

Created: 2015-May-03

DEAR CUSTOMER:

PLEASE VISIT OUR WEBPAGE UNDER:

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You will find

- **Torque value on a drawing**
- **Electronic form of this manual**
- **Maintenance movies for all tasks**

New helpers will be uploaded constantly.

Your ViscoTwin – Team 😊

Data sheet

Customer:

Pump identification

| | | | | | |
|--------------------|--------------------|------------|--|---------------------|--|
| Pump type: | ViscoTwin 70-xx 3A | Serial- #: | | EDATA component-ID: | |
| Configuration key: | | | | | |

Specification pump head

| | |
|--|--|
| Certification | 3A |
| Screw type screw pitch | 70-xx 3A |
| Screw material | Stainless: AISI: 316L (EN: 1.4404) |
| Screw hardened | No |
| Rotation | CCW |
| Screw arrangement | V |
| Shaft sealing type | Single acting mechanical seal |
| Shaft sealing materials | SIC/SIC// FKM C/TC//FKM |
| Flushing of mechanical seal | |
| Pump housing material | Stainless: AISI: 316L (EN: 1.4404) |
| Pump housing nozzle orientation | to top to bottom |
| Process connection pump housing (top port) | SMS ____" OD |
| Process connection front port | SMS ____" OD |
| Suction port | Front cover port housing port |
| Discharge port | Housing port front cover port |
| Elastomer | FKM EPDM |
| Material bearing housing | Stainless: AISI: 304 (EN: 1.4301) |
| Material drive shaft | Stainless: AISI: 420 (EN: 1.4021 NANO) |
| Drive shaft diameter | 20 mm |
| Atex-execution | No |
| Temperature probe | Without |
| Gear oil cooling | Without |
| Special accessories | No |
| Quench fluid vessel | Without |
| Heating jacket | Without |

Coupling specification

| | |
|------------------------|----------------------------------|
| Brand / Model | _____ 28/38 |
| Hub type pump head | Standard length, standard keyway |
| Hub bore pump head | 20 mm |
| Hub material pump head | Aluminum cast iron |
| Spider material | NBR |
| Hub type motor | Standard length, standard keyway |
| Hub bore motor | 38 mm |
| Hub material motor | Aluminum cast iron |

Drive specification

| | |
|--------------------------|-------------------------|
| Drive | |
| Norm | |
| Manufacturer | |
| Type | AC |
| Model | |
| Rated power | hp |
| Frame | |
| Flange | |
| Speed at rated frequency | rpm |
| Voltage | 220 V / 480 V |
| Rated frequency | 60 Hz |
| Poles | 2 4 6 |
| Protection class | IP55 |
| Washdown | No |
| Mounting position | B35 |
| Insulation class | F |
| Cooling / Enclosure | TEFC |
| Terminal box | Top (270°) |
| Drive protection | included with pump head |
| Origin | USA |

Base plate

| | |
|---------------------------------------|------------------------------|
| Base plate | no plate |
| Intermediate flange | Yes |
| Support legs | 3 support legs, 3-A standard |
| Material (support legs or base plate) | Stainless steel |
| Motor frame | |

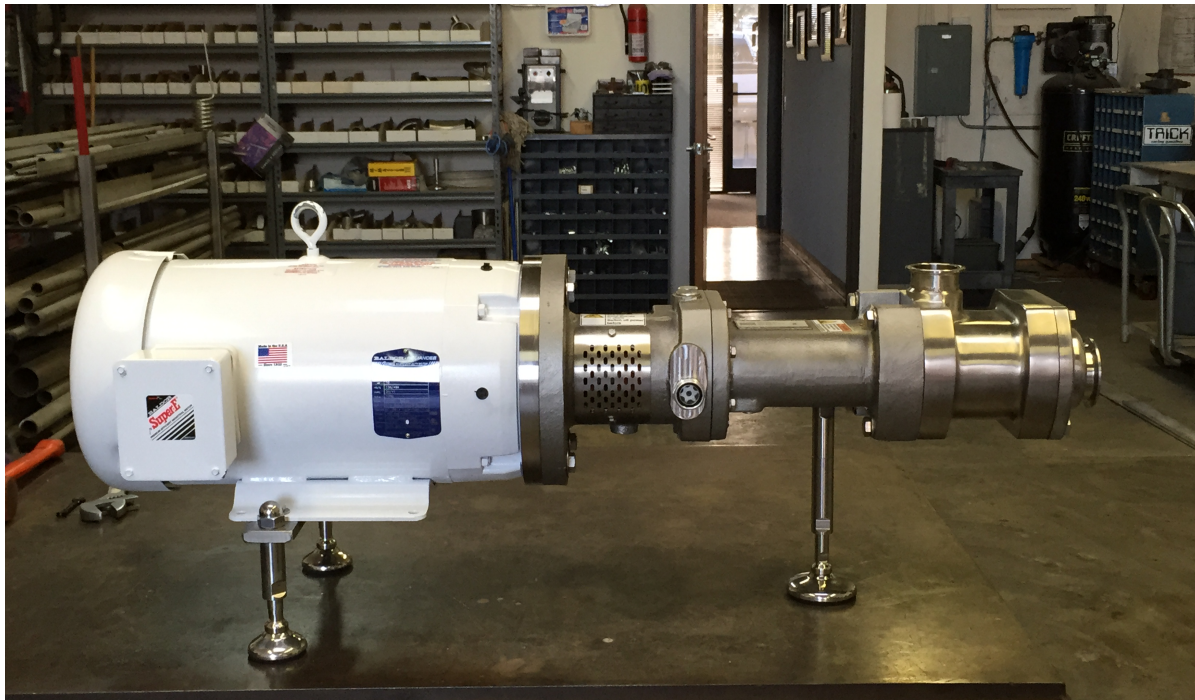
Accessories

| | |
|--------------------------|---|
| Temperature control | - |
| Manometer | - |
| Sealing liquid reservoir | - |

Visalia, CA, USA, 2015, May 7th KD

Manual ViscoTwin screw pumps

Type ViscoTwin 70



Release: May 2015 KD

Manual ViscoTwin

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1. Safety notes

1.1 Important notes

- Read these instructions before assembly and initial operation.
- They describe the safe use of the pump in all life cycles.
- Heed the safety notes contained without fail
- Do not put damaged products into operation

The notes on safe and undisturbed operation are designated as follows:

| Symbol | Signal word | Meaning | Consequences of disregard |
|--|-------------|--|---|
| Example.  General hazard  Specific hazard, e.g. electric shock | Danger | Imminent danger | Severe or fatal injury |
| | Warning! | Possible dangerous situation | Severe or fatal injury |
| | Caution! | Possible dangerous situation | Minor injuries |
|  | Note! | Potential damage to property | Damage to pump or plant system |
|  | Note! | Important notes on explosion prevention and protection | Neutralizing the explosion protection and resulting dangers |
|  | Note! | For safe and undisturbed operation | |

1.2 Qualified personnel

The operating company has to instruct the operator by means of this Operating Manual. The minimum age is 16 years. An experienced person has to supervise young persons and apprentices during the work on the machine.

Only metal workers, industrial mechanics or persons with comparable education may perform assembly, maintenance, initial commissioning, and repair work on the screw pump.

All electro technical work may only be performed by a trained electrically qualified person. Electrically qualified person in the sense of this Operating Manual are individuals who are familiar with electrical installation, commissioning, troubleshooting, and maintenance and hold a corresponding qualification for this function.

All work in the other fields, transport, storage, operation, and disposal may only be carried out by individuals who know the Operating Manual and have been appropriately instructed.

Make sure that the applicable standards and regulations of the respective country of use are kept and monitored.


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1.3 Further applicable documents

Heed the following additional documents:

| Document | Description |
|---------------------------------|---|
| Data sheet | Technical data, performance and operating limitations, service conditions |
| Dimensional drawing | Pump dimensions and connections with mounting points |
| Spare parts lists | Exploded drawing with spare parts |
| Assembly instructions | Special models or incomplete machine |
| ATEX supplementary instructions | Operating the pump in explosion hazardous area |
| Drive documentation | Drive Operating Manual |
| Shaft coupling | Shaft coupling Manual |
| Accessories documentation | Accessories Operating Manual |
| Declaration of decontamination | Shipping the pump for repair |

1.4 Safety Notes for Commissioning, Maintenance, Inspection and Installation works.

| | |
|---|---|
|  | Warning!! |
| | The pump has live, pressurized, pressure-retaining and rotating or moved machine parts and possibly hot surfaces during operation. Potential consequences: Severe or fatal injuries. |

Principally perform any necessary work on the machine when the system is at a standstill.

Disconnect the electric drive from mains and secure against unauthorised and inadvertent activation.


Make sure prior to opening the pump that the system and its auxiliary systems are in the no-pressure state.

Keep in mind that the pump may possibly have hot surfaces during and after operation.

Follow the regulations on handling the pumping medium when opening the pump.

Reattach all protection devices before restarting.

Heed the points stated in Chapter 'Commissioning' when restarting

| | |
|---|---|
|  | Warning! |
| | Risk of injuries through falling or tipping heavy machine parts. Potential consequences: Severe or fatal injuries. |

The pump or parts of it may be very heavy and need to be moved using appropriate lifting gear.

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1.5 Intended use

The machine is intended for commercial use and may only be employed for delivery of the agreed pumping media in accordance with this Operating Manual.

The operating points (delivery volume, pressure, rotational speed) mentioned in the pump specification (→ data sheet) should be understood as limit values and must not be exceeded.

Any change of the pump delivery conditions (e.g. delivery rate, delivery route, pressurisation level, pipe diameter, throttle devices) may result in strongly changed operating conditions. If this occurs, compare the new operating conditions with the data contained in the data sheet. You will need to consult with the manufacturer if the changed conditions should exceed the data contained in the data sheet.

Foreign bodies in the medium are improper change in operating conditions. They are to prevent with suitable measures such as magnetic separators and filters, and others.

The resistance of various sealing materials to some common pumping media is shown in the following table. Because each sealing material can vary in resistance you shall consult the pump manufacturer before choosing the sealing material.

Characteristics of resistance

| Material | organic acid | inorganic acid | Alkaline | Oil + Fat | polar solvents | Non-polar solvents | steam | alcohol | Amine |
|----------|--------------|----------------|-------------|-------------|----------------|--------------------|-------------|-------------|-------------|
| EPDM | well usable | well usable | excellently | do not use | excellently | do not use | excellently | excellently | well usable |
| FKM | do not use | excellently | do not use | excellently | do not use | well usable | excellently | well usable | do not use |

Organic acids: e.g. citric acid or formic acid

Inorganic acids: e.g. Nitric acid or hydrochloric acid

Polar solvents: e.g. acetone

Non-polar solvents: e.g. methyl ethyl ketone

In case of equivocality consult the manufacturer.

Deployment in the Ex area is prohibited unless not expressly intended for this purpose.

[Ensure for 3-A application the use of only 3-A certified elastomers Standard 18-03 class I.](#)

1.6 Predictable Misuse

- Only use the pump to deliver the specified medium.
- Do not operate the pump beyond the specified speed range.
- The solids contents in the pumping medium must not exceed the specified limit values for grain size and proportion of solids.
- Take appropriate measures to ensure that no foreign objects (metal parts, stones, etc.) can get into the pump and possibly cause damage.
- Do not use the stationary pump as shut-off device.

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1.7 Operating restrictions

The ViscoTwin screw pump is a positive displacement pump that can build up very high pressure. The developing pressure with the delivery line shut can reach the multiple of the permissible system pressure. This may result in serious damage to system components posing a risk to persons.

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Do not operate against closed shut-off devices!

Breakage and risk of injuries!

Secure the pump through approved safety devices (overpressure protection).


- Keep the relevant safety and handling instructions when delivering dangerous media.
- Medium contamination through foreign objects may result in damage to the pump elements.
- Observe the relevant legal requirements and the possibly resulting requirements and restrictions when delivering and storing hazardous substances and inflammable liquids.
- For pumps with gaskets and seals made of EPDM the fat content must not exceed a percentage rate of 8%. Otherwise the resistance of the sealing material is no longer guaranteed.

For pump with gaskets and seals made of FKM / FPM the basic and acidic cleaners must not exceed the following levels:

- E.G. Sodium hydroxide (NaOH) concentration up to 3%
- E.G. nitric acid concentration (HNO₃) up to 3%.

1.8 Specific safety notes

Due to the medium or heating of the bearing support the pump can reach a dangerous high temperature. Provide protection against contact for hot and cold parts, without hindering the cooling of the pump. In case of a possible electrostatic charge provide appropriate earthing.

| | |
|---|--|
|  | Danger! |
| | Rotating screw spindles in the pump can draw in arms or other parts of the body. Imminent danger: Severe or fatal injuries. |

Access into the pump during operation must not be possible.

The running screw spindles can cause serious hand and personal injuries.

Only operate the pump when mounted (connected to a piping system).

Be sure to secure the openings (pressure and suction port) when running a possibly necessary test run.

Only perform manual cleaning and maintenance work after disconnecting the drive (system control) from mains and protecting it from inadvertent and unauthorised reclosure.

1.9 Specific safety notes on pumps with heating jacket

The housing of these pumps is of double jacket design and has connections for heating medium flow.

The housing has been designed for **6 bar** overpressure if no other internal pressure has been approved in the data sheet.

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Use for the inlet- and outlet connection of the heating circuit the connectors on the opposite according to the nozzle. The connectors on the nozzle side can be used for the vent or a pressure measurement.

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Operate the heating circuit exclusively using water.

Make sure by corresponding pressure limiting devices that the approved pressure rating for the housing will not be exceeded. The medium escaping via the relief port has to be discharged safely into a pressure less area when the pressure limiting device is responding. No shut-off devices are allowed to be arranged in this area.

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2. Construction and general description

2.1 ViscoTwin pump construction

| | |
|---|--|
|  | <p>Only exemplary representation, Decisive for the dimension is the dimensional drawing 3-A-Baseframe is different and shown on separate drawing</p> |
|---|--|

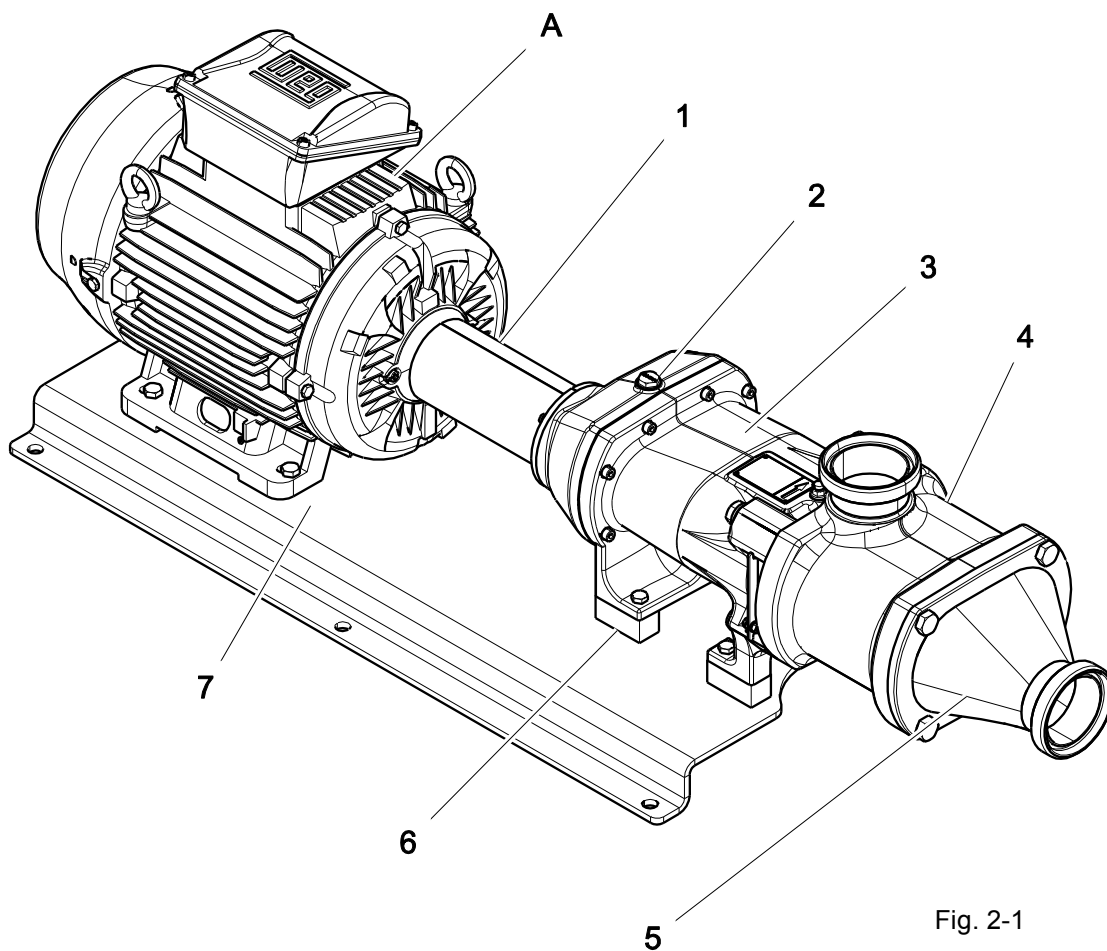


Fig. 2-1

- A Drive
- 1 Coupling with guard
- 2 Gear housing
- 3 Bearing housing
- 4 Pump casing
- 5 Cover
- 6 Pump foot
- 7 Base plate

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2.2 General description

Screw pumps are rotating displacement pumps for delivering low to highly viscose media.

Pumps for use in the foodstuffs and beverage industry are designed and built to the recommendations of DIN EN 1672-2 'Food processing machinery - Basic concepts'. This does not include pipe connections, which require special cleaning procedures. These must be cleaned manually by the operator. The cleaning cycle is dependent on the food and the relevant hazard from. This is set by the operator. Correspond to the pipe connections according to DIN 11864, according to DIN EN 1672-2 there is no health risk. The operator does not define any special cleaning measures.

Non-corroding materials suitable for cleaning and/or disinfection are being used for the product-contacting parts of these pumps. Elastomer materials and seals for pumps used in the foodstuffs and beverage industry correspond to the BfR (German Federal Institute for Risk Assessment) recommendations and the FDA guidelines respectively (US Food and Drug Administration) and the Regulation (EC) No 1935/2004.

The pumps and pump units respectively are designed and built taking the health and safety requirements of the EC Machinery Directive into account. With all requirements met, either the EC Declaration of Conformity (with CE mark) or in the case of partly completed machines, a Declaration of Incorporation is issued.

The Declaration of Conformity issued by manufacturer is valid for the delivered machine in connection with the intended use of the drive (gear motor, gear unit for mounting an IEC standard motor with defined power and torque as motive propulsion source for the pump) as determined in the data sheet. The customer will be solely responsible for any subsequent interferences or modifications on the machine and has then to assert conformity with the EC directives by himself.

For 3-A conformity all pumps, motors (NEMA), connections, base frames, support legs and elastomers are built in respect of 3-A standards.

2.3 Sound emission

Each pump is manufactured and tested acc. to the currently valid technical documentation. The weighted continuous sound level is normally <70 dB(A) with drive and pipe lines not included in this measurement. Cavitation-free operation and proper fastening of the pump unit on level concrete slab or warp resistant steel structure is taken for granted.

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3. Transport, packaging, storage

3.1 Transport / packaging

The pumps are shipped in non-returnable packaging. Any transport damage has to be immediately reported to the transport company after receipt of the consignment. Do not put damaged products into operation



Warning!

The pump can drop or tilt as a result of improper transport.
Potential consequences: Severe or fatal injuries.

Use only hoisting gear and load-carrying equipment with sufficient load capacity.

Lift pumps with suitable load-carrying equipment (chains, ropes) properly acc. to opposing pictures using hoisting gear.



The pictures used are example pictures

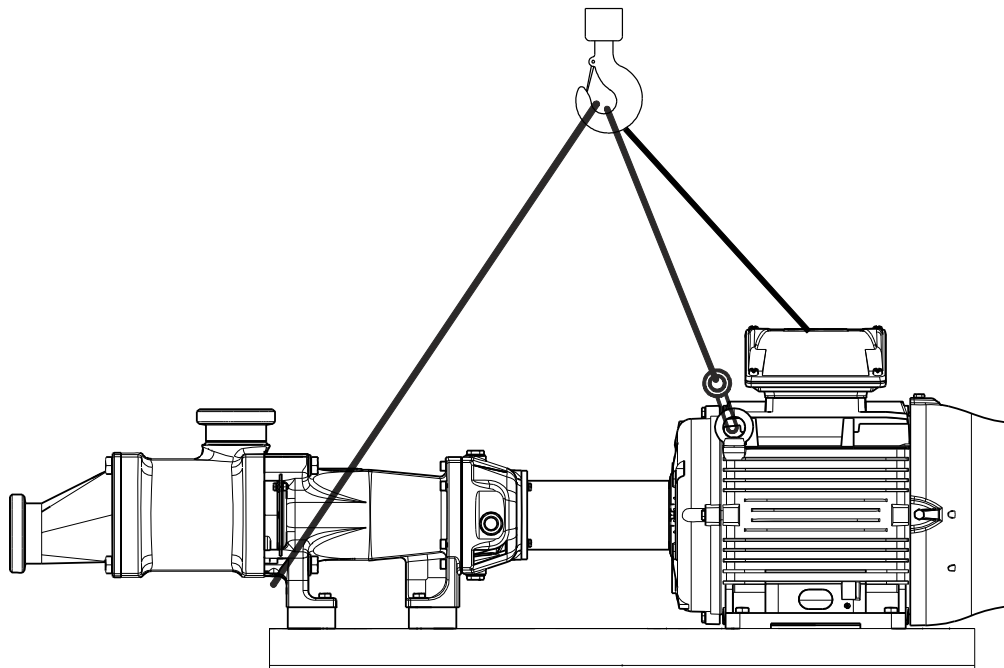


Fig. 3.1 ViscoTwin 130 with baseplate and drive

ATTENTION

Possible damage to property

Lift the pumping aggregates as indicated in the display. Never raise the entire aggregate only at the eye-bolts of the drive unit. These anchor points are to be employed only for the drive alone.

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When transporting pump units, consider that they can be very top heavy due to certain drive assemblies.

Always transport screw pumps in horizontal position.

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3.2 Storage

The pumps are sufficiently preserved under normal environmental conditions. Take the following measures when storing for a longer period:

Protect pump from dust, dirt, water, and other harmful environmental influences.

Coat all non-painted surfaces with acid-free and resin-free grease.

Do not grease stainless steel parts and non-metallic parts.

Cover all openings of pressure and suction ports.

Drain water when using it as quench medium for shaft seal.

Make sure that the storage room is frost protected and dry

Check the preservation regularly.

3.3 Disposal

Collect oil from gear unit and seals and dispose of acc. to the local regulations.

3.3.1 Final decomposition of the pump, sorting

Check parts availability as spare parts and optionally store it.

- Shaft seal and sealing rings / gaskets: rubbish.
- Bearing support Type P and PC:
 - Housing and shafts: Scrap for rustproof steel
- Bearing support other types: Steel scrap
- All parts of the gear: Steel scrap
- All other parts: Steel scrap

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4. Assembly / installation

4.1 Rotational direction

The rotational direction of the drive shaft determines the direction of flow. The rotational direction is stated on the data sheet and on the pump casing / coupling guard.

4.2 Speed and torque of the pump

The permissible speed and the maximum torque on the clutch shaft of the screw pumps are shown in the following table:

| Characteristic | Value |
|--------------------------------|----------|
| Min speed | 100 rpm |
| Max. speed | 3600 rpm |
| Maximum torque on clutch shaft | 120 Nm |

4.3 Mounting

Mounting of the twin screw pump is done via the holes in the base plate and the holes in the case foot respectively. Provide for a solid and level ground, such as:

- a sufficiently dimensioned, level concrete slab
- level and warp resistant steel structure

The foundation has to sustain the dead weight and all operating forces and guarantee pump unit stability.

The size of the holes on the casing or base plate predetermine the diameters of the screws or dowel anchors.



Normally, mounting is done by screwed connection (hexagon head screws, dowel anchors). In this context, observe the following screw diameters and max. torquing values:

•

| Screw diameter | Max. tightening torque |
|----------------|------------------------|
| M10 | 44 Nm |
| M12 | 90 Nm |
| M16 | 220 Nm |

(The values apply for hexagon head bolts to DIN 931-B or EN 24014 of strength category 8.8)

The pump units need to be tightly mounted to the base plate mounting points when the pump unit is put up on 4 – 6 calottes. With this job done, the pump unit needs to be horizontally aligned by adjusting the calotte feet so that the pump stands safely and firmly on the ground.

For the base frame installation of pumps meeting the requirements of 3-A Sanitary Standards (Standard 02-11) leveling feet also meeting the requirements of 3-A Sanitary Standards (Standard 88-00) have to be used.

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For pumps meeting the requirements of 3-A Sanitary Standards (Standard 02-11) a clearance of at least 100 mm between aggregate console and the floor has to be observed.

Mobile pump units have to be locked via their fixing wheels prior to commissioning.

4.3.1 Tightening torques for specified components

Tightening torques has been specified for certain components as shown in the table below:

| Designation | ScrewØ | Tightening torque |
|---|--------|-------------------|
| Gear housing cylinder head-/hexagonal screws 2258 | M 8 | 20 Nm |
| Gearwheel hub cylinder head screws 2186 | M 5 | 8 Nm |
| Driven shaft hexagon screw 2177 | M 10 | 45 Nm |
| Cover hexagon screw 1041 | M 12 | 70 Nm |
| Spindle screw 2180 | M 18 | 100 Nm |
| Pump housing hexagon screw 1016 | M 12 | 70 Nm |
| Pump foot mounting | M 10 | 44 Nm |
| Gear housing screws | M 8 | 20 Nm |
| Groove nut | M 25 | 45 Nm |

4.4 Pipe lines

Correct dimensioning of the pressure-side pipe line is crucial to avoid unnecessary pressure build up when delivering viscous media. Therefore, orient yourself at least by the dimensions of the pump flanges. The pressure stated in the data sheet must not be exceeded.

Mind the delivery pressure stated in the data sheet with respect to the pipe line pressure resistivity.

Purge the piping system and the feeding devices and clean them from foreign objects.

Seal pipe connections for quench exclusively with a sealing tape. Do not use liquid seals. Liquid seal can clog the inner flushing lines.

ATTENTION

Possible damage to property

Do not use liquid seals. Liquid seal can clog the inner flushing lines.

4.4.1 Connection of the pipe lines

1. Clean and purge the pipes.
2. Flange the pump to the pipe line via elastic seals so that a tight connection develops and no undue forces act on the pumps.
3. Provide shut-off devices for removing the pump and maintenance and fitting pieces in the pressure and suction lines.
4. Provide safety valve or pressure monitoring right into the pressure line behind the pump.

ATTENTION

Possible damage to property

Do not support pipe lines on the pump! Mount pipe lines as force- and torque-free as possible. Allow for the permissible forces and torques on the ports (see table below) when connecting the pipe lines.

Do not stress threaded connections with torques causing pipe clamping or declamping in the pump casing.

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4.4.2 Permissible forces and torques on the pump flanges

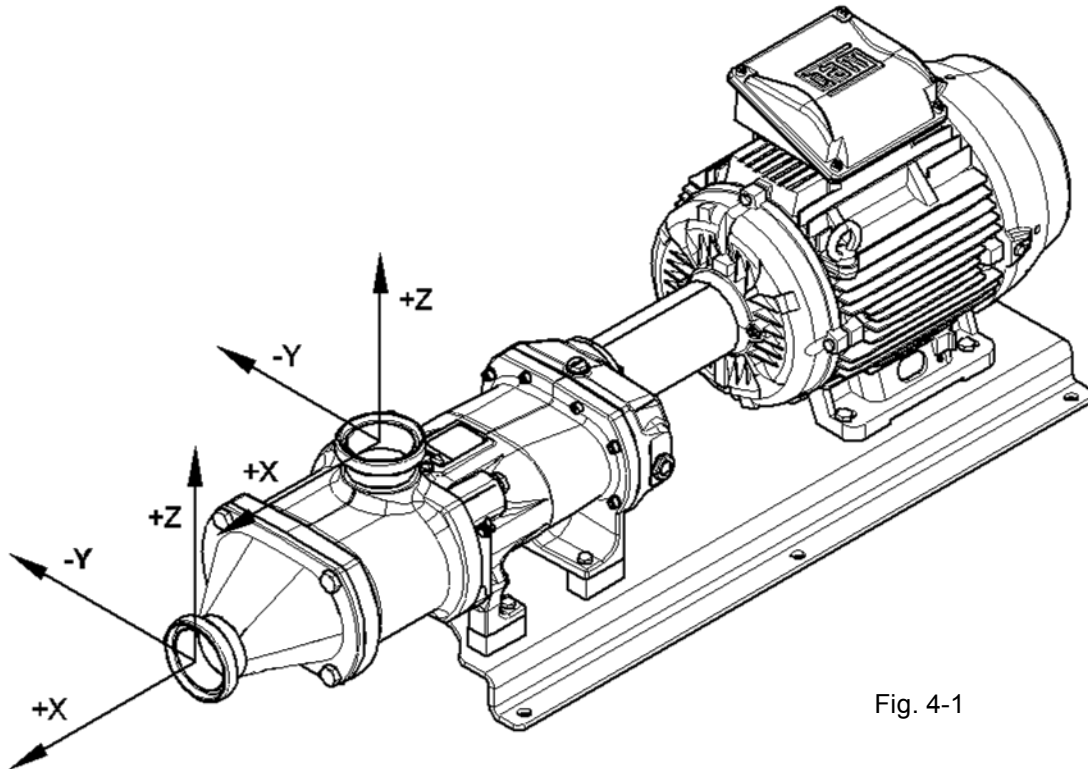


Fig. 4-1


$$F_{ges} = \sqrt{Fx^2 + Fy^2 + Fz^2} \quad \text{and} \quad M_{ges} = \sqrt{Mx^2 + My^2 + Mz^2}$$

| Nominal width | F (x,y,z) [N] | F (tot) [N] | M (x,y,z) [Nm] | M (tot) [Nm] |
|---------------|---------------|-------------|----------------|--------------|
| 1" | 190 | 270 | 85 | 125 |
| 2" | 295 | 420 | 145 | 210 |
| 3" | 425 | 600 | 215 | 315 |
| 4" | 505 | 720 | 260 | 385 |
| 5" | 610 | 870 | 325 | 480 |

4.5 Permissible pressure in the pump casing


The permissible internal compressive stress is specified in the datasheet.

4.6 Operation and maintenance space requirements

| | |
|---|---|
|  | <p>Allow for free space around the pump (→ dimensional drawing) to provide for maintenance work without removing the pump. To simplify installation, use fitting pieces and shut-off devices.</p> <p>In addition, plan free space for sufficient drive motor ventilation (→ drive documentation).</p> |
|---|---|

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4.7 Electric connection

| | |
|---|---|
|  | Danger! |
| | Danger to life through electric shock! Potential consequences: severe or fatal injuries. |

Electrical connection by qualified personnel only.

Disconnect system from mains and prevent unintentional restart/reclosing.

- Check the data on the motor type plate against mains voltage and frequency before connecting the motor.
- When connecting the motor, it is an imperative to heed the drive manufacturer's instructions and the applicable regulations for electrical equipment (e.g. motor protection, main switch).
- Check the phase sequence for the direction of motor rotation prior to making the connection.
- Screw pump are preferably operated on frequency converters or on soft-start control units.
Three-phase current squirrel-cage motor

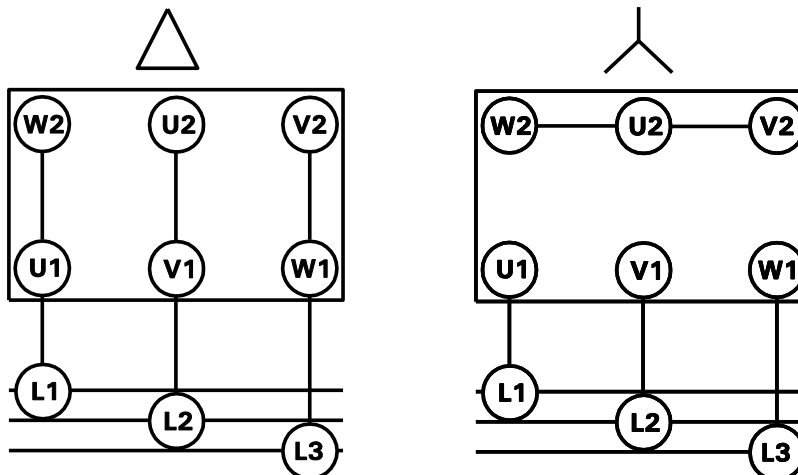


Fig. 4-2

Low
voltage stated on the type plate.

high

- Provide emergency stop facilities to shut down the pump in the event of dangerous situations.

4.7.1 Driving elements

| | |
|---|---|
|  | Warning! |
| | Driving elements are quickly moving during operation. They can squash hands. Potential consequences: severe or fatal injuries. |

Always cover driving elements with a protective guard.

Manual ViscoTwin 70.xx 3A

4.7.2 Coupling elements

Screw pumps with free shaft (cylinder shaft with shaft key) are connected to the drive through a flexible coupling.

ATTENTION

Possible damage to property

Do not mount using a hammer.

Use a pull-on device or heat the coupling half to approx. 80 °C.

(Remove rubber parts before) and mount the coupling in hot condition.

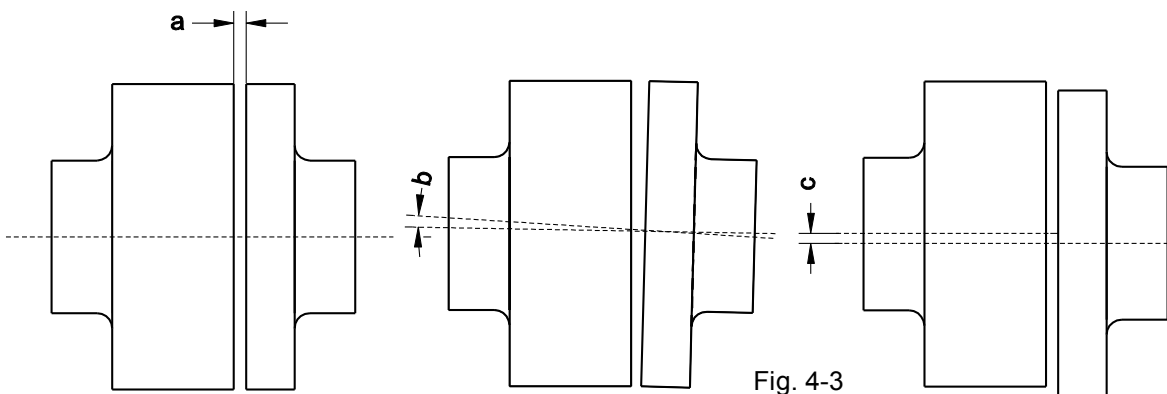


Fig. 4-3



The coupling halves must be aligned against each other.

When assembling the drive with the pump, it is necessary to adjust

a = maximum and minimum clearance

b = angular offset and

c = axial offset

according to the coupling manufacturer's specifications.

The coupling of the ViscoTwin 70 is properly aligned by means of proper central alignment of drive (1473), intermediate flange (2298) and gear housing (2172).

4.8 Mounting and adjusting additional equipment accessories

Mount additional equipment accessories (speed measuring devices, counter-pressure systems) according to the attached instructions (see Appendix).

4.9 Shaft seals

It is of the essence that there is a lubricating and cooling film between the seal faces. Depending on application, there are various methods of ensuring that the appropriate medium is being fed to the seal so that this film can be developed. Different types of rotating mechanical seals can be installed into the screw pump. The built-in version is stated on the data sheet.

4.9.1 Single acting mechanical seal

The seal is being lubricated through the medium.

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4.9.2 Single acting mechanical seal with quench

In this version rotary shaft lip type seals provide a quench chamber at the mechanical seal. The quench fluid is being supplied to the seal via a quench reservoir, and the quench fluid is circulated back into the reservoir via a return pipe.

4.9.3 Double-acting mechanical seal with quench and thermo siphon rotation

In this version, the quench fluid is being supplied to the seal via a quench reservoir, and the quench fluid is circulated back into the reservoir via a return pipe.

The quench medium circulates between seal and quench vessel due to the elevated temperature on the rotating mechanical seal faces during pump operation.

Make sure before starting the pump that the quench medium can circulate from the seal to the vessel and back. Carefully bleed the system.

For this purpose, attach the quench vessel approx. 1-2 m above the pump and the seal and vessel should be connected through tubes preferably made from stainless steel. Other tubes or even hoses can also be used temperature and medium permitting. The lines towards the seal inlet must be fastened in continuously falling way and the lines from the seal outlet back to the vessel must be fastened in a continuously rising way. (See Fig. 4-4)

Applies to all seals with quench:



The lines must have at least a nominal diameter of 8 mm. The lines must be fastened in a steadily falling way or rising way and should not build waves. Each seal must be fitted with a separate line to the tank or have to be connected in series in a row.

1. Connect the line from the lower outlet of the quench vessel (**flow line**) up to the bottom of first seal. (**Flow line quench vessel → E 1**) (→Fig. 4-4)
2. Then install a line from the upper outlet of the seal to the lower input of the second seal. (**A 1 → E 2**).
3. Finally, a return line onto the top outlet of the second seal and lead to the upper port of the quench vessel (return line). (**A 2 → quench vessel**)
4. All lines and seals should be vented carefully, especially the bridge line between the two seals when connected in series.

ATTENTION

Possible damage to property

The quench medium should not exceed a temperature of 70°C.

No bubbles should form since otherwise circulation would no longer be ensured.

In the case that the quench fluid temperature has to be cooled, the vessel can be equipped with a condensing coil through which cold water flows.

4.9.4 Double-acting mechanical seal with flow

The seal is flown through by a quench medium in this version. This medium is supplied from an external source (pressure pipe system, pump, connected 'water line', etc.).

Please ensure that the quench supply has been connected to the seal and quench fluid is flowing through the seal before pump is started. This is necessary to ensure that the sliding surfaces on the outside are being cooled. Carefully bleed the system.

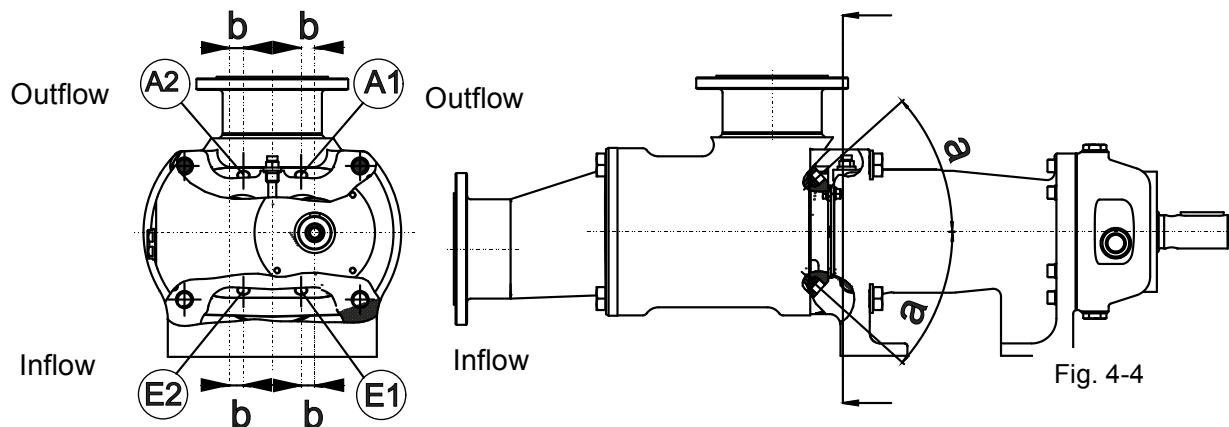
Manual ViscoTwin 70.xx 3A

Both pressure and flow through the seal can be adjusted using a flow meter and two control valves. This flow should be adapted to the heat generation on the seal depending on pressure, speed and media temperature.

Adjust the flow such that the quench fluid outlet temperature does not exceed 40-45°C. The flow velocity should not drop below 1 l/min.

| | |
|----------|--|
| i | <p>Make sure that both seals are sufficiently flows through. This can be ensured by two control valves, one for each seal, or series connection of the two seals.</p> |
|----------|--|

4.10 Quench connections



| A | b | A1 | A2 | E1 | E2 |
|-----|---------|-------|-------|-------|-------|
| 29° | 10,6 mm | G1/8" | G1/8" | G1/8" | G1/8" |

4.11 Quench media

The manufacturer uses only quench fluids suitable for food products (e.g. distilled water). Some usable quench media are being shown below. Change these quench media at regular intervals.

Do not use aggressive quench fluids.

4.11.1 Glycerine / water mix

This mixture is used in different concentrations. Glycerine does not boil until 290 °C and decomposes in the process. The water vaporises in continuous operation and has to be regularly refilled particularly at higher temperatures of up to 150°C. Glycerine/water mix is suitable for foodstuff.

4.11.2 Glycol/water mix

This is also used in various concentrations. Glycol does not boil until 190°C. The water vaporises in continuous operation and has to be regularly refilled particularly at higher temperatures of up to 150°C. Suitable for foodstuffs.

Manual ViscoTwin 70.xx 3A

4.11.3 Distilled water

Distilled water is a poor lubricant but cools very well. The water boils at 90-100 °C. The water vaporises in continuous operation and has to be regularly refilled particularly at higher temperatures of up to 80°C. Distilled water is suitable for foodstuffs.

The following rules have to be kept when using water as a quench fluid:


- **Solid particles max. 10 mg/l**
- **Particle size max. 50 µm**
- **Permanganate value max. 30 (humus-free)**
- **Iron content max. 1 mg/l**
- **Water hardness max. 10 ° of German hardness (d H)**
- **Critical particle size 2-5 µm**
- **Do not use any de-ionized water**

Critical particles of the above-mentioned size of 2 – 5 µm can accumulate between the sliding surfaces resulting in increased wear.

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5. Commissioning

5.1 Preparing commissioning

| | |
|---|--|
|  | Warning! |
| | Risk of injuries through rotating machine parts or from liquids escaping under high pressure. Potential consequences: Severe or fatal injuries. |

Do not perform any work with the pump running!

Only let qualified personnel perform commissioning.

5.1.1 Pump

Clean the pump prior to initial commissioning.

5.1.2 Sealing system

1. Check the shaft seal (see data sheet for information which type of shaft seal is in your pump).
2. Check oil level of gearbox
3. Ensure that auxiliary systems (quench supply of the seals) are connected

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Pressurise double-acting mechanical seals using the counter-pressure system.

Operation without quench medium can destroy the seal.

5.1.3 Pumps for handling foodstuffs

Ensure that pumps for handling foodstuffs are clean before commissioning and each production cycle. Cleaning can be carried out as follows:

Basically by disassembling the pump and manual cleaning of the component parts using the detergents required for that purpose (hand cleaning).

By the so-called C.I.P. - Cleaning (Cleaning in Place) or S.I.P. (Sterilisation in Place), flushing using appropriate cleaning agents, provided the cleaning method is permissible for this medium.

A clean in place treatment on the pump should be executed at the following times:

When the pump is first commissioned for use.

When any spare components are fitted into the wetted area.

After operations, i.e. before a fairly long idleness of the pump.

After long idleness, before re-operation.

With the CIP cleaning process completed, subsequent to initial commissioning, first cleaning cycles, corresponding periods, and any modifications on the system, cleaning process or detergent, the cleaning efficiency has to be inspected (i.e. whether the pump is really clean) by disassembling the pump.

The operator is responsible for securing the cleaning success. The manufacturer cannot assume any warranty for the cleaning success and does not accept any liability for consequential damage.

5.1.4 EHEDG certified pumps:

These pumps must be cleaned by a flow directed from the pump cover nozzle to the pump casing nozzle.

That is:

- Rotating direction **right hand** along with **Spindle arrangement V**, or
- Rotating direction **left hand** along with **Spindle arrangement A**

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We recommend using the Twin pump in addition to its regular duty also as cleaning pump, as CIP-driving pump. So no extra cleaning pump is needed.

To achieve excellent cleaning results run the pump in cleaning process at high rotation speed. Respect the limits of maximum rotation speed as mentioned in chapter 4.2.

5.1.5 Pumps in a processing system by 3A Standard (02-11)

Pumps used in a SIP processing system must be equipped with a pressure monitoring device, which shuts down the system immediately if the processed product falls below atmospheric pressure and the system cannot be started without getting sterilized again.

C.I.P. – process

Are suitable for the materials of the pump:

Use 1 percent nitric acid solution at a temperature up to 82 ° C (acid)
or use a 1 percent solution of sodium hydroxide or sodium hypochlorite (200ppm) (alkaline)
for your C.I.P. process.

For pump housings with chrome-wear coating pH values below 3 are not permitted. Therefore use an accordingly lower acid concentration when using the nitric acid solution for CIP Cleaning.

S.I.P – process


Are suitable for the materials of the pump:

Sterilization over a period from 10 to 30 minutes with saturated steam at about 2.2 bars is allowed.

The maximum steam temperature for elastomeric materials in EPDM is 121° C.

The maximum steam temperature for elastomeric materials in FKM is 135° C.

If the equipment is installed in an aseptic processing system that is sterilized by heat and operated at a temperature of 250°F (121°C) or higher, 3-A Standard 02-11 requires that the system monitors internal pressure and shuts the system automatically down if the product pressure in the system becomes less than atmospheric. The system shall only be able to be restarted after it is re-sterilized.


| | |
|---|--|
|  | Warning! |
| | <p>Risk of injuries through rotating machine parts or from liquids escaping under pressure.</p> <p>Potential consequences: Severe or fatal injuries.</p> |

Do not perform any work with the pump running!

Disconnect the pump from mains and secure against inadvertent start up. (U-lock)

Use safety gloves and goggles when using aggressive detergents.

1. Connect pump to CIP cleaning system or switch system.
2. Start cleaning system.
3. Cleaning pipe line system and pump.
4. Shut cleaning system, remove CIP medium completely.

| | |
|---|---|
|  | <p>C.I.P. cleaning must conform to the hygiene of foodstuffs regulations as amended from time to time. The specifics pertaining to material stability must be strictly observed.</p> |
| | <p>In case you have developed own C.I.P. cleaning methods for your pumping media, ensure pump suitability for the selected method by consulting the pump supplier.</p> |

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ATTENTION

Possible damage to property

Avoid abrupt changes in temperature during cleaning process With the pump in stationary state, fill in hot medium and wait until the pump has warmed up..

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5.2 Switching on

Check before switching on:

Pump with drive safely installed and connected?

Connections sealing and connected stress-free?

Oil level checked?

Quench fluid level OK? Correct pressure set in case of a counter-pressure device?

Rotational direction checked?

Safety devices (covers and limit switches, safety valve) installed and checked for function?

1. Before start up, check pump for contamination and foreign objects.
2. Fully open pressure and suction-side valves.
3. Fill pump with medium to enable suction safely.
4. Switch on drive.
5. When initially operating the pump, check to see whether it and the pipe lines are tight.

5.3 Operation



Warning!

Do not operate against closed shut-off devices.

Bursting of the pipe line or downstream system components is possible.

Potential consequences: Severe or fatal injuries.

Secure the pump through an approved overpressure protection.


ATTENTION

Possible damage to property

The pump needs to be cleaned for handling foodstuffs (see 5.1.3)

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6. Placing out of operation

| | |
|---|--|
|  | Warning! |
| | <p>Rotating machine parts or liquids escaping under high pressure. Potential consequences: Severe or fatal injuries.</p> |

Do not perform any work with the pump running!

6.1 Shutting off

1. Stop the pump by shutting down and switching off the drive unit.
2. Shut the pressure and suction-side valves.

| | |
|---|--|
|  | Caution! |
| | <p>Risk of injuries through hot machine parts Potential consequences: Burns.</p> |

6.2 Drainage

Drain the pump after shutdown and clean it, particularly when:

it is a pump for foodstuffs,

the pump was deployed outdoors and the medium can freeze up due to atmospheric influences,
the pumping medium tends to settle / cool or hardens through chemical reaction.

6.3 Decommissioning

Please observe following measures when decommissioning the unit or shutting it down for a longer period:

Clean the pump thoroughly.


Open the cover so that residual water can run out.

6.4 Final decommissioning of the pump

1. Disconnect the electrical power (electrical engineering professionals).
2. Close the inlet and outlet lines. Remove pipelines. Drain the pump. (Professionals)
3. Complete emptying and cleaning of the pump. (professional and material disposal of the residues see also chapter 3.3)

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7. Maintenance and servicing

| | |
|---|--|
|  | Warning! |
| | <p>Risk of injuries through rotating machine parts Potential consequences: Severe or fatal injuries.</p> |

Do not perform any work with the pump running!

Drain pump and connected pipe lines and check the surface temperature before opening.

7.1 Maintenance after commissioning

All external screw connections of the pump or pump unit should be checked and, if necessary, tightened after approx. 50 hours of operation.

7.2 Notes on service and maintenance

| Period | Assembly | Who | Jobs |
|--|--|-----------------------------|---|
| Weekly | Gear housing | Operator Technical staff | → Check oil level → If necessary, top up/change oil, see chapter 7 |
| | Slip-ring seal | Operator Technical staff | → Check for leakage: In case of stronger leakage: → coordinate with manufacturer → replace slip rings or sealing rings, see chapter 9 |
| | Shaft sealing rings | Operator Technical staff | → Check for leakage: In case of stronger leakage: → coordinate with manufacturer → replace slip rings or sealing rings, see chapter 9 |
| | Counter-pressure system Quench system | Operator Technical staff | → Check for leakage → Refill counter-pressure/quench medium if necessary. → Check slip-ring seal and replace counter-pressure/quench medium if quench medium is contaminated. |
| After 100 hours of operation or at least semi-annually | Spindle screw | Technical staff | → Check spindle screws and O-rings: If contaminated or medium is leaking through → see chapter 7 |
| After the first 250 operating hours | Gear housing | Technical staff | → Changing gear oil → chapter 7.4 |
| Monthly | Pump housing | Technical staff | → Check tightening moment of the spindle nut → chapter 4 |
| 6 months | Counter-pressure system Quench system | Technical staff | → Change counter-pressure and quench medium → chapter 4 |

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| | | | |
|---|---------------------------------|-----------------|-------------------------------------|
| After 500 cleaning cycles or thermal cycles, after one year at the latest | Pump casing and mechanical seal | Technical staff | → Replace all O – rings → chapter 9 |
|---|---------------------------------|-----------------|-------------------------------------|

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| Period | Assembly | Who | Jobs |
|--|--------------------|-----------------|---|
| According to the specifications of the drive manual | Drive | Technical staff | → Grease bearings (→ Drive manual) |
| In continuous operation after 3000 operating hours | Gear housing | Technical staff | → → Change gear oil → chapter 7 |
| Into Ex – area: check contact resistance of the grounding - | Complete pump unit | Technical staff | → Check contact resistance of pump parts to electrical ground. This resistance must be less than 10 9 ohms, Chapter 1 |

7.3 Inspection of sanitary pumps for food processing

The instruction given in chapter 7.2 ‘Notes on service and maintenance’ apply exceedingly to hygienic pumps for food processing.

Then the spindle screws are to be checked every 100 operating hours. If contamination (underneath the O-ring) is detected, all parts in this sector which are in direct contact with the medium (spindle, spindle screw with O-ring) must be dismantled and thoroughly cleaned in an alcoholic bath. Clean and disinfect the shafts and all inner parts of the pump housing carefully with alcohol solution and a clean cloth. Renew the O-ring of the spindle screw 2194 and the O-ring 130 of the Inboard Rotor Holder 80 inside the mechanical seal. (→ see Parts List)

Subsequently, no corrosion or seizure marks must be visible; otherwise the affected parts must be replaced.

If contamination on the mechanical seal outside the medium sector is detected after 500 cleaning cycles or one year at the latest, all component parts of the mechanical seal are to be thoroughly cleaned and disinfected in an alcohol bath. Replace all O-rings of the Inboard Rotor Holder (O-ring 90, 130, 140 and 220). (→ see Parts List)

Subsequently, no corrosion or seizure marks must be visible; otherwise the affected parts must be replaced.

7.4 Lubrication

Pump bearings and gear run in an oil bath. Replacement of these bearings and gear wheels is recommended after 10,000 hours of operation. These bearings **have to be changed** after 10,000 hours if the pump is operated in an **Ex – area**.

You should set shorter change intervals for particularly difficult operating conditions, such as:

- large temperature variations
- large pressure fluctuations

in the interest of a long pump life-cycle.

The gear has been factory provided with food-compatible high-performance gear oil. The table below represents the necessary quantity of lubricant.

Change this gear oil after 3,000 operating hours or after 1 year latest.

Grease the drive bearings following the manufacturer's specifications (→ drive documentation).

7.4.1 Checking the oil level

Check the oil level in the gear housing weekly. Top up the gear oil if necessary. Switch – off pump and wait for 3 minutes until the oil has calmed. Then read off the oil level.

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Check oil quality also by the means of its colour. Dark and nearly untransparent oil must be replaced. The locking screws have a magnetic core. Clean them after each opening.

7.4.2 Topping up gear oil

1. Switch –off pump.
2. Open locking screw 2233 on the upper side of the gear housing.
3. Clean the locking screw thoroughly.
4. Fill in gear oil until reaching maximum in the oil-level gauge glass.
5. Screw in the locking screw.

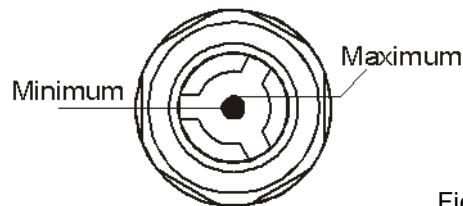


Fig. 7-1 Oil-level gauge glass

7.4.3 Changing gear oil

1. Switch -off pump.
2. Open locking screw 2233 on top of the gear housing. Then open lower locking screw 2233 and drain the gear oil into a collecting vessel.
3. Clean the locking screws thoroughly.
4. Screw in lower locking screw and fill in fresh gear oil.
5. Fill up to the oil-level gauge glass (maximum).
6. Screw in the upper locking screw.

ATTENTION

Possible damage to property

**Only use gear oil approved for the food industry.
Use correct type of gear oil. (See list of lubricants)**

7.5 Lubricating agents

7.5.1 Gear oil with NSF or USDA H1 approval

The following gear oil suitable for food products to the FDA guideline NSF-H1 and viscosity of ISO VG 68 is factory-used in the screw pump for applications in the food sector.

| Product | Gear oil |
|---------|---------------|
| Castrol | Optileb Hy 68 |

Other gear oils of other producers and makes that correspond to the same qualification can be alternatively used. (e.g.)

| Product | Gear oil |
|---------|------------------|
| AVIA | AVIAFOOD GEAR 68 |
| Mobil | Mobil DTE FM 68 |

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7.6 Lubricants filling quantity (Gear oil)

Gear oil filling quantity is 0.6 L

7.7 Lubricating grease

A lubricant to NSF-H1 that is approved for the food industry is used at the factory during the installation of the pump components. Use this or equivalent lubricant during assembly.

| | |
|-----------------|-------------|
| Product | Lubricant |
| Fuchs Lubritech | Geralyn ® 2 |

ATTENTION

Possible damage to property

Do not mix together synthetic lubricants and do not mix with mineral lubricants.

7.8 Maintenance of shaft seal

Check the quench fluid filling level regularly and at least once a week. Top up the quench fluid as required or change the fluid at regular intervals. The filling level can also be monitored using a level indicator.

Persisting leakage (medium seeps out from the lower opening in the bearing housing) indicates wear of the slip rings or damage to the elastomer rings.

Mechanical seals which being operated under counter-pressure need also to be checked for this counter-pressure or monitored via a corresponding monitoring equipment. (Level switch).

7.9 Disassembling the pump



Warning!

Risk of injuries through rotating machine parts or from liquids escaping under pressure.

Potential consequences: Severe or fatal injuries.

Do not perform any work with the pump running!

Disconnect system from mains and prevent unintentional restart/reclosing!

Only qualified personnel may carry out work on the electric system!

Only let qualified personnel carry out pump disassembly!

1. Shut down the pump.
2. Shut the suction and pressure-side valves.
3. Let the pump cool.
4. Drain the pump; collect the flowing out pumping medium and dispose of it.
5. Disconnect the pump from electrical energy.
6. Remove connections of auxiliary systems (sealing systems, temperature sensors, etc.).
7. Remove the pump from the system.

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7.10 Shipping pump for repair




Repair work is only carried out with the declaration of decontamination at hand.

1. Drain and clean the pump.
2. Seal all openings and holes.
3. Ship the pump to the manufacturer along with completely filled in declaration of decontamination
4. Attach information about reasons of repair and operating conditions.

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8. Disturbances and their elimination

| | |
|---|--|
|  | Warning! |
| | <p>Risk of injuries through rotating machine parts or from liquids escaping under pressure.</p> <p>Potential consequences: Severe or fatal injuries.</p> |

In case of a fault stop pump immediately!

Disconnect system from mains and prevent unintentional restart/reclosing!

After fault clearance check pump and plant carefully before restarting pump!

Disturbances on pumps and pump units can basically be of hydrodynamic, mechanical or electrical nature.

8.1 Mechanical and hydrodynamic disturbances checklist

| Type of disturbance | possible cause | Elimination |
|--|--|--|
| Pump does not start | Jam by foreign objects | Remove foreign objects |
| | Deposits at shutdown | Immediately clean pump |
| | Medium hardens (due to temperature/chemical action) | |
| | Solids content too high | Check pump delivery conditions, change project planning if necessary |
| | System pressure too high Shut-off devices partly shut, pipe line clogged | Compare pump pressure rating with system conditions, change project planning if necessary Open shut-off devices fully, eliminate clogging |
| Delivery rate decreases or is not reached any longer | Shut-off devices partly shut, pipe line clogged | Open shut-off devices fully, eliminate clogging |
| | Screw spindles worn | Replace |
| | Trapped air in medium | Check suction line, medium supply and seals |
| | Seals defective | Replace seals |
| Pump does not suck | wrong direction of rotation | Correct direction of rotation, observe directional arrow |
| | Screws mounted incorrectly | mount spindles correctly |
| | Suction line clogged | Clean |
| | Pump or filter clogged | Clean pump / filter |
| | Suction line draws air. | Seal line / Increase filling level when sucking from tank |

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| Type of disturbance | possible cause | Elimination |
|---------------------|---|--|
| Loud pump noise | Cavitation, rotational speed too high or suction pipe too narrow, clogged | Check project planning, chose lower speed if necessary, increase pipe line cross-section |
| | Foreign objects in medium | Remove foreign matter and check the pump for damage, repair as needed. |
| | Bearing damage | Renew bearing and check the pump for damage, repair as needed. |


8.2 Electric disturbances

Disturbances in the electric drive of the pumps or the pump unit can have numerous causes (power supply, dimensioning of the drive, motor protection, etc.).

Eliminate disturbances in connection with the electric drive following the attached drive manufacturer's operating and maintenance manual.

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9. Disassembly and assembly

| | |
|---|---|
|  | Warning! |
| | <p>Risk of injuries through rotating machine parts or from liquids escaping under pressure or hot surfaces. Potential consequences: Severe or fatal injuries.</p> |


Do not perform any work with the pump running!

Don not operate pump without protective guard protection!


Disconnect system from mains and prevent unintentional restart/reclosing.

Drain pump and connected pipe lines and check the surface temperature before opening.

Let cool the pump.

| | |
|---|---|
|  | Warning! |
| | <p>Risk of injuries through falling or tipping heavy machine parts. Potential consequences: Severe or fatal injuries.</p> |

The pump or parts of it may be very heavy and need to be moved using appropriate lifting gear.

| | |
|---|---|
|  | Caution |
| | <p>Wear protective gloves when disassembly / assembly of sharp-edged screw spindles and other machine parts!</p> |

9.1 General notes on disassembly and assembly

| | |
|---|---|
|  | <p>Always replace the removed gaskets, O-rings and shaft sealing rings after disassembly.</p> |
| | <p>The numbers stated in the following figures are the Position-numbers of the spare parts list.</p> |

Please see the enclosed exploded drawing incl. spare parts list for the designations used for the parts.

The employed special tools and assembly sleeves (tools) are listed in the chapter itself, as well as in the appendix under **Special keys and tools**.

9.2 Protective guard ViscoTwin

The reach-in protection 2286 on the sealing casing of the ViscoTwin reliably prevents any reaching into the pumps. With maintenance work, it can be dismantled and mounted over bolts 2287 at the seal.

The pump must not be operated without a mounted protective guard.

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9.3 Disassembling and installing the pump

9.3.1 Driving elements

| | |
|---|--|
|  | Caution! |
| | <p>Risk of jamming and crushing when disassembling the drive. Potential consequences: Minor injuries</p> |

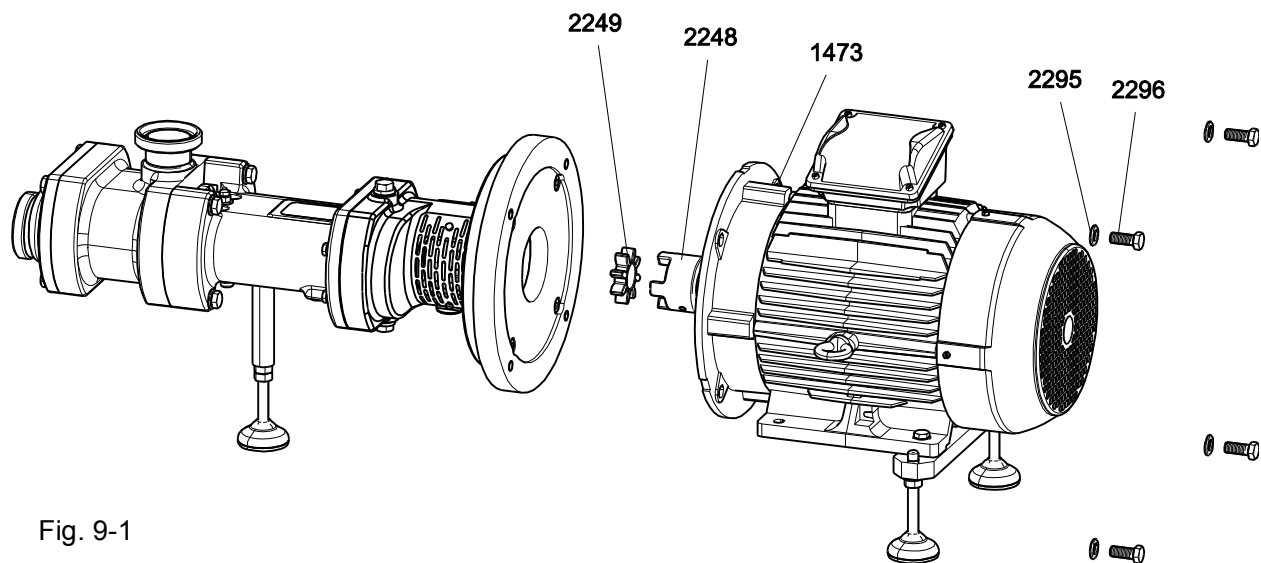


Fig. 9-1

Dismounting:

1. Undo the connections of the pump to the pipeline system.
2. If the pumping aggregate was mounted on a base plate, loosen the connections to the base plate.
3. Loosen the screws connecting of the pump to the drive. Remove the pump from the drive. Remove the elastic coupling element 2249. Keep this in a safe place.

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Adjust the drive unit on a suitable support safely.

Use a lifting device to remove the pump from the drive.

4. Set off the pump and drive on appropriate supports. (E.g. wooden blocks).

Mounting:

1. Put the elastic coupling element into the coupling (on pumps side). Connect pump and drive unit. The drive unit should now sit safely on a suitable support. Screw in the screws 2296 with washers 2295 and tighten it. (according to specified tightening torque of the drive manufacturer)
2. Install the pump assembly in the plant. (Use a lifting device).

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9.3.2 Gear housing

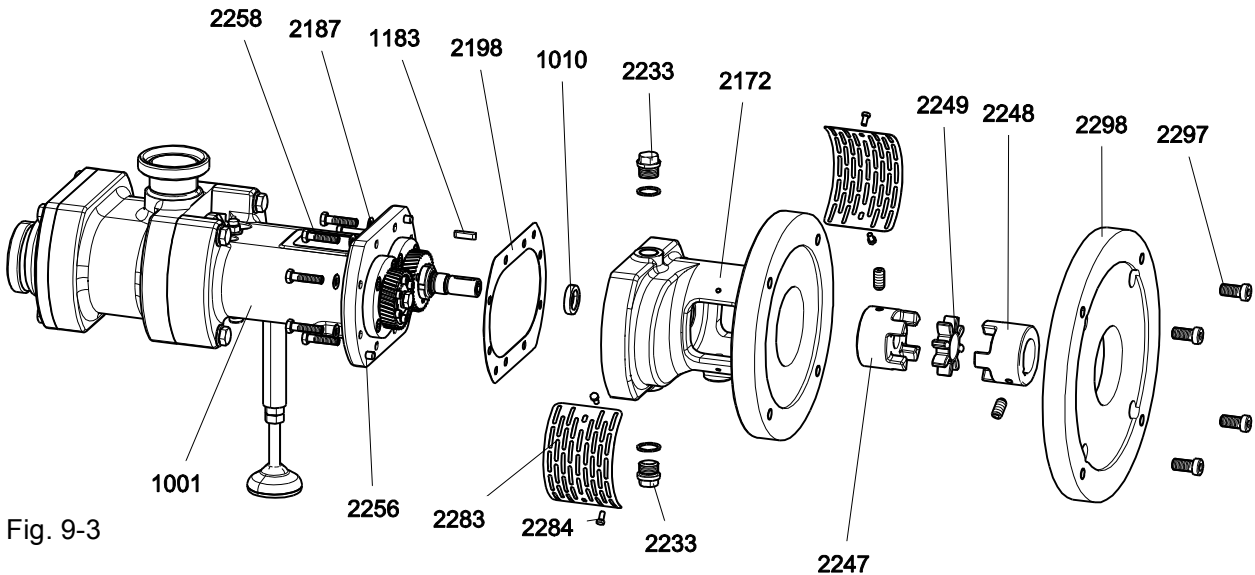


Fig. 9-3

Dismounting:

1. Loosen the screws connecting of the pump to the drive (see 9.3.1). Remove pump from the drive unit. Remove the elastic coupling element 2249. Keep this in a safe place.
2. Loosen cylindrical cap screws 2297 from the flange adapter 2298 and remove it.
3. Undo screws 2284 from protecting cover 2283 and take it off.
4. Turn drive shaft so that the set screw is achieved in the coupling part 2247. Loosen the setscrew in the coupling part of the pump 2247. With a suitable extractor pull down the clutch part 2247 of drive shaft 1000.
5. Remove parallel key 1183 from the drive shaft.
6. Open the top and the locking plug 2233 and the collect leaking gear oil.
7. Loosen the screws 2258 and remove them together with the washers 2187. Carefully pull off the gear housing. This may require slight hammer blows by a plastic mallet because the gear housing has been fitted with cylindrical pins 2258. Take off gasket 2198 carefully.



The locking screws have a magnetic core. Clean them after each opening. Possible existing metallic contaminants and wear debris in oil can be collected. On that occasion check the shaft seal in the gearbox 1010. Press out with a suitable mounting tube. (T 1) Renew this shaft seal periodically (at least annually).

Mounting:

1. Clean the sealing surfaces between the bearing and gear housing, the seat of rotary shaft seal 1010 and drive shaft carefully. Put on a new gasket 2198 to bearing housing 1001.
2. Lightly grease the rotary shaft seal ring 1010 outside and to the sealing lips. Carefully press into the gearbox with a mounting tube (T 1). (The spiral ring of the rotary shaft seal ring shows into the housing.) Place on the drive shaft 1000 mounting sleeve (T46).

Manual ViscoTwin 70.xx 3A

Screw in to 2 opposite threaded holes of the gear housing 2172 the centering rods (T49) (4 pieces).

3. Insert gear housings 2172 with centering rods into the parallel pins 2256. Unscrew centering rods (T49) and remove mounting sleeve (T46). Insert machine screws 2258 with the washers 2187 and tighten alternately crosswise. (Torque 20 Nm).

ATTENTION

Possible damage to property

The Mounting Tube T1 prevents damages of the shaft seal ring 1010 for installation in the gearbox housing.

The mounting sleeve T46 and the centering rods T 49 prevent damages to the sensitive sealing lips of rotary shaft seal ring.

4. Screw in and tighten the lower locking screw 2233, fill in clean gear oil (see chapter 'Maintenance') and check the oil level on sight glass 1541.
5. Screw in upper locking screw and tighten.
6. Mount coupling part of the pump, apply hexagon socket set screw with a liquid screw-locking, screw in and tighten.

9.3.3 Cover

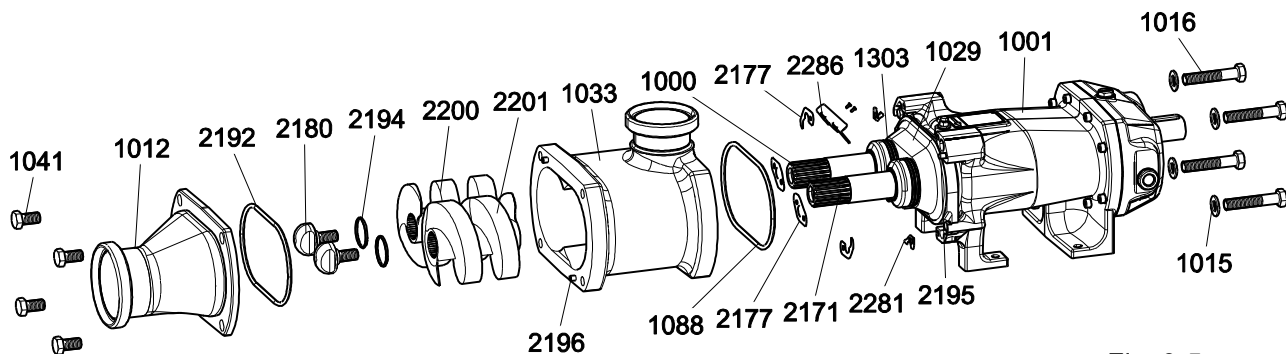


Fig. 9-5

Dismounting:

1. Loosen and remove screws 1041.
2. Remove cover.
3. Thoroughly clean the cover and its seal seat.



- If necessary, loosen the cover using slight blows of a hammer (plastic mallet) because it is centred by dowel pins 2196.

Mounting:

4. Insert seal 2192 into the cover. Place covers over the parallel pins on the pump housing 1033. Check the correct seating of the O-ring in the cover. This may not be pressed out from the slot during installation, either externally or internally. Screw in bolts 1041 and tighten alternately and crosswise. (Torque M12 = 70 Nm)

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9.3.4 Removing and installing screws

| | |
|---|--|
|  | Caution |
| | Wear protective gloves when disassembly / assembly of sharp-edged screw spindles! |


Dismounting:

1. Relieve existing locking pressure system / flushing system, drain quench fluid, unscrew and remove connections.
2. Loosen and unscrew hexagonal screws 1016 and remove them with washers 1015. Remove pump housing.
3. Loosen spindle bolt 2180 and unscrew. Place a locking mandrel (**T 4**) into the bore of the pump-sided coupling and in this way hold the drive shaft fixed and carefully take off the O-ring 2194.
4. Remove screw spindles 2200 + 2201 from the shaft. (Use puller)
5. Check the screw spindles, shafts as well as the pump housing for damage and carefully clean all parts. Replace O-ring 2198 on seal housing 1029.

Mounting:

| | |
|--|---|
|  | <p>The pump housing must be clean. Screw spindles must also be meticulously clean. Apply lubricant to shafts and hubs of the screw spindles (factory uses Geralyn® 2).</p> |
|--|---|

1. Carefully slide the screw spindles (imperative in pairs) onto the shafts. For the arrangement of the screw spindles refer to chapter 9.3.7 "Arranging screw spindles". Observe correct seat of the O-rings when sliding the spindle onto the seal.
2. Insert O-ring 2194 into the greased groove of the spindle nuts.
3. Screw in spindle screws 2180 on both shafts and slightly tighten alternating, manually at first, then using a special key **T 35** or **T 36**. In this process, just hold shafts and spindles in place manually.

| | |
|---|---|
|  | <p>The seals are pre-stressed when slightly tightening the spindle nuts. Check to see that exterior stator 11 is slowly pushed into the seal housing against its spring.</p> |
|---|---|

4. Insert a locking arbor, **T 4**, into the bore of the coupling and hold back. (Torque 100 Nm)
5. Tighten spindle bolt 2180 of driven shaft spindle 2171 while hold in place with steel pin in the hole of the drive shaft 1000 (torque 100 Nm)
6. Insert O-ring 1088 into the sealing casing.
7. Allow pump housing 1033 to slide over the screw spindles into the dowel pins, in this case check the correct seating of the O-ring 1088 in the upper side and in the lower side, insert bolt 1016 with washer 1015 over the bearing housing and tighten bolt 1016 with washer 1015 alternately and crosswise. (Torque M 12 = 70 Nm)
8. Mount cover (see chapter 9.3.3)

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Carefully slide the screw spindles together onto the shafts.

Before screwing in the spindle screws, wet both threads on the spindle screws with a thread-locking compound (factory uses Loctite 270).

Manual ViscoTwin 70.xx 3A

Observe the required tightening torques (Chapter 4)

When replacing screw spindles, you will also need to synchronize them via the pinion gear drives (see Chapter 9.6)

9.3.5 Arranging pump housing

There are 3 intended arrangements of the dowel pins corresponding to the three different positions of the pump housing. The arrangement of the different positions is shown in colours here.

NOTE: Figure 9-6 (below) shows VIEW ON PUMP HOUSING and NOT on bearing housing.

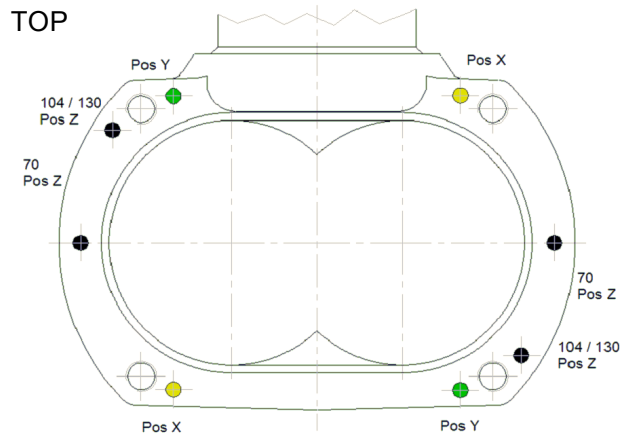
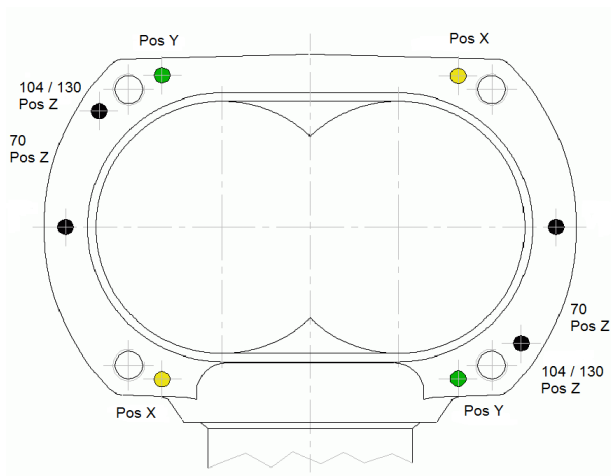


Fig. 9-6: View on the pump housing

| | | Pos. of housing nozzle | |
|--------------------|------------|------------------------|--------|
| | | TOP | BOTTOM |
| Rotating direction | LEFT | Pos X | Pos Y |
| | LEFT/RIGHT | Pos Z | Pos Z |
| | RIGHT | Pos Y | Pos X |



BOTTOM

Manual ViscoTwin 70.xx 3A

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Wrong combination of the dowel pin arrangement and wrong direction of load rotation results in damage to the pump casing and spindles. See the data sheet for correct arrangement of the dowel pins. (Direction of rotation, Spindle arrangement and position of the housing nozzle.)

9.3.6 Incorrect arrangements of the pump casing

The following table shows incorrect arrangements of pump housing relative to the mounting orientation. Incorrect arrangements are marked in red. These incorrect arrangements occur only with the here degradation specified series and nominal diameter combinations.

| Twin 104 | DN 80/3" | Spindle arrangement | |
|----------------------------|-----------|---------------------|---|
| Twin 130 | DN 125/5" | V | A |
| Position of housing nozzle | TOP | ☹ | ☺ |
| | BOTTOM | ☺ | ☹ |

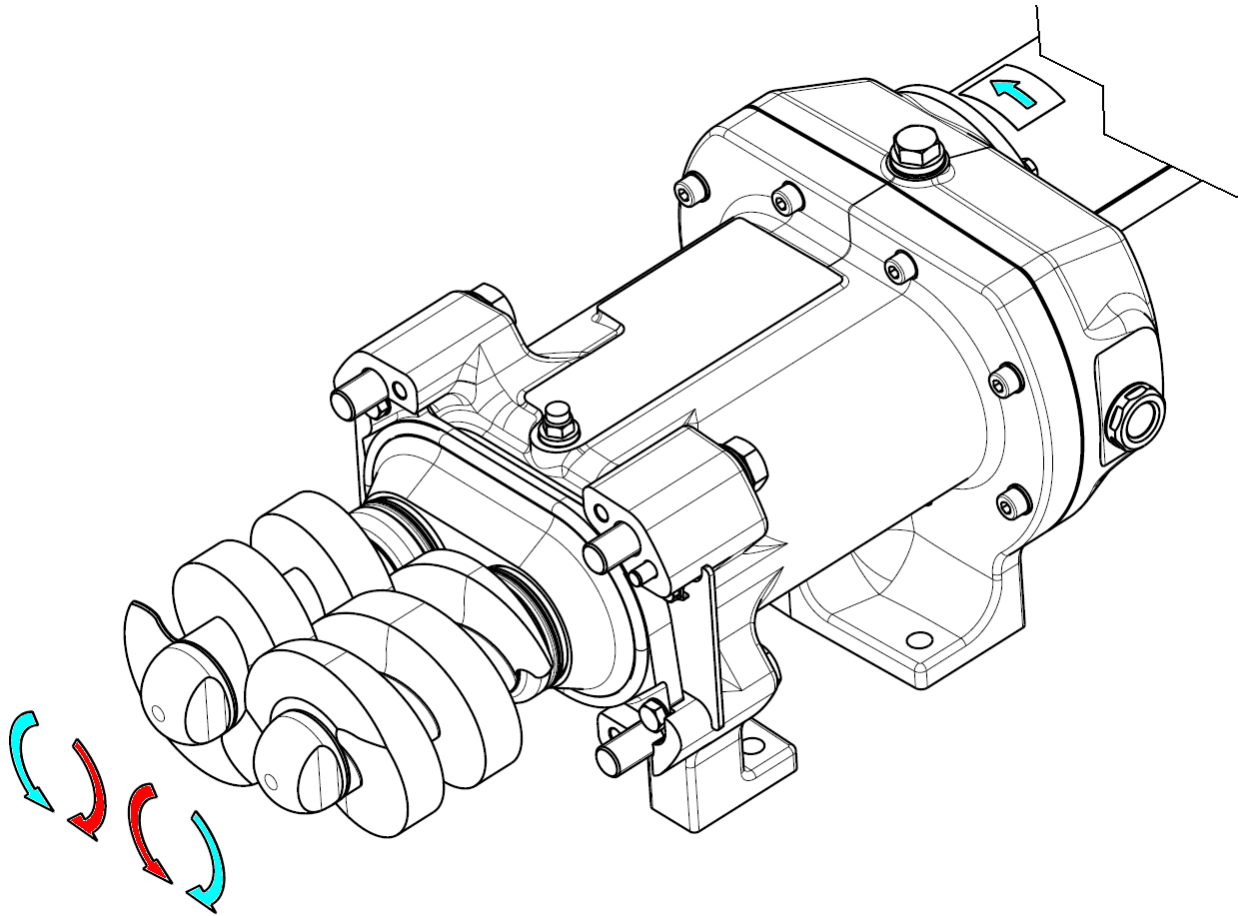
| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Use of an incorrect arrangement of pump housing will result in loss of performance.

9.3.7 Arranging screw spindles

Right-hand and left-hand spindles can be swapped but this will change the flow direction of the pump as well as reversal of drive rotation direction.

Manual ViscoTwin 70.xx 3A



Naming the rotating direction (see rotating direction arrow attached to the coupling guard):

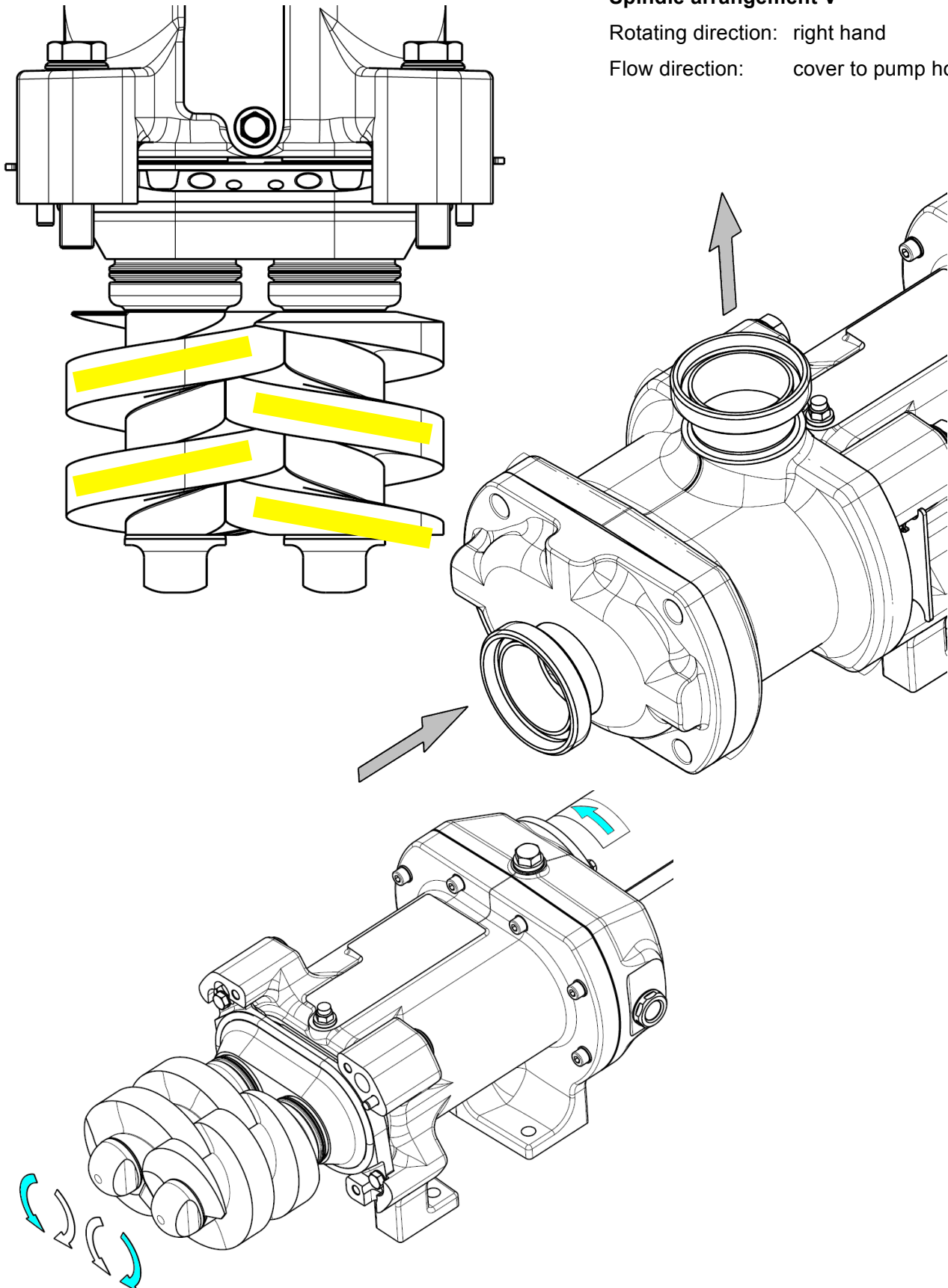
| |
|-------------------------------|
| rotating direction right hand |
| rotating direction left hand |

Manual ViscoTwin 70.xx 3A

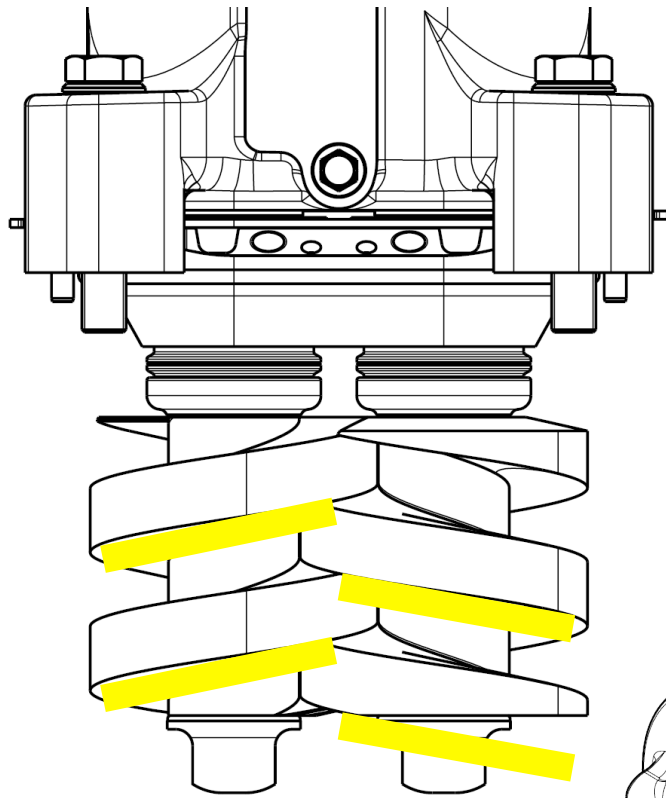
Spindle arrangement V

Rotating direction: right hand

Flow direction: cover to pump housing



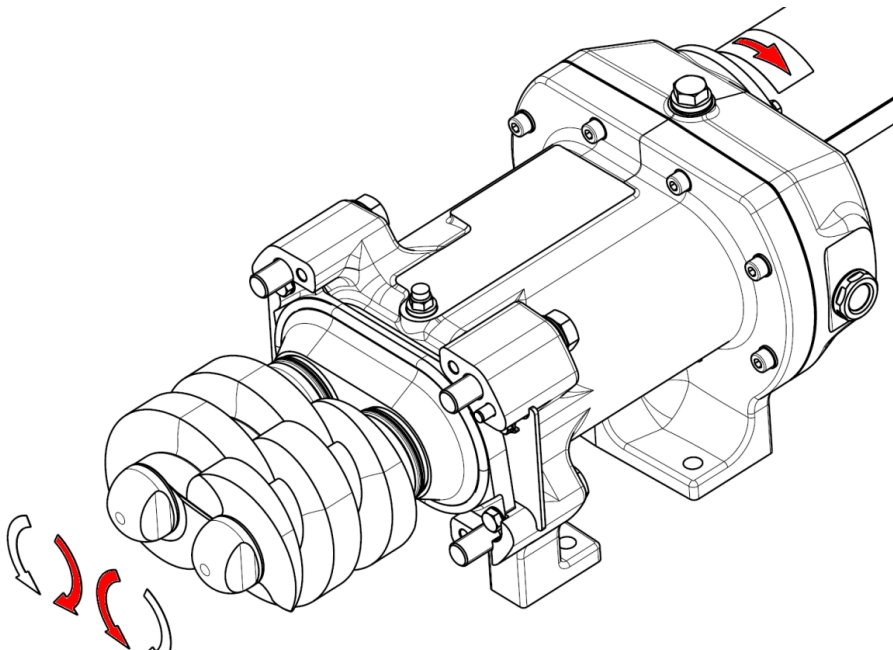
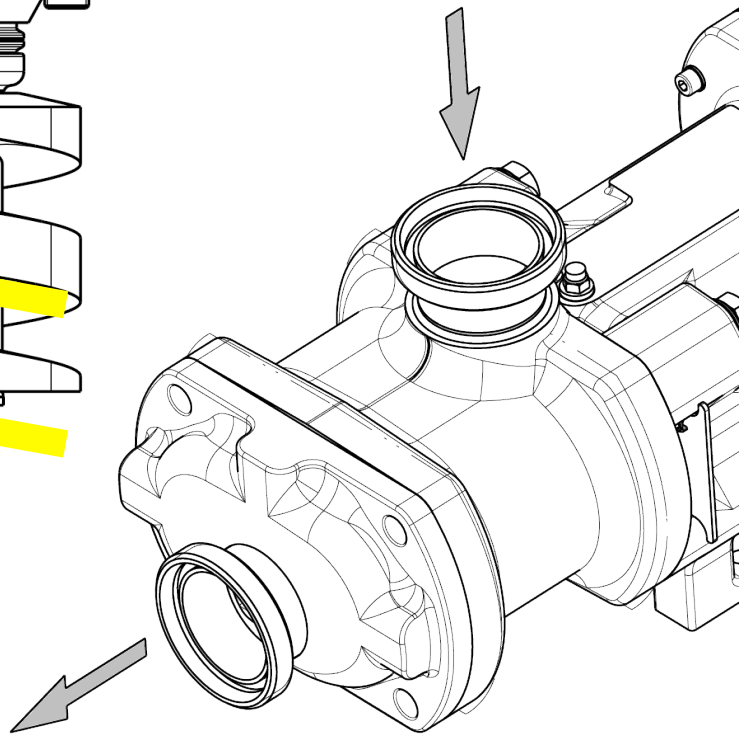
Manual ViscoTwin 70.xx 3A



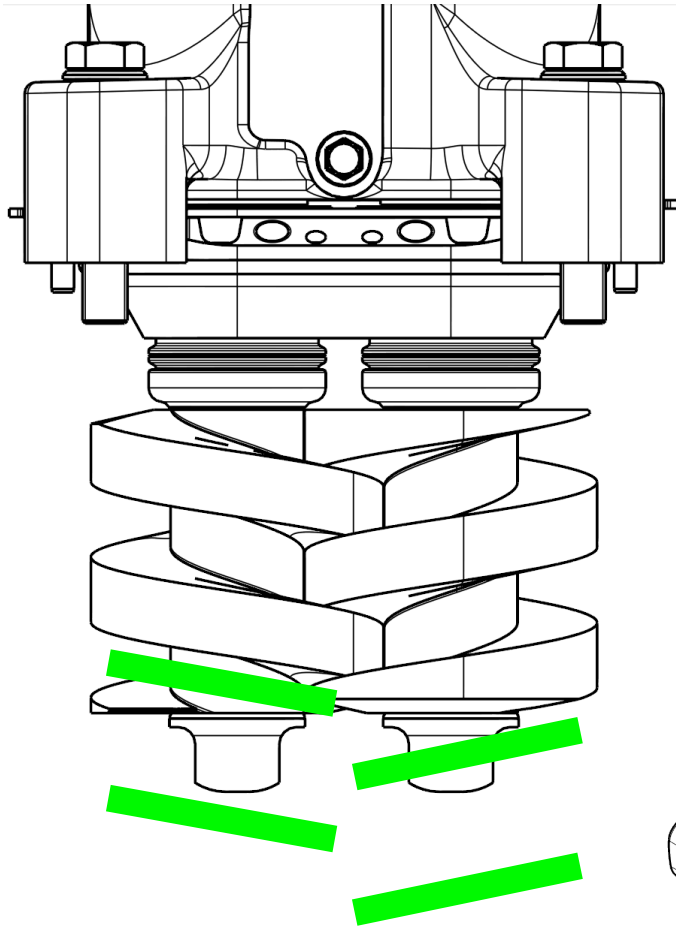
Spindle arrangement V

Rotating direction: left hand

Flow direction: pump housing to cover



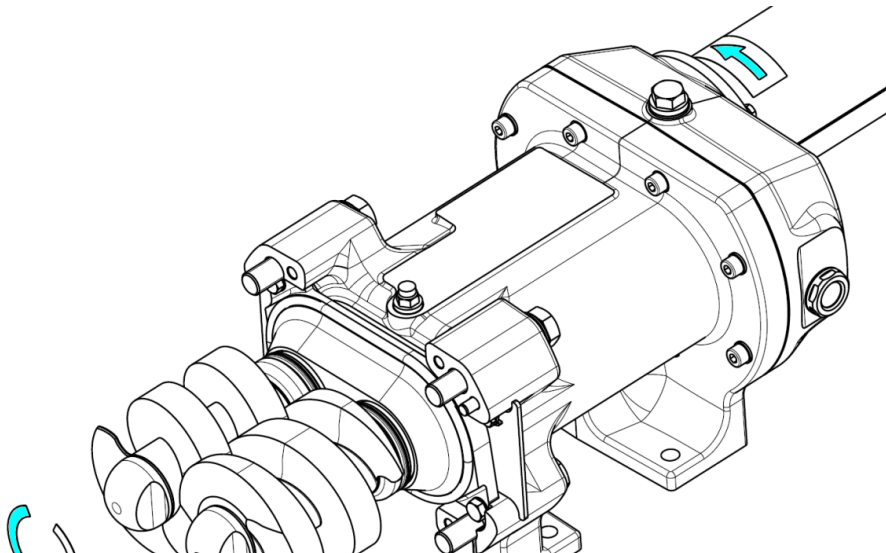
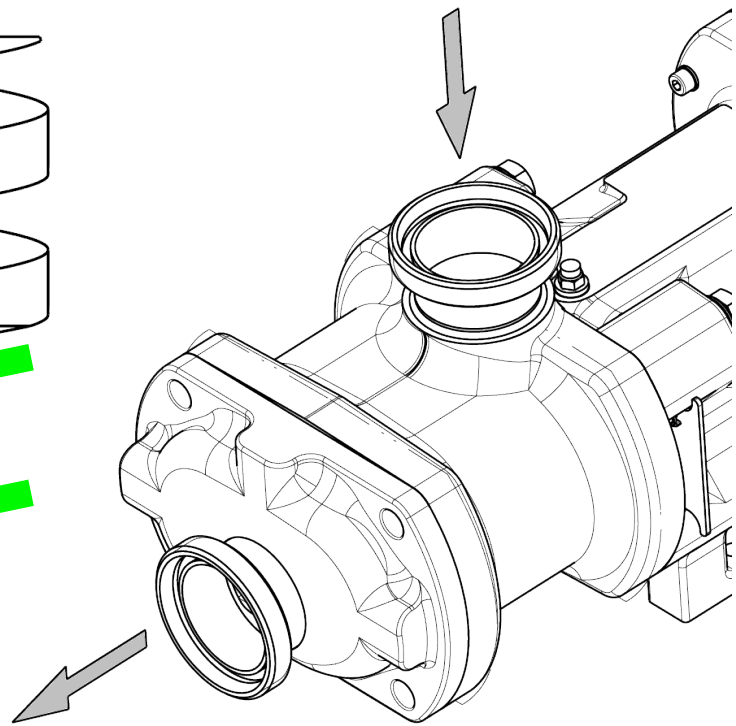
Manual ViscoTwin 70.xx 3A



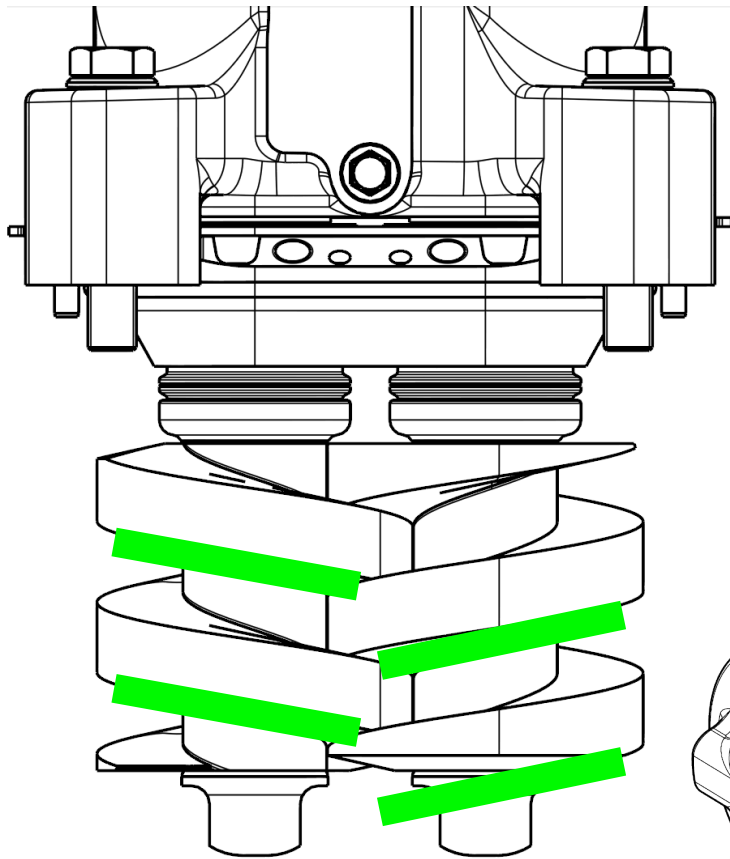
Spindle arrangement A

Rotating direction: right hand

Flow direction: pump housing to cover



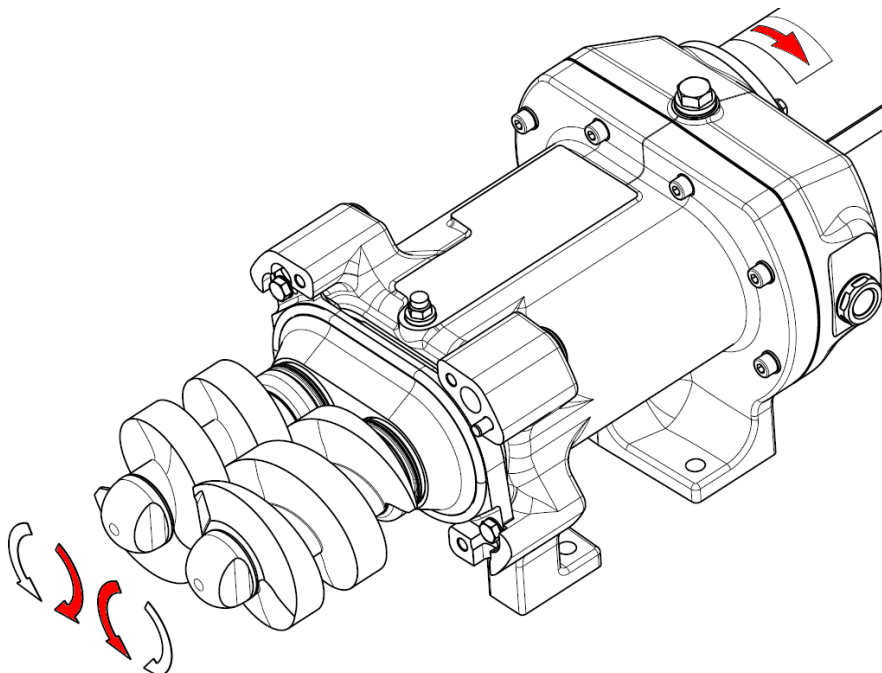
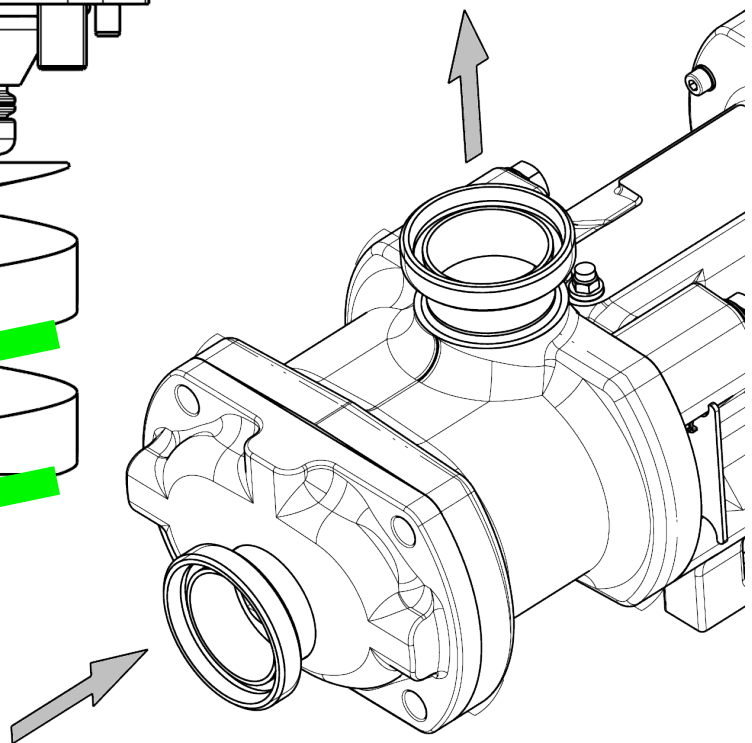
Manual ViscoTwin 70.xx 3A



Spindle arrangement A

Rotating direction: left hand

Flow direction: cover to pump housing



Manual ViscoTwin 70.xx 3A

9.4 Shaft seal

9.4.1 Single-acting mechanical seal – (shaft seal)

Dismounting:

1. Disassemble cover 1012.
2. Disassemble pump housing 1033.
3. Disassemble both screw spindles 2200 and 2201.
4. Loosen bolts 2287 and remove reach-in protection 2286.
5. Pull down inboard rotor holders 80 from the shaft. Inserted in it are seal face 40, drive pins 210 as well as O-rings 90, 130 and 220. Twist the inboard rotor holder quickly while pulling to separate the seal faces.
6. Pull off the seal housing in 1029 with remaining seals from the shafts.
7. Remove the inboard stators 11 from the seal housing. Remove O-rings 140 located in the front section of the seal housing.
8. Using circlip pliers grasp and remove the retaining rings 200 on the rear of the seal housing. In addition, remove spacers 190, backup rings 180 as well as wave rings 50 in backward direction.
9. Finally, remove drive disc 150 along with drive pins 210 from the seal housing.

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Equally clean the seal housing as well as the shafts and seal seats and carefully check the removed parts. Replace any damaged parts as well as all O-rings and shaft sealing rings.

During disassembly be careful about the drive pins 210. If they get lost use new ones. Therefore use grease to stick them in the holes of the drive discs 150 and inboard rotor holders 80 respectively.

Manual ViscoTwin 70.xx 3A

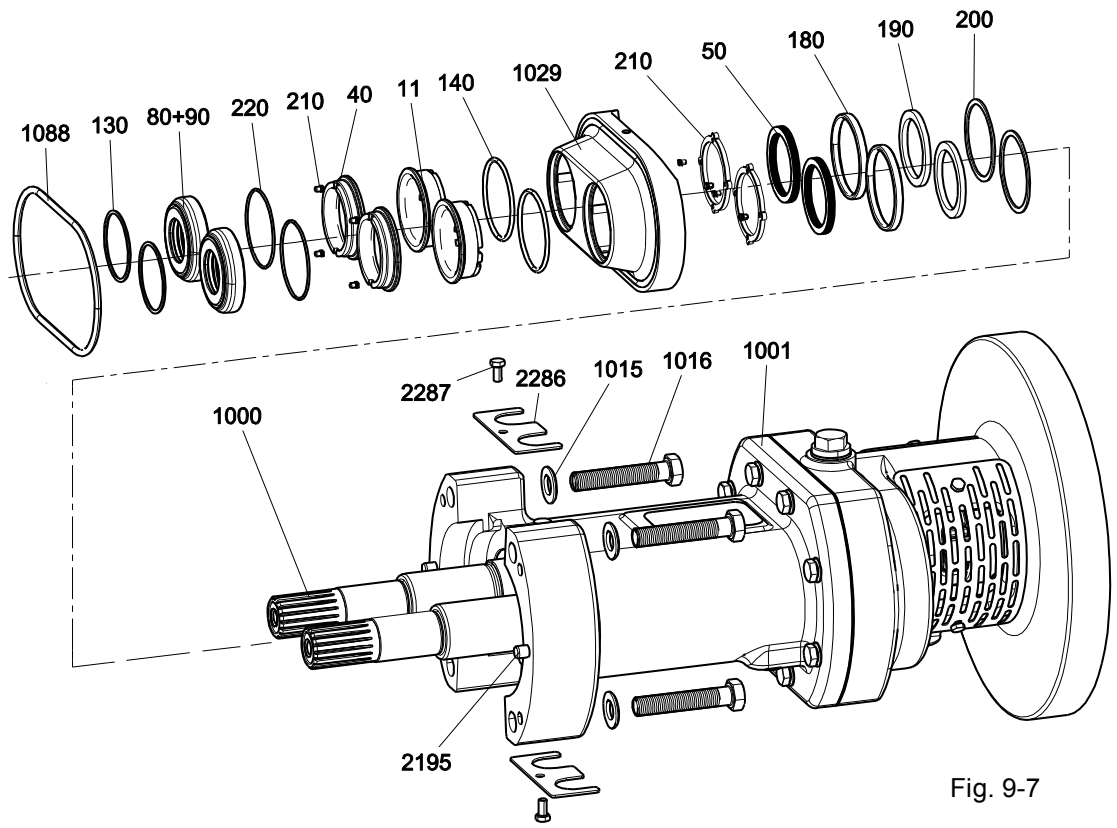
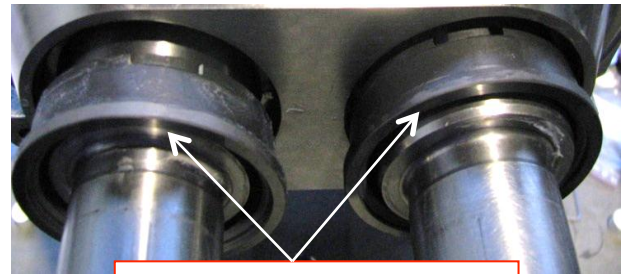


Fig. 9-7

Manual ViscoTwin 70.xx 3A

Mounting:

1. Insert drive disks 150 with the pre-assembled drive pins 210 (glue them into the disc ring using grease) into the seal housing from behind. The drive pins must be directed to the front
2. Fit backup rings 180 into the rear groove of the seal housing. Push wave ring 50 against it from behind. Slide spacers 190 against it.
3. Insert retaining rings 200 using circlip pliers.
4. Insert O-rings 140 into the front groove of the seal housing.
5. Carefully insert the seal housing 1029 on the shaft into the bearing housing.
6. Carefully slide inboard stators 11 into the seal housing via the shaft. The stator groove must engage with drive pins 210 of drive disc 150. (see picture)
7. Place inboard rotors 80 incl. seal faces 40 and built-in O-rings onto the shaft.



Diagonal grooves opposing

ATTENTION

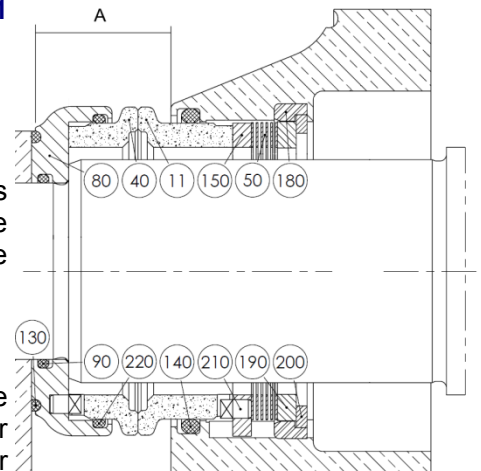
Possible damage to property

Check the free room of motion of the sealing by pushing the inboard rotor holder and spinning it bidirectional. During spinning a small gap shall be noticeable, coming from the gap between the drive pins 210 and the grooves they are positioned in the seal faces. During pushing the gap between the stator 11 and the seal housing 1029 shall stay circular constant.

Therefore dimension A in the drawing showing the sealing cross section shall be controlled. (depth gauge)

A = 22.5 ±0.3 mm (ViscoTwin 70)

8. When installing the screw spindles make sure that the O-rings 130 (are located to the front of the inboard rotor holders) are correctly placed in their receptacle. The seals will now be prestressed during the installation of the screw spindles. (see 9.3.4)
9. Insert O-ring 1088 in seal housing.
10. Slide on pump housing 1033, in this case check again the correct seating of the O-ring 1088 with the fingers in the upper and lower side. The O-ring may not protrude from the slot either externally or internally.
11. Screw in bolt 1016 with washer 1015 and tighten alternately and crosswise. (tightening torque 60 Nm)
12. Insert reach-in protection 2286 and fix with the bolts 2287.
13. Insert the O-ring 2192 into the cover and place on cover. Ensure that O-ring does not protrude from the slot either externally or internally, screw in bolt 1041 and tighten alternately and crosswise. (torque 70 Nm)



Manual ViscoTwin 70.xx 3A

ATTENTION

Possible damage to property

Slide the screw spindles together onto the shafts.

Before screwing in the spindle screws, wet both spindle screws 2180 at the spindle nuts with a thread-locking compound (factory uses Loctite 270).

Observe the required tightening torques (Chapter 4)

When replacing screw spindles, you will also need to synchronize them via the pinion gear drives (see Chapter 9.6)

Keep the sliding surfaces free from dust and grease. Avoid any contact with the hands. If necessary, clean with a soft, clean cloth and acetone.

9.4.2 Lip sealing

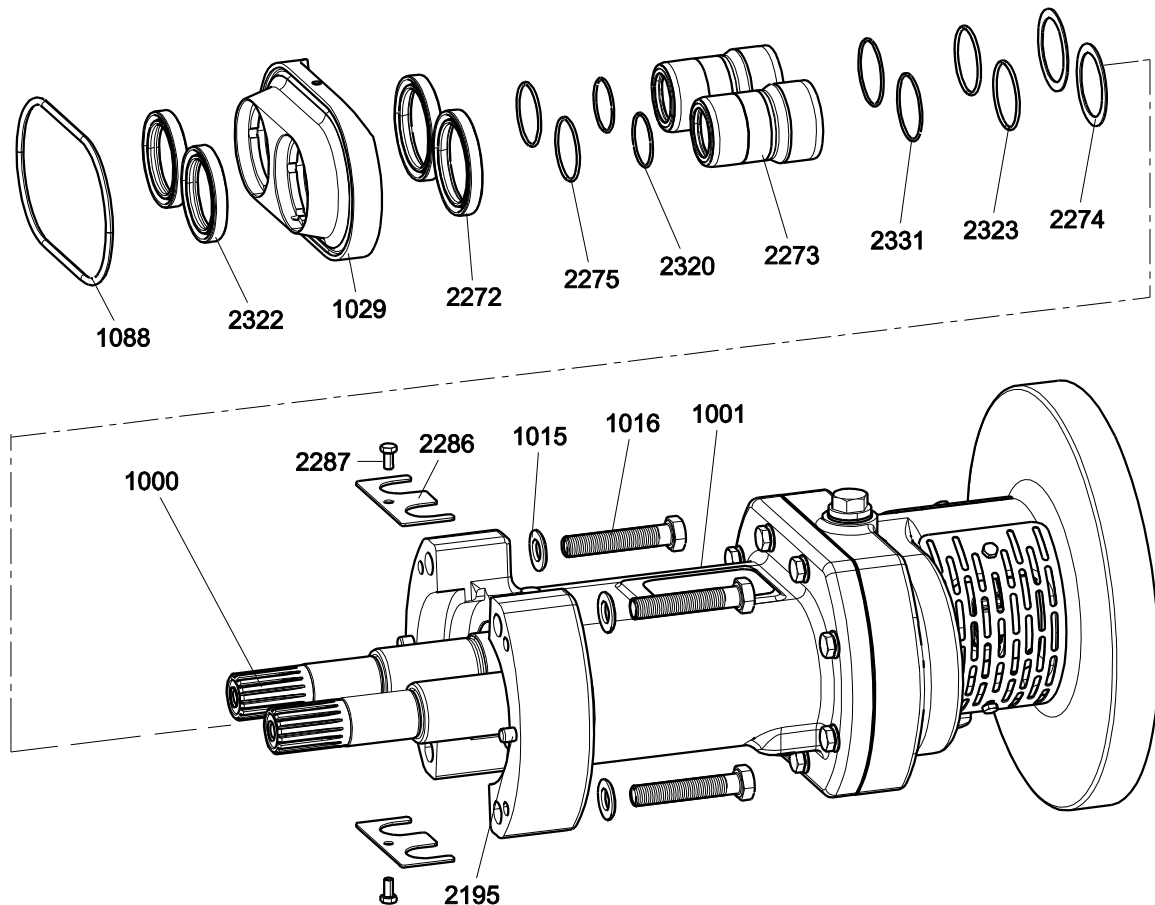


Abb. 9-10

Dismounting:

1. Drain the quench fluid. Disassemble the auxiliary systems.
2. Disassemble cover 1012. Remove O-ring 2192.
3. Disassemble pump housing 1033.
4. Mark position of the dowel pins 2195 (Important for the re-installation).
5. Dismantle both screw spindles 2200 + 2201.
6. Loosen bolts 2287 and remove reach-in protection 2286.

Manual ViscoTwin 70.xx 3A

7. Pull shaft seal housing 1029 with the included shaft ring gaskets from the shafts 1000+2171.
8. Press out the shaft ring gaskets 2322 and 2272.
9. Pull off the shaft protective sleeves 2273 from drive shaft 1000 and driven shaft 2171.
10. Remove the centrifugal washers 2274 with the O-ring positioned 2323 before it.
11. Remove the O-rings 2320 and 2321 from the shaft protective sleeves.

ATTENTION

Possible damage to property

Equally clean the seal housing as well as the shafts and seal seats and carefully check removed parts. Replace any damaged parts as well as all O-rings and shaft lip type seals.

Mounting:

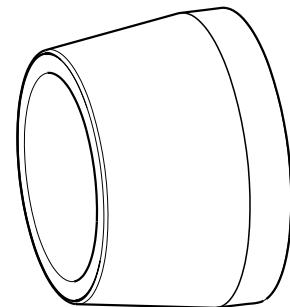
1. Slide centrifugal washers 2274 onto the shafts 1000 and 2171, in this case slide against the shaft attachment. (The centrifugal washers must sit fixed on the shafts).
2. Slide the O-ring 2323 against this.
3. Insert O-rings 2320 and 2321 into the shaft protective sleeves 2273.
4. Grease both shaft protective sleeves 2273 lightly and press both shaft protective sleeves 2273 over the shafts against the centrifugal washers.

ATTENTION

Possible damage to property

It is absolutely necessary to use matching assembly sleeves for the installation of the sealing casing. (T 6) in this way you prevent that the sensitive sealing lips of the lip sealing are damaged.

5. For the installation of the sealing casing, slide the assembly sleeves **T6** onto the shafts against the shaft attachment. Slide sealing casings carefully onto the shafts. After this, remove the assembly sleeves and keep them.
6. Insert O-ring 2275 before the shaft protective sleeves.
7. Insert O-ring 1088 into the sealing casing.
8. With installation of the screw spindles, note that the O-ring 2275 (seated in front before the shaft protective sleeves) is located correctly in its receptacle. The seals will now be prestressed during the installation of the screw spindles.
9. Slide on pump housing 1033, in this case check again the correct seating of the O-ring 1088 with the fingers in the upper and lower side. The O-ring may not protrude from the slot either externally or internally.
10. Screw in bolt 1016 with washer 1015 and tighten alternately and crosswise. (torque 70 Nm)
11. Insert the O-ring 2192 into the cover 1012 and place on the cover. Check that the O-ring does not protrude either externally or internally. Screw in bolt 1041 and tighten alternately and crosswise. (torque 70 Nm)
12. Insert reach-in protection 2286 and tighten bolts 2287.
13. Connect quench receiver, fill with quench liquid and vent seal



Manual ViscoTwin 70.xx 3A

ATTENTION

Possible damage to property

Observe correct seat of the O-rings when moving the screw spindles toward the inboard rotor holders.

Slide the screw spindles together onto the shafts.

Before screwing in the spindle screws, wet both spindle screws 2180 on the thread using a thread-locking compound (factory uses Loctite 270).

Observe the required tightening torques (Chapter 4)

When replacing screw spindles, you will also need to synchronize them via the pinion gear drives (see Chapter 9.4)

Keep the sliding surfaces free from dust and grease. Avoid any contact with the hands. If necessary, clean with a soft, clean cloth and acetone.

9.4.3 Double-acting mechanical seal (shaft seal)

Dismounting:

1. Relieve quench system or counter-pressure device, drain quench fluid.
2. Disassemble cover.
3. Disassemble pump casing 1033.
4. Loosen bolts 2287 and remove reach-in protection 2286.
5. Disassemble screw spindles 2200 and 2201.
6. Pull out inboard rotor holder 80 incl. seal faces 40 from the shafts. This will also disassemble O-rings 90, 130 and 220 as well as drive pins 210.
7. Remove the seal housing via the shafts.
8. Remove Inboard stators 11 on the front side from seal housing 1029. Remove O-rings 140.
9. Pull out outboard stators 12 from the seal housing via the rear side of the seal housing. Remove O-rings 70 and backup rings 170.
10. Remove disk rings 150 along with built-in drive pins 210 from the seal housing.
11. Pull off outboard rotors 20 from the shafts.
12. Remove wave rings 50 from the shafts.
13. Loosen the threaded pins of stop rings 110 and pull off the stop rings 60 incl. O-rings 30 and 160 from the shafts.

ATTENTION

Possible damage to property

Equally clean the seal housing as well as the shafts and seal seats and carefully check the removed parts.

Replace any damaged parts as well as all O-rings and shaft lip type seals.

During disassembly be careful about the drive pins 210. If they get lost use new ones. Therefore use grease to stick them in the holes of the drive discs 150 and inboard rotor holders 80 respectively.

Manual ViscoTwin 70.xx 3A

Mounting:

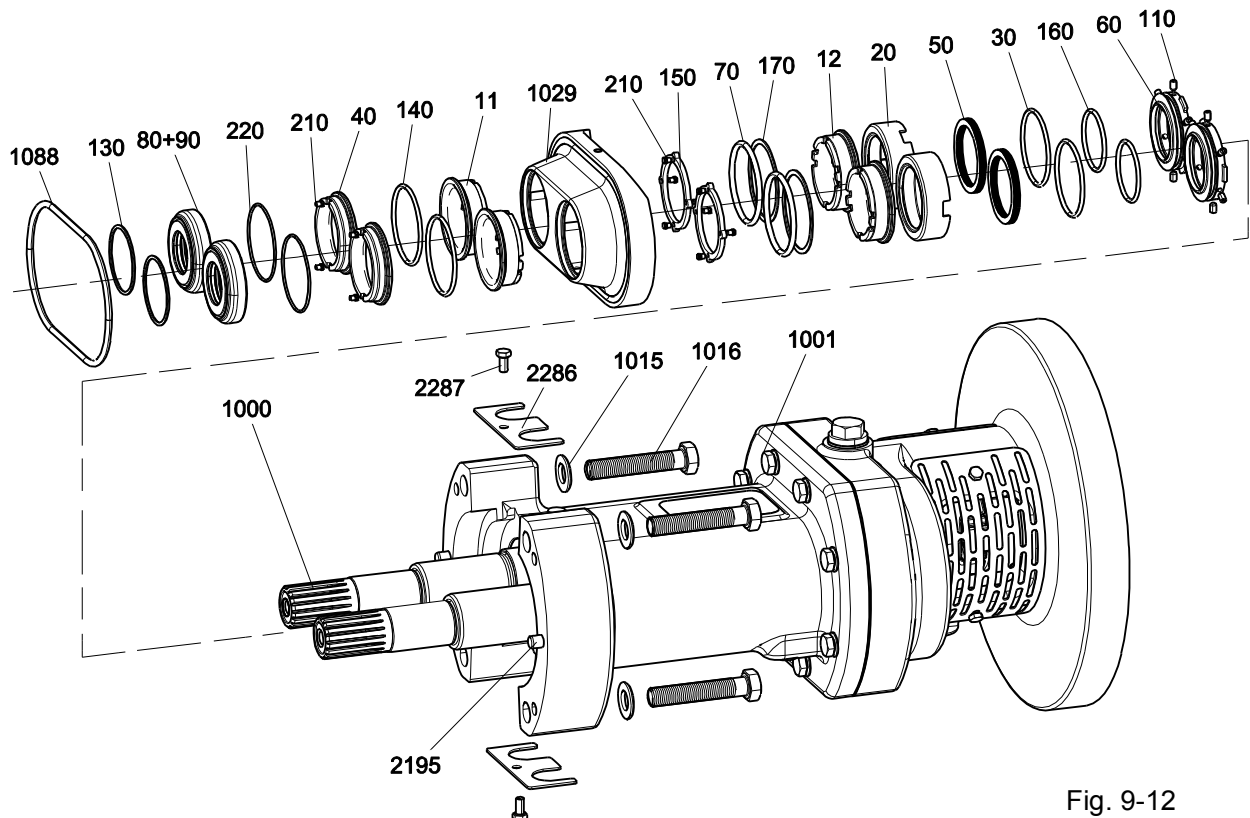


Fig. 9-12

1. Unpack new seals and place them onto a clean and soft pad.
 2. Grease 4 drive pins 210 and insert them greased into drive disc 150 (2x) these drive pins 210 are inserted paired and that is 2 each on the front side and 2 each on the rear side of drive disc 150.
 3. Insert drive discs 150 with the drive pins into the seal housing from the rear side.
 4. Insert O-rings 70 into the first groove of the seal housing (seen from the rear side). Insert backup rings 170 in to this groove, too. (Viewed from the front side, the O-ring is positioned in front of the backup ring).
 5. Insert outboard stators 12 into the seal housing from the rear side. The stator groove must engage with drive pins 210 of drive disc 150. Stators 12 are now held by O-rings 70. The diagonal grooves in the stators 12 must show to the respective other shaft, so that they form the passage to the quench channel. (see picture)
-
6. Insert O-rings 140 (grease them) into the front grooves of the seal housing now.
 7. Turn back the threaded pins 110 at stop rings 60 until the inner rings are free. Insert O-rings 30 and 160 into the stop rings. Now, slide stop rings 60 onto the shaft all the way up to the shaft shoulder. Tighten each of the 6 threaded pins crosswise per ring.
 8. Slide wave rings 50 against stop rings 60.
 9. Lubricate outboard rotors 20 inside and slide them against wave rings 50. In the process, the grooves of the outboard rotor need to engage with the claws of stop rings 60. (Adjust carefully!)

Manual ViscoTwin 70.xx 3A

- Slide the seal housing 1029 to the bearing housing via the shafts and place it in position. Check on the back gap that the grooves of rotor 20 engaged in nicks of stop ring 60.

ATTENTION

Possible damage to property

Crank the shafts by hand observing the seal.

The stop ring claws must at least protrude 1 mm into the grooves of the outboard rotor.

- Carefully slide stators 11 into the seal housing via the shafts. The respective stator 12 has 6 grooves. 2 grooves each of them should engage with drive pins 210. 2 further grooves clear the way for the rinsing liquid. These grooves must be exactly positioned above or below the rinsing ports. There is only one correct position of these grooves. The two other grooves remain free.

ATTENTION

Possible damage to property

Incorrectly adjusted flushing grooves will result in seal overheating and destruction during pump operation.

- Insert O-rings 90, 130 and 220 into inboard rotor holders 80. (fix using grease). Fix drive pins 210 in inboard holder 80 using grease.
- Insert seal faces 40 into inboard rotor holders, whereby the grooves of the seal faces must thread in into the drive pins 210.
- Place inboard rotor holders 80 with inserted seal faces 40 onto the shafts.

ATTENTION

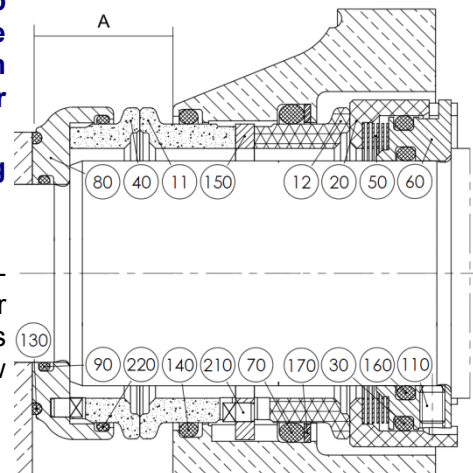
Possible damage to property

Check the free room of motion of the sealing by pushing the inboard rotor holder and spinning it bidirectional. During spinning a small gap shall be noticeable, coming from the gap between the drive pins 210 and the grooves they are positioned in the seal faces. During pushing the gap between the stator 11 and the seal housing 1029 shall stay circular constant.

Therefore dimension A in the drawing showing the sealing cross section shall be controlled. (depth gauge)

A = 22.5 ± 0.3 mm (ViscoTwin 70)

- When installing the screw spindles make sure that the O-rings 130 (are located to the front of the inboard rotor holders) are correctly placed in their receptacle. The seals will now be prestressed during the installation of the screw spindles.
- Insert O-ring 1088 into the sealing casing.
- Slide on pump housing 1033, in this case check again the correct seating of the O-ring 1088 with the fingers in the upper and lower side. The O-ring may not protrude from the slot either externally or internally.
- Screw in bolt 1016 with washer 1015 and tighten alternately and crosswise. (Torque 60 Nm)
- Insert the O-ring 2192 into the cover 1012 and place on the cover. Check that the O-ring does not protrude either externally or internally. Screw in bolt 1041 and tighten alternately and crosswise. (Torque 60 Nm)
- Insert reach-in protection 2286, screw in bolts 2287 and tighten.
- Connect quench chamber, fill up fluid and vent the shaft seal.



Manual ViscoTwin 70.xx 3A

ATTENTION

Possible damage to property

Observe correct seat of the O-rings when moving the screw spindles toward the inboard rotor holders.

Slide the screw spindles together onto the shafts.

Before screwing in the spindle screws, wet both spindle screws 2180 on the thread using a thread-locking compound (factory uses Loctite 270).

Observe the required tightening torques (Chapter 4).

When replacing screw spindles, you will also need to synchronize them via the pinion gear drives (see Chapter 9.4).

Keep the sliding surfaces free from dust and grease. Avoid any contact with the hands. If necessary, clean with a soft, clean cloth and acetone.

9.4.4 Bearing frame



For this purpose, the following pump elements need to be removed before: drive, coupling elements if necessary, gear housing, cover, pump casing, screw spindles, and shaft seal.

Disassembled bearings need to be replaced with new ones during the assembly work.



Be sure to mark the position of the gear wheels to one another now.

Only loosen screws 2186 when disassembling the gear wheels if the installation of new shafts, screw spindles or a new basic setting of the pump is being intended.

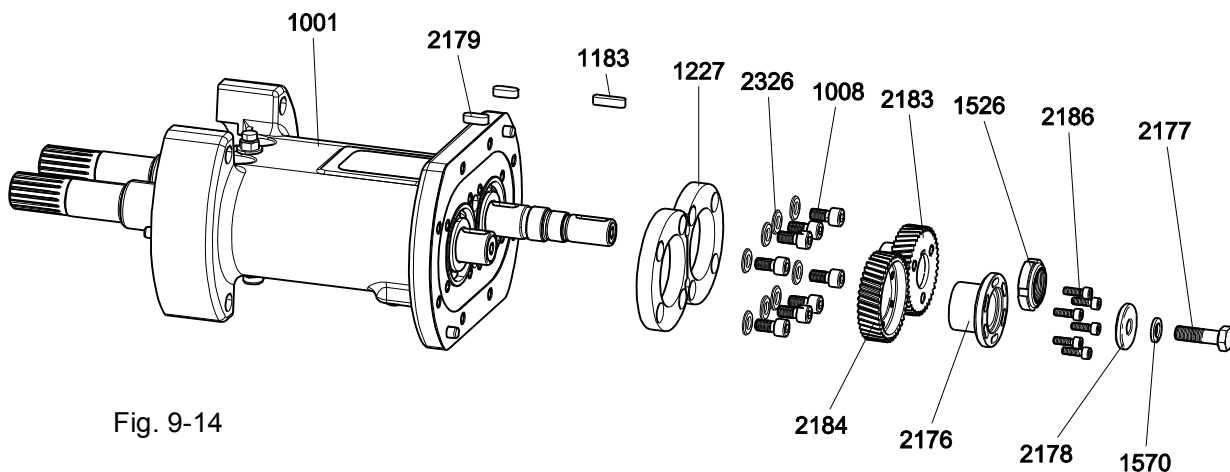


Fig. 9-14

Dismounting:

Special tools:

Hook spanner for shaft nut, Allen key, steel mandrel for counter holding, assembly press, various mounting sleeves and other tools.

1. Loosen hexagon screw 2177 of driven shaft 2171 and remove it incl. washer 2178. Hold up drive shaft by a bush T 39 or block the shafts with a copper or bronze wedge in the teeth of the gears.

Manual ViscoTwin 70.xx 3A

- Loosen the threaded pin in the shaft nut 1526 by one revolution by means of an Allen key 2.5 mm.

ATTENTION

Possible damage to property

- Ever loosen the threaded pin before disassembling the shaft nut; otherwise the thread of the drive shaft is damaged.**
- Loosen and remove shaft nut 1526 of the drive shaft.
- Pull gear 2183 from the shaft with wheel puller **T9**.
- Pull off gear wheel 2184 incl. hub 2176 from the driven shaft.
- Remove keys 2179.
- Loosen socket head bolts 1008 of the bearing crown 1227, take off bearing crown and socket head bolt with spring washer 2326.

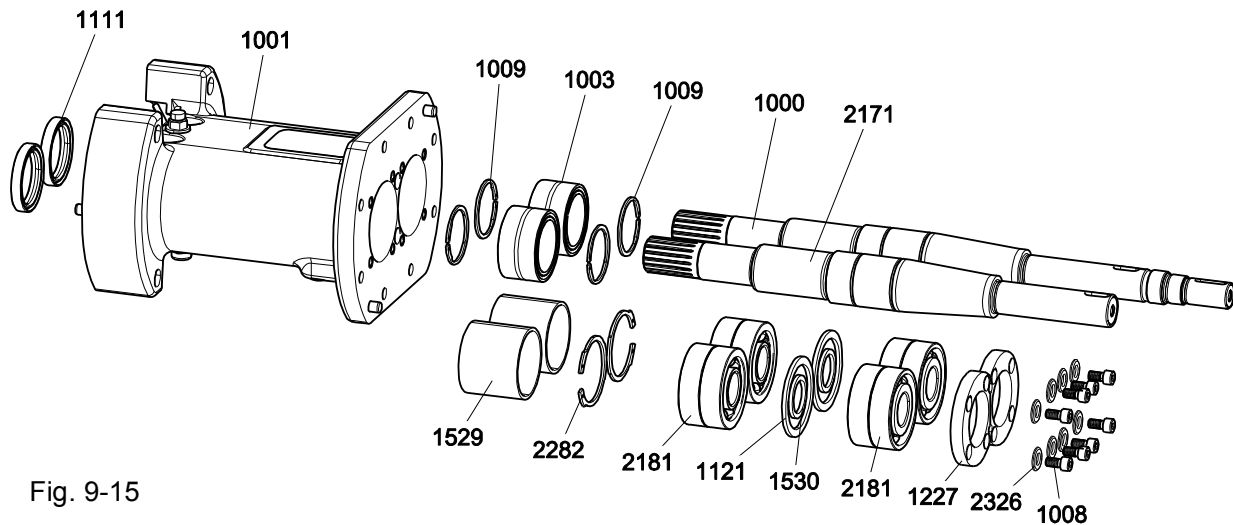


Fig. 9-15

- Remove rotary shaft seals 1111 with a hook remover from the bearing housing. The shaft seals are destroyed now, and these must be renewed by a new one.
- Remove front circlips in 1009 with a snap ring plier.
- Using a press, press out the shafts incl. bearings and distance rings toward the drive end. Afterwards, remove rear circlips 1009 and remove the inner rings of needle bearings from the shaft using an extractor tool. Next, pull out angular ball bearings 2181 from the shaft one after the other and remove spacer rings 1530, 1121 and spacer bush 1529. Remove circlips 2282 with a snap ring plier from bearing housing. Using a puller, pull out the outer race of the needle bearings from the bearing housing.

Manual ViscoTwin 70.xx 3A

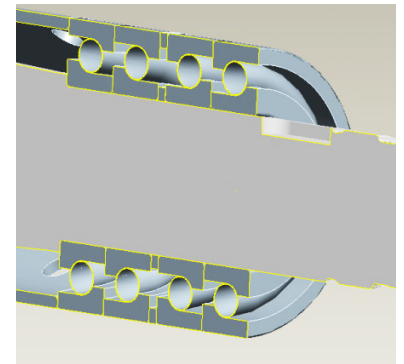
ATTENTION

Possible damage to property

Carefully equally clean the drive shafts and gear wheels. Replace worn parts.

Mounting:

1. Place the housing of the bearing bracket onto the press bed
2. Grease the bearing surfaces of the housing (see chapter 4 for assembly grease).
3. Likewise apply lubricating agent onto the shafts in the region of the bearing positions.
4. Press inner sleeve of needle bearing 1003 onto the shafts using a pressure plate **T 10**. Insert inner snap ring 1009 into the shaft.
5. Press in outer rings of the needle bearings with a suitable tube **T11**. (From the driving side.)
6. Place spacer bush 1529 onto the shaft. Place retaining ring 2282 with a circlip plier into the housing.
7. Press 2 each angular ball bearings 2181 one after the other and individually onto the shaft. (Heed installation position, in double O arrangement) (press only the inner races of the bearings). Place spacer rings 1121 and 1530 into the middlebetween the 4 angular ball bearings **T 12 und T 13**.
8. Carefully insert the drive shaft incl. fitted bearings into the bearing housing and carefully press fit the shaft with its bearings all the way up using the press and a mounting bush that only presses onto the outer race of the bearing **T 14**. The last bearing will then only protrude approx. 1 mm from the bearing housing.



Angular ball bearing
in O arrangement

ATTENTION

Possible damage to property

Align the distance bushes and rings precisely when pressing them in otherwise they will be destroyed.

9. Put in the outer circlip 1009. In this case protect the drive shaft with the mounting tube **T42** and sliding tube **T43**.
10. Install the driven shaft 2171 in the same way.
11. Lubricate rotary shaft seal rings 1111, slide them over the toothed shaft ends and carefully fit them into the seat in the bearing housing using a mounting tube **T15 and T16**. (The spiral ring of the sealing lip shows in the pump housing).
12. Insert the two bearing crowns 1227, apply socket head bolt 1008 with a thread lock fluid (Loctite 270 is used by manufacturer) screw in with placed-on spring washer 2326 and tighten. M8 torque = 20 Nm.
13. Insert keys 2179 into the shafts on the drive side.
14. Slide gear wheel 2183 onto the drive shaft, screw in and tighten shaft nut 1526.
15. Slide gear wheel 2184 incl. hub 2176 onto the driven shaft. (**Observe mark**)
Screw in and tighten screw 2177 incl. washer 1570 and lock washer 2178 (torque 45 Nm).
16. Tighten the bolt 2177 likewise with a torque of 45 Nm on **T17**.
17. Tighten the threaded pin in the shaft nut. (torque Twin 070 Nm = 4 Nm)

Manual ViscoTwin 70.xx 3A

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

Place a bronze or copper bar into gear teeth of the gear wheels when tightening screw 2177.

Do not use hard metals, such as pry bars or steel bars keeping the sensitive tooth flanks in mind.

18. Put on a new gasket 2198 to bearing housing 1001.
19. Place on the drive shaft 1000 mounting sleeve (**T46**).
20. Screw in to 2 opposite threaded holes of the gear housing 2172 the centering rods (**T49**) (4 pieces).
21. Insert carefully gear housings 2172 with centering rods into the parallel pins 2256. Unscrew centering rods (**T49**) and remove mounting sleeve (**T46**). Insert hexagon screws 2258 with the washers 2187 and tighten alternately crosswise. (Torque 20 Nm)

| | |
|------------------|------------------------------------|
| ATTENTION | Possible damage to property |
|------------------|------------------------------------|

The mounting sleeve T46 and the centering rods T 49 prevent damages to the sensitive sealing lips of rotary shaft seal ring.

22. Install shaft seal and screw spindles, mount pump housing (torque: 70 Nm). Install cover (torque 70 Nm).
23. Mount driving elements (coupling guard).
24. Fill in gear oil. Check the oil level via the sight glass. (torque 45 Nm)

Manual ViscoTwin 70.xx 3A

9.5 Adjusting screw spindles.

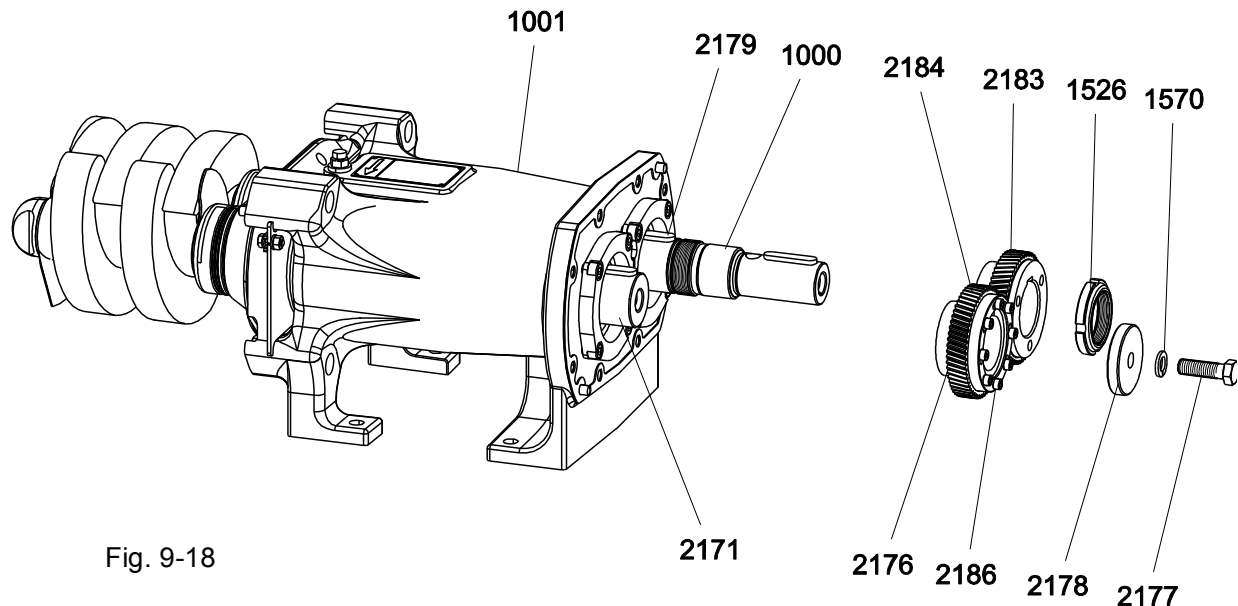


Fig. 9-18

Installation:

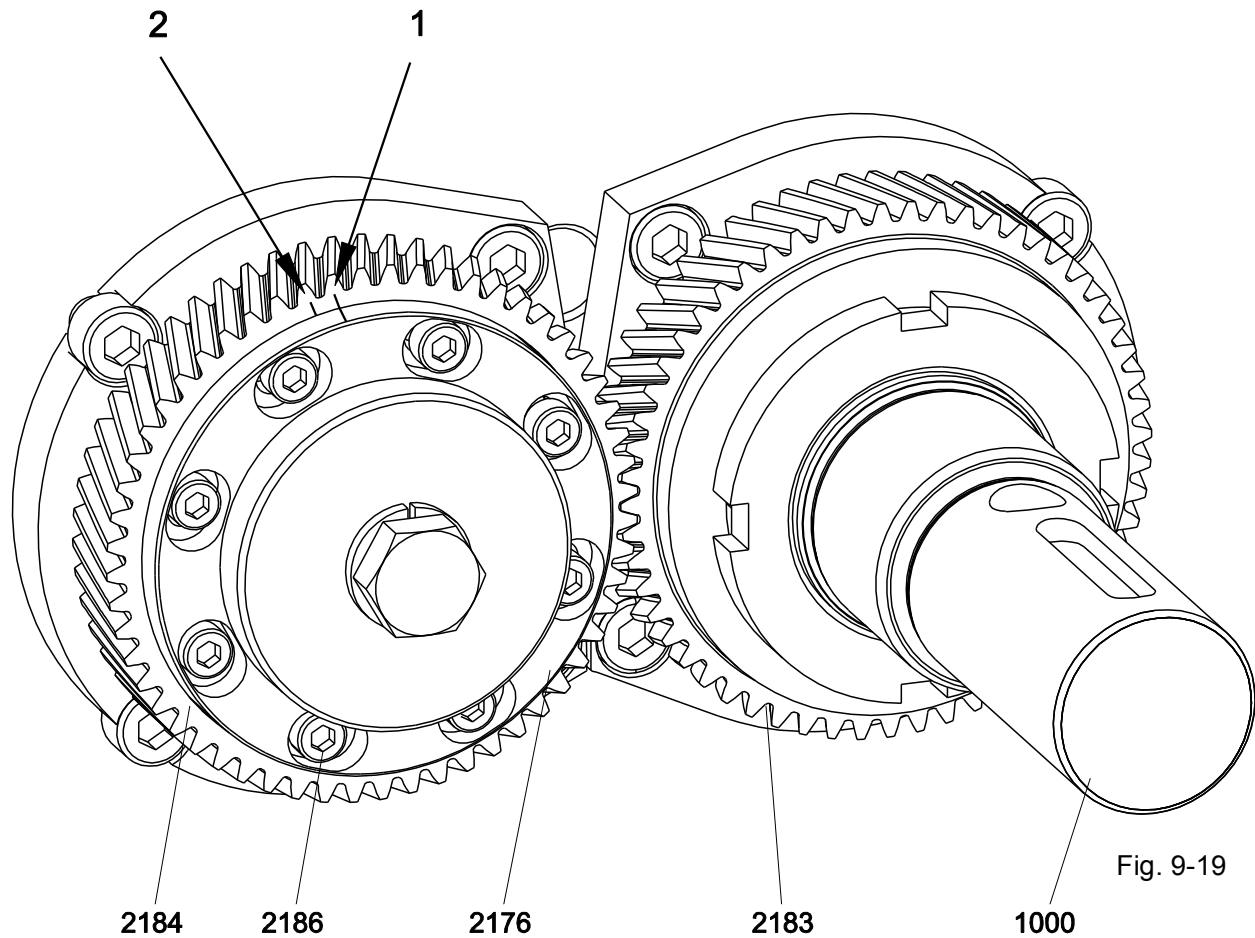
1. Insert keys 2179.
2. Slide gear 2183 onto the drive shaft 1000, turn on shaft nut 1526 and tighten with a groove nut wrench. **T 17** (Tightening torque 45 Nm for M25H). Hold shaft by means of a locking mandrel in the bore in the pump-sided coupling part.
3. Tighten set screw in shaft nut 1526 (torque: 4 Nm)
4. Slide gear wheel 2183 onto the drive shaft 1000, screw on and tighten shaft nut 1526. (Tightening torque 45 Nm for M25). Hold shaft in place with a steel mandrel.
5. Tighten set screw in grooved nut 1526 (torque 4 Nm)
6. Slide on gear wheel hub 2176 incl. gear wheel 2184 onto driven shaft 2171. Turn the gear wheel on the hub until the holes of hub and tapped holes of the gear ring check. (Tapped hole is positioned roughly in the middle of the oblong hole). Note the inclined position of the gear ring.
7. Screw in cylinder head screws 2186 by hand.
8. Place lock washer 2178 onto the driven shaft, screw in and tighten hexagon screw 2177 incl. spring ring 1570 (torque 80 Nm).

ATTENTION

Possible damage to property

Place a bronze or copper bar into gear teeth of the gear wheels when tightening screw 2177. Do not use hard metals, such as pry bars or steel bars keeping the sensitive tooth flanks in mind.

Manual ViscoTwin 70.xx 3A



Adjustment:

1. Turn drive shaft 1000 until the spindles stop.
2. Mark this position on gear wheel hub 2176 and driven gear wheel 2184.
3. Now turn the drive shaft into the opposite direction until the spindles contact.
4. Mark this position on gear wheel hub 2176, too.
5. Turn back the drive shaft by a half of this mark. The screw spindles are freely moving now.
6. Now tighten cylinder head screws 2186 crosswise in alternating fashion.



Tightening torque of the cylinder head screws = 8 Nm

Manual ViscoTwin 70.xx 3A

10. Spare parts

10.1 Stocking of spare parts

Wear and hence the life-cycle of the major pump components are essentially influenced by a variety of factors, such as:

- Working pressure
- Temperature
- Properties and condition of the pumping medium
- System operating times.

We recommend stocking up the major spare parts as per table below. You will thus reduce the MTTR values (mean time to repair) (recommendation acc. to DIN 24296).

| Number of same pumps per system section | | | |
|--|----------------|---------------|--------------|
| Spare parts | Pos.- number | up to 2 pumps | from 3 pumps |
| Gear housing shaft sealing ring | 1010 | 1 | 2 |
| Bearing housing shaft sealing ring | 1111 | 2 | 4 |
| Pump casing O-ring | 1088 | 1 | 2 |
| Spindle nuts O-ring | 2194 | 4 | 8 |
| Cover O-ring | 2192 | 1 | 2 |
| Gear housing flat gasket | 2198 | 1 | 1 |
| Shaft seal, set of O-rings | 2261 | 2 | 4 |
| Axial face seal wear part set | 40, 11, 12, 20 | 2 | 4 |
| Gear ring | 2249 | 1 | 2 |
| Gear oil, 1 L | 2294 | 1 | 2 |
| Pump housing contact surface insulation | 2277 | 2 | 4 |
| Sealed receptacle contact surface insulation | 2281 | 2 | 4 |
| Parallel pin | 2196 | 2 | 4 |
| Parallel key for coupling | 1183 | 2 | 4 |

(*) depending on pump model chosen (see data sheet)

ATTENTION

Possible damage to property

Use only original spare parts to avoid any adverse effects on the functionality of your pump.

10.2 Ordering spare parts

Please report to your personal contact of the ViscoTwin team or consult www.viscotwin.com. When ordering spare parts, please state

- pump type
- serial number of pump

The necessary data are on the pump type label. Most convenient way to collect required data from pump type label is by means of the QR code, which can be read by means of most QR code reader, e.g. on a smart phone. No liability will be assumed for wrong deliveries on account of insufficient data.

Appendix

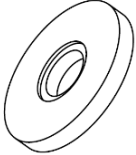
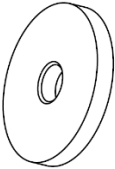
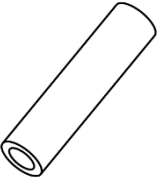
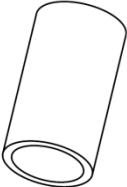
- **Special wrenches and tools**
- **Exploding drawings with index**

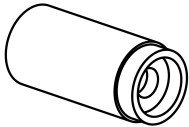
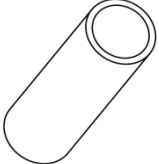
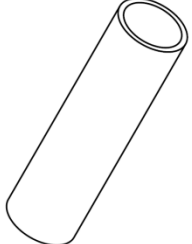
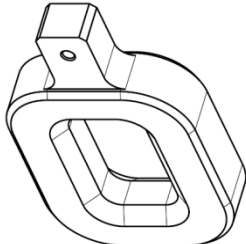
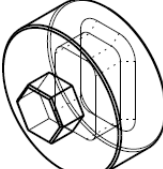
Appendix 1: Special wrenches and tools for dismantling and installation

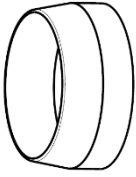
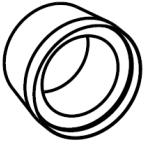

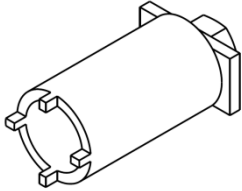
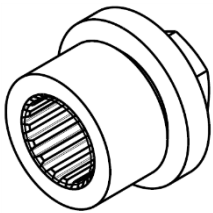
With the dismantling and installation of the pumps, special wrenches and tools must be employed, as represented below.

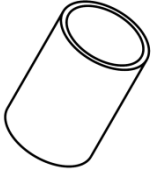
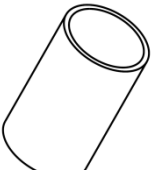
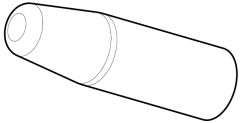
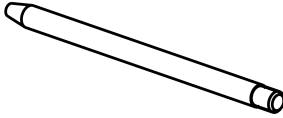
The indicated tools can be found under the designated article number at ProcessTec, Inc., Visalia, CA

If you should wish to produce the tools yourself, you can request a list of the tools with the measurements.

| Tool | Tool No.: | Drawing number | Pump model | Item Number | Material |
|--|-----------|----------------|------------|-------------|----------|
| Pressure plate for needle roller bearing inner race  | T 10 | 1011-397 | # 070 | 95534 | 1.4301 |
| | T 19 | 1011-398 | # 104 | 95535 | |
| | T 20 | 1011-399 | # 130 | 95536 | |
| Receptacle plate installation shaft ball bearing  | T 12 | 1011-401 | # 070 | 955537 | 1.4301 |
| | T 33 | 1011-402 | # 104 | 95538 | |
| | T 34 | 1011-403 | # 130 | 95539 | |
| Installation pipe for ball bearing inner race  | T 13 | 1011-406 | # 070 | 95556 | 1.4301 |
| | T 21 | 1011-407 | # 104 | 95552 | |
| | T 22 | 1011-408 | # 130 | 95550 | |
| Installation pipe for ball bearing outer ring  | T 14 | 1011-409 | # 070 | 95554 | 1.4301 |
| | T 23 | 1011-410 | # 104 | 95555 | |
| | T 24 | 1011-411 | # 130 | 95549 | |

| Tool | Tool No.: | Drawing number | Pump model | Item Number | Material |
|---|----------------------|----------------------------------|-------------------------|--------------------------|----------|
| Installation pin for bearing crown shaft ring gasket  | T 1 T 2 T 3 | 1011-718 1011-772 1011-773 | # 070 # 104 # 130 | 95578 95579 95580 | 1.4301 |
| Installation pipe for needle roller bearing outer ring  | T 11 T 31 T 32 | 1011-416 1011-417 1011-418 | # 070 # 104 # 130 | 95553 95548 95551 | 1.4301 |
| Installation pipe bearing housing shaft ring gasket  | T 15 T 27 T 28 | 1011-419 1011-420 1011-421 | # 070 # 104 # 130 | 955547 95545 95546 | 3.1645 |
| Spindle key without hexagon  | T 35 T 37 | 1010-823 1010-820 | # 070# # 104 / # 130 | 40706 40705 | 3.1645 |
| Spindle key with hexagon  | T 36 T 38 | 1011-124 1011-125 | # 070 # 104 / # 130 | 41106 41107 | 3.1645 |

| Tool | Tool No.: | Drawing number | Pump model | Item Number | Material |
|--|----------------------|----------------------------------|-------------------------|-------------------------|----------|
| Shaft ring gasket assembly sleeve bearing housing  | T 16 T 25 T 26 | 1010-806 1011-082 1011-083 | # 070 # 104 # 130 | 95439 95441 95442 | 1.4301 |
| Shaft ring gasket assembly sleeve lip sealing  | T 6 T 7 T 8 | 1011-351 1011-354 1011-374 | # 070 # 104 # 130 | 41446 41454 41500 | 1.4301 |
| Spur gear wheel puller  | T 9 T 18 | 1010-648 1009-756 | # 070 # 104 / # 130 | 95434 95427 | 1.4301 |
| Socket spanner for groove nut  | T 17 T 29 T 30 | 1011-405 1011-404 1009-215 | # 070 # 104 # 130 | 95532 95533 W0803 | 1.4301 |
| Shaft adjustment for keeping the shaft on the gearing  | T 39 T 40 T 41 | 1011-422 1011-423 1011-424 | # 070 # 104 # 130 | 95445 95444 95443 | 1.4301 |

| Tool | Tool No.: | Drawing number | Pump model | Item Number | Material |
|--|----------------------|----------------------------------|-----------------------|---------------------------|----------|
| Installation pipe for inner race retaining ring needle roller bearing  | T 42 T 44 T 45 | 1011-441 1011-444 1011-445 | #070 #104 #130 | 95561 | 1.4301 |
| Sliding sleeve for inner race retaining ring needle roller bearing  | T 43 | 1011-446 | # 070 | 95562 | 1.4301 |
| Mounting sleeve for rotary shaft seal  | T 46 T 47 T 48 | 1011-782 1011-783 1011-784 | # 070 #104 #130 | 95581 95582 95583 | 1.4301 |
| Centering rod for gear housing  | T 49 T 50 T 51 | 1011-785 1011-786 1011-787 | # 070 #104 #130 | 955584 955585 95586 | 1.4301 |

Instruction Manual ViscoTwin

Appendix

Appendix 2: Explosion drawings with index ViscoTwin 70

(see following pages)

| Einzelteiliste | | Parts list | | Pièces détachées | |
|----------------|------|------------------------------|----------------------------|---------------------------------------|-------------|
| P-No | Qty. | Benennung | Description | Description | Description |
| 1000 | 1 | Antriebswelle | Drive shaft | Arbre de commande | |
| 1001 | 1 | Lagergehäuse | Bearing housing | Corps de palier | |
| 1003 | 2 | Nadellager | Needle roller bearings | Roulements à aiguilles | |
| 1008 | 8 | Zylinderschraube | Socket head cap screw | Boulon à six pans creux | |
| 1009 | 4 | Sicherungsring | Snap ring | Circlip | |
| 1010 | 1 | Weilendichtring | Shaft sealing ring | Joint d'étanchéité de l'arbre | |
| 1012 | 1 | Deckel | Cover | Couvrir | |
| 1015 | 4 | Scheibe | Washer | Rondelle | |
| 1016 | 4 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 1029 | 1 | Dichtungsgehäuse | Shaft seal housing | Corps de garniture | |
| 1033 | 1 | Pumpengehäuse | Pump housing | Corps de pompe | |
| 1041 | 4 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 1088 | 1 | O-Ring | O-ring | O-ring | |
| 1111 | 2 | Weilendichtring | Shaft sealing ring | Joint d'étanchéité de l'arbre | |
| 1121 | 2 | Distanzring | Distance ring | Bague d'écartement | |
| 1183 | 1 | Passfeder | Key | Clavette | |
| 1227 | 2 | Lagerdeckel | Bearing cover | Chapeau de palier | |
| 1303** | 2 | Gleitringdichtung (komplett) | Mechanical seal (Complete) | Garniture mécanique (complet) | |
| 1473 | 1 | Antrieb | Drive unit | Entrainement | |
| 1526 | 1 | Weilennutter | Groove nut | Écrou en T | |
| 1529 | 2 | Distanzhülse | Spacer ring | Manche | |
| 1530 | 2 | Distanzring | Distance ring | Bague d'écartement | |
| 1538 | 1 | Typenschild | Type plate | Plaque signalétique | |
| 1541 | 1 | Ölstandsauge | Oil level glass | Voyant de niveau d'huile | |
| 1543 | 1 | Getriebedl | Gear oil | Huile à engrenages | |
| 1570 | 1 | Federring | Spring ring | Circlip | |
| 2024 | 1 | Temperaturfühler | Temperature sensor | Sonde de température | |
| 2025 | 1 | Kabelverschraubung | Cable gland | Passe-câble à vis | |
| 2171 | 1 | Abtriebswelle | Driven shaft | Arbre de sortie | |
| 2172 | 1 | Getriebegehäuse | Gear housing | Logement d'entraînement | |
| 2176 | 1 | Nabe | Driving collar | Moyeu | |
| 2177 | 1 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 2178 | 1 | Spannscheibe | Lock washer | Plaque de serrage | |
| 2179 | 2 | Passfeder | Key | Clavette | |
| 2180 | 2 | Spindelmutter | Nut for spindle | Écrou pour le fuseau | |
| 2181 | 8 | Schrägkugellager | Angular ball bearing | Roulements à billes à contact oblique | |
| 2183 | 1 | Stirnrad Antrieb | Spur gear, drift | Engrenage, flottante | |
| 2184 | 1 | Stirnrad Abtrieb | Spur gear, propelled | Engrenage, actionnée | |
| 2186 | 6 | Zylinderschraube | Socket head cap screw | Boulon à six pans creux | |
| 2187 | 8 | Scheibe | Washer | Rondelle | |
| 2192 | 1 | O-Ring | O-ring | O-ring | |
| 2194 | 2 | O-Ring | O-ring | O-ring | |
| 2195 | 2 | Passstift | Dowel pin | Goupille de serrage | |

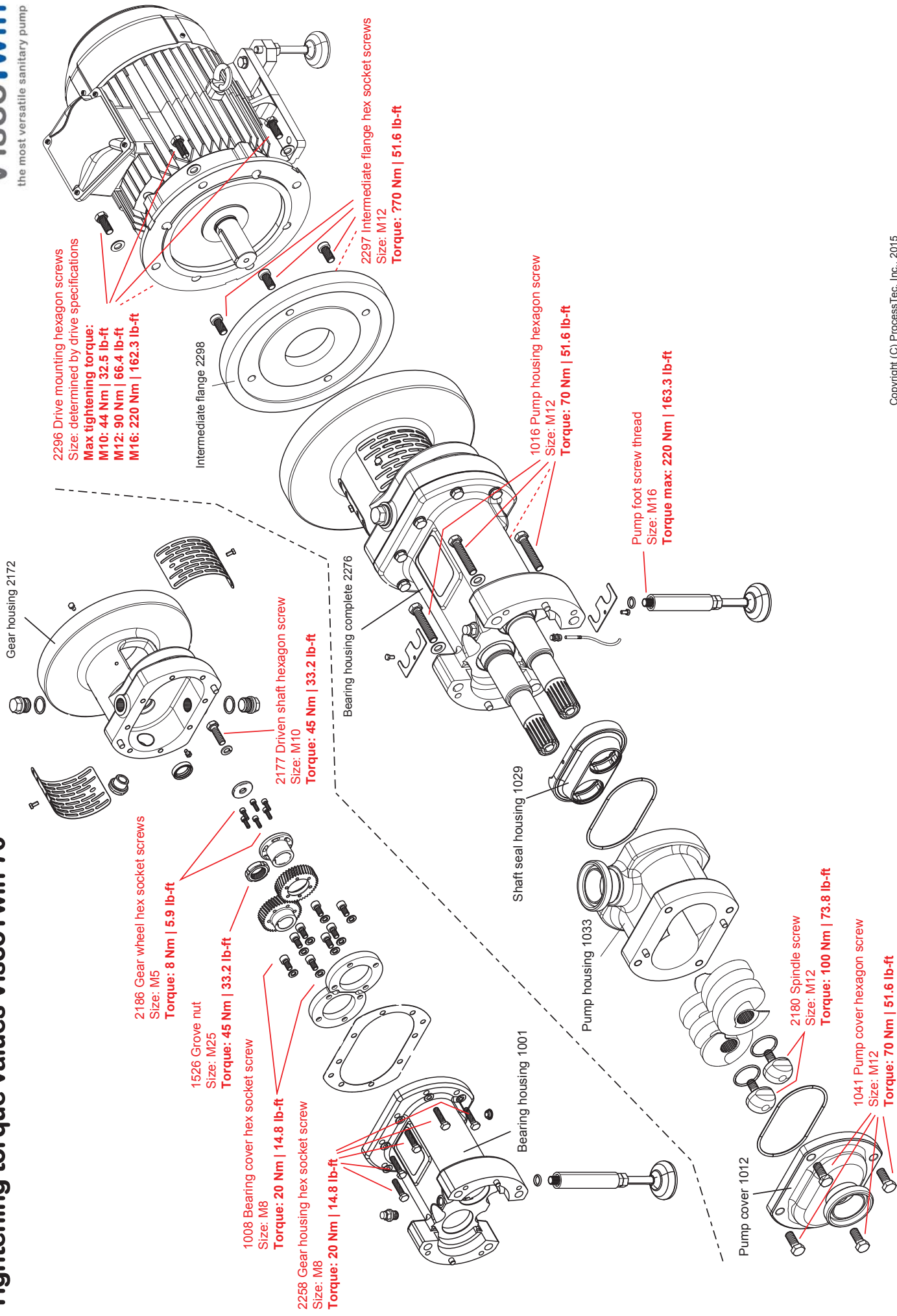
| Einzelteiliste | | Parts list | | Pièces détachées | |
|----------------|------|--------------------------------|------------------------------------|---|-------------|
| P-No | Qty. | Benennung | Description | Description | Description |
| 2196 | 2 | Passstift | Dowel pin | Goupille de serrage | |
| 2198 | 1 | Flachdichtung | Flat seal | Joint | |
| 2200 | 1 | Schraubenspindel, linksgängig | Screw spindle, left handed | Vérin, fileté à gauche | |
| 2201 | 1 | Schraubenspindel, rechtsgängig | Screw spindle, right handed | Vérin, fileté à droite | |
| 2232 | 1 | Entlüftungsschraube / Quench | Breather plug / Quench | Bouchon évent / Quench | |
| 2233 | 2 | Verschlusschraube | Plug screw | Vis d'arrêt | |
| 2247 | 1 | Kupplungsteil, Pumpe | Clutch part, pump | Élément d'accouplement, pompe | |
| 2248 | 1 | Kupplungsteil, Antrieb | Clutch part, drive | Élément d'accouplement, Entrainer | |
| 2249 | 1 | Zahnkranz | Sprocket | Pignon | |
| 2256 | 2 | Passstift | Dowel pin | Goupille de serrage | |
| 2258 | 8 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 2272 | 2 | Weilendichtring | Shaft sealing ring | Joint d'étanchéité de l'arbre | |
| 2273 | 2 | Weilenschonhülse | Shaft sleeve | Chemise d'arbre | |
| 2274 | 2 | Schleuderscheibe | Centrifugal disk | Rondelle de joint | |
| 2275 | 2 | O-Ring | O-ring | O-ring | |
| 2277 | 2 | Kontaktschutz Lagergehäuse | Contact protection bearing housing | protecteur de contact corps de palier | |
| 2281 | 2 | Kontaktschutz Lagergehäuse | Contact protection bearing housing | protecteur de contact corps de palier | |
| 2283 | 2 | Schutzabdeckung | Protective cover | Couvercle de protection | |
| 2284 | 2 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 2285 | 2 | Blindstopfen | Blind plug | Plot de remplissage | |
| 2286 | 2 | Eingreifschutz | protective cover | Couvercle de protection | |
| 2287 | 2 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 2288 | 1 | O-Ring | O-ring | O-ring | |
| 2289 | 2 | Distanz | Distance | Distance | |
| 2290 | 3 | Gelenkfuß | Hinged foot | Pied articulant | |
| 2291 | 2 | Sechskantmutter | Hexagonal nut | Écrou hexagonal | |
| 2295 | 4 | Scheibe | Washer | Rondelle | |
| 2296 | 4 | Sechskantschraube | Hexagonal screw | Vis à tête hexagonal | |
| 2297 | 4 | Zylinderschraube | Socket head cap screw | Boulon à six pans creux | |
| 2298 | 1 | Adapter | Adaptor | Adaptateur | |
| 2320 | 2 | O-Ring | O-ring | O-ring | |
| 2321 | 2 | O-Ring | O-ring | O-ring | |
| 2322 | 2 | Weilendichtring | Shaft sealing ring | Joint d'étanchéité de l'arbre | |
| 2323 | 2 | O-Ring | O-ring | O-ring | |
| 2326 | 8 | Federscheiben | Spring ring | Rondelle élastique | |
| 2327 | 1 | Verschleißteilsatz Dichtung | Set of wearing parts, sealing | Ensemble de pièces d'usure, garniture mécanique | |
| 2328 | 1 | Verschleißteilsatz Dichtung | Set of wearing parts, sealing | Ensemble de pièces d'usure, garniture mécanique | |

*wenn erforderlich
** BC : doppeltwirkend
BF : einfachwirkend

* if necessary
** BC double acting
BF: single acting

*le cas échéant

Tightening torque values ViscoTwin 70



The Engineering Design and Technical Construction File

4. CIP - SIP and COP Instructions, Swab-Testing Instructions

4.1 CIP & SIP Instructions

Pumps in a processing system by 3A Standard (02-11)

Pumps used in a SIP processing system must be equipped with a pressure monitoring device, which shuts down the system immediately if the processed product falls below atmospheric pressure and the system cannot be re-started without getting sterilized again.

4.1.1 C.I.P. – process

Are suitable for the materials of the pump:

Use 1 percent nitric acid solution at a temperature up to 82 ° C (acid)

or use a 1 percent solution of sodium hydroxide or sodium hypochlorite (200ppm) (alkaline) for your C.I.P. process.

For pump housings with chrome-wear coating pH values below 3 are not permitted. Therefore use an accordingly lower acid concentration when using the nitric acid solution for CIP Cleaning.

4.1.2 S.I.P – process


Are suitable for the materials of the pump:

Sterilization over a period from 10 to 30 minutes with saturated steam at about 2.2 bars is allowed.

The maximum steam temperature for elastomeric materials in EPDM is 121° C.

The maximum steam temperature for elastomeric materials in FKM is 135° C.

If the equipment is installed in an aseptic processing system that is sterilized by heat and operated At a temperature of 250°F (121°C) or higher, 3-A Standard 02-11 requires that the system monitors Internal pressure and shuts the system automatically down if the product pressure in the system Becomes less that atmospheric. The system shall only be able to be restarted after it is re-sterilized.

| | |
|---|--|
|  | Warning! |
| | <p>Risk of injuries through rotating machine parts or from liquids escaping under pressure.</p> <p>Potential consequences: Severe or fatal injuries.</p> |

4.1.3 Do not perform any work with the pump running!

Disconnect the pump from mains and secure against inadvertent start up. (U-lock)


Use safety gloves and goggles when using aggressive detergents.

4.1.3.1 Connect pump to CIP cleaning system or switch system.

4.1.3.2 Start cleaning system.

4.1.3.3 Cleaning pipe line system and pump.

4.1.3.4 Shut cleaning system, remove CIP medium completely.

| | |
|---|---|
|  | <p>C.I.P. cleaning must conform to the hygiene of foodstuffs regulations as amended from time to time. The specifics pertaining to material stability must be strictly observed.</p> |
| | <p>In case you have developed own C.I.P. cleaning methods for your pumping media, ensure pump suitability for the selected method by consulting the pump supplier.</p> |

ATTENTION**Possible damage to property**

Avoid abrupt changes in temperature during cleaning process with the pump in stationary state, fill in hot medium and wait until the pump has warmed up..

4.2 Inspection of sanitary pumps for food processing.

The instruction given in chapter 7.2 'Notes on service and maintenance' apply exceedingly to sanitary pumps for food processing.

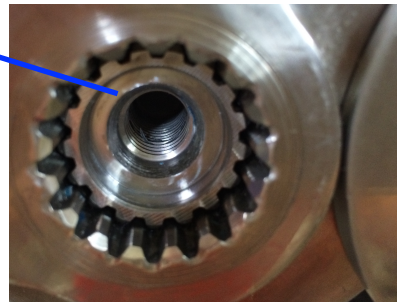
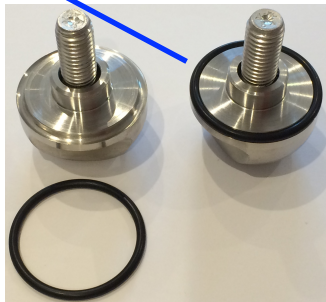
Then the spindle screws are to be checked every 100 operating hours. If contamination (underneath the O-ring) is detected, all parts in this sector which are in direct contact with the medium (spindle, spindle screw with O-ring) must be dismantled and thoroughly cleaned in an alcoholic bath. Clean and disinfect the shafts and all inner parts of the pump housing carefully with alcohol solution and a clean cloth. Renew the O-ring of the spindle screw 2194 and the O-ring 130 of the Inboard Rotor Holder 80 inside the mechanical seal. (® _see Parts List)

Subsequently, no corrosion or seizure marks must be visible; otherwise the affected parts must be replaced.

If contamination on the mechanical seal outside the medium sector is detected after 500 cleaning cycles or one year at the latest, all component parts of the mechanical seal are to be thoroughly cleaned and disinfected in an alcohol bath. Replace all O-rings of the Inboard Rotor Holder (O-ring 90, 130, 140 and 220). (® _see Parts List)

Subsequently, no corrosion or seizure marks must be visible; otherwise the affected parts must be replaced.

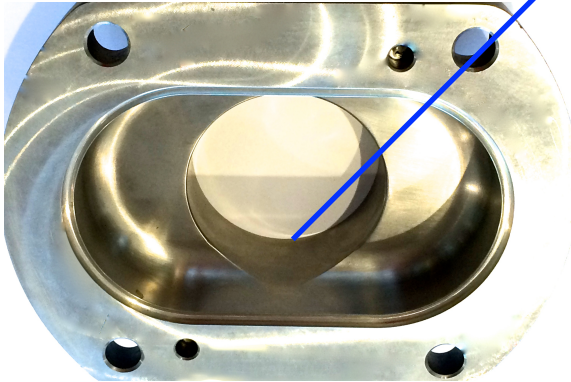
1. Remove Bolts from the Spindles and first visually test the cleanliness of the O-ring and the groove.
2. Visually check cleanliness of threads on the shaft



3. Remove O-Rings and clean bolts with FDA-compliant detergent. If needed sanitize with alcohol-bath
4. Remove residue from bolts with the use of a sturdy brush
5. Remove residue from the threads by spraying alcohol, blow it out with compressed air
- hold a towel in front of the thread to protect yourself from spilling solution.
6. Wipe it with non-fuzzing paper towel dry and clean.
7. Now install NEW O-rings (3-A approved elastomers) and fixate with medium strength Loctite food grade, torqued to required value. (see Appendix "Torque-table")

Fully drainable pump housing due to machined DRAIN in the front cover. See picture below:

Make sure, drain shows to bottom when Mounting to the housing



4.3 COP (manual cleaning) Instructions

4.3.1 **Safety is first – DISCONNECT THE PUMP FROM THE POWER!**

4.3.2 Disconnect piping from the pump housing

4.3.3 Remove the 4 hexagon screws (Pos. 1016 on explosion drawing)

4.3.4 Remove the pump housing and manually wash it properly with FDA-compliant detergent. Avoid scratching pads. Rinse it with clear water.

4.3.5 Clean the impellers manually with non-scratching pad or sponge with FDA-compliant detergent. Spin the shafts to clean the impellers from all sides. Rinse with clear water.

4.4 Swab-Test

4.4.1 **Safety is first – DISCONNECT THE PUMP FROM THE POWER!**

4.4.2 Disconnect piping from pump housing

4.4.3 Remove the 4 hexagon screws (Pos. 1016 on explosion drawing)

4.4.4 Remove pump housing carefully

4.4.5 Take swab-sample as per Lab-Instruction of food-safety instructions (This procedure may be vary based on customer's internal requirements)

4.5 Switching on

Check before switching on:

4.5.1 **Pump with drive safely installed and connected?**

4.5.2 **Connections sealing and connected stress-free?**


4.5.3 **Oil level checked?**

- 4.5.4 Quench fluid level OK?
- 4.5.5 Correct pressure set in case of a counter-pressure device?
- 4.5.6 Rotational direction checked?

- 4.5.7 Safety devices (covers and limit switches, safety valve) installed and checked for function?
 - 4.5.7.1 Before start up, check pump for contamination and foreign objects.
 - 4.5.7.2 Fully open pressure and suction-side valves.
 - 4.5.7.3 Fill pump with medium to enable suction safely.
 - 4.5.7.4 Switch on drive.

4.6 When initially operating the pump, check to see whether it and the pipe lines are tight.

Operation

| | |
|---|--|
|  | Warning! |
| | <p>Do not operate against closed shut-off devices. Bursting of the pipe line or downstream system components is possible. Potential consequences: Severe or fatal injuries.</p> |
| <p>Secure the pump through an approved overpressure protection.</p> | |
| <div style="border: 2px solid black; padding: 2px; display: inline-block;">ATTENTION</div> | <p>Possible damage to property</p> |

The Engineering Design and Technical Construction File

12. Gear Oil – maintenance

12.1 Gear-Oil Type

Use only designated food – grade gear lubricant, such as:

- Castrol Optileb Hy 68
- AVIA AVIAFOOD GEAR 220
- Mobil Mobil DTE FM 220

12.2 Fill-Level

Please take manual page 22 fig. 7-1 Oil-level gauge for reference.

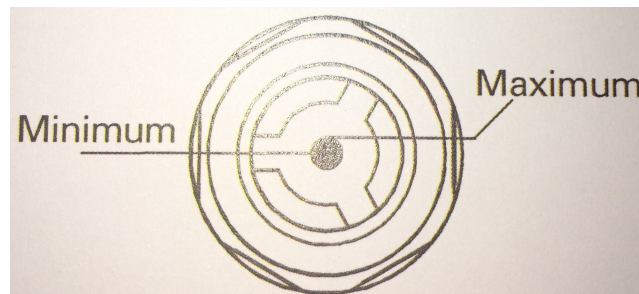


Fig. 7-1 Oil-level gauge

12.3 First Oil Change:

First Oil Change is due after 250 hours of operation

12.4 Check Oil Level:

Check Oil level at least weekly and top level up if necessary to Maximum level

As per fig. 7-1 under point 12.2

(turn pump off, wait 3 min. to cool down the oil to show the actual level in the sight glass of the level gauge)

12.5 Oil changes

Oil changes have to take place every 3000 hours of operation

In case the oil shows color-changes, oil has to be changed immediately and the change rhythm has to be adjusted based on the need through excessive use of the pump.

General recommendation: Please put the recommended maintenance routine of the Manual on page 21 to set up a service-routine for your ViscoTwin.

Your Pump will show its great performance for a longer time on a high level.