



SUBMERSIBLE ELECTRIC PUMPS

INSTRUCTIONS MANUAL



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FOREWORD, WARRANTIES AND LIMITATIONS

The purpose of this instructions manual is to ease as much as possible the installation, operation and servicing of Aturia submersible pumps. We strongly recommend to read it attentively and to consult it whenever work is done on the pump. Unobservance of the instructions here reported or improper use of the pump by unskilled personnel may result in heavy damage to things and/or injuries to the person due to the presence of moving parts, pressurized fluids and electrical connections.

ATURIA technical assistance is readily available: for any doubt or possible problem, please contact us also by phone.

The electric pumps are carefully inspected and tested before dispatchment. Check however the equipment at delivery against the accompanying documents.

Check case integrity before removing the group. Parts and accessories can be packed alone or fastened to the packing case. If something is missing or damaged, please contact immediately Your local forwarding agent.

WARRANTY AND LIMITATIONS

The warranty does not include possible damages or failure caused by mishandling, wrong electrical connections and uncorrect assembling; the warranty also excludes in all cases the emission of pass certificates and reimbursements for the equipment or for consequential damage.

Aturia declines any responsibility for damages to persons and things due to improper use of the machinery here described.

Consumables are not subject to warranty.

CHAPTER 1

GENERAL DESCRIPTION

1.1 Pump and motor group

The electric pump is a centrifugal multistage pump with submersible motor and built-in non return valve, designed to minimize friction losses. The impellers are dynamically balanced and the shafts are driven by co-axial bush bearings.

The electric pump is manufactured in two versions:

- radial flow
- mixed flow

The radial version features compact axial stages made of stage casing, impeller and diffuser, allowing the assembling of a large number of stages to reach higher delivery heads.

The mixed flow stages features instead stage casings with built-in diffusers and semi-axial impellers. This kind of pump is employed in place of radial versions when higher capacities are required with the same well diameter.

1.2 Construction features

Pump nameplate reports the following informations:

- Manufacturer
- Serial number
- Head (meters)
- Shaft speed (Rpm)
- Pump type
- Capacity (m³/h)
- Month/ year of construction
- Break Power (kW)

1.3 Applications

Submersed electric pumps are mainly employed in the following applications:

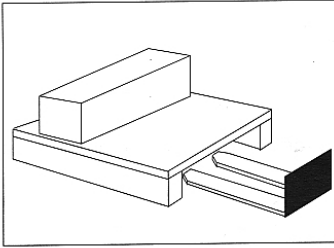
- Industrial and civil applications
- Irrigation systems
- Water supply systems
- Mining
- Offshore
- Nuclear and steam power stations
- Fire-fighting equipments

Motors are guaranteed for plant operation up to 20 bar. Maximum allowable water temperature in standard constructions is 25°C. For higher temperatures, please consult our Technical Department.

CHAPTER 2

TRANSPORT AND STORAGE

2.1 Transport



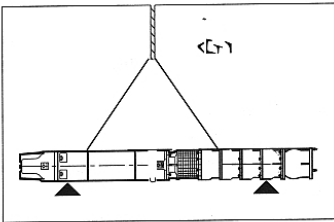
Before transportation, please perform the following checks:

- Weight of pump/ motor group
- Overall dimensions of pump/ motor group
- Suitability of lifting points

Aturia pumping units and their accessories (if included) are packed in crates suited for transportation to avoid any damage on the way. However, we recommend to inspect carefully the group at delivery.

The pump should be handled with equipment suited to its weight and to the shape of its crate (see side pictures).

Lifting by hand is allowed only for weights lower than 20 kilograms.



2.2 Storage

During storage, please observe the following precautions:

Store the pump in a closed, dry and airy environment.

All motors are filled with a water/ antifreeze mixture to prevent internal freezing up to -30°C.

Motors should not be stored or installed with lower temperatures or for periods longer than 12 months; however, if this is unavoidable, turn the shaft by hand once a month.

If the motor has been stored for more than 12 months, disassemble it and check rotating parts and thrust bearing.

Just before installation, drain completely the motor from the water/ antifreeze mixture and fill it with clear water, following the instructions reported on this manual.

Protect cable ends against humidity.

To avoid any damage to the electric cables, never bend them with a curving radius than lower 6 times their diameter.

Protect against direct sunlight the pump/ motor group, the electric cables and, in case the pump will be stored partially dismantled, the rubber parts and the thrust bearings.

CHAPTER 3

GENERAL SAFETY INSTRUCTIONS

3.1: General Instructions

The pump(s) should be used only for the applications specified in par. 1.3.

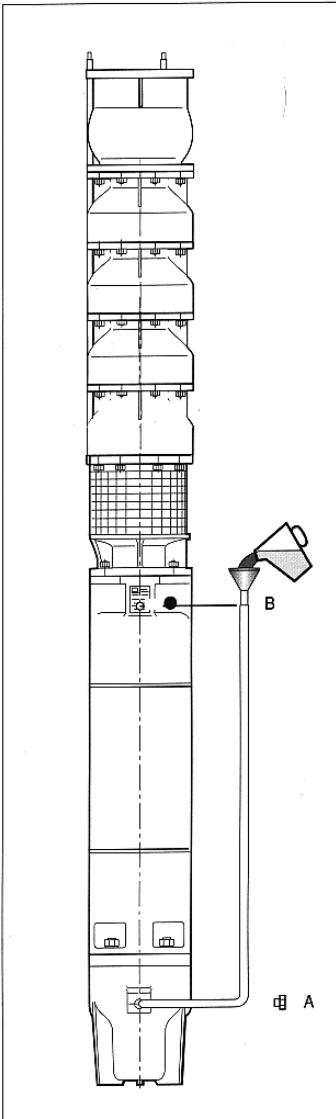
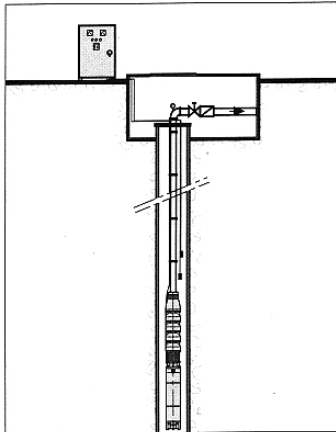
In case of applications not specified on this manual, please contact ATURIA to check for pump suitability, installation safety and pump life.

Before working on the pump, make sure the electric components of the concerned installation are disconnected from main power supply.

CHAPTER 4

INSTALLATION

4.1 Installation



For what concerns pump handling at the installation site, please refer to section 2.1.

Clean the well from sand or grit by applying the normal cleaning procedures, then place the pumping unit at the top of the well, fasten it to the hoist hook and fill the motor as follows:

- a) Place the motor in vertical position.
- b) Remove filling plug (A) and replace it with the nipple equipped with pipe and funnel delivered with the motor.
- c) Remove vent plug (B) to bleed the air possibly trapped in the motor.
- d) Holding the funnel higher than the vent valve, pour clear water in the motor until the mixture already in starts dropping from the vent valve.
- e) Stop pouring water in the motor, screw valve (B) plug back in place, remove the nipple and screw valve (A) plug back in place.

The group should never run without being filled, since pump bearings are lubricated by the pumped fluid.

Dry running should be absolutely avoided even for a very short period, since it might heavily damage the pump.

Also, the pump should not rest on the well bottom as the motor would run in a high sand-concentration environment with a dangerous reduction of its cooling capacity and probable windings burn-out.

Check cable connection to the control panel terminals. Check also the calibration of thermal protection relays, which should be set according to rated break power.

Disconnect the group from main electric supply before lowering it in the well.

Fasten accurately the cable far end as the cable might fall in the well. Lower then the electric pump into the well with the help of two supporting brackets placed alternately on the pump column pipe.

Proceed in the following way:

- a) Connect the first column section to the pump delivery nozzle after having placed a splitted supporting bracket at the opposite end of the pipe. In case of threaded column pipes, place by the upper end the suited threaded sleeve to avoid possible sliding between pipe and bracket.
- b) Move the assembly with a hoist and lower it till the bracket will rest on the well opening.
- c) Fasten every 2 or 3 meters the electric supply cables to the pump column by means of suited bands. We recomend a firm fastening, since slacken cables will tend to slide down along the pipe due to their own weight, creating loose, bending sections which could violently rub against the well internal walls at pump startup and stopping.
- d) Connect the second column pipe, that too coupled to a supporting bracket at its top.
- e) Keep the assembly lifted and remove the first supporting bracket, then lower the unit as described at point (b).
- f) Repeat this operation till reaching the desired depth. The unit should be submersed for at least f or 2 meters below the water dynamic level, such however to fulfil its NPSH requirements. The water level, for seasonal drop or for an excessive pump delivery compared to well feeding, should never be

lower than the pump suction chamber, as that could cause driving bushes seizing and motor overheating.

Check the length of the column pipe while lowering the unit, to make sure the unit is installed at the right depth. Definitive fastening is performed by welding and bolting the last pipe flange to the well opening.

In case of threaded pipes, these have to be completely tightened and possibly locked since the group reaction torque at startup could make them loose.

NOTE : Flanges should be provided with suited slots to accommodate the wires.

During the assembling use a suspension ring fastened to the column pipe, to avoid dropping the pump in the well in case of hoist failure or chain breaking.

4.2 Electrical Connections

Electrical connections should be made only by specialized personnel, strictly following the instruction of motor and electrical equipment manufactures. We recommend to install upstream the motor a safety switch to protect the motor against voltage drop or overload. Refer to voltage data on motor nameplate for its correct sizing. Leave 2 or 3 meters of cable more in case the terminal connection should be changed.

4.3 Power supply cable connection

The supply cable should be selected according to the Ampere flow, showed on motor nameplate.

If the cable is not supplied with the motor, it should suit the following requirement:

- a) Its section should correspond to the one recommended by the motor manufacturer according to carried power, installation depth and motor starting system.
- b) Warranty required: up to 600V in water.
- c) Motor connection should be performed with extreme care.
- d) The cable should show no cuts, cracks, scratches or other damages.

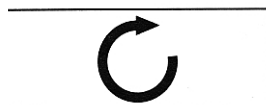
If two cables have to be joined in parallel, pay extreme attention when connecting cables of the same color.

4.4 Electric system

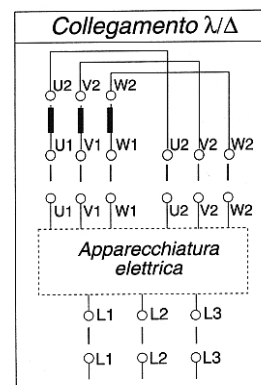
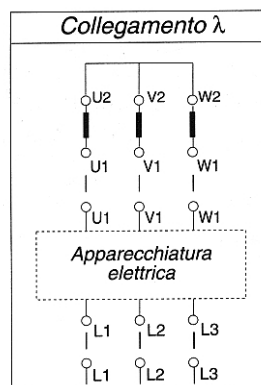
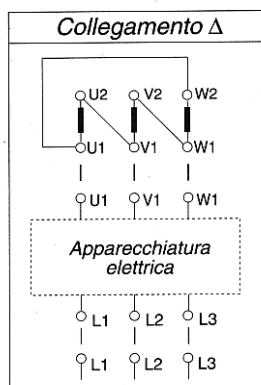
The motor is connected by the supply cable to the control panel which contains the necessary control and protection devices. Since every difficulty, either mechanical or electric, will damage almost automatically the motor windings, it is necessary for the control and protection equipment to be adequate and reliable. Economy may, in this case, produce unpleasant results. We recommend besides an efficient grounding of the control panel.



Elettropompe con senso di rotazione antiorario visto dalla bocca di mandata



Elettropompe con senso di rotazione orario visto dalla bocca di mandata



4.5 Electric protections

In all case of:

- DOL starting
- Star/ Delta starting
- Stator starting
- Autotransformer

Are necessary:

- An overload protection
- A short circuit protection
- Such protections should trip on all three phases.

We suggest besides protections against:

- Phase drop
- Voltage drop
- Water level drop.



4.6 Rotation direction

Check motor rotation direction before coupling the motor to the pump, so to avoid any damage to motor thrust bearing. Find and mark by means of cyclic phase indicator, whose pointer is turning clockwise, mains terminals L1, L2 and L3 and connect them to control panel terminals L1, L2 and L3.

Star/delta starting

Motor cables are marked with letters U1-V1-W1 e U2-V2-W2.

They have to be connected to control panel terminals, respectively: U1-V1- W1 and U2-V2-W2 for clockwise rotation (seen from motor/pump coupling).

In case of counterclockwise rotation, reverse terminals U1-V1 and U2- W2.

DOL, stator and autotransformer starting

Motor cables are marked with letters U1, V1, W1 and have to be connected to control panel terminals, respectively: U1, V1,W1 for clockwise rotation (seen from motor/pump coupling). For counterclockwise rotation, reverse two of the cables.

4.7 Further instructions for six-cables motors terminals connection



Six cables motors can be started with a Star/Delta starter only if main voltage is at least equivalent to the motor minimum rated voltage.

To obtain the correct rotation direction, find main terminals L1, L2 and L3 as previously described.

CHAPTER 5

COMMISSIONING AND STARTUP

5.1: Startup

Start the pump with gate valve half opened to check rotation direction. When the water starts flowing, close further the gate valve: pressure rating should be higher than rated pressure value.

If this is not the case, the rotation direction is wrong. Reverse two motor phases to restore the correct rotation direction.

The pump should not run in the wrong sense for more than 3 minutes.

Close then the gate valve to about the half of its full opening and leave the pump running for a minute. Stop then the pump for five minutes to allow the dissolution of air bubbles which, if present, might endanger shaft lubrication.

Start the pump and gradually open the delivery gate valve till the water shows free of sand, or till the suspended sand has dropped to a sufficiently low percentage (40 g/m³).

Before definitively commissioning the pump, remove starter fuses and check the electric circuit integrity with an ohm-meter to make sure there have been no damages when lowering the pump in the well.

If the results are negative, lift the group again and check it thoroughly.

For three-phases units, the electric resistance value should be nearly the same for each phase.

Check insulation resistance to the ground (i.e. between cable end and discharge pipe) using a megahoms-meter. Minimum value to the ground for a new pump is 10 megahoms with cold motor.

However, if some malfunctioning is detected during startup, stop immediately the pump and investigate the problem starting with the Fault Finding chart (chapter 7).

Check also that the pump runs within its operating limits and that voltage rates reported on control panel do not exceed motor nameplate rated values. If necessary, partially close gate valve or adjust the intervention of pressure switches.

Attention: The system should be fully completed before starting the pump, especially for what concerns electrical, mechanical and hydraulical components. All safety systems must be correctly operating.

5.2 Operation

The max. number of possible startups / hour depends from motor power and starter type.

- Up to 100 Hp = 10 startups / hour
- 100/200 Hp = 8 startups / hour
- above 200 Hp = 5 startups / hour

If the pump does not start, avoid insisting without having before investigated the reason.

All motors can afford ÷ 5% voltage deviation from rated voltage values.

5.3 Running tests

In case of pump malfunctioning, perform the following tests to find out the probable reasons:

First test

Close fully the gate valve.

Note at startup the AMPS absorbed.

Note during operation.

Note pressure as reported by the pressure gauge on delivery.

Note vertical distance between water level and the gauge dial center.

The following cases are possible:

Same pressure, same AMPS absorbed.

If the gauge readings do not differ substantially from previous readings, the impellers are not worn and motor rotation is correct.

If the AMPS absorber did not change from the original readings, the pump and motor internal rubbing did not increase and the percentage of water suspended sand is not representing a problem for the pump.

Lower pressure:

Lower pressure means worn impellers, or too low main voltage.

Higher AMPS absorbed:

This usually indicates a strong rubbing by the bearing journals due to suspended solids.

Second test

Open completely the gate valve.

Note the AMPS absorbed.

Note pressure as reported by the pressure gauge.

Note pump delivery as reported by the flow meter.

The following case is possible:

Pump delivery lower than rated delivery. This can depend from scaling, from a clogged upstream valve or from leaks along the pipe line.

CHAPTER 6

MAINTENANCE

Periodical maintenance is strictly related to the percentage of water suspended sand.

No maintenance is necessary as long as the pump keeps running efficiently, i.e. pump delivery keeps above 50% of rated delivery or the AMPS absorbed do not exceeds the 5% allowance. In some cases it will be necessary to replace worn parts such as impellers, sealing rings or bearings. In case of an high sand percentage, we suggest a first inspection after a 1000 running hours.

During long idle periods in the well, the pump / motor groups should be shortly started every 2 or 3 months, making sure the group is still fully submersed.

CHAPTER 7

PROBLEM, PROBABLE CAUSE, REMEDY

PROBLEM	PROBABLE CAUSE	REMEDY
1 THE PUMPS GIVES NO WATER	1.1 Water level in the well lower than pump suction nozzle	Correct pump installation
	1.2 Blocked valve	Kick the pipe line with a hammer trying to unblock the valve
	1.3 Leaks in the delivery pipe	Check delivery pipe by the flanges
	1.4 Voltage lower than rated voltage and BHP higher than normal	Increase voltage. Change the supply cable with a larger one
	1.5 BHP lower than normal because of air trapped in the pump	Start and stop the pump at intervals of about a minute
	1.6 Clogged grid because of suspended solids	Clean the pump
	1.7 Unexpected friction losses	Check calculations and use larger pipes if necessary
2 THE PUMP IS NOT STARTING BUT FUSES DON'T BLOW UP AND STARTER RELAYS DO NOT TRIP	2.1 No voltage in the line	Check voltage ratings on main and on starter terminals
	2.2 The circuit is cut off by the cable on in motor winding	Remove starter fuses and connect one Ohmmeter conductor to delivery pipe. Check then motor cables terminals one by one with the other conductor. The reading of each terminal should be at least 10 Megahoms
	2.3 Open circuit in the starter	Check circuit integrity referring to electric diagrams

PROBLEM	PROBABLE CAUSE	REMEDY
3 THE STARTER TRIPS OR THE FUSES BLOW-OUT WHEN THE PUMP IS RUNNING	3.1 Too low voltage	Increase supply cable diameter
	3.2 Overload due to sand clogging; bearings tend to seize	Pull on the pump and clean it
	3.3 Single phase: a voltage 1.5/2 times higher than normal runs through motor windings, so the starter trips stopping the unit	Check voltage on all three phases. Check the conditions of starter fuses and contact
	3.4 The starter is installed in a too warm place	Set starter overload relays on the highest value
	3.5 The starter is not correctly calibrated	If the amperometer shows normal voltage and the starter trips also after different calibrations, replace the overload relay
	3.6 Pump stopped in a bent well with abnormal BHP	Move the unit so to straighten it and it again
	3.7 Cut-off conductors in the starter	See point 2.3
	3.8 Grounded, short-circuited or cut-off cable joint or motor windings	See point 2.2
4 THE PUMP RUNS WITH A LOW CAPACITY OR HEAD	4.1 Wrong motor rotation	Lift the pump out of the well and check the delivery pipe
	4.2 The delivery pipe leaks; flange or coupling not well fastened	Move the unit so to straighten it and start it again
	4.3 Pump stopped in a bend well with abnormal BHP	Lift the pump out of the well and check the delivery pipe
	4.4 Clogged grid	Clean the pump
	4.5 Worm impellers and diffusers	Replace worm parts
	4.6 The manometric head has been wrongly calculated	Calculate again the manometric head; replace the unit with a more suited one

CHAPTER 8

REPAIRING THE PUMP

8.1 Disassembling the pump / motor group

Because of its construction features, the pump and motor group easily disassembled and re-assembled with normal metric size shop tools. If the pump adopts a non return valve, consider the additional weight of the water-filled column besides the group weight and use therefore a suited hoist. We suggest to employ specialized personnel for assembling and disassembling.

8.2 Assembling the pump / motor group

Check the free rotation of pump and motor rotating parts, paying attention not to damage them.

The axial joint between pump shaft and motor shaft should be installed without forcing. Absolutely avoid kicking the shaft, as that could damage the thrust bearing. The pump-motor coupling should be done perfectly, a wrong alignment will unavoidably cause motor bearing failure and vibrations.

The pump joints are provided with screws to lock the rotating part axially. The coupling screw for 10" - 12" - 14" motors should be strongly locked on the motor key. When coupling 6" - 8" motors, the coupling screw shall be aligned to the hole located on the motor shaft; after locking, the screw must be unscrewed half turn and locked in this position by a sealing product (loctite or similar) or in a mechanical position positive way (calking), paying attention not to damage the screw thread. The locking of the screw on the shaft could cause an eccentric rotation of the rotating part and consequently damage the bearings.

CHAPTER 9

SPARE PARTS

9.1 Spare parts ordering

For a faster processing of Your order, when ordering spare parts please specify:

- Pump type
- Pump serial number
- Part name and number as listed on sectional drawing
- The first two informations are easily found on pump nameplate

CHAPTER 10

DECOMMISSIONING AND DISMANTLEMENT

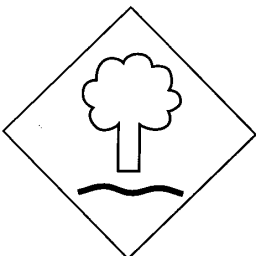
10.1 Dismantlement

When the pump will be permanently stopped and dismantled, the various materials composing it should be properly disposed of. It is important to make sure that no residual polluting liquids are trapped within the pump.

The materials used in pump construction are:

- Steel and cast iron
- Aluminum
- Rubber and plastic
- Copper

The disposal of polluting liquids and materials should follow current environmental regulations. Environment protection is an increasingly pressing problem, and it seems almost unnecessary to insist on the need for everybody to play its part.



REGULATION (EU) N. 547/2012 of 25-06-2012 implementing Directive 2009/125/CE
We, GRUPPO ATURIA S.p.a. – P.za Aturia, 9 – Gessate (MI) – Italy, declare under our exclusive responsibility that the following directive integrates the EC Declaration of Conformity contained in the present manual of instructions.

Minimum efficiency index: $MEI \geq 0,4$

The benchmark for most efficient water pumps is $MEI \geq 0,7$

The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.

The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.

information on benchmark efficiency is available at :
[www.europump.org].

Benchmark efficiency graph for $MEI = 0,7$ and $MEI = 0,4$ for this pump can be found at :
[www.europump.org/efficiencycharts]

Gessate (MI), 01/01/2015


Stefano Gallieni
CEO Gruppo Aturia

DICHIARAZIONE DI CONFORMITA'
(secondo allegato II A - Direttiva Macchine 2006/42/CE)
DECLARATION OF CONFORMITY
(according to enclosure II A - Machinery Directive 2006/42/EC)

Sezione 1
Section 1

DESCRIZIONE MACCHINA
Machinery Description

Costruttore
Manufacturer

GRUPPO ATURIA S.p.A.

Tipo
Type

AP-BG-CG-DG-XR-XN-X

Descrizione
Description

Elettropompa Sommera
Submersible Pumpset

Sezione 2
Section 2

NORME / DIRETTIVE APPLICABILI
Applicable Directives / Standards

Direttiva Macchine 2006/42/CE
Machinery Directive 2006/42/EC

Norma Armonizzata UNI EN 809
Harmonised Standard *UNI EN 809*

Sezione 3
Section 3

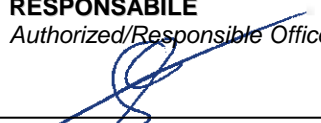
DICHIARAZIONE
Declaration

Noi, Gruppo Aturia S.p.a. /Piazza Aturia,9 /Gessate/ Mi/, dichiariamo che é garantita la conformità ai requisiti essenziali di sicurezza e di tutela della salute della Direttiva Macchine 2006/42/CE.

We, Gruppo Aturia S.p.a. /Piazza Aturia,9/Gessate/ Mi/, declare that is in conformity with all the essential health and safety requirements of the Machinery Directive 2006/42/CE.

RESPONSABILE
Authorized/Responsible Officer

Firma
Signed



Gallieni Ing. Stefano

data/date: 04/2011

Qualifica
Title

Direttore Generale
General Manager

Persona Giuridica Responsabile del Fascicolo Tecnico
Legal Person Responsible of Technical File

Gruppo Aturia S.p.A.
P.zza Aturia, 9 – 20060 Gessate (MI) - Italy

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