## OPERATING AND MAINTENANCE MANUAL FOR BOERGER ROTARY LOBE PUMPS

	□ AL 25 □ AL 50 □ AL 75
Code No.:	4
1st Modification*: Date:	4
2nd Modification*: Date:	4
3rd Modification*:	4
Date of Shipment:	
To:	

\*) Please modify Code with changes to the pump (see 9.1)

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### 1. BOERGER Rotary Lobe Pumps (Bare Shaft Pump)

#### 1.1 Construction of the Rotary Lobe Pump

BOERGER Rotary Lobe Pumps of the FL Series are designed on a modular basis. Gear unit, axial wear plates, cover and mechanical seals remain the same throughout the series.

Rotary Lobe Pump	Displacement per 100 Revolution
AL 25	6.6 gal / 100 rev
AL 50	13.2 gal / 100 rev
AL 75	19.8 gal / 100 rev

The material of the fluid wetted parts of the pump unit should be adapted to the chemical and physical conditions of the fluid. The Code Number represents the parts used in the pump unit.





#### 1.2 Flanges

The flange material is usually galvanized steel or stainless steel. Gaskets (see 9.2 Spare Parts List Pos. 25) have to be installed between the pump casing and the flanges. The material of the gaskets should be adapted to the chemical and physical conditions of the fluid.

### 1.3 Drive Specification

The BOERGER Rotary Lobe Pump needs a drive unit with suitable rotation speed and torque. The design of the drive unit (rotation speed and power) depends on the hydraulic conditions (i.e. capacity, pressure, viscosity) of the application.

### 1.4 Assembly of Aggregate

The Rotary Lobe Pump and the drive unit must be assembled free of distortion. The pump shaft and drive shaft have to be connected with a suitable coupling including guard for protection. After assembly of the pump aggregate on the foundation and in the pipe system the alignment of the coupling has to be controlled as part of the warranty.

#### Follow also Operation and Maintenance Manual of Drive Unit!

Shaft Diameter of AL-Series:

Shaft-Design	Diameter
Standard, DIN 748	0.94 " (24 mm)

## 2. Complete BOERGER – Aggregate

#### 2.1 Standard Design

Rotary Lobe Pump and drive (standard: helical geared motor) fitted on common base (twist-free), made from galvanized steel, incl. elastic coupling and coupling guard. Also possible is an overhead mounted drive and a variable speed drive. The base of the aggregate has to be fastened on an even foundation.

- 1.) BOERGER Rotary Lobe Pump
- 2.) Elastic coupling
- 3.) Coupling Guard
- 4.) V-Belt Disc
- 5.) V-Belt
- 6.) V-Belt Guard
- 7.) Motor
- 8.) Gear Reduction Unit
- 9.) Variable Speed Drive
- 10.) Base
- 11.) Flanges



### 2.2 Oil Level and Oil Change

Before start up of the pump unit check oil level of timing gear at the oil gauge. The oil level must be at the middle of the oil gauge. The oil of the timing gear has to be exchanged after 250 hours of operation, after that every six months for continuous working units and at least once a year for discontinuous working units.

The oil level in the intermediate chamber must be at the level of the top shaft. The top opening of the intermediate chamber must remain open to the environment and must be protected against dirt with our plastic stopper (see parts list Pos. 69). Submersible units must be equipped with a sensor for monitoring of the mechanical seal.

The functions of the intermediate chamber are

- 1. Lubrication and cooling of the mechanical seals and rotor/shaft connection
- 2. Detection of seal failures
- 3. Buffer zone to the sealed timing gear

Check oil of intermediate chamber with every rotor change. When changing mechanical seals the intermediate chamber has to be flushed and cleaned with water before fill up of new oil.

# Attention: Please check if the factory site filled oil types and/or listed oil types of the pump unit are allowable with the environmental regulations at the application site. If need please consult factory.

Oil quantity depending on model!

Rotary Lobe Pump	Timing Gear	Intermediate Chamber
Model	Oil quantity	Oil quantity
AL 25	App. 0.1 gal (0.37 liter)	0.06 gal (0.22 liter)
AL 50	App. 0.1 gal (0.37 liter)	0.06 gal (0.22 liter)
AL 75	App. 0.1 gal (0.37 liter)	0.06 gal (0.22 liter)

#### Factory site used oil types:

*Timing Gear: Intermediate Chamber:*  Mobilgear 630 Mobil Ambrex 68

Attached is a list of factory approved oil types for BOERGER Rotary Lobe Pumps:

#### **Oil Types Timing Gear**

Type of Lubricant	Ambient Temperatur e °C	Viscosity	ARAL	ВР	CASTROL	DEA	ESSO	KLOPER	MOBIL	SHELL	TRIPOL
Mineral Oil	-540 (normal)	ISO VG 220	Degol BG 220	Energol GR- XP220	Alpha SP 220 Alpha MW 220	Deagear DX SAE 85 W 90 Falcon CLP 150	Spartan EP 220	Klüberoil GEM 1-220	Mobilgear 630	Shell Omala Oel 220	Tribol 1100/220
	-15 25	ISO VG 100	Degol BG 100	Energol GR-XP 100	Alpha SP 100 Alpha MW 100	Deagear DX SAE 80W Falcon CLP 150	Spartan EP 100	Klüberoil GEM 1-100	Mobilgear 629	Shell Omala Oel 100	Tribol 1100/100
	-5015	ISO VG 15	Vitamol 1010	Bartran HV15	Hyspin AWS 15 Hyspin SP 15	Airkraft Hydraulic Oil 15	Univis J13	Isoflex MT 30 rot	Mobil DTE 11M	Shell Tellus Oel T15	Tripol 770

#### **Oil Types Intermediate Chamber**

Type of Lubricant	Ambient Temperature °C	Viscosity	ARAL	BP	CASTROL	DEA	ESSO	KLOPER	MOBIL	SHELL	TRIPOL
Mineral Oil	-15+40	ISO VG 68	Motan ol HE 68	BP Energol CS 68	Magna 68	Renolin DTA 68	NURAY 68	Klüberoil GIM 1-68	AMBREX 68	SHELL Vitrea 68	Tripol 943 AW-68

Attention: Oil level must be at the middle of the oil gauge!



Oil level and oil change for drive follow instruction of Operation and Maintenance Manual of the drive unit.

## 3. Installation in the Pipe System

The BOERGER Rotary Lobe Pumps are self-priming under certain conditions. To prevent cavitation install the pump with flooded suction or only with a small suction lift. With larger suction lifts and/or long suction pipes control, if the NPSH available of the system is higher in comparison to the required NPSH of the pump. The required NSPH value must be at least a 0.5 m under the NPSH available to prevent cavitation. With suction lifts over 2 m (6 ft) it is required to install a check valve at a suitable position in the pipe system.

Especially in pump installations with gaseous fluids it is important to prevent air bubbles on the suction side of the pump. If this is not practicable, install an air release valve close to the pump at a suitable position in the pipe system. This ensures a trouble free start up of the pump aggregate.

Install compensators (follow the mounting instruction of the compensator manufacturer) between pump flanges and system especially with thin-walled pipes. Also consider loads caused by changing physical conditions (i.e. temperature).

Connection flanges or valves are not allowed to load the pump unit.

Before start up check and if needed correct the alignment of the coupling. Uneven foundation surfaces have to be corrected with spacers.



Recommended Maintenance Space

## 4. Start Up

- Check Oil Levels (see 2.2)
- Check that flange and pipe connections are sealed and not leaking.
- At pumps with infinite variable rotating flanges (i.e. mobile pumps) check the tightness of the clamps.
- Check of all installed appurtenances in addition to the pump aggregate (i.e. VFDs, dry running protection, pressure gauges etc.).
- Start of drive unit for rotation direction check.
- Prevent dry running longer than one minute in the start up phase. Fluid is needed for cooling of the pump.
- Do not operate pump in hose systems without supervision!
- The BOERGER Rotary Lobe Pump can operate in either direction. Check if rotation direction fits your needs.



Top shaft rotates counterclockwise. Fluid flows in direction of arrow.



Top shaft rotates clockwise. Fluid flows in direction of arrow.

Change rotation direction of the drive or change to the other driving shaft of the pump (if suitable) to reverse flow.

- Opening of valves.
- After a short time the Rotary Lobe Pump is displacing the nominal capacity. The pressure is not allowed to rise over the permissible pressure of the pipe system and of the Rotary Lobe Pump and shall not overload the drive unit.

The top opening of the **intermediate chamber** must remain open to the environment and must be closed for dirt protection with our **plastic stopper** (see parts list Pos. 69).

### 4.1 Start Up Report

	Customer:			
	Contact:			
	Phone #:			
	Rep:			
	Check	Dowould	Dete	Cimatura
em 1	Pump used as per	Remark	Date	Signature
·	BOERGER Datasheet			
2	Alignment of coupling checked after fitting on foundation			
3	Wiring and direction of rotation			
4	Suction and pressure piping fitted correctly			
5	Pump protection devices fitted correctly and checked			
6	Oil level of drive unit correct, breather opened			
7	Oil level of synchronising gear correct, breather fitted			
8	Oil level of quench chamber correct, plugged with plastic plug only			
9	Valves opened at suction and at pressure side			
10	Pump started, noise normal			
11	All connections tight, leak-proof			
12	Periodical maintenance arranged as per operating instructions.			
13	Check for Amp draw at Start-Up and after 15 minutes of operation			
	NULES:			

### 5. Maintenance and Control

Before every start up check lubricant levels. I addition to the lubricant has to be changed in the named periods. (see 2.2).

#### 5.1 Disassembly of Quick Release Cover and Flanges

Following are precautions before disassembly of quick release cover and flanges:

- Disconnect geared motor from power or remove drive from pump unit.
- Close suction and discharge valves.
- Loosen ring nuts of the quick release cover equally app. 5 mm and move the cover slowly of the pump casing. Pressure may still exist inside the pump.

Caution: Remaining pressure in the pump can splash fluid out of the gap between pump casing and cover. Cover gap with suitable rag.

#### 5.2 Cleaning of the Rotary Lobe Pump

Remove quick release cover of the pump (see 5.1). Clean pump and flanges with suitable cleansing agent. Let the pump casing dry and use metal surface protection (i.e. grease) suitable for the rubber material of the rotors. Do not use grease with EPDM or SBR rotors.

### 5.3 Danger of Frost

The pump and pipe system must be secured against frost. As a supplement BÖRGER can deliver a heated quick release cover.



Attention:

Frozen fluid pieces from the pipe system can cause wear inside the pump, especially at the rubber - coating of the rotors.

### 5.4 Storage Instructions

Instructions for storage and recommissiong of Rotary Lobe Pumps

Please refer to these instructions if Rotary Lobe Pumps are stored prior to commissioning. With following these instructions you will protect the pump and avoid damage from humidity and corrosion. Actions are required for long-term storage only.

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As the requirements depend on the kind of storage and the environmental conditions it cannot be said from which time on these instructions are valid.

A longer storage prior to commissioning does not extend the time of warranty.

### 5.4.1 Actions prior to storage

- 5.4.1.1 The flanges as well as the further openings to the pump have to be closed by using the transport-covers. If these are no longer available please use other suitable humidity controlled protections.
- 5.4.1.2 Possible surface damages from transport handling should be repaired, at the galvanised as well at painted surfaces.
- 5.4.1.3 The storage room should be dry and ventilated. The temperature should not exceed 5 to 40 °C. In case of storage outside this temperature area the actions described under item 2 and 3 are required for short-term storage already.

#### 5.4.2 Actions during storage time

It is advised to rotate the pump shaft approximately every half year. This is to lubricate the upper gearwheel and the mechanical seals.

### 5.4.3 Actions prior to commissioning

- 5.4.3.1 Prior to commissioning it is advised to check for easy rotation of the pump shaft. In case of doubt the rotors and seal should be disassembled and reassembled as per operating instructions.
- 5.4.3.2 The pump should be rotated by hand or by short tipping of the motor switch. An easy rotation of the pumps must be ensured.
- 5.5 In case of storage longer than two years, or in case of abnormal storage temperatures, the lubricants should changed prior to commissioning. Please refer to the operating instructions.
- 5.6 Remove all covers and protections.
- 5.7 Install the pump aggregates as per operating instructions.
- 5.8 Actions for taking pumps out of order
- 5.8.1 If it becomes necessary to take a pump out of order for a limited period please contact us for instructions as the actions depend on the individual use of the pump.

- 5.8.2 If possible empty and clean the pump and use corrosion protection agent for non-coated steel parts.
- 5.8.3 Before re-commissioning it is advisable to check the easy rotation of the shafts in the mechanical seals. If necessary disassemble and reassemble the seal as per instructions.
- 5.8.4 The pump should be rotated by hand or by short tipping of the motor switch. An easy rotation of the pumps must be ensured.

#### 5.9 Storage of drives

5.9.1 For storage and recommissioning of drives please follow the instructions of the manufacturers.

#### 5.10 Storage of spare parts

- 5.10.1 For the storage of spare parts please follow item 1 to 5 of this information.
- 5.10.2 Elastomeres must be stored dry and light protected (UV-radiation must be avoided).

## 6. Troubleshooting

### 6.1 Problem / Help

#### Pump does not start after shut down

Pc	ssible problem	He	elp
•	Solids have settled inside the pump after shut down.	•	Cleaning of pump (see 5.2)
•	Rotors are swollen and are tight to the pump casing.	•	Check temperature and chemical compounds of fluid. Change rotor to a suitable rubber material.
٠	Long fibers, foil or plastics are blocking the pump.	•	Cleaning of pump and suction flange (see 5.1 and 5.2)
•	Axial rotor tolerance misaligned	•	Adjust axial rotor tolerance (see 7.2)
•	Power and/or torque too weak, drive too small	•	Change to bigger drive

#### Pump does not self prime

Possible problem	Help
Rotation direction wrong of the drive	Change rotation direction of the drive
Suction pipe blocked	Cleaning of suction pipe
Suction connection leaky	Check gasket and tightness of connections
Air bubble inside the pump or pipe system	• Fill up pump with fluid or release air out of the system
Rubber coating of rotors destroyed	Replace rotors

#### Pump cavitates

Ро	ssible Problem	Help		
•	Rotation speed too high: The cavities inside the pump are not filled (cavitation).	•	Decrease rotation speed and/or increase flooded suction	
•	Solid is blocking suction side	•	Remove solid	

#### Oil leakage at the top of the intermediate chamber

Pc	ssible Problem	Help			
•	Mechanical seal defect	•	Change of mechanical seal (see 7.1 / 7.2)		

#### Technical information mechanical seal

The single acting mechanical seals used in BOERGER Rotary Lobe Pumps consist of two against one another positioned identical seal faces. The mechanical seals are quenched with the fluid (standard: hydraulic oil) in the intermediate chamber. With capillary and centrifugal force created by the rotation the oil is forced between the seal faces and lubricates the seal gap and removes developing heat from the mechanical seal. Pumped fluid is not needed to lubricated and/or cool the mechanical seal.

If the mechanical seals had to be opened during maintenance it is recommended to exchange the mechanical seal, even if the wear limit has not been reached.

#### 6.2 Exchange of Linear Rotors



1. Shut down pump unit and close valves surrounding the pump (see 5.1).

Loose ring nuts (1) of the quick release cover equally app. 1/5" and move the cover (2) slowly of the pump casing. Eventually pressure still can exist inside the pump. Clean or flush the pump casing.

## Caution: Remaining pressure in the pump can splash fluid out of the gap between pump casing and cover. Cover gap with suitable rag.

- 2. Open the socket head cap screw (3), which holds the rotor in axial position on the shaft, by using a 14 mm hexagon head socket wrench. (The shafts may be locked to each other by pushing a dull tool between the rotors!).
- 3. Remove cover disc (4), if applicable.
- 4. Pull off the rotors by using the special BOERGER tools (see spare parts list Pos. 90 / 91). With tri-lobe rotors, remove the three stud screws, screw the screws of the three wing puller into the female threads (6) of the rotor and pull the rotors of the shaft.

## Hint: Intermediate chamber fluid (standard: Hydraulic Oil) can leak between rotating holding bush and shaft. Shafts are not product-wetted.

- 5. Check (if necessary replace) and oil the O–rings (5).
- 6. Oil the shafts and push on the new rotors. If more then one rotor (mostly tri-lobe) will be assembled on one shaft, use spacer sleeves (Pos 20/21, spare parts list) to keep the rotor/shaft connection non-product-wetted. Screw the stud screws, if applicable, into the threaded bores (6) at the front of the linear tri-lobe rotors.
- 7. With linear tri-lobe rotors refit the cover disks (4).

- 8. Screw in the socket head cap screws (3) with the sealing washer (7) and tighten them with a torque wrench.
  - Torque 710 in-lbs (80 Nm) for standard screws
  - Torque 530 in-lbs (160 Nm) for stainless steel screws
- 9. Check easy motion of the rotors, if necessary, correct the alignment of the rotors.
- 10. Control the cover O-ring and tighten the quick release cover with the wear plate to the pump casing with the ring nuts.
- 11. Before restarting the pump, test it by carefully tipping the motor switch to ensure the function of the pump.

## 7. Exchange of Mechanical Seal



#### 7.1 Exchange of Mechanical Seal

- 1. Drain the oil from the intermediate chamber through the oil drain (11).
- 2. Remove the rotors as described under 6.2.
- 3. Remove the feather key (9) from the groove. Unscrew the holding bush with thread (2) by using the special BOERGER tool (spare part list Pos. 95).
- 4. Remove the mechanical seal faces (4) with O–rings (5) from the holding bush with thread (2) and from the stationary holding bush (8). Clean and oil the O-ring seats of the holding bushes. Flush the intermediate chamber for cleaning purpose.
- Push the O-rings (5) onto the new mechanical seal faces (4). Press one seal (4) into the stationary bush (8) and the other into the holding bush with thread (2). For this operation is also a special tool available (spare part list Pos. 93).
- 6. Screw the holding bush with thread (2) onto the shaft until aligned with the wear plate (7), then turn it backwards app. 1/6 revolution. The holding bush projects app. 0,3 mm to the wear plate. Ensure that one groove of the bush (2) is aligned with the groove on the shaft for the feather key (see 7.2).



- 7. Place the feather key (9) into the aligned grooves of the holding bush with thread (2) and of the shaft.
- 8. Check (replace if necessary) and oil the O–ring (1). Clean and oil the counter surfaces for the rotors.
- 9. Refit the rotors (see 6.2).
- 10. Fill oil (see 2.2) into the intermediate chamber through the oil inlet opening (10) (minimum to the level of the top shaft). Close intermediate chamber with plastic stopper (spare part list Pos. 69) for dirt protection.

#### 7.2 Adjustment of the axial Tolerance of the Rotors

- 1. Remove the lobes as described under 6.2.
- 2. Take the feather key (9) out of the shaft groove.
- 3. a) The rotors are too tight to the **quick release cover**:

Turn the holding bush with thread (2) **clockwise** 1/6 revolution until the next groove is aligned with the shaft groove by using the special BOERGER tool (spare part list Pos. 93).



b) The rotors are too tight to the **rear wear plate (7)**:

Turn the holding bush with thread (2) **counter clockwise** 1/6 revolution until the next groove is

aligned with the shaft groove by using the special BOERGER tool (spare part list Pos. 93).



## Do not unscrew the threaded bush (2) more than 1/6 turn! Danger of oil leakage from the intermediate chamber!

4. Place the feather key (9) into the aligned grooves of the holding bush with thread (2) and of the shaft.

Refit the rotors (see 6.4 and/or 6.5).

#### 7.3 Gland Packing

Please refer to separate operation and maintenance instructions.

### 7.4 Special Pump Constructions

*Please refer to separate operation and maintenance instructions.* File: BEDI-AL-7-15-02-USA Valid from: 07/15/02

### 8. Spare Parts List

The Spare Parts List contains position number referring to the explosion drawing, the name of the part, material, article number (important for spare part orders) and quantity per pump. The BOERGER Rotary lobe pump is furnished with fluid wetted parts according to the code number (see 9.1).

Exchange of Rotors		
2/4/6 x rotors	Pos. No.:	9
2/4/6 x O-Rings	Pos. No.:	31
2/4/6 x O-Rings	Pos. No.:	32
Exchange of Mechanical Seal		
2 x mechanical seal	Pos. No.:	15
$2 \times O - Rings$	Pos. No.:	31
2 x O–Ring	Pos. No.:	32
Exchange of wear plates		
1 x front wear plate	Pos. No.:	10
1 x rear wear plate	Pos. No.:	11
2 x O-Rings	Pos. No.:	31
2 x O-Rings	Pos. No.:	32
1 x O–Ring	Pos. No.:	30
2 x countersunk screw; M8 x 16	Pos. No.:	52
Exchange of fluid wetted parts		
1 x pump casing	Pos. No.:	5
2/4/6 x rotors	Pos. No.:	9
1 x front wear plate	Pos. No.:	10
1 x rear wear plate	Pos. No.:	11
2 x holding bush with thread	Pos. No.:	13
2 x stationary holding bush	Pos. No.:	14
2 x mechanical seal	Pos. No.:	15
2 x cover disc	Pos. No.:	24
2 x spacer sleeve	Pos. No.:	20
2 x gasket	Pos. No.:	25
1 x O–Ring	Pos. No.:	30
2 x O–Ring	Pos. No.:	31
2 x O–Ring	Pos. No.:	32
2 x O-Ring	Pos. No.:	33
2 x countersunk screw M8 x 16	Pos. No.:	52
2 x socket head cap screw M12 x 25	Pos. No.:	64
2 x sealing washer A 12 x 18	Pos. No.:	74

# As special tools use the withdrawal tool for tri-lobe rotors (Pos. No. 90), the special tool for the holding bush (Pos. No. 95) and the special tool for the mechanical seal (Pos. No. 93).

### 9. Spare Parts regarding the Code Number

#### 9.1 Code Number

The code number stamped to the pump nameplate identifies all fluid wetted parts the pump is furnished with. The code number is also recorded on the cover page of this operation and maintenance manual.

To decode the pump code, refer to the attached code table on the next page.

#### 9.2 Spare Parts List

The attached spare parts list is universal and contains all available combinations. Please use the pump code for identification.

Please order required spare parts at (please mention the article numbers):

BOERGER LLC PO Box 3949 Minneapolis, MN 55403 USA

E – mail: america@boerger-pumps.com

Phone:612 331 - 8765Fax:612 331 - 8769

No	Part	Material / Design	Romark	C	hc	N	um	hbo	r					
1	Model	AL 25		4	Jue									
	inodoi	AL 50		В										
		AL 75		C										
		PL 100 PL 200		D						_			-	
		PL 300		F										
		PL 400		G										
		FL 518		н									-	
		FL 1036		ĸ									-	
		FLA 518		S										
		FLA 776		Τ										
		FLA 1036		U						_		_	-	
		FLA 2072		0									-	
		FLA 3080		R										
		CL260		Q										
		CL390		V									-	
		02320		:										
2	Pump Casing	ASTM A48	Standard	:	Α									
		ASTM A48	nitride hardened		В							_		
——		ASTM A536 Stainless Steel	laser hardened Standard		D					_			-	-
		Stainless Steel	plasma hardened	:	E		-			-		-		
		MIP-Casing ASTM A48	MIP Standard, Liners from XAR 400		F									
		MIP-Casing ASTM A48	MIP Liners from Stainless Steel	:	G									
		MIP-Casing ASTM A48 Stainless Steel	MIP Liners / Wear Plates from St. Steel		н					_			-	
		Special Design	Customized Order		x									
				:	:									
3	Rotor Design	dual lobe (AL / PL / FL)		L.	L	A		<u> </u>	$\square$			<u> </u>	Ē	Ц
	1	tri lobe (AL / PL) dual lobe adjustable (PL)		÷	÷	B	-				-	-	⊢	
		tri lobe screw rotor (AL / PL)			÷	Ď	t	L			L		L	
		tri lobe linear rotor tips (FL)		•••	:	Ε								
		tri lobe linear rotor tips, rotor body stainless	steel (FL)	:	:	F							<u> </u>	<u> </u>
		tri lobe screw rotor tips (FL)	steel (FL)		-	G	-					-	-	
		arrobe sciew rotor aps, rotor body stamiess		:	:	:								
4	Rotor Material	Buna		•••	:	•••	Α							
		Buna-N		:	:	:	C	[						
		EPDM			-					_		_	-	-
		Urethane		:	:	:	P			-		-		
		Stainless Steel		•••	:	•••	Ε							
		PTFE		:	:	:	Τ	Ļ						
5	O-Rings	Buna-N					÷	С		_		-	-	
	o rungo	EPDM		:	:	:	:	D						
		FPM		•••	:	•••	:							
		PTFE		:	÷		:	T					-	
6	Lip Seals	Buna-N		÷	÷		÷		С	_		-	-	-
		FPM		• • •	:	• • •	:	:	Ĩ					
		Special Design	Customized Order		:	•••	:	:	Х					
7	Elange Gaskets	Bupa-N							:	c		_	-	
<u> </u>	i lange Gaskets	EPDM		:	:	:	:	:	:	D			-	
		FPM		•••	:	•••	:	:	:	Ī				
		PTFE		••	:	•••	:	:	:	T				
		Special Design	Customized Order		÷	÷				X			-	
8	Shaft Sealing Set Up	Seal Faces: Duronit	O-Rings: Buna-N	:	÷	:	÷	÷	÷	:	А		-	-
		Seal Faces: Duronit	O-Rings: EPDM	•••	:	•••	:		•••	•••	В			
		Seal Faces: Duronit	O-Rings: FPM	•••	:	•••	:	:	:-	•••	C			
	1	Seal Faces: Duronit Seal Faces: Silicon Carbide	O-Rings: PTFE	+	÷	÷	H	H	÷	÷	D F	-	⊢	$\vdash$
		Seal Faces: Silicon Carbide	O-Rings: EPDM	:	:	:	:	:	:		F			
	(	Seal Faces: Silicon Carbide	O-Rings: FPM	:	:	:	:	:	:	:	G			
	ł	Seal Faces: Silicon Carbide	O-Rings: PTFE				1	<u> </u>	L i		н	—	$\vdash$	Щ
	1	Packing with Flush Connection		÷	÷	÷	÷	÷	÷		H	-	⊢	$\vdash$
		Special Design	Customized Order	:	:	:	:	:	:	:	X			
		· · · · · · · · · · · · · · · · · · ·		:	:	:	:	:	:	:	:			
9	Shaft Design and Positioning	1x Driving Shaft: top			L.	-	-	1				A	Ē	Ш
		1x Driving Shaft: bottom			÷		-		-			B	<u> </u>	-
		2x SAE-Driving Shaft (PTO) (1 3/8")			Ė	Ŀ	L :	Ŀ				Ď	t	Н
		1x SAE-Driving Shaft (PTO) (1 3/8"), top		:	:	:	:	:	:	:	:	Ε		
$\vdash$	l	1x SAE-Driving Shaft (PTO) (1 3/8"), bottom		H	+	÷			H			F	<u> </u>	$\square$
		2x SAE-Driving Snatt (PTO) (1 3/4"), FL 103 2x SAE-Driving Shaft (PTO) (1 3/4") FL 103	36. top	H	H	H	÷	H	H	H		H	-	$\vdash$
		2x SAE-Driving Shaft (PTO) (1 3/4"), FL 103	36, bottom					Ė				Ï		
				:	:	:	:	1	:	:	:	:		
10	O&M Manual Edition No.	1		:	:	:	:	:	:	:	:	:	4	
	1					V	V	V					l l	$\square$
			Code Number:		Ľ		Ĺ	Ĺ	Ľ	Ľ			4	
11	Special Design	Horizontal, Rotated Set Up	Pump 90° rotated	-	-	-	<u> </u>	┣—			<u> </u>	-	⊢	Ļ
	1	Sealsensor	Sensor in Intermediate Chamber		-	-	-	-			-		<u> </u>	D
		Temperature Control	Temperature Sensor in Pump Casing											Z
		Special Accessory	Customized Order											х
						-	1	1			-	-	<u> </u>	$\square$
	1	1	1				1	1					1	



Pos.	name	material	articel-No.	quantity		/
				AL 25	AL 50	AL 75
1	gear case	ASTM A48	A30005	1	1	1
2	gear case cover	ASTM A48	A30105	1	1	1
7	pump casing AL 25	ASTM A48	B50115	1	I	-
	pump casing AL 50	ASTM A48	B50215	-	1	-
	pump casing AL 75	ASTM A48	B50315	-	-	1
	pump casing AL 25, nitrided hardening	ASTM A48	B50336	1	-	-
	pump casing AL 50, nitrided hardening	ASTM A48	B50345	-	1	-
	pump casing AL 75, nitrided hardening	ASTM A48	B50356	-	I	1
	pump casing AL 25, laser hardening	ASTM A536	B50366	1	-	-
	pump casing AL 50, laser hardening	ASTM A536	B50376	-	1	-
	pump casing AL 75, laser hardening	ASTM A536	B50386	-	-	1
	pump casing; AL 25, stainless steel	St. Steel	B50125	1	-	-
	pump casing; AL 50, stainless steel	St. Steel	B50225	-	1	-
	pump casing; AL 75, stainless steel	St. Steel	B50325	-	-	1
8	pump casing cover	ASTM A536	B51005	1	1	1
9.1	rotor 2-lobe; AL 25	FPM	R92658	2	-	-
	rotor 2-lobe; AL 25	Buna-N	R92678	2	-	-
	rotor 2-lobe; AL 25	EPDM	R92678	2	-	-
	rotor 2-lobe; AL 50	FPM	R92708	-	2	-
	rotor 2-lobe; AL 50	Buna-N	R92718	-	2	-
	rotor 2-lobe; AL 50	EPDM	R92728	-	2	-
	rotor 2-lobe; AL 75	FPM	R92758	-	-	2
	rotor 2-lobe; AL 75	Buna-N	R92768	-	-	2
	rotor 2-lobe; AL 75	EPDM	R92778	-	-	2
9.2	rotor 3-lobe; stainless steel	St. Steel	R93205	2	4	6
	rotor 3-lobe; PTFE	PTFE	R93231	2	4	6
10	cover protection plate, hardened steel	A 128	B51015	1	1	1
	cover protection plate, stainless steel	St. Steel	B51025	1	1	1
11	axial casing protection plate, hardened steel	AISI 4140	B51055	1	1	1
	axial casing protection plate, stainless steel	St. Steel	B51065	1	1	1
13	stationary holding bush	AISI 1045	D55215	2	2	2
	stationary holding bush, stainless steel	St. Steel	D55225	2	2	2

Pos.	name	material	articel-No.	quantity		/
				AL 25	AL 50	AL 75
14	holding bush with thread, steel	AISI 1045	D55115	2	2	2
	holding bush with thread, stainless steel	St. Steel	D55125	2	2	2
15.1	mechanical seal, cast iron; O-ring, Buna-N	cast iron	D55005	2	2	2
	mechanical seal, cast iron; O-ring, EPDM	cast iron	D55015	2	2	2
	mechanical seal, cast iron; O-ring, FPM	cast iron	D55025	2	2	2
	mechanical seal, cast iron; O-ring, PTFE	cast iron	D55055	2	2	2
	mechanical seal, Sic/Sic, O-ring, Buna-N	Sic/Buna-N	D55035	2	2	2
	mechanical seal, Sic/Sic, O-ring, EPDM	Sic/EPDM	D55046	2	2	2
	mechanical seal, Sic/Sic, O-ring, FPM	Sic/FPM	D55056	2	2	2
	mechanical seal, Sic/Sic, O-ring, PTFE	Sic/PTFE	D55065	2	2	2
16	driving shaft, AL 25	AISI 4140	W51115	1	-	-
	driving shaft, AL 50	AISI 4140	W51215	-	1	-
	driving shaft, AL 75	AISI 4140	W51315	-	-	1
	driving shaft, AL 25	St. Steel	W51116	1	-	-
	driving shaft, AL 50	St. Steel	W51216	-	1	-
	driving shaft, AL 75	St. Steel	W51316	-	-	1
17	short shaft, AL 25	AISI 4140	W51125	1	-	-
	short shaft, AL 50	AISI 4140	W51225	-	1	-
	short shaft, AL 75	AISI 4140	W51325	-	-	1
	short shaft, AL 25	St. Steel	W51126	1	-	-
	short shaft, AL 50	St. Steel	W51226	-	1	-
	short shaft, AL 75	St. Steel	W51326	-	-	!
19	gear wheel with groove, linear gear design	AISI 4140	E42305	2	2	2
20	stance bushing, 3-lobe; rotor/rotor stainless ste	St. Steel	D81100	2	2	2
21	distance bushing, 3-lobe; rotor/rotor PTFE	St. Steel	D81110	2	2	2
24	cover disc; stainless steel	St. Steel	C90015	2	2	2
25	gasket; AL 25	Buna-N	F92015	2	2	2
	gasket; AL 25	EPDM	F92025	2	2	2
	gasket; AL 25	FPM	F92035	2	2	2
	gasket; AL 25	PTFE	F92047	2	2	2
	gasket; AL 50	Buna-N	F92115	2	2	2
	gasket; AL 50	EPDM	F92125	2	2	2

Pos.	name	material	articel-No.	quantity		/
				AL 25	AL 50	AL 75
	gasket; AL 50	FPM	F92135	2	2	2
	gasket; AL 50	PTFE	F92147	2	2	2
	gasket; AL 75	Buna-N	F92215	2	2	2
	gasket; AL 75	EPDM	F92225	2	2	2
	gasket; AL 75	FPM	F92235	2	2	2
	gasket; AL 75	PTFE	F92247	2	2	2
30	O-ring, cover; 155 x 3	Buna-N	O55405	1	1	1
	O-ring, cover; 155 x 3	EPDM	O55415	1	1	1
	O-ring, cover; 155 x 3	FPM	O55411	1	1	1
	O-ring, cover; 155 x 3	PTFE	O55435	1	1	1
31	O-ring; 31 x 3	Buna-N	O55505	2	2	2
	O-ring; 31 x 3	EPDM	O55515	2	2	2
	O-ring; 31 x 3	FPM	O55525	2	2	2
	O-ring; 31 x 3	PTFE	O55535	2	2	2
32	O-ring; 34 x 2,5	Buna-N	O55605	2	2	2
	O-ring; 34 x 2,5	EPDM	O55615	2	2	2
	O-ring; 34 x 2,5	FPM	O55625	2	2	2
	O-ring; 34 x 2,5	PTFE	O55635	2	2	2
33	O-ring; 55 x 3	Buna-N	O55705	2	2	2
	O-ring; 55 x 3	EPDM	O55715	2	2	2
	O-ring; 55 x 3	FPM	O55725	2	2	2
	O-ring; 55 x 3	PTFE	O55735	2	2	2
36	oil seal; 30 x 40 x 7	Buna-N	S26505	1	1	1
37	double-lip oil seal; 40 x 62 x 10 DUO	Buna-N	S26105	2	2	2
	double-lip oil seal; 40 x 62 x 10 DUO	FPM	S26125	2	2	2
40	cylindrical roller bearing	DIN 5412	S24605	2	2	2
41	self-align roller bearing	DIN 635	S24505	2	2	2
42	hardened sleeve; 35 x 40 x 17	52100	S26005	2	2	2
43	hardened sleeve; 25 x 30 x 17	52100	S26705	1	1	1
46	feather key; A 8 x 7 x 45	DIN 6885	S24325	1	1	1
50	cover nut; M 12	DIN 580	Z42205	4	4	4
52	countersunk screw; M 8 x 16	DIN 6912	Z48205	2	2	2

Pos.	name	material	articel-No.		/	
				AL 25	AL 50	AL 75
53	screw stud; M 12 x 35	DIN 939	Z42105	4	4	4
55	dowel pin; 12m6 x 24	DIN 7979	Z43505	4	4	4
56	hexagon head screw; M 8 x 15	DIN 912	Z49105	8	12	12
58	socket head cap screw; M 12 x 140	DIN 912	Z49305	4	4	4
59	socket head cap screw; M 10 x 25	DIN 6912	Z49405	8	8	8
63	feather key for 2-lobe rotor; 8x7x 18,5	DIN 6885	Z49025	2	-	-
	feather key for 2-lobe rotor; 8x7x57,5	DIN 6885	Z49035	-	2	-
	feather key for 2-lobe rotor; 8x7x57,5	DIN 6885	Z49045	-	-	2
	feather key, rotor stainless steel; 8x7x25	DIN 6885	Z49026	2	-	-
	feather key, rotor stainless steel; 8x7x63	DIN 6885	Z49036	-	2	-
	feather key, rotor stainless steel; 8x7x103	DIN 6885	Z49046	-	-	2
64	socket head cap screw M12x25	DIN 6912	Z49605	2	2	2
	socket head cap screw M12x25; st. Steel	DIN 6912	Z49705	2	2	2
65	oil gauge, R1"	brass	Z18508	1	1	1
66	oil drain screw, inspection chamber, G 3/8"	DIN 908	Z29305	2	2	2
67	air vent screw; B 1/2"	brass	Z19108	1	1	1
69	stopper B 146	PE	Z19508	1	1	1
70	sealing washer; A 33 x 39 x 2		K22208	1	1	1
71	sealing washer, A 17 x 23	Cu	K32405	2	2	2
73	sealing washer; A 21 x 26	Cu	K22508	1	1	1
74	sealing washer A 12 x 18	Cu	K32505	2	2	2
77	circlip 72 x 2,5	DIN 472	K33005	2	2	2
80	sealing compound (tube 50 ml)		U22308	1	1	1
	sealing compound (tube 250 ml)		U22208	1	1	1
90	withdrawal tool for 3-lobe rotor	ASTM A570	U32935	1	1	1
91	withdrawal tool for 2-lobe rotor	ASTM A570	U32915	1	1	1
93	special tool for mechanical seal		U32945	1	1	1
95	special tool for holding bush	ASTM A570	U32965	1	1	1
96	feather key, gear; A 10 x 8 x 28	DIN 6885	S24335	2	2	2
97	lifting eye bolt; M 12	DIN 580	Z39508	1	1	1