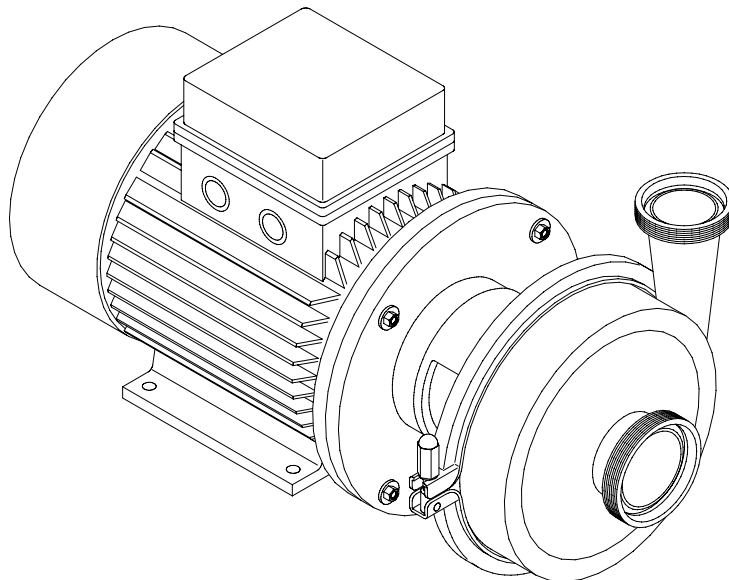




INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

HYGINOX SH



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EC DECLARATION OF CONFORMITY

(according to Directive 98/37/CE, annex II, part A)

Manufacturer: INOXPA, S.A.
C/ Telers, 54
17820 Banyoles (Girona) - SPAIN

Hereby declares, that the product:

<u>CENTRIFUGAL PUMP</u>	<u>HYGINOX SH</u>	<u>2008</u>
Name	Type	Year of manufacture

conforms to the specifications of the Council Directive:

Machine Directive 98/37/CE, and complies with the essential requirements of the Directive and Harmonised Standards:

UNE-EN ISO 12100-1/2:2003

UNE-EN 1050:1996

UNE-EN 809/AC:2001

UNE-EN 294/AC:1993

UNE-EN 953:1997

UNE-EN 563/A1/AC:2000

Low Voltage Directive 2006/95/EC (what repeal 73/23/CEE Directive), and are conforms with UNE-EN 60204-1:1997 and UNE-EN 60034-1/A11:2002

EMC Directive 2004/108/EC (what repeal 89/336/CEE Directive), and are conforms with UNE-EN 60034-1/A11:2002

In compliance with the Regulations **(CE) n° 1935/2004**, relating to materials and articles intended to come into contact with foodstuff (repeal Directive 89/109/CEE), the materials in contact with the product do not transfer their components in quantities which may jeopardise consumer's health or safety

Declaration of Incorporation (Directive 98/37/CE, annex II, part B):

The equipments above mentioned won't put to operation till the machine into or onto it will be installed must comply with the stipulations of the Machine Directive.

Banyoles, February 2008


Marc Pons Bague Technical Manager

1. Introduction

CHECK THE SHIPMENT.

The first thing to do when the pump is received is to check it and ensure that the contents conform to the shipping voucher. INOXPA inspects all equipment prior to shipment, but it cannot guarantee that the merchandise reaches the user intact. Therefore, the pump and any other article received should be checked and in the event the item in question did not conform to specifications and/or was missing a/some part(s), the transportation company should prepare a report as soon as possible. Each pump bears a serial number engraved on the plate. Indicate the serial number on all documents and correspondence.

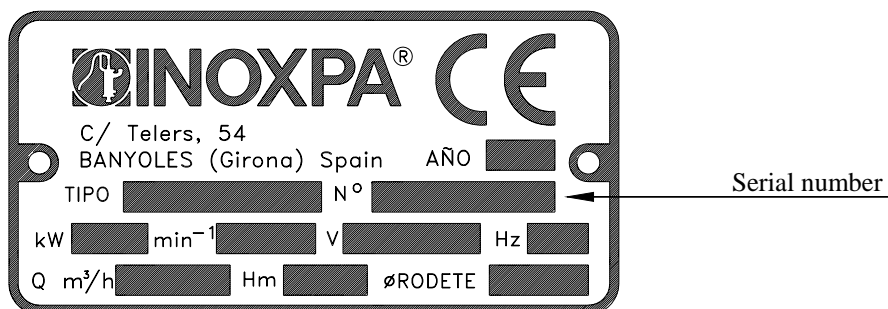


Figure 1.1: Serial number engraved on the manufacturer's plate

If the pump is not put into service upon arrival, a complete revolution of the shaft should be made once a week.

INSTRUCTIONS MANUAL.

The information provided in the instruction manual refers to updated data.

We reserve the right to modify the design and/or manufacturing specifications of our products as required, devoid of any obligation on our part to adapt any product supplied prior to such alteration.

The technical information made available in this instruction manual, together with the graphs and technical specifications provided, shall continue to belong to us and should not be used (except for starting up this installation), copied, photocopied, made available or otherwise given to third parties without our prior written consent.

INOXPA is reservation the right to modifying this instructions manual without previous notice.

START-UP INSTRUCTIONS.

This instruction manual contains vital and useful information for properly operating the pump and for keeping it in good running condition. It also contains important instructions for avoiding possible accidents and serious damage that could be produced prior to its start-up and during its installation, thereby ensuring its handling in the safest way possible. Please read the instructions carefully before operating the pump and familiarize yourself with its operation, following very carefully the instructions provided. We wish to stress the importance of being informed on how to perform the installation correctly. It is extremely important to keep these instructions in a secure place close to the installation.

MAINTENANCE.

This pump, like any other machine, requires routine maintenance. Chapter 9, "Spare Parts", deals with the identification of the spare parts. It is intended for the use of technical and maintenance personnel and for those persons responsible for supplying spare parts.

OPERATING PRINCIPLES.

A. Safety.



This symbol indicates those safety instructions contained in this manual which when not followed could jeopardize your safety



This symbol indicates potential problems with electrical safety.



This symbol indicates a compulsory measure to be taken by the user in compliance with specific instructions which serve to guarantee operating safety and/or protection of the pump.

B. Technical principles.

Quantity	Symbol	Unit
Dinamic viscosity	μ	mPa.s (=cP=Centipoise)
Kinematic viscosity	$V=\mu/\rho$	with ρ =specific weight [Kg/dm ³] and V = kinematic viscosity [mm ² /s] = cSt = Centistoke
	Only the dynamic viscosity is used in this manual.	
Pressure	p	[bar]
	Δp	[bar] - differential pressure
	Pm	[bar] - maximum pressure at discharge mouth (design pressure)
	Unless otherwise indicated, in this manual pressure is understood to be relative pressure.	
Net positive suction head (NPSH)	NPSH [m]	
	<p>In this manual, NPSH = NPSHr (NPSH required for the pump). NPSHr = the net pressure above the liquid vapour pressure at pumping temperature and at the pump inlet connection required to avoid performance impairment due to cavitation at rated capacity. NPSHr is measured at the suction flange at the point where the capacity drop = 4% of the rated capacity, and is corrected to the datum elevation. NPSHa = the total suction pressure available from the system at the pump suction connection, minus the vapour pressure if the liquid at pumping temperature. NPSH available is calculated for the installation. It is the responsibility of the user to determine this value.</p> <p style="text-align: center;">NPSHa \geq NPSHr + 0,5</p>	

Symbols.

It is absolutely necessary to place symbols on the pump, e.g., arrows which indicate the direction of rotation or other symbols indicating connections to fluids. All of these symbols should be clearly visible and legible.

Training and experience.

The personnel who are responsible for the operation, maintenance, inspection and assembly of the equipment should have the proper experience and training. The scope of their responsibilities and the supervision of the operators should be specifically defined by the plant foreman.

If the operators did not have the required knowledge, they should be trained, which could be done by the manufacturer of the machine or by the supplier on behalf of the shop foreman.

Furthermore, the shop foreman should make sure that the contents of the instruction manual are fully understood by the operators.

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.

In accordance with the regulations governing safety at work.

The instructions contained in this manual should be followed for operating the pump, along with national regulations and any other service and safety instructions made available by the shop foreman, so as to avoid accidents.

Safety instructions for handling.

If the machine's components, whether in a cold or warm state, constitute some hazard, then accidental contact with the same should be avoided.

When the machine is operating, be sure that the rotating parts are protected by a shield.

In the event of a fire (e.g., mechanical seal) of hazardous fluids (e.g., explosives, toxic agents, hot products), the machine should be emptied to prevent any risk to persons or to the ambient conditions. Existing regulations should be strictly adhered to. Avoid any hazard which could be produced by the electrical circuits (e.g.: VDE specifications and regulations on the supply of local energy services).

Safety instructions for maintenance, inspection and assembly.

It is the shop foreman's responsibility to see to it that maintenance, inspection and assembly work is performed by qualified personnel once they have become familiar with the subject; they should read this manual very carefully.

Work should only be done on this machine when it is stopped; it is extremely important that the procedure for stopping the machine be followed as set forth in this manual.

Those pumps should be de-contaminated which may contain hazardous agents.

Upon completion of the work, re-install the safety and protection devices.

Prior to re-initiating the operation of the machine, the instructions given in the chapter on "Operating Principles" should be read.

Changes without prior authorization and production of spare parts.

No modification can be made to the machine without the prior consent of the manufacturer. For your safety, use spare parts and accessories authorized by the manufacturer.

The use of other parts exempts the manufacturer from any and all responsibility.

Unauthorized operations.

The machine's safety is only ensured if it is used properly in accordance with the instructions given in this manual.



The limits for values specified in the data sheet cannot be exceeded under any circumstances.

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

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

INOXPA SERVICE.

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

DESCRIPTION.

The sanitary centrifugal pumps in the HYGINOX SH series are manufactured using AISI 316 stainless steel die-pressed steel plate with an electro-polished finish.

The HYGINOX SH centrifugal pump has a compact construction, monoblock, axial intake, radial discharge, and sanitary-type connections. The impeller is of open design and made of one single piece. The mechanical seal is according to DIN 24960 L₁K. The friction surfaces are silicon carbide, graphite and the EPDM o-rings in the standard version.

The motor conforms to the IEC standard with a stainless steel facing, IP-55 protection. Class-F insulation. Three-phased power supply with 220-240 / 380-420 / 660 V at 50Hz, depending on the power source. The motors can be ordered for working in explosion hazardous environments. Depending on environmental conditions, the motors can be explosion-proof (EExd) or of enhanced safety (EExe).

The HYGINOX SH series has been specially developed to respond to all hygienic requirements in the food industry.

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

Thanks to its design, there is optimal interchangeability of parts between the different pumps.

This equipment is suitable for his use in food process.

PRINCIPLE OF OPERATION.

The rotor or impeller, situated in the housing, rotates solidly fixed to the pump shaft and consists of a given number of blades, depending on the pump model.

The impeller blades transmit energy to the fluid in the form of kinetic and pressure energy.

The pump is not reversible by simple inversion of the direction of rotation. The direction of rotation is clockwise when the pump is seen from the rear part of the motor.

NOISE.

Particularly when the type of use to which the pump is put determines the level of noise to which the operator is exposed as a result of its handling and installation --if it is similar or greater than 85 dBA-- measures as prescribed in regulation no. 277 dated 15/8/91 should be adopted in order to protect users from the risks which this entails.



When the noise level in the operating area exceeds 85 dB(A), use special protection.

APPLICATION.

As a general rule, the standard version of the HYGINOX SH pumps are used to transfer liquids for the food industry. Subject to special design, they can be used in concentrators, closed tanks, evaporators, distillation towers, etc.

The hydraulic performance at various impeller diameters and different speeds is given for each of the pump types. The curves also show the power required and the NPSH required.

HYGIENE.

Special attention has been given to hygiene and cleaning requirements in the construction of the pump. The number of grooves and dead spaces have been limited to an absolute minimum.

The pump can be cleaned easily and thoroughly in either of the two following ways:

- without disassembling it, for ex.: by means of steam or water, referred to as CIP (Cleaning in Place).
- by easy disassembly of the pump housing, the impeller and the mechanical seal.

Refer to chapter 10 (Cleaning and disinfection) on how to properly clean the pump and the methods and products to be used.

Hyginox SH centrifugal pumps by INOXPA have been approved by the American 3A Standard Authorities.

MATERIALS USED IN CONSTRUCTION.

All pump parts which are in contact with the product are stainless steel, or are made of tasteless and odorless materials. This makes the pump resistant to corrosion and avoids contamination of the liquid being pumped.



It is necessary to check and verify that the materials in contact with the product are made for pumping a product which is specifically for human consumption..

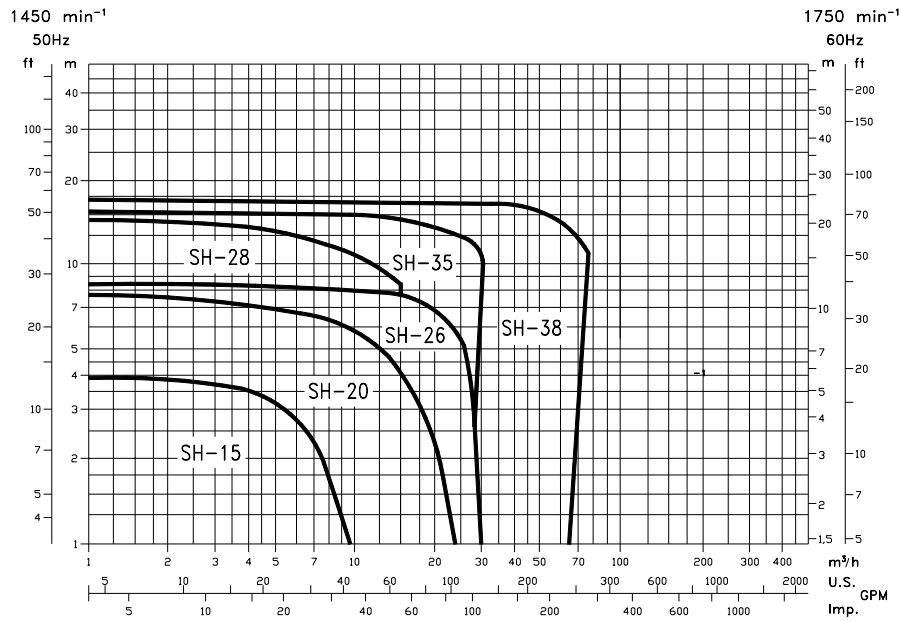
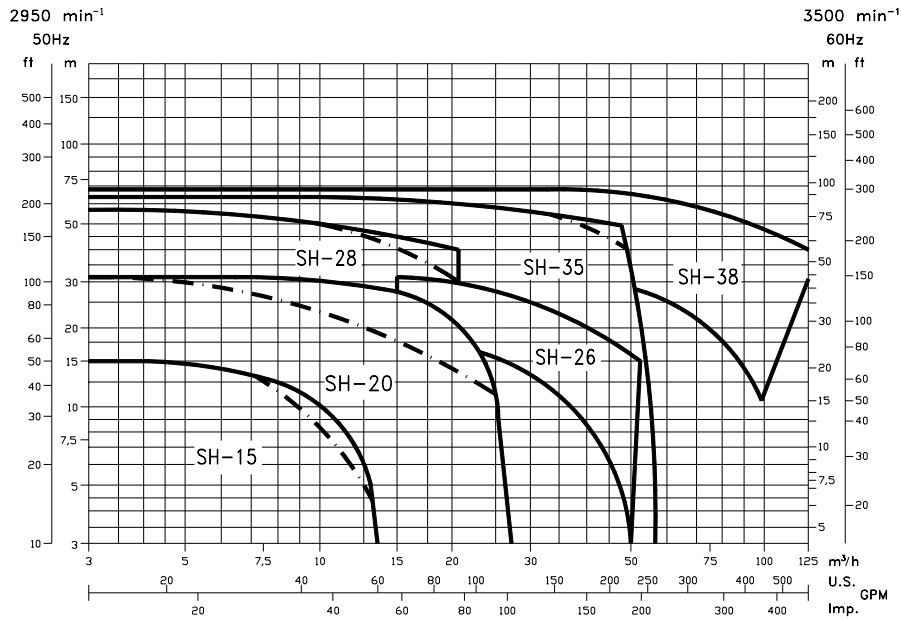
Table 3.1: Parts in contact with the liquid.

Part	Material
Pump housing	AISI 316 (1.4401)
Impeller	AISI 316 (1.4408)
Pump cover	AISI 316 (1.4401)
Impeller nut	AISI 316 (1.4408)

Table 3.2: Parts that can be in contact with the liquid.

Part	Material
Lantern	GG - 15 (0.6025)
Clamping ring	AISI 304 (1.4301)

FIELD OF APPLICATION.



--- limite por potencia instalada a 60 Hz

Figure 3.1: Field of application.



The field of application for each type of pump is limited. The pump was selected for certain pumping conditions at the time that the order was passed. INOXPA assumes no responsibility for damages that may arise in the event that the information made available by the purchaser is incomplete (nature of the liquid, viscosity, r.p.m. ...).

Do not use the pump for applications other than those for which it has been specified on purchase and installation. No modifications can be made without previously consulting with INOXPA and without the latter's written consent. A correct application shall take into account the following: the viscosity of the product, its properties, purity, temperature, suction and discharge pressure, r.p.m. ...

When the pump is used in a pumping unit or in an environment for which the pump has not been designed, the operator and the material may be exposed to hazard. Consult with INOXPA in case of doubt prior to use.

Refer to Table 3.3 and the corresponding notes for value limits (viscosity, temperature, pressure...).

Table 3.3: field of application

	Hyginox SH	
	50 Hz	60 Hz
Maximum flow rate	140 m ³ /h	150 m ³ /h
Maximum differential pressure	6,8 bars	9,5 bars
Maximum suction pressure	4 bars	4 bars
Maximum temperature	120 °C	120 °C
Maximum recommended viscosity	250 mPa.s.	250 mPa.s.
Maximum speed	2900 min ⁻¹	3500 min ⁻¹

ATTENTION The following limits should be considered for these options:

- **Elastomers** **EPDM** : maximum temperature 120°C.
- VITON** : maximum temperature 120°C.
- NBR** : maximum temperature 100°C.
- PTFE** : maximum temperature 120°C.

SHAFT SEALING.

The following options for the mechanical seal are applicable to the entire range of pumps.

- Single sanitary mechanical seal.

Table 3.4: Materials for faces exposed to friction and internal mechanical seal elastomers

	Rotating part	Stationary part	Elastomers
standard	silicon carbide	graphite	EPDM
option	silicon carbide	silicon carbide	EPDM

The elastomers of the mechanical seal options can be of viton, NBR, PTFE or EPDM.

4. Installation

GENERAL CONSIDERATIONS.

This manual provides basic instructions which should be taken into account when proceeding to install the pump. It is of utmost importance that the shop foreman read this manual before assembly.

The instructions include pertinent information which will enable you to install your pump correctly. The manual also contains important instructions for preventing possible accidents and serious damage which could occur prior to start up and during the installation :

- It is imperative to put warning markers on the pump, e.g., arrows which indicate the direction of rotation or symbols indicating fluid connections. All these warnings should be clearly visible and legible.
- Any failure to comply with the instructions could result in a risk for the operators, the surroundings and the machine, and could result in the loss of any right to make a claim for damages.

INSTRUCTIONS UPON DELIVERY, FOR TRANSPORT AND STORAGE.

When the machine arrives, read the instructions on page 1 of the chapter titled "Introduction".



Hyginox SH pumps are often too heavy to be stored manually. Use an adequate means of transport. Use the points which are indicated in the drawing for lifting the pump. Only authorized personnel should transport the pump. Do not work or walk under heavy loads.

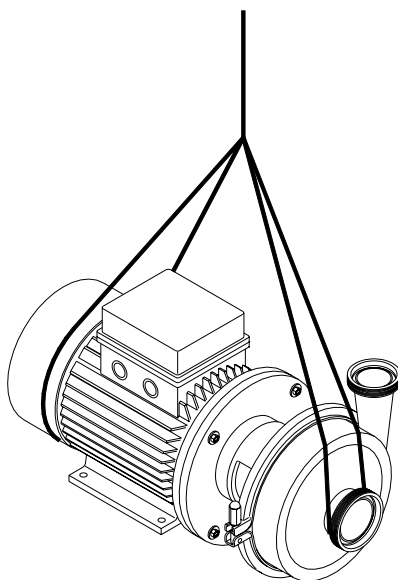


Figure 4.1: Lifting the pump.

LOCATION.

Piping.

Place the pump as close as possible to the suction tank (refer to the chapter, "Pump Installation"), and if possible below the level of the liquid or even lower in relation to the deposit so that the static manometric suction head is at its maximum. Place the suction and discharge piping in straight runs with a minimum of elbows and fittings in order to reduce to the extent possible any loss of head caused by friction. This improves the suction conditions, thereby affording maximum performance of the pump.

Accessibility.

Place the pump so that access can be had to the pump and to the drive units so as to make inspections and revisions. Leave sufficient space around the pump for proper inspection, separation of the pump from other units and for maintenance operations. In order to disassemble the pump you should leave sufficient space in front of and behind it. (Chapter 9 deals with the dimensions).

Place the pump with sufficient space for the lifting equipment if the components or the total weight of the unit exceed 22 kg.

Place the pump near the drain on the floor.

It is very important to be able to gain access to the pump connecting device (including when it is operating).

Outdoor installation.

The HYGINOX SH pump can only be installed out of doors if there is a roof covering. Consult with INOXPA prior to installation.

Weights.

TYPE	Power kW	Speed min ⁻¹	Pump without motor (kg.)	Pump with motor (kg.)	
SH-15 A	0.25	1450	6	10.5	
	0.37	2950		11.5	
	0.55	2950		12.5	
SH-20 B	0.75	1450	11	21	
	1.1	2950		21	
	1.5	2950		24	
	2.2	2950		27	
SH-26 B	0.75	1450	11.5	21.5	
	E	3	2950	16	37
		4	2950	41	
SH-28 B	0.75	1450	15.5	25.5	
	1.1	2950		25.5	
	C	1.1		1450	28.5
		1.5		2950	28.5
	E	2.2	2950	31.5	
		3	2950	20	41
	F	4	2950	45	
		5.5	2950	24.5	61.5
SH-35 C	1.5	1450	17	33	
	F	5.5	2950	26	63
		7.5	2950		68
		9	2950		82
G	11	2950	32.5	110.5	
SH-38 C	1.5	1450	19	35	
	E	2.2	1450	23.5	44.5
		3	1450		47.5
		4	1450		50.5
	G	11	2950	34.5	112.5
		15	2950		119.5
		18.5	2950		131.5
	H	22	2950	158.5	
J	30	2950	53.5	225.5	

Indoor installation.

Place the pump so that the motor is properly ventilated. Prepare the motor to be started according to the instructions provided by the manufacturer.



When inflammable or explosive liquids are pumped, an adequate connection needs to be used. Connect the components of the unit with grounding jumpers in order to reduce the danger from static electricity.

Use explosion-proof motors in accordance with national and local standards and regulations.

Excessive temperatures.

Depending on the fluid to be pumped, high temperatures can be reached inside and around the pump.



Over 70 °C the operator should take protective measures and place warning notices advising of the danger which exists if the pump is touched. The type of protection selected should not isolate the pump entirely. It should allow for optimum cooling of the motor.

STABILITY.

Foundation.

Prepare the foundation so that the pump is level and well supported. Its emplacement should be rigid, horizontal, flat and resistant to vibrations, so as to avoid any warping (if the pump's alignment is maintained its operation is ensured during start-up).

HANDLING.



If the pump is supplied without a motor, the purchaser/user is responsible for the pump's start-up and assembly.

ELECTRIC MOTORS.

Regulations.

Prior to connecting an electric motor to the power supply, check local regulations on electrical safety and also refer to the EN 60204-1 standard.



Let qualified personnel perform the connection of electrical motors. Take the necessary steps to prevent faults in the connections and wiring.

Automatic switch.

In order to work on the pump without hazards, an automatic switch should be installed as close as possible to the pump. The use of a grounding switch is also recommended.



The equipment used for handling the pump should comply with current regulations, as set forth in the EN 60204-1 standard on electrical safety.

Protection of the motor against overloads.

In order to protect the motor from overloads and short circuits, the use of thermal or magnetic relays is recommended. Adjust these relays to maximum rated current values as indicated on the data plate of the motor.

Connection.

Consult the supplier's instructions prior to connecting the motor to the power net.

For single-phase motors, use motors with an increased starting torque.

Ensure a starting torque which is sufficiently high for motors controlled by a frequency changer, and which provide for adequate cooling at low speeds. If necessary, install an independent fan.



The electrical equipment, the terminals and the control system components can continue to carry current when disconnected. Any contact with them can endanger the safety of the operators or cause irreparable damage to the material.

DIRECTION OF ROTATION.

The direction of rotation is clockwise viewing the pump from the rear part of the motor.



Make sure that the pump rotates in the direction indicated on the plate. If the pump rotates in the wrong direction its hydraulic performance will be lower.

Electrical diagram.

	Connection U=...	
	3x220	3x380
motor		
220/380	Δ	
380	-	Δ

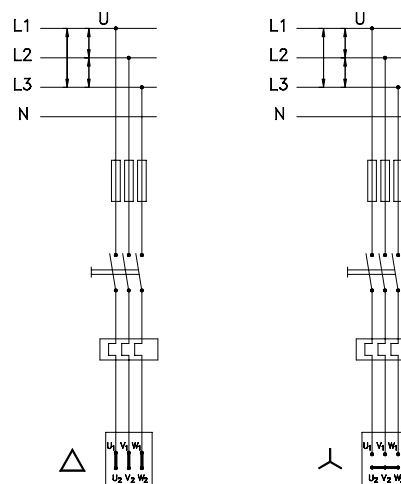


Figure 4.2: Electrical Connections

SUCTION AND DISCHARGE PIPES.

Excessive forces and tensions on pump connections, caused by the piping, could result in mechanical damage to the pump. These pipes should be connected in a straight line, without leaving spaces between connections and the faces of parallel connections. Provide for adequate anchoring devices and make sure that they are not tensed too much when the pump is operating. When hot liquids are pumped, pay attention to thermal expansion; if this is the case, use expansion joints. Once the connection has been made, check that the shaft can turn freely.

Pipes.

Use pipes with a diameter which is equal to or greater than that of the pump's connections. If the liquid to be pumped is viscous, the loss of head from the suction and discharge pipes can increase considerably. Other pipe components such as valves, elbows, filters and foot valves, can also cause a loss of head.

For this reason, the diameters and the length of pipes and other components should be selected so that the pump will operate within the minimum pressure limits allowed for the suction (refer to NPSH graph), the maximum working pressure (refer to chapter 3, "Field of Application"), and the rated motor power.

Suction pipe.

Liquids should be introduced into the pump from a higher level than that of the pump; the pipe should be inclined in its path to the pump and devoid of air pockets.



A diameter which is too small or a suction pipe which is too long, a filter too small or clogged, will lead to a greater loss of head and thus the NPSH available (NPSHa) is less than the required NPSH (NPSHr). Cavitation may occur, causing noise and vibrations. The possibility that the pump may also suffer mechanical

If a filter is installed in the suction mouth, a constant check for loss of load in the suction pipe should be made. Also check to see whether the suction pressure at the suction mouth of the pump is sufficiently high (see NPSH). Check the tension of the suction pipe after its connection.

Self-priming process.

In general terms --if the self-priming process is followed-- it is necessary for the pump to contain sufficient liquid to fill the housing, enabling the pump to create a pressure difference.

However, if the pump does not operate with a load, a foot valve which has the same or a greater diameter as that of the suction pipe should be installed; or the pump can be installed with a self-priming housing.

The use of a foot valve is not recommended for pumping viscous liquids.

In order to eliminate air and gases from the suction pipe, the counter-pressure on the discharge pipe should be reduced. When the self-priming process is used, the pump's start-up should be done by opening and emptying the discharge pipe which allows the air and gases to escape at a low counter-pressure.

Another possibility involves long pipes or when a check valve is installed in the discharge pipe; it is also possible to install a by-pass with a shut-off valve on the discharge side of the pump. This valve will open in the case of priming and will allow air and gases to escape at a minimum counter-pressure.

The by-pass should not lead back to the suction mouth but rather it should lead to the supply tank.

Shut-off valves.

The pump should be isolated for proper maintenance. This isolation can be obtained by installing shut-off valves in the suction and discharge pipes of the pump.

These valves should be able to open completely, both for suction and for discharge, as occurs with the suction and discharge pipes (ball-checks or sluice valves are preferable).



When the pump is started up, the shut-off valves should be completely open. The flow rate should never be regulated by closing the shut-off valve in the suction or discharge pipe.

The flow rate is to be regulated by increasing or decreasing the pump's speed, trimming the impeller, or using a by-pass which re-directs the flow to the supply tank.

Filters.

Foreign particles can seriously damage the pump. Avoid the entry of these particles by installing a filter.

When selecting a filter, bear in mind the diameter of the screen openings so that loss of head will be minimal. The filter diameter should be three times greater than that of the suction pipe.

The filter should be placed in such a way that it does not interfere with maintenance and cleaning operations. Be sure that the density of the liquids is appropriate and that they can be filtered easily.

5. Start-up

GENERAL CONSIDERATIONS.

The pump can be started up so long as the instructions given in chapter 4 ("Installation") have been followed.



Prior to start-up, the persons responsible for the operation must be duly informed of the pump's operation and the safety instructions. This instruction manual should be available to personnel at all times.
Prior to start-up, check the pump for any possible failure. If a failure is found, the plant foreman should be notified immediately.

Also consult the section "Dimensions" in chapter 9.

CLEANING.



Prior to start-up, check to see that the pipes and the pump are completely clean and devoid of weld splatterings or other foreign particles.

Consult chapter 10 (cleaning and disinfection) on how to properly clean the pump and the methods and liquids which should be used.

- Completely open the shut-off valves in the suction and discharge pipes.
- If the liquid does not flow into the pump, fill it with liquid when pumping.



The pump should never rotate when empty.

- If the pump has a heating chamber, open the valve for feeding in the heat source. Wait at least 15 minutes for the pump and the liquid in it to reach the correct working temperature. Rotate the shaft by hand to check the unfreezing of the pump.
- Open the shut-off valve for the secondary washing circuit; if the pump is equipped with a cooled seal, a pressure greater than the working pressure of the pump is not needed in the cooling chamber.
- Check to see if the pump can be started up safely.
- Start the pump.
- Check to see whether the absolute suction pressure is sufficient, so that vapour cannot be produced inside the pump. Refer to the curve for the minimum pressure required above the vapour pressure (NPSH).
- Control the discharge pressure.



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

6. Maintenance

GENERAL CONSIDERATIONS.



Inadequate, wrong or improper maintenance could result in the faulty operation of the pump, high repair costs, and breakdown in the long run. For this reason the instructions given in this chapter should be followed.

During maintenance operations which are performed on the pump, whether due to inspections, preventive maintenance or the movement of the installation, the procedures indicated should always be followed.

Failure to comply with these instructions could endanger the operator and/or seriously damage the pump. Maintenance work should only be done by qualified personnel. Wear appropriate clothing which provides adequate protection against high temperatures and hazardous and/or corrosive fluids. Make sure that the personnel read the entire instruction manual and, in particular, indicate to them the chapters which refer to work which needs to be done.

INOXPA does not assume responsibility for accidents and damage which might occur as a result of any failure to comply with the instructions indicated herein.

PREPARATION.

Work area.

Provide for a clean work area; some parts are extremely delicate and others support small tolerances.

Tools.

Use tools which are designed for the purpose for which they are to be used in maintenance and repair work. Use them properly.

Disconnection.

Before beginning maintenance and inspection work, disconnect the pump.

Decompress the pump and the pumping unit.

If the fluid to be pumped allows for it, let the pump cool down until it reaches room temperature.

Safety.

Do not let the motor start if work needs to be done on the pump. This is very important when electric motors are involved which are connected from a certain distance.

Follow the procedure outlined below:

- Place the pump switch in the "Off" position.
- Disconnect the pump from the power supply.
- Block the electrical control panel or put a warning notice on it.
- Remove the fuses and take them with you to the work area.
- Do not remove the protection pieces located around the lantern until the pump is completely stopped.

CONSERVATION.

Should the pump be taken out of service for a long period of time:

- First of all, empty the pump.
- Apply VG46 mineral oil to the internal parts.
- The pump should be worked on for a brief period of time once a week or the shaft rotated manually. This ensures the correct circulation of the protective oil.

EXTERNAL CLEANING.

Attempt to keep the exterior of the pump clean at all times. This helps in inspection work and keeps warning notices visible.

Make sure that cleaning products do not get into the motor's ball bearings. Cover all parts which should not enter into contact with the cleaning fluid.



Do not spray hot parts of the pump with water as some components could crack due to quick cooling and the fluid inside the pump could spill out.

ELECTRICAL INSTALLATION.

Maintenance work on electrical installations can only be done by qualified personnel and only when the power supply has been cut off. Carefully follow national safety regulations.



Also abide by the regulations referred to above if you are working while the power supply is still connected.



Check to see whether the electrical materials to be cleaned are well protected (for ex., IP 54 indicates protection against dust and water spray but does not include protection against pressure water jets). Consult EN 60529. Choose an appropriate method of cleaning electrical materials.

Replace defective fuses with new ones having the prescribed amperage.

On finishing each maintenance operation, check the electrical installation components to see if they are defective and repair them if necessary.

MAINTENANCE.

Periodically check suction and discharge pressures.

Inspect the motor in accordance with the manufacturer's instructions.

In general, a mechanical seal does not require maintenance; however, the seal should never be made to work when empty. Should a leak occur, replace the seal.

7. Operating Problems

Problems	Probable Causes
Overloading of motor.	8, 9, 13
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
The pump gets clogged.	9, 10, 13, 15
Overheating of the pump.	8, 9, 10, 13, 15
Abnormal wear.	4, 5, 10, 15
Leak in mechanical seal.	11, 12, 16

Probable causes		Solutions
1	Wrong direction of rotation.	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	Pump not purged.	Purge or fill.
4	Cavitation.	Increase suction pressure (also see 2)
5	The pump sucks in air.	Check the suction pipe and all its connections.
6	Suction pipe obstructed.	Check suction pipe and the filters, if any.
7	Discharge pressure too high.	If necessary, reduce head losses, for ex., by increasing the pipe diameter.
8	Flow rate 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	Viscosity of liquid too high.	Reduce the viscosity, for ex., by heating the liquid.
10	Temperature of the liquid too high.	Reduce the temperature by cooling the liquid.
11	Damaged or worn mechanical seal.	Replace the seal
12	O-rings not the right ones for the liquid.	Insert the proper O-rings; check with the supplier.
13	The impeller scrapes.	- Decrease the temperature. - Decrease the suction pressure. - Adjust the clearance between the impeller and the housing.
14	Tension in the pipelines.	Connect the pipelines to the pump free of tension.
15	Foreign objects in the liquid.	Place a filter in the suction.
16	Mechanical seal spring tension too low.	Adjust as indicated in the manual.
17	Pump speed too low.	Increase the speed.
18	Suction shut-off valve closed.	Check and open.
19	Discharge pressure too low.	Increase the pressure: - Increase the diameter or the impeller. - Increase the speed of the pump.



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

8. Disassembly and Assembly

GENERAL CONSIDERATIONS.

The assembly and disassembly of the pumps should only be done by qualified personnel. Make sure that the personnel read carefully this instruction manual and, in particular, those instructions which refer to the work they will perform.



Incorrect assembly or disassembly may cause damage in the pump's operation and lead to high repair costs and a long period of down-time.

INOXPA is not responsible for accidents or damages caused by a failure to comply with the instructions in this manual.

Preparations.

Provide for a clean working environment as some parts, including the mechanical seal, are very delicate and others have little tolerance.

Check that the parts which are used do not suffer damage during transport. When doing this, you need to inspect the adjustment edge, the butted faces, clogging, burrs, etc.

After each disassembly, carefully clean the parts and check for any damage. Replace all damaged parts.

Tools.

Use the proper tools for assembly and disassembly operations. Use them correctly.

Tightening torque.

Table 8.1: Tightening torque

Material	Tightening torque N.m.								
	M5	M6	M8	M10	M12	M14	M16	M18	M20
8.8	6	10	25	49	86	135	210	290	410
A4	5	9	21	42	74	112	160	210	300

Cleaning.

Before disassembling the pump, clean it on the outside and on the inside.



NEVER clean the pump by hand when it is running.

Safety.

Prevent the motor from starting if you need to work on the pump.

Take steps to ensure that the motor cannot be started if the pump housing is removed, for ex., for cleaning operations.



NEVER cause the pump to run without the housing.

Disconnection.



Before beginning disassembly and assembly work, disconnect the pump. Decompress the pump and the pumping unit.

If the fluid in the pump allows for it, let the pump cool off until reaching room temperature.

Electrical safety.

Prevent the motor from starting if you need to work on the pump. This is very important when working with electric motors that are connected from a certain distance.

Follow the procedure outlined below:

- Place the pump switch in the "Off" position.
- Disconnect the pump from the power supply.
- Block the electrical control panel or put a warning notice on it.
- Remove the fuses and take them with you to the work area.
- Do not remove the protection pieces located around the lantern until the pump is completely stopped.

DISASSEMBLY AND ASSEMBLY.

PUMP HOUSING.

- Close the suction and discharge valve.



ATTENTION! The liquid can spill out when the pump housing is removed.

- Remove the clamp (15).
- Check to see that the O-ring (80A) is still in good condition.
- Make sure that the O-ring is not inverted when inserted.
- Once the pump housing is assembled the clamp needs to be inserted and the wing nut tightened.

DISASSEMBLY OF THE IMPELLER AND THE PUMP COVER.

Remove the pump housing as indicated in the foregoing section.

- Remove the screw (50A) and the protection (47A).
- Insert open-jaw wrench in the shaft flats (05) to keep it from rotating. Remove the nut (45) and the washer (35).
- Remove the impeller (02). If necessary, hit it with a dead blow using a plastic mallet in order to drive off the cone.
- Remove the rotating part of the mechanical seal (08).
- Remove the pump cover (03). The stationary part of the mechanical seal (08A) remains in place on the pump cover.

MECHANICAL SEAL.

Disassembly of the single mechanical seal.

Disassemble the single mechanical seal as indicated in the section on "Disassembly of the impeller and the pump cover".

- When the impeller is removed, the rotating part of the mechanical seal (08) remains attached to the shaft of the pump. Check that the sealing surface of the rotating face and the seal are in good condition.
- When the pump cover is disassembled, the stationary part of the mechanical seal (08A) comes off from the cover. Check to see that the sealing surface and the O-ring are not damaged.

Assembly of the single mechanical seal.

- Fit the pump cover (03) on the lantern (04). The stationary part of the mechanical seal (08A) needs to be inserted first into its location in the cover.
- Slide the rotating part of the mechanical seal (08) over the shaft.
- Fit the impeller as indicated in the corresponding section.

WARNING! When fitting the new seals, be sure to wet the O-rings with soapy water so that the fixed parts slide easily into their locations and the rotating parts onto the shaft.

ASSEMBLY OF THE IMPELLER.

- Slide the impeller (02) over the shaft up to the rotating part of the mechanical seal (08).
- Place an open-jaw wrench on the shaft flats (05) to keep it from rotating. Slide the impeller washer (35) into place and tighten the nut (45).
- Check that the clearance between the impeller and the cover (03) remains at 0.3 - 0,5 mm so that the working pressure of the seal would be the correct one; see Figure 8.1.

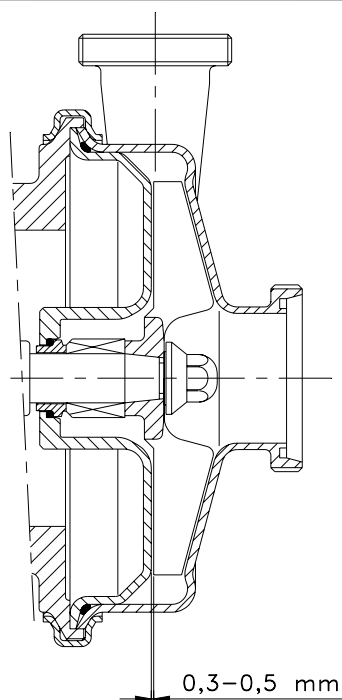


Figure 8.1: Clearance between impeller and pump cover.

MOTOR REPLACEMENT.

In order to replace the motor (93), follow the indications as given in the section "Disassembly of the impeller and the cover".

- Remove the splash ring (82).
- Loosen the studs (55) and take the shaft (05) out.
- Remove the allen screws (51) and the washers (53),
- Take the lantern (04) out.

Replace the motor or its ball bearings as indicated in the manufacturer's instruction manual.

9. Technical Specifications

TECHNICAL SPECIFICATIONS.

PUMP TYPE		IEC motor / 50 Hz [kW]		sealing shaft	open impeller	
		2900 min ⁻¹	1450 min ⁻¹	seal diameter	maximum impeller	minimum impeller
				DIN 24960 L ₁ K		
SH-15	A	0,37-0,55	0,25	25	105	75
	B	1,1	0,75			
SH-20	C	1,5-2,2	-	25	145	110
	B	-	0,75			
SH -26	E	3-4	-	25	145	120
	F	5,5	-			
	B	1,1	0,75			
SH-28	C	1,5-2,2	1,1	25	200	140
	E	3-4	-			
	F	5,5	-			
	C	-	1,5			
SH-35	F	5-9	-	25	200	140
	G	11	-			
	C	-	1,5			
SH -38	E	-	2,2-3-4	25	205	140
	G	11-15-18	-			
	H	22	-			
	J	30	-			
	C	-	1,5			

MATERIALS.

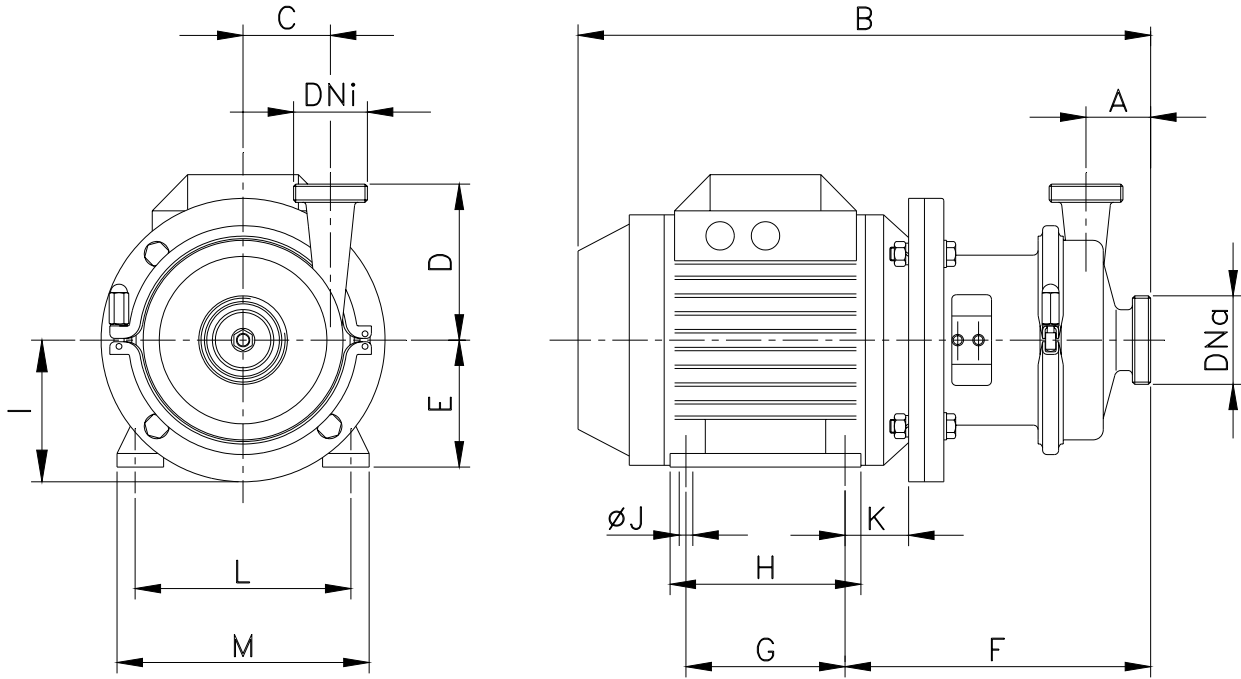
Parts in contact with the liquid

Part	Item	Material	Material n.
Pump housing	01	AISI 316	1.4401
Impeller	02	AISI 316	1.4408
Pump cover	03	AISI 316	1.4401
Shaft	05	AISI 316	1.4401
Impeller nut	45	AISI 316	1.4408

Parts which can be in contact with the liquid

Part	Item	Material	Material n.
Lantern	04	GG - 15	0.6025
Clamping ring	15	AISI 304	1.4301

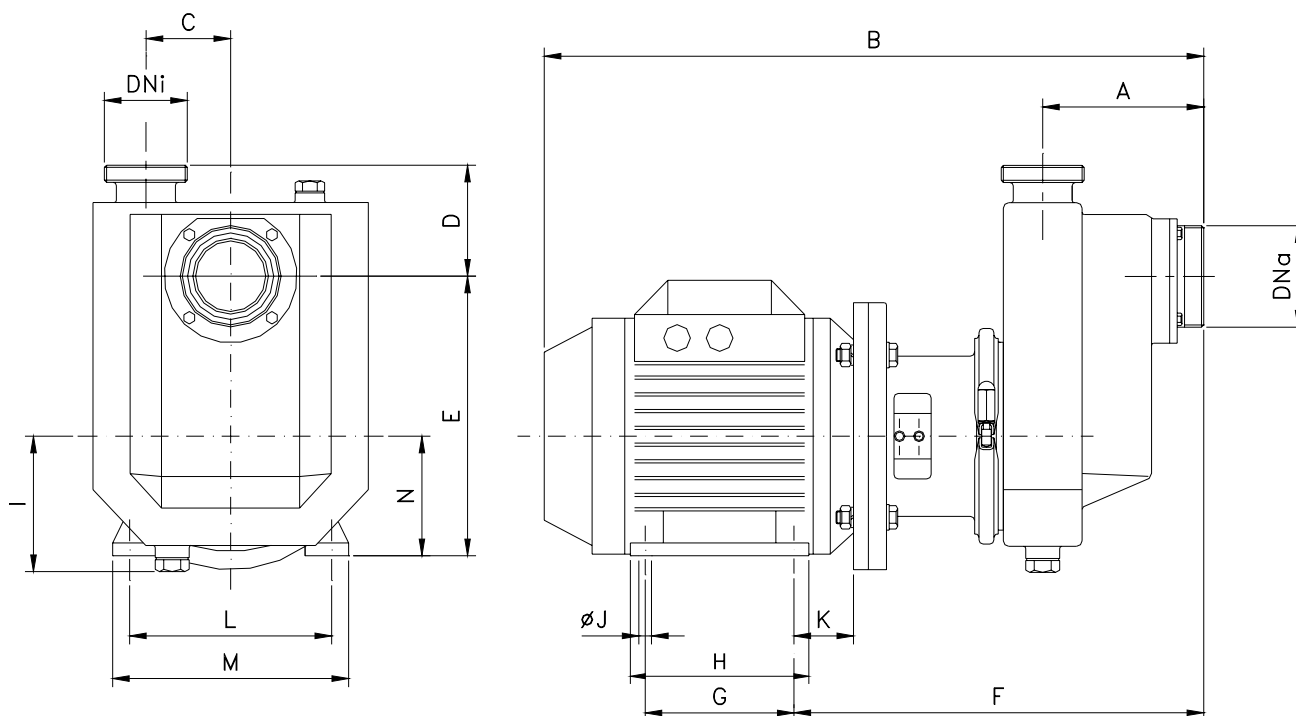
Hyginox SH pump dimensions.



TYPE	Motor frame	[kW]		DNa	DNi	A	B	C	D	E	F	G	H	I	ØJ	K	L	M	
		2900 min ⁻¹	1450 min ⁻¹																
SH - 15	A	71	0,37	0,25	40 1 1/2"	32 1 1/2"	55	395	55	100	71	230	90	112	85	7	38	112	135
			0,55																
SH - 20	B	80	1,1	0,75	50 2"	40 1 1/2"	55	415	74	140	80	231	100	125	105	9	40	125	153
	C	90S	1,5					455			90	237	100	150		10	46	140	170
		90L	2,2								125								
SH - 26	B	80		0,75	65 3"	50 2"	55	425	72	150	80	240	100	125	105	9	40	125	153
	E	100	3					510			100	272		172	125	12	50	160	197
		112	4					540			112	279	140	168			57	190	222
	F	132	5,5					645			132	332		212	150		73	216	262
SH - 28	B	80	1,1	0,75	40 1 1/2"	40 1 1/2"	65	420	107	165	80	235	100	125	140	9	40	125	153
	C	90S	1,5	1,1				455			90	241	100	150		10	46	140	170
		90L	2,2								125								
	E	100	3					505			100	267		172		12	50	160	197
		112	4					535			112	274	140	168			57	190	222
	F	132	5,5					640			132	327		212		150		73	216
SH - 35	C	90L		1,5	65 3"	50 2"	75	470	104	175	90	255	125	150	140	10	46	140	170
	F	132	5,5-9					655			132	341	140	212	150	12	73	216	262
	G	160M	11					745			160	372	210	264	175	14	88	254	302
SH - 38	C	90L		1,5	100 4"	65 3"	75	470	98	180	90	256	125	150	140	10	46	140	170
	E	100		2,2-3				520			100	282		172		12	50	160	197
		112		4				550			112	289	140	168			57	190	222
	G	160M	11-15					745			160	373	210	264	175	14	88	254	302
		160L	18,5					790			180	386	241	309		15	100	279	340
	H	180M	22					845			180	386	241	323		15	100	279	340
	J	200	30					910			200	428	305	365	200	19	113	318	406

Dimensions with connections DIN 11851

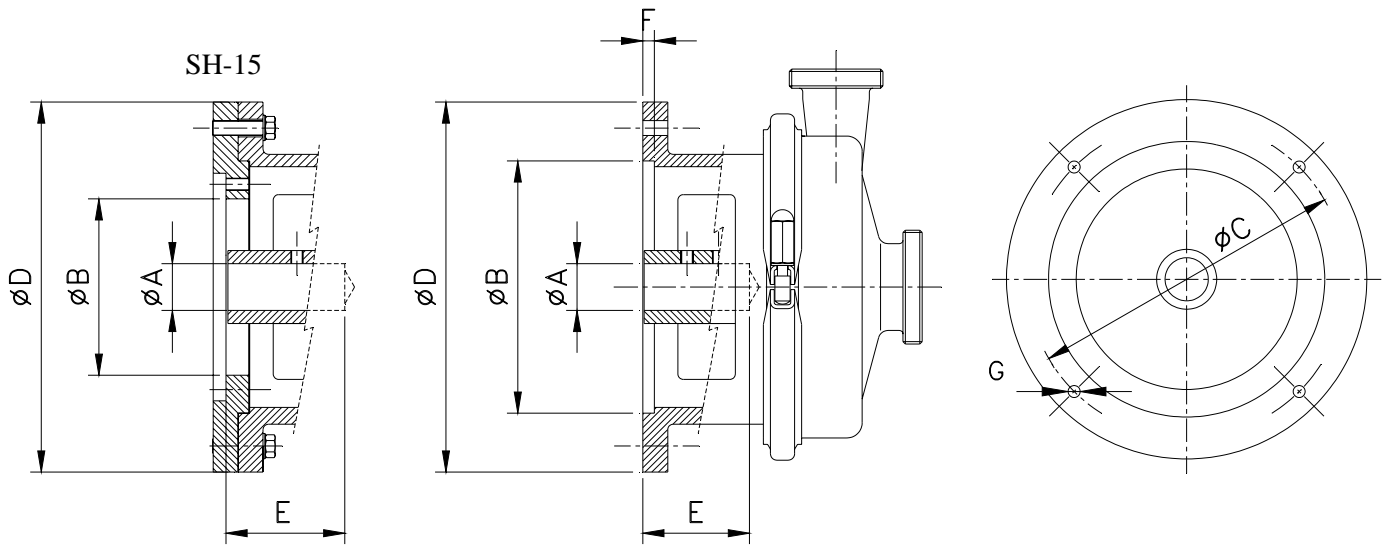
Hyginox SH pump dimensions with self-priming housing



TYPE	Motor frame	[kW]		DNa	DNi	A	B	C	D	E	F	G	H	I	øJ	K	L	M	N																					
		2900 min ⁻¹	1450 min ⁻¹																																					
SH - 15	A	71	0,37	0,18	40 1 1/2"	40 1 1/2"	223	462	65	83	216	297	90	112	100	7	38	112	135	71																				
			0,55																																					
SH - 20	B	80	1,1	0,75	65 2 1/2"	50 2"	157	517	75	100	235	333	100	125	125	9	40	125	153	80																				
	C	90S	1,5																		557	245	339	100 125	150	10	46	140	170	90										
		90L	2,2																																					
SH - 26	B	80		0,75	65 2 1/2"	50 2"	157	525	75	100	235	340	100	125	125	9	40	125	153	80																				
	E	100	3																		610	255	372	140	172	125	50	160	197	100										
		112	4																												640	267	379	140	168	125	57	190	222	112
		F	132	5,5																																				
SH - 28	B	80	1,1	0,75	40 1 1/2"	40 1 1/2"	121	485	92	73	260	300	100	125	160	9	40	125	153	80																				
	C	90S	1,5	1,1																	520	270	306	100 125	150	10	46	140	170	90										
		90L	2,2																																					
	E	100	3																		570	255	332	140	172	125	50	160	197	100										
		112	4																												600	267	339	140	168	125	57	190	222	112
	F	132	5,5																		705	287	392	212	160	73	216	262	132											
SH - 35	C	90L		1,5	65 2 1/2"	50 2"	164	570	105	106	310	355	125	150	160	10	46	140	170	90																				
	F	132	5-9																		755	352	441	140	212	160	12	73	216	262	132									
	G	160M	11																													845	380	472	210	264	175	14	88	254
SH - 38	C	90L		1,5	100 4"	80 3"	218	602	120	130	320	398	125	150	160	10	46	140	170	90																				
		100		2,2																	652	330	414	140	172	160	12	50	160	197	100									
	E	112		3																												682	342	421	140	168	160	12	57	190
				4																																				
	G	160M	11-15																		875	390	505	210	264	175	14	88	254	302	160									
		160L	18,5																													920	410	518	241	323	15	100	279	340
	H	180M	22																		975	430	560	305	365	200	19	113	318	406	200									
	J	200	30																		1042																			

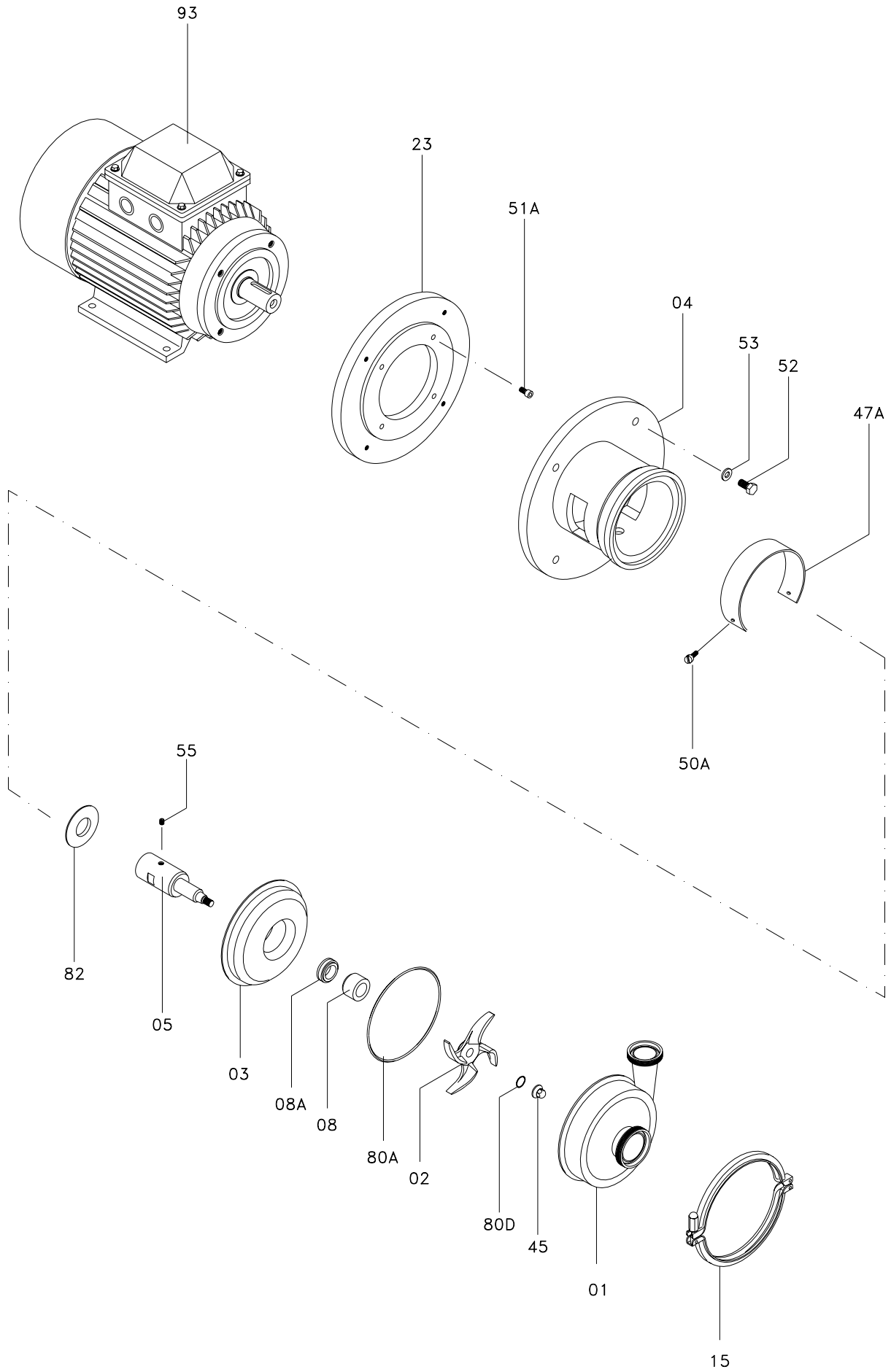
Dimensions with connections DIN 11851

Hyginox SH pump motor coupling dimensions.



TYPE	Motor frame	A	B	C	D	E	F	G	
SH - 15	A	71	14	70	85	168	32	-	7
SH - 20	B	80	19	130	165	200	42	3,5	11
	C	90	24				52		
SH - 26	B	80	19	130	165	200	42	3,5	11
	E	100/112	28	180	215	250	62	4	13
	F	132	38	230	265	300	82		
SH - 28	B	80	19	130	165	200	42	3,5	11
	C	90	24				52		
	E	100/112	28	180	215	250	62	4	13
	F	132	38	230	265	300	82		
SH - 35	C	90	24	130	165	200	52	3,5	11
	F	132	38	230	265	300	82	4	13
	G	160	42	250	300	350	112	5	18
SH - 38	C	90	24	130	165	200	52	3,5	11
	E	100/112	28	180	215	250	62	4	13
	G	160	42	250	300	350	112	5	18
	H	180	48						
	J	200	55	300	350	400		6	M16

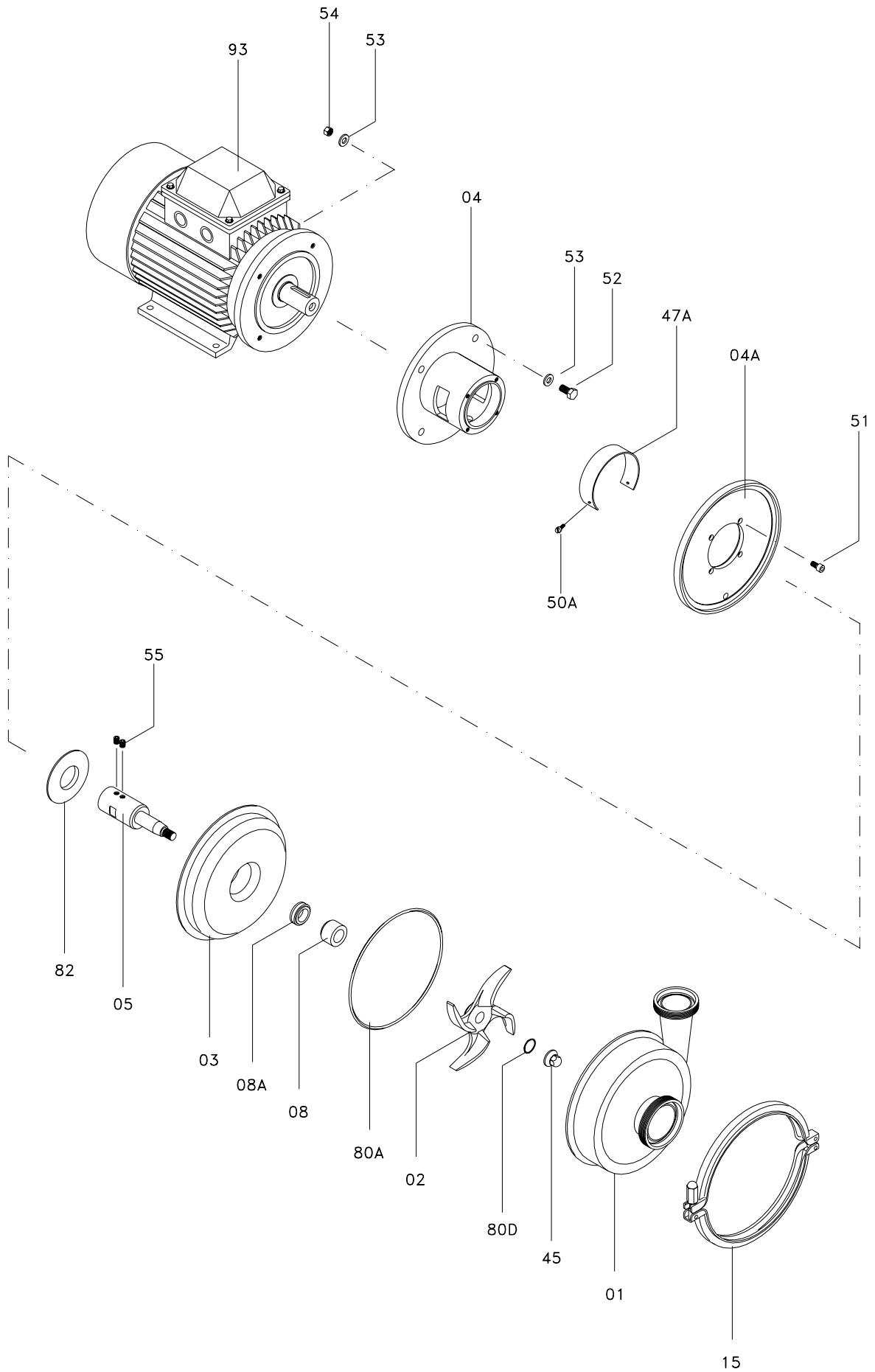
Hyginox SH - 15 pump.



Parts list Hyginox SH-15.

Position	Quantity	Description	Material
01	1	Pump housing	AISI 316
02	1	Impeller	AISI 316
03	1	Pump cover	AISI 316
04	1	Lantern	GG - 15
05	1	Shaft	AISI 316
08	1	Mechanical seal –rotating part-	-
08A	1	Mechanical seal –stationary part-	-
15	1	Clamping ring	AISI 304
23	1	Counter-flange	GG - 15
45	1	Impeller nut	AISI 316
47A	1	Protector	Plastic
50A	2	Screw	A2
51A	4	Allen screw	8.8
52	4	Hexagonal screw	8.8
53	4	Flat washer	St
55	1	Stud	A2
80A	1	O-ring	EPDM
80D	1	O-ring	EPDM
82	1	Splash ring	EPDM
93	1	Motor	-

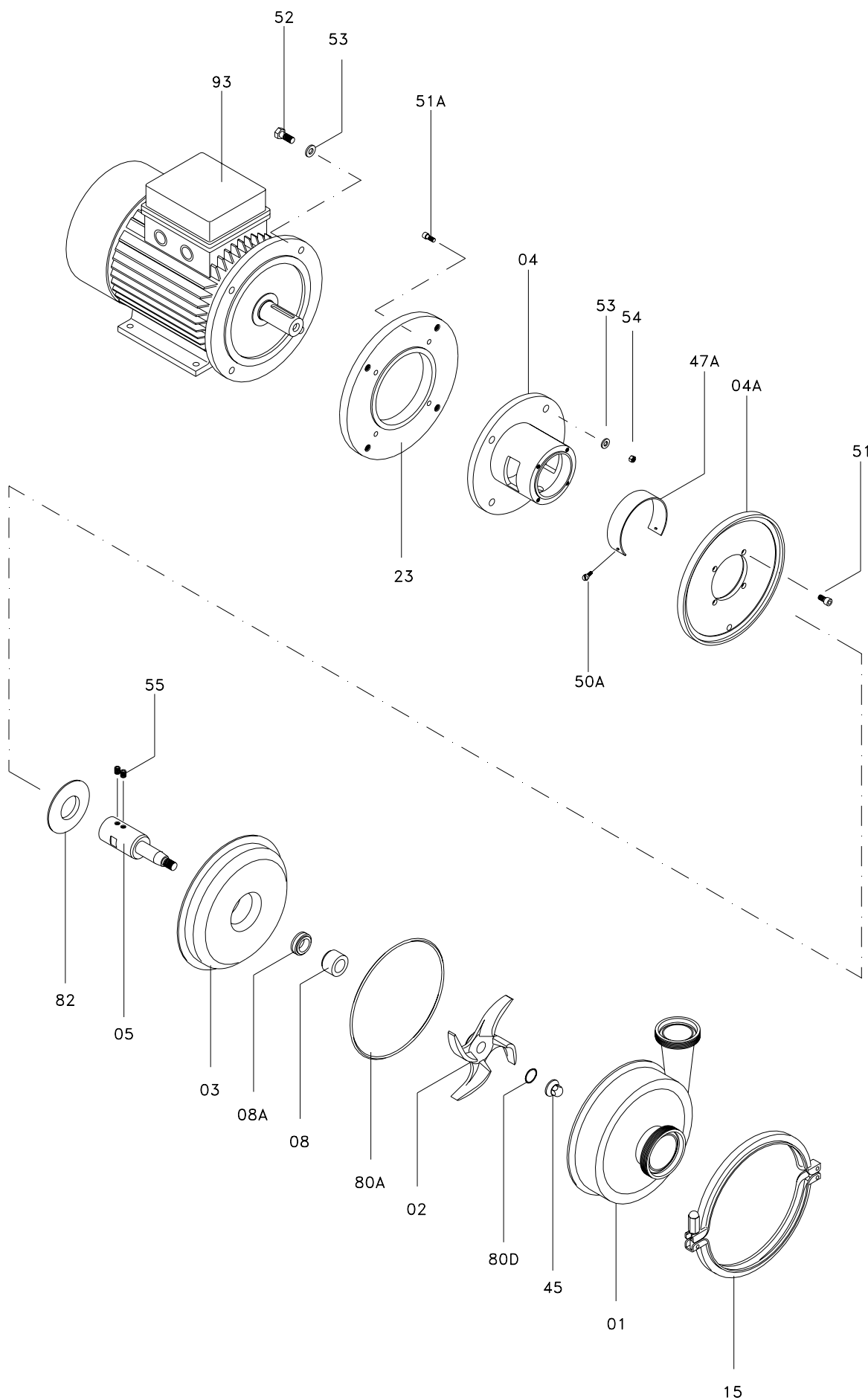
Hyginox SH-20/26/28/35/38 pump.



Parts list Hyginox SH-20/26/28/35/38.

Position	Quantity	Description	Material
01	1	Pump housing	AISI 316
02	1	Impeller	AISI 316
03	1	Pump cover	AISI 316
04	1	Lantern	GG - 15
04A	1	Lantern flange	GG - 15
05	1	Shaft	AISI 316
08	1	Mechanical seal –rotating part-	-
08A	1	Mechanical seal –stationary part-	-
15	1	Clamping ring	AISI 304
45	1	Impeller nut	AISI 316
47A	1	Protector	Plastic
50A	2	Screw	A2
51	4	Allen screw	8.8
52	4	Hexagonal screw	8.8
53	8	Flat washer	St
54	4	Nut	8.8
55	1 - 2	Stud	A2
80A	1	O-ring	EPDM
80D	1	O-ring	EPDM
82	1	Splash ring	EPDM
93	1	Motor	-

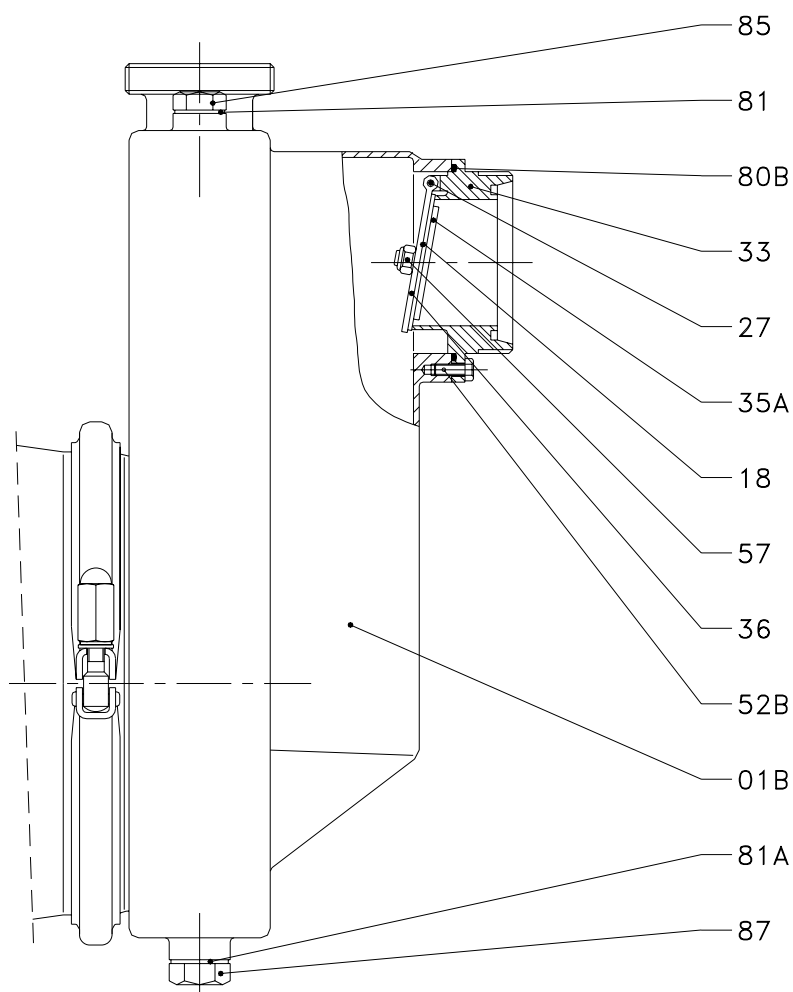
Hyginox SH-38J pump.



Parts list Hyginox SH-38J.

Position	Quantity	Description	Material
01	1	Pump housing	AISI 316
02	1	Impeller	AISI 316
03	1	Pump cover	AISI 316
04	1	Lantern	GG - 15
04A	1	Lantern flange	GG - 15
05	1	Shaft	AISI 316
08	1	Mechanical seal –rotating part-	-
08A	1	Mechanical seal –stationary part-	-
15	1	Clamping ring	AISI 304
23	1	Counter-flange	GG - 15
45	1	Impeller nut	AISI 316
47A	1	Protector	Plastic
50A	2	Screw	A2
51	4	Allen screw	8.8
51A	4	Allen screw	8.8
52	4	Hexagonal screw	8.8
53	8	Flat washer	St
54	4	Nut	8.8
55	1 - 2	Stud	A2
80A	1	O-ring	EPDM
80D	1	O-ring	EPDM
82	1	Splash ring	EPDM
93	1	Motor	-

Self-priming housing.



Position	Quantity	Description	Material
01B	1	Self-priming housing	AISI 316
18	1	Flap valve joint	PTFE
27	1	Pin	AISI 316
33	1	Suction mouth	AISI 316
35A	1	Washer	AISI 316
36	1	Flap valve	AISI 316
52B	4	Hexagonal screw	AISI 304
57	1	Self-locking nut	AISI 316
80B	1	O-ring	EPDM
81	1	Primer cap joint	PTFE
81A	1	Draining cap joint	PTFE
85	1	Priming plug	AISI 316
87	1	Drain plug	AISI 316

10. Cleaning and Disinfection

GENERAL CONSIDERATIONS.

Cleaning and disinfection of the installations is necessary and mandatory on completing any manufacturing process in the food industry. The use of an installation which is NOT cleaned or disinfected can cause contamination of the products.

The cleaning cycles as well as the chemical products and procedures used will vary depending on the product and the manufacturing process.

It is the user's responsibility to establish an appropriate cleaning or disinfection program according to his needs. Such a program needs to take into account all applicable laws, regulations and standards pertinent to public health protection and safety in the use of chemical products.

HYGIENE.

Special attention has been given to hygiene and cleaning and disinfection operations in the design of the Hyginox SH pump. The number of grooves and dead spaces have been kept to a minimum. The materials used in making the pump have been selected for their resistance to corrosion and so as not to contaminate the liquid to be pumped.

Cleaning.

The pump can be cleaned easily and thoroughly in one of two ways:

- without disassembling it, for ex., using steam or water, referred to as CIP ("Cleaning in Place).
- by simply disassembling the pump housing, the impeller and the mechanical seal (see Assembly and Disassembly).

It is important that the pump be running during the CIP process in order to obtain the most thorough cleaning.

During the automated CIP processes the pump could be started up unexpectedly because of some remote signal. This could cause serious damage to anyone who is in contact with the pump.



**NEVER disassembly the pump during the CIP cleaning process.
Disconnect the electrical supply to the pump and take those steps which are needed for safety before beginning any manual cleaning operation on the pump.**

Direct contact with cleaning or disinfecting solutions can provoke burns due to chemical agents or high temperatures.



Provide personnel responsible for cleaning operations with adequate protective equipment --clothing, footwear, safety glasses-- in order to avoid any hazard.

Train personnel in the safe use and handling of chemical solutions and high working temperatures.

Disinfection.

Disinfection cycles are used to kill bacteria on the surfaces in contact with the product before the manufacturing process takes place. Disinfecting solutions are extremely corrosive, especially those which contain halogen components (chloride, bromide, iodine) or strong acids (nitric, hydrochloric).

When metal parts are allowed to remain in contact for a longer period of time with the solutions containing chemical agents, even these attack the stainless steel parts of a pump. To avoid serious damage:

- Do NOT disinfect the pump earlier than 15 minutes before beginning production.
- Do NOT leave disinfecting solutions in prolonged contact with pump surfaces or the outside of it. Drops of dried solution are more concentrated and can provoke corrosion points or pitting.
- Do NOT use strong concentrations, high temperatures or exposure times over and above those required to obtain an effective disinfection.

SAFETY IN CLEANING AND DISINFECTION.



Manual cleaning.

- **Disconnect the motor starting system before cleaning the pump.**
- **Provide cleaning personnel with the most appropriate protective equipment -clothing, footwear, safety glasses.**
- **Do not use toxic or inflammable solvents for cleaning the pump.**
- **Clean up any water spilled around the pump as soon as possible.**
- **With the pump running, NEVER clean it by hand.**



CIP Procedure.

- **Make sure that all cleaning circuit connections are securely tightened so as to avoid splashing of hot water or cleaning solutions.**
- **Establish a safety device in the event of any failure in the automatic process and avoid automatic start-up.**
- **Check to see that the housing and the clamp are well-positioned and securely tightened.**
- **Do not disassemble any pipes, fittings or the pump without being sure that the cleaning cycle is completely finished.**

For reference purposes for the user, the cleaning methods and products used can be those mentioned in the DIN 11483 standard