

ZMR SERIES

IDENTIFICATION CODE

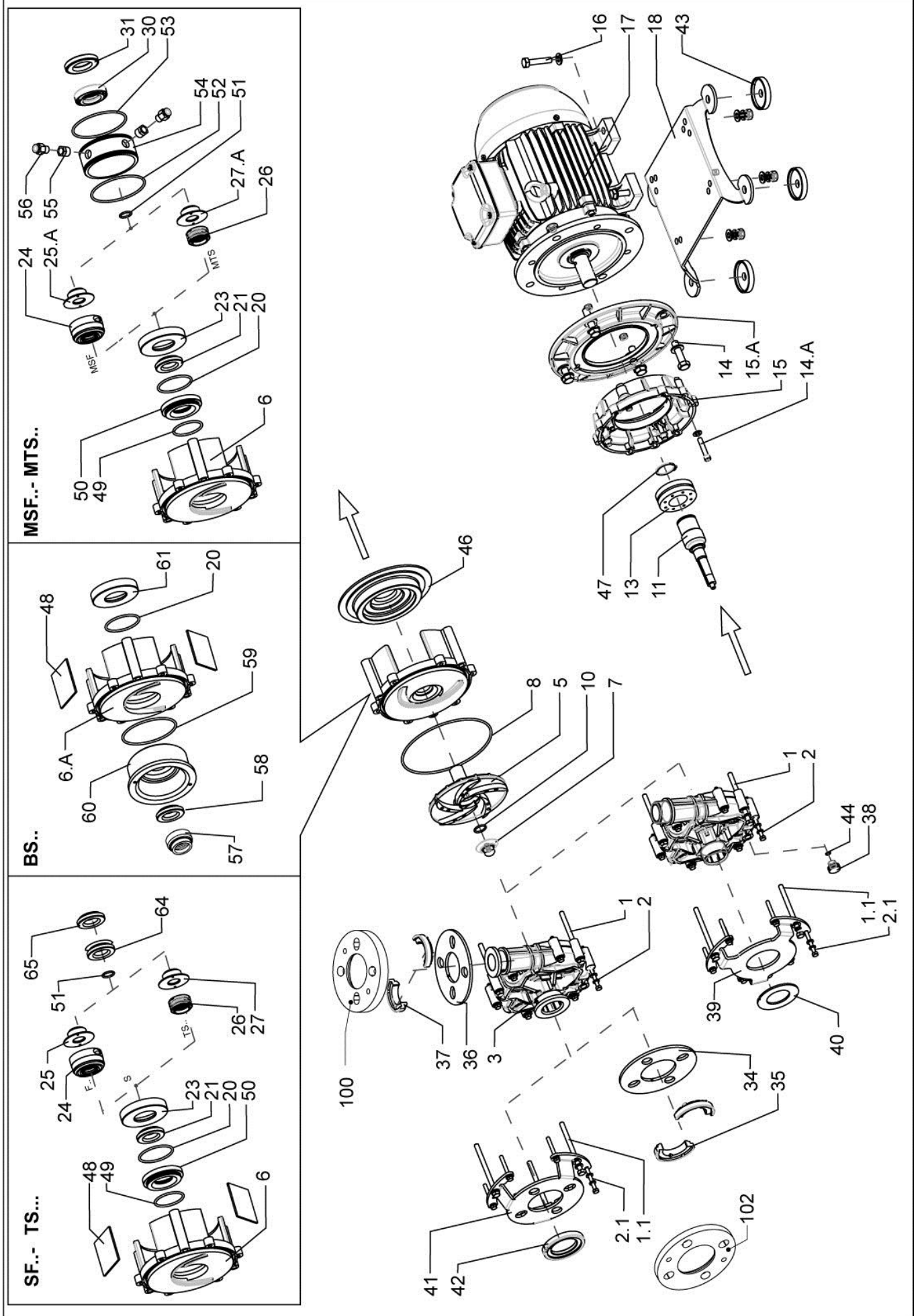
IDENTIFICATION CODE															
PUMP DATA							MOTOR DATA								
range	model				execution	material O-ring	Mechanical seal		connections	rpm	motor	voltage/EEEx	phases	powers	
	50Hz		60Hz												
ZMR	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> WR GFR-PP	<input type="checkbox"/> V FPM	<input type="checkbox"/> SF1	<input type="checkbox"/> BS7	<input type="checkbox"/> B BSP threaded	<input type="checkbox"/> 1450	<input type="checkbox"/> E IEC	<input type="checkbox"/> 0 senza motore	<input type="checkbox"/> 3 fasi	<input type="checkbox"/> 0.55	<input type="checkbox"/> ¾		
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> GF CFF-E-CTFE	<input type="checkbox"/> E EPDM	<input type="checkbox"/> SF2	<input type="checkbox"/> BS8	<input type="checkbox"/> N NPT threaded	<input type="checkbox"/> 2900	<input type="checkbox"/> U NEMA	<input type="checkbox"/> N V std	<input type="checkbox"/> 1 fase	<input type="checkbox"/> 0.75	<input type="checkbox"/> 1		
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> GX	<input type="checkbox"/> K FFKM	<input type="checkbox"/> TS5	<input type="checkbox"/> MSF1	<input type="checkbox"/> Z flange 40/32 ISO - ANSI - JIS	<input type="checkbox"/> 1740	<input type="checkbox"/> S V speciale <input type="checkbox"/> E EEEx	<input type="checkbox"/> 1.1	<input type="checkbox"/> 1½	<input type="checkbox"/> 1.5	<input type="checkbox"/> 2		
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N <input type="checkbox"/> P	<input type="checkbox"/> CFF-E-CTFE		<input type="checkbox"/> TS6	<input type="checkbox"/> MSF2	<input type="checkbox"/> Y flange 40/040 ISO - ANSI - JIS	<input type="checkbox"/> 3500							
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N	Outside structure		<input type="checkbox"/> TS7	<input type="checkbox"/> MTS5				<input type="checkbox"/> 2.2	<input type="checkbox"/> 3				
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N	<input type="checkbox"/> integral		<input type="checkbox"/> TS8	<input type="checkbox"/> MTS6				<input type="checkbox"/> 3	<input type="checkbox"/> 5				
	<input type="checkbox"/> N <input type="checkbox"/> P <input type="checkbox"/> S	<input type="checkbox"/> N	<input type="checkbox"/> armoured		<input type="checkbox"/> BS5	<input type="checkbox"/> MTS7				<input type="checkbox"/> 4	<input type="checkbox"/> 5				
					<input type="checkbox"/> BS6	<input type="checkbox"/> MTS8									



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for MAINTENANCE	DEALER
date of commissioning	
position / system reference	
Service	

1 DISASSEMBLING SEQUENCE



1.1 LEGEND

Pos.	Ref.	Part name	Material	Q.ty	Disassembling steps sequence										Spare stock			
					1	2	3	4	5	6	7	8	9	0	Start up	2 year		
1	910.1	Connection volute casing / strainer	AISI 304	3	●													●
1.1	910.2	Connection volute casing / strainer	AISI 304	3	●													●
2	910.2	Connection volute casing / intermediate casing	AISI 304	6	●													●
2.1	910.3	Connection volute casing / intermediate casing	AISI 304	6	●													●
3	102	Volute casing	WR:PP / GF:E-CTFE / GX:E-CTFE	1		●												
5	230	Impeller	WR:PP / GF:E-CTFE / GX:E-CTFE	1				●									●	●

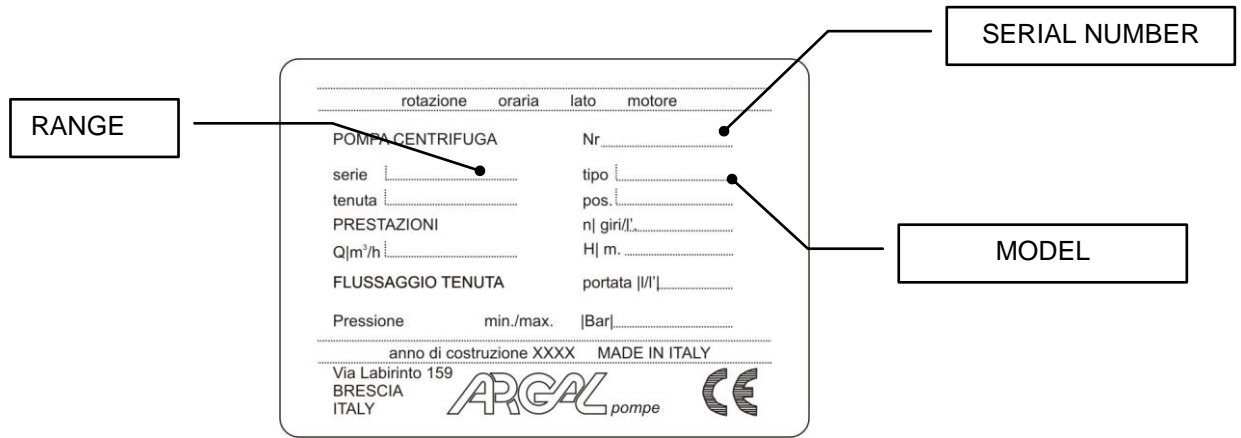
7	260	Ogive	WR:PP / GF:E-CTFE / GX:E-CTFE	1			●											●
8	412.1	OR volute casing (OR 4675)	V:FKM / E:EPDM / K:FFKM	1		●												●
10	412.2	OR ogive (OR 3081)	V:FKM / E:EPDM / K:FFKM	1			●											●
11	210	Shaft	AISI 304	1					●									
13	840	Cone coupling element	STEEL	1					●									
14	910.3	Connection strainer / electric motor	AISI 304	4					●									
14.A	910.3	Connection strainer / motor flange	AISI 304	4						●								
15	807	Bracket	PPS	1						●								
15.A	334	Motor flange	PPS	1							●							
16	910.4	Connection electric motor / baseplate	AISI 304	4	●													
17	800	Electric motor	///	1														●
18	890	Baseplate	AISI 304	1		●												
34	722.1	Inlet flange	AISI 304	1	●													
35	727.1	Inlet flange adaptor	PARA	2	●													
36	722.2	Outlet flange	AISI 304	1	●													
37	727.2	Outlet flange adaptor	PARA	2	●													
38	912	Drain plug (optional)	PTFE	1	●													
39	195.1	Armoured (connect. B – N)	AISI 304	1			●											
40	922	Lock nut	PP	1	●													
41	195.2	Armoured (connect.Y – Z)	AISI 304	1			●											
42	932.1	Seeger ring	PP	1	●													
43	185	Packing ring	PP	1	●													
44	412.6	OR drain plug (OR 2050)	V:FKM / E:EPDM / K:FFKM	1		●												
46	493	Dividing plate	PP	1					●									
47	932.2	Seeger ring	STEEL	1						●								
100	722.3	Outlet flange FF	PP	1	●													
102	722.4	Inlet flange FF	PP	1	●													

Mechanical seal																		
6	134.1	Intermediate casing	WR:PP / GF:E-CTFE / GX:E-CTFE	1					●									
6.A	134.2	Intermediate casing (BS...)	WR:PP / GF:E-CTFE / GX:E-CTFE	1					●									
20	412.3	OR fixed seal (OR 3200)	V:FKM / E:EPDM / K:FFKM	1							●					●	●	
21	475.1	Fixed seal	TS5-TS6-SF1: Al ₂ O ₃ / TS7-TS8-SF2:SSiC	1							●					●	●	
23	922.1	Lock nut fixed seal	PP	1						●						●	●	
24	472.1	Rotating seal (SF...)	PTFE	1						●						●	●	
25	504.1	Spacer (SF...)	PP	1						●								
25.A	504.2	Spacer (MSF...)	Bronze	1						●								
26	472.2	Rotating seal (TS...)	TS5-TS7:CHD-GRAPHITE / TS6-TS8:SSiC	1							●					●	●	
27	504.2	Spacer (TS...)	PP	1						●								
27.A	504.4	Spacer (MTS...)	Bronze	1						●								
30	472.3	Rotating seal	CHD-GRAPHITE	1							●					●	●	
31	475.2	Fixed seal	Al ₂ O ₃	1							●					●	●	
48	164	Barrier	PVC	2							●							
49	412.4	OR diaphragm (OR 3281)	V:FKM / E:EPDM / K:FFKM	1								●				●	●	
50	443	Diaphragm	WR:PP / GF:PTFE / GX:PTFE	1								●				●	●	
51	412.5	OR impeller (OR 3081)	FKM	1								●				●	●	
52	412.7	OR seal chamber (OR 3375)	FKM	1								●				●	●	
53	412.8	OR seal chamber (OR 3375)	FKM	1								●				●	●	
54	471	Seal chamber	PP	1								●						
55	761	Nipple	AISI 304	2		●												
56	762	Fluxing connection	AISI 304	2	●													
57	472.4	Rotating seal (BS...)	BS5-BS7:CHD-GRAPHITE / BS6-BS8:SSiC	1							●					●	●	
58	475.3	Fixed seal (BS...)	BS5-BS6: Al ₂ O ₃ / BS7-BS8:SSiC	1								●				●	●	
59	412.9	OR diaphragm (OR 4337)	V:FKM / E:EPDM / K:FFKM	1								●				●	●	
60	443.2	Diaphragm (BS...)	WR:PP / GF:PTFE / GX:PTFE	1								●				●	●	
61	922.2	Lock nut fixed seal	PP	1								●						
64	415.1	V-ring	NBR	1									●				●	
65	414.1	Counterface V-ring	Al ₂ O ₃	1									●				●	

2 IDENTIFICATION CODES

Each pump is supplied with the serial and model abbreviation and the serial number on the rating plate, which is riveted onto the support side. Check these data upon receiving the goods. Any discrepancy between the order and the delivery must be communicated immediately.

In order to be able to trace data and information, the abbreviation, model and serial number of the pump must be quoted in all correspondence.



3 GENERAL NOTES

"ZRM" pumps are designed and built for the transfer of liquid chemical products having a specific weight, viscosity, temperature and stability of state appropriate for use with centrifugal pumps in a fixed installation, from a tank at a lower level to a tank or a pipe to a higher level. The characteristics of the liquid (pressure, temperature, chemical reactivity, specific weight, viscosity, vapour tension) and the ambient atmosphere must be compatible with the characteristics of the pump and are defined upon ordering.

The pump's performance (capacity, head, rpm) is defined upon ordering and specified on the identification plate.

"ZMR" pumps are not self priming.

"ZMR" pumps cannot run dry.

The type of the solid particles contained in the pumped liquid depend on the mechanical seal; the presence of fibrous, adhesive or abrasive bodies is not allowed.

Exame of the solid particles:

	Mech.seal SF1-TS5	Mech.seal TS6	Mech.seal MSFA – MTSC - MTSD
max quantity in weight %	1 ÷ 3	1÷ 3 (a) - 1÷ 5 (b)	1 ÷ 11
max dimension in mm	0.1 ÷ 0.6	0.1÷ 0.6 (a) - 1÷ 2 (b)	0.1 ÷ 0.8
max hardness Mohs index	1 ÷ 2	3 ÷ 6	1 ÷ 2

Clockwise rotation seen from the motor side.

Make sure that the chemical and physical characteristics of the liquid have been carefully evaluated for pump suitability.

The specific weight which can be pumped at a temperature of **25°C** (both of the liquid and the ambient) depends upon the diameter of the impeller (shown on the identification plate) and the installed motor power (shown on the motor plate) and has to be defined upon ordering.

The level of kinematic viscosity must not exceed 20 cSt so as not to significantly modify the pump's performance. Higher values up to a maximum of 250 cSt are possible provided that the pump is equipped with suitable impeller and motor to be defined upon ordering.

The maximum continuous working temperature referred to water depends on the choice of materials (specified on the identification plate):

80°C (176°F) version WR
110°C (230°F) version GF

variations may occur, depending on operating pressure

The ambient temperature interval is related to the choice of materials (specified on the identification plate):

0 ÷ 40 °C (14 ÷ 104 °F) version WR
-20 ÷ 40 °C (-4 ÷ 104 °F) version GF

The maximum pressure the pump may be subjected to is 1.5 times the head value developed with the outlet closed.

The vapour pressure value of the liquid to be pumped must exceed (by at least 1m w.c) to the difference between the absolute total head (suction side pressure added to the positive suction head, or subtracted by the suction lift) and the pressure drops in the suction side piping (including the inlet NPSHr drops shown on the specific tables).

In case of double mechanical seal, the value of the pressure in the seal chamber must be less than 1/3 of the operating pressure value of the pump.

In case of double mechanical seal, the flushing liquid must be clean and must not lead to violent chemical reactions on contact with the liquid being pumped.

The pump does not include any non return valve nor any liquid flow control or motor stop device.

4 OPERATING PRINCIPLE

HYDRAULICALLY alike to all centrifugal pumps, it is equipped with a vane-type impeller rotating within a fixed housing. It has a tangential outlet and, by creating a depression in the centre, it allows the liquid to flow from the central suction side. Then, flowing through the impeller's blades, the fluid acquires energy and is conveyed towards the outlet.

-MECHANICALLY the impeller is driven directly by the shaft The axially of the pump-motor assembly is guaranteed by the self-centring coupling system jointing the pump shaft and the motor shaft; All the mechanical loads, of a reduced nature in this type of pump, are borne by the motor bearings.

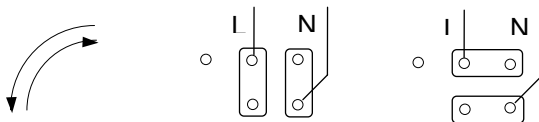
-THE MECHANICAL SEAL, placed at the point where the shaft enters the pump body to drive the impeller, is made up of two main section: a fixed section inserted in the pump body and a rotating section integral with the shaft. The tight contact between these two parts guarantees a seal against leakage whether the pump is rotating or not. The rubbing action that occurs between these two parts when the pump is operating generates heat by friction; this heat is absorbed by the liquid being pumped in the case of single mechanical seal and by the cooling liquid (generally water) in the case of double seal (trim the inlet pressure between 0.3 and 1 bar - flow approx. 0,1÷0,3 l/minute). The presence of the thin layer of liquid between the sealing surfaces, as well as its cooling action, is indispensable for the life of the seal.

5 MOTOR

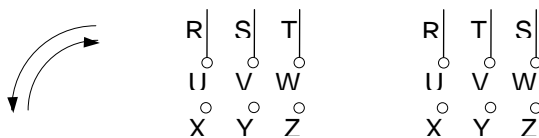
Electrical connections

The electrical connection to the motor terminal determines the direction of rotation of the motor and can be verified by looking at the cooling fan at the rear of the motor (for the Argal pump this has to rotate clockwise looking at the front end).

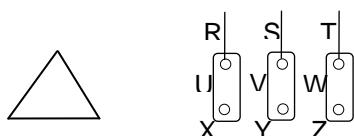
With single phase motors the direction of rotation may be reversed by changing the position of the connection plates:



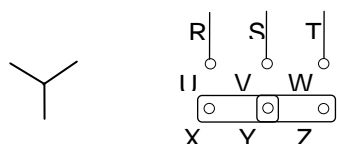
With three-phase motors the direction of rotation may be changed by swapping any two of the three conductors independently of the type of connection to the windings:



The windings of three-phase motors (e.g. with (a) 230-400 V; (b) 400-600 V) require a delta-connection for lower voltage (230 volts for a ; 400 volts for b).



They require a star-connection for higher voltage (400 volts for a; 690 volts for b).



Star/Delta starting is used when the motor power is above 7.5 kW (10 HP) only in case of frequent starts and short running times, but always when the motor power is above 15kW (20 HP). All this is also to safeguard the structure of the pump.

Protection level

The initials IP are followed by two numbers :

The first number indicates the level of protection against penetration of solid objects and in particular :

- 4 for solids whose dimension is greater than 1mm
- 5 for dust (eventual internal deposits will not harm operation)
- 6 for dust (no penetration)

The second number indicates the protection against the penetration of liquids. In particular:

- 4 for water sprays from all directions
- 5 for jets of water from all directions
- 6 for tidal and sea waves.

According to the IP protection indicated on the identification plate of the motor and to the environmental conditions, arrange for opportune extra protections allowing in any case correct ventilation and rapid drainage of rainwater.

6 PRESSURE SWITCH TO PREVENT DRY RUNNING

The principal cause of pump malfunctions is dry-running (being it caused by improper use or cavitation). It is therefore advisable to install a simple device that will stop the pump motor when the pressure falls below a preset level. This is justified by the fact that such a condition is normally caused to an inadequate flooding of the impeller due to various causes: absence of liquid, suction valves closed at start-up, cavitation, clogged channels, dirty filters, etc.....

The pressure switch (pressure gauge with electrical contacts) must be fitted on the discharge side of the pump at approximately 20cm from the outlet. This device needs furthermore:

- 1)) A fluid separator to transmit pressure to the instrument via a secondary fluid separated from the main one by a chemically resistant diaphragm.
- 2) Remote-control switch to energize the motor (controlled by a pushbutton or auxiliary relay) having the normally closed contact of the pressure switch in series with the latch circuit of said remote-control switch.

In order to obviate any pulsations of the pressure switch, it is necessary to set its setpoint to a pressure value equal to 65% of the working pressure. It is obvious that this device cannot be used to control working pressure.

On start-up the pressure switch contact must be by-passed for a sufficient time to allow pressure to build up in the system. In case of automatic start-up it is necessary to short circuit the latch with a timer for the pressure build-up time.

The system is not suitable for full capacity applications in which case it is advisable to install some control devices for the motor power absorption.

All of the above must be adapted to the local safety rules and in particular when the classification of the environment requires explosion-proof equipment.

7 INSTRUCTION ON INSTALLATION AND USE

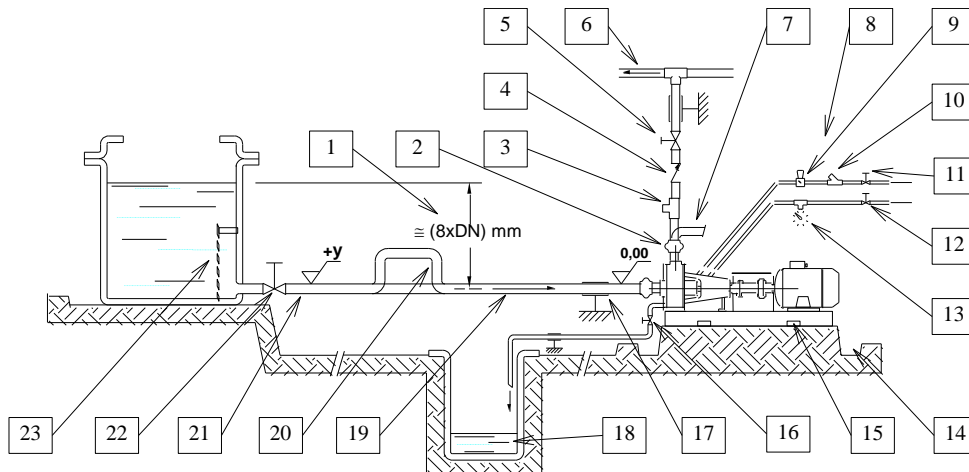
7.1 TRANSPORT

- cover the hydraulic connections
- when lifting the unit do not exert force on the plastic fittings
- lay the pump on its base or fixing plate during transport
- if the road is particularly rough, protect the pump by means of adequate shock absorbing supports
- bumps and shocks may damage important working parts vital for safety and functionality of the machine

7.2 INSTALLATION

- check that bolts and nuts are correctly screwed (cfr. 9.3 pag. 12 "Assembly" for the right bolts torque setting), thermoplastics are dimensionally sensitive to sizeable temperature changes.
 - clean the plant before connecting the pump
 - make sure that no foreign bodies are left in the pump. Remove safety caps on the hydraulic connections.
 - follow the instructions indicated in the following diagram:
 - 1) Suction head varies according to flow in order to prevent windage (min. 0.5 m, max. 15% of pump head)
 - 2) YES: expansion joint (indispensable with long pipes or hot liquids) and/or anti-vibration facility during discharge and suction; anchored near to pump
 - 3) YES: attachment for gauge or safety pressure switch
 - 4) YES: check valve (especially for long vertical or horizontal pipes; compulsory with parallel pumps).
 - 5) YES: adjusting gate valve on outlet
 - 6) speed of delivered fluid: 3.,5 m/s max. .
 - 7) NO: elbow joints (and other parts) on the pump (discharge and suction lines)
 - 8) YES: drainage channel around base
- 6

- 9) Fix the pump by the fixing holes provided: the supports must be level
 - 10) YES: pipe discharge (completely sealed), discharge valve shut during normal operations
 - 11) YES: pipe fixing parts
 - 12) YES: discharge collection well (does not leak)
 - 13) Fluid speed suction: 2.5 m/s
 - 14) NO: air pockets: the circuit must be short and straight
 - 15) With positive head: tilt of piping towards pump
 - 16) With negative suction lift: tilt of piping towards suction tank
 - 17) YES: check valve (with negative suction lift)
 - 18) YES: gate valve (may also be near pump in the case of long piping)
 - 19) YES: line strainer (3-5 mm mesh)
 - 20) YES: strainer (3-5 mm mesh)
 - 21) Suction head, 3 m max.
 - 22) Immersion depth: 0.3 m min.
- YES: overcoming obstacles at lower depths.



- anchor the pump to an adequate base plate having a mass at least 5 times that of the pump
- do not use anti-vibration mounts to fix the pump
- anti-vibration joints are recommended on the pipe connections
- manually verify that all rotating parts are free to turn without abnormal friction by turning the motor cooling fan
- make sure that the power supply is compatible with the data shown on the pump motor identification plate
- connect the motor to the power supply via a magnetic/thermal control switch
- ensure that star-delta starting is implemented for motors whose power is more than 15kW
- install emergency stop devices to switch off the pump in case of low liquid level (floating, magnetic, electronic, pressure-sensitive)
- ambient temperature as a function of the physical-chemical characteristics of the liquid to be pumped and in any case not greater or lower than the interval indicated in the GENERAL HINTS
- other environmental conditions in accordance with the IP protection of the motor
- install a drainage pit to collect any liquid overflow from the base drainage channel due to normal maintenance work
- leave enough free space around the pump for a person to move
- leave free space above the pump for lifting operations
- highlight the presence of aggressive liquids with coloured tags following the local safety regulations
- do not install the pump (made in thermoplastic material) in close proximity to heating apparatus
- do not install the pump in areas subject to solid or liquid matter falling
- do not install the pump in an explosive atmosphere unless the motor and its coupling have been adequately pre-arranged
- do not install the pump in close proximity to workplaces or crowded areas
- install extra protection guards for the pump or persons as the need arises
- install a spare equivalent pump in parallel

7.3 START-UP

- verify that the instructions outlined in the INSTALLATION have been followed
- verify that fixing elements (screws and bolts) are closed (see bolt torque on page)
- verify the correct direction of rotation (clockwise from the motor side) supplying the motor with short impulses
- ensure that the NPSH available is greater than that required by the pump (in particular for hot liquids, liquids with high vapour pressure, very long suction pipes or negative suction lift)
- close the discharge valve; completely cover the suction pipe and the pump.
- close the outlet valve. Start up the motor two or three times with short supplies of current in order to expel the air from the pump and the lubrication circuit between the guide shaft and bush.
- start the pump with the suction valve completely open and the outlet valve semi-closed.
- slowly adjust the flow by adjusting the outlet valve (never adjust the suction valve) and making sure that the motor absorption is does not exceed the nominal power rating shown on the plate

- do not operate at the extremes of the operating curve: maximum head (discharge valve shut too tight) or maximum flow (total absence of loss and lift in discharge circuit).
- set the operating point for which the pump has been requested
- check that there are no unusual vibrations or noises due to inadequate fixing or cavitation
avoid excessively short and/or frequent start-ups by adjusting the consent appliances

Motor power ; kW 0,75÷5,5
Max. no. starts/hour ; 2-4 poles 20 - 40

- check that temperature, pressure and characteristics of liquid match order specifications

7.4 **USE**

- switch automatic control on
- do not activate valves whilst the pump is in operation
- risks of dangerous water hammer effects in case of sudden or improper valve actuation (only trained personnel should operate valves)
- completely empty and wash the pump before using a different liquid
- isolate or empty the pump if the crystallization temperature of the liquid is the same or lower than the ambient temperature
- stop the pump if the liquid temperature exceeds the maximum allowed temperature indicated in the general notes; if the increase is of approximately 20%, check internal parts
- close the valves in case of leaks
- wash with water only if compatible from the chemical point of view. As alternative use an appropriate solvent that will not generate dangerous exothermal reactions
- contact the liquid supplier for information on the appropriate fire precautions
- empty the pump in case of long periods of inactivity (in particular with liquids which would easily crystallize)

7.5 **SHUTDOWN**

- disconnect the motor
- before starting maintenance, turn off the suction and discharge valves

8 **MAINTENANCE**

- all these maintenance operations must be performed under the supervision of qualified personnel
 - make periodic inspections (2 to 6 months depending on the type of liquid and the operating conditions) on the rotating parts of the pump; clean or replace as necessary
 - make periodic inspections (3 to 5 months depending on the type of liquid and the operating conditions) on the functionality of the motor control system; efficiency must be guaranteed
 - make periodic inspections (2 to 30 days depending on the type of liquid and the operating conditions) of the in-line and foot filters as well as of the bottom valve
 - the presence of liquid below the pump could be a clue to pump problems
 - excessive current consumption could be an indication of impeller problems
 - unusual vibrations could be due to unbalanced impeller (due to damage or presence of foreign material obstructing its blades)
 - reduced pump performance could be due to an obstruction of the impeller or damages to the motor
 - motor damages could be due to abnormal friction within the pump
 - damaged parts must be replaced with new original parts
- the replacement of damaged parts must be carried out in a clean dry area

8.1 **DISMANTLING**

Tools required: Open end wrenches CH6 , CH10 , CH13 , CH17 , CH19, Hex key wrench CH6, Phillips screw driver
Right handed nuts and bolts

- all these maintenance operations must be performed under supervision of qualified personnel
- cut off the power supply from the motor and disconnect the electrical wiring; pull the wires out from the terminal box and isolate their extremities accordingly
- close the suction and discharge valves and open the drain valve
- use gloves, safety glasses and acid-proof overalls when disconnecting and washing the pump
- disconnect the piping and leave enough time for the residual liquid to exit the pump body and atmospheric air to fill the empty volume
- wash the pump before carrying out any maintenance work
- do not scatter the liquid in the environment
- before attempting to dismantle the pump ensure that its motor is disconnected and that it may not be started accidentally
- before the inspection, check that you have spare O-rings ready to hand for re-installing at the end of operations

- proceed with opening of the pump according to sequence described on paragraph no. 1.1 in the column of the LEGEND
 - the access to the mech. Seal is possible only after dismantling of the impeller (remove ogive and take the impeller off) :removing the rotating part of the mechanical seal from the impeller you can reach the fixed part of the seal.
- the motor can be separated from strainer unscrewing the 4 bolts that fix the strainer itself to it ; than open the cone coupling by friction and take off the shaft of the pump from motor shaft.

8.2 INSPECTION

Check:

- excessive wear of seal rings
- counterthrust bushing for cracks or excessive wear
- for lumps and clusters created by the pumped liquid (especially at the bottom of the rear chamber)
- the impeller, volute and intermediate disk for abrasion and corrosion
- for infiltration of liquid outside the seal in the support

Replace broken, cracked or deformed parts.

Reopen all the blocked pipes and eliminate any chemical agglomeration.

Clean all surfaces before reassembly; in particular seal rings (risk of leakage or premature wear) and O-ring seats (risk of leakage).

8.3 ASSEMBLY

Tools required: No.6 socket spanner, No.10 socket spanner, No.13 socket spanner, No.17 socket spanner, No.19 socket spanner, screw driver CH6(Hex drive type), screw driver (Phillips drive type). The nuts and bolts have a right-hand thread

Bolt torque setting: (reduce by 25% on plastic parts) Nm	M4	M6	M8	M10	M12	M16	M20	M24
	4	14	24	48	60	75	120	175

- all the tasks must be performed under supervision of qualified personnel
- seal with new o-rings
- assemble the pump by following the procedure set out in the LEGEND column in the reverse order
- clean out the motor shaft from any trace of dust and/or grease
- mount the pump shaft (pos.11) complete with cone capling element (pos.13) and seager ring (pos.47) – fig.8.1
- Lock up the screws of cone capling element to block off the pump shaft to the motor
- Assemble the strainer (pos.15) together with the motor flange (pos. 15.A)
- Install the strainer assembly (strainer + flange) on the motor taking care to place the components as indicated in fig. 8.2

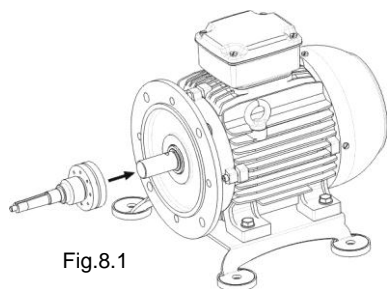


Fig.8.1

Installation of mechanical seals SF.. – TS..

Assemble the parts in the following order (fig. 8.3)

- 1) Dividing plate (pos. 46)
- 2) Spacer (pos. 25 or pos. 27)
- 3) O ring Impeller (pos. 51) , care for installation in the foreseen round slot in the spacer.

Installation of mechanical seals MSF.. – MTS.. (fig. 8.3)

- 1) Insert the fixed seal ring (pos. 31) in the foreseen dividing plate slot (pos. 46)
- 2) Assemble the rotating seal (pos. 30) and the spacer pos. (25)
- 3) Position the dividing plate complete with the fix seal in the strainer.
- 4) Install on the shaft the spacer complete with rotating seal
- 5) Assemble the o ring impeller (pos. 51) in the slot of the spacer.

Position the mechanical seal chamber (pos. 54) complete with O rings (pos 52, pos. 53) and nipples (pos. 55) and fluxing connection

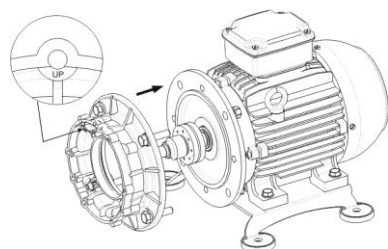


Fig.8.2

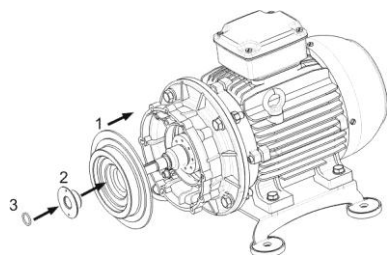


Fig.8.3

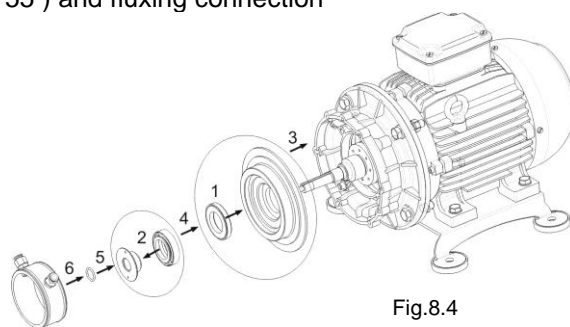


Fig.8.4

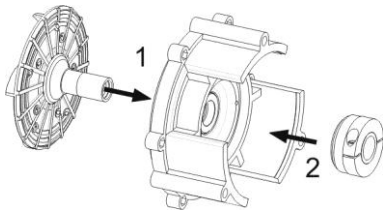


Fig.8.5

Fit in the intermediate casing (pos.6) the diaphragm (pos.50) and the fixed seal (pos. 21) with relevant O rings (pos. 20 – pos. 49) and pack all the parts by locking the lock nut fixed seal

Insert the rear side of the impeller in the intermediate casing and then fit on it (fig. 8.5)

- the seal (rotating seal pos. 24 or pos. 26)
assemble the complete intermediate casing (inclusive of barrier pos. 48 if present – fig. 8.6) on the shaft (pos. 11) previously locked on the electric motor shaft.

- **WARNING !** Rotate the impeller until the correct assembly position is found and lock the group with the ogive (pos. 7 – locking torque 24 Nm) (fig. 8.7)

- Should the seal installed be SF1 , set the pump vertical and lock the nut fixed seal through the opening of the intermediate casing placed in the lower side of the pump deprived of the barrier.

Should the seal installed be type MSFA , remove one of the two fluxing connection (pos. 56) to reach and screw with the key wrench the two hexagonal socket on the mechanical lock nut fixed seal (fig. 8.8)

- Complete the assembly positioning the O ring (pos. 8) and the volute casing (pos. 3)

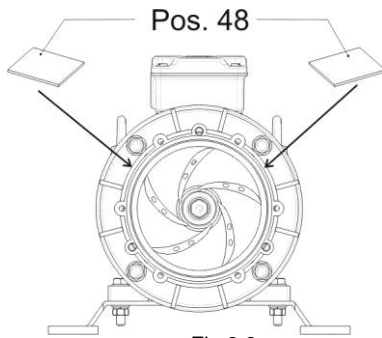


Fig.8.6

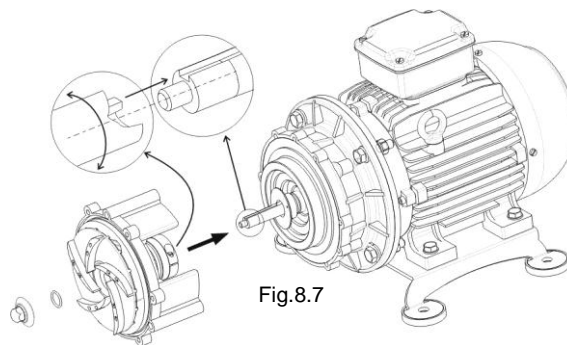


Fig.8.7

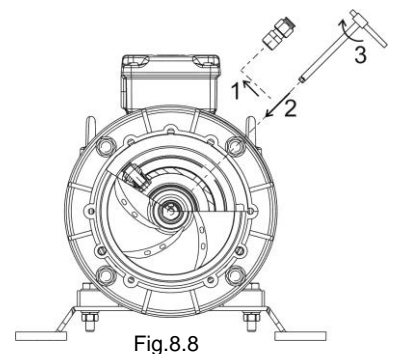


Fig.8.8

9 SAFETY RISKS

WARNING! CHEMICAL HAZARD.



The pumps are designed to pump different types of liquid and chemical. Follow the specific instructions to decontaminate during inspection or maintenance

WARNING!

Safety risks for personnel mainly arise from improper use or accidental damages.



These risks may be of an electrical nature as far as the non-synchronous motor is concerned and may cause injury to hands if working on an open pump. Risks may also arise due to the nature of the liquids pumped. It is therefore of utmost importance to closely follow all the instructions contained in this manual so as to eliminate the causes that may lead to pump failure and the consequent leakage of liquid dangerous for both personnel and the environment.

In any case five general rules are important:

- A - all services must be carried out by specialised personnel or supervised by qualified personnel depending on the type of maintenance required
- B - install protection guards against eventual liquid sprays (when the pump is not installed in remote areas) due to an accidental pipe rupture. Arrange for safety basins to collect possible leakage
- C - when working on the pump always wear acid-proof protective clothing
- D - arrange for proper conditions for suction and discharge valve closing during disassembly
- E - make sure that the motor is completely disconnected during disassembly.

Proper design and building of the plants, with well positioned and well marked piping fitted with shut-off valves, adequate passages and work areas for maintenance and inspections are extremely important (since the pressure developed by the pump could give some kind of damage to the plant in case this one should be faulty made or wear and tear-damaged).

It must be stressed that the major cause of pump failures leading to a consequent need to intervene is due to the pump running dry in manually operated plants. This is generally due to:

- the suction valve being open at start-up or the suction tank being emptied without stopping

9.1 INSTALLATION AND COMMISSIONING PERSONNEL

Interventions allowed only to specialised personnel who may eventually delegate to others some operations depending on specific evaluations (technical capability required: specialisation in industrial plumbing or electric systems as needed).

9.2 OPERATORS AND MAINTENANCE PERSONNEL

Interventions allowed to general operators (after training on the correct use of the plant):

- pump starting and stopping
- opening and closing of valves with the pump at rest
- emptying and washing of the pump body via special valves and piping
- cleaning of filtering elements

Interventions allowed to qualified personnel (technical capacities required: general knowledge of the mechanical, electrical and chemical features of the plant being fed by the pump and of the pump itself):

- verification of environmental conditions
- verification of the condition of the liquid being pumped
- inspections of the control/stop devices of the pump
- inspections of the rotating parts of the pump

trouble shooting

9.3 REPAIR PERSONNEL

Interventions allowed to general operators under the supervision of qualified personnel:

- stopping of the pump
- closing of the valve
- emptying of pump body
- disconnection of piping from fittings
- removal of anchoring bolts
- washing with water or suitable solvent as needed
- transport (after removal of electrical connections by qualified personnel)

Interventions by qualified personnel (technical capacities required: general knowledge of machining operations, awareness of possible damage to parts due to abrasion or shocks during handling, know-how of required bolt and screw tightening required on different materials such as plastics and metals, use of precision measuring instruments):

- opening and closing of the pump body
- removal and replacement of rotating parts

9.4 WASTE DISPOSAL

Materials: separate plastic from metal parts. Dispose of by authorized companies.

10 IMPROPER USE

The pump must not be used for purposes other than the transfer of liquids.

The pump cannot be used to generate isostatic or counter pressures.

The pump cannot be used to mix liquids generating an exothermal reaction

The pump must be installed horizontally on a firm base.

The pump must be installed on a suitable hydraulic plant with inlet and outlet connections to proper suction and discharge pipes.

The plant must be able to shut off the liquid flow independently from the pump.

Handling of aggressive liquids requires specific technical knowledge

11 OPERATING FAULTS AND POSSIBLE CAUSES

The pump does not deliver:

1. rotates in wrong direction
2. suction pipe is excessively long and tortuous
3. insufficient geodetic pump head or excessive suction geodetic lift
4. air infiltration into the suction pipe or branches
5. pump or suction pipe not completely covered by liquid
6. impeller channels blocked by impurities
7. check valve on discharge pipe jammed
8. geodetic system height is greater than maximum potential pump head
9. impeller jammed by considerable layer of crystals or by melting of materials for dry rotation.
10. bottom valve blocked by mud or other debris
11. bottom valve insufficiently immersed
12. bottom valve faulty, thereby causing suction valve to empty when pump stops

Pump discharge rate or pressure insufficient: see 01, 02, 03, 04, 05, 06, 10, 11, 12

- 14. system's resisting head is greater than expected
- 15. suction pipe, closing valve and other items have an insufficient nominal diameter
- 16. small geometric pump suction head
- 17. damaged or worn impeller
- 18. liquid viscosity greater than expected
- 19. excessive quantities of air or gas in liquid
- 20. elbow joints, check valves or other items on the outlet port
- 21. liquid (especially if hot) with tendency to change into gaseous state

Pump absorbs too much power: see 17

- 22. pump operates at greater capacity than expected
- 23. specific weight of liquid is greater than expected
- 24. impurities inside pump create abnormal wear
- 25. electric motor supply voltage is not rated voltage

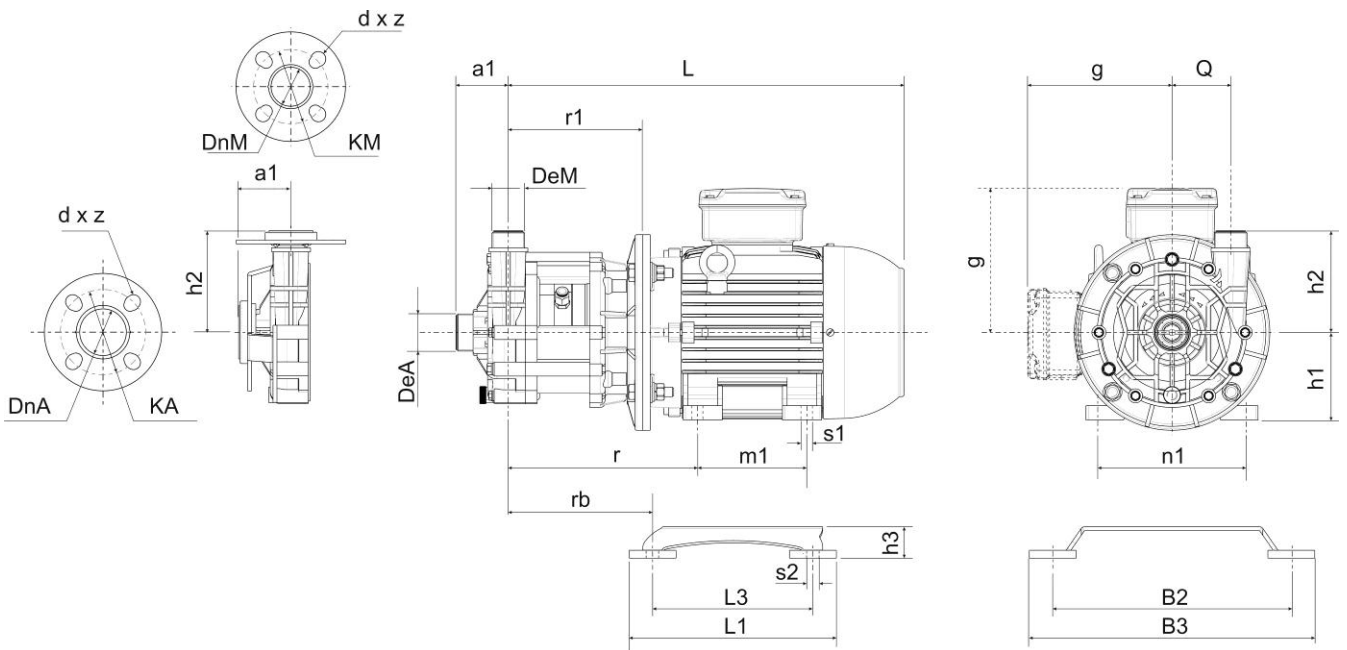
Pump vibrates and is noisy: see 23

- 26. operates at full capacity (no head)
- 27. pump or pipes inadequately fixed
- 28. eccentric impeller operation because of worn bushes
- 28. support bearing without grease

Pump's internal parts wear out too quickly : see 23

- 29. liquid excessively abrasive
- 30. recurring cavitation problems (see. 02, 14, 18, 16)
- 31. high tendency of liquid to crystallise or polymerise when pump is not operating.
- 32. pump made of materials that are unsuitable for pumped liquid
- 33. operation with capacity too reduced

12 TECHNICAL DATA



MOTOR IEC - 50 Hz

Modello ZMR	06.10			10.10			10.15			16.15			16.20			02.30		
IEC frame	71	80A	80B	80A	80B	90S	80B	90S	90L	90S	90L	100	90L	100	112	90L	100	112
a1	67			67			67			67			67			67		
L	364	393		393		413	393	413	438	413	438	486	438	486	495	438	486	495
Q	75			75			75			75			75			75		
h1	71	80		80		90	80	90		90		100	90	100	112	90	100	112
h2	130			130			130			130			130			130		
r	202	207		207		213	207	213		213		235	213	235	242	213	235	242
r1	157			157			157			157			172	157	172		157	172
rb	169			169			169			169			184	169	184		169	184
m1	90	100		100			100	125		100	125	140	125	140		125	140	
n1	112	125		125		140	125	140		140		160	140	160	190	140	160	190
s1	7	8		8			8			8		10	8	10		8	10	
g	106	110		110		142	110	142		142		155	142	155	168	142	155	168
L3	185			185			185			185			205	185	205		185	205
B2	248			248			248			248			305	248	305		248	305
S2	14			14			14			14			14			14		
L1	245			245			245			245		259	245	259		245	259	
B3	308			308			308			308		359	308	359		308	359	
h3	40			40			40			40			40			40		
KM (ISO) (*)	100			100			100			100			100			100		
KA (ISO)	110			110			110			110			110			110		
KM (ANSI) (*)	89			89			89			89			89			89		
KA (ANSI)	98			98			98			98			98			98		
KM (JIS) (*)	100			100			100			100			100			100		
KA (JIS)	105			105			105			105			105			105		
d x z (ISO)	18 x 4			18 x 4			18 x 4			18 x 4			18 x 4			18 x 4		
d x z (ANSI)	16 x 4			16 x 4			16 x 4			16 x 4			16 x 4			16 x 4		
d x z (JIS)	19 x 4			19 x 4			19 x 4			19 x 4			19 x 4			19 x 4		

(Dimensions in mm)

(*) for connections type "Y" (see pag.1 "IDENTIFICATION CODE) KM = KA

MOTOR IEC - 60 Hz

Model ZMR	07.11			07.14			11.15			11.23		17.25		03.35
IEC frame	80A	80B	90S	80B	90S	90L	90S	90L	100	90L	100	112	112	
a1	67			67			67			67		67		67
L	393	413		393	413	438	413	438	486	438	486	495	495	
Q	75			75			75			75		75		75
h1	80	90		80	90		90		100	90	100	112	112	
h2	130			130			130			130		130		130
r	207	213		207	213		213	235		213	235	242	242	
r1	157			157			157		172	157	172	172	172	
rb	169			169			169		184	169	184	184	184	
m1	100			100	125		100	125	140	125	140	140	140	
n1	125	140		125	140		140		160	140	160	190	190	
s1	8			8			8		10	8	10	10	10	
g	110	142		110	142		142	155	142	155	168	168	168	
L3	185			185			185		205	185	205	205	205	
B2	248			248			248		305	248	305	305	305	
S2	14			14			14			14		14		14
L1	245			245			245		259	245	259	259	259	
B3	308			308			308		359	308	359	359	359	
h3	40			40			40			40		40		40
KM (ISO) (*)	100			100			100			100		100		100
KA (ISO)	110			110			110			110		110		110
KM (ANSI) (*)	89			89			89			89		89		89
KA (ANSI)	98			98			98			98		98		98
KM (JIS) (*)	100			100			100			100		100		100
KA (JIS)	105			105			105			105		105		105
d x z (ISO)	18 x 4			18 x 4			18 x 4			18X4		18 x 4		18 x 4
d x z (ANSI)	16 x 4			16 x 4			16 x 4			16X4		16 x 4		16 x 4
d x z (JIS)	19 x 4			19 x 4			19 x 4			19 x 4		19 x 4		19 x 4

(Dimensions in mm)

(*) for connections type "Y" (see pag.1 "IDENTIFICATION CODE) KM = KA

MOTOR NEMA - 60 Hz

Model ZMR	07.11		07.14			11.15			11.23		17.25	03.35
NEMA frame	56	145	143	145	182	145	182	184	182	184	184	184
a1	2 21/32		2 21/32			2 21/32			2 21/32		2 21/32	2 21/32
L	15 ½	17 ¼	16 ¼	17 ¼	18 13/16	17 ¼	18 13/16	19 13/16	18 13/16 19 13/16		19 13/16	19 13/16
Q	2 15/16		2 15/16			2 15/16			2 15/16		2 15/16	2 15/16
h1	3 ½		3 1/2		4 1/2	3 1/2	4 1/2		4 1/2		4 ½	4 ½
h2	5 1/8		5 1/8			5 1/8			5 1/8		5 1/8	5 1/8
r	8 3/4	8 7/16	8 7/16		9 11/16	8 7/16	9 11/16		9 11/16		9 15/16	9 15/16
r1	6 3/16		6 3/16		6 15/16	6 3/16	6 15/16		6 15/16		6 15/16	6 15/16
rb	6 21/32		6 21/32		7 7/16	6 21/32	7 7/16		7 7/16		7 7/16	7 7/16
m1	3	5	4	5	4 1/2	5	4 1/2	5 1/2	4 1/2	5 1/2	5 ½	5 ½
n1	4 7/8	5 ½	5 1/2		7 1/2	5 1/2	7 1/2		7 1/2		7 ½	7 ½
s1	3/8		3/8		13/32	3/8	13/32		13/32		13/32	13/32
g	5 7/16	5 29/32	5 29/32		7 1/32	5 29/32	7 1/32		7 1/32		7 1/32	7 1/32
L3	7 9/32		7 9/32		8 1/16	7 9/32	8 1/16		8 1/16		8 1/16	8 1/16
B2	9 ¾		9 ¾		12	9 ¾	12		12		12	12
s2	9/16		9/16			9/16			9/16		9/16	9/16
L1	9 21/32		9 21/32		10 3/16	9 21/32	10 3/16		10 3/16		10 3/16	10 3/16
B3	12 1/8		12 1/8		14 1/8	12 1/8	14 1/8		14 1/8		14 1/8	14 1/8
h3	1 9/16		1 9/16			1 9/16			1 9/16		1 9/16	1 9/16
KM (ISO) (*)	3 15/16		3 15/16			3 15/16			3 15/16		3 15/16	3 15/16
KA (ISO)	4 11/32		4 11/32			4 11/32			4 11/32		4 11/32	4 11/32
KM (ANSI) (*)	3 ½		3 1/2			3 1/2			3 1/2		3 ½	3 ½
KA (ANSI)	3 7/8		3 7/8			3 7/8			3 7/8		3 7/8	3 7/8
KM (JIS) (*)	3 15/16		3 15/16			3 15/16			3 15/16		3 15/16	3 15/16
KA (JIS)	4 1/8		4 1/8			4 1/8			4 1/8		4 1/8	4 1/8
d x z (ISO)	3/4 x 4		3/4 x 4			3/4 x 4			3/4 x 4		3/4 x 4	¾ x 4
d x z (ANSI)	5/8 x 4		5/8 x 4			5/8 x 4			5/8 x 4		5/8 x 4	5/8 x 4
d x z (JIS)	3/4 x 4		3/4 x 4			3/4 x 4			3/4 x 4		3/4 x 4	3/4x 4

(Dimensions in inches)

(*) for connections type "Y" (see pag.1 "IDENTIFICATION CODE) KM = KA

ZMR	50 Hz	06.10	10.10	10.15	16.15	16.20	02.30
	60 Hz	07.11	07.14	11.15	11.23	17.25	03.35
Ø inlet	BSP – NPT	1 ½"	1 ½"	1 ½"	1 ½"	1 ½"	1 ½"
Ø outlet	BSP – NPT	1 ¼"	1 ¼"	1 ¼"	1 ¼"	1 ¼"	1 ¼"
Flange ISO– ANSI–JIS	DNA *	40 - 1 ½"	40 - 1 ½"	40 - 1 ½"	40 - 1 ½"	40 - 1 ½"	40 - 1 ½"
	DNM *	32 - 1 ¼"	32 - 1 ¼"	32 - 1 ¼"	32 - 1 ¼"	32 - 1 ¼"	32 - 1 ¼"

Pump	Model	06.10						10.10						10.15						16.15						16.20						03.20									
	Version	N		P		S		N		P		S		N		P		S		N		P		S		N		P		S											
		WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF										
power (IEC) 50 Hz	KW		0.55		0.75		1.1		0.75		1.1		1.5		1.1		1.5		2.2		1.5		2.2		3		2.2		3		4		2.2		3		4				
Motor frame	IEC		71		80A		80B		80A		80B		90S		80B		90S		90L		90S		90L		100L		90L		100L		4		90L		100L		4				
Pump weight	IEC	No motor		Kg		3		4		3		4		3		4		3		4		3		4		3		4		3		4		3		4					
		3P		Kg		10		11		11		12		13		14		11		12		13		14		16		17		20		21		16		17		20		21	
		E-exd		Kg		18		19		23		24		23		24		23		24		33		34		23		24		33		34		34		35		33		34	
		1 P		Kg		12		13		14		15		17		18		14		15		17		18		20		21		17		18		20		21		27		28	
noise	dB		65						70						70						70						70						70								
Max. Head	M		11						14,5						18						23,5						26,5						31								
Max. Capacity	m³/h		17						19						25						26						30						8								
Max. NPSH req.	mc.l																																								

Pump	Model	07.11						07.14						11.15						11.23						17.25						03.35									
	Version	N		P		S		N		P		S		N		P		S		N		P		S		N		P		S		N		P		S					
		WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF	WR	GF						
Power (IEC) 60 Hz	KW		0.75		1.1		1.5		1.1		1.5		2.2		1.5		2.2		3		2.2		3		//		4		//		//		4		//		//				
Motor frame	IEC		80A		80B		90S		80B		90S		90L		90S		90L		100L		90L		100L		//		112		//		//		112		//		//				
power (NEMA) 60 Hz	HP		1		1 1/2		2		1 1/2		2		3		2		3		5		3		5		//		5		//		//		5		//		//				
Motor frame	NEMA		56		56		145		143		145		182		145		182		184		182		184		//		184		//		//		184		//		//				
Pump weight	IEC	No motor		Kg		3		4		3		4		3		4		3		4		3		4		3		4		3		4		3		4					
		Lb		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9		6.7		8.9			
		3P		Kg		11		12		13		14		16		17		13		14		16		17		20		21		16		17		20		21		25		26	
		E-exd		Kg		23		24		23		24		33		34		23		24		33		34		34		35		44		45		34		35		44		45	
		Monofase		Kg		14		15		17		18		20		21		17		18		20		21		27		28		//		//		27		28		//		//	
		1 P		Lb		33		35		35		38		48		50		44		46		48		50		86		88		48		50		86		88		91		94	
NEMA	3F		Lb		33		35		35		38		48		50		44		46		48		50		86		88		48		50		86		88		91		94		
	E-exd		Lb		33		35		35		38		48		50		44		46		48		50		86		88		48		50		86		88		91		94		
noise	dB		70						70						70						70						74						74								
Max. Head	m		15.5						16.5						22						28						36						35								
Max. Capacity	m³/h		15						19.5						24						27						30						10								
Max. NPSH req.	mc.l																																								

phase	N.	Trifase (tutti i modelli) – Monofase (< 3kW)																									
voltage Std. IEC	V	400 ± 5% 50 Hz																									
voltage Std. NEMA	V	460 ± 5% 60 Hz																									
protection	IP	55																									
Loads (ports-section)	Kg	Max. single strength value F(x,y,z) = 2,5																									
Dynamic loads (base)	Kg	6,5													11												

(*) for connections type "Y" (see pag.1 "IDENTIFICATION CODE) DnM = DnA

Dimensions in mm
Weight and loads in kg
Centre of gravity along the motor axis, in the middle of dimension -L-

GENERAL CONDITIONS OF SALE

1. ACCEPTING ORDER

The order is deemed to be accepted: a) through our Order Confirmation b) by returning a copy of the Customer's Order signed by us to indicate our acceptance. Any departure from these conditions and any verbal agreement will be deemed to be valid only if they are accepted by us in writing. The purchaser forgoes the right to raise objections based on any type of verbal agreement. Our offers and quotations are not binding and may be modified. Measurements, weights, drawings and reproductions are not essential parts of the order unless this is specifically stated in writing.

2. SUPPLIES AND DELIVERY TIMES

Only the supply and delivery dates set out in our order confirmation are binding. The delivery time that we indicate shall be calculated from the moment in which all the details required for meeting the order have been settled. Unavoidable interruptions to work or other cases of force majeure, including decisions by public authorities, procurement difficulties, lack of raw materials, labour disputes, etc, shall, if prompt notification thereof is given, entitle us to put back delivery dates without this giving entitlement to claim any sort of compensation. Without our explicit consent, orders that have been confirmed in writing may not be cancelled either wholly or in part even if deliveries are late. Any order accepted by our agents or representatives is not binding until it has been formally approved by us. Our agents and representatives are not entitled to collect any sort of payment until they are authorised so do in writing by ourselves. Any other payments are made at the purchaser's risk. If the goods have still not been collected seven days after the agreed delivery date the invoice for the goods will be issued and payment will fall due subject to the agreed conditions.

3. CARRIAGE OF GOODS

If the method of carriage of goods is not specified in the order documents or agreement, we shall dispatch the goods in the manner that we deem to be most appropriate. We also reserve the right to dispatch goods from places other than our premises. For carriage-paid goods the purchaser must take out insurance to cover carriage and the relative amount will be charged in the invoice.

4. COMPLAINTS

Complaints of any type must be made upon receiving the goods and within **one week** of discovering the defect. Complaints about incomplete orders or deterioration during transit must be made to us **immediately** and all the proofs of the irregularity must be collected in order to substantiate any claims against the carrier.

5. LONG TERM STORAGE – HORIZONTAL PUMPS

The following storage procedure is recommended for pumps that will remain idle for extended periods prior to start-up (for accessory equipment such as motors and controls, refer to the appropriate equipment manufacturer for their recommended procedures).

1. Drain pump.
2. Cover suction and discharge flanges with flange protectors and plug all the auxiliary connections to exclude dust or dirt from pump internals.
3. Coat interior and exterior of all metallic items - in contact with the external atmosphere (unpainted) - with a rust preventative.
4. Remove breather and oiler and plug tapped holes in pump power frame.
5. Cover and wrap pump with barrier film sacks (suitable for a long-term preservation of materials that need a constant environment to maintain their properties). Protect with wooden box if storage area could result in damage to pump. Indoor storage is highly recommended.
6. Rotate shaft several times at 4-6 month intervals.

6. LONG TERM STORAGE PACKAGE

Due to their unique corrosion resistant design, **ARGAL Horizontal Pumps** require very little special preparation for long term storage (more than **four** months). Those customers who find it necessary to store horizontal pumps for long periods of time may purchase a special Long Term Storage Package at: a nominal price. This package includes items 1, 2, 3, 4, and 5 as stated above using our standard wooden box. Cut away area on box will be noted for shaft rotation.

THIS LONG TERM STORAGE PACKAGE HAS A COST PER PUMP.

7. WARRANTY

Specifications, dimensions and any other information contained in our catalogues is to the best of our knowledge accurate. However, the above information is merely illustrative and is subject to modification without warning. In all cases we reserve the right to - at any moment - make any changes to our products that we deem to be appropriate and such changes shall not entitle the purchaser to make any claims against us. All drawings remain our exclusive property and may not be passed on to third parties or be reproduced without our written approval.

APPROVAL TESTING: the purchaser is entitled to request that the pumps be tested on our premises. Such testing must be requested in good time before the pumps are due to be dispatched and shall be conducted using the instruments in our possession. The cost of the test shall be agreed with our Sales Department in writing. The purchaser will be given **ten** days' advance notice of the test date. The test will be conducted on this date even if the purchaser (or his official delegate) is absent and they will be informed of the results - If the results are satisfactory, the pump shall be deemed to have been approved.

DURATION OF WARRANTY: Argal manufactures its products from first-class materials, uses qualified personnel and tests the different production stages. Within **twelve** months from the time of installation and no more than **eighteen** months from delivery Argal undertakes to examine any defective parts and to promptly replace any faulty parts free of charge if it is responsible for the fault. Such faults must not be due to wear, inexpert use or carelessness on the purchaser's part, fortuitous events or force majeure. The warranty period is shortened to **six** months if the machines work continuously twenty-four hours a day. Even machines that are under warranty must be sent to Argal carriage paid. Once the machines have been repaired they will be returned to the purchaser carriage forward. The replaced parts remain the property of Argal and must be returned to Argal.

The warranty is voided: **1a)** if the machines have not been properly maintained; **1b)** if they have not been used in accordance with the technical standards set out in the manuals supplied with the delivery; **1c)** if the machines are dismantled without our prior authorisation; **1d)** if the machines are 'mistreated'; **1e)** if the machines are used to circulate liquids in applications that are different from those which have been specifically approved beforehand by ARGAL. We shall not be liable for the downtime arising from repairs to or the replacement of any machines of ours that are under warranty.

Argal shall not be responsible for any direct, accidental or indirect damage, injury or loss (including, but not limited to accidental or indirect damage arising from loss of profit or sales, or for any personal injury or damage arising or any other accidental or indirect loss) or for damage and injury caused by use of the machine or inability to use the machine. Before using the machine the user must check the suitability of the machine for its intended purpose and shall use the machine entirely at his own risk and responsibility.

The user notes that the pumps supplied to him by us oblige him, in accordance with Article 2050 of the Italian Civil Code, to comply with all the legislative and regulatory standards governing dangerous activities such as using, storing and conveying aggressive and polluting chemical products.

The user also undertakes to comply with the prescriptions that apply to the system (such as guards, washers, seals etc) in which the pumps will be used and to comply with the installation instructions, checks and maintenance prescribed for pumps and installations. The user must also allow us, if necessary, to check the operating efficiency of the systems and to subsequently check that the pump has been correctly installed.

If the user fails to comply with the prescriptions laid down by us or prevents us from carrying out the above inspection, he voids all contractual warranty rights and warranty rights under the terms of Articles 1667 and 1668 of the Civil Code.

NOTE: The purchase of the **ARGAL Long Term Storage Package** does not extend the standard pump warranty in any manner, i.e., **twelve** months from start-up not to exceed **eighteen** months from factory shipment. If an extension of our standard warranty is to be considered, the Long Term Storage Package must be furnished and the customer must agree to allow a ARGAL representative to inspect the equipment prior to installation and start-up. The customer shall bear the cost of this visit plus traveling expenses for the representative. As we have no control over the actual storage conditions, any repairs or repair parts required to put the equipment back in an "as new condition" shall be billed to the customer. If an extension of our standard warranty is required and if the customer is agreeable to the above conditions, contact ARGAL Division management, who has the sole authority to extend our standard warranty.

8. TERMS OF PAYMENT AND RETENTION OF TITLE

Only the terms of payment set out in the approved documents are valid. We retain title to the goods sold until the goods have been paid for in full. We have the right to cease or suspend deliveries if the purchaser should fall into arrears with his payments by however small an amount or if the state of his assets and/or financial situation should deteriorate after the agreement has been signed. If the purchaser should fall into arrears with his payments, even for other supplies of goods, and even if he falls into arrears by refusing to pay for goods that he deems to be faulty, we shall be entitled to demand full payment of the outstanding amount owing to us or to make good our retention of title by requiring the immediate return of the goods. Interest will be charged on late payments at two percentage points above the current bank rate, without there being any need to declare the purchaser to be in arrears.

9. DISPUTES

Any disputes arising over the interpretation or performance of the agreement shall be subject to the exclusive jurisdiction of the Court of Brescia, whatever method of payment is chosen.

BS, 11.04.2017

ARGAL S.r.l.

Rev. 01 - 2017

13 MANUFACTURER DATA



Production head and legal office:
Via Labirinto, 159 I - 25125 BRESCIA
Tel: 030 3507011 Fax: 030 3507077

Administration	Tel: 030 3507019
Export manager	Tel: 030 3507017
Customer service	Tel: 030 3507025
Web	www.argal.it
E-mail	argal@argal.it

REV. 10 / 10.2018

The INSTRUCTION MANUAL must be delivered to the pump-user, who takes diligent note of it, fills in data for Maintenance Department (page 1), keeps the file for subsequent reference. Possible modifications do not imply updating of the existing manuals

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