SPXFLOW

OPERATING MANUAL
EN

Cavitator

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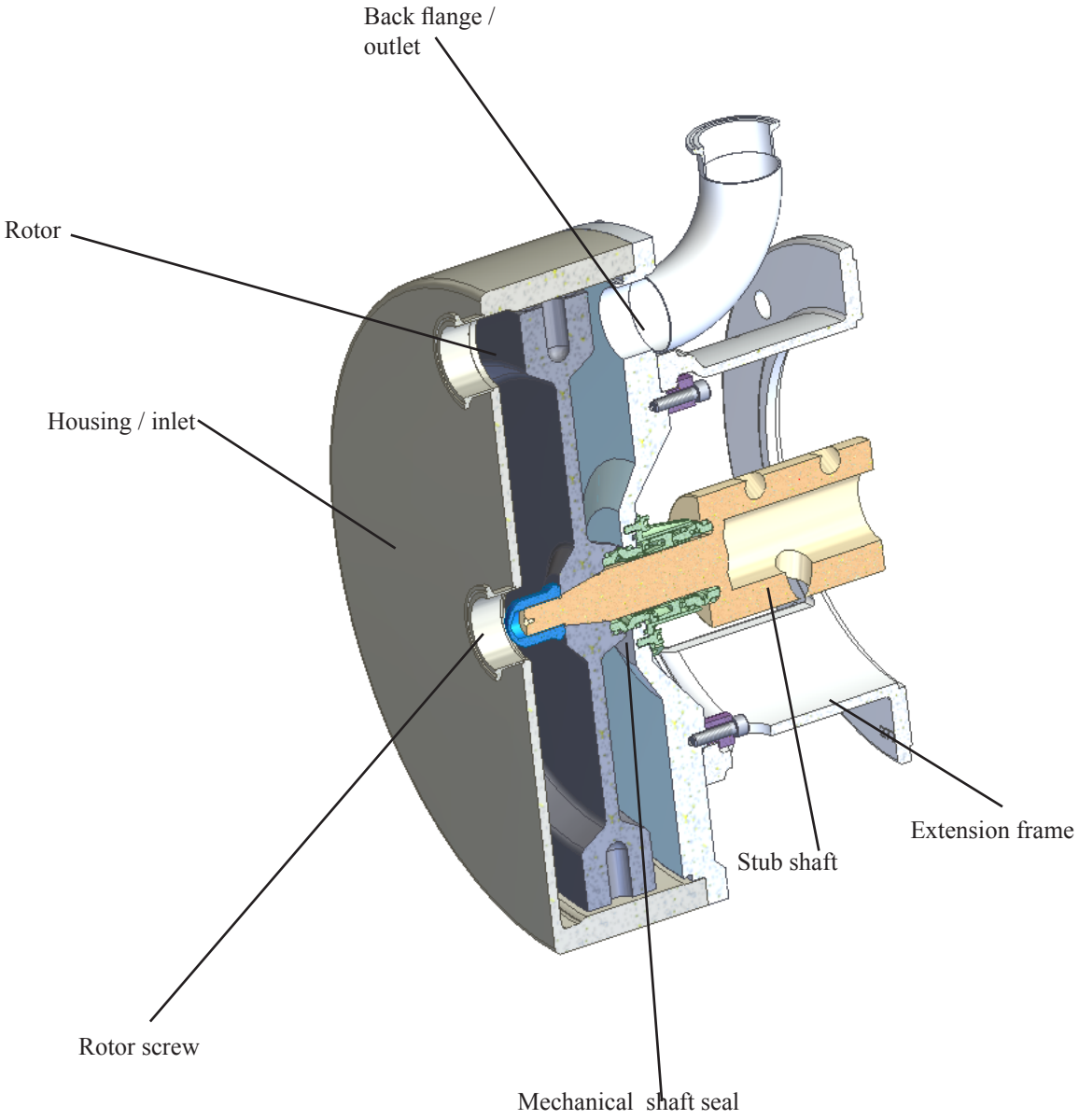
ORIGINAL INSTRUCTIONS
READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.

APV®

Sectional drawing



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0. Warnings

Read this instruction carefully before installing and starting the Cavitator. Always follow the guidelines for assembly and disassembly in order to secure optimum operational reliability. The Cavitator can due to its function make a risk for personal injury by incorrect assembling and use. Therefore only qualified staff must carry out assembling and operation. In case of doubt, contact your local SPX partner.

Electric Installations

- Check that the specifications of motor and motor control are cor rect. This particularly implies when operating in environments where there may be a risk of explosion applies.
- Never flush with water or cleaning fluids directly on the electric motor.
- Never dismantle the Cavitator before having interrupted the power supply to the motor. Remove fuses and disconnect the cable from the terminal box for the motor.
- All electrical installations need to be made by skilled and authori zed electricians.

Personal injuries

- Never start the APV Cavitator before the guard above the Cavitator shaft has been securely mounted.
- The Cavitator contains rotating parts. Never put hands or fingers into a Cavitator while it is in operation.
- Never touch the motor guard during operation as it may be very hot.
- Never touch the Cavitator housing during operation if the Cavitator is being used for hot media (heating application) where there may be a risk of burning.
- Do not start the Cavitator until all pipe connections have been fitted carefully and tightened. If the Cavitator is to be used for hot and/or hazardous liquids, special precautions must be taken. In such cases follow the local regulations for personal safety when working with these products.
- Never dismantle the Cavitator before the tank has been drained.

Remember that liquid will always collect in the Cavitator housing. If the Cavitator is to be used with hot and/or hazardous liquids, special precautions must be taken. In such cases follow the local regulations for personal safety when working with these products

Safety precautions

- Always remove assembly tools from the Cavitator before starting it up.
- Always ensure that no debris of any kind is present in the Cavitator.
- Never lift the Cavitator in the motor shroud, as it is not designed to carry the weight of the motor. Remove the shroud before lif ting the Cavitator. Always use securely fitted lifting straps when lifting with a crane or similar lifting tools.

The below stated values for the Cavitator outlet pressures must not be exceeded: Max. 10bar.
It is also important to remember that the values for max. outlet pressure apply to water at a temperature of 20°C.

1. Introduction to the Cavitator Program

1.1 Cavitator Programme:

The Cavitator is a standalone unit intended for use in the following applications: Scale free heating, cavitation duty, and a combination of heating and cavitation duties.
This manual covers all standard versions of the Cavitator.
Check the identification plate to ensure that one of the above-mentioned versions is in question

1.2 Cavitator choices and optional equipment

As part of the Cavitator program there are a number of standard options, meaning that the Cavitator is available as follows:

- In 3A version
- With NEMA-norm motor
- With IEC norm motor
- With rotors with other hole formations
- With housing for larger radial clearance.
- With or without shroud
- With O-rings in EPDM or FPM (Viton) (Kalrez or others).

The APV Cavitator can be delivered with all usually used weld unions and clamp rings within DS/BS/DIN/SMS and ISO and DIN flanges; or with special aseptic connections prepared for sterile flushing.

1.3 Determination of Cavitator Type

On the intermediate flange a identification label has been placed, as shown on fig 1.

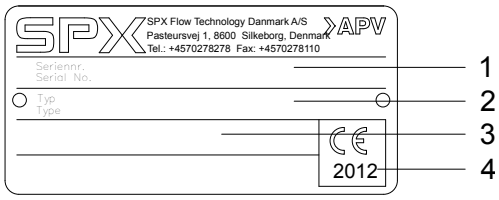


Fig.1

[1] The serial number of the machine.

This number refers to the construction. The number i ndicates all necessary details of the Components used. In case of technical inquiries or order of spare parts, always refer to this number.

[2] Machine type and size of mixing vessel

[3] The field can be used for identification of the machine in the plant or factory.

[4] Production month / year.

1.4 Determination of motor type

The motor is identified by removing the motor guard and read the kW and building height on the identification

2 Installation of the Cavitator

2.1 Positioning

The Cavitator must be positioned so that the suction pipe is as short as possible and there is a falling gradient towards the suction nozzle. Keep the number of valves, bends and tee-pieces on the suction side at an absolute minimum. There must be sufficient space around the Cavitator for piping and access for maintenance.

2.2 Lining up the pipe systems

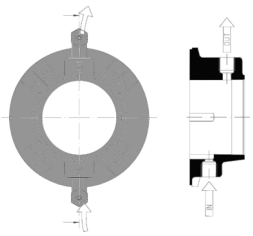
Carefully line up the pipes to the Cavitator suction and discharge nozzles. Make sure that the pipe systems are adequately supported by pipe supports so that the Cavitator body is not subject to strains and weights from the pipe system.

2.3 Power supply

The motor should be connected to the mains via a motor isolator in accordance with local regulations. The motor should be connected in accordance with the instructions inside the cover of the motor's terminal box.

The motor should be connected so that the direction of rotation of the motor (and thus of the rotor) is anticlockwise when viewed from the front towards the suction nozzle of the Cavitator body. (fig 2).

2.4 Water supply for water-flushed shaft seal



Cavitator with a water-flushed shaft seal have two hose connectors on the seal flange. The hose connectors are 1/8" and fit an ø6 mm hose. The necessary liquid rate is 15-30 l/h. Max. pressure 7 bar.

The hose connection in the seal flange should always be positioned vertically with the fluid inlet underneath and the outlet on top.

Water consumption can be limited by installing a solenoid valve for the flushing water on the supply side. The open/close function of the solenoid valve can be controlled by the Cavitator´ s start/stop sequence.

Do not use flushing water connectors for steam or steam condensate. If you want to use steam as the barrier medium a special aseptic piping is required, see section 2.5

2.5 Connecting steam or steam condensate for aseptic use

Shaft seals for aseptic use are supplied with ø6/ø4 PTFE pipes for connections.
The connection for steam or steam condensate with static double seal in the Cavitator body is supplied with fittings for 8 mm steel pipes.
Steam can be used at temperatures up to 150°C and pressures up to 5 bar.

3. Before start-up

Before starting the Cavitator, is the suction pipe dismantled and cleaned. Any foreign material in the Cavitator should be removed.

3.1 Checking the Cavitator body for foreign material

Remove the Cavitator body as described below. The assembly drawing is to be used for reference.

1. Disconnect the power supply.
2. Remove the Cavitator housing by undoing the body screws and carefully pull off the Cavitator housing.
3. Turn the rotor to ensure that there is no foreign material behind it and in the holes
4. If there is any foreign material in the Cavitator, remove it.
5. When the Cavitator body is clean and free of foreign material, reassembly the Cavitator. Mount the Cavitator body as descri bed below.
6. Press the Cavitator body carefully in over the O-ring without damaging it, and fasten the body screws, observing the correct tightening torque:

   M8:30 Nm (22 lbf ft), M10:45 Nm (33 lbf ft), M12:74Nm (53lbf ft)
7. Install suction and discharge pipes. Check that the pipe unions have been tightened properly and that pipe supports have been fitted.

To make the Cavitator body easier to fit, we recommend that you give the O-ring a thin layer of food-approved, acid-free grease or soap.

3.2 Testing the Cavitator

To check the Cavitator, pour water into the double mechanical shaft seal and start it for a moment. Check the direction of rotation (fig 2). Listen for any unusual noises.

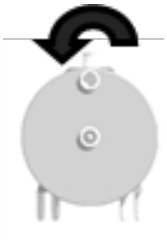


Fig.2

Never let the Cavitator run without liquid in the double mechanical shaft seal as it will ruin the shaft seal.

4 Putting the Cavitator into service

Check the following before starting the Cavitator:

- that the shaft guard has been fitted properly.
- that there is free access for liquid

4.1 Flushing water/steam/condensate etc.

Check that the supply for flushing medium is open and that the flow of the medium is adequate (approx. 15-30 l/hour)

5 Maintenance

General

To be able to maintain and replace the different parts it is necessary to dismantle the Cavitator as described in the following. The sectional drawing is used as a reference.

Before the Cavitator is dismantled for inspection and replacements of new parts the following has to be ensured:

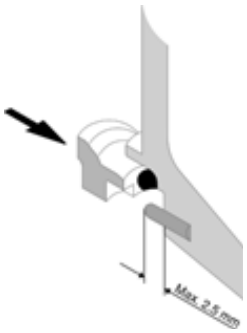
- Disconnect the power supply in the motor isolator by removing the fuses and disconnect the cables.
- Turn off the steam and flushing water supply
- Close the inlet and discharge of the Cavitator and drain the Cavitator body.
- If the Cavitator is used for hot/or aggressive liquids, special precauti ons must be taken. In such cases, observe the local regulations for personal protection when working with these products.

5.1 Shaft seal, inspection and replacement

Check frequently the shaft seal for leakage. Is the shaft seal leaking replace the **internal shaft seal**, the **external shaft seal** or both as described below. It might also be necessary to replace the **Fixing kit** or parts of this.

After the sealing elements have been taken apart, inspect them to clarify the need for replacement:

- Stator and rotor rings are examined for sign of wear. Are there scrat ches, cracks, imperfection or other irregularities the seal rings have to be replaced. The rotor and stator-ring shall always be replaced in pairs.
- The O-rings are inspected for cracks, lack of elasticity, brittleness and/ or chemical attack. Replace worn or defected parts.
- The parts in the Fixing kit are checked. Are there cracks, deformation or other irregularities, affecting the functionality. If so the parts are replaced.



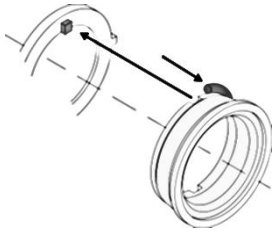
5.2 Internal shaft seal

Dismantling

Undo the body screws and remove carefully the Cavitator body. Unscrew the Rotor screw from the shaft and take off the rotor.

- Remove the stationary seal face with the O-ring mounted in the back plate.
- Remove the rotary seal face with the O-ring from the rotor.
- Clean the stator and rotary seal face locations, if necessary with air or water.
- New parts can now be mounted.

5 Maintenance



Assembling

- Fit the stationary seal face with the O-ring in the back plate without using tools. Moisten the O-ring with water. The “not ches” in the stationary seal face must mate with the driving dogs on the carrier in the back plate.
- Fit the rotary seal face with the O-ring in the rotor. Ensure that the slot in the seal ring is aligned with the pin in the rotor.

5.3 External shaft seal

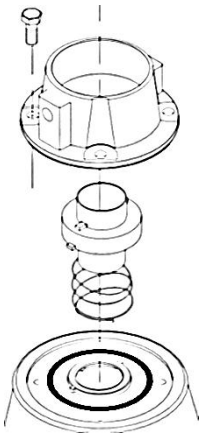
Dismantling

- After the rotor has been dismantled, loosen the screws and bracket, which fit the back plate to the extension frame. The back plate is carefully removed by taking it over the shaft.
- Remove the stationary seal face with the O-ring from the fixing kit mounted on the back plate.
- Remove the rotary seal face with the O-ring from the shaft.
- Clean the stator and rotary seal face locations, if necessary with air or water.
- New parts can now be mounted.

Assembling

- Fit the stationary seal face with the O-ring in the fixing kit wit hout using tools. Moisten the O-ring with water. The “notches” in the stationary seal face must mate with the driving dogs on the carrier in the back plate.
- Fit the rotary seal face with the O-ring in the shaft.
- NB! Do never use oil or grease when mounting the rotary seal face on the shaft.

5.4 Fixing-kit



Dismantling

- After the back plate has been dismantled, the 4 screws, which fix the fixing kit, are removed. The spring force will move the parts apart.
- The O-ring between the pack plate and the fixing kit can be removed.
- New parts can now be mounted.

Assembling

- Put the O-ring in the back plate.
- Place the pressure ring, spring, and pressure ring with tube on the back plate. Ensure that the dowels at the pressure rings mate the same plan as the tracks in the fixing kit.
- The fixing kit is moved over the pressure rings and is pressed against the back plate. Fasten with the screws.

5 Maintenance

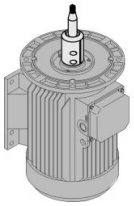
5.5 Shaft seals, general assembling

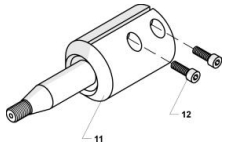
After replacement of respectively the internal shaft seal, the external shaft seal, or both and if necessary the fixing kit, the back plate, the rotor and the Cavitator body are mounted in the mentioned order.

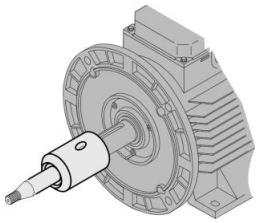
- The back plate is mounted with screws and brackets. Ensure that the in/outlet for the water flushing are in the correct posi tion. The inlet at the bottom and the outlet at the top.
- The rotor is mounted and fastened with the cap nut. Tightening torque: M20: 200 Nm (132lbf ft)
- The Cavitator body is mounted and is screwed on Tightening torque: M10: 45Nm (33lbf ft), M12: 74Nm (53lbf ft)

5.6 Motor- inspection and replacement

Check frequently the motor and the performance, i.e. the current consumption, noise and vibration level, temperature etc. See the motor supplier's instructions. For identifying the motor, see the motor nameplate.
The standard motor for the Cavitator has a drive-end located bearing. If the motor is replaced, the new motor must also have a drive-end located bearing. The motor bearing is enclosed and permanently lubricated at frame 160 –180. For replacement of bearings, see the motor supplier's service manual.







5.6.1 Replacement of the motor

In order to be able to replace the motor some parts of the Cavitator have to be demounted.

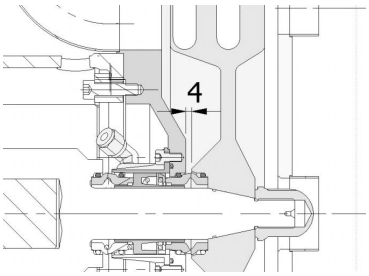
Dismantling

- Undo the body screws and remove carefully the Cavitator body.
  Unscrew the cap-not from the shaft and take off the rotor.
- Remove the motor shroud and, if possible, place the Cavitator on the motor's fan cover.
- Undo the four motor flange bolts between the motor and exten sions frame and remove them.
- Lift the back plate, extension frame, and spacer flange (where fitted), which are still bolted together, up and off the shaft.
- Loosen the screws in the shaft muff and pull off the shaft.
- The bracket/feet are removed from the motor's foot. The motor can now be replaced.

Assembling

- The brackets/feet are mounted on the motor's foot.
- Mount the Cavitator shaft loosely on the motor shaft. Position the balance holes at the stub shaft above the keyway on the motor shaft.
- Before remounting the Cavitator shaft, remove any dirt and gre ase from the motor shaft and the muff's internal clamping sur face.
- The back plate and the extension frame with the space flange are taken over the motor shaft and are put on the motor flange. Bring them into the correct position. Mount and tighten the four bolts.

5 Maintenance



- Place the Cavitator back on its bracket/legs.
- The Rotor is mounted and is tightened with the cap nut. Remember the tightening torque: M20; 200Nm (148 lbf ft)
- A gauge (4 mm) is put between the rotor and the back plate.
- The shaft is pushed back, until the rotor make full contact with the gauge.
- The shaft is fixed, tighten the screws with the correct torque: M8: 30 Nm (22lbf ft) and M10: 55 Nm (40lbf ft).
- The gauge is removed
- The Cavitator body is mounted.

5.7 Recommended stocks of spare parts

Seal set

We recommend that you keep both seal kits and service kits for the Cavitator in stock. The seal kit for the Cavitator consist of the wearing parts of the Cavitator, as specified on page 26

Service kit

The service kit is made up of a number of the main components of the Cavitator which are not wearing parts, but which you still may have to replace: shaft, rotor, stator, cap nut, and fixing kit.

The table below shows the recommended stocks of spare parts for normal operation and in cases where there are special needs – for example 24-hour operation, operation with abrasive media, or processes that are sensitive to even the shortest production stoppage.

Wearing parts (seal kit, see page 26)

	No. Of Cavitator in service		
	0-5	5-20	>20
	sets	sets	Sets/10 Cavitators
Normal operation	2	3	1
Special needs	3	6	3

Service parts (shaft, stator, rotor, cap nut page 23, fixing kit page 26)

	No. Of Cavitator in service		
	0-5	5-20	>20
	sets	sets	Sets/10 Cavitators
Normal operation	0	1	1
Special needs	1	2	1

6.Technical data

6.1 Level of sound pressure and sound intensity for the APV Cavitator

The measurements have been carried out in accordance with DS/EN 12639 and ISO 3746 grade 3

Tolerance: ±3dB.

	Bottom Cavitator											
	8”			10”			12”			16”		
	A	B	C	C	B	C	A	B	C	A	B	C
LpA [dB]												
LWA [Watt]												

LpA = Sound pressure level in dB measured at 1 meters distance from the Cavitator surface at a height of 1.6m above the floor level according to EF-directive (89/392/EØF) 1.7.4.

LwA = sound intensity level in Watt, recalculated from LpA

Operation conditions A, B and C refers to the following:

A. Nominal flow, 1 bar operating pressure, 3550 rpm

B. Nominal flow, 1 bar operating pressure, 2950 rpm

C. Nominal flow, 1 bar operating pressure, 1750 rpm

The use of this information is under the condition that the motor in question is an aluminum ABB motor, and that the motor size suits the required power of Cavitator.

The noise level may change essentially by mounting reduction fittings on in and outlet.

6.2 Max. Permissible discharge pressure of the Cavitator

The below values for the Cavitators discharge pressure must under no circumstances be exceeded (valid for water at 20°C).

The values are also valid for the corresponding models of the Cavitator. Max. 10 bar: Cavitator size: 8”, 12”, 14”, and 16”

6.3 Tightening torque for impeller, inducer and shaft.

Tightening torque required for the screws in the shaft muff and for body bolts:

M8: 30 Nm (22 lbf ft)

M10: 55 Nm (41 lbf ft)

M12: 80 Nm (59 lbf ft)

M16: 180 Nm (132 lbf ft)

Tightening torque required for the cap nut:

M20: 200 Nm (148 lbf ft)

7 Operating guide

The Cavitator have two main operating functions.

- One is scale free heating duty.
- The other is cavitation duty.

The Cavitator do not create any pump work and it has to be fed by a pump. This pump can be a centrifugal pump or a positive displacement pump.

7.1 Scale free heating duty

The heating is created by the internal disk friction between the rotor and the liquid. Because no hydraulic work is generated, all added energy is converted into heat. This will heat the product.

The heating is thus generated by electrical energy added to the motor which drive the rotor. It means that the motor load (net power consumption) is almost equal to the added energy. There is a small energy loss due to the heat radiating from the Cavitator and the energy consumption from the mechanical shaft seal.

The temperature rise can be calculated as
$dt = Ps\ (1 – \mu/100)\ 3600 / Cp\ q\ \rho$
where
dt = temperature rise in the Cavitator (°C)
q = volume flow through the Cavitator (m3/h)
Ps = added shaft power = motor power/motor efficiency(kW)
Cp = specific heat capacity of the fluid (kJ/kg°C)
μ = Cavitator energy loses in %
ρ = fluid density (kg/m3)

Examble:

Temp.rise in Cavitator:	**5,67**	**°C**
Flow:	**3,00**	**m³/h**
Power:	**22,00**	**kW**
Specific heat:	**4,19**	**kJ/kg°C**
Energy loses i %:	**10**	**%**
Fluid density:	**1000**	**kg/m³**

The added motor power is a function of the size of the Cavitator, the rotor type and the speed of the rotor.
When running the power consumption will follow the law of affinity:
$P_1 / P_2 = (n_1 / n_2)^3$.
Where P = motor power in kW, n= motor speed in rpm, subscripts 1 and 2 denote the value before and after the change.
If the speed of the motor is increased with 10% the power increase with 33%
It is recommended to use the Scale free heating duty only for heating in the critical temperature range for the product. The pre-heating up the critical temperature e.g. the protein denaturation temperature shall be done by traditional heating methods like plate or tubular heat exchanges.

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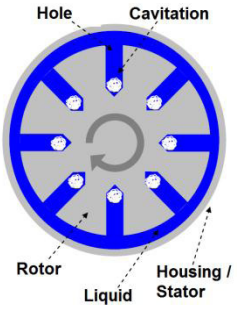


7.2 Cavitation duty

The Cavitator produces cavitation in each of the radial holes in the rotor when it rotates. It means that the greater the numbers of holes, the more cavitation is produced. In each hole hydro dynamic forces are created which cause interchange of pressure and kinetic energy. The pressure will be lower than the vapour pressure for the product and formations of small cavities (bubble clouds) will be generated. When these shortly after collapse shear forces are generated. The collapse of the cavities will in general occur in the liquid and not on the metal surfaces of the rotor.

Depending of the need for the shear forces applied to the product different types of rotors are available. There are optional rotors with 2, 3 and 4 row of holes. The intensity of the cavitation in each hole will increase with increasing speed; larger hydro dynamic forces will be added. The product passes through a cylindrical zone between the stator and rotor, a kind of liquid tube. The total volume of the holes in the rotor related to the volume of this cylindrical tube defines the level of product exposed to cavitation. The more holes (big cavitation volume) the more will the entire product be exposed to cavitation. The cross section area between the rotor and stator determined the axial liquid velocity at a given flow and the rotor length the time for the product exposed to cavitation.

In case of high viscosity of the product, the radial gap between the rotor and stator can cause relative high power consumption (viscous resistance). Therefore there are also optional casing (housing) with different internal diameter, for radial gap between rotor / stator at 3 and 6 mm. The 6mm casing is intended for high viscous fluids.

The following applications are typically Cavitation duties:

- Gas – Liquid Mixing. Aeration. Dissolve / mixing or partly dissolve gases like oxygen or carbon dioxide into water or other fluids than water.
- Solids and liquid mixing. Particle size reduction, homogenization, hydration of gums and polymers. Fish eye removal.
- Liquid – liquid mixing. Emulsification, mixing viscous liquids

7.3 Operating parameters

7.3.1 Flow and back pressure.

The Cavitator shall be product fed by a pump. It can be a centrifugal or a positive displacement pump. The flow capacity will in case of positive displacement pump be controlled by the pump speed, in case of a centrifugal pump the capacity shall be controlled by a back pressure valve.

The back pressure valve shall be positioned downstream after the Cavitator.

In both cases it shall be insured that the Cavitator back pressure is minimum **1.5 bar**.

Too low a back pressure can cause cavitation corrosion on the metal parts.

Especially at high product temperature, the back pressure shall be at levels which insure that the product is not boiling rather that cavitating in the holes.

7 Operating guide

7.3.2 Start and stop of the Cavitator

The start and stop of the Cavitator is very closely related to the start and stop of the feed pump.
When the Cavitator is running it generates energy and heat to the product. If the product flow is stopped when the Cavitator is still running, the product left in the Cavitator will be heated quit extremely and there is a risk of overheating the product which can results in severe fouling/burning/solidification of the product in the Cavitator. In general it can be said that the Cavitator shall only run when there is a product flow through it. It means the feed pump shall be activated.

- Start the feed pump before the Cavitator at production start
- Stop the Cavitator before the feed pump at production stop, or

at least reduce the Cavitator speed to a very low level(lowenergy consumption)

7.4 System design and installation

The installation of the Cavitator is relative simple. Basically it is in line with a normal pump installation.
The functionality of the Cavitator, the heating duty and the cavitation duty, makes some demands on the associated system.
It is recommended to always insure that:

- The Cavitator is run by a frequency converter. This allows a very accurate temperature control when the Cavitator is used for heating. The Cavitation level can also be adjusted by vary ing the speed.
- The product temperature after the Cavitator should be recor ded. The used temperature gauge shall be of a fast reacting type. The change in the temperature caused by Cavitator speed changes happens immediately, and the speed regulation depends of a fast and correct temperature signal.
- The feed pump shall be able to provide the pressure needed. It means minimum the recommended back-pressure and further system pressure drops.
  In many cases it will make sense to use a positive displace ment pump type. This type will provide the system with a constant flow which makes temperature control of the product through the Cavitator simpler.
- A back-pressure valve shall be installed after the Cavitator. This insures that the minimum back-pressure can be obtained.
- The pressure after the Cavitator should be recorded.

7 Operating guide

7.5 Cleaning and sanitising

7.5.1 Installation with CIP – systems, Cleaning In Place

The Cavitator are constructed so that they easily can be cleaned with CIP-methods for cleaning of processing plants. To achieve the necessary fluid velocities within the pump when cleaning we recommend a differential pressure of 2-3 bars across the Cavitator.

Caustic danger

The best result will be achieved when the Cavitator is spinning at approximately 1200rpm as cavitation will assist the cleaning process.

The recommended procedure for CIP cleaning of the Cavitator is as follows:

!! Always use protective goggles

!! Always use rubber gloves

1. Thoroughly flush the Cavitator for product with ordinary cold water.
2. Circulate a basic cleaning agent, e.g. lye (NAOH) through the Cavitator:
   Max. concentration: 1-2 % (percentage by weight)
   Max. temperature: 70-80°C
   Circulation time: Approx. 30 min. or according to need
3. After finished circulation, flush the Cavitator with water.
4. Circulate nitric acid (HNO3) through the Cavitator:
   Max. concentration: 1% (percentage by weight)
   Max. temperature: 60° C
   Circulation time: Approx. 20 min. or according to need
5. After finished circulation, flush the Cavitator with sufficient quantities of clean water.

In order to achieve the best cleaning, the above mentioned demands on temperature and concentrations must not be exceeded. If using different concentrated chemicals for CIP, these chemicals must be diluted correspondingly before use, and the temperature must not exceed 60 – 80°C during CIP.

- The Cavitator must not be used for heating of cleaning agents.
- Never leave cleaning agents overnight in the Cavitator.

6. Disinfection: For use of disinfectants, the following demands and procedures must be observed:
   - Never use disinfectants containing chlorine (CL) in heated condition
   - Never leave disinfectants in the Cavitator. After disinfection and before using the machine again the chemicals must be thoroughly washed out with water.

7.5.2 Manual cleaning

If desired the APV Cavitator can of course also be cleaned manually and this could be done in connection with the dismantling for routine checks. Before starting up and in case of standstill of long duration the machine should be cleaned manually. - Please see section 5 regarding inspection and maintenance. At the same time it is recommended to inspect all rotating components visually.

7.5.3 Installation with SIP- systems, Sterilizing In Place

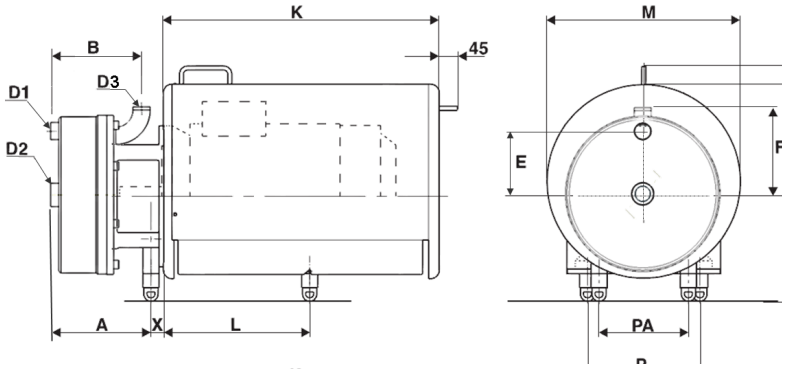
The Cavitator are capable of handling a SIP-process.
Equipment components may need sterilising, i.e. heating to high temperatures (up to 140°C) to kill organisms still remaining on the surface of the equipment. Sterilising is done by using steam or pressurised, heated water.
Check that the elastomer seal materials (e.g. EPDM) can handle the high sterilizing temperature.

8. Cavitator Dimension

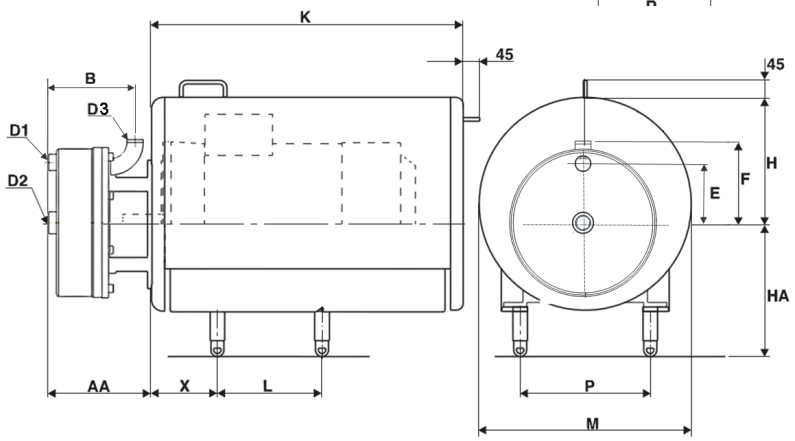
8 Cavitator Dimension 8

Adjustable Feet (only for 12”, 14” and 16”)

Motor 160 - 200



Motor 225



	Cavitator Size:				
	8”	10”	12”	14”	16”
B	168	200	200	194	206
D1	ø16	ø38	ø38	ø38	ø51
D2	ø16	ø51*	ø51*	ø51*	ø51
D3	ø16	ø38	ø38	ø38	ø51
E	98	115	141	166	185
F	123	194	194	224	251

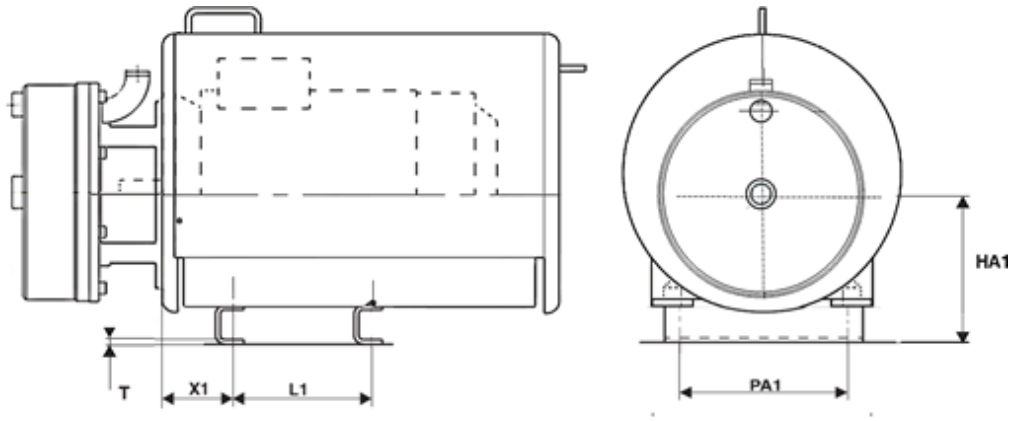
*: Add on a reduction fitting from ø 51 to ø 38

		Motor size:				
Cavitator Size:		132	160	180	200	225
10”	A		235	235		
12”			235	235	235	
14”			235	235	235	
16”			235	235	235	
8”	AA	224				
10”			282	282		
12”			282	282	282	
14”				282	282	
16”				282	282	282
All	X		46	46	46	179
	H	193	255	277	372	405
	HA		305	305	305	305
	K	482	588	688	848	921
	L		318	362	463	286
	M	360	450	480	580	700
	P		254	279	318	356
	PA		222	222	222	

8. Cavitator Dimension

Bracket type A

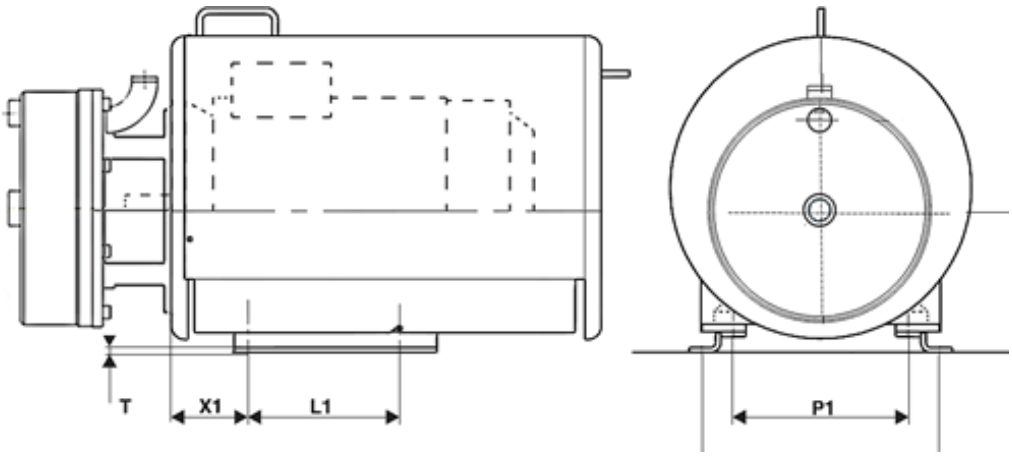
Motor IEC 132 - 225



	132S	160M	180M	200M	225S
X1	112	108	121	158	179
L1	140	210	241	305	286
PA1	216	254	279	318	356
T	6	6	6	8	8
HA1	212	240	260	280	305

Bracket type B

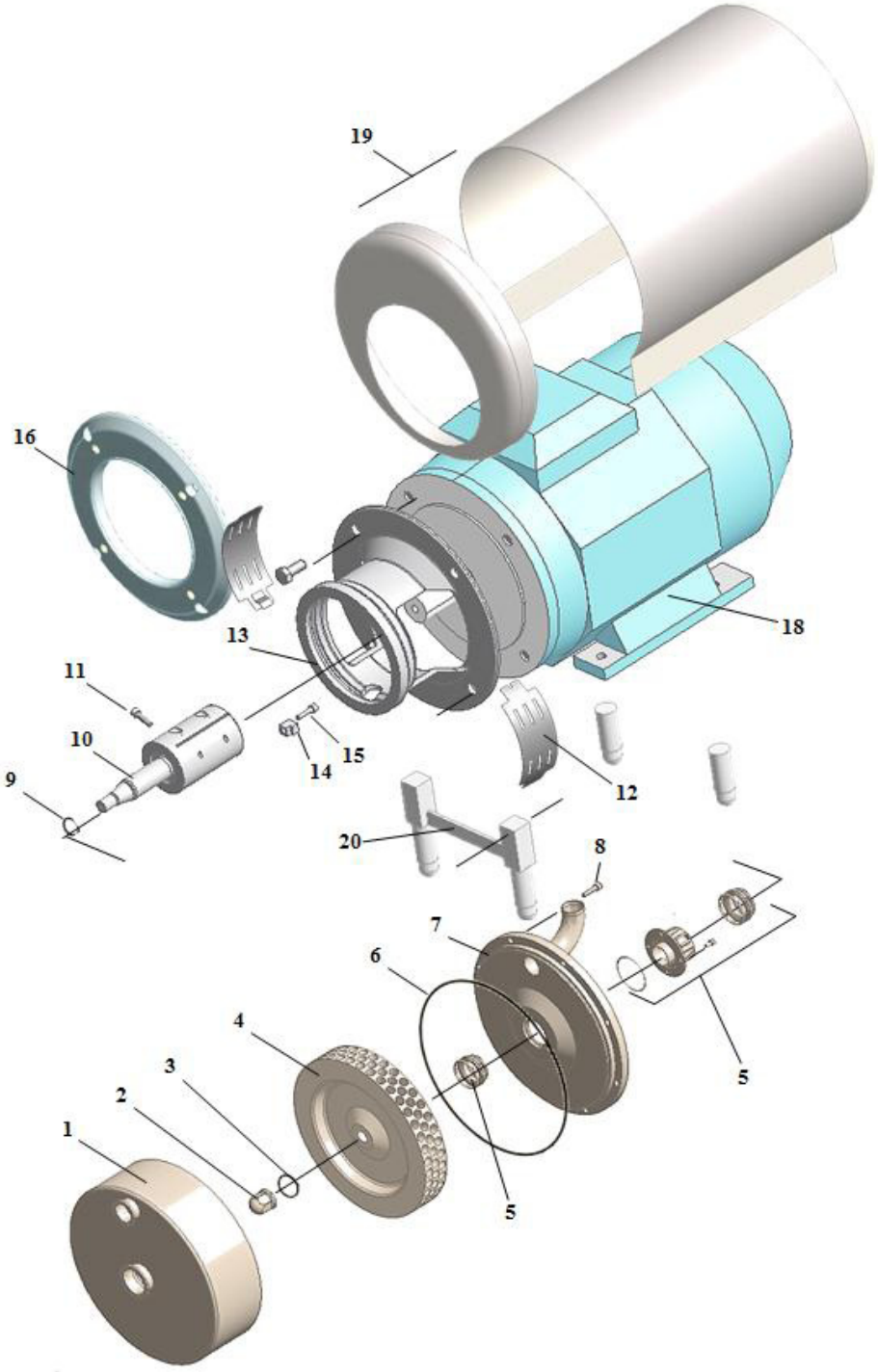
Motor IEC 132 - 200



	132S	160M	180M	200M
X1	112	108	121	158
L1	178	254	279	305
P1	216	254	279	318
PA1	292	358	379	432
T	6	6	6	10
HA1	225	225	225	225

9. Spare Parts

9.1 Cavotator complete



9. Spare Parts

9.2 Cavitator complete- IEC Norm Motor

Pos	Qty	Description		Type 8”	10”	12”	14”	16”
				Part No.				
1	1	Housing (inlet)	3 mm clearance	P286179	P195594	P806398	P806397	P806399*
			6 mm clearance	P285152	P286294	P286134	P286135	P286136*
2	1	Cap nut		L260058	L260059	L260059	L260059	L260059
3	1	0-ring	EPDM	L772489	L772491	L772491	L772491	L772491
			FKM, FPM (Viton)	L772490	L772492	L772492	L772492	L772492
4	1	Rotor		s.p	s.p	s.p	s.p	s.p
5	1	Shaftseak		s.p	s.p	s.p	s.p	s.p
6	1	O-ring	EPDM	L771627	L771714	L771714	L771717	P901689
			FKM, FPM (Viton)	L771628	L771715	L771715	L771718	P901690
7	1	Back plate		P815896	P811905	P811905	P811904	P811903*
8	8	Screw		M10 x 25	M12 x 30	M12 x 30	M12 x 30	M12 x 30
9	1	O-ring	EPDM	L771624	L771624	L771624	L771624	L771624
			FKM, FP132(Viton)	L771622	L771625	L771625	L771625	L771625
10		Stub shaft	Motor IEC 132	L261547		----	----	----
			Motor IEC 160,ø42	----	L261551	L261551	L261551	L261551
			Motor IEC 180,ø48	----	L261563	L261563	L261563	L261563
			Motor IEC 200-225, ø55	----	----	L261552	L261552	L261552
11	2	Screw for shaft IEC 132-160-180		L771119	L771199	L771199	L771199	L771199
		Screw for shaft IEC 200-225		----	----	L701700	L701700	L701700
12	2	Shaft quard		L188334	L188259	L188259	L188335	L188335
13		Extension frame	Motor IEC 132	P285156				
			Motor IEC 160 & 180		P286151	P286151	P286133	P286133
			Motor IEC 200		---	P286151	P286133	P286133
			Motor IEC 225			n.a.	P286133	P286133
14	4	Bracket (screw)		N.a.	L268499	L268499	L268499	L268499
15	4	Screw (DIN 931)		M8 x 30	L701942	L701942	L701942	L701942
16	1	Motor flange	Motor IEC 160 & 180	----		----	----	----
			Motor IEC 200	----		L267666	L267666	L267666
			Motor IEC 225	----		----	L267667	L267667
17								
18	1	Motor						
19	1	Shroud		s.p	s.p	s.p	s.p	s.p
20		Frame		s.p	s.p	s.p	s.p	s.p

*** NOTE: PART NO. IS WITHOUT FITTINGS**

9. Spare Parts

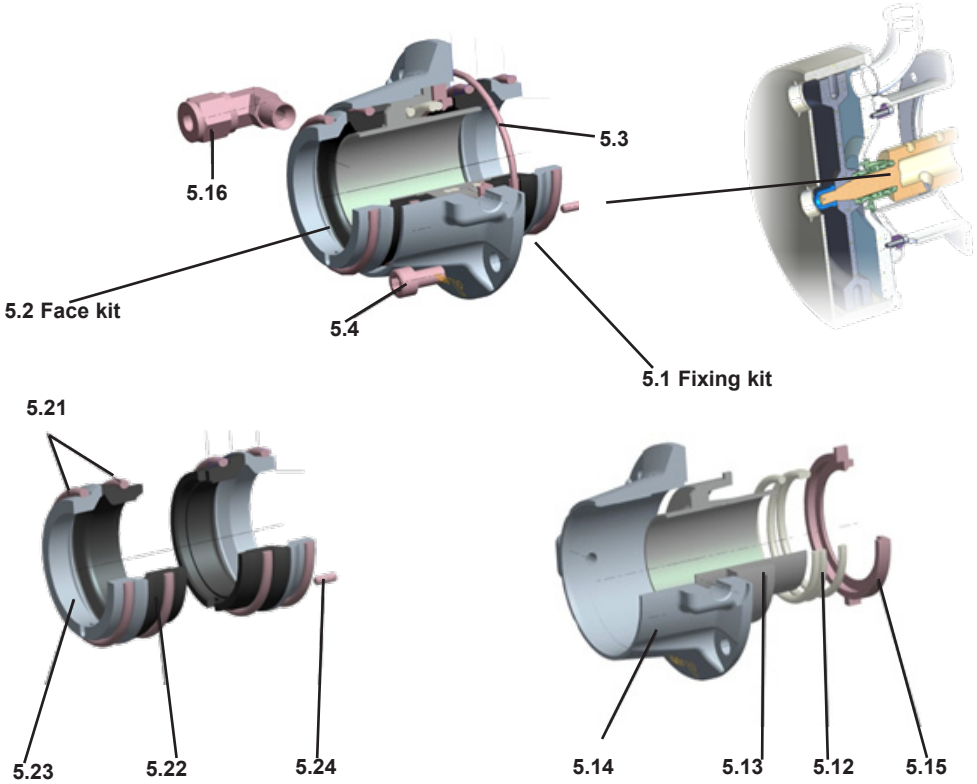
9.3 Cavitator complete – NEMA Norm Motor

				Type				
				8”	10”	12”	14”	16”
Pos	Qty	Description		Part No.				
1	1	Housing	3 mm clearance	P286179	P195594	P806398	P806397	P806399*
			6 mm clearance	P285152	P286294	P286134	P286135	P286136*
2	1	Cap nut		L274213	L274214	L274214	L274214	L274214
3	1	0-ring	EPDM	L772489	L772491	L772491	L772491	L772491
			FKM, FPM (Viton)	L772490	L772492	L772492	L772492	L772492
4	1	Rotor		s.p	s.p	s.p	s.p	s.p
5	1	Shaftseak		s.p	s.p	s.p	s.p	s.p
6	1	O-ring	EPDM	L771627	L771714	L771714	L771717	P901698
			FKM, FPM (Viton)	L771628	L771715	L771715	L771718	P901690
7	1	Back plate		P815896	P811905	P811905	P811904	P811903*
8	8	Screw DIN 931		M10 x 25	M12 x 30	M12 x 30	M12 x 30	M12 x 30
9	1	O-ring	EPDM	L771624	L771624	L771624	L771624	L771624
			FKM, FPM(Viton)	L771622	L771625	L771625	L771625	L771625
10		Stub shaft	Motor NEMA 213-215TC	L267335		----	----	----
			Motor NEMA 284 – 286TC	----	L267342	L267342	----	-----
			Motor NEMA 324- 326TSC	----		L267343	L267343	L267343
			Motor NEMA 324- 326TSC	----		----	L267343	L267343
			Motor NEMA 404 – 405 TSC	----		----	----	L267357
11	2	Screw for shaft NEMA 213 - 286		L771199	L771199	L771199	L771199	L771199
		Screw for shaft NEMA 324 - 405				L701700	L701700	L701700
12	2	Shaft quard				L188816	L188816	L188816
13		Extension frame	Motor NEMA 213 – 215TC	P285140		----	----	----
			Motor NEMA 284 – 286TC	----	P286132	P286132	----	----
			Motor NEMA 324- 326TSC	----		P286171	P286138	P286138
			Motor NEMA 364-365TSC	----		----	P286138	P286138
			Motor NEMA 404 – 405 TSC	----		----	----	P286138
14	4	Bracket (screw)		----	L268499	L268499	L268499	L268499
15	4	Screw		M8 x 30	L701942	L701942	L701942	L701942
16	1	Motor flange	Motor NEMA 284 – 286TC	----		----	----	----
			Motor NEMA 324- 326TSC	----		----	L267097	L267097
			Motor NEMA 364-365TSC	----		----	L267097	L267097
			Motor NEMA 404 – 405 TSC	----		----	----	P281072
17								
18	1	Motor						
19	1	Shroud, not available for NEMA motors		n.a	n.a.	n.a	n.a	n.a
20		Frame			s.p	s.p	s.p	s.p

*** NOTE: PART NO. IS WITHOUT FITTINGS**

9. Spare Parts

9.4 Shaft seal



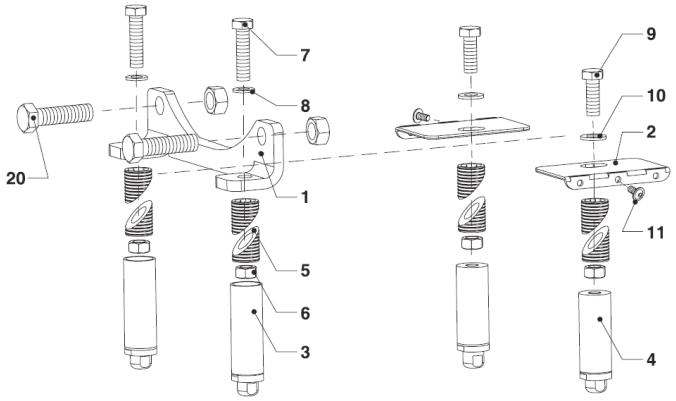
POS.	Stk/Qty	Benævnelse	Description	Materiale/ Material	Ø35 Del nr./ Part no.	Ø25 Del nr./ Part no.
5.1	1	Fixing kit dobbelt tætning:	Fixing kit double seal:		L194449	L194448
5.12	1	Fjeder	Spring	AISI 316	L772473	
5.13	1	Trykring	Pressure ring	AISI 316	L267778	
5.14	1	Tætningshus	Seal housing	AISI 316	L267767	
5.15	1	Trykring	Pressure ring	AISI 316	L771996	
5.16	2	Vinkelforskruning	Union elbow			
		Face kit komplet:	Face kit complete:			
5.2	1	SiC/Kul tætningsringe	SiC/Carbon seal rings	EPDM O-ring	L782466	L782461
	1	SiC/Kul tætningsringe	SiC/Carbon seal rings	FPM(Viton)	L782467	L782462
	1	SiC/Kul tætningsringe	SiC/SiC seal rings	O-ring	L782468	L782463
	1	SiC/Kul tætningsringe	SiC/SiC seal rings	EPDM O-ring FPM(Viton)	L782469	L782464
5.21	2	O-ringe	O-rings	O-ring		
5.22	1	Starorring	Stationary seal face			
5.23	1	Rotor	Rotary seal face			
5.24	1	Stift	Pin	AISI 316		
5.3	1	O-ring	O-ring	EPDM	L771362	L772470
5.4	4	Screws (M6X10)	Screwa (M6x10)	AISI 316	L770496	

Dobbelt tætning komplet */Double seal complete *: 1xFicing kit (dobbelt/double) + 2XFace kit +1x Pos. 5.10 +1x5.12
Sliddele dobbelt akseltætning */Wear parts double shaft seal *:2xFace kit.

9. Spare Parts

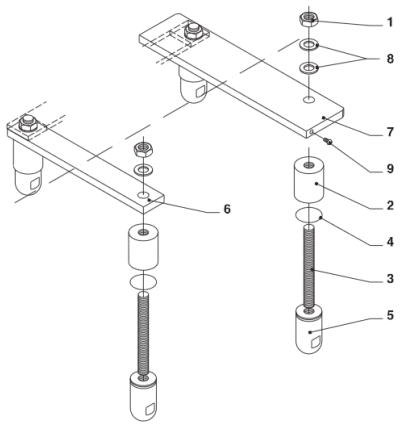
9.5 Adjustable Feet

Motor type IEC 160 - 225



			Motor							
			160			180			200	
			Centre height							
			260	305	350	260	305	350	305	350
Item	Qty.	Description	Part no.							
-	-	Complete frame	L808806	L808807	L808808	L808809	L808810	L808811	L808812	L808813
1	1	Frame for front leg	L279962	L279962	L279962	L279962	L279962	L279963	L279963	L279963
2	2	Angle plate	L282488	L282488	L282488	L282488	L282488	L282488	------	------
2	1	Angle plate R	-------	------	------	------	------	------	L808709	L808709
2	1	Angle plate L	-------	------	------	------	------	------	L808710	L808710
3	4	Leg.complete	L809063	L809051	L809061	------	------	------	L809065	L809066
3	2	Leg.front.complete	------	------	------	L809063	L809051	L809066	------	-------
4	2	Leg.back.complete	------	------	-------	L809062	L809060	L809049	------	-------
5	8	Split bushing	------	L282473	L282473	------	L282473	L282473	L282473	L282473
6	4	Nut	------	L700242	L700242	------	L700242	L700242	L700242	L700242
7	2	Screw	L701265	L703141	L703141	L701265	L703141	L703141	L703141	L703141
8	2	Washer	L701475	L701475	L701475	L701475	L701475	L701475	L701475	L701475
9	2	Screw	L702996	L771697	L702997	L702996	L702997	L702997	L702998	L702998
10	2	Washer	L781058	L781058	L781058	L781058	L781058	L781058	L781058	L781058
11	2	Screw.flanged head	L700420	L700420	L700420	L700420	L700420	L700420	L700420	L700420
20	2	Screw.	L801474	L801474	L801474	L801474	L801474	L801474	L801533	L701533

9. Spare Parts

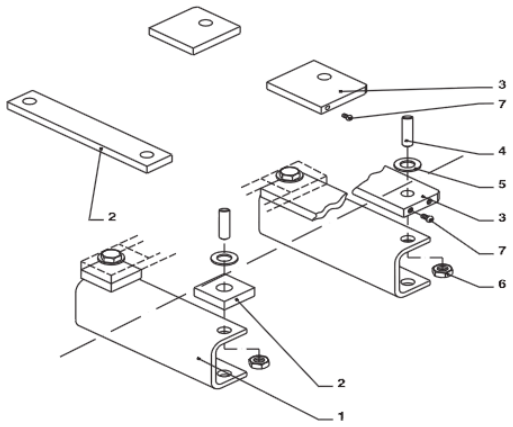


				Motor	
				225S-225M	
				Centerhøjde/Centerheight	
				305	350
POS.	Stk/Qty	Benævnelse	Description	Del nr./ Part no.	Del nr./ Part no.
		Komplet-understøtning	Complete frame	L801108	L801109
1	4	Møtrik	Nut	L772449	L772449
2	4	Rørben	Leg	L268474	L194461
3	4	Gevindstang	Threaded rod	L268489	L268492
4	4	O-ring	O-ring	L772491	L772491
5	4	Tå	Ball type foot	L268469	L268468
6	1	Fladprofil	Fitting	L273824	L273824
7	1	Fladprofil S/M	Fitting S/M	L268465	L268465
	1	Fladprofil M	Fitting M		
8	2	Skive	Washer	L772450	L772450
9	2	Skrue	Screw	L700420	L700420
10	4	Skive	Washer	L268391	L268391

9. Spare Parts

9.6 Bracket

Type A, Motor type IEC 160 - 225

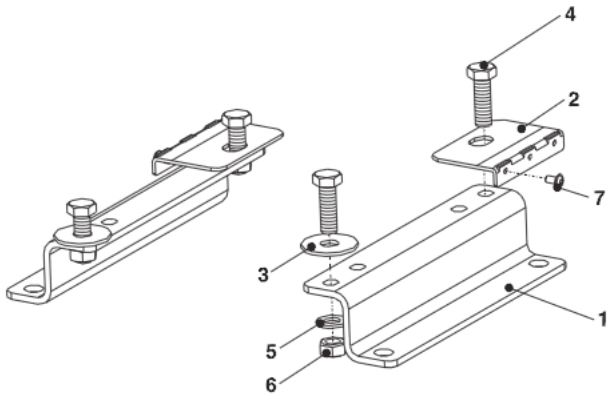


			Motor						
			180	200	200	225	250	280	315
			Centre height						
			305	280	305	305	330	360	395
Item	Qty.	Description	Part no.						
-	-	Bracket, complete	L809090	L809091	L809092	L809093	L809094	L809095	L809096
1	2	Bracket	L282421	L267732	L282422	L267733	L267734	L282423	L282424
2	2	Fitting, front	L268479	------	------	------	------	------	------
2	1	Fitting, front	------	L273820	L273820	L273824	L273825	------	------
3	2	Fitting, rear M	L268459	------	------	------	------	------	------
3	2	Fitting, rear L	L268461	------	------	------	------	------	------
3	1	Fitting, Rear L/M	------	L273820	L273820	L268465	L243822	------	------
4	4	Threaded rod	L268489	L268489	L268489	L268489	L268489	L268489	L268489
5	8	Washer	L772450	L772450	L772450	L772450	L442450	L772450	L772450
6	8	Nut	L772449	L772449	L772449	L772449	L772449	L772449	L772449
7	2	Screw, fl.head	L700420	L700420	L700420	L700420	L700420	------	------

9. Spare Parts

9.6 Bracket

Type B (constant centre height)

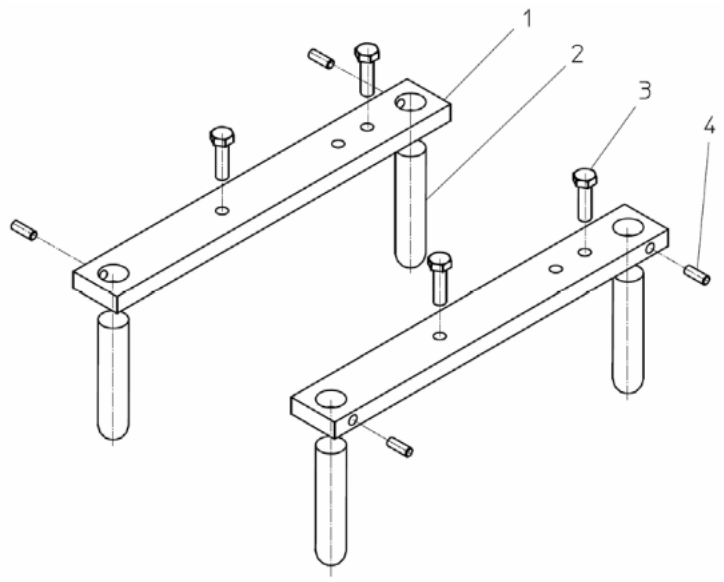


			Motor			
			132	160	180	200
			Centre height			
			225	225	225	225
Item	Qty.	Description	Part no.			
-	-	Bracket, complete	L809101	L809102	L809103	L809104
1	2	Bracket	L279991	L279992	L279993	L182913
2	2	Angle plate	L282503	L282488	L282488	------
2	2	Fitting, back	------	-------	------	L268487
3	2”	Washer	L781058	L781062	L781062	L781062
4	2	Screw	------	-------	------	l781066
4	4**	Screw	L702996	L773643	L773643	L773868
5	4	Washer	L701475	L772450	L772450	L772450
6	4	Nut	L700242	L772449	L772449	L772449
7	2	Screw, fl.head	L700420	L700420	L700420	L700420

9. Spare Parts

9.7 Frame

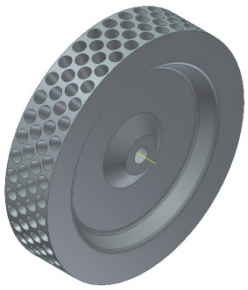
NEMA motors



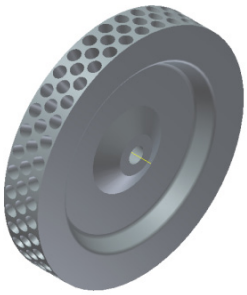
			Motor								
			56C	143-145TC	182-184TC	213-215TC	254-256TC	284-286TSC	324-326TSC	364-365TSC	405TSC
Item	Qty.	Description	Part no.								
-	-	Frame cpl.	L114365	L110256	L110255	L110254	L110253	L110252	L110251	L110251A	
1	2	Side bar	L114364	L110262	L110261	L110260	L110259	L110258	L110257	L220257A	
2	4	Leg 3/4”	L110264				------				
2	4	Leg 1”	------				L110263				
3	4	Screw	5/16-18x3/4		3/8-16x1		1/2-13x1 1/8		5/5-11x 1 1/4		
4	2	Screw	1/4-20 x 1/2 SQ.HD				1/4-20 x 5/8 SQ.HD				

9. Spare Parts

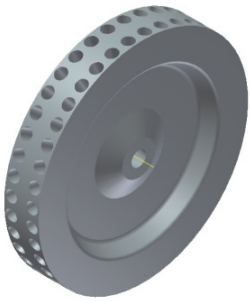
9.8 Rotors



4 rows of holes



3 rows of holes



2 rows of holes

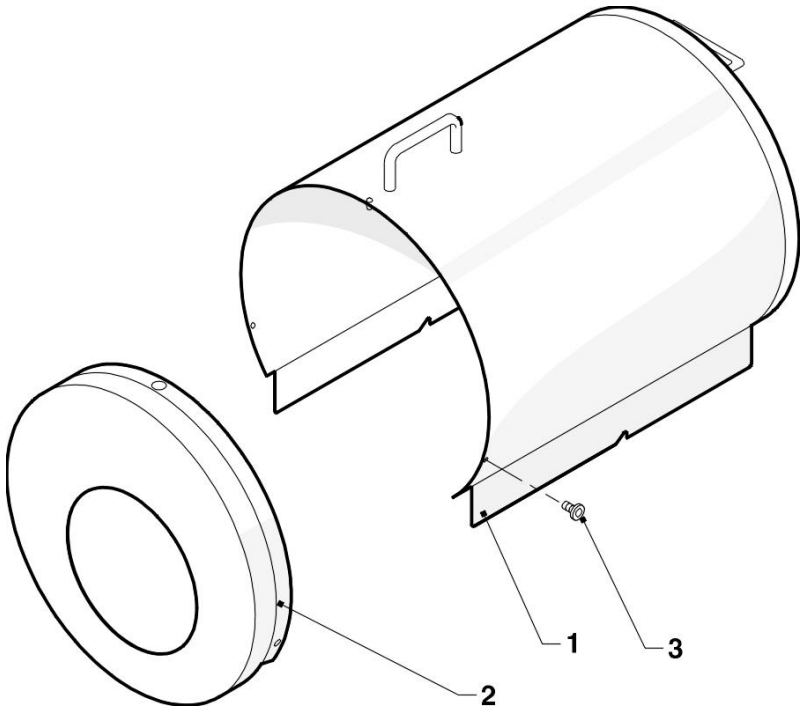
	Rotor		Rotor data.			
Cavitator Size:	Part No.	Type	Diameter	Rows of holes	Width og rotor	Numbers of holes
			mm/inch.		mm/inch.	
8”	P285151	R4	200/8”*	4	65 / 2 9/16”	88
	P285150	R3		3	50 / 2”	66
	P285149	R2		2	50 / 2”	44
10”	P286291	R4	Ø254 / 10”	4	65 / 2 9/16”	128
	P286292	R3		3	50 / 2”	96
	P286293	R2		2	50 / 2”	64
12”	P286184	R4	305 / 12”	4	65 / 2 9/16”	160
	P286185	R3		3	50 / 2”	120
	P286186	R2		2	50 / 2”	80
14”	P286188	R4	355 / 14”	4	65 / 2 9/16”	180
	P286189	R3		3	50 / 2”	135
	P286190	R2		2	50 / 2”	90
16”	P286196	R4	406 / 16”	4	65 / 2 9/16”	232
	P286197	R3		3	50 / 2”	174
	P286198	R2		2	50 / 2”	116

* 7 7/8

9. Spare Parts

9.9 Shrouds

The shrouds are only supplied to fit IEC motors and ABB Aluminum motor series.



				IEC MOTOR TYPE					
				132	160	180	200	225	250
POS.	Stk/ Qty	Benævnelse	Description	Del nr./Part No.					
1	1	Kappe	Shroud	L188447	L188448	L188449	L194637	L188452	L188452
2	1	Dæksel	Collar	L194424	L194425	L194426	L194427	L194477	L194429
3	4	Skrue	Screw	L773113	L773113	L773113	L773113	L773113	L773113

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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.spx.com.

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