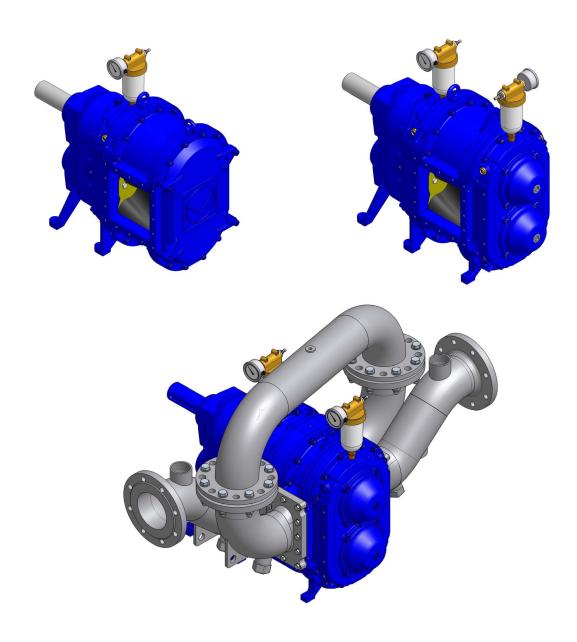


Operating and Maintenance Manual

Rotary Lobe Pump VX100Q, VX136QD/VX186QD, VX136QDR, VX136QD/VX186QD Marathon





Contents

1		Intended Use		4		
2		Saf	ety Notes			
	2.1		Warning and safety labels	6		
3		Ass	sembly			
	3.1		Transport			
	3.2		Assembly of pump and motor on base			
	3.3 3.4		Assembly of rotary lobe pumps without base	9 		
	3.5		Pipelines and nominal pressures			
	3.6		Long suction lines over 30m (100 ft)			
	3.7		Temperature and pressure control			
4		Sta	rt-up	11		
•	4.1		Check list before start-up			
	4.2		Before start-up of pump in case of longer stock holding period/shutdown			
5		Pur	mp drives and direction of flow	12		
	5.1		Drive units			
	5		Direction of rotation	12		
		.1.2				
	5.2		PTO drive			
	5.3 5.4		Marathon pumps			
	5.5		Pump systems			
_	0.0					
6			visories For Using Rotary Lobe Pumps			
7		Mai	intenance			
	7.1	1 1	Buffer/Quenching fluid			
		7.1.1 7.1.2 7.1.3	Inspecting and changing the buffer/quenching fluid			
			Draining and flushing the buffer chamber			
	7.2		Changing of gearbox oil			
	7.3		Greasing of sealing prechamber			
8		Rer	epair			
-	8.1		Conversion and spare parts			
	8.2		Opening the cover plate for Q pumps (such as QDR-cover plate)	27		
	8.3		Opening the cover plate for QD/QD Marathon-pumps			
	8.4		Closing the cover plate for QD/QD Marathon-pumps			
	8.5	51	Change of lobes for Q, QD and QD Marathon pumps (second stage)			
	_	8.5.1 8.5.2	Additional components for VX100QVVA and VX136QVVA pumps			
		.5.3	Additional components for VX186QVVA (stainless steel) pumps			
	8.6	-	Change of wear plates	33		
	8.7		Change of cartridge mechanical seal			
	8.8		Change of component mechanical seals (no more actual)			
	8.9 8.10		Adjusting of pump housing segments			
_	0.10					
9			vice Instructions In Tabular Form			
10	0	Ser	vice Plan	41		
11	1	Tro	uble-shooting	42		
12	2	Spe	ecifications	44		
	12.	1	Material description for rotary lobes with elastomeric coating	44		
	12.2		VX100 – Technical data			
12.			VX136 – Technical data			
	12.4		VX186 – Technical data			
11	3	FC.	Manufacturer's Declaration	48		



Dear customer,

By buying this Vogelsang rotary lobe pump, you have acquired a high quality product. If you want your pump to function reliably over a long period of time, it has to be serviced at regular intervals, as stipulated in the instructions. Therefore, this manual should be at the disposal of the operators and maintenance personnel at all times and they should adhere to the manual carefully.

We do not accept any liability for any damage sustained resulting from failure to adhere to these maintenance instructions.



ATTENTION! Please read before first operation!

Our operating and maintenance manuals are updated at regular intervals. With your improvement proposals, you would help us make this manual more user-friendly.

Please fax your proposals to our design department +49 5434 83 10, or e-mail krampe@vogelsang-gmbh.com.

Notes				
Legend of symbols	Legend of symbols			
	Warning advisories (technical), safety advisories			
$ \mathbf{i} $	Technical or general information			

2008-11-26 WBV.PU.002.EN **3/49**



1 Intended Use

The VOGELSANG rotary lobe pump is a positive displacement pump.

This pump is suitable for the following fluids:

- fluids with high solids content (observe max. ball diameter)
- highly viscous fluids
- shearing stress sensitive fluids
- fluids loaded with gas
- all other free-flowing fluids

If you are in doubt, please ask us.

Any other use is contrary to the intended purpose. The manufacturer is not liable for damage or wear caused by incorrect use.

2 Safety Notes

Before start-up



- Read and follow the operating and safety notes carefully.
- Familiarise yourself with all facilities and operating options.
- Note all the items in the "Checklist before start-up" in the "Start-up" chapter.
- Ensure that access to rotating parts is not possible.

Warning and safety labels



- The warning and safety labels fitted provide important information for safe operation.
- In the interests of your own safety, pay attention to these labels.
- The warning and safety labels must not be removed and must be replaced immediately if damaged or lost (see chapter "Warning and safety labels").



Pumping dangerous materials

If contact with the medium cannot be ruled out during maintenance or repair work, appropriate safety measures must be taken (protective goggles, protective gloves, etc.).

Warning! In certain circumstances, this dangerous material may have reached the buffer chamber or the drive unit.



Safety devices

Pressure can be limited, for example, using

- a current limiter on the motor
- a pressure relief valve
- a pressure switch to switch the system off
- an overload coupling



- a temperature monitor
- a level gauge
- a flow rate gauge



Safety devices must regularly be checked for proper function, especially after maintenance and repair work and before putting into operation.



Warning!

Before carrying out maintenance and repair work, switch off the drive. Ensure that the drive cannot be switched on by mistake.



Use the **eye bolts** on the pumps only for lifting the pump without mounting parts (for example, the motor)! See chapter on "Transport".



2.1 Warning and safety labels

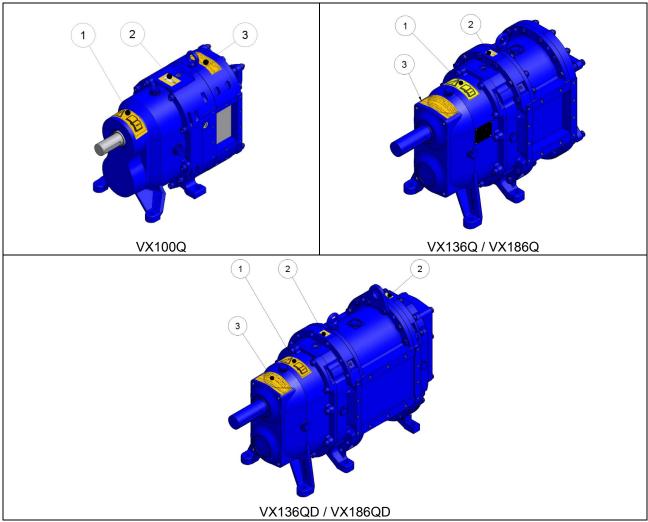


Fig. 1: Position of warning and safety labels (The figures are examples, only. The exact position of labels may deviate.)

Pos.	Label	Part-no.	Meaning		
1		VAU.133	Before putting the machine into operation, read the maintenance and operating instructions.		
2		VAU.138	Buffer-/Quenching fluid tank		
3	ACHTUNG! Bei neuen Pumpen, die nicht direkt in Betrieb genommen werden, muss die Welle ca. alle zwei Monate gedreht werden (mind. eine Umdrehung), damit die Dichtflächen der Gleitringe nicht aneinander haften! ATTENTION! To avoid adhesion of the mechanical seal faces the pump needs to be rotated (at least one revolution) every two months when not in service!	VAU.115	Text – see label (Using only for pumps with mechanical seal material combination SiSiC – SiSiC)		



3 Assembly

3.1 Transport

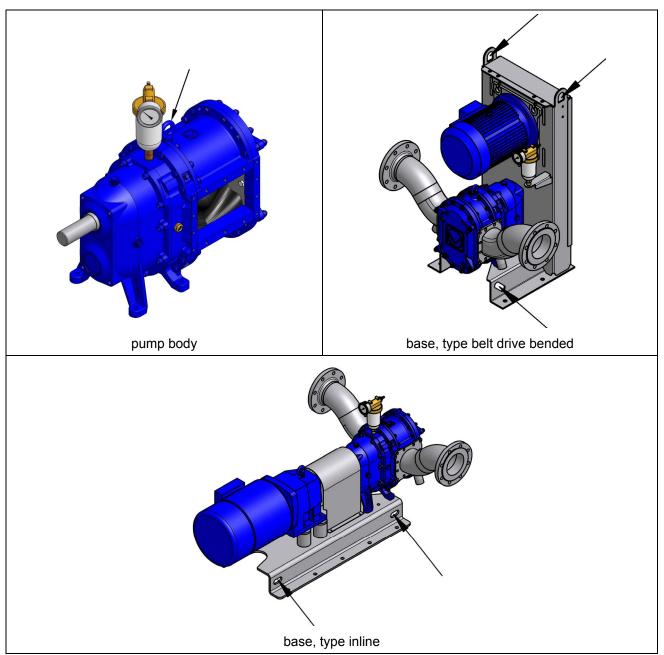


Fig. 2: Transport aids

If the pumps are transported in suspension, use the fitted transport aids, for example, eye bolts* or lifting brackets, see fig. "Transport aids".



Use the **eye bolts** on the pumps only for lifting the pump without mounting parts (for example, the motor)! See chapter on "Transport".

* Max. permissible weight with one eye bolt M8: 140 kg Max. permissible weight with one eye bolt M12: 340 kg Max. permissible weight with two eye bolts M12: 480 kg (at an angle of attack up to 45°)



3.2 Assembly of pump and motor on base

To prevent wear, vibrations and noise,

- the base for pump and motor must not be out of alignment or under stress by the mounting bolts
- the alignment of coupling must be checked and corrected before start-up, see fig.
 "Alignment methods"

Retighten all motor and pump mounting screws on the base after 20 operating hours.

For pumps with belt drive check the belt tension acc. to 'accompanying sheet':

- at start-up
- before and after longer out-of-service periods
- after the first 10 operating hours
- every 2000 operating hours, once per year minimum



Use the **eye bolts** on the pumps only for lifting the pump without mounting parts (for example, the motor)! See chapter on "Transport".

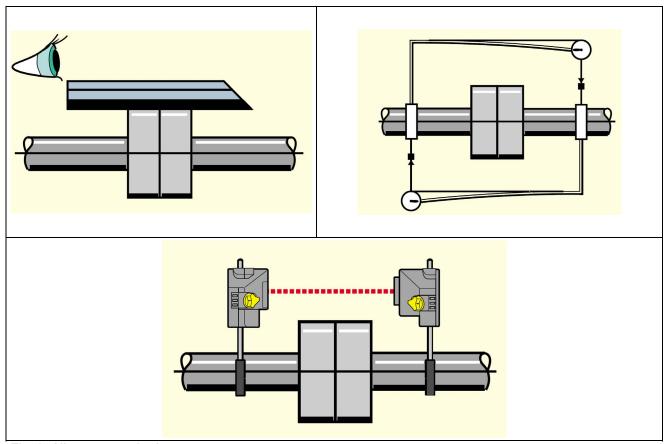


Fig. 3: Alignment methods



3.3 Assembly of rotary lobe pumps without base

Ensure that the pump is free of constraints while installation and while operating, too.

3.4 Installing the rotary lobe pump in pump systems and vehicles

- When installing the pump, ensure that there is easy access for maintenance work. If the hex head screw plugs for draining the gearbox oil and buffer/quenching fluid are not easy to reach, drain hoses may be used (part-no. PBT.013 and/or PBT.014).
- The connectors must be mounted free from stresses. In other words, the connectors have to be exactly one in front of the other even without screws.
- May be installed either upright or horizontally.
- Position the pressure and suction connections pointing upwards. This will ensure that the fluid remains in the pump after it is switched off.
- If the pump is installed horizontally, position the suction side facing downwards.
- If the pump is to be suspended, please contact us.



Important! Connector with sight glass may only be installed on suction side. Do not exceed the maximum suction height of 8 m (26.2 ft). This is the maximum distance between the lowest and highest points of the suction pipe.



If the diameter of the suction pipe is too small, the maximum suction height will be reduced by the friction loss. Please contact us for a calculation.

3.5 Pipelines and nominal pressures

Only use the pipeline diameters, wall thicknesses and materials recommended by us or by our representatives. This is essential for ensuring that the system functions properly!



Warning! Suction lines whose diameter is too small may restrict the suction capability of the pump (risk of cavitation).

Only use high-pressure pipes on the pressure side:

- up to nominal diameter 150 mm high pressure pipes with nominal pressure 16 bar (232 psi).
- **from** nominal diameter 200mm high pressure pipes with nominal pressure 10 bar (145 psi), except when the permissible operating pressure of the pump is ≥ 10 bar.

If you are uncertain about anything, please contact us!



Pump systems must be protected from excessive pressure!



3.6 Long suction lines over 30m (100 ft)

Long suction lines must be laid with a slope of at least 2 x pipe diameter in the direction of flow, ensuring that the pipeline can never run dry.

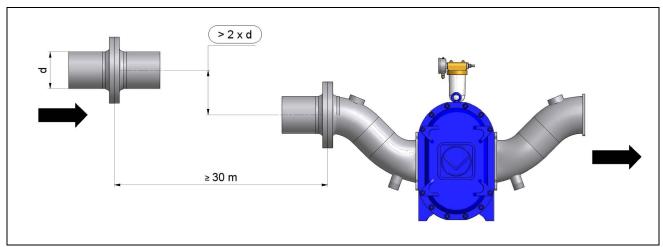


Fig. 4: Long suction lines

3.7 Temperature and pressure control

For running pumps with automatic mechanism, a temperature and pressure monitoring unit (optionally available from Vogelsang) is required. See also point on "Safety devices" in the chapter on "Safety instructions".



4 Start-up

4.1 Check list before start-up

Is the pipework sealed and free from leakage?
Is free passage in the pipework guaranteed? Positive displacement pumps may never be operated against a closed pipework (e.g. valves)?
Is the coupling correctly aligned?
Is the tension of belt drive okay?
Is the optional buffer chamber arrangement correctly installed? Is the buffer chamber correctly pressurized?
Are grade and level of oil in pump gearbox and buffer chamber okay?
Is the sealing prechamber greased (only if grease nipples installed)?
Are all safety devices installed and is the proper function guaranteed?
Are the drain cocks closed and is the pump filled with fluid?
Is the "STOP" switch easy to reach?
Is the direction of flow okay? Check the direction of rotation of pump.
Put the pump into operation and check suction and discharge pressure, speed and pump performance.

4.2 Before start-up of pump in case of longer stock holding period/shutdown



Attention! Pump with mechanical seal - combination of material: SiSiC-SiSiC!

To avoid adhesion of the mechanical seal faces this pump needs to be rotated (at least one revolution) every two months when not in service!

2008-11-26 WBV.PU.002.EN **11/49**



5 Pump drives and direction of flow

The rotary lobe pump is essentially suitable for use in either direction of motion.



Important! The sight glass has to be installed on the suction side. If the sight glass is on the pressure side (pumping backwards), the pressure may not exceed 2 bars (29 psi).

5.1 Drive units

5.1.1 Direction of rotation

If you are using motor-driven pump (such as an electrically powered motor, hydraulic motor) with one drive shaft, select the direction of rotation by determining the direction of the drive motor.

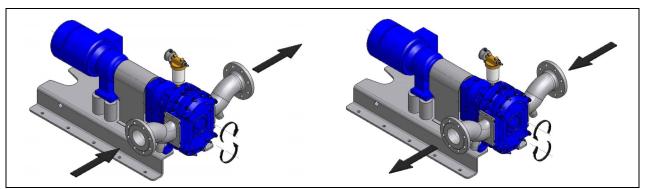


Fig. 5: Motor driven pump

5.1.2 Variable frequency drive operation

In general, rotary lobe pumps can be designed for variable frequency drive operation.

Advantages:

- Adaptation to operating conditions (viscosity, delivery rate, NPSHA)
- Wear compensation
- Speed proportional delivery rate (see characteristic line)

A variable frequency drive with a static characteristic line is to be used. The starting torque / nominal torque ratio must be > 1.3.



5.2 PTO drive

If you are using PTO driven pumps with 2 drive shafts, connect the PTO shaft to either the upper or the lower drive shaft. This determines the pump's direction.

To avoid shearing of drive shaft, for example by foreign matter in the pumps, the operating torque must be limited to:

- 1600 Nm for shaft joints with profile 1 3/8", 6-parts.
- 3200 Nm for shaft joints with profile 1 3/4", 6-parts and with profile 1 3/4", 20-parts.



Attention! This limitation of operating torque is no safety device for overpressure of pump.

(see 'operating torque' in chapter "Specifications").

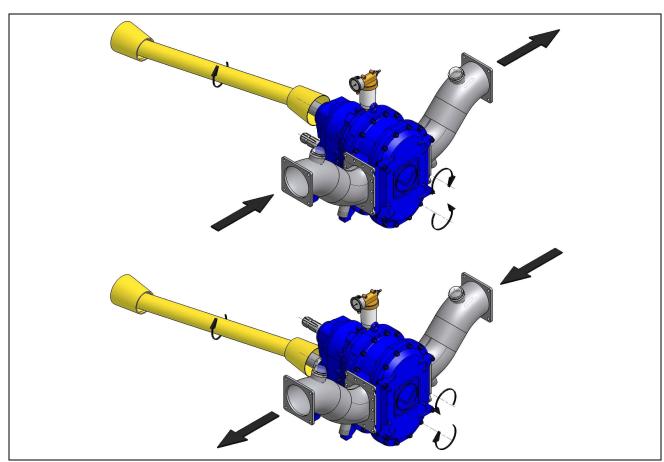


Fig. 6: PTO drive



5.3 Marathon pumps

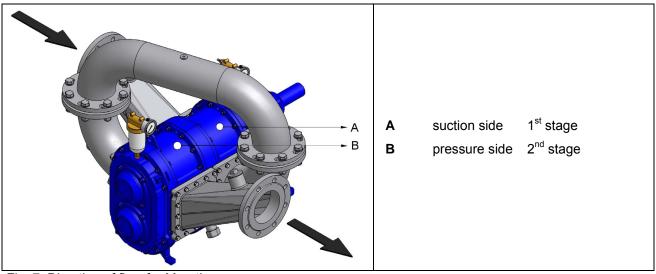


Fig. 7: Direction of flow for Marathon-pumps

5.4 Pump systems

The pressure and suction sides are rigidly defined by the rotation of the pumps. If you are having suction difficulties, you can temporarily fill the suction line by reversing pump direction. However, this cannot be done with pipelines that are secured by means of check valves / non-return valves.

5.5 Sight glass in the pump connector



Important! The sight glass has to be installed on the suction side.

If the sight glass is on the pressure side (pumping backwards), the pressure may not exceed 2 bars (29 psi).

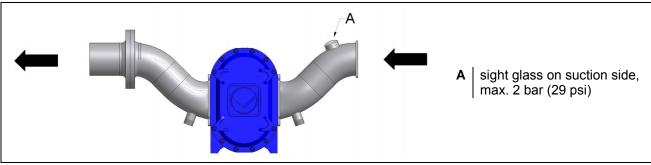


Fig. 8: sight glass



6 Advisories For Using Rotary Lobe Pumps

Foreign objects	Keep the pipes as free as possible from foreign objects such as stones, wood residues, etc. These foreign objects lead to increased wear of the rotary lobes and the pump housing segments.
Highly viscous liquids	When using the pump for viscous sludges or slurries, depending on the liquid / sludge being pumped, the pump speed must be reduced according to the fluid's viscosity. This prevents cavitation from occurring.
Wintertime operation	If there is a risk of frost, the pump must be drained by dry running the pump in either direction, until all liquid is drained out of the pump. Therefore you may use the drain valves in the connectors. For a complete draining you must remove the cover. Warning! Before start-up, fill up with liquid again.
Periods of hot weather	During hot weather, gas may form in closed pipe systems. Because of higher pressures, this gas may damage the pump or pumping systems. Prevent the medium from becoming trapped in the pump.
Removing from service	Drain the pump by opening the cover and flush if necessary, for example in case of critical medium.



7 Maintenance

7.1 Buffer/Quenching fluid

Pump type	VX100	VX136	VX136VVA	VX186	VX186VVA
Buffer/quenching fluid per buffer chamber in litres [l]	0.3*	1.5*	1.2*	2.4*	2*

^{*}Reference value, depends on the structure of the buffer chamber

Please check your order confirmation to see if your pump is filled with a buffer/quenching fluid not on the following table. If that is the case, use this buffer/quenching fluid only.



Do not use oils for pumps with EPDM O-rings, silicone oil excepted.

In case of dry buffer chamber do not fill the pump with any fluid.

For standard pumps the following oils are recommended to ensure optimum function of the mechanical seals:

VX100 - for pump speed up to max. 1000 min⁻¹ VX136 - for pump speed up to max. 800 min⁻¹ VX186 - for pump speed up to max. 600 min⁻¹

VOGELSANG standard oil Alternatively: White oil W530

Mineral oil Titan Gear MP90 DAB10

SAE 90 Part no. BSS.010

Part no. BSS.006

For electronic buffer chamber monitoring: Hydraulic oil on polyglycol basis Renolin PG100 Part no. BSS.021

VX100 - for pump speed up to max. 1000 min⁻¹ VX136 - for pump speed up to max. 800 min⁻¹ VX186 - for pump speed up to max. 600 min⁻¹

(can also be used for above-listed pump speed up to 1000 min⁻¹ (VX100), 800 min⁻¹ (VX136) or 600 min⁻¹ (VX186)):

Hydraulic oil Renolin B15 VG46 Alternatively: Hydraulic oil Plantohyd 40N

Part no. BSS.014 biodegradable Part no. BSS.016

For electronic buffer chamber monitoring: Hydraulic oil on polyglycol basis Renolin PG46

Part no. BSS.017

The load-carrying capacity of ≥12 required.



7.1.1 Inspecting and changing the buffer/quenching fluid

Check the buffer/quenching fluid for visible contamination:

- after the first 20 operating hours
- then every 200 operating hours

If strong contamination is visible, change the buffer/quenching fluid.

Change the buffer/quenching fluid every 2000 operating hours (see chapter "Service Instructions"). Change the mechanical seal in case of strong leakage.



Note!

A slight contamination of buffer/quenching fluid such as a slight rise or fall of buffer/quenching fluid - level is determined by the hydrodynamic lubrication-film of mechanical seal.

7.1.2 Buffer chamber assemblies

7.1.2.1 Pump with pressurized buffer fluid tank

The pressurized buffer fluid tank, **PSG.014**, with manual pump AHP.001, provides a steady defined buffer chamber pressure (buffer chamber pressure = tank pressure).

In addition the canister is for a safe monitoring of the buffer chamber (see fig. "Buffer chamber monitoring").

Setting up

First remove the plug from the buffer chamber. Then completely fill the buffer chamber.

After that, screw the tank PSG.014 directly into the casting of the buffer chamber. Fill the tank until about 1/4. Then set the expected tank pressure with a manual pump or a compressed air supply.

Tank pressure

The tank pressure should be about 0.5 bar higher than the middle pressure in the pump.

Tank pressure = 0.5 bar + (pressure on the suction side + pressure on the pressure side) / 2.

Example:

One pump primes with 0.4 bar under pressure and presses with 2.0 bar overpressure.

Pressure on the suction side: – 0.4 bar, pressure on the pressure side: 2.0 bar.

Tank pressure = 0.5 bar +
$$\frac{(-0.4bar + 2bar)}{2}$$
 = 1.3 bar

Tank pressure is 1.3 bar.

However the tank pressure should be max. 5 bar.

Trouble indication

After a possible running period, trouble with the sealing system would be directly noticed in form of:

- strong pollution of the buffer fluid in the tank
- escape of buffer fluid (tank is empty)
- increasing of buffer fluid (tank is full)

Refilling

First depressurize the buffer chamber through the air valve. Then unscrew the upper housing (hold the union nut tight while avoid loosening the lower screw connection – see picture below). After that fill the buffer fluid in the tank. Finally reset the pressure. (see fig. "Fill buffer chamber").

Change of lobes

Before changing the lobes, depressurize the **buffer chamber** and prime it again after changing.

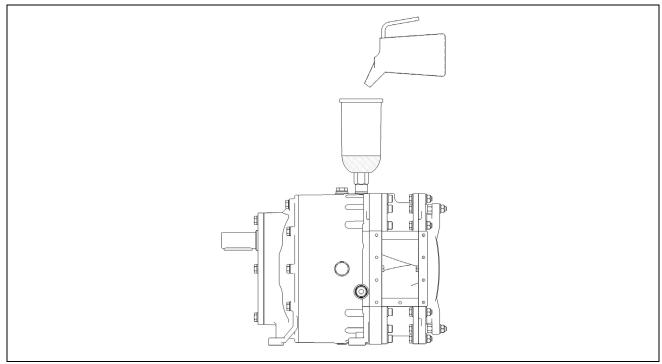


Fig. 9: Fill buffer chamber

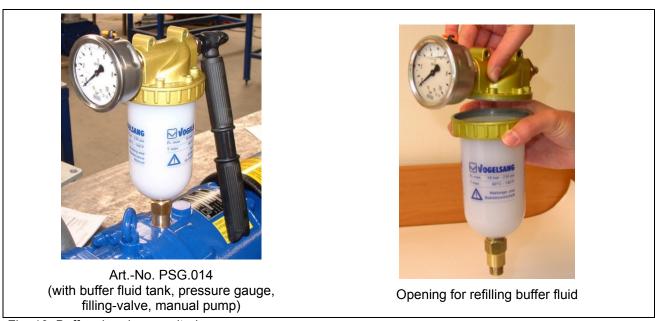


Fig. 10: Buffer chamber monitoring



7.1.2.2 Pump with pressure valve

(see fig. "Pump with pressure valve, without buffer fluid tank"):

Remove pressure valve for inspection of buffer fluid and for filling shortages in quantities into the buffer chamber.



Attention! Air pocket must be present!

7.1.2.3 Pump with unpressurised quenching fluid tank (Pos. 7)

(see fig. "Pump with unpressurised quenching fluid tank, without pressure valve"):

- The quenching fluid tank must always be a quarter full with quenching fluid to allow for thermal expansion.
 - Note: The level of quenching fluid in the tank can vary because of operational conditional heating of the pump.
- Unscrew the upper housing of the quenching fluid tank. Hold the union nut tight while avoid loosening the lower screw connection.
- Fill shortages of quantities into the quenching fluid tank.

7.1.2.4 Pump with plug (for special designs, only, for example submersible pumps)

Remove the upper plug (instead of pressure valve) for filling shortages in quantities into the buffer chamber. (Buffer fluid level: see fig. "Pump with pressure valve, without buffer fluid tank").



Attention! Air pocket must be present!



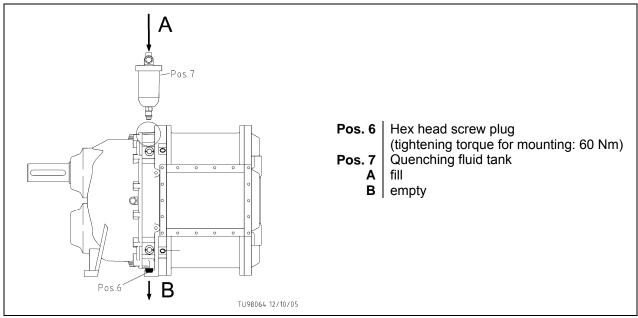


Fig. 11: Pump with quenching fluid tank, without pressure valve

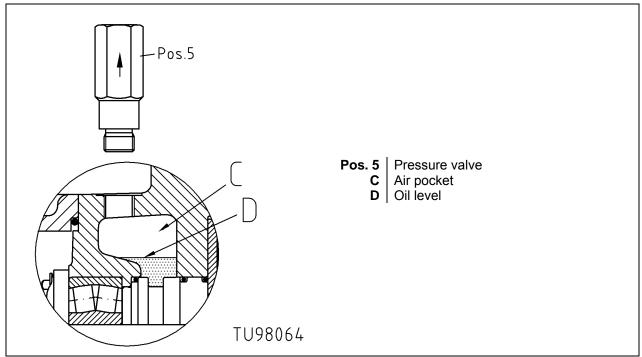


Fig. 12: Pump with pressure valve, without buffer fluid tank



7.1.2.5 Pump with dry buffer chamber

Intended use:

This seal is typically used, when no buffer chamber liquid is allowed in the pump medium. This seal can only be used, if pumping pure, non abrasive liquid e.g. water.

Food grade oil (white oil) can be used in the gear box – part. No. BSS.010 as gear oil.



Warning!

Pumps with dry buffer chamber sealing system must not run dry! Before start-up remove plug from vent screw (5). Before putting into operation the pump must completely be filled up with liquid.

Combination of seal rings for this sealing system:

Design: Block ring

Combination of material: SS304/SS316Ti tungsten carbide coated / carbon

Assembly:

The buffer chamber tank (3) with connecting pipe (4) is connected under the buffer chamber housing. The tank must be installed below the buffer chamber to collect possible leakage. The level of liquid in the buffer chamber tank is allowed to reach maximum up to the bottom of the buffer chamber, see fig. "Installation example - dry buffer chamber".

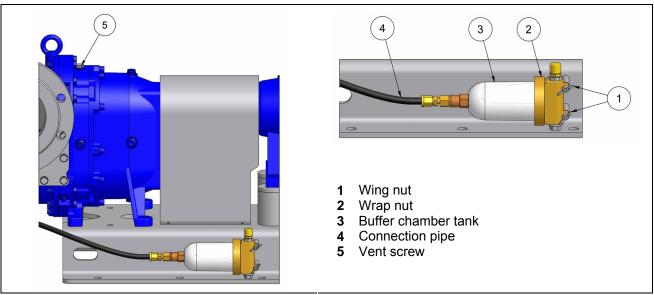


Fig. 13: Installation example - dry buffer chamber

Control the buffer chamber

If the buffer chamber tank (3) is filled with leakage (for example pump medium or condensed water), loosen the wing nut (1), unscrew the tank cover (wrap nut (2)) and drain the buffer chamber tank. If the buffer chamber tank is filled with leakage more than a half within a month, please contact our service department.

7.1.2.6 Pump with circulation system for buffer chamber

Caution! If the pump is fitted with a circulation system for buffer chamber, observe the instructions for this system. Please contact us.



7.1.3 Draining and flushing the buffer chamber

(applicable only if mechanical seal is defective)

Each time before the mechanical seals are changed, the buffer chamber must be drained and flushed. In case of pressurized buffer fluid tank or pressure valve, depressurize the buffer chamber before draining or flushing.

Then unscrew all external buffer chamber assemblies (see chapter "Buffer chamber assemblies") and the lower hex head screw plug (pos. 6) to allow the buffer/quenching fluid to drain out of the buffer chamber. In case of heavy contamination, clean buffer chamber.

Screw on lower hex head screw plug (pos.6) (tightening torque = 60 Nm) and install the various assemblies in reverse sequence.

If the bottom hex head screw plug is not accessible it is possible to install an extended connection (on request).

2008-11-26 WBV.PU.002.EN **22/49**



7.2 Changing of gearbox oil

Change the gearbox oil (see fig. "Gearbox oil change"):

- for the first time after a period of 20 operating hours.
- every 2000 operating hours.

Changing the quenching oil has to be carried out after changing the gearbox oil.

The oil should be checked and filled up (when the gearbox is not running):

- every 500 operating hours, however not more than 3 months between fill ups.
 - fill the oil until it reaches the control opening [C].

Lubricant:

VOGELSANG standard oil

Mineral oil Titan Gear MP90

SAE 90

Combustion point: 215°C

Art-No. BSS.006

If you need other lubricants, please ask us for a table (TINF lubricants) of alternative oils.

Series	VX100	VX136	VX186
Quantity of oil in litres [l]:	0.65	2	4



Attention! If the pump is installed in a vertical position (drive shaft pointing upward), the quantity of gearbox oil is 1 litre instead of 0.65 litres.



Hex head screw plug (Pos.1) always mounted on the top of the pump, magnetic hex head screw plug (Pos.2) on the bottom of the pump.

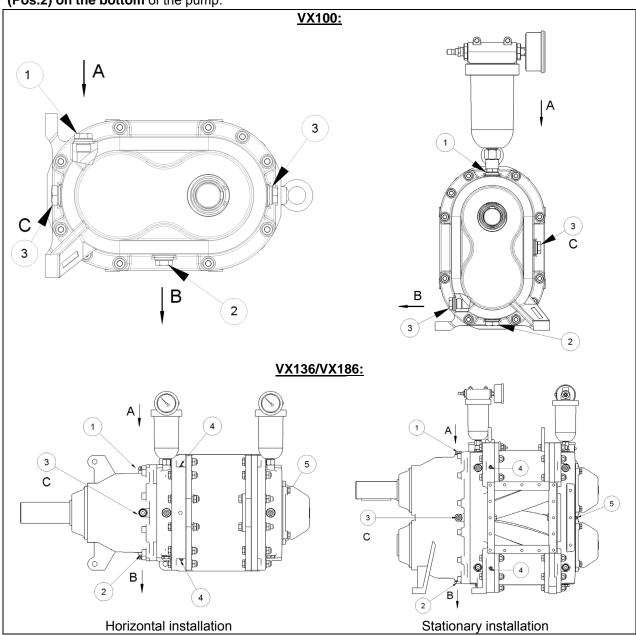


Fig. 14: Gearbox oil change

- 1 Hex head screw plug
- 2 Magnetic hex head screw plug
- 3 Hex head screw plug
- 4 Grease nipple (gearbox side)
- 5 Grease nipple (at the VX186 QD cover):
- A Fill
- **B** Drain
- **C** Control



Tightening torque for mounting the hex head screw plugs → 60 Nm



7.3 Greasing of sealing prechamber

(for VX136/VX186 versions, only)

Grease nipples are primarily used for long-fibred media, for example in agriculture or biogas plants. They can be retrofitted upon request.

The sealing prechamber can be greased through the grease nipples (if applicable) (see fig. "Changing the gearbox oil")

Lubrication prevents the fibrous matter from hardening and adversely affecting the function of the axial seal.



Only lubricate when machine is running, not while at a standstill!

Lubricating the 4 grease nipples (gearbox side) Lubricating the 2 grease nipples (at the QD cover of the VX186 QD pump)

- At start up
- Before and after a longer period of removing from service (2-3 weeks)

Lubricant

High-quality lubricant for rotary lobe pumps Renolit GP2 NLGI class 2, water resistant Art no. BSS.008

Qty

Grease nipple (gearbox side): 5 shots per nipple with a lube gun Grease nipple (at the VX186 QD cover): 6 shots per nipple with a lube gun

2008-11-26 WBV.PU.002.EN **25/49**



8 Repair

8.1 Conversion and spare parts

Modifications or changes to the unit are only permissible after consultation with the manufacturer. Only spare parts approved by the manufacturer or original spare parts can be used. The use of other parts invalidates the guarantee for any resulting damage.



Caution when pumping dangerous materials:

Take appropriate safety measures: see "Safety notes" chapter.



Before opening the cover, if possible:



- Shut off the connected pipes
- Empty the pipe as much as possible using drain valves

Warning! The remaining liquid flows out of the pump when the cover is opened.

8.2 Opening the cover plate for Q pumps (such as QDR-cover plate)

- 1. Depressurise buffer chamber in case of disassembling the rotary lobes.
- 2. Remove the nuts from the cover plate.
- 3. Take off the cover plate and the O-ring.
- 4. In case of QDR-cover plate a tread for removing is existing.

8.3 Opening the cover plate for QD/QD Marathon-pumps

- Depressurise the buffer chambers.
- 2. Unscrew the twelve screws or threaded rods (pos. 1) from cover plate (positions see fig.).
- 3. Unscrew the hex head screw plugs (pos. 2).
- 4. Loosen both strain screws (pos. 3).
- 5. Using the screws/threaded rods (pos. 1), (or, for Marathon pumps, use the screws designed for it) the cover plate can be pulled off over the threads (pos. 4) until the cover is loose.

 Warning! Do not tilt the cover, but press it evenly "by hand"!

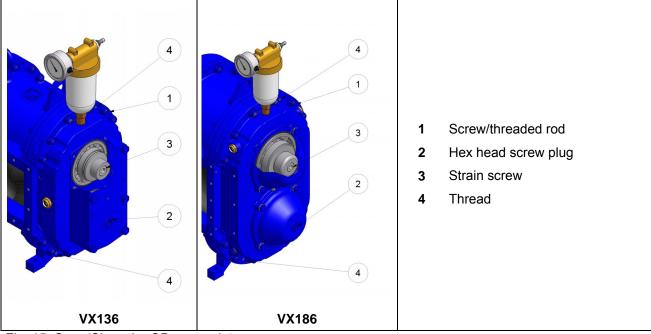


Fig. 15: Open/Close the QD-cover plate



8.4 Closing the cover plate for QD/QD Marathon-pumps

(See Fig. "Open/Close the QD-cover plate")

- 1. Before assembly of the QD cover, thoroughly clean the components as shown in the figure "Cleaning before QD cover assembly", and oil if necessary.
- 2. Put on the cover plate.
- 3. Screw in loosely both strain screws (pos. 3), but do **not** tighten.
- 4. Screw on the twelve screws or threaded rods (pos. 1) (see table "Tightening torque"). Warning! Do not tilt the cover while doing this, but press it evenly "by hand"!
- 5. Tighten both strain screws (pos. 3) (see chapter "Tightening torque for mounting the pressure disk").
- 6. Mount the hex head screw plugs (pos. 2).

i

Tightening torque for mounting the threaded rods:

VX136: M10 (10.9) → 70 Nm M10 (A4 70) → 40 Nm

VX186: M12 (12.9) → 140 Nm M12 (A4 70) → 60 Nm

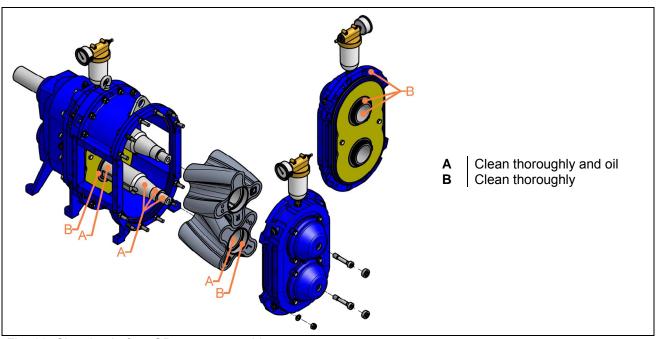


Fig. 16: Cleaning before QD cover assembly



8.5 Change of lobes for Q, QD and QD Marathon pumps (second stage)



For the change of lobes and seals Vogelsang supplies a special combination tool (Part-no. PBA.027). Please contact us.

See fig. "Disassembling of separation plates (for Marathon) and rotary lobe change"

Rotary lobe change: Q pumps

- ⇒ see chapter "Opening the cover plate for Q pumps" – points 1-3.
- 2. Remove the strain screws (48), the pressure disk (45) and the spring washers (44) with a suitable screw (for example the strain screw or with the threaded rod of lobe puller).
- 3. Pull off the lobes (43) from the shaft; (lobe puller see spare parts list).
- 4. Assemble **HiFlo**[™]-lobes in pairs, i.e. simultaneously to the upper and the lower shaft. The new lobes have to be installed in a reverse sequence. See fig. "HiFlo™ rotary lobe installation". Before installing the new lobes, clean contact surfaces of lobes and sealing components very carefully.
- 5. For the VX136Q use two spring washers for each shaft, for the VX100Q/VX186Q use one spring washer for each shaft.
- 6. Insert the spring washers correctly into the pressure disk (see fig. "Position of pressure disk and spring washers in the lobe").
- 7. Press spring washers and pressure disk carefully into the lobe to prevent the spring washer from falling into the groove (see fig.).
- 8. Screw on pressure disk and spring washers with strain screw (see chapter "Tightening torque for mounting the pressure disk").
- 9. Fix the O-ring (50) to the cover plate.
- 10. Screw on the cover plate with nuts.
- 11. Fill buffer chamber (see chapter "Maintenance").

Rotary lobe change: QD pumps Rotary lobe change: QD Marathon pumps (2nd stage)

- ⇒ see chapter "Opening the cover plate for QD/QD Marathon pumps" – points 1-5.
- ⇒ see point 2 Rotary lobe change of Q pumps.
 - → see point 3 Rotary lobe change of Q pumps.
- 3. Fix the O-ring (50) to the cover plate, install the cover and screw on the strain screws (see chapter "Tightening torque for mounting the pressure disk").
- see point 10 Rotary lobe change of Q pumps.

Disassembly of separation plates for the rotary lobe change of QD Marathon pumps (1st stage).

- 1. Remove the keys from the shafts.
- 2. Unscrew two cap screws (42) of the wear plate and take off the wear plate (37).
- 3. Unscrew four cap screws (10) on the left and on the right as well as two cap screws (78) above and below and take off the fixing plate (80).
- 4. For the VX186 remove angle rings above and below, such as sealing plate.
- 5. Take off the shims (29), the O-rings (28).
- 6. Then remove the distance ring (80) incl. Orings (46).
- 7. Pull off the big O-ring (35)
- 8. Take off the fixing plate (77) incl. wear plate (79).



For assembling the wear plates see chapter "Change of wear plates"

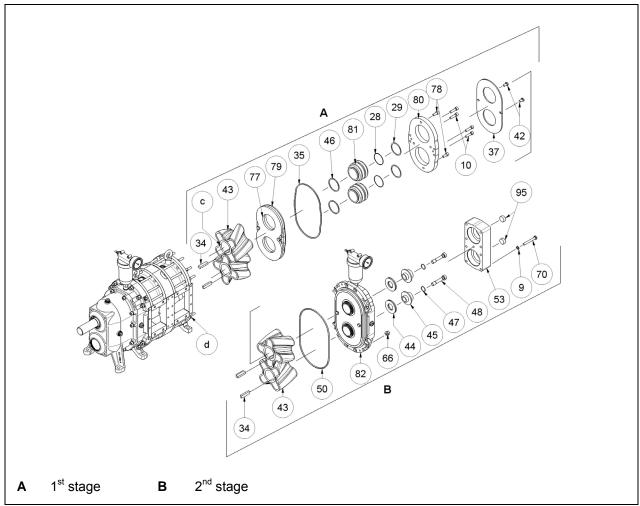


Fig. 17: Disassembly of separation plates (for Marathon) and rotary lobe change

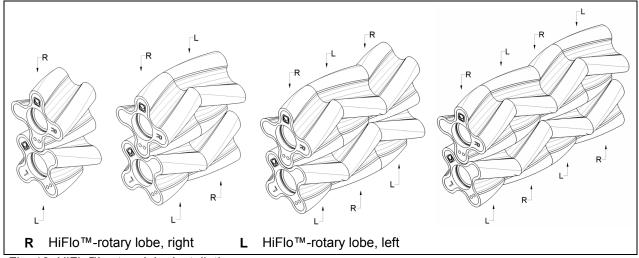


Fig. 18: HiFlo™-rotary lobe installation



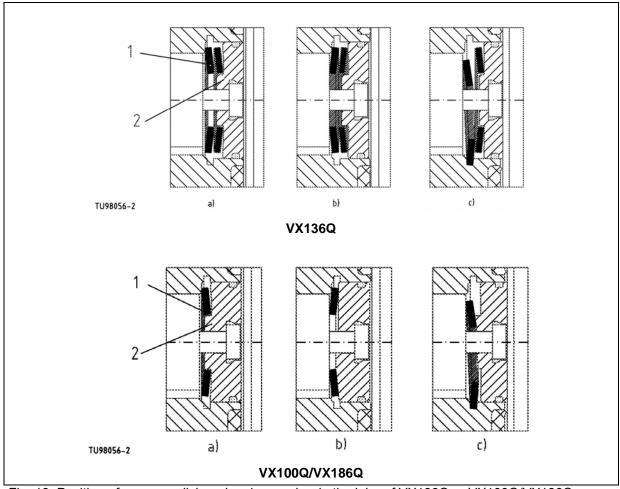


Fig. 19: Position of pressure disk and spring washer in the lobe of VX136Q or VX100Q/VX186Q pumps

- 1 spring washer
- 2 pressure disk
- a) correct
- **b)** not correct
- c) not correct



8.5.1 Tightening torque for mounting the pressure disk

Pump type	Tightening torque strain screw
VX100Q	45 Nm (M10, 10.9)
VX100QVVA	42 Nm (M10, A4)
All VX136/186 pump versions	Tighten the strain screw (M16, 10.9) with 200 Nm, then loosen it and tighten again with 140 Nm.
All VX136/186 VVA pump versions and all VX136/186 pumps with stainless steel screws	Tighten the strain screw (M16, A4) with 160 Nm, then loosen it and tighten again with 140 Nm.



Attention! Before mounting of stainless steel screws / nuts:

Clean threads and contact surfaces. Then apply Anti-Seize Paste (Art-No. BKL.014) evenly and in sufficient quantity on screw head/nut contact surface and on thread with a brusher, putty knife etc. to avoid seizing of stainless steel.

8.5.2 Additional components for VX100QVVA and VX136QVVA pumps



VVA = All parts of the pump which are in contact with the medium are stainless steel components.

An additional ring seal, including pressure disk and spring washers, protects the lobe core.

8.5.3 Additional components for VX186QVVA (stainless steel) pumps

There are two wear plates between the cover plate and O-ring:

- one wear plate at the cover plate side
- one wear plate at the lobe side with two holes in the shaft area

An additional sealing ring, including pressure disk and spring washers, protects the lobe core.



8.6 Change of wear plates



Attention! Wear plate (10) has a special curved design. Pay attention to correct position (see fig. "Wear plate - curved design")

VX100:



Tightening torque of wear plate screws: 20 Nm

VX136/VX186:



Tightening torque of wear plate screws: 40 Nm

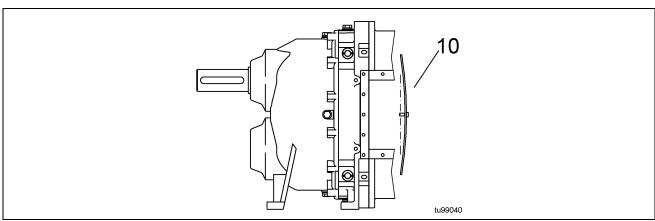


Fig. 20: Wear plate - curved design (10)



8.7 Change of cartridge mechanical seal

In addition to the parts from replacing the rotary lobes and wear plates, the following parts have to be removed. Combination tool: see chapter "Change of lobes" (see fig. "Cartridge mechanical seal change"):

- 1. Drain buffer chamber fluid and gearbox oil.
- 2. Put on cartridge mounting device and screw it on its borings (fig. 1).
- 3. Pull off cartridge consistently by the means of the three screws of the cartridge mounting device (fig. 2).
- 4. Change O-ring in the seal case (fig. 3).
- 5. Before installing the new cartridge remove carefully the burrs at the keyway.
- 6. Push the new cartridge seal on the pump shaft. Oil carefully the outer O-rings at the seal carrier (fig. 2) before mounting. Attention! Don't use oil for EPDM-O-rings!
- 7. For assembling the new seal, put the mounting device on the cartridge without screws (fig. 4).
- 8. Push a rotary lobe on the shaft without key.
- 9. Insert the pressure disk and the strain screw.
- 10. Tighten the rotary lobe, so that the new cartridge seal is exactly fitted (aligned) in the pump housing.
- 11. Push O-ring and washers on the shaft.
- 12. Before installing the new lobes, clean contact surfaces of lobes and sealing components very carefully.

2008-11-26 WBV.PU.002.EN **34/49**

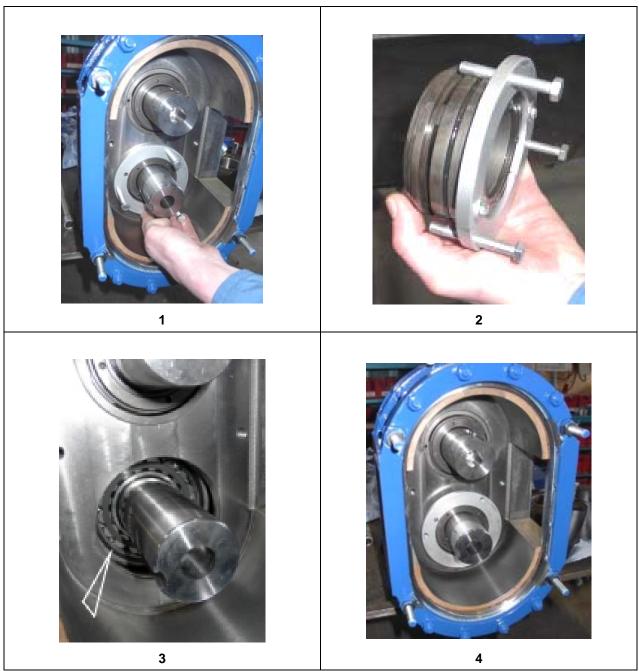


Fig. 21: Cartridge mechanical seal change



8.8 Change of component mechanical seals (no more actual)

In addition to the parts from replacing the rotary lobes and wear plate, the following parts have to be removed (see fig. "Mechanical seal change"):

- 1. Drain buffer chamber fluid and gearbox oil.
- 2. Pull spacer washer (11) and O-ring (12) from the shaft with a small screwdriver.
- 3. Remove seal holder (13) with one half of mechanical seal (15B).
- 4. Remove second half of mechanical seal (15) with a screwdriver.
- 5. Before installing the new mechanical seals, it is necessary
 - remove carefully the burrs at the keyway
 - clean all parts of mechanical seal very carefully
 - be careful not to contaminate the mechanical seals!

Only then an optimum function of mechanical seal is assured.

- 6. The O-rings (14A,B) have to be pulled dry over the mechanical seals (15A,B).→ Only the contact screws of the O-ring and sealing support are brushed with oil.
- 7. Put one half of mechanical seal (15A) into the pump's seal carrier (16). (O-ring on the top) into assembly tool.
- 8. Using the assembly tool, press the mechanical seal into the sealing support in the pump. Press the second half of the mechanical seal (15B) with the assembly tool into the seal holder (13)
- 9. Before the mechanical seals are assembled, it is necessary to moisten the slide faces with **clean** hydraulic oil. Install seal holder (13).

The rest of the parts have to be installed in reverse sequence. Before installing the new lobes, clean **contact surfaces** of lobes and sealing components **very carefully**.



If using pumps with special sealing/gaskets, please contact us.

2008-11-26 WBV.PU.002.EN **36/49**



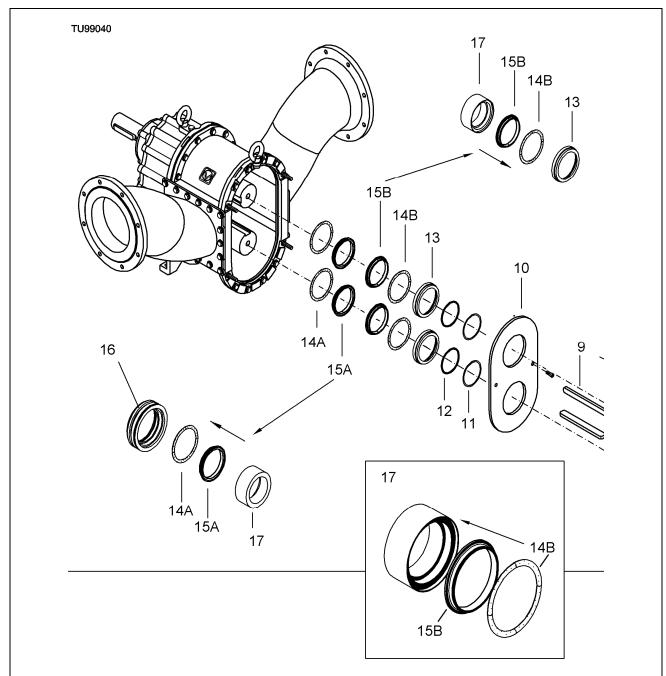


Fig. 22: Mechanical seal change

9 Key

10 Wear plate

11 Shim

12 O-ring

13 Seal holder

14A O-ring seal support

14B O-ring seal holder

15A Mechanical seal - seal support

15B Mechanical seal -seal holder

16 | Seal support

17 Installation tool



8.9 Adjusting of pump housing segments

Should the pump housing shells wear out, they can be readjusted.

- loosen the connector parts and screws at the pump housing segments.
- unscrew the cover plate.
- adjust the dowel pins in the housing segments as shown in fig. "Adjustment of housing segments"
- screw on all screws at the pump and the connector parts such as the cover plate.

Please note: Before installation apply the sealing material 'Curil' on every housing segment and seal them with asbestos-free gaskets.

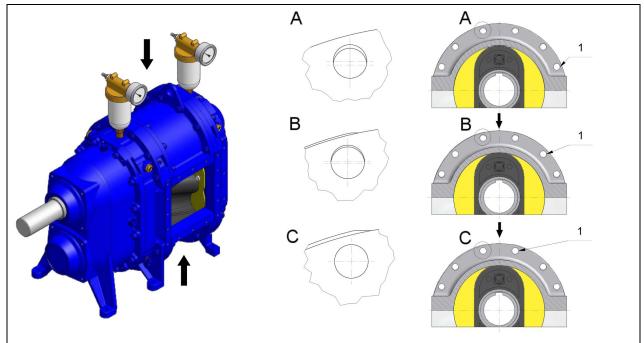


Fig. 23: Adjustment of pump housing segments

1	Position of dowel pin			
Α	Original position			
		VX100	VX136	VX186
В	First adjustment	0.5 mm	0.7 mm	0.9 mm
С	Second adjustment	1.0 mm	1.4 mm	1.8 mm



8.10 Reducing the starting torque for Q pumps

The starting torque of a Q pump can be reduced by installing shims.

Increasing the gaps between lobes and wear plates however reduces the volumetric efficiency.

(see "Increasing gap" table)

Increasing the gap between the lobes and wear plate at the gearbox:

VX136/VX186: Slide the shims in front of the first lobe onto the shaft.

VX100Q: Replace the shims.

In addition put one shim on each of the four distance nuts of the cover to adjust the gap accordingly.

Increasing the gap between the lobes and wear plate at the cover:

Place the shims on the four distance nuts of the cover.

If more than two shims are placed on each distance nut, you have to lay a thicker O-ring under the pump cover to attain continued reliable sealing.

In case of wear on lobes and plates, the gaps can be reduced accordingly again.

	Gap: lobe – gearbox Shim	Increasing the gap [mm]	Gap: lobe – cover Shim	O-ring	Increasing the gap [mm]
VX100Q	NUS.056 (45x55x0,5) replaces NUS.033 (45x55x0,3)	→ + 0.2	NUS.063 (8x14x0.2)	DOR.092	→ + 0.2
VX136Q	NUS.061 (60x75x 0,2)	→ + 0.2	NUS.067 (10x31x0.2)	DOR.093	→ + 0.2
VX186Q	NUS.048 (85x105x0,3)	→ + 0.3	NUS.049 (12x25x0.3)	DOR.094	→ + 0,3

Table "Increasing the gap"

Increasing the gap by installing thinner wear plates (VVA-pumps excluded)

Increasing the gap $(\rightarrow + 1 \text{ mm})$

VX136Q

Gearbox side: Wear plate PFL.B009.T1 (4 mm) replaces wear plate PFL.B009 (5 mm) Cover side: Wear plate PFL.B002.T1 (3 mm) replaces wear plate PFL.B002 (4 mm)

VX186Q

Gearbox side: Wear plate PFL.A017.T1 (5 mm) replaces wear plate PFL.A017 (6 mm) Cover side: Wear plate PFL.A002.T1 (4 mm) replaces wear plate PFL.A002 (5 mm)

Increasing the gap $(\rightarrow + 0.3 \text{ mm})$

VX136Q

Gearbox side: Wear plate PFL.B009.T2 (4.7 mm) replaces wear plate PFL.B009 (5 mm) Cover side: Wear plate PFL.B002.T2 (3.7 mm) replaces wear plate PFL.B002 (4 mm)

VX186Q

Gearbox side: Wear plate PFL.A017.T2 (5.7 mm) replaces wear plate PFL.A017 (6 mm) Cover side: Wear plate PFL.A002.T2 (4.7 mm) replaces wear plate PFL.A002 (5 mm)

2008-11-26 WBV.PU.002.EN **39/49**



9 Service Instructions In Tabular Form

	Before start-up of pump in case of longer stock holding period/shutdown: every 2 months	Start-up*	Before and after longer out-of-service periods	10 operating hours after start up	20 operating hours after start up	Every 200 operating hours	Every 500 operating hours, all three months minimum	Every 2000 operating hours, once a year minimum	When strong contamination is present
New pump with mechanical seal - combination of material: SiSiC- SiSiC! In the case of new pumps with this seal that are not going to be used immediately, the shaft needs to be rotated (by at least one revolution)	x								
Lubricate the grease nipples		X	X						
Check belt tension (for pumps with belt drive) acc. to accompanying sheet		х	х	х				х	
Tighten the screws to the base					X				
Check buffer/quenching fluid					X	X			
Change buffer/quenching fluid								Х	X
Change gearbox oil					Х			Х	
Check gearbox oil							Х		

^{*} see chapter "Check list before start-up"



10 Service Plan

Warranty is valid only when service intervals acc. to chapter "Service instructions in tabular form" have been followed and performed.

Pum	o numb	er:											
Lubricate grease nipples	Check belt tension in acc. to accompanying sheet	Tighten the screws to the base	Check the buffer/quenching fluid	Change the buffer/quenching fluid	Check the gearbox oil	Change the gearbox oil				Total capacity	Date	Name	Signature
	S &		S	Ö	5	S	Other		Operating hours		Date	Name	Signature



11 Trouble-shooting

								_						,				
Pump is not pumping	Pump stops after start	Suction flow breaks away after start	Irregular pumping	Pump performance too low	Pump blocked	Power consumption too high	Drive belt slips	Leakage at the pump	Pressure and level variations in the buffer chamber	Extreme pressure and level changes in the buffer chamber	Dry buffer chamber: Buffer chamber tank is filled more than a half	Pump too hot	Motor too hot	Noises & vibration	Cause		Action to be taken	
X	п.	()		Ь	ш	Ь			<u>п</u>	Ш		Ь	2		Pump does no	t prime	Fill the pump with fluid	
X															Incorrect direct	ect direction of rotation Change direction of rotation pump		
					х	х		х				х	х	х	Pipe causing p warping	ump housing	Check the alignment of the pipe to the pump, if necessary provide a compensator or fix the pipe	
		,	,,	,										,	Leakage in the	suction pipe	Check suction-side pipe system for leakage	
X		Х	X	X										Х	Gas generation	า	Vent the suction pipe and pump chamber, fill with fluid	
		Х	X											Х	Suction pipe cl	ogged	Check the free-flow of the suction- side pipe system	
					X		X							X	Foreign matter	in medium	Clean the system, install a strainer in the suction pipe	
x		x	X	X										x	NPSH _A too low	(pump cavitates)	Increase suction pipe diameter, shorten suction pipe length, simplify suction pipework, reduce suction height, reduce speed, adjust medium temperature	
							х								Belt tension to	o low	Tighten in accordance with manufacturer's specifications	
														х	Coupling not correctly aligned		Check the alignment and align according to manufacturer's specifications if necessary	
х	х		х	х	х									х	Belt drive slips		Tighten in accordance with manufacturer's specifications	
															Swollen lobe elastomer		Check the chemical resistance of the lobe elastomer	
	x				X	X	X					X	X	X	Stiff running		Clean pump chamber, increase the gaps (see chapter "Repair"), adjust the drive	
												х		х	Oil level in the is not okay	gearbox	See chapter "Maintenance"	
	ш								<u> </u>		<u> </u>				is not okay			



Pump is not pumping	Pump stops after start	Suction flow breaks away after start	rregular pumping	Pump performance too low	Pump blocked	Power consumption too high	Drive belt slips	Leakage at the pump	Pressure and level variations in the buffer chamber	Extreme pressure and level changes in the buffer chamber	Dry buffer chamber: Buffer chamber tank is filled more than a half	Pump too hot	Motor too hot	Noises & vibration	Cause	Action to be taken
_		· ·		_		_			Х					_	Operation related variations	See chapter "Maintenance"
										Х					Mechanical seal damage	Change mechanical seals
										X					Faulty repair	See chapter "Repair"
											х				Sealing leakage	See chapter "Pump with dry buffer chamber"
X	Χ			X	Χ	Χ	Χ	Χ				Χ	Х	X	Operating pressure too high	Reduce operating pressure
	Х	Х		х		Х	Х					Х	х	х	Medium viscosity above the	Reduce speed, increase medium
	^			^		^						^	<u> </u>	_^	nominal value	temperature
															Medium viscosity below the	Increase speed,
				х											nominal value	decrease medium temperature,
				^											Gap too large	change wear parts, reduce gaps (see chapter "Repair")
				X	X			X	X			X			Medium temperature above nominal value	Reduce medium temperature
	X	х			X	х			X				х		Medium temperature below nominal value	Increase medium temperature (after consulting Vogelsang)



12 Specifications

12.1 Material description for rotary lobes with elastomeric coating

Material	Hardness (shore A)	Chem. components	Resistant up to °C	Pump medium	Properties
SBR	70	Butadiene, styrene	60°C	Liquid manure	Wear-resistant
NBR	70	Butadiene, acrylonitrile	80°C	Sewage sludge, petrol, oil, grease, diesel oil, spindle oil	Oil-resistant
NBR, white	70	Butadiene, acrylonitrile	80°C	Oil, butter, linseed and olive oil, lard	Food grade oil
EPDM-SL (EPDM-Sewage-Line)	70	Ethylene propylene	80°C	Water, liquid manure, sewage sludge, biogas substrate	Water resistant
EPDM, white	70	Ethylene propylene	80°C	Water, mash, slightly acidic products	Food grade oil
FPM	70	Fluorocarbon gum	80°C	Solvents, salt water, oil, petrol, acids	Acid-resistant and alkali- resistant
PU (Werobust)	70	Polyurethane	50°C	Abrasive medium	Wear-resistant

Attention! Note max. operating pressure:



- The elastomer coating 'FPM' is usable for rotary lobes only up to max. 6 bar operating pressure.
- Seal rings of material 'Duronit' are allowed only up to 10 bar real operating pressure.



12.2 VX100 - Technical data

pump size of series V100QHD/VX100Q	Theo	oretical capa _x = 1000 [mi	city* n ⁻¹]		perating sure**	Max. operating torque (valid for NBR elastomers)
	[l/rev]	[l/min]	[m³/h]	[bar]	ALU*** [bar]	[Nm]
45	0.29	290	20	10	7	65
64	0.42	420	25	9	5	80
90	0.59	590	35	7	3	90
128	0.84	840	50	4	2	85

- * All data are as to theoretical capacity. The actual capacity depends on the various operating conditions.
- ** Valid only for short operation times. For continuous operation, please contact our technicians. The service life of the rotary lobes is reduced by high temperatures, especially in combination with high pressure.
- *** Please note the reduced max. operating pressure for pumps with gearbox housing made of aluminium.



Ball diameter:

Maximum ball diameter: Ø 20 mm.



12.3 VX136 - Technical data

pump si	ze of series:	capa	retical acity* 800 min ⁻¹	max. op	erating pre	essure**	max. operating torque			
VX136	VX136QD Marathon			VXQD VXQDR ¹⁾	VXQ	VXQD Marathon	VXQD VXQDR ¹⁾	VXQ	VXQD Marathon	
		[l/rev	[m³/h]	[bar]	[bar]	[bar]	[Nm]	[Nm]	[Nm]	
70	140 (70/ 70)	1.27	60	12 5 ¹⁾	10	16	280 135 ¹⁾	240	400	
105	210 (105/105)	1.90	90	12 5 ¹⁾	10	16	415 200 ¹⁾	355	580	
140	280 (140/140)	2.53	120	12 5 ¹⁾	8	14	550 260 ¹⁾	390	675	
210	420 (210/210)	3.80	180	10 5 ¹⁾	5	12	695 380 ¹⁾	395	860	
280	-	5.06	240	8 5 1)	-	-	755 500 ¹⁾	-	-	
420	- -	7.59	360	6 -	-	-	865 -	-	-	

¹⁾ specifications for QDR pumps

- * All data are as to theoretical capacity. The actual capacity depends on the various operating conditions.
- ** Valid only for short operation times. For continuous operation, please contact our technicians. The service life of the rotary lobes is reduced by high temperatures, especially in combination with high pressure.



Ball diameter (VX136):

Maximum ball diameter: Ø 40 mm.



12.4 VX186 - Technical data

pump si	ze of series:	capa	retical acity* 00 min ⁻¹	max. op	perating pre	essure**	max. operating torque			
VX186	VX186QD Marathon			VXQD	VXQ	VXQD Marathon	VXQD	VXQ	VXQD Marathon	
		[l/rev]	[m³/h]	[bar]	[bar]	[bar]	[Nm]	[Nm]	[Nm]	
92	184 (92/ 92)	3.56	125	-	10	16	-	675	1100	
130	260 (130/130)	5.03	180	12	10	16	1100	940	1510	
184	368 (184/184)	7.12	250	12	8	14	1540	1090	1850	
260	520 (260/260)	10.06	360	10	5	12	1835	1035	2205	
368	-	14.24	510	8	2	-	2100	740	-	
390	-	15.09	540	7	2	-	1975	780	-	
520	-	20.12	720	6	-	-	2250	-	-	
736	-	28.48	1000	3	-	-	1680	-	-	

^{*} All data are as to theoretical capacity. The actual capacity depends on the various operating conditions.

^{**} Valid only for short operation times. For continuous operation, please contact our technicians. The service life of the rotary lobes is reduced by high temperatures, especially in combination with high pressure.



Ball diameter (VX186):

Maximum ball diameter: Ø 61 mm.



13 EC-Manufacturer's Declaration



EC Manufacturer's Declaration

in accordance with the Machinery Directive 98/37/EC Annex II B

Hugo Vogelsang, Maschinenbau GmbH Holthöge (Gewerbegebiet) D- 49632 Essen (Oldb.)

We declare that the following pump is not a complete machine. Installation of this machine component must be in accordance with the safety instructions which are included in the Operating and Maintenance Manual. The machine must not be put into service until the machinery into which it is incorporated has been declared to be in conformity with the Machinery Directive .

Category of machine: Rotary lobe pump

Machine type:

EC Directives: Machinery Directive (98/37/EC) :1998

Applied harmonized standard:

DIN EN ISO 12100-1:2004; DIN EN ISO 12100-2:2004

DIN EN ISO 13857:2008

DIN EN 349 :2008 DIN EN 1037:1996

Applied national standards and technical specifications: DIN 4844-1 :2002; DIN 4844-1 :2002; DIN 4844-1 :2002

DIN 24295 :1981 DIN 31001-1 :1976 DIN v 8418 :1988 DIN v 66055 :1988 DIN EN 690 :1995

Hugo Vogelsang Maschinenbau GmbH

49632 Essen,2008-11-26

Harald Vogelsang (Managing Director)

H. Vogels &



© 2007 Hugo Vogelsang Maschinenbau GmbH. All rights reserved. HiFloTM and the Vogelsang Logo are registered trademarks.



Vogelsang Deutschland West

Hugo Vogelsang Maschinenbau GmbH

D-49632 Essen (Oldb.)



+49 54 34 83 0



+49 54 34 83 10



info@vogelsang-gmbh.com



www.vogelsang.info



Vogelsang Danmark

Vogelsang A/S DK-6880 Tarm



+45 97 37 27 77



+45 97 37 30 77



vogelsang@adr.dk



Vogelsang Italia

Vogelsang S.r.l.

IT-26025 Pandino (CR)



+39 03 73 22 03 12



+39 03 73 91 08 7 info@vogelsang-srl.it





www.vogelsang-srl.it



Vogelsang Romania

Vogelsang Romania SRL RO-021041 Bucuresti



+40 753 105 777



+40 31 427 2757



info@vogelsang.ro



www.vogelsang.ro



Vogelsang Deutschland Ost

Vogelsang Maschinenbau GmbH D-06295 Rothenschirmbach



+49 3 47 76 2 05 81



+49 3 47 76 2 05 82 rsb@vogelsang-gmbh.com



www.vogelsang.info



Vogelsang USA

Vogelsang USA Ltd. USA-Ravenna, OH 44266



+1 33 02 96 38 20



+1 33 02 96 41 13



sales@vogelsangusa.com www.vogelsangusa.com



Vogelsang Great Britain

Vogelsang Ltd. GB-Crewe, Cheshire CW1 6YY



+44 12 70 21 66 00



+44 12 70 21 66 99



sales@vogelsang.co.uk

Vogelsang Españia

ES-28770 Colmenar Viejo Madrid

www.vogelsang-spain.es

+34 91 84 64 648

+34 91 84 64 648



且

 \bowtie

Vogelsang S.L.

www.vogelsang.co.uk



Vogelsang France

Vogelsang France S.A.R.L. F-26740 Montboucher Sur Jabron



+33 4 75 52 74 50



+33 4 75 52 76 61



info@vogelsang.fr

www.vogelsang.fr

Vogelsang Polska

Vogelsang Sp. z o.o. PL-52-214 Wroclaw

+48 71 7 98 9 5 80

 \bowtie

+48 71 7 98 9 5 82 info@vogelsang.pl

www.vogelsang.pl

Vogelsang Malaysia

marcial.gil@vogelsang-spain.es

Vogelsang Malaysia

MY-52200 Kuala Lumpur



+60 1 22 11 42 23



+60 3 62 72 91 87



chan@vogelsang-gmbh.com

Vogelsang China

Vogelsang Mechanical Engineering (Shanghai) Co., Ltd

CN-Shanghai 200436



+86 21 61 39 85 01



+86 21 61 39 85 02



sales@vogelsang.com.cn www.vogelsang.com.cn