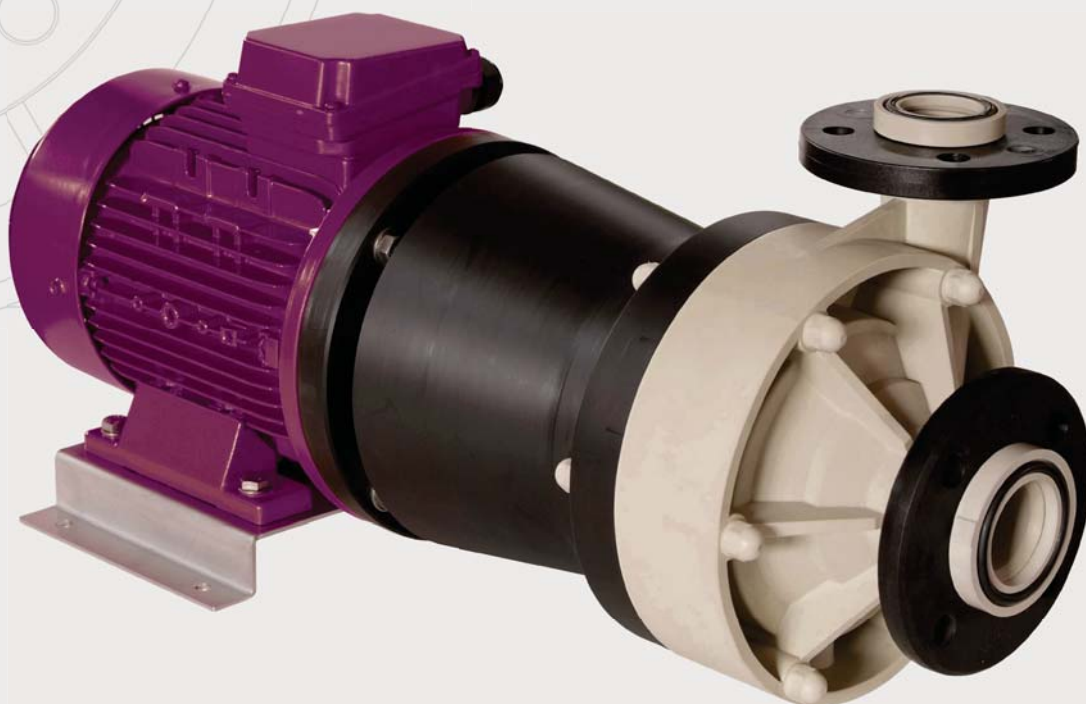




**YOUR
SOLUTIONS**

C O R R O S I V E A P P L I C A T I O N S

User manual
Installation
Operation
Maintenance



ISO 9001:2015
Certified company



2006/42/EC
Machinery Directive



Translation of the
original instructions

User manual in the original or in different languages should be requested to the manufacturer.

Centrifugal pumps
with magnetic drive

MMB-E

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1.0 GENERAL

1.1 EC CONFORMITY DECLARATION

Manufacturer:
 Affetti Giuseppe & C. s.n.c.
 Via P. Maroncelli, 4
 21053 Castellanza (VA) ITALY

The manufacturer declares that the MMB-E pump unit in the standard designs and supplied with a drive (electric motor or internal combustion engine) and baseplate, complies with the 2006/42/EC Machinery Directive.

Applied harmonized standards:

- EN ISO 12100:2010 General principles for design
- EN ISO 809:2009 Pumps and pump units for liquids

Conformity to the directives and standards listed above is subject to the condition that the pump unit is used in accordance with the conditions of service contractually agreed, this responsibility belong to the end-user.

Any modification to the machine or its use not contractually agreed or not approved in writing by the manufacturer will make null and void this declaration.

The pump units to which this declaration refers may only be put into operation after they have been installed as specified by the manufacturer and after that the complete system or plant of which these pumps form part complies with the requirements of the Directive 2006/42/EC.

In case of supply of partly completed pump, the purchaser / user must provide the assembly of the pump unit (pump, drive and baseplate) according the manufacturer's instructions and verify the compliance to the Directive 2006/42/EC before to put the machinery into operation.

1.2 GENERAL INFORMATION

This manual is written to ensure safe handling of the equipment and its intended use. The equipment must be operated in compliance with these instructions in order to ensure reliability and avoid any risk. The user / operator must follow the national standards and safety regulations in force, even if they have not been mentioned in this manual.

This information must always be kept close to where the pump is installed or attached to the pump itself.
The user manual must be read and analysed before installing, operating or carrying out any maintenance work on the pump unit.
Failure to comply with the instructions contained in this manual may cause danger to personnel and will void the AFFETTI warranty.

The instructions and information contained in this user manual are only valid for the pump to which the manual is attached. They do not apply to the plant in which the pump unit will be installed.

1.3 DISCLAIMER AND RIGHTS

Information contained in this manual is deemed reliable. The manufacturer shall not be held responsible in the event that, despite their efforts to supply exhaustive and consistent information, the contents of this manual prove to be insufficient. The purchaser/user must check the information contained in this instruction manual and contact the manufacturer for any missing information.

All rights reserved. No part of this manual may be reproduced, stored in any type of system or transmitted in any form whatsoever, nor by any means, without prior authorisation from the manufacturer.

The manufacturer reserves the right to make changes to the structure of the pump without updating previous supplies.

1.4 DESCRIPTION OF MMB-E RANGE

The pumps of this series have been developed by applying the properties of magnetic drive for the pumping of corrosive liquids, with particular attention to a heavy construction, an easy access for maintenance and hydraulic efficiency. They do not any kind of mechanical seal system, avoiding any possible leakage of liquid from the pump to the environment.

The impeller is rotated by magnetic force to transfer liquid from the suction side to the discharge side.

Each pump is combined with a series of motors of different power ratings and satisfies the most varied needs thanks to an optimum ratio between flow and total head in relation to the specific gravity of the pumped liquid, guaranteeing low energy consumption.

The motors installed comply with the IEC standards, have an IP55 protection rating and are built in insulation class F, unless other special requirements apply.

1.5 PUMP CODE

The pump code identifies the pump and construction materials.

Code	Description
MMB-E	Name of series
40-130	Size of pump
PVDF	Material of casing and impeller
EPDM	Material of O-rings
5,5 kW	Motor output

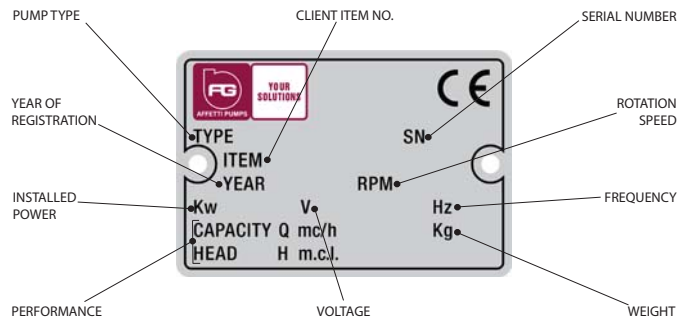
TABLE 1.5.1: Identification codes

1.6 SERIAL NUMBER

The serial number is a sequential number used to identify every pump manufactured. It is marked on the pump's tag plate.

1.7 MARKING

Each pump is equipped with a tag plate marked with all of the data required in accordance with the 2006/42 EC Machinery Directive, which also facilitates identification of the pump. For any spare part requests, should be provided the data marked on the pump's tag plate or the serial number.



NOTE: The weight indicated on the tag-plate of the pump refers to the weight of the pump unit (pump, drive and baseplate). Detailed weights of the single parts are shown in this manual (see table 3.2.1).

NOTE: In case of supply of partly completed pump, the weight indicated refers only to the parts provided. For safety reasons, the purchaser / user must provide the permanently fixing of an additional tag-plate indicating the total weight of the pump unit (pump, drive and baseplate) complies with the Directive 2006/42/EC.

1.8 CERTIFICATIONS

Certifications supplied as standard are:

- 2006/42/EC conformity declaration
- Warranty certificate
- Pump data sheet

Certifications available on request are:

- Certificate of origin
- Certificate of origin for materials
- Material conformity certificate
- Impeller balancing certificate
- Pump shaft balancing certificate
- Hydrostatic test

- Functional test without data recording
- Visual examination and dimensional test
- Vibration measurement (at the duty point)
- A-weighted sound pressure (at the duty point)
- Strip down certificate
- Performance test with report (Q-H-Na-%)
- Performance test with report (Q-H-Na-%-NPSHr)

1.9 DOCUMENTATION

The following documentation is attached to the user manual:

- Cross sectional drawing of the pump
- User manual of the motor
- User manual of the optional supplied

NOTE:

If the above documents were not shipped or sent, they should be required to the manufacturer.

1.10 WARRANTY

The products are guaranteed by our company in so far as they are of our manufacture. Manufacturing or material defects are covered by the warranty, unless otherwise agreed, for a period of up to one year from the date of dispatch from our factory (data of invoice) and not more than six months from the date of installation. During this period the manufacturer undertakes to substitute and repair free of charge any appliance found to have been faulty from the start due to manufacturing or material defects.

The warranty provides for the substitution of faulty parts, but only after an investigation has been conducted to prove that any damage to the pump was not caused by external factors, but purely and exclusively by construction faults.

The manufacturer shall not be held liable for damages caused by dry operation, faulty assembly of the pump and/or plant, foreign bodies entering the pump, the use of liquids other than those declared by the purchaser, variations in flow rate, total head or temperature compared to the data indicated at the time of order, water hammer, transport (in the event that the goods travel at the customer's own risk), works carried out by unskilled personnel, etc.

The warranty does not cover direct or indirect compensation for damages caused by our pump to objects or persons or during repair work performed by the purchaser or third parties.

The product will not be covered by the warranty if the customer tampers with it by repairing or even manipulating it without our prior agreement.

The use of any parts or accessories supplied by a third party will render the manufacturer warranty null and void.

The warranty conditions also require that the appliance be forwarded to our factory suitably packed and that after its replacement or repair it be dispatched to the customer with transport and packing charges at their expense.

The manufacturer does not accept liability for our products unless the customer strictly observes all of the contractual clauses.

Work performed under warranty will not affect the warranty period.

Parts subject to wear are not covered by the warranty.

Non-compliance with the indications and instructions given in this manual will void the warranty.

1.11 SAFETY

All personnel involved in operation, installation, inspection and maintenance of the pump must be qualified for the job.

If the personnel are not already qualified for the intended job, the user shall ensure that they receive appropriate training. On request from the operator, the user may ask the manufacturer/supplier to arrange appropriate training which should be appropriately priced and agreed upon according to the formal request.

All original parts and accessories have been designed, tested and incorporated to guarantee the quality of the end product and continuity of the performance characteristics. The use of parts and accessories supplied by third parties may have a negative effect on the performance characteristics and product safety. Damage or failure caused by improper use are not covered by the warranty. Furthermore, any changes made to the equipment or removal of the original components may impair the safety of these products during operation.

This manual contains specific safety symbols, as described here below. Non-observance of the instructions related to the various symbols will result in the creation of a hazardous situation.



This Hazard symbol indicates safety measures regarding electrical parts. Non-observance of these instructions could pose a serious safety risk for people.



This warning symbol indicates safety measures. Non-observance of these instructions could pose a safety risk for people.



This warning symbol indicates safety measures. Non-observance of these instructions could pose a safety risk for people and the operation of equipment and could result in damage to property.

NOTE:

This symbol indicates important instructions that must be followed.

Some important instructions related to safety are given here below:



Beware of the liquid pumped, avoiding any contact.



The pumps of this series are used to transfer dangerous chemicals. The operators should be equipped with appropriate equipment during all procedures of installation, operation and maintenance. Rubber boots, anti-acid overalls and a helmet with a protective visor for the face are essential requirements to allow operators to work without risking their physical safety.



In the event of leakages of corrosive or hot liquid immediate actions to avoid the any contact, such as the evacuation of the area, must be taken. The corrosive liquid must be removed by authorized companies in accordance with national laws and regulations.



Never touch the pump if the liquid pumped exceeds +70°C. Wait until the pump cools down before performing any work.



When handling a toxic liquid, ventilate the working area.



Do not drain the pumped liquid out of the casing directly onto the ground. Install a pipe system (including a gate valve) to the drainage hole of the casing (if provided) and drain the pumped liquid into a chemically resistant container or reservoir according to the laws and regulations related to the application, handling and processing of hazardous liquids.



The pumps of this series contains powerful magnets. People with cardiac pacemakers, internal wound clips, prosthetic joints, metallic wiring, implanted defibrillators or other electronic medical devices must not handle or be in the proximity of magnets contained inside the pump. People who have had any surgery and do not know if metallic clips were surgically implanted need to avoid work on this unit unless their physician can confirm that no metallic devices exist.



Keep the drive magnets away from metallic parts, tools and electronic devices.



Do not remove guards and protective devices during the pump operation.




After maintenance works place and fix again all guards and protective devices. All parts must be assembled before the start-up of the pump.





Do not put hands or fingers inside the pump's holes, openings or windows.





Handle any sharp components with care.


 Any rotating part should not be freely accessible during the pump operation.


 Do not stand on the pump or use it as support or step.


 Never perform maintenance work when the pump is connected to the power supply. If a switch has been fitted, make sure it is in the "zero" (off) position. Wait until the pump has stopped completely.


 Do not remove the end caps from the nozzle of the pump until the installation. Place them again when the pump is removed from the system.


 **CAUTION** Never start the pump without liquid inside the casing.


 **CAUTION** The gate valves in the suction pipe must be fully open when the pump is starting or operating.


 **CAUTION** Comply with the limits of flow and use specified in the order confirmation.


 **CAUTION** Prevent the entry of foreign objects into the pump.

 **CAUTION** Never choke the pipes when the pump is in operation.

 **DANGER** Electrical motor and other devices must be installed according to the safety regulations in force.

 **DANGER** If pump is used on variable speed drive, do not exceed the frequency for which the pump was designed.

 **DANGER** Run the at the specified power supply voltage on the tag plate of the motor.

 **DANGER** Install an earth leakage breaker.

 **DANGER** Arrange grounding.

2.0 PUMP DESCRIPTION

2.1 MAIN PARTS

2.1.1 Casing

The pump casing is equipped with a volute and a suction port located in axial position whilst a discharge port in a tangential position. The casing has two flanged connections, suction and discharge, according to ISO standards (ANSI B16.5 class 150 on request). In the lowest area of the casing is provided on request a threaded hole to allow the complete drainage of any liquid remaining in the pump.

2.1.2 Impeller


The impeller is semi-open or closed; the blades on the rear side reduce the axial thrust caused by the flow of liquid during the working operation. The size of the impeller depends on the capacity required.

2.1.3 Magnetic drive

The impeller is rotated by magnetic force created between the outer magnets container and the magnets contained in the rotor. When the motor is started the outer magnets container rotates together with motor and drag the rotor at the same speed of rotation. As a result the impeller, fixed to the rotor, is maintained in rotation.

2.1.4 Baseplate

The baseplate is in sheet metal steel (SS304). On request, the baseplate can be provided with a regulation system to align the drive.

 On request the baseplate can be provided with a drip-pan for pump leakages. The drip-pan has a drain hole that should be connected to a drainage piping with a check valve. Leakages should be conveyed in a chemically resistant reservoir. The leakages level must never exceed the maximum capacity of the drip-pan.

2.1.5 Drive

The motors installed comply with the IEC standards (NEMA on request), have an IP55 protection rating and are built in insulation class F, unless other special requirements apply.

NOTE: On request the pump can be supplied with an internal combustion engine.

NOTE: The user manual of the drive is provided with the goods. It has the same importance of the user manual of the pump and should be read and analysed before all operations.


2.2 MAXIMUM OPERATING SPEEDS

Pump model	Max. RPM
25-100	3500
25-125	3500
32-125	3500
40-130	3500
40-160	3500
50-160	3500

TABLE 2.2.1: Maximum operating speeds.

2.3 MAXIMUM PRESSURES

The maximum pressure (including the hydrostatic test) is equal to 1.5 times the maximum working pressure at the duty point (specified on the purchase order). Higher factor or different conditions must be agreed with the manufacturer.

 Apply higher pressures than those agreed could pose a safety risk for people and the operation of equipment and could result in damage to property.

2.4 MINIMUM OPERATING FLOW RATES

The minimum flow value (continuous flow) must be maintained with regard to the pump's best efficiency point (BEP) as indicated in the following table:

Pump model	% BEP	
	2950-3500	1480-1780
25-100	10%	10%
25-125	10%	10%
32-125	15%	10%
40-130	15%	10%
40-160	20%	10%
50-160	20%	10%

TABLE 2.4.1: Minimum operating flow rates (continuous flow).

NOTE: The maximum flow value must not exceed 125% of the pump's best efficiency point (BEP).

NOTE: If the flow rate required is less than the minimum flow rate, the equipment must be equipped with a by-pass system in order to guarantee the return of excess liquid from the discharge pipe (before the gate valve) to the suction reservoir.

3.0 TRANSPORT AND STORAGE

3.1 PACKING

The packaging structure and materials are chosen according to shape, dimensions and weight of the good to be shipped.

The following procedure should be followed on receipt of the goods:

1. Check that the contents correspond with that specified on the transport document and your order.
2. Check whether the packaging shows any sign of damage that may have occurred during transport.
3. Carefully remove the contents from the packaging.

NOTE: If the pump unit has been damaged during transport, save the packaging and notify the forwarder immediately. Furthermore, contact the manufacturer to check product functionality.

3.2 TRANSPORT, HANDLING AND HOISTING

Great care must be taken with transport as it is a delicate operation and very important for the correct operation of the pump unit.


Loading and unloading of the goods must be performed taking into account the shape, weight and nature of the packaging.


Hoisting should be done without putting any stress on the pump's most fragile parts (plastic parts and connections). The packed pump unit should be set down gently and without knocking it and it must be fixed and supported so that it does not move from its original position and is not exposed to strong vibrations during transport.


Unloading at the customer's premises must be performed with the same precautions taken for loading.


Instructions for transport, handling and hoisting are given here below:

- Before handling, check the weight, size and centre of gravity of the component (provided on request) to be handled (see table 3.2.1).
- If the pump unit needs to be moved after it has been installed, make sure that the pump has been drained (if drainage hole is provided).
- Always hoist the pump horizontally, never vertically.
- The ropes or slings must not create an angle greater than 90°.

 Never pass below a hoisted load.

 Use oversized lifting gears appropriate for the total weight to be transported.

 For loads greater than the manual handling (including spare parts) use a suitable, type-tested hoisting system that is in good condition connected to rings, eyebolts, holes or threaded terminals of the part to lift. Goods must only be handled by suitably trained personnel, according to the relevant regulations in force.

 Safety systems and protective equipment such as gloves, helmets and safety shoes must be used to protect personnel during goods handling.

Model	Motor frame	Weight of components in Kg			
		Pump weight (without motor)	Baseplate weight	Motor weight (2 poles)	Motor weight (4 poles)
25-100	80M	5	1,5	12,5	12,5
	90S	6		13	-
25-125	80M	7	1,5	12,5	12,5
	90S	8		13	13
	90L	9		14	-

32-125	90S	8	1,5	-	13	
	90L	9		-	14	
	100L	10	1,75	25	25	
	112M	11		28	-	
	132S	13	2	45	-	
40-130	90S	8	1,5	-	13	
	90L	9		-	14	
	100L	10	1,75	25	25	
	112M	11		28	-	
		132S	13	2	45	-
	132M	15	55		-	
40-160	90S	8	1,5	-	13	
	90L	9		-	14	
	100L	10	1,75	-	25	
	112M	11		28	28	
		132S	13	2	45	45
		132M	15		55	-
	160M	20	3	120	-	
50-160	90S	8	1,5	-	13	
	90L	9		-	14	
	100L	10	1,75	-	25	
	112M	11		-	28	
		132S	13	2	45	45
		132M	15		55	-
	160M	20	3	120	-	

TABLE 3.2.1: pump, motor and baseplate masses. The values given are approximate.


3.3 INSPECTION


A thorough inspection should be conducted on arrival of the goods. The manufacturer is not responsible for damages to the pump components during the transport. In case damages occurred during transport, the responsible forwarding agent should be contacted.

NOTE: For safety reasons some components or accessories may be contained within the main package but packaged separately. Inspect the inside of the case after removing the pump unit.

3.4 STORAGE

Dispatched pump unit normally expected to be installed within a brief period of time. If a longer period of storage will be necessary, make sure that the place where the pump unit will be stored is dry, clean, far from sources of vibrations, radiations and inflammable or explosive materials and not exposed to the sun or heat sources to prevent any damage occurring before the equipment is installed.

 **CAUTION** The stored pump unit must be protected against humidity and dirt and should not be accessible to unauthorized personnel.

 The pump stored after use should not contain any liquid or solid particles. The pump should be internally washed and the fluid drained before storage.


Below general instructions that should be followed:

- Store the pump unit indoors in a package. If the pump unit will be stored outdoors, the packaging must be waterproof and prevent the infiltration of humidity.
- Place the stored pump unit horizontally and cover it with a waterproof canvas.
- Place all equipment upon skids or block to prevent contact with ground or

- surfaces contaminants and support them to prevent distortion or bending.
- Do not place heavy objects on the packaged products.
- Protect the stored pump unit from splashes or corrosive substances.
- Maintain the temperature in the storage area from +5 °C to +35°C. The storage temperature must always be above the freezing point.
- During storage, once a week, rotate the shaft head manually for at least 5 turns in the direction of rotation (via the fan of the motor) to prevent the contact faces from seizing up due to friction.
- Do not remove the end plugs on the ports of the pump until ready to install the equipment.
- Clean the pump thoroughly before install it on the plant, eliminating any foreign bodies that could compromise its correct operation.

 The motor should be storage according to the manufacturer's instructions.

NOTE: The storage instructions must be also applied to the auxiliary components and spare parts.

 After a long period of storage elastomeric elements could lose its elastic properties. In this case replace them with new parts.

NOTE: On the user request, after a long period of storage or before the installation a manufacturer's representative could be employed to conduct a priced inspection.

NOTE: The manufacturer does not accept any liability for defects due to incorrect storage.

4.0 INSTALLATION

Read this manual carefully before installation. Personnel performing the installation must be aware of all of the information contained herein. Failure to follow these instructions could cause serious damage to the pump unit, which would no longer be covered by the warranty.

4.1 LOCATION OF THE PUMP UNIT

 The follow operations must only be performed by specialized and trained staff.

The pump unit has to be installed in the best possible position to ensure:


- Easy installation of the suction and discharge pipes.
- Easy access for inspection during normal duty or for maintenance work.
- Proximity to the suction tank or reservoir.
- NPSH available 1 meter greater than NPSH required.

NOTE: The ambient temperature should be between +5 and +35 °C and the humidity should not be higher than 85% RH.

NOTE: The place of installation must always be clean, well-ventilated and sufficiently lit (with natural or artificial lighting according to 89/654/EEC).

 The pump unit should not be installed in earthquake or fire risk areas.

 The pump unit installed outdoors should be protected from rain by a roof.

 Sufficient safety distance must be kept between the pump unit and any passing people. To ensure the safety of the operator or any other interested party the positioning of the pump should be performed taking into consideration possible ruptures of the parts or leakages or splashes of corrosive liquid under pressure.

 Before installing the pump unit, make sure that the switch is in

the "zero" position (OFF) and disconnect the cables from the power supply to avoid the accidental operation of rotating parts.

NOTE: Install the pump horizontally with the discharge port on the top.

NOTE: If the pump unit is installed in a raised position, take any measures necessary to prevent it or any of its parts from falling over or down whilst in operation. The pump unit must be securely fastened to a firm baseplate. In addition, the installation place should be provided of facilities allowing the secure access to the pump unit during installation and maintenance works.

4.2 SUPPORT BASEPLATE AND FOUNDATIONS

The support baseplate must be made using suitable materials to guarantee the stability of the support and its surrounding area. Foundations in reinforced concrete laid on solid ground are highly recommended. The baseplate must be positioned horizontally, checked using a spirit level and fixed using SS 316 stainless anchor bolts. In case of misalignment between the pump unit and pipes is recommended to use metal shims (SS 316) or regulation system (if provided) to even out any differences found when making the connection.

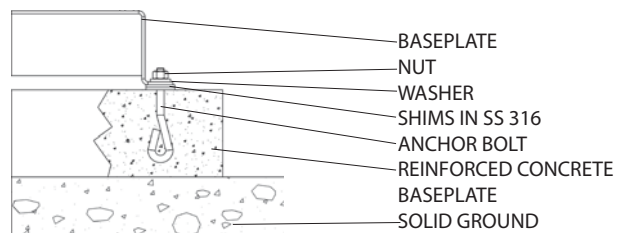




ILLUSTRATION 4.2.1: Example of support baseplate and foundation.

 Before putting the pump unit into position, check that the foundation is clean, level and solid, after which carefully rest the baseplate on the foundation so as to prevent misalignment of the pump axis.

 The walking surfaces should be non-slip material.

NOTE: The area of the foundations must be greater than the baseplate of the pump.

NOTE: In the area below the pump should be arranged (if not supplied by the manufacturer) a chemically resistant container and a drip-pan for the collection of any losses of the pumped liquid. The container must be suitably connected to a drainage system and emptied before reaching its maximum capacity. These operations must be performed taking into account the safety factors to avoid any contact with the pumped liquid.

4.3 PIPING

The design of the piping system has a direct effect on the operation of the centrifugal pump. Due consideration must be given to the size of the suction reservoir and both the suction and discharge piping.

NOTE: Check that the pump unit is insulated from any external source of vibration. If the pump unit is subject to vibration provide anti-vibration mount.

NOTE: Suction and discharge flanges require O-rings in chemically resistant material.

 Always check the chemical resistance of the seals to the pumped liquid.

The suction and discharge pipes, connected to the inlets and outlets of the pump, should not produce excessive or disproportionate loads. Excessively high forces and moments transmitted by the pipes may cause damage to the pump. Suction and discharge piping should be well supported and firmly fastened in place. This operation is essential and compulsory for ensuring correct operation of the pump.

The maximum allowable forces and moments to the pump connections are given below (see table 4.3.1 and 4.3.2). Higher values should not be applied to the pump.

Forces (N) and Moments (N-m) on suction branch								
DN	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
40	41	38	47	73	45	53	65	95
50	56	51	62	97	50	58	70	103
65	69	63	78	123	55	60	75	110

TABLE 4.3.1: Forces (N) and Moments (N-m) on suction branch.

NOTE 1: All values of forces and moments are given for the basic material (Polypropylene) and for temperature of 20°C applied to pump unit provided by Affetti and firmly anchored to a solid ground. For different conditions contact the manufacturer.

NOTE 2: ΣF and ΣM are the vector sums of the forces and moments.

Forces (N) and Moments (N-m) on discharge branch								
DN	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
25	32	26	28	49	30	35	45	75
32	39	32	34	62	38	43	55	80
40	47	38	41	73	45	53	65	95
50	62	51	56	97	50	58	70	103

TABLE 4.3.2: Forces (N) and Moments (N-m) on discharge branch.

NOTE 1: All values of forces and moments are given for the basic material (Polypropylene) and for temperature of 20°C applied to pump unit provided by Affetti and firmly anchored to a solid ground. For different conditions contact the manufacturer.

NOTE 2: ΣF and ΣM are the vector sums of the forces and moments.

NOTE:

The pump must not be used to support the piping.



It must always be checked the parallelism between the pipe and the pump flanges. Incorrect positioning of these parts could cause forced unnatural alignment of the various manifolds connected, which could subsequently cause leaks from the gaskets or even cracks in some sections of piping.

4.4 SUCTION PIPING

Sizing of the suction piping is very important. Many problems connected with the operation of centrifugal pumps are caused by incorrect suction conditions.

NOTE:

Size the suction piping taking into account the NPSH required by the pump so that it is at least 1m lower than the plant's NPSH available.

Follow the general instructions given below:

- The suction piping should be as short and straight as possible and should have an ascending gradient of 1% toward the pump in suction conditions or descending gradient of 1% toward the pump in flooded conditions.
- Support the piping using brackets built with or coated in material resistant to contact with the liquid and vapours.
- The diameter of the suction pipe must be selected so that a flow velocity of 2,5 m/s of water is not exceeded. In case the diameter of the suction pipe is greater than the suction port install an eccentric reducer before the pump.
- In suction conditions determinate the maximum suction height from the lowest liquid level in the suction tank. Take also into account the viscosity, degree of encrustation and temperature of the liquid.
- Avoid elbows, bottlenecks, sudden reductions or obstructions of any kind. Install only wide radius bends.
- Never fit an elbow directly to the suction port of the pump.
- Avoid any high spots that could create air pockets in the suction pipe.
- Install a gate valve in case of flooded condition of the pump. Maintain the gate valve fully open during the operation. Close it only in case of inspection of the pump.
- Avoid any air infiltration in the suction pipe set carefully the joints between the connections.
- Install a strainer at the end of the suction pipe to prevent foreign matter infiltration in case solid particles are in the liquid. The strainer must be

periodically cleaned to prevent restriction.

- Maintain the end of the filling and suction pipes in the suction tank always submerged (see plant recommendations on pages 12-14).
- Maintain a minimum distance between the end of suction pipe and the bottom of the suction tank (see plant recommendations on pages 12-14). The distance must be more than 0,5 meter in case of solids particles or mud are on the bottom of the tank.
- Fit a baffle walls into the suction tank to prevent infiltrations or vortices in the suction piping.
- Monitor the minimum level of liquid contained in the priming tank (if provided), preferably using a level probe connected to a solenoid valve for filling up any liquid shortages in the suction tank.
- Install the recommended fittings according to the paragraph 4.8.
- Fit the recommended instrumentations according to the paragraph 4.9.

4.5 DISCHARGE PIPING

A check valve and gate valve should be fitted on the discharge piping, together with performance and temperature monitoring instrumentation.

Follow the general instructions given below:

- Support the piping using brackets built with or coated in material resistant to contact with the liquid and vapours.
- Design the discharge pipe calculating the friction losses. Take also into account the viscosity, degree of encrustation and temperature of the liquid.
- The diameter of the discharge pipe must be selected so that a flow velocity of 5 m/s of water is not exceeded. Install an eccentric expansion after the pump if the diameter of the discharge pipe is greater than the discharge port.
- Avoid elbows, bottlenecks, sudden reductions or obstructions of any kind. Install only wide radius bends.
- Never fit an elbow directly to the discharge port of the pump.
- Avoid any high spots that could create air pockets in the discharge pipe.
- Install an air vent piping between the pump and the check valve. The end of the pipe should be open to the atmosphere.
- Fit a drainage line if the liquid might freeze and drain the liquid before each stoppage.
- Install a flushing system to flush the pump before maintenance works.
- Install the recommended fittings according to the paragraph 4.8.
- Fit the recommended instrumentations according to the paragraph 4.9.

4.6 FILLING PIPING

The filling system is used to fill the suction pipe and the pump in suction conditions with the required amount of liquid before the start-up. The filling system should have a gate valve to isolate the pump and a strainer before the filling port (see plant recommendations on pages 12-14).



The gate valve should be always maintained closed during the operation.

NOTE:

The strainer should be cleaned periodically.



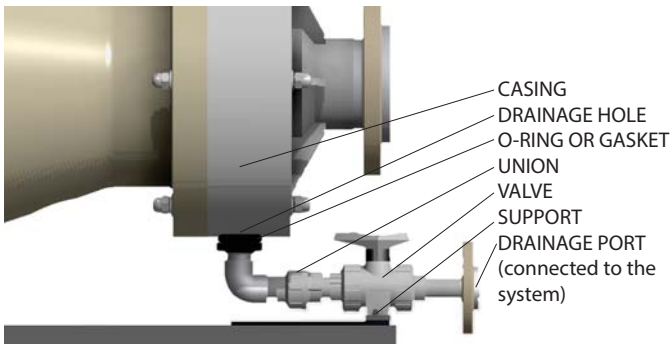
Fluid leakages may occur during routine cleaning or replacement of the filter. These operations must be carried out when the pump is not in operation and using appropriate safety equipment.

4.7 DRAINAGE PIPING


The manufacturer provides on request a threaded drainage hole on the lowest area of the casing, with a gaskets and a plug. Belong to the user the responsibility to connect a drainage system to the casing. The drainage system (not provided by the manufacturer) should be used to evacuate the liquid from the casing (after the shutdown) or the drip-pan of the baseplate (in case of leakages) to a chemically resistant reservoir.


The drainage system should be connected to the casing and should have a gate valve to isolate the pump (see illustration below or in the plant recommendations on page 12-14).

The same recommendations should be followed for the drip-pan of the base.



NOTE: The drainage hole on the casing and the drip-pan in the baseplate are provided on request.

 The drainage piping and fittings should be made of the same material of the threaded connection.


 The gate valve should be always maintained closed during the operation.

4.8 FITTINGS

To guarantee correct operation in safety conditions the piping should be equipped with the below fittings:

Recommended fittings		
Fitting	Use	Location
Bracket	To support the pipe.	All piping lines.
Strainer	To reduce the quantity of solid particles.	At the end of the suction pipe.
Eccentric reducer	To avoid air pockets.	Before the suction port.
Gate valve	To isolate the pump in case of inspection.	In the suction line.
Flow conditioner	To minimize swirl and turbulence.	In the suction piping, after the gate valve and at least 5DN far from the suction port.
Strainer	To reduce the quantity of solid particles.	After the gate valve and before the filling port.
Gate valve	To isolate the pump during the operation.	In the filling line.
Gate valve	To isolate the pump in case of inspection.	In the drainage line.
Eccentric expansion	To avoid air pockets.	After the discharge port.
Check valve	To protect the pump from water hammer and to avoid the emptying of the discharge pipe after shutdown.	In the discharge line between the pump and the gate valve.
Gate valve	To regulate the pump performance.	After the check valve.
Gate valve	To exclude the air during the priming process.	In the air vent piping.

TABLE 4.8.1: Recommended fittings in the piping.

 Carefully follow the manufacturer's use and installation instructions for all of the fittings.


NOTE: In order to reduce the pressure losses, the internal diameter of fittings and piping should be the same.

4.9 CONTROL INSTRUMENTS

To guarantee correct operation the piping should be equipped with the below instruments:

Recommended instrumentation		
Instrument	Use	Location
Minimum level probe	To verify the reaching of the minimum level of liquid.	Into the suction tank.
Vacuum gauge	To verify the suction pressure in the suction pipe.	Twice the diameter of the suction port far from the pump.
Thermometer	To check the temperature of the liquid.	In the suction line.
Thermometer	To check the temperature of the liquid.	In the discharge line.
Pressure gauge	To measure the operating pressure.	Twice the diameter of the discharge port far from the pump and before the check valve.
Flow meter	To measure the operating flow.	After the gate valve in discharge line.
Load monitor	To prevent dry running.	Connected to the motor.
Switch (ON/OFF)	To start and stop the pump.	Control panel.
Emergency switch	To stop the operation of the pump in case of failure.	Control panel.
Wattmeter or Ampere-meter	To monitor power absorption.	Control panel.

TABLE 4.9.1: Recommended control instruments in the piping.

 Carefully follow the manufacturer's use and installation instructions for all of the auxiliary control instruments.


4.10 FINAL CHECK

1. Check that the bolts has been tightened correctly .
2. Check that the end caps have been removed from the suction and discharge flanges of the pump.
3. Check the parallelism between the flanges of the pipe and flanges of the pump.
4. Check the suction and discharge flanges has been tightened correctly.

4.11 CONNECTION OF THE ELECTRIC MOTOR

 **DANGER** All electrical connections must be made by a qualified electrician in accordance with EN 60204-1. National or local regulations in force must be observed.

NOTE: An alarm system (visual or audio) must be fitted to warn the user in the event of a possible fault connected with the power supply or electric motor.

 **CAUTION** Avoid any electrical, hydraulic or mechanical overloading. Operations to be performed before starting the equipment:

- Check that the motor has been connected in compliance with the manufacturer's instructions.
- Check that the earthing connection complies with local regulations.
- Check the tag plate on the motor to ensure that the power supply is correct.
- Check the electric motor has been installed at room temperature, avoiding damp and dusty environments.
- Check the bottom part of the motor is sufficiently free, in proportion to the size of the motor to ensure free air circulation, essential for cooling.
- Install a switch (ON/OFF) and an emergency switch according to the regulation in force.
- Install a soft-start or inverter for motors larger than 11 kW.



If the pump is installed outdoor, waterproof the wiring to protect the electrical connections from rainwater.

Three phase motors can be connected “Star” or “Delta”. Star connection is obtained by connecting together the terminals W2, U2, V2 and supplying the terminals U1, V1, W1. Delta connection is obtained by connecting the end of a phase with the beginning of the following one.

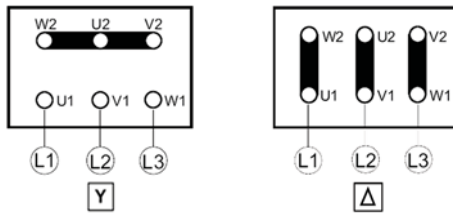


ILLUSTRATION 4.11.1: Electrical connections of the motor.

4.12 CONNECTION OF THE INTERNAL COMBUSTION ENGINE

The user manual for the combustion engine is supplied with the pump. If the engine manual has not been provided, contact the manufacturer immediately. The user should read the instructions carefully and get to know the operations described. By not doing so he may place at risk his own health and safety and that of anyone else in the vicinity of the pump unit.



The responsibility to provide protections for the hot parts of the pump unit belong to the user.

Some important instructions are given here below:

- The fuel to be used is DIESEL. Never use other liquids or fuels.
- Before starting the engine check the level of the oil and the cooling liquid in the radiator.
- Check that the internal combustion engine rotates in the same direction as the pump.
- Every 350 working hours, check that the bolts for the pump are tight.

Some important instructions related to safety are given here below:

- The engine may be used or mounted on a pump unit only by personnel suitably trained in its operation and aware of the dangers involved. This is particularly true for standard and, above all, special maintenance work. For special maintenance contact personnel trained specifically by the manufacturer.
- The manufacturer declines all responsibility for accidents or for failure to comply with the requirements of law if changes are made to the engine's functional parameters or to the fuel flow rate adjustments and speed of rotation, if seals are removed, or if parts not described in the operating and maintenance manual are removed and reassembled by unauthorized personnel.
- Do not start the pump unit in closed or poorly ventilated environments. The internal combustion process generates carbon monoxide, an odourless and highly toxic gas, so spending too long a time in an environment where the engine discharges its exhaust products freely can lead to loss of consciousness and even death.
- The engine may not be used in environments containing flammable materials, explosive atmospheres or easily combustible powders.
- To prevent the risk of fire, keep the machine at a distance of at least one metre from buildings or other machines.
- Fuel is flammable, so the tank must be filled only when the engine is turned off. Dry carefully any fuel that may have spilled, remove the fuel container and any cloths soaked in fuel or oil, check that any sound-absorbing panels made of porous material are not soaked with fuel or oil, and make sure that the ground on which the machine is located has not absorbed fuel or oil.
- Before starting, remove any tools that have been used for carrying out maintenance work to the engine and/or the pump unit and check that any guards removed have been replaced. In cold climates it is possible to mix kerosene with the diesel fuel to make the engine easier to start. The liquids must be mixed in the tank by pouring in first the kerosene and

then the diesel fuel. Consult the manufacturer technical office for mixture proportions. Petrol may not be used because of the risk of it forming flammable vapours.

- During operation the surface of the engine reaches temperatures that may be dangerous. Avoid in particular all contact with the exhaust system.
- Before carrying out any work on the engine, turn it off and allow it to cool down. Do not perform any operation while the engine is running.
- The liquid cooling circuit is under pressure. Do not carry out any checks before the engine has cooled down, and even then open the radiator cap or the expansion tank cautiously. Wear protective clothing and glasses. If there is an electric fan, do not approach the engine while it is still hot as the fan may come on even when the engine is not running. Clean the cooling system with the engine turned off.
- While cleaning the oil bath air filter, check that the oil is disposed of in such a way as not to harm the environment. Any filtering sponges in the oil bath air filter should not be soaked with oil. The cyclone pre-filter cup must not be filled with oil.
- Since the oil must be emptied out while the engine is still hot (approx. 80°C), particular care should be taken in order to avoid burns. In any case make sure that oil does not come into contact with your skin because of the health hazards involved.
- Check that the discharged oil, the oil filter and the oil contained in the oil filter are disposed of in such a way as not to harm the environment.
- Close the fuel tank filler cap carefully after each filling operation. Do not fill the tank right up to the top, but leave sufficient space to allow for any expansion of the fuel.
- Fuel vapours are highly toxic, so fill up only in the open air or in well ventilated environments.
- Do not smoke or use naked flames while filling.
- Take care when removing the oil filter as it may be hot.
- The operations of checking, filling up and replacing the cooling liquid must be carried out with the engine turned off and cold. Take particular care if liquids containing nitrites are mixed with others not containing these compounds as this may give rise to the formation of nitrosamines which are a health hazard. The cooling liquid is polluting, so dispose of in a manner that does not damage the environment.
- During operations which involve access to moving parts of the engine and/or removal of the rotary guards, disconnect and insulate the positive cable of the battery so as to prevent accidental short circuits and activation of the starter motor.
- Check the belt tension only when the engine is turned off.
- In order to move the engine simultaneously use the eyebolts fitted for this purpose by the manufacturer. These lifting points are however not suitable for the entire pump unit, so in this case use the eyebolts fitted by the manufacturer.
- To prevent accidental starting remove the ignition key of the engine after the shut-off of the pump.



All of the safety instructions are contained in the engine user manual.

4.12.1 Starting the engine

Insert the ignition key, turning it partially to the right until the LEDs switch on. When the yellow LED switches off, turn the key further to the right until the engine starts. Allow the engine to idle for at least 15 min, keeping the accelerator lever fully to the right then, very gradually, move the lever to the left until the required performance is reached and secure it there by tightening the knob on the control support. If the pump's flow rate and head values correspond to the engine's maximum rpm, secure the lever in position using the safety pin.

4.12.2 Removing the engine's hood



To protect the health of the maintenance operator, the hood should only be removed when the engine is switched off and cold.















The removal procedure is as follows:

1. If there is an outside pipe connected to the end of the silencer, remove it.
2. Unhook the hooks on the side of the hood.
3. Attach slings to the ringbolt in the upper part of the hood.
4. Lift the hood vertically.

4.13 EXAMPLES OF INSTALLATION

The following is a list of fittings, instruments or indications to be applied in the plant as shown in the examples on pages 12-14.

NOTE: The warning symbol  indicates the equipment and fittings needed for safety requirements.

No.	Description
DN	The diameter of the port of the pump.
DN1	The diameter of the pipe.
A	The minimum distance between the end of suction pipe and the bottom of the reservoir.
B	The minimum submergence of liquid of the suction pipe into the reservoir
C	The minimum distance between the pipes and the walls of the reservoir.
E	The minimum distance between the suction pipe and the filling pipe in the reservoir.
01	SUCTION PIPE conveys liquid to the pump. In suction conditions, it should be as short and straight as possible and have an ascending gradient of 1% toward the pump while in flooded conditions it should have a descending gradient of 1% toward the pump. The flow velocity should not be higher than 2,5 m/s.
02	 BRACKET supports the piping preventing excessive loads on the branches of the pump. It should be built with or coated in material resistant to contact with the liquid and vapours.
03	 DRAINAGE PIPE conveys the liquid evacuated from the pump to the reservoir. The end of the pipe should be open to the atmosphere. It is required a gate valve.
04	BY-PASS ensures the pump's minimum flow rate is maintained. It conveys liquid to the reservoir or the suction piping.
05	SUBMERGED TERMINAL is required for the suction pipe and filling pipe in the suction tank or reservoir to prevent the formation of vortices in the piping.
06	WIDE RADIUS BEND has lower pressure losses compared with tight radius bends and prevents the formation of air pockets.
07	 GATE VALVE isolates the pump from the piping.
08	STRAINER reduces the concentration of solid particles in the liquid pumped.
09	DRAINAGE PORT is the terminal of the pump that allows the drainage of liquid (provided on request).
10	FOOT VALVE makes it possible to operate in suction conditions.
11	ECCENTRIC REDUCER prevents the formation of air pockets.
12	VACUUM GAUGE measures the suction pressure.
13	SUCTION PORT is the terminal of the pump that allows entry of the liquid into the casing. It is connected to the suction piping.
14	FILLING PORT is the terminal in the discharge piping that allows the liquid filling of the pump and suction piping.
15	DISCHARGE PORT is the terminal of the pump that allows the exit of the liquid. It is connected to the discharge piping.
16	DISCHARGE PIPE conveys the pumped liquid to a reservoir. The flow velocity should not be higher than 5 m/s.
17	ECCENTRIC EXPANSION prevents the formation of air pockets.
18	PRESSURE GAUGE allows to check the working pressure.
19	 CHECK VALVE protects the pump from water hammer and avoids the emptying of the discharge pipe after shutdown.
20	GATE VALVE (on the discharge pipe) permits to regulate the performance of the pump.
21	FLOW METER allows to check the amount of liquid.
22	FILLING PIPE conveys the liquid to the suction tank or reservoir.
23	 REINFORCED CONCRETE BASEPLATE is required to guarantee stability to the pump.
24	 SOLID GROUND is required to guarantee stability to the pump.
25	 DRIP-PAN is required to collect leakages of liquid from the pump.
26	 LOAD MONITOR is used to prevent the dry running of the pump.
27	 BAFFLE WALL prevents air or vortices from entering in the suction pipe.
28	 LEVEL PROBE is used to monitor the minimum level of liquid.
29	PLUG FOR PROBE is used to apply an external level probe.
30	SOLENOID VALVE is used for filling the self-priming tank.
31	PLUG FOR PROBE is provided for the use of an internal level probe and monitoring the minimum and maximum levels in the tank.
32	MMB-E PUMP transfers the liquid from a reservoir to another.
33	SELF-PRIMING TANK (provided on request) permits to operate above the level of the liquid inside the suction reservoir.
34	FLOW CONDITIONER minimizes swirl and turbulence in the suction piping.
35	VENT, installed on highest point, allows the evacuation of the air or gas inside the piping or self-priming tank.
36	 POWER SWITCH (ON/OFF) starts or stops the pump without activating or interrupting the other functions of the plant or other machinery.
37	 EMERGENCY SWITCH, installed closed to the machinery, stops the operation of the pump in case of failure. It should be used ONLY if the discharge pipe includes a non-return device. It should be in accordance with the requirements of EN ISO 13850.
38	 WATTMETER/ AMPERE-METER monitors power absorption.
39	 ALARM SYSTEM warns the user in case of fault of power supply or electric motor, absence of liquid in the suction piping or fault of auxiliary flushing.

GENERAL NOTES:

1. The sketches are illustrative. The recommendations refer to a general installation and some information may be missing.
2. All information shown are to be considered useful for the proper functioning of the pump and not for the plant.
3. Information contained in these sketches are deemed reliable. The manufacturer shall not be held responsible in the event that, despite their efforts to supply exhaustive and consistent information, the contents prove to be insufficient. The purchaser/user must check the information contained in this sketch.
4. Unless otherwise indicated the number of fittings (including brackets) and instruments and their position in the sketches are illustrative.

4.13.1 Installation in suction conditions

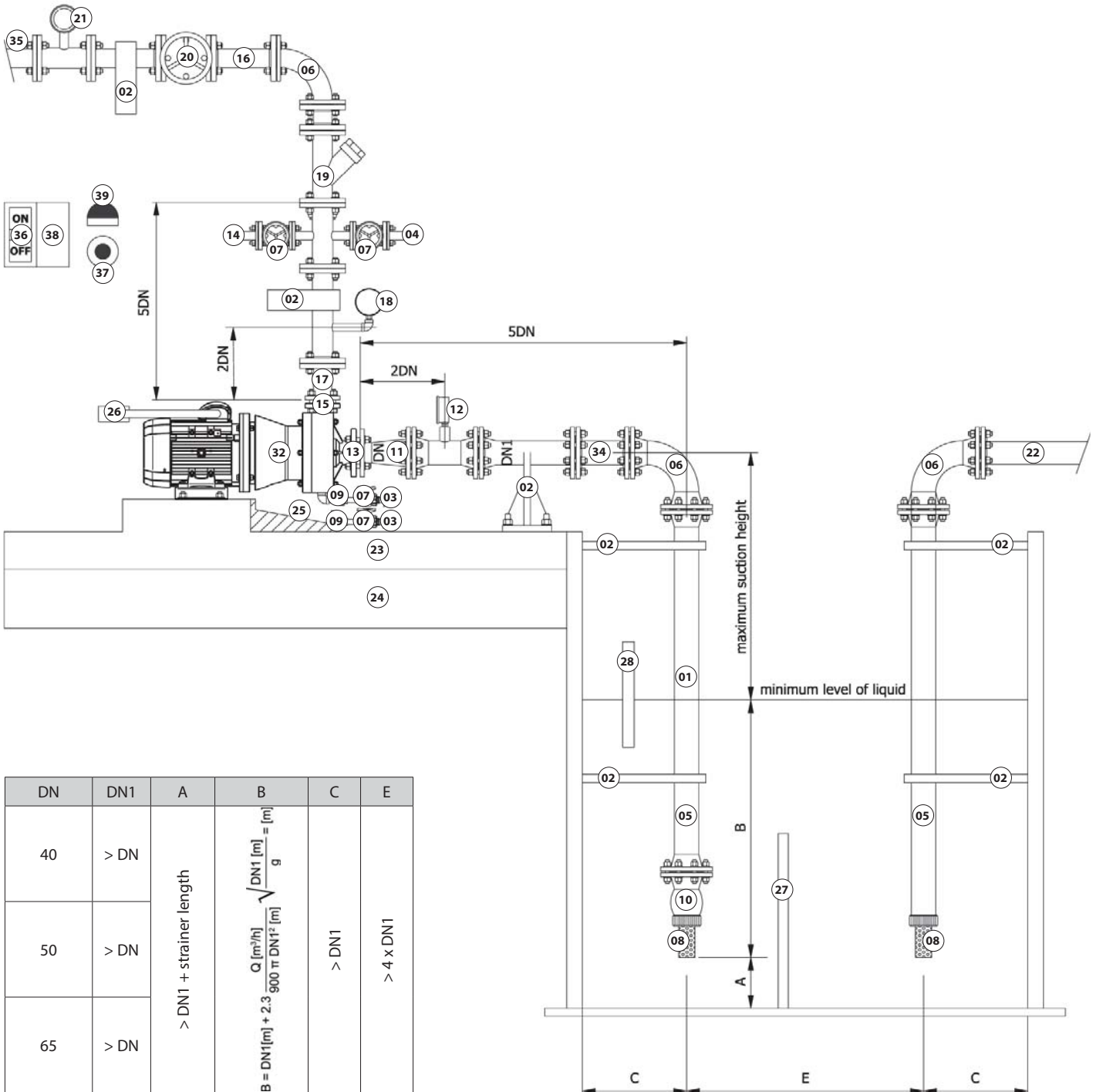
NOTE: The installation in suction conditions must be authorized by the manufacturer.

Never increase the suction heights without the approval of the manufacturer. Maintain the same suction heights or lower than declared on the Order Confirmation or data sheet.

Suction and discharge piping must be tested hydraulically in accordance with the safety regulations before installing the pump.

The suction piping must be resistant to vacuum conditions.

The emergency switch should be used ONLY if the discharge pipe includes a non-return device.



4.13.2 Installation in suction conditions with self priming tank.

NOTE: The installation of self-priming tank must be authorized by the manufacturer.

NOTE: It is recommended to use a common base for the pump and the self-priming tank.

! Never increase the suction heights without the approval of the manufacturer. Maintain the same suction heights or lower than declared on the Order Confirmation or data sheet.

! Suction and discharge piping must be tested hydraulically in accordance with the safety regulations before installing the pump.

! Never reduce the capacity of the self-priming tank.

! Fill the self-priming tank until reaching the maximum level of liquid before starting the pump.

! Monitor the minimum level of liquid in the self-priming tank during the operation.

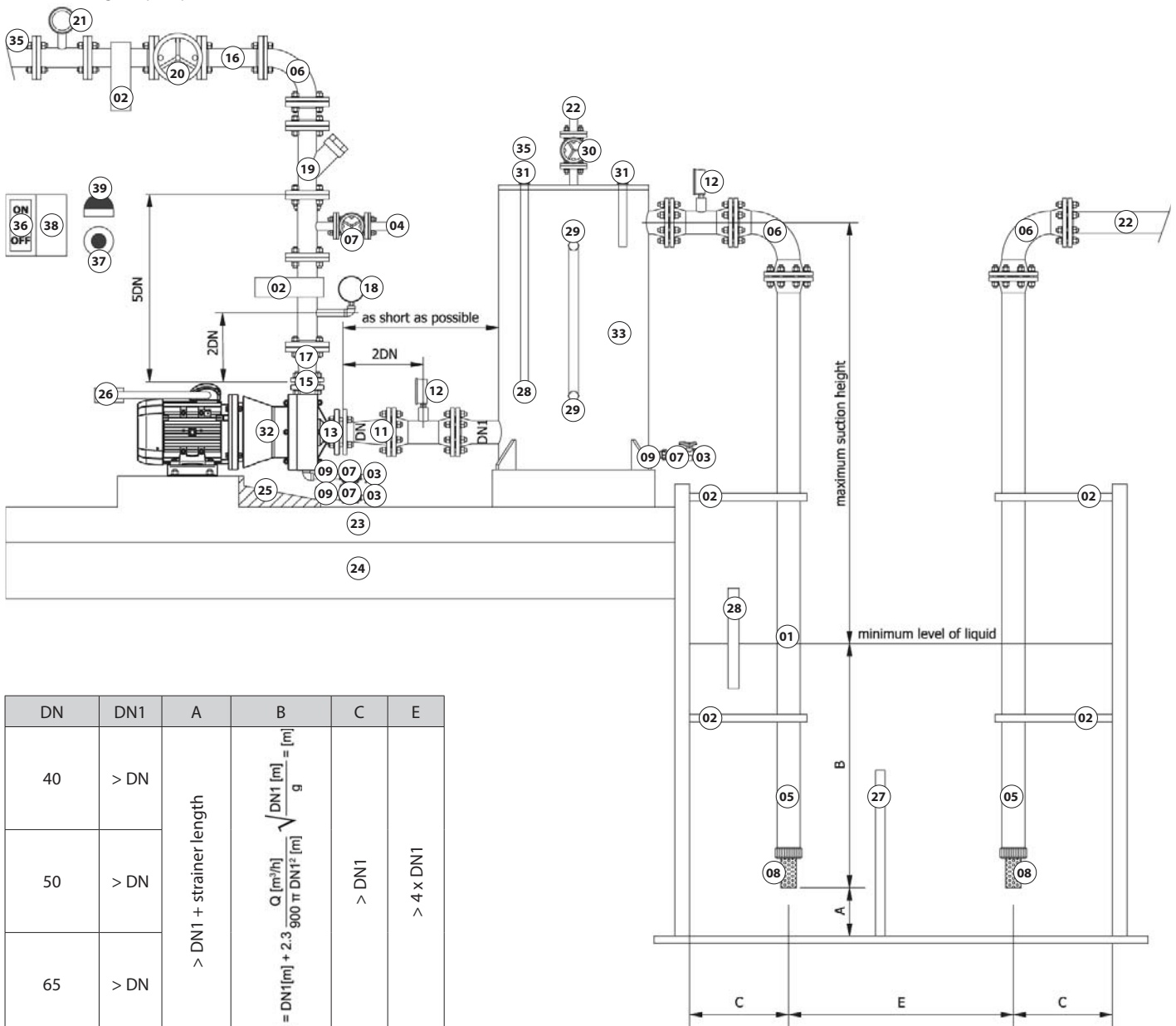
! The solenoid valve should be connected to the probes inside self-priming tank and should be open when the liquid reaches the minimum level and closed when the self-priming tank is full (even during the operation).

! Check the vacuum pressure in the suction piping is not higher than vacuum resistance of the self-priming tank.

! The suction piping must be resistant to vacuum conditions.

! Forces and moments should not be applied to the nozzle of the self priming tank. Use brackets.

! The emergency switch should be used ONLY if the discharge pipe includes a non-return device.



DN	DN1	A	B	C	E
40	> DN	> DN1 + strainer length	$B = DN1[m] + 2.3 \frac{Q [m^3/h]}{900 \pi DN1^2 [m]} \sqrt{\frac{DN1 [m]}{g}}$	> DN1	> 4 x DN1
50	> DN				
65	> DN				

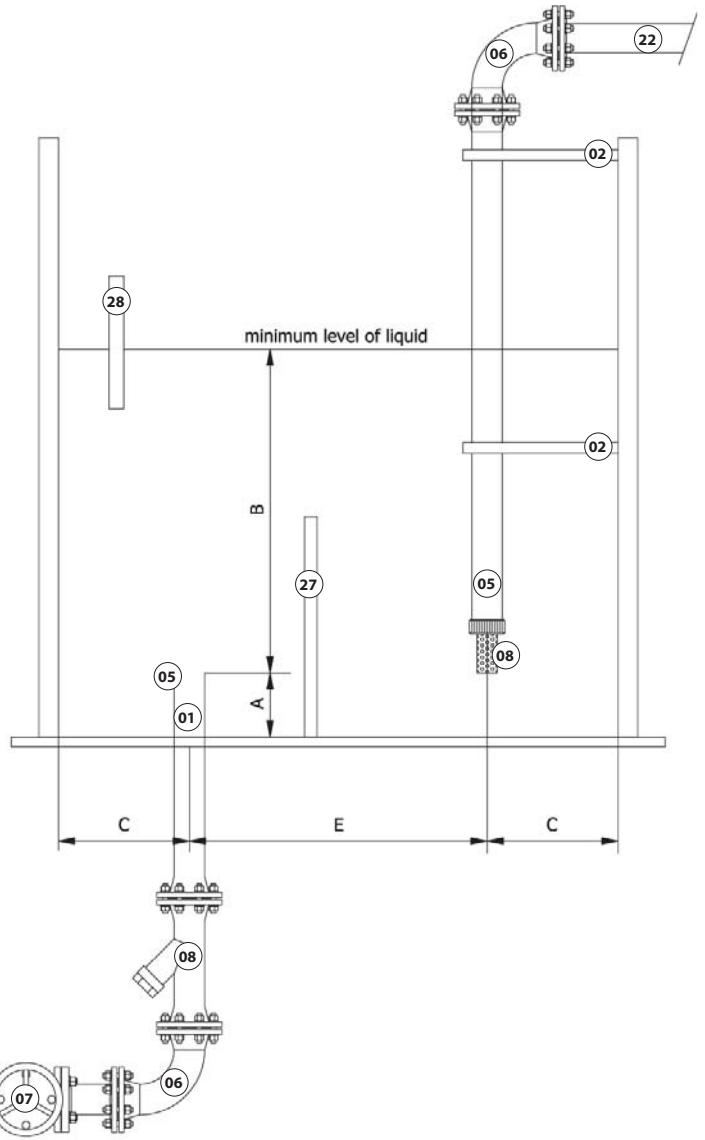
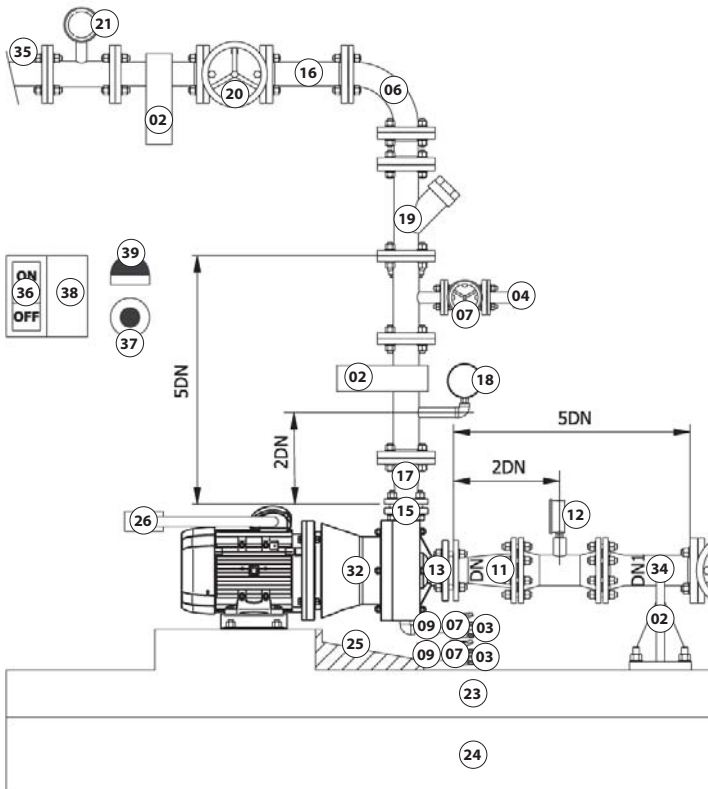
4.13.3 Installation in flooded conditions.

! Suction and discharge piping must be tested hydraulically in accordance with the safety regulations before installing the pump.

NOTE: The minimum distance between the pump and gate valve in the suction pipe should be not less than 5 times the diameter of the suction port.

NOTE: The minimum length of the straight suction pipe should be not less than 10 times the diameter of the suction port.

! The emergency switch should be used ONLY if the discharge pipe includes a non-return device.



DN	DN1	A	B	C	E
40	> DN	> DN1 + strainer length	$B = DN1[m] + 2.3 \frac{Q [m^3/h]}{900 \pi DN1^2 [m]} \sqrt{\frac{DN1 [m]}{g}}$	> DN1	> 4 x DN1
50	> DN				
65	> DN				

5.0 OPERATION



The operators should be equipped with appropriate equipment during all operations of this chapter. Rubber boots, anti-acid overalls and a helmet with a protective visor for the face are essential requirements to allow operators to work without risking their physical safety. It is strictly prohibited to insert fingers or other parts of the body into the orifices and various openings. The pump unit is equipped with moving parts. The follow operations must be performed by skilled staff.

5.1 DIRECTION OF ROTATION

The direction of rotation should be checked before the start-up. The direction of rotation is indicated, in permanent form, on the pump unit; clockwise looking from the motor to the pump.



To ensure the correct direction of rotation is essential to use a phase-meter in order to identify the phases and the colours of the cables.



The pump should never run in the reverse direction of rotation.



The arrows indicating the direction of rotation should always be clean and visible.

5.2 PRELIMINARY PUMP TESTING

Before the start-up, manually rotate the pump shaft in the direction of rotation by the fan of the motor to make sure that it rotates freely and is free of friction or obstructions. The operation must be performed with electric cables disconnected from the terminal board.

5.3 PRELIMINARY MOTOR TESTING

Check all of the electrical connections (see paragraph 4.11) and the direction of rotation (see paragraph 5.1) before the start-up of the pump.

5.4 START-UP

Before starting the pump the following steps should be performed:

1. Check the direction of rotation of the motor (refer to the arrow marked on the pump unit).
2. Check that the suction and discharge pipes and gaskets are connected correctly and that all the bolts are well tightened.
3. Close the drainage valves (if provided).
4. Fully open the gate valve on the suction piping.
5. Check and flush the suction piping to remove any solid or foreign bodies.
6. In suction conditions fill the pump and the suction pipe completely and check that the foot valve is operating correctly.
7. Turn the pump on using the power switch.
8. Open gradually the gate valve in the discharge pipe (start from 10%).
9. Adjust the duty point regulating gradually the gate valve (discharge pipe).
10. Check the absorption values of the pump unit referring to those marked on the tag plate of the motor and make sure that those values (absorbed power in kW or intensity in amperes) are not exceeded.



The pump must never run dry.



Clean the inside of the pump before the start-up procedure of a inactive or repaired unit.



Do not use the suction valve to adjust the flow. The suction valve must always be completely open.



Do not open excessively the discharge valve if it will cause the over-load of the motor. Open the discharge valve according to

the duty point and amperage.



Alternate operation of the pump unit in use with the stand-by unit at weekly intervals.

5.5 OPERATION

Attention should be paid to the following warnings during the pump's operation:

- It is prohibited to work on the pump unit when it is in operation.
- It is prohibited to carry out any work on the motor when connected to the electric power supply.
- Prevent people or things coming into contact with hot parts of the pump unit.
- Make sure that the pump unit does not vibrate and is not excessively noisy (see paragraphs 5.9 - 5.10).



Check during the operation there are not increases in temperature.



The pump unit should never operate with one or some parts damaged. In the event of a fault, turn the pump off and investigate the cause (see paragraph 6.15).



The pump must never run dry.



During the operation check the discharge pressure do not exceed the allowable limit (see paragraph 2.3).



The pump should not operate more than 1 minute with the discharge valve fully closed.



Stop the pump in case of cavitation.

5.6 SHUTDOWN

Close the discharge valve (slowly to prevent water hammer) until reaching the 10% of the flow rate. Turn off the power switch and close completely the discharge valve.



When the pump is stopped without a non-return device on the discharge pipe the liquid will flow through the pump to the suction source.



Start and stop the pump frequently will damage the pump early.



Do not use a solenoid valve to stop the pump unit.



When the ambient temperature falls below freezing point, the liquid tends to crystallize, or in case of storage the pump and the piping must be drained and washed after the shut-off of the pump.



Operation of the inactive pump should be checked on a regular basis.




If the pump remains inactive for a long period of time, rotate the pump shaft (via the fan of the motor) at least 5 turns every week. See paragraph 3.4.


5.7 TEMPERATURES

The working temperature of the pump is indicated in the data sheet and in the order confirmation.



The temperatures limits may vary changing the pumped liquid or its concentration. In order to know the temperature limit for the pumped liquid contact the manufacturer.

 If the operating temperature exceeds 60°C the pump must carry a warning notice to alert personnel working in the area.

 The personnel working close the pump unit must avoid any contact with the hot parts.

5.8 FLOW RANGE

The choice of the type of pump, impeller and motor is made at the time of offer based on data provided by the customer related to flow rate and head. The user should strictly observe the operating conditions mentioned on the data sheet, especially related to the data concerning flow rate, head and the liquid pumped for which the pump was intended. The pump should be used in accordance with the percentages shown in the paragraph 2.4. In the event that the operator needs to use the pump in a different point compared to that shown on the data sheet contact the manufacturer

5.9 VIBRATION LEVEL

Measurement of vibration performed at regular intervals, compared against the values provided by the manufacturer measured during the production test, will highlight any changes in the operating conditions, wear or imbalance of the rotating parts, installation conditions that do not meet the requirements for correct assembly of the pump to the plant or a general state of disrepair of the whole system.

Working condition	Max. vibration level	
	Motor ≤ 5,5 kW	Motor ≤ 15 kW
Normal	3 mm/s	4,5 mm/s

TABLE 5.9.1: Vibration level.

Note: the limits above are for new pump unit provided entirely by the manufacturers and carefully anchored in accordance with the instructions given in this manual. Used pump unit may have values of vibration exceeding the limits.

NOTE: The installation of anti-vibration mounts is recommended.

5.10 NOISE LEVEL


Generally the pump unit does not exceed the 80 dB. However, the noise level could increase due a sum of factors, as the duty point, size of motor, type and material of pipeworks and the structure of the building.

Approximate values are shown below:

Motor nominal power [kW]	Noise level in dB(A)			
	1480 RPM	1780 RPM	2950 RPM	3500 RPM
1.5	58	59	63	64
2.2	60	61	66	67
3	62	63	68	69
4	63	64	69	70
5.5	65	66	71	72
7.5	66	67	72	73
11	68	69	74	75
15	69	70	75	76


TABLE 5.10.1: Pump unit's sound pressure.


NOTE: The noise values were measured during operation of the pump driven by an electric motor, pumping water at ambient temperature, cavitation free, at the best efficiency point in our test room. Operational factors such as the flow rate, type of pipework and acoustics of the building can increase the pump's sound pressure. The values specified are therefore subject to a tolerance of +5 dBA and are not guaranteed.

 Acoustic emissions should be lower than the maximum levels permitted by local regulations. If the noise level exceeds the safety values, some action that can be taken to protect the health of personnel exposed to sound pressure generated by the pump are indicated in the follow table:


Sound pressure	Action to be taken
Less than 70 dB	No particular action
Greater than 70 dB	Provide personnel working close to the pump with personal protective equipment.
Greater than 80 dB	Signs must be put up at the entrance to and within the area warning that it is a hazardous area due to the high sound pressure level. Anti-noise head phones must be worn. The pump unit must be equipped with a soundproof covering. Anti-noise head phones must be worn.

TABLE 5.10.2: Actions to protect the health of the personnel.

 If the pump is driven by an internal combustion engine the noise level may exceed 80 dB. If this is the case, the pump unit should be provided with a soundproof covering and personnel must use PPE to protect them from the noise.

 **CAUTION** Excessive noise from the motor could be a sign that the bearings are worn and excessive noise from the pump could be a sign of cavitation (cavitation typically produces a booming sound, as if the liquid being pumped contains gravel).

6.0 MAINTENANCE


 **CAUTION** **The operators should be equipped with appropriate equipment during all operations of maintenance. Rubber boots, anti-acid overalls and a helmet with a protective visor for the face are essential requirements to allow operators to work without risking their physical safety. It is strictly prohibited to insert fingers or other parts of the body into the orifices and various openings. The pump unit is equipped with moving parts. These operations must be performed by skilled staff.**


6.1 PREVENTIVE MAINTENANCE


Check the characteristics of the pumped liquid (temperature, specific gravity and chemical composition). Check that the flow rate and pressure values comply with the design values and that they have not been subject to change. Make sure that control instruments are fully efficient and they always receives the right signals.


6.2 MAINTENANCE INSTRUCTION


Some instructions for the safety of personnel performing maintenance on the pump unit are given here below:


 Before carry out any maintenance work should be analysed the safety data sheet of the pumped liquid.


 All maintenance operations should be carried out outside of hazardous areas previously allocated for this purpose.


 For loads greater than the manual handling (including spare parts) use a suitable, type-tested hoisting system that is in good condition connected to rings, eyebolts, holes or threaded terminals of the part to lift. Goods must only be handled by suitably trained personnel, according to the relevant regulations in force.


 If the lighting is not sufficient the inspection and all maintenance operations should be performed using portable lamps.


 Any work must be carried out when the pump is not operating. If a switch has been fitted, it must be set to the "zero" (off) position.

 Take precautions to ensure that the pump is not started involuntarily.

 Never touch the pump if the liquid pumped exceeds +70°C. Wait until the pump cools down before performing any work.

 If the liquid pumped is hazardous take appropriate safety precautions when performing maintenance work, in accordance with the regulations in force.

 Never spray water or washing liquid on hot parts or components as it could cause thermal shocks.

 **ANGER** If the pump is washed using a water jet, prevent sprays or drops of liquid from entering the terminal board of the electric motor.

NOTE: Replace gaskets and O-rings each time the pump is disassembled.

NOTE: On completion of any maintenance work, for the start-up procedure repeat the steps indicated in the paragraph 5.4.

6.3 DAILY INSPECTION AND MAINTENANCE

Daily monitoring during operation will avoid complications and ensure immediate action can be taken in the event of malfunction.

Inspect the pump unit every time it is used:

1. Check the noise level, vibration, temperature and performance.
2. Check that there are no unexpected leakages of liquid.
3. Make sure the pump never operates without liquid.
4. Check the drip-pan of baseplate (if provided) is not full of liquid. If it is full, open the valve and empty the drip-pan.
5. Always make sure that the pump unit is properly fastened, checking that all of the screws are tightened correctly.


6.4 SIX-MONTHLY INSPECTION AND MAINTENANCE

Inspect the pump every six months irrespective of whether it has been used or not.

The six-monthly maintenance procedure is as follows:


1. Disconnect the electrical part.
2. Drain the casing of the pump (if the drainage hole is provided).
3. Clean and wash the pump, checking the compatibility of cleaning products used with residues of the liquid pumped. Never use flammable solvents to clean the parts.
4. Disassembly the pump unit (see paragraph 6.13).
5. Check the condition of the guide bushings.
6. Check if the plastic parts are damaged or worn.
7. Check if there are cavitation traces.
8. Replace gaskets and O-rings.
9. If the liquid contains solid particles, check that the suction filter and the foot valve (in suction conditions) are clean.
10. Check the condition of the bolts used to fasten the baseplate and foundation (see paragraph 4.2).
11. Assembly the pump unit (see paragraph 6.14).
12. Make sure that the pump is properly fastened, checking that all of the screws are tightened correctly.
13. Start-up the pump (see paragraph 5.4).


If a fault is found, replace the damaged or worn parts or according to the manufacturer send back the pump to repair (see paragraph 6.12).

 If the pump is used on fluids with solids particles or high temperature may be requested an earlier inspection and maintenance work.

6.5 EXTRAORDINARY MAINTENANCE

Immediate action must be taken in the event that a fault, malfunction or fluid leakage is reported by the operator or signalled by the general electrical panel, stopping the pump according to the shutdown procedure (see paragraph 5.6). The cause of the fault or malfunction must then be analysed (see paragraph 6.15). It is important to contact the manufacturer if the source or cause of the problem cannot be identified. No work must be carried out on the pump without prior approval from the manufacturer.

 In case of emergency or safety risk for the personnel can be used the emergency switch if a non-return device is included in the discharge piping.

 In the event of leakages of corrosive or hot liquid immediate actions to avoid the any contact, such as the evacuation of the area, must be taken. The corrosive liquid must be removed by authorized companies in accordance with national laws and regulations.

6.6 CRYSTALLIZATION OF PUMPED LIQUID


The crystallization of liquids is a problem that should not be underestimated. The user must obtain the technical data sheet of the pumped liquid from the relevant supplier to identify at what temperature and under what circumstances the crystallization process begins. The manufacturer must be informed of the use of any liquid that has a tendency to crystallise. Failure to declare the required information will invalidate the AFFETTI warranty.


6.7 DRAINING AND CHANGING THE PUMPED LIQUID

The user must request written consent from the manufacturer for any variation in the liquid to be pumped. Different specific gravity or viscosity could affect the suction lift or increase the shaft power and the discharge pressure.

The procedure to be followed when changing the liquid to be pumped is as follows:

1. Stop the pump unit (see paragraph 5.6).
2. Drain completely the pump (if drainage hole is provided) and the suction piping.
3. Clean the pump internally with water or a compatible liquid, taking care with regard to any chemical reactions that could cause irreparable damage to the pump and the operator.
4. Dispose of the rinsing liquid, with due care for the protection of the environment.

 In the event of leakages of corrosive or hot liquid immediate actions to avoid the any contact, such as the evacuation of the area, must be taken. The corrosive liquid must be removed by authorized companies in accordance with national laws and regulations.

 In case of leakage of not corrosive liquid provide immediate cleaning of the parts and the floor according to the safety recommendations.

6.8 DRY RUN OPERATION

The pumps of this series should never dry run. The dry run operation could damage the guide bushings or the other parts of the pump.

Below are listed situations in which dry run operation could occur:

- Total or partial absence of fluid in the tank.
- Missing or malfunction of the instrumentation to verify the absence of liquid in the piping or in the tank.
- Inefficient maintenance of the filter or foot valve
- Failing of the gate valve in the suction piping.
- The formation of air pockets and cavitation due to incorrect sizing and an inadequate structure of the fittings in the suction piping.

6.9 IMPURITIES CONTAINED IN THE PUMPED LIQUID

The pumped liquid should be clean. It is advisable not pumping liquids with percentages, even low, of solid particles. In case the liquid contains solids particles, the concentration, size and hardness must be declared in the enquiry in order to allow selection of the most suitable solution for the application.

NOTE: Solid particles in the liquid increase the wearing of the internal parts.

NOTE: If the liquid contains solid particles, install a strainer in the suction pipe.

NOTE: If solid particles are being pumped, it is recommended to have guide bushings faces in Silicon Carbide.

NOTE: Slurry liquid pumping is not possible.

6.10 RECOMMENDED SPARE PARTS

To determine the minimum quantity of spare parts that should be kept available for any replacements that may be required, the user should take into consideration the operating conditions and the number of interchangeable units installed on the plant. In order to know the frequency of replacement for each unit please contact the manufacturer.

The spare parts listed below are always needed on stock for each unit in operation:

No.	Description
003	Rear gasket
013	Front static bushing
014	Front gasket
016	Front rotating bushing
018	O-ring
023	Rear rotating bushing
025	Rear static bushing

TABLE 6.10.1: Recommended spare parts.

NOTE: Replace gaskets and O-rings each time the pump is disassembled.

To order spare parts you must provide:

- The serial number, name and type of pump (marked on the tag plate).
- Component position number (see on pages 24 - 25).
- Number of pieces required.

NOTE: Spare parts must be manufactured exclusively by AFFETTI. The use of parts not manufactured by AFFETTI will invalidate the pump's warranty and safety certification.

NOTE: Spare parts must be kept in a dry, clean place, away from sources of vibration and at a temperature of between +5°C and +35°C.

6.11 DISPOSAL

Replaced parts or pump units that have reached the end of their working life must be subjected to a careful selection process to separate and dispose the various parts according to their material.

CAUTION Disposal of used or damaged pumps must be done in accordance with laws and regulations by specialized and authorized companies.

6.12 RETURNING OF THE PUMP UNIT

Before returning the pump unit to repair in the manufacturer's factory the pump must be drained completely and cleaned internally with water or a compatible liquid, taking care with regard to any chemical reactions. Rinsing liquid should be disposed according national laws and local regulations.

! In case the pump is returned with the liquid inside or not completely drained and washed, AFFETTI will send back the goods with transport on charge of the user.

6.13 DISASSEMBLY OF THE PUMP UNIT

! Do not try to disassemble or repair the pump unit by your-self. Disassembly procedure of the pump unit should only be performed by personnel in possession of at least basic mechanical knowledge and skills. Minimum knowledge of the materials used is also needed to provide a better understanding of the pump's characteristics.

! Never try to remodel the pump or change some parts without the authorization from the manufacturer.

Before disconnecting the pump from the plant follow the below procedure:

- Make sure that the pump unit is not in operation.
- In order to avoid any unexpected start-up during the maintenance working disconnect the plug from the electric board and the electric wires from the terminal board of the motor. Carefully isolate the ends.
- Close the suction and discharge valves.
- Wait until the pump unit reaches the ambient temperature.
- Open the draining valve and clean the wetted parts and the drip-pan of the baseplate (if provided) with water or an appropriate liquid and dispose the pump washing solution according to laws and regulations.
- Disconnect the pump unit from the system.

NOTE: Great care must be taken during the disassembly process to prevent damage to internal parts of the pump caused by the incorrect use of pliers and screwdrivers.

NOTE: Place the various components on a bench in the same order in which they are removed and protect them from knocks and dust.

DISASSEMBLY PROCEDURE

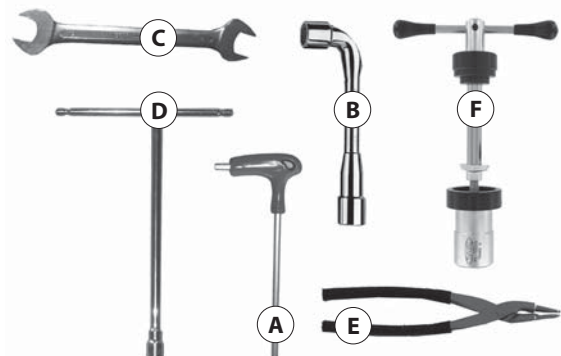
NOTE: Identify all of the parts and their codes on pages 24 to 25 before proceeding with disassembly.

! If provided, pay attention during the disassembly procedure of the drainage and the drip pan of the baseplate. If traces or small quantity of liquid are into the drip pan remove it with care avoiding any leakage of liquid.

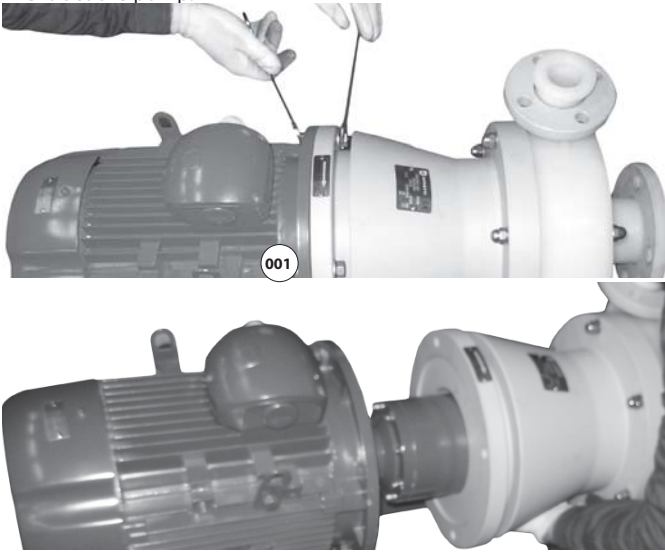
CAUTION Damaged or deteriorated tools are dangerous. Use qualified and suitable tools only.

NOTE: Single disassembly operations should be performed only if necessary.

1. Arrange all of the required tools on a bench:
 - A. Key for internal hexagon socket screws
 - B. Socket spanner
 - C. Hexagon key
 - D. T-handle key for external hexagon socket screws
 - E. Pliers for internal elastic ring
 - F. Extractor for guide bushings

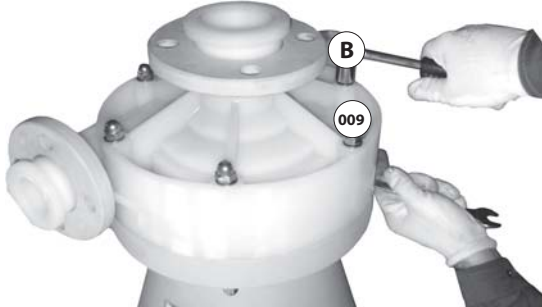


2. Unscrew the bolts (Pos. 001) holding the pump to the motor and extract the pump.



The pump contains powerful magnets. Fingers could catch between the magnet container parts during this step.

3. Rest the pump on a work bench and unscrew the casing fastening nuts (Pos. 009) using a socket spanner (B).



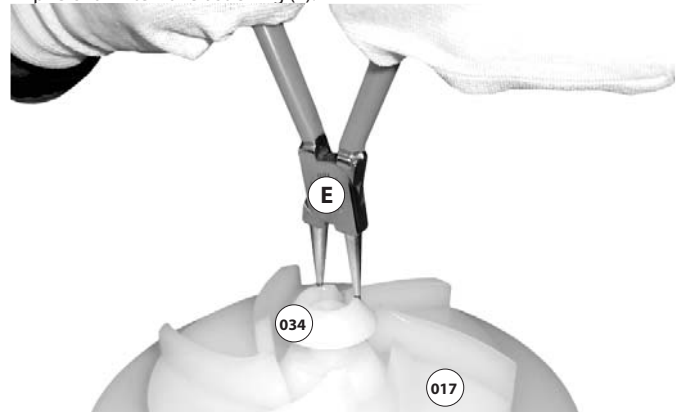
4. Remove the pump casing (Pos. 015).



5. Lift out the impeller (Pos. 017) and the containment shell (Pos. 005).



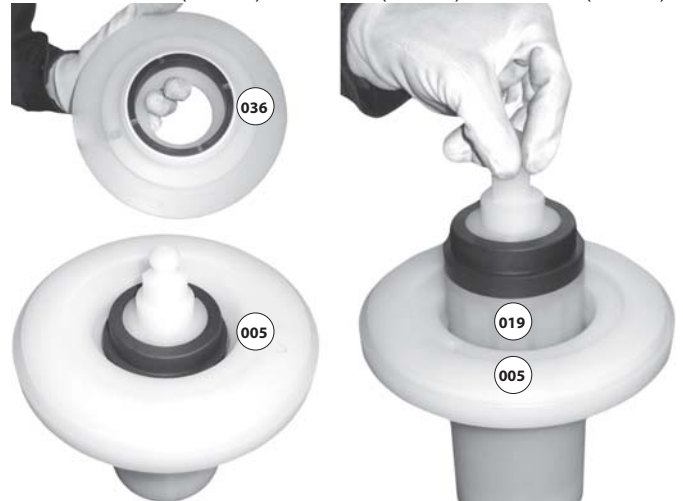
6. Lift out the locking ring (Pos. 034) securing the impeller (Pos. 017) using pliers for internal elastic ring (E).



7. Remove the impeller (Pos. 017) from the rotor (Pos. 009).



8. Lift out the cover (Pos. 036) and the rotor (Pos. 019) from the shell (Pos. 005).



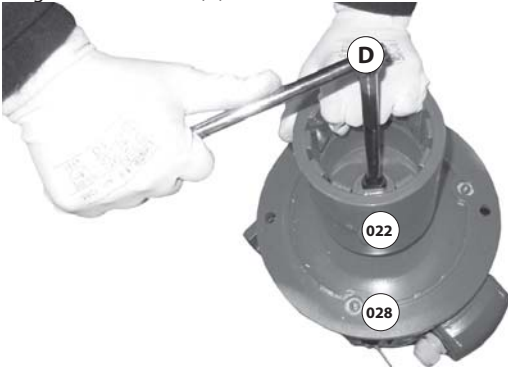
9. Use an extractor (F) to remove the static bushings (Pos. 013, 025).



10. Remove the rotating bushings (Pos. 016, 023) from the rotor (Pos. 019).



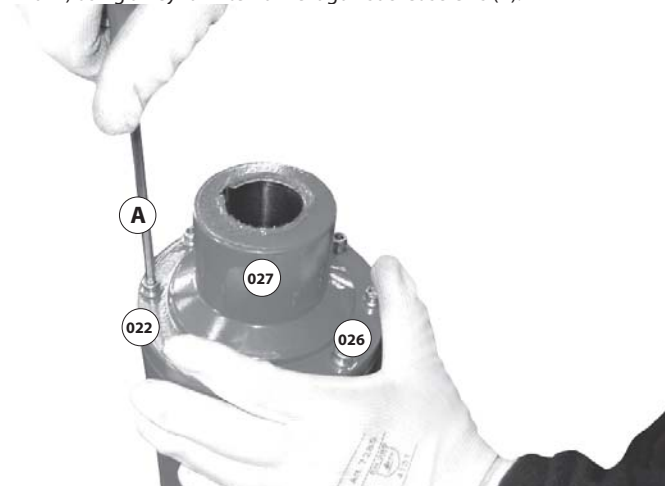
11. Back-off the screw (Pos. 002) fastening the magnetic coupling (Pos. 022, 027) to the motor shaft (Pos. 028) using a T-handle key for external hexagon socket screws (D).



12. Remove the magnetic coupling (Pos. 022, 027).





13. Back-off the screws (Pos. 026) fastening the magnetic coupling (Pos. 022, 027) using a Key for internal hexagon socket screws (A).





NOTE: After the disassembly procedure clean the disassembled parts with compatible liquid placing them on a bench in the same order in which they have been removed. Replace the damaged or worn parts.

6.14 ASSEMBLY OF THE PUMP UNIT

 These operations must be carried out by qualified technical personnel.

 Any work must be carried out when the pump unit is not operating. If a switch has been fitted, it must be set to the "off" position.

 Take precautions to ensure that the pump unit is not started involuntarily, disconnecting the cables from the power supply.

 **CAUTION** The pumps of this series contains powerful magnets. Fingers could catch between the magnet container parts during the assembly procedure or metal pieces could be attracted to magnets.

NOTE: Considerable precision and care must be taken when performing the operations involved in the assembly procedure.

NOTE: Thoroughly clean any parts still in good condition using water or an appropriate liquid before assembling a pump in repair.

NOTE: The assembly procedure should be carried out in a place free of dust and vibrations.


The tightening torques (N/m) for the pump assemblies are indicated here below:

Thread	Metallic parts	Plastic parts
M6	15 N/m	8 N/m
M8	25 N/m	10 N/m
M10	35 N/m	15 N/m
M12	50 N/m	30 N/m

TABLE 6.14.1: Tightening torques in N/m.

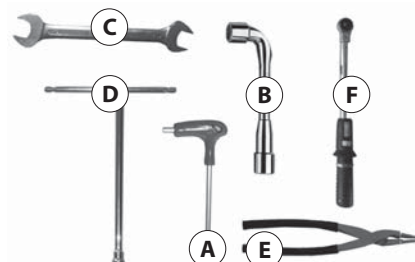
NOTE: Apply an equal torque to each bolt tightening in diagonal order.

NOTE: Identify all of the parts and their codes on pages 24 and 25 before proceeding with assembly.

 **CAUTION** Damaged or deteriorated tools are dangerous. Use qualified and suitable tools only.

1. Arrange all of the required tools on a bench:

- A. Key for internal hexagon socket screws
- B. Socket spanner
- C. Hexagon key
- D. T-handle key for external hexagon socket screws
- E. Pliers for internal elastic ring
- F. Dynamometric wrench



2. Tighten the screws (Pos. 026, 033) fastening the magnetic coupling (Pos. 022, 027) using a Key for internal hexagon socket screws (A).

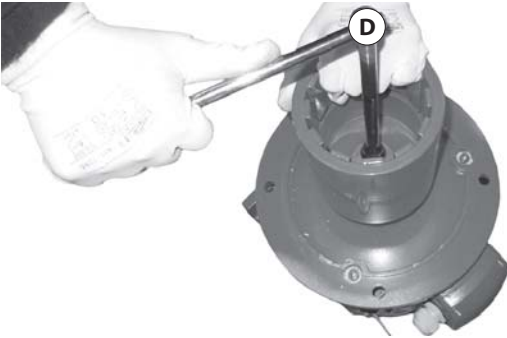
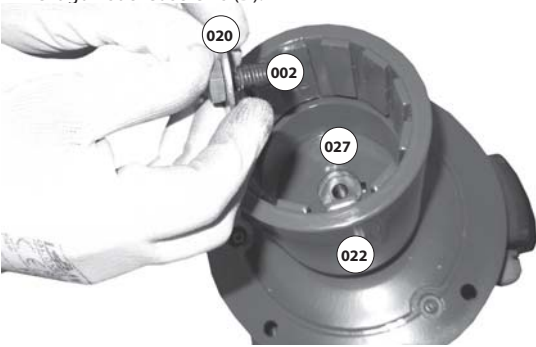


3. Rest the electric motor, on the fan cover side, on a work bench and assemble the magnetic coupling (Pos. 022, 027) on the motor shaft (Pos. 028).



NOTE: It is recommended to smear grease on the motor shaft before to assembly magnetic coupling (Pos. 022, 027) on the motor shaft (Pos. 028).

4. Tighten the screw (Pos. 002, 020) fastening the magnetic coupling (Pos. 022, 027) to the motor shaft (Pos. 028) using a D. T-handle key for external hexagon socket screws (D).



NOTE: It is recommended to apply a thread-locker on the screw (Pos. 002).

! Do not forget to assembly the plain washer (Pos. 020) with the screw (Pos. 002).

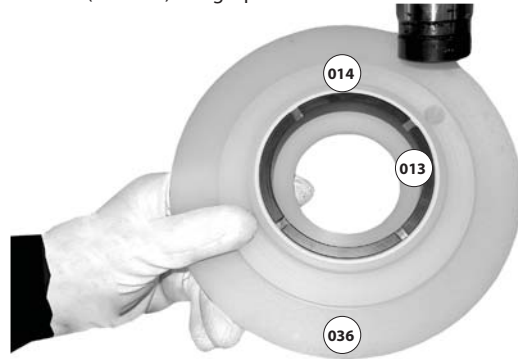
5. Assembly the rotating bushing (Pos. 016, 023) on the rotor (Pos. 019) using the pins to set their positions (Pos. 066).



6. Assembly the gasket (Pos. 003) and the static bushing (Pos. 025) in the shell (Pos. 005) using a press.



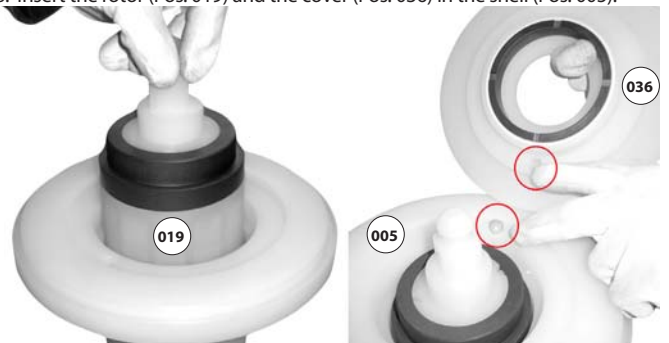
7. Assembly the gasket (Pos. 014) and the static bushing (Pos. 013) in the cover (Pos. 036) using a press.



NOTE: It is recommended to press uniformly the bushings using a buffer.



8. Insert the rotor (Pos. 019) and the cover (Pos. 036) in the shell (Pos. 005).

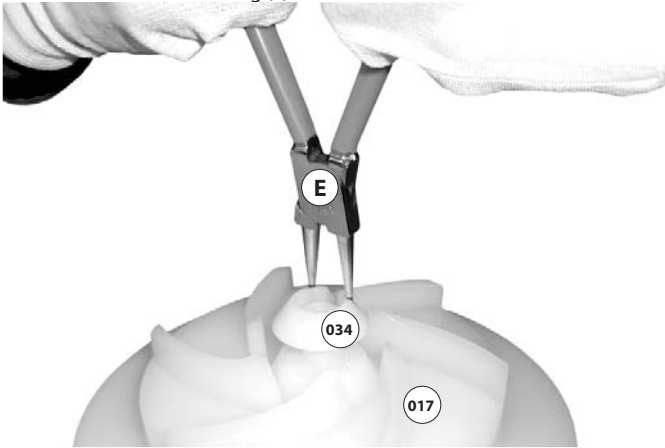


NOTE: Use the pin (Pos. 035) to set the position of the cover (Pos. 005).

9. Assembly the impeller (Pos. 017) on the rotor (Pos. 019).



10. Fit the locking ring (Pos. 034) to secure the impeller (Pos. 017) using pliers for internal elastic ring (E).



11. Insert the impeller (Pos. 017) and the containment shell (Pos. 005) in intermediate adaptor (Pos. 004).



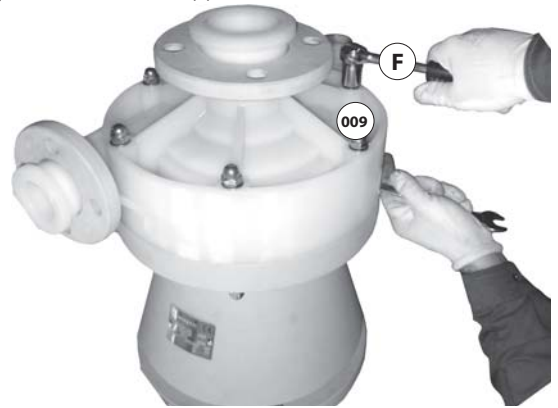
12. Fit the O-ring (Pos. 018) in the groove of the shell (Pos. 005).



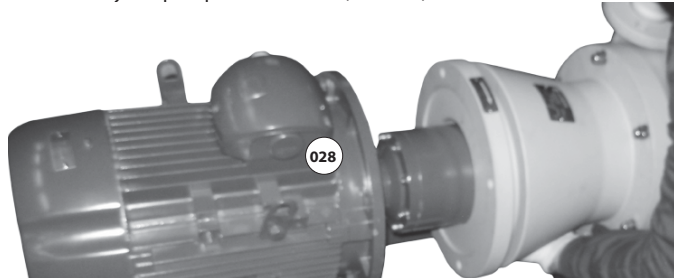
13. Assembly the pump casing (Pos. 015).



14. Place and screw the casing fastening nuts (Pos. 009) and studs (Pos. 006) using a dynamometric wrench (F).

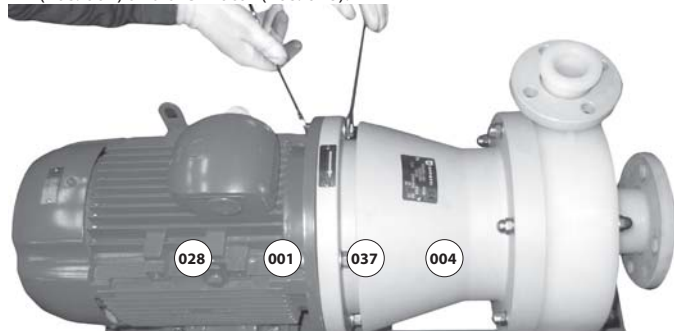


15. Assembly the pump on the motor (Pos. 028).



The pump contains powerful magnets. Fingers could catch between the magnet container parts during this step.

16. Set the screws (Pos. 001, 021, 037) fastening the intermediate adaptor (Pos. 004) and the motor (Pos. 028).



6.15 CAUSES OF TROUBLE AND TROUBLESHOOTING

TROUBLE	CAUSES	TROUBLESHOOTING
THE PUMP DOES NOT PUMPING OR IN SUCTION CONDITIONS THE PRIMING IS SLOW	Insufficient NPSHa	Check NSPHa is greater then NSPHr + 1 meter.
	The end of the suction pipe or the foot valve are not submerged.	Submerge the end of the pipe or the foot valve at the recommended distance.
	In suction conditions the foot valve is too small or faulty.	Check or replace the foot valve.
	In suction conditions the suction lift exceed the pump ability.	Check the suction height is not higher than the pump limit or the level of liquid is the tank is not too low.
	The suction pipe is too long or the diameter is too small.	Check the dimension of the suction pipe.
	Air leaks in the suction piping.	Check the sealing condition and tightening between the connections on the suction piping.
	The gate valve in the suction pipe is closed or partially closed.	Open the gate valve completely.
	The specific gravity, temperature or viscosity of the liquid are higher then design values.	Check the specific gravity, temperature and viscosity values.
	Foreign bodies obstruct the impeller or the suction or discharge piping.	Remove the foreign bodies.
	The impeller is worn or damage.	Replace the impeller.
	The discharge valve is closed.	Open the discharge valve.
	Two-phase motor operation.	Check the motor's electrical power supply.
	The speed of rotation is low.	Check the wiring.
	The sense of rotation is wrong.	Check the wiring.
The frequency is not suitable for the pump.	Check the frequency.	
INSUFFICIENT FLOW OR PRESSURE	Air pockets are in the piping.	Check the piping conditions.
	The liquid contains air or gas.	Check the liquid conditions.
	Foreign bodies obstruct the impeller or the suction or discharge piping.	Remove the foreign bodies.
	The impeller is worn or damage.	Replace the impeller.
	Total head of the plant greater then the head provided by the pump.	Check hydraulic losses and condition of the plant.
	The viscosity of the liquid is higher then design values.	Check the specific gravity, temperature and viscosity values.
	The speed of rotation is low.	Check the wiring.
	The sense of rotation is wrong.	Check the wiring.
The frequency is not suitable for the pump.	Check the frequency.	
PUMP VIBRATES EXCESSIVELY	The pump cavitating.	Check the plant conditions and the causes of the cavitation.
	Duty point outside the recommended flow rate.	Regulate the duty point according the recommended flow rate.
	Foreign bodies obstruct the impeller or the suction or discharge piping.	Remove the foreign bodies.
	One or some parts of the pump are damaged or worn.	Disassembly the pump and replace the damaged or worn parts.
	The motor bearings are worn.	Replace the motor bearing.
	The baseplate is not anchored firmly.	Anchor the baseplate firmly to a reinforced concrete base.
The installation screws are not tightened.	Tighten the bolts.	
THE MOTOR IS OVERHEATED	The discharge valve is too open.	Regulate the discharge valve according the declared duty point.
	The specific gravity or viscosity of the liquid are higher then design values.	Check the specific gravity and viscosity values.
	The ambient temperature is too high.	Install the motor providing a minimum distance from other objects and supplying a proper ventilation.
	The speed of rotation is high.	Check the wiring.
	The bearings of the motor are defective.	Replace the bearings of the motor.
RAPID WEAR OF GUIDE BUSHINGS	The flushing or pumped liquid contains foreign bodies or abrasive substances.	Check that the percentage of solid particles does not exceed the maximum amount allowed for the application.
	The materials of the guide bushings are not compatible with the liquid.	Contact the manufacturer.
	The pumped liquid causes the formation of air or gas.	Contact the manufacturer.
	Duty point outside the recommended flow rate.	Regulate the duty point according the recommended flow rate.
	Dry run operation.	Check the installation and operation of the pump.
Higher values of forces and moments on the pump nozzles than recommended.	Check maximum forces and moments on the pump nozzles.	

NOTE: Contact the manufacturer in case the failure reason has not been found.

7.0 COMPONENTS LIST

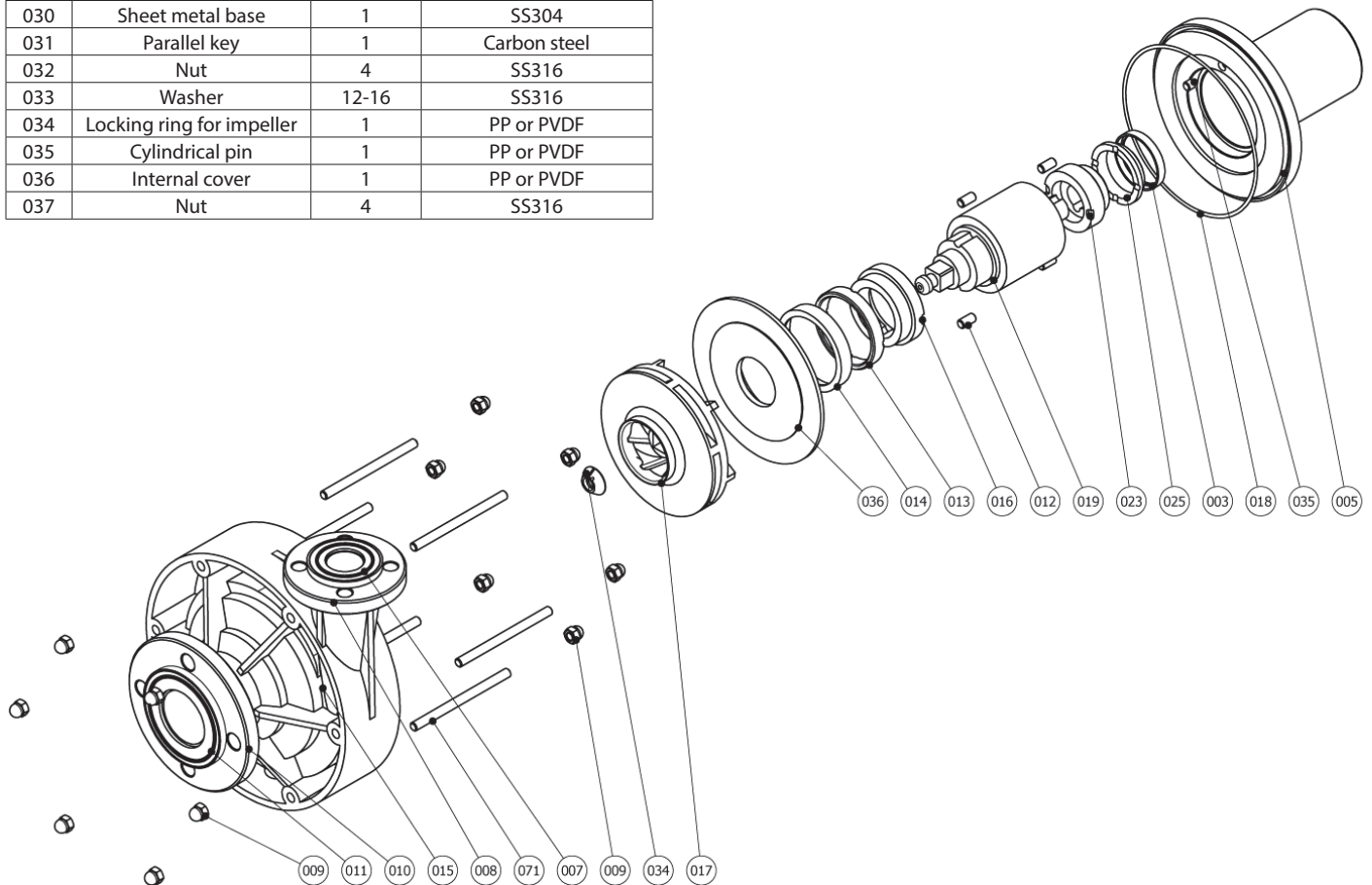
7.1 EXPLODED AND CROSS SECTIONAL VIEW

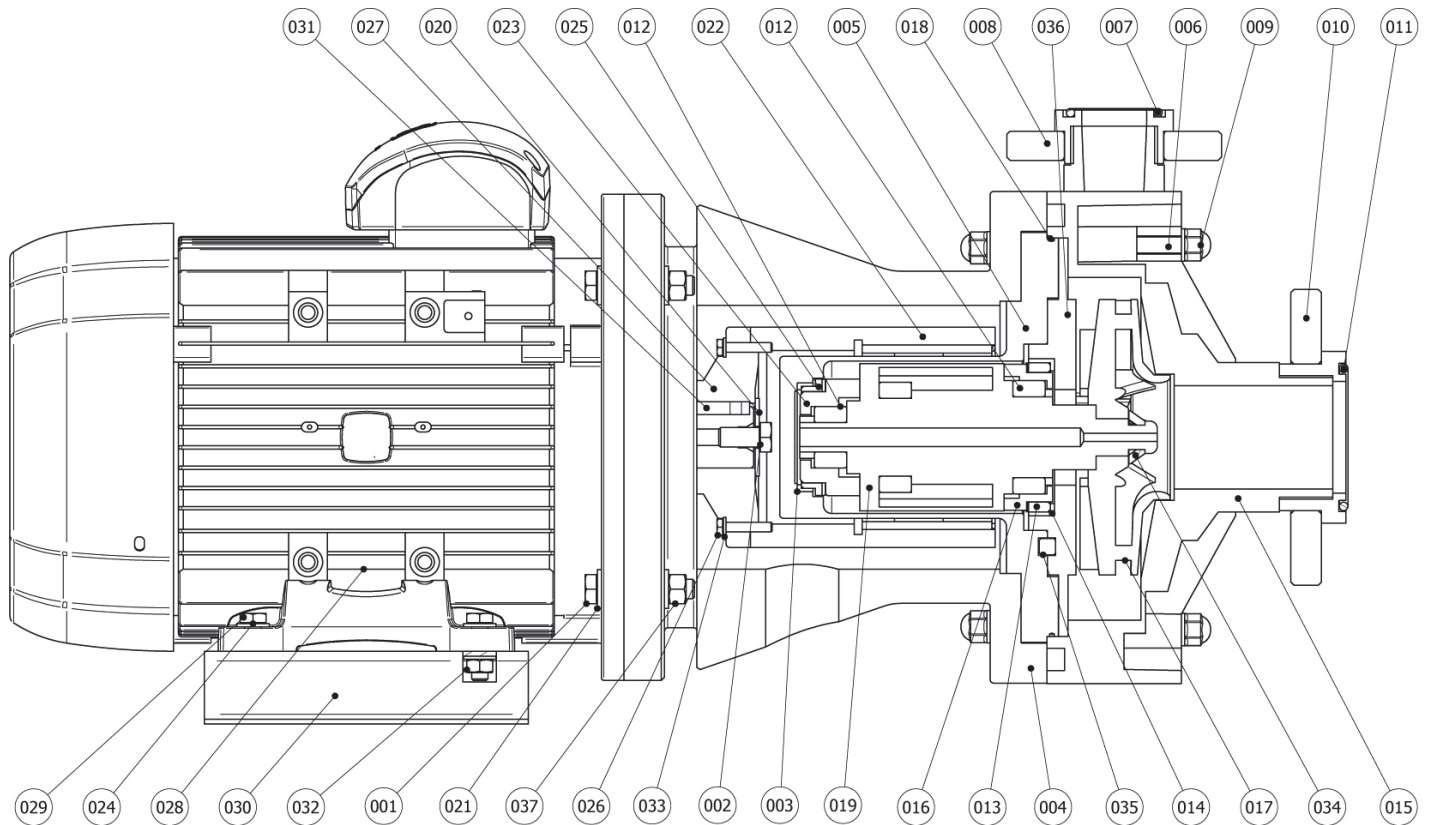
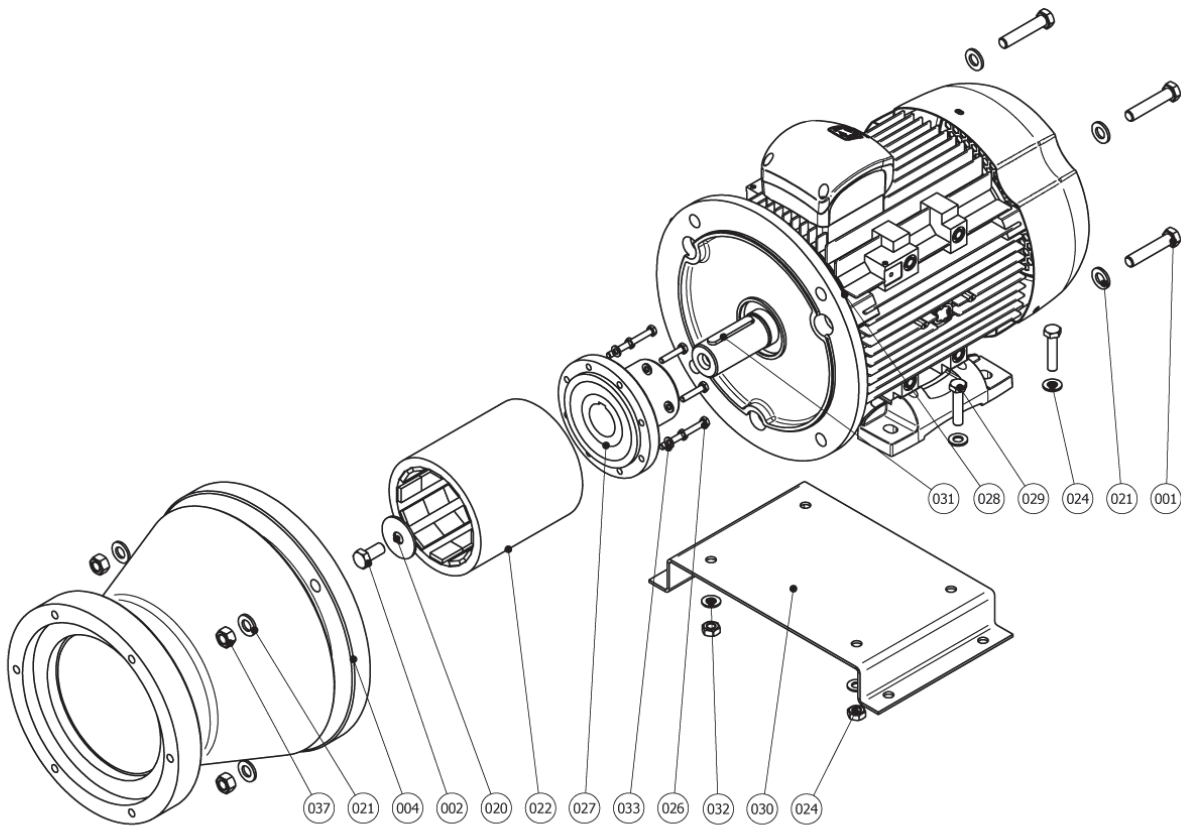
POS.	DESCRIPTION	QUANTITY	MATERIAL
001	Screw	4	SS316
002	Screw	1	SS316
003	Gasket	1	PTFE
004	Intermediate adaptor	1	PP
005	Containment sheel	1	PP or PVDF
006	Stud	4-6	SS316
007	O-ring	1	EPDM - FPM - FEP
008	Discharge flange	1	CS + PP FG
009	Covered nut	8-12	PP or PVDF
010	Suction flange	1	CS + PP FG
011	O-ring	1	EPDM - FPM - FEP
012	Cylindrical pin	4	PP or PVDF
013	Static bushing	1	Al ₂ O ₃ or SiC
014	Gasket	1	PTFE
015	Casing	1	PP or PVDF
016	Rotating bushing	1	PTFE CG or SiC
017	Impeller	1	PP or PVDF
018	O-ring	1	EPDM - FPM - FEP
019	Rotor	1	PP or PVDF
020	Washer	1	Carbon steel
021	Washer	8	SS316
022	External magnetic coupling	1	CS + Nd-Fe-B
023	Rotating bushing	1	PTFE CG or SiC
024	Washer	8	SS316
025	Static bushing	1	Al ₂ O ₃ or SiC
026	Screw	6-8	SS316
027	Internal magnetic coupling	1	Aluminium
028	Electric motor	1	Aluminium or Cast iron
029	Screw	4	SS316
030	Sheet metal base	1	SS304
031	Parallel key	1	Carbon steel
032	Nut	4	SS316
033	Washer	12-16	SS316
034	Locking ring for impeller	1	PP or PVDF
035	Cylindrical pin	1	PP or PVDF
036	Internal cover	1	PP or PVDF
037	Nut	4	SS316

NOTE: The drip-pan of the baseplate (provided on request) is not represented. For detailed view please send a request to the manufacturer.

NOTE: Flanged connections according to ANSI standards does not require O-rings (pos. 007, 011). The purchaser/user should be apply full flat gaskets.

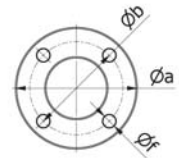
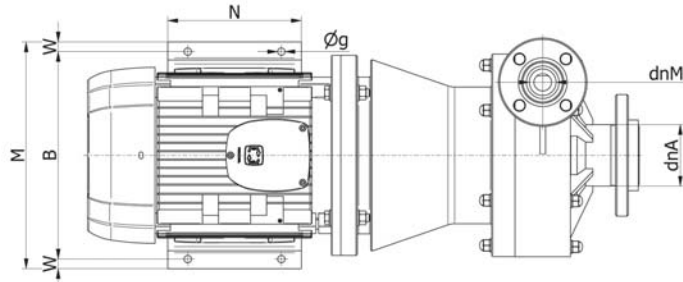
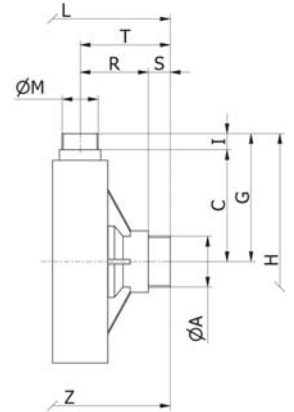
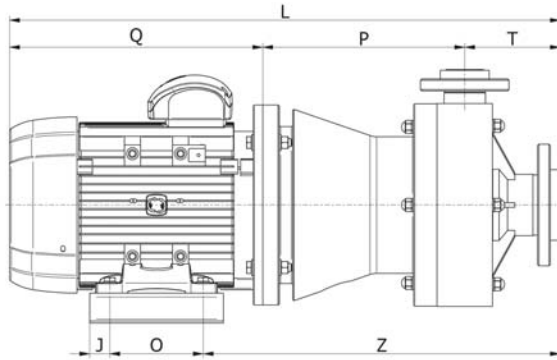
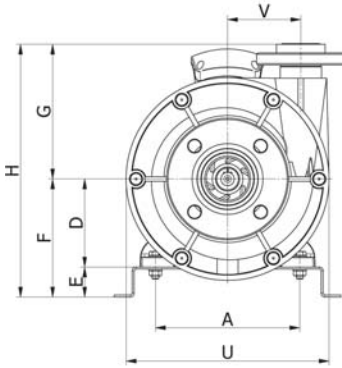
NOTE: The models 25-100 and 25-125 with flanged connections are provided with slim nuts for the discharge flange.





8.0 OUTER DIMENSIONS

8.1 DIMENSIONS OF THE PUMP UNIT



Model	Motor frame	PUMP DIMENSIONS																
		A	B	D	E	F	J	M	N	O	P	Q	U	V	W	g		
25-100	80M	125	213	80	30	110	22,5	238	145	100	195	243	150	47	12,5	9		
	90S	140	223	90		120	25	248	150			260						
25-125	80M	125	213	80	40	110	22,5	238	145	140	296	243	220	74,5	15	11		
	90S	140	223	90		130	25	248	150			100					260	
	90L	140	223	90		120	25	248	175			125					288	
32-125	100L	160	242	100	45	140	27,5	272	195	200	298	313	253	86	17,5	9		
	112M	190	274	112		152	30	304	200			140					330	
	132S	216	311	132		177	30	346	200			140					380	
	90S	140	223	90		130	25	248	150			100					260	
	90L	140	223	90		120	25	248	175			125					288	
40-130	100L	160	242	100	45	140	27,5	272	195	200	298	313	304	110	20	13		
	112M	190	274	112		152	30	304	200			140					330	
	132S	216	311	132		177	30	346	200			140					380	
	132M	216	311	132		177	30	346	238			178					416	
	90S	140	223	90		130	25	248	150			100					260	
	90L	140	223	90		120	25	248	175			125					288	
40-160	100L	160	242	100	45	160	27,5	272	195	200	303	313	304	110	12,5	9		
	112M	190	274	112		152	30	304	200			140					330	
	132S	216	311	132		177	30	346	200			140					380	
	132M	216	311	132		177	30	346	238			178					416	
	160M	254	356	160		205	33,5	396	277			210					352	505
	90S	140	223	90		130	25	248	150			100					260	
50-160	90L	140	223	90	45	120	25	248	150	200	303	288	304	110	12,5	9		
	100L	160	242	100		140	27,5	272	195			140					313	
	112M	190	274	112		152	30	304	200			140					330	
	132S	216	311	132		177	30	346	200			140					380	
	132M	216	311	132		177	30	346	238			178					416	
	160M	254	356	160		205	33,5	396	277			210					352	505

NOTE: All other dimensions are in millimeters.

NOTE: All dimensions are preliminary and for pumps in Polypropylene and ISO flanged or threaded connections. For different materials or in order to receive the specific dimensional drawings please send a request to the manufacturer.

NOTE: The total lengths are given by Motive electric motors. It could change assembling different electric motors brands. In order to receive the specific dimensional drawings please send a request to the manufacturer.

FLANGE DIMENSIONS									
ISO 7005					ANSI 150				
DN	a	b	f	n° hole	DN	a	b	f	n° hole
25	115	85	14	4	1"	107,9	79,4	16	4
32	140	100	18		1 ¼"	117,9	88,9		
40	150	110			1 ½"	127	98,4	19	
50	165	125			2"	152,4	120,6		
65	185	145	2 ½"		177,8	139,7			

PUMP DIMENSIONS WITH ISO FLANGED CONNECTIONS							PUMP DIMENSIONS WITH THREADED CONNECTIONS										
G	H	L	T	Z	dnA	dnM	ØA	ØM	C	G	H	I	L	R	S	T	Z
128	238	551	113	358	40	25	1 ½" hole	1" hole	80	80	190	20	501	62,5	25	63	308
	248	568		200							518		314				
134	244	551	113	358	40	25	1 ½" thr.	1" thr.	110	130	240	20	542	78,5	25	104	349
	254	568		250							559		355				
173	303	597	137	393	50	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		625		496													
	313	746		503													
	325	763		522													
186	316	604	137	395	50	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		632		498													
	326	758		505													
	338	785		524													
201	356	604	142	400	65	40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		632		508													
	361	758		515													
	353	775		534													
	378	825		602													
210	378	861	142	534	65	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	406	999		602													
	365	604		400													
		632		508													
	370	758		515													
210	362	775	142	534	65	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		825		534													
	387	861		602													
	415	999		602													



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