

ARGAL

USE MANUAL

ELK (TMA)



EAC CE

DEALER

for Maintenance

date of commissioning:

.....

position / system reference:

.....

service:

.....

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- DECLARATION OF CONFORMITY (MACHINERY DIRECTIVE 2006/42/EC)

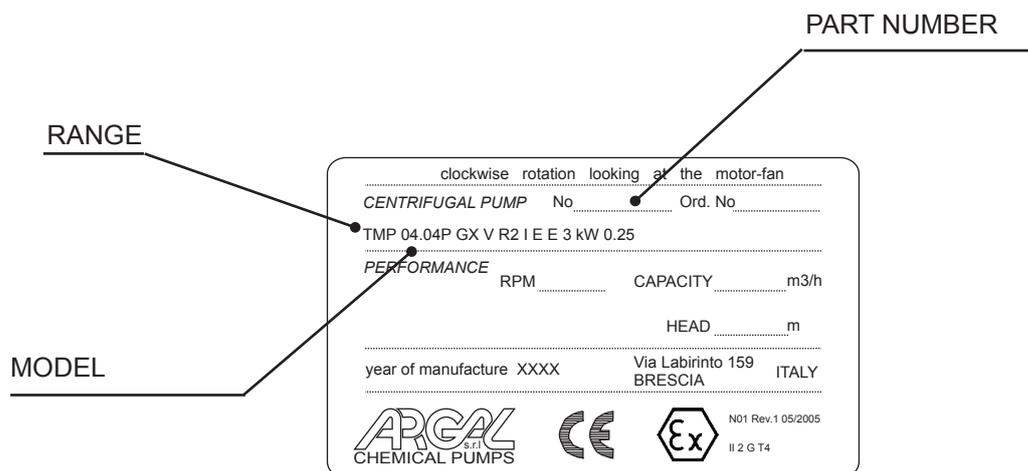
- MOTOR USE MANUAL

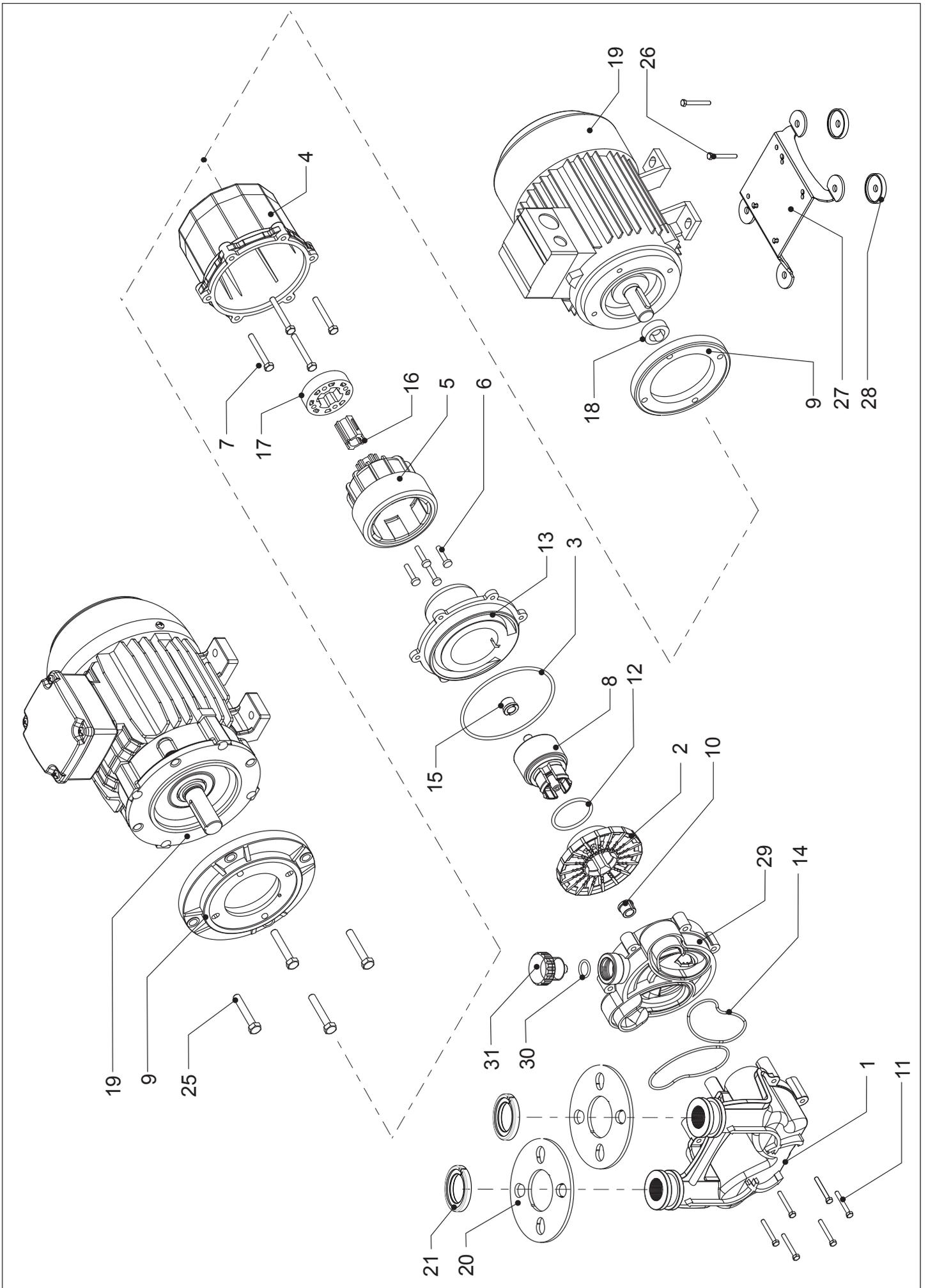
IDENTIFICATION CODE

Pump data					Motor data		
range	model	Execution (materials)	O-ring	guide	rpm	power	phase
TMA	□ 01.16	□ WR (polypropylene PP)	□ V (FPM)	□ R1 (C/Al ₂ O ₃)	□ 1450	□ 0.18 kW	□ 1 (1 phase)
		□ GF (ethylene-chloro trifluoro ethylene E-CTFE)	□ E (EPDM)	□ N1 (GFR-PTFE)	□ 2900	□ 0.25 kW	□ 3 (3 phase)
	□ 01.21			□ X1 (SiC/Al ₂ O ₃)	□ 1740	□ 0.37 kW	
				□ R2 (C/SiC)	□ 3480	□ 0.55 kW	voltage/EEEx
	□ □ □	connections		□ N2 (GFR-PTFE/ Al ₂ O ₃)		□ 0.75 kW	□ 0 (without motor)
	N P S	□ B (BSP threaded)		□ X2 (SiC/SiC)	standard	□ 1.1 kW	□ N (STD voltage)
		□ N (NPT threaded)			□ E (IEC)		□ S (special voltage)
		□ Z (ISO ANSI JIS flanged)			□ N (NEMA)		□ E (EEX)

Each pump is supplied with the serial and model abbreviation and the serial number on the rating plate, applied 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.





LEGEND

note	ref	pos.	Part name	Q.ty	Disassembling steps sequence										Spare stock for working years		
					1	2	3	4	5	6	7	8	9	10	2	5	
	102.1	1	Connections casing	1		•											
	233	2	Impeller	1				•								1	1
	412.1	3	O ring (or 4437)	1				•								1	2
	331	4	Strainer	1										•			
	858	5	Drive magnet assembly	1							•						
	910.3	6	Screws (magnet-assembling locking)	4						•							
	910.2	7	Connection strainer / electric motor	1										•			
	857	8	Magnetic core	1				•									1
(*)	722	9	Motor lock flange	1										•			
	545.1	10	Front guide bushing	1					•							1	2
	910.1	11	Connection volute casing/strainer	1	•												
	412.2	12	O-ring (OR 3175)	1					•							1	2
	162	13	Rear volute casing	1			•										1
	412.3	14	O-ring (OR 3300)	2				•								2	4
	545.2	15	Back guide bushing	1					•							1	2
	523	16	Socket	2										•			
	518	17	Collar (drive magnet assembly)	1										•			
(*)	504	18	Space ring	1										•			
	800	19	Electric motor	1													
	722.1	20	Inlet flange	1		•											
	727.1	21	Inlet flange-adaptor	2	•												
	910.4	25	Connection motor lock flange / electric motor	1										•			
	910.5	26	Connection electric motor / base	1	•												
	890	27	Base	1		•											
	185	28	Socket plate	4	•												
	102.2	29	Duct casing	1			•										1
	412.4	30	O-ring (OR 121)	1		•											1
	912	31	Filling plug	1	•												1

NOTES:

During the dismantling or assembling steps take the pump in vertical position (inlet side up).

(*) These parts are referred to an IEC 80 size motor pump.

GENERAL NOTES

"TMA" 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 radial blades impeller pumps in a fixed installation, from a tank at a upper/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 environmental conditions must be compatible with the characteristics of the pump and are defined upon ordering. Impeller and static casings, in contact with the liquid, are constructed from thermoplastic materials; other parts in high chemical-resistant materials

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

The value of the suction lift is defined upon ordering.

"TMA" pumps are self-priming, horizontal, single stage, close coupled to a non-synchronous electric motor, with side-inlet and upward-outlet for connection to the hydraulic system. They are foot-mounted for floor fixing.

At start-up the pipes can be empty and the pump body full of liquid.

The priming time depends on the suction lift and on the suction circuit (total length and diameter).

"TMA" pumps cannot run dry.

The liquid being pumped may contain a maximum 1% of solid non-abrasive particles not greater than 0,1 mm in size.

The presence of fibrous, adhesive or abrasive bodies is not allowed; la dimensione massima consentita per corpi solidi occasionalmente presenti è di 0,5 mm.

"TMA" pumps are bi-directional, so they can work rotating clockwise or counter clockwise without any performances reductions. (see page 15)

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, depends upon the installed motor power (shown on the motor identification plate) and has to be defined upon ordering.

standard construction N (riportata in targhetta)	1,05	kg/dm ³
powered construction P (riportata in targhetta)	1,35	kg/dm ³
strong-powered construction S (riportata in targhetta)	1.8	kg/dm ³

The specific weight that can be pumped at 70°C is 10% less than that at 25°C.

The level of cinematic viscosity must not exceed 10 cSt so as not to significantly modify the pump's performance. Higher values up to a maximum of 40 cSt are possible provided that the pump is equipped with suitable impeller to be defined upon ordering.

The liquid temperature is a primary factor of suction lift and has to be defined upon ordering; at 60 °C the pump is not usable as self-priming pump.

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

60 °C (140°F)	version WR
90 °C (194°F)	version GF

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

OPERATING PRINCIPLE

HYDRAULICALLY different to all centrifugal pumps.

The radial blades impeller rotates into a body with symmetrical inlet and outlet sections: this construction allow the bi-directional working.

The impeller, during the rotation, produce vacuum closeness the inlet section and so induce the fluid to flow through the blades into the volute in which it increase its pressure. At the end of the volute, the fluid is forced to flow through the blades yet and directed to the discharge side.

MECHANICALLY different from the traditional centrifugal pumps in the impeller motion drive thanks to the magnetic field created between the primary outer magnet and the inner magnet (not visible because housed inside the impeller hub). The magnetic field crosses the plastic parts and the liquid, and firmly couples the two magnet assemblies. When the motor causes the outer magnet to rotate together with its housing, the inner magnet assembly is dragged at the same speed. As a result the impeller, which is integral to it, is maintained in rotation. The internal/external permanent magnets coupling don't cause losses during the operation.

An excessive torque (load) leads to the uncoupling of the magnets system: the pump can still move the fluid after the stopping only.

The guide bushing, totally within the housing, is not involved in the transmission of rotary motion; its only function is to act as a centering guide and support for the impeller. To this end the components are designed so that a spontaneous cooling circuit (due to a simple effect of pressure) is established to cool the surfaces subject to friction. The frictions due to axial movements of the impeller are neutralised by the same bushings working as thrust bearings too. Periodic inspections prevent the build-up of sediments between the shafts and the guide bushes significantly lengthening their working life.

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.

With single phase motors the direction of rotation may be reversed by changing the position of the connection plates(fig.1)

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(fig.2)

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)(fig.3)

They require a star-connection for higher voltage (400 volts for a; 690 volts for b)(fig.4)

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 :

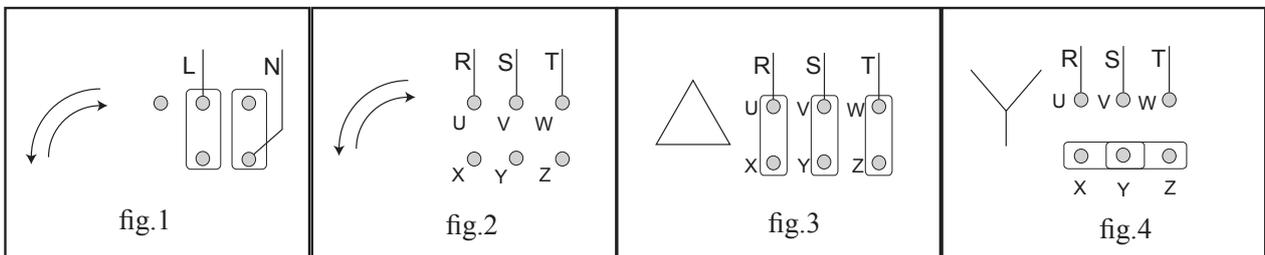
The first number indicates the level of protection against penetration of solid objects and in particular :

- 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.



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.

INSTRUCTIONS ON INSTALLATION AND USE

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

STORAGE INSTRUCTIONS

- When is necessari to store the pump before installation don't remove it from the original packaged. The packaged pump must be stored lifted from ground level, the ambient must be close, clean and dry.
- If at the receipt of the pump package seems damaged is necessary to free the pump in order to check its integrity and to store a new package
- The place where the pump is stored must be closed with an ambient temperature not lower than -5°C and not higher than 40°C , the air humidity rate not higher than 80%, the package pump mustn't received shock, vibrations and loads rising above.
- If the storing period is higher than 6 months, before installation check the condition of the grease in the support, eventually provide to restore it.

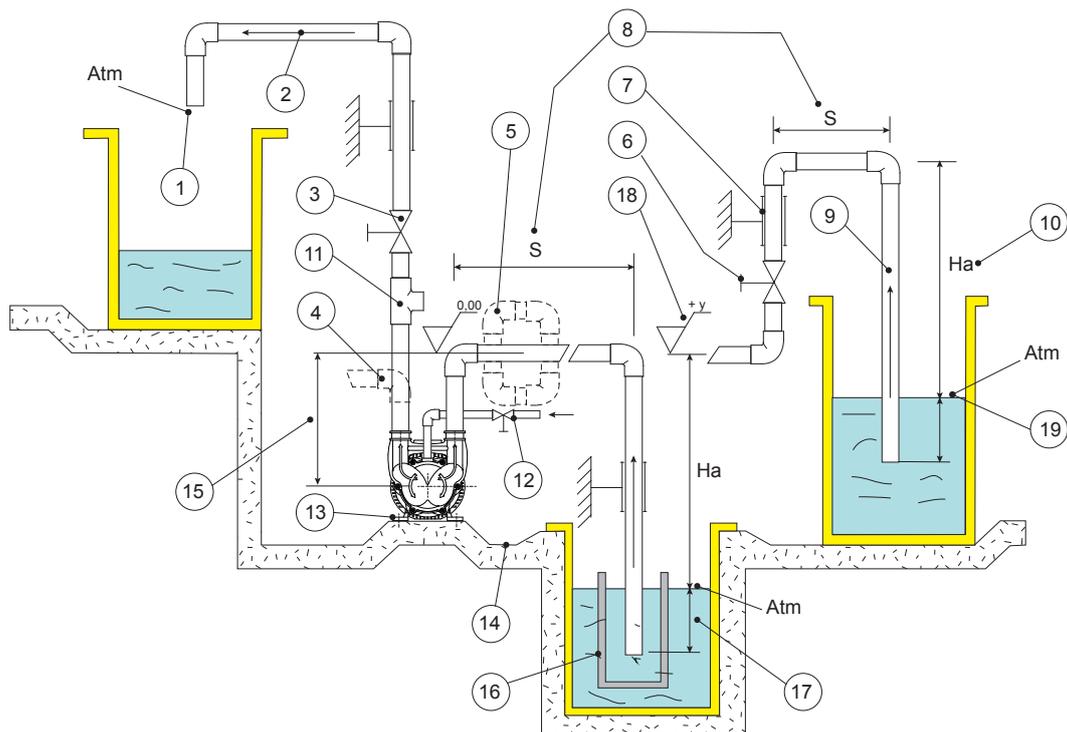
INSTALLATION INSTRUCTIONS

- realize a perfectly airtight plant is a basic factor for a successful priming-phase
- 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) Discharge must take place in the atmosphere and at a level above the suction tank
- 2) Maximum discharge fluid speed: 3.5 m/sec.
- 3) YES: flow control gate valve on the discharge side
- 4) NO: bends (or other fittings) mounted close to the pump (both on suction and discharge sides)
- 5) NO: air pockets. The circuit must be linear and short
- 6) YES: blocking gate valve if the Suction level is higher than the pump level (installation A)
- 7) YES: firmly fix all piping
- 8) Keep horizontal S lengths without air discharge as short as possible
- 9) Maximum suction fluid speed: 3 m/s (correlated with priming-time and suction lift)

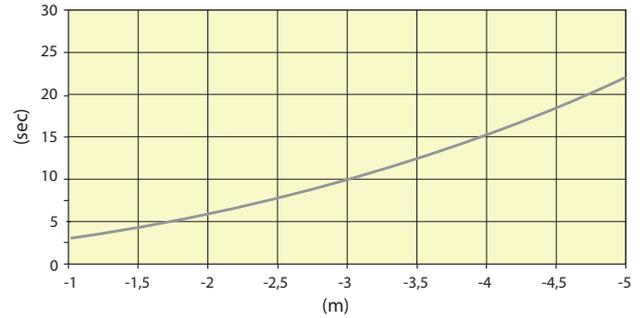
- 10) Suction lift -Ha- specified upon ordering, in any case not over 5m. Small increments in specific weight, temperature and circuit length considerably reduce such value
- 11) YES: connection point for pressure gauge or protection pressure switch
- 12) YES: connection point for manual flooding of the pump (generally town water except in the case where there is risk of abnormal or violent chemical reactions with the liquid to be pumped)
- 13) The pump must be installed using all of the fixing holes provided; the fixing points must be at the same level
- 14) YES: drainage channel around the base plate
- 15) Guarantee a minimum value of 0,3 m (DN25)for the siphon height
- 16) YES: large and rigid separating filter in the case of open tanks
- 17) Minimum immersion depth: 0.3 m
- 18) Pipe inclination towards the pump
- 19) Level of liquid subjected to atmospheric pressure

- 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 NOTES
- 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



STARTUP

- verify that the instructions outlined in the INSTALLATION have been followed
- verify the correct direction of rotation supplying the motor with short impulses
- totally flood the the pump
- start the pump with the discharge valve partially closed and the suction valve (if present) completely open
- measure the priming time; see chart
- when the pump is primed slowly regulate the flow by means of the discharge valve (never with the suction valve). Make sure that the current absorbed by the motor does not exceed the rated value indicated on the motor identification plate
- do not operate the pump at the limit values of its performance curve: maximum head (discharge valve excessively closed) or maximum capacity (total absence of drops and geodetic head on the discharge side)
- set the operating point to that for which the pump was requested
- ensure that there are no abnormal vibrations or noise due to inadequate mounting or cavitation
- verify that the priming-time is constant by repeating several times the priming-phase, starting the pump without refill up the liquid trapped in the pump casing
- avoid excessively short and/or frequent start-ups by adjusting the consent appliances



Motor power;	kW	0,55÷5,5	7,5÷30	37÷110	132÷200	250÷315
Max. no. starts/hour;	2-4 poles	20 - 40	10 - 20	6 - 12	2 - 4	1 - 2

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

Warning!!! At the start-up be sure that all the internal hydraulic parts are not in CCW rotation (the cooling fan of the motor must stand or CW rotate), to prevent decoupling among magnetic driven parts of the pump; if the CCW rotation is due to the feed-back of the liquid in the discharge side, add a no-return valve in the plant.

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 exothermic 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)

SHUTDOWN

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

MAINTENANCE

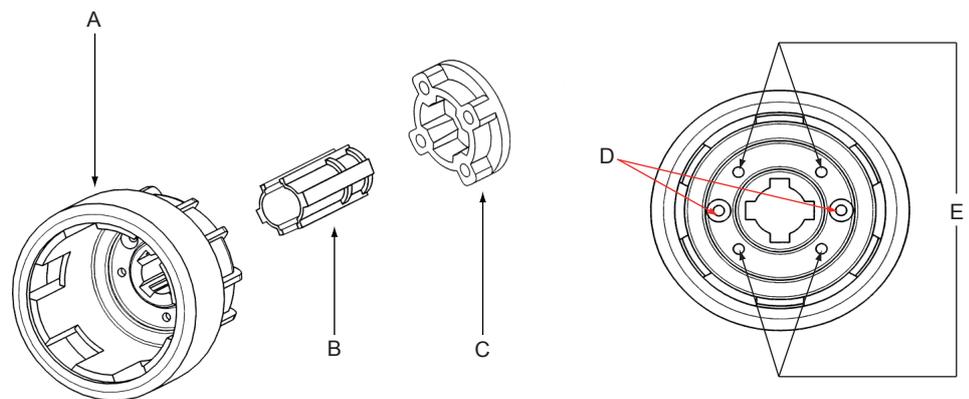
- all these maintenance operations must be performed under the supervision of qualified personnel
- make periodic inspections (2 to 6 months depending on the type of liquid and the operating conditions) on the rotating parts of the pump; clean or replace as necessary
- make periodic inspections (3 to 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

DISASSEMBLING

- Tools required: size 8 socket spanner, cross cogging screw driver, punch $f < 4\text{mm}$.
- Bolts have right-hand thread
-
- 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
- warning: operations near the magnet attract the tools. Proceed with caution to avoid damage.
- during the dismantling take the pump in vertical position (inlet side up).
- now open the pump following the sequence indicated in the respective table of the LEGEND
- disassembly connections casing - front volute casing - impeller - rear volute casing screwing off six M5 screws. Take care to avoid any kind of shock that could crash SiC or Al₂O₃ parts of the guide system.
- after removing the rear casing we reach the drive magnet assembly where we can see 4 cross cogging screws, after unscrewing the 4 screws (pos. E in pic.) we have to insert the punch in the hole (pos. D in pic.) to extract the collar (pos. C in pic.) from the drive magnet assembly tang.
- After removing the collar we can unthread drive magnet assembly, sockets and collar (pos. A, pos.B, pos. C in pic.) from the motor shaft.



INSPECTION

Check:

- the pump shaft for cracks and excessive wear
- guide bushing for excessive wear (5 %)
- extreme abrasion and corrosion of the impeller blades and volute casings surfaces.
- for lumps and clusters created by the pumped liquid (especially at the bottom the rear chamber)
- abrasions on the outside surface of the reinforcement chamber due to scratching of the outer magnets
- replace broken, cracked or deformed parts.
- Reopen all the blocked pipes and eliminate any chemical agglomeration.
- Clean all the surfaces before re-assembly, especially the O-ring seats (risk of drip leaks).

ASSEMBLY

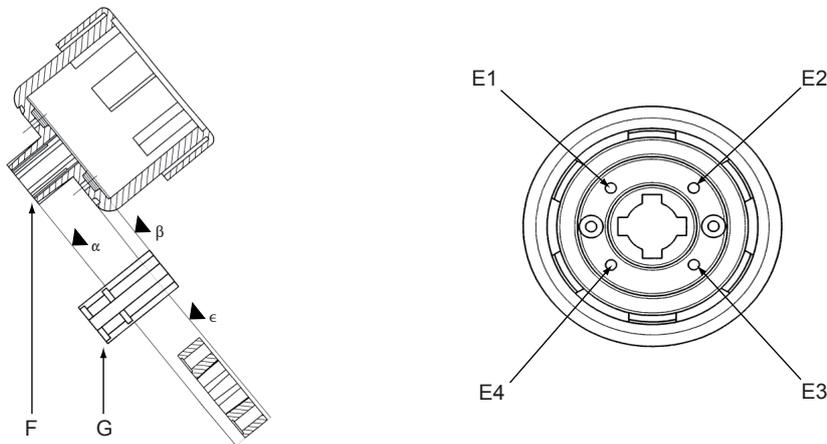
Tools required: size 8 socket spanner, cross cogging screw driver.

Bolts have right-hand thread

Bolt torque setting:

	M4	M6	M8	M10
(reduce by 25% on plastic parts)	Nm 4	14	24	25

- all these maintenance operations must be performed under supervision of qualified personnel
- before the inspection, check that you have spare o-rings ready to hand for re-installing at the end of operations
- now open the pump following the sequence indicated in the respective table of the legend
- insert possible sockets (pos.g in pic.) into the drive magnet assembly tang (pos.f in pic.)
- the relative position between the drive magnet assembly and the sockets is shown by the a e b plans in the picture.
- insert the collar (pos. h in pic.) on the drive magnet assembly tang, the collar side where are visible brass inserts have to be located to the pump side and as far as possible from the e plan insert the assembly group (drive magnet assembly, sockets, collar) on the motor shaft (during the group insertion verify that the relative position between the sockets and the drive magnet assembly remain the same, the sockets (pos.g) and drive magnet assembly (pos.f) must be located as shown in the picture
- screw the 4 cross cogging screws sharing the operation in more than one phase, repeat the sequence e1, e2, e3, e4 (torque @ 6 Nm)
- don't insert the impeller freely into the drive magnet assembly
- during the impeller insertion take care not to damage the Al₂O₃- SiC-C HD components



SAFETY RISKS



WARNING! MAGNETIC FIELDS. Magnetic pumps contain some of the most powerful magnets in existence. The magnets are positioned on the back of the impeller and the outer magnet housing. The magnetic fields may adversely affect persons fitted with electronic devices (e.g. pacemakers and defibrillators): such persons must not be allowed to handle magnetic pumps and magnetic pump components.



WARNING! MAGNETIC FORCE. Exercise extreme caution and follow instructions carefully during pump assembly/dismantling. Magnetic force attract (cause insertion of) internal and magnetic units, and are therefore a potential source of injury to fingers and hands.



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.

Risks may also arise from improper maintenance or dismantling practices.

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

INSTALLATION AND START-UP 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).

MAINTENANCE AND OPERATIONAL 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

PERSONNEL RESPONSIBLE FOR REPAIRS

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

WASTE DISPOSAL

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

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

MALFUNCTIONS AND POSSIBLE CAUSES

The pump does not prime:

- 1.excessive geodetic suction lift
- 2.air intake from suction pipe or branch pipes
- 3.the pump is not totally filled in before starting, or else the vertical length of the discharge pipe is too short so the pump is not totally re-filled in after each stop.
- 4.impeller blades obstructed by impurities
- 5.blocked check valve on the discharge pipe
- 6.geodetic system height is greater than maximum potential pump head
- 7.impeller blocked by a considerable layer of crystals or by melting due to dry running
- 8.bottom valve blocked by mud or other debris
- 9.bottom valve insufficiently immersed
- 10.magnets release a much greater specific weight and flow rate of liquid than planned

Pump discharge rate or pressure insufficient:

cfr. 01, 02, 03, 04, 07, 08, 10

- 11.the head required by the plant is greater than that expected
- 12.insufficient nominal diameter of suction piping, bottom valve or other suction parts
- 13.damaged or worn impeller
- 14.viscosity of liquid greater than that expected
- 15.excessive quantities of air or gases in the liquid
- 16.bends, non-return valve or other parts close to the outlet
- 17.liquid (especially if hot) liable to change to gaseous state

Pump absorbs too much power:

cfr. 14

- 18.pump operates at greater capacity than expected
- 19.specific weight of liquid is greater than expected
- 20.impurities inside pump create abnormal wear
- 21.electric motor supply voltage is not rated voltage

Pump vibrates and is noisy:

cfr. 20

- 22.working with insufficient (very low) capacity
- 23.the pump or piping are not firmly fixed
- 24.eccentric impeller operation because of worn bushes

he pump shows signs of premature wear of internal parts:

cfr. 20

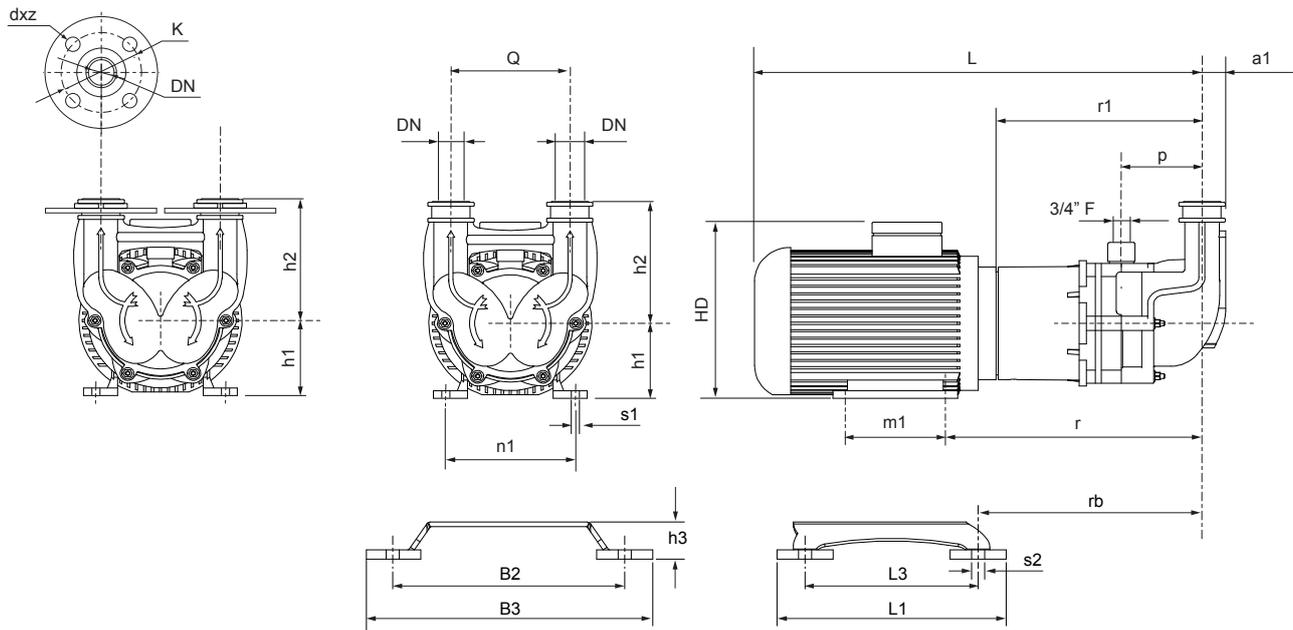
- 25.liquid excessively abrasive
- 26.recurring cavitation problems (cfr. 11, 15)
- 27.high tendency of liquid to crystallise or polymerise when pump is not operating.
- 28.pump made of materials that are unsuitable for pumped liquid
- 29.operation with capacity too reduced

DIMENSIONS

DIMENSIONS

TMA	STD motore	dimensioni	VERSIONE	a1	Q	L(*)	h1	h2	r1	p	r	m1	n1	s1	HD (*)	rb	L1	L3	B2	B3	s2	h3
01.16	IEC	mm	N	23,5	118	435	71	129	204.5	80	249.5	90	112	7	177	216	245	185	248	308	14	40
			P				80		214.5		100	125	10	190	282							
			S				80															
01.21	IEC	mm	N	23,5	118	435	71	129	204.5	80	249.5	90	112	7	177	216	245	185	248	308	14	40
			P				80		214.5		100	125	10	190	282							
			S				80															
01.21	NEMA	inch	N	0.925	4.65	9.04	3.5	5.1	8.93	3.15	11.5	3	4.875	0.342	6.37	9.43	9.65	7.28	9.76	12.1	0.5	1.57
			P																			
			S				10.22															

(*) can change for motors of different brands



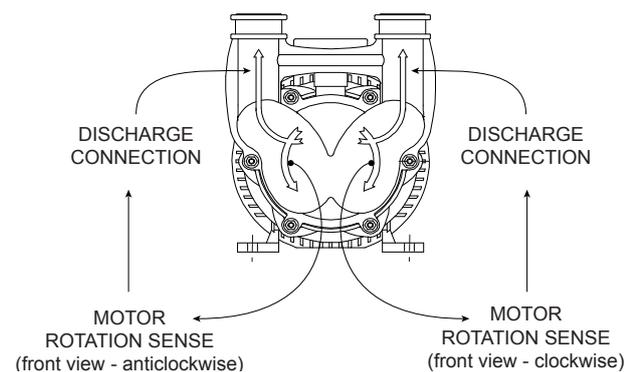
CONNECTIONS

TMA	threaded connection				flanged connection					
	DN	thread		DN	K			dxz		
		BSP	NPT		ISO - ANSI - JIS	ISO	ANSI	JIS	ISO	ANSI
01.16	20 - 3/4"	3/4 f	3/4 f	20 - 3/4"	75	70	75	14x4	16x4	15x4
01.21										

WEIGHT - MOTOR - PERFORMANCES

TMA	01.16		01.21			01.21				
	version	WR	GF	WR	GF	WR	GF			
Weight	Kg									
Motor	standard	IEC			IEC			NEMA		
	version	N	P	S	N	P	S	N	P	S
	Hz	50			60			60		
	frame	71B	80A	80B	71B	80A	80B	B56	B56	D56
	kW	0.55	0.75	1.1	0.55	0.75	1.1	0.55	0.75	1.1
	phases	1 / 3			1 / 3			1 / 3		
	V	400 ± 5% 50 Hz			460 ± 5% 60 Hz			460 ± 5% 60 Hz		
	Protection	IP 55			IP 55			IP 55		
	Weight	6.3	7.8	9.4	6.3	7.8	9.4	10.5	11.5	13
Load (port section)	Kg Max. single strength value F(x;y;z) = 2									
Noise	dB								79	
max. head	m									
max. capacity	m³/h									

BIDIRECTIONAL ACTION



GENERAL CONDITIONS OF SALE

1. 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.

2. LONG TERM STORAGE – HORIZONTAL AND VERTICAL 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.

3. LONG TERM STORAGE PACKAGE

Due to their unique corrosion resistant design, **ARGAL Centrifugal Pumps** require very little special preparation for long term storage (more than **four** months). Those customers who find it necessary to store centrifugal 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.

4. 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.

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 Italian 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.

BS, 13.11.2017
ARGAL S.r.l.

Rev. 02 - 2017

WARRANTY FORM

Company: _____	
Telephone: _____	Fax: _____
Address: _____	
Country: _____	Contact Name: _____
E-mail: _____	
Delivery Date: _____	Pump was installed (date): _____
Pump type: _____	Serial no.: _____
Description of the fault: _____	

The installation	
Liquid: _____	
Temperature (°C): _____	Viscosity (cPs): _____ Spec. grav. (Kg/m ³): _____ PH-value: _____
Contents of particles: _____ % of max size (mm): _____	
Flow (l/min): _____	Duty (h/day): _____ No. of starts per day: _____
Discharge head (mwc): _____	Suction head/lift (m): _____
Other: _____	

Place for sketch of the installation	

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 3507022
Customer service:	Tel: 030 3507025
Web:	www.argal.it
E-mail:	sales@argal.it

REV. 5 - 01/18

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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