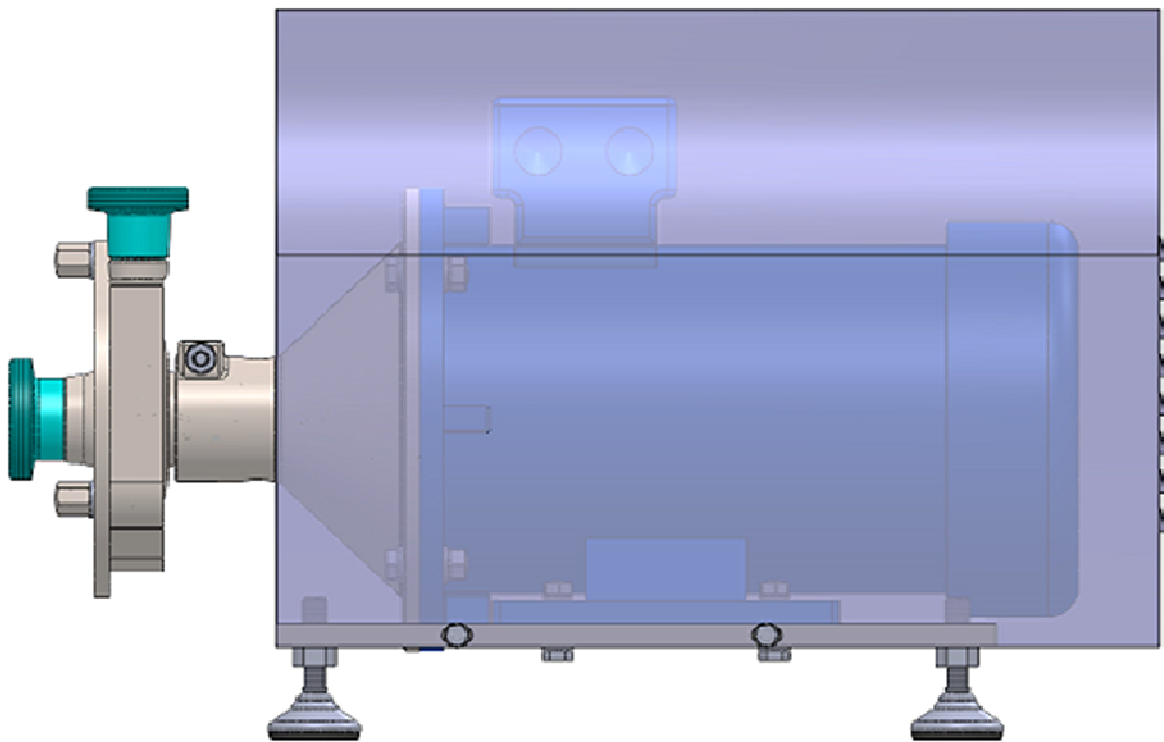


Ampco Pumps GmbH



LME Series **Instruction and Maintenance Manual**

M-041 REV A

<i>Introduction</i>	3
Warranty, General Information Shipping Damage or Loss	
<i>Receiving / Safety / Labels</i>	4
Pump Receiving, Safety, Label Information on the Pump	
<i>Technical Information</i>	5
Materials of Construction Seal, Motor Recommended Torque Values	
<i>Service and Maintenance</i>	6
Daily, semi annual, annual Pump Maintenance Checks Motor Lubrication Schedule Contingency Plan	
<i>Installation, Start-Up and Shutdown of the Pump</i>	7-8
Pump Location, Electrical Installation, Intended Use, Flushed Seals Start-Up, Shutdown Instructions	
<i>Pump Design</i>	9-11
Pump Head, Adapter and Electric Motor	
<i>Models / Pump Key</i>	12
<i>Assembly</i>	13-18
Assembly of Pump with Seal and Motor Exploded Assembly Drawing and Pump Parts List Assembly and Adjustment of Pump Shaft Mounting the Adapter Mounting the Pump Housing Pump with Clamp Connection Pump with Flange Connection Mounting the Pump Cover	
<i>Setting Impeller Clearance</i>	18-19
<i>Seals—Description and Installation</i>	20-22
<i>Sound Piping Practices</i>	23
<i>Troubleshooting</i>	24-25

To ensure the best results and service, please read and fully understand this manual prior to putting this pump into service. For any questions regarding operation, maintenance, or installation, please contact your local distributor or Ampco Pumps:

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Ampco Pumps Warranty

Ampco Pumps guarantees all of its manufactured products sold to be free from defects in material and craftsmanship for a period of one (1) year (in the EU according to Directive 1999/44EC) from the date of shipment. The warranty does not apply to products requiring repair or replacement due to what is deemed as normal wear and tear. Conditions arising from normal wear and tear include, but are not limited to, standard rotor wear, pump body wear, seal wear, bearing or gear wear. Damages due to accident, misuse, or improper maintenance are not covered by the Ampco Pumps' warranty.

Ampco Pumps assumes no liability for consequential, incidental or indirect, damages. The purchaser, by acceptance of delivery, assumes all liability for the consequences of use or misuse by the purchaser, his employees, or others. Unless approved by Ampco Pumps in advance, Ampco Pumps will assume no field related expenses for service or parts.

General Information

Each Ampco LME pump (when supplied with motor) is fully assembled, lubricated, and tested at the factory and shipped ready for use. Standard maintenance practices are outlined in this manual. For more information, please refer to the Maintenance section starting on page 7. Following these guidelines will provide long-lasting, trouble-free service when the pump is incorporated in a properly designed system.

If deemed necessary to return product under warranty, or for any other reason, contact Ampco Pumps to receive a Returned Material Authorization (RMA) number to allow us to expedite this request as quickly as possible.

Shipping Damage or Loss

Visually inspect shipping crate(s)/pallet(s) for damage. Ampco pumps will be shipped in boxes labeled Ampco or in crates. If there is any damage it is imperative to notify the driver at the time of delivery. Failure to do so will make it difficult, if not impossible, to file a damage claim and Ampco will not be held accountable. Please contact Ampco Pumps GmbH with damage details ASAP.

Pump Receiving

Ampco covers the pump inlet and discharge ports prior to shipping, ensuring that foreign matter does not enter the pump during shipment. If the protective covers are missing upon arrival, remove the pump cover and inspect to ensure it is free of foreign matter before turning the shafts. Please make a note of the pump serial number; this will assist in the process of ordering replacement parts and/or warranty claim. For more information regarding shipment damage or warranty, please refer to the Introduction/Warranty section in this manual.

Once unpacked, carefully inspect the pump for any damage that may have occurred during shipping. Using a suitable socket, an extension drive and ratchet turn the impeller nut to make sure the impeller turns freely. There should be a little noise from the seal which is normal. If there is metal to metal contact when the impeller is turned shipping damage is likely. Leave the protective covers on the inlet and discharge connections until the pump is installed and is ready to be connected to the piping.

Safety

IMPORTANT: Read and understand this manual BEFORE installation, operation or maintenance of the pump. Improper installation, operation or maintenance may result in severe injury or death. Equipment damage caused by user neglect will invalidate the pump warranty.

There are safety symbols used throughout this manual identifying safety concerns.



WARNING: Hazards or unsafe practices that COULD result in severe personal injury or death, and how to avoid them.

CAUTION: Hazards of unsafe practices that COULD result in minor personal injury or damage to product or property.

Label Information



WARNING: Labels are installed on the pump at the factory to ensure proper warning to users. Do not try to remove these labels; doing so may result in injury.

The pump is installed with simple, but effective labels to help the customer better understand the LME pump. An identification plate is applied at the factory to help track the life of the pump. The customer should be aware of the pump's serial number and model number prior to contacting Ampco with any concerns.

Max. Inlet Pressure	10.3 bar
Temperature range	-40° C → 150° C
Materials	
Housing	Stainless steel AISI 316L
Cover	Stainless steel AISI 316L
Impeller	Stainless steel AISI 316L
Shaft	Stainless steel AISI 316L
Adapter	Stainless steel AISI 304
Product contact surface finish	0.8µm (standard)
Optional finish	0.6 or 0.4 µm, electropolished
O-rings and gaskets	EPDM (standard)
Optional materials	Viton (others upon request)
Seal	
Type	internal single shaft seal
Option	internal single shaft seal with flush
Pressure (for flushed shaft seal)	Approx. 0.3 bar
Water consumption	Approx. 18 l/h
Stationary seal material	Stainless steel
Rotating seal material	Carbon
Optional material	Silicon carbide/Silicon carbide Tungsten carbide/Tungsten carbide
Motor	Please observe the motor manufacturer's specifications.
Impeller Clearance	See Section "Setting Impeller Clearance" Pages 18-19

Daily Pump Maintenance Checks

1. Pump leakage (seal or otherwise)
2. Pressure reading and flow indication
3. Change in operating sound
4. Change in bearing temperature
5. Flow through flushed seals

Semi-Annual Pump Maintenance Checks

1. Shaft seal
2. Motor bearing lubrication

Annual Pump Maintenance Checks, including semi-annual maintenance checks plus:

3. Removal of seal for inspection
4. Bearing check
5. Check of axis/running clearance of impeller

Motor Lubrication Schedule: Every 2200 hours of standard service.
 Every 1100 hours of severe service.
 Every 220 hours of extreme service.

Standard service: 8-16 hours of service up to 104°F/40°C in a clean environment with a low corrosion level.

Severe service: 16+ hours of service per day up to 120°F/50°C in an environment with moderate pollution and corrosion levels.

Extreme service: 8-16 hours of service per day over 120°F/50°C in an environment with severe abrasive dust pollution, a high corrosion level and heavy shocks or vibrations.

Contingency Plan

An adequate supply of probable replacement parts should be kept in stock.
The minimum spare parts are:

1. Single shaft seal (kit)
2. Cover gasket
3. Impeller key

In addition, Ampco also recommends keeping the following in stock:

4. Impeller
5. Cover
6. Impeller nut

Where service cannot be interrupted, a complete stand-by pump unit fully assembled (in a bypass line) is recommended.

Pump Location

Install the pump in an optimal location. Be sure that there is room around the pump so it can be accessed readily for maintenance and that the motor has adequate ventilation. Make sure the motor type is suitable for the environment in which it is installed.

Electrical Connection



Electrical work may only be carried out by properly qualified personnel!

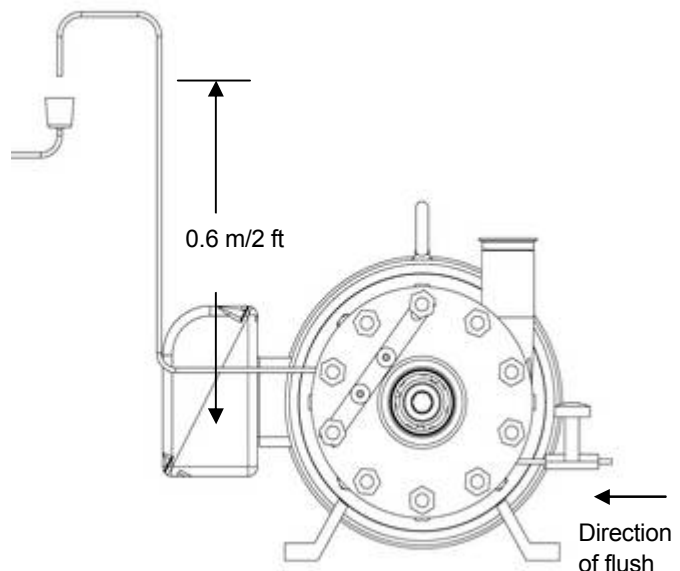
Have a qualified electrician connect the motor using sound electrical practices. Do not test run the motor with the pump dry. Shaft seals can be damaged running dry, even momentarily. The pump must be flooded and the flush must be connected with the flushing water flowing before starting the pump.

Intended Use

The pump and motor are intended for specific applications and are designed to suit the environment and plant in which they are to operate. Any changes to the environment or system conditions (e.g. medium, pressure losses or NPSHR values) can lead to an overload of the motor. Should your system conditions change or if you are unsure whether the equipment is suitable for the planned application, please contact Ampco Pumps GmbH for technical advice.

Flushed Seals

Install flush piping as shown on the right. The regulating valve must be on the inlet end of the flush. The flush requires approx. 18 l per hour at 1 bar. The tubing on the exit side of the flush has a minimum height of 0.6 m so once the flush has run, there will be a small amount of water on the seal and it will not run dry. Direction of flow should always be from a lower elevation inlet to a higher elevation outlet to evacuate air if there is a difference in elevation.

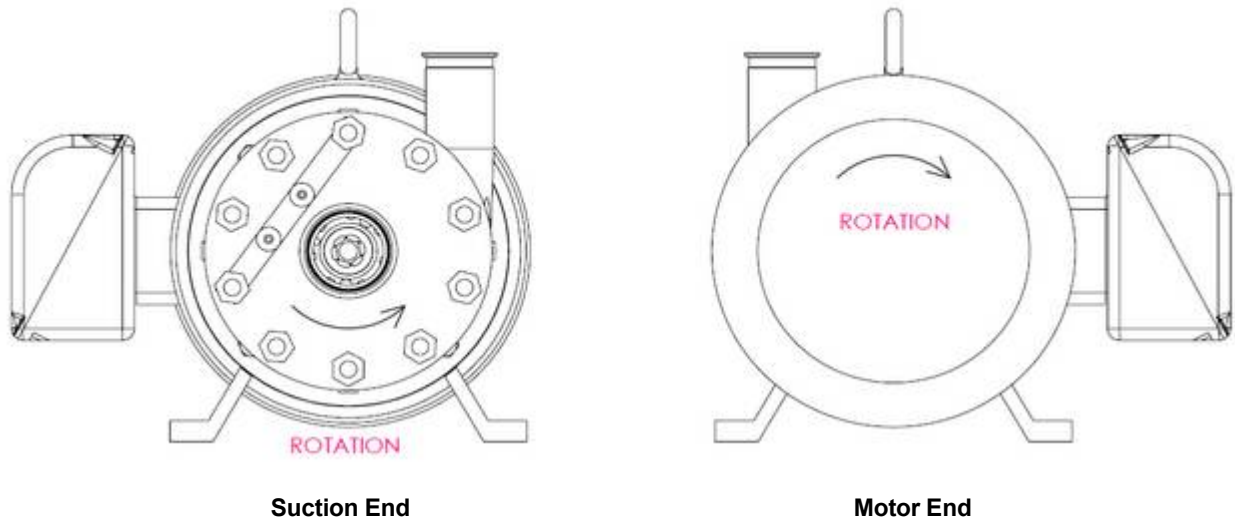


Start-Up and Shutdown

Start-Up

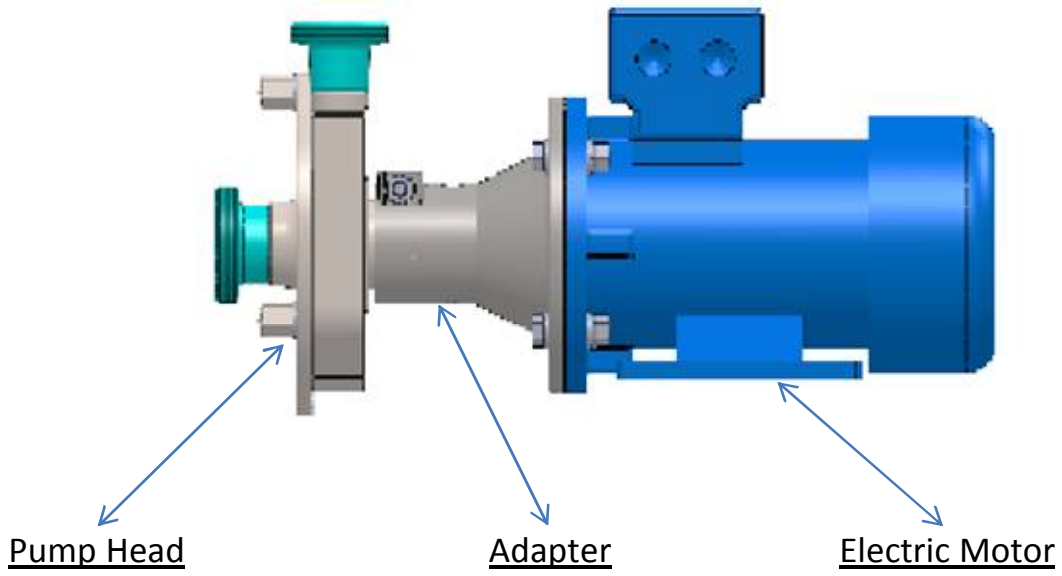
Make sure the pump is clean and free of any foreign matter.

Once the motor, flush and piping all have been properly connected, the flush is turned on and is visibly flowing (if the pump has a flush option) and the pump has been flooded, the pump can be momentarily turned on to check the motor rotation. The correct rotation is counter-clock wise while looking at the pump from the suction end clock wise if looking at the pump from the motor end. When the rotation of the motor has been verified to be correct the pump is ready to run continuously for service.

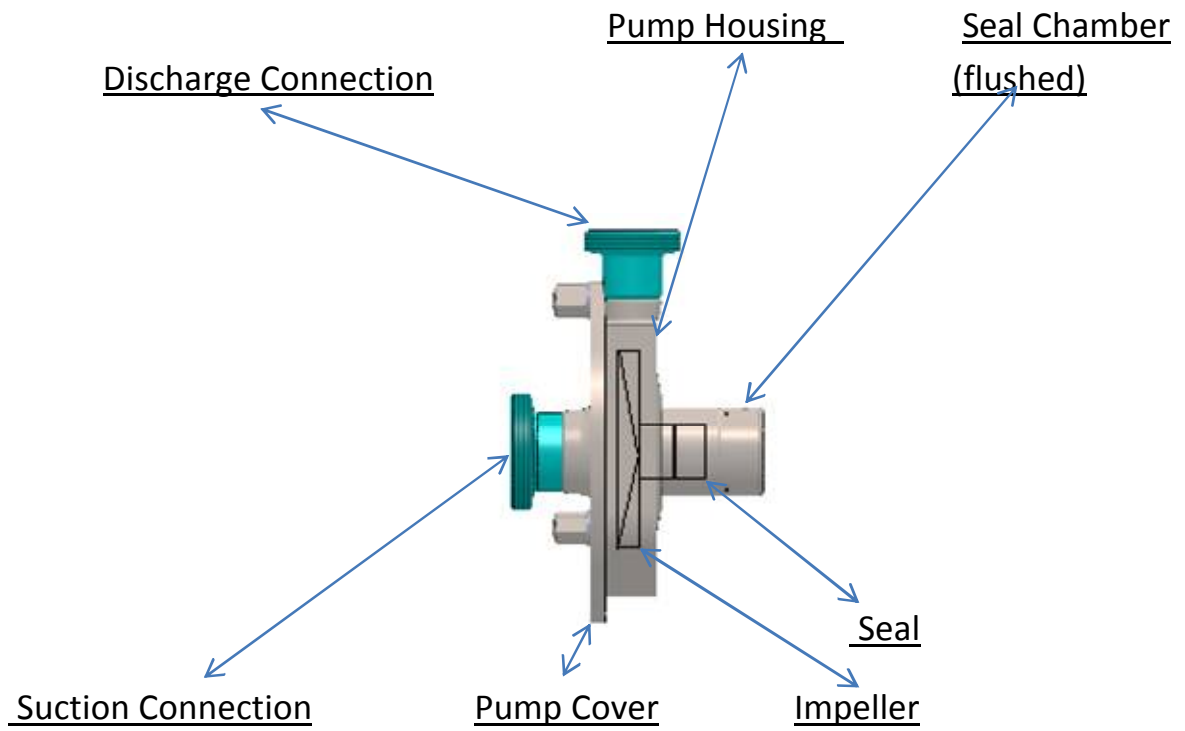


Shutdown Instructions:

- Turn off the power supply to the pump.
- Close shut-off valves.
- Drain and clean the pump.



Pump Head :



Pump cover :

The connection for the suction line is located on the pump cover.

Pump housing :

The discharge line connection is on the pump housing.

Impeller

The impeller is installed inside the pump housing.

Shaft seal

The shaft seal is installed inside the pump housing.

There are two types of seal available:

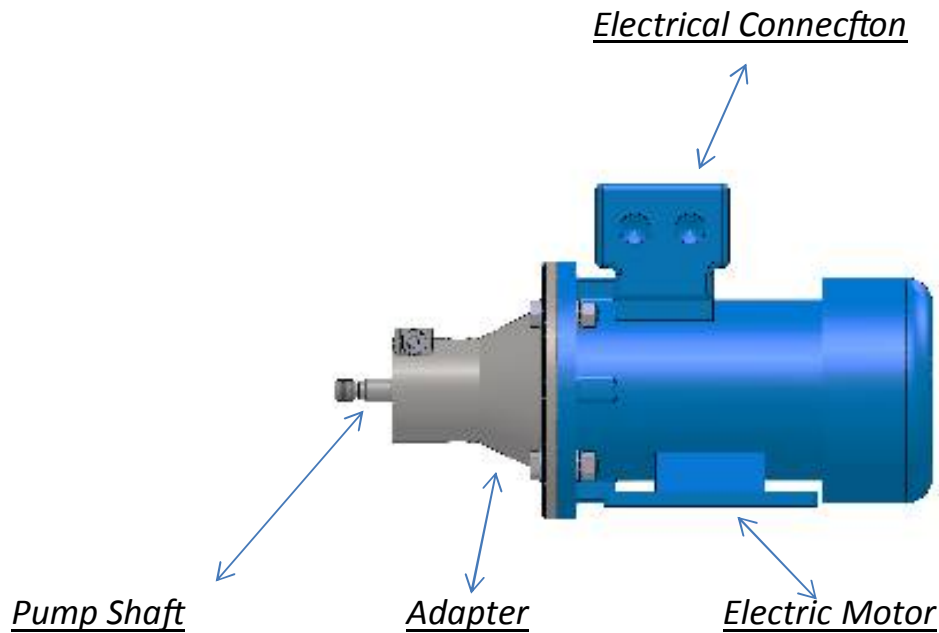
- Single shaft seal
- Flushed shaft seal

If the flushed seal is used, two additional connections are required on the pump housing for the sealing liquid.

Seal chamber

The seal chamber is on the pump housing when using the flushed seal option.

Adapter and Electric Motor



Pump shaft :

The pump shaft is placed onto the motor shaft and clamped.

Adapter :

An adapter is used with all models to connect the pump housing to the motor. Two versions are used depending on pump size:

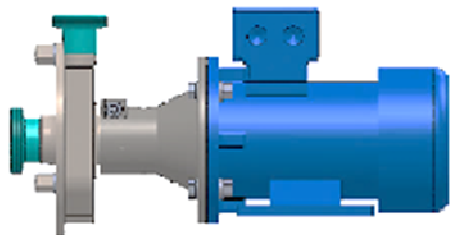
- Pump housing and adapter are fitted using a push-in/clamp connection.
- Pump housing and adapter have a flange-screwed connection.

Electric motor :

An IEC standard motor with shaft and key is used with:

- B3/B5 : Model with flange and base. With standard motor, the pump shaft is clamped onto the motor shaft. The drive end bearing is fixed.

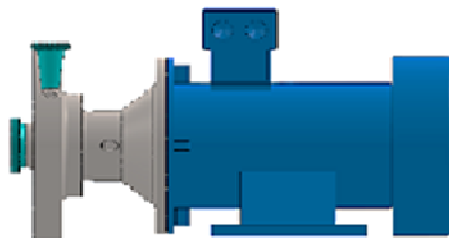
LME R / V



Motor : IEC standard motor, Model B3/B5

Adapter : Clamp connection

Pump head : Clamp connection

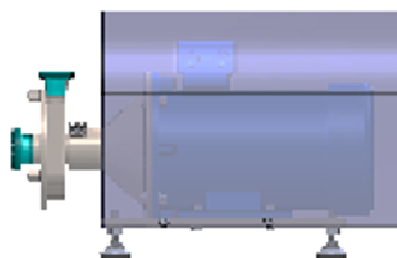


Motor : IEC standard motor, model B3/B5

Adapter : double flange connection

Pump head : flange connection

Versions with enclosure, foot plates and adjustable feet are available for all models (see diagram).



LME with enclosure, foot plates plates and adjustable feet

Pump key

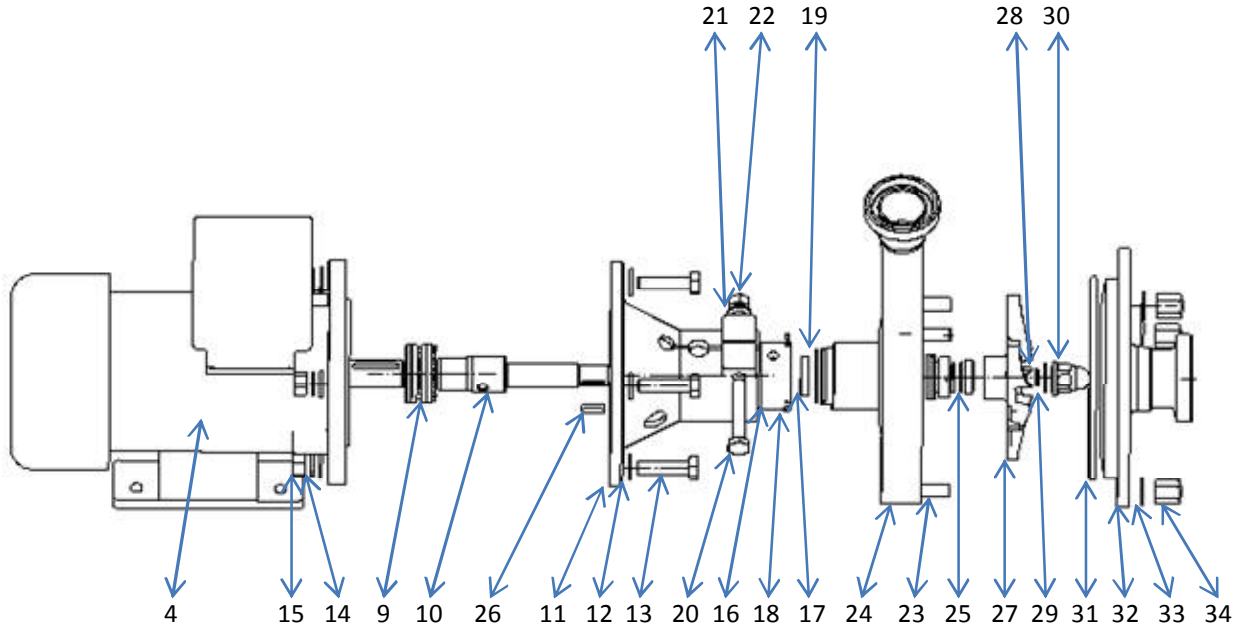
LME R 42

LME V 542

- LME: Pump Type
- R / V: R Version => Round Housing or V => Volute Housing
- 42 / 542 : IEC Standard Motor, Model B3/B5, 2-pole 3000 min⁻¹

Assembly of pump with seal and motor

Exploded assembly drawing of LME Pump



Key to pump parts:

Parts Number	Description	Parts Number	Description
4	Motor	22	Hex nut
9	Shrink disc	23	Stud screw
10	Shaft	24	Pump housing
11	Adapter	25	Shaft seal
12	Washer	26	Shaft key
13	Hex screw	27	Impeller
14	Lock washer	28	Snap ring
15	Hex nut	29	O-ring, impeller
16	Seal chamber	30	Impeller nut
17	Lip seal	31	O-ring, cover
18	Threaded pin	32	Pump cover
19	O-ring, housing	33	Washer
20	Hex screw	34	Hex nut
21	washer		

Item numbers and quantities are specified in an order-related parts list.

Assembly and adjustment of pump shaft:



When repair work on an existing system needs to be done, switch off the motor and secure against accidental restarting!

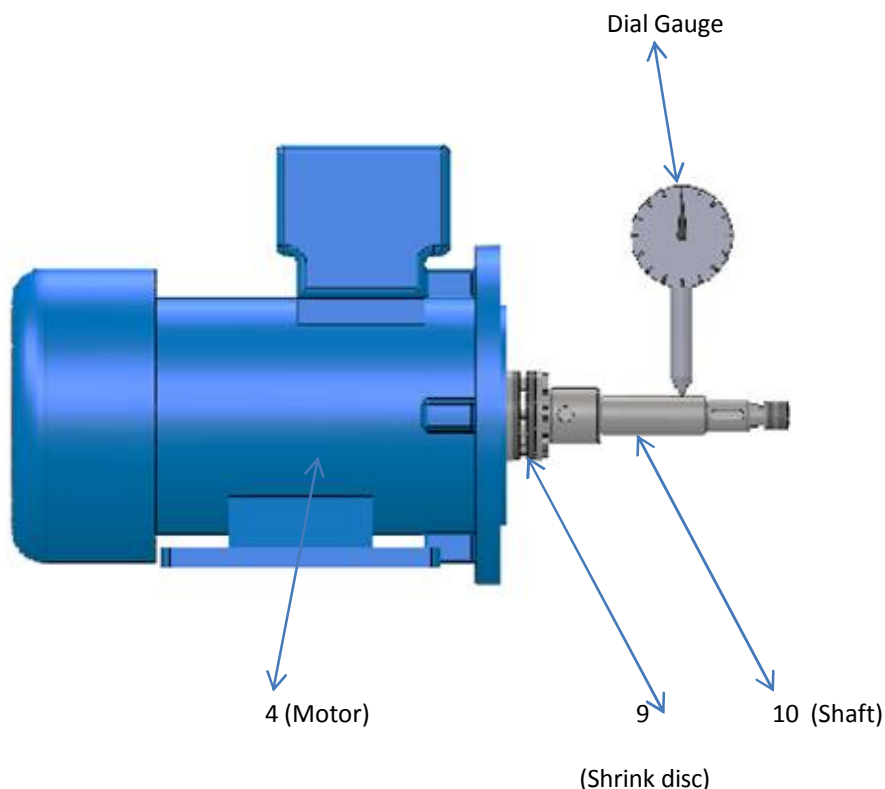
1. Remove the key from the motor shaft extension—with motor outputs of 30kW upwards a half key is inserted in the keyway.
2. Degrease the drill hole of the pump shaft (10) and shaft extension with a suitable cleaner.
3. Deburr the keyway and smooth the motor shaft extension with sandpaper.
4. Slide the pump shaft (10) with shrink disc (9) onto the motor shaft extension as far as possible.
5. Tighten the shrink disc (9) screws crosswise according to the torque table:

Thread	Tightening Torque
M5	6 Nm
M6	12 Nm
M8	30 Nm

6. Check the runout tolerance of the pump shaft (10) using the dial gauge.

Motor < 30 kW	Runout tolerance = 0.06 mm
Motor > 30 kW	Runout tolerance = 0.08 mm

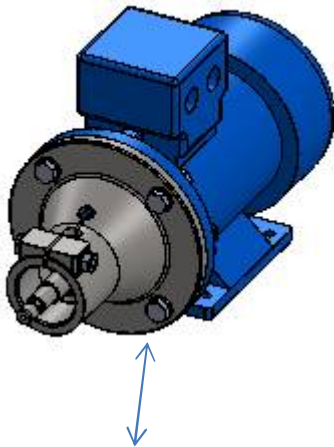
7. Align shaft if necessary.



Mounting the adapter

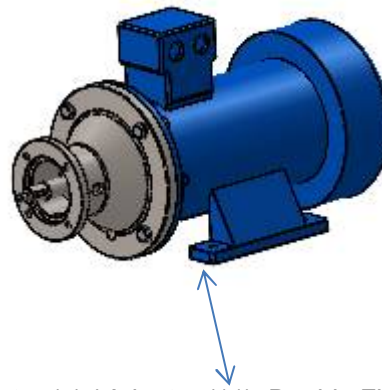
1. Visually check the mounting surfaces of the motor (4) and adapter (11) and, if necessary, smooth down with abrasive paper.
2. Clean the surfaces and connect the motor (4) to the adapter using suitable screws (13), washers (12), lock washer (14) and nuts (15). Make sure that the adapter is in the correct position.
3. Tighten the screws according to the torque table (lightly grease screws and nuts with suitable assembly paste, e.g. Klüber paste UH1 84-201).

Screw, Nut from A2 or A4	Tightening Torque
M 10	44 Nm
M 12	74 Nm
M 14	119 Nm
M 16	183 Nm



Motor (4) / Adapter (11) Clamp Connection

- Adapter with clamp connection:
Clamp connection is at the **top**.



Motor (4) / Adapter (11) Double Flange

- Adapter with double flange:
Drain hole at the **bottom**

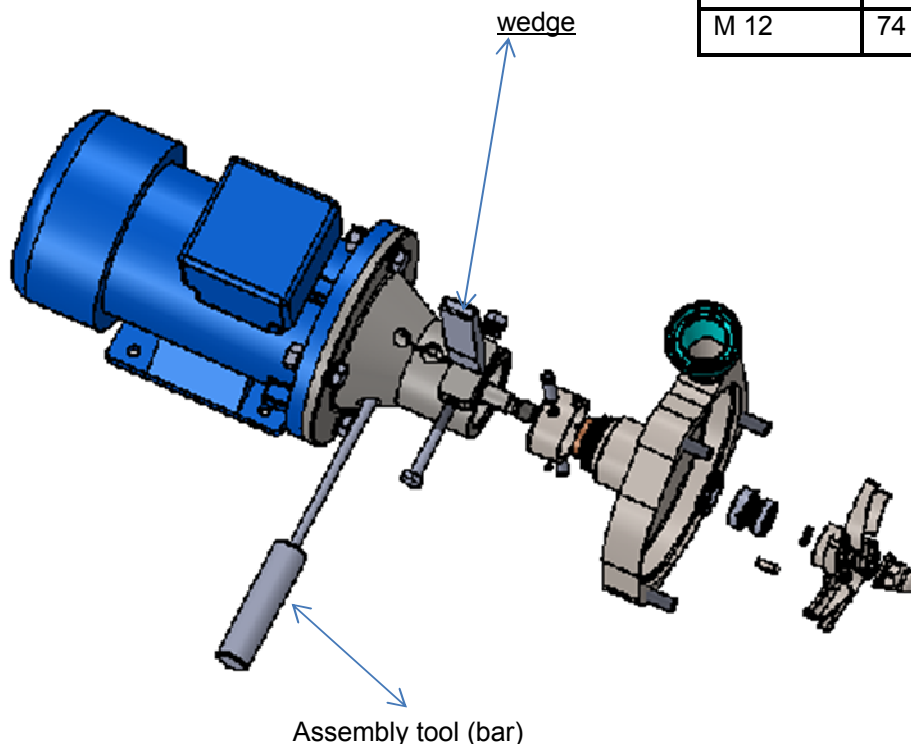
Mounting the pump housing (24)

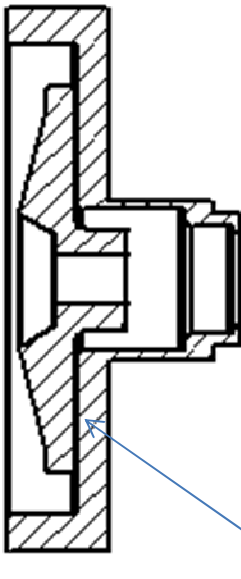
- Clean parts and check for damage and correct fit.
- Rework or replace any damaged parts.
- Assemble the parts carefully without applying much force—seals are easily deformed or broken.
- Replace all o-rings.
- To avoid damage, lubricate the mating surfaces and o-rings with silicone grease, water or alcohol.
- Clean the sealing surfaces of the shaft seals with a grease solvent. Do NOT touch the surfaces afterwards with your fingers or allow contact with grease or oil.

Pump with clamp connection

1. Using a wedge, slightly widen the clamp connection at the adapter (11).
2. For single shaft seal (25) or version with 35mm drill hole, go to step 3.
 For flushed shaft seal (25): First assemble the housing o-ring (19), seal chamber (16) with lip seal (17) onto the pump housing and push the shaft sleeve into the correct position using an assembly tool. Align the drill holes for the sealing liquid vertically and secure the seal chamber by tightening the threaded pins (18) with a torque of 2.6 Nm.
3. Insert the stationary seal ring into the pump housing.
4. Carefully slide the pump housing into the adapter and remove the wedge. Align housing so that the surface of the discharge line connection is horizontal.
 Set adapter and motor into position, grease the hex screw (20), nut (22) with assembly paste, e.g. Klüber paste UH1 84-201 and tighten slightly.
5. Slide the shaft seal (25) onto the shaft, insert the key (26), cut open and insert the snap ring (28) and install the impeller (27).
6. Fit the o-ring (29) into the impeller nut, lightly grease with assembly paste, e.g. Klüber paste L250L, and screw onto the pump shaft (10). Using an assembly tool (round bar) stop the pump shaft from turning by inserting it through the hole on the adapter and into the hole at the side of the shaft. Hold the bar and tighten the impeller nut (30) with a torque of 100 Nm.
7. Set the clearance between housing and impeller by moving the pump housing—use a feeler gauge to check the distance (see Table on page 17). Ensure that the surface of the discharge line connection is horizontal and tighten the screw and nut of the clamp connection according to the torque table below.

Thread	Tightening Torque
M 10	44 Nm
M 12	74 Nm





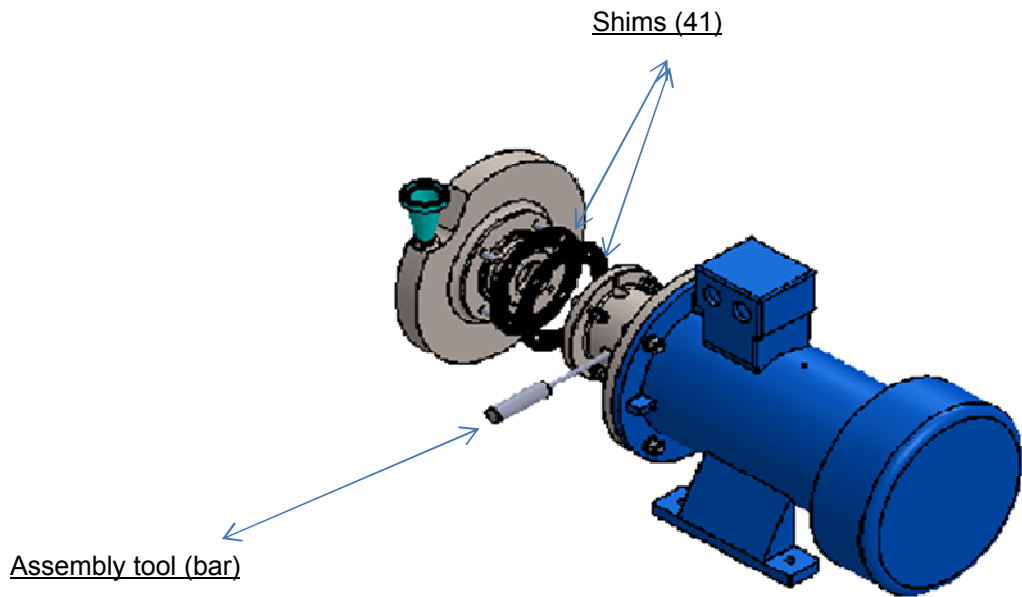
Clearance between housing (24) and impeller (27)

Type	Clearance in mm	
	Housing (24) / Impeller (27)	
LME R10	0.5	
LME R20	0.7	
LME R40	0.5	
LME R50	1.0	
LME V520	0.5	
LME V530	1.5	
LME V540	1.0	
LME V550	1.0	

Pump with flange connection

For pumps with flange connection the clearance is adjusted by shimming. First, the pump has to be assembled with driver, shaft key, impeller and impeller nut. Measure the distance between the housing and impeller with a feeler gauge to calculate the number of shims/shim thickness required. Then disassemble the pump and insert the shims between the adapter and housing. Reassemble and check the pump again after final assembly.

1. Align shim(s) (41) and housing (24) so that the surface of the discharge line connection is horizontal and then screw to the flange.
2. Mount the shaft seal driver onto the shaft.
3. Insert the shaft key (26) and install the impeller (27).
4. Lightly grease the impeller nut (30), e.g. with Klüber paste L250L. Stop shaft from turning with the assembly tool (bar) and tighten the nut with a torque of 100 Nm. Check that there is clearance.
5. Measure the clearance with a feeler gauge to determine the shimming required.
6. Remove impeller nut, impeller, shaft key and driver.
7. Remove the pump housing.
8. Place the required shims as calculated between flange and pump.
9. Preassemble the seal in the pump housing and screw housing to the flange.
10. Install seals, shaft key, impeller and impeller nut and tighten.
11. Recheck the clearance.



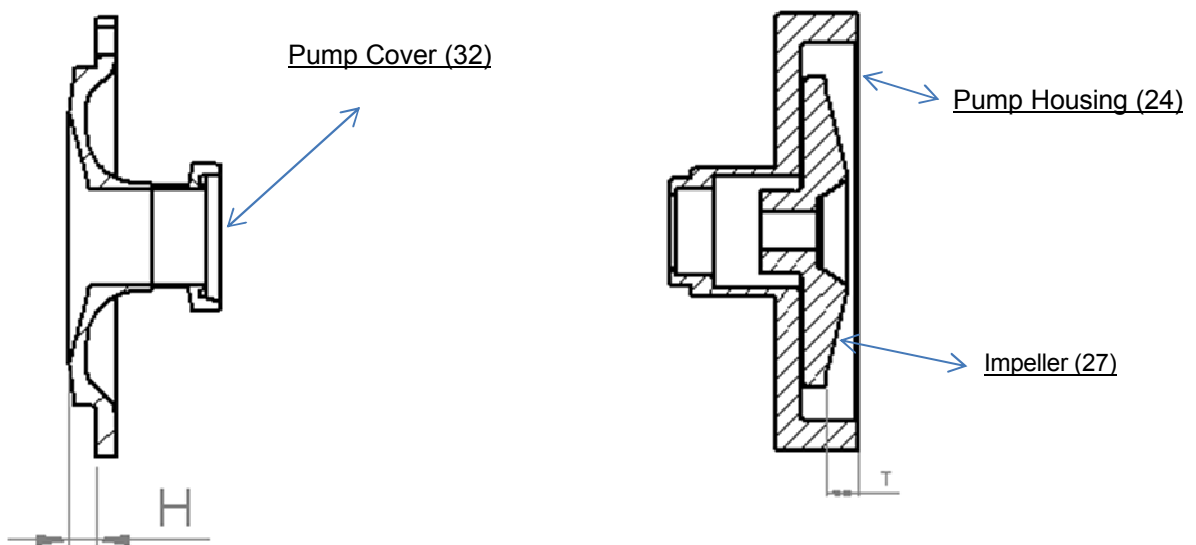
Assembly of pump cover

Before the pump cover 32) can be screwed to the pump housing (24) the clearance between the impeller (27) and cover (32) first has to be calculated.

Furthermore:

- The pump housing must already be connected firmly to the adapter and the housing/impeller clearance correctly adjusted.
- The impeller is installed and the impeller nut correctly tightened.

Calculating clearance between impeller (27) and pump cover (32)



Setting Impeller Clearance

1. Using a depth gauge measure the height H between the surface of the pump cover (32) and the contact surface of the housing (see drawing on page 18).
2. Measure the depth T from the cover contact surface to the outside flat surface of the impeller.
3. Calculate the clearance with the formula: Clearance=depth T– Height H.
4. Compare your result with the Clearances table, Impeller/Pump Cover.

Model	Clearances in mm
	Impeller (27) / Pump Cover (32)
LME R10	0.5
LME R20	0.5
LME R40	0.5
LME R50	1.0
LME V520	0.5
LME V530	0.5
LME V540	1.0
LME V550	1.0

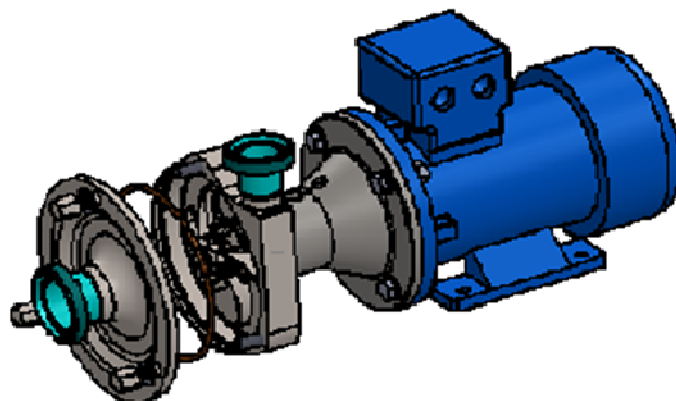
5. If the clearance does not match, check the parts again and rework, if necessary.

Mounting pump cover onto housing

1. Visually check the mounting surfaces of the housing (24) and cover (32).
2. Lightly grease o-ring, e.g. with Klüber paste L250L, and fit onto the seal surface of the cover. Mount cover with o-ring onto the housing.
3. Lightly grease the stud screws (23) e.g. with Klüber paste UH1 84-201. Put washers (33) onto the stud screws and screw on the cover nuts (34).
4. Fasten the cover nuts (34) with a 19 mm ring spanner, checking the fit of the cover, and tighten crosswise with a torque of 74 Nm.
Turn the impeller slowly by attaching a 24 mm socket wrench to the impeller nut (access it through the suction connection) and check for any friction noise at the housing or cover.



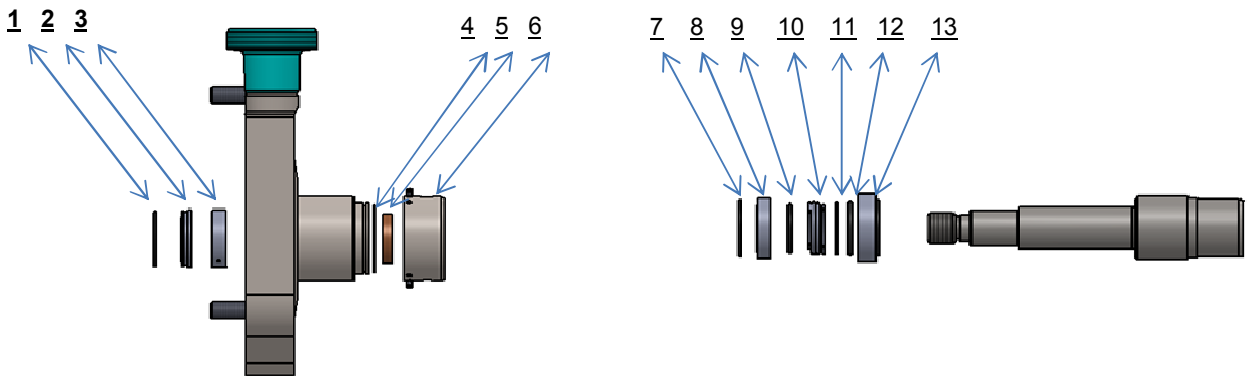
Never let the pump run dry !



Installation of standard shaft seals

Housing Seal Assembly LME R 22mm seal

Shaft Seal Assembly LME R 22mm seal



<u>1</u> O-ring	<u>7</u> O-ring	<u>10</u> Spring	<u>13</u> Rotating seal ring
<u>2</u> Stationary seal ring	<u>8</u> Driver	<u>11</u> Support ring	
<u>3</u> Spacer bushing	<u>9</u> O-ring	<u>12</u> O-ring	

Option for flushed seal:

<u>4</u> O-ring for housing (19)
<u>5</u> Lip seal (17)
<u>6</u> Seal chamber (16)

Housing seal assembly without flushed seal:

1. Insert the spacer bushing (3) into the hole at the pump housing (24) as far as it will go.
2. Place a lightly greased o-ring (1) into the groove on the stationary seal ring (2).
3. Slide the stationary seal (2) with o-ring into the pump housing so that it presses against the spacer bushing.

Housing seal assembly with flushed seal:

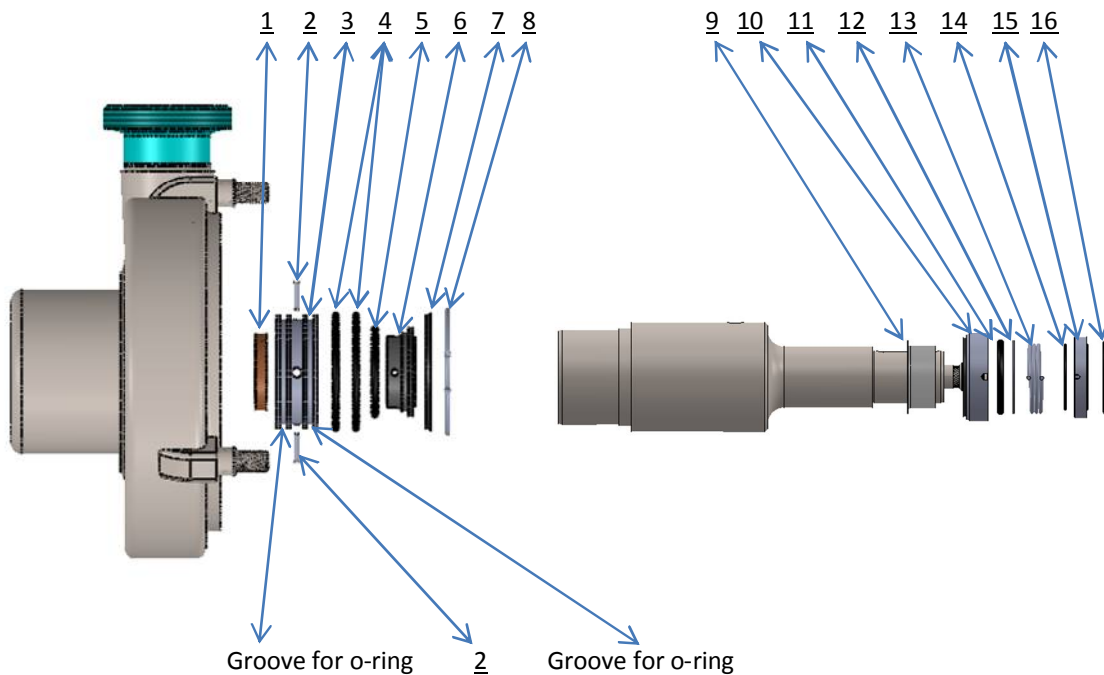
1. Place lightly greased housing o-ring (4) into the groove.
2. Insert the lip seal (5) into the seal chamber (6) and press in as far as it will go.
3. Mount the seal chamber (6) onto the pump housing, align the drill holes vertically and tighten the threaded pins (18) with a torque of 2.6 Nm.

Installation of shaft seal after assembly of pump housing:

1. Lightly grease and place o-ring (12) in the rotating seal ring (13).
2. Place the support ring (11) on the o-ring (12). Slide the rotating seal ring (13) with rings onto the shaft until it presses against the stationary seal ring (2).
3. Place the spring (10) onto the support ring (11) and allow the end of the spring to lock into the rotating seal ring.
4. Place lightly greased o-ring (9) into the driver (8).
5. Slide the driver (8) with o-ring onto the shaft until it locks into the end of the spring.
6. Lightly grease o-ring (7) and place in outside groove on the driver (8).

Item numbers for seal parts are specified in the order-related parts list.

Shaft seal LME R / V 35 mm seal



- | | | | |
|-----------------------------|-------------------------------|------------------------------|------------------|
| <u>1</u> Lip seal | <u>5</u> O-ring | <u>9</u> Shaft sleeve | <u>13</u> Spring |
| <u>2</u> Pin | <u>6</u> Stationary seal ring | <u>10</u> Rotating seal ring | <u>14</u> O-ring |
| <u>3</u> Shaft seal housing | <u>7</u> Thrust ring | <u>11</u> O-ring | <u>15</u> Driver |
| <u>4</u> O-ring | <u>8</u> Snap ring | <u>12</u> Support ring | <u>16</u> O-ring |

Installation of shaft seal:

1. Press the lip seal (1) into the shaft seal housing (3), checking that the installation direction and fit of the lip seal (1) are correct.
2. Guide the pins (2) into the holes on the shaft seal housing—press in and glue if necessary, e.g. with Loctite 248. When mounting the pins, make sure they do NOT touch the shaft.
3. Lightly grease o-ring (4) and place in the o-ring groove in the shaft seal housing (3).
4. Press the shaft seal housing (3) with mounted pins (2), seals (1,4) into the pump housing with the lip seal (1) facing towards the motor.
5. Place thrust ring (7) on the shaft seal housing (3) in the pump housing and secure with the snap ring (8).
6. Lightly grease o-ring (5) and push onto stationary seal ring (6).
7. Press stationary seal ring (6) with o-ring (5) into the shaft seal housing (3) and make sure that the pins (2) engage with the slots in the shaft seal housing (3). Clean the sealing surfaces with a suitable grease solvent.

Depending on the model, there are mechanical seals with or without a lip seal (1) and shaft sleeve (9).

Installation of shaft seal:

1. Using an assembly tool slide the shaft sleeve (9) into the correct position on the shaft.
2. Mount the pump housing before completing assembly of the shaft seal.
3. Place lightly greased o-ring (11) in the rotating seal ring (10), then place the support ring (12) on the o-ring.
4. After assembling the housing, degrease the sealing surface of the rotating seal ring (10) then slide it onto the shaft with o-ring (11) and support ring (12) until it contacts the stationary seal ring.
5. Lightly grease o-ring (14) and place in the driver (15).
6. Push the spring (13) with driver (15) and o-ring (14) against the rotating seal ring and make sure the spring ends engage with the grooves.
7. Lightly grease o-ring (16) and place in the groove on the driver.

Depending on the model, there are mechanical seals with or without a lip seal (1) and shaft sleeve (9).

Item numbers for seal parts are specified in the order-related parts list.

Suction and discharge piping must be properly supported and aligned with the pump's suction and discharge ports.

Avoid throttling valves in the suction line of the system.

Check valves must be at a minimum of 5 pipe diameters from the pump's discharge. (Fig. 43).

Keep the suction piping short and as direct as possible. Avoid elbows in the suction line of the system. If this is unavoidable, locate the elbow at least 5 pipe diameters away from the pump's inlet. Elbow radii should not be less than twice the diameter of the pipe (Fig. 43).

Make sure that the NPSH available in the system is always greater than the NPSH required.

Avoid bending piping over obstacles as this will cause the formation of air pockets in the suction line (Fig. 44). Route piping under any obstructions whenever possible (Fig. 45).

When using a reducer on the suction end the reduced centre line should not be below the suction centre line as in Figure 46. The centre line of the small diameter end of the reducer should be above the centre line of the suction line as in Figure 47.

Injection line angles should be 45° or less (Fig. 48).

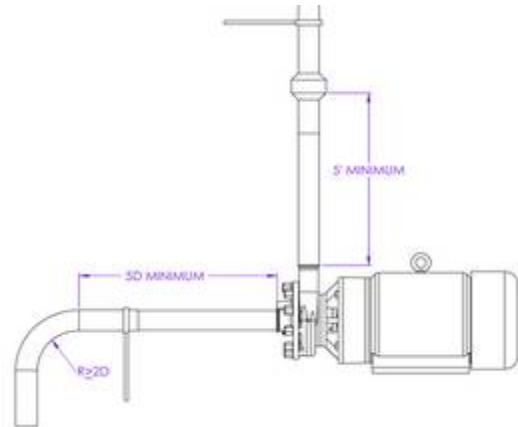


Abb. 43

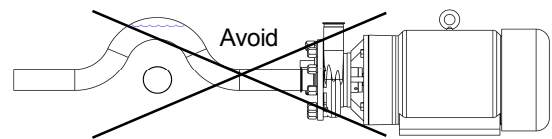


Abb. 44

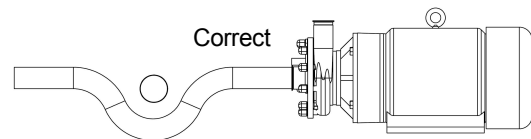


Abb. 45

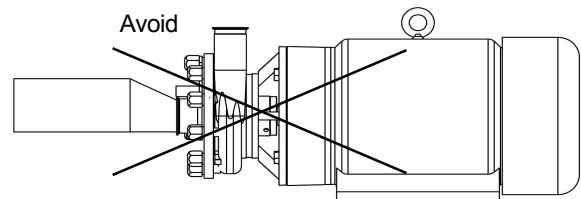


Abb. 46

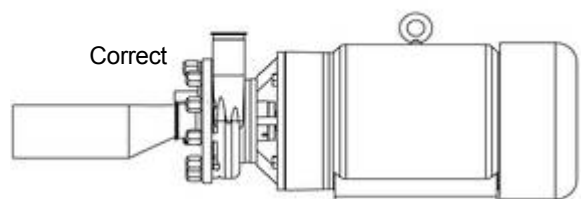


Abb. 47

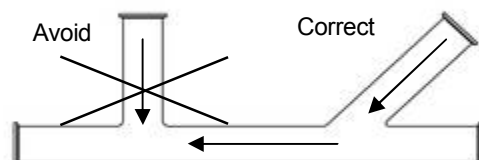


Abb. 49

Common Troubles and their Causes

The Ampco LME centrifugal pump has been assembled and tested at the factory and is designed to provide trouble-free operation. Problems may occur during the life of the pump due to system variations, standard wear, or user error. The following information should help you identify and solve the most common ones. Always use proper instruments to measure values of pressure, suction lift, speeds, temperature rise of motors, etc. Human judgement should not be relied on to measure operating conditions. If motor speeds are incorrect, check connections and measure voltage at motor terminals. For additional technical assistance, please contact Ampco with the pump's serial number.

1. No liquid delivered

- Pump and suction line not completely primed
- Speed too low
- Required discharge too high
- Suction lift too high
- Impeller, piping or fittings completely plugged up
- Wrong direction of rotation

2. Capacity is insufficient

- Air leaks in suction pipe for shaft seal
- Speed too low
- Required discharge too high
- Suction lift too high or insufficient NPSH available
- Impeller, piping or fittings partially plugged
- Insufficient positive suction head for hot water or other volatile liquids
- Liquid viscosity is too high
- Mechanical problems – impeller damaged or shaft seal defective
- Wrong direction of rotation
- Suction pipe entrance is too close to surface of liquid
- Air pockets in pipe high points

3. Pressure is insufficient

- Speed too low
- Mechanical problems – impeller damaged or shaft seal defective
- Impeller diameter too small
- Air or gas in liquid
- Wrong direction of rotation
- Air pockets in pipe high points

4. Pump operates for a while, then switches off

- Leaky suction line
- Air leaking in through shaft seal
- Suction lift too high or insufficient NPSH available
- Air or gas in liquid
- Suction piping and fitting not completely freed of air during priming
- Air pockets in pipe high pockets

5. Pump power consumption too high

- Speed too high
- Capacity too low—required pressure higher than expected
- Viscosity and / or specific gravity is higher than specified
- Mechanical problems—binding inside seal from distortion due to piping strains, shaft bent, impeller rubbing against housing
- Wrong direction of rotation
- Incorrect wiring or motor voltage



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