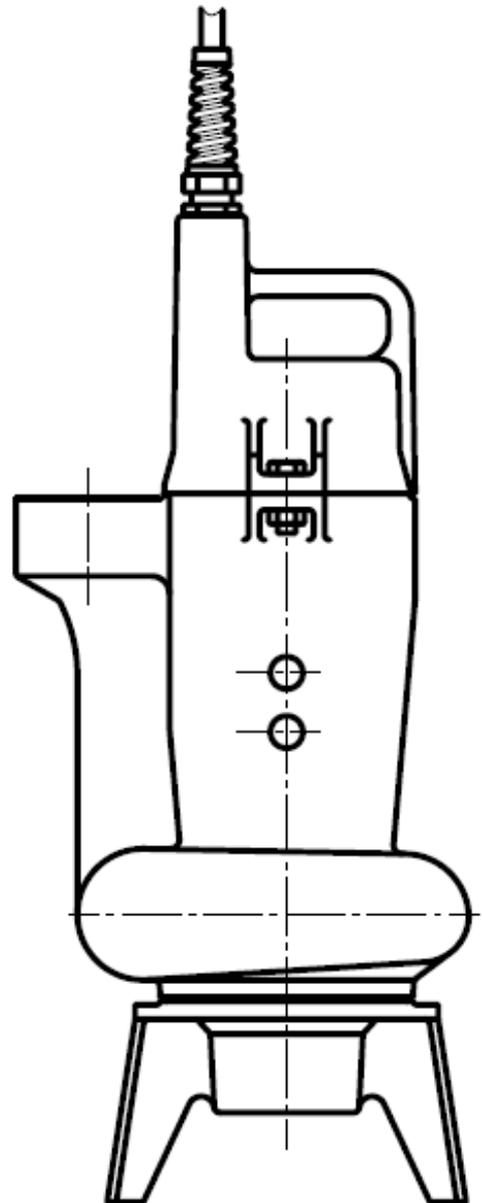




# INSTRUCTION MANUAL FOR PUMPS

**A2QR2 / A2QS2 / A2QE2  
A2QR4 / A2QS4 / A2QE4**



POMP  IRECT

T 0294-457712 F 0294-457713 [Info@Pompdirect.nl](mailto:Info@Pompdirect.nl)

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## 1. TO PROTECT YOUR WARRANTY

The HIDROSTAL warranty is void unless the following requirements are met:

1. Proper extra-quick-tip overload protectors, fixed to nominal current, **MUST** be used on all three phases.
2. Any repairs must be made exactly as per instructions in this manual, and using only genuine HIDROSTAL replacement parts furnished through the HIDROSTAL distribution organisation.

Use of any other parts (even - and especially - O-rings) will void the HIDROSTAL warranty.

3. The motor ratings shown in the name plate are for ambient temperature (liquid and air) of up to +40° C. For higher temperature, contact the factory.

Prior to shipment, each pump has been factory-tested for proper mechanical and electrical operations, as well as pressure tested for absolute water-tightness of the motor housing. Disassembly of the pump by other than official HIDROSTAL service center may cause loss of any remaining warranty.

HIDROSTAL will not assume responsibility for damages to the pump that have been caused due to not following instructions in this manual, nor for consequential damages of any kind.

## 2. DELIVERY AND RECEPTION OF PUMP UNIT

Examine pumps for damages (especially cables and cable-entries); report any claims to shipper. Lift pumps **ONLY** by lifting-eyes of motor.

**DO NOT PULL ON CABLES!**

### 2.1 STORAGE (PRIOR TO INSTALLATION)

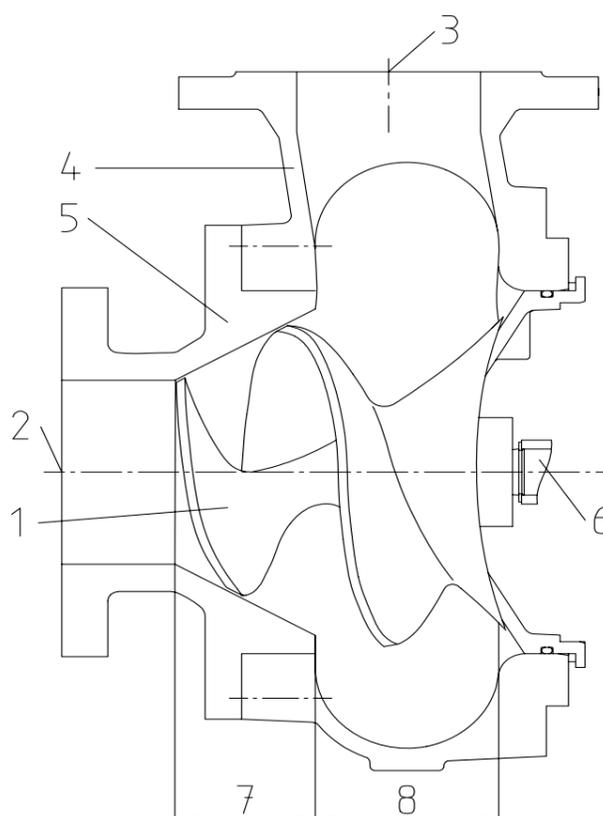
Storage area should be: clean, dry, without vibrations, and -10 °C to +40 °C (without extreme changes in temperature).

### 2.2 NAMEPLATE

The nameplate attached to the motor contains all motor and pump data. Please give **the complete data on the nameplate** for any inquiry about parts or service.

### 2.3 THE CONSTRUCTION MARKS OF THE HIDROSTAL-SCREW-CENTRIFUGAL-PUMP

- 1 Screw centrifugal impeller
- 2 Inlet
- 3 Outlet
- 4 Volute
- 5 Suction cover
- 6 Shaft
- 7 Screw impeller part
- 8 Centrifugal impeller part



### 3. INSTALLATION

#### 3.1 SUBMERGED WET PIT

- a) The pump can be suspended directly by its discharge pipe (see Fig. 1) or the pump may rest on its feet on the sump floor.
- b) Two pumps in series for higher head (Fig. 1a).  
NOTE: Horizontal mounting is possible.

#### 3.2 DRY PIT (Immersible)

The pumps A2QR2/A2QR4 and A2QS2/A2QS4/A2QE4 may be sufficiently cooled by the ambient air and his temperature must be not over 40° C.

This type of pump does not require submersion in liquid for cooling, and can be connected in line with the piping (Fig. 1).

NOTE: Horizontal mounting is possible.

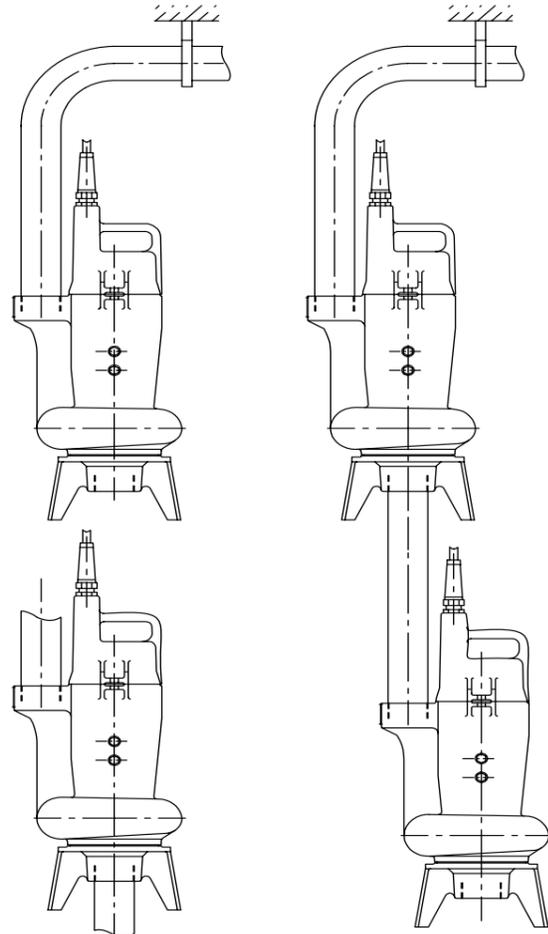


Fig. 1

Fig. 1a

### 4. CONTROL PANEL REQUIREMENTS

#### FOR OPERATOR SAFETY

Prior to any work on the pump, motor or control panel, the power supply to the unit must be completely disconnected. Disconnect switch or remove fuses from panel.

**IT IS NOT SAFE ENOUGH JUST TO SWITCH OFF THE CONTROL SWITCH!**

#### 4.1 MINIMUM REQUIREMENTS

For proper operation and protection of the pump, the control panel **must** contain the following components (see connection diagram in Fig. 2):

- **Isolation switch**, preferably lockable, with slow trip fuses or a 3 ph. circuit breakers.
- **Lightning protection**  
Lightning arrestor on each incoming phase, if there is any possibility of lightning-stroke.
- **Motor starter (C1)**  
Full-voltage magnetic-contact starter should be sized according to local electrical code requirements based on motor power rating.
- **Extra quick trip overload protectors (e 1)**  
The overload protectors must be selected according to the amperage indicated on the nameplate of the motor. The protectors **must** react within 6 seconds upon locked rotor.

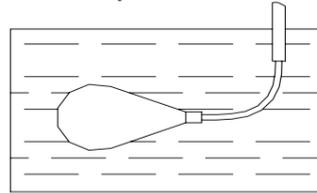
#### CAUTION:

Warranty is void unless proper extra quick trip overloaded protectors are used on all three motor phases. Claims for warranty repair of motors must include documentation that proper overload protectors have been installed.

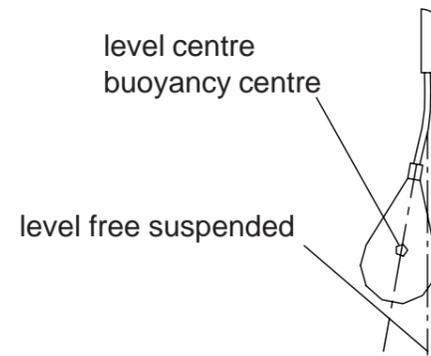
#### 4.2 LEVEL SWITCHES

"Pump-on" and "Pump-off"-level should be placed to ensure:

1. Required pump submergence
2. Maximum starts per hour



level submerges



level centre buoyancy centre

level free suspended

For the "On" and "Off"-levels, use control systems that are appropriate for the pumped liquid, for the high-level alarm use a floating-ball type switch (this has proven to be the most fail-safe type).

The high level alarm should be placed at a reasonable distance above the highest pump-start level to avoid false alarms.

#### 4.3 REQUIRED SUBMERGENCE

Pumps A2QR2/A2QR4 and A2QS2/A2QS4/A2QE4 can work continuously, or in a dry environment if desired (the most do not require submergence in liquid for cooling). In the case of wet pit pumps the "OFF"-level can therefore be set below the pump casing. However, care should be taken to provide sufficient submergence to avoid vortexing or pulling of air into the pump station.

Vertically installed A2Q-pumps will prime themselves if impeller tip is submerged in the pumping liquid, and a discharge pipe work between pump and non-return valve. If installed with suction lift, the pump may be primed by an ejector or vacuum pump.

#### 4.4 MAXIMUM STARTS PER HOUR

"ON" and "OFF"-levels must be set in such a way as to provide sufficient sump capacity between "ON" and "OFF" so that in the most unfavorable case (sump-inflow 50 % of pump output) the pump cannot be switched on more than 15 to 20 times per hour. Higher starting frequency may damage the motor control devices in the panel and will cause excessive power consumption.

#### 4.5 REQUIRED VOLTAGE

- a) Observe required voltage stamped on nameplate. Watch for undersized wiring systems or overlong pump cables, which could cause excessive voltage drops.

If actual voltage supplied to motor is:

95 - 105 % of nameplate voltage = OK

90 - 95 % " " " = OK, but slight increase in amperes, slight decrease in performance

**below 90 % " " " = NOT OK, severe decrease in performance, excessive increase in amperes, nuisance and trip-outs possible**

- b) Observe voltage balance between phases: Keep voltage balance below 10 %.

Voltage fluctuation of only 10 % can cause 6 to 10 % amperage fluctuation in the electric circuit within the windings (not observed by ammeter connected externally); which will significantly INCREASE WINDING TEMPERATURE and can even cause STATOR BURN-OUT!

**4.6 CONNECTION OF MOTOR CABLES**

Each cable set contains three leads and one earth lead, cable ends are marked. Pump must be equipped with thermal protector. The protector must react within 6 seconds upon locked rotor.

**4.6.1 For three-phase motor (Fig. 2)**

U V W = Leads (3 phases)

MOTOR CABLE CONNECTION

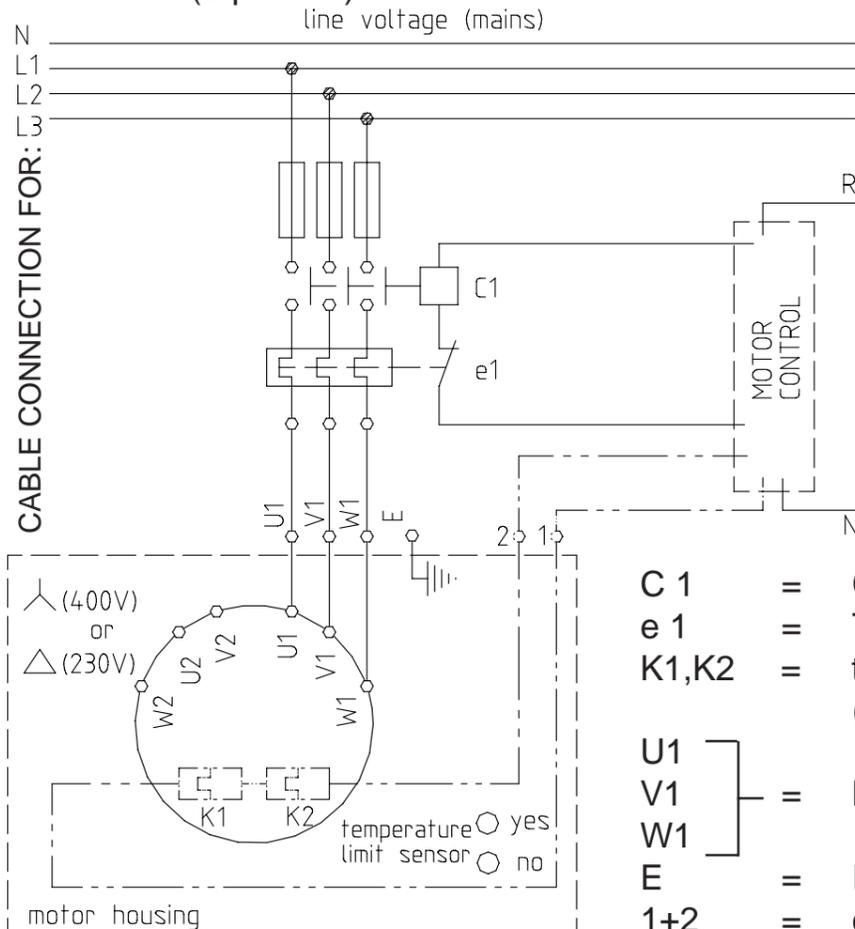


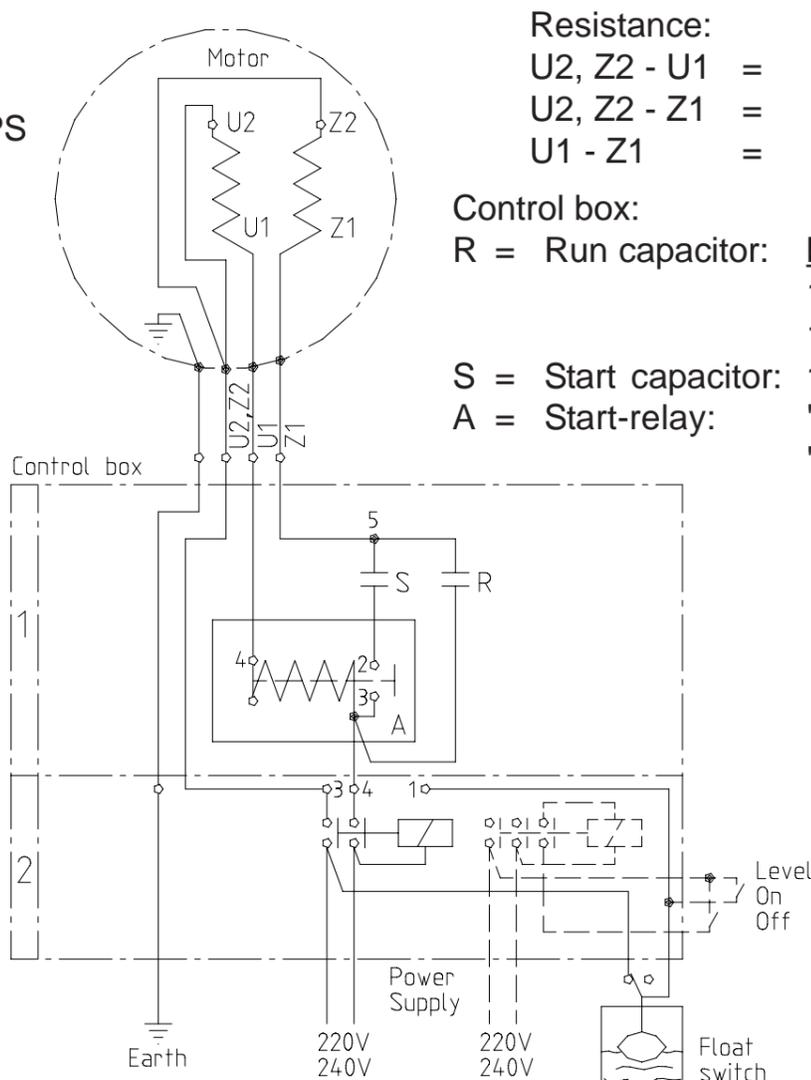
Fig. 2

**4.6.2 For single-phase motor (Fig. 2a)**

**WIRING DIAGRAM:**

SINGLE PHASE COMPACT PUMPS  
220/240 V 50 Hz

yellow/green = Earth  
brown = U  
blue = V  
black = W



Resistance:

U2, Z2 - U1 = 2,3 - 2,4 Ω

U2, Z2 - Z1 = 2,3 - 2,4 Ω

U1 - Z1 = 4,6 - 4,8 Ω

Control box:

R = Run capacitor: kW 220V 240V

1,1 45μF 40μF

1,5 50μF 45μF

S = Start capacitor: 150 μF

A = Start-relay: "Fabrimex or

"Klixon" 4CR1-785

Fig. 2a

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#### 4.7 DIRECTION OF ROTATION

Before lowering the pump into the sump, start the pump for one second and note impeller rotation. **Rotation must be counter-clockwise viewed from suction end.** If impeller is not easily seen, suspend pump from the lifting eyes (resting inclined on the floor) and start up for one second.

The starting jerk should be **counter-clockwise when viewed from the top of the motor**, as indicated on Fig. 3.

Change the power leads of the pump or speed with wrong rotation at the pump cable connection to its starter in the control panel.

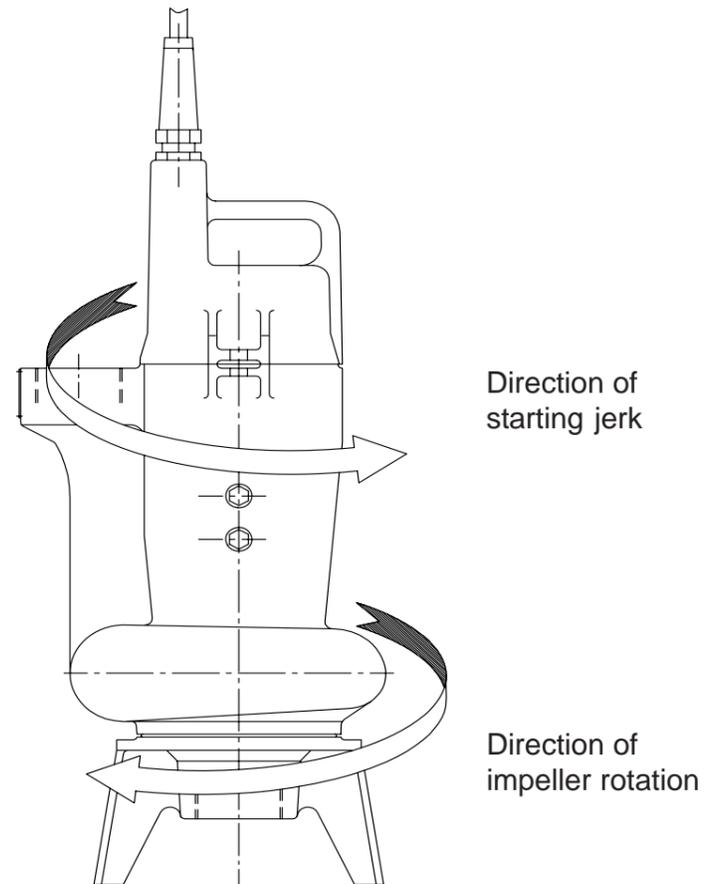


Abb. 3

#### 5. PRE-INSTALLATION CHECKS

Finish all construction work, and remove all debris from wet pit, before lowering the pump into the sump. Check that:

- The cable entry assemblies on top of the pump motor have not been damaged or loosened.
- The cables are still firmly gripped by the cable entry assemblies.
- The cables have not been damaged during transportation or cable cover: any damage penetrating through the cutter layer of the cable will require replacement of the cables.
- The motor cables are long enough for easy pump removal and that they can follow the pump unhindered as the pump is lowered.
- The cable ends have never before (and cannot come) in contact with water!
- The direction of rotation is correct (see 4.7, Fig. 3).

#### 5.1 START-UP OF THE PUMP

Prior to starting, check that level controls are correctly set, especially that the OFF-level is set sufficiently high to prevent air entering the pump suction. Check that discharge valves are completely open! Permit the pump sump to be flooded.

**NEVER START PUMP AGAINST CLOSED VALVES!**

Start the pump using manual operation. Measure and record the amperage drawn on each phase leg; verify these readings with the nameplate ratings. If amperage is more than 5 % higher than the nameplate rating, stop unit and check probable causes according to "Operating Troubles" chart, section 6.

Once preliminary checks are complete, place the pump into automatic operation. Cycle the system through several wetwell pumpdowns to observe that level controls are properly set and functioning correctly. Also observe that the alarm system and change over switch (alternator), if included in control panel, are working properly. Log date and hour meter reading; perform maintenance as recommended in this manual, according to total hours run.

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**5.2 FLUSHING WATER CONNECTION**

Pumps are supplied with a flushing connection (552) R 1/4". For normal sewage application this connection is not used. However, when pumping solids which tend to dehydrate or sedimentate, such as high concentrations of sludge or mud, "F" should be connected to cleaning water, to flush between the impeller and the lower mechanical seal, providing periodic removal of accumulate solids.

Flushing water must be pressure-regulated to 0.5 to 1 bar (7 to 14 psi) above pump discharge pressure, flow rate should be not more that 6 to 8 liters/minute.

Typically, flushing is duration by a solenoid valve on a time clock. Adequate curation of each flushing is 60 seconds. Frequency of flushing must be established for each different installation, starting with once per day.

**TROUBLE**

**6. OPERATING TROUBLES**

POSSIBLE REASONS	TROUBLE						
	No flow	Flow not sufficient	Head not sufficient	Reduction of flow or head after start up	Vibrations	Motor overloaded	Motor does not start
1. RPM too low	X	X	X				
2. RPM too high					X	X	
3. Air entrance into suction line (flanges not tight)	X	X		X	X		
4. Discharge line clogged / Valve closed	X				X		
5. Air or gas in pumped liquid	X	X	X	X	X		
6. TDH too high (higher than calculated)	X	X	X		X		
7. Suction head too high	X			X	X		
8. Not sufficient suction head on hot liquids	X	X			X		
9. Insufficient submergence of suction	X	X	X	X	X		
10. Sludge concentration higher than assumed	X	X	X	X	X	X	
11. Specific weight of medium higher than assumed						X	
12. Impeller or suction line clogged	X	X	X		X		
13. Wrong direction of rotation	X	X	X		X	X	
14. Impeller clearances too high		X	X				
15. Damaged impeller	X	X	X		X		
16. Thermal overloads tripped; control switch off							X
17. Motor damage	X				X	X	X
18. Low voltage	X	X	X			X	X
19. Attachments loose					X		
20. Bearings worn out					X	X	X
21. Impeller out of balance					X		
22. "On"-level switch not overflowed, or damaged							X
23. Impeller too small	X	X	X				
24. Impeller rubbing against suction cover					X	X	
25. High viscosity and tight impeller clearance						X	
26. Air or gas on impeller backside	X		X				
27. Pump is not vented	X						

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**7. COOLING LIQUID FOR IMMERSIBLE MOTORS  
LUBRICATION LIQUID FOR MECHANICAL SEALS**

Low viscosity oil with following features:

Specific gravity at 20°C	0.812	g/ml
Viscosity at 40°C	3.5	mm <sup>2</sup> /s (cst)
Solidification point	-38.0	°C
Flash point	132.0	°C
Burning point	142.0	°C
Evaporation energy	251.0	kJ/kg
Solubility in water	none	

It is important, that the viscosity does not exceed.

**7.1 ANNUAL OIL CONTROL**

Oilquality	Procedure
<ul style="list-style-type: none"> <li>- clear oil</li> <li>- small quantity of water in oil</li> <li>- very dirty oil</li> </ul>	<ul style="list-style-type: none"> <li>- pump o.k.</li> <li>- separate water from oil and fill up to oil level</li> <li>- change mechanical seal in authorised workshop</li> </ul>

**8. BEARING**

It is not necessary to lubricate the bearings.

**9. TECHNICAL AND HYDRAULICAL DATAS**

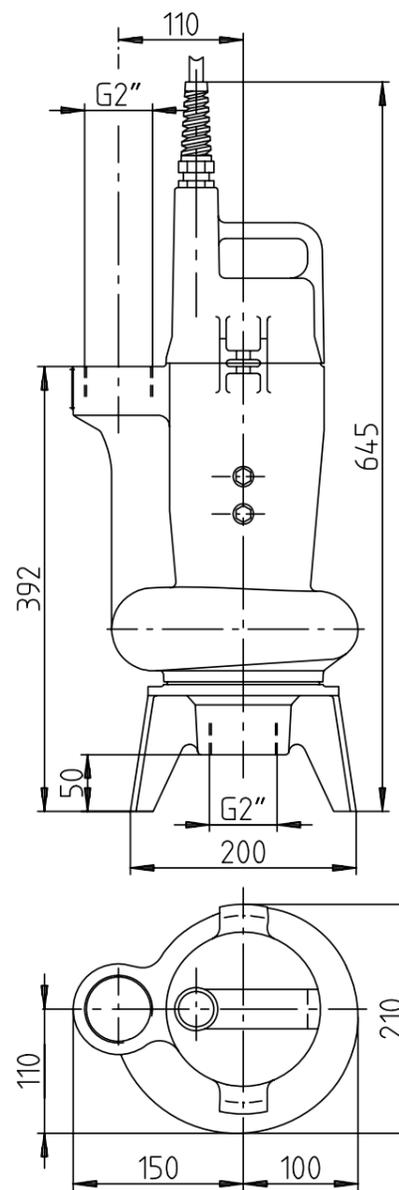
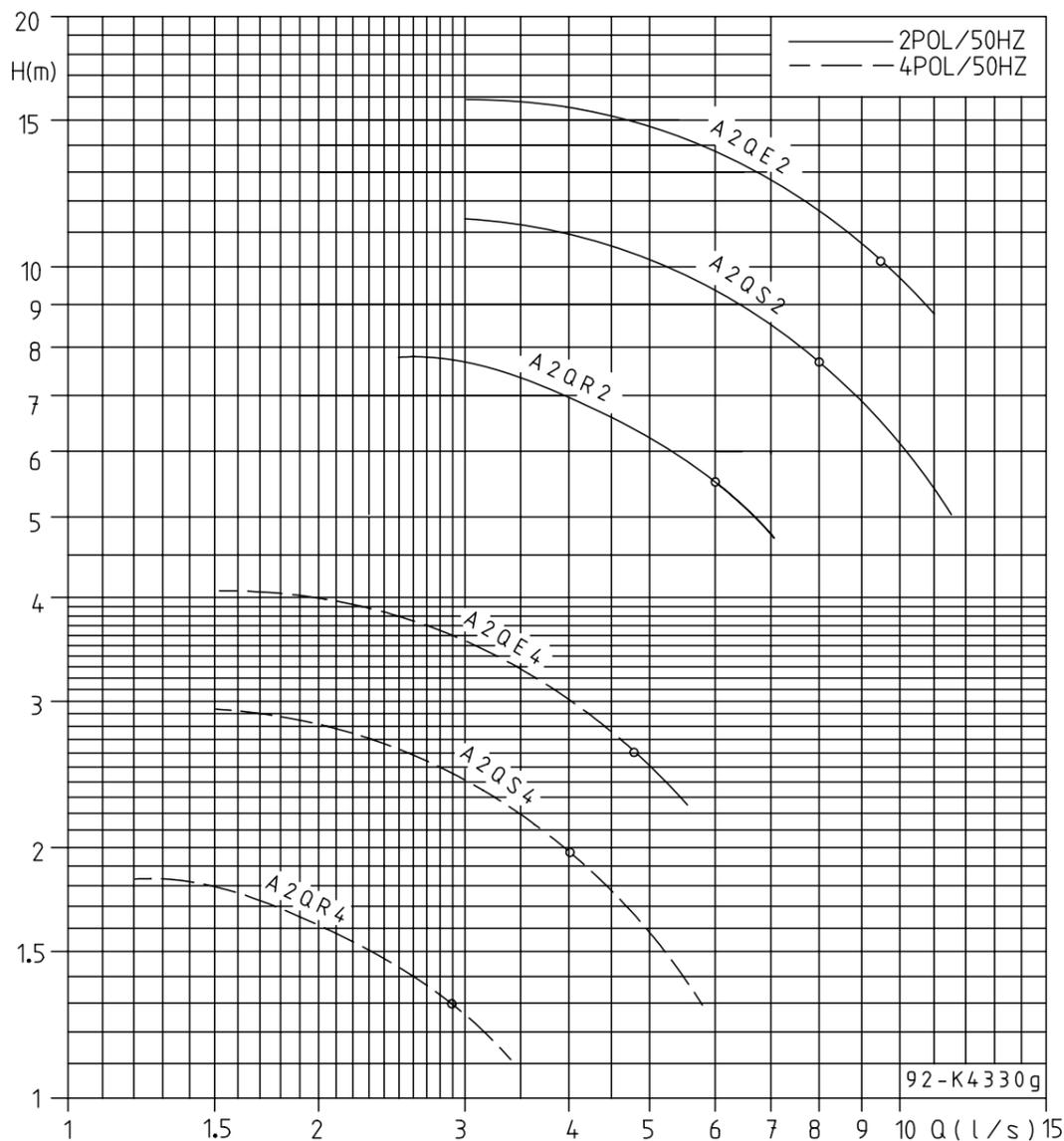
**TECHNICAL DATA**

TYPE	BEARING		SIZE OF MECH. SEAL		OIL	IMPELLER-BOLT	O-RING DIMENSIONS			
	Pos. 513	Pos. 514	M.S. Pos. 516	P.S. Pos. 515			mm	mm		
					l	mm	Pos. 415	Pos. 209	Pos. 406	Pos. 524
A2QR4 A2QS4 A2QE4 A2QR2 A2QS2 A2QE2	6203Z	63052R	C 7/8"	5/8"	0,25	8x25	3,5x100	2,5x120	3,5x120	

**9.1 CLEARANCE CONTROL**

If impeller (401) and suction cover (402) have wear, a greater clearance arises. This may result in clogging the pump. In this case remove spacer ring (414) or replace it with a thin ring to minimize clearance. If clearance is too great, replace wear parts.

**HYDRAULIC DATAS**



All dimensions in mm

PUMP TYPE:	CABLE:	A2QR4-..3 + A.1-10	A2QR2-..3 + A.1-10	A2QS2-..3 + A.1-10	A2QE2-..3 + A.1-10	A2QR2-..1 + A01-10	A2QS2-..1 + A01-10	
	PUMP:	(2) (4)	(2) (4)	(2) (4)	(2) (4)	(2)	(2)	
Type of current	Ph	3~	3~	3~	3~	1~	1~	
Nominal power	kW	0,5	1,1	1,5	1,8	1,1	1,5	
Pump speed	rpm	1417	2870	2805	2775	2810	2725	
Nominal current (In)	at 400V	A	1,8	2,9	3,6	-	-	
	at 230V	A	3,1	(5,1)	(6,2)	(7,3)	7,6	9,4
	at 240V	A	3,0	(4,8)	(5,9)	(6,9)	7,4	9,0
Start current factor	(3)	3,6	6,7	5,4	4,6	6,0	5,0	
Discharge dimension	G	2"	2"	2"	2"	2"	2"	
Total weight incl. cable	kg	32	32	32	32	32	32	
Number and dimension of leads	n x mm <sup>2</sup>	(4)	(4)	(4)	(4)	4x1,5	4x1,5	
Electrical connection diagram	EL	3510	3510	3510	3510	3475	3475	

Notes:

- Pumps will be delivered with 10 m of cable attached to and free cable end.
- Single phase pumps are delivered without capacitors and without auxiliary winding switch.

- (1) These Motors are of convection cooling.
- (2) For ordering pumps, seal type has to be chosen and pump code has to be completed (see price book).
- (3) Start current factor =  $I_s/I_n$  ( $I_s$  = start current).
- (4) without temp. limit sensor: A01-10 = 4x1,5 mm<sup>2</sup>, with temp. limit sensor: AA1-10 = 7x1,5 mm<sup>2</sup>.

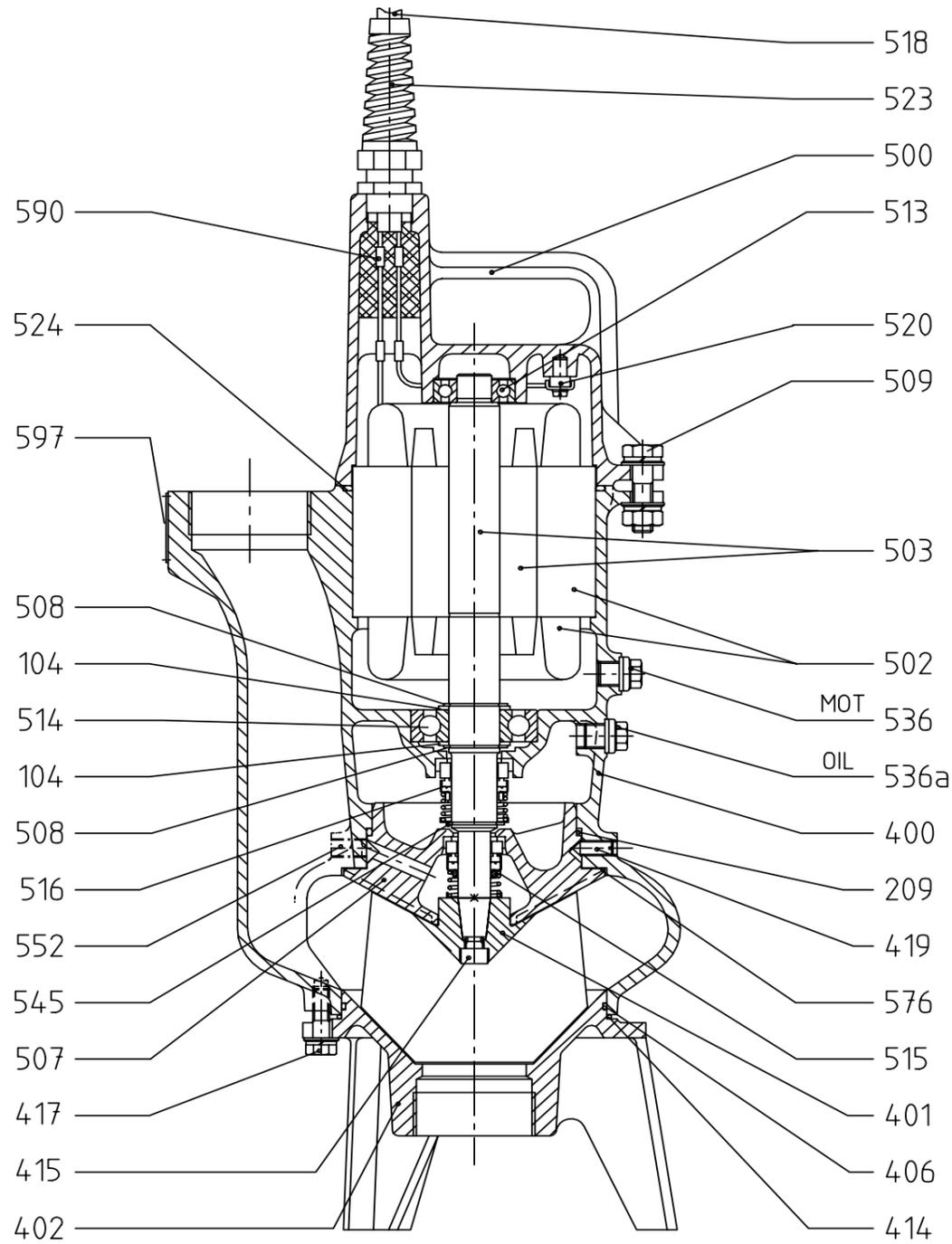
Hidrostat reserves the right of making changes without giving prior notice.

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10. SECTIONAL DRAWING AND POSITIONLIST



Pos.	Description	Code	Pos.	Beschreibung	Code
104	Spacer ring	8RS	509	Fastening set 400-500	8BS
209	O-ring	8DO	513	Bearing cable side	8LW
400	Volute casing	4G1	514	Bearing P.S.	8LW
401	Impeller	411	515	Mechanical seal P.S.	8DM
402	Suction cover	421	516	Mechanical seal M.S.	8DM
406	O-ring	8DO	518	518 cable	5EK *
414	Spacer ring	441	520	Ground cable connection (earth)	8EA
415	Impeller bolt	4B5	523	Cable entry assembly compl.	5EE*
417	Fastening set	8BS	524	O-ring for 500	8DO
419	Fastening set	8FG	536	Plug with gasket	8FV
500	Motorcover kompl. with cable cover	5DM *	545	Snap ring for 516	8RF
502	Motor stator	5ES	552	Plug for flushing connection	8FO
503	Shaft with rotor	8ER	576	Shim set peelable	8PS
507	Back cover	5GD	590	Cable connection	5EV *
508	Snap ring for 514	8RF	597	Name plate	

\* = mounted (cable set)