



INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

TLS lobe pump



01.520.32.0001

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Original Manual

01.520.30.05EN

(A) 2015/03



EC Declaration of Conformity

The manufacturer: **INOXPA, S.A.**
c/ Telers, 57
17820 Banyoles (Girona), Spain

herewith declares that the machine:

TLS lobe pump

with the serial number: _____

conforms to the relevant provisions of the following directives:

Machinery Directive 2006/42/EC (RD 1644/2008)
Low voltage Directive 2006/95/EC
Electromagnetic Compatibility Directive 2004/108/EC

Applicable harmonised Standards:

UNE-EN ISO 12100:2012
UNE-EN 809:1999+A1:2010

Identification of the person empowered to draw up the Declaration on behalf of the manufacturer, and qualified to compile the technical file established by the Community:

Banyoles, 8 January 2014

David Reyer Brunet
Technical Office Manager

1. Safety

1.1. INSTRUCTION MANUAL

This manual contains information regarding the reception, installation, operation, assembly, disassembly and maintenance of the TLS pump.

The information published in the instruction manual is based on updated data.

INOXPA reserves the right to modify this instruction manual without prior notice.

1.2. INSTRUCTIONS FOR START-UP

This instruction manual contains essential and useful information for the correct handling and maintenance of your pump.

Carefully read the instructions prior to starting the pump, familiarise yourself with the installation, operation and correct use of the pump and strictly follow the instructions. These instructions should be kept in a safe location near the installation area.

1.3. SAFETY

1.3.1. Warning symbols



Safety hazard for people in general



Danger of injury caused by rotating equipment parts



Electric hazard



Danger! Caustic or corrosive agents.



Danger! Suspended loads



Danger for the correct operation of the equipment



Mandatory to ensure safety at the workplace



Mandatory use of safety goggles

1.4. GENERAL SAFETY INSTRUCTIONS



Read the instruction manual carefully before installing and starting the pump. Contact INOXPA in case of doubt.

1.4.1. During the installation



The *Technical Specifications* of Chapter 8 should always be observed.

Never start the pump before connecting it to the lines.

Do not operate the pump if the pump casing is not so fitted and the lobes are well secured.

Check for proper specifications of the motor, especially if its working conditions create an explosion hazard.



During the installation, all the electric work should be carried out by authorised personnel.

1.4.2. During operation



The *Technical Specifications* of Chapter 8 should always be observed. Under no circumstances can the specified limit values be exceeded.

NEVER touch the pump or the pipework during operation if the pump is being used for transferring hot liquid or during cleaning.



The pump contains moving parts. Never place your fingers inside the pump during operation.



NEVER operate with the suction and discharge valves closed.

NEVER spray water directly on the electrical motor. The standard motor protection is IP-55: protection against dust and water spray.

1.4.3. During maintenance



The *Technical Specifications* of Chapter 8 shall always be observed.

NEVER disassemble the pump until the pipes have been emptied. Remember that liquid will remain inside the pump's body (if does not have a purge). Bear in mind that the pumped liquid may be hazardous or extremely hot. Consult the regulations in effect in each country for these cases.

Do not leave loose parts on the floor.



ALWAYS disconnect the electrical power to the pump prior to carrying out any maintenance. Remove the fuses and disconnect the cables from the motor's terminals.

All electrical work must be carried out by authorised personnel.

1.4.4. Compliance with the instructions

Not following the instructions may impose a risk for the operators, the environment and the machine, and may result in the loss of the right to claim damages.

This non-compliance may result in the following risks:

- Failure of important machine/plant functions.
- Failure of specific maintenance and repair procedures.
- Possible electrical, mechanical and chemical hazards.
- Risk to the environment due to the type of substances released.

1.4.5. Warranty

Any warranty will be void immediately and lawfully; additionally, INOXPA will be compensated for any civil liability claims submitted by third parties, in the following cases:

- The service and maintenance work have not been carried out in accordance with the service instructions, the repairs have not been carried out by our personnel or have been carried out without our written authorisation;
- Modifications have been carried out on our material or equipment without written authorisation;
- The parts or lubricants used are not INOXPA genuine parts;
- The material or equipment has been improperly used, has been used negligently, or has not been used according to the instructions and their intended;
- The pump parts are damaged because they have been subjected to high pressure due to not having used a safety valve.

The General Conditions of Delivery already in your possession are also applicable.



The machine may not undergo any modification without prior approval from the manufacturer. For your safety, only use original spare parts and accessories.

The usage of other parts will relieve the manufacturer of any liability.

Changing the service conditions can only be carried out with prior written authorisation from INOXPA

Please do not hesitate to contact us in case of doubts or if further explanations are required regarding specific data (adjustments, assembly, disassembly, etc.).

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3. General Information

3.1. DESCRIPTION

The TLS lobes pumps by INOXPA are part of our wide range of positive displacement rotary pumps for viscous liquids. The following models exist in the lobe pump range:

- The TLS normal flow rate pump suitable for pressures of up to 12 bar.
- The TLS with wider lobes, delivers a higher flow rate, and is suitable for pressure of up to 7 bar.

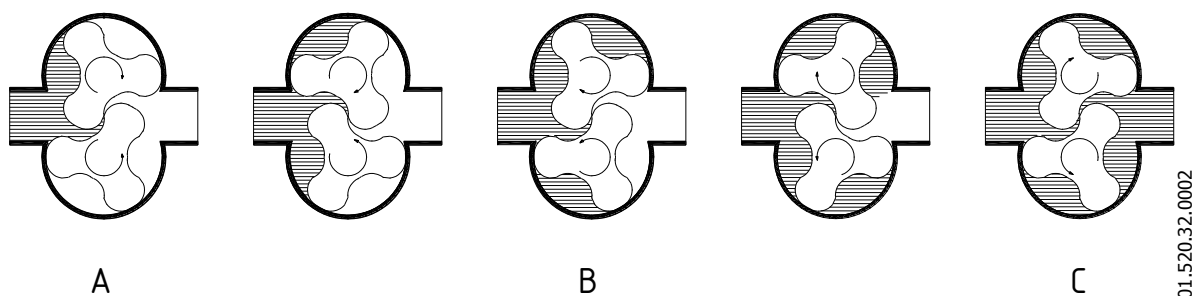
The TLS model has been specially developed to respond to all hygienic requirements in the food industry.

As regards hygiene, reliability and sturdiness, the complete range of lobes pumps satisfies all requirements set by the aforesaid industry.

The rotary lobe pumps are positive displacement pumps. Owing to the contact between the internal parts, the pressure variations, etc. they make a louder noise than centrifugal pumps. This noise must be taken into consideration when installing these pumps.

3.2. PRINCIPLE OF OPERATION

The lobe pump is a positive displacement rotary pump. The top lobe is driven by the driving shaft. The lower lobe is located on the driven shaft, and is driven via a helical gear. Both lobes rotate in synchronism without one touching the other. When the pump is running they displace a set volume of liquid. Figure 3.1. shows how a lobe pump operates.



- A: When the lobes rotate, the space on the suction side increases because one lobe moves away from the other, thus causing a partial vacuum that draws the liquid into the pumping chamber.
- B: Each lobe void is filled consecutively as the shafts rotate and the liquid is displaced towards the discharge side. The small clearances between the lobes, and between the lobes and the walls of the pump body duly cause the spaces to be rather well closed.
- C: The pump casing is completely full and the liquid leaks through the meshing of the lobes, knocking against the space walls so as to thus complete the pumping action.

3.3. APPLICATION

The main advantage of the INOXPA TLS lobe pump is its capacity to pump a great variety of viscous liquids, from 1 mPa.s up to 100.000 mPa.s

Furthermore, it is capable of pumping liquid products that require very careful handling and liquids that contain soft solids thus causing only a minimum degradation of same.

The intended use of the pump is defined by its characteristic curve and operating limits provided in the [Technical Specifications](#) section.



Misuse of the pump or its use beyond the operating limits may be dangerous or cause permanent damage to the equipment.

4. Installation

4.1. RECEPTION OF THE PUMP

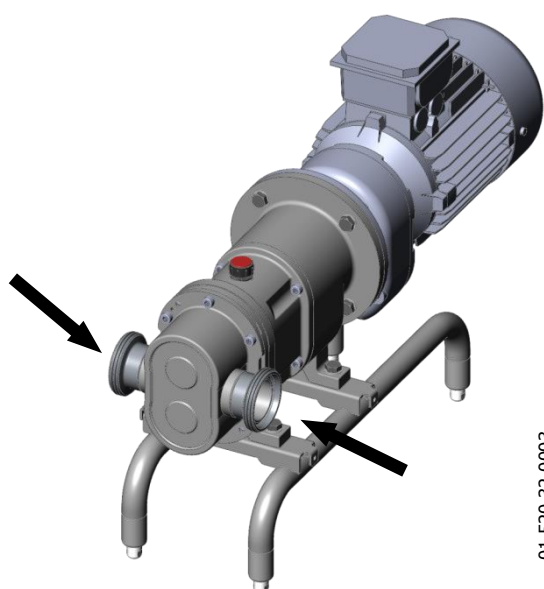


INOXPA will not be liable for any deterioration of the material due to transport or unpacking. Visually check that the packaging has not been damaged.

The following documentation is included with the pump:

- Shipping documents.
- Instructions and Servicing manual for the pump.
- Instructions and Servicing manual for the motor (*).
- (*) If the pump has been supplied with a motor from INOXPA.

Unpack the pump and check the following:

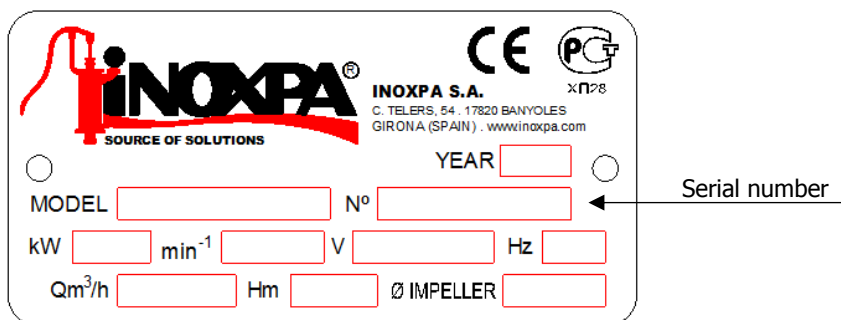


- The suction and discharge connections on the pump, removing any remaining packaging material.
- Check that the pump and motor have not suffered any damage.
- If not in good material condition and/or if not all the parts are included, the shipping carrier should submit a report as soon as possible.

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4.1.1. Identification of the pump

Each pump has a nameplate with the basic data required to identify the model.



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CE

PCF

YEAR

MODEL N° ← Serial number

KW min⁻¹ V Hz

Qm³/h Hm Ø IMPELLER

Pump plate

4.2. TRANSPORT AND STORAGE



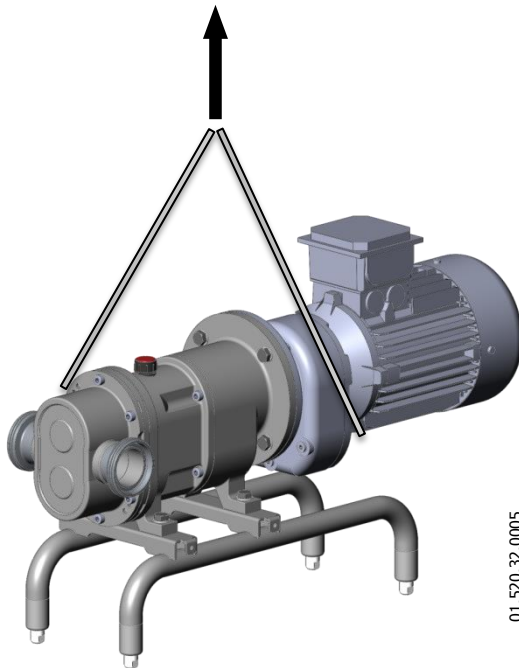
The TLS pumps are often too heavy to be stored manually.

Use the points which are indicated in the drawing for lifting the pump.

Only authorized personnel should transport the pump.

Do not work or walk under heavy loads.

Lift the pump as indicated below:



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ATTENTION!

Always remove the motor shroud before hoisting, if it is necessary.

4.3. LOCATION

Place the pump in a position that allows enough space around it to provide access to the pump as well as to the motor. (Refer to Section 8. *Technical Specifications* for weights.

Place the pump on a flat and level surface.



Install the pump so that it can be properly ventilated.

If the pump is installed outdoors, it must be sheltered under a roof. Its location must allow for easy access during any inspection or maintenance tasks.

4.4. PIPES

- As a general rule, install the suction and discharge lines in straight sections, with the minimum possible number of elbows and fittings in order to reduce any pressure losses that may be caused by friction.
- Make sure that the pump's ports are properly aligned with the pipework and have a diameter similar to that of the pump connections.
- Place the pump as close as possible to the suction tank and whenever possible below the liquid level, or even below the tank level in order to achieve the largest possible static head for suction.
- Install support brackets for the lines as close as possible to the pump's suction and discharge ports.

4.4.1. Shut-off valves

The pump may be isolated for maintenance. To accomplish this, shut-off valves must be installed and connected to the pump's suction and discharge connections.

These valves must ALWAYS be open during operation of the pump.

4.5. ELECTRICAL INSTALLATION



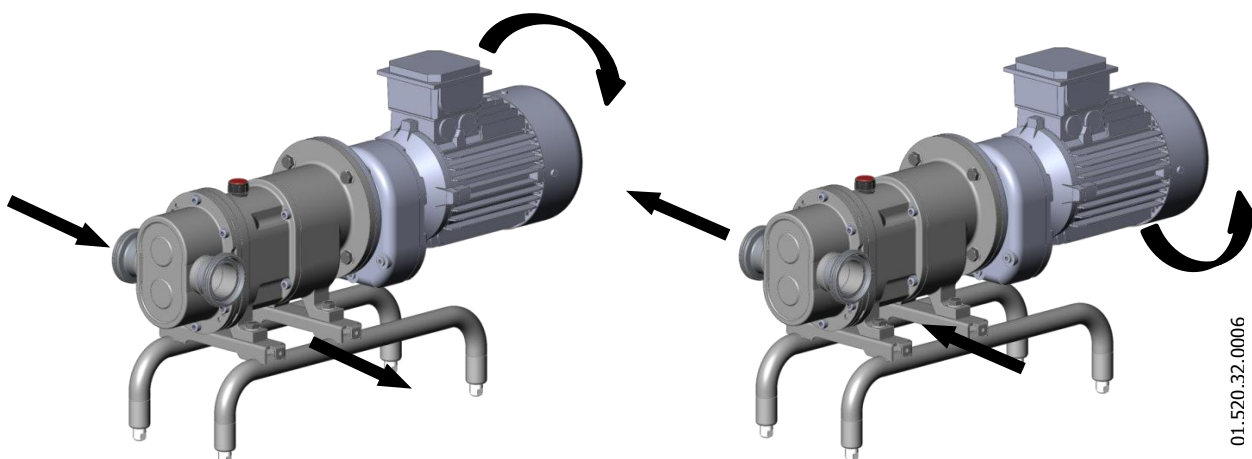
Only qualified personnel can connect the electric motors.
Take the necessary measures to prevent damage to cables and connections.



Electrical equipment, terminals and components of the control systems may still carry current when they are disconnected. Contacting them may impose a hazard to operators or cause irreparable material damage.

Prior to handling the pump, make sure that the electrical panel is disconnected.

- Connect the motor in accordance with the instructions supplied by the motor manufacturer.
- Check the direction of rotation that determines which is the suction and discharge direction.
- If the direction of rotation is reversed, the direction of the flow changes the direction also.



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ATTENTION!
See indicator label on the pump.

Start and stop the pump motor momentarily. Make sure that the pump rotates in the correctly direction of rotation.



ALWAYS check the direction of rotation of the motor with liquid inside the pump.

5. Starting the pump



Prior to starting the pump, carefully read the instructions in Section 4. [Installation](#).

5.1. START-UP



Carefully read Section 8. [Technical Specifications](#). INOXPA will not be liable for improper use of the equipment.



NEVER touch the pump or the lines if hot liquids are being pumped.

5.1.1. Checks before starting the pump

- Completely open the shut-off valves on the suction and discharge lines.
- If liquid does not flow towards the pump, fill it with the liquid to be pumped.
- Remove the secure transport of gear oil plug
- Check oil level of the pump. Add correct grade of oil as necessary to maintain level in centre of oil sight glass (In the case of first start-up: pumps are shipped with oil in the gearbox).



The pump must never turn dry.

- Check that the direction of rotation of the motor is correct and adequate for the application.

5.1.2. Checks when starting the pump

- Check that the pump is not making any strange noises.
- Check if the absolute inlet pressure is sufficient to prevent cavitation in the pump. Check the curve to obtain the minimum required pressure above the vapour pressure (NPSHr).
- Control the discharge pressure.
- Check for leaks in the sealing areas.



A shut-off valve shall not be used to regulate the flow in the suction line. All shut-off valves must be fully open during operation.



Control the motor consumption to prevent an electrical overload.

Reduce flow and motor power consumption by reducing motor speed.

5.2. PRESSURE BY-PASS

When pump has a pressure by-pass, pump only can rotate in one direction. To reverse the direction of the pump's rotation, the assembly of the by-pass must also be reversed.

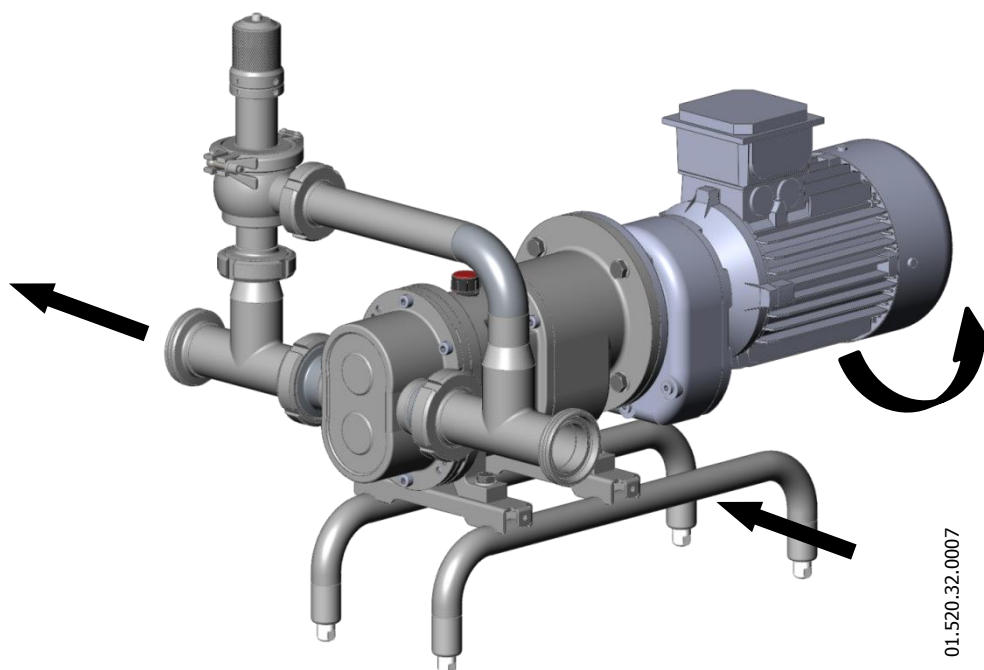
The valve's opening pressure depends on the fluid to be pumped, its viscosity, its rpm ..., and so before starting-up the pump, the operator ought to adjust the pressure relief valve's opening pressure.



When an overflow valve or a pressure bypass is installed, the valve is adjusted to the maximum working pressure of the pump. The end user must adjust the valve to the correct pressure.

When an overflow valve or a pressure bypass does not operate properly, the pump must immediately be removed from service for repair.

The valve must be examined by the INOXPA technical assistance personnel.



6. Operating problems

The attached table lists solutions to problems that may arise while operating the pump. It is assumed that the pump has been properly installed and that it has been selected correctly for the specific application. Contact INOXPA if technical assistance is required.

Motor overload									
↓	The pump flow or pressure is insufficient.								
↓	There is no pressure on the discharge side.								
↓	Irregular discharge flow rate / pressure.								
↓	Noise and vibrations.								
↓	The pump gets clogged.								
↓	Pump overheated.								
↓	Abnormal wear.								
↓	Leak through the mechanical seal.								
↓					PROBABLE CAUSES		SOLUTIONS		
•	•	•	•	•	Wrong direction of rotation.		Reverse the direction of rotation.		
•	•	•	•	•	Insufficient NPSH		Raise the suction tank. Lower the pump. Reduce the vapour pressure. Widen the diameter of the suction pipe. Shorten and simplify the suction line.		
•	•	•	•	•	Pump not purged		Purge or fill.		
•	•	•	•	•	Cavitation.		Increase the suction pressure.		
•	•	•	•	•	The pump sucks in air.		Check the suction line and all of its connections.		
•	•	•	•	•	Suction pipe obstructed		Check the suction line and the filters, if available.		
•	•	•	•	•	Desajuste de la válvula de seguridad		Comprobar el taraje de la válvula.		
•	•	•	•	•	Discharge pressure too high		If necessary, reduce the pressure losses, for example, by increasing the pipe diameter.		
•	•	•	•	•	Pump speed too high		Reduce the speed of the pump.		
•	•	•	•	•	Viscosity of the liquid too high.		Reduce the speed of the pump. Reduce the viscosity, for example, by heating the liquid.		
•	•	•	•	•	Liquid temperature is too high		Decrease the temperature by cooling the liquid.		
•	•	•	•	•	Mechanical seal worn or damaged.		Replace the seal.		
•	•	•	•	•	The lobes are worn		Replace the lobes		
•	•	•	•	•	Inadequate O-rings for the liquid.		Install the correct O-rings after consulting the supplier.		
•	•	•	•	•	Worn bearings		Replace the bearings, check the pump		
•	•	•	•	•	Worn gears		Replace and readjust the gears		
•	•	•	•	•	Tension in the lines.		Connect the pipes to the pump without tension.		
•	•	•	•	•	Foreign matter in the liquid.		Install a filter in the suction pipe.		
•	•	•	•	•	Mechanical seal spring tension is too low.		Adjust as indicated in this manual.		
•	•	•	•	•	Insufficient lubricating oil level		Fill up with oil		
•	•	•	•	•	Unsuitable lubricating oil		Use an appropriate oil		
•	•	•	•	•	The lobes rub		<ul style="list-style-type: none"> • Reduce the temperature • Reduce the discharge pressure • Adjust the clearance 		

7. Maintenance

7.1. GENERAL CONSIDERATIONS

This pump, just like any other machine, requires maintenance. The instructions contained in this manual cover the identification and replacement of spare parts. The instructions are aimed at maintenance personnel and those responsible for the supply of spare parts.



Carefully read Chapter 8. *Technical Specifications*.

All replaced material should be duly disposed of/recycled according to the directives in force in each area.



ALWAYS disconnect the pump before beginning any maintenance work.

7.1.1. Check the mechanical seal

Periodically check that there are no leaks around the shaft. If leakage is detected through the mechanical seal, replace it following the instructions in the section Assembly and Disassembly.

7.1.2. Oiling

The bearings are oiled by immersion in an oil bath.

The pumps are supplied with oil.

- Regularly check the oil level, for example, weekly or every 150 operating hours.
- The first oil change must be carried out after 150 hours of operation.
- Afterwards, it can be changed every 2500 operating hours or at least once a year when operating under normal conditions.

When change the oil: the oil sump must be filled up to the level in the middle of the peephole.



Do not pour too much oil into the sump.

Leave the pump switched off for a while and then re-check the oil level; if necessary, add a little oil.

Oils for environment temperatures of 5 to 50°C: SAE 90 or ISO VG 220

PUMP SIZE	Quantity of oil in the gear case (l.)
TLS 1	0,7
TLS 2	1
TLS 3	2

7.2. STORAGE

Before storing the pump it should be completely drained. Prevent as far as possible exposing the parts to excessively humid environments.

7.3. CLEANING



The use of aggressive cleaning products such as caustic soda and nitric acid may burn the skin.

Use rubber gloves during the cleaning process.



Always use protective goggles.

7.3.1. CIP (Clean-in-Place) cleaning

If the pump is installed in a system with a CIP process, its removal will not be required. If an automatic cleaning process is not available, disassemble the pump as indicated in the section [Assembly and Disassembly](#).

Cleaning solutions for CIP processes.

Only use clear water (chlorine-free) to mix with the cleaning agents:

a) Alkaline solution: 1% by weight of caustic soda (NaOH) at 70°C (150°F)

1 kg NaOH + 100 litres of water = cleaning solution

or

2.2 litres of 33% NaOH + 100 litres of water = cleaning solution

b) Acid solution: 0.5% by weight of nitric acid (HNO₃) at 70°C (150°F)

0.7 litres of 53% HNO₃ + 100 litres of water = cleaning solution



Check the concentration of the cleaning solutions; incorrect concentrations may lead to deterioration of the pump seals.

To remove any traces of cleaning products, ALWAYS perform a final rinse with clean water at the end of the cleaning process.

7.3.2. SIP (Sterilization-in-Place) cleaning

Sterilization with steam is applied to all equipment including the pump.



Do NOT use the equipment during the steam sterilization process.

The parts/materials will not be damaged if the indications specified in this manual are observed.

Make sure that no cold liquid enters the system until the temperature of the pump is lower than 60°C (140°F).

The pump generates an important pressure loss through the sterilization process. We recommend the use of a branch circuit with a discharge valve to ensure that steam / superheated water sterilizes the integrity of the circuit.

Maximum conditions during the SIP process with steam or overheated water

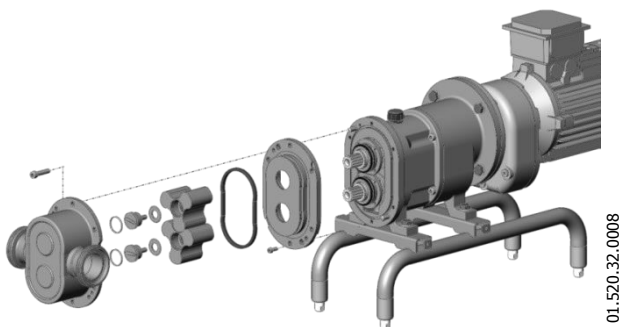
- a) **Max. temperature:** 140°C / 284°F
- b) **Max. time:** 30 min.
- c) **Cooling:** Sterile air or inert gas
- d) **Materials:** EPDM
FPM

7.4. ASSEMBLY / DISASSEMBLY OF THE PUMP

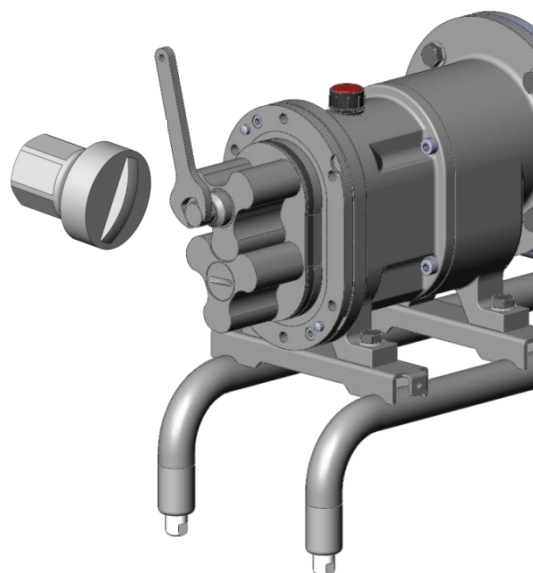
7.4.1. Pump casing, lobes and seal cover.

⇒ Disassembly

1. Remove the allen screws (51) and disassemble the pump casing (01).
2. Remove the lobe screws (25) using a wrench that could deliver by Inoxpa. These screws are threaded to the right. Wooden or nylon blocks can be placed between the lobes to stop them from rotation (blocks position: one to the left in front of the top lobe screw and the other to the right in front of the lower lobe screw).
3. Check that the O-ring (80) is still in good condition.
4. Loosen the Allen screws (51E) that attach the pump cover (09) to the support. There are two notches to loosen the pump cover, for example, using a screwdriver. Two pins (56) are used to centre the cover.
5. Press the notches so that the both lobes (02) and the pump cover are loosened. If necessary, use a suitable tool.
6. When the Allen screws (51E) have been removed, the lobes and the pump cover can also be taken apart. The rotating part of the mechanical seal (08) remains situated in the shaft sleeve (13).



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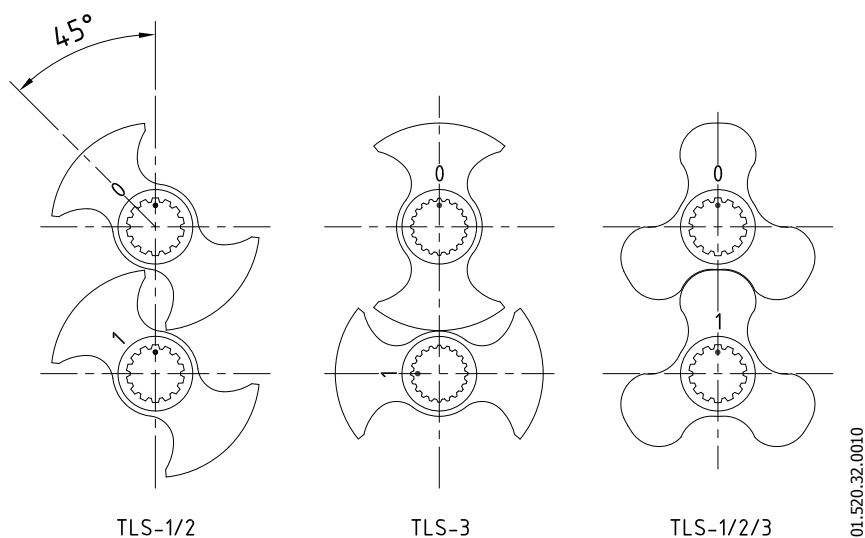


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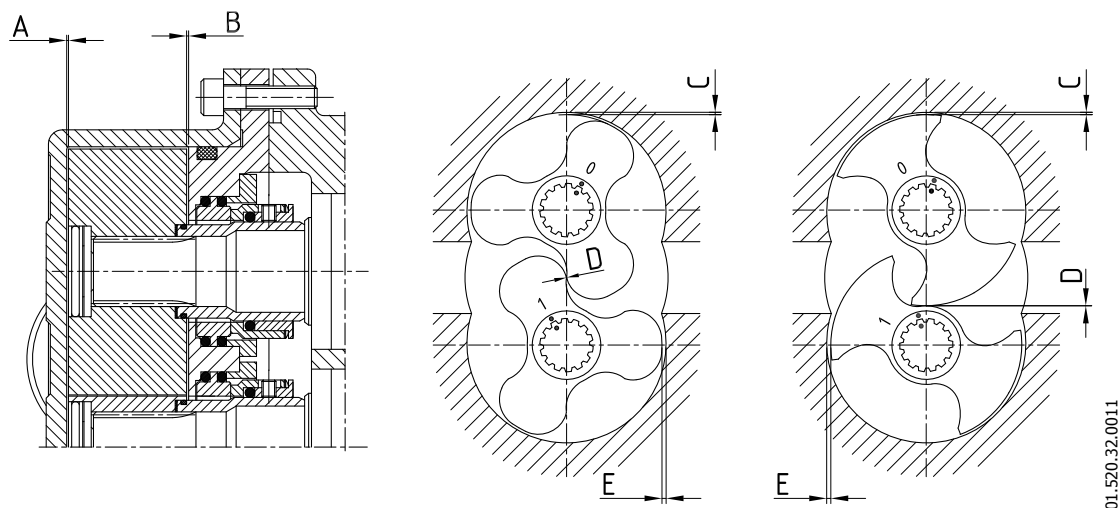
⇐ Assembly

1. Fit the seal cover (09) in the support (06). During the assembly of the seal cover observe the position of the centering pins (56).
2. Tighten the allen screws (51E).
3. Slide the lobes onto the shafts as far as the shaft sleeve. Observe the markings (0 - 1 and ●) from the figure shown below.
4. Rotate the driving shaft a few times and make sure that the lobes do not touch each other. If necessary, refer to the section describing how to adjust the lobes.
5. Check that the O-rings (80) of the lobe screws (25) are still in a good condition and that they are correctly positioned in the groove.
6. Fit the lobes with the screws (25) and the washers (35). Tighten the screws with a wrench as shown in previous figure. A wooden or nylon block can be placed between the lobes to avoid that they rotate simultaneously.
7. Check that the front parts of both lobes are aligned.
8. Make sure that the clearance both behind and between the lobes is similar to that shown in the page.
9. Check to see that the o-ring (80A), located in the pump cover (09), is still in good condition.
10. Make sure that the o-ring is not inverted when is inserted.
11. Once the pump casing is assembled, the allen screws (51) must be tightened (crosswise).

7.4.1.1 Markings and lobes positions



7.4.1.2 TLS pump clearances and tolerances.



(mm)	A	B	C	D	E
TLS 1-25	0,15 ±0,05	0,1 ±0,05	0,15 ±0,05	0,15 ±0,05	0,35 ±0,05
TLS 1-40	0,15 ±0,05	0,1 ±0,05	0,2 ±0,05	0,15 ±0,05	0,4 ±0,05
TLS 2-40	0,2 ±0,05	0,15 ±0,05	0,15 ±0,05	0,15 ±0,05	0,35 ±0,05
TLS 2-50	0,2 ±0,05	0,15 ±0,05	0,2 ±0,05	0,15 ±0,05	0,4 ±0,05
TLS 3-50	0,25 ±0,05	0,2 ±0,05	0,2 ±0,05	0,2 ±0,05	0,4 ±0,1
TLS 3-80	0,3 ±0,05	0,2 ±0,05	0,3 ±0,05	0,2 ±0,05	0,5 ±0,1

A = axial clearance between the lobe and the pump cover.

B = radial clearance between the lobe and back side pump casing.

C = radial clearance between lobe and the pump casing top and bottom

D = radial clearance between lobes

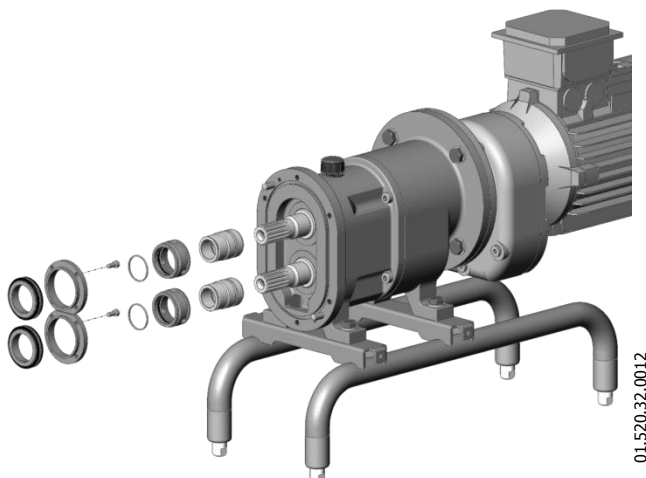
E = radial clearance between lobe and pump casing at inlet and outlet

Dimensions in mm.

7.4.2. Mechanical seal, shaft sleeve and seal covers

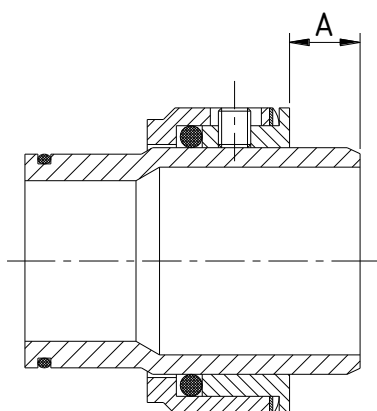
⇒ Disassembly

1. One time the pump cover (09) has been disassembled, as indicated in the foregoing section, take out the seal cover (09A) - the stationary part of the mechanical seal (08A) comes out of the pump cover -. Measures have been taken to avoid that this face could rotate simultaneously with the shaft.
2. Loosen the screws (50B -support 1-, 51F -support 2 and 3-) that attach the seal cover (09A) to the pump cover (09). Take the stationary part of the mechanical seal (08A) out.
3. Check that the rubbing face and the O-rings are in good condition.
4. The rotating part of the seal (08) remains in the shaft sleeve (13).
5. Dismantle the shaft sleeve (13). If this sleeve is stuck to the shaft, a screwdriver, for example, can be introduced in between the sleeve and the shaft.



⇐ Assembly

1. Check that the sealing surface of the rotary face, the O-ring and the shaft sleeve are still in good condition.
2. The rotating part of the mechanical seal (08) has to be fitted first on to the shaft sleeve. Use soapy water to best assembly.
3. If the adjustment ring in the rotating part of the mechanical seal is dismantled, it must be readjusted when the seal and sleeve are assembled, and placed at the end of the sleeve and positioned between the shaft's two dragging pivots; see the next figure and table. Then, the rotating part of the mechanical seal (08) with the O-ring and the spring can also be mounted.
4. Slide the sleeves on to the shafts.
5. Fit the O-rings (80D) onto the shaft sleeves.
6. Position the stationary part (08A) of the mechanical seal in its location in the seal cover.
7. Fit the seal cover (09A) in the pump cover (09) and tighten the screws (50B) on the support 1 or the screws (51F) on the supports 2 and 3.



Model	A
TLS 1	8
TLS 2	4
TLS 3	4,8

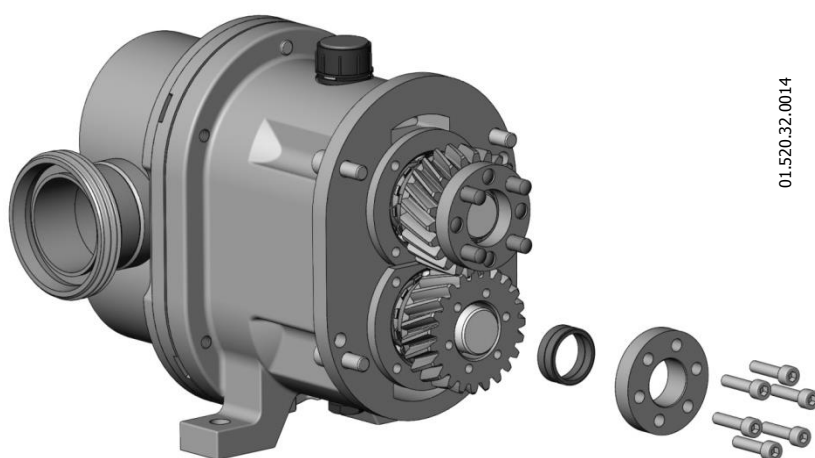
ATTENTION! When installing the new seal, use soapy water when fitting the different parts and gaskets to allow them to slide better; apply to the stationary as well as the rotating parts.

7.4.3. Changing the lip seal.

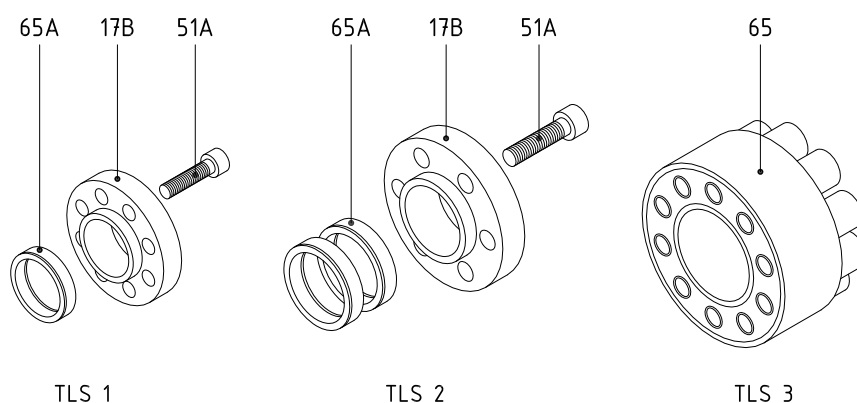
1. Disassembly the seal cover (09), see the disassembly of the cover.
2. Now the lip seal is visible in the seal cover.
3. Check if the lip seal element (08C) is in good condition. If necessary, the lip seal element can be replaced after the lip seal cover (09B) has been removed.
4. Check if the shaft sleeve (13A) is in good condition. To disassembly the shaft sleeve see the mechanical seal and shaft sleeve instructions.
5. Slightly grease the shaft sleeves local to the lip seal element before assembly of the lip seal cover.

7.4.4. Adjusting the lobes

To adjust the lobes, the lantern unit and the geared motor must be removed from the support. For this purpose, the housing, the lobes, the pump cover and the seals must be disassembled first, as indicated in the relevant section.



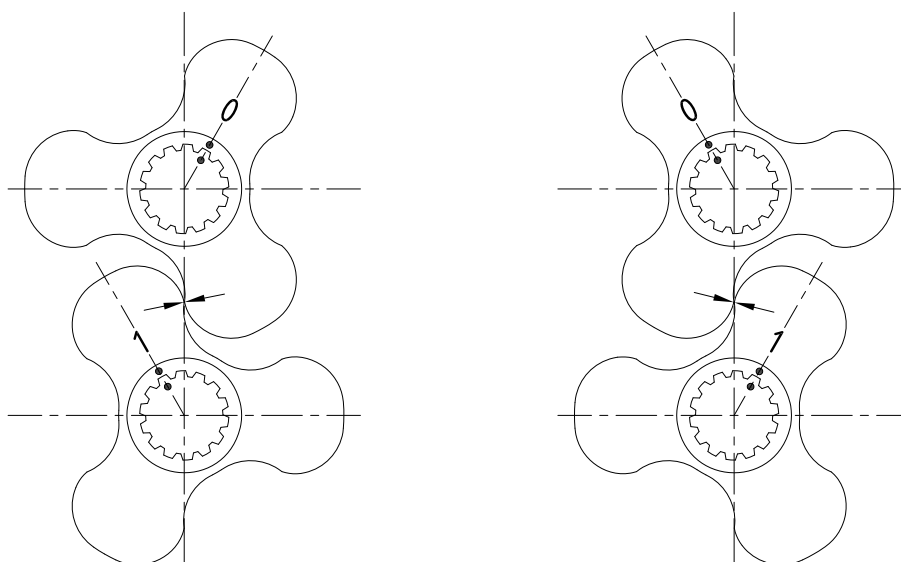
1. Empty the oil from the support, remove the oil plug (85) and the bleed-emptying plug (87).
2. Remove the allen screws (51B) which have been used to attach the lantern (04) in the support (06). These screws are centred respectively by means of two centring pins (56A).
3. Gently tap the lantern with a plastic hammer. When the lantern is slightly loosened from the support, make sure the seal (18B) does not stick to both sides. If necessary, loosen the seal.
4. Loosen the take up screws of the adjustable fastening mechanism for the driven gear (19A), see the next figure. In theory, the take up unit is self-releasing. It is now possible to rotate the driving shaft, whilst the driven shaft can be held stationary.



TLS 1 y 2: the adjustable fastening system is made up of three parts: allen screws (51A), conical tightening rings (65A) and dragging bushing (17B).

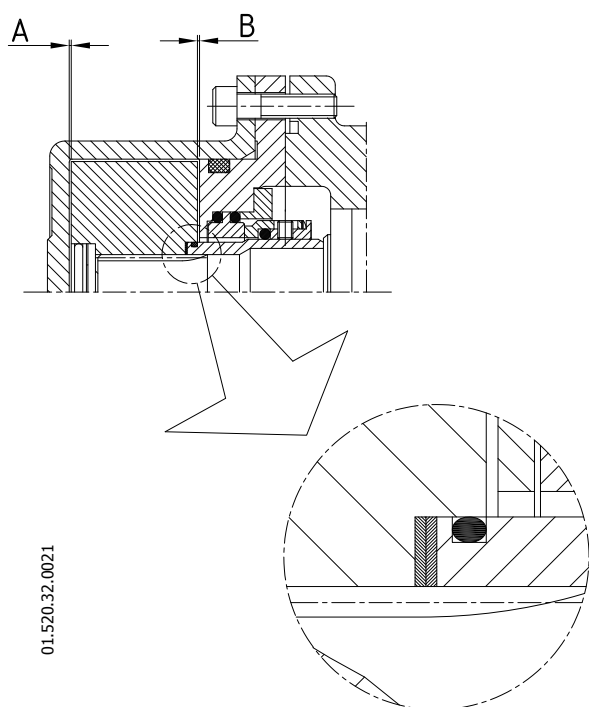
TLS 3: the adjustable fastening system consists in one single part (65).

5. Slide the lobes onto the shafts as shown in the figure from 7.4.1.1. Press the lobes against the shaft sleeve.
6. Now rotate the lobes to the position indicated from the next figure. Then, rotate a little the both lobes one reference the other, until the clearance (throw) has been to indicate in table from 7.4.1.2.
7. Tighten a few of the adjustable fastening mechanism take up screws by hand.
8. Now rotate the top lobe 60° to the left; see the next figure. Make sure that the clearance in this position is the same as that between the lobes in the position shown in the previous figure.
9. If not so, these clearances should equal rotating a little a lobe and stopping the other.
10. Tighten the adjustable fastening mechanism take up screws crosswise in 2 or 3 passes and with the established tightening torque.
11. When tightening the adjustable fastening mechanism screws, take care to avoid that the gears rotate with regard to each other. This can be prevented by placing a wooden wedge between the gears.
12. Re-check the mutual clearance between the lobes and rotate the driving shaft a few times to make sure that the lobes do not rub together at all.
13. Check that the seal (18B) for the lantern has not been damaged and stick it with a little grease in the correct position against the lantern flange.
14. Fit the lantern unit and the drive in the support, and on doing so, take care of the centring pins (56A).
15. Fit the Allen screws (51B).
16. Fill the oil sump with the recommended oil type; see oiling instructions.



01.520.32.0016

7.4.5. Adjusting lobe-pump casing with shims.



01.520.32.0021

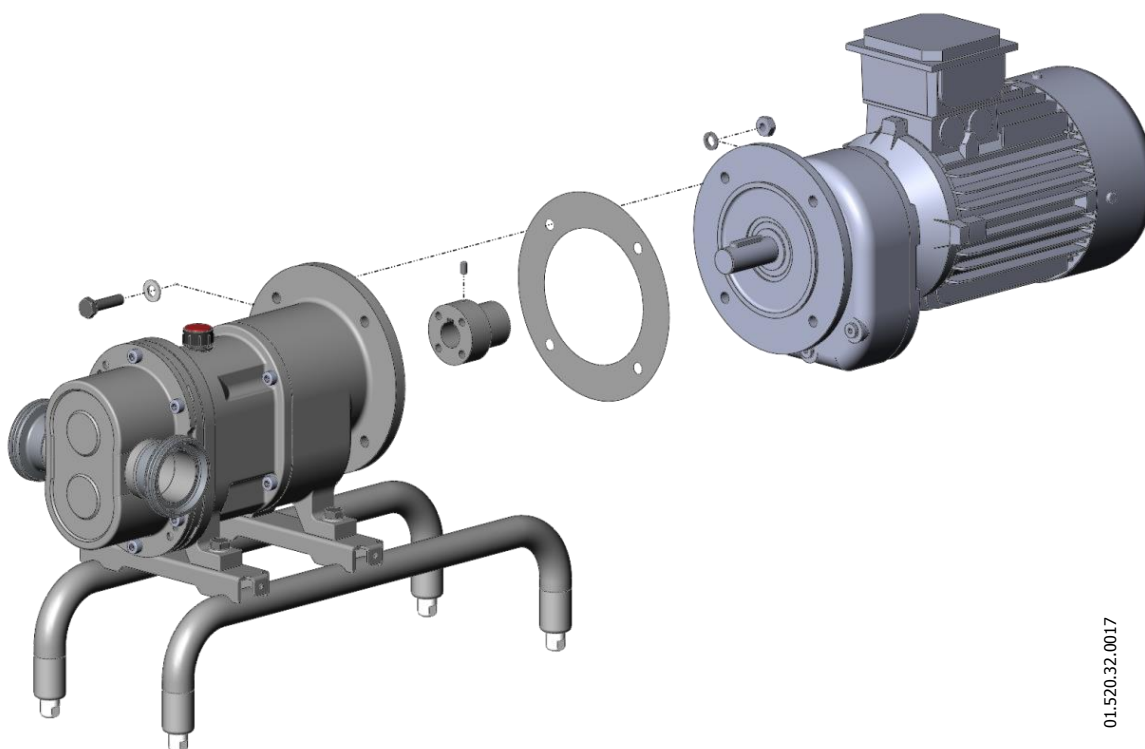
1. This is the last adjustment to be done. The pump must be previously synchronized (adjust the lobes between them).
2. In order to have the correct adjustment between the pump casing (01) and the lobes (02), should we add in front of the shaft sleeve (13) an adjusting shims to obtain the correct clearance B (see section 7.4.1.2).
3. There are 3 different shims available of: 0,1, 0,15 and 0,2 mm.
4. Assemble the lobes (02) and adjust the screws (25) according the section 7.4.4 [Adjusting the lobes](#).

7.4.6. Changing the lip seals.

1. In order to change the lip seals (88), the pump casing, the lobes and seal cover have to be disassembled first. See the corresponding section in the manual, and bleed the oil sump.
2. Lubricate the shafts in the relevant lip seal position.
3. Fill the oil sump once the lip seals have been changed.

7.4.7. Changing the drive.

1. Empty the oil from the oil sump, remove the oil plug (85) and the bleeding-emptying plug.
2. Remove the allen screws (51B) which have been used to attach the lantern (04) on the support (06). These screws are centred respectively by means of two centring pins (56A).
3. Gently tap the lantern with a plastic hammer. When the lantern is slightly loosened from the support, make sure the seal (18B) does not stick to both sides. If necessary, loosen the seal.
4. Remove the screws (51B/51A) that join the lantern to the drive (93).
5. Gently tap the lantern with a plastic hammer. When the lantern is slightly loosened from the drive, make sure the seal (18C) does not stick to both sides. If necessary, loosen the seal.
6. Loosen the studs (55) and dismantle the coupling (41) from the shaft.
7. Check if the flexor (40) is in good condition.
8. Change the drive.
9. Once the drive is fitted, fill the oil sump with the oil type recommended in the oiling instructions.



01.520.32.0017

8. Technical Specifications

8.1. TECHNICAL SPECIFICATIONS

Maximum operating pressure	1200 kPa (12 bar)	174 PSI
Temperature range (1)	-10 to 120 °C (EPDM)	14°F a 248°F
Noise level (2)	61 to 80 dB (A)	
Maximum viscosity	100.000 mPa.s	

Materials

Parts in contact with the product	AISI 316L (1.4404)
Other steel parts	AISI 304L (1.4306)
Gaskets in contact with the product	EPDM (standard) FPM (other materials available upon request)
Other gaskets	NBR
Exterior surface finish	Brilliant
Interior surface finish	Polished Ra<0,8 µm

Mechanical seal

Type	Single mechanical seal and balanced
Material of rotating part	Silicon carbide (SiC) (standard)
Material stationary part	Graphite (C) (standard) Silicon carbide (SiC)
Gasket material	EPDM (standard) FPM

- (1) Maximum temperature for continuous application due to EPDM gaskets and standard lobe rotor clearances. Consult for higher temperatures.
- (2) The maximum viscosity allowed will depend on the nature of the liquid and the sliding speed of the seal faces. Consult INOXPA should the viscosity be still greater.



Use special protection when the noise level in the operation area exceeds 85 dB(A).

	DN	Maximum speed [min ⁻¹]	Maximum pressure [bar]	Volume per revolution [l/rev.]
TLS 1-25	25 1"	950	12	0,10
TLS 1-40	40	950	7	0,14
TLS 2-40	1½"	950	12	0,23
TLS 2-50	50	950	7	0,30
TLS 3-50	2"	720	12	0,68
TLS 3-80	80 3"	720	7	0,95

8.2. SIZE OF THE PARTICLES



WARNING! Only soft particles.

< 10 % damage when using trilobe geometry.

< 2 % damage when using wing lobe geometry.

Pump size	Internal diameter connection [mm]	Maximum theoretical sphere frame [mm]	Recommended maximum theoretical sphere frame [mm]
TLS 1-25	26	20,6	7
TLS 1-40	38	20,6	7
TLS 2-40	38	25,6	9
TLS 2-50	50	25,6	9
TLS 3-50	50	38,5	13
TLS 3-80	81	38,5	13

8.3. TIGHTENING TORQUES

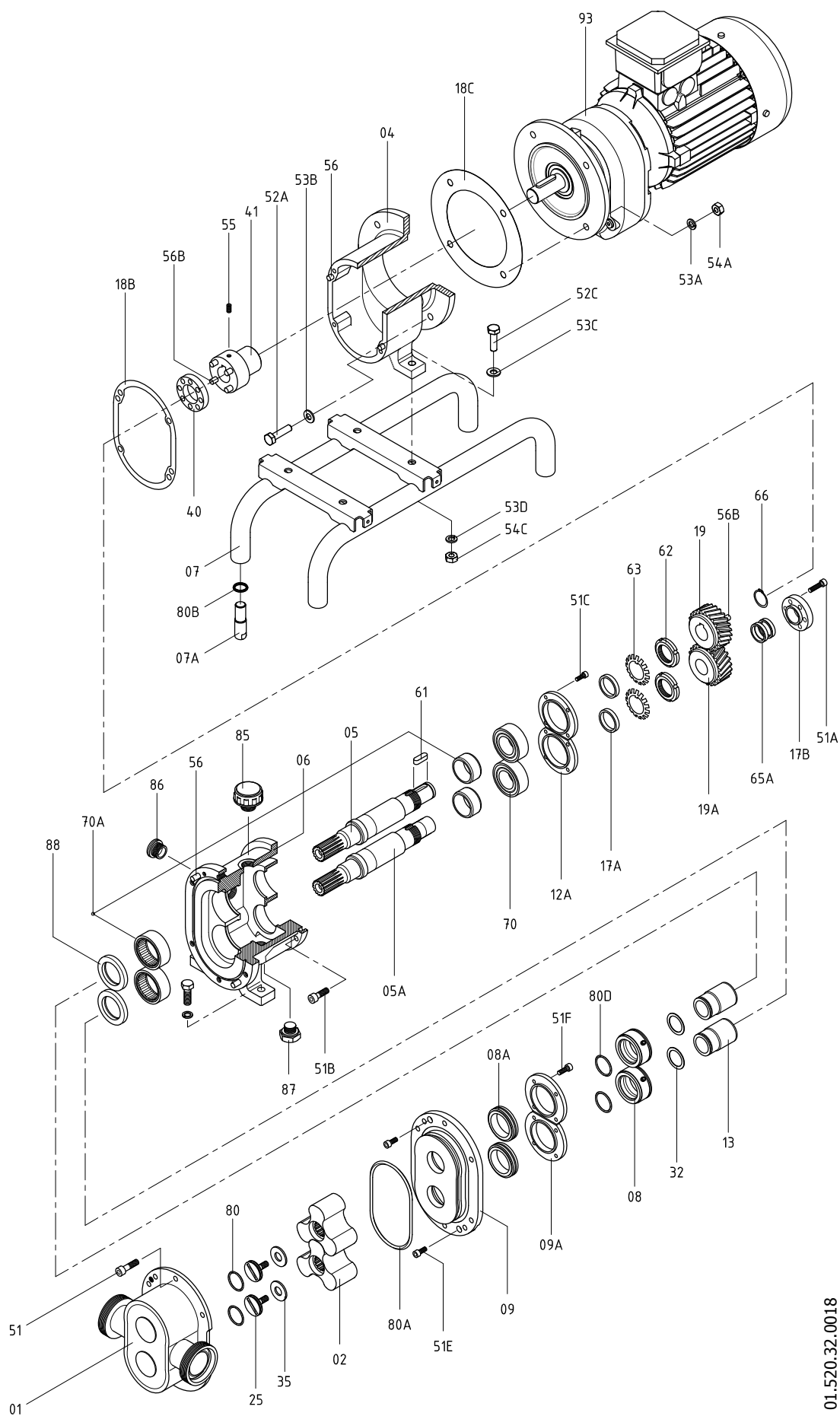
If not stated otherwise, the torques listed in the following table should be applied on the nuts and bolts of this pump.

Size	Nm	lbf·ft
M6	10	7
M8	21	16
M10	42	31
M12	74	55
M16	112	83

8.4. WEIGHTS

Size	kW	Kg.
TLS 1-25	0,55	36
	0,75	39
TLS 1-40	0,75	40
	1,1	44
TLS 2-40	1,1	59
	1,5	63
TLS 2-50	1,5	64
	2,2	74
TLS 3-50	2,2 / 3	121
	4	126
	5,5	156
TLS 3-80	3	124
	4	130
	5,5	159
	7,5	166

8.5. CROSS SECTION TLS

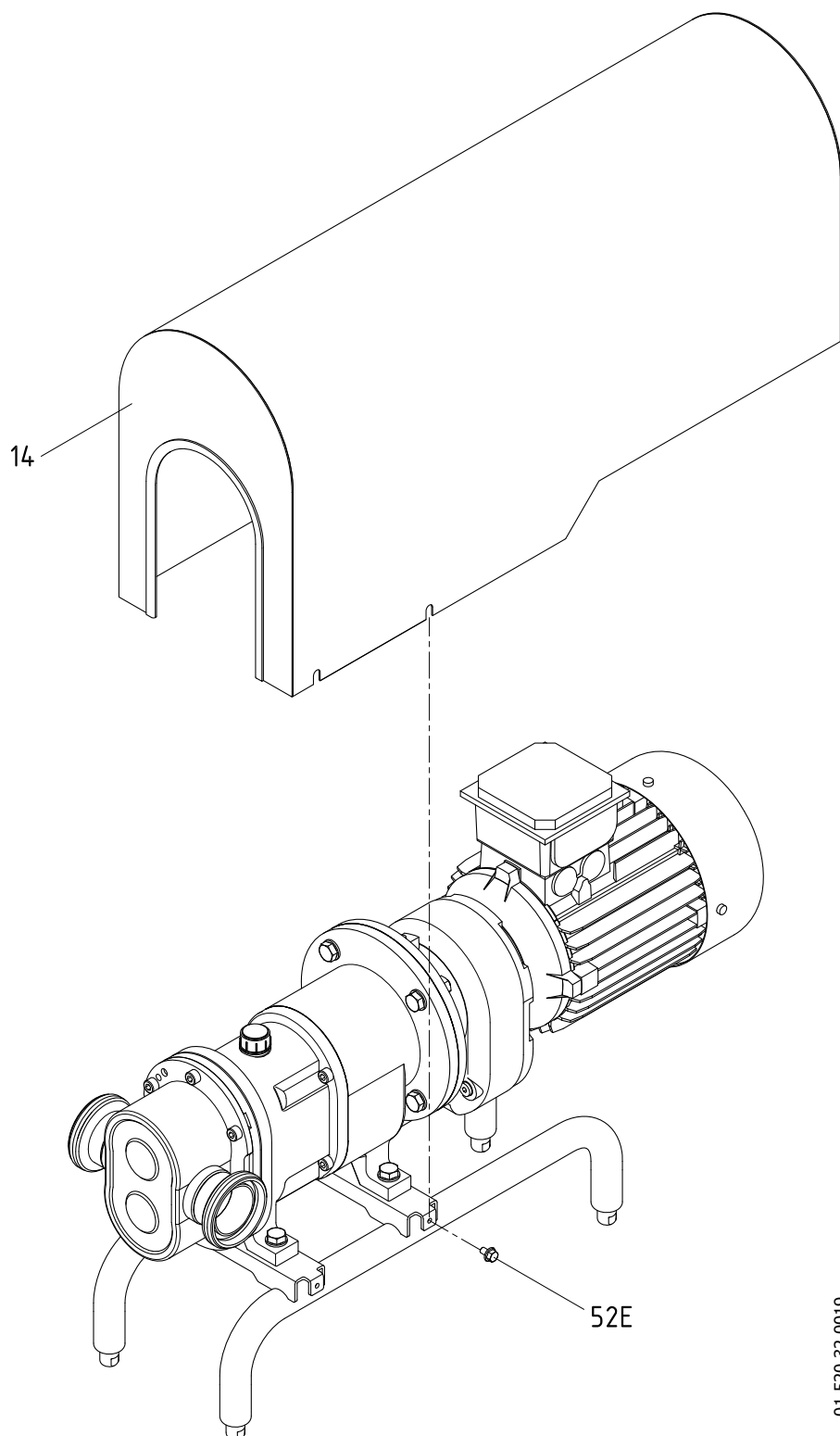


01.520.32.0018

8.6. TLS PARTS LIST

Position	Description	Quantity			Material
		TLS 1	TLS 2	TLS 3	
01	Pump casing		1		AISI 316L
02	Trilobe		2		AISI 316L
04	Lantern		1		GG-25
05	Drive shaft		1		AISI 316L
05A	Driven shaft		1		AISI 316L
06	Support		1		GG-25
07	Leg pump		1		AISI 304
07A	Adjustable leg		4		AISI 304
08	Mechanical seal -rotating part-		2		-
08A	Mechanical seal -stationary part-		2		-
09	Pump cover		1		AISI 316L
09A	Seal cover		2		AISI 304
12A	Bearing stop flange		2		GG-25
13	Shaft sleeve		2		AISI 316L
17A	Driven shaft bushing		2		ST-52
17B	Dragging bushing	1	1	-	F-114
18B	Support joint		1		Klingerit
18C	Lantern joint		1		Klingerit
19	Drive shaft gear		1		F-154
19A	Driven shaft gear		1		F-154
25	Lobe screw		2		AISI 316L
32	Shim		2		AISI 316L
35	Lobe washer		2		AISI 316L
40	Flector		1		Poliamide
41	Coupling		1		F-114
50B	Allen screw	8	-	-	
51	Allen screw		6		A2
51A	Allen screw	8	6	-	8.8
51B	Allen screw	4	8	6	8.8
51C	Allen screw		8		8.8
51E	Allen screw		2		A2
51F	Allen screw	-	8	8	A2
52A	Hexagonal screw		4		A2
52D	Hexagonal screw		4		A2
53A	Flat washer		4		A2
53B	Spring washer		4		A2
53C	Spring washer		4		A2
53D	Flat washer		4		A2
54A	Hexagonal nut		4		A2
54C	Hexagonal nut		4		A2
55	Stud		1		8.8
56	Pin		2		A2
56A	Pin		2		Steel
56B	Pin	6	8	8	Steel
61	Key		1		Steel
62	Safety nut		2		Steel
63	Safety washer		2		Steel
65A	Conical tightening ring		1		Steel
66	Elastic ring		1		Steel
70	Ball bearings		2		Steel
70A	Needle bearings		2		Steel
80	O-ring		2		EPDM
80A	Joint		1		EPDM
80B	O-ring		4		NBR
80D	O-ring		2		EPDM
85	Oil plug		1		Plastic
86	Peephole		1		Plastic
87	Bleeder		1		Plastic
88	Lip seal		1		NBR
93	Drive		1		-

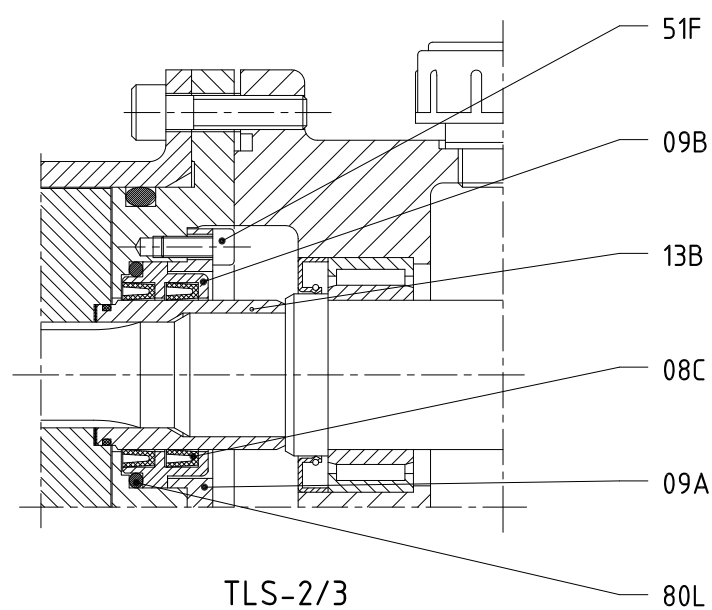
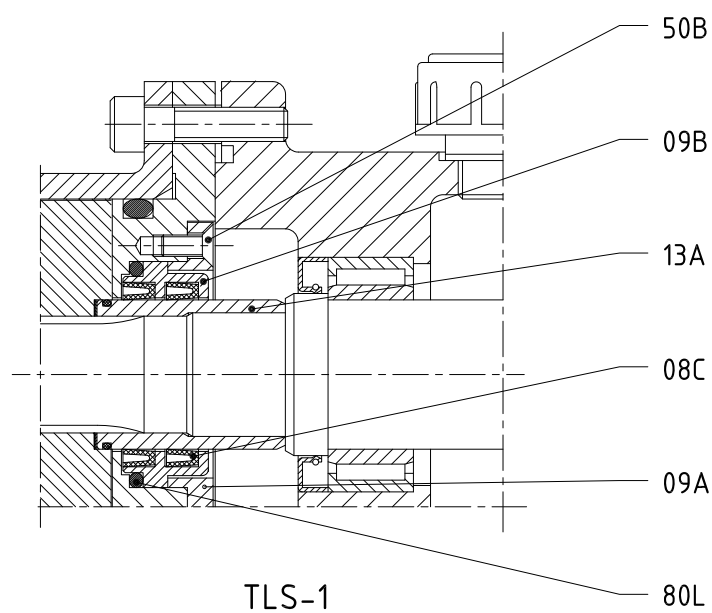
8.7. TLS B5 SHROUD



01.520.32.0019

Position	Description	Quantity	Material
14	Shroud with joint	1	AISI 304
52E	Hexagonal flange screw	4	A2

8.8. LIP SEAL



01.520.32.0020

Position	Description	Quantity			Material
		TLS 1	TLS 2	TLS 3	
08C	Lip seal	4			FPM
09A	Seal cover	2			AISI 316L
09B	Lip seal cover	2			AISI 316L
13A	Shaft sleeve	1	-		AISI 316L
13B	Shaft sleeve	-	1		AISI 316L
50B	Countersink screw	8	-		A2
51F	Allen screw	-	8		A2
80L	O-ring	2			EPDM

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