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1.0 Introduction

1.1 General

The RB1-6-range is manufactured by Fors Marin, Göteborg, Sweden, and is sold and marketed by a net of authorized distributors. This instruction manual contains necessary information of the RB-pumps and must be read carefully before installation, service and maintenance. The manual must be kept easily accessible to the operator.

Important!

The pump must not be used for other purposes than recommended and quoted for without consulting Fors Marin



Liquids not suitable for the pump can cause damages to the pump unit and imply risk of personal injury.

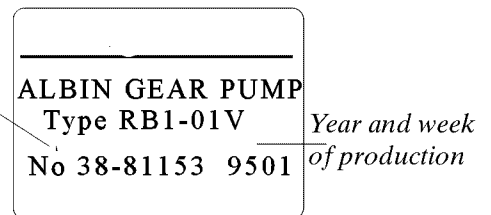
1.2 Reception, handling and storage

1.2.1 Reception

Remove all packing materials immediately after reception. Check the consignment for damage immediately on arrival and make sure that the name plate/type designation is in accordance with the packing slip and your order.

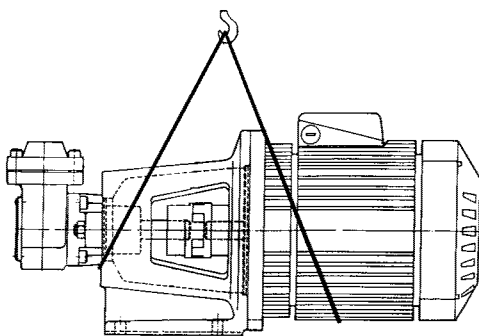
In case of damage and/or missing parts, a report should be drawn up and presented to the carrier at once. Notify your Johnson Pump distributor.

On the pump there is a plate with the article number. Always state this number when contacting your distributor.

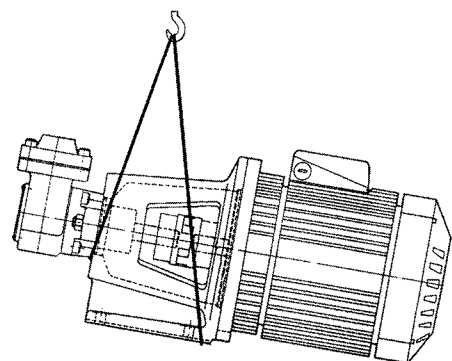


1.2.2 Handling

Check the weight of the pump unit. All parts weighing more than 20 kg must be lifted using lifting slings and suitable lifting devices, e.g. overhead crane or industrial truck. See section 7.0 for the weights.



Always use two lifting slings. Make sure that they are secured in such a way as to prevent them from slipping and that the pump unit is hanging straight.



Never lift the pump unit with only one fastening point. Incorrect lifts can cause personal injury and/or damage to the product.

1.2.3 Storage

If the pump is not installed immediately, it must be stored in a dry and clean place. Turn the shaft every second month and check that there is oil for protection in the pump housing.

1.3 Safety

Important!

The pump must not be used for other purposes than recommended and quoted for without consulting **Fors Marin**

A pump must always be installed and used in accordance with existing national and local sanitary and safety regulations and laws.



- Always wear suitable safety clothing when handling the pump.



- Anchor the pump properly before start-up to avoid personal injury and/or damage to the pump unit.



- Install shut-off valves on both sides of the pump to be able to shut off the in- and outlet before service and maintenance. Check to see that the pump can be drained without injuring anyone and without damaging the environment or nearby equipment.



- Make sure that all movable parts are properly covered to avoid personal injury.
- All electrical installation work must be carried out by authorized personnel in accordance with EN60204-1. Install a lockable circuit breaker to avoid inadvertant starting. Protect the motor and other electrical equipment from overloads with suitable equipment. The electric motors must be supplied with ample cooling air.

In environments where there is risk of explosion, motors classified as explosion safe must be used, along with special safety devices. Check with the governmental agency responsible for such precautions.



Improper electrical installation can cause fatal injuries.

- Dust, liquids and gases that can cause overheating, short circuits, corrosion damage and fire must be kept away from the motor and other exposed equipment. If the pump handles liquids hazardous for person or environment, some sort of container must be installed into which leakage can be led.



- If the surface temperature of the system or parts of the system exceeds 60°C, these areas must be marked with warning text reading "Hot surface" to avoid burns.



- The pump unit must not be exposed to rapid temperature changes of the liquid without prior pre-heating/pre-cooling. It is absolutely forbidden to flush a hot pump with cold water. Big temperature changes can cause crack formation or explosion, which in turn can entail severe personal injuries.



- The pump must not operate above stated performance.
- Before intervening in the pump/system, the power must be shut off and the starting device be locked. When intervening in the pump unit, follow the instructions for disassembly/assembly. If the instructions are not followed, the pump or parts of the pump can be damaged. It will also invalidate the warranty.
- Do not run the pump dry. If there is a risk of dry running install a suitable dry running protection to avoid serious damages.
- If the pump does not function satisfactorily, contact your distributor.

1.4 Type designations

Example	RB	5	-	02	V
	1	2	-	3	4

- 1 = family name
- 2 = displacement per revolution in dm³
- 3 = pump version (see below)
- 4 = shaft seal (see below)

3 Pump version

(Degrees show max working temperature)(A) V = mechanical seal

02 = tufftrided, 140°C

03 = increased clearances, 250°C

4 Shaft seals

V = mechanical seal

F = gland packing PTFE

R = gland packing of pure graphite

L = PTFE double lip seal

1.5 Function and operating principle

There are two moving parts (see figure A) – rotor (1) and idler gear (2). The gear is eccentrically positioned in relation to the rotor and has less teeth than the rotor. The crescent (3) acts as a seal between the suction and discharge ports and divides the liquid which is transported in the gear and rotor pockets.

1.5.1 Operating principle

A

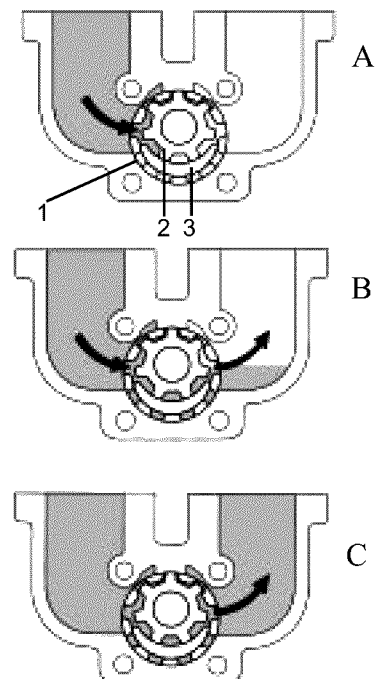
As the rotor shaft is turned the volume of the pockets between the rotor and the gear is increased and a vacuum is created. Liquid enters the suction port.

B

Observe the progress of the liquid through the pump and how the crescent shape on the head divides the liquid and acts as a seal between the suction and discharge ports. The gear design of the idler and the rotor form locked pockets for the liquid which guarantees absolute volume control.

C

Pump in a completely flooded condition in the process of discharging the liquid through the discharge port.



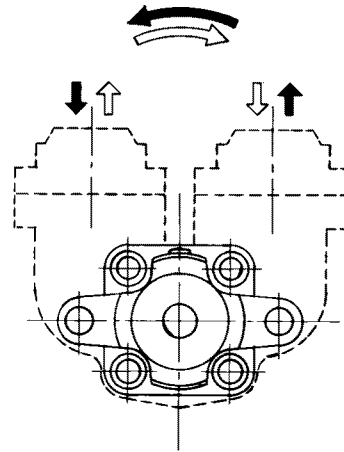
Arrows show the direction of rotation and progress of the liquid flow.

1.5.2 Direction of rotation

The pumps are normally built for left hand rotation (viewed from the shaft end) which means suction port (inlet) to the left and discharge port (outlet) to the right.

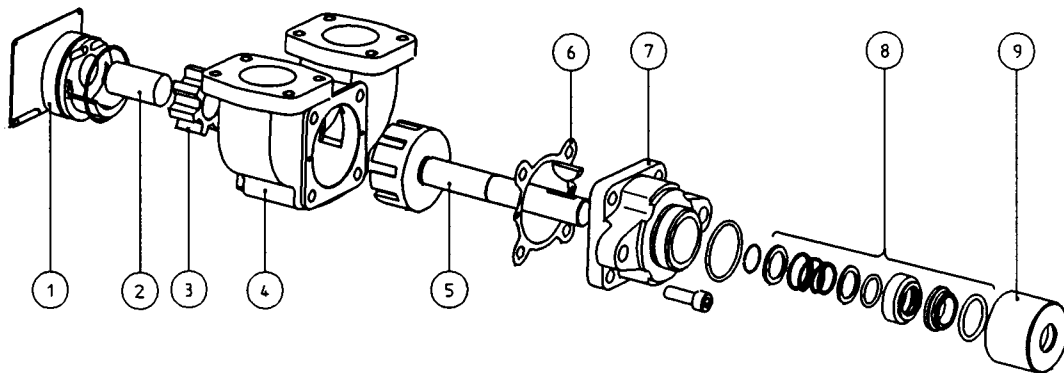
For reverse operation

Release the front cover (see pos 7 below), turn it 180° and tighten it again. Now the pump can be run in the right hand direction with the suction port to the right and the discharge port to the left.



Direction of rotation and flow.

1.6 Standard parts of the pump



- | | | |
|---------------|----------------|--------------|
| 1 Crescent | 4 Pump housing | 7 Cover |
| 2 Journal pin | 5 Rotor | 8 Shaft seal |
| 3 Gear | 6 Shims | 9 Gland nut |

2.0 Technical information

2.1 Material specification

Pump housing	-	Cast iron, BS1452, grade 17
Crescent	-	Cast iron, BS1452, grade 17
Flanges	-	Steel, E.N. 2
Rotor	-	Steel, E.N. 8M
Gear	-	Steel, E.N. 3B
O-rings	-	Viton

2.2 Pump versions

02 - Standard pump version for most liquids e.g. oils, paints and glues.
Heat treated parts (nitro carburated). Max. liquid temperature 140°C.

03 - Pump with increased radial and axial clearances for temperatures up to 250°C and for liquids sensitive to temperature increases, e.g. heat transfer oils, polyester, glue, bitumen, sugar solutions.

2.3 Shaft seals

V = mechanical seal

F = gland packing, PTFE

L = PTFE double lip seal

R = gland packing, pure graphite

2.3.1 Mechanical seal, type V

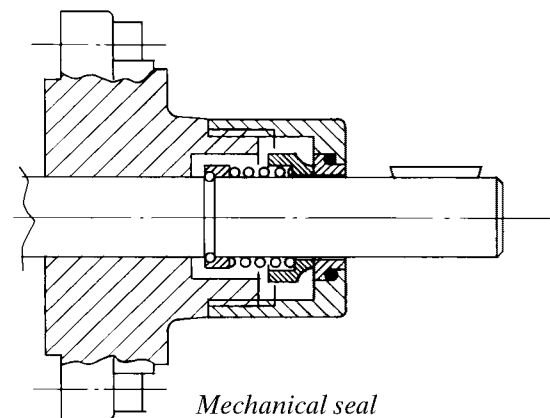
For oils, emulsions, detergents and similar liquids.

Max viscosity: 1500 cP

Max temperature: 175°C

Max pressure suction side: 5 bar

Material: carbon/steel, viton O-rings



2.3.2 Gland packing F and R

F Non-asbestos PTFE impregnated packing for both low and high viscous liquids.
Spring loaded, self adjusting.

Max temperature: 200°C

□ dimension: RB1-2 = 1/8"
RB3-6 = 1/4"

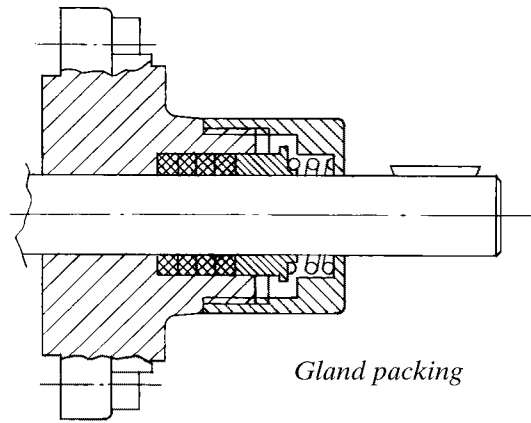
R Gland packing rings of pure graphite with conventional gland and gland screws.

Can be run dry.

Chemically very good durability.

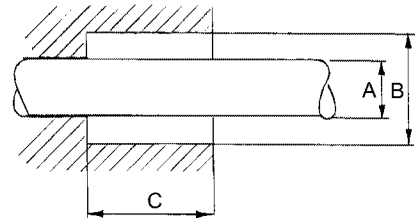
Max temperature: 300°C.

Remember that the gland packing is designed to leak somewhat to give proper lubrication.



Dimensions of stuffingbox

Pump	A	B	C
RB1-2	Ø12 mm	Ø20 mm	21 mm
RB3-4	Ø18 mm	Ø31 mm	30 mm
RB5-6	Ø25 mm	Ø38 mm	30 mm



2.3.3 Double lip seal, type L

Double PTFE lip seals for quench or flush.

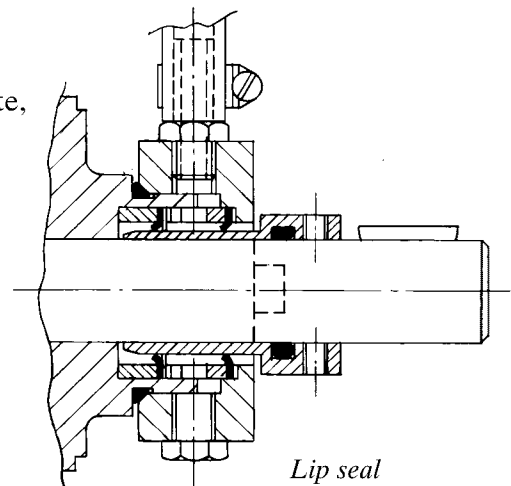
For hazardous and difficult liquids e.g. isocyanate, solvents, paints and to prevent crystallization.

Max temperature: 170°C

Max pressure: 6 bar

Max pressure on the suction side: 3 bar

Important! The pump is delivered without flushing liquid. The flushing liquid must be compatible with the liquid being pumped. Always maintain liquid lubrication in the seal.



2.4 Temperature

With standard clearances:
Version -02: -40 C – +140 C

With increased clearances:
Version -03: -40 C – +250 C

2.5 Particle size

Max size of solid particles:

RB1-2	0.05 mm
RB3-4	0.015 mm
RB5-6	0.015 mm

2.6 Revolutions

RB1-4	3000 rpm at max 40 cP
RB5-6	1700 rpm at max 40 cP

2.7 Pressure

For a good lubricant of at least 30-40 cP the max permissible discharge pressure is:

RB1-4	30 bar
RB5-6	8 bar

2.8 Rotor clearances

When assembling a pump the rotor clearance is important to maintain the capacity/efficiency of the pump. The following measurements apply:

	Version -02		Version -03	
RB1-2	0.02	0.01 mm	0.05	0.01 mm
RB3-4	0.05	0.01 mm	0.09	0.01 mm
RB5-6	0.07	0.02 mm	0.12	0.02 mm

The above is measured (use a dial indicator) at the shaft end when the pump is dry and clean. Correct clearance is set with shims.

2.9 Sound level

Highest measured sound level for the RB-pumps is 74 dB(A) for a pump mounted to a standard electric motor.

3.0 Capacity

3.1 range at 700 rpm

Pump	Viscosity	Pressure, bar											
		0		5		10		15		20		25	
		l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW
RB1	10	1.4	0.04	1.4	0.04	1.3	0.07	1.3	0.10	1.3	0.15	-	-
	35	1.4	0.04	1.4	0.04	1.4	0.07	1.4	0.10	1.3	0.15	1.3	0.20
	75	1.5	0.04	1.5	0.05	1.4	0.07	1.4	0.11	1.4	0.15	1.3	0.19
	150	1.5	0.04	1.5	0.05	1.5	0.07	1.4	0.11	1.4	0.15	1.4	0.18
	380	1.5	0.04	1.5	0.05	1.5	0.07	1.5	0.11	1.4	0.13	1.4	0.16
	750	1.5	0.06	1.5	0.07	1.5	0.08	1.5	0.10	1.5	0.13	1.4	0.14
	1500	1.5	0.07	1.5	0.07	1.5	0.09	1.5	0.10	1.5	0.11	1.5	0.13
	2200	1.5	0.07	1.5	0.08	1.5	0.09	1.5	0.10	1.5	0.11	1.5	0.13
	8000	1.5	0.07	1.5	0.08	1.5	0.09	1.5	0.11	1.5	0.11	1.5	0.13
RB2	10	3.1	0.04	3.0	0.04	3.0	0.08	2.9	0.13	2.9	1.18	-	-
	35	3.1	0.04	3.0	0.06	3.0	0.09	3.0	0.13	2.9	0.19	2.9	0.24
	75	3.1	0.04	3.1	0.07	3.0	0.10	3.0	0.15	3.0	0.20	2.9	0.25
	150	3.1	0.05	3.1	0.07	3.1	0.11	3.0	0.15	3.0	0.21	3.0	0.26
	380	3.1	0.06	3.1	0.10	3.1	0.13	3.1	0.18	3.0	0.22	3.0	0.26
	750	3.1	0.10	3.1	0.13	3.1	0.16	3.1	0.20	3.1	0.24	3.1	0.27
	1500	3.1	0.16	3.1	0.18	3.1	0.20	3.1	0.21	3.1	0.24	3.1	0.27
	2200	3.1	0.18	3.1	0.19	3.1	0.21	3.1	0.22	3.1	0.24	3.1	0.27
	8000	3.1	0.22	3.1	0.22	3.1	0.22	3.1	0.23	3.1	0.24	3.1	0.27
RB3	10	6.3	0.06	6.2	0.11	6.1	0.20	5.9	0.32	5.7	0.47	-	-
	35	6.4	0.07	6.3	0.13	6.2	0.21	6.1	0.32	5.9	0.47	5.6	0.62
	75	6.5	0.10	6.4	0.15	6.3	0.24	6.2	0.35	6.0	0.48	5.8	0.63
	150	6.5	0.11	6.4	0.17	6.3	0.24	6.2	0.35	6.1	0.48	5.9	0.65
	380	6.5	0.15	6.5	0.21	6.4	0.29	6.3	0.38	6.2	0.48	6.0	0.65
	750	6.5	0.19	6.5	0.26	6.5	0.33	6.4	0.42	6.3	0.52	6.2	0.63
	1500	6.5	0.28	6.5	0.32	6.5	0.37	6.5	0.43	6.4	0.50	6.3	0.57
	2200	6.5	0.38	6.5	0.40	6.5	0.43	6.5	0.46	6.5	0.49	6.5	0.56
	8000	6.5	0.40	6.5	0.43	6.5	0.48	6.5	0.49	6.5	0.50	6.5	0.56
RB4	10	12.7	0.07	12.3	0.14	12.0	0.24	11.6	0.37	11.2	0.54	-	-
	35	12.7	0.08	12.5	0.15	12.2	0.26	11.8	0.40	11.5	0.57	11.1	0.74
	75	12.8	0.12	12.6	0.19	12.3	0.29	12.0	0.43	11.6	0.57	11.3	0.74
	150	12.9	0.19	12.6	0.28	12.4	0.37	12.2	0.51	12.0	0.62	11.7	0.77
	380	12.9	0.25	12.8	0.36	12.5	0.43	12.4	0.58	12.2	0.65	12.0	0.81
	750	12.9	0.28	12.8	0.39	12.7	0.47	12.6	0.60	12.6	0.71	12.5	0.85
	1500	12.9	0.36	12.9	0.43	12.9	0.51	12.8	0.63	12.7	0.74	12.7	0.85
	2200	12.9	0.49	12.9	0.54	12.9	0.60	12.9	0.66	12.9	0.77	12.9	0.88
	8000	12.9	0.62	12.9	0.74	12.9	0.75	12.9	0.75	12.9	0.81	12.9	0.88
RB5	10	31.0	0.15	30.6	0.41	29.5	0.85						
	35	31.0	0.22	30.8	0.50	30.0	0.92						
	75	32.0	0.26	31.5	0.56	31.0	1.01						
	150	33.0	0.33	32.7	0.72	32.0	1.10						
	380	33.5	0.52	33.0	0.96	32.7	1.20						
	750	33.5	0.74	33.0	1.12	32.8	1.32						
	1500	33.5	1.03	33.0	1.25	32.8	1.47						
	2200	33.5	1.25	33.0	1.38	32.8	1.55						
	8000	33.5	1.62	33.0	1.65	32.8	1.67						
RB6	10	62.0	0.18	61.0	0.86	60.0	1.77						
	35	63.0	0.28	62.0	0.96	61.0	1.84						
	75	64.0	0.40	63.3	1.07	62.5	1.91						
	150	65.0	0.52	64.3	1.18	63.5	2.00						
	380	66.0	0.74	65.3	1.40	64.5	2.10						
	750	67.0	1.07	66.5	1.62	66.0	2.20						
	1500	67.0	1.40	66.5	1.84	66.0	2.32						
	2200	67.0	1.84	66.5	2.10	66.0	2.43						
	8000	67.0	2.55	66.5	2.60	66.0	2.85						

The above values apply when the pump operates with a manometric suction lift of 4 meters or 13 feet water column. Capacity tolerance 5%. The kW-power stated are those required at the pump shaft. When selecting size of motor, the kW-rating should be 15% higher than the value indicated.

3.2 range at 900 rpm

Pump	Viscosity	Pressure, bar											
		0		5		10		15		20		25	
		l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW
RB1	10	1.9	0.04	1.8	0.05	1.8	0.08	1.7	0.13	1.7	0.18	-	-
	35	2.0	0.04	1.9	0.06	1.9	0.09	1.8	0.13	1.7	0.18	1.6	0.24
	75	2.0	0.04	2.0	0.06	1.9	0.09	1.8	0.13	1.8	0.18	1.7	0.22
	150	2.0	0.04	2.0	0.07	2.0	0.10	1.9	0.13	1.9	0.18	1.8	0.22
	380	2.0	0.07	2.0	0.09	2.0	0.11	2.0	0.14	1.9	0.18	1.9	0.22
	750	2.0	0.07	2.0	0.09	2.0	0.11	2.0	0.14	2.0	0.16	1.9	0.18
	1500	2.0	0.10	2.0	0.11	2.0	0.13	2.0	0.14	2.0	0.16	2.0	0.18
	2200	2.0	0.10	2.0	0.11	2.0	0.13	2.0	0.14	2.0	0.16	2.0	0.18
	4000	2.0	0.11	2.0	0.12	2.0	0.13	2.0	0.14	2.0	0.16	2.0	0.18
8000	2.0	0.12	2.0	0.13	2.0	0.14	2.0	0.15	2.0	0.16	2.0	0.18	
RB2	10	3.9	0.04	3.8	0.07	3.8	0.11	3.7	0.17	3.7	0.24	-	-
	35	4.0	0.05	3.9	0.08	3.9	0.12	3.8	0.17	3.7	0.24	3.7	0.30
	75	4.0	0.05	3.9	0.08	3.9	0.13	3.8	0.18	3.8	0.25	3.8	0.32
	150	4.0	0.06	3.9	0.10	3.9	0.15	3.9	0.20	3.8	0.26	3.8	0.32
	380	4.0	0.08	4.0	0.13	3.9	0.18	3.9	0.23	3.9	0.28	3.9	0.32
	750	4.0	0.13	4.0	0.16	4.0	0.21	4.0	0.25	4.0	0.29	4.0	0.33
	1500	4.0	0.18	4.0	0.21	4.0	0.24	4.0	0.26	4.0	0.29	4.0	0.33
	2200	4.0	0.24	4.0	0.25	4.0	0.27	4.0	0.29	4.0	0.32	4.0	0.35
	4000	4.0	0.29	4.0	0.30	4.0	0.30	4.0	0.31	4.0	0.32	4.0	0.35
8000	4.0	0.33	4.0	0.34	4.0	0.35	4.0	0.35	4.0	0.36	4.0	0.36	
RB3	10	8.1	0.10	8.0	0.17	7.8	0.27	7.6	0.41	7.4	0.59	-	-
	35	8.2	0.11	8.1	0.18	7.9	0.27	7.8	0.41	7.6	0.59	7.3	0.77
	75	8.3	0.14	8.2	0.21	8.0	0.32	7.9	0.45	7.7	0.60	7.5	0.78
	150	8.3	0.16	8.3	0.23	8.1	0.32	8.0	0.47	7.8	0.60	7.6	0.78
	380	8.3	0.21	8.3	0.29	8.2	0.38	8.1	0.49	8.0	0.60	7.8	0.77
	750	8.3	0.29	8.3	0.36	8.3	0.44	8.2	0.53	8.1	0.63	8.0	0.74
	1500	8.3	0.36	8.3	0.42	8.3	0.49	8.3	0.55	8.2	0.63	8.1	0.72
	2200	8.3	0.52	8.3	0.54	8.3	0.57	8.3	0.60	8.3	0.65	8.2	0.71
	4000	8.3	0.60	8.3	0.60	8.3	0.62	8.3	0.67	8.3	0.67	8.2	0.71
8000	8.3	0.70	8.3	0.75	8.3	0.80	8.2	0.82	8.2	0.85	8.2	0.86	
RB4	10	16.2	0.12	15.7	0.20	15.4	0.31	15.0	0.47	14.4	0.66	-	-
	35	16.5	0.13	16.2	0.23	15.8	0.35	15.2	0.52	14.8	0.71	14.3	0.91
	75	16.6	0.18	16.3	0.27	15.9	0.40	15.5	0.56	15.0	0.75	14.6	0.94
	150	16.7	0.21	16.4	0.32	16.0	0.44	15.6	0.60	15.4	0.81	15.1	0.99
	380	16.7	0.29	16.6	0.40	16.2	0.53	15.9	0.68	15.7	0.85	15.4	1.03
	750	16.7	0.37	16.6	0.48	16.4	0.60	16.2	0.77	16.2	0.92	16.1	1.10
	1500	16.7	0.54	16.7	0.63	16.7	0.74	16.5	0.88	16.5	0.99	16.4	1.14
	2200	16.7	0.70	16.7	0.77	16.7	0.85	16.7	0.92	16.7	1.03	16.7	1.18
	4000	16.7	0.98	16.7	1.05	16.7	1.06	16.7	1.08	16.7	1.12	16.7	1.26
8000	16.7	1.40	16.7	1.42	16.7	1.44	16.7	1.45	16.7	1.45	16.7	1.45	
Pressure, bar		0		5		8							
RB5	10	40.0	0.22	38.5	0.55	37.0	1.07						
	35	40.0	0.37	39.0	0.68	38.0	1.16						
	75	40.0	0.40	39.5	0.77	38.5	1.29						
	150	41.0	0.49	40.6	0.90	40.0	1.40						
	380	42.0	0.74	41.2	1.10	40.5	1.55						
	750	42.0	1.03	41.2	1.32	40.5	1.69						
	1500	42.0	1.40	41.2	1.69	40.5	1.99						
	2200	42.0	1.69	41.2	1.84	40.5	2.06						
	4000	42.0	2.15	41.2	2.17	40.5	2.25						
8000	42.0	2.40	41.2	2.45	40.5	2.50							
RB6	10	80.0	0.29	78.5	1.14	77.0	2.20						
	35	80.0	0.46	78.5	1.25	77.0	2.36						
	75	82.0	0.59	80.5	1.44	79.0	2.50						
	150	84.0	0.74	82.5	1.55	81.0	2.50						
	380	84.0	0.99	83.0	1.84	81.8	2.80						
	750	84.0	1.47	83.0	2.13	81.8	2.94						
	1500	84.0	2.02	83.0	2.58	81.8	3.16						
	2200	84.0	2.33	83.0	2.87	81.8	3.24						
	4000	84.0	3.09	83.0	3.41	81.8	3.42						
8000	84.0	3.50	83.0	3.74	81.8	3.82							

The above values apply when the pump operates with a manometric suction lift of 4 meters or 13 feet water column. Capacity tolerance ± 5%. The kW-power stated are those required at the pump shaft. When selecting size of motor, the kW-rating should be 15% higher than the value indicated.

3.3 range at 1400 rpm

Pump	Viscosity	Pressure, bar											
		0		5		10		15		20		25	
		cP	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn	kW	l/mn
RB1	10	3.0	0.04	2.9	0.07	2.9	0.11	2.8	0.17	2.7	0.25	-	-
	35	3.1	0.05	3.0	0.07	2.9	0.12	2.9	0.18	2.8	0.26	2.8	0.34
	75	3.2	0.06	3.1	0.09	3.0	0.13	2.9	0.19	2.9	0.26	2.8	0.33
	150	3.2	0.07	3.2	0.10	3.1	0.15	3.0	0.20	3.0	0.26	2.9	0.33
	380	3.2	0.11	3.2	0.14	3.2	0.18	3.1	0.22	3.1	0.27	3.0	0.33
	750	3.2	0.15	3.2	0.18	3.2	0.21	3.2	0.24	3.1	0.28	3.0	0.32
	1500	3.2	0.18	3.2	0.21	3.2	0.23	3.2	0.26	3.2	0.29	3.1	0.32
	2200	3.2	0.21	3.2	0.22	3.2	0.24	3.2	0.26	3.2	0.29	3.2	0.31
	8000	3.2	0.23	3.2	0.24	3.2	0.25	3.2	0.26	3.2	0.30	3.2	0.31
RB2	10	6.1	0.05	6.0	0.09	6.0	0.16	5.9	0.24	5.8	0.34	-	-
	35	6.2	0.07	6.1	0.11	6.1	0.18	6.0	0.25	5.9	0.35	5.9	0.44
	75	6.2	0.07	6.2	0.12	6.1	0.18	6.0	0.26	6.0	0.36	5.9	0.46
	150	6.2	0.10	6.2	0.15	6.2	0.22	6.1	0.29	6.0	0.38	6.0	0.46
	380	6.2	0.21	6.2	0.27	6.2	0.33	6.2	0.38	6.1	0.40	6.1	0.48
	750	6.2	0.19	6.2	0.28	6.2	0.33	6.2	0.38	6.2	0.42	6.1	0.49
	1500	6.2	0.26	6.2	0.29	6.2	0.34	6.2	0.39	6.2	0.44	6.2	0.50
	2200	6.2	0.30	6.2	0.33	6.2	0.36	6.2	0.40	6.2	0.44	6.2	0.50
	8000	6.2	0.37	6.2	0.39	6.2	0.39	6.2	0.41	6.2	0.44	6.2	0.50
RB3	10	12.8	0.15	12.5	0.26	12.2	0.41	11.8	0.62	11.4	0.87	-	-
	35	12.9	0.18	12.6	0.29	12.4	0.46	12.0	0.66	11.6	0.88	11.2	1.15
	75	13.0	0.21	12.8	0.33	12.6	0.50	12.2	0.70	11.8	0.92	11.4	1.16
	150	13.0	0.27	13.0	0.38	12.8	0.53	12.5	0.74	12.2	0.92	11.9	1.16
	380	13.0	0.38	13.0	0.49	12.9	0.63	12.7	0.77	12.4	0.96	12.1	1.18
	750	13.0	0.47	13.0	0.59	13.0	0.72	12.9	0.88	12.8	1.03	12.6	1.18
	1500	13.0	0.61	13.0	0.70	13.0	0.81	13.0	0.92	12.9	1.03	12.8	1.19
	2200	13.0	0.77	13.0	0.81	13.0	0.88	13.0	0.96	13.0	1.07	12.9	1.19
	8000	13.0	1.00	13.0	1.00	13.0	1.00	13.0	1.04	13.0	1.12	12.9	1.20
RB4	10	25.5	0.18	24.7	0.32	24.0	0.53	23.3	0.77	22.5	1.05	-	-
	35	26.0	0.21	25.3	0.37	24.6	0.59	23.7	0.85	23.1	1.12	22.3	1.40
	75	26.0	0.25	25.4	0.44	24.7	0.68	24.1	0.93	23.4	1.18	22.8	1.46
	150	26.0	0.33	25.5	0.52	24.9	0.77	24.4	1.03	24.0	1.29	23.5	1.55
	380	26.0	0.69	25.8	0.87	25.3	1.05	24.8	1.18	24.5	1.44	24.1	1.96
	750	26.0	0.69	25.8	0.88	25.6	1.10	25.3	1.32	25.2	1.54	25.1	1.80
	1500	26.0	1.03	26.0	1.18	26.0	1.36	25.8	1.55	25.7	1.73	25.6	1.91
	2200	26.0	0.32	26.0	1.40	26.0	1.55	26.0	1.66	26.0	1.84	26.0	2.02
	8000	26.0	1.70	26.0	1.80	26.0	1.84	26.0	1.90	26.0	2.00	26.0	2.25
RB5	10	62.0	0.37	61.0	0.85	59.0	1.55						
	35	62.0	0.49	61.0	1.03	59.5	1.77						
	75	63.0	0.74	62.0	1.21	61.0	1.91						
	150	64.0	1.20	63.0	1.62	62.0	2.34						
	380	65.0	1.48	64.0	2.33	63.0	2.85						
	750	66.0	1.69	65.0	2.54	64.0	3.07						
	1500	66.0	2.36	65.0	2.80	64.0	3.24						
	2200	66.0	2.58	65.0	2.83	64.0	3.24						
	8000	66.0	3.11	65.0	3.30	64.0	3.44						
RB6	10	125.0	0.52	122.5	1.84	119.0	3.39						
	35	125.0	0.59	122.5	1.95	119.0	3.53						
	75	125.0	0.96	123.0	2.20	120.0	3.68						
	150	125.0	1.18	124.5	2.43	124.0	3.97						
	380	130.0	1.73	128.0	3.02	125.5	4.42						
	750	130.0	2.20	128.0	3.46	126.0	4.71						
	1500	132.0	3.31	130.0	4.05	128.0	5.00						
	2200	132.0	4.12	130.0	4.42	128.0	5.08						
	8000	132.0	5.50	130.0	5.10	128.0	5.31						

The above values apply when the pump operates with a manometric suction lift of 4 meters or 13 feet water column. Capacity tolerance ± 5%. The kW-power stated are those required at the pump shaft. When selecting size of motor, the kW-rating should be 15% higher than the value indicated.

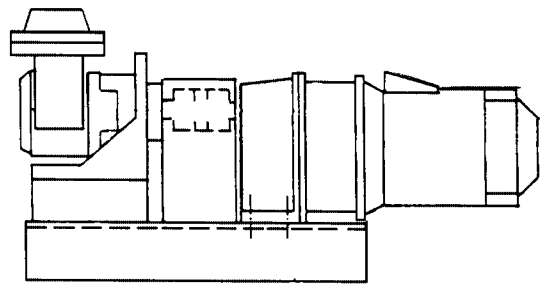
4.0 Installation and maintenance

4.1 General

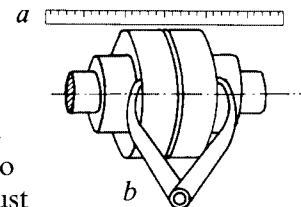
- The pump unit must be thoroughly fastened.
- The pump unit must be provided with a lockable circuit breaker.
- Before any service or maintenance in the pump or system, shut off the power and lock the starting device to prevent inadvertent starting. The pump must be separated from the pipelines and power. If the pump is used for aggressive/dangerous liquids, drain the pump and the system.
- Always install a suitable safety relief valve or other safety equipment to prevent overloads of the pump or pump system.
- The pump can be installed horizontally or vertically but not with the connections downwards unless the liquid storage tank is placed above the pump (flooded pump).

4.2 Installation and piping

- If the pump and drive is mounted on a base plate **the alignment of the pump and the motor shaft must be carefully checked** after the foundation bolts have been tightened and the pipings have been connected. Even small deviations must be corrected. The clearance between the coupling halves should be approximately 2 mm.



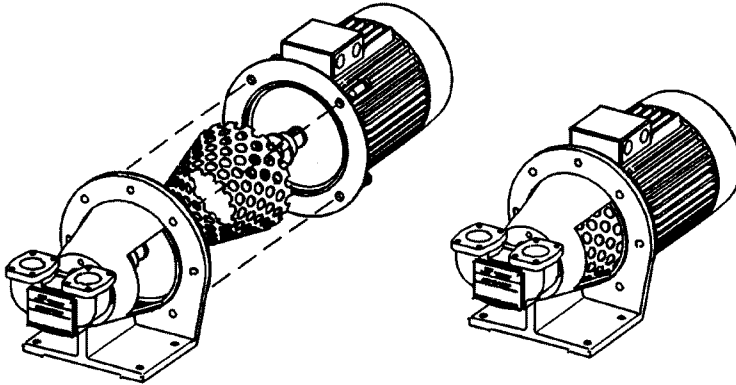
Check with a steel rule or ruler at four different places around the machined surfaces of the coupling (a). The length of the coupling should be equal and is measured at four different places of the periphery of the coupling halves (b).



- Check that all pipelines are correctly aligned with the pump ports and **relieved from stress** to prevent loads from being transferred to the pump. Use pipes of correct size and material. All pipelines must be thoroughly cleaned. Seal the pipe joints with a suitable material.
- If the pump and motor are mounted to a flange pedestal the alignment is automatically achieved by means of guides for both motor and pump.
- Check that the pipe flanges fit well against the pump flanges before they are tightened.
- If a shut-off valve is installed in the discharge piping system a safety relief valve should always be mounted between the pump and the shut-off valve. This is to protect the pump from excessive pressures if the shut-off valve is closed when the pump is running. If the pump is provided with a built-on safety valve it must be mounted in such a way, that the arrow on the valve housing points towards the direction of rotation.
- Springs for different pressure ranges are available. When changing the spring, the protection cap nut is unscrewed. The rear seat of the spring has a metric 5 or 6 mm thread which can be used to lift the seat. Fasten the protection cap nut.
- **Clean the piping system very carefully before start up, especially the suction side, so that no burr and impurities remain.**

4.3 Start-up

- Open all valves in the piping system and make sure that there are no obstructions in the pipe line.
- Fill the pump with liquid.
- Check that all safety devices are properly installed, and that all movable parts are properly covered to avoid personal injury.



The protective cover must always be fitted prior to start-up to avoid personal injuries.

- First jog start the pump and check that the direction of rotation is correct - see rotation arrow on the pump cover.
- Start the pump and check the liquid flow rate. If it is not correct, stop the pump and follow the trouble shooting chart (see page 17).
- Check the pressure, temperature and capacity.
- If the pump is supplied with a gland packing, allow a small leakage to lubricate and cool the gland packing. Adjust the leakage with the gland nut.

4.4 Routine check-up

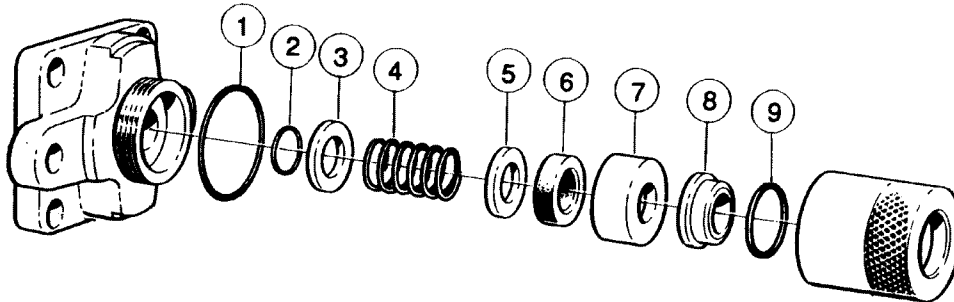
- Regularly check that the sound level, vibrations and the pump temperature are normal.
- Check that no abnormal leakage occurs.
- Check the discharge pressure and flow regularly.
- Check the pump shaft seal and other wearing parts. Change when necessary.

4.5 Service and maintenance

4.5.1 Replacement of mechanical seal (see figure page 15)

1. Remove the coupling half and the shaft key.
2. Remove burr from the shaft and its keyway.
3. Unscrew the gland nut and remove all parts (2-9) from the shaft.
4. Replace the O-ring (1).
5. Fit the circlip (2) and check that it is located in the shaft groove and then fit the inner washer (3) with **the bevel towards the circlip.**

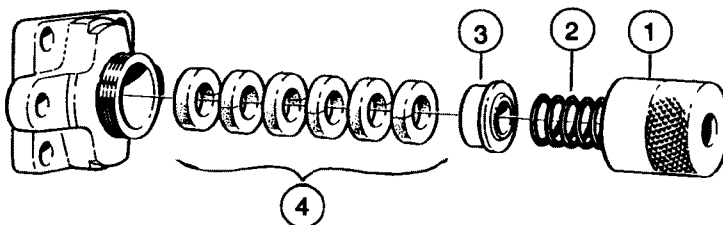
6. Slide the spring (4) and the outer washer (5) onto the shaft. Fit the O-ring/packing (6) and ensure that it is not damaged by the keyway.
7. Fit the rotary ring (7). Press the O-ring (9) into place on the back side of the stationary ring (8). Check that the sealing surfaces are clean and without damages. Fit the stationary ring (8) in the gland nut.
8. Fasten the gland nut properly and fit the key. Mount the coupling half by means **of light tapping** and lock it with the stop screw.



4.5.2 Replacement of gland packing

F All RB-pumps

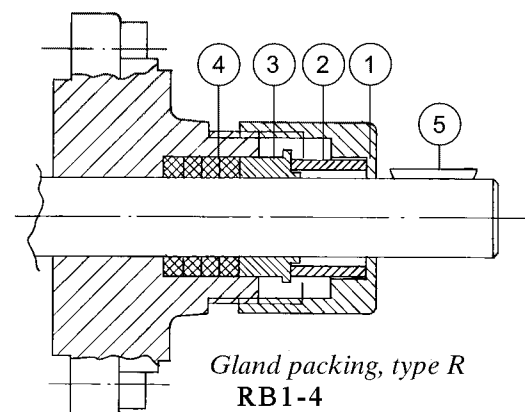
1. Remove the shaft key and release the gland nut (1), spring (2) and the gland (3).
2. Remove the packing braids (4) and replace them with new ones.
Note - put the joints of the gland packings with 90° shifting.



Gland packing, type F
RB1-6

R RB1-4

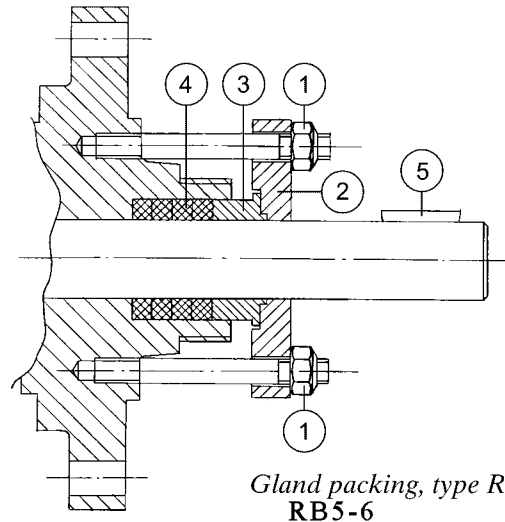
1. Remove the shaft key (5), gland nut (1), distance ring (2) and gland (3).
2. Remove the old graphite rings (4).
3. Press the new rings into the the stuffing box.



Gland packing, type R
RB1-4

R RB5-6

1. Remove the shaft key (5) and release the gland nuts (1), yoke (2) and gland (3).
2. Remove the old graphite rings (4).
3. Press the new rings into the stuffing box.



4.5.3 Replacement of lip seal

All RB-pumps

1. Remove the coupling halves and the shaft key.
2. Remove burr, if any, from the pump shaft and its keyway.
3. Unscrew the stop screws (1) and remove the wearing sleeve (2) and O-ring (3).
4. Unscrew the screws (4) holding the seal housing (5). Remove the seal housing and the O-ring/gasket (6).

RB1-4 (see figure below to the left)

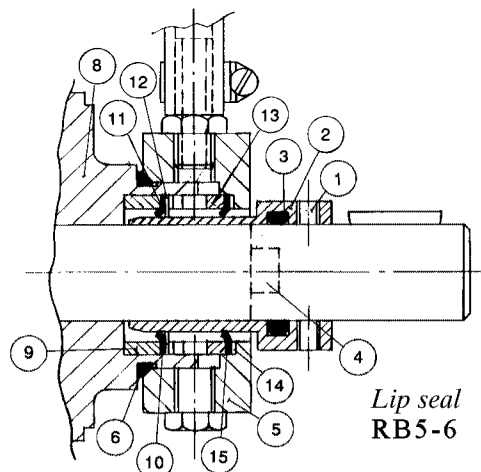
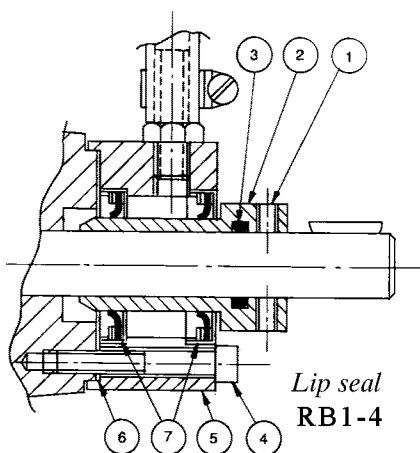
5. Remove the lip seals (7) from the seal housing (5).
6. Fit the new lip seals (7) in the seal housing.

RB5-6 (see figure below to the right)

5. Remove the rubber gaskets, lip seals and the sleeves in the cover (8) and the seal housing (5).
6. Fit the sleeve (9), lip seal (10), washer (11), gasket (12) and the lantern ring (13) to the cover (8) in said order. Fit the gasket (14) and the lip seal (15) in the seal housing (5).

All RB-pumps

7. Check that the O-ring/gasket (6) is not damaged and fit the O-ring/gasket and the casing (5) to the pump.
8. Fit the O-ring (3) into the groove in the wearing sleeve (2) and slide the sleeve onto the pump shaft. Tighten the stop screws (1).
9. Fit the key and the coupling half to the pump shaft by **means of light tapping** and lock it with the stop screws.



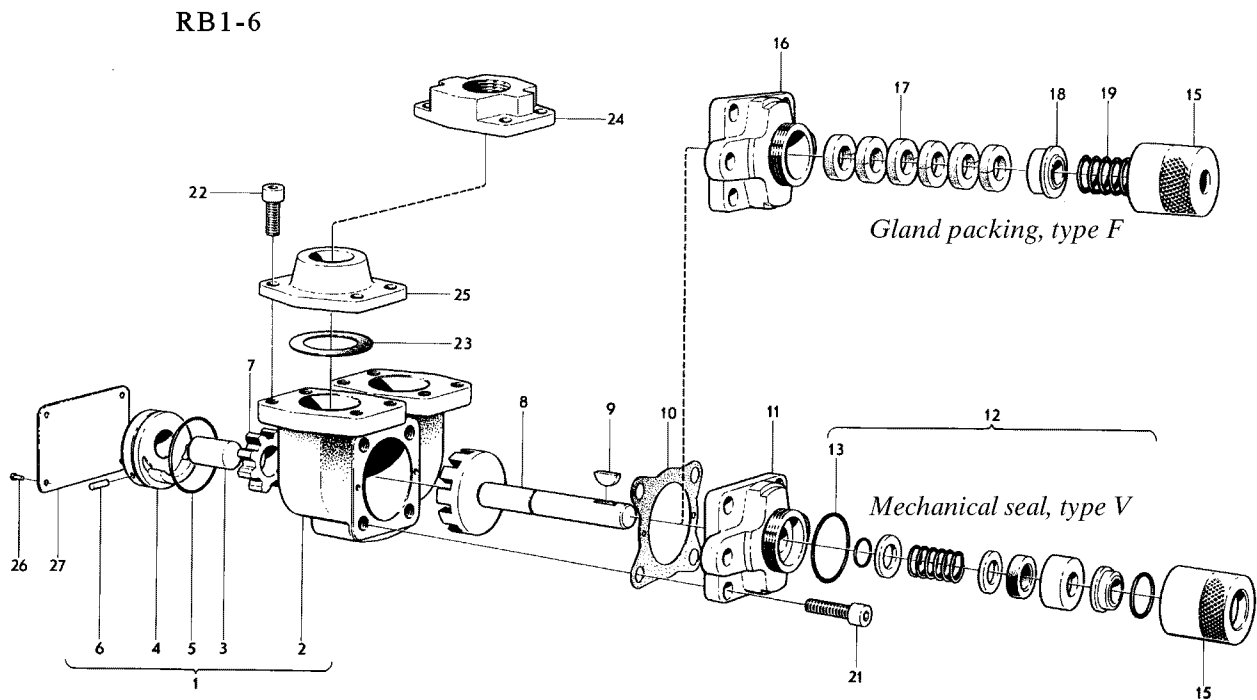
5.0 Trouble shooting chart

Problem	Possible cause	Remedy
No flow when pump is running.	Wrong direction of rotation.	Reverse rotation.
	Air pockets in suction pipe.	Fill the suction line. Evacuate all air.
	Clogged check-valve.	Clean the check-valve.
	Pump is priming air through unsealed suction line or through shaft seal.	Check and seal the suction line. If necessary replace the shaft seal.
Insufficient capacity and/or capability.	Clogged check-valve.	Clean check-valve.
	Air leakage.	Check and seal the suction line. If necessary replace the shaft seal.
	NPSH too low (manometric suction lift too high).	Increase the suction pipe diameter and/or shorten the suction pipe. Decrease the manometric suction lift.
	Pump is worn.	Check the rotor clearance. If necessary, reduce the rotor clearance by removing shims.
	Safety relief valve opens too early or does not close.	Adjust the opening pressure. Check the valve mechanism.
Noise in the pump.	Cavitation – manometric suction lift too high.	Increase the suction pipe diameter and/or shorten the suction pipe. Decrease the suction lift. Check the filters/strainers on the suction side.
	Rotor/gear damages.	Check and replace if necessary.
	Incorrect alignment pump/drive shaft.	Correct with shims/washers.
	Vibrating noise from the safety relief valve.	Increase the pressure on the spring. Replace if necessary.

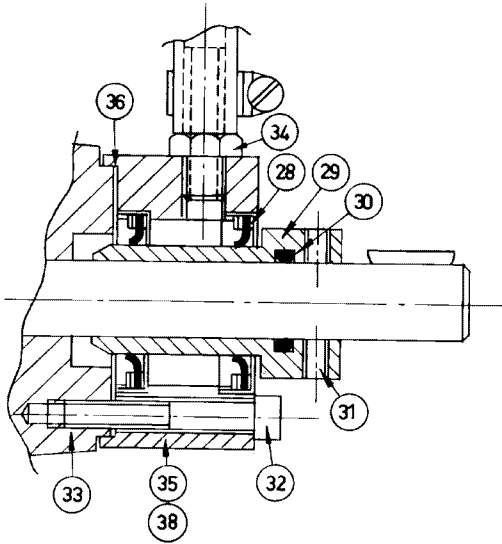
6.0 Spare parts list

6.1 Spare parts for RB1-6 -range

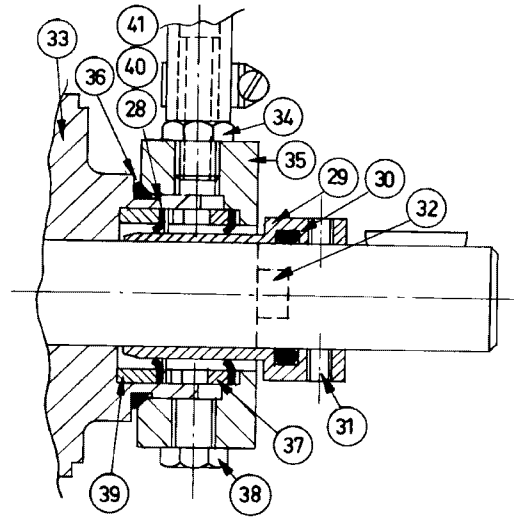
Pos	Qty	Description	Pos	Qty	Description	Pos	Qty	Description
2	1	Pump housing	19	1	Gland spring	36	1	Gasket/O-ring
3	1	Journal pin	21	4-6	Screw	37	1	Sleeve
4	1	Crescent	22	8	Screw	38	1	Plug
5	1	O-ring	23	2	Gasket	39	1	Sleeve
6	2-6	Pin	24	2	Threaded pipe flange	40	2	Rubber gasket
7	1	Gear	25	2	Welding flange	41	1	Distance ring
8	1	Rotor	26	4	Screw	42	1 (1x5)	Gland packing, set, type R
9	1	Key	27	1	Plate	43	1	Gland
10	x	Shims	28	2	Lip seal, type L	44	1	Cover
11	1	Cover	29	1	Wear sleeve	45	1	Sleeve
12	1	Mechanical seal, type V	30	1	O-ring	46	1	Gland nut
13	1	O-ring	31	2	Stop screw	47	1	Yoke
15	1	Gland nut	32	2	Screw	48	2	Nut
16	1	Cover	33	1	Cover	49	2	Stud bolt
17	1	Gland packing, set, type F	34	1	Hose socket			
18	1	Gland	35	1	Seal housing			



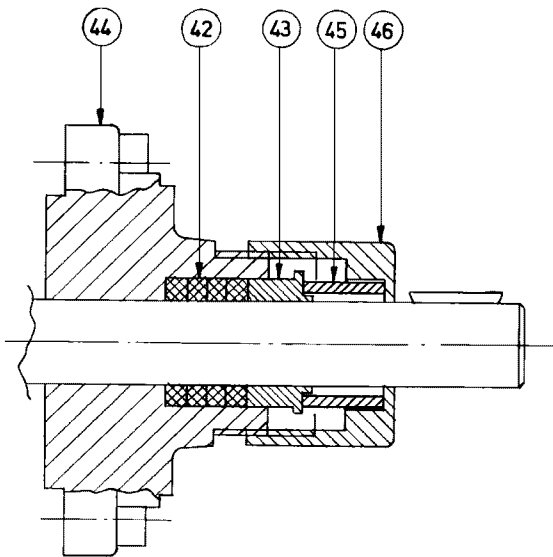
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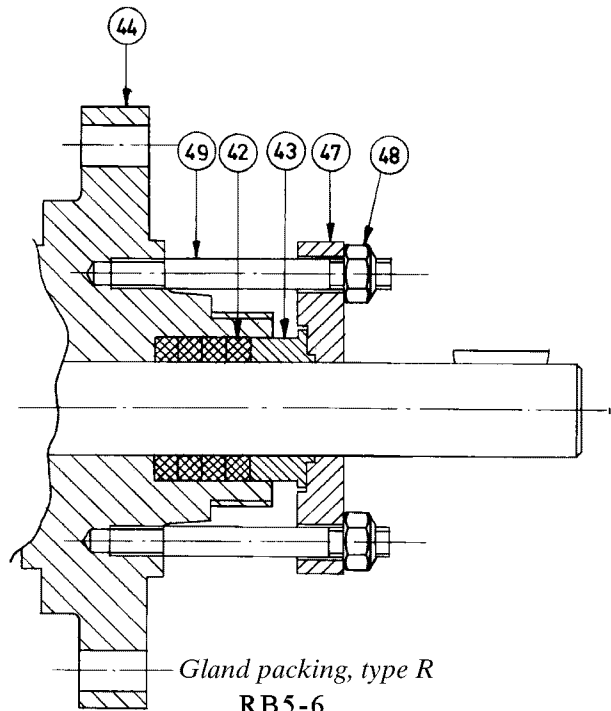
Lip seal, type L
RB1-4



Lip seal, type L
RB5-6



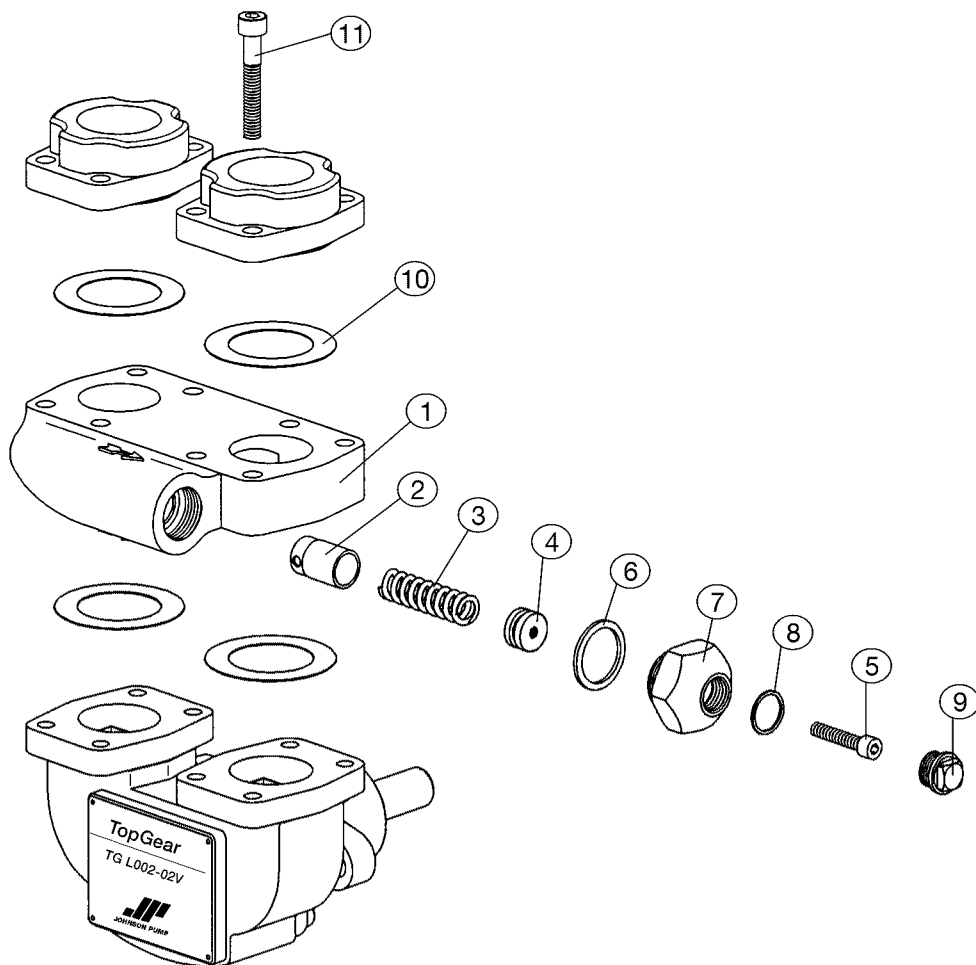
Gland packing, type R
RB1-4



Gland packing, type R
RB5-6

6.2 Built-on safety relief valves

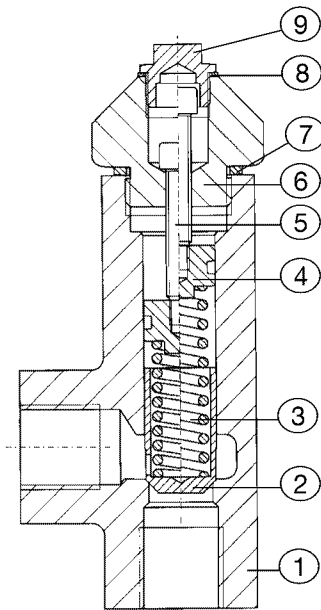
Pos	Description	RB1-2	RB3-4	RB5-6
1	Valve body	38-46457	38-46459	38-46461
2	Piston	38-18304	38-18304	38-20156
3	Spring 0,5–3 bar	38-49295	38-49295	38-49300
3	Spring 1–15 bar	38-46565	38-46565	38-46592
3	Spring 13–25 bar	38-47444	38-47444	38-46593
3	Spring 20–30 bar	38-47445	38-47445	-
4	Plunger	38-46566	38-46566	38-46590
5	Screw	38-956557	38-956557	38-956572
6	Washer	38-957190	38-957190	38-52531
7	Nut	38-78226	38-78226	38-78361
8	Washer	38-957180	38-957180	38-957184
9	Plug	38-31911	38-31911	38-43685
10	Gasket	38-46061	38-46363	38-46419
11	Screw	38-959227	38-959227	38-959245



6.3 Separate safety relief valves

Valves with 1/2" and 1" connections

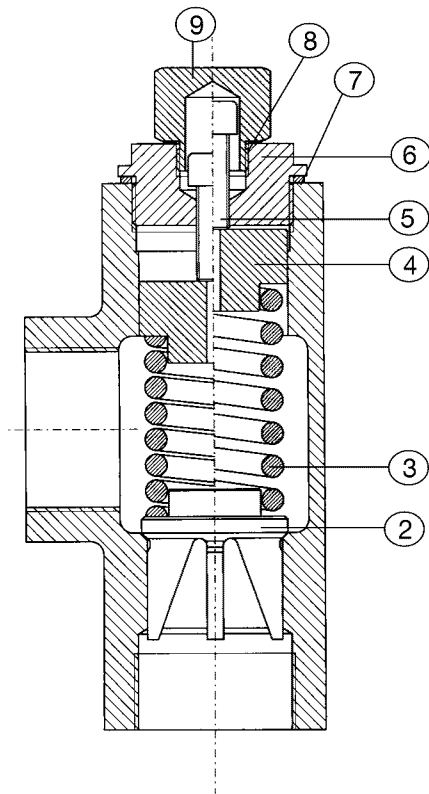
Pos	Description	1/2"	1"
1	Valve body	38-81571	38-80899
2	Piston	38-18304	38-20156
3	Spring 0,5–3 bar	38-49295	38-49300
3	Spring 1–15 bar	38-46565	38-46592
3	Spring 13–25 bar	38-47444	38-46593
3	Spring 20–30 bar	38-47445	-
4	Plunger	38-46566	38-46590
5	Screw	38-956557	38-956571
6	Nut	38-78226	38-78361
7	Washer	38-957190	38-52531
8	Washer	38-957180	38-957184
9	Plug	38-31911	38-43685



Valves with 2" connections

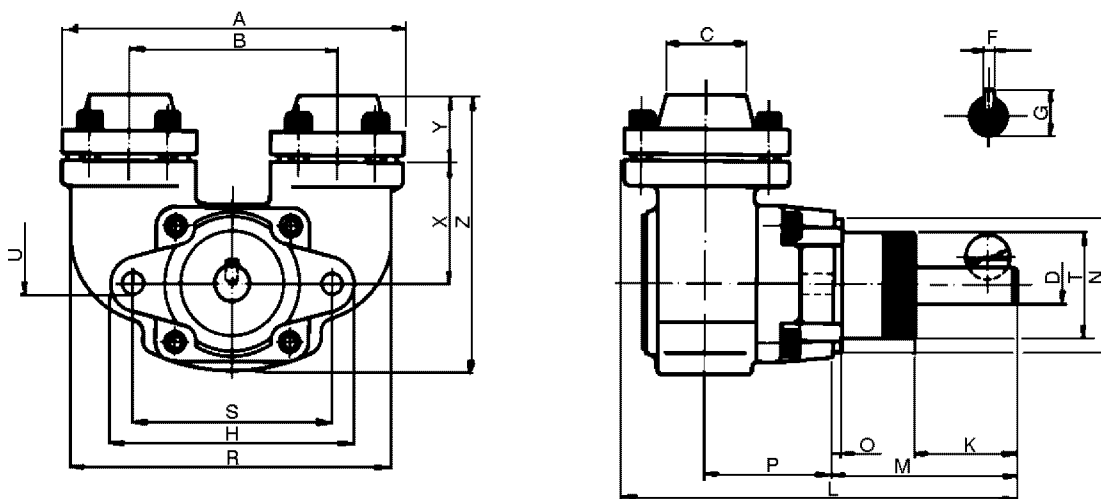
Pos	Description	2"
2	Piston	38-81038
3	Spring 0,5–3 bar	38-81041
3	Spring 1–7 bar	38-81040
4	Plunger	38-81042
5	Screw	38-959256
6	Nut	38-81561
7	Gasket	38-81045
8	Washer	38-18265-11
9	Nut	38-81562

N.B. 2" valve is discontinued

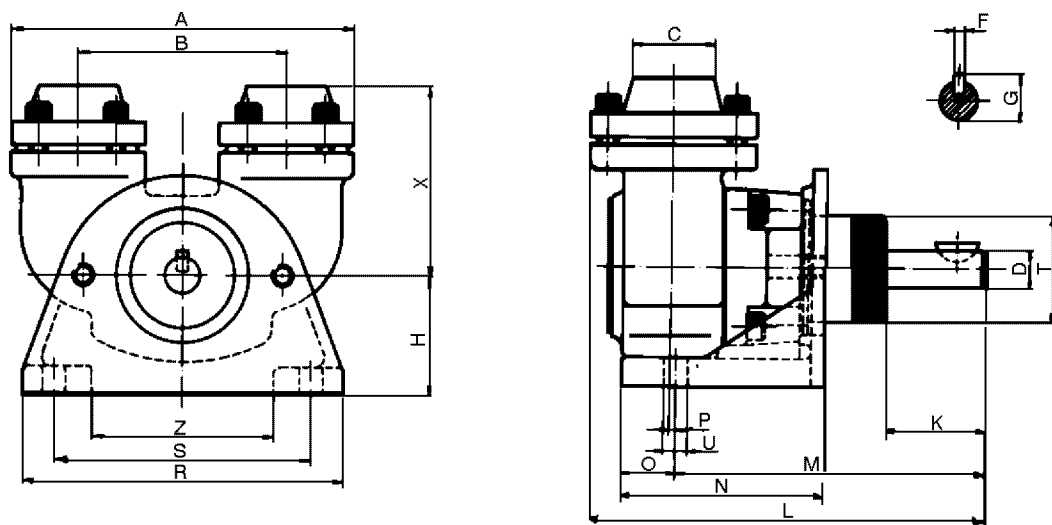


7.0 Dimensions and weights

7.1 RB1-6



With bracket for foot mounting



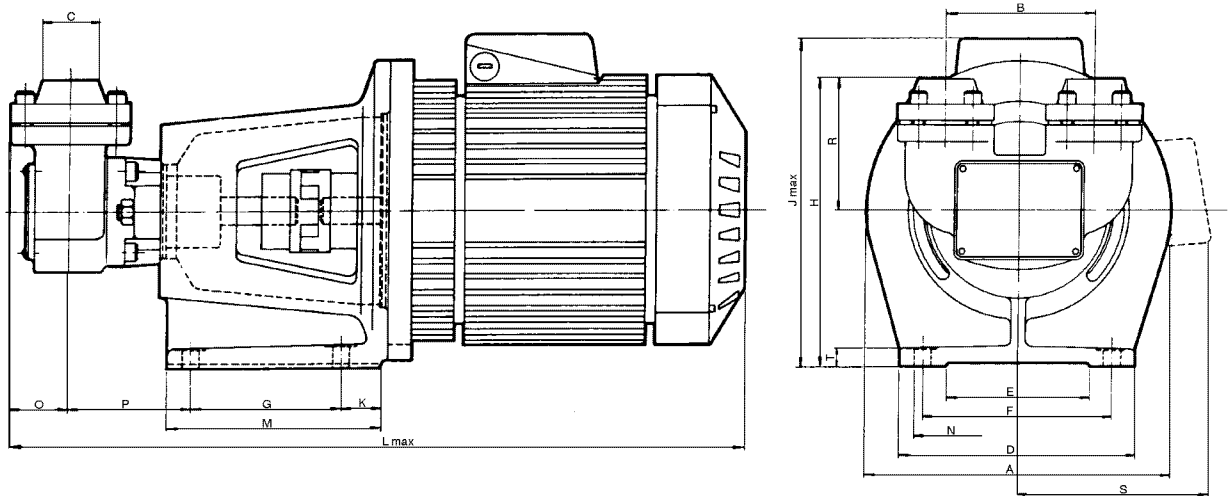
Dimensions in mm

Type	A	B	C	D ¹	F	G	H	K	L	M	N	O	P	R	S	T	U	X	Y	Z	Weight, kg
RB1-2	123	68	30/	12	4	13,5	93	28	136	62	48	3	39	108	78	34	9,0	46	25	102	3,0
*			BSP1"				44			98	67	18	3		85		8,5	71		68	
RB3-4	162	98	38/	18	6	20,5	114	47	186	87	62	4	60	150	94	48	11,0	57	30	126	7,0
*			BSP1.1/4"				56			145	98	25	2		120			87		86	
RB5-6	205	128	44,5/	25	8	28,0	160	47	220	107	90	4	67	182	140	60	11,0	81	30	175	13,5
*			BSP1.1/2"				65			169	115	34	5		150		13,5	111		125	

¹ The following tolerances apply: ISO f6.

* With bracket for foot mounting.

7.2 Flanged pump unit



Dimensions in mm

Type	IEC	A	B	C	D	E	F	G	H*	J	K	L*	M	N	O*	P	R*	S	T	Weight, kg**		
RB1-2	63	160	68	30/ BSP1"	145	85	120	60	156	185	25	380	100	9	35	57	71	90	15	7,5	21	
	71									205		400						120				
	80									176		235						35				435
RB3-4	63	160	98	38/ BSP1.1/4"	145	85	120	60	172	185	25	430	110	9	40	87	90	12	12,0	25		
	71									205		450					120					
	80									235		490					130					
	90S	200			100	170	110	140	192	240	520	140	11	80	135	15	15,0	34				
	90L	280																	545	150		
	100L	280																	565	175		
112M	250	210	140	180	217	305	630	17,5	55													
RB5-6	90S	200	128	44,5/ BSP1.1/2"	200	130	170	120	231	255	40	570	175	11	46	87	111	135	15	24,0	43	
	90L											280						625				150
	100L											280						680				185
	112M	250			230	160	200	241	305	50	725	185	11	46	97	111	18	27,0	64			
	132S	725																		185		
	132M	300																		273	362	60

* With direct fitted safety relief valve the following measures are increased by:

RB1-2 : H and R 26 mm, L and O 38 mm.

RB3-4 : H and R 26 mm, L and O 46 mm.

RB5-6 : H and R 30 mm, L and O 55 mm.

** Weight without motor and weight complete with standard motor in cast iron.

8.0 RBS4

8.1 General

The RBS4 pump is similar to the **RB4** as regard to capacity and size. All wetted parts are made of stainless steel AISI 316 and the rotor is journalled in a double ball bearing.

8.2 Type designation

Example:

RBS	4	-	01	S
1	2	-	3	4

1 = RBS-pump for flange mounting

2 = pump size

3 = pump version (see below)

4 = shaft seal (see below)

3 Pump version

(Degrees show max working temperature)

01 = standard pump, 60°C

11 = ceramic idler gear bushing and
hard metal pin, 140°C

4 Shaft seal

S = mechanical seal

F = gland packing PTFE

8.3 Direction of rotation

The RBS4 is built for right hand rotation (viewed from the shaft end side) which means suction port (inlet) to the right and discharge port (outlet) to the left. By turning the front cover 180° the pump can be run with left hand direction and suction and discharge ports change sides. **Since the spring of the mechanical seal is wound for right hand rotation problems can occur when pumping sticky liquids.**

8.4 Material specification

Pump housing - casting, E.N.58J

Crescent - casting, E.N.58J

Flanges - casting, E.N.58J

Rotor - steel, E.N.58J

Gear - steel, E.N.58J

O-rings - Viton

8.5 Temperature

With standard clearances:

Version -01S max. +60°C

-11 max. +140°C

8.6 Particle size

Maximum size of solid particles 0,1 mm.

8.7 Revolutions

2800 rpm at max 40 cP.

8.8 Pressure

The max permissible differential pressure is 6 bar.

8.9 Rotor clearances

When assembling a pump the rotor clearance is important to maintain the capacity and efficiency of the pump. The following measurements apply:

Clearance between rotor and cover $0,09 \begin{smallmatrix} - \\ + \end{smallmatrix} \begin{smallmatrix} 0 \\ 0,05 \end{smallmatrix}$ mm

Axial clearance between rotor and crescent $0,02 \begin{smallmatrix} - \\ + \end{smallmatrix} \begin{smallmatrix} 0 \\ 0,02 \end{smallmatrix}$ mm.

The above is measured at the shaft end when the pump is dry and clean.
Correct clearance is set with shims.

8.10 Dimensions and weights

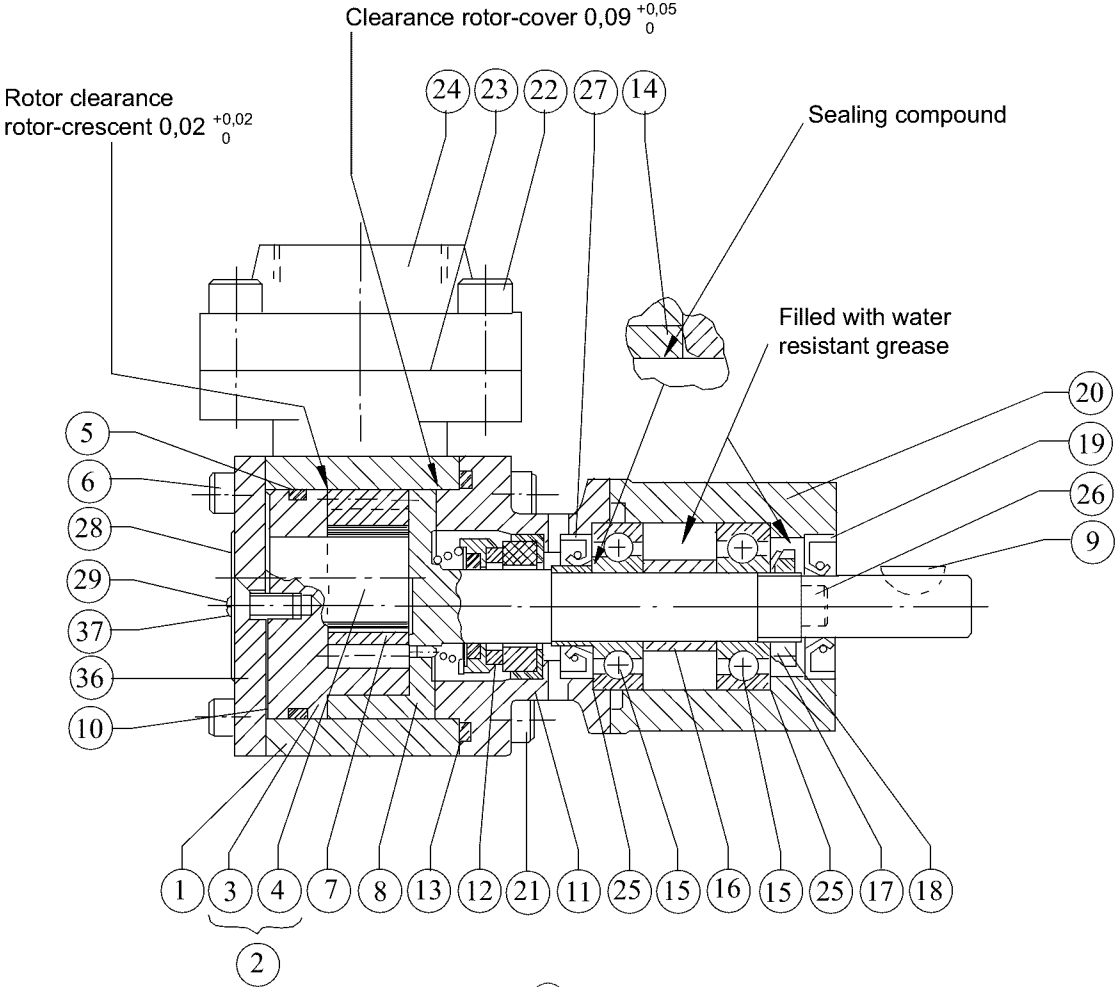
See table (page 22) for RB4 . All dimensions are the same as for RB4 , except the shaft dia which is 15 mm. Ports are only available with 1.1/4" BSP threads.

For further specifications, see RB-range.
Please contact your distributor for further information.

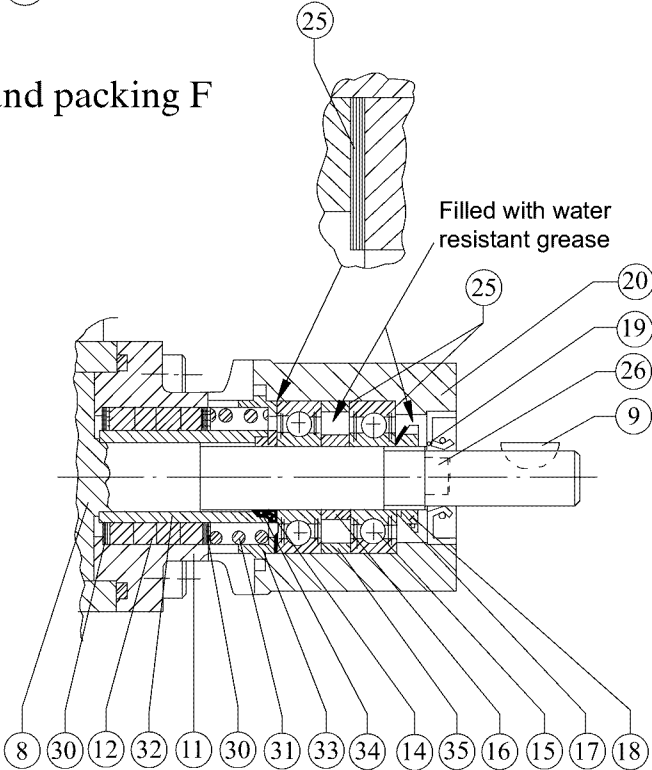
8.11 Spare parts list

Pos	Version	Qty	Description	RBS4
1	01, 11	1	Pump housing	38-77981
2	01	1	Crescent with journal pin	38-79975
2	11	1	Crescent with journal pin	38-81207
3	01, 11	1	Crescent	38-79977
4	01	1	Pin	38-81781
4	11	1	Pin	38-81203
5	01, 11	1	O-ring 49.5 x 3V	38-53107
6	01, 11	4	Screw	38-942001
7	01	1	Gear with bushing	38-77973
7	11	1	Gear with bushing	38-81205
7a	01, 11	1	Gear	38-77974
7b	01	1	Bushing	38-77975
7b	11	1	Bushing	38-80433
8	01, 11 F, 01 S	1	Rotor	38-77968
9	All	1	Key	05-03-119
10	All	x	Shim 0.013	38-80461
10	All	x	Shim 0.025	38-79979
10	All	x	Shim 0.05	38-80462
10	All	x	Shim 0.10	38-80463
11	01, 11 F	1	Cover	38-81243
11	01 S	1	Cover	38-80951
12	01, 11 F	1	Gland packing, set	38-75085
12	01 S	1	Mech. seal	38-82566
13	All	1	O-ring 59.9 x 3V	38-53110
14	01, 11 F	1	Washer	38-84169
14	01 S	1	Sleeve	38-80964
15	All	2	Ball bearing 6203 DDU	05-08-128
16	01, 11 F	1	Distance sleeve	38-78425
16	01 S	1	Distance sleeve	38-80963
17	All	1	Locking washer	38-907021
18	All	1	Locking nut	38-906631
19	All	1	Sealing ring	38-52937
20	All	1	Bearing house	38-80965
21	All	4	Screw	38-942247
22	All	8	Screw	38-959222
23	All	2	Gasket	38-46363
24	All	2	Flange	38-78477
25	All	x	Shim 0.05	38-47799
25	All	x	Shim 0.76	38-47800
25	All	x	Shim 0.20	38-78557
26	All	2	Screw	38-959212
27	01 S	1	Sealing ring	38-80389
28	All	1	Name plate	
29	All	2	Screw	38-50355
30	01, 11 F	2	Washer	38-78426
31	01, 11 F	1	Spring	38-78427
32	01, 11 F	1	Sleeve	38-79192
33	01, 11 F	1	Sleeve	38-83612
34	01, 11 F	1	O-ring 16.3 x 2.4V	38-53100
36	All	1	Front cover	38-79978
37	All	2	Screw	38-50142

Pump with mechanical seal S



Pump with gland packing F



8.12 Capacity for RBS4, water

For higher viscosities and for power calculations use the **RB4**-diagram (see page 10 and following).

