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**sigmaTECH**

## INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

### *d-I series pump KS*



# 1. Safety

## 1.1. INSTRUCTION MANUAL

This instruction manual contains information on the reception, installation, operation, fitting, disassembly and maintenance for the centrifugal pump.

The information given herein is based on the most up-to-date data available.

SIGMATECH reserves the right to modify this instructions manual without prior notice.

## 1.2. START-UP INSTRUCTIONS

This instruction manual contains vital and useful information for properly operating the pump and for keeping it in good running condition.

Not only should the safety instructions set forth in this chapter be carefully read before putting the pump into operation, but those concerned must also familiarise themselves with the operating features of the pump and strictly adhere to the instructions given herein. It is extremely important that these instructions be kept in a set place near the installation

## 1.3. SAFETY

### 1.3.1. Warning signs



Danger for people in general.



Danger of injury caused by rotating parts of the equipment.



Danger! Electricity.



Danger! Caustic or corrosive agents.



Danger! Suspended loads.



Danger to the proper operating of the machine.



Obligation to ensure safety at work.



Use of safety goggles obligatory.

### 1.4. GENERAL SAFETY INSTRUCTIONS



Please read the instruction manual thoroughly before installing and commissioning the pump. Should you have any doubts or queries, contact **SIGMATECH**.

#### 1.4.1. During the installation



You must always bear in mind the [Technical Specifications](#) set forth in Chapter 8.

Do not put the pump into operation before connecting it to the pipes.

Do not put the pump into operation if the cover of the pump has not been fitted and the impeller fixed in the pump.

Check that the motor specifications are correct, especially if there is a special risk of explosion due to the work conditions.



During the installation procedure, all the electrical work must be carried out by duly authorised personnel.

#### 1.4.2. During operation



You must always bear in mind the [Technical Specifications](#) set forth in Chapter 8. The limit values that have been set must NEVER be exceeded.

NEVER touch the pump or pipes whenever the pump is being used to decant hot liquids or during the cleaning procedure.



The pump has moving parts. Do not put your fingers into the pump when it is operating.



NEVER work with the suction and the delivery valves shut off.

NEVER directly sprinkle the electric motor with water. Standard motor protection is IP-55: dust and water sprinkling protection.

#### 1.4.3. During maintenance



You must always bear in mind the [Technical Specifications](#) set forth in Chapter 8.

NEVER strip the pump down until the pipes have been drained. Remember that there will always be some liquid left in the pump casing (if it has not been fitted with a drain). Always remember that the liquid that has been pumped may be dangerous or subject to high temperatures. For situations of this type, please consult the prevailing regulations in the country in question.

Do not leave loose parts on the floor.



ALWAYS turn the power supply to the pump off before embarking on maintenance work. Take out the fuses and disconnect the wires from the motor terminals.

All electrical work must be carried out by duly authorised personnel.

#### 1.4.4. In accordance with the instructions

Any failure to comply with the instructions could lead to a hazard for the operators, the atmospheric conditions of the room, and the machine, and it could lead to a loss to any right to make a claim for damages.

Such non-compliance could bring with it the following risks:

- Important operating failures of the machine / plant.
- Failure to comply with specific maintenance and repair procedures.
- Potential electrical, mechanical and chemical hazards.
- Atmospheric conditions in the room could be hazardous due to the release of chemical substances.

#### 1.4.5. Warranty

We wish to point out that any warranty issued will be null and void and that we are entitled to an indemnity for any civil liability claim for products which might be filed by third parties if:

- Operation and maintenance work has not been done following the corresponding instructions; the repairs have not been made by our personnel or have been made without our written authorization;
- Modifications are made to our material without prior written authorization;
- The parts or lubricants used are not original SIGMATECH parts/lubricants;
- The material has been improperly used due to error or negligence or have not been used according to the indications and the intended purpose.
- The parts of the pump have been damaged as a result of having been exposed to strong pressure as there was no safety valve.

The General Delivery Terms which you have already received are also applicable.



No modification can be made to the machine without the prior consent of the manufacturer. For your safety, use spare parts and original accessories. The use of other parts exempts the manufacturer from any and all responsibility.

Any change in operating conditions can only be done with the prior written consent of **SIGMATECH**.

In the event of doubt or should you require a fuller explanation on particular data (adjustment, assembly, disassembly...), please do not hesitate to contact us

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## 3. General Information

### 3.1. DESCRIPTION

SIGMATECH KS-series centrifugal pumps have been especially designed to work under pressure of up to 10 bar. KS centrifugal pump is a robust close-coupled pump with a shrouded motor, axial suction and radial delivery, and hygienic-type connections. The impeller is of an open or half-open design, and manufactured in a single piece. The mechanical seal is balanced, specially made to work at high pressure, and it is completely hygienic. The working surfaces are silicon carbide and graphite and gaskets material is EPDM in the standard version. The motor complies with IEC standards. IP-55 protection. Class-F insulation.

Please refer to the motor standard below:

Power (KW)	Voltage
0.55	210V~230V / 50HZ
0.75	
1.1	
1.5	
2.2	
3	360V~400V / 50HZ
4	
5.5	
7.5	
11	630V~690V / 50HZ
15	
18.5	
22	420V~460V / 60HZ
30	

The motor supplies depending on buyer's power supply, such as 60HZ 220V,380V, and other different frequency and voltage. On demand, it is possible to provide motors intended for work in explosive environments.

The parts in contact with the product are made of AISI 304/316L stainless steel, external finish is sandblast and internal finish is Ra 0.8. KS centrifugal pumps are hygienic pumps that comply with the highest hygiene requirements for use in the food and pharmaceuticals industries.

### 3.2. OPERATING PRINCIPLE

The pump impeller, housed in the pump housing, turns along with the pump shaft. It is fitted with a certain number of blades in accordance with the model of pump chosen.

Given this design, the impeller blades transmit both pressure and kinetic energy to the fluid in question.

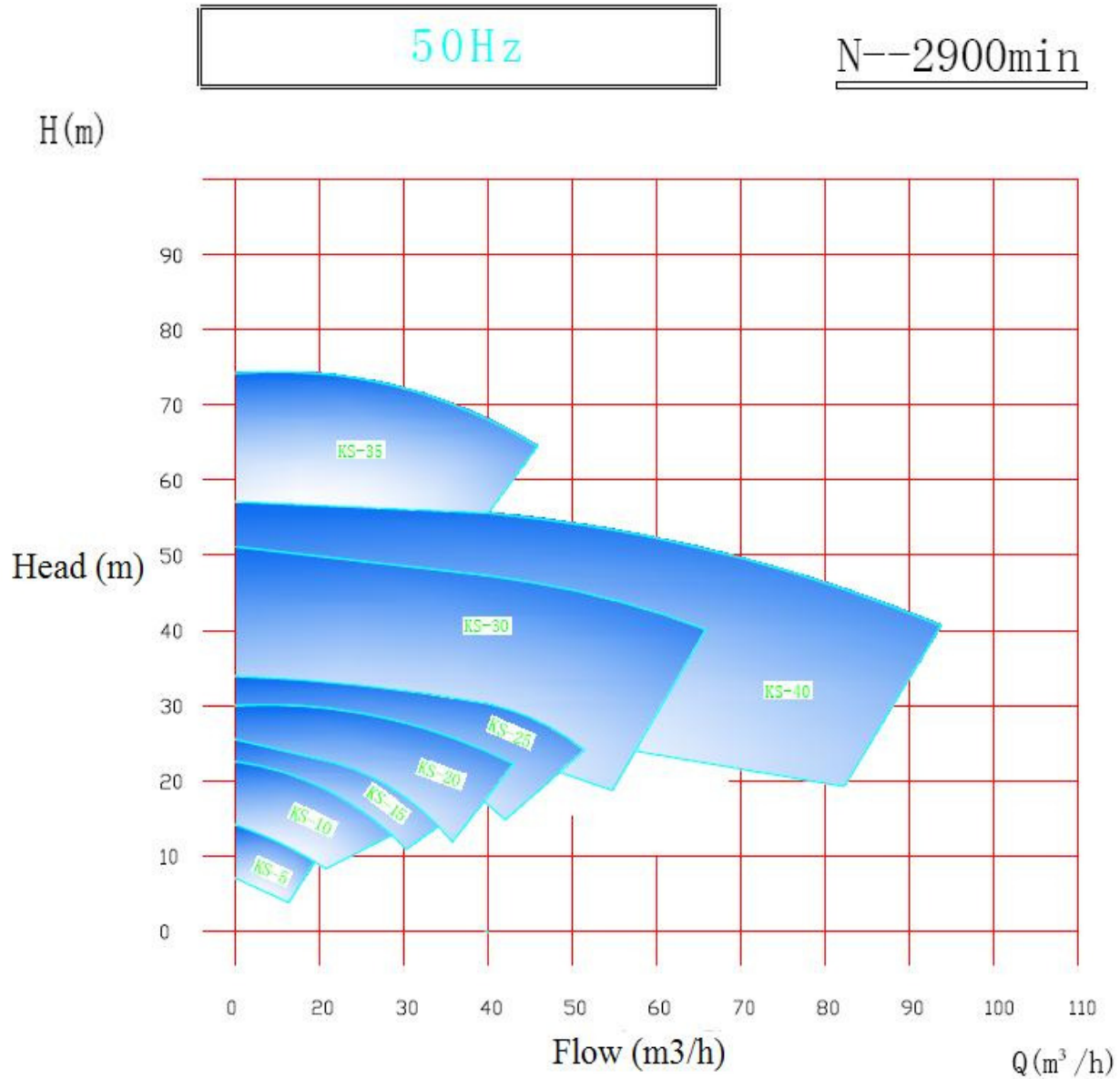
The pump cannot be reversed by simply changing of the rotation direction. The rotation direction, to be seen from the rear of the motor, should be clockwise.

### 3.3. APPLICATION

As a general rule, the standard KS series pumps are mainly used in the food,beverage,syrup,and beer processes.

For each pump type the hydraulic specifications are provided depending on impeller diameters and speed rates. The performance curves also show the absorbed power and required NPSH.

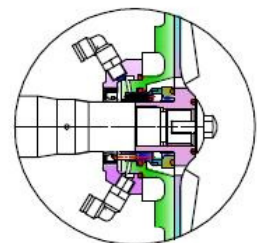
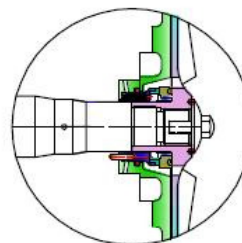
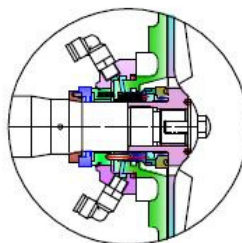
### 3.3.1. Range of application



### Mechanical Seal

There are three assembly options for KS series pump:

1. Single mechanical seal(standard)
2. Flushed double mechanical seal
3. Flushed single mechanical seal



Flushed double mechanical seal

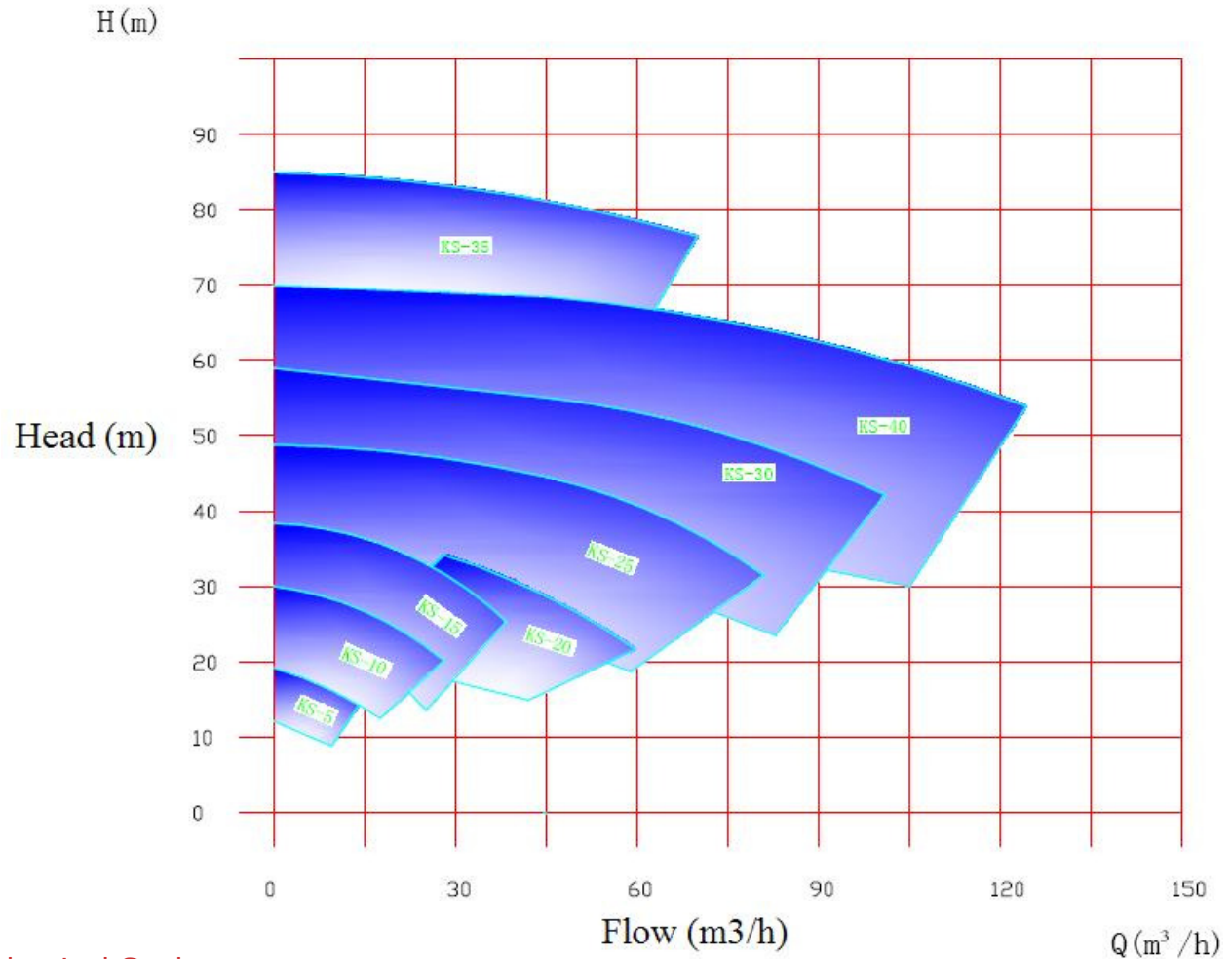
Single mechanical seal

Flushed single mechanical seal

### 3.3.2. Range of application

60Hz

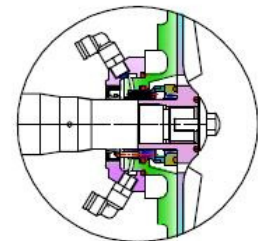
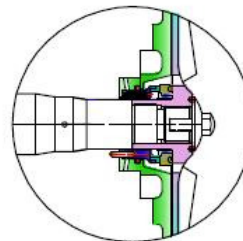
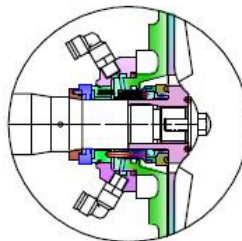
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### Mechanical Seal

There are three assembly options for KS series pump:

1. Single mechanical seal(standard)
2. Flushed double mechanical seal
3. Flushed single mechanical seal



Flushed double mechanical seal

Single mechanical seal

Flushed single mechanical seal

## 4. Installation

### 4.1. PUMP RECEPTION

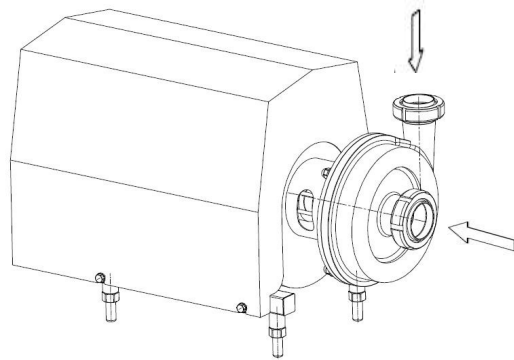


**SIGMATECH** is not responsible for any deterioration of the material as a result of its transportation or unpacking. Visually check that the packing has not suffered any damage.

The pump will be accompanied by the following documentation:

- Dispatch notes.
- Pump Instruction and Service Manual.
- Motor Instruction and Service Manual (\*).
- (\*) If the pump has been supplied with a motor from SIGMATECH.

Unpack the pump and check the following:



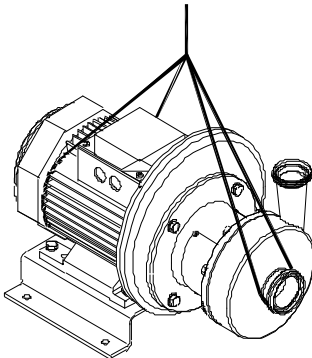
- The pump suction and delivery connections, removing the remains of any packing material.
- Check that the pump and the motor have not suffered any damage.
- Should the pump not be in proper condition and/or does not have all the parts, the carrier must draw up a report as soon as possible with regard to the same.

### 4.2. TRANSPORT AND STORAGE



**KS series pumps** are quite often too heavy to be put into their storage space manually.

Lift the pump as shown below:



- Always remove the shroud, if installed, before lifting the pump.



### 4.3. LOCATION

- Position the pump as near as possible to the suction tank, and whenever possible below the level of the liquid.
- Place the pump in such a way that there is enough space around it to provide access both to the same and to the motor. (See Chapter 8. [Technical Specifications](#) to consult dimensions and weights).
- Place the pump on a level and flat surface.
- The basement must be rigid, horizontal and against any vibration.



**Install the pump in such a way that it can be properly ventilated. If the pump is to be installed outside, it must be done so under cover. Its positioning must enable easy access for any inspection and maintenance operations that may need to be carried out.**

### 4.4. PIPES

- In general, suction and delivery pipes should be fitted in straight stretches, with the minimum amount of elbows and accessories, in order to reduce, as far as possible, any load loss that might be produced by friction.
- Make sure that the pump mouths are well aligned with respect to the piping, and that they are similar in diameter to that of the pipe connections.
- Position the pump as near as possible to the suction tank, and whenever possible below the level of the liquid, or even lower with respect to the tank in order for the static suction head to be at its maximum.
- Place supports for the pipes as near as possible to the suction and delivery nozzles of the pump.

#### 4.4.1. Shut-off valves

The pump can be isolated for the purpose of carrying out maintenance work. To this end, shut-off valves should be fitted at the pump suction and delivery connections. These valves must ALWAYS be open whenever the pump is operating.

### 4.5. ELECTRICAL INSTALLATION



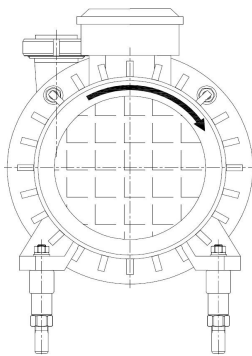
**Leave the connecting of the electrical motors to qualified personnel. Take the necessary measures to prevent any breakdowns in the connections and wires.**



**The electrical equipment, the terminals and the components of the control systems may still carry an electric charge even when disconnected. Contact with them may put the safety of operators at risk, or cause irreparable damage to the material.**

**Before manoeuvring the pump, make sure that the electric box is switched off.**

- Connect the motor in accordance with the instructions supplied by the manufacturer.
- Check the direction of the rotation (see the signaling label on the pump).



Put the pump motor into operation momentarily. Make sure, by looking at the pump from the rear, that the motor ventilator is rotating in a clockwise direction.



**Check ALWAYS the direction of the motor rotation with liquid inside the pump.**

**For the models with sealing chamber, make sure always that it is filled with liquid before checking the rotating direction.**

# 5. Start-Up



Before putting the pump into operation read thoroughly the instructions on installation given in Chapter 4. [Installation](#).

## 5.1. START-UP



Read Chapter 8. [Technical Specifications](#) thoroughly. **SIGMATECH** will not assume responsibility for any improper or incorrect use of the equipment.



Do not touch the pump or the piping while it is pumping products at a high temperature.

### 5.1.1. Checks to be carried out before putting the pump into operation

- Completely open the pipe suction and delivery shut-off valves.
- If the liquid fails to flow toward the pump, fill it with the liquid to be pumped.



The pump must **NEVER** be run dry.

- Check that the rotation direction of the motor is correct.

### 5.1.2. Checks to be carried out on putting the pump into operation

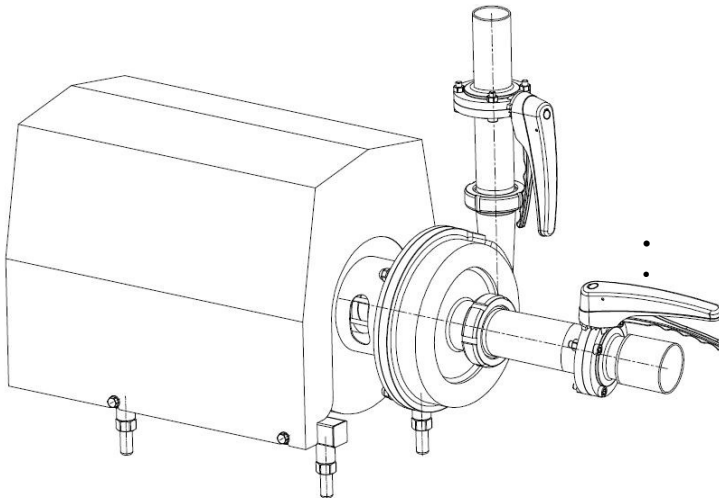
- Check to make sure that the pump is not making any strange noises.
- Check to see if the absolute inlet pressure is sufficient, in order to avoid cavitations in the pump. Consult the curve for the minimum required pressure above the steam pressure (NPSHr).
- Monitor the delivery pressure.
- Check that there are no leaks in the sealed areas.



A shut-off valve should not be used in the suction pipe to regulate the flow rate. It must be completely open during operation.



Monitor motor consumption in order to avoid a circuit overload.



Reduce the flow and the power consumed by the motor:

- Regulating the flow to the pump delivery.
- Decreasing motor speed.

## 6. Operating problems

The table given below provides solutions to problems that might arise during pump operation. With respect to the same, it is assumed that the pump has been properly installed and has been correctly selected for the application in question. Should there be a need for technical service please contact SIGMATECH.

Operating problems	Causes problems
Overloading of motor.	8, 9, 13, 14, 20, 21, 22, 23, 24.
Insufficient flow rate or pressure in pump.	1, 2, 4, 5, 7, 9, 10, 17, 19.
No pressure on the discharge side.	2, 3, 6, 18.
Irregular discharge flow rate / pressure.	1, 2, 4, 5, 6, 9.
Noise and vibrations.	2, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 20, 21, 22, 23, 24.
The pump gets clogged.	9, 10, 13, 14, 15, 20, 21, 22, 24.
Overheating of the pump.	8, 9, 10, 13, 14, 15, 20, 21, 22, 23, 24.
Abnormal wear.	4, 5, 10, 14, 15, 20, 24.
Leak in mechanical seal.	11, 12, 16.

Causes problems	Solutions
1 Wrong rotation direction.	Invert the direction of rotation.
2 Insufficient NPSH.	Increase available NPSH: - Raise the suction deposit. - Lower the pump. - Reduce the vapour pressure. - Increase the diameter of the suction pipe. - Shorten and simplify the suction pipe.
3 Non-purged pump.	Purge or fill.
4 Cavitation.	Increase suction pressure (also see 2).
5 The pump is sucking air.	Check the suction pipe and all its connections.
6 Obstructed suction piping.	Check suction pipe and the filters, if any.
7 Delivery pressure is too high.	If necessary, reduce head losses, for ex., by increasing the pipe diameter.
8 Flow is too high.	Reduce the flow rate: - Reduce the flow rate using a diaphragm. - Partially close the discharge valve. - Trim the impeller. - Decrease the speed.
9 The viscosity of the liquid is too high.	Reduce the viscosity, for ex., by heating the liquid.
10 The temperature of the liquid is too high.	Reduce the temperature by cooling the liquid.
11 Mechanical seal either damaged or worn.	Replace the seal.
12 Unsuitable O-ring for the liquid in question.	Insert the proper O-rings; check with the supplier.
13 The impeller is rubbing.	- Decrease the temperature. - Decrease the suction pressure. - Adjust the clearance between the impeller and the housing.
14 Pressure in the pipes.	Connect the pipelines to the pump free of tension.
15 There are foreign bodies in the liquid.	Place a filter in the suction.
16 The tension of the mechanical seal spring is too low.	Adjust as indicated in the manual.
17 The pump speed is too low.	Increase the speed.
18 The suction shutoff valve is closed.	Check and open.
19 Delivery pressure is too low.	Increase the pressure: - Increase the diameter or the impeller. - Increase the speed of the pump.
20 Worn bearing.	Replace the bearings, check the pump.
21 Not enough lubricating oil.	Fill up with oil.
22 Unsuitable lubricating oil.	Use an appropriate oil.
23 Non aligned coupling.	Align the coupling.
24 Pump and/or motor not fixed to the base-plate.	Affix the pump and/or the motor to the base-plate, check to see if the pipes are connected without pressure and align the coupling.



**If the problems persist stop using the pump immediately. Contact the pump manufacturer or his representative.**

# 7. Maintenance

## 7.1. GENERAL MAINTENANCE

This pump, as with any other machine, needs to be maintained. The instructions contained in this manual deal with the identification and replacement of the spare parts. These instructions have been drawn up by maintenance staff and are destined for those people who are responsible for supplying spare parts.



Read thoroughly Chapter 8. [Technical specifications](#).

All the parts or materials that are changed must be duly eliminated/recycled in accordance with the prevailing directives in each area.



ALWAYS disconnect the pump before starting out on any maintenance work.

### 7.1.1. Check the mechanical seal

Periodically check that there are no leaks in the shaft area. Should there be any leaks in the mechanical seal area, replace the same pursuant to the instructions given in the section Disassembly and Assembly of the pump.

## 7.2. DRY THREAD TORQUE

Material	Dry thread torque [N.m.]								
	M5	M6	M8	M10	M12	M14	M16	M18	M20
8.8	6	10	25	49	86	135	210	290	410
A2	5	9	21	42	74	112	160	210	300

## 7.3. STORAGE

Before being stored the pump must be completely emptied of liquids. Avoid, as far as possible, the exposure of the parts to excessively damp atmospheres.

## 7.4. CLEANING



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

Use rubber gloves during the cleaning process.



Always use protective goggles.

#### 7.4.1. Automatic CIP (Clean-in-place)

If the pump is installed in a system provided with a CIP process, there will be no need for disassembly.

If it is not fitted with an automatic cleaning process, disassemble the pump pursuant to the instructions given in the section [Disassembly and Assembly](#) of the pump.

<u>Cleaning solutions for CIP processes.</u>	
Only use clear water (chloride free) to mix with the cleaning agents:	
<b>a) Alkaline solution:</b>	1% in weight of caustic soda (NaOH) to 70°C (150°F)
	1 Kg NaOH + 100 l. water = cleaning solution or 2.2 l. NaOH al 33% + 100 l. of water = cleaning solution
<b>b) Acid solution:</b>	0.5% in weight of nitric acid (HNO <sub>3</sub> ) to 70°C (150°F)
	0.7 liters HNO <sub>3</sub> to 53% + 100 l. water = cleaning solution



**Monitor the concentration of cleaning solutions, it could cause the deterioration of the pump sealing gaskets.**

In order to remove any remains of cleaning products, ALWAYS rinse the element in question with clean water after completing the cleaning process.

#### 7.4.2. Automatic SIP (sterilization-in-place)

The process of sterilization with steam is applied to all the equipment including the pump.



**Do NOT start the equipment during the process of sterilization with steam.**

**The parts/materials suffer no damage if the indications specified in this manual are observed.**

**No cold liquid can enter the equipment till the temperature of the equipment is lower than 60°C (140°F).**

**A flow by-pass is recommended to be used in order to assure the flow of sterile product after the pump.**

<u>Maximum conditions during the SIP process with steam or overheated water</u>	
a)	<b>Max. temperature:</b> 60°C / 140°F
b)	<b>Max. time:</b> 30 min
c)	<b>Cooling:</b> Sterile air or inert gas
d)	<b>Materials:</b> EPDM / PTFE (recommended)

## 7.5. PUMP DISASSEMBLY/ASSEMBLY

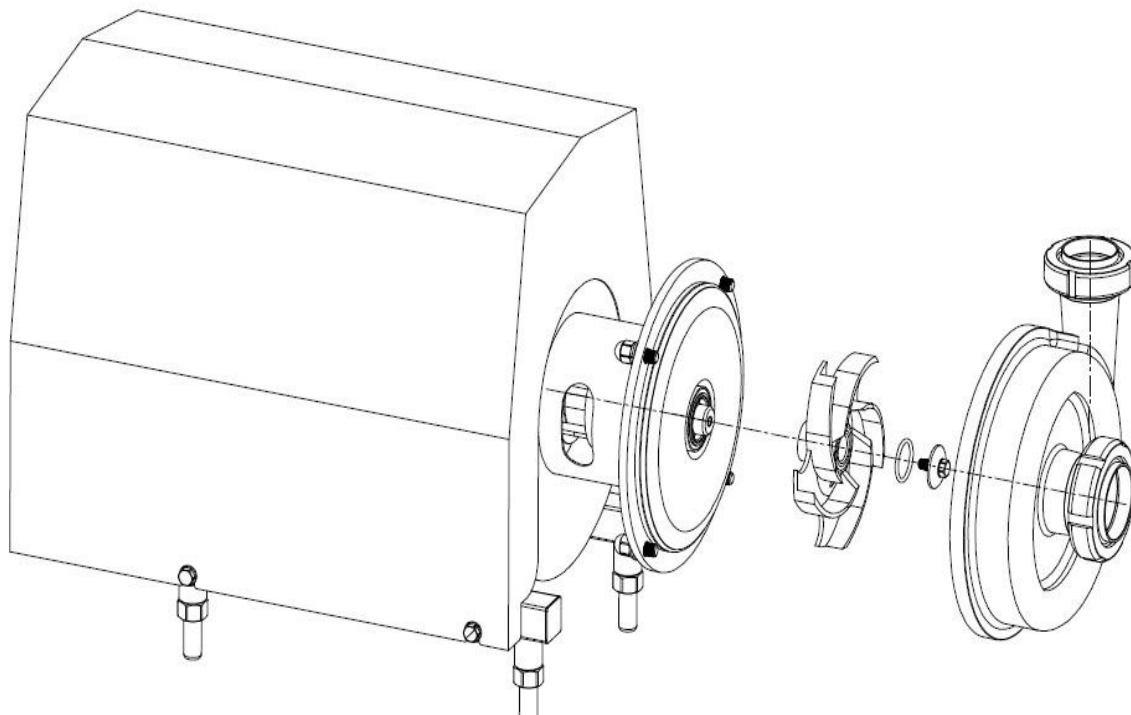
### 7.5.1. Pump casing and impeller

#### ⇒ Disassembly

Loosen the impeller cover bolts (08,09,10,11) using a spanner, and remove the impeller cover(23), impeller nut(22) and O-ring (21). Tap the impeller(20) slightly in deasil direction using a nylon hammer, and then take out the impeller.

#### ⇐ Assembly

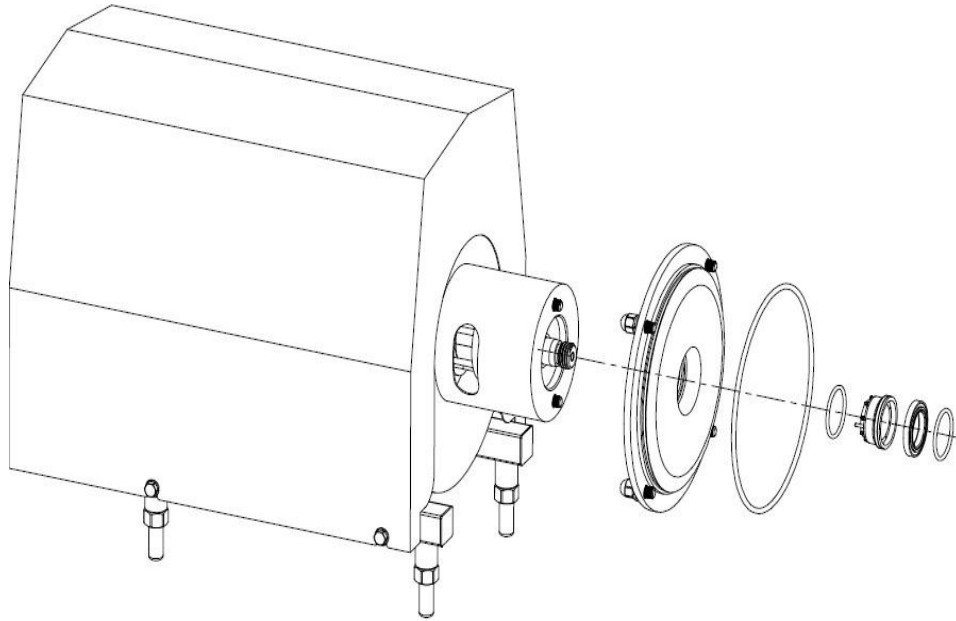
Slide the impeller (20) over the shaft, and tighten it until reach to a suitable position between the impeller and pump rear cover. place the O-ring (21) in the slot of the impeller, mount the impeller nut (22) over the shaft and tighten it with spanner. See chapter 7.5.3 adjusting the pump shaft and impeller.



### 7.5.2. Simple mechanical seal

#### ⇒ Disassembly

Remove the rotary part(18) and O-ring(21) of the mechanical seal.  
Remove the stationary part(17) and O-ring(16) of the mechanical seal.  
Remove the bolts (30,31,32,33) that fix in the pump rear cover(14).  
Remove the pump rear cover (14).  
Remove the O-ring(15) that fixed in the pump rear cover.

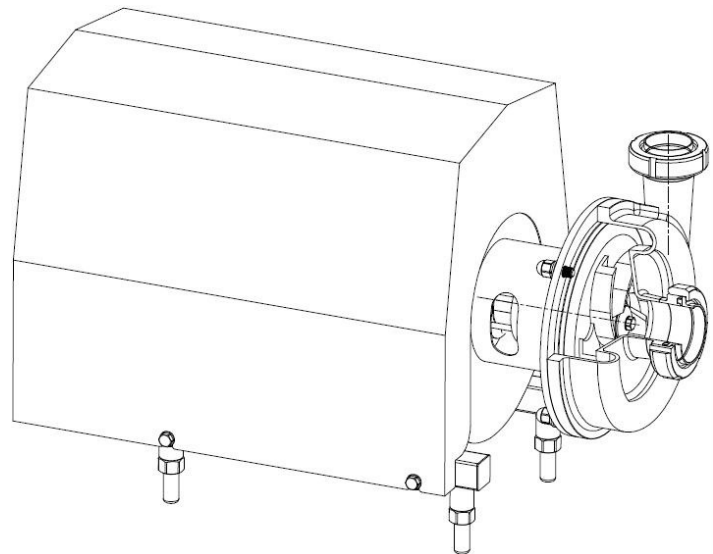
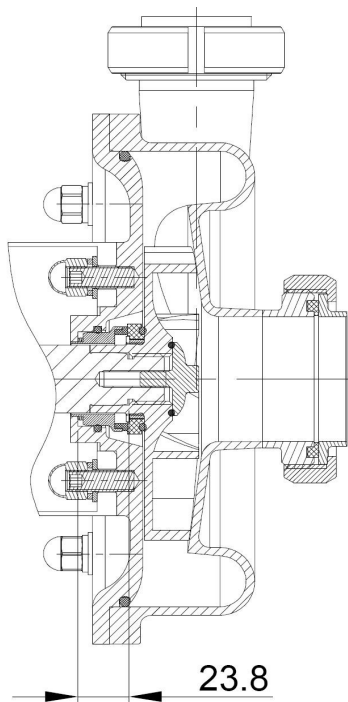


**ATTENTION!** When assembling the new seal, be careful and mount the parts and the O-rings with soapy water in order to allow an easy glide of the parts, either the stationary part and the rotary part on the shaft.

← **Assembly**

Mount the pump rear cover (14) to the connection support(12), tighten bolts(30,31,32,33), fix the O-ring(15) to the pump rear cover, Place the fixed part of the mechanical seal in the pump rear cover(14), slide the mechanical seal over the shaft till the end.

Check that the assembly dimension used is as described below:

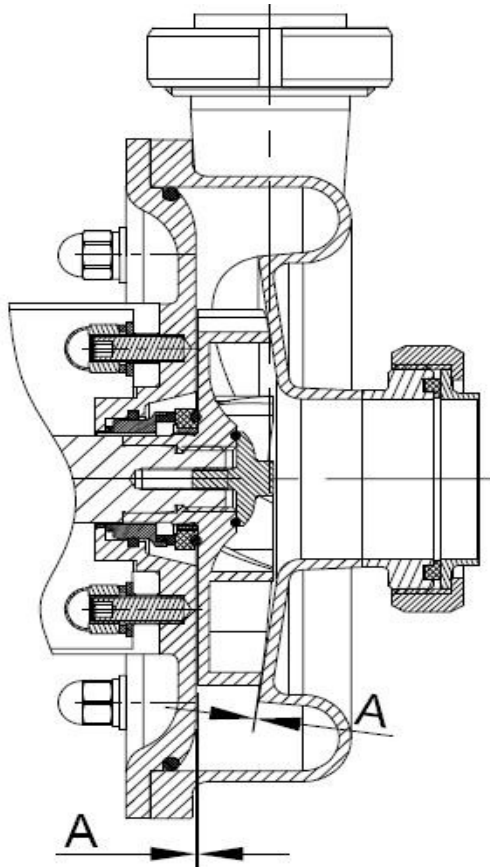


### 7.5.3. Adjusting the pump shaft and impeller

Slide the impeller (20) over the shaft (04) until reaching the rotary part of the mechanical seal (16).

Attach the O-ring (21) in the slot of the impeller, place the impeller nut(22) over the pump shaft(04).

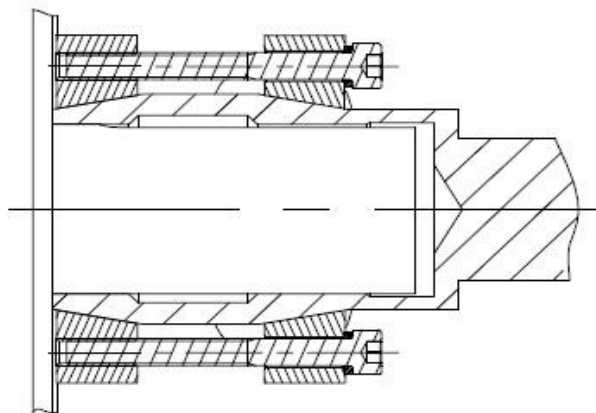
Check that the clearance between the impeller (20), pump cover(23) and pump rear cover (14) is as indicated below.



Type	A(mm)
KS-5	1.0mm
KS-10	1.0mm
KS-15	0.5mm
KS-20	0.5mm
KS-25	0.5mm
KS-30	0.5mm
KS-35	1.0mm
KS-40	1.5mm

If not, adjust the dimension until it is as indicated below.

- Loosen the tighten bolt (06,07) and slide the shaft (04) until the dimension has been adjusted. Finally, tighten the screws.





#### 7.5.4. Support and motor

##### ⇒ Disassembly

Remove the shroud.

Remove the bolts (13) , take out the support (12)

Loosen the pump shaft bolt(06,07), remove the tighten ring(05), take out the pump shaft (04) slightly

Remove the tighten ring (03), allen screws (34), and remove the motor (02) from the base plate (35).

##### ⇐ Assembly

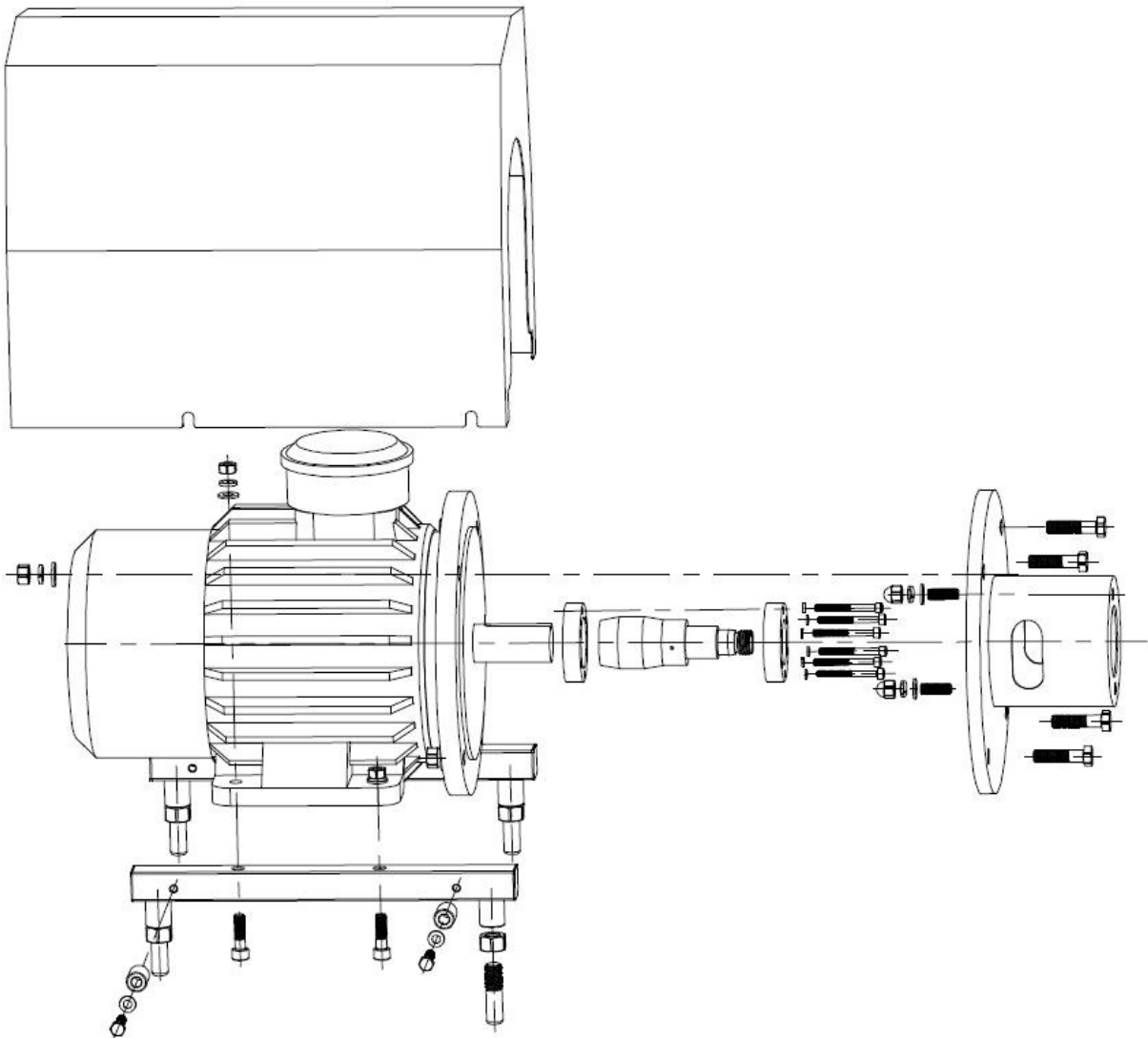
Place the motor (02) onto the base plate (35) and tighten screws (34) and nuts using a spanner.

Slide the tighten ring (03) and (04) over the shaft (04), and fasten it with bolts (06,07) slightly.

Attach pump shaft(04) to the motor shaft (02), tighten the bolts(06,07) using a spanner.

Place the pump support(12) in the motor flange(02), fix the bolts(13) and tighten it by spanner.

Assemble the shroud.



# 8. Technical Specifications

## 8.1. TECHNICAL SPECIFICATION

	50Hz	60Hz
Maximum flow rate .....	100m <sup>3</sup> /h	120 m <sup>3</sup> /h
Maximum differential height .....	70m	80m
Maximum operating pressure .....	7 bar	7 bar
Operating temperature .....	-10 °C to +120 °C (EPDM) 14 °F to 248 °F (EPDM)	-10 °C to +120 °C (EPDM) 14 °F to 248 °F (EPDM)
	Temporal temperature up to 140 °C / 284 °F (EPDM)	Temporal temperature up to 140 °C / 284 °F (EPDM)
Maximum speed.....	3000 r.p.m.	3600 r.p.m.
Suction / discharge connections .....	DIN 11851 (Standard) SMS,RJT,ISO,IDF,3A	DIN 11851 (Standard) SMS,RJT,ISO,IDF,3A

### Materials

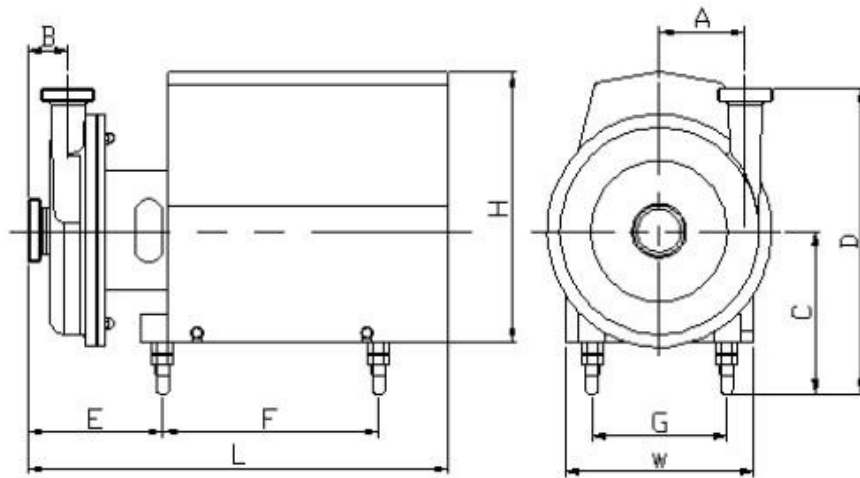
Parts in contact with the product .....	AISI 304/316L
Other parts in stainless steel .....	AISI 304
Gaskets in contact with the product .....	EPDM (Standard)
Other optional gasket materials .....	Consult your supplier
Surface finish .....	Standard finish

### Mechanical seal

Seal type .....	Internal balanced single seal
Stationary parts material .....	Graphite
Rotary parts material .....	SiC
Seals material .....	EPDM (Standard)

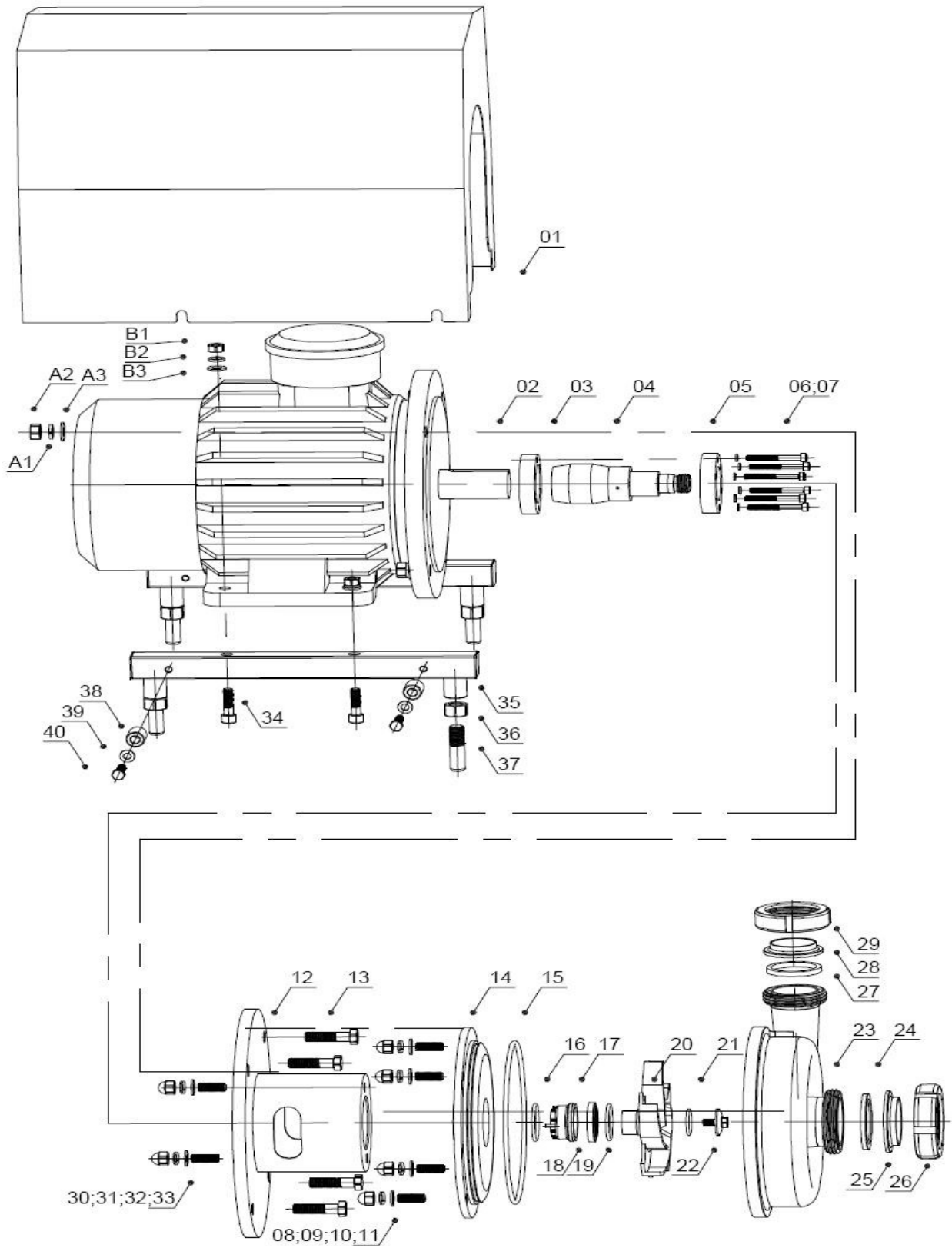
**8.2. KS series Pump Dimension**

**KS**

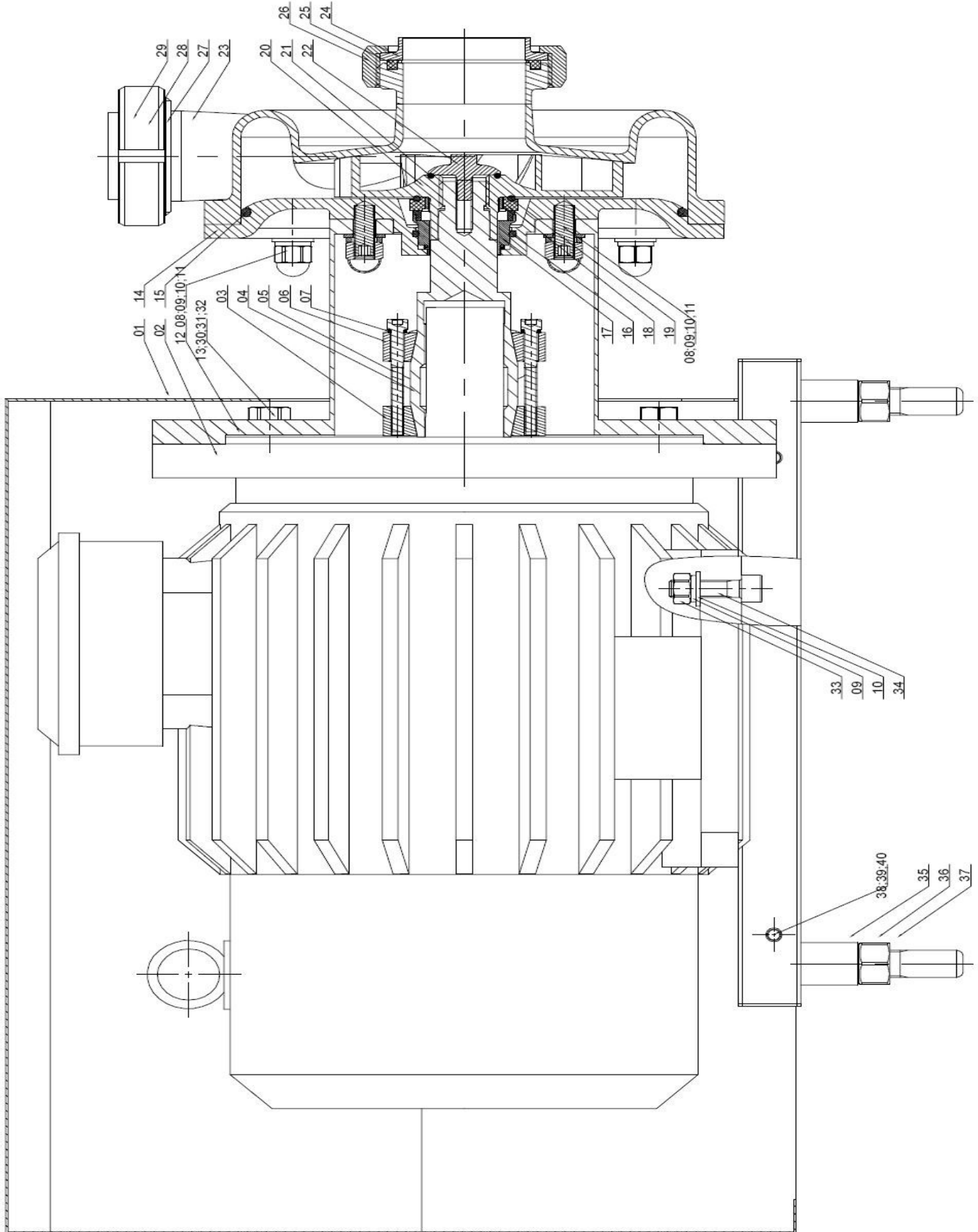


Series KS	Power	Inlet d"/DN	Outlet d"/DN	Assembly dimension									
				A	B	C	D	E	F	G	H	L	W
KS-5	0.75	1.5"/32	1.5"/32	56	61	160	296	180	200	125	300	465	210
	1.1	1.5"/32	1.5"/32	56	61	160	296	180	200	125	300	465	210
KS-10	1.5	2"/50	1.5"/40	95.6	44	190	343	180	240	140	290	484	210
	2.2	2"/50	1.5"/40	95.6	44	190	343	180	240	140	290	484	210
KS-15	3	2"/50	2"/50	95.6	44	202	358	218	300	160	351	658	260
KS-20	4	2"/50	2"/50	95.6	44	202	358	218	300	190	351	658	260
	5.5	2"/50	2"/50	95.6	46	222	378	238	330	216	380	668	310
KS-25 KS-30	7.5	2.5"/65	2"/50	95.6	46	222	378	238	330	216	380	668	310
	11	3"/80	2.5"/65	163	107	280	430	265	440	254	470	825	360
KS-35 KS-40	15	3"/80	2.5"/65	163	107	280	430	265	440	254	470	825	360
	18.5	3"/80	2.5"/65	163	107	280	430	265	440	254	470	870	360
	22	3"/80	2.5"/65	163	107	330	450	265	450	279	490	895	360
	30	3.5"/100	3"/80	163	107	330	450	265	490	279	490	905	360

### 8.3. KS series Pump Exploded View



### 8.4. Pump Parts



**8.5. PARTS LIST**

29	Locknut	304	1
28	Liner	304/316L	1
27	Gasket	EPDM	1
26	Locknut	304	1
25	Liner	304/316L	1
24	Gasket	EPDM	1
23	Pump head	304/316L	1
22	Impeller screw cap	304/316L	1
21	O-ring	EPDM	1
20	Impeller	304/316L	1
19	O-ring	EPDM	1
18	Rotary parts	Other	1
17	Stationary parts	Other	1
16	O-ring	EPDM	1
15	O-ring	EPDM	1
14	Pump rear cover	304	1
13	Hex.bolt	A2~70	4
12	Support	304	1
11	Locked bolt	A2~70	6
10	Flat gasket A class	A2~70	10
09	Standard spring gasket	65Mn	10
08	Cap nut	A2~70	6
07	Column bolt	A2~70	6
06	Standard spring gasket	65Mn	6
05	Tighten cap	304	1
04	Driveshaft	304/316L	1
03	Tighten cover(thread bore)	304	1
02	Motor	Other	1
01	Motor Shroud	SUS304	1
<b>Pos.</b>	<b>Part name</b>	<b>Material</b>	<b>Qty.</b>

B3	Flat gasket A class	304	4
B2	Spring gasket	304	4
B1	Nut	304	4
A3	Flat gasket	304	4
A2	Nut	304	4
A1	Spring gasket	304	4
40	Hex.bolt	A2~70	4
39	Flat gasket A class	A2~70	4
38	Antivibration column cover	POM	4
37	Pump foot	SUS304	4
36	Hex.nut	A2~70	4
35	Base plate	304	2
34	Hex.column bolt	A2~70	4
33	Flat gasket	304	2
32	Cap nut	304	2
31	Spring gasket	304	2
30	Bolt	304	2
<b>Pos.</b>	<b>Part name</b>	<b>Material</b>	<b>Qty.</b>