



Instruction and Maintenance Manual

Internal gear pumps Type R ATEX

Contents

A. Declaration of Conformity - ATEX Certificate	2
B. Introduction	3
C. ATEX – Information	5
D. Installation	8
E. Maintenance	13
F. Repairs	17
G. Safety valve	18
H. Coupling for Bi-Block Pumps	19
I. Temperature sensor	20
Technical sheet + Curve + Spare parts list	Annexes

Pump serial no.



A. Declaration of Conformity - ATEX Certificate

With this Declaration of Conformity we declare that ${f R}$ type internal gear pumps comply with the following directives:

 \Rightarrow EC Machinery Directive 2006/42/EC, Annex II A.

 \Rightarrow EU directive on explosion prevention 2014/34/EU relating to equipment:

with code +2A for equipment of category	$\langle \pmb{ \xi x} \rangle$ II 2G Ex h IIB T4 T1 Gb
with code +2AC for equipment of category	$\left<\!\!\overline{\pmb{\xi}\pmb{x}}\!\right>$ II 2G Ex h IIC T4 T1 Gb
with code +3A for equipment of category	$\langle \pmb{ \overleftarrow{ \textbf{ fx} }} \rangle$ II 3G Ex h IIB T4 T1 Gc
with code +3AC for equipment of category	⟨ £ x⟩ II 3G Ex h IIC T4 T1 Gc

Pumps **without their own drive** must be connected to other devices. It is forbidden to start up the group in which the pump is installed if the device itself has not been declared compliant with the aforementioned Directives.

For pumps **with their own drive** that have been modified and/or are not used for the use for which they were produced, this Declaration of conformity is to be considered null and void.

The following are harmonized standards that have been applied in whole or in part:

- \Rightarrow EN 809:2009
- \Rightarrow EN ISO 12100:2010
- \Rightarrow EN ISO 80079-36:2016
- ⇒ EN ISO 80079-37:2016

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B. Introduction

1. Introduction

- 1.1 The instruction manual contains important information on how to operate the pump in a safe, adequate and effective manner. Compliance with these instructions will help you avoid dangerous situations, reduce any repair costs and downtime, and improve the reliability and durability of the pump.
- 1.2 The operating instructions refer only to the pump part. For the motor and the coupling cover refer to the separate instructions.
- 1.3 The operating instructions must always be available in the place where the pump is in operation.
- 1.4 The operating instructions must be read and applied by all personnel assigned to work with the pump.
- 1.5 The rules and regulations indicated in this manual must be scrupulously complied with, to prevent accidents and protect the environment in which the pump is used. In addition, the local technical and safety regulations necessary for the correct and safe use of the pump must be complied with.
- 1.6 The fundamental operations for the use of the pump, as well as for its transport, assembly, installation, commissioning, maintenance and repair, must be carried out by qualified and responsible personnel.

2. Safety

- 2.1 A pump can be dangerous if it is not installed correctly, if it is not properly maintained or if it is not working properly. Failure to comply with the following warnings could compromise the safety of the staff or the correct operation of the pump.
- 2.2 Each part of the pump must be used in full compliance with safety regulations. In the event that the weight of the pumps or their accessories exceeds 20 kg, the use of special lifting devices is recommended in order to avoid any damage to personnel.

CAUTION Lifting hooks suitable for lifting single elements such as pumps and motors must not be used to lift the complete unit.

- 2.3 Before starting disassembling the pump it is advisable to take all the necessary safety precautions, especially if dangerous or toxic products have been used in the pumps. If in doubt, contact your Safety Manager or the pump manufacturer.
- 2.4 While disassembling the pumps that have used dangerous or toxic products, always wear adequate clothing, safety glasses and protective masks.
- 2.5 Before disassembling, disconnect the pump electrically. Make sure that nobody can act on the main switch during the work.
- 2.6 Before disconnecting the pump from the pipes, empty the product from the pump casing.
- 2.7 Rinse the pump casing with a compatible liquid and allow it to dry in a safe area.
- 2.8 Before proceeding with any maintenance, consult the system manager to verify the need for special decontamination procedures.
- 2.9 All pumps returned to the manufacturer must be decontaminated and marked with a special label that will state the precautions to be taken during disassembly.

3. Checking the delivery

- 3.1 Pumps and their parts are shipped duly protected to prevent damage during normal transport operations. Nevertheless, the goods must be inspected immediately after arrival. Any damage found on the packaging, which might have also damaged the material contained, must be communicated to the haulier and, if possible, accompanied by photographs too.
- 3.2 The photographic support will be useful in case of complaints to the haulier. Inform also the company that sold you the pump.
- 3.3 Immediately notify the haulier in case of any material missing from what is indicated in the transport document.
- 3.4 Check that the data mentioned on the goods label correspond to those in the transport document and in the purchase order, to ensure that the pump received is actually the one ordered.

4. Storage

4.1 Should the pump not be installed immediately after it has been received and checked, it should be repackaged and placed in a suitable storage location.



- 4.2 Check and leave the protective coatings on unpainted surfaces intact. The application of a protective coating on unpainted surfaces untreated by the manufacturer is recommended.
- 4.3 Leave the plastic or port covers intact or replace some.
- 4.4 The pumps should be placed in a dry and clean place. If moisture or dust is present in the storage area, the pump must be protected with a waterproof coating.
- 4.5 If the pump has been used, open the cover or the drain plug, empty the pump casing and fill it with an anti-corrosion oil.

5. Description of the pump

- 5.1 R type pumps are internal gear pumps suitable for pumping liquids of any viscosity. Some special versions can also pump liquids containing abrasives.
- 5.2 The pumps are self-priming and can suck up to a maximum of 8 m. The intake is limited by the pressure and the low viscosity of the liquid.
- 5.3 The internal gears generate a constant flow, without pulsations.
- 5.4 The pumps are produced with a single rotating seal.
- 5.5 The axial position of the rotor can be changed without disassembling the pump.
- 5.6 The pumps are reversible and it is possible to obtain maximum suction capacity in both directions.
- **CAUTION** If the pump is fitted with a safety valve, the cover and the adjustment screw must be on the side of the suction port. If the direction of rotation of the pump has been reversed, the position of the safety valve must also be inverted: it is sufficient to unscrew the 4 screws that secure the valve.

NOT POSSIBLE FOR MAGNETIC OR CHOCOLATE PUMPS!

- Contact the pump supplier for alternative suggestions.
- 5.7 The pumps are supplied with supports suitable for elastic joints or V-belts.
- 5.8 The pumps are identified by model and serial number. The pump model is printed on the plate fixed to the pump support. The serial number is stamped on the support, next to the plate.
- 5.9 Further information can be found in the attached brochure.

6. Warranty

- 6.1 The manufacturer warrants the pump against defects or faulty workmanship for a period of 12 months from the date of delivery. On request, the manufacturer can guarantee longer warranty periods.
- 6.2 Repair of the pump or replacement of parts or of the pump itself can only be carried out after careful examination of the pump in our workshop where the pump should be sent by carriage paid. Any exceptions must be confirmed in writing.
- 6.3 This warranty does not cover parts subject to deterioration or normal wear, or damaged by misuse or improper handling of the pump by the user.
- 6.4 This warranty is no longer valid if the pump is disassembled or modified without the authorization of the manufacturer.



C. ATEX – Information

1. Marking

1.1 Internal gear **R** type pumps are marked as follows:



1.2 **Group**:

 \Rightarrow II: non-mining use

1.3 Category:

- \Rightarrow 2G = high gas safety
- \Rightarrow 3G = normal gas safety

1.4 **Protection**:

 \Rightarrow Ex h = construction protection

1.5 Class of gas explosion:

- \Rightarrow IIB = IIA and IIB permitted gases
- \Rightarrow IIC = IIA, IIB and IIC permitted gases For details on the conditions of use, see paragraph C.2.8, page 6.

1.6 **Class of temperature**:

- ⇒ T4... T1 = All temperature classes are allowed from T4 (up to 135°C), T3 (up to 200°C), T2 (up to 300°C) and T1 (up to 450°C)
 - For details on the conditions of use, see paragraph C.2.12, page 6.

1.7 EPL "Equipment Protection Level" classification according to EN ISO 80079-36:

- ⇒ Gb = Monitoring of potential ignition sources during normal operation and expected failures (Zone 1)
- \Rightarrow Gc = Monitoring of potential ignition sources during normal operation. (Zone 2)



2. ATEX requirements

- 2.1 Pumps with a mechanical seal: It might leak. If the pumped liquid is flammable, the area next to the pump must be declared as Zone 1 (category 2).
- 2.2 Pumps with a double balanced double mechanical seal, type .6..: A standard lubrication system (+O2) must be present or an API 51, 52 or 53 type quench system must be installed.
- 2.3 Pumps with a double tandem mechanical seal, type .7..: A standard lubrication system (+O2) must be present or an API 52 type quench system must be installed.
- 2.4 Pumps with a double back-to-back mechanical seal, type .8..: An API 53 type quench system must be installed (at least 1 bar above the pump maximum pressure).
- 2.5 Pumps with a cartridge seal: A quench system must be installed according to the indications of the cartridge seal manufacturer.
- 2.6 Pumps with a packing set: These have a constant fluid outflow. Should the pumped liquid cause an ATEX zone, it is forbidden to use the pump with a packing set.
- 2.7 The pump must be connected to earth. As an option, grounding is available on the base plate already connected to the motor and the pump. Therefore, grounding on the base plate is sufficient as the sole grounding.
- 2.8 If the pump is used with IIC vapour explosion class, there is a danger of electrostatic charging if the coating thickness of the equipment is greater than 0.2 mm, or greater than 2 mm if used in class IIB.
- 2.9 The pump may get blocked due to the presence of solid parts. It is therefore necessary to use a motor protection switch (PTC if with inverter).
- 2.10 Use the pump only within the parameters indicated in the performance curves, the technical data sheet and the instructions. The product must never be pumped to the limits of vaporization, crystallization, polymerization and solidification. If the pump is to be used for purposes other than that requested at the time of ordering (and for which the pump has been produced), please check its compatibility and ask the pump manufacturer for authorization for new use.
- 2.11 The pump material must be compatible with the pumped liquid. The pump manufacturer is not responsible for the inappropriate use of the pumped liquid.
- 2.12 The operating temperature of the pump must not exceed the values shown below. If there is the possibility that the liquid to be pumped can reach this temperature, the pump must not be put into operation. If necessary, use a temperature sensor. Upon request, the pump manufacturer may provide additional protection measures. This must be indicated in the technical sheet.

Class of tomporaturo	Classification of maximum working temperature * with					
DIN EN ISO 80079-31	Packing set seal °C	Mechanical seal °C	Magnetic seal °C			
T1	360	360	360			
T2	230	240	240			
Т3	130	160	160			
T4	65	105	105			

*Caution: This is not the pump limit temperature. To find out the pump limit temperature, see the information in the technical data sheet.

- 2.13 The internal gear R pump is a volumetric pump. It is not possible to regulate the flow rate by closing the delivery or intake, or by means of a pressure regulator. The flow rate can be adjusted only by varying the rotation speed or by a by-pass line.
- 2.14 There is no zone inside the pump because there is always product in the pump casing. This product is necessary to lubricate the pump (against dry running) and to allow self-priming.
- 2.15 The use of the pump with closed suction and/or discharge pipes/hoses is prohibited. The owner of the pump must take all necessary precautions to prevent this from happening. To protect the pump from a closed unloading line the (+Y) safety valve can be used. As an alternative it is possible to use a sufficiently large external by-pass line, which is always active and which preferably returns to the suction reservoir.



2.16 For pumps that are used in Zone 1 (+2A and +2AC) following instruction is mandatory. For pumps that are used in Zone 2, it is not mandatory, but we recommend it as well. To avoid running dry or the prolonged use of the safety valve, proceed as follows:

Is the flow continuously monitored during the pump operation?	Yes	Always monitor the operation of the pump and stop it immediately if the pumped liquid flow is considerably reduced for more than 30 seconds or if the pump makes strange noises or vibrations. Provide for the installation of an easily accessible (ON-OFF) switch.
No		
		The pump must be fitted with a temperature sensor (PT100). (See paragraph I, Temperature sensor, page 20).



D. Installation

1. Installation

- 1.1 Check and follow all the points of paragraph C.2 "ATEX requirements" on page 6.
- 1.2 The pumps can be supplied in various ways:
 - \Rightarrow bare shaft pump: Select a coupling, coupling cover and ATEX standard motor adequate for the performance of the pump, install them according to the instructions of the various manufacturers.
 - ⇒ Pump on base prepared for a certain motor: Read in the attached technical sheet which motor is going to be used. Install it according to the instructions of the coupling and of the motor itself.
 - ⇒ Bi-Block pump (code .BB.) without motor: Read in the attached technical sheet which motor is going to be used. Install it according to paragraph H "Coupling for Bi-Block Pumps", page 19 and the motor instructions.
 - \Rightarrow Pump with motor: The pump is ready to be installed in a plant.
 - ⇒ Pump already assembled in a system: The installation was carried out by the installer. Please follow the installer's instructions. Please go to chapter D.2 "First start-up", page 9
- 1.3 Please take into consideration the existing ATEX regulations as well as the local ones for installing the pump in a system. The following ATEX certificates are required for a pump with motor:

 \Rightarrow Pump

- \Rightarrow Coupling (in Bi-Block pumps it is already included in the pump certificate).
- \Rightarrow Motor
- \Rightarrow Temperature sensor (if any).
- The sum of these certificates must meet the system requirements.
- 1.4 The pumps are supplied with a protective liquid. The liquid is medicinal liquid (food) paraffin. In the event that this liquid can contaminate the pumped product, wash the pump before installing it and then fill it with the product to be pumped.

CAU	TION	The pumps should never be tested or washed with water because they might be damaged.
1.5	Place the	e pump on a level surface, as close as possible to the surface of the liquid to be pumped, in
	an easy-t	to-reach position for maintenance.

- 1.6 The diameter of the suction pipe should be at least equal to that of the pump inlet and should be as short as possible. Avoid unnecessary bends, elbows or bottlenecks. Liquid gases can be pumped only in submerged pipes.
- 1.7 To easily install the pump, it may be useful to rotate the pump casing. Unscrew the screws of the rear cover and rotate the pump casing. Refer to the paragraph D.2.5 on page 9 for the correct position of the safety valve. To invert the position of the safety valve, unscrew the valve 4 screws and screw them in again in the reverse position.

CAUTION Never rotate the casing of chocolate or magnetic pumps. This might damage the pump. If necessary, contact your supplier for alternative suggestions.

- 1.8 We recommend the installation of a filter in the suction pipe/hose, near the mouth, in order to protect the pump from the presence of foreign parts, welding residues, iron splinters, etc.
- 1.9 The size of the delivery pipe/hose must be appropriately calculated in order to reduce power losses due to high friction. High pressures can reduce the life of the pump, especially if the liquid contains abrasive substances.
- 1.10 Make sure that the weight of the pipes/hoses does not load on the pump casing. Check the alignment of the flexible coupling.
- 1.11 If the pump is equipped with a non-return valve in the delivery line and is set at a pressure higher than 2 bar, the pump cannot self-prime, since the air inside it cannot escape from the non-return valve. In this case, fit the pump with an air-relief valve between the pump and the valve.
- 1.12 The safety valve (by-pass), available upon request, protects the pump casing and the pipes/hoses in case the pump works with the delivery line closed or blocked. If the pump is used in both suction directions, a double safety valve is available.

CAUTION The safety valve must not be considered a flow control valve. To change the flow rate of the pump, use a variable speed drive or an external by-pass line.



- 1.13 Pumps equipped with a heating jacket can be heated with steam, at a maximum pressure of 10 bar, or with diathermic oil up to 250°C. Pumps with more than one heating jacket can be connected in series or in parallel.
- 1.14 We recommend the installation of a vacuum gauge and a pressure gauge near the suction and delivery flanges. This installation is easy to apply due to the presence of special connections with which the pumps are equipped. The vacuum gauge and the pressure gauge are valid tools to find the possible causes of problems with the pump or system.
- 1.15 The directly connected electric motors must be protected with safety switches which must be calibrated at +10% in comparison to the maximum current indicated on the motor plate. Make sure the surrounding environment is adequately ventilated (see the engine manufacturer's instructions).
- 1.16 Electric motors controlled by an inverter must have thermocouples. These must be installed in the inverter and calibrated specifically so as not to overheat motors.
- 1.17 The pump must be connected to earth. To do this, use one of the four screws that fix the pump to the base. To ensure the connection, scrape off any paint present. Alternatively, some pumps also have a ground terminal. In the case of a Bi Block pump, the terminal on the motor can be used for earthing purposes. As an option, grounding is available on the base already connected to the motor and the pump. Therefore, grounding on the base is sufficient as the sole grounding.
- 1.18 Check that there are no air leaks in the pipe/hose connections, in the flange gaskets and in the joints. If necessary, seal with grease.

2. First start-up

- 2.1 Use the pump only within the levels prescribed by the performance curve, technical data and instructions! The liquid should never be pumped to the limits of vaporization, crystallization, polymerization or solidification.
- 2.2 Before the first start-up, we recommend some liquid is introduced into the pump casing. Normally it is already filled with medicinal liquid paraffin. In the case of dry running, you risk damaging the gears.

CAUTION If you are uncertain, if there is liquid in the pump, we recommend filling the pump casing with liquid to be pumped for safety once more before starting the pump. In case of dry running, the pump may be blocked or damaged.

- 2.3 Manually check that the pump turns without problems. In case of a packing set, first loosen the gland.
- 2.4 Check that all the valves in the suction and delivery lines are open.
- 2.5 Start the motor and check the direction of rotation. See Figure 1.



Figure 1 - Direction of rotation





2.6 If the pump is fitted with a safety valve, the cover and the adjustment screw must be on the side of the suction port. If the direction of rotation of the pump is reversed, the position of the safety valve must also be inverted: it is sufficient to unscrew the 4 screws that secure the valve.

CAUTION	This is not possible for chocolate or magnetic pumps! Contact your pump supplier for
	alternative suggestions.

- 2.7 If present, fill +O2 reservoir with quench liquid. See paragraph E.2 "+O2 reservoir" on page 13.
- 2.8 In the case of pumps with a packing set, carefully tighten the gland (Pos. 13) by means of the screw in Pos. 52 (up to a maximum of 10 Nm) and then slightly re-loosen it.



CAUTION Never tighten the packing set gland if it is not aligned. This might cause the shaft to come into contact with the gland with the consequent risk of sparks during the operation.

CAUTION For a safe use of the pump in an ATEX environment it is important to follow the packing set adjustment instructions to prevent the shaft from overheating. A dangerous ignition source could be created.

2.9 Start the pump.

2.10 Check the priming of the pump and wait a few minutes until the pump runs as expected.

CAUTION	Any change in normal working conditions (such as power, temperature, vibrations, noise, etc.) or alarm signals to the system indicate malfunctioning. Immediately inform the maintenance manager in order to prevent the problem from getting worse, directly or indirectly causing serious bodily or material harm.
	**** If in doubt, switch the pump off immediately! ****

- 2.11 Check the pump pressure. In the event of overpressure or lack of pressure, adjust the safety valve. See paragraph G "Safety valve", on page 18.
- 2.12 In pumps with packing set, check for liquid leakage during the running-in phase (about 20 min.) and, if necessary, reduce it by tightening the screws gradually and evenly. The leakage of liquid may be more or less consistent based on pressure, viscosity, temperature and speed. The leakage can be reduced to get only a few drops of liquid per minute.

CAUTION	The pump must never run dry, without leaks. This would increase the temperature, a very risky situation when operating with dangerous substances. A dangerous source of ignition could be created.

2.13 It is necessary to check the noise and correct operation of the pump at the following time intervals: 10 min. / 1 hour / 10 hours / 1 day / 1 week / 1 month. The check can then be carried out at monthly intervals, unless the conditions of use change.



3. Start-up

- 3.1 Start and stop the pump as required. The pump is designed for 6 starts an hour. More frequent starting cycles must be approved by the pump manufacturer.
- 3.2 If the suction line is empty, the pump first sucks in air and then the liquid.
- 3.3 In the event of a stoppage, the liquid in the pipes/hoses could come back.
- 3.4 Check the operation and noise level of the pump starting from commissioning at the following time intervals: 10 min. / 1 hour / 1 day / 1 week / 1 month. The check can then be carried out at monthly intervals, unless the conditions of use change. In ATEX zone operation, check the bearing above all.

4. Operating problems

4.1 In the event of operating problems, first of all, always check the pressure of the suction and delivery lines, an operation that can be easily performed since the pump flanges are equipped with ¹/₄" connections for pressure gauge and vacuum gauge.

4.2 THE PUMP DOES NOT START. Possible causes:

- (a) Wrong rotation direction (see paragraph D.2.5 on page 9).
- (b) Pump casing not sealed because it has no liquid (see paragraph D.2.1 on page 9. The vacuum gauge hardly moves. If the pump self-primes at each priming and has suction problems, we recommend you install a suction trap. Alternatively, a foot valve can be installed in the suction pipe/hose to ensure that there is always liquid inside the pump.
- (c) Suction line with closed valve. Filter or suction line blocked. High vacuum gauge values. Carefully check the suction line.
- (d) Air leaks in the suction line. Check that all flanged or threaded connections are tight.
- (e) The pump fails to expel the air. Check that all valves are open. If necessary, let the air escape by bleeding the delivery pipe.
- (f) Excessive vacuum in the suction line. Reduce the vacuum, for example by reducing the geodetic height of the pump.
- (g) Rotation speed too low. In the case of liquids with viscosity lower than 20 mm²/s (cSt), the rotation speed should not be less than ⅓ of the rated speed.
- (h) Safety valve (by-pass) blocked by impurities in the open position. Clean the valve and its seat.

4.3 **LOW FLOW**. Possible causes:

- (a) Rotation speed too low. Check if the rotation speed is sufficient to obtain the required flow rate.
- (b) Clogged suction line or filter. Vacuum gauge values are high. Cavitation.
- (c) Air leaks in the suction line. The vacuum gauge and the pressure gauge oscillate. Check connections, threads, gaskets, welds, etc. It is very difficult to identify air leaks in the suction line. They are almost invisible in case of low pressure in the suction line.
- (d) The pressure of the safety valve is set too low and part of the liquid gets back into circulation. Tighten the adjustment screw (see paragraph G "Safety valve" on page 18). The pressure gauge will indicate a higher pressure value.
- (e) The suction pipe is not sufficiently immersed in the liquid thus allowing air to enter the suction line. The vacuum gauge oscillates.
- (f) The viscosity of the liquid is too high. Vacuum gauge values are too high. Cavitation. Reduce the viscosity of the liquid by heating it or increasing the diameter of the suction line.
- (g) Excessive suction pressure or excessive pressure drop in suction. Vacuum gauge values are high. Cavitation. Reduce the suction static thrust and shorten the suction line as much as possible, eliminating unnecessary valves, bends and reductions.
- (h) Air passes through the packing set or mechanical seal. Tighten or replace the packing set, or replace the mechanical seal. This drawback occurs mainly when the delivery pressure is lower than the suction pressure.
- (i) Incorrect axial pump adjustment. Adjust it again. See paragraph E.6 "Rotor axial adjustment" on page 14.
- (j) Pump internal parts too worn. Contact the pump Manufacturer.



4.4 **EXCESSIVE NOISE - CAVITATION.** Possible causes:

- (a) Clogged suction line. Vacuum gauge values are very high. Locate and remove the obstruction cause. Open the valves fully.
- (b) Clogged filter. Check and clean.
- (c) Rotation speed too high for the liquid viscosity. Warm the liquid up to reduce its speed. Increase the diameter of the suction pipe/hose. Reduce the motor revs. Change the pulleys or gearbox ratios.

4.5 **ENGINE OVERLOAD**. Possible causes:

- (a) Delivery line valves partially closed. Gauge values are high. Check all valves.
- (b) Delivery pipe/hose blocked or too small in diameter. Gauge values are high. Locate and clean the cause of the obstruction or change the pipe/hose.
- (c) Gland too tight. Shaft and packing set overheated. Loosen the gland (see paragraph E.3.2 "**Packing set**:" on page 13).
- (d) Liquid with higher viscosity or density than the one for which the pump was produced. Reduce the viscosity of the liquid. Reduce the rotation speed. Increase the diameter of the delivery pipe/hose or install a more powerful motor.
- (e) The bushing of the shaft or idler tends to seize and block the pump. Grind the shaft or pin and bore the bushings to allow greater tolerances. Contact the pump Manufacturer.

4.6 **EXCESSIVE WEAR**. Possible causes:

- (a) Liquid containing objects with a diameter larger than 0.5÷1 mm. Install a suction filter. Liquid containing abrasive impurities. Reduce the motor revs. In the case of abrasive liquids, the rotation speed should be reduced by ⅓ compared to the rated speed.
- (b) Excessive pressure. With abrasive liquids the pressure should not exceed 4 bar.
- (c) Pump version not compatible with the pumped liquid. The pump is corroded by corrosive liquids. Example: solvents pumped with a pump suitable for oils.
- (d) Torsion due to the weight of the pipes/hoses transmitted directly to the pump casing. Joints not aligned. V-belt too narrow. Shaft overloaded. Base not flat.

4.7 **MAGNETIC COUPLING SLIPS.** Possible causes:

- (a) Torque too high. Check pressure and viscosity.
- (b) Starting torque too high. Install a soft starter or inverter.
- (c) Pump blocked. Check the rotor and the idler.
- 4.8 **For any other type of operating problem**, contact the pump supplier stating:
 - \Rightarrow Pump type
 - \Rightarrow Pump serial number
 - \Rightarrow Problem
 - \Rightarrow Operating time
 - \Rightarrow If possible, attach photos of both the pump and pipes/hoses.



E. Maintenance

1. Maintenance

- 1.1 After starting, it is necessary to check the noise and correct priming of the pump at the following time intervals: 10 min. / 1 hour / 10 hours / 1 day / 1 week / 1 month. The check can then be carried out at monthly intervals, unless the conditions of use change.
- 1.2 Every month: if present, check and calibrate the packing set. See paragraph E.3.2 "**Packing set**:" on page 13.
- 1.3 Every month: check the noise and wear of the ball bearing (Pos. 38). Replace as required. As a source of risk of explosion due to excessive temperature, check carefully after a leak of the shaft seal that the bearing has not been damaged.
- 1.4 Every month: with double mechanical seals (.6.,, .7.,, .8.. type or cartridge) the quench system must be checked.
- 1.5 Every 3 months: if a lubricator is present, lubricate the ball bearing. See paragraph E.5 "Bearing" on page 14.
- 1.6 Every 3 months: if present, replace the quench liquid of the +O2 reservoir. See paragraph E.2 "+O2 reservoir" on page 13.



- 1.7 Every 6 months: clean the pump and the motor. If necessary, check more frequently.
- 1.8 Every 5-10 years: carry out a general overhaul of the pump.

2. +O2 reservoir

- 2.1 The function of the reservoir is to maintain a quench liquid inside the mechanical seal, avoiding any contact between the pumped liquid and the air.
- 2.2 If +O2 is present in the pump code then the pump is arranged for the reservoir. This consists of a metal and glass reservoir with a total capacity of 140ml and a ¼" connection.
- 2.3 In the supply of a new pump, the reservoir is supplied separately together with a bottle with liquid paraffin (of the medicinal type) for the first filling.
- 2.4 The most suitable quench fluids are high density thermostable oils, compatible with the pumped liquid (e.g. liquid paraffin, Vaseline, glycerine, glycol).
- 2.5 Install the reservoir after the ¹/₄" bend, near the seal.
- 2.6 Unscrew the cap of the reservoir and fill, with the quench liquid, up to half the barrel.
- 2.7 The level of the quench liquid can increase or decrease depending on the temperature or tightness of the seal. In the event of liquid leakage, empty half the reservoir and check every day for a week if the mechanical seal is leaking. If this is not the case, replace the mechanical seal.
- 2.8 Every 3-4 months, empty all the liquid through the ¼" cap near the mechanical seal. Then refill the reservoir with new quench liquid.

3. Shaft seal

3.1 The pump is fitted with a single shaft seal, in one of the following versions:

3.2 Packing set:

Over time the wear of the rings (Pos. 49) can increase leakage from the packing set. In this case it is possible to tighten the seal with the screws (Pos. 52). If the gland (Pos. 13) has reached the end of the adjustment, or the leak does not decrease even though the gland has been pressed, it is necessary to replace the sealing rings (element 49). See paragraph E.4.



CAUTION Do not tighten the gland excessively. During operation, some liquid must escape from the packing set If this leakage can cause a risk of corrosion or fire, the pump must be equipped with a mechanical or magnetic seal.

CAUTION Never tighten the packing set gland if it is not aligned. This might cause the shaft to come into contact with the gland with the consequent risk of sparks during the operation.

3.3 Mechanical seal:

- \Rightarrow Single (.4. type): No maintenance or with +O2
- ⇒ Double, tandem (.7.. type): Present with reservoir (see paragraph E.2 "+O2 reservoir" on page 13) or to be used according to "Plan 52" by API.
- ⇒ Double, back-to-back (.8.. type): To be used according to "Plan 53" by API (minimum 1 bar over the pump pressure).
- ⇒ Cartridge: See the separate instructions; normally it can operate with the reservoir or according to "Plan 52" or "Plan 53" by API.
- ⇒ Double balanced double seal (.6.. type): The seal, in order to work, has a lubricator with a spring that keeps the quench chamber at pressure. Alternatively it can operate according to "Plan 51", "Plan 52" or "Plan 53" by API.

3.4 Magnetic seal:

No maintenance required.

4. Replacement of the packing rings

- 4.1 Loosen the screws (Pos. 52) and push the seal gland backwards (Pos. 13).
- 4.2 Remove the old rings (Pos. 49) and clean the seal housing.
- 4.3 Check the wear of the shaft surface and replace it if necessary.
- 4.4 Insert new rings, one after the other, and pre-seal them offsetting the terminals by 180°.



CAUTION	Use only original packing rings. The use of incorrect materials can increase the temperature
	of the seal.

- 4.5 Insert the gland (Pos. 13) and tighten the screw (Pos. 52) manually.
- 4.6 Start the pump as if it were the first priming, following the instructions in the paragraph D.2 "First startup" on page 9, so that the new packing set can work correctly.

5. Bearing

- 5.1 The pump is fitted with bushings that require no maintenance as they are lubricated by the pumped liquid or self-lubricating.
- 5.2 The ball bearing generally requires no maintenance. Some are equipped with ball lubricators and must be lubricated every 500 hours of operation or every 3 months. A small amount of grease is sufficient for lubrication.

6. Rotor axial adjustment

- 6.1 If the pressure or capacity of the pump is not sufficient, the axial clearance of the gears can be changed by adjusting the rotor. This is not possible in the case of magnetic coupling pumps which can be adjusted by thicker cover gaskets (1-3 gaskets).
- 6.2 A high axial clearance is optimal against wear and high viscosity, but not for self-priming and obtaining the required pressure using liquids with low viscosity.

Instructions



Internal gear pumps Type R ATEX

6.3 Adjustment:

- (a) Loosen the screws of the inner bearing cover.
- (b) Tighten the outer bearing cover until the rotor is locked.
- (c) Retighten the inner bearing cover firmly.
- (d) Loosen the screws of the outer bearing cover.
- (e) Tighten the screws of the inner cover as shown in the following table.
- (f) Retighten the outer bearing cover.



Figure 2 - Bearing covers

CAUTION Both bearing covers must be mounted parallel to the seat. They must not be tilted so that they can touch and mark the shaft. Check after the adjustment also turning the shaft. A crooked bearing cover can drag on the shaft and create sparks.

6.4 Table for pumps with a product temperature from -50 °C to 180 °C.

Class		A mm²/s (cSt)		B mm²/s (cSt)		C mm²/s (cSt)		
			<1000		1000÷6000		>6000	
Туре	Screw	Pitch	R	mm	R	mm	R	mm
R 35,40	M8	1.25	1/6	0.2	1⁄3	0.4	1/2	0.6
R 50	M8	1.25	1⁄3	0.4	1/2	0.6	2/3	0.8
R 65	M8	1.25	1⁄3	0.4	1/2	0.6	2/3	0.8
R 80	M8	1.25	1/2	0.6	2/3	0.8	1	1.2
R105	M10	1.5	1/2	0.7	2/3	1	1	1.5
R151	M10	1.5	1/2	0.7	2/3	1	1	1.5
R180	M12	1.75	1/2	0.8	2/3	1.2	1	1.8
R200	M12	1.75	1/2	0.8	2/3	1.2	1	1.8
R250	M16	2	1/2	1	2/3	1.4	1	2

R = screw rotation

Classes:

- A = standard (as supplied normally)
- B = pumps for viscous liquids
- C = pumps for highly viscous liquids
- C+ = wide tolerances for special applications



6.5 Table for pumps with a product temperature exceeding 180 °C.

Class				B mm²/s (cSt)		C mm²/s (cSt)		
					<1000		>1000	
Туре	Screw	Pitch			R	mm	R	mm
R 35,40	M8	1.25			1⁄3	0.4	1/2	0.6
R 50	M8	1.25			1/2	0.6	² /3	0.8
R 65	M8	1.25			1/2	0.6	² /3	0.8
R 80	M8	1.25			2/3	0.8	1	1.2
R105	M10	1.5			2/3	1	1	1.5
R151	M10	1.5			2/3	1	1	1.5
R180	M12	1.75			2/3	1.2	1	1.8
R200	M12	1.75			2/3	1.2	1	1.8
R250	M16	2			2/3	1.4	1	2

R = screw rotation

Classes:

A = not used

- B = standard (as supplied normally)C = pumps for viscous liquids

C+ = wide tolerances for special applications



F. Repairs

1. Introduction

- 1.1 Comply with the recognized technical standards for safe and professional work, in addition to the instructions for use and the mandatory accident prevention regulations applicable at the place of use.
- 1.2 Repair work as well as transport, installation and commissioning must be carried out by qualified personnel or checked by responsible specialists.
- 1.3 Make a note of the reason for the machine stoppage before attempting to repair the pump. This is useful information when you want to send the pump out for repair.
- 1.4 Check if the reason for the shutdown can be caused by the system or solved with simple on-site maintenance, especially in the event of flow and pressure problems (see D.4, "Operating problems", page 11).

2. Disassembling the pump from the system

- 2.1 Before proceeding, consult the system manager to verify the need for special decontamination procedures.
- 2.2 A certain quantity of product always remains in the pump casing. Evaluate the risk during the disassembly phase.
- 2.3 Comply with the notes in the safety information leaflet of the pumped product.
- 2.4 Before disassembling, disconnect the pump electrically. Make sure that nobody can act on the main switch during the work.
- 2.5 Before disconnecting the pump from the pipes, always empty the product from the pump casing, using the appropriate drain plug or port.

3. Repair preparation

- 3.1 If you wish to repair the pump yourself, special knowledge is required. If necessary, contact the manufacturer who offers dedicated courses, instructions and advice.
- **CAUTION** If the pump has pumped toxic or hazardous substances, always wear protective clothing and appropriate protective glasses during disassembly. Breathing apparatus may be required.
- 3.2 If you wish to send the pump to the dealer or manufacturer for repair, keep the following in mind:
 - (a) Empty and wash the pump to remove any residual fluid.
 - (b) Write a report indicating the reason for the repair and the checks carried out before dismantling the pump from the system.
 - (c) Pack the pump securely on a pallet together with a safety card (if necessary).
 - (d) All pumps returned to the manufacturer must be decontaminated and marked with a special label that will state the precautions to be taken during disassembly.

4. After the repair

- 4.1 After the repair in the pump casing there is liquid paraffin which is used to preserve the pump and lubricates it when starting. Before commissioning the pump, please check the presence of paraffin. This is important to avoid damage to the pump during start-up.
- 4.2 Follow the instructions in the D, "Installation" chapter, page 8, to restart the pump.



G. Safety valve

1. Introduction

- 1.1 Internal gear pumps can reach a high pressure that can damage both the pump and the pipes/hoses. The safety valve can prevent the problem of over pressures.
- 1.2 On request, the pump can also be equipped with a safety valve integrated in the pump cover. Alternatively, the pump can be protected by other devices (e.g. external return line, sliding clutch, pressure switch).



Figure 3 - Safety valve (by-pass)

2. Adjustment

- 2.1 In the case of double safety valves, adjust the valves separately, according to the two directions of rotation.
 - (a) Unscrew the cap.
 - (b) Loosen or tighten the adjustment screw to decrease or increase the by-pass calibration pressure. Pay attention to the engine performance. It is possible to carry out the adjustment with the pipes/hoses filled with liquid and while the pump is running since the liquid leaks from the screw are minimal.

CAUTION Do not loosen the screw too much. If the spring is not compressed, the adjustment screw becomes loose. Do not continue to unscrew. Proceed with caution if flammable or corrosive liquids are used.

CAUTION Do not tighten the screw fully. The spring would be too compressed compromising the correct operation of the safety valve.

(c) Screw the cap on.

3. Direction of rotation

- 3.1 The safety valve is calibrated only for one direction of rotation (except for double safety valves of the +YY type).
- 3.2 If you want to change the rotation ask your reference technician for instructions on changing the position of the safety valve.

H. Coupling for Bi-Block Pumps

1. Description

- 1.1 Bi-Block type pumps (Abbreviation .BB.) have a built-in coupling.
- 1.2 For all other couplings check the separate instructions.
- 1.3 The coupling consists of two hubs and a polyamide sleeve.

2. Assembly

- 2.1 The pump-side hub is already fitted and secured.
- 2.2 Insert the sleeve around the pump-side hub.
- 2.3 Insert the hub into the crankshaft as shown until the hub aligns with the shaft end. The toothed part should be placed on the shaft-end side.
- 2.4 Fix the hub on the crankshaft with the dowel with the following values:



2004 000

bood

C

0

2.5 Insert and fix the motor with the flange on the pump as shown below.

3. Maintenance and replacement

3.1 The coupling does not require maintenance. If the pump gets stuck or is overloaded, the sleeve will wear out. In this case it must be replaced with an identical one and the cause of the error must be identified. The hubs are not consumables.











I. Temperature sensor

1. Instructions

- 1.1 In all the pumps (magnetic drive versions excluded) there is a hole in the flanges to fit a pressure gauge and a temperature sensor. In all magnetic pumps there is a hole for the installation of a PT100 temperature sensor.
- 1.2 The sensor monitors the temperature increases of the pumped fluid. This means that a problem in the delivery pipe/hose or abnormal wear can be controlled by increasing the temperature. When the temperature limit is exceeded, the sensor disconnects the supply of energy to the pump which then stops working.
- 1.3 The shut-off device and the relative electrical connections are not included in the supply of the pump, and must be carried out by a qualified technician, in compliance with the EN ISO 80079-37 b1-type system standard.

2. Installation of the sensor in the pump (magnetic drive version excluded)



- 2.1 In all the pumps (magnetic drive versions excluded) the holes for the temperature sensor are on the flange side (Pos. 61). Use the hole at the pump delivery end (discharge flange).Insert the gasket into the sensor thread.
- 2.2 Insert and screw the PT100 temperature sensor into the flange threaded.

3. Sensor installation in magnetic drive pumps

- 3.1 The temperature sensor for magnetic pumps consists of 3 parts: the sensor with the head and the transmitter, the compression fitting and a gasket, if provided.
- 3.2 The holes for the temperature sensor are on the side of the pedestal. Use the most convenient hole for sensor installation.
- 3.3 Screw the sensor connection with the gasket (if provided) into the selected hole up to half the total length of the thread.





- 3.4 Insert the PT100 temperature sensor into the compression fitting until the head touches the shell.
- 3.5 Tighten the small threaded fitting to secure the sensor to the compression fitting.
- 3.6 Secure the compression fitting to the sensor. In this way the spring inside the compression fitting will increase the contact between the head and the shell.

4. Transmitter connections

- 4.1 Insert the supplied special PT100 temperature sensor up to the stop of the threaded fitting and tighten it completely.
- 4.2 The pump manufacturer supplies the sensor (PT100) with a built-in transmitter. The transmitter is set according to the following parameters:

Temperature range	Output signal	Current
0-150 °C	4 - 20 mA, linear	8 - 30 VDC

- 4.3 Connect the transmitter to a reading unit (not included in the supply) with an ATEX 2-wire cable (blue cable).
- 4.4 The sensor assembly must be set to automatically switch the pump off within 5 seconds of exceeding the limit temperature.
- 4.5 The temperature limit value must be set 10°C above the pumping temperature but 5°C below the boiling point of the pumped liquid and must not exceed the following values:

Class of temperature: DIN EN ISO 80079-31	Classification of maximum working temperature * with		
	Packing set seal °C	Mechanical seal °C	Magnetic seal °C
T1	362	362	362
Т2	232	242	242
Т3	132	162	162
Т4	67	107	107

*Caution: This is not the pump limit temperature. To find out the pump limit temperature, see the information in the technical data sheet.

4.6 In the technical data sheet, different values can be specifically permitted if necessary.



Self-priming centrifugal pumps **Type S**



Centrifugal pumps with open impeller **Type C**



Internal gear pumps **Type R**



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