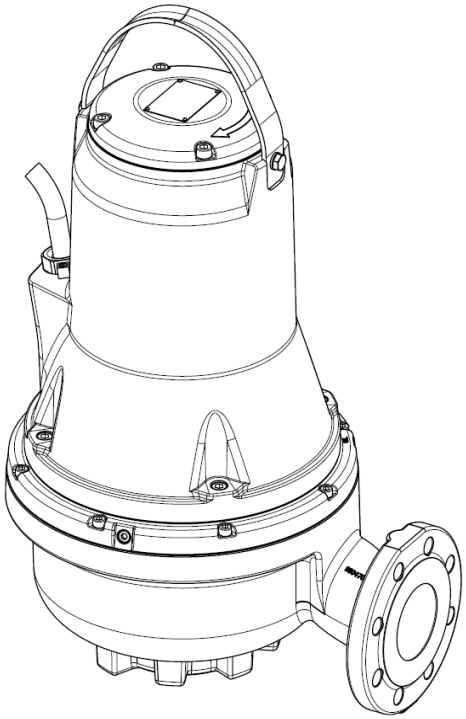
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– EN 60335-2-41:2003/A2:2010	- EN IEC 60079-0:2018 (IEC 60079-0:2017 for IECEx)
– EN 60204-1:2006/A1:2009	- EN 60079-1:2014 (IEC 60079-1:2014 for IECEx)
– EN 809:1998+A1:2009	- EN ISO 80079-36:2016
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Certificato Numero / Certificate Number:

- ATEX: EPT 16 ATEX 2440 X
- IEC EX: IECEx EUT 16.0003X

Mestrino (PD), 27/05/2016

Francesco Sinico
Group R&D Director

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– EN 60335-1:2012/A13:2017
– EN 60335-2-41:2003/A2:2010
– EN 60204-1:2006/A1:2009
– EN 809:1998+A1:2009
– EN 12050-1:2015

only for products classified as explosion-proof and marked EX II 2G:
- EN IEC 60079-0:2018 (IEC 60079-0:2017 for IECEx)
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- IEC EX: IECEx EUT 16.0003X

Mestrino (PD), 27/05/2016



Francesco Sinico
Group R&D Director

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1. SAFETY INSTRUCTIONS

KEY

The following symbols have been used in the discussion:



Situation of general danger.
Failure to respect the instructions that follow may cause harm to persons and property.



Situation of electric shock hazard.
Failure to respect the instructions that follow may cause a situation of grave risk for personal safety.



Notes



These instructions must be observed for explosion-proof pumps.

WARNINGS



Read this documentation carefully before installation. Installation and operation must comply with the local safety regulations in force in the country in which the product is installed. Everything must be done in a workmanlike manner.
Failure to respect the safety regulations not only causes risk to personal safety and damage to the equipment, but invalidates

every right to assistance under guarantee.



PERSONNEL QUALIFICATIONS

Installation, commissioning and maintenance must be carried out by competent, skilled personnel in possession of the technical qualifications required by the specific legislation in force.

The term skilled personnel means persons whose training, experience and instruction, as well as their knowledge of the respective standards and requirements for accident prevention and working conditions, have been approved by the person in charge of plant safety, authorizing them to perform all the necessary activities, during which they are able to recognize and avoid all dangers. (Definition for technical personnel IEC 364).

The appliance is not intended to be used by persons (including children) with reduced physical, sensory or mental capacities, or who lack experience or knowledge, unless, through the mediation of a person responsible for their safety, they have had the benefit of supervision or of instructions on the use of the appliance. Children must be supervised to ensure that they do not play with the appliance.

SAFETY



Use is allowed only if the electric system is in possession of safety precautions in accordance with the regulations in force in the country where the product is installed (for Italy CEI 64/2).



The pump must be provided with a device for isolating the power supply complying with the requirements of standard EN60204-1 5.3.2.



Pump installation in tanks must be carried out by specially trained persons.
Work in or near tanks must be carried out according to local regulations.
For safety reasons, all work in tanks must be supervised by a person outside the pump tank.
It is advisable to make all maintenance and service jobs when the pump is placed outside the tank.



Tanks for submersible sewage and wastewater pumps may contain sewage or wastewater with toxic and/or disease-causing substances. Therefore, all persons involved must wear appropriate personal protective equipment and clothing, and all work on and near the pump must be carried out under strict observance of the hygiene regulations in force.



Never tamper installed protections and safety devices; when necessary, ask for intervention of competent personnel.



Be sure to operate in safety conditions with well dimensioned equipment and instrumentations complying with local safety regulations and standards.

Failure to observe the warnings may create situations of risk for persons or property and will void the product guarantee.

RESPONSIBILITY



The Manufacturer does not vouch for correct operation of the electropumps or answer for any damage that they may cause if they have been tampered with, modified and/or run outside the recommended work range or in contrast with other indications given in this manual.

The Manufacturer declines all responsibility for possible errors in this instructions manual, if due to misprints or errors in copying. The Manufacturer reserves the right to make any modifications to products that it may consider necessary or useful, without affecting their essential characteristics.

POTENTIALLY EXPLOSIVE ENVIRONMENTS

Use explosion-proof pumps for applications in potentially explosive environments.



FKV and FKC pumps must under no circumstances pump combustible liquids.



The classification of the installation site must be approved by the local fire-fighting authorities in each individual case

Special conditions for safe use of FKV and FKC explosion-proof pumps:

1. Make sure that the thermal switches are connected in the same circuit but have separate alarm outputs (motor cutout) in the event of a high temperature in the motor.
2. Bolts used for replacement must be class A2-70 or better according to EN/ISO 3506-1.
3. Contact the manufacturer for information on the dimensions of the flameproof joints.

4. THE PUMP MUST ALWAYS BE SUBMERGED WHEN WORKING. The level of pumped liquid must be controlled by two level switches connected to the motor control circuit. The minimum level depends on the installation type and is specified in these installation and operating instructions.
5. Make sure the permanently attached cable is suitably mechanically protected and terminated in a suitable terminal board placed outside the potentially explosive area. The pump is supplied with an appropriate power supply cable.
6. The sewage pumps have an ambient temperature range of -20 °C to +40 °C and a maximum process temperature of +40 °C. The minimum ambient temperature for a pump with a water-in-oil sensor is 0 °C.
7. The thermal protection in the stator windings has a nominal switch temperature of 130°C and must guarantee the disconnection of the power supply; the power supply must be reset manually.

2. GENERAL DESCRIPTION

This manual contains the instructions for the installation, operation and maintenance of submersible pumps of the FK series. The pumps are equipped with electric motors with power between 1.1 and 11 kW.
The pumps in the FK series are designed and suitable for pumping domestic and industrial sewage and waste waters compatible with the materials of which the pumps are made.

The pumps can be installed on an auto-coupling system or stand freely on the bottom of a tank.

The booklet also includes specific instructions for the explosionproof pumps.

TECHNICAL CHARACTERISTICS

Consult the Instructions Booklet and the data plate to check the following technical data:
Electric Power Supply | Construction Characteristics | Hydraulic Performance | Working Conditions | Pumped liquids.

2.1 Product drawing

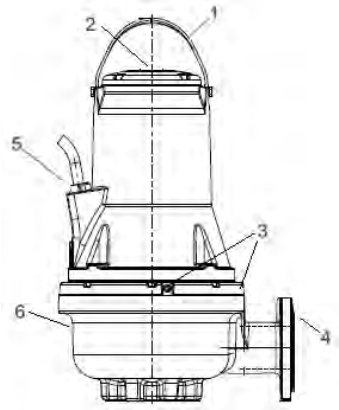


Fig. 1 FK pump

Pos.	Description	Material
1	Lifting bracket	Steel AISI 304
2	Nameplate	Steel AISI 304
3	Oil screws	Steel AISI 304
4	Discharge flange	GJL200
5	Cable plug	H07RN8-F
6	Pump housing	GJL200

2.2 Operating conditions

The FKV and FKC pumps are suitable for the following operating situations:

- S1 operation (continuous operation), the pump must always be covered by the pumped liquid to the top of the motor. See fig. 2.
- S3 operation (intermittent duty), the pump must always be covered by the pumped liquid up to the top of the pump body. See fig. 2 (only for non explosion-proof versions).

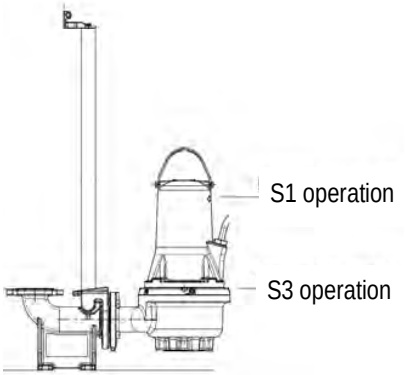


Fig. 2 Stop levels

PH value
FKV and FKC pumps in a fixed installation can be used for pumping liquids with pH values from 6.5 to 12.

Temperature of the operating liquid
0 °C to +40 °C.
For short periods a temperature of up to +60 °C is permissible (non-Ex versions only).

Explosion-proof pumps must never pump liquids of a temperature higher than +40 °C.

Ambient temperature

For non-explosion proof pumps, the ambient temperature may exceed +40 °C for a short period.



For explosion-proof pumps, the ambient temperature on the installation site must be in the range from -20 °C to +40 °C.

Density and viscosity of pumped liquid
When pumping liquids with a density and/or a kinematic viscosity higher than that of water, use motors with correspondingly higher outputs.

Flow velocity
It is advisable to keep a minimum flow velocity to avoid sedimentations in the piping system. Recommended flow velocities:
• in vertical pipes: 1.0 m/s
• in horizontal pipes: 0.7 m/s

Max. dimension and quantity of solids
Dimension from 50 a 100 mm, depending on pump size.
Quantity of suspended solid bodies max 1%.

Operating mode
Maximum 20 starts per hour.

FOR FURTHER LIMITATIONS OF THE OPERATING RANGE, REFER TO THE IDENTIFICATION PLATE.

2.3 Technical data

Supply voltage
From rated voltage - 10 %/+ 10 %, 50/60 Hz
Enclosure class
IP68. According to IEC 60529.
Insulation class
F (155 °C).
Operating pressure
All pump housings have a cast iron PN 10 discharge flange.
Dimensions
Discharge flanges are DN 65, DN 80, DN 100 or DN 150 according to EN 1092-2.
Pump curves
Pump curves are available via the internet on www.dabpumps.com.
The curves are to be considered as a guide. They must not be used as guarantee curves.
Test curves for the supplied pump are available on request.
It must be ensured that the pump does not operate outside the recommended operating range during normal operation.
Pump noise emission < 70 dB(A)

- Sound power measurements were carried out according to ISO 3743.
- Sound power was calculated at a distance of 1 metre according to ISO 11203.

The sound pressure level of the pump is lower than the limiting values stated in the EC Council Directive 2006/42/EC relating to machinery.

3. DELIVERY AND HANDLING

3.1 Transportation



Before lifting the pump, check that the tools and equipment used for handling, lifting and lowering it into the sinkhole are suitable for the weight to be lifted, efficient and complying with the applicable safety laws.

The weight of the pump is declared on the pump identification plate and on the label on the packaging.



Always lift the pump by its lifting bracket or by means of a fork-lift truck if the pump is fixed on a pallet. Never lift the pump by means of the motor cable or the hose/pipe.



Make sure that the lifting bracket is tightened before attempting to lift the pump. Tighten if necessary. Carelessness during lifting or transportation may cause injury to personnel or damage to the pump.

See FK Quick Guide for further details on handling.

3.2 Storage

During long periods of storage, the pump must be protected against moisture and heat.
Storage temperature: -30 °C to +60 °C. If the pump has been in use, the oil should be changed before storage. After a long period of storage, the pump should be inspected before it is put into operation. Make sure that the impeller can rotate freely.

The impeller may have sharp edges – wear protective gloves.

If stored outside the limits indicated, pay particular attention to the conditions of the mechanical seal, the O-rings, the oil and the cable gland.

4. IDENTIFICATION

4.1 Nameplate

The nameplate states the operating data and approvals applying to the pump.
The identification plate is applied on the top of the motor body, next to the handle.

Pos.	Description
1	Pump Designation
2	Serial number
3	Model Code
4	Weight (with 10m cable)
5	Maximum liquid temperature
6	Range of flow
7	Range of head
8	Maximum head
9	Min. head
10	Rated power at the shaft
11	Rated input power
12	Enclosure class to IEC
13	Insulation class
14	Rated voltage
15	Rated current
16	Frequency
17	Capacitor capacity (not applicable)
18	Number of phases
19	Rated speed
20	Level of duty

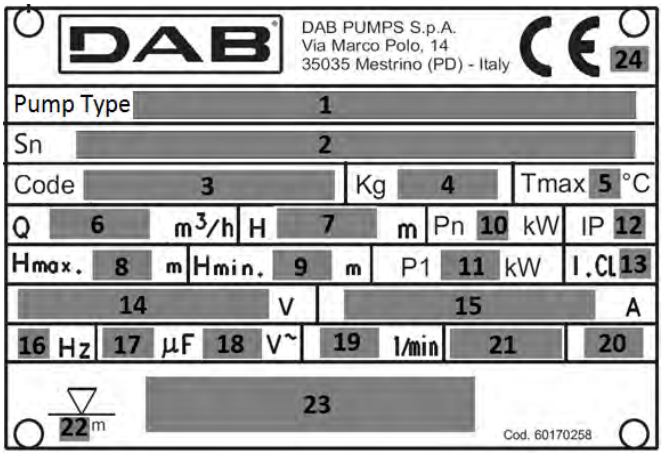


Fig. 3 Nameplate

21	Country of production		
22	Maximum installation depth		
23	Marking Ex/Quality marks		
24	CE mark		

4.2 Information on products with the Ex marking

Marking: CE 0477 II2G
Ex db h IIB T4 Gb
EPT 16 ATEX 2440 X

0477: code identifying the body that checks the production site;
explosion-proof appliance designed for use in a potentially explosive atmosphere;

II: group. identifies an electrical appliance for use in an environment other than mines with possible presence of firedamp;
2: category. pump designed for use in places where it is probable that there will be explosive atmospheres caused by mixtures of air and gas, vapours or mists, or mixtures of air and dust;
G: gas. the pump is protected in environments with gas, vapours or inflammable mists;
EX: explosion-proof appliance designed for use in a potentially explosive atmosphere;
db: electrical constructions for potentially explosive atmospheres – Explosion-proof housings "d";
h: non electrical constructions for potentially explosive atmospheres – Protection with immersion in liquid "h";
IIB: characteristic of the gas for which the appliance is intended;
T4: corresponds to 135°C, and is the maximum surface temperature that can be safely reached by the pump;
X The letter "X" on the certificate indicates that the appliance is subject to special conditions for safe use. The conditions are mentioned in the certificate and in the installation and operating instructions.
Gb: Level of protection of the appliances, appliances for explosive gas atmospheres having a "HIGH" protection level.

Marking for explosion-proof versions according to the IECEx scheme
Marking: CE xxxx Ex db h IIB T4 Gb IECEx EUT 16.0003X
Ex Area classification according to AS 2430.1.
db Flame protection in compliance with IEC 60079-1:2014.
h: Non electrical constructions for potentially explosive atmospheres – Protection with immersion in liquid "h";
IIB Suitable for use in explosive atmospheres (not in mines).
Gas classification, see IEC 60079-0:2004, Attachment A. Gas group B includes gas group A.
T4 The max. surface temperature is 135°C according to IEC 60079-0.
X The letter "X" on the certificate indicates that the appliance is subject to special conditions for safe use. The conditions are mentioned in the certificate and in the installation and operating instructions.
Gb Appliance protection level.

4.3 Type key

DIGITS		FK	C	65	22	2	T	5	230D	Ex	S
FK	Technical pump range name										
C	Single Channel										
V	Free passage Vortex										
65	Outlet diameter										
80											
100											
150											
22	Approximate nominal power kW x10 (a, b, c, d in case of different curve at same power)										
2	Number of poles										
4											
T	Three-phase										
5	Tension frequency										
6											
230 D.O.L.	Tension rate & Start method										
220-277 D.O.L.											
400 D.O.L.											
380-480 D.O.L.											
230 Y/D											
400 Y/D											
220-277 Y/D											
380-480 Y/D											
blank	No explosion proof										
EX	Explosion proof (ATEX)										
IECEX	Explosion proof (IECEX)										
blank											
S	Sensor version (moisture sensor) NOT for Ex version										
Blank	*Cable length [m]: blank 10m*										
20,30,50											

5. INSTALLATION

Before beginning installation procedures, carry out these checks:
- Does the pump correspond to order?
- Is the pump suitable for the supply voltage and frequency available at the installation site?
- Are accessories and other equipment undamaged?



When choosing the installation site, check that:

1. The voltage and frequency on the pump's technical data plate correspond to the values of the power supply system.
2. The electrical connection is made in a dry place, far from any possible flooding.
3. The electric system must be approved by the safety regulations in force and in good condition.



The construction of tanks, reservoirs or sinkholes where the electropump is to be housed, as well as its positioning with respect to the level of the sewage network, are subject to standards and legal regulations that must be respected.



Before beginning the installation, switch off the power supply and lock the mains switch in position 0 with a padlock to ensure that the power supply cannot be accidentally switched on. Any external voltage connected to the pump must be switched off before working on the pump.



For further details on the accessories, see the pump technical data sheet or contact DAB Pumps.

Fix the extra nameplate supplied with the pump to the cable end in the control cabinet.
All safety regulations must be observed at the installation site, e.g. the use of blowers for fresh-air supply to the tank.



Do not put your hands or any tool into the pump suction or discharge port after the pump has been connected to the power supply, unless the pump has been switched off by removing the fuses or switching off the mains switch. It must be ensured that the power supply cannot be accidentally switched on.



We recommend to always use Dab Pumps accessories to avoid malfunctions due to incorrect installation.



Only use the lifting bracket for lifting the pump. Do not use it to hold the pump when in operation. Check that the tools and equipment used for handling, lifting and lowering it into the sinkhole are suitable for the weight to be lifted, efficient and complying with the safety laws in force.

Installation types

The FKV and FKC pumps are designed for two installation types:

- submerged installation on auto-coupling,
- free-standing submerged installation on ring stand.

Before installation, check that the bottom of the tank is flat and uniform.

Check that pit, pool or tank are well dimensioned and that water level assures a correct running of electric pump with limited startings per hour.

5.1 Submerged installation on an automatic coupling device

Pumps for permanent installation can be installed on a stationary auto-coupling guide rail system. The auto-coupling system facilitates maintenance and service as the pump can easily be lifted out of the tank.

In the case of a potentially explosive atmosphere, before starting installation operations, check that the pump is suited for working in that atmosphere.

Make sure that the piping is correctly installed so that the pump does not have to bear loads due to the weight of the pipes.

Do not use elastic elements or bellows in the pipework; these elements should never be used as a means to align the pipework.

1 - Electric submersible pump
2 - Lifting chain
3 - Floating switch / probes
4 - Electric cable
5 - Electric panel
6 - Non return valve
7 - Gate valve
8 - Pit
9 - Supplementary pit with grid (optional)
10 - Delivery pipe
11 - Decantation area
12 - Foot pedestal

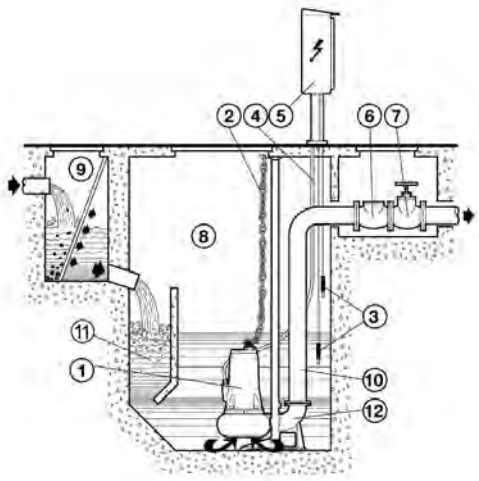


Fig. 4

Proceed as follows:

- Fix the upper bracket for the guide pipes (fig. 5 – pos. A) to the edge of the pit.
- Locate at bottom of pit the foot pedestal for the automatic coupling (fig. 5 – pos. B) and check that the guide pipe conical fixations are perfectly perpendicolar and leveled to the correspondent fixations of the upper bracket located to the edge of the pit.
- Mark the position of the slots in the support foot, then measure the exact length of the guiding pipes (fig. 5 - pos. C).
- Fix firmly the pedestal foot to the bottom of pit with suitable anchor clamps or metallic blocks.
- Connect the delivery pipe to the foot pedestal outlet.
- Disassemble the upper brackets from the edge of the pit and insert in the conical fixations of the foot pedestal the guide pipes previously cutted of correct length and fix them to the brackets reassembling the same to the edge of the pit.
- Assemble the special skid-flange (fig. 5 – pos. D) on the delivery outlet of the pump and hook the rope or chain to the handle or slot located on the upper part of it.
- Lift the electric pump up to over the pit and let it slowly descend guiding

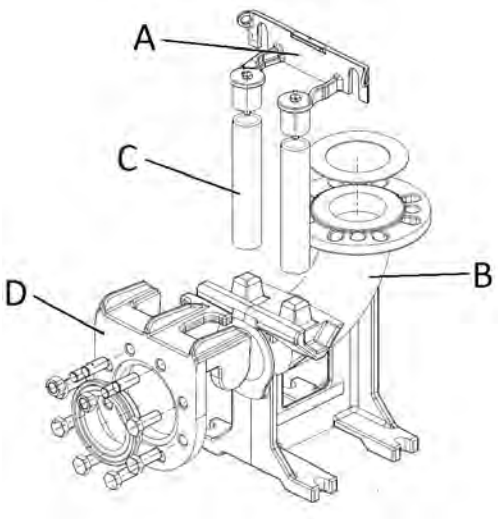


Fig. 5

the skid-flange in the guide pipes.

- When it arrives at the bottom, the electropump will automatically connect to the support foot.
- The hook of lifting rope or chain must be in line with the center of gravity of pump.
- Secure the extremities of rope or chain to the upper bracket located at the edge of the pit.
- Dispose the electric cables avoiding bends and deflections and paying attention that relevant terminals are not in contact with water.

The correct fixed installation must include installation of a non-return valve.

The guide rails must not have any axial play as this would cause noise during pump operation.

During positioning of the pump, air may remain blocked inside the pump body. The air may be removed from the pump body by installing the pump after having removed the cap of the vent hole positioned on the side of the pump. (Fig. 6).

Attention, the vent hole is on the side opposite the oil filling holes.

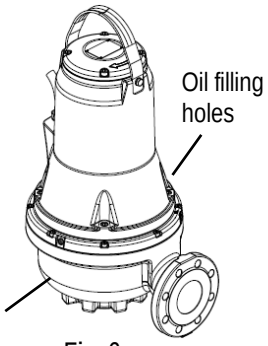
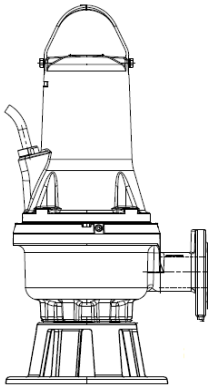


Fig. 6

5.2 Submerged installation on a support base

Delivery pipe must have diameter not inferior to the pump inlet.
When using a flexible pipe , it is advisable a reinforced pipe with metallic spiral which maintains the section unchanged even in presence of bends.
The eventual foot valve and gate valve must be assembled at a distance of approx 50 ÷ 200 cm. in a section of metallic pipe (rigid).
Special attention should be paid to the positioning of electric cables in order to avoid possible bending, pressing, lifting and that the same are accidentaly sucked by the pump.

The free end of the cable must not be submerged, as water may penetrate through the cable into the motor.


Fig. 7 Submerged installation on a support base

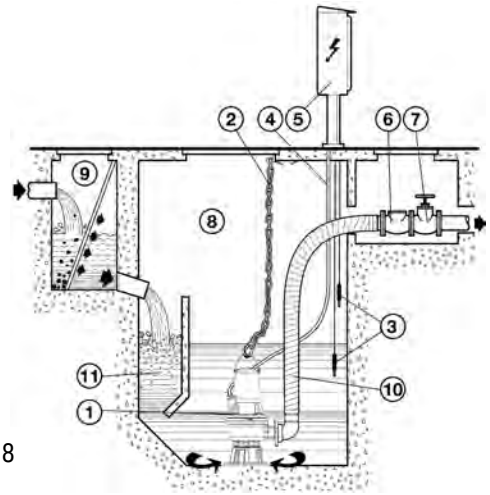


Fig. 8

6. ELECTRICAL CONNECTION

Attention: always respect the safety regulations!
Electrical installation must be carried out by an expert, authorised electrician, who takes on all responsibility and respects the regulations in force.

The system must be correctly and safely earthed as required by the regulations in force.

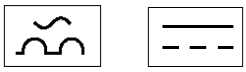
The control panel and respective electrical equipment, when contemplated, must be of a type approved by the safety regulations in force. Instruments and components of the panel must be of an adequate capacity and quality to maintain reliable operation over time.

In potentially explosive environments, the electrical connection and the control panel must be provided with explosion-proof protection.

The line voltage may change when the electropump is started. The line voltage may undergo variations depending on other devices connected to it and on the quality of the line.

The pump must be connected to a device for isolating the power supply, complying with the requirements specified in standard EN60204-1 paragraph 5.3.2.

The differential switch protecting the system must be correctly sized and must be of the “Class A” type. The automatic differential switch must be marked with the following two symbols:



Before making the electrical connection, turn off the power and ensure that it cannot be reconnected accidently. Connect the earth lead before connecting the line leads; if the electropump has to be removed or dismantled, the earth lead must be removed last.
The installer is responsible for ensuring that the earthing system is efficient and made in compliance with the regulations in force.

For explosion-proof pumps the electrical and equipotential connection must be made according to standard EN 60079-14.

Before installation and the first start-up of the pump, check the condition of the cable visually to avoid short circuits.

If the power cable is damaged, it must be replaced by the manufacturer’s service centre or by another qualified person.

On explosion-proof pumps, make sure that an external earth conductor is connected to the external earth terminal on the pump.
The section of the earth lead must be at least 4mm², yellow/green.
Make sure that the earth connection is protected from corrosion.
Make sure that all protective equipment has been connected correctly.
Float switches used in potentially explosive environments must be approved for this application.

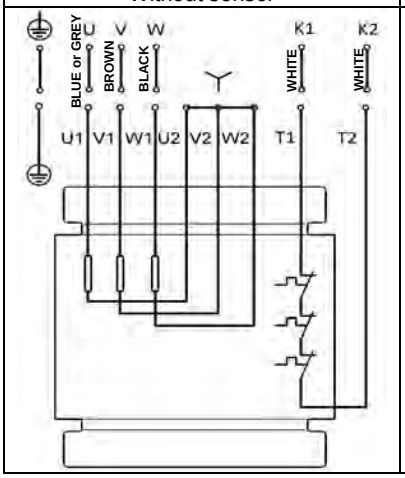
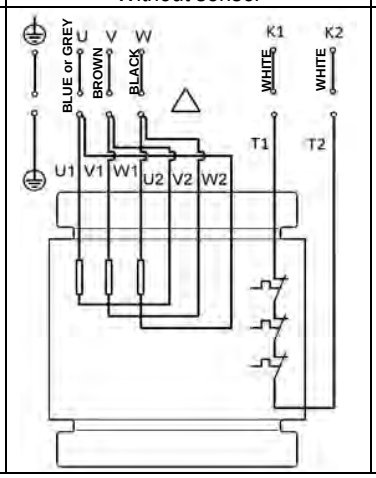
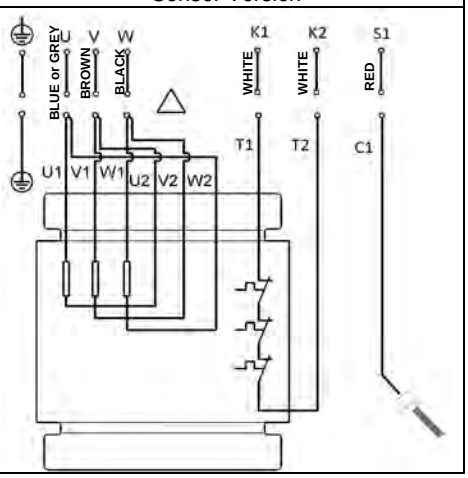
Set the motor-protective circuit breaker to the rated current of the pump. The rated current is stated on the pump nameplate.

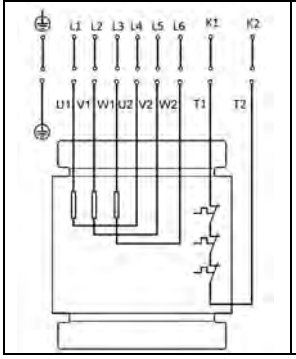
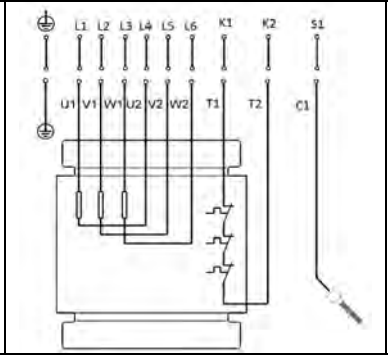
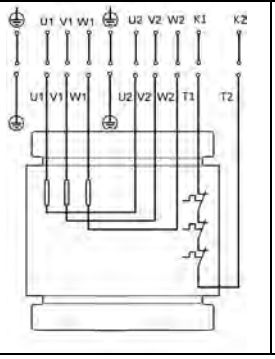
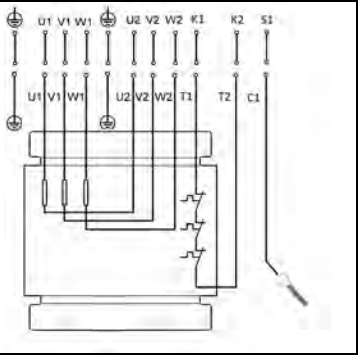
The supply voltage and frequency are marked on the pump nameplate. The voltage tolerance must be within - 10 %/+ 10 % of the rated voltage. Make sure that the motor is suitable for the power supply available at the installation site.
All the pumps are supplied with a 10 m cable and a free cable end.
For greater lengths contact the DAB Pumps technical assistance service.
The connections of the pump protection system, such as thermal protections and oil-in-water sensor, are to be provided by the user, who must use a control panel with suitable characteristics.

6.1 Wiring diagrams

<table>
<tr><td>400 D.O.L 50Hz
up to 3kW 2P / 2.2kW 4P

380-480 D.O.L 60Hz
up to 3kW 2P / 2.2kW 4P</td><td colspan="2">400 D.O.L 50Hz from 4kW 2P / 3kW 4P and up
380-480 D.O.L 60Hz from 4kW 2P / 3kW 4P and up

230 D.O.L. 50Hz up to 3kW 2P / 2.2kW 4P
220-277 D.O.L. 60Hz up to 3kW 2P / 2.2kW 4P</td></tr>
<tr><td>Without sensor</td><td>Without sensor</td><td>Sensor Version</td></tr>
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</table>

400 Y/D 50Hz 380-480 Y/D 60Hz		230 Y/D 50Hz 220-277 Y/D 60Hz	
Without sensor	Sensor Version	Without sensor	Sensor Version
			

6.2 *Electric panel level switches*

During operation the electropump must be immersed in the pumped liquid. It is necessary to install a control system with level switches (level probes or floats or other appliances) that ensure the minimum level of liquid and protect the electropump against dry running.

When installing the level switches, observe the following points:

- To prevent air intake and vibrations install the **stop level switch** in such a way that the pump is stopped before the liquid level is lowered below the top of the cable entry.
- In tanks with one pump, install the **start level switch** in such a way that the pump is started at the required level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the tank.
- In tanks with two pumps, the **start level switch** for pump 2 must start the pump before the liquid level reaches the bottom inlet pipe to the tank, and the start level switch for pump 1 must start this pump correspondingly earlier.
- If installed, always install the **high-level alarm switch** about 10 cm above the start level switch; however, the alarm must always be given before the liquid level reaches the bottom inlet pipe to the tank.

For further information on electric panels and the respective use of level switches, contact DAB Pumps.

Switches or sensors in potentially explosive environments must be certified for this application.

Fig. 9 Start and stop levels
Make sure that the effective volume of the tank does not become so low that the number of starts per hour exceeds the maximum permissible number.

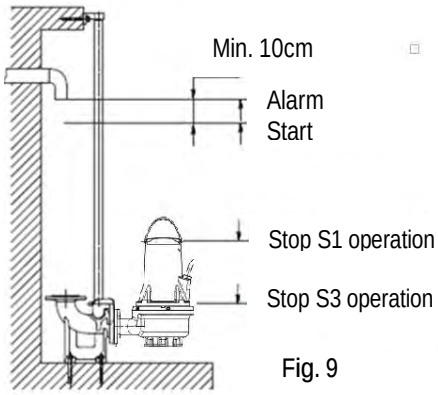


Fig. 9

6.3 *Thermal switch*

All FKV and FKC pumps have thermal protection incorporated in the stator windings (see wiring diagrams, contacts k1, k2) See parag. 6.1.
The thermal switches are inserted in the motor windings and intervene by opening and interrupting the circuit when an excessive temperature is reached in the windings (about 150°C).

Non explosion-proof pumps
For correct operation the thermal switch must be connected to a device for interrupting the power supply circuit of the electropump. When the electropump has cooled, once the circuit of the thermal switch has been reset, the device can automatically restart the pump.

Explosion-proof pumps

The device for interrupting the power supply circuit of explosion-proof pumps must not restart the pump automatically. This ensures protection against over temperature in potentially explosive environments.

6.4 Sensor (water in the oil) (not available for explosion-proof versions)

The sensor probe inserted in the oil chamber detects any presence of water in the oil when the water percentage exceeds a predetermined value.
When the water level in the oil is reached, the probe closes the circuit between the sensor (contact S1 on wiring diagram) and the equipotential contact of the pump.
The probe must be connected to a suitable device in the control panel; the device may give an acoustic alarm or a luminous signal or, when requested, it may stop the electropump.

If the signal is activated you must stop the electropump, dismantle it and check the state of the oil, the mechanical seals, and look for the causes of intervention.

7. START-UP



Before starting work on the pump, check that the main switch is off.
It must be ensured that the power supply cannot be accidentally switched on.
Make sure that all protective equipment has been connected correctly.
The pump must not run dry.



The pump must not be started if the atmosphere in the tank is potentially explosive.



Before starting the pump, check that it is suitably connected to the pumping system to avoid uncontrolled leakage of liquid.



Do not put your hands or any tool into the pump suction or discharge port after the pump has been connected to the power supply.

7.1 General start-up procedure

This procedure applies to new installations as well as after service inspections if start-up takes place some time after the pump was placed in the tank.

- After long periods of storage, check the conditions of the oil in the oil chamber. See also section 8.1 Routine maintenance.
- Check that the system, bolts, gaskets, pipework and valves etc. are in correct condition.
- Mount the pump in the system.
- Switch on the power supply.
- Check whether the monitoring units, if used, are operating satisfactorily.
- Check the setting of the float switches or of the level sensors.
- Check that the impeller can turn freely by briefly starting the motor.
- Check the direction of rotation. See section 7.2 Direction of rotation.
- Open the isolating valves, if fitted.
- Check that the liquid level is above the motor for S1 operation and above the cable entry for S3 operation. See fig. 9. If the minimum level is not reached do not start the pump.
- Start the pump and let the pump run briefly, and check if the liquid level is falling.
- Observe if the discharge pressure and input current are normal. If not there might be air trapped inside the pump (See section 5 Installation).



In case of abnormal noise or vibrations from the pump, other pump failure or power supply failure or water supply failure, stop the pump immediately. Do not attempt to restart the pump until the cause of the fault has been found and the fault corrected.

After one week of operation or after replacement of the shaft seal, check the condition of the oil in the chamber. For pumps without sensor, this is done by taking a sample of the oil. See section 8. Maintenance and service for procedure. Every time the pump has been removed from the tank, go through
the above procedure when starting up again.

7.2 Direction of rotation



The pump may be started for a very short period without being submerged to check the direction of rotation.

Check the direction of rotation before starting up the pump. An arrow on the motor housing indicates the correct direction of rotation. Correct direction of rotation is clockwise when viewed from above.

Checking the direction of rotation

The direction of rotation should be checked in the following way every time the pump is connected to a new installation.

Procedure

1. Let the pump hang from a lifting device, e.g. the hoist used for lowering the pump into the tank.
2. Start and stop the pump while observing the movement (jerk) of the pump. If connected correctly, the pump will rotate clockwise, i.e. it will jerk counter-clockwise. See fig. 10. If the direction of rotation is wrong, interchange any two of the phases in the power supply cable.

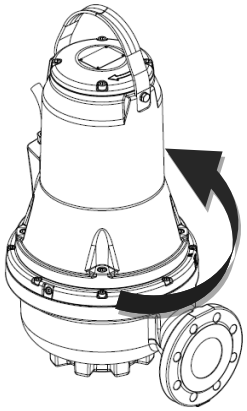


Fig. 10 Jerk direction

8. MAINTENANCE AND SERVICE



Routine maintenance work, limited to checking, cleaning or replacing limited parts, may be carried out only by expert and qualified personnel, provided with suitable equipment, who know the safety regulations for the working environment and have read and carefully checked the content of this manual and of any other documentation attached to the product.

Special maintenance or repairs must be entrusted to authorised Dab Pumps service centres.



Before starting any work on the system or troubleshooting, ensure that the main switch is off and that the power supply cannot be switched on again accidentally. Check that all the protection systems are correctly connected and that all the rotating parts are stopped.



Maintenance work on explosion-proof pumps must be carried out by DAB Pumps or a service workshop authorized by DAB Pumps.
However, this does not refer to hydraulic components such as the pump body, the impeller and the mechanical seal.



The replacement of the cable must be carried out exclusively by the manufacturer's service centre or by another qualified person.



The pump may have been used for pumping liquid that is harmful to health, contaminated or toxic. Take all the precautions concerning health and safety before carrying out maintenance or repairs.

Use genuine spare parts only for repairs.
Select the spare parts to be ordered, consulting the exploded drawings available on the DAB Pumps site or the DNA selection software.
The manufacturer declines any responsibility for eventual damages to persons, animals or things for maintenance and repair interventions carried out by non authorized personnel or with no genuine spare parts.

Specify the following information when ordering spare parts:
1. The type of electric pump.
2. Serial number and manufacturing year.
3. Denomination and reference number of the spare parts.
4. Required number of parts.

8.1 Routine Maintenance

Pumps running normal operation should be inspected every 3000 operating hours or at least once a year. If the pumped liquid is very muddy or sandy, inspect the pump at shorter intervals.
Check the following points:

- Power consumption

See pump nameplate.

- Oil level and oil condition

When the pump is new or after replacement of the shaft seal, check the oil level and water content after one week of operation. If there is more than 20 % extra liquid (water) in the oil chamber, the shaft seal is defective. The oil should be changed after 3000 operating hours or once a year.

- Cable entry

Make sure that the cable entry is watertight (visual inspection) and that the cable is not sharply bent and/or pinched.

- Pump parts

Check impeller, pump housing, etc. for possible wear. Replace defective parts.

- Ball bearings

Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace defective ball bearings.
A general overhaul of the pump is usually required in case of defective ball bearings or poor motor function. This work must be done by an assistance workshop authorised by DAB Pumps.

The ball bearings used are sealed and lubricated, using a special lubricant for high temperatures (-40°C + 150°C).

Defective bearings may reduce the Ex safety.

- O-rings and similar parts

During service/replacement, it must be ensured that the grooves for the O-rings as well as the seal faces have been cleaned before the new parts are fitted.

Used rubber parts must not be reused.

Explosion-proof pumps must be checked by an authorized Ex workshop once a year.

- Oil change

After 3000 operating hours or once a year, change the oil in the oil chamber as described below.
If the shaft seal has been replaced, the oil must be changed.

When loosening the screws of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screws until the pressure has been fully relieved.

- Draining of oil
  1. Place the pump on a plane surface with one oil screw pointing downwards.
  2. Place a suitable container (approx. 1 litre), for instance made of transparent plastic material, under the oil screw.

Used oil must be disposed of in accordance with local regulations.

  3. Remove the lower oil screw.
  4. Remove the upper oil screw. If the pump has been in operation for a long period of time, if the oil is drained off shortly after the pump has been stopped, and if the oil is greyish white like milk, it contains water. If the oil contains more than 20 % water, it is an indication that the shaft seal is defective and must be replaced. If the shaft seal is not replaced, the motor will be damaged. If the quantity of oil is smaller than the quantity stated, the shaft seal is defective.
  5. Clean the faces for the gaskets for oil screws.

- Filling with oil
  1. Rotate the pump so that one of the two oil holes in a vertical position facing upwards.
  2. Pour the oil into the chamber. The suitable amount of oil is indicated by the second oil venting hole (positioned beside the vertical filling hole). Once the oil has reached and escapes from the hole at the side, the oil quantity is correct.
  3. Fit the oil screws with new gaskets.

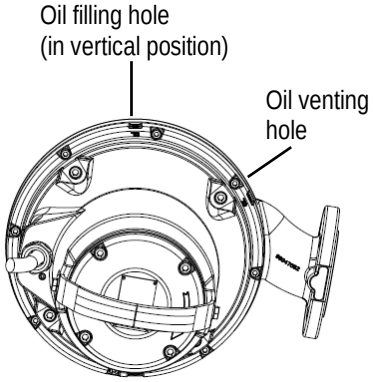


Fig. 11 Oil filling holes

The table shows the quantity of oil in the oil chamber of FKV and FKC pumps. Oil type: ESSO MARCOL 152.

Motor type	Oil quantity [l]
up to 3kW 2poles / up to 2.2kW 4poles	0.5
from 4kW 2poles /from 3kW 4poles	0.95

8.2 Special maintenance

Special maintenance operations must be carried out exclusively by an assistance workshop authorised by DAB Pumps.

8.3 Contaminated pumps

If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

If you are asking to have a pump repaired, you must contact the service centre to give them the details about the pumped liquid, etc., before sending the pump for repair. Otherwise, the service centre may refuse to accept the pump.
However, any application for service (no matter to whom it may be made) must include details about the pumped liquid if the pump has been used for liquids which are injurious to health or toxic.
Before a pump is returned, it must be cleaned in the best possible way before it is returned.

Service instruction and service video can be found on www.dabpumps.com.

9. FAULT FINDING



Before attempting to diagnose any fault, make sure that the fuses have been removed or the mains switch has been switched off. It must be ensured that the power supply cannot be accidentally switched on. All rotating parts must have stopped moving.

All regulations applying to pumps installed in potentially explosive environments must be observed. It must be ensured that no work is carried out in potentially explosive atmosphere.

INCONVENIENTS	PROBABE CAUSES	REMEDIES
Failure in electric pump.	Lack of current to the motor.	Check electric network, supply cables, connections and fuses.
	Insufficient voltage.	Check the value (see chapter 10 "Technical Data").
	Thermal protection activated.	Wait for motor cooling, reset thermal relay and check ratin starting.
	No signal from electrodes for level control.	Wait for level reset, check efficiency of level control relay and relevant electrodes.
	One phase interruption (three-phase motors).	Reset connections.
	Clogged impeller.	Remove obstruction, wash and clean (contact the Assistance Service if necessary).
	Motor failure.	contact the Assistance Service.
Electric pump starting with thermal protection intervention winding.	Voltage different from plate.	Measure the voltage between two phases of the motor. Tolerance: - 10 %/+ 6 %. Restore the correct voltage.
	Wrong rotation direction.	Invert two of the three phases (see par. 7.2: "Direction of rotation")
	Three-phase motor: phase interruption.	Reset connections.
	Three-phase motor: Low rating.	Adjust rating of relay value.
	Short-circuit; earth leakage in electric cables or motor.	Individuate interruption and repair (contact the Assistance Service if necessary).
	Too high temperature of pumped liquid.	Check whether the right type of pump has been selected.
	Pumped liquid too dense.	Dilute liquid. Check whether the right type of pump has been selected.
	Dry running of the electropump.	Check the level of liquid in the sinkhole and the level control instruments.
	Defective thermal relay.	Replace it.
Electric pump drawing more power than value of plate.	Overload due to pump clogged.	Remove obstruction and clean (contact Assistance Service if necessary).
	Pumped liquid too dense or viscious.	Dilute liquid. Check whether the right pump has been selected.
	Overload due to obstruction.	Remove obstruction and clean of extraneous bodies.
	Wrong rotation direction.	Invert two of the three phases (see par. 7.2: "Direction of rotation").
	The pump is operating outside the allowed working range.	Check the work point of the pump and, if necessary, increase the delivery pressure.
Insufficient performances.	Suction, impeller, valve ordelivery pipeline clogged.	Clean carefully.
	Weared pump or impeller.	Replace or repair.
	Errato senso di rotazione.	Invert two of the three phases (see par. 7.2: "Direction of rotation").
	Air or gas in the pumped liquid.	Increase dimensions of pit or collecting tank and foresee degasing devices.
	Presence of air in the pump.	Vent the pump. (see installation paragraph).