

Operating Manual

Börger Rotary Lobe Pump Classic

AL series

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		- tamp	

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Product Specifications

Machine:	
Product group: Type:	Classic rotary lobe pump Classic AL 25, Classic AL 50, Classic AL 75
	The precise product specifications for your rotary lobe pump can be found in the data sheet enclosed with this operating manual.
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1 General Information

1.1 Introduction

This operating manual is an important aid for the correct and safe operation of the rotary lobe pump.

It contains important information for operating the rotary lobe pump in a safe, proper and economical manner.

Adhering to these instructions will help avoid associated dangers, reduce repair costs and downtimes and increase the reliability and service life of the rotary lobe pump.

The operating manual must be made available at all times. All personnel who work on or with the rotary lobe pump must read and adhere to the manual. This work includes:

- Operation and troubleshooting
- Maintenance (machine care, maintenance and repairs)
- Transportation

1.2 Notes on copyrights and property rights

This operating manual must be treated as confidential. It may only be made accessible to authorized persons. The manual may only be passed on to third parties following written approval from Börger GmbH.

All documents are protected according to the copyright laws. The distribution and reproduction of documents, in whole or in part, plus the exploitation and distribution of all associated content is forbidden unless expressly authorized in writing.

Violations will be prosecuted and may lead to claims for compensation. All rights for exercising industrial property rights are reserved by Börger GmbH.

1.3 Information for the operator

The operating manual is an integral part of the rotary lobe pump. The operator (i.e. the responsible party) is responsible for making the operating personnel aware of this manual.

Additionally, the operator is obligated to ensure the notice and observance of national regulations for accident prevention and environmental protection, plus the notice and observance of supervision and reporting duties taking special operational aspects into account, e.g. regarding work organization, work processes and personnel.

Aside from the operating manual and the currently valid accident prevention regulations in the country of operation and at the installation site, all recognized special regulations for safe and proper operation must be observed.

The operator is not permitted to make or advise any changes, modifications or alterations to the rotary lobe pump without approval from Börger GmbH.

Any spare parts used must comply with the technical requirements specified by Börger GmbH. This is always guaranteed when original spare parts are used. Only original spare parts may be used during the warranty period, failing which the warranty is void.

Only trained or instructed personnel may be assigned to operate, maintain, repair or transport the rotary lobe pump. Clearly define the personnel responsible for operation, maintenance, repair and transportation.

1.4 Training and instruction

As the operator, you are obligated to inform and, if necessary, instruct operating personnel in regard to the applicable legal and accident prevention regulations, as well as the available safety equipment on the rotary lobe pump. This obligation also applies to all other safety equipment on and around the rotary lobe pump. The different technical qualifications of the operating personnel must be taken into account.

The operating personnel must have fully understood the instructions, and adherence to the instructions must be guaranteed. Only then can your personnel work safely and be fully aware of associated risks.

Adherence to instructions must be checked on a regular basis. As the operator, you should therefore have each instructed staff member confirm their training participation in writing.



Sample training topics and a sample form for confirming participation in the training / instruction can be found on the following pages.

Börger GmbH, their regional subsidiaries or your local sales partner will be happy to help you regarding staff instruction. They can also carry out training on the functionality, commissioning, maintenance and repair of the rotary lobe pump on request.

Contact us for a detailed quotation.

1.5 Sample training topics

1. Operational safety Accident prevention regulations General legal regulations General safety instructions Measures in the event of emergencies Safety instructions for operating the rotary lobe pump Using the safety equipment on the rotary lobe pump Safety equipment on and around the rotary lobe pump Explanation of symbols and signs 2. Operating the rotary lobe pump Using the operating elements on the rotary lobe pump Explanation of the operating manual for operating personnel Specific experiences in using the rotary lobe pump Troubleshooting / dealing with malfunctions 3. Repair and maintenance regulations Correct handling of cleaning agents and lubricants Specific experiences regarding repair, maintenance, cleaning and care of the rotary lobe pump

General Information



Confi	Confirmation of Training					
Traini	ing topic:					
Date:		Trainer:	Trainer signature:			
No.	Surname, first name	9	Signature			
1						
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3						
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2 Safety

2.1 General information

The rotary lobe pump has been developed and constructed according to current state-of-the-art technology and recognized safety guidelines in observance of the valid safety regulations in the country of manufacture.

However, operation of the rotary lobe pump may endanger the operating person and cause damage to the pump or other material assets in the following circumstances:

- When operated by untrained or uninstructed personnel
- When not used properly
- When not maintained or repaired properly

2.2 Notes on signs and symbols

The following terms, signs and symbols are used in this operating manual, and indicate particularly important information.



Danger!

Warns of an immediate hazardous situation with unavoidable serious injuries or death as a result if the instructions shown are not strictly adhered to.



Warning!

Warns of a hazardous situation with the possible risk of subsequent serious injuries or death if the instructions shown are not strictly adhered to.



Caution!

Warns of a possible hazardous situation with the risk of subsequent moderate or light injuries and material damage if the instructions shown are not strictly adhered to.





Notice

Indicates a possible hazardous situation or unsafe, dangerous work processes that may lead to damage to the machine or surrounding area.

1

Note

Offers useful information on safe and proper operation.

• Bullet points describe work and / or operational steps. These steps must be carried out from the top down.

— Indents indicate lists.

All instructions and symbols attached directly to the rotary lobe pump (e.g. warning signs, operational signs, all component designations etc.) must be strictly adhered to. They may not be removed and must be kept completely legible.

Some of the diagrams and photographic images used in this operating manual, which are only used to illustrate a function or a particular work step, show a different type of rotary lobe pump. However the functional principle or work step is the same.



2.3 Proper use

The rotary lobe pump is a self-priming, valveless positive displacement pump.

The rotary lobe pump delivers the pumped medium specified in the data sheet continuously, at speed-proportional flow rates, in a gentle, low-pulsation procedure.



Note

The rotary lobe pump or entire unit is configured exclusively for the operating conditions entered in your request / order and specified in the order confirmation and enclosed data sheet.

Therefore, proper use of the pump is restricted to the specified pumped medium, temperatures, speeds and pump output only.

Observe the technical specifications in the data sheet.

Proper use includes compliance with the instructions on

- safety,
- operation and control,
- repairs and maintenance,

specified in this operating manual.

Any other use or use over and above these specifications is deemed as improper use. The operator of the rotary lobe pump is solely liable for any resulting damage.

2.4 Residual risk

Even when all safety instructions are adhered to, there are residual risks involved in operating the rotary lobe pump as detailed below.

All persons that work on and with the rotary lobe pump must be aware of these residual risks and observe the associated instructions to avoid accidents or damage caused by these residual risks.



It may be necessary to remove on-site safety equipment during installation and modifications. This causes a residual risk and potential danger that each operating person must be aware of:



Warning!

Risk of hand injuries when operating the rotary lobe pump!

Automatic movements of the rotary lobe pump during operation may cause hand injuries.

The operating person is obligated to check that all safety equipment is installed and fully functional before operating the rotary lobe pump.



Warning!

Risk of serious injuries caused by the pumped medium spouting out or escaping gases!

Gases or liquids may escape uncontrollably from seals and screw connections.

Especially when the quick-release cover is opened, liquid can spout out at the cover when the pump is pressurized.

Take the appropriate precautions.



Warning!

There may be a considerable danger from the drive of a complete unit, e.g. due to an electric current for an electric drive.

Please read and observe the residual risks described in the operating manual for the drive of this unit.

2.5 Description of the safety equipment

The rotary lobe pump is equipped with the required safety equipment according to the applicable legal guidelines in the country of manufacture, current state-of-the-art technology and recognized safety regulations.



2.5.1 Coupling guard

The rotating shafts between the drive and rotary lobe pump are connected by a coupling, and must be secured by a fixed safety guard against reaching in and blockages caused by falling parts.

Börger GmbH delivers units with couplings and drives including a screw-fixed coupling guard as standard.

This coupling guard may not be removed, and must always be reinstalled carefully following removal due to maintenance.

If your rotary lobe pump is delivered without an installed drive, you must attach the enclosed coupling guard (or another suitable coupling guard) after the drive is installed.

This also applies to the V-belt / chain guards on overhead mounted drive assemblies and the coupling lantern on hydraulic units.

2.5.2 Intermediate chamber with safety plug

The intermediate chamber with safety plug separates the hydraulic pump part from the timing gear. It is used for monitoring the integrity of the mechanical seals on rotary lobe pumps with single-acting mechanical seals.

Overflowing caused by penetrating pumped medium indicates that the mechanical seals must be replaced immediately in order to prevent the pumped medium from entering the gear unit.

The safety opening in the intermediate chamber may only be closed with the safety plug.

When the safety opening is closed tightly, emerging pumped medium cannot escape and will penetrate the gear unit if the mechanical seal is defective. This could damage the gear unit.

2.5.3 Optional monitoring devices

Optional monitoring devices are listed and described in chapter 8 *Accessories*.



2.6 Markings and signs on the rotary lobe pump









Meaning:

Nameplate according to DIN EN 809

Location:

In a clearly visible position on the rotary lobe pump

¹⁾ Different address possible, e.g. when delivered through a subsidiary. CE marking not applicable for incomplete

machines where only a declaration of incorporation may be delivered, and in certain other cases.

Meaning:

Protective ground connection

Location:

On the base frame, to the right of the quick-release cover

Meaning:

Do not leave the opening of the intermediate chamber open. Do not close the opening of the intermediate chamber with a screw.

Location:

In a clearly visible position on the rotary lobe pump

Meaning:

Do not touch rotating pump parts

Location:

In a clearly visible position on the rotary lobe pump



Meaning:

Please read the operating manuals carefully before performing any activity involving the device! Keep for future reference!

Location:

In a clearly visible position on the packaging of the operating manual

2.7 Markings and signs to be attached by the operator

The operator is obligated to label the pumped medium and the flow direction on the rotary lobe pump (see chapter 4.3.5.1).

The operator may also be required to attach additional markings and signs on or around the rotary lobe pump. These additional markings and signs may relate to regulations for wearing personal protective equipment (ear protection), for example.

2.8 Safety instructions for operating personnel

The rotary lobe pump may only be operated while it is in perfect working condition and only for its intended purpose, in a safe and risk-conscious manner having regard to this operating manual. All malfunctions must be rectified immediately, especially those affecting safety.

Every person assigned with commissioning, operation or maintenance work must have fully read and understood this operating manual beforehand – specifically chapter 2, *Safety*. Consulting the manual during work is already too late. This applies especially to personnel that only work occasionally on the pump.

The operating manual must always be kept accessible next to the rotary lobe pump.

No liability will be assumed for any damage and accidents caused by non-compliance with the operating manual.

Adhere to the applicable accident prevention regulations and all other generally recognized safety regulations and guidelines for occupational health at work.



Clearly specify the responsible parties for the various maintenance and repair tasks and adhere thereto. Only then can handling errors be avoided, especially in dangerous situations.

The operator must make personal protective equipment mandatory for operating and maintenance personnel. This especially applies to safety shoes, protective goggles and gloves. Always wear this protective equipment when working on the rotary lobe pump.

Keep long hair tied and do not wear loose clothing or jewelry. There is always a danger of getting caught, pulled in or dragged along by moving parts.

If malfunctions occur on the rotary lobe pump:

- Bring the rotary lobe pump to an immediate halt.
- Secure the pump against accidental restart.
- Report the malfunction to the responsible department / person.

This especially applies to safety-related alterations to the rotary lobe pump.

Observe the maintenance instructions when carrying out maintenance on the rotary lobe pump.

Work on the rotary lobe pump may only be carried out by trained, reliable personnel. Personnel in training or requiring instruction, as well as persons currently in vocational training, may only operate the rotary lobe pump under the constant supervision of an experienced staff member.

2.9 Safety instructions for maintenance and rectifying malfunctions on the rotary lobe pump

Adhere to the prescribed intervals for regular maintenance and inspections or those specified in the operating manual.

Aside from the special tools specified in the spare parts list, suitable customary workshop equipment is essential for carrying out maintenance work.

Modifications, repairs, maintenance and troubleshooting may only be carried out when the rotary lobe pump is switched off. Accidental restarting of the unit must be prevented completely.



To the extent necessary, amply secure the surrounding area when performing maintenance. Cordon off the working area with a red and white safety chain and a warning sign.

Large assemblies and components must be carefully attached and secured to hoists when they are removed or replaced so that associated dangers are minimized. Only appropriate hoists and lifting media in technically perfect working condition with sufficient load capacities may be used.

Never stand under suspended loads.

At the start of maintenance, repairs or machine care, clean any dirt or cleaning agents off the connections and screw connections. Do not use any aggressive cleaning agents. Use lint-free cleaning cloths.

During installation, always tighten any screw connections that have been loosened for maintenance and repair work. Tighten to the prescribed torque, where this is specified.

Dispose of operating materials and replacement parts in a safe and environmentally-friendly manner.

2.10 Information on special dangers

2.10.1 Oil, grease and other chemical substances

When handling oil, grease and other chemical substances, pay attention and adhere to the applicable regulations and safety data sheets issued by the respective manufacturer relating to storage, handling, correct use and disposal.

2.10.2 Noise

The A-weighted equivalent continuous noise level on the workstations is below 80 dB(A) during normal operation of the rotary lobe pump. Higher noise levels may occur at the pump installation site due to local conditions. In this case, the operator is obligated to provide operating personnel with appropriate protective equipment.



3 Product Description

3.1 Construction of the rotary lobe pump



Figure 3.1-1 Rotary lobe pump components

Components:

- 1 Pump chamber
- 2 Intermediate chamber
- 3 Gear chamber



Figure 3.1-2 Construction of the rotary lobe pump

Construction

of the rotary lobe pump (standing):

- 1 Quick-release cover
- 2 Pump casing
- 2.1 Connection flange, inlet (suction side) and outlet (pressure side)
- 3 Rotor
- 4 Timing gear
- 4.1 Oil sight glass
- 4.2 Breather, oil filler for gear unit
- 4.3 Oil drain for gear unit
- 4.4 Two shafts with parallel axes; drive shaft can optionally be at position 0 or 1 (see chapter 3.1.4)
- 5 Shaft seal on pump chamber
- 6 Intermediate chamber (quench)
- 6.1 Filler for quench fluid, safety opening with safety plug
- 6.2 Drain for quench fluid

3.1.1 Quick-release cover



- 1 Quick-release cover
- 2 Ring nuts

Figure 3.1.1 Quick-release cover

3.1.2 Pump casing



Figure 3.1.2 Depths

The Börger MIP principle (Maintenance in Place) starts with the quick-release cover (1):

This cover enables easy access to the interior of the pump casing and to all parts subject to wear in the pump.

The suction line and pressure line remain connected.

The cover can be removed after loosening the four ring nuts (2), see chapter 6.3.1 / 6.3.2.

The pump can be inspected, maintained and repaired directly at its point of installation.

Descriptions for other cover versions, e.g. the Variocap and the cover with groove for the temperature sensor, can be found in the supplementary operating manual in the *appendix*, if these versions were delivered.

The Classic AL rotary lobe pump is available in three casing depths. The performance data of your rotary lobe pump depends on this depth, among other things (see chapter 3.3).

The block-type, one-piece pump casing is equipped as standard with an internal casing protection plate towards the gear unit and one towards the quick-release cover.

The pump casing is manufactured from high-quality gray cast iron, spheroidal cast iron and stainless steel.

The **eighth**, **ninth and tenth positions of the type code** indicate the relevant pump casing design and equipment.



3.1.3 Rotors

A wide variety of different rotors are available for Börger rotary lobe pumps. The rotor type on your rotary lobe pump depends on the operating conditions and the properties of the pumped medium.

The **thirteenth position of the type code** on the nameplate indicates the rotor **design**.

	Туре А	Dual-lobe, linear, polymers Position 9.4 in the spare parts list
C	Type J	Premium rotor, dual-lobe, linear, polymers Position 9.6 in the spare parts list
	Types JS, JE, JJ	Premium rotor, dual-lobe, linear, steel / stainless steel Position 9.6a in the spare parts list

The rotor **material** used in your rotary lobe pump with regard to the resistance to the pumped medium is defined according to the attached data sheet and the **fourteenth position of the type code**.

3.1.4 Timing gear

The rotors are driven synchronously and exactly through the carrier shafts by two gear wheels.

The shafts on the rotary lobe pump are seated on one side inside the carrier gear unit. As the gear unit is completely separate from the pump chamber, disassembly is not necessary for any maintenance work.



Figure 3.1.4 Drive shaft position

Depending on the ordered version, the drive shaft is installed in position 0 or position 1.

The **fifth position of the type code** on the nameplate indicates the design and position of the drive shaft.

The lip seal material on the gear unit is indicated by the **seventh position of the type code**.

The timing gear is equipped with a breather system to compensate for increased pressure due to rising temperatures. The breather system must always be installed on the highest point of the pump, compare the illustrations of the pump versions for the different mounting positions in chapter 3.1.7.

3.1.5 Shaft seal on pump chamber

Börger rotary lobe pumps are equipped as standard with mechanical seals designed specifically for this pump type.These are used to completely seal off the pump chamber from the gear unit, or from the intermediate chamber (see chapter 3.1.6).

These seals can be quickly accessed through the pump chamber without removing the pump, and can be replaced easily.

Mechanical seals are available in a variety of material combinations.

The shaft seal of the pump chamber on your rotary lobe pump is described in the attached data sheet and is indicated by the **twelfth position of the type code**.

Information about any special seals that apply to your pump can be found in the additional documentation in the appendix.



3.1.6 Intermediate chamber (quench)

The pump chamber and gear chamber are separated by an intermediate chamber filled with quench fluid as standard.

The heat-absorbing quench fluid prevents the mechanical seals from running dry and captures any pumped medium that enters the intermediate chamber due to leaks in the shaft seals. This *quench* function also prevents the gear unit from being damaged by intrusion of the pumped medium. Overflowing of the intermediate chamber indicates a seal malfunction.

The rotor/shaft connection is also lubricated with quench fluid, thus preventing corrosion.

The intermediate chamber is sealed from the gear unit with DUO lip seals. The lip seal material is indicated by the **seventh position of the type code**.



Notice

Risk of damage to the gear unit when the intermediate chamber is closed tightly!

The safety opening in the intermediate chamber is used for monitoring the integrity of the mechanical seals, and may only be closed with the safety plug.



Ensure that the safety plug can move out without pressure when the quench is overfilled.

When the safety opening is closed tightly, emerging pumped medium cannot escape and will penetrate the gear unit if the mechanical seal is defective. This could damage the gear unit.



The safety opening on the intermediate chamber can be positioned in a visible location via an extension pipe for special applications, e.g. on submerged pumps.



3.1.7 Designs / Mounting positions

Depending on the mounting position, the position of the oil sight glass, breathers, fill holes as well as the drain holes for the gear unit and for the intermediate chamber can vary.

The mounting position is indicated by the **seventeenth position of the type code**:

- 1 Oil level check on gear unit (oil sight glass / oil dipstick)
- 2 Oil drain for gear unit
- 3 Drain from intermediate chamber
- 4 Fill hole for gear unit, closing: breather system
- 5 Fill hole / safety opening of intermediate chamber, fill level check, closing: safety plug

For mounting position M1, type code 1:

Standing pump, feet at bottom, horizontal shafts



For mounting position M2, type code 2:

Vertical pump, quick-release cover at bottom, feet at side, vertical shafts, drive shaft pointing upwards







On immersion pumps, for example with the following:

- Feet pointing downwards on rectangular flange
- Installation without feet
- Pump without feet

Fill holes with extension pipe (see figure) or completely closed



- 1 Oil level check on gear unit (oil sight glass / oil dipstick)
- 2 Oil drain for gear unit
- 3 Drain from intermediate chamber
- 4 Fill hole for gear unit, closing: breather system
- 5 Fill hole/safety opening of intermediate chamber, fill level check, closing: safety plug

For mounting position M3, type code 3:

Pump upside-down, feet upwards, horizontal shafts



For mounting position M5, type code 5:

Pump turned 90° to the left, feet to the right, horizontal shafts



For mounting position M6, **type code 6:** Pump turned 90° to the right, feet to the left, horizontal shafts





3.1.8 Pipe connections on inlet and outlet:

In most cases, Börger rotary lobe pumps are equipped with pipe connectors on the inlet and outlet that have been specially designed for the different mounting conditions. The inlet and outlet can be equipped with the same or different pipe connectors. Pipe connectors are available with a variety of connections, for example:

- DIN EN flange / DIN flange
- ANSI / ASME flange
- Quarter turn coupling
- Dairy screw connections, and others

The pipe connectors can be equipped with optional additional fittings, e.g. screw socket $G^{1/2}$ " or G 1" for the connection of pressure gauges, shut-off devices or breather systems.

Pipe connectors (sample designs) – Short, straight pipe connector:





– 90° pipe bend

connection towards the front, back, top or bottom:



Gooseneck version
each with connection towards the front, back or side:





- Angled version for narrow installations,
 - connection towards the front, back, top or bottom:



• **Double bend upwards,** connection towards the front, back, top, bottom or side:



A 90° turned rotary lobe pump can be equipped with an *intake hopper on the inlet* for highly viscous, fluid material:





3.1.9 Pump units

Figure 3.1.9-1

coupling

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(10

3

Pump unit with torsionally flexible

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8

The majority of Börger rotary lobe pumps are delivered as a complete unit, i.e. with mounted drive fixed on a base frame. The most common unit variations are as follows:

Standard unit

(8)

(10)

12)

- 1 Börger rotary lobe pump
- 2 Torsionally flexible coupling
- 3 Coupling guard
- 8 Drive (with gear reducer in this example)
- 10 Base frame
- 11 Pipe connector (short, straight pipe connector with flange in this example)
- 12 Motor plate

Overhead mounted drive assembly (piggyback)

- 1 Börger rotary lobe pump
- 4 V-belt pulley / chain drive
- 5 V-belt (up to five belts, depending on the drive) or chain drive
- 6 V-belt / chain guard
- 8 Drive (with gear reducer in this example)
- 10 Base frame
- 11 Pipe connector (short, straight pipe connector with flange in this example)
- 12 Motor plate





Pump unit with hydraulic drive

- 1 Börger rotary lobe pump
- 2 Torsionally flexible coupling
- 7 Hydraulic drive
- 9 Coupling lantern / drive fastening
- 11 Pipe connector (short, straight pipe connector with flange in this example)

Figure 3.1.9-3 Pump unit with hydraulic drive



3.1.10 Options and accessories

A variety of special equipment and additional accessories (cf.chapter 8) are available for the safe operation of the rotary lobe pump.

You can determine whether your rotary lobe pump has special equipment on the nameplate (19th position onwards in type code). You will find explanations referring to the special equipment and any delivered accessories in the appendix.



Notice

Risk of material damage due to non-compliance with the operating manuals for accessories!

If your rotary lobe pump is equipped with special equipment, then you must first read the corresponding supplementary operating manual for the equipment or accessories before carrying out any installation, commissioning or repair work on the pump.

Otherwise, you run the risk of damaging the rotary lobe pump.

3.2 Operating principle of a rotary lobe pump



- 1 Suction chamber
- 2 Transfer from suction chamber to pressure chamber
- 3 Pressure chamber

Figure 3.2 Operating principle

Börger rotary lobe pumps are self-priming, valveless, positive displacement pumps.

The rotors are turned in opposite directions via an external drive using two parallel shafts.

The geometry of the rotors results in a complete separation of the suction chamber (1) and pressure chamber (3).

The synchronous rotation of the rotor pairs creates a vacuum on the priming side of the pump, which can be defined by the direction of rotation of the drive. This vacuum draws the liquid into the pump chamber.

The dynamic transfer (2) from the suction chamber to the pressure chamber allows low-pulsation pumping, and nearly pulsation-free pumping when screw rotors are used.



The pumped medium is forced into the pressure lines on the pressure side (3) through the rotating, intermeshing rotors.

Depending on the rotor type, up to six chamber charges are displaced with each drive rotation.

The symmetrical construction of the rotary lobe pump means that the flow direction can be changed by reversing the direction of rotation, provided this is allowed by the system.

When the rotor pair is at a standstill, the pump seals off almost completely.

3.3 Technical data

Börger rotary lobe pumps are configured individually for the application requirements. This leads to a wide range of variations that have been optimized for specific applications. Therefore, only some of the standard versions can be listed here as examples. Detailed specifications for your rotary lobe pump or unit can be found in the data sheet and the **individual dimensional drawing** sent when the pump was ordered. Please contact Börger customer service if you require a copy of this drawing.

3.3.1 Dimensions

3.3.1.1 Pump without attachment parts



Dimensions of standard Classic AL rotary lobe pump in mm / inches (approx.)

								-	-	-			-		-			
AL	Α	В	C1	D	Е	F	G	н	i	J	κ	L	М	Ν	0	Р	Q	R
25	35 1.38	64 2.52	54 2.13	88 3.46	356 14.02													
50	74 2.91	64 2.52	73 2.87	88 3.46	395 15.55	260 10.24	150 5.91	175 6.89	200 7.87	142.7 5.62	25 .98	67.3 2.65	50 1.97	G1⁄2	105 4.13	G¾	13 .51	107 4.21
75	113 4.45	64 2.52	93 3.66	88 3.46	434 17.09													

AL	Weight:
25	approx. 35.5 kg 78.3 lb
50	approx. 39.0 kg 86 lb
75	approx. 45.0 kg 99.2 lb



3.3.1.2 Pipe connectors



The pipe connectors are designed according to the dimensional drawing created for the order.

We deliver short, straight pipe connectors as standard, with flanges (selectable) according to:

— DIN EN 1092-1,

for some pipe diameters (pump side) according to former DIN 2633, PN 10/16

- ANSI/ASME B 16.5 RF Class 150

Short, straight pipe connectors with connection flange and gasket in mm / inches (approx.)

			Classic pump type										
			AL	25		AL50				AL 75			
	Standard:	DIN / D	DIN EN	ANSI /	ASME	DIN / C	DIN EN	ANSI /	ASME	DIN / [DIN EN	ANSI /	ASME
Nominal diameter:	Dimension:	Α	в	Α	в	Α	в	Α	в	Α	в	Α	в
DN 32 (1¼")		96 3.78	346 13.62	114 4.49	380 14.96	_	—	_	_	_	_	—	_
DN 40 (1 ¹ / ₂ ")		101 3.98	356 14.02	121 4.76	396 15.59	126 4.96	406 15.98	146 5.75	446 17.56	—	—	—	
DN 50 (2")		116 4.57	386 15.2	135 5.31	424 16.69	121 4.76	396 15.59	140 5.51	434 17.09	171 6.73	496 19.53	191 7.52	534 21.02
DN 65 (2½")		111 4.37	376 14.8	135 5.31	424 16.69	121 4.76	396 15.59	146 5.75	446 17.56	141 5.55	436 17.17	165 6.5	484 19.06
DN 80 (3")		141 5.55	436 17.17	146 5.75	446 17.56	136 5.35	426 16.77	156 6.14	466 18.35	131 5.16	416 16.38	151 5.94	436 17.17
DN 100 (4")						141 5.55	436 17.17	165 6.5	484 19.06	141 5.55	436 17.17	165 6.5	484 19.06

Deviations in individual dimensions within an acceptable tolerance due to production cannot be ruled out.

3.3.1.3 Base frame (standard version)



Dimensions (mm / inches)

Α	В	С	C1	D	Е	F	ØG	Ρ
535	70	290	260	440	40	20	14	88
21.06	2.76	11.42	10.24	17.32	1.57	. 79	. 55	3.46

Weight: approx. 15 kg (33.07 lb)



3.3.1.4 Complete unit

The dimensions can be found in the specific dimensional drawing created for the order. The dimensions and weights of the drive and coupling etc. can be found in the corresponding manufacturer's documentation.

The weight of the complete pump unit or pump (as delivered) is specified in the data sheet.

3.3.2 Performance data and maximum loads

The specification of the pump output for which the rotary lobe pump was actually configured can be found in the data sheet.

The **geometric displacement volume** of the pump series is as follows:

AL 25	up to approx. 0.25 I (.066 gal) per rotation
AL 50	up to approx. 0.50 I (.132 gal) per rotation
AL 75	up to approx. 0.75 I (.198 gal) per rotation

The actual pump output depends on several factors, such as pressure, viscosity, speed and pump configuration.

The working pressure and differential pressure for which your rotary lobe pump unit was designed are also specified in the data sheet.

The following limits should be taken into account, especially for rotary lobe pumps delivered without drives:

Limits

AL	Flow rate Q [m³/h / gpm]		Speed n [rpm]		Vacuum ps	Working pressure
	Recommended	Permitted	Recommended	Permitted	Max.	Max.
25	1-6 4-26	0.5-9 2-40	150-400	50-700	-0.7 bar 21" HG vac	10 ^{1) 2)} bar 145 psi
50	4-12 18-53	1-18 4-80	150-400	50-700	-0.7 bar 21" HG vac	8 ¹⁾ bar 116 psi
75	6-18 26-80	2-25 9-110	150-400	50-700	-0.7 bar 21" HG vac	4 ¹⁾ bar 58 psi

Pumps that are switched in series can have a higher maximum permitted working pressure (see data sheet).
12 bar (174 psi) subject to agreement

Maximum differential pressure Δ p, depending on the speed

AL	Speed n [rpm]							
	100	200	300	400	500	600		
25	10 ¹⁾ bar	10 ¹⁾ bar	10 ¹⁾ bar	10 ¹⁾ bar	10 bar	8 bar		
	145 ¹⁾ psi	145 ¹⁾ psi	145 ¹⁾ psi	145 ¹⁾ psi	145 psi	116 psi		
50	8 bar	8 bar	8 bar	8 bar	8 bar	6 bar		
	116 psi	116 psi	116 psi	116 psi	116 psi	87 psi		
75	4 bar	4 bar	4 bar	4 bar	4 bar	2 bar		
	58 psi	58 psi	58 psi	58 psi	58 psi	29 psi		

¹⁾ 12 bar (174 psi) subject to agreement




Forces and torques on metal pipe connectors (short, straight pipe connectors)

Specified		Forces				Torques			
values valid	Pipe nominal diameter (mm)	N max			Nm max				
for / acc. to:		Fx	Fy	Fz	F _(total)	M_{x}	My	Mz	M _(total)
Börger rotary lobe pump	32,40,50, 65, 80, 100	4300	6000	4300	8542	890	770	1070	1590
EN 14847	200		930		1320		500		735

The values Fx, Fy and Fz or Mx, My and Mz may never be used simultaneously as maximum values.

The specified values are calculated, and may deviate in practice due to casting tolerances and structural changes. Therefore, the limits specified in terms of EN ISO 14847 for pipe diameter 200 should not be exceeded.



Notice

Risk of material damage due to stress in the pipes!

Börger rotary lobe pumps are robust, and are constructed for use with high loads. However, the pump must not be used as an anchor point for the pipe under any circumstances.

In particular, misalignment between the pump flange and pipe must not occur, see chapter 4.3.

Even at low vibrations, the stress generated on the pipe during pump operation can lead to cracks on weaker components / weld seams.



4 Transportation, Storage and Installation



Warning!

Dangerous crush injuries are possible during transportation of the rotary lobe pump.

The pump may tilt over and fall due to improper lifting and transportation.

Only use hoists, cranes, auxiliary tools and protective equipment that are suitable for the load.

Never stand under suspended loads.

Observe the weight of the rotary lobe pump unit according to the delivery documentation / data sheet.

The ring bolt on the rotary lobe pump must not be used to lift the complete unit (rotary lobe pump with drive).



A pump without attachment parts can be lifted using the ring bolt.



Standard pump units with electric drives can be transported safely using the methods shown here, for example.

(Schematic drawing; observe specifications for the inclination angle in accordance with the hoist instructions!)

Overhead mounted drive assemblies can be transported safely as shown here.



• If a special base frame with additional lifting lugs was delivered, use the lugs accordingly.

4.1 As-delivered condition

The rotary lobe pump or complete rotary lobe pump unit is delivered in a pre-assembled, packed state. Optional accessories may be included in separate packaging.

- Observe the applicable delivery conditions for the order.
- Check that the delivery is complete when you receive it.
- Inspect the delivery immediately for any signs of transport damage.
- Ensure that the unit is not put into operation in the event of incorrect or incomplete delivery, or transport damage.
- Inform the shipping agent immediately of any transport damage and contact Börger GmbH.

4.2 Storage / interim storage

4.2.1 Storage

If the rotary lobe pump is not used immediately, then appropriate storage conditions are as important as the correct installation and maintenance for subsequent trouble-free operation.

- <u>Always adhere to the following storage conditions</u> for the rotary lobe pump:
 - The storage room must be evenly ventilated and free of dust and vibrations.
 - The relative humidity must be below 65% and the temperature between 15 °C and 25 °C (59 °F and 77 °F)
 - Avoid exposure to direct heat sources (sunlight, heating)
- Repair any damage to the external coating, galvanized components and corrosion protection on bare metal parts caused by external influences.
- Protect the rotary lobe pump from cold, moisture, contamination and mechanical influences.

Close the inlet and outlet connections in particular (flange, coupling etc.), plus any other openings to the interior of the pump with covers impermeable to moisture.

- When the pump is stored for longer periods, rotate the rotating parts several times after about six months (or more often, depending on the storage conditions). This way the gears, bearings and shaft seals are moved and coated again with lubricant.
- Before commissioning / recommissioning at a later date, remove all protective covers and anti-corrosion coatings.

If the device was stored for two years or more, or if the storage conditions detailed above could not be met::

- Replace the gear oil before commissioning.
- Check the O-rings and the elastomer rotors that come into contact with the medium and the mechanical seals and replace them if necessary.

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Note

Börger GmbH recommends contacting Börger customer service in these cases.

• Observe the drive manufacturer's instructions for storing the drive.

4.2.2 Interim storage

For the interim storage of a used pump, the following applies:

- Clean the rotary lobe pump thoroughly.
- Apply suitable corrosion protection to the rotary lobe pump.
- Follow the storage instructions as detailed in chapter 4.2.1.



4.3 Installation

Note

The pipe lengths and nominal diameters must have been defined before the pump was configured.

Check that the original pipe layout has been adhered to before installing the pump.

A change in pipe diameter, length etc. can completely change the suction and pressure conditions in the system.

Börger rotary lobe pumps are configured for different mounting positions. Refer to the diagram in chapter 3.1.7 for the mounting position of your rotary lobe pump.

Depending on the design, it may be necessary to replace the temporary shipping plugs in the intermediate chamber and gear unit with the safety plug (intermediate chamber) and the breather system (gear unit).

- Check all specifications in the technical data sheet and only install the rotary lobe pump if it is suitable for the intended application.
- Apart from the performance data on the rotary lobe pump, also check that the materials are compatible with the pumped medium.
- If available, replace the temporary shipping plug on the gear unit with the breather system.

If your rotary lobe pump was delivered <u>on a base frame without</u> <u>a drive</u>:

- Connect the rotary lobe pump to a suitable drive. Observe the appropriate speed and sufficient torque, and take all necessary parameters into account, such as viscosity, the solid content of the medium, pump pressure, displacement volume and desired flow rate.
- Attach a suitable cover (coupling guard) for the rotating parts.

If your rotary lobe pump was delivered <u>without a drive or base</u> <u>frame</u>:

- Attach the rotary lobe pump to a solid, rigid surface.
- Connect the rotary lobe pump to a suitable drive, see the previous section.

If your rotary lobe pump was delivered without pipe connectors:

(with standard rectangular flanges on the inlet and outlet), the appropriate pipe connectors must be attached as follows:

- Use the following components accordingly:
 - Flange screws (spare parts list, position 58)
 - Spring washers (spare parts list, position 54) for securing the flange screws
 - Seals (gaskets spare parts list, position 25) made from materials compatible with the pumped medium
- Tighten the flange screws used to install the pipe connectors on the pump inlet and outlet. Ensure that the seal is not squeezed out and the spring washers are not damaged.

4.3.1 Positioning



Notice

Risk of damage caused by frost!

Protect the rotary lobe pump and pipe connectors against frost. Ice particles from the pipes can cause damage if they enter the pump chamber.

Standard rotary lobe pump units are installed ready for operation on a rigid base frame together with elastic shaft connections, a coupling guard and pipe connectors.

The recommended space required for maintenance is 1.0 m x 1.0 m (3.28 ft x 3.28 ft).

A space of at least 0.8 m x 0.8 m (2.62 ft x 2.62 ft) is necessary to access the pump easily for maintenance and repair work, see figure 4.3.1.



Figure 4.3.1 Service space

1

Note

Ensure that there is sufficient circulation of air around the drive; see the drive manufacturer's operating manual.

4.3.1.1 Versions with base frames



Note

The nuts underneath the base frame must be accessible with a wrench from the front and back. If realignment is required or a pump is reinstalled on the base frame (e.g. following repairs or replacement), then it must be possible to hold the nuts in place with a wrench.

Only set the base frame in concrete if a suitable special base frame has been delivered as agreed upon in advance.

The surface must be solid, level, clean and dry.

- Position the base frame without subjecting it to stress.
- Compensate for any unevenness in the floor, e.g. by using washers.
- Install the base frame onto the reinforced surface without subjecting it to stress, e.g. using four suitable M10x130 anchor bolts and appropriate resin capsules or four other safe fixing systems suitable for the surface and the application.



4.3.1.2 Other versions

- Mobile pumps must be operated on a solid surface and be secured in place.
- Pumps that are operated on a vehicle must be fixed to the vehicle frame.
- When installing special versions, check whether a supplementary operating manual is enclosed in the appendix and, if so, follow the instructions.

4.3.2 Installing the inlet and outlet

Suitable seals are required for installing the inlet and outlet pipe connectors to the pipes / hoses, i.e. gaskets are required on flange connections. These must be resistant against the pumped medium.

The type, design, nominal diameter and nominal pressure of the connection flanges (or any special connections) are specified in the order confirmation / data sheet. Only suitable counter flanges / connectors may be attached in combination with the appropriate seals.

The pipes to be connected must correspond to the specifications in the order (material, DN, PN, NPSH_A value etc.).

-			
2			
	_		

Note

Pipes to be connected and any additional components such as valves, check valves etc. must not subject the pump and flange connections to stress.

All components must be supported as close to the pump as possible according to the valid general technical rules.



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Note

In order to avoid cavitation, the rotary lobe pump should only have to negotiate a minimal priming height or no priming height at all. The NPSH value on the system (NPSH_{avail.} / NPSH_A) must always be sufficiently larger than the required NPSH value on the pump (NPSH_{reg.} / NPSH_R). The following applies here:

 $NPSH_{avail.} \ge NPSH_{req.} + 0.5 \text{ m} (1.64 \text{ ft}) \text{ or } NPSH_A \ge NPSH_R + 0.5 \text{ m} (1.64 \text{ ft}).$

Depending on the application (e.g. when used with gas-emitting media) and pipe construction, it may be advisable to equip the pipe system with vents at high points.

Ensure that no pockets of air can build up in front of or behind the pump.

- Clean all connection flanges and all other connections before installation and ensure that they are not damaged.
- On flange connections, ensure that the flanges are positioned exactly face to face, even without being fixed by screws. They must not be inclined, nor pressed together, nor spring backwards due to tensile forces.
- Prevent any stress on the pipes connected to the pump by taking suitable measures.
- Use seals that are suitable for the connections.
- Install the connections to the matching pieces on the pipes or hoses without stress. When necessary, apply the appropriate torque for the connection. Consult the manufacturer's instructions for coupling connections.

4.3.3 Aligning the unit

4.3.3.1 On versions with torsionally flexible couplings:

In order to rule out damage caused by displacement, you must check the alignment of the coupling on pump units with gear motors mounted on a base frame after the pump is installed.

Refer to the manual from the coupling manufacturer in the appendix.

Note

The coupling guard is a safety-relevant component.

It prevents personnel from reaching into rotating parts.

- Loosen the fastening screws of the coupling guard.
- Bend up the coupling guard shown here slightly.
- Lift off the coupling guard.
- Check the alignment of the coupling in several positions using a suitable tool (straightedge, laser-optical sensor).
- When necessary, carefully correct any misalignment according to the specifications of the coupling manufacturer, e.g. using the adjusting screws on the motor plate.
- Reattach the coupling guard correctly. Fasten all fastening screws tightly.
- Check the screws used to fasten the pump to the base frame and retighten them, if necessary.

4.3.3.2 On overhead mounted drive assemblies:

1

The correct belt pre-tension or chain tension is necessary for correct belt drive or chain drive functionality and a long service life for the V-belts / chains.

• Observe the specifications from the V-belt or chain manufacturer in the appendix.

Note

The V-belt / chain guard is a safety-relevant component.

It prevents personnel from reaching into rotating parts.







- Open the retaining clamps (2) on the V-belt / chain guard and lift off the protection cover (1).
- Check that the V-belt or chain is positioned correctly and that the pre-tension is correct according to the manufacturer's specifications.
- Put the protection cover (1) of the V-belt / chain guard with the pins back into the corresponding bores of the base frame and fasten the cover with the retaining clamps (2).
- Check the screws used to fasten the pump to the base frame and retighten them, if necessary.

4.3.4 Electrical and hydraulic connection

4.3.4.1 Electrical connection

The rotary lobe pump must be completely installed before establishing the electrical connections.



Note

A machine must be integrated in an emergency stop system.

It is only permissible to do without an emergency stop device if the emergency stop device would not reduce the stopping time and if it would not enable the special measures required to deal with the risk to be taken. The normal shutdown equipment must then be labeled accordingly.



Danger!

Risk of fatal injury due to electric shock!

Electrical connections may only be installed by qualified electricians.

Pay particular attention to all instructions and safety regulations contained in the operating manuals for electronic components in the appendix.

- Connect all electrical monitoring devices and the drive according to the operating manuals from the manufacturers.
- Ground the rotary lobe pump. Use the grounding terminal on the base frame.



4.3.4.2 Hydraulic connection



Warning!

Danger of injuries due to hydraulic oil spurting out under pressure!

Hydraulic connections may only be installed by qualified technicians.

Pay particular attention to all instructions and safety regulations contained in the operating manuals for hydraulic components.

• Connect the hydraulic connections on pump versions with a hydraulic drive according to the operating manual from the drive manufacturer.

4.3.5 Checking the pump functions



Warning!

Risk of serious hand injuries due to rotating parts!

Do not reach into the rotating parts under any circumstances when checking the direction of rotation as detailed below.



Notice

Risk of material damage (to the system) when operating the rotary lobe pump with incorrect direction of rotation!

The rotary lobe pump must not be put into operation during the following function test.

Ensure that all valves and shut-off devices are closed.





Notice

Risk of material damage to the rotary lobe pump due to frictional heat caused by dry run!

A <u>rotary lobe pump</u> with polymer rotors should not run dry, **i.e. without pumped medium**, for longer than 15 seconds at a normal speed under any circumstances. Otherwise, the frictional heat would cause damage to the pump components.

Ensure that the drive is switched on only briefly for the function test and switched off again in time.

4.3.5.1 Flow direction

The flow direction on Börger rotary lobe pumps can be reversed, and is defined by the direction of rotation on the drive.



Figure 4.3.6.1-1 Flow direction RL (View of quick-release cover)

Flow direction from **right to left**, when the **upper** shaft turns counter-clockwise, as shown here.



Figure 4.3.6.1-2 Flow direction LR (View of quick-release cover)

Flow direction from **left to right**, when the **upper** shaft turns clockwise, as shown here.

On non-standing versions (cf. chapter 3.1.7), the flow direction according to figures 4.3.6.1-1 and -2 applies correspondingly when looking at the quick-release cover.



Figure 4.3.6.1-3 Marking of flow direction

• After establishing the electrical connections or the drive, check the **direction of rotation** of the rotary lobe pump and correct it, if necessary:

Transportation, Storage and Installation

- Open the quick-release cover according to chapter 6.3.2.
- Check the direction of rotation on the drive, for example by pressing the switch briefly so that the direction of rotation of the pump can just be determined.
- Switch the drive off again immediately.
- If the direction of rotation is incorrect, change the direction of rotation of the drive.
- Attach the cover-side casing protection plate and quick-release cover in accordance with chapter 6.3.2.
- Mark the selected flow direction (RL or LR) on the pump using the adhesive label provided.

4.3.5.2 Smooth running following storage and long downtimes

Following long storage periods and downtimes, check that the rotors run smoothly before commissioning the pump again (see chapter 6.3.3):

- Open the quick-release cover according to chapter 6.3.2.
- Attach a hexagon socket wrench or ratchet to one of the hexagon socket head cap screws that fasten the rotors to the shafts and rotate the shaft. The shafts and rotors must not become jammed.
- On used pumps, remove any foreign bodies that may cause the rotors to jam. If this does not solve the problem, then removal and possibly replacement of the rotors is necessary (see chapter 6).
- Attach the cover-side casing protection plate and quickrelease cover in accordance with chapter 6.3.2.

4.3.6 Preparation for commissioning

• Ensure that you have removed the **transport lock from the breather system** on the drive if one was present according to the operating manual of the drive manufacturer. Adhere to all instructions from the drive manufacturer regarding commissioning.



- If your pump was delivered with special **accessories**, then ensure that these accessories are installed correctly and ready for operation. This especially applies to devices used for safety and monitoring system functionality. Adhere to the relevant operating manuals in the appendix.
- Check the **oil level** in the pump gear unit. On standing versions, the oil level must reach at least halfway up the oil sight glass (for other designs, see chapter 6.2.2). If this is not the case, the gear oil (cf. data sheet) must be refilled according to chapter 6.2.2.

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Note

The quench fluid is used for monitoring the integrity of the mechanical seals, and for the protection, lubrication and cooling of the mechanical seals (cf. chapters 3.1.5 / 3.1.6) as well as the rotor / shaft connections.

- Check whether the delivered quench fluid (see enclosed data sheet) is suitable or whether an alternative quench fluid must be used in order to observe environmental protection regulations or for biological or other reasons.
 This fluid must be compatible with the pumped medium, and must not adversely affect the O-rings of the mechanical seals. Consult Börger GmbH regarding this, if necessary.
- Check the **level of quench fluid**. On standing versions, the fluid must reach at least halfway up the top shaft. If this is not the case, the quench fluid (cf. data sheet) must be refilled according to chapter 6.2.2.

Notice

Risk of damage to the gear unit when the intermediate chamber is closed tightly!

The safety opening in the intermediate chamber is also used for monitoring the integrity of the mechanical seals, and may only be closed with the safety plug.

When the safety opening is closed tightly, emerging pumped medium from the pump chamber cannot escape through the intermediate chamber and will penetrate the gear unit if the mechanical seal is defective. This could damage the gear unit.

- Check that the **coupling guard** is positioned correctly and fixed securely.
- Ensure that the **supply lines** to the drive are connected and secured according to the relevant regulations.
- Check that the rotary lobe pump unit is grounded.
- Check that the **pipe connectors** are attached correctly and do not leak.
- Check that all **screws**, which may have become loose during transportation and installation, are tight.
- Rectify all errors determined by this check.



5 Operation



Notice

Risk of severe damage to the rotary lobe pump caused by running against closed valves!

The rotary lobe pump should not be run against closed valves under any circumstances.

Running against closed valves will cause lasting damage to your rotary lobe pump.



Notice

Notice

Risk of permanent damage if the pressure / temperature / speed limits are exceeded!

The pressure on the outlet must not exceed the permissible pressure of the pipe system and rotary lobe pump, and must not overload the drive unit and its elastic connections.

The temperature values may not exceed or fall below the limits.

The maximum drive speeds may not be exceeded.

Otherwise, permanent damage to the components cannot be ruled out.



Risk of damage due to blockage of the drive shaft!

Long-fibrous particles and other foreign bodies which might result in a blockage of the drive shaft must not enter the pump chamber. Take the appropriate precautions if necessary (install a macerator / stone trap upstream).

Notice

Risk of damage to the mechanical seal due to a lack of quench fluid!

The heat-absorbing quench fluid prevents the mechanical seals from running dry and captures any pumped medium that enters the intermediate chamber due to leaks in the mechanical seals.

This *quench* function also prevents the gear unit from being damaged by intrusion of the pumped medium.

Make sure that the fill level in the intermediate chamber is sufficient.

Note

Rotary lobe pumps are self-priming positive displacement pumps. However, we recommend filling the pump with medium for suction operation before switching it on. This shortens the priming process and prevents dry run with increased wear. Suitable equipment for filling and venting may be required in the suction and pressure lines. The pump should be prepared so that venting is possible directly behind the pump, on the pressure side, during the initial priming process. If the suction line is flooded with medium (e.g. gravity feed), only the pipes need to be free and all valves open to ensure the unrestricted transportation of pumped medium and any air remaining in the pipe.

5.1 Qualifications for operating personnel

The operating personnel must have been informed or instructed on the applicable legal and accident prevention regulations as well as the safety equipment on and around the rotary lobe pump.



The operating personnel must have fully understood the instructions, and adherence to the instructions must be guaranteed. Only then can all personnel work safely and in full awareness of the associated risks.

- Appoint only trained or instructed personnel.
- Clearly define the personnel responsible for operation, installation, maintenance and repair.
- In addition, also specify the area of responsibility for the operating persons and allow them to reject unsafe instructions from others.

5.2 Commissioning

Note

There might be residues of soft soap in the rotary lobe pump as a result of the manufacturing process and test runs. Dirt caused by packaging and transport cannot be ruled out.

If necessary, thoroughly rinse the rotary lobe pump with a suitable agent as part of the test run (chapter 5.2.1) while adhering to the limits before commissioning the pump for the first time.

5.2.1 Test run with pumped medium

This test run may only be made when all measures detailed in chapter 4 are completed, all errors have been rectified and the functional check without medium (chapter 4.3.5) has shown the desired direction of rotation and the required smooth running.

- Open any pipe shut-off devices on the pressure side and suction side.
- First, switch on all additional devices, especially those with measurement and control functions relevant to safety.
- Switch on the pump drive.
- Check all pipe connectors, the quick-release cover, etc., for leaks.
- Check the correct functionality and display on all additional devices, especially the dry run monitoring.

- Check that the pump runs quietly and vibration-free. If the pump or drive emits uneven, rattling sounds, then the cause must be determined.
- Check the power consumption of the drive. Compare the values with those in the drive operating manual.
- Check the development of noises and temperature on the drive.
- Check the connections for leaks.

After a short run-in period, the rotary lobe pump delivers the flow rate that corresponds to the rated capacity under the prevailing operating conditions.

5.2.2 Complete commissioning

The rotary lobe pump can be operated properly when all functions run correctly and no leaks are detected.



Note

A checklist for commissioning Börger rotary lobe pumps can be found in chapter 9.7.

5.3 Normal operation

Börger rotary lobe pumps are suitable for continuous operation. The specified operating cycle for which the rotary lobe pump was designed can be found in the enclosed data sheet.

- Ensure that no imbalances are caused by improper cleaning, product residue or foreign bodies.
- On pumps that operate with a frequency converter (the manufacturer's operating manual is attached in this case), make sure that the operating speed is sufficiently below the maximum permissible speed (speed limit based on pump configuration, see enclosed data sheet).



5.4 Downtimes

- Switch off the pump drive.
- Close the valves on the suction and pressure line.
- Leave the pumped medium in the pump during normal downtimes, provided the type of medium does not prevent this (e.g. the medium hardens when cooling down).
- Clean the pump in these cases, and before long downtime periods.

5.5 Malfunctions



votice

Permanent damage to components due to a delayed shutdown of the system in the event of malfunctions!

In the event of a malfunction, shut down the pump and all upstream and downstream system components immediately until the cause has been rectified. Otherwise, permanent damage to the components cannot be ruled out.

Troubleshooting

The pump does not	Possible causes	Remedial action
difficulty after a downtime	Pressure-side pipes blocked or closed	 Open the shut-off devices Clean the pressure line
	Sediment of the pumped medium has been deposited in the pump chamber following a lengthy downtime of the rotary lobe pump	Clean the pump chamber
	Long-fibrous or film-like particles have become wrapped around the rotors	 Remove all foreign bodies If necessary, install a macerator (Multicrusher, Multichopper) upstream
	Incorrect parameterization of the control unit or frequency converter	 Correct the settings Check that the frequency converter is suitable (it must emit a constant torque)
	Polymer rotors have expanded and press too strongly against the casing wall	• Determine the chemical composition and temperature of the pumped medium and use rotors made from suitable materials (test plates for testing the expansion are available from Börger GmbH)
	Drive output too low	Install a more powerful drive



The pump does not	Possible causes	R	emedial action
generate suction	Incorrect flow direction / direction of drive rotation	•	Change the direction of drive rotation
	Suction line closed or blocked	•	Open the shut-off devices Clean the suction line
	Suction connection is leaky	•	Tighten the screws on the flange connection cross-wise with uniform strength Check / replace the seal Check the pipes for damage and rectify, if necessary Rule out any leaks on components (pressure gauges, ball valves etc.)
	Suction line completely empty	•	Provide a flooded suction line / start-up volume Lower the pump* / prevent emptying of the pump chamber, e.g. with 90° pipe bend (see chapter 3.1.8)
	Suction height too large (> 8 m / 26.25 ft)*	•	Lower the pump*
	Pipe diameter too large*	•	Adjust the pipe diameter to the pump output of the rotary lobe pump*
	Cross-linked pipes: several / all lines open	•	Only open the shut-off devices of the applicable suction and pressure lines on which the pump is to operate
	Viscosity of pumped medium too high*	•	Reduce the viscosity when possible* Change the pump position* or install an auger upstream
	Build-up of air pockets (pump could not discharge air on pressure side)	•	Provide venting

* Observe the information in chapters 2.3 and 4.3.2.

Continued	Possible	causes	F	Remedial action
generate suction	Rotors have been destroyed			
	—	By wear	•	Replace the rotors
		By dry run	•	Replace the rotors Notice: If the rotors were damaged due to dry run, the mechanical seals should also be replaced.
			•	Determine the cause of dry run and eliminate it
		By foreign bodies	•	Replace the rotors Install a macerator (Multicrusher, Multichopper) and a stone trap upstream, if necessary
	Wear on casing	casing liners or pump	•	Replace worn parts



Note

Observe the note regarding the sequence of the measures at the end of this chapter.

The pump emits	Possible causes	Remedial action
rating noises	Speed too high* (pump chambers only partially filled)	Reduce the speedInstall larger suction lines*
	Foreign bodies in priming area	Remove foreign bodiesInstall a stone trap upstream, if necessary
	Line blocked on suction side	 Clean the line If necessary, install a macerator (Multicrusher, Multichopper) upstream
	Suction height too large (> 8 m / 26.25 ft)*	• Lower the pump*
	Gas-emitting medium	Reduce the speedReduce the suction height
	Pipe not supported / not supported near the pump	• Support the pipes sufficiently, taking the weight of the pumped medium into account
	Coupling not aligned correctly	Align the coupling
	Cam ring (coupling) worn	• Replace the cam ring
	Damage to the pump gear unit or drive gear unit	Contact Börger / the manufacturer
	* Observe the information in chapters	2.3 and 4.3.2.
Liquid escapes	Possible causes	Remedial action
opening	Temperature-related expansion with too much fluid in intermediate chamber	Drain some quench fluid
	Rotor seal damaged	Replace the rotor seal
	Shaft seal on product side damaged	 Replace the mechanical seals or MultiSeal cartridges

Pump output below	Possible causes	Remedial action
the nominal value	Suction height too large (/ 26.25 ft)*	> 8 m • Lower the pump*
	Suction line diameter too large / too small*	 Adjust the pipe diameter to the pump output of the rotary lobe pump*
	Pressure line diameter to small*	 Adjust the pipe diameter to the pump output of the rotary lobe pump*
	Shut-off devices not oper open completely, pipes blocked	 n / not Open the shut-off devices Clean the pipes
	Counter-pressure too hig other reasons	 Reduce the counter-pressure Install pressure monitoring equipment
	Speed too low*	 Increase the speed*
	Viscosity of pumped med too high*	 Reduce the viscosity when possible* Change the pump position* or install an auger upstream
	Rotors have been destroy — By wear — By dry run — By foreign bod	 Replace the rotors Replace the rotors Replace the rotors Notice: If the rotors were damaged due to dry run, the mechanical seals should also be replaced. Determine the cause of dry run and eliminate it Replace the rotors
	, ,	 Install a macerator (Multicrusher, Multichopper) and a stone trap upstream, if necessary
	Wear on casing liners or casing	pump Replace worn parts

* Observe the information in chapters 2.3 and 4.3.2.



Note

In the event of decreased pump output, Börger GmbH recommends first checking the condition of the rotors. Replace the rotors when they exhibit signs of significant wear.

If these measures are not successful and the original pump output is still not reached following the installation of new rotors, the casing protection plates must be inspected.

If one of the gear-side and cover-side casing protection plates exhibits significant signs of wear, it must be replaced, whereby the cover-side casing protection plate can be turned once before replacing it.

If a gap still remains between the rotor body tips and the radial casing wall following the installation of new rotors – while the pump output remains too low – then we also recommend replacing the pump casing.

Before replacing wear parts, take advantage of the possibility of increasing the speed of the pump drive (and thus, the pump output).

On electric motors, this can be an increase in frequency on your frequency converter (this can also be above the mains frequency).

For example, the speed can be varied on some drive types by adjusting the drive speed (hand wheel on the control gear motor or gas lever on the combustion motor) or oil quantity (on hydraulic drives).

Consider the maximum loads as detailed in chapter 3.3.2.

If in doubt, contact Börger customer service regarding the physical limitations of your unit.

)

Note

Contact Börger GmbH if there are other kinds of malfunctions / any other possible causes for malfunctions.



6 Maintenance and Repairs

The *Maintenance and Repairs* chapter is divided into sections on machine care, maintenance and inspection, and repairs.

The instructions described in this chapter are to be understood as the minimum requirements.

Depending on the operating conditions, further work may be necessary to maintain the rotary lobe pump in an optimum condition.

Information on maintenance and repairs for special assemblies can be found in the supplier documentation in the appendix.

The maintenance and repair tasks detailed in this chapter may only be carried out by trained personnel employed by the operator.

Observe the assembly drawing, the spare parts list and the wear parts list in chapter 9.2 to 9.4 when carrying out repairs or ordering spare parts.

Any spare parts used must comply with the technical requirements specified by Börger GmbH, especially if they come into contact with the medium. **This is always guaranteed when original spare parts are used.** Only original spare parts may be used during the warranty period, failing which the warranty is void.

Read and strictly comply with the applicable regulations, manufacturer's safety data sheets and operator's instructions in respect of the storage, handling, use and disposal of oils, grease and other chemical substances.

Dispose of operating materials and replaced parts in a safe and environmentally-friendly manner.

6.1 Machine care

Appropriate machine care helps to maintain the functionality of the rotary lobe pump unit on a long-term basis.

In general, regular cleaning of dust and deposits from all surfaces is sufficient.





Caution!

Risk of burns!

The gear casing and, when the medium has reached certain temperatures, also the pump casing, can become hot and should not be touched during operation.

Only clean the rotary lobe pump when it is at a standstill.

Allow the rotary lobe pump to cool down completely, if necessary.

Avoid dust formation as this contributes to heat build-up.



Notice

Improper cleaning of the rotary lobe pump can lead to malfunctions and damage!

Do not use water jets.

Do not use aggressive cleaning agents, solvents or sandpaper, as these can damage the metallic and plastic surfaces, casing coating and seals.

Do not use metal objects such as scrapers and screwdrivers for cleaning coated machine parts.

Never clean sensitive components with hard scrubbing and strong mechanical pressure.

- Only clean the rotary lobe pump by wiping or brushing it. Use lint-free cleaning cloths.
- When required, use a standard aqueous industrial cleaner.
- Keep all markings on the rotary lobe pump in a legible state at all times.

6.2 Maintenance and inspection

6.2.1 Maintenance and inspection plan

1



Note

Also observe the maintenance intervals detailed in the operating manuals for the drive, coupling, V-belts etc., which are included in the appendix.

In the event of a malfunction, shut down the rotary lobe pump immediately until the cause has been rectified.

The following intervals are **guidelines**. These intervals can be significantly reduced depending on the operating conditions.

Inspection / maintenance	Interval (approx.)	Operating hours (approx.)	Measures
Cleaning the outer surfaces	Ν		See chapter 6.1 <i>Machine</i> care
Visual check for leaks*	D	24	Replace the seals, if necessary
Audible check for smooth running	D	24	Check the suction line, rectify any cavitation Check the rotors and replace, if necessary
Checking the functions and flow rate	W	168	Replace wear parts, if necessary
Checking the oil level of the gear unit on the oil sight glass	Μ	720	Refill, if necessary
Checking the pump and components for tight fit and possible damage	¼ Y	2160	Fasten loosened parts tightly, replace damaged parts
Checking the level and quality of the quench fluid	½ Y	4320	Refill, if necessary
Changing the lubricants	2 Y	10,000	See chapter 6.2.2
	* Inc	ludes check o	f any overflowing quench fluid

N = when necessary M = monthlyD = dailyY = yearlyW = weekly



6.2.2 Lubricant fill level and changing the lubricants

The intervals for changing the lubricants can vary significantly and be reduced considerably depending on the operating conditions, such as high levels of humidity, high temperatures / temperature variations, aggressive atmospheres etc.



Caution!

Danger to health caused by contact with the pumped medium!

The quench fluid can contain pumped medium.

When using dangerous or health-endangering pumped media, take all necessary safety measures when draining and checking the fill level of the intermediate chamber.

- Check the oil level and oil quality in the timing gear on the oil sight glass on a regular basis, according to chapter 6.2.1 or more often depending on the operating conditions. Also check the level and quality of the quench fluid.
- Use an oil dipstick, when necessary.



Note

The quench fluid can rise to the rim of the fill hole due to its **quench function** and depending on the operating temperature.

A leak of a mechanical seal can only be assumed if the liquid overflows.

The fill levels specified below relate to optimal volumes of pure lubricants.



Fill levels (optimum):

Mounting position	Type code 17th position	Gear unit	Intermediate chamber
M1 standing	1	Center of oil sight glass	Top shaft center to covered
M2 vertical	2	Completely filled ^{1) 2)}	Completely filled ^{1) 2)}
M3 upside-down	3	Center of oil sight glass	Approximately up to the 90° bend in the filler
M5, M6 turned 90°	5, 6	Center of oil sight glass	Approximately up to the bend in the filling channel

¹⁾ In this case: Expansion of the gear oil caused by the temperature cannot be compensated. The operating temperature must not exceed the temperature specified in the order.

²⁾ For submerged pumps: approx. 10 cm (3.94") below the edge of the extension pipe

- Change the lubricants after approximately 10,000 operating hours (or earlier, depending on the operating conditions) or after two years, whichever occurs first.
- Change the lubricants earlier if they are heavily contaminated.

Notice

Risk of material damage caused by using wrong lubricants!

Observe the detailed specifications and instructions on changing the lubricants in the **<u>lubricant list in the appendix</u>**, which is part of this operating manual, as well as the specifications in the data sheet regarding the lubricant used.

Due to the possibility, though unlikely, of quench fluid entering the pump chamber and thus intruding on the process itself, the quench fluid must be compatible with the pumped medium in addition to the other materials (O-rings).

- Observe the repair instructions in chapter 6.3.1.
- Shut down the rotary lobe pump.



- Use a safe drip pan when draining used lubricant.
- Position of drain and fill holes: See chapter 3.1.7.
- Observe the following fill quantities:

Fill quantities:

Mounting position	Type code 17th position	Gear unit	Intermediate chamber
M1 standing	1	approx. 370 ml (.098 gal)	approx. 270 ml (.071 gal)
M2 vertical	2	approx. 750 ml (.198 gal)	approx. 370 ml (.098 gal)
M3 upside-down	3	approx. 370 ml (.098 gal)	approx. 270 ml (.071 gal)
M5, M6 turned 90°	5, 6	approx. 370 ml (.098 gal)	approx. 270 ml (.071 gal)

Note

Do not leave the intermediate chamber open.

It may only be closed with the safety plug which must be able to move out without pressure when the quench fluid overflows.

- Properly close the fill hole of the intermediate chamber with the safety plug.
- Reattach the breather system on the gear unit correctly (cf. chapter 4.3.6).
- When restarting after completing maintenance, observe the instructions in chapter 5.

6.3 Repairs

6.3.1 Notes on repair work



Warning!

Risk of serious hand injuries due to rotating parts!

Shut down the rotary lobe pump before carrying out repair work on the rotary lobe pump and accessories.

Secure the pump against accidental restart, e.g. by disconnecting the electrical drive from the power supply.



Warning!

Risk of serious injuries caused by pumped medium spouting out!

Liquid – when it is still pressurized – can spout out of the gap opening behind the cover while dismounting.

Therefore, wear protective clothing (gloves, goggles) when opening the cover and take all necessary precautions.



Warning!

Danger to health caused by contact with the pumped medium!

You may come into contact with the pumped medium when carrying out repair work.

Adhere to all possible safety regulations relating to the pumped medium.

When necessary, flush the pump and pipes before opening the quick-release cover.





Warning!

Risk of serious injuries caused by falling heavy parts!

Wear suitable protective clothing, especially safety shoes. Secure heavy parts using suitable hoists.



Caution!

Risk of burns!

The gear casing and, when the medium has reached certain temperatures, also the pump casing can become hot and should not be touched during operation.

Allow the system to cool down completely, if necessary.



Note

Observe the assembly drawing of the rotary lobe pump in chapter 9.3.

Repair work on the rotary lobe pump may only be carried out by qualified, authorized specialists employed by the operator.

- Shut down the rotary lobe pump.
- Secure the pump against accidental restart, e.g. by disconnecting the electrical drive from the power supply.
- Close all valves and shut-off devices so that no pumped medium can enter the pump.
- Only replace worn components, seals, screws, nuts etc., but especially the wetted parts, with original spare parts according to the following instructions.
- When restarting after completing repairs, observe the instructions in chapter 5.2.

6.3.2 Opening and closing the quick-release cover



1 Ring nut

2 Quick-release cover

4 Cover-side casing protection plate

5 Stud screw

6 O-ring

The numbers indicated in brackets in the following chapter relate to this figure unless displayed in a more detailed figure next to the text.

Figure 6.3.2-1 Opening and closing the quick-release cover

All parts on the rotary lobe pump that are subject to wear are accessible after the quick-release cover has been removed.

- Read and follow the safety instructions detailed in chapter 2.9 and 6.3.1.
- Switch off the drive and secure it against accidental restart in accordance with chapter 6.3.1.
- Close all valves and shut-off devices so that no pumped medium can enter the pump.

Opening the quick-release cover:

- Use a suitable cover to prevent the medium from spouting out.
- Place a drip pan underneath.
- Loosen the four ring nuts (1) uniformly by approx. 5 mm
 (.20") using a wrench.
- Initially, only open the cover (2) at the bottom (3 on standing versions) by a small gap (approx. 5 mm / .20") to allow all residual pressure to escape and catch any pumped medium that spouts out.
- Completely undo the four ring nuts (1).
- Remove the quick-release cover (2).
- Remove the cover-side casing protection plate (4).



Figure 6.3.2-2






Closing the quick-release cover:

- Check the O-ring (6). Replace the O-ring (6) if it shows signs of damage.
- Clean the O-ring groove before inserting / reinserting the O-ring.
- Press the O-ring seal (6) carefully into position.
- Check the cover-side casing protection plate (4) for wear. If the cover-side casing protection plate (4) exhibits significant signs of wear, it can be turned once. If both sides are already worn, it has to be replaced.
- Attach the cover-side casing protection plate (4).
- Push the quick-release cover (2) over the stud screws (5) and fasten it with the four ring nuts (1).
- Tighten the ring nuts (1) crosswise with uniform strength using a wrench. Take care not to damage the O-ring (6) or to push it out of position. Make sure that the ring nuts (1) are fastened tight enough so they cannot be loosened by hand.

6.3.3 Replacing the rotors

А

M

S



15 Parallel key

The numbers indicated in brackets in the following chapter relate to this figure unless displayed in a more detailed figure next to the text.

Special tools required: ARotor puller

For rotors made from steel or stainless steel:

Z Auxiliary puller with S Outer bores M Threaded bore



Notice

Risk of lasting damage due to

- improper cleaning
- switching on without rotors installed!

If the rotors are not properly installed, the parallel keys cannot reliably fix the rotating seal holding bushes. This may cause permanent damage to the rotary lobe pump.

Do not use pressurized fluid in the pump chamber for cleaning purposes.

Never switch the rotary lobe pump on, even for testing or cleaning, if the rotors are not properly installed, see also chapter 2.9.

• Shut down the rotary lobe pump and open the quick-release cover in accordance with chapter 6.3.2.



А

- Block the rotors by clamping an object with no sharp edges between the rotors, e.g. a lint-free cloth.
- Loosen the hexagon socket head cap screws (1, 13) using a10 mm hexagon socket wrench.

Polymer rotors (9, 10, 11):

- Screw the rotor puller [A, spare parts list, position W2] into the bore of the respective rotor.
- Remove the respective rotor.

Rotors made from steel, stainless steel (2):

- In each case, remove the sealing washer
 (5).
- Remove the respective cover disk (4) and O-ring (3) using a suitable hook or two slotted screwdrivers.







- Unscrew the grub screws (6) from the threaded bores (6.1) • using a 4 mm hexagon socket wrench.
- Screw two screws (M8x25) into the threaded bores (6.1) of the rotor (2) through the outer bores (S) of the auxiliary puller А [Z].
- Screw the rotor puller [A] into the center bore (M) of the auxiliary puller [Z].





Remove the respective rotor.

Note

1

Some quench fluid may escape from between the rotating holding bush and shaft as a result of the normal lubricating function. This is not a malfunction.

Clean and oil the shafts.



- Check the O-rings (14) on the rotating holding bushes and replace them when necessary as detailed in chapter 6.3.5. (Börger GmbH recommends: Always replace the O-rings as well in this situation.)
 - Check the condition and correct positioning of the parallel keys (15) in the shafts; cf. chapters 6.3.5 and 9.6.





- [a] Polymers: Letter according to the 14th position of the type code
- [b] Stainless steel: Hard stamping of the material number



• Compare the quality symbol on the front of new rotors that describes the material with the type code table. Only use rotors made from suitable materials and of the correct type.

- Clean the fit bores of the rotors.
- Lubricate the fit bores of the rotors with a suitable oil / lubricant that is compatible with the medium, and also lubricate the O-ring (14) if its resistance allows this.
 - Attach the (new) rotors:



Rotors made from steel, stainless steel (2):

- On rotors made from steel or stainless steel (2), screw the grub screws (6) back into the threaded bores (6.1).
- Use new O-rings (3) and coat them depending on their resistance, e.g. with oil or flushing agent.
- Use new cover disks (4) if required.
- In each case, push on the cover disk (4) with the O-ring
 (3) correctly fitted into the groove so that the recess points towards the parallel key (15).
- Use new sealing washers (5) for the rotor fastening screws (1).



Premium rotors made from PFA, type JT (11):

- Use new O-rings (12).
- Fit the O-rings (12) onto the rotor fastening screws (13) which have also been replaced if necessary.
 Ensure that each O-ring (12) is correctly fitted into the O-ring groove of the rotor fastening screw (13).
- Screw in the suitable rotor fastening screws (1 or 13, with sealing washer / O-ring if required) and tighten them with a torque wrench.

Torque specifications

M12 steel screws, 10.9	80 Nm (708 in-Ibs)
M12 stainless steel screws A4-70	60 Nm (531 in-Ibs)
M12 Duplex	60 Nm (531 in-Ibs)

• Check that the newly installed rotors run smoothly. The easiest way of doing this is by turning the rotor on the drive shaft clockwise with an appropriate amount of force using a hexagon socket wrench or ratchet.



Note

"Smooth running" means a uniform, trouble-free true-running (concentricity) without any blocking.

When dry, **polymer rotors** can only be rotated with a certain degree of force, as they are positioned close to the pump casing.

Providing the pumped medium and materials used allow this, the rotors can be coated with liquid (e.g. soft soap) for the smooth running check.

- Attach the cover-side casing protection plate and quickrelease cover in accordance with chapter 6.3.2.
- Before releasing the rotary lobe pump, a further short test run of the correct true-running must be made, e.g. by tapping the motor switch.



6.3.4 Replacing other rotor types

If your rotary lobe pump was equipped with a rotor version which has not yet been described in chapter 6.3.3 and where a different procedure is required, then the relevant descriptions can be found in a supplementary operating manual in the appendix.

6.3.5 Replacing the mechanical seals



Figure 6.3.5 Replacing the mechanical seals



- 1 O-ring
- 2 Rotating seal holding bush
- 3 Shaft
- 4 Seal faces
- 5 O-ring
- 6 Lip seal
- 7 Gear-side casing protection plate
- 8 Stationary seal holding bush
- 9 Parallel key
- 10 Fill hole / safety opening of intermediate chamber, with safety plug
- 11 Drain from intermediate chamber

The numbers indicated in brackets in the following chapter relate to this figure unless displayed in a more detailed figure next to the text.

Special tools required:

- 12 Multitool
- special tool for the rotating holding bushes on one side,
- push-in tool for the mechanical seals on the other side (remove handle!)
- Switch off the drive and secure it against accidental restart.
- Close all valves and shut-off devices.
- Loosen the screw plug at the drain hole of the intermediate chamber (11) and drain the quench fluid while adhering to the relevant safety precautions relating to the pumped medium and the quench fluid. See also chapter 3.1.7 regarding the position of the drain screw as well as chapter 6.2.2 and the lubricant list in the appendix for the quench fluid.



- Thoroughly clean the intermediate chamber following a leak in the mechanical seal in order to remove all deposits of the pumped medium from the intermediate chamber and from in front of the lip seals (6). To do this, flush a suitable liquid (water, if appropriate, do not use high pressure!) through the fill hole (10) with the drain (11) open.
- Open the quick-release cover according to chapter 6.3.2.
- Remove the rotors as detailed in chapter 6.3.3.



- Take precautions for <u>pumps turned 90°</u> to ensure the parallel key cannot fall into the inlet / outlet opening.
- Lift each parallel key (9) out of the keyway of the shaft using a suitable tool (e.g. small lever). Make sure that the parallel key is not damaged while doing this.



• Unscrew each rotating seal holding bush (2) using the special tool (Multitool, 12) and pull it off the shaft.



 Remove the seal face (4) with O-ring (5) out of the corresponding rotating seal holding bush (2).



- Remove the seal faces (4) with O-rings (5) out of the stationary seal holding bushes (8) remaining in the pump using a suitable tool (e.g. small lever).
- Clean the O-ring seats with a suitable agent that is compatible with the seal material, quench fluid and pumped medium, e.g. alcohol-based industrial cleaner.



Notice

Risk of consequential damage caused by improper handling of the new seal faces!

Make sure not to damage the sealing surfaces of the new seal faces.

The sealing surfaces must be clean and should not be scratched.

 If delivered separately, fit the O-rings (5) onto the new seal faces (4). The mechanical seals are normally equipped with O-rings on delivery.



Notice

Risk of consequential damage caused by improper handling of the new O-rings!

The O-rings of a mechanical seal must be installed **without oil** or grease.

Otherwise, the sealing function is compromised.



Note

Generally, the mechanical seals equipped with O-rings can be inserted dry. In order to ensure that they are free of grease and to aid insertion, the O-rings can be sprayed lightly, **depending on their resistance**, with a quickly-volatilizing spray cleaner (degreaser) that **leaves no residue**.

- Press one seal face (4) with O-ring (5) into each rotating holding bush (2) using the push-in tool (Multitool, 12) for mechanical seals.
- - Remove the pulling handle from the Multitool (12).
 - Press both remaining seal faces (4) with O-rings (5) into the stationary holding bushes (8) using the push-in tool for mechanical seals (Multitool, 12).
 - Lightly coat the clean sealing surfaces of the seal faces with suitable oil.

Notice

Risk of material damage if the rotating seal holding bushes are installed incorrectly!

First install one rotating holding bush with new mechanical seal completely according to the following description and secure the bush with the parallel key before installing the second rotating holding bush with new mechanical seal on the second shaft.

If the rotating holding bush with thread is not secured when the shafts are turned, the position of the holding bush can imperceptibly change while the second bush is being aligned. Use the special tool / Multitool for the installation.



• On polymer-rotors (with cast sealing washers): Screw in the rotating holding bush (2) flush to the gear-side casing protection plate (7) so that one groove is aligned to the keyway. If not aligned when flush, then unscrew the rotating holding bush until the groove is aligned to the keyway.

On steel/stainless steel rotors:

Screw in the rotating holding bush (2) flush with the gear-side casing protection plate (7) and then unscrew it until the first groove is aligned with the keyway (*figure 6.3.5-2*). The rotating holding bush (2) should then protrude by approximately 0.3 mm (.01").



Figure 6.3.5-2



Notice

Risk of consequential damage if the rotating seal holding bush (2) is unscrewed too far!

The pre-tension on the seal faces required for a correct seal is generated by the correct setting of the rotating holding bush.

Do not unscrew the rotating seal holding bush (2) too far.

• Insert the parallel key (9) so that it fits into the groove of the rotating seal holding bush (2) and the keyway of the shaft (3).

Note

If the parallel key only has one rounded side, then this must be fitted into the groove of the rotating holding bush (2). If the parallel key has a straight front, then this must point towards the quick-release cover.

If the parallel key consists of two pieces, insert the parallel key rounded on both sides so that it fits into the rotating holding bush.

Insert the second parallel key with the straight front pointing towards the quick-release cover.





- Fit the new O-ring (1) onto the rotating seal holding bush (2).
 Only reuse an old O-ring when damage can be completely ruled out.
- Install the second rotating holding bush with new mechanical seal in the same way.



- Clean the fit bores of the rotors and the outer shaft surfaces.
- Lubricate the fit bores of the rotors and the outside surfaces of the shafts with a suitable oil / lubricant that is compatible with the medium, and also lubricate the O-ring (1) if its resistance allows this.
- Install the rotors as detailed in chapter 6.3.3. Observe the proper torque when doing this.
- Check that the rotors run smoothly.
- If the rotating seal holding bush was screwed in too far, then the rotors will rub against the gear-side casing protection plate and will be difficult or impossible to move.
 - Remove the rotors and unscrew the rotating holding bush by ¹/₆th of a turn (one groove).
- If a rotating seal holding bush was not screwed in far enough, the rotors will protrude on the pump cover side. In this case, the rotors will rub or become jammed on the cover-side casing protection plate when the ring nuts are tightened.
 - Ensure that the rotors do not protrude. If necessary, screw in the rotating holding bush further by 1/6th of a turn (one groove).
- Attach the cover-side casing protection plate and quick-release cover in accordance with chapter 6.3.2.
- Check the smooth running of the rotors again by switching on the drive briefly with the quick-release cover closed.

- Make sure that the drain hole (11) of the intermediate chamber is tightly closed.
- Fill the intermediate chamber with quench fluid through the fill hole (10, see chapter 3.1.7 for the position of the fill holes on other models) up to at least the middle of the upper shaft (on standing versions). Adhere to chapter 6.2.2 and the lubricant list in the appendix.
- Close the fill hole (10) of the intermediate chamber with the safety plug.

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Note

Do not leave the intermediate chamber open.

It may only be closed with the safety plug which must be able to move out without pressure when the quench fluid overflows.



6.3.6 Replacing the pump casing



- 1 Pump casing
- 2 Gear casing
- 3 Gear casing cover
- 4 Hexagon socket head cap screw M12x140
- 5 Adapter for coupling guard
- 6 Dowel pin
- 7 Bore for dowel pin
- 8 Disassembly recess
- 9 Pipe connector
- 10 Hexagon socket head cap screws
- 11 Coupling guard
- 12 Base frame
- 13 Screw (factory standard: hexagon socket head cap screw M12x45)
- 14 Stationary holding bush
- 15 Collar on stationary holding bush
- 16 O-ring for stationary holding bush
- 17 Hexagon head screw
- 18 Coupling hub

The numbers indicated in brackets in the following chapter relate to this figure.

Figure 6.3.6: Replacing the pump casing, standard unit

Dependent on extreme usage, eventually the pump casing might show signs of wear which affect the performance of the rotary lobe pump. If this happens, the casing can be replaced.

This section describes the removal of the casing on a standard unit with a torsionally flexible coupling.

The descriptions apply accordingly to overhead mounted drive assemblies and units with hydraulic drives, with certain deviations regarding the drive and access to the through passing hexagon socket head cap screws (4).

Please contact customer service if you require further information here.

- Read and follow the safety instructions detailed in chapter 2.9 and 6.3.1.
- Switch off the drive and secure it against accidental restart.
- Close all valves and shut-off devices.

- Loosen the screws (10) and remove the pipe connectors (9) on the pump inlet and outlet.
- Remove the coupling guard (11) as detailed in chapter 4.3.3.
- Loosen the hexagon socket head cap screws (13) which fasten the gear casing of the rotary lobe pump (2) to the base frame (12).
- Lift up the entire rotary lobe pump.

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Note

Depending on the installation conditions, it may be better not to dismount the rotary lobe pump from the base plate, but the drive. In this case, the drive is loosened and removed from the base plate while the gear casing of the rotary lobe pump remains fastened to the base frame. Subsequent work can then be carried out accordingly.

- Open the quick-release cover according to chapter 6.3.2.
- Remove the rotors as detailed in chapter 6.3.3.
- After emptying the intermediate chamber, remove the mechanical seals as detailed in chapter 6.3.5.
- Remove the gear-side casing protection plate as detailed in chapter 6.3.7.
- Check the gear-side casing protection plate for wear. Only reuse it when it shows no signs of damage. Thoroughly clean the gear-side casing protection plate before reusing it.
- Remove the coupling hub (18) on the pump and any other attached drive / connection elements as detailed in the manufacturer's operating manual.
- Loosen the three hexagon head screws (17) on the adapter for the coupling guard and remove the adapter (5).
- Loosen the four through passing M12x140 hexagon socket head cap screws (4) on the gear casing cover (3).
- Remove the pump casing (1). To to this, insert a suitable tool (lever) into both lateral disassembly recesses (8).
- If removed together with the pump casing (1), remove the dowel pins (6) from the pump casing.



• Press the stationary holding bushes (14) into the pump casing from behind, then remove them.

In most cases, the stationary holding bushes can be reused following thorough cleaning.

- Check and clean the stationary holding bushes (14).
- Fit new O-rings (16, spare parts list, position 33) for the stationary holding bushes (14), which have been replaced, if necessary.
- Coat the O-rings (16) depending on their resistance, e.g. with oil or flushing agent.
- Apply sealing compound (spare parts list, pos. W1) to the gear-side collars (15) of the stationary holding bushes (14).
- Insert the stationary holding bushes (14) uniformly into the new pump casing (1) from the inside (pump chamber), using a plastic mallet when necessary.



(14)

(15)

- Drive two dowel pins (6) into the appropriate bores (7) in the gear casing.
- Apply a suitable amount of sealing compound (spare parts list, position W1) to the contact surfaces on the gear casing (2) and pump casing (1).
- Push the new pump casing (1) over the shafts in such a way that both dowel pins (6) fit into the corresponding bores in the pump casing.
- Strike the pump casing (1) with a rubber mallet until it is flush with the gear casing (2).
- Tighten the four through passing M12x140 screws (4) on the rear wall of the gear casing.
- Install the gear-side casing protection plate (replaced, if necessary) as detailed in chapter 6.3.7.
- Install the mechanical seals as detailed in chapter 6.3.5.
 Börger recommends: Replace the mechanical seals!

- Replace the O-rings (spare parts list, position 31) on the rotating holding bushes, compare chapters 6.3.3 and 6.3.5.
- Reinstall the rotors as detailed in chapter 6.3.3. Observe the proper torque when doing this.
- Attach the cover-side casing protection plate (turned or replaced, if necessary) and quick-release cover in accordance with chapter 6.3.2.
- Attach the adapter for the coupling guard using suitable M10x30 hexagon head screws (17).
- Attach the coupling hub on the pump and / or any other attached drive elements / connection elements as detailed in the manufacturer's operating manual.
- Fill the intermediate chamber as detailed in chapter 6.2.2.
- Position the rotary lobe pump on the base frame (12) and fasten the gear casing onto the base frame using suitable screws (factory standard: M12x45 hexagon socket head cap screws) and washers. Hold the loose nuts on the pump cover side in place using a wrench.
- Attach the pipe connectors (9) on the inlet and outlet of the pump casing using suitable gaskets, screws (10) and spring washers, as detailed in chapter 4.3.
- Align the coupling as detailed in chapter 4.3.3 according to the manufacturer's operating manual.
- Attach the coupling guard (10) as detailed in chapter 4.3.3.
- Consider chapter 4.3 ff. when recommissioning the rotary lobe pump.

6.3.7 Replacing the gear-side casing protection plate



1 O-ring

- 2 Hexagon socket head cap screw
- 3 Gear-side casing protection plate
- 4 Threaded bore

Figure 6.3.6 Replacing the gear-side casing protection plate

- Shut down the rotary lobe pump and open the quick-release cover in accordance with chapter 6.3.2.
- Remove the rotors as detailed in chapter 6.3.3.
- Unscrew the hexagon socket head cap screws (2) from the gear-side casing protection plate (3) using a suitable 6 mm hexagon socket wrench.
- Screw two M10 screws (e.g. M10x20) into the threaded bores
 (4) to loosen the casing protection plate, then remove the plate.
- Clean any sealing compound from the rear wall of the pump casing.
- Apply sealing compound (position W1 in the spare parts list) to that side of the new casing protection plate which faces away from the medium.
- Insert the new gear-side casing protection plate (3) and fasten it using the hexagon socket head cap screws (2).
- Replace the O-rings (1, position 31 in the spare parts list) on the rotating holding bushes.
- Reinstall the rotors as detailed in chapter 6.3.3. Observe the proper torque when doing this.
- Attach the cover-side casing protection plate and quick-release cover in accordance with chapter 6.3.2.



6.3.8 Other repairs

If repairs to the rotary lobe pump are required that are not covered by the described repair and maintenance measures, we recommend contacting Börger customer service.

The factory can only accept repair orders if a completed safety certificate / declaration of decontamination accompany the device submitted for repair, as well as any necessary safety data sheets for the pumped medium and / or cleaning agent. The relevant form is also available as a download from our website under the service menu.

6.3.9 Queries

Börger rotary lobe pumps are easy to maintain. We hope that we have clearly described all the relevant operating steps in this operating manual. However, the applications and variations of Börger rotary lobe pumps are so multi-faceted that a general operating manual cannot answer all questions entirely.

• If you have any questions, please contact Börger customer service. We will be happy to help.

We would also be grateful to receive feedback on any errors or unclear passages in this operating manual. This will help us to improve and develop this document and to offer you and all of our customers the best possible service.

6.3.10 Maintenance instructions for special equipment

• Adhere to all possible supplementary operating manuals in the appendix.

7 Disposal

7.1 Environmental protection



Caution!

Water-polluting materials

Such materials can pollute the soil and groundwater and enter the sewage system.

Comply with the legal obligations regarding waste avoidance and the proper recycling / disposal of waste during all work on and around the machine.

Water-polluting materials such as grease and lubricating oil must not pollute the soil or enter the sewage system, especially during installation, repair and maintenance work.

These materials must be collected, stored, transported and disposed of in suitable containers.

The applicable legal regulations must be strictly adhered to when disposing of operating materials or replacement materials during maintenance or decommissioning of the rotary lobe pump.

7.2 Oil, oily waste and grease

Oil, oily waste and grease pose a significant risk to the environment. Therefore, disposal of such materials must be handled by a specialist company.

• Collect any oil and oily waste and only dispose of them according to the legal requirements through authorized waste disposal companies / authorities.

7.3 Plastics

- Sort any plastic waste as thoroughly as possible.
- Dispose of plastics according to the legal requirements through authorized waste disposal companies / authorities.

7.4 Metals

- Sort and separate different metal types.
- Dispose of these metals according to the legal requirements through authorized waste disposal companies / authorities.

7.5 Electrical and electronic waste

Electrical and electronic waste must be disposed of separately. Electrical and electronic waste must not be disposed of with domestic waste.

• Only dispose of electrical or electronic waste according to the legal requirements through authorized waste disposal companies / authorities, e.g. recycling plants.

7.6 Final decommissioning

• Check which materials can be recycled and make the appropriate arrangements.



8 Accessories

The range of pump accessories provided by Börger GmbH is as multi-faceted as the areas of application for the Börger rotary lobe pump. Only the most frequently requested equipment can be mentioned below.

If your rotary lobe pump was delivered with accessories, the corresponding operating manuals can generally be found in the appendix or in the packaging of the units, if delivered as originally packed.

8.1 Frequency converter

Rotary lobe pumps can be operated with frequency converters.

As on all positive displacement pumps, only frequency converters that deliver a **constant** torque are suitable.

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Note

An external drive cooler may be necessary if the motor frequency is set very low.

8.2 Monitoring equipment

8.2.1 Dry run protection with temperature sensor / conductivity sensor

Long dry run periods (i.e. operation without pumped medium) should be avoided. This especially applies to rotary lobe pumps with polymer rotors. Components on the rotary lobe pump are damaged when frictional heat is generated.

In processes in which dry running cannot be fully excluded, e.g. when containers are emptied using the rotary lobe pump, dry run protection is recommended through a temperature sensor or a conductivity sensor as a level control indicator, both in combination with a connected controller.



Temperature sensor: If the temperature in the pump chamber rises to a preset value due to a lack of pumped medium, the rotary lobe pump / system is switched off by means of a control unit. This then prevents the rotary lobe pump from running dry. PT100 temperature sensors and control units are available from Börger GmbH.

Conductivity sensors measure the electrical conductivity on the pump inlet and switch the rotary lobe pump / system off by means of a control unit when the value drops beneath a specified limit.

8.2.2 Pressure monitoring devices as overpressure protection



Exceeding the permissible maximum pressure can cause lasting damage to parts of the rotary lobe pump and all attachment parts. There is also a risk of leakage and subsequent risks to personnel and the environment, depending on the pumped medium.

Pressure switches / pressure monitoring devices offer protection against damage caused by overpressure. They are used to switch off the rotary lobe pump or system automatically when a preset pressure is exceeded, or to carry out other measures for reducing the pressure.

8.2.3 Pressure relief valve with bypass



By using a bypass with pressure relief valve (safety valve), it is possible to close the pressure line completely for a short period without switching off the pump.

While the pressure line is closed, the pump delivers the medium back to the suction side through the opened pressure relief valve. The causes of overpressure can now be rectified.

When the pressure decreases or the pressure line opens again, the pressure relief valve closes and operation can be continued without delay.



8.2.4 Level monitor with float switch

Float switches and floating magnetic switches are used for monitoring or controlling the fill level, and can also be used for dry run protection (depending on the version).

The *Condor* PSN-X float switch with converter (no protective ground connection) is often used for monitoring the pump processes of filling and emptying, and is stocked by Börger GmbH.

8.3 Auger feed

An auger feed installed in front of the pump inlet with a feed hopper allows non-flowing media that are just able to be pumped to be conveyed in certain cases.

9 Appendix

9.1 Data sheet

The data sheet is included separately from the operating manual. The data sheet contains all relevant data for your Börger rotary lobe pump.

9.2 Wear parts

The following wear parts list includes the quantity, designation and position number (see assembly drawing in chapter 9.3) of the pump elements that are replaced during the corresponding installation and repair work. The complete spare parts list with article numbers (important when ordering) is found in chapter 9.4.

The rotor type and corresponding materials are indicated by the type code on the unit nameplate (see chapters 2.6 and 9.5).

The required number of individual parts will to some extent depend on your rotary lobe pump version. Take note of the number of parts removed from the rotary lobe pump. Please contact Börger GmbH if you have any questions on this matter.

Quantity	Unit	Designation	Pos. no.
2	piece(s)	Rotors	9
1	piece(s)	O-ring for quick-release cover	30
2	piece(s)	O-ring for rotating holding bush	31
0/2	piece(s)	O-ring for cover disk on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	32
0/2	piece(s)	Cover disk for Premium rotors made from steel or stainless steel (types JS, JE, JJ)	24
	piece(s)	Rotor fastening screw	64.1
0/2	piece(s)	Special rotor fastening screw with O-ring groove, for PFA rotors, type JT	64.2a
0/2	piece(s)	Sealing washer for rotor fastening screw on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	74
	piece(s)	O-ring for rotor fastening screw on PFA rotors, type JT	64.2b

Rotor replacement

Replacement of casing protection:				
Quantity	Unit	Designation	Pos. no.	
1	piece(s)	Cover-side casing protection plate	10	
1	piece(s)	Gear-side casing protection plate	11	
1	piece(s)	O-ring for quick-release cover	30	
2	piece(s)	O-ring for rotating holding bush	31	
0/2	piece(s)	O-ring for cover disk on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	32	
2/4	piece(s)	Hexagon socket head cap screw for gear-side casing protection plate	52	
	piece(s)	O-ring for rotor fastening screw on PFA rotors, type JT	64.2b	
0 / 2	piece(s)	Sealing washer for rotor fastening screw on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	74	

Replacement of pump casing

Quantity	Unit	Designation	Pos. no.
1	piece(s)	Pump casing	5
1	piece(s)	O-ring for quick-release cover	30
2	piece(s)	O-ring for rotating holding bush	31
0 / 2	piece(s)	O-ring for stationary holding bush	33
0/2	piece(s)	O-ring for cover disk on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	32
	piece(s)	O-ring for rotor fastening screw on PFA rotors, type JT	64.2b
0/2	piece(s)	Sealing washer for rotor fastening screw on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	74

Replacement of mechanical seals:

Quantity	Unit	Designation	Pos. no.
2	piece(s)	Mechanical seal (2 seal faces, 2 O-rings)	15
1	piece(s)	O-ring for quick-release cover	30
4	piece(s)	O-ring for rotating holding bush	31
0/2	piece(s)	O-ring for cover disk on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	32
	piece(s)	O-ring for rotor fastening screw on PFA rotors, type JT	64.2b
0/2	piece(s)	Sealing washer for rotor fastening screw on Premium rotors made from steel or stainless steel (types JS, JE, JJ)	74

Installation aids:

- Rotor **puller** (spare parts list, position W2)
- Auxiliary puller for rotors made from steel / stainless steel (spare parts list, position W3)
- Multitool (spare parts list, position W4), with special tool for rotating holding bushes on one side and push-in tool for mechanical seals on the other.



Note on ordering spare parts

You can order spare parts by quoting the article number from the enclosed spare parts list.

You can also quote the type code and serial number on the nameplate of the rotary lobe pump when ordering. Börger GmbH will then obtain the information for the appropriate spare parts for you from the production documents of your rotary lobe pump.

Record all modifications made to the pump equipment after the initial delivery in the type code table, such as changes to the rotor material and / or type (see chapter 9.5).

In order to avoid incorrect deliveries, always quote all modifications made when ordering spare parts.

9.3 Assembly drawing

The assembly drawing shows the positions of the spare parts detailed in the spare parts list (chapter 9.4).

The most common wear parts are distinguished by a black border around the position number (see chapter 9.2).





Figure 9.3-1 Assembly drawing





Figure 9.3-2 Tools

The item with position number W3 is used together with item under position W2 and two M8x25 screws.



9.4 Complete spare parts list

The spare parts list is universal and contains many variations of the pump elements. The positioning of the parts can be seen in the assembly drawing. The elements used in your rotary lobe pump are defined according to the type code and all additional specifications in the data sheet.

Observe the article numbers in the separate parts list of the order for special versions, e.g. steel / stainless steel rotors with temperature-dependent undersizes for applications in explosive areas.

9.4.1 AL rotary lobe pump spare parts list

Pos	Art no	Item description	Material	Quantity AL			
105.				25	50	75	
1	A30005	Gear casing, AL	EN-JL1040 (~ASTM A48-40 B, UNS F12801)	1	1	1	
2	A30105	Gear casing cover for top or bottom drive shaft	EN-JL1040 (~ASTM A48-40 B, UNS F12801)	1	1	1	
5	B50115	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801)	1	_	_	
	B50336	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801) nitrided	1	_	_	
	B50366	Pump casing	EN-JS1060 (~A48-45 B, ASTM A536 80-55-06, UNS F33800) laser hardened	1	_	_	
	B50125	Pump casing	1.4517 (~ASTM A 890)	1	-	_	
	B50135	Pump casing	1.4517 (~ASTM A 890) plasma hardened	1	_	_	
	B50215	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801)	-	1	_	
	B50345	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801) nitrided	_	1	_	
	B50376	Pump casing	EN-JS1060 (~A48-45 B, ASTM A536 80-55-06, UNS F33800) laser hardened	_	1	_	
	B50225	Pump casing	1.4517 (~ASTM A 890)	_	1	_	
	B50235	Pump casing	1.4517 (~ASTM A 890) plasma hardened	_	1	_	
	B50315	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801)	-	-	1	
	B50356	Pump casing	EN-JL1040 (~ASTM A48-40 B, UNS F12801) nitrided	-	-	1	
	B50386	Pump casing	EN-JS1060 (~A48-45 B, ASTM A536 80-55-06, UNS F33800) laser hardened	_	_	1	
	B50325	Pump casing	1.4517 (~ASTM A 890)	_	_	1	
	B50335	Pump casing	1.4517 (~ASTM A 890) plasma hardened	-	-	1	
8	B51005	Pump casing cover	EN-JS1030 (~ASTM A536, 60- 40-18, UNS F32800)	1	1	1	
	B51005PT	Pump casing cover with groove for PT 100	EN-JS1030 (~ASTM A536, 60- 40-18, UNS F32800)	1	1	1	
	B51006	Pump casing cover, simple design	1.4571 (~AISI 316 Ti)	1	1	1	
	B51006PT	Pump casing cover, simple design, with groove for PT 100	1.4571 (~AISI 316 Ti)	1	1	1	

Pos.	Art. no.	Item description	Material	Qua	intity A	L
				25	50	75
9.4	R92658	Type A rotor, dual-lobe, linear	FKM	2		
	R92668	Type A rotor, dual-lobe, linear	NBR	2		
	R92678	Type A rotor, dual-lobe, linear	EPDM	2		_
	R92680	Type A rotor, dual-lobe, linear	CSM	2		_
	R92708	Type A rotor, dual-lobe, linear	FKM		2	_
	R92718	Type A rotor, dual-lobe, linear	NBR		2	
	R92728	Type A rotor, dual-lobe, linear	EPDM		2	_
	R92758	Type A rotor, dual-lobe, linear	FKM			2
	R92768	Type A rotor, dual-lobe, linear	NBR			2
	R92778	Type A rotor, dual-lobe, linear	EPDM		—	2
9.6	R92810	Type JP Premium rotor, dual-lobe, linear	PUR black	2		
	R92812	Type JP Premium rotor, dual-lobe, linear	PUR black		2	
	R92814	Type JP Premium rotor, dual-lobe, linear	PUR black			2
	R92830	Type JT Premium rotor, dual-lobe, linear	PFA	2		
	R92832	Type JT Premium rotor, dual-lobe, linear	PFA		2	
	R92834	Type JT Premium rotor, dual-lobe, linear	PFA	-	_	2
9.6a	R89310	Type JS Premium rotor, dual-lobe, linear	1.7225 (~AISI 4140/4142)	2	—	—
	R89312	Type JE Premium rotor, dual-lobe, linear	1.4404 (~AISI 316 L, UNS S31603)	2	_	_
	R89314	Type JJ Premium rotor, dual-lobe, linear	1.4539 (~AISI 904 L, UNS N 08904)	2	_	_
	R89320	Type JS Premium rotor, dual-lobe, linear	1.7225 (~AISI 4140/4142)		2	_
	R89322	Type JE Premium rotor, dual-lobe, linear	1.4404 (~AISI 316 L, UNS S31603)	-	2	_
	R89324	Type JJ Premium rotor, dual-lobe, linear	1.4539 (~AISI 904 L, UNS N 08904)	-	2	_
	R89330	Type JS Premium rotor, dual-lobe, linear	1.7225 (~AISI 4140/4142)	_	_	2
	R89332	Type JE Premium rotor, dual-lobe, linear	1.4404 (~AISI 316 L, UNS S31603)	-	_	2
9.6b	Z41150	Grub screw M8x12, DIN EN ISO 4027	Steel, galvanized	4	4	4
	Z41151	Grub screw M8x12, DIN EN ISO 4027	Stainless steel A4	4	4	4
10	B51015	Cover-side casing protection plate	1.8714 (~XAR 400)	1	1	1
	B51025	Cover-side casing protection plate	1.4571 (~AISI 316 Ti)	1	1	1
	B51026	Cover-side casing protection plate	1.4539 (~AISI 904 L, UNS N 08904)	1	1	1
11	B51055	Gear-side casing protection plate	1.7225 (~AISI 4140/4142)	1	1	1
	B51065	Gear-side casing protection plate	1.4571 (~AISI 316 Ti)	1	1	1
	B51066	Gear-side casing protection plate	1.4539 (~AISI 904 L, UNS N 08904)	1	1	1
13	D55215	Stationary holding bush	1.0503 (~AISI 1045, UNS G10450)	2	2	2
	D55216	Stationary holding bush	1.7225 (~AISI 4140/4142) tempered	2	2	2
	D55225	Stationary holding bush	1.4404 (~AISI 316 L, UNS S31603)	2	2	2
	D55228	Stationary holding bush	1.4539 (~AISI 904 L, UNS N 08904)	2	2	2
	D55217	Stationary holding bush with flushing groove	1.0503 (~AISI 1045, UNS G10450)	2	2	2
	D55227	Stationary holding bush with flushing groove	1.4404 (~AISI 316 L, UNS S31603)	2	2	2
14	D55115	Rotating holding bush with thread	1.0503 (~AISI 1045, UNS G10450)	2	2	2

Appendix

Pos.	Art. no.	Item description	Material	Qua	ntity A	L
				25	50	75
	D55116	Rotating holding bush with thread	1.7225 (~AISI 4140/4142) tempered	2	2	2
	D55125	Rotating holding bush with thread	1.4404 (~AISI 316 L, UNS S31603)	2	2	2
	D55128	Rotating holding bush with thread	1.4539 (~AISI 904 L, UNS N 08904)	2	2	2
	D55115R	Rotating holding bush with thread and backflush grooves, cw	1.7225 (~AISI 4140/4142) tempered	1	1	1
	D55115L	Rotating holding bush with thread and backflush grooves, ccw	1.7225 (~AISI 4140/4142) tempered	1	1	1
	D55125R	Rotating holding bush with thread and backflush grooves, cw	1.4404 (~AISI 316 L, UNS S31603)	1	1	1
	D55125L	Rotating holding bush with thread and backflush grooves, ccw	1.4404 (~AISI 316 L, UNS S31603)	1	1	1
15	D55005	Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55351): NBR	SiSiC/NBR	2	2	2
	D55015	Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55361): EPDM	SiSiC/EPDM	2	2	2
	D55025	Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55371): FKM	SiSiC/FKM	2	2	2
	D55055	* Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55341): FEP/FKM	SiSiC/FEP/FKM	2	2	2
	D55058	Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55381): EEKM	SiSiC/FFKM	2	2	2
	D55059	Mechanical seal: 2 x seal face: SiSiC 2 x O-ring 38x4 (D55391): FEPM	SiSiC/FEPM	2	2	2
16.1	W51115	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with kevway DIN 6885-1	1.7225 (~AISI 4140/4142)	1		
	W51116	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *	1		
	W51215	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.7225 (~AISI 4140/4142)	_	1	_
	W51216	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *	_	1	_
	W51315	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.7225 (~AISI 4140/4142)	_	_	1
	W51316	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *	_	_	1
16.2	W51125	Short shaft	1.7225 (~AISI 4140/4142)	1	—	—
	W51126	Short shaft	1.4571 (~AISI 316 Ti) *	1	—	—
	W51225	Short shaft	1.7225 (~AISI 4140/4142)	_	1	_
	W51226	Short shaft	1.4571 (~AISI 316 Ti) *	_	1	_
	W51325	Short shaft	1.7225 (~AISI 4140/4142)	_	_	1
	W51326	Short shaft	1.4571 (~AISI 316 Ti) *	_	_	1
17.1	W51125	Short shaft	1.7225 (~AISI 4140/4142)	1	_	_
	W51126	Short shaft	1.4571 (~AISI 316 Ti) *	1		_
	W51225	Short shaft	1.7225 (~AISI 4140/4142)		1	
	W51226	Short shaft	1.4571 (~AISI 316 Ti) *		1	
	W51325	Short shaft	1.7225 (~AISI 4140/4142)	_		1
	W51326	Short shaft	1 4571 (~AISI 316 Ti) *			1
17.2	W51115	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.7225 (~AISI 4140/4142)	1	_	_
	W51116	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *	1	_	

Pos	Art no Item description Material		Quantity AL			
1.05				25	50	75
	W51215	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.7225 (~AISI 4140/4142)		1	
	W51216	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *		1	
	W51315	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.7225 (~AISI 4140/4142)			1
	W51316	Shaft with cylindrical shaft end DIN 748-1, Ø 25 mm, with keyway DIN 6885-1	1.4571 (~AISI 316 Ti) *	_	_	1
19	E42305	Gear wheel with keyway, straight teeth, 37 tooth, m=2	1.7225 (~AISI 4140/4142)	2	2	2
24	C90014	Cover disk for rotors made from steel, stainless steel, pos. 9.6a	1.7225 (~AISI 4140/4142)	0/2	0/2	0/2
	C90015	Cover disk for rotors made from steel, stainless steel, pos. 9.6a	1.4571 (~AISI 316 Ti)	0/2	0/2	0/2
25	F92015	Gasket, 2 mm	NBR	2	—	—
	F92025	Gasket, 2 mm	EPDM	2	_	—
	F92035	Gasket, 2 mm	FKM	2	_	—
	F92047	Gasket, 2 mm	PTFE base	2	—	—
	F92115	Gasket, 2 mm	NBR	—	2	—
	F92125	Gasket, 2 mm	EPDM	_	2	_
	F92135	Gasket, 2 mm	FKM	—	2	—
	F92147	Gasket, 2 mm	PTFE base	_	2	-
	F92215	Gasket, 2 mm	NBR	_	_	2
	F92225	Gasket, 2 mm	EPDM	_	_	2
	F92235	Gasket, 2 mm	FKM	_	_	2
	F92247	Gasket, 2 mm	PTFE base	_	_	2
30	O55405	Cover seal, O-ring 155x3 mm	NBR	1	1	1
	O55415	Cover seal, O-ring 155x3 mm	EPDM	1	1	1
	O55411	Cover seal, O-ring 155x3 mm	FKM	1	1	1
	O55436	Cover seal, O-ring 155x3 mm	FEPM	1	1	1
	O55437	Cover seal, O-ring 155x3 mm	FFKM	1	1	1
	O55435	Cover seal, O-ring 155x3 mm	FEP/FKM	1	1	1
	O55460	Cover seal 4x4x155 from 520 mm cord	PTFE	1	1	1
31	O55605	O-ring for rotating holding bush, 34x2.5 mm	NBR	2	2	2
	O55615	O-ring for rotating holding bush, 34x2.5 mm	EPDM	2	2	2
	O55625	O-ring for rotating holding bush, 34x2.5 mm	FKM	2	2	2
	O55636	O-ring for rotating holding bush, 34x2.5 mm	FEPM	2	2	2
	O55635	O-ring for rotating holding bush, 34x2.5 mm	FEP/FKM	2	2	2
	O55645	O-ring for rotating holding bush, 34x2.5 mm	FFKM	2	2	2
32	O55505	O-ring for rotor cover disk (pos. 24), 31x3 mm	NBR	0/2	0/2	0/2
	O55515	O-ring for rotor cover disk (pos. 24), 31x3 mm	EPDM	0/2	0/2	0/2
	O55525	O-ring for rotor cover disk (pos. 24), 31x3 mm	FKM	0/2	0/2	0/2
	O55536	O-ring for rotor cover disk (pos. 24), 31x3 mm	FEPM	0/2	0/2	0/2
	O55535	O-ring for rotor cover disk (pos. 24), 31x3 mm	FEP/FKM	0/2	0/2	0/2
	O55538	O-ring for rotor cover disk (pos. 24), 31x3 mm	FFKM	0/2	0/2	0/2
33	O55705	O-ring for stationary holding bush, 55x3 mm	NBR	2	2	2
	O55715	O-ring for stationary holding bush, 55x3 mm	EPDM	2	2	2
	O55725	O-ring for stationary holding bush, 55x3 mm	FKM	2	2	2
	O55736	O-ring for stationary holding bush, 55x3 mm	FEPM	2	2	2
	O55735	O-ring for stationary holding bush, 55x3 mm	FEP/FKM	2	2	2
	O55740	O-ring for stationary holding bush, 55x3 mm	FFKM	2	2	2
36	S26505	Lip seal with dust protection lip, DIN 3760 form AS, 30x40x7 mm	NBR	1	1	1

Pos.	os. Art. no. Item description Material		Material	Quantity A		
				25	50	75
	S26506	Lip seal with dust protection lip, DIN 3760 form AS, 30x40x7 mm	FKM	1	1	1
37	S26105	DUO double lip seal, 40x62x10 mm	NBR	2	2	2
	S26125	DUO double lip seal, 40x62x10 mm	FKM	2	2	2
40	S24605	Cylindrical roller bearing, NJ2206, DIN 5412	Cage 1.3505 (~AISI 52100)	2	2	2
	S24615	Cylindrical roller bearing (extra long life) NJ2206, DIN 5412 / ISO 281	Cage 1.3505 (~AISI 52100)	2	2	2
41	S24505	Self-aligning roller bearing, 22207, DIN 635	Cage 1.3505 (~AISI 52100)	2	2	2
	S24515	Self-aligning roller bearing (extra long life), 22207, DIN 635 / ISO 281	Cage 1.3505 (~AISI 52100)	2	2	2
42	S26005	Inner ring as shaft protection sleeve, 35x40x20.5 mm	1.3505 (~AISI 52100) hardened	2	2	2
	S26006	Inner ring as shaft protection sleeve, 35x40x20.5 mm	1.4034 (~AISI 420 C) hardened	2	2	2
43	S26705	Inner ring as shaft protection sleeve, 25x30x17 mm	1.3505 (~AISI 52100) hardened	1	1	1
	S26706	Inner ring as shaft protection sleeve, 25x30x17 mm	1.4034 (~AISI 420 C) hardened	1	1	1
46	S24335	Parallel key for gear wheel, DIN 6885-1 A 10x8x28 mm	Steel	2	2	2
50	Z42205	Cover nut, ring nut M12	Steel, galvanized	4	4	4
	Z42206	Cover nut, ring nut M12	Stainless steel			
	Z50344	Cover nut, hexagon nut M12, DIN EN ISO 4032	Steel, galvanized	4	4	4
	Z48216	Cover nut, hexagon nut M12, DIN EN ISO 4032	Stainless steel	4	4	4
52	Z48205	Hexagon socket head cap screw, M8x16, DIN 6912	Steel (10.9)	2	2	2
	Z48206	Hexagon socket head cap screw, M8x16, DIN 6912	1.4571 (~AISI 316 Ti) (A4-70)	2	2	2
	Z48207	Hexagon socket head cap screw, M8x16, DIN 6912	1.4539 (~AISI 904 L, UNS N 08904)	2	2	2
53	Z42105	Stud screw, M12x35, DIN 939	Steel, galvanized	4	4	4
	Z42106	Stud screw, M12x35, DIN 939	Stainless steel (A4)	4	4	4
	Z42110	Stud screw M12x40, DIN 939 On stainless steel pump casing covers	Stainless steel (A4)	4	4	4
54	Z39412	Spring washer B8 (former DIN 127)	Steel, galvanized	8	12	12
	Z39329	Spring washer B8 (former DIN 127)	Stainless steel (A4)	8	12	12
55	Z43505	Dowel pin 12x24, DIN EN ISO 8734	Steel	2	2	2
56	Z43505	Dowel pin 12x24, DIN EN ISO 8734	Steel	2	2	2
57	Z49305	Hexagon socket head cap screw, M12x140, DIN EN ISO 4762	Steel (8.8), galvanized	4	4	4
	Z49306	Hexagon socket head cap screw, M12x140, DIN EN ISO 4762	Stainless steel (A4)	4	4	4
58	Z39411	Hexagon socket head cap screw, M8x25, DIN EN ISO 4762	Steel (8.8), galvanized	8	12	12
	Z39328	Hexagon socket head cap screw, M8x25, DIN EN ISO 4762	Stainless steel (A4)	8	12	12
59	Z49405	Hexagon socket head cap screw, M10x20, DIN 6912	Steel (8.8), galvanized	8	8	8
	Z49406	Hexagon socket head cap screw, M10x20, DIN 6912	Stainless steel (A4)	8	8	8
60	Z39508	Lifting eye bolt M12, DIN 580	Steel, galvanized	1	1	1
	Z39509	Lifting eye bolt M12, DIN 580	Stainless steel	1	1	1
62	S24325	Parallel key for drive shaft, DIN 6885-1 A 8x7x45 mm	Steel	1	1	1
63	Z49025	Parallel key, DIN 6885-1 A modified 8x7x18.5 mm	Steel	2	_	_
	Z49037	Parallel key, DIN 6885-1 A modified 8x7x24 mm	Steel	2	_	_
	Z49035	Parallel key, DIN 6885-1 A modified 8x7x57.5 mm	Steel	_	2	-
	Z49036	Parallel key, DIN 6885-1 A modified 8x7x63 mm	Steel	_	2	_

Pos.	Art. no.	Item description	Material	Qua	ntity A	L
				25	50	75
	Z49045	Parallel key, DIN 6885-1 A modified 8x7x96.5 mm	Steel			2
	Z49046	Parallel key, DIN 6885-1 A modified 8x7x103 (40/63) mm	Steel	_	_	2
64.1	Z49605	Hexagon socket head cap screw, M12x25, DIN 6912	Steel (10.9)	2	2	2
	Z49705	Hexagon socket head cap screw, M12x25, DIN 6912	Stainless steel (A4-70)	2	2	2
	Z49710	Hexagon socket head cap screw, M12x25, DIN 6912	1.4539 (~AISI 904 L, UNS N 08904)	2	2	2
64.2a	Z49706	Hexagon socket head cap screw, M12x25, DIN 6912 modified	Stainless steel (A4-70)	2	2	2
64.2b	O55750	O-ring 15x2.5 mm for rotor fastening screw on PFA rotors, type J	FFKM	2	2	2
65	Z18508	Oil sight glass 1"	Brass	1	1	1
66	Z29305	Screw plug, G %" male, for oil drain, DIN 908	Steel, galvanized	2	2	2
	Z29310	Screw plug, G %" male, for oil drain, DIN 908	Stainless steel (A4)	2	2	2
67	Z19108	Breather system, 1/2"	Steel, galvanized	1	1	1
	Z18408	Oil sight glass, G ½ A (male) (for 90° turned pumps)	Brass	1	1	1
68	Z41100	Grub screw, M6x6, DIN EN ISO 4027	Steel, galvanized	4	4	4
69	Z19508	Safety plug B146	PE	1	1	1
70	K22408	Sealing washer A21x26x1.5, DIN 7603 (for pos. 78)	Cu	1	1	1
71	K32405	Sealing washer A17x23x1.5, DIN 7603 (for pos. 66)	Cu	2	2	2
72	K22208	Sealing washer A33x39x2 (for pos. 65)	Cellulose/NBR	1	1	1
73	K22210	Sealing washer $\frac{1}{2}$ ", for oil sight glass on 90° turned pump (pos. 67)	Cellulose/NBR	0/1	0/1	0/1
74	K32505	Sealing washer A12x18x1.5, DIN 7603, for rotor, pos. 9.6	Cu	2	2	2
	K34002	Sealing washer A12x19x1.6, DIN 7603, for rotor, pos. 9.6	PTFE	2	2	2
77	K33005	Snap ring 72x2.5, DIN 472	Steel	2	2	2
78	Z19308	Screw plug G 1/2" male, DIN 908, gear unit	Steel, galvanized	1	1	1
79	K32405	Sealing washer A17x23x1.5, DIN 7603 (for pos. 80)	Cu	2	2	2
80	Z29305	Screw plug, G %" male, DIN 908	Steel, galvanized	2	2	2

* Delivery time upon request

9.4.2 Tools and installation aids

Pos.	Art. no.	Tool / installation aid	Material	Quantity
W1a	U22308	Sealing compound (50 ml tube)		1
	U22208	Sealing compound (200 ml tube)		1
W2	U32915	Rotor puller	1.0038 (~ASTM A570-36)	1
W3	U32925	Auxiliary puller for dual-lobe rotors made from steel / stainless steel (Premium) *	1.0038 (~ASTM A570-36)	0/1
W4	U22101	Multitool, push-in tool for mechanical seals and special tool for rotating holding bushes	1.0038 (~ASTM A570-36)	1

There is a wide variety of attachment parts, such as the coupling guard and pipe connectors, which are delivered depending on the order. This means that not all variations can be listed here. Always quote the Börger order number or pump number according to the nameplate when ordering spare parts.


9.4.3 Material information on spare parts list

Material	Description	~ Equivalent US market
EN-JL1040	Gray cast iron (EN-GJL-250), DIN EN 1561 (former designation GG 25 / 0.6025)	ASTM A48-40 B, UNS F12801
EN-JS1030	Spheroidal graphite cast iron (EN-GJS-400-15), DIN EN 1563 (Sphäroguss [®] ; <i>former designation GGG 40 / 0.7040</i>)	ASTM A536, 60-40-18, UNS F32800
EN-JS1060	Spheroidal graphite cast iron (EN-GJS-600-3), DIN EN 1563 (Sphäroguss [®] ; <i>former designation GGG 60 / 0.7060)</i>	A48-45 B, ASTM A536 80-55-06, UNS F33800
1.0038	Non-alloy structural steel, hot rolled, DIN EN 10025-2 (former designation St 37)	ASTM A570-36
1.0503	Non-alloy steel for quenching and tempering as per DIN EN 10083-2 (former designation C45)	AISI 1045, UNS G10450
1.2379	Secondary hardening, 12% Cr cold work tool steel	AISI D2
1.3505	Ball and roller bearing steel (100Cr6), DIN EN ISO 683-17	AISI 52100
1.4034	Martensitic stainless steel (X5CrNi18-10), DIN EN 10088	AISI 420 C
1.4301	Austenitic stainless steel, DIN EN 10088, (V2A)	AISI 304
1.4404	Austenitic stainless steel (X2CrNiMo17-12-2), DIN EN 10088	AISI 316 L, UNS S31603
1.4462	Austenitic-ferritic duplex steel (X2CrNiMON22-5-3), DIN EN 10088	ASTM A182 F-51 318LN, UNS S 31803
1.4517	Corrosion-resistant austenitic-ferritic steel casting (GX2CrNiMoCuN25-6-3-3), DIN EN 10283 (Duplex)	ASTM A 890
1.4539	Superaustenitic stainless steel (X1NiCrMoCu25-20-5), DIN EN 10088, (A5)	AISI 904 L, UNS N 08904
1.4571	Austenitic stainless steel (X6CrNiMoTi17-12-2), DIN EN 10088, (V4A)	AISI 316 Ti
1.6220	Steel casting for pressure purposes with specified low temperature properties, G20Mn5 V, DIN EN 10213, (formerly 1.1120, GS2 20 Mn5, DIN 17182)	Steel casting, ASTM A352 LCB
1.7218	Alloy steel for quenching and tempering (25CrMo4), DIN EN 10083-3	AISI 4130
1.7225	Alloy steel for quenching and tempering (42CrMo4V), DIN EN 10083-3	AISI 4140/4142
1.8159	Alloy steel for quenching and tempering (51CrV4), DIN EN 10083-3	AISI 6150
1.8714	Hard metal $(a + b) = b + b + b + b + b + b + b + b + b + b$	_
CSM	(non-wearing special structural steel, trade names: Hardox , XAR 400)	COM
Duronit [®]	Lodoburitic chilled cast iron (60.65 HPC)	COM Duronit [®]
EPDM	Ethylene-propylene-diene rubber (trade marks e.g. Vistalon [®] Keltan [®])	EPDM
FEPM	Tetrafluorine-ethylene-propylene rubber (trade marks e.g. Aflas [®] , Viton extreme [®])	FEPM
FFKM	Perfluoro rubber (previously FFPM; trade marks e.g. Chemraz [®] , Kalrez [®])	FFKM
FKM	Fluoro rubber (previously FPM; trade mark e.g. Viton [®])	FKM
HNBR	Hydrogenated acrylonitrile-butadiene rubber (trade marks e.g. Therban ^{®,} Zetpol [®])	HNBR
HPM™	Bearing material made of PTFE, reinforced with full-length, high-strength coiled fibers, encapsulated in high-strength epoxy resin	HPM TM
NBR	Acrylonitrile-butadiene rubber (trade mark e.g. Buna N [®])	NBR
NR	Natural rubber	NR
PE	Polyethylene	PE
PFA	Perfluoroalkoxy (trade marks e.g. Teflon [®] , Symalit [®] , Hyflon [®])	PFA
PTFE	Polytetrafluoroethylene (trade mark e.g. Teflon [™])	PTFE
PU / PUR	Polyurethane	PU / PUR
SBR	Styrene-butadiene rubber (trade marks e.g. Buna S [®] , Solprene [®])	SBR
SiSiC	Reaction-bonded, silicium-infiltrated silicon carbide with extreme abrasion resistance	SiSiC
TC	Tungsten carbide (normally bonded e.g. with 6% nickel = TC-6N)	TC



9.5 Type code table

The following type code table can be used to identify your pump version.

Observe the additional descriptions in the delivery note, invoice or data sheet for special variations that are not included in the type code.

The letter **X** at any position of the type code indicates that your pump is equipped with a special part at this position, for instance a part made from a different material than those listed in our regular type code.

To facilitate the quick and accurate ordering of spare parts, record the necessary details and all modifications to the pump equipment in the space provided at the end of the type code table. Always indicate any modifications explicitly on every spare part order.

Appendix

BÖRGER.

Type code	1 Equipment group	2 Type	3 Size	4 Gear design	5 Drive shafts	6 Flow direction	7 Lip seals, inner rings	8 Casing	9 Casing protection plates	10 Casing liners	11 Holding bushes	12 Mechanical seals	13 Rotors / blades	14 Rotor / blade material	15 O-rings	16 Flange seals	17 Mounting position	18 Series index	19 Special equipment
1-3	Pur	mp t	ype																
Classic AL 25	Р	Α	2															4	
Classic AL 50	Р	А	5															4	
Classic AL 75	Р	Α	7															4	
Classic / Select PL 100	Р	Р	1															5	
Classic / Select PL 200	Р	Р	2															5	
Classic / Select PL 300	Ρ	Р	3															5	
Classic / Select PL 400	Р	Р	4															5	
Classic / Select CL 260	Ρ	С	2															5	
Classic / Select CL 390	Р	С	3															5	
Classic / Select CL 520	Р	С	5															5	
Classic / Select FL 518	Р	F	5															4	
Classic / Select FL 776	Р	F	7															4	
Classic / Select FL 1036	Р	F	1															4	
Classic FLA 518	Р	L	5															4	
Classic FLA 776	Р	L	7															4	
Classic FLA 1036	Р	L	1															4	
Classic FLA 1540	Р	L	4															4	
Classic FLA 2072	Р	L	2															4	
Classic EL 1000	Р	Е	0															1	
Classic EL 1550	Ρ	Е	1															1	
Classic EL 2250	Р	Е	2															1	
Classic EL 3050	Р	Е	3															1	
Classic XL 1760	Р	х	1															1	
Classic XL 2650	Р	х	2															1	
Classic XL 3530	Ρ	Х	3															1	
Protect PL 100	Ρ	D	1															1	
Protect PL 200	Р	D	2															1	
Protect PL 300	Ρ	D	3															1	
Protect PL 400	Р	D	4															1	
Protect FL 518	Ρ	G	5															1	
Protect FL 776	Ρ	G	7															1	
Protect FL 1036	Р	G	1															1	
4	Gea	ar de	sigi	n (be	earin	g)													
Standard				S															
ATEX				A															
Reinforced bearing	Dati			V			- 141 -		- 4	-1)									
5	Un	ve si	natts	s (ae	sign	i, po	SITIO	n, m I	ateri	aı)									
1x drive shaft, cylindrical with keyway, pos. 0, steel					A														
2x drive shaft, cylindrical with keyway, pos. 1, steel					D C														
2x drive shaft with DTO profile 13/" 6 teeth peo 0 and 1, steel																			
1x drive shaft with PTO profile 1%, 6 tooth, pos. 0 steel					E														
1x drive shaft with PTO profile 1%, 6 tooth, pos. 0, steel					с С														
2x drive shaft with PTO profile 1 ³ / ¹¹ , 20 tooth pos, 0 and 1 steel					G														
1x drive shaft with PTO profile $1\frac{3}{4}$, 20 tooth, pos. 0 steel					н														
1x drive shaft with PTO profile $13/4^{\circ}$, 20 tooth, pos. 1, steel					1														
1x hollow drive shaft cylindrical with parallel key nos 0 steel																			
1x hollow drive shaft, cylindrical with parallel key nos 1 steel					ĸ														
1x hollow drive shaft with PTO profile 1 ³ / ₄ " 6 tooth nos 0 steel					L L														
1x hollow drive shaft with PTO profile 1 ³ / ₄ " 6 tooth post 0, steel					M														
1x drive shaft, cylindrical with keyway pos 0, stainless steel					N														
1x drive shaft, cylindrical with keyway, pos. 1, stainless steel					0														
2x drive shaft with PTO profile 1 ³ / ₄ ". 6 tooth. pos. 0 and 1. steel					P														
1x drive shaft with PTO profile 1 ³ / ₄ ", 6 tooth, pos. 0, steel					Q														
1x drive shaft with PTO profile 1¾", 6 tooth, pos. 1, steel					R														

Appendix

									tes					al					
							sĝu		ı pla			s		ateria			on		ent
	dno					u	er ri		ctior	s	hes	seal	des	e me		6	ositi	2	pme
Type code	nt gr			ign	fts	ctiol	, inn		oteo	iner	snq	ical	blac	olade		seals	g pc	xəpu	equi
	Iemo			desi	sha	dire	eals,	6	ıd bı	ng l	ling	han	ors/	or / b	sɓu	ge s	ntin	es ir	cial
	iquip	ype	ize	sear	rive	wo!	ip s(asin	asin	Casi	Holc	Mec	Roto	Roto	0-riı	Flan	Mou	Seri	Spe
	1	2 T	3 S	4	5 D	6 F	1 L	8 C	06	10	11	12	13	14	15	16	17	18	19
1x drive shaft with spline profile according to former DIN 5482, pos. 0. steel					s														
1x drive shaft with spline profile according to former DIN 5482, pos. 1,					т														
steel	Flo	w di	roct	ion															
From left to right (when looking at the quick-release cover)						А													
From right to left (when looking at the quick-release cover)						В													
Reversible						R			-		-								
Classic NBR / steel	Цр	sea	is, ii	nner	ring	s	С												
Classic FKM / steel																			
Classic NBR / stainless steel							Е												
Classic FKM / stainless steel							J												
Classic magnet-activated bearing isolator							Μ												
Classic PTFE / steel							Р												
Select FKM / steel							R												
Select PTFE / steel							T												
8	Pu	mp c	asir	ng														_	
Gray cast iron, standard								A											
Sharoidal cast iron, laser bardened								В											
Stainless steel								D											
Stainless steel, plasma hardened								E											
Gray cast iron, with radial MIP liners								F											
Gray cast iron, with radial MIP liners								Т											
Special steel casting								J											
Special steel casting, with radial MIP liners								K											
Gray cast iron, standard, Select								N											
Grav cast iron, with radial MIP liners. Select								R											
Stainless steel with radial MIP liners. Select								S											
9	Cas	sing	pro	tecti	on p	lates	5	-											
Hard metal									А										
Stainless steel									В						_	_		_	
Hard metal, with fiber barrier edge									С										
Stainless steel, 1.4539 Hard metal (special version for fiber barrier)																			
Stainless steel (special version for fiber barrier)									E										
Ceramic									F										
Ceramic coated									G										
Stainless steel, plasma hardened									Н										
Longlife ceramic composite									к						_	_		_	
10	Car	sina	lino	re															
Hard metal	Ja	 								А									
Stainless steel										В									
Stainless steel, 1.4539										С									
Ceramic										D									
Without										E									
Stainless steel, plasma hardened										Н									
11	Ho	lding	l bu	shes	5														
Steel, standard											A								
Steel hardened											C								
Stainless steel, 1.4539											D								
		•	•		-		•	•				•							

Appendix

BÖRGER.

Type code Steel, flushing bore Stainless steel, flushing bore Hardened steel, fiber barrier, dependent on the direction of rotation Stainless steel, fiber barrier, dependent on the direction of rotation	1 Equipment group	2 Type	3 Size	4 Gear design	5 Drive shafts	6 Flow direction	7 Lip seals, inner rings	8 Casing	9 Casing protection plates	10 Casing liners	표 여 내 Holding bushes	12 Mechanical seals	13 Rotors / blades	14 Rotor / blade material	15 O-rings	16 Flange seals	17 Mounting position	18 Series index	19 Special equipment
Hardened steel, fiber barrier, independent of the direction of rotation Stainless steel, fiber barrier, independent of the direction of rotation MultiSeal K											I J K								
Protect PL stainless steel									_		L								
Protect PL stainless steel 1.4539											М								
Mechanical seal: seal faces chilled cast iron, O-rings: NBR Mechanical seal: seal faces chilled cast iron, O-rings: EPDM Mechanical seal: seal faces chilled cast iron, O-rings: FKM Mechanical seal: seal faces chilled cast iron, O-rings: FEPM Mechanical seal: seal faces chilled cast iron, O-rings: FEPM Mechanical seal: seal faces chilled cast iron, O-rings: FEPM Mechanical seal: seal faces chilled cast iron, O-rings: FFKM Mechanical seal: seal faces chilled cast iron, O-rings: FFKM Mechanical seal: seal faces SiSiC/SiSiC, O-rings: NBR Mechanical seal: seal faces SiSiC/SiSiC, O-rings: FFKM Mechanical seal: seal faces tungsten carbide, O-rings: EPDM (FDA) Mechanical seal: seal faces tungsten carbide, O-rings: FKM Mechanical seal: seal faces tungsten carbide, O-rings: FKM Mechanical seal: seal faces tungsten carbide, O-rings: FEPM Mechanical seal: seal faces tungsten carbide, O-rings: FEPM <td></td> <td>A B C D L Y E F G J Z Z M R S T U P O N</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>												A B C D L Y E F G J Z Z M R S T U P O N							
Double-acting mechanical seal, O-rings: FFKM/FKM												Q							
									_										
Special seal (e.g. MultiSeal)	Bai											Х							_
13 Rotors:	Ro	tor a	esig	jn															
Dual-lobe, linear Tri-lobe, linear Tri-lobe, linear, readjustable Tri-lobe, screw profile, elastomer coated Tri-lobe, linear, MIP lobe tips Tri-lobe, linear, MIP lobe tips, stainless steel rotor body Tri-lobe, screw profile, MIP lobe tips, stainless steel rotor body Dual-lobe, screw profile, Optimum rotors Dual-lobe, Premium profile rotors (version 1) Dual-lobe, Premium profile rotors (version 2) Tri-lobe, linear, MIP lobe tips, rotor body hardened Tri-lobe, screw profile, MIP lobe tips, rotor body hardened Dual-lobe, Premium profile rotors with V-shaped arranged grooves, MIP lobe tips 14 Potor material	Rot	tor m	nate	rial									A B C D E F G H I J K L M N O						
Rotor material																			
														A					
EPDM														D					

•						•
Δ	n	n	Δ	n	Ы	ιv
	ν	ν	c		u	IN

							SG		plates					erial			_		÷
Type code	1 Equipment group	2 Type	3 Size	4 Gear design	5 Drive shafts	S Flow direction	7 Lip seals, inner rinç	3 Casing	Casing protection p	10 Casing liners	11 Holding bushes	12 Mechanical seals	13 Rotors / blades	14 Rotor / blade mate	15 O-rings	16 Flange seals	17 Mounting position	18 Series index	19 Special equipmen
FKM				~	47	w		~	0,	`	``				` I	``	`	``	
PLIR														P					
Stainless steel 1 4404														F					
Steel 1 7225 tempered														0					
PTEF														т					
CSM														н					
Stainless steel 1 4539																			
NBR light-colored														ĸ					
EPDM light-colored																			
H-NBR														M					
														IVI					
15	0_r	inae	eta	atic															_
NRP		liiga	, su												C				
EPDM															р				
EKM															1				
FEPM															J				
FEKM															7				
FEP/FKM															т				
EPDM (EDA)															i.				
16	Fla	nae	sea	ls											=				_
NBR				Ĩ												С			
EPDM																D			
EKM																1			
PTEE base																T			
17	Mo	untii	na n	lositi	ion														
Standing nump feet downwards (M1)			99														1		
Pump vertically positioned cover downwards feet at the side (M2)																	2		
Pump upside-down, feet upwards (M3)																	3		
Pump turned 90° to the left, feet to the right* (M5)																	5		
Pump turned 90° to the right, feet to the left* (M6)																	6		
* when looking at the guick-release cover																			_
18	Ser	ries i	nde	x															
See above																		see	
	Spe	ecial	equ	lipm	ent													20010	
Seal monitoring / conductivity measurement in intermediate chamber																			D
Temperature monitoring / temperature sensor in the casing cover																			Z
Variocap as integrated overpressure protection																			V
Quick-release cover with shaft support (integrated slide bearing)																			G
Other special equipment or more than one optional extra																			Х

Appendix

Modification	Date	Reason	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

9.6 Parallel keys

The following parallel key lengths must be adhered to and checked when replacing rotors on the AL pump series.



Notice

Imprecise parallel key lengths can lead to misalignment of the rotating holding bush and can cause mechanical damage to the pump or to the complete unit.

Position:		Rotors:	Parallel key di	mensions / ar	ticle no.	
			AL 25	AL 50	AL 75	
9.4 Type A		Dual-lobe, linear, polymers	8 x 7 x 18.5 mm	8 x 7 x 57.5 mm	8 x 7 x 96.5 mm	Cover disk
9.6 Types JP, JT		Premium rotor, dual-lobe, linear, polymers	.73" Z49025	2.26" Z49035	3.8" Z49045	integrated
9.6 Types JS, JE, JJ		Premium rotor, dual-lobe, linear, steel / stainless steel	8 x 7 x 24 mm	8 x 7 x 63 mm	8 x 7 x 103 (40+63) mm	Cover dis
9.8 * Type BE	ß	Tri-lobe, linear, stainless steel*	.94" Z49037	2.48" Z49036	(1.57+2.48)" Z49046	k separate

* special version, see supplementary operating manual



9.7 Checklist for commissioning

This checklist can be used as an additional aid when commissioning a Börger rotary lobe pump. It is not a substitute for careful reading of the operating manual before commissioning the unit.

Cust	omer:	Börger order confirmatior	n no.:
Mach	nine number:	Type code:	
Your	project:	Order number:	
Com	missioning date:	Delivery date:	
Test	point	Carried out by: (date / signature)	Checked by: (date / signature)
1	Operating manual and appendices read and understood		
2	Application data and operating parameters according to pump data sheet correspond to application		
3	Base frame fixed correctly to solid, even surface		
4	Coupling alignment within the permitted tolerance, coupling guard attached		
5	Pipes laid correctly on suction and pressure side, pipes fixed and not leaking		
6	Optional safety equipment installed correctly, connected and functions checked		
7	Electrical connections and grounding OK, direction of pump rotation correct		
8	Oil level in drive OK, transport lock removed from breather system (if present)		
9	Oil level in pump gear unit OK; in M2 mounting position: screw plug replaced by breather system		
10	Fluid level in intermediate chamber of pump OK, fill hole closed with supplied safety plug		
11	All valves in pipes opened; check valves installed correctly		
12	Noise and vibration levels normal when drive is switched on		
13	Pipes checked for leaks again with pump switched on		
14	Check made of the flow rate achieved and the pump pressure		
15	Power consumption of drive checked to guarantee correct installation		
16	Maintenance and inspection intervals organized for the machine		



9.8 EC Declaration of Conformity / EC Declaration of Incorporation

EC Declaration of Conformity for complete units:

EG-Konformitatserklarung	<u> </u>
EC-Declaration of conformity Déclaration de conformité EC EG-Conformiteitsverklaring	Bewegt wa
Börger GmbH Benningsweg 24 46325 Borken-Weseke Deutschland	
Hiermit erklären wir, dass die Herewith we declare, that the partly comp Par la présente, nous déclarons ci après Hiermee verklaren wij, dat de navolgende	folgenden Produkte: pleted machinery described below: que les machines suivantes: e producten:
Produktbezeichnung: Type of machinery: Nom type: Productomschrijving:	Drehkolbenpumpe Rotary Lobe Pump Pompes à lobes Draaizuigerpomp
Produktlinie: Productline, Ligne de produits, Productliji	Classic, Select, Protect
Typenbezeichnungen: Models, Modèles, Typeaanduidingen:	AL, PL, CL, FL, FLA, EL, XL
Seriennummer: Serial numbers, Numéro de série, Serial	ab / valid as from / valable dès / geldig sinds: $11XX XXXX - 1.X$ I numbers:
Baujahr: Year of manufacture, Année de construc	ab / valid as from / valable dès / geldig sinds: 2012 ction, Bouwjaar:
allen einschlägigen Bestimmu	ingen der Richtlinie Maschinen (2006/42/EG) entsprechen.
allen einschlägigen Bestimmu Die Maschinen entsprechen w Betriebsmittel (2006/95/EG) Is complying with all essential requiremer Voltage Directive (2006/95/EC) and the L'ensemble de ces produits sont conform Nos produits sont également conformes : aan alle desbetreffende eisen van de ma De machines voldoen verder aan alle eis verdraagbaarheid (2004/108/EG).	ungen der Richtlinie Maschinen (2006/42/EG) entsprechen. veiterhin allen Bestimmungen der Richtlinien Elektrische und Elektromagnetische Verträglichkeit (2004/108/EG). nts of the Machinery Directive (2006/42/EC). The machinery is also in conformity with the Lo EMC Directive (2004/108/EC). nes en tous points à la directive Machine (2006/42/CE). aux directives Basse tension (2006/95/CE) et électromagnétique (2004/108/CE). achinerichtlijn (2006/42/EG) voldoen. sen van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische
allen einschlägigen Bestimmu Die Maschinen entsprechen w Betriebsmittel (2006/95/EG) Is complying with all essential requiremer Voltage Directive (2006/95/EC) and the L'ensemble de ces produits sont conform Nos produits sont également conformes i aan alle desbetreffende eisen van de ma De machines voldoen verder aan alle eis verdraagbaarheid (2004/108/EG). Folgende harmonisierte Norm Used European standards: Les normes suivantes ont été harmonisé Navolgende geharmoniseerde normen zi	ungen der Richtlinie Maschinen (2006/42/EG) entsprechen. veiterhin allen Bestimmungen der Richtlinien Elektrische und Elektromagnetische Verträglichkeit (2004/108/EG). nts of the Machinery Directive (2006/42/EC). The machinery is also in conformity with the Lo EMC Directive (2004/108/EC). nes en tous points à la directive Machine (2006/42/CE). aux directives Basse tension (2006/95/CE) et électromagnétique (2004/108/CE). tehinerichtlijn (2006/42/EG) voldoen. ten van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische nen wurden angewandt: nes: ijn van toepassing:
allen einschlägigen Bestimmu Die Maschinen entsprechen w Betriebsmittel (2006/95/EG) Is complying with all essential requiremen Voltage Directive (2006/95/EC) and the L'ensemble de ces produits sont conform Nos produits sont également conformes s aan alle desbetreffende eisen van de ma De machines voldoen verder aan alle eis verdraagbaarheid (2004/108/EG). Folgende harmonisierte Norm Used European standards: Les normes suivantes ont été harmonisé Navolgende geharmoniseerde normen zi	ungen der Richtlinie Maschinen (2006/42/EG) entsprechen. veiterhin allen Bestimmungen der Richtlinien Elektrische und Elektromagnetische Verträglichkeit (2004/108/EG) . nts of the Machinery Directive (2006/42/EC). The machinery is also in conformity with the Lo EMC Directive (2004/108/EC). nes en tous points à la directive Machine (2006/42/CE). aux directives Basse tension (2006/95/CE) et électromagnétique (2004/108/CE). technerichtlijn (2006/42/CG) voldoen. sen van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische nen wurden angewandt: nes: ijn van toepassing:
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allen einschlägigen Bestimmu Die Maschinen entsprechen w Betriebsmittel (2006/95/EC) Is complying with all essential requiremet Voltage Directive (2006/95/EC) and the L'ensemble de ces produits sont conform Nos produits sont également conformes : aan alle desbetreffende eisen van de ma De machines voldoen verder aan alle eis verdraagbaarheid (2004/108/EG). Folgende harmonisierte Norm Used European standards: Les normes suivantes ont été harmonisé Navolgende geharmoniseerde normen zi DIN EN ISO 13857 DIN EN 809 DIN EN 12162 Name und Adresse des Dokume The person authorised to compile the rel Nom du rédacteur documentaire et adres Naam en Adres van de documentatiegev	Ingen der Richtlinie Maschinen (2006/42/EG) entsprechen. veiterhin allen Bestimmungen der Richtlinien Elektrische und Elektromagnetische Verträglichkeit (2004/108/EG) . nis of the Machinery Directive (2006/42/EC). The machinery is also in conformity with the Lo EMC Directive (2004/108/EC) . nes en tous points à la directive Machine (2006/42/CE). aux directives Basse tension (2006/95/CE) et électromagnétique (2004/108/CE). technerichtlijn (2006/42/EG) voldoen. sen van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische men wurden angewandt: nes: ijn van toepassing: Ansgar Riers - Börger GmbH evant technical documentation: se: rolmachtigde:
allen einschlägigen Bestimmu Die Maschinen entsprechen w Betriebsmittel (2006/95/EC) Is complying with all essential requiremer Voltage Directive (2006/95/EC) and the L'ensemble de ces produits sont dorformes : aan alle desbetreffende eisen van de ma De machines voldcen verder aan alle eis verdraagbaarheid (2004/108/EG). Folgende harmonisierte Norm Used European standards: Les normes suivantes ont été harmonisé Navolgende geharmoniseerde normen zi DIN EN ISO 13857 DIN EN 809 DIN EN 12162 Name und Adresse des Dokume The person authorised to compile the rel Nom du rédacteur documentaire et adres Naam en Adres van de documentatiegev	Angen der Richtlinie Maschinen (2006/42/EG) entsprechen. veiterhin allen Bestimmungen der Richtlinien Elektrische und Elektromagnetische Verträglichkeit (2004/108/EG) . Ints of the Machinery Directive (2006/42/EG). The machinery is also in conformity with the Lo EMC Directive (2004/108/EC) . Tes en tous points à la directive Machine (2006/42/CE). aux directives Basse tension (2006/95/CE) et électromagnétique (2004/108/CE). Achinerichtlijn (2006/42/EG) voldoen. sen van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische hen wurden angewandt: res: ijn van toepassing: Ansgar Riers - Börger GmbH evant technical documentation: sse: volmachtigde:



EC Declaration of Incorporation for pumps delivered separately:

	BOILGEIL ®
EC-Declaration of incorporation Déclaration d'incorporation EC EG-Inbouwverklaring	Bewegt wa
Börger GmbH Benningsweg 24 46325 Borken-Weseke Deutschland	
Hiermit erklären wir, dass die fol Herewith we dealare, that the partly completed machin Par la présente, nous déclarons of après que les mach Hiermee verklaren wij, dat de navolgende producten:	genden Produkte: nery described below: nines sulvantes:
Produktbezeichnung: Type of machinery Nom, type Productomschrijving:	Drehkolbenpumpe Rotary Lobe Pump / Pompes à lobes / Draaizuigerpomp
Produktlinie: Productline, Ligne de produits, Productlijn:	Classic, Select, Protect
Typenbezeichnungen: Model, Modèles, Typeaanduidingen:	AL, PL, CL, FL, FLA, EL, XL
Seriennummer: Serial numbers, Numéro de série, Serienummer:	ab / valid as from / valable dès / geldig sinds: $11XX XXXX - 1.X$
Baujahr: Year of manufacture, Année de construction, Bouwjaz	ab / valid as from / valable dès / geldig sinds: 2012
Appendix I, Article 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4 and L'ensemble de ces produits sont conformes en tous p Airsi qu'aux articles 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, et voldoen aan de navoigende fundamentele eisen mach Bijlage I, Artikel 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4 et 1.5. Die unvollständige Maschine ent Betriebsmittel (2006/95/EG) un The partly completed machinery is also in conformity v Nos produits sont également conforme aux directiver De niet complete machine voldoet verder aan alle bep	1.5.1. soins à la directive Machine (2006/42/CE). 1.5.1. inherichtlijn (2006/42/EG): 1. tspricht weiterhin allen Bestimmungen der Richtlinien Elektrische Id Elektromagnetische Verträglichkeit (2004/108/EG). wih the Low Voltage Directive (2006/95/EC) and the EMC Directive (2004/108/EC). s Basse tension (2006/95/CE) el diectromagnetiue (2004/108/CE). salingen van de richtlijn Elektrische bedrijfsmiddelen (2006/95/EG) en Elektromagnetische verdraagbaarheid (2004/10
Die unvollständige Maschine dar Maschine, in die die unvollständi Maschinen (2006/42/EG) entspri The partly completed machinery must not be put into (2006/42/EG) on machinery, where appropriate, and u cette machine est destinée à être incorporte dans un machines (2006/42/EG), et qu'elle ne peut Inotectionner De niet complete machine mag pas dan in bediffet. Depailingen van de machinertottijn (2006/42/EG) voit	If erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass of ige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie icht. servise until the final machinery into which is to be incorporated has been declared in conformity with the provisions of Dire mit the EC Declaration of Conformity according to Annex II A is issued. e machine ou à être assemblée avec d'autres machines en vue de constituer une machine à laquelle s'applique la directive de marière indépendante. omen worden, ais vastgesteld is dat de installatie, waarin de niet complete machine ingebouwd en opgenomen wordt, aan et.
Der Hersteller verpflichtet sich, d Stellen auf Verlangen elektronisc We commit to transmit, in response to a reasoned reg department. Il est rappelé que la régiementation interdit la mise en conforme aux dispositions de la directive européenne be tabrikant verplicht zich, de specifike bescheiden v	tie speziellen Unterlagen zur unvollständigen Maschine einzelstaatlichen ch zu übermitteln. uest by the market surveillance authorities, relevant documents on the partly completed machinery by our documentation service de la machine ou de l'élément concerné avant que la machine dans laquelle elle sera incorporée n'aura été déclar 98/37/CE. voor niet complete machines op verzoek van de rijksoverheid aan deze elektronisch te verstrekken.
Die zur Maschine gehörenden sp The related technical documentation according to App Documentation de Appendix VII Part B. De bij de machine behorende specifieke bescheiden	Deziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt. endix VII Part B has been made. worden conform bijlage VII deel B samengesteld.
	antationsbevollmächtigten: Ansgar Riers - Börger GmbH
Name und Adresse des Dokume The person authorised to compile the relevant technic Nom du rédacteur documentaire et adresse: Naam en Adres van de documentatiegevolmachtigde:	
Name und Adresse des Dokume The person authorised to compile the relevant technic Nom du rédacteur documentaire et adresse: Naam en Adres van de documentatiegevolmachtigde: Borken-Weseke,	Pa



9.9 Additional documentation

The lubricant list in the appendix is part of the operating manual.

• Follow the instructions.

Further, separate **supplementary operating manuals** for special versions are also part of this operating manual.

• Follow the instructions.

9.10 Supplier documentation

• You must completely read the separate supplier documentation and consider it accordingly to prevent damage to the equipment.

Additional Documentation for Lubricants

BÖRGER







Lubricants

1 Area of validity

Unless subject to special agreements, this lubricant list is part of the operating manual and applies to all standard Börger pump versions and macerating units for industrial and agricultural use.

Deviations can be agreed upon individually for special applications. In such cases, only the agreement applies instead of this lubricant list.

On delivered drives, the corresponding operating manual and lubricant list from the drive manufacturer applies.

2 Börger gear units

2.1 Oil quality

Only CLP-quality oils containing active substances for improving corrosion protection and aging resistance and reducing wear in gear units according to DIN 51517 (part 3) are permitted for use in Börger gear units.

Additionally, the gear oils must also meet the following quality requirements:

- Suitable for lip seal material and gear casing material
- Compatible with residual oil originally used by the manufacturer
- Sufficient viscosity for the relevant temperature range

Notice

Risk of material damage and loss of warranty when using low-quality lubricants!

The oil classification and viscosity must be adhered to according to the factory-supplied lubricant specified in the data sheet. The lubricants used must meet the quality standards as detailed above.

Otherwise, the warranty supplied by Börger GmbH is void. Deviations are only permitted following consultation with Börger GmbH.

If the actual operating conditions on or after commissioning deviate from those specified in the order, then a change of lubricant must be considered. Any such actions must be approved by Börger GmbH.

Lubricants suitable for use in Börger gear units are listed in the table in chapter 5.1. However, the lubricant manufacturers are solely liable for the suitability and quality of their products.

According to the manufacturer's specifications, the listed lubricants are available globally in compliance with the necessary quality.

2.2 Oil change

The purity of the lubricant influences the service life of the oil and gear unit, plus general operating safety.

Therefore, always ensure that the gear unit contains clean oil.

Instructions for changing the oil / lubricant contained in the operating manual of the Börger device must be strictly adhered to.

The amount of remaining used oil in the gear unit must be kept **as low as possible**, even when the same oil type is used for the oil change.



Note

Gear oils of different types or from different manufacturers must not be mixed together.



When necessary, a confirmation of oil compatibility with the used oil must be obtained from the manufacturer of the new oil.

If the composition of the new oil type deviates greatly from the used oil (e.g. additives), then the used oil must be completely removed from the gear unit. In this case, the gear unit must be flushed carefully with the new oil. Gear oils must not become contaminated with other substances, including any residue from cleaning agents (e.g. petrol). Therefore, flushing with petrol or other cleaning agents is not permitted.

3 Börger intermediate chamber

Most Börger devices are equipped with an intermediate chamber as standard. This chamber is filled with an unpressurized fluid. This protective fluid is used for the following:

- Collection of any pumped / flow media that enter the intermediate chamber due to leaks in the mechanical seal (protection of the gear unit against penetration of pumped / flow media)
- Monitoring of the mechanical seal through periodical or continuous determination of the fill level
- Lubrication and cooling of sliding surfaces on the mechanical seal
- Air exclusion (especially important for pumped media that react negatively with air)

Any fluids with good lubricant qualities that do not react with any of the materials they come into contact with are suitable as quench fluids.

Pay attention to compatibility with the residual quench fluid when filling or refilling.



Notice

Risk of material damage when using wrong lubricants!

Due to the possibility, though unlikely, of quench fluid entering the pump / cutting chamber and thus intruding on the process itself, the quench fluid must be compatible with the pumped / flow medium in addition to the other materials (O-rings).

In order to rule out damage to the gear unit as comprehensively as possible, even in the exceptional case that quench fluid enters the gear unit (e.g. due to improper maintenance of the gear unit), the quench fluid should also be compatible with the gear oil. In Börger devices, the quench fluid is:

- Zinc-free hydraulic oil as standard, or
- A synthetic gear or hydraulic oil (CLP / HLP) on ATEX versions

See table in chapter 5.2.



Notice

Risk of material damage when using wrong lubricants!

Versions used for special applications and / or those with special sealing materials (e.g. EPDM), can be filled with special lubricants, such as:

- Castrol Optileb HY 68 (food quality)
- Sugar-dissolving oil (Klüberfood NH 1 6-10)
- Solvents (lacquer)
- Other special lubricants

Filling with these lubricants is approved / tested specifically for the supplied version and is indicated in the data sheet. In such cases, the same quench fluid must be used exclusively when filling or refilling. Otherwise, there is a risk of material damage, which can be significant depending on the application.



4 Oil properties

4.1 Oil classifications

The oil classifications of applicable oils are specified in chapter 5 next to each lubricant.

Observe chapter 3 for details on the intermediate chamber. In certain applications, oil may not be permitted for use as a lubricant.

Explanation of classification according to DIN										
Classification according to DIN 51524-2	HLP	High-performance hydraulic oil (H), with corrosion protection (L) and high-pressure additives (EP)								
	С	Can be used as lubricating oil								
Classification according to	CL	Circulating oil, C-oil with corrosion protection								
	CLP	Industrial gear oil, CL-oil with EP additives (high-pressure additive)								
Additional letters according to DIN 51502	HC	Synthetic hydrocarbons								

4.2 Operating temperatures

Compared to mineral oils, synthetic oils can be used in a wider operating temperature range, whereupon the temperature-related viscosity deviation is lower (higher viscosity index).

Therefore, only use synthetic, high-quality industrial gear oil in gear units in potentially explosive atmospheres.

Alternatively, a synthetic high-performance hydraulic oil can be used in the intermediate chamber.

We recommend adhering to the following limits for lubricants used in Börger devices:

Mineral oils	up to +80 °C (176 °F)
Hydraulic oil (zinc-free, quench only)	up to +80 °C (176 °F)
Synthetic oils	up to +100 °C (212 °F)
	(for short periods +110 °C (230 °F))



Note

Special lubricants for higher operating temperatures can be delivered on agreement. In this case, the agreed limits apply.



The specified values are recommended guidelines.

Consult the **technical data sheets of the relevant lubricant manufacturer** for their specified operating temperature ranges and other oil property details.

4.3 Oil service life

The general service life at average temperatures in gear units without a significant change in oil quality is approximately 2 years or 10,000 operating hours.

In potentially explosive atmospheres, an oil change should be made annually or after 8,000 operating hours.

The actual service life can increase or decrease significantly depending on the operating conditions.

Therefore, check the oil level and oil quality on a regular basis.

This also applies to the quench fluid.

5 Oil types

Viscosity class 1)	Label / DIN classification			Pour point	Flash point
ISO VG 220	ARAL	Degol BG 220	CLP	-12 °C 10.4 °F	274 °C 525.2 °F
	BP	Energol GR XP 220 ²⁾	CLP	-21 °C -5.8 °F	274 °C 525.2 °F
		Enersyn HTX 220	CLP HC (PAO ⁴⁾)	-36 °C -32.8 °F	270 °C 518 °F
	CASTROL	Alpha SP 220	CLP	-21 °C -5.8 °F	226 °C 438.8 °F
		Alphasyn T 220	CLP HC (PAO ⁴⁾)	-45 °C -49 °F	220 °C 428 °F
		Aphasyn HTX 220 ³⁾	CLP HC (PAO ⁴⁾)	-39 °C - 38₋2 °F	220 °C 428 °F
	ESSO	Spartan EP 220	CLP	-24 °C -11.2 °F	255 °C 491 °F
	Klüber Lubrication	Klüberoil GEM 1-220	CLP	-10 °C 14 °F	> 200 °C > 392 °F
	SHELL	Omala Oil F 220	CLP	-27 °C -16.6 °F	240 °C 464 °F

5.1 Applicable lubricants in Börger gear units

¹⁾ i.e. viscosity v = 220 mm²/s (cSt) at 40 °C (104 °F)

²⁾ Börger factory standard, unless agreed otherwise

³⁾ Börger factory standard for ATEX versions and for Protect pumps

⁴⁾ PAO = polyalphaolefin-based fully synthetic base oils



5.2 Applicable lubricants in Börger intermediate chambers



Risk of material damage when using wrong lubricants!

Check the quench fluid specifications in the data sheet before filling / refilling the intermediate chamber.

Only use a lubricant with the same classification.

When the device was delivered with special lubricants for special applications or seal materials, only use the same fluid as originally applied by the manufacturer. This fluid has been tested for the version. Alternative quench fluids may only be used following consultation with Börger GmbH. Otherwise, there is a risk of material damage, which can be significant depending on the application.

Viscosity class 1)	Label / DIN classification				Flash point
ISO VG 68	ARAL	Vitam GF 68 ²⁾	HLP (only <u>zinc-</u> free!)	-18 °C -0.4 °F	258 °C 496.4 °F
		Degol BG 68	CLP	-30 °C -22 °F	242 °C 467.6 °F
	BP	Energol CS 68	С	-15 °C 5 °F	235 °C 455 °F
		Enersyn HTX 68	CLP HC (PAO ⁴⁾)	-42 °C -43.6 °F	270 °C 518 °F
	CASTROL	Magna 68	С	-18 °C -0.4 °F	220 °C 428 °F
		Alphasyn T 68	CL HC (PAO ⁴⁾)	-57 °C -70.6 °F	220 °C 428 °F
		Alphasyn HTX 68 ³⁾	CLP HC (PAO ⁴⁾)	-39 °C -38.2 °F	220 °C 428 °F
	ESSO	Nuray 68	С	-18 °C -0.4 °F	230 °C 446 °F
	Klüber Lubrication	Klüberoil GEM 1-68	CLP	-15 °C 5 °F	> 200 °C > 392 °F
	SHELL	Vitrea 68	С	-9 °C 16 °F	223 °C 433.4 °F

¹⁾ i.e. viscosity v = 68 mm²/s (cSt) at 40 °C (**104** °F)

²⁾ Börger factory standard, unless agreed otherwise

³⁾ Börger factory standard for ATEX versions

⁴⁾ PAO = polyalphaolefin-based fully synthetic base oils

We reserve the right to make technical alterations. Errors cannot be excluded.