensor.

Mount the counter nut and turn it as far backwards as possible. Lead the PT100 sensor through the bracket, and into the hole in the rear cover. When the sensor tip touches the bottom of the hole, turn the sensor ¼ revolution backwards and tighten the counter nut.

26.2.2 ED Pumps

When mounting a PT100 sensor on an ED pump, apply a small amount of heating conductive paste on the tip of the sensor, to ensure good heat transfer from the canister that surrounds the media in the pump and the sensor.

Mount the counter nut and turn it as far backwards as possible. Mount the PT100 sensor on the pump rear cover. Turn the sensor in until it touches the canister, when the sensor tip touches the canister turn it ¼ revolution back and tighten the counter nut.

26.2.3 Bypass valve

When mounting a PT100 sensor on a bypass valve, the sensor is to be mounted in a sensor pocket. The sensor pocket is always mounted on the bypass valve pressure side, marked "P". Apply a small amount of heating conductive paste on the tip of the sensor, to ensure good heating transfer between the sensor pocket and the sensor. The counter nut is turned as far backwards as possible, and the sensor is mounted in the sensor pocket. Turn the sensor in the sensor pocket until the tip of the sensor touches the bottom, then turn it ¼ revolution back and tighten the counter nut.

27. Service centres – Denmark

Service center - Denmark			
City	Address	Telephone	Fax
Nørresundby	Tagholm 1 9400 Nørresundby	+45 70236363	+45 9817 5499
Kolding	Albuen 18 C DK-6000 Kolding	+45 70236363	+45 75 58 34 65
Aarhus	Lilleringvej 20 DK-8462 Harlev J	+45 70236363	+49 407 522040
Hvidovre	Stamholmen 173 DK-2650 Hvidovre	+45 70236363	+45 3677 3399
Odense	Hestehaven 61 DK-5260 Odense S	+45 70236363	+45 6595 7565

28. Subsidiary companies – DESMI PUMPING TECHNOLOGY A/S

Subsidiary companies – DESMI Pumping Technology A/S				
Company Name	Address	Country	Telephone	Fax
DESMI Pumping Technology (Suzhou) Co.,Ltd.	No. 740 Fengting Avenue Weiting Sub District 215122 SIP Suzhou, P. R. China	China	+86 512 6274 0400	+86 512 6274 0418
DESMI Danmark A/S DESMI Contracting A/S DESMI Ocean Guard A/S	Tagholm 1 9400 Nørresundby	Denmark	+45 9632 8111	+45 9817 5499
DESMI GmbH	An der Reitbahn 15 D-21218 Seevetal	Germany	+49 407 519847	+49 407 522040
DESMI B.V	Texasdreef 7 3565 CL Utrecht	Netherlands	+31 302610024	+31 302623314
DESMI Norge AS	Skibåsen 33 h 4636 Kristiansand	Norway	+47 3812 2180	+47 3804 5938
DESMI Ltd.	"Norman House", Rosevale Business Park Parkhouse Industrial Estate (West) Newcastle Staffordshire ST5 7UB	United Kingdom	+44 1782 566900	+44 1782 563666
DESMI Singapore Pte.Ltd.	No. 8 Kaki Bukit Road 2, Ruby Warehouse Complex Unit no: # 02-13 417841	Singapore	+65 6748 2481	+65 6747 6172
DESMI Inc.	HQ, Manufacturing and sales 1119 Cavalier Blvd. Chesapeake, VA 23323	USA	(757) 857 7041	(757) 857 6989
DESMI Korea	503-8, DangSa Ri, Kijang-eup, Kijang-gun Busan	Korea	+82 51 723 8801 +82 70 7723 8804	+82 51 723 8803
DESMI SARL	21G rue Jacques Cartier F-78960 Voisins-le-Bretonneux RCS Versailles en cours	France	+33 (0) 1 30 43 97 10	+33 (0)130 43 97 11
DESMI UAE	Dubai Office Office 307 D-Wing P.O. Box 341489 Dubai Silicon Oasis	UAE	+971-56-300 3422	
DESMI India	413, Aditya Trade Centre Ameerpet Hyderabad – 500016	India	+91-9949339054	
DESMI Africa	Plot No.1848 Yacht Club Road Msasani Peninsular Dar es Salaam	Tanzania	+255 757597827	
DESMI Poland	Przedstawicielstwo w Polsce ul. Batalionu Platerówek 3 03-308 Warszawa	Poland	+48 22 676 91 16	+48 22 618 19 53