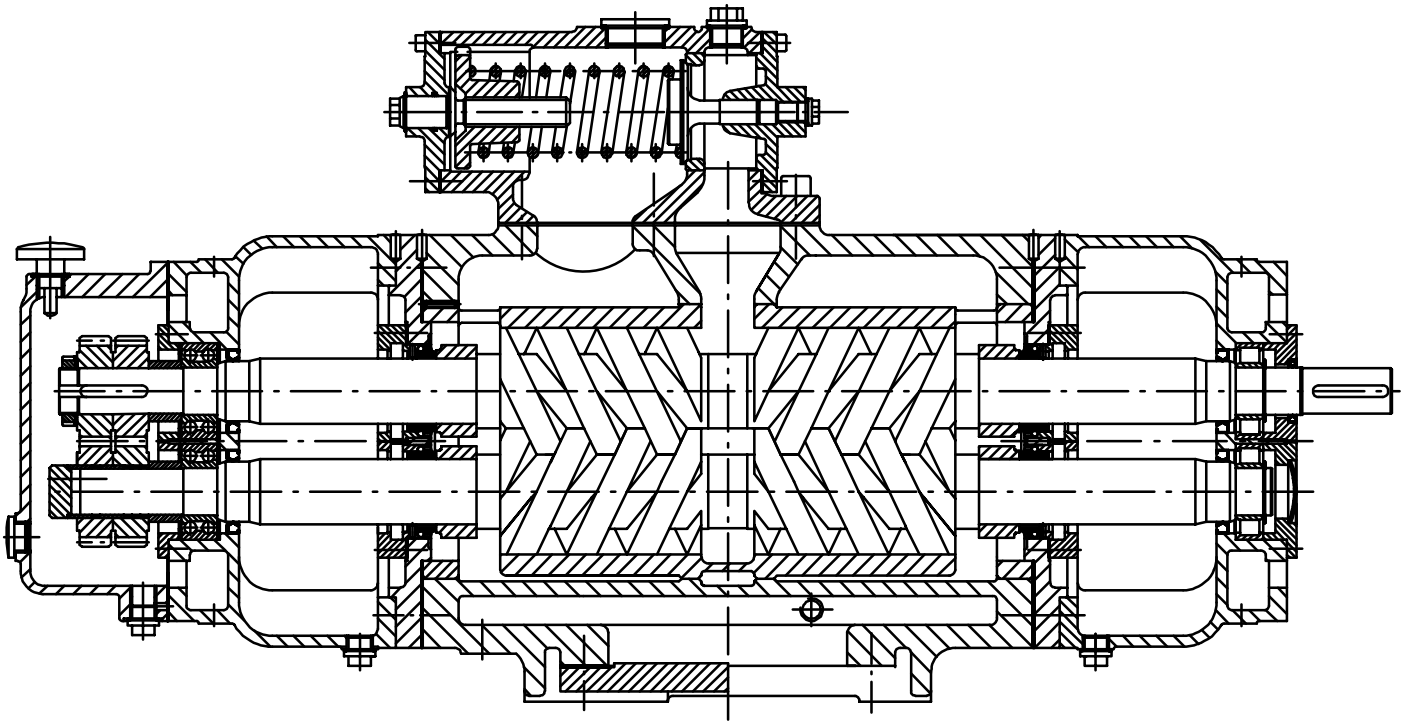
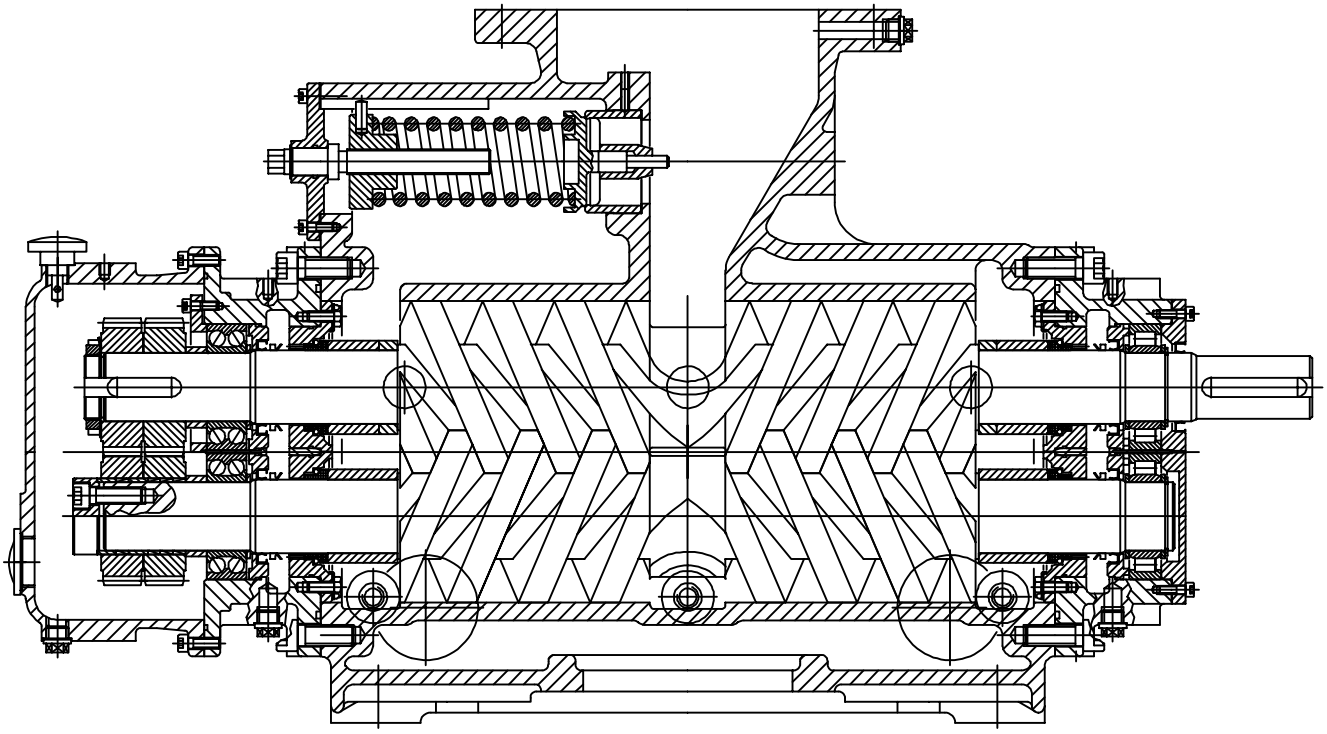
Instruction Manual
Installation, Operation, Maintenance
Screw Pump Series L 4 N G and L 4 N O
Type A (bearings arranged externally)





Contents

1. General Information

1.1. Application

This screw pump is used to deliver non–lubricating media or media that lubricate in a different way, for a pressure range of up to 20 bar.

1.2. Product Information

1.2.1. Manual Application

This document was produced for the series L4NG and L4NO – Type A screw pump (bearings arranged externally).
For other designs, the respective regulations are applicable: should these not be available by the user, they should be ordered separately from the manufacturer.

1.2.2. Manufacturer

The manufacturer of the screw pump Type L 4 N G and L 4 N O is;

LEISTRITZ AG

residing in the

Federal Republic of Germany
90459 Nuremberg, Markgrafenstrasse 29 – 39
or **90014 Nuremberg, Postfach 30 41**

DIN–Parts, accessories and other additional parts are purchased from subcontractors.

1.2.3. Designation, Types and Sizes

Description: 4–spindle, double–flow screw pump
Type: L4NG Type A
Sizes: 48, 62, 82, 96, 106, 126, 140, 164, 186 and 240

or

Type: L4NO Type A
Sizes: 164, 212 and 240

For further details see specifications key.

1.2.4. Serial Number and Type Designation

Each unit is supplied with a Standard–Designating Plate that shows the Manufacturer, Serial Number of the Unit and Type Key.Designating Type Plates containing more information should be separately ordered.

1.2.5. Date of Issue of this Manual

Issued 20th. April 1995.
We reserve the right to make technical and design changes and improvements without prior notice.

1.2.6. Modification Notes and Documentation Numbers

All modifications are listed on the final page of this manual.
The Type of Modification, Appropriate Chapter and Paragraph, Date, Executor and Assayer are monitored.
Manual Number E 185 5190 / e includes references to further documents and drawings.

1.2.7. Copyrights

All manuals, documents and drawings are copyrighted acc. to DIN 34.

1.2.8. Technical Documentation and Data Sheet

For detailed information see the following chapters:

1.2.9. After Sales Service

If an After Sales Service or consultation becomes necessary, please contact our headquarters or one of our sales organisations.

1.2.10. Quality Assurance and Quality Control

A complex quality assurance system guarantees the high quality standard levels of Leistritz screw pumps. A quality assurance acc. to DIN ISO 9001 covers all planned and systematic production steps that are necessary in order to fulfill all the predetermined quality demands. Quality assurance measures, their extent, type of tests and documentation, including the appropriate Standards and Regulations, shall be prepared, in writing, by the purchaser. Prior to shipment, all pumps undergo exhaustive run–in tests and they are also subjected to power performance tests. Only pumps that have passed the appropriate tests and that meet the accepted performance characteristics will be shipped. Compliance with this Operating Manual will assure a trouble–free operation and full flow performance. The monitored test bench data are in accordance with the General Test Recommendations for Rotary Positive Displacement Pumps acc. to VDMA 24284. Test certificates containing test results are documented in test protocols acc. to DIN 50049,3.1 B.

1.2.11. Warranty

Our liability covering the defects of shipped goods is outlined in our **Delivery and Payment Conditions**, which are an integral part of our Sales Terms and Conditions.
No responsibility will be accepted for damages that may occur as a result of non–compliance to the Operating Instructions and Application Conditions. If at a later date, application conditions change, (e.g. other media, viscosity, temperature, speed or inlet flow conditions), the the conditions shall be reviewed and acknowledged by Messrs. LEISTRITZ. If no other agreements have been signed by Messrs. LEISTRITZ, then the delivered pumps shall only be dismantled and/or modified during the total period covered by the warranty by Messrs. LEISTRITZ or a qualified LEISTRITZ service representative, otherwise the warranty for resulting damage will be null and void.

2. Safety

2.1. General Regulations

This Operating Manual contains the most important regulations that shall be observed during installation, operation and maintenance. For this reason, this Operating Manual shall be read before installation and operation occures by both the erector and the responsible specialist/ user. It shall be made available on–site for reference at some later date.

2.2. Dangers of non–compliance with Safety Advice Information

Ignoring the Safety Advice Information, may possibly endanger persons, the environment and/or the pump unit. A non– compliance, can for example cause the following dangers to occur:

– Failure of important unit functions,
– failure of predetermined methods for service and maintenance,
– endanger persons due to electrical, mechanical and/or chemical influences,
– endanger the environment due to leakage of harmful substances and pollutants,
– and other causes.

2.3. Safety Concious Handling

The Safety Advice Information as listed in this Operating Manual, the appropriate valid Accident Prevention Regulations (APR) and also all Internal Working and Factory Safety Regulations of the User shall be adhered to at all times.

2.4. Warning and Advice Signs

In this Operating Manual, safety symbols are illustrated that can assist in preventing accidents to persons, with the general danger symbol:

as warning for electrical voltages with:

For safety advice, which when not adhered to will cause damage or malfunction of the unit are characterised by the word

Attention

In addition to this, information signs are marked directly on the unit. These shall be adhered to at all times:

– Direction of rotation and media flow arrows
– Designation of media connections
– Designation of filling and draining ports
– ”No dry running”
– and others.

2.5. Safety Advice Applicable for the Operator

– Hot and cold machine parts are potential hazards and shall be protected against access.
– Protection guards, which protect moving parts (e.g. couplings) shall not be removed from the unit during operation.
– Leakage of hazardous media (e.g. from seals) shall be drained to a safe area so that operating persons and the environment are not endangered.
– All legal requirements shall be adhered to.

2.6. Safety Advice Applicable for Service, Inspection and installation

All service, inspection and installation work shall be carried out by authorized personal who have studied this manual thoroughly. Without exception, all work on the unit shall only be carried out when the unit is stationary. The shut–down regulations as described in this Operating Manual shall be explicitly followed.

Immediately after all servicing or inspection work has been completed, all safety and protection guards shall be refitted.
Before restarting, all points as described under 6.4. shall be followed.

2.7. Denial of Modifications or Alterations without Approval

Alterations and/or modifications to the unit that have not been approved by Messrs. Leistritz are inadmissible.

2.8. Inadmissible Operating Conditions

The operational safety of the delivered unit can only be assured when operated according to the appropriate instructions. Units shall not be operated under other operating conditions without the manufacturer s permission. The performance limiting data, as listed in the data sheets shall not be exceeded.

2.9. Other Operations and Safety Hazards

All packing materials for the pump, resp. the unit shall only be removed directly before installation is to be carried out. No foreign matter shall be permitted to enter the pump!
Accident hazards during installation and mounting shall be observed at all times. Thereby shall the stability be assured.

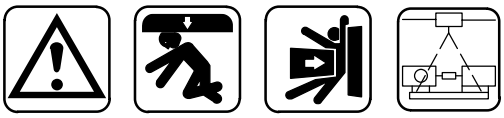
Parts to be assembled shall not be dropped, loose parts shall be supported by proper means.

The pump unit shall not be lifted or lowered via the power supply lines or other supply lines.
Connection of the mains power supply to the motor control unit shall be carried out by a qualified electrician acc. to the circuit diagram as supplied by the motor manufacturer.

Care shall be taken to ensure that the supply lines are of the correct dimension.
All hazards from the power supply shall be eliminated. VDE–Regulations and regulations of the local Electricity Board shall also be observed.

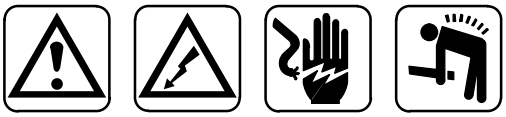
3. Transport and Intermediate Storage

3.1. Safety Measures



Due to the weight of screw pumps and complete pump units, it is essential that they should be lifted and transported to the installation site via hoists or cranes. During lifting and lowering, an exact equilibrium shall exist. Cranes and hoists shall be correctly dimensioned. Care shall be taken to ensure that the unit cannot topple over. Shelves and racks used to store pump units and spare parts shall be designed to accommodate the appropriate weights.

3.2. Transport Precautions



Care shall be taken to ensure that the pump units are not damaged during transport. Lifting by means of connecting boxes, power supply cables, etc. shall not be permitted. Furthermore, care shall be taken to ensure that the unit cannot slide or fall during transport. The packaging material shall not be damaged and all information as printed on the package shall be strictly adhered to.

3.3. Unpacking

The pump unit shall be immediately inspected on receipt for possible transport damage. Transport damage shall be immediately reported to the appropriate authority. Before installing the pump unit, all packing material shall be completely removed. All uncovered openings of the pump unit, e.g. inspection hole in the coupling housing, shall be inspected for loose parts, e.g. nails, screws, splinters, metal clips etc. Such articles shall be removed. End covers, blind plugs, etc. shall also be removed.

3.4. Intermediate Storage

The screw pump units, as delivered, contain sufficient conservating media acc. to the expected storage time as specified by the user. During longer stut–down periods, the pump units shall be protected from corrosion via an internal/external conservation as described in Par. 3.5.

3.5. Conservation

The time limitation of the preserving material is dependent on the composition of the material. Therefore preserving materials should be used which will be stable for at least 12 months. The following materials can be used for an inside and outside preservation.

Conservation points:	Conservating media:
All machined and non–painted surfaces e.g. shaft ends, flange covers	TECTYL 506 or a compound TECTYL 506 and TECTYL 511–M (*)
Internal surface of the pump housing, rotor package and end covers	compound consisting of TECTYL 506 and TECTYL 511–M (*)

— (*) Supplier: VALVOLINE OEL GmbH & Co. —

The preservative agent shall be spread by means of brushing or spraying.

The listed conservating media shall be considered as recommended media. Other conservating media supplied by other manufacturers may also be used. The conservating media in the inner of the pump are to be forced out by filling up. Slowly turn the drive spindle in the opposite direction to the normal direction of rotation during the filling process. Filling is to be done until the conservating media come out of the inlet and without bubbles.

3.5.1. Life Durability of the Conservation

According to the information issued by the conservating media manufacturers, the shalf life of TECTYL 506 is 4 to 5 years for indoor storage and 12 to 24 months for outdoor storage; TECTYL 511–M approx. 18 months for indoor storage. For compounds consisting of 50/50% TECTYL 506 and TECTYL 511 M, a shelf life of 2 1/2 to 4 years for indoor storage and 12 months for outdoor storage when stored under a protective roof.

Additional packing will increase the shelf life accordingly. The effective substances contained in these conservating media offer an effective corrosion protection even under high humidity conditions (sea air and/or tropical humidity conditions).

They are also not effected by high temperatures.

3.5.2. Reconservation

Attention

When the pump units are to be stored for longer periods, the user shall ensure that the corrosion protection is checked from time to time and, if necessary, shall be renewed. No warranty will be accepted for damage caused by incorrect or faulty conservation.

3.5.3. Conservating Media Removal

Before the screw pump units are put into operation, the conservating media shall be removed. The internally applied conservating media can normally be removed by flushing the unit with the media that is to be transported providing that this does not contaminate it. An appropriate solvent may also be used to remove the internal and external conservating media.

Appropriate solvents being: petroleum, kerosene, benzine, diesel fuels, alcohol, industrial cleaning agents (alkalines), or any other wax solvents. High–temperature steam–cleaning machines with suitable additives can also be used.

Attention

The pump shall be immersed in the media to be transported at all times in order to prevent the spindles seizing up. Should the plant components, piping, tanks and other parts be covered with petroliferous conservating media, then the complete plant unit shall be cleaned of all conservating media. This is necessary because petrolium lowers the degassing capability of the media. This may cause rough pump running together with an excessive noise level (aeration).

3.6. Environmental Protection

When storing the screw pump units, the suction side of the pump shall be covered with an appropriate cover (plastic sheet,cardboard, etc.). The discharge side should be sealed via a flange cover. The storage place shall be dry and dust free. It is recommended, that during storage periods the pump should be manually rotated every 3 to 4 weeks in order to change the position of the internal components. An acceptable corrosion protection can only be guaranteed when the relevant precautions are carefully followed.

4. Pump Description

4.1. General Description

Leistritz screw pumps of the L4NG or L4NO series are self–priming, double–flow pumps and are used to deliver non–lubricating media or media that lubricate in a different way. The operating data and application limits for the current project are given in the specification sheet.

4.2. Construction and Operation

In principle, two screw spindles are necessary as delivery units in the L4NG screw pump. The standard double–threaded, double–flow driving spindle (Pos. 150) rotates hermetically sealed but without contact with a double–threaded, double–flow idler spindle (Pos. 151) in the spindle borings of the casing unit (Pos. 002 on L4NG or 001 on L4NO), which encloses the spindle set with little clearance. The casing unit (Pos. 002) divides the pump casing (Pos. 001) into two suction chambers and one pressure chamber. This is also valid for the pump serie L4NO.
Sealed areas are formed through the special shape, and their enclosed volumes are moved continuously by rotation in an axial direction from the inlet chambers into the delivery area (casing centre) without violent pressure or turbulence.
The driving and idler spindles are mounted in roller bearings on both sides, outside the pumping area, so that they do not come into contact with the pump media. Thus wear as a result of metallic contact between the casing and the spindles is avoided. Helical gear wheels (Pos. 160, 161, 162 and 163) allocated in pairs to the spindles are used for axial fixing of the idler spindle (Pos. 151) to the driving spindle (Pos. 150) and to relieve the load on the spindle flanks. The various directions of the gearing produce herringbone (double helical) gearing. The gear wheel pair of the driving spindle (Pos. 150) is attached with a feather key (Pos. 168) and a grooved nut with locking piece (Pos. 166, 167). The fastening of the gear wheels of the idler spindle (Pos. 151) is done with conical tensioning elements (Pos. 190). The helical gearing of the gear wheels allows the required flank clearance between the spindles to be set with the aid of the tensioning elements without any difficulty.
Due to the double–flow geometry and the identical diameters of the four seals, the hydraulic pressure is always equalized within the entire spindle package.
This constructive design and operation guarantees a low operating noise level and an almost pulsation–free media transportation.

4.3. Construction of the Components

4.3.1. Pump Casing

Fundamentally, the configuration of the pump casing (Pos. 001) depends on the various types of installation. The inlet and outlet connections can be produced in the desired direction of flow, such as in an in–line configuration with inlet and delivery flanges opposite each other, as well as with other flange positions. The casing is made of cast or welded blanks to suit the requirements.
The casing can be reinforced, according to the chosen configuration, either by using a stanchion or by adding a flange reinforcement in the operating area. In a vertical installation it is also usual to use a reinforcement with end–side pump columns (pedestals). In special cases all the surface parts, or individual ones, can be heated or cooled.
The configurations available for special cases can be found in the applicable drawings for the projects, such as the specification sheets, installation drawings or cross–section drawings.
The casing insert is mounted in the pump casing, and this is used for internal flow direction, separating the individual pumping chambers and forming the pumping unit together with the spindle set. The pump casing of the L4NO replaces the function of the casing insert and the pump casing. As is the case with every positive–displacement pump, this double–flow screw pump requires a pressure relief valve to protect against overloading. This valve can be installed externally, as an external valve in the piping system, or directly as an integrated component on the pump. The L4NO is designed with a pressure relief valve wich is integrated into the casing. The relevant configuration is to be fond from the specifications sheet or the applicable drawings.

The pressure relief valve only protects the pump against overloading and is not to be used as a pressure control valve. See Para: 4.3.9. concerning the method of operation and instructions for use of the pressure relief valve.
The pump casing can be completely emptied in any type of installation. For this reason pay attention to any openings that have not been closed off before start–up (Pos. 003, 004, 005, 006, 028, 029, 036, 037, 126, 127, 132, 133).

The direction of flow is marked with an arrow at the inlet and delivery connection. Always check the direction of flow before startup.

4.3.2. Spindle Pack

The driving spindle (Pos. 150) is double–threaded and double–flow, surface–treated according to the base material, and is fixed in a radial and axial direction by cylindrical roller bearings (Pos. 170) at the drive side end and by angular ball bearings (Pos. 171) at the non–drive side. The idler spindle (Pos. 151), which is likewise double–threaded and double–flow, surface–treated according to the base material, is arranged parallel to the driving spindle and fixed in a radial direction by cylindrical roller bearings (Pos. 170) at the drive side end and by angular ball bearings (Pos. 171) at the non–drive side. The drive for the idler spindle (Pos. 151) is taken from the gear wheels arranged in the direction of the arrow (Pos. 160, 161, 162 and 163). Setting of the required flank clearance between the spindles is done without difficulty by the conical clamping rings (Pos. 190).

4.3.3. Shaft Sealing (fluid)

The arrangement and configuration of the shaft seals is matched to the operating conditions and the properties of the liquid being pumped. The seals described below are installed to seal the four shaft ends against the inlet pressure. Since the sealing spaces are always within the suction area of the pump, it is always subject to the suction or inlet pressure of the pump in the L4NG series.
The corresponding type of sealing of the pump can be found from the type description.

❑ **Sealing G** (mechanical seal)

A mechanical seal seal is used for suction and inlet pressures from 0.5 to 4 bar, as it is an unbalanced, maintenance–free seal with a simple mode of operation. The floating surfaces of the seal are washed by the pumped liquid. This produces good lubrication of the rubbing surfaces and ensures adequate removal of heat produced by the friction. In the standard form, the heat of the pump media must not exceed a temperature of 200°C. The materials and configuration (by the manufacturer) of the mechanical seal are chosen to match the relevant operating conditions and properties.
In many applications the sealing space can be configured with external flushing in the sealing space or a liquid blocking unit on the atmospheric side or provided with heating / cooling. If the pump media have a tendency to crystallize out or to crack, we recommend the use of a quench on the atmospheric side, to which steam is applied at a maximum pressure of 1 bar.
When running the pump, pay attention that the rubbing surfaces of the seal do not run dry. (See chapter 7 for removal and installation).

❑ **Sealing G** (double–acting mechanical seal) **(back to back)**

If a double–acting mechanical seal is installed in the pump (see sectional drawing) , attention has to be paid that the running surface of the seal is being sufficiently flushed, thereby attaining a good lubrication and eduction of the frictional heat. In order to achieve this results a barrier fluid aggregate is necessary. The barrier pressure should be approx 2 bar over the pressure which has to be sealed. Material and design of the mechanical seal and selection of the barried fluid is adjusted to the respective operating conditions and merits of the flow medium. **The pump may only be into operation at operative barrier fluid aggregate.** The details of the barrier fluid aggregate are described in the technical documentation of the barrier fluid aggregate.

❑ **Seal S** (packing seal)

In a configuration with stuffing box packing (Pos. 072), the stuffing box area of the pump is equipped as standard per seal with a built–in liquid blocking unit (Pos. 073) with regulator valve. The stuffing box part is always subject to inlet or suction pressure. In order to prevent the drying out of the packing rings or the entry of air, some of the liquid being pumped is passed from the delivery area of the pump to the blocking units (Pos. 073) via the regulator valve so that the stuffing box rings glide over the spindles with a light impact pressure.
The materials, braiding and configuration (by the manufacturer) of the packing rings are chosen to match the relevant operating conditions and properties.
The sealing rings can either be heated or cooled for special applications.

4.3.4. Shaft Sealing (Bearings)

The sealing of the bearings is done at the non–drive side and drive side end bearing casings (Pos. 100, 101) and also at the drive side end cover plate (Pos. 112) with corresponding shaft sealing rings. The space within the shaft sealing rings is filled with grease at the drive side end and with gearbox oil at the non–drive side. This seal requires no maintenance. (See chapter 7 for removal and installation).

4.3.5. Casing Seal

With gaskets (Pos. 012, 026, 031, 099) and sealing rings (Pos. 004, 006, 029, 037, 127, 133) and O–rings, selection of materials according to operating conditions and pump media.

4.3.6. Bearings

The drive and idler spindles are mounted in roller bearings on both sides, outside of the pumping area, so that these do not contact the pump media. On the drive side, the drive and idler spindles are mounted in cylindrical roller bearings (Pos. 170) and at the non–drive side in angular ball bearings (Pos. 171). Only the angular ball bearings of the drive spindle is fixed in an axial direction. The cylindrical roller bearings (Pos. 170) can be subsequently lubricated, the angular ball bearings (Pos. 171) are flushed by the gearbox oil in the gearbox cover (Pos. 030).

4.3.7. Direction of Rotation

The standard direction of rotation is clockwise, as seen at the end of the drive shaft. Direction of rotation arrows as information plates are available for all the pumps. A special direction of rotation, anti–clockwise as seen at the end of the drive shaft, is possible if the operator especially requires it. This must be requested at the time of ordering the pump!

4.3.8. Direction of Flow

The standard direction of flow is clockwise, as seen at the end of the drive shaft. The direction of flow is marked with an arrow at the inlet and delivery connections, and the direction of flow must be checked before startup. If the user requires it, the direction of flow can be arranged to be from right to left, in which case the entire pump casing (Pos. 001) is turned around by 180° about the longitudinal axis. This must be requested at the time of ordering the pump!

4.3.9. Pressure Relief Valve

As described in Para: 4.3.1, the pump can optionally be equipped with either an externally–mounted pressure relief valve for the L4NG or with an integrated pressure relief valve for the type L4NO.
If the set values are exceeded, the valve cone (Pos. 219) lifts from the valve seat (Pos. 217) and the pump media flow back into the inlet area of the pump casing. The opening pressure is set by preloading the valve spring (Pos. 235) with the setting screw (Pos. 222) at the factory or by the user as required. Turning the setting screw to the left increases the opening pressure. The pressure relief valve can be equipped with a hand regulator. Turning the hand wheel (Pos. 227) can be used to feed back part of the pumped flow into the inlet area without changing the setting of the valve spring.

During operation, the manual regulating valve must be closed. When operating the pump in combination with a pressure relief valve, care should be taken to ensure that the valve cone (Pos.219) is free to move.The relief valve shall never be completely closed. This happens when the setting screw (Pos.222) is screwed too far in so that the valve spring (Pos.235) is completely compressed. This may cause damage to the pump. Should a pressure regulation be required, this can be accomplished via a special regulating unit that must be supplied and fitted by the user.

4.3.10. Connections

The inlet and delivery connections are to be made through DIN or ANSI flange connections, marked with arrows to indicate the direction of flow. For an extra charge, suitable welding mating neck flanges as per DIN or ANSI can be supplied.

The maximum permissible forces and moments are to be taken into account according to the size given in the pump specification sheets or the installation drawings. They may never be exceeded. Any connections that are not required for emptying, air purging, etc., should be suitably blanked off before startup.

4.3.11. Drive and Shaft Coupling

The pump is installed directly via a shaft coupling to electric motors of various types or to other drive machines of a through–type base plate with or without oil sump or with a fixing flange (pedestal) and intermediate lantern gear.

Always pay attention to the correct rotational speed and direction of rotation! The pumps can also be installed vertically. For safety reasons, it is not permissible to install the motor below the pump. The shaft coupling transfers the torque positively as a three–part torsionally–elastic dog clutch and equalizes the axial, radial and angular displacements in the shafts connected. For an extra charge, various configurations (by the manufacturer) and materials are available.

4.4. Dimensions and Geometry

4.4.1. Overall and Individual Dimensions Sheets

Overall and individual dimensions sheets for the various sizes and configurations are attached to this document as an appendix. If special dimensions sheets are to be produced for the operators, these must be requested.

4.4.2. Overall and Individual Installation Drawings

Overall and individual installation drawings for the various sizes and configurations are attached to this document as an appendix. If special installation drawings are to be produced for the operators, these must be requested.

4.4.3. Sectional Drawings and Documents

Sectional drawings, additional sectional drawings and more detailed documents for the various sizes and configurations are attached to this document as an appendix. If special sectional drawings are to be produced for the operator, these must be requested.

4.5. Configuration Variations

4.5.1. Specifications Key

Combinations of all the possible types can be found in the specifications key in the appendix. This summarizes the details for each type of standard pump through number and letter selection.

4.5.2. Standard Materials

Pump casing (only on serie L4NG)	0.6025, 0.7040, 1.0619 or St, welded
Pump casing	0.6025, 0.7040, (serie L4NO)
Casing inset	0.6025, 0.7040 (only on serie L4NG)
Seal casing	0.6025, 0.7040 or 1.0619
Bearing casing	0.6025, 0.7040 or 1.0619
Gearbox cover	0.6025, 0.7040 or 1.0619

Valve casing	0.6025, 0.7040 or 1.0619
Drive spindle	1.7139 hardened
Idler spindles	1.7139 hardened
Valve inserts	St
Gaskets	CENTELLEN WS 3820

The individual parts will be made out of the corresponding material if stainless steel is to be used.

4.6. Applications

4.6.1. Main Spheres of Application

General industrial technology, oil burner, energy, marine and off–shore technology, machine and heavy machine construction, tank farms, chemical and petrochemical and related downstream processing industries.

4.6.2. Temperature and Pressure Limits


Maximum pumping overpressure	20 bar
Maximum viscosity	up to 500,000 mm2/s
Maximum inlet pressure	up to 4 bar (for seal G)
Maximum media temperature	320°C

(for casing materials 0.7040 and 1.0619)

If the pumps are to be heated (seal spaces), a maximum temperature of 200°C at 16 bar (L4NG) e.g. 10 bar (L4NO) is permitted for casings made of 0.6025. A maximum heating temperature of 360°C at 16 bar (L4NG) is permitted for casing materials 0.7040, 1.0619 or St or 10 bar on L4NO.

4.6.3. Performance Data and Speeds

4.6.3.1. Performance Tables

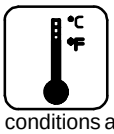
Performance tables and performance diagrams for each type and the pitch for various rotational speeds and viscosities are available on request.

4.6.4. Operative Range

4.6.4.1. Required Space for Operation and Maintenance

The mounting shall be selected to ensure that an undisturbed operation and an uncomplicated maintenance of the unit are guaranteed. All safety regulations shall also be adhered to.

4.6.4.2. Environmental Conditions



The pump unit shall be protected against existing environmental conditions that may have a negative effect on the operation of the unit., e.g. high radiant heat, neighboring components, spray water, etc. All environmental conditions and mounting configurations shall be stated when ordering. Additional operating measures, e.g. isolation, vibration damping devices, etc. shall also be stated when ordering.

4.6.4.3. Location, Foundations, Base Plate and Fastening

The fastening down of the unit depends on the type and size of the unit. If the overall unit is to be fastened down with a base plate, in such cases all the drilled holes in the base plate must be used.

In general, the type of fastening is to be selected such that no movement, displacement or stressing of the overall unit can occur. All locations and foundations must permit a flawless static fastening. There must be no vibration from other machines or components that would affect the unit, and any vibration present must be dealt with by the use of anti–vibration mountings.

If the pump casing is to be installed on site onto a base frame, pay attention that the dimensions of the overall arrangement are adequate. All the fastening holes of the pump must be used. All components (pump, coupling and motor) are to be aligned as described in Chapter 5. We assume no liability whatsoever for damage to the unit caused by inadequate fastening down.

4.6.4.4. Delivery and Inlet Lines

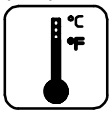
The pump unit must not be used as a fixed point for piping. The maximum permissible forces and moments acting on the connecting flanges may not exceed the values given in the dimensional drawings and installation drawings. This also applies to any heat stresses see Para: 8.3.

The nominal widths of the delivery and inlet lines must be at least as large as the pump connections. A selection can be made on the basis of the given flow speeds. The flow speed in the inlet line may not exceed 1 m/s, or 3 m/s in the delivery line. When laying the inlet and delivery piping, pay attention that the flow of the pump media is not restricted by building in sharp bends, corner valves, non–return valves or check valves in the inlet piping. Any unavoidable changes in cross–section in the delivery lines should be made with gradual transitions, and any sudden changes in direction should be avoided. The inlet and delivery lines must be properly sealed without fail and laid such that no air pockets can form. Thus the pipes must be laid such that they are always rising. The sliding spindles of cutoff valves must always be arranged horizontally or facing downwards vertically and it must be possible to remove the air from the delivery lines at the highest point. Furthermore, the flange seals must not protrude into the internal diameter of the piping.

The installation of cutoff units before and after the pump, or a non–return valve or check valve in the delivery pipeline is recommended. The cutoff units are only to be used to close the pipes and must always be kept fully open in normal operation.

All piping, vanes and valves must be subjected to thorough cleaning before the pump is installed, during which any welding slag, welding beads and any items remaining from the installation such as screws, nuts, etc., must be removed (flush all piping). We assume no liability whatsoever for damage caused to the pump caused by solid particles in the pump media.

The geometry of the media tank must also be set up such that any air bubbles and foam formed in the media can be separated from the pump media and not drawn back into the pump.



The media tank shall be dimensioned and mounted in a manner that will prevent the maximum permissible flow and media temperatures from being exceeded. For this, special measures when mounted shall be observed.

Due to the close tolerances between the spindle and housing bore, the useful life of a spindle pump is mainly determined by the degree of purity of the flow media. We therefore recommend that suction filters with the following mesh sizes shall be fitted:

Mesh size	viscosity of the media to be
0.3 – 0.5 mm	>150 mm^2/s
0.1 – 0.3 mm	37 – 150 mm^2/s
0.06 – 0.1 mm	<37 mm^2/s

When connecting the piping, always pay attention to the direction of flow of the pump media through the pump (shown by the arrow on the pump). It is possible to connect a pressure gauge to the pump casing (close to the pump).

The cleaning of the pipework should not be executed with water or with fluids with minimum viscosity below the minimum indicated viscosity shown in the pump data sheet. During hydrostatic test of the whole pipework system, the pump must be isolated. The hydrotest of the pump (dynamic or static) will cause damage to the pump (especially to the shaft sealing system). If this procedure is not maintained, the guarantee is not void.

4.6.4.5. Supply Connections

All further supply connections shall be correctly dimensioned and connected to the pump unit in an appropriate manner. Material selection and dimensioning is the sole responsibility of the user. No mechanical stresses shall be applied to the pump unit by these supply connections.

5. Mounting and Installation

5.1. Tools Required

For the complete assembly and dismantling work, only standard tools are required:

- Allen key wrenches angled according to DIN 911
- Offset double–ended ring spanners according to DIN 838 ISO 3318
- Double open ended spanners according to DIN 3110
- Plastic hammer according to DIN 1041
- Rubber hammer
- Screwdriver according to DIN 5.264/A
- Insulated screwdriver (for electricians)
- Universal 2 or 3 arm gear puller
- Circlip pliers according to DIN 5254
- Circlip pliers according to DIN 5256
- Mounting bushes for roller bearings

5.2. Initial Installation of the Pump

The shaft ends of the pump and driving motor shall be correctly aligned in order that eccentricity, coaxial and longitudinal running faults shall not cause premature wear of the coupling elements and subsequent damage to the pump. When connecting the pump to the motor,care shall be taken to ensure that the maximum axial displacement (spacing of the shaft ends), the maximum radial displacement (out of centre of the shaft ends) and the maximum angular displacement of the shaft ends as stated by the coupling manufacturer are not exceeded.

Follow the instructions of the relevant manufacturer when using special couplings. Furthermore, no axial forces may be transferred via the coupling to the drive shaft of the pump.

Careful and precise alignment of the shaft ends increases the working life of the coupling. The half of the coupling on the pump side may under no circumstances be subjected to hammer blows.

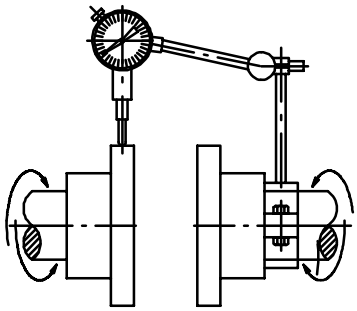
The pump bearer and other auxiliary means to fasten dow the pump are to be checked thoroughly regarding the sufficient exactness before the installation. The values for out of roundness given in DIN 42955 (as per table 1,N) and for coaxiality and run–out tolerance (as per table 2,N) may not be exceeded when manufacturing the intermediate lantern gearbox.

Take note of the installation instructions of the manufacturer of the coupling.

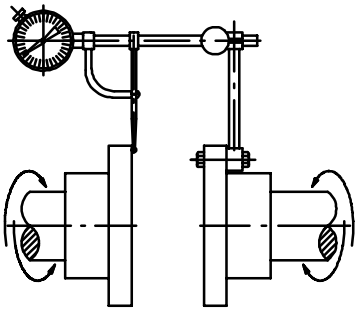
Guards shall be in place at all times on all rotating parts. Damages caused by incorrect mounting, resp. alignment are not covered under our warranty.

5.3. Initial Installation of the Pump Unit

The pump unit shall be inspected on site for possible transport damage. If the unit is to be assembled on site, this shall be carried out acc. to Para: 5.2. After correctly aligning, the complete unit shall be correctly mounted. For base and foundation information, see Para. 4.6.!



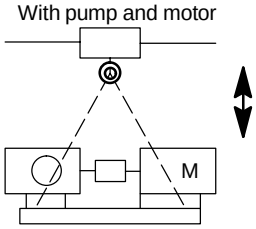
1. Fit the dial gauge to the drive shaft and check concentricity of both hubs by turning, if necessary realign.



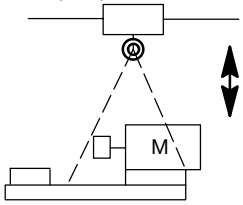
2. Fit the dial gauge to the flange of one hub and check the symmetry of both hubs by turning, if necessary realign.

Lifting of the base frame units

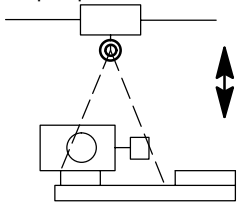
With pump and motor



Without pump and with motor

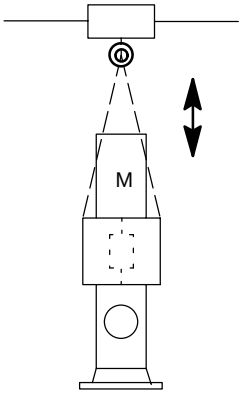


With pump and without motor



Lifting of the pedestal units

Pump and motor in pedestal form



6. Starting Up – Shutting Down

6.1. Technical Documentation

Attention

Before starting up, check all technical demands and documentation. In particular, check the pump unit for the following:

- **Serial No.**
- **Type and Size**
- **Direction of rotation and mode of operation**

6.2. Pipeline Schematic Drawing and Measuring Points

The complete pipeline arrangement within the bundle of pipelines, the correct connections and dimensions of measuring and controlling devices shall be checked.

The cleaning of the pipework should not be executed with water or with fluids with minimum viscosity below the minimum indicated viscosity shown in the pump data sheet. During hydrostatic test of the whole pipework system, the pump must be isolated. The hydrotest of the pump (dynamic or static) will cause damage to the pump (especially to the shaft sealing system). If this procedure is not maintained, the guarantee is not void.

Damages that occur due to incorrect arrangement, resp. dimensioning of measuring and controlling devices are not covered under warranty.

6.3. Preparation for Starting Up

Before starting up for the first time, the following jobs shall be carried out:

- Clean the connection lines, Para. 4.6.4.4.
- Check the mounting screws, Para. 4.6.4.3.
- Check the mains power supply to the motor
- Check the direction of rotation of the driving motor, the direction of rotation must correspond to the direction of rotation arrow on the pump. By an incorrect direction of rotation, the pump will produce no suction, this will cause the pump to be damaged.
- Remove the blind stoppers on the inlet and delivery sides (Para: 3.3).
- Connect pipelines acc. to direction of rotation,Para. 4.3.9. and 4.6.4.4.
- Visual check of the pump unit, acc. to Para. 6.1.
- Open the shut–off valves.
- Fill the pump with the pump media, protect without fail against running dry.
- During installation of the double–acting mechanical seal, the barrier fluid aggregate has to be filled sufficiently with barrier fluid. (Details see manual " barrier fluid ")

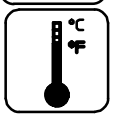
Attention: Never run the pump without seal oil system. This could cause damage to the pump.

- Fill the gearbox cover (Pos. 030) with oil (Pos. 038) through the air venting hole up to the middle of the sight glass, using a high–grade gearbox oil that resists aging and with high oil film retention and corrosion–resisting additives, as per Para: 7.7.
- All regulating and monitoring devices shall be checked for correct functioning after being adjusted, (e.g. Emergency–Off Switch, Pressure gauges, etc.).
- To protect operators, all guards and devices shall conform to the appropriate safety regulations.

Attention

If after installation of the pump or the pump aggregate into the site flushing–, cleaning–, or pressure procedures are carried out with mediums the pump is not designed for, it can lead to for example corrosion or impurities. In order to prevent damages at the pump components, external mediums have to be removed completely as soon as possible. The innerparts have to be filled with suitable preservatives.

6.4. Starting Up



Before starting up, the direction of rotation and speed shall be checked.
Watch the pressure and vacuum gauges compare them against the ordering and operating details. Monitor the temperature and viscosity of the pump media. At the drive side and end side of the sealing casing, the temperature may be approx. 20–30°C above that of the pump media, but it must not exceed the operating temperature limits of the shaft seal.
Before starting the pump, the seal oil system must be switched on **(only at the double–acting mechanical seal).** Make sure that the seal oil pressure on the mechanical seal is at minimum 2 bar higher than the pressure on the suction side of the pump. Also check the seal oil flow on the flowmeter for each pair of the mechanical seals. Only when the seal oil system runs proberly, the pump can be switched on.

The pressure line shall be vented at the highest point until valve. The venting devices shall be subsequently closed.After the pump has been switched On, the complete flow pressure, media flow, viscosity, temperature, speed and current consumption shall be compared with the order, resp. the operating data. Care shall be taken to ensure that the drive motor is not overloaded due to transporting a flow media with a higher specific gravity or higher viscosity than that of the media for which the pump was designed originally and also that the suction head is not higher than that of the capacity of the pump. In this case, cavitation will take place. The liquid level in the media tank shall also be checked in order to ensure that the liquid level does not fall below the level of the suction tube.

6.5. Shutting Down

Before shutting down the pump unit, no preparation is necessary. If the motor is switched Off during operation, the pump will stop almost immediately, (for pump and motor quite safe). We recommend that a non–return valve should be fitted between the cut–off valve and shutoff device. The cutoff units should be closed if the unit is to be shut down for a longer period of time. If it is necessary to take into account changes in the concentration of the liquid, crystallizing out, thickening, etc., the pump must be emptied and flushed with a suitable liquid as necessary.

6.6. Restarting

After only a short shut down period, the motor may be restarted without any prior preparation. After longer shut down periods, resp. refitting the pump unit, restarting shall be carried out as described under Para. 6.3.

Attention: Never run the pump without seal oil system. This could cause damage to the pump. (double–acting mechanical seal)

6.7. Shutdown

6.7.1. Shutdown Periods of up to 3 Months

If the pump unit is to be put into operation, resp. restarted within roughly 3 months, no special conservation is necessary.

6.7.2. Shutdown Periods from 3 to 6 Months

Before the initial startup (after being put away), the inlet and delivery outlet must be provided with blind stoppers. If shutting down, the inlet and delivery sliders before and after the pump should be closed. In such a case the pump remains full of the pump media. If the pump media contain corrosive components that would attack the materials of the pump, the procedure given in Para: 6.7.3 must be carried out.

6.7.3. Shutdown for Periods longer than 6 Months

Shutdown Periods Longer Than 6 Months
The pump is to be closed off as per Para: 6.7.2. and filled with preservating agent. In order to avoid pressure being

exerted on the rubbing surfaces of the roller bearings as a result of knocking or vibrations, the drive spindle should be rotated manually at suitable intervals, such as every 4 weeks. Parts such as the spindle package and roller bearings should change their position of rotation as a result.

6.8. Operation Monitoring

Monitoring of Leistritz screw pumps can be kept to a minimum by correct mounting and operation. At regular intervals, the operating pressure, media flow, excess current consumption of the electric motor, couplings, seals and gaskets, filter soiling and shall be observed. Any unusual pump noises shall be investigated. The useful life cycle of the pump depends upon the degree of purity of the flow media.A visual check of the pump unit shall be carried out at least once per month.
Monitor the lubrication of the roller bearings (lubrication), filling with grease must be performed in rotation as per Para: 7.7.
The operatability and the liquid level of the barrier fluid aggregate from the sealing system has to be checked regularily.
Monitor the oil level of the gearbox, oil changes must be performed in rotation as per Para: 7.7.
The pump shall operate smoothly without undue vibration. The pump shall not be allowed to run dry! Check shaft seals. Leakages occur especially during run–in periods.

❑ **Seal G (mechanical seal)**

A leakage of roughly one or two drops of fluid every hour can be regarded as normal for an undamaged seal.

– The mechanical seal shall not be run dry!

1❑ **Seal S** (packing seal)

The leakage of a few drops of pump media per hour can be taken as a guideline for an intact packing seal, since the sealing surfaces on the drive spindle must always be wetted with a film of the pump media. In order to ensure this, a slight overpressure of approx. 0.5 bar must always be set in the sealing area (liquid blocking unit (Pos. 074)). This preloading and thus sealing must be done during startup.

6.9. Drive Shaft Bearing

The bearings for the spindles consist of cylindrical roller bearings on the drive side and angular ball bearings or swivel–joint roller bearings on the end side. The bearings are designed for a working life of 20,000 hours under the operating conditions quoted in Para: 4.6.2. Rough use, failure to observe the lubrication and oil change intervals, high temperatures and the like can significantly reduce their working life.

Settings:

The stuffing box packings have already been installed in delivered pumps. The packing rings have been lightly preloaded. The inlet area of the pump was set to a slight underpressure in the presetting. The packing glands must be slightly detensioned for startup (approx 1/4 turn of the tensioning screws).
If there is an underpressure in the inlet area of the [pump during operation then blocking medium is to be fed into the blocking liquid unit.
This is done either by an internally–installed flushing line from the delivery side of the pump or by an external flushing medium inlet.
The specification sheet and the pump cross–section drawing show if and what kind of flushing is provided (this flushing is not required for supply at the inlet). The regulator valves should be opened slightly at startup. After a certain running–in time (approx. 10 minutes), the elements of the regulator valve and the packing gland should be matched to each other such that there is a slight leak at the sealing point. This process must be constantly monitored during the running–in phase until the packings have bedded in and have reached a state of equilibrium.

The setting should be done at the inlet exclusively with the packing gland.

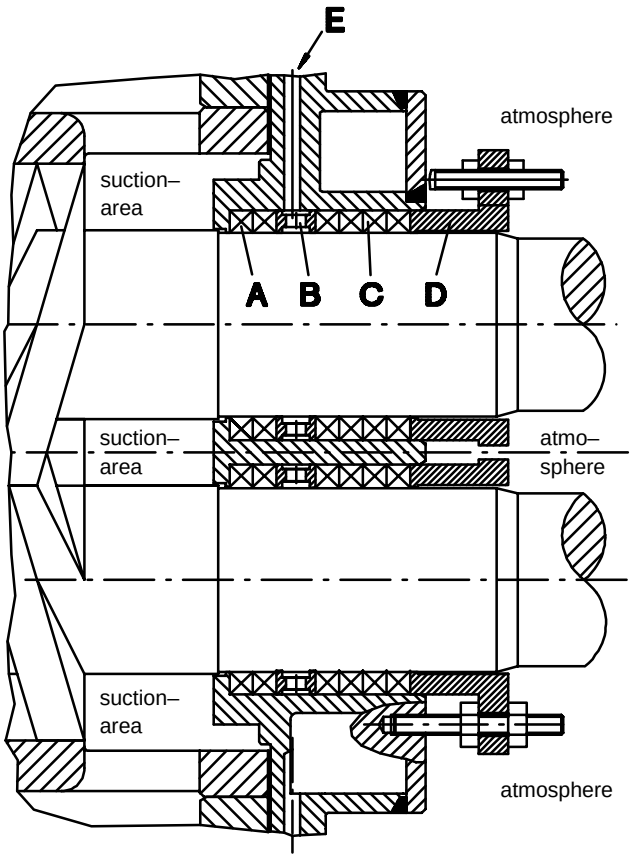
Monitoring Operation:

The leakage of a few drops of pump media per hour can be taken as a guideline for an intact packing seal. If there is more leakage than this, the setting operation should be repeated and likewise if the operating parameters change.

Attention **– The packing seal must never be allowed to run dry!**

If reserve pumps are available, then they must be run briefly from time to time to ensure that they are always ready for use. This also means that the shafts should be rotated as described in Para: 6.7.3.

Construction:



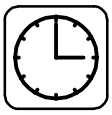
A – 1st section of the packing rings (to suit the medium)
B – Liquid blocking unit
C – 2nd section of the packing rings (atmospheric side)
D – Packing gland
E – Blocking or flushing medium inlet

7. Service/Maintenance

7.1. General Information

Service work normally includes checking the pump components for wear and damage.
Leistritz screw pumps of Type L4NG or L4NO require little or no service providing that the respective operating data are not exceeded and that the flow media does not contain abrasive particles. The degree of purity and lubricating factor of the flow media are largely responsible for determining the useful life cycle of the pump. If however a higher operating degree of safety is required, then we recommend that the maintenance and inspection intervals should be followed as described in Para. 7.2.

7.2. Service and Inspection



– The pump should be inspected after 800 to 1000 operating hours. Listen to the pump to hear if there are any unusual noises, check the oil level in the gearbox casing and the filling of grease of the drive–side roller bearings and refill as needed.
– **Synoptical Table for oil and grease quantities together with the appropriate relubricating intervals: according to 7.7.**
– The amount of leakage from the ends of the shafts should not exceed a few drops per hour.
– If a double–acting mechanical seal has been mounted, the operatability, the liquid level of the barrier fluid aggregate as well as the oil temperature and the differential pressure have to be checked after 150 operating hours and adjusted if necessary.
– After about two years, the pump should be dismantled and all internal parts should be inspected for damage and wear.
– Investigate with special care to see if the contact path of the roller bearings and the rubbing surfaces of the shaft for flawless surface condition, and examine the gear wheels in the gearbox cover for any wear.
– Worn parts must always be replaced.
– Minor striations on the running surfaces of the spindles and in the area of the shaft seals can be smoothed off with a suitable polishing tool, but such striations point to the pump media being contaminated.
– Deposits of dirt in the casings, e.g., on the lower parts or in the back–flow area of the pressure limiting valve should be looked for, and removed as necessary.

7.3. Dismantling and Reassembly

7.3.1. General Precaution

With careful monitoring of the pump, operating interruptions that would make a dismantling necessary, are rare. If however faults occur, the cause of these should be located, if possible, before the pump is dismantled. The Trouble Shooting Table in Para. 8.1. lists possible causes. During dismantling and assembly work, all components shall be treated with the utmost care. Shocks and impacts shall be avoided. All components shall be carefully cleaned, serviced and, if necessary replaced with the appropriate spare parts. After reassembly, it shall be possible to rotate the driving shaft freely. If this is not the case, premature damage may be caused to the bearings and shaft seals. For all work, the respective sectional drawings shall be observed.

7.3.2. After Sales Service Technicians/Dangers

LEISTRITZ–Service Technicians for mounting and repairs can be made available to the user upon request.

If repair work is to be carried out by the user or by LEISTRITZ service personnel, the pump must be at atmospheric pressure, completely drained and cleaned. This is especially applicable for pumps that are returned to the factory for repair. In order to protect our service personnel and also for environmental reasons, pumps filled with flow media will not be accepted for repair.

Should they be accepted for repair, the user must bear the costs involved for an environmentally appropriate waste disposal.

Attention

For pumps handling dangerous media and/or environ–mental endangering products, if repair work has to carried out either on site or the pump has to be returned to the factory, the user must inform personnel on site and also the factory personnel of this. In this case, a proof of flow media in the form of a DIN Safety Data Sheet shall be supplied.

Dangerous products are:

– Toxic, cancer inducing, fruit and vegetable damaging and gene changing materials or materials that can endanger the health of persons
– Corrosive materials
– Irritating materials, explosion endangering materials, flame exhilerating and highly and lightly flammable materials.
– Toxic, Cancer creating, vegetable damaging, Gene changing materials, which endanger in other ways people's health. Acids, irritating materials, explosion endangering, flame exhilarating, high and light flammable materials
– The user is solely responsible for mounting on site warning signs, which naturally shall be observed at all times. On site service personnel and/or Leistritz service personnel, who are required to carry ourservice work, shall be informed of all dangerous materials they may encounter.

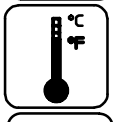
7.3.3. Dismantling and Assembly Information

The most important dismantling and assembly steps are described in the following paragraph. These steps shall be carefully followed. For damages caused due to unauthorized and/or incorrect dismantling and/or assembly, no warranty can be accepted.

7.3.4. Mounting Tools

List of the necessary mounting tools, see Para. 5.1.

7.4. Dismantling the Pump



– Disconnect the mains power supply. This shall be carried out by a qualified electrician. It shall not be possible to operate the motor or other driver.
– Check the shut of valves in the delivery and inlet lines, these must be closed.
– Allow the pump to cool to the ambient temperature.
– Undo suction– and pressure flange– connections used for supply (e. g. barrier fluid aggregate or flushing).
– Undo the fastening screws, the pump can be lifted from the fastening unit (base frame / pump pedestal) with suitable lifting apparatus.
– Pull of the coupling using a gear puller
– Remove the feather key (Pos. 180) from the pump shaft stub.
– Remove the drain plug and drain the gear (Pos. 036, 037)
– Unscrew allen screws (Pos. 032), remove the gear cover (Pos. 030) and joint for gear cover (Pos. 031).

Attention: At demounting, the parts have to be marked in order to make sure that the parts are being braught in their correct position during reassembling.

– Undo the screws, thrust flange, thrust rings and conical clamping rings (Pos. 186, 187, 185, 182, 181, 190), dismantle the tab washer and shaft nuts (Pos. 167, 166).
– Pull off the fastening pieces and gear wheels (Pos. 160, 161, 162, 163), mark the gear wheels, remove the feather key (Pos. 168).
– Remove the screws (Pos. 117), remove the drive–side bearing covers (Pos. 112, 113), remove the circlips (Pos. 173).
– Undo the screws (Pos. 124) and pull off the drive–side bearing housing (Pos. 100) with the pulling–off screws, paying attention to

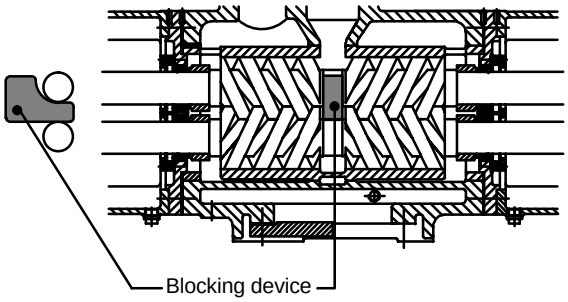
the guiding studs (Pos. 020) and the shaft sealing rings (Pos. 052) **(valid for pump type L4NG)**.

– Loosen screws (Pos.123) and pull off the bearing casing on driving side (Pos.100) with the pull–off screws. Before the bearing casing on driving side (Pos.100) is pressed out of the centering fit first and afterwards that on endside (Pos.101) guiding studs (Pos.123) have to mounted in two opposite borings in order to center these parts. This ensures that the bearing casing cannot fall on the spindles after they have suddenly been loosen out of the centering fit. Any damage in the sealing area is thereby prevented **(valid for pump type L4NO).**

– Push the roller bearing outer ring (Pos. 170) out of the drive–side bearing housing (Pos. 100), pull the roller bearing inner ring from the spindles.

▼

Attention Before dismantling further, the spindle set with the casing unit must be blocked to prevent the sealing area from being damaged when the non–drive side roller bearings are drawn out and dismantled. Make a blocking device out of hard wood, plastic or copper and which is to be inserted in the middle of the double–flow spindle set through the outlet flange opening and simultaneously block the spindle package in the casing insert (see illustration below). The dimensions for this device should be taken from the pump. The device should be tapered slightly in width.



▼ The following described procedure is valid for the pump serie L4NG.

❑ **Dismantling double–acting mechanical seal**

– Undo the screws (Pos. 67) and pull off the endcover (65) carefully from the seal casing.
– Remove gasket (Pos. 66).
– Loosen locking piston of the external mechanical seals and carefully pull off the mechanical seals (rotating part) from the spindles.
– Loosen circlips.
– Loosen locking piston of the internal mechanical seals (rotating part) and carefully pull off the parts from the spindles.
– Press The mating rings carefully out of the end cover (65).

❑ **Dismantling for seal S** (packing)

– Detension the stuffing box packing (Pos. 072) with the aid of the stuffing box gland (Pos. 075), undo (Pos. 075, 076, 077, 078).
– Remove the preloading screws (Pos. 076) and tensioning nuts (Pos. 078), dismantle stuffing box gland (Pos. 075).
– Undo the piping to the regulator valve.

▼

Attention Before the drive–side seal housing (Pos. 102) and later, the non–drive side housing (Pos. 103) are pushed out of the centering fit, insert guiding studs into two opposing drilled holes for the screws (Pos. 124) to guide these parts. This will prevent the seal casing from falling out of the centerings and onto the spindles when it is suddenly loosened. This will prevent damage to the stationary seal rings **(valid for pump type L4NG)**.

– Undo the screws (Pos. 122) and pull off the drive–side seal housing (Pos. 102) with the pulling–off screws, paying attention to the guiding studs (Pos. 020) and the shaft seal, remove the gasket (Pos. 099).

❑ **Dismantling seal S** (packing)

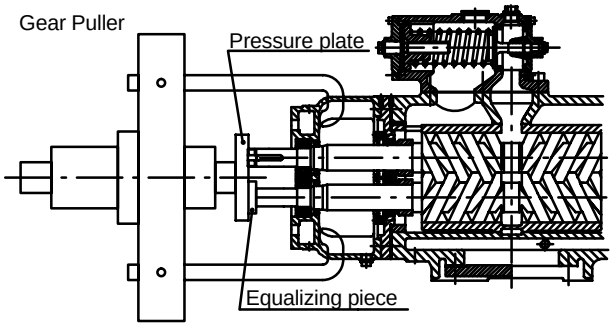
– Push the packing rings (Pos. 072) and liquid blocking unit (Pos. 073) out of the drive–side seal housing (Pos. 102).

❑ **Dismantling seal G** (mechanical seals)

– Carefully press the stationary seal rings, the static parts of the mechanical seals (Pos. 062), out of the drive–side seal housing (Pos. 102) with seal collars or O–rings.
– Carefully pull the mechanical seals (Pos. 062), rotating parts, off the spindle, having loosened beforehand the set screws (threaded pins), according to the type of unit.

▼

– Undo the screws (Pos. 118) and remove the non–drive side seal cover (Pos. 114).
– Undo the screws (Pos. 124) and pull out the roller bearings with the non–drive side bearing casing (Pos. 101) from the spindles, and at the same time, the bearing casing (Pos. 101) is drawn from the centering fit of the seal casing (Pos. 103).
Use a gear puller to pull off these parts, as shown in the following illustration.



If no suitable gear puller is available, the non–drive side seal casing (Pos. 103) can also be undone with pulling–off screws. This must be done with special care, since the spindle set pushes against the blocking device and the casing insert and thus placed under load while it is being extracted.

– Loosen screws (Pos.124) and pull off the endside bearing casing (Pos.101) with the pull–off screws. Before the endside bearing casing (Pos.101) is pulled out of the centering fit guiding studs (Pos.123) have to mounted in two opposite borings in order to center these parts. This ensures that the bearing casings cannot fall on the spindles after they have suddenly been loosen out of the centering fit. Any damage in the sealing area is thereby prevented **(valid for pump type L4NO).**

▼ The following described procedure is valid for the pump serie L4NG.

❑ **Dismantling seal S** (packing)

– Detension the stuffing box packing (Pos. 072) with the aid of the stuffing box gland (Pos. 075), undo (Pos. 075, 076, 077, 078).
– Remove the preloading screws (Pos. 076) and tensioning nuts (Pos. 078), dismantle the stuffing box gland (Pos. 075).
– Undo the piping to the regulator valve.

▼

– Undo the screws (Pos. 122) and pull off the non–drive side seal housing (Pos. 103) with the pulling–off screws, paying attention to the guiding studs (Pos. 020) and the shaft seal, remove the gasket (Pos. 099).
– Remove the blocking device that is blocking the spindle set in the casing insert, lift the spindle package (Pos. 150, 151), and carefully pull it out of the casing.

– Press the roller bearings (Pos. 170, 171) and the shaft seal rings (Pos. 052) out of the drive side and non–drive–side bearing casings.

❑ **Dismantling seal S** (packing)

– Push the packing rings (Pos. 072) and blocking unit (Pos. 073) out of the non–drive side seal housing(Pos. 103).

❑ **Dismantling seal G** (mechanical seals)

– Carefully press the stationary seal rings, the static parts of the mechanical seals (Pos. 062), out of the non–drive side seal housing (Pos. 103) with seal collars or O–rings.
– Carefully pull the mechanical seals (Pos. 062), rotating parts, off the spindle, having loosened beforehand the mechanical seal of the turning locks (threaded pins), according to the type of unit.

▼

– Undo the screws (Pos. 021), remove the heating plate (Pos. 011) with the gasket (Pos. 012). (* Only if configured with a heating base.)

❑ **Characteristic features at the dismantling of type L4NG 186/**

The spherical roller bearing (fixed bearing) is not directly mounted on the idler spindle, but it is situated on the idler spindle axially adjustable via the setting bush (Pos.109). For the dismantling, the spherical roller bearing is to be drawn–off from the idler spindle together with the setting bush (Pos.109) after the loosening of the adjusting screw (Pos.34 and 108). The key is to be removed (Pos.325).
For the dismantling, the valid sectional drawing for the specific pump is to be observed.

Further demounting procedure is valid for the pump serie L4NO.

Demounting of the tightening casing (Pos. 102), mechanical seals, roller bearings including the sealing rings have to be carried out on demand. **Please consider the sectional drawings valid for the respective pump.**

❍ **Dismantling Externally–Mounted Valve** (Pressure Relief Valve)

A number of constructionally different pressure regulating valves are used with pumps of the L4NG series (see table below).

Pump size	L4NG 48	L4NG 62	L4NG 82	L4NG 96	L4NG 106	L4NG 126
Valve size	VLN 48	VLN 70	VLN 96		VLN 106	VLN 140

Pump size	L4NG 140	L4NG 164	L4NG 186	L4NG 240		
Valve size	VLN 140	VLNF 107	VLNF 140			

The specification sheet clearly states which valve have been chosen for the relevant pump and also a reference to the corresponding drawings, specification sheets and parts lists.

In general, installation and dismantling of the externally–mounted valves should only be done by trained technicians for safety reasons. The constructional setup requires specialized technical knowledge. This is the only way to ensure correct dismantling and reassembly of the inner parts of the individual externally–mounted valves. We accept no liability whatsoever if dismantling or reassembly work was undertaken on your own initiative and in a technically inappropriate manner and thus caused malfunctioning of and / or damage to the unit, personal injury or environmental contamination.

If the user nonetheless chooses to dismantle the unit, always pay close attention to the preloaded valve springs.

– Undo the screws (Pos. 027) and the seal (Pos. 026) from the pump casing, remove the valve casing (Pos. 200) with the intermediate plate ** (Pos. 203), (** Only if configured for back–flow to the tank.)
– Turning the adjusting screw (Pos. 222) clockwise will partially untension the valve spring (Pos. 235). Note the number of turns made.
– Slowly untension the valve spring above the valve cover (Pos. 209) by a suitable means (the fixing screws (Pos. 211) can be replaced in pairs by long bolts), since otherwise the strong springs will violently hurl the valve cover (Pos. 222) off the valve casing (Pos. 200).
– **Carefully examine the cross–sectional drawings.**
– Undo the remaining screws by equal amounts and remove them.
– Once the pressure spring (Pos. 235) has been completely untensioned, pull the cover (Pos. 209), complete with the adjusting screw (Pos. 222) and spring collar (Pos. 220), out of the valve casing.
– Remove the pressure spring (Pos. 235) and the flat seal (Pos. 210).
– Undo the locking ring (Pos. 223) and push the adjusting screw (Pos. 222) out of the cover (Pos. 209). Unscrew the drain plug (Pos. 215) and seal (Pos. 216) from the valve seat. (*** Only if configured without a hand wheel.)
– Undo the screws (Pos. 214) and pull the valve seat cover (Pos. 217), complete with the valve cover (Pos. 219), out of the valve casing, undo the seal (Pos. 213).
– Dismantle the hand wheel (Pos. 227) and adjusting spindle (Pos. 225) and unscrew it out of the valve seat cover (Pos. 217). (*** Only if configured with a hand wheel.)

❍ **Demounting of the integrated pressure relief valve (L4NO)**

The demounting procedure of the integrated valves for pump type L4NO corresponds to those of the installed valves. The only difference is that the valve casing of the pump type L4NO is component of the pump casing.

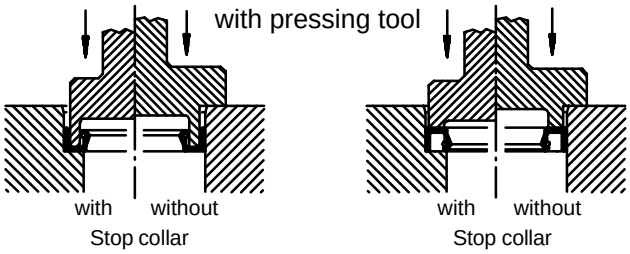
If customer service or technical services are required, if conversion work is to be done or if the operating parameters are to be changed, or if you have any questions, please contact our company our one of our authorized sales branches.

7.5. Assembling the Pump

A reassembly of the pump shall only be carried out with fully functional components that are in no way damaged. It is also recommended that heavily stained or dirty components shall be cleaned.

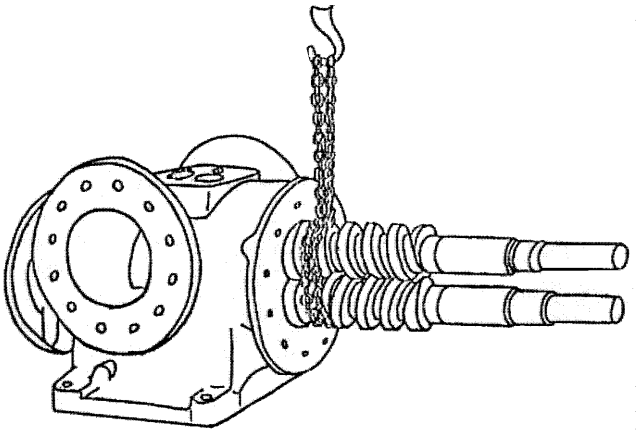
If new casing parts are required for reassembly, the centering of the spindles in the casing must be carefully checked.
Check the casing parts for any dirt or small parts such nuts, screws, pins, etc., that have fallen in.
All gaskets and O–rings should be renewed for reassembly and the shaft seals likewise (if they have been damaged or dismantled individually).
Before starting installation, have ready to hand all the aid devices for installation and setup (see also Para: 5.1, Installation Tool).
Preinstall the shaft sealing rings (Pos. 052) in the bearing end plate (Pos. 104 and 105) and also Pos. 116 in the bearing cover (Pos. 112).
When installing the shaft sealing rings, take special care with the direction of the lips of the seal (see the relevant cross–section drawing).
Pressing in the shaft sealing rings in the retainer must be done with a hydraulic or mechanical pressing device and a suitable pressing tool. Fundamentally, it is necessary to take care that the pressing force is applied close to the external diameter and that the pressing tool pushes parallel to the axis

Installation of the shaft seal rings with pressing tool



Assembly of the parts

– Pay attention to the direction of flow of the pump casing.
– The spindles (Pos. 150, 151) and the bores in the casing for the spindles must be oiled before they are inserted.
– Align the driving and idler spindles (Pos. 150, 151) parallel and on the right sides.
– Only introduce the spindle package when using lifting gear for installation.(see illustration)



❑ **Only for installation of seal G** (mechanical seals)

– The shaft surface of the spindles must not show any damage at all in the area of the mechanical seals.
– Before installation of the drive–side and non–drive–side seal housings (Pos. 102, 103 or 106), insert two guiding studs into two opposing drilled holes for the screws (Pos. 124) to guide these parts better. This will prevent the seal casing from damaging the seals on the shafts by their own weight.
– Push the rotating parts of the mechanical seals (Pos. 062) onto the shafts.
– In order to reduce the amount of friction when installing the mechanical seals (Pos. 062), the spindles (Pos. 150) should be lubricated with oil or silicone grease in the area of the rotating seal elements. Since O–rings made of EP rubber must never come into contact with mineral oil or grease, we recommend the use of silicon grease.
– Attach the guiding studs.
– Position the stationary seal rings (Pos. 062), in the drive–side and non–drive–side seal housings (Pos. 102, 103) with seal collars or O–rings.
– Ensure that the pressure is distributed equally when pressing in the stationary seal rings, and the amount of O–ring friction is to be reduced by using only water or alcohol.
– Pay attention to the position of the grooves (if there are any) in the stationary seal rings and the position of the close–tolerance lock pins (Pos. 061) in the seal casings (Pos. 102, 103).
– Position, and grease if necessary, the gasket (Pos. 099) on the pump casing (Pos. 001) on the drive side and non–drive–side.

▼ ❑ **Only for installing double–acting mechanical seal**

– Position the stationary rings, static elements of the mechanical seals in the endcover (65) and in the seal casings endside and driving side (102, 103)
– Push the internal, rotating parts of the mechanical seals onto the shafts.
– Insert circlip (169)
– Push the external, rotating parts of the mechanical seals onto the shafts.
– Attach the guiding studs.

▼ **Only for mounting of the type L4NG**

– Carefully pre–assemble the drive–side and non–drive–side seal housings (Pos. 102, 103) and guide them over the shaft ends of the spindles and pre–install them to the pump casing with allen screws (Pos. 122).
– Fit in the positioning pin (Pos. 020) to ensure the proper alignment of the bearing casing and the pump casing.
Two threaded pins (Pos. 020) are provided for exact centering of the pump casing (Pos. 001) to the seal housing (Pos. 103) and also of the seal housing (Pos. 103) to the bearing housing (Pos. 101). The two pins are offset from each other by 90° and thus provide exact position of the parts.

❑ **Only for installation of seal S** (packing seals)

– The shaft–surface of the spindles must not show any damage at all in the area of the shaft seals.
– Before installation of the drive–side and non–drive–side seal housings (Pos. 102, 103 or 106), insert two guiding studs into two opposing drilled holes for the screws (Pos. 124) to guide these parts better. This will prevent the seal housing from damaging the seals on the shafts by their own weight.
– Position, and grease if necessary, the gasket (Pos. 099) on the pump casing (Pos. 001) on the drive side and end side.
– Carefully pre–assemble the drive–side and non–drive–side seal casings (Pos. 102, 103) and guide them over the shaft ends of the spindles and pre–install them to the pump casing with allen screws (Pos. 122).
– Put in place the guiding studs (Pos. 020) to ensure the proper alignment of the bearing casing and the pump casing.
Two threaded pins (Pos. 020) are provided for exact centering of the pump casing (Pos. 001) to the seal casing (Pos. 103) and also of the seal casing (Pos. 103) to the bearing casing (Pos. 101). The two pins are offset from each other by 90° and thus provide exact fixing of the parts.
– Arrange the packing rings individually around the driving spindle and press them one after another and with equally distributed force into the packing casing, and in doing so, the parting lines of the individual packing rings (Pos. 072) must be offset from each other by 90°. Pay attention to the number and size (cross–section) of these.
– Arrangement of the lantern ring between the stuffing box rings according to the sectional drawing.
– Press the gland (Pos. 075) equally and without kinking into the packing casing.
– Install the fixing and preloading pieces (Pos. 076, 077, 078), but without pushing in the packing rings firmly in place, the preloading is only done when the pump is started up.
– Mounting of the piping regulating valve

❍ **Assembly non–drive–side**

– Guide the bearing housing (Pos. 101) over the spindles and fasten it to the pump casing (Pos. 001) with the screws (Pos. 124).
– Fit in the positioning pin (Pos. 020) to ensure the proper alignment of the bearing casing and the pump casing.
– Insert the washer (Pos. 177) into the bearing housing.
– Support the driving and idler spindles on the drive side so that the seal (and especially the mechanical seal) are not damaged when pressing in the roller bearings.
– For the support of the spindle set in the casing insert, also the conical clamping rings can be used, which was already described and recommended in 7.4 (dismounting).
– Carefully press in the roller bearings (Pos. 171) over the ends of the spindles, do not use hammer blows, but instead press on with a sleeve.

– Insert the adjusting washer (Pos. 177) over the driving spindle (Pos. 150).
– Install cover (Pos. 114) with allen screws (Pos. 118) and spring washers (Pos. 119) onto the bearing housing.
– Place the spacer rings (Pos. 178) over the ends of the spindles (Pos. 150).
– Insert the feather key (Pos. 180).
– Press the gear wheel (Pos. 160) onto the driving spindle (Pos. 150).
– Degrease the ends of the idler spindle (Pos. 151), conical clamping rings, and the hubs of the gear wheels (Pos. 163, 162).
– Slide on the gear wheel (Pos. 163) with the conical clamping rings (Pos. 190) and the thrust rings (Pos. 181 and 182) onto the idler spindle; the arrangement of the conical clamping rings is shown in the cross–section drawing.
– Slide the gear wheel (Pos. 161) onto the driving spindle, screw on place the shaft nut with locking piece (Pos. 166, 167) and lock it.
– Pre–install onto the driving spindle the gear wheel (Pos. 162) with the remaining conical clamping rings (Pos. 190), retaining ring (Pos. 182), and shaft nut (Pos. 166) with tab washer (Pos. 167), but do not do them up tight.

❍ **Assembly drive–side**

– Guide the bearing casing (Pos. 100) over the spindles and fasten it to the pump casing (Pos. 001) with the screws (Pos. 124).

– Insert the threaded pins (Pos. 020) to ensure alignment of the bearing casing and the pump casing. Two threaded pins (Pos. 020) are provided for exact centering of the pump casing (Pos. 001) to the seal casing (Pos. 102) and also of the seal casing (Pos. 102) to the bearing casing (Pos. 100). The two pins are offset from each other by 90° and thus provide exact fixing of the parts.
– Carefully press in the roller bearings (Pos. 170) over the ends of the spindles, do not use hammer blows, but instead press on with a sleeve.
– Install the circlips (Pos. 173).
– Apply an adequate quantity of a suitable grease for roller bearings into the bearings spaces and the grease cups (Pos. 120), as per Para: 7.7.
– Install the seal covers (Pos. 112, 113) with allen screws (Pos. 117) onto the bearing casing.
– Slide the shaft sealing ring (Pos. 116) into the seal cover (Pos. 112), if it has not already been pre–installed.

❑ **Characteristic features at the mounting of type L4NG 186/**

The spherical roller bearing (Pos.170) is to be mounted on the idler spindle together with the setting bush (Pos.109), the key (Pos.325), the spacer (Pos.193) and with the circlip (Pos.173). Then it has to be fastened with the adjusting screws (Pos.34 and 108) after the axial centering of the double–flow spindle package. The set of gearwheels (Pos.162 and 163) is not directly jammed on the idler spindle together with the clamping sleeve (Pos.190), but via the intermediate bush (Pos.110).
For the mounting, the valid sectional drawing for the specific pump is to be observed.

▼ **Mounting instructions for the type L4NO**

– Position the stationary seal rings (Pos. 062), in the drive–side and non–drive–side seal housings (Pos. 102, 103) with seal collars or O–rings.
– Ensure that the pressure is distributed equally when pressing in the stationary seal rings, and the amount of O–ring friction is to be reduced by using only water or alcohol.
– Pay attention to the position of the grooves (if there are any) in the stationary seal rings and the position of the close–tolerance lock pins (Pos. 061) in the seal casings (Pos. 102, 103).

The further mounting procedure fits largely with that of type L4NG. However, the features of the pump type L4NO, the documented procedure of demounting and respectively valid pump sectional drawings have to be considered.

❍ **Assembly non–drive–side, final assembly of the gear wheels**

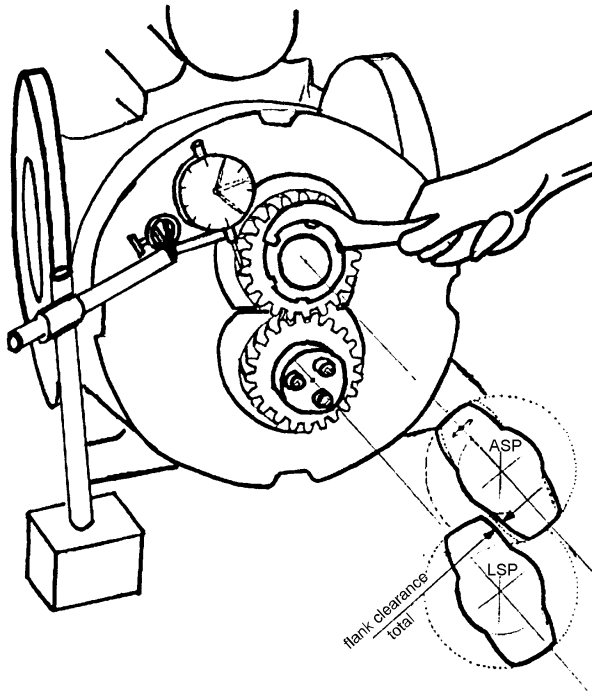
– The drive spindle shall now be turned by hand in both directions for adjustment purpose. Fit a turning device on the drive shaft end (where the coupling sits). Protect the shaft with copper sheets. As an alternative, the driving spindle can be turned with a sickle spanner (as used already to fasten the shaft nut (Pos. 166)) via the shaft nut (Pos. 166).
– Turn the driving spindle and check for smooth running, it is important to note that a certain amount of running friction between the shaft sealing rings and the mechanical seals or packing rings must be overcome.

Adjustment of the spindles, setting of the flank clearance

At this point in the installation process, the drive spindle is supported radially and axially in the roller bearings, i.e., the **driving spindle** can be rotated, but cannot be displaced axially. The **idler spindle** is supported radially by the bearings.
The arrangement of the non–driv– side roller bearings nonetheless allows a small amount of axial movement of the idler spindle. This movement is required in order to be able to adjust the thread flanks of the double–flow spindle package symmetrically to each other.
This is achieved by careful turning of the driving spindle to the left or right up to the relevant pressure point. The flank clearance can now be adjusted to be equal at each side of the threads. This is done in the following way: the driving spindle is turned to the left until it stops against the flanks of the idler spindle, and next to the right until it stops against the other side of the flanks. This is the total flank clearance. The driving spindle must now be set at the mid–position between the two stops.

Attention

The idler spindle must not be allowed to turn when this procedure is being carried out. The angle of rotation between the two points of flank contact is very small and is difficult to determine by marking the location points. It is therefore necessary to use a dial gauge. Fix the dial gauge foot to the casing or the bearing arm. The dial gauge should be able to feel on the flank of the drive–side gear wheel. If the driving spindle is now moved between the two stop points as described above, the mid–point can be determined exactly with the dial gauge.



– The location of the spindles shall now be fixed as follows:
The gear wheels (Pos 162, 163) on the idler spindle are fixed to the spindle by means of a clamping ring set (Pos. 190). By tightening

the allen screws (Pos. 186) (carefully!) the gearwheels will be clamped to the shaft.

Attention

No torque should be transferred to the idler spindles when tightening up, otherwise the clearance previously set will be disturbed.

– If the screws can be tightened up easily in the manner described above, then adjustment of the spindle set has been successful. The screws (Pos. 186) shall now be tightened up by the torque given under para 8.2. Put a piece of flat copper strip between the gear wheels to block them and prevent rotation when doing this. The counter–force to the bolt tightening torque can be provided by the sickle spanner and the shaft nut (Pos. 166) via the driving spindle.

❑ **Characteristic features at the type L4NG 186/ Adjusting of the spindles – adjusting of the flank clearance**

As far as the pump type L4NG 186/ is concerned, an adjusting bush (Pos.109) is installed for the axial adjusting of the idler spindle (Pos.151) oppositely of the driving spindle (Pos.150). By means of this adjusting bush, the double–flow idler spindle can be axially moved from one flank stop point to another flank stop point of the driving spindle and to the necessary central position.
This happens as follows :

– Turn the adjusting screw (Pos.34) slightly to the stop in direction of the threaded bush (Pos.108).
– Unscrew the threaded bush (Pos.108) (anticlockwise). Due to this, the idler spindle is being pushed in direction of the driving side against the one flank of the double–flow driving spindle (Pos.150).
– Screw in the threaded bush (Pos.108) (clockwise). Due to this, the idler spindle is being pushed in direction of the end side against the other flank of the driving spindle.
– Find out the central position (test the position by using an sensor measuring device) and fix the central position by lateral reversing of the threaded bush (Pos.108) with the adjusting screw (Pos.34).

The double–flow spindle package is now adjusted in such a way so that the flank clearance can be realized in the previously described manner.

Attention

Trouble–free operation of the pump is only possible if the flank clearance is set correctly, we assume no liability whatsoever for installation done on your own initiative or incorrectly.

– After adjustment, the driving spindle must be turned by hand (in the case of the larger pumps, with the help of an extension such as a screw clamp or similar).
– Install the gearbox cover (Pos. 030) with the lubricated gasket (Pos. 031) and allen screws (Pos. 032) to the non–drive–side bearing housing.
– Install the drain plug (Pos. 036) with joint ring (Pos. 037).
– Install the oil level sight glass (Pos. 038).
– Fill up with gearbox oil as per Para: 7.7 through the opening for the air filter (Pos. 042).
– Install the air filter (Pos. 042).
– Insert the feather key (Pos. 180).

– Heat the pump side half of the coupling to a temperature of approx 110°C and slide onto the driving spindle (Pos.150). Under no circumstances shall the coupling be subjected to hammer blows during fitting as this will damage the roller bearing and the shaft seal.

❍ **Installation of externally–mounted valve (pressure relief valve)**

– Screw the regulator spindle (Pos. 225) with the O–ring (Pos. 226) into the valve seat cover (Pos. 217), install the hand wheel (Pos. 227) on the regulator spindle (Pos. 225) (*** Only if configured with a hand wheel.)
– Insert the valve cone (Pos. 219) with the shaft into the valve seat cover (Pos. 217).
– Push the valve seat cover (Pos. 217), complete with the valve cone (Pos. 219) and gasket (Pos. 213) into the valve casing (Pos. 200) and screw it up tightly with the screws (Pos. 214)**(only valid for L4NG).**
– Insert the valve cone (Pos.219) into the pump casing (Pos.001) einschieben **(only valid for L4NO).**
– Push the valve spring (Pos. 235) with the fore–part onto the pressure spring guide of the valve cone (Pos. 219).
– Insert the O–ring (Pos. 224) into the groove of the adjusting screw.
– Screw the spring collar (Pos. 220) into the adjusting screw (Pos. 222) up to the join, lubricate the shaft of the adjusting screw and turn it while pushing it into the drilled hole in the valve cover (Pos. 209).
– Lock the adjusting screw (Pos. 222) with the locking ring (Pos. 223) to prevent any axial movement.
– Install the valve cover (Pos. 209) with the adjusting screw (Pos. 222) and the gasket (Pos. 210) on the valve casing (Pos. 200) and pump casing (Pos. 001) of the L4NO respectively.
– Next, to fasten it, use two longer allen screws placed opposite each other and with a equal number of turns up to the stop.
– Insert the screws (Pos. 211) into the remaining fixing holes, finally, remove the longer installation screws and insert the remaining screws (Pos. 211).
– Install the spacer plate (Pos. 203). ** Only if configured for back–flow to the tank **(only valid for L4NG).**
– Place the valve casing (Pos. 200) and seal (Pos. 026) on the pump casing, screw them up tight with the fastening pieces (Pos. 027, 253, 254 and 256), **(only valid for L4NG).**

After reassembly has been completed, the pump unit should be connected again to the driver and fastened down as per Para: 5.2. The delivery, inlet and power supply lines should be connected correctly. During the re–startup as per Para: 6, the pressure relief valve, if available, is to be set to the required opening pressure.

⇒ **Setting of pressure relief valve (opening pressure), Fig. 01**

Exact setting of the opening pressure can only be done with measurement of the flow throughput and operating pressure. If that is not possible on site, it must be done at the factory by the manufacturer.

If the number of turns to untension the pressure relief valve had been noted, the opening pressure cannot be set to approximately the same as before by applying the same number of left–hand turns of the adjusting screw (Pos. 222). This does not apply if the valve spring has been replaced!

Simplified Setting of the Opening Pressure:

– Lightly preload the valve spring (Pos. 235) with the setting screw (Pos. 222).
– Let the pump run, and open throttle slide A (delivery side).
– Close valve C at the inlet point so that the pressure display shows approx. –0.4 to –0.5 bar.
– Open valve A slowly while constantly watching pressure gauge D (delivery side) and D (inlet side).
– If the pressure at D moves slightly towards atmospheric pressure, then the valve has opened at value B.
– If the desired value has not been reached yet, open valve A again and change the opening pressure with the setting screw (Pos. 222).
Turning clockwise sets the opening pressure lower, and turning anti–clockwise sets it higher.
– Adjustment has to be repeated as many times as necessary until the correct setting–pressure is reached.

7.6. Spare Parts

In general, we recommend that the user should keep a complete set of spare parts for the pump unit on store. It is also possible to select a set of appropriate spares acc. to our spare parts list for the individual user. In order to do this, the following information shall be supplied when ordering.

- Pump type
- Pump size
- Leistritz serial Number
- Designation, sectional drawing number and Pos. No.
- Leistritz Item No. and quantity
- Orderer/User
- Name of contact person
- Address and Telephone Number

Attention An interchangeability can only be guarantied when exact information is supplied.

Only original LEISTRITZ spare parts may be used.

For information regarding preservation and intermediate storage of spare parts, resp. replacement units, see Para. 3.4. and 3.5.

7.7. Lubrication Information

Pumps of the L4NG type have the following machine parts which require lubrication at regular intervals:

- gearbox casing with helical gear set, including the roller bearings lubricated by oil mist.
- drive–side roller bearing set.

Selection of the correct lubricants is important. Thus please make a selection from the **Lubrication Table**, which you will find in the appendix to the operating and maintenance instructions.

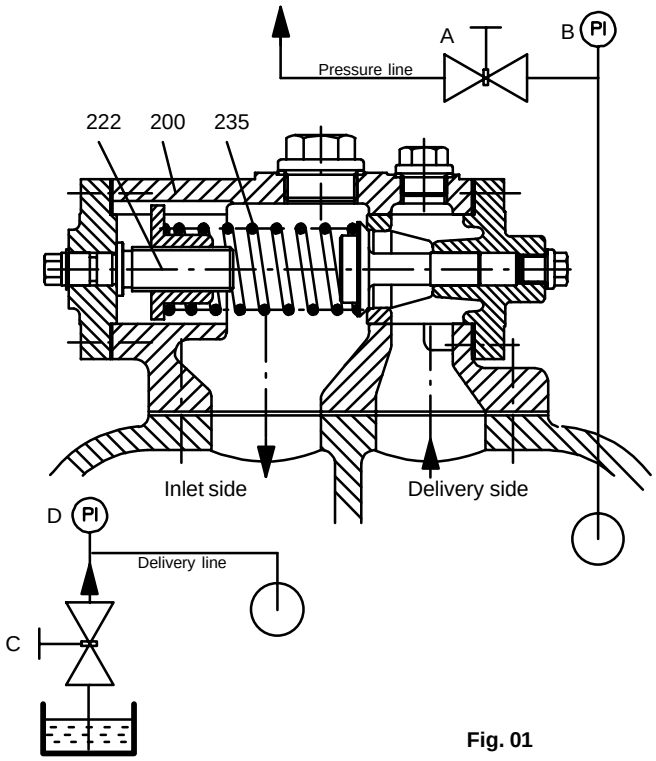


Fig. 01

8. Faults, Reasons and Elimination

8.1. Table of faults with definition of reasons and the elimination

The table shown below serves to illustrate possible faults of the pump unit. Should faults occur during operation that are not included in the table, we recommend that you contact the factory or one of our sales representatives.

When faults are to be rectified, the pump must be pressureless and drained.

Operating faults of the Screw Spindle Pump								
No suction or discharge pressure	Delivery pressure and flow capacty too low	Fluctuating media flow	Pump is leaky or sucks air	Pump produces unusual noise	Pump has seized	Pump is overloaded	Pump unit vibrates	Reasons for faults and their elimination
■								Compare direction of rotation arrow on pump with direction of rotation of motor. If necessary reverse motor.
■	■	■		■				Check inlet line and fittings for proper sealing, check valve setting Vacuumetric inlet suction too high, shorten inlet line, arrange pump lower Improve volume flow, increase the nominal width of the inlet line Reduce flow turbulence, lay inlet line in straight lines
■								The suction side is empty. Stop the pump immediately.
■	■	■				■		Drive speed too low. Check motor for speed and power output. Compare motor speed, supply voltage and frequency to designating plate.
				■		■		Discharge pressure too high. Check operating data of pump, media viscosity. Compare operating data. Heat media if necessary.
	■							Viscosity too low. Compare operating data, increase drive speed as required. Select a pump with steeper spindle pitch or next larger size of motor. Increase media viscosity by changing media temperature.
			■		■			Damaging the sealing system due to dry running of the pump. If the sealing system does not preview an external quench or if it is not suitable, the mechanical seal can be damaged during long dry running. They can be washed into the spindle system and seize. Remove malfunction by repairing the pump.
■	■	■		■				Air in inlet and delivery system, bleed air from the pump at the highest point, select larger media tank with better air and gas separation, run flow–back lines below the level of the media
			■					Mechanical seal has been damaged by impurities in the media flow. Mechanical seal surfaces worn. mechanical surfaces overheated due to being allowed to run dry. Replace complete mechanical seal
			■					The stuffing–box–seals should be checked eventually as described in item ”adjustment” in chapter 4.3.8, the glands should be readjusted .
	■				■			Pump damaged through overstressing. Spindles seized or run in in the casing boring. Remove malfunction with slight damages: smooth damaged areas, mount the parts again on the pump and control the operating points.
	■			■	■			Pump damaged through overstressing. Inner parts of the pump considerably worn out. Repair pump with spare parts.
				■		■	■	Pump and coupling are not correctly aligned and mounted. Realign the unit. Check manufacturers data for the coupling.
				■		■	■	Pressure and vacuum lines are under tension (see para 4.5.4.4.).
				■		■	■	Foundation bolts not tightened up equally, tighten them up equally without stressing the unit
				■	■	■	■	Ball bearings defective, dismantle and replace
				■			■	Coupling components defective. Dismantle unit and replace.

8.2. Screw Torque Requirements

Respective torque requirements acc. to VDI 2230, Sheet 1 (medium friction class Factor 0.14) for shoulder studs with standard metric threads acc. to DIN 13, Part 13 and head dimensions of hexagon head screws acc. to ISO 4014, 4016 and 4018 resp. fillister socket head screws acc. to DIN 912.

Thread size	Tensile Strength Class	Tightening Torque in Nm
M6	8.8	10.4
M8	8.8	25
M10	8.8	51
M12	8.8	87
M16	8.8	215
M20	8.8	430
M24	8.8	740
M30	8.8	1500
(M33)	8.8	2000
M36	8.8	2600

8.3. Permissible Pipeline Forces and Torques

The piping forces and moments acting on the delivery and inlet lines of the pump given in the individual and overall specification sheets may not be exceeded. The applicable installation drawing is listed in the specification sheet.

If these values are exceeded, damage to the pump unit may occur. Possible thermal stresses shall be compensated for by the appropriate means, e.g. flexible pipeline couplings.

8.4. Amendments to this Technical Documentation.

Rev.–No.	Chapter	Page	Modification / Amendment	Date	Name	Checked
1	7	12,14, 15	Characteristic features of size 186 additionally	97.4.9		
2	4, 6, 7	4, 5, 8, 9, 10, 11, 13	Details “double–acting mechanical seal” additionally	97.10.8	Frbg.	
3	1, 4, 7	1, 4, 5, 6, 11, 12, 13, 14, 15, 16, 17	pump serie L4NO additionally	7.12.99	Frbg.	
4	4.6.4.4 +6.2	6+8	Cleaning and pressure test of the pipework	25.2.02	HB	

First Issued		Prepared by	Checked by	Approval by
Date	20th. April 1995	see Rev. 1		see Rev. 1
Department		KDP	. . . . .	. . . . .

9. For Drawings and Documents, see Appendix

Lubrication Information

Lubrication point 1: Gearbox casing
The gearbox cover (Pos. 030) is to be filled up to the middle of the sight glass (Pos. 038) with gearbox oil as per the Lubrication Table.

Lubrication point 2: Roller bearing set on drive side
The drive–side roller bearings must be lubricated or greased via the side–mounted compression lubricators with high–grade, temperature–resistant roller bearing grease.

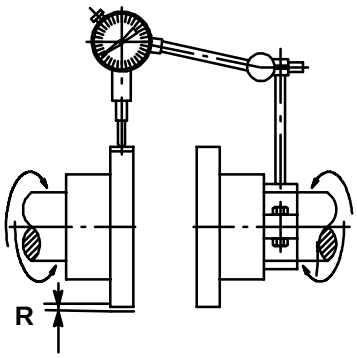
Amounts of Oil for Filling or Topping Up (General Information)
The table below gives the filling quantities, oil change intervals, and the lubrication intervals for all sizes of pumps of the L4NG or L4NO type. The lubrication intervals are for pump media temperatures of 100°C and up to 200°C, and are listed in the lubrication table below according to the temperature.
The time intervals between oil change and topping–up operations should be halved for each temperature increase of 60°C.
The quoted amounts of oil are approximate values only and only apply if the drive spindle and main spindle are arranged as shown at the table.

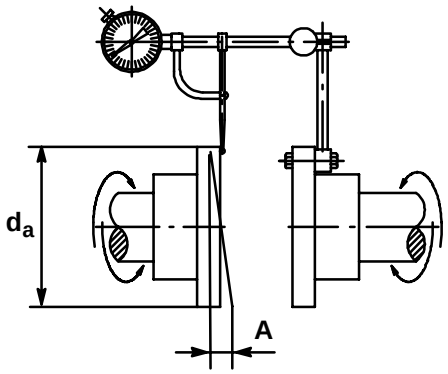
In general, the gearbox cover is to be filled up to the middle of the sight glass. The filling quantities for specific projects and installations are listed in the specification sheets in the relevant project–related documentation. In general, the gearbox cover is to be filled up to the middle of the sight glass. Furthermore, the compression lubricators must always be filled with a suitable roller bearing grease.

Pump	Amount of oil			Oil change **Interval**	Bearing **grease**	Lubrication interval
	Pump horizontal Arrangement of spindle		vertical			
	vertical stacked	horizontal side–by–side				
L4NG(O) 48	0,15 l	0,34 l	0,34 l	8000 h	35 cm^3	800 h
L4NG(O) 62	0,65 l	1,3 l	0,65 l	8000 h	50 cm^3	800 h
L4NG(O) 82	0,78 l	1,6 l	1,3 l	8000 h	60 cm^3	800 h
L4NG(O) 96	1,1 l	2,2 l	2,0 l	8000 h	80 cm^3	800 h
L4NG(O) 106	1,2 l	2,5 l	2,4 l	8000 h	100 cm^3	800 h
L4NG(O) 126	1,4 l	3,0 l	3,2 l	8000 h	130 cm^3	800 h
L4NG(O) 140	2,0 l	4,0 l	4,5 l	8000 h	280 cm^3	800 h
L4NG(O) 164	2,0 l	4,8 l	7,0 l	8000 h	450 cm^3	800 h
L4NG(O) 186	3,9 l	10,5 l	12,0 l	8000 h	750 cm^3	800 h
L4NG(O) 240	6,7 l	11,9 l	16,0 l	8000 h	1,15 dm^3	600 h

Lubrication table:

	For temperatures at the prevailing temperature of the pump media			
	up to 100°C		from 100°C to 200°C	
	Gearbox casing with gear wheel set	Drive–side roller bearing set	Gearbox casing with gear wheel set	Drive–side roller bearing set
Aral	Degol BG 100	Aralub HLP 2	Degol BG 150	—
BP	BP–Energol GR–XP100	BP–Energrease LS–EP2	BP–Energol GR–XP 150	—
Castol	Alpha–MW 100 oder Alpha–SP 100	Spheerol Ap 2	Alpha–MW 150 oder Alpha–SP 150	—
Dea	Falcon CLP 100	Glissando EP 2	Falcon CLP 150	Diskor Plus 2
Esso	Spartan EP100	Beacon Ep 2	Spartan EP 150	Unirex S 2
Fuchs	Renolin MR 30	Renolit FEP 2	Renolin MR 40	Renoplex EP 3
Mobil	Mobilgear 627	Mobilux EP 2	Mobilgear 629	Mobiltemp SHC 32
Optimol	Optigear 100 oder Ultra 100	Olit 2 EP oder Longtime PD 2	Optigear 150 oder Ultra 150	Optitemp HT 2
Shell	Omala ISOVG 100	Alvania Grease Ep 2	Omala ISOVG 150	Darina Grease 2





	speed n= up to max 1500 rpm		speed n= up to max 3600 rpm	
Ø coupling up to da =	**R_{max}**	**A_{max}**	**R_{max}**	**A_{max}**
30	0,06	0,06	0,04	0,04
40	0,07	0,07	0,05	0,05
50	0,08	0,08	0,05	0,05
65	0,09	0,09	0,06	0,06
80	0,10	0,10	0,07	0,07
100	0,12	0,12	0,08	0,08
120	0,14	0,14	0,09	0,09
140	0,16	0,16	0,10	0,10
160	0,17	0,17	0,11	0,11
180	0,19	0,19	0,12	0,12
200	0,21	0,21	0,13	0,13
225	0,23	0,23	0,15	0,15
250	0,25	0,25	0,16	0,16