



INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

MS-0 and MS-1 MULTISTAGE



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MANUFACTURER DECLARATION
According the EC directive about machines
98/37/CE, Annex II B

The manufacturer:

INOXPA, S. A.

c/ Telers, 54

17820 Banyoles (Girona) - Spain

Hereby declares, that the pumps

_____	_____	_____
Denomination	Type	Manufacturing year

Comply with the pertinent disposition, in the execution supplied by **INOXPA, S.A.** for the incorporation in a machine or installation, or for the assembly with other machines as a subunit of other higher order machine.

Harmonized norms used, particularly:

EN 292 part 1 and 2, EN 809

The machine above must not be put into service until the machinery into which it has been incorporated have been declared in conformity with the EC Machinery Directive. It must meet, particularly, the standards EN 294, EN 563, EN 809 y EN 953 in its respective current editions.

Year of CE marking: CE 95
Banyoles, January 1995



Marc Pons Bague Technical Manager

EC DECLARATION OF CONFORMITY
According the EC directive about machines
98/37/CE, Annex II A

The manufacturer:

INOXPA, S. A.

c/ Telers, 54

17820 Banyoles (Girona) - Spain

Hereby declares, that the pump

_____	_____	_____
Denomination	Type	Manufacturing year

Are in conformity with the essential requirements of the Machinery Directive 98/37/CE (latest modifications included) and according the following Council Directives and harmonized norms:

- 72/23/CE Directive "low voltage"
- Norms EN 292 part 1 and 2, EN 809

Year of CE marking: CE 95
Banyoles, January 1995



Marc Pons Bague Technical Manager

1. Safety

1.1. INSTRUCTIONS MANUAL

This manual contains information about the reception, installation, operation, assembly, disassembly and maintenance of the MS-0 / MS-1 MULTISTAGE pumps.

The information provided in this Instructions Manual is based on updated facts. INOXPA reserves the right to modify this Instructions Manual without prior notice.

1.2. START-UP INSTRUCTIONS

This Instructions Manual contains vital and useful information for properly operating and maintaining your pump.

Read carefully these instructions before starting up the pump; become familiar with the operation and use of your pump and follow the instructions closely. It is very important that a copy of these Instructions is kept in a set place near the plant.

1.3. SAFETY

1.3.1. Warning signs



General danger of injury



Danger of injuries caused by the rotary parts of the equipment



Electrical hazard



Danger! Caustics or etching materials



Danger! Suspended load



Danger of equipment malfunction



Compulsory requirement to ensure safety at work



Use of goggles is compulsory

1.4. GENERAL SAFETY INSTRUCTIONS



Read carefully this Instructions Manual before installing the pump and starting it up. If in doubt, contact INOXPA.

1.4.1. During installation



Always observe the **Technical Specification** given in Chapter 8.

Never start up the pump before it has been connected to the piping.

Do not start up the pump if the pump cover is not in place.

Check that the motor specifications are the required ones, especially when working under conditions that involve the risk of explosion.



During the installation of the pump, all the electrical work must be carried out by an authorized operative.

1.4.2. During operation



Always observe the **Technical Specification** given in Chapter 8. NEVER exceed the limit of the specified values.

NEVER touch the pump or the pipes during operation when the pump is being used to decant hot fluids or when it is being cleaned.



The pump contains moving parts. Never introduce your fingers into the pump while the pump is in operation.



NEVER operate the pump with the inlet and discharge valves closed.

NEVER clean the electrical motor with water. The standard protection of the motor is IP-55: Protection against dust and spraying water.

1.4.3. During maintenance



Always observe the [Technical Specification](#) given in Chapter 8.

NEVER disassemble the pump before the pipes have been emptied. Remember that some of the fluid will always remain in the pump casing (when no drainage is provided). Note that the pumped fluid may be dangerous or very hot. Please refer to the regulations applicable in the respective country.

Do not leave detached parts on the floor.



ALWAYS disconnect the pump from the power before beginning the maintenance. Remove the fuses and disconnect the cables from the motor terminals.

All the electrical work must be carried out by an authorized operative.

1.4.4. Compliance with the instructions

Any failure to comply with the instructions might entail risks to the operators, the environment and the equipment, and result in the loss of the right to claim for damages.

Such non-compliance might entail the following risks:

- Failure of important functions of the equipment / plant.
- Failure of specific maintenance and repair procedures.
- Threat of electrical, mechanical and chemical risks.
- Environmental risks caused by the release of substances.

1.4.5. Warranty

Any warranty provided shall immediately and *ipso jure* become void, and INOXPA shall be indemnified against any product liability claim from third parties, if:

- the service and maintenance work was not carried out in accordance to the service instructions, or the repair work has not been carried out by our personnel or it has been carried without our written authorization;
- our materials have been changed without prior written authorization;
- the parts or lubricants used are not original INOXPA parts and products;
- the materials were used improperly or carelessly, or not in accordance to these instructions and their intended use;
- pump parts were damaged by strong pressure for lack of a safety valve.

The General Delivery Terms already furnished to you also apply.



No change can be made to the equipment without prior discussion with the manufacturer. For your safety, please use original spare parts and accessories. The use of other parts will release the manufacturer from any liability.

The service terms can only be changed with prior written authorisation from INOXPA.

When in doubt, or if you would like more detailed information on specific matters (adjustment, assembly, disassembly), please do not hesitate to contact us.

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3. General information

3.1. DESCRIPTION

INOXPA's MS-01 and MS-1 multistage pumps are manufactured in stamped AISI 316L stainless steel sheet. The MS-0 and MS-1 multistage pumps are compact, closed-coupled pumps with axial suction and radial discharge and they use health-safe connections and DIN 11851 adapters. The impellers are of closed and stamped construction. The mechanical seal is interior and its working surfaces are made of silicon carbide, silicon carbide with EPDM gaskets in the standard version. The motor conforms to IEC standards. IP-55 protection. Class-F isolation. Three-phase power 220-240 / 380-420 V @ 50 Hz. On demand, motors suitable for operating in explosive environments can be provided. Depending on the environmental conditions, the motors can be flameproof (EExd) or enhanced-safety (EExe) motors. The design of the multistage MS-0 and MS-1 pumps makes them suitable for handling low-viscosity fluids, preferably without solid particles.

3.2. OPERATING PRINCIPLE

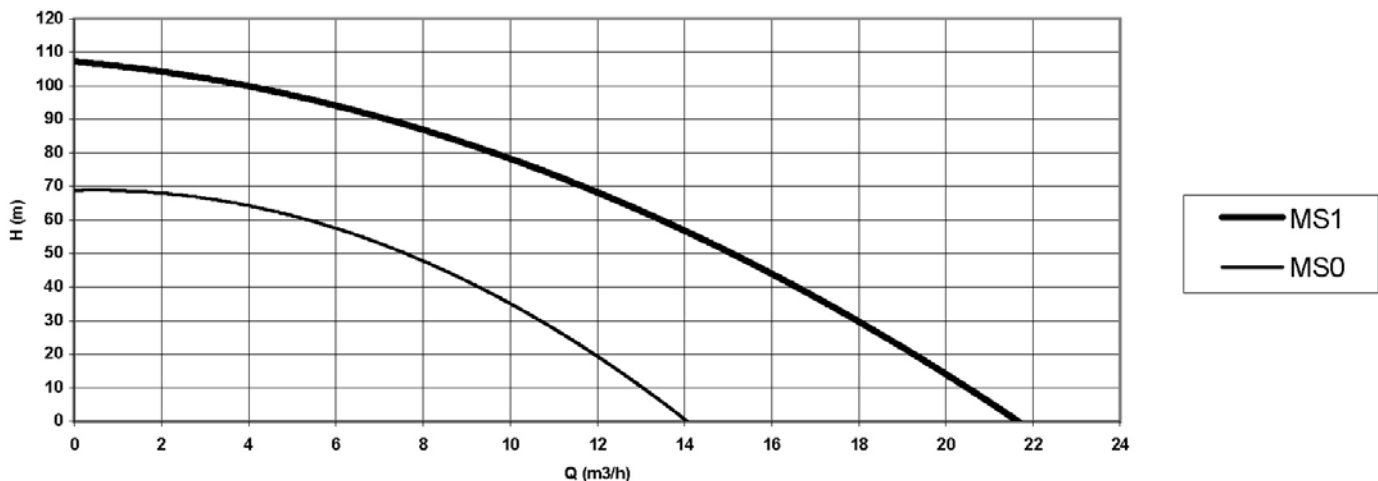
The impellers, each of them housed inside its respective venturi casing, rotate in conjunction with the multistage shaft. The coaxial venturi transfers the fluid flowing out from each impeller to the suction opening of the following stage. Each impeller and its respective venturi casing comprise a pumping stage. These stages follow the operation principle of centrifugal pumps. Each stage increases the pressure of the fluid, and the successive increases are cumulative.

3.3. USE

As a general rule, standard multistage pumps are mainly used in the food-processing industry for the transfer of fluids, filters systems, filling heat-exchanging.

Because of their design, multistage pumps are especially suitable for plants requiring high pressure at low flow, achieving efficiency higher than single stage centrifugal pump.

3.3.1. Range of applications



The range of application for each type of pump is limited. The pump was selected for a given set of pumping conditions when the order was placed. INOXPA shall not be liable for any damage resulting from the incompleteness of the information provided by the purchaser (nature of the fluid, RPM, etc.).

4. Installation

4.1. RECEPTION OF THE PUMP

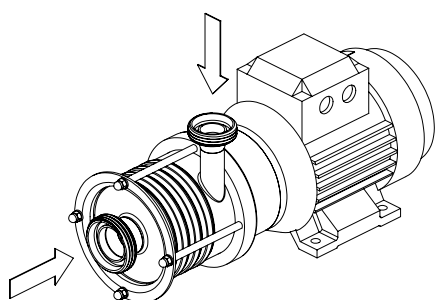


INOXPA cannot be held responsible for the damage sustained by the equipment during transport or unpacking. Please visually check that the packaging is not damaged.

The pump package includes the following documents:


- Dispatch sheets.
- Instruction and Service Manual of the pump.
- Instruction and Service Manual of the motor (*)
(*) when the pump is supplied with an motor by INOXPA.

Unpack the pump and check the following:



- The suction and discharge connections of the pump, removing any rest of packaging materials.
- The pump and the motor are not damaged.
- If the equipment is not in good condition and/or any part is missing, the carrier should report accordingly as soon as possible.

4.1.1. Identification of the pump

		INOXPA S.A. C. Telers, 54 · P.O. BOX 174 17820 BANYOLES · GIRONA (SPAIN) Tel. 972 57 52 00 · Fax 972 57 55 02	CE
TIPO <input type="text"/>	AÑO <input type="text"/>	← Serial number	
N° <input type="text"/>	KW <input type="text"/>	min ⁻¹ <input type="text"/>	V <input type="text"/>
QM ³ /h <input type="text"/>	Hm <input type="text"/>	Hz <input type="text"/>	øRODETE <input type="text"/>

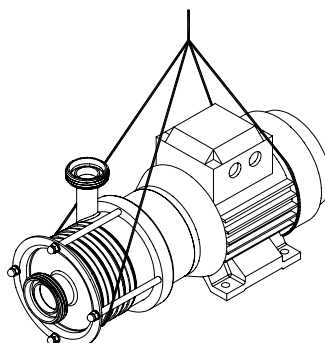
Pump plate

4.2. HANDLING AND STORAGE



Multistage pumps are often too heavy to be handled and stored manually.

Lift the pump as shown below:



4.3. LOCATION

Place the pump as close as possible to the suction tank, and if possible below the fluid level.

Place the pump so as to allow around it space enough to access the pump and the motor. (See Chapter 8 [Technical Specification](#) for dimensions and weight).

Mount the pump on a flat, level surface.

The foundation must be rigid, horizontal, level and vibration-proof.



Install the pump so as to allow proper ventilation.

If the pump is installed outdoors, it should be covered by a roof. Its location should allow easy access for inspection or maintenance operations.

4.4. PIPES

- As general rule, fit the suction and discharge pipes in straight sections, with the least possible number of bends and accessories in order to reduce as much as possible any loss of load caused by friction.
- Ensure that the nozzles of the pump are properly aligned to the pipe and their diameter is similar to that of the pump connections.
- Place the pump as close as possible to the suction tank, if possible below the fluid level, or even below the tank, so that the manometric head of the static suction is highest.
- Place pipe supports as close as possible to the suction and discharge nozzles of the pump.

4.4.1. Cut-off valves

The pump can be isolated for maintenance purposes. To such end, cut-off valves must be fitted to the suction and discharge nozzles of the pump.

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

4.5. ELECTRIC WIRING



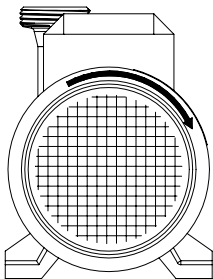
The connection of the electrical motors must be performed by a qualified operative. Take all necessary precautions to prevent the failure of connections and cables.



The electrical equipment, the terminals and the components of the control systems may still bear electrical current when powered off. Contact with them may be dangerous for operators or cause irreversible damage to equipment.

Before handling the pump, make sure that the switchboard is not powered on.

- Connect the motor following the manufacturer's instructions.
- Check the direction of rotation (see the label on the pump).



Start the pump motor briefly. Ensure the pumping direction is the right one. If the pump operates in the wrong direction it may cause severe damage.



ALWAYS check the direction of rotation of motor with fluid inside de pump.

For models with a seal chamber, ALWAYS ensure that the chamber is full of fluid before checking the direction of rotation.

5. Start-up



Before starting the pump, carefully read the instructions given in Chapter 4. Installation.

5.1. START-UP



Read Chapter 8 [Technical Specification](#) carefully. INOXPA cannot be held responsible for the improper use of the equipment.



NEVER touch the pump or the pipes when hot fluid is being pumped.

5.1.1. Checks before starting up the pump

- Fully open the cut-off valves on the suction and discharge pipes.
- If the fluid does not flow into the pump, fill the pump with fluid.



The pump must **NEVER** rotate without fluid inside it.

- Check that the direction of rotation of motor is the right one.

5.1.2. Checks when starting up the pump

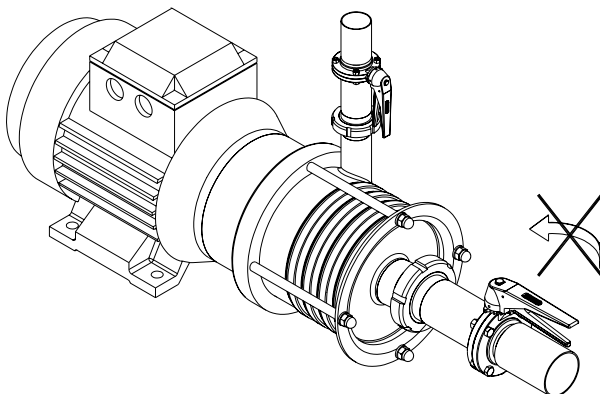
- Check whether the pump makes strange sounds.
- Check whether the absolute inlet pressure is enough to avoid cavitation in the pump. See the curve to determine the minimum pressure required above steam pressure (NPSHr).
- Control discharge pressure.
- Check that there are no leaks through the sealed areas.



A cut-off valve on the suction pipe must no be used to regulate flow. Cut-off valves must be fully open during operation.



Control motor consumption to avoid power overload.



To reduce flow and motor consumption:

- Regulate flow on the discharge area of the pump.
- Reduce motor speed.

6. Operating problems

The following table provides solutions to problems that might arise during the operation of the pump. The pump is assumed to have been properly installed and be suitable for the relevant application. Please contact INOXPA if technical assistance is required.

Operating problems	Probable causes
Motor overload	8, 9, 13.
The pump does not provide enough flow or pressure	1, 2, 4, 5, 7, 9, 10, 17,19.
No pressure on the discharge side	2, 3, 6, 18,19.
Uneven discharge flow / pressure	1, 2, 4, 5, 6, 9.
Noise and vibration	2, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 20, 21.
The pump gets clogged	9, 10, 13, 14, 15, 20, 21.
Overheated pump	8, 9, 10, 13, 14, 20, 21.
Excessive wear	4, 5, 10, 14, 15, 20, 21.
The mechanical seal leaks	11, 12, 16.

Probable causes	Solutions
1 Wrong direction of rotation	Reverse the direction of rotation
2 NPSH is not high enough	Increase the available NPSH: - Place the suction tank higher - Place the pump lower - Reduce steam pressure - Increase the diameter of the suction pipe - Shorten and simplify the suction pipe
3 Pump not drained	Drain or fill
4 Cavitation	Increase suction pressure (see also 2)
5 Air is suctioned by the pump.	Check the suction pipe and all its connections
6 Clogged suction pipe	Check the suction pipe and all its filters, if any
7 Discharge pressure too high	If necessary, reduce load losses, e.g. by increasing the diameter of the pipe
8 Flow too high	Reduce speed
9 Fluid viscosity too high	Reduce the viscosity, e.g. by heating the fluid
10 Fluid temperature too high	Reduce the temperature by cooling the fluid
11 Mechanical seal damaged or worn out	Replace the seal
12 O-rings unsuitable for the fluid	Fit suitable O-rings. Consult the manufacturer.
13 Excessive impeller expansion	- Reduce temperature - Change the impeller
14 Stressed pipes	Connect the pipes to the pump so as to avoid stress
15 Foreign matter in the fluid	Fit a filter to the suction pipe
16 The mechanical seal tension is too low	Adjust according the instructions of this Manual
17 Pump speed too low	Increase speed
18 The cut-off valve on the suction side is closed	Check and open
19 Pump too small	Choose a larger pump size
20 Bearings are worn out	Replace bearings; review the pump
21 Pump and/or motor not attached to the bedplate.	Attach the pump and/or motor and check whether the pipes are connected without stress



If the problem persists, use of the pump must cease immediately. Contact the pump's manufacturers or their representative.

7. Maintenance

7.1. GENERAL

Like any other machine, this pump requires maintenance. The instructions included in this manual cover the identification and replacement of spare parts. These instructions are intended for the maintenance personnel and those responsible for the supply of spare parts.



Please carefully read Chapter 8 **Technical Specification**.

All replaced materials must be disposed of /recycled in accordance to the applicable local regulations.



ALWAYS disconnect the pump from the power before performing the maintenance.

7.1.1. Check the mechanical seal

Regularly check that there are no leaks in the shaft area. If there are leaks through the mechanical seal, replace it following the instructions given under the Disassembly and Assembly section.

7.2. STORAGE

The pump must be completely emptied of fluid before storage. If possible, avoid exposing the components of the pump to excessively humid environments.

7.3. CLEANING



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

Use rubber gloves during cleaning procedures.



Always use protective goggles.

If the pump is installed in a system with a CIP process, it is not necessary to disassemble the pump.

If the automatic cleaning process is not provided, proceed to disassemble the pump as indicated in the Disassembly and Assembly section.

Cleaning solutions for CIP processes

Use only clear water (without chlorides) for mixing with the cleaning agents:

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

1 Kg NaOH + 100 l. water = cleaning solution

or

2.2 l. NaOH at 33% + 100 l. water = cleaning solution

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

0.7 liters HNO₃ at 53% + 100 l. water = cleaning solution



Control the concentration of the cleaning solutions to avoid deterioration of the pump seals.

To remove the remaining cleaning products, ALWAYS perform a final rinse with clean water on completion of the cleaning process.

7.4. DISASSEMBLY / ASSEMBLY OF THE PUMP

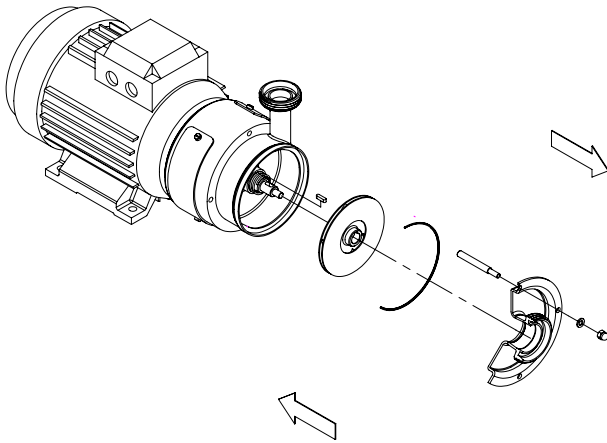
7.4.1. Cover, impellers and casings (MS-0)

⇒ Disassembly MS-0

Loosen and remove the blind nuts (54), nuts (54A) and washers (53), thus the cover (03) can be removed.
Pull out the gasket (80).
Remove the tie bars (29) of the lantern (04).
Remove the blind nut (45).
Pull out all the impellers (02, 02A, and 02B), casings (01), gaskets (80) and rings (30).
Remove the key (61) from the shaft (05).

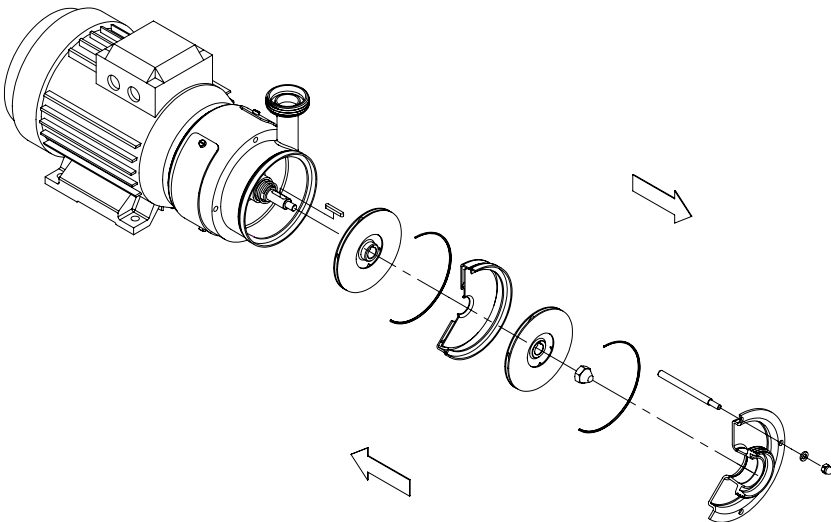
⇐ Assembly MS-0/1

Insert the key (61) into the shaft (05).
Slide the impeller (02A) over the shaft (05) to the stop.
Fasten the blind nut (45).
Place the gasket (80) on the casing (01).
Mount the appropriate tie bars (29) to the lantern (04).
Mount the cover (03) to the casing (01).
Mount the washers (53) and blind nuts (54) to the tie bars (29), making sure that the assembly dimension matches the table below. See detail.



⇐ Assembly MS-0/2

Insert the key (61) into the shaft (05).
Slide the impeller (02A) over the shaft (05) to the stop.
Place gasket (80) into the impeller casing (01A) and mount the casing (01) to the impeller casing (01A).
Mount the suction impeller (02B).
Fasten the blind nut (45).
Place the gasket (80) on the casing (01).
Mount the appropriate tie bars (29) to the lantern (04).
Mount the cover (03) to the casing (01).
Mount the washers (53) and blind nuts (54) to the tie bars (29).



← **Assembly MS-0/3, MS-0/4, MS-0/5, MS-0/6**

Insert the key (61) into the shaft (05).

Slide the impeller (02A) over the shaft (05) to the stop.

Place the gasket (80) into the impeller casing (01A) and mount the casing (01) to the impeller casing (01A).

Mount the successive pumping stages following this procedure:

Mount the impeller (02)

Place the ring (30) and the gasket (80) on the impeller casing (01A).

Mount the casing (01) to the casing (01) of the preceding stage.

Mount the suction impeller (02B).

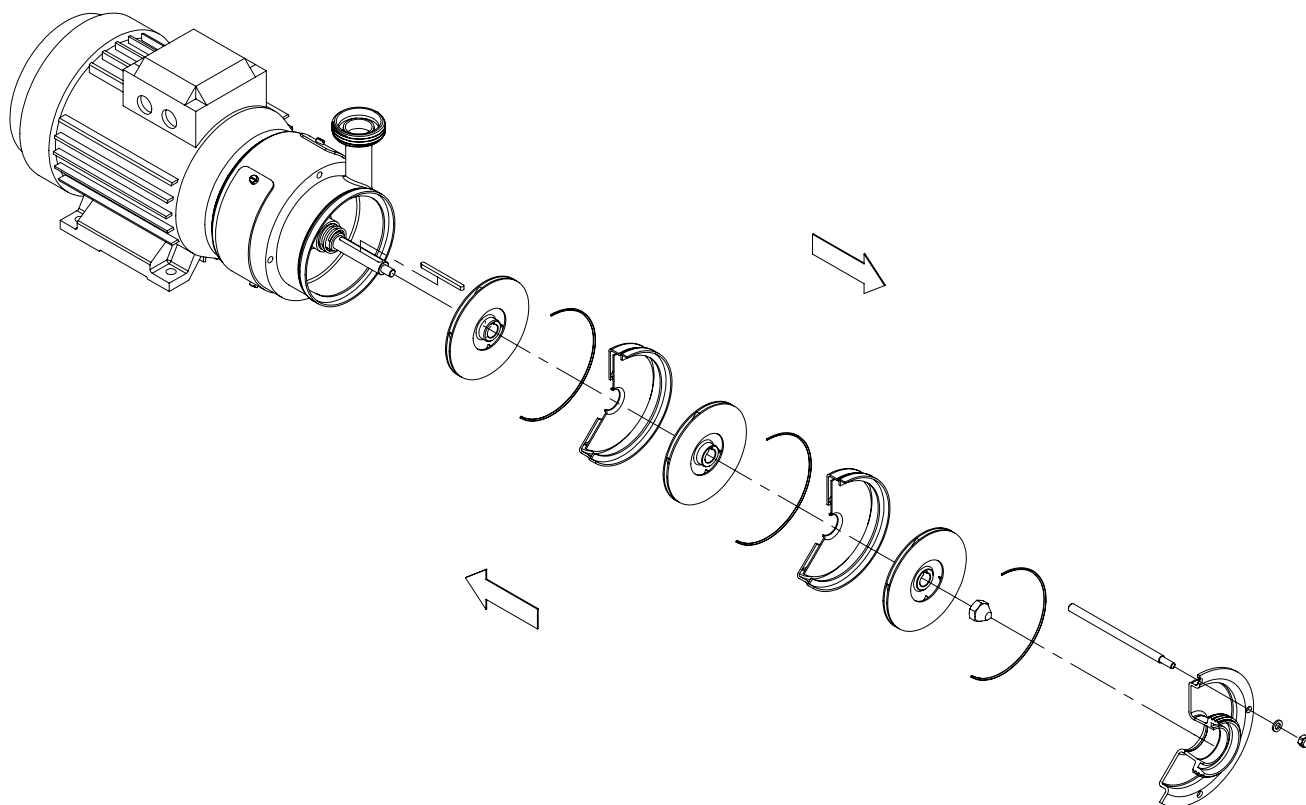
Fasten the blind nut (45).

Place the gasket (80) on the casing (01).

Mount the appropriate tie bars (29) to the lantern (04).

Mount the cover (03) to the casing (01).

Mount the washers (53) and blind nuts (54) to the tie bars (29), making sure that the assembly dimension matches the table below. See detail.



7.4.2. Cover, impellers and casings MS-1

⇒ Disassembly

Loosen and remove the blind nuts (54), nuts (54A), thus the washers (53), the pump cover ring (30A) and the cover (03) can be removed.

Pull out the gasket (80).

Remove the tie bars (29) of the lantern (04).

Remove the blind nut (45).

Pull out all the impellers (02, 02A), casings (01) and gaskets (80).

Remove the key (61) from the shaft (05).

⇐ Assembly

Insert the key (61) into the shaft (05).

Slide the impeller (02A) over the shaft (05) to the stop.

Place the gasket (80) on the impeller casing (01A).

Mount the successive pumping stages following this procedure:

Mount the casing (01) to the impeller casing (01A) or to the casing (01).

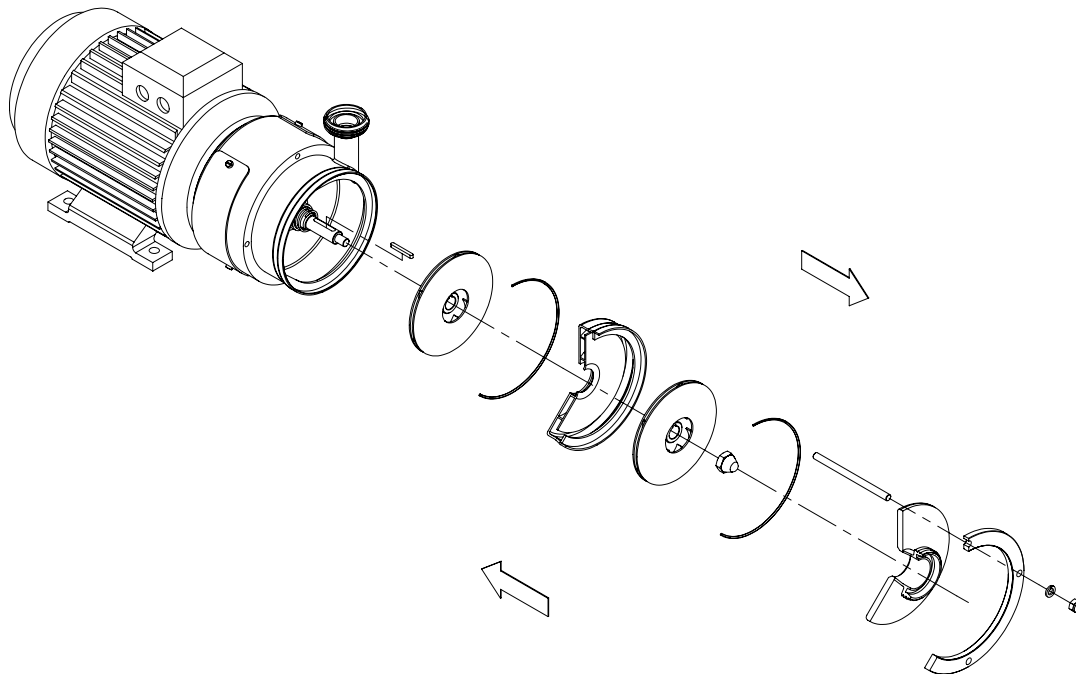
Place the ring (30) and the gasket (80) on the casing.

Fasten the blind nut (45).

Mount the tie bars (29) to the lantern (04).

Mount the cover (03) and the pump cover ring (30A) to the casing (01).

Mount the washers (53), nuts (54A) and blind nuts (54) to the tie bars (29), making sure that the assembly dimension matches the table below. See detail.



7.4.3. Mechanical seal

Previously, disassemble the pump as shown in.

⇒ Disassembly

Remove the rotary part of the seal (08).

Remove the impeller casing (01A); the stationary part of the seal will come out along with it.

Remove the stationary part of the seal from the inside of the impeller casing.

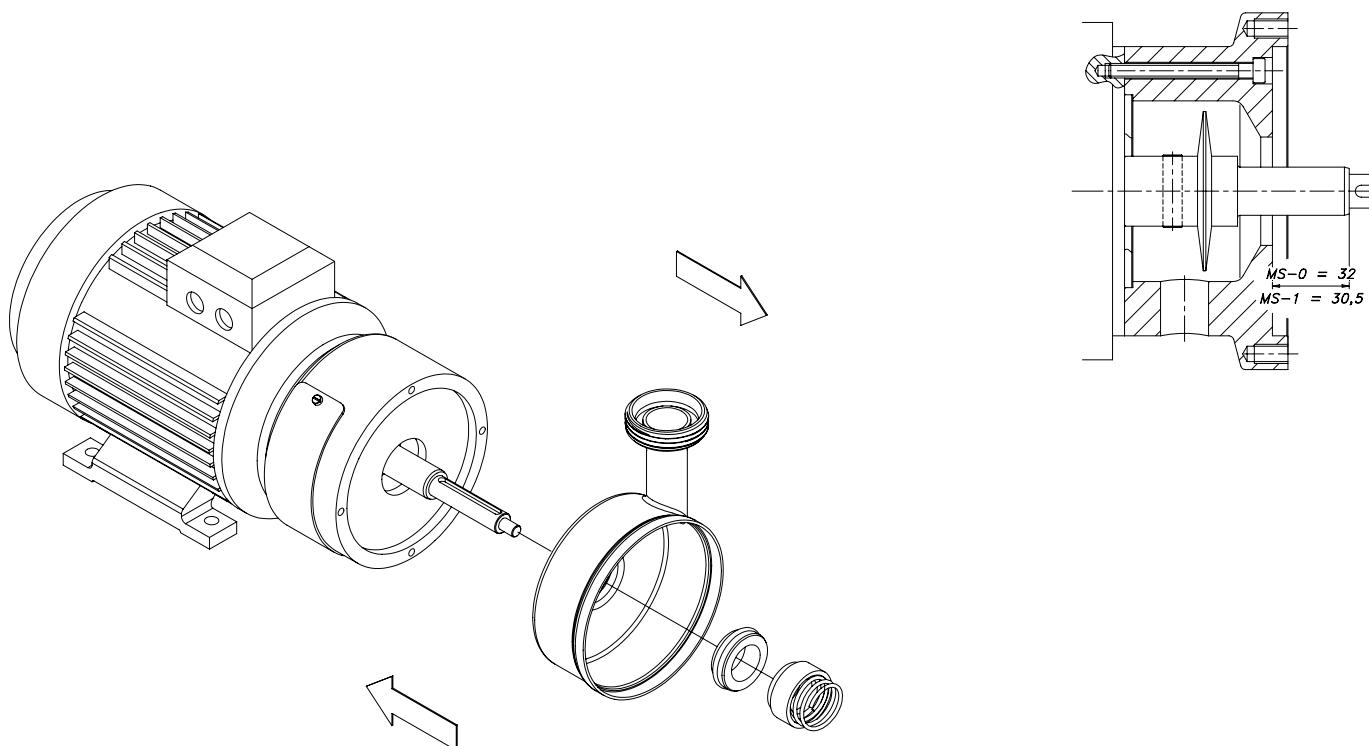
⇐ Assembly

Before performing the assembly, check that the assembly dimension of the shaft (05) in respect to the lantern (04) is the right one (see detail).

Slide the impeller casing (01A) over the shaft until it makes contact with the lantern. Try to achieve the right alignment of the discharge hole.

Slide the stationary part of the seal (08) over the shaft until it makes contact with the impeller casing.

Slide the rotary part of the seal (08) over the shaft until it makes contact with the stationary part of the seal.



CAUTION! When mounting the new seal, plunge the parts and seals in soapy water to facilitate sliding of both the stationary and the rotary parts.

7.4.4. Change of drive

Previously, disassemble the pump as shown in.

⇒ Disassembly

Remove the protections (47) by loosening the screws (50A), for models with motor size 90, 100, and 112.

Loosen and remove the screws that attach the lantern (04) to the motor (93). Hexagonal screws (52) for motor sizes 71 and 80, and Allen screws (51) for motor sizes 90, 100 and 112. Thus, the lantern (04) can be removed.

Remove the splash ring (82) from the shaft (05).

Remove the elastic pin (56) that makes the motor shaft and the pump shaft (05) rotate in conjunction.

Pull out the pump shaft (05) from the motor shaft.

⇐ Assembly

Drill a hole in the drive shaft according to the dimension shown in the figure below

Mount the pump shaft (05) to the shaft of the motor (93).

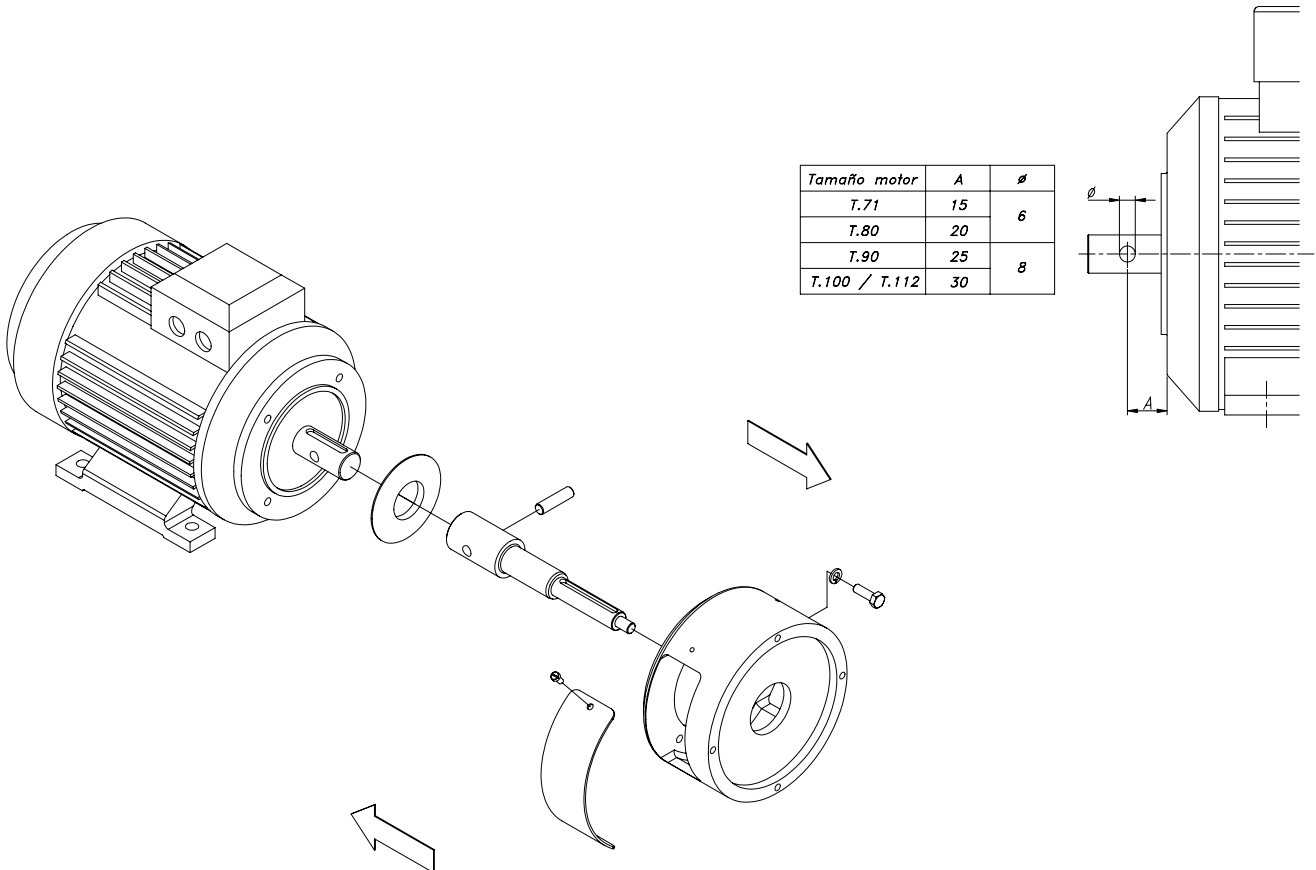
Insert the elastic pin (56) into the shaft, thus attaching the motor shaft to the pump shaft.

Slide the splash ring (82) over the shaft (05) into position.

Place the lantern (04) in position and attach it to the motor (93) using the screws. Hexagonal screws (52) for models with motor sizes 71 and 80, and Allen screws (51) for models with motor sizes 90, 100 and 112.

Check the assembly dimension of the shaft. See the parts list detail.

Fit the protections (47) to the lantern using the screws (50A), for models with motor size 90, 100, and 112.



CAUTION! When mounting the new seal, plunge the parts and seals in soapy water to facilitate sliding of both the stationary and the rotary parts.

8. Technical specifications

8.1. TECHNICAL SPECIFICATIONS

Maximum flow (2900 min ⁻¹)	21 m ³ /h (92 GPM)
Maximum differential pressure	15 bar (218 PSI)
Maximum suction pressure	4 bar (58 PSI)
Maximum operating pressure	15 bar (218 PSI)
Maximum temperature	+95°C (+203 °F)
Sound level	60-80 dB(A)
Suction / discharge connections	DIN 11851 (standard)



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

Materials

Impeller	AISI 316L
Parts in contact with pumped material	AISI 316L
Gaskets in contact with pumped material	EPDM (standard) Quality FDA 177.2600
Other materials for optional gaskets	Check with the supplier
Surface finishing	Electropolished

Mechanical seal

Type of seal	Inside single seal
Stationary parts material	Silicon carbide (standard) or graphite
Rotary parts material	Silicon carbide (standard)
Seals material	EPDM (standard), Viton [®] or NBR.

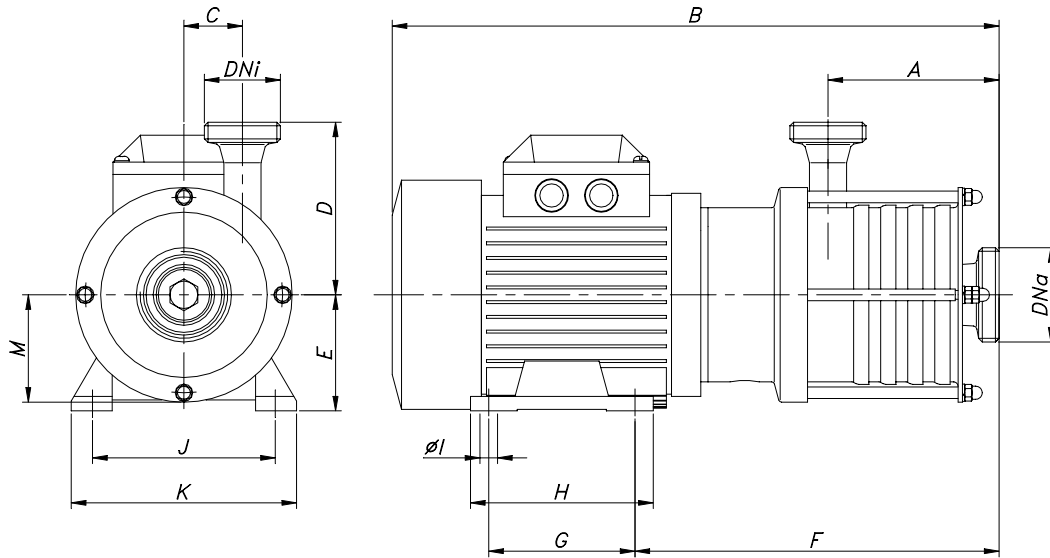
Motor

Standard IEC B34 motor (legs and small flange)	
2 poles (2900min ⁻¹ at 50 Hz)	
Protection	IP55
Power	3~, 50Hz, 220-240VΔ/380-420VY

8.2. WEIGHTS

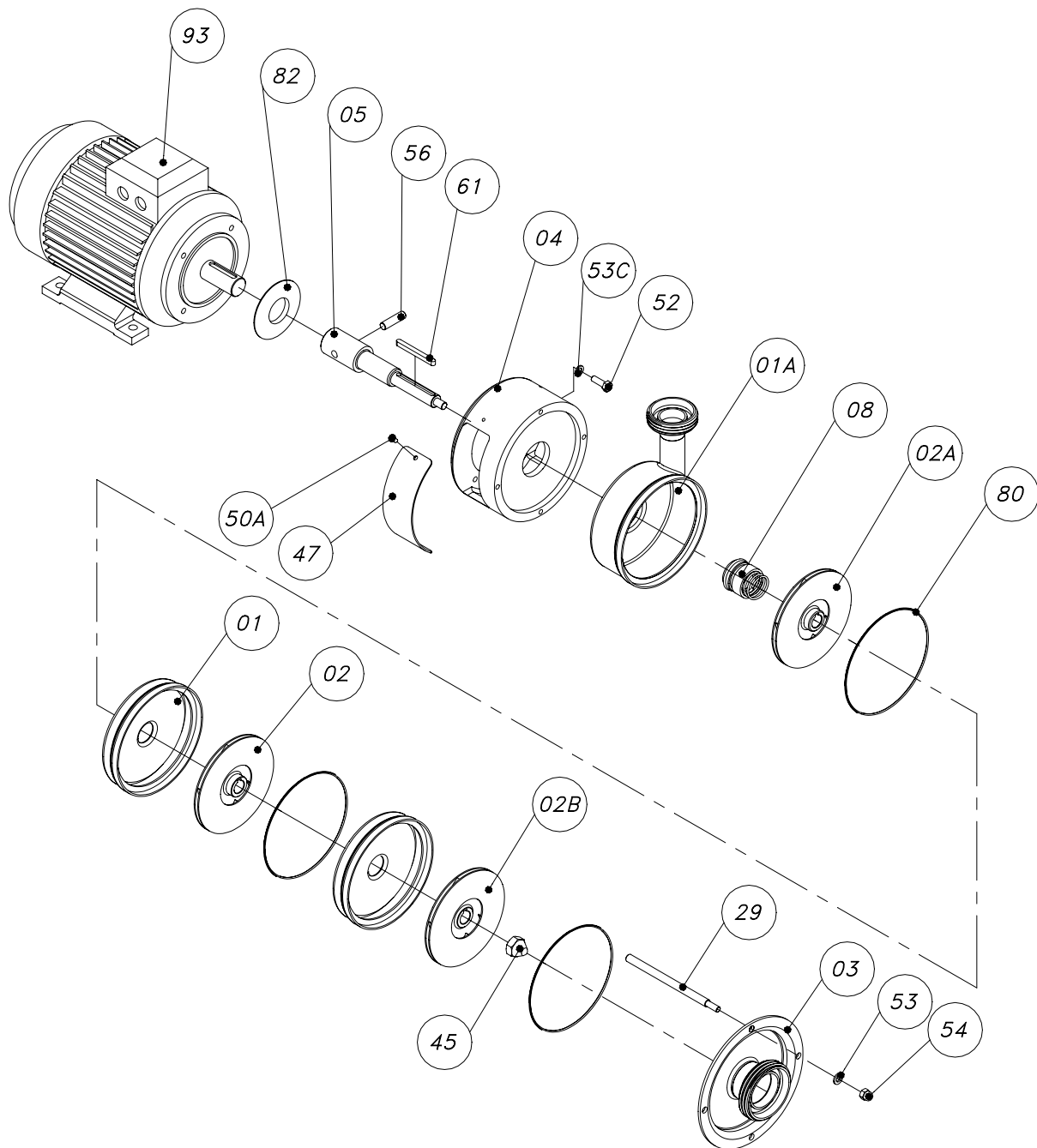
Pump type	Motor		Weight [Kg]	Weight [lbs]
	Size	KW.		
MS-0/1	71	0.37	8	17.5
		0.55	9	20
MS-0/2	80	0.75	9.5	21
			12	26.5
MS-0/3	80	1.1	13	29
			15.5	34
MS-0/4	90	1.5	16	35
			20.5	45
MS-0/5	90	2.2	21	46
			23	51
MS-0/6	90	2.2	24	53
MS-1/2			1.5	26.5
MS-1/3	90	2.2	30	66
MS-1/4			3	38
MS-1/5	112	4	40	88
MS-1/6			41.5	91

8.3. MULTISTAGE MS-0 AND MS-1 DIMENSIONS

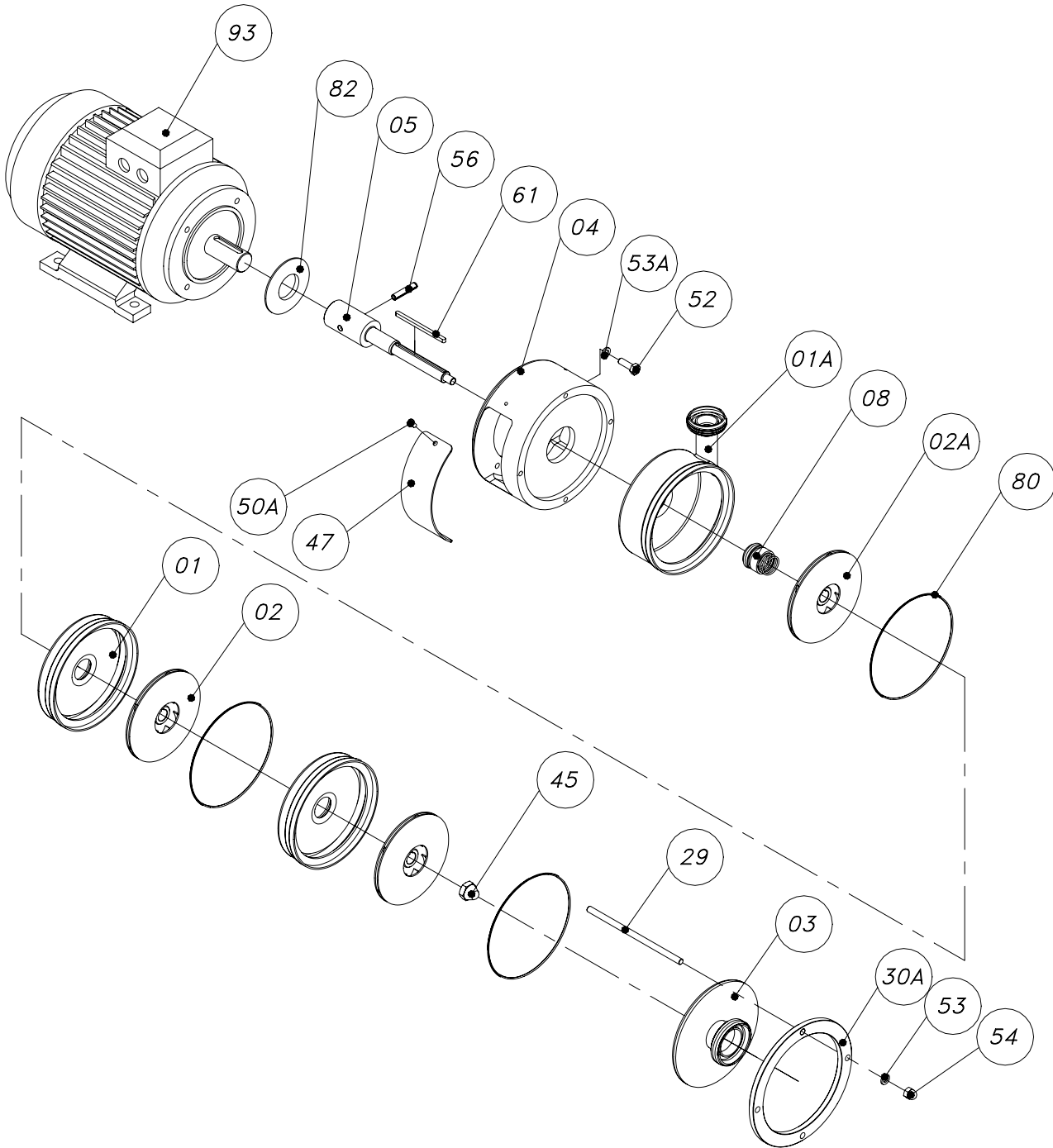


Pump type	Motor		DNa	DNi	A	B	C	D	E	F	G	H	φI	J	K	L
	Size	KW.														
MS-0/1	71	0.37	40 1 1/2"	25 1"	62	327	40	120	71	164	90	110	7	112	136	74
MS-0/2		0.55								182						
MS-0/3	80	0.75			212											
MS-0/4		1.1			231	100			125	10	125	154				
MS-0/5	90	1.5			249								150	140	170	
MS-0/6		2.2			265	125			170							
MS-1/2	90	1.5	40 1 1/2"	25 1"	91		438	58		122	90	252	100	150	10	140
MS-1/3		2.2			117	488	278		125							
MS-1/4	100	3			143	552	100		320		140	172	12	160	197	
MS-1/5	112	4			169	608										112
MS-1/6					195	634	380									

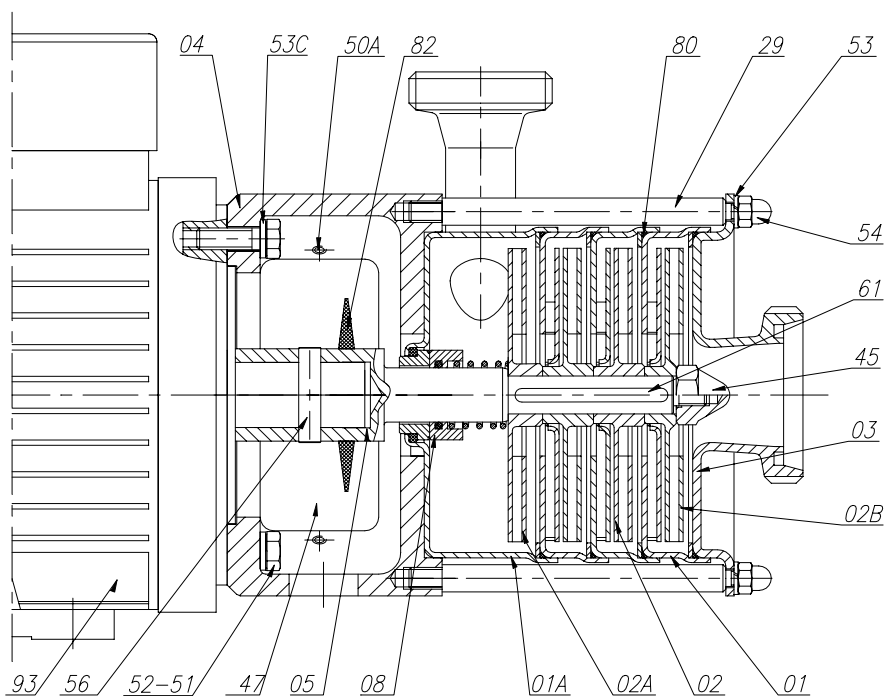
8.4. MULTISTAGE MS-0



8.5. MULTISTAGE MS-1



8.6. MULTISTAGE MS-0



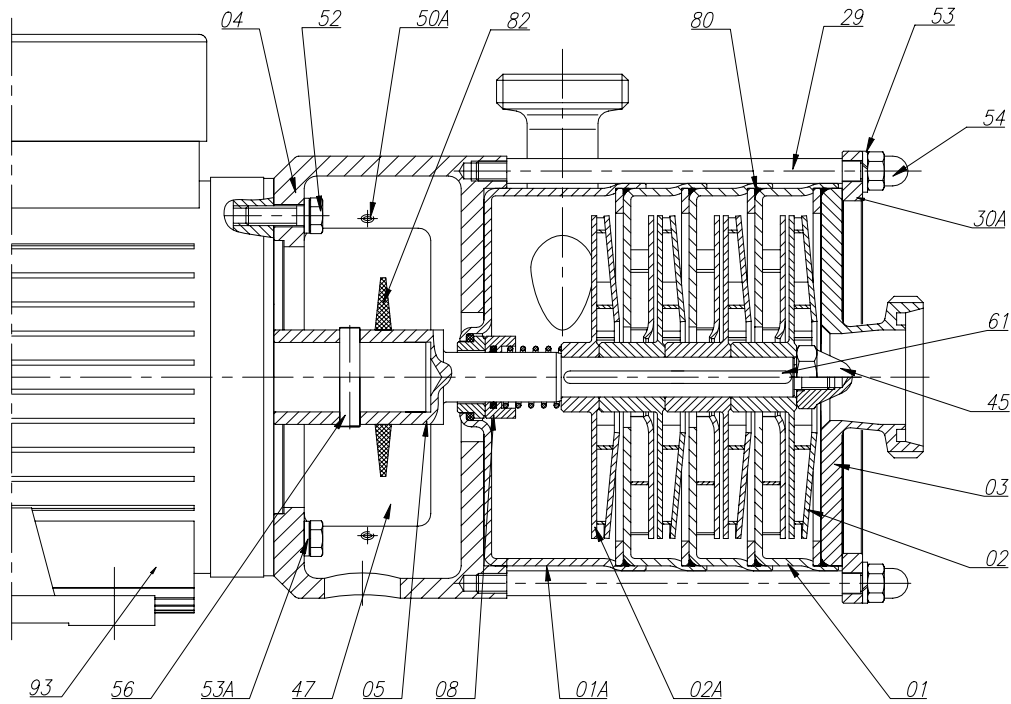
8.7. PARTS LIST MULTISTAGE MS-0

Quantity per pump type

Position	Description	MS-0/1	MS-0/2	MS-0/3	MS-0/4 t. 80	MS-0/4 t. 90	MS-0/5	MS-0/6	Material
01	Pump casing	0	1	2	3	3	4	5	AISI 316L
01A	Impeller casing	1	1	1	1	1	1	1	AISI 316L
02	Impeller	0	0	1	2	2	3	4	AISI 316L
02A	Discharge impeller	1	1	1	1	1	1	1	AISI 316L
02B	Suction impeller	0	1	1	1	1	1	1	AISI 316L
03	Pump cover	1	1	1	1	1	1	1	AISI 316L
04	Lantern	1	1	1	1	1	1	1	GG-22
05	Shaft	1	1	1	1	1	1	1	AISI 316L
08 *	Mechanical seal	1	1	1	1	1	1	1	SiC/SiC/EPDM
29	Tie bar	4	4	4	4	4	4	4	AISI 316
45	Blind nut	1	1	1	1	1	1	1	AISI 316L
47	Protection	0	0	0	0	2	2	2	Plastic
50A	Screw	0	0	0	0	4	4	4	A2
51	Allen screw	4	4	4	4	0	0	0	8.8
52	Hexagonal screw	0	0	0	0	4	4	4	8.8
53	Spring washer	4	4	4	4	4	4	4	A2
53C	Spring washer	0	0	0	0	4	4	4	8.8
54	Blind nut	4	4	4	4	4	4	4	A2
56	Elastic pin	1	1	1	1	1	1	1	A2
61	Key	1	1	1	1	1	1	1	A2
80 *	O-ring	1	2	3	4	4	5	6	EPDM
82	Splash ring	1	1	1	1	1	1	1	EPDM
93	Motor	1	1	1	1	1	1	1	-

(*) Recommended spare parts

8.8. MULTISTAGE MS-1



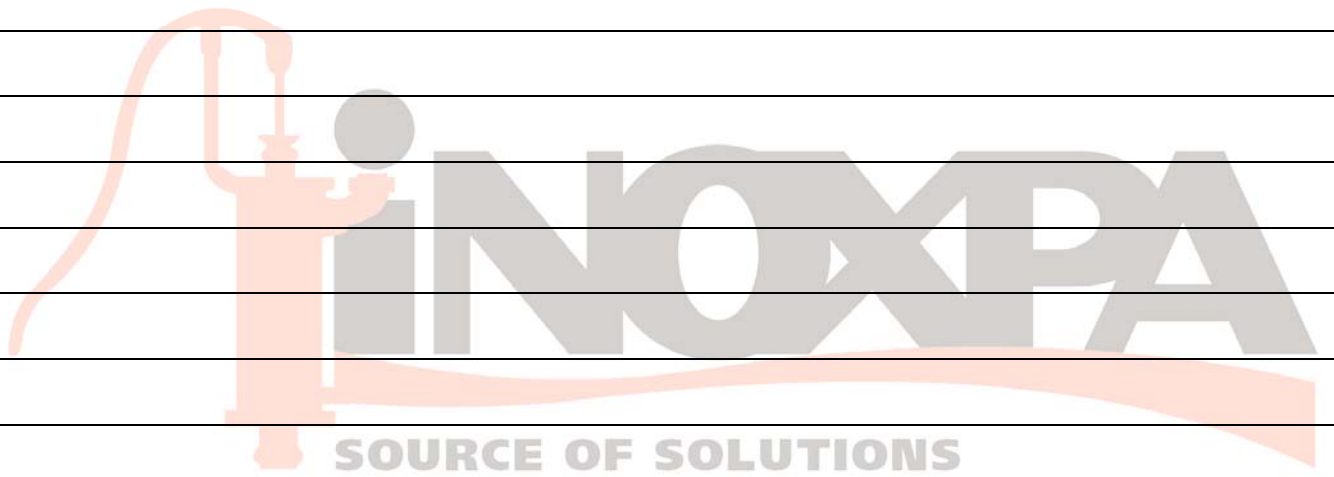
8.9. PARTS LIST MULTISTAGE MS-1

Quantity per pump type

Position	Description	MS-1/2	MS-1/3	MS-1/4	MS-1/5	MS-1/6	Material
01	Pump casing	1	2	3	4	5	AISI 316L
01A	Impeller casing	1	1	1	1	1	AISI 316L
02	Impeller	1	2	3	4	5	AISI 316L
02A	Discharge impeller	1	1	1	1	1	AISI 316L
03	Pump cover	1	1	1	1	1	AISI 316L
04	Lantern	1	1	1	1	1	GG-22
05	Shaft	1	1	1	1	1	AISI 316L
08 *	Mechanical seal	1	1	1	1	1	SIC/SIC/EPDM
29	Tie bar	4	4	4	4	4	AISI 316
30A	Pump cover ring	1	1	1	1	1	AISI 316
45	Blind nut	1	1	1	1	1	AISI 316L
47	Protection	2	2	2	2	2	Plastic
50A	Screw	4	4	4	4	4	A2
52	Hexagonal screw	4	4	4	4	4	8.8
53	Spring washer	4	4	4	4	4	A2
53A	Spring washer	4	4	4	4	4	8.8
54	Blind nut	4	4	4	4	4	A2
56	Elastic pin	1	1	1	1	1	A2
61	Key	1	1	1	1	1	A2
80 *	O-ring	2	3	4	5	6	EPDM
82	Splash ring	1	1	1	1	1	EPDM
93	Motor	1	1	1	1	1	-

(*) Recommended spare parts

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