

Submersible Borehole Pump with Integrated Pressure Switch

Ixo-Pro

Installation/Operating Manual



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Installation/Operating Manual Ixo-Pro

Original operating manual

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Glossary

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Close-coupled design

Motor directly fitted to the pump via a flange or a drive lantern

Pump

Machine without drive, additional components or accessories

Pump set

Complete pump set consisting of pump, drive, additional components and accessories

1 General

1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series / size and the main operating data.


In the event of damage, immediately contact your nearest KSB service centre to maintain the right to claim under warranty.

1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.4, Page 7)

1.3 Symbols

Table 1: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇔	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

2 Safety










All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 Key to safety symbols/markings

Table 2: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

This manual contains general installation, operating and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

2.3 Intended use

- The pump (set) must only be operated in the fields of application and within the use limits specified in the other applicable documents.
- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing damage, etc).
- Observe the minimum flow rate and maximum flow rate indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

2.4 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.7 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energised).
- The pump (set) must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual.
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 18)

2.9 Unauthorised modes of operation


Never operate the pump (set) outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use. (⇒ Section 2.3, Page 7)


3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

	NOTE
	<p>The pump set is supplied by the manufacturer/supplier in packaging which largely prevents sagging or other damage during transport and/or storage.</p>


3.2 Transport


	CAUTION
	<p>Improper pump transport Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Always transport the pump/pump set in the specified position. ▷ Never suspend the pump (set) from the power cable. ▷ Prevent the pump (set) from getting knocked or dropped. ▷ Always secure a pump set in upright position against tipping over. ▷ Wear personal protective equipment.

Use lifting equipment which is suitable for the weight of the pump set.
Make sure that the power cable is not kinked or damaged during transport.

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken:

	WARNING
	<p>Pump set tilting or rolling off Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Always secure vertically positioned pump sets against tipping over. ▷ Always secure horizontally positioned pump sets against rolling off.

	CAUTION
	<p>Damage during storage by frost, humidity, dirt, UV radiation or vermin Corrosion/contamination of the pump!</p> <ul style="list-style-type: none"> ▷ Store the pump (set) in a dry, dark, frost-proof room not exposed to sunlight where the atmospheric humidity is as constant as possible.

Store the pump as follows:

- In a dry environment
- Protected against direct sunlight and heat
- Protected against dirt and dust
- Protected against freezing
- Protected against vermin



Further information on storing the pump set after it has been in use
(⇒ Section 6.4, Page 19) .

3.4 Return to supplier

1. Drain the pump as per operating instructions.
2. Flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen also neutralise the pump and blow through with anhydrous inert gas to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump.
Indicate any safety measures and decontamination measures taken.
(⇒ Section 11, Page 26)

	NOTE
<p>If required, a blank certificate of decontamination can be downloaded from the following web site: www.ksb.com/certificate_of_decontamination</p>	

3.5 Disposal

	 WARNING
<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▸ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▸ Wear safety clothing and a protective mask if required. ▸ Observe all legal regulations on the disposal of fluids posing a health hazard. 	

1. Dismantle the pump (set).
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description

4.1 General description

Submersible borehole pump with integrated pressure switch
 Pump for handling clean water without suspended solids.

4.2 Designation

Example: Ixo-Pro 4

Table 3: Designation key

Code	Description
Ixo-Pro	Type series
4	Number of stages

4.3 Name plate

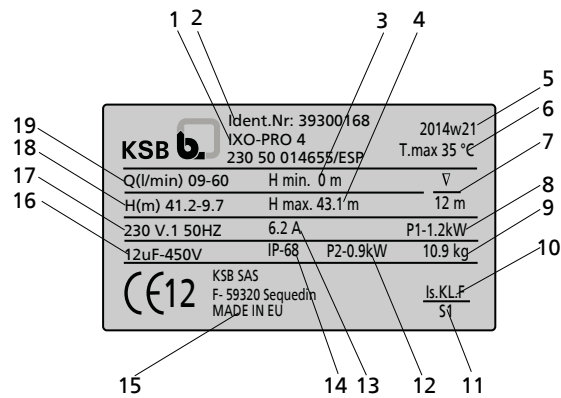


Fig. 1: Name plate

1	Type series, number of stages	2	Material number
3	Minimum head	4	Maximum head
5	Series code	6	Maximum fluid temperature
7	Maximum immersion depth	8	Power input (P ₁)
9	Weight	10	Thermal class
11	Mode of operation	12	Power output (P ₂)
13	Nominal current	14	Enclosure
15	Manufacturer/supplier	16	Capacitor
17	Voltage, frequency	18	Range of heads
19	Range of flow rates		

4.4 Design details

Design

- Centrifugal pump
- Close-coupled design
- Multistage
- Integrated pressure switch
- For fully submerged operation
- Low-level inlet

- Suction strainer with a maximum mesh width of 2 mm
- Flow sensor
- Swing check valve

Drive

- Water-cooled single-phase AC motor
- 230 V, 50 Hz
- Thermal class F
- IP68 enclosure
- Continuous duty
- Integrated capacitor
- Electronic dry running protection with 4 consecutive start-up attempts
- Thermal overload protection
- Motor connection cable 15 m (H07 RNF) and plug

Bearings

- Ball bearing
- Grease-packed bearings sealed for life

Shaft seal

- Double shaft seal with oil reservoir fitted in between

4.5 Configuration and function

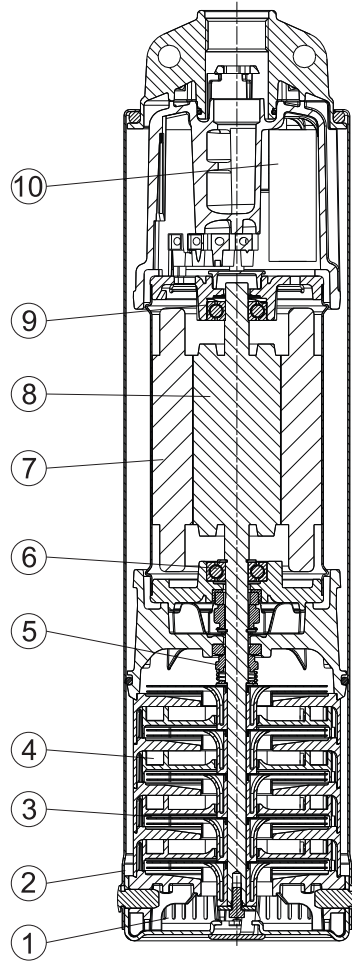


Fig. 2: Sectional drawing

1	Suction casing	2	Pump casing
3	Rotor	4	Diffuser
5	Double mechanical seal	6	Rolling element bearing
7	Stator	8	Motor shaft
9	Rolling element bearing	10	Capacitor

The fluid enters the pump via the suction casing (1). It is accelerated outward by the rotating impellers. In the flow passage of the diffusers (4) and the pump casing (2) the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge side, where it leaves the pump. At the rear side of the impeller, the motor shaft (8) enters the casing via the bearing cover. The shaft passage is sealed by a double mechanical seal (5). The shaft is supported by rolling element bearings (6) and (9).

4.6 Scope of supply

- Multistage submersible borehole pump with integrated pressure switch
- Motor connection cable 15 m (H07 RNF) and plug

4.7 Dimensions

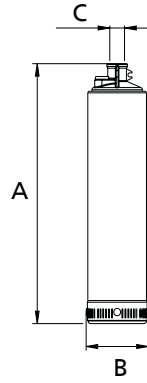



Fig. 3: Dimensions

Table 4: Dimensions [mm]

Size	Dimensions		Thread
	A	B	C
4	493	126	Rp 1
6	560	126	Rp 1

5 Installation at Site

5.1 Installing the pump set

	CAUTION
	<p>Incorrect installation Damage to the machine</p> <ul style="list-style-type: none"> ▸ The pump set must always be installed in a vertical position. ▸ Never suspend the pump set by the power cable or discharge line.

Observe the following when selecting a place of installation:

- Never install the pump set directly on the floor of the tank / rainwater storage tank.
- Never install the pump set too close to the inner walls of the tank / rainwater storage tank.
- Observe the installation height (see table: maximum installation height x)

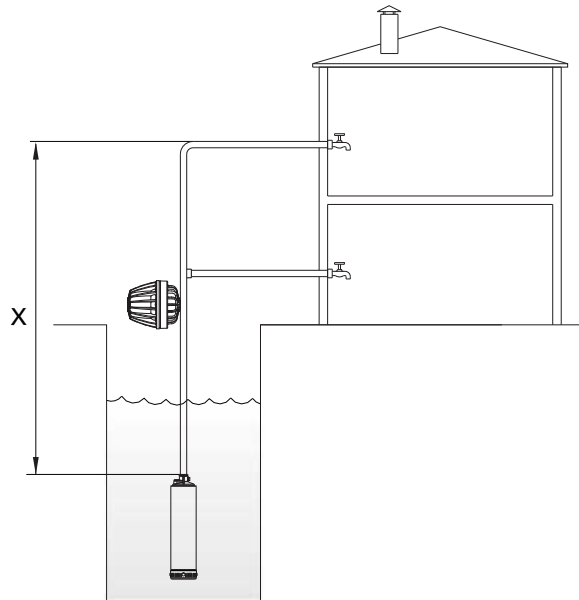







Fig. 4: Installation information

Table 5: Maximum installation height x

Size	x [m]
4	20
6	30


1) See cable manufacturer's documentation or DIN VDE 0298-3.

5.2 Connecting the piping

	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Using damaged cables in the tank / rainwater storage tank Electric shock!</p> <ul style="list-style-type: none"> ▸ Do not kink the cable. Observe the minimum bending radius¹⁾ of the cable. Do not drag the cable over sharp edges. ▸ Fasten the cable to the riser or piping with suitable fasteners (e.g. cable clips). ▸ Do not use any tools, equipment or accessories with sharp edges (e.g. sharp-edged pipe sockets) for the installation.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</div> <p>Persons falling into unsecured tanks / rainwater storage tanks Risk of injury!</p> <ul style="list-style-type: none"> ▸ Always secure open tanks / rainwater storage tanks during the entire installation procedure to prevent persons from falling in. ▸ Suitably fence off the work area.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">CAUTION</div> <p>Pump set falling into the tank / rainwater storage tank Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Secure the pump set during the entire installation procedure. ▸ Dimension any securing devices (supporting clamps, supports, etc.) so that they can carry all weights during the installation.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">CAUTION</div> <p>Unsuitable pipeline Faulty operation of the pump!</p> <ul style="list-style-type: none"> ▸ If using plastic pipelines, make sure they are designed to withstand the pump pressure. ▸ Do not kink the plastic pipeline.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">CAUTION</div> <p>Incorrect installation Pressure surges! Damage to the material!</p> <ul style="list-style-type: none"> ▸ Never install an additional swing check valve in the piping. The swing check valve is already integrated in the pump set. ▸ Fit an expansion vessel to the discharge line (optional accessory: see Kit-Press connection set).




Installation information

- The pumps can be connected to pipelines with an Rp 1 thread.

	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>Using a discharge line of a larger diameter is recommended in the case of very high static heads or very long pipelines in order to prevent pressure losses.</p>
---	---

1. Install the pipelines in accordance with the manufacturer's documentation.
2. Lower the pump set into the tank / rainwater storage tank.

5.3 Electrical connection



	<p style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</p> <p>Electrical connection work by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▸ Always have the electrical connections installed by a trained and qualified electrician. ▸ Observe regulations IEC 60364.
	<p style="background-color: #f39c12; color: white; padding: 5px;">⚠ WARNING</p> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▸ Observe the technical specifications of the local energy supply companies.
	<p style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</p> <p>Connection of damaged power cables Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▸ Check the power cables for damage before connecting them. ▸ Never connect damaged power cables. ▸ Replace damaged power cables.

- ✓ Check the available mains voltage against the data on the name plate.
 - ✓ The mains is protected by a residual current device of 30 mA.
1. Plug the mains plug into the mains socket.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up

6.1.1 Starting up and stopping

	 DANGER
	<p>Start-up with defective earth conductor Personal injury from electric shock!</p> <ul style="list-style-type: none"> ▷ Never switch on a pump set without an earth conductor or with a defective earth conductor.

- ✓ The pump set has been properly connected to the power supply.
 - ✓ Any shut-off elements in the discharge line are open.
1. The pump starts up automatically as soon as a consumer installation (e.g. outdoor tap) is opened.
 Depending on the length of the pipeline it may take several minutes until the discharge line is completely filled with the fluid handled.

Start-up and stop are automatic processes. The pump set starts up when a consumer installation is opened. When it is closed again, the pump stops. The start-up pressure equals 2 or 3 bar, depending on the pump size. If the water consumption exceeds 1.4 l/min the pump remains in operation.

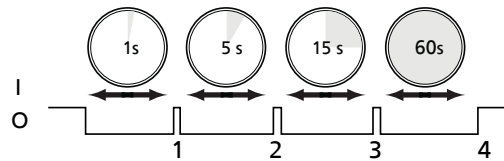


Fig. 5: Timing of start-up attempts

1, 2, 3, 4	Start-up attempts
------------	-------------------

Start-up attempts When the electronic circuit recognises that the fluid handled is not available, the pump set stops. The pump set will carry out 4 start-up attempts (see Fig.: Timing of start-up attempts).

If the pump set can not be started up in any of these 4 start-up attempts, the pump set will be switched off indefinitely. The pump set can only be re-started by manually switching the power supply off and then on again.

Anti-blockage function The pump set features an anti-blockage function. After an idle time of 100 hours, the pump set will automatically be started up for 2 seconds to prevent the hydraulic section from blocking.

6.2 Operating data

Table 6: Operating properties

Characteristic	Value	
Flow rate	Q [m ³ /h]	≤ 3.9
	Q [l/min]	≤ 65
Head	H [m]	≤ 60
Fluid temperature	T [°C]	5 - 35

6.3 Operating limits

- Only suitable for vertical operation.
- Maximum immersion depth: 12 m
- Maximum particle size: 2 mm
- Maximum number of start-ups/hour: 30

6.4 Taking the pump set out of service

If the pump set is not in service for a prolonged period of time, taking the following measures is recommended.



1. Remove the pump set from the tank / rainwater storage tank.
2. Drain the pipelines and the pump set.
3. Store the pump set properly. (⇒ Section 3.3, Page 9)

7 Servicing/Maintenance

7.1 Maintenance/inspection

The pump set is maintenance-free.

8 Trouble-shooting

	 WARNING
	<p>Improper work to remedy faults Risk of injury!</p> <p>▸ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.</p>

If problems occur that are not described in the following table, consultation with the KSB customer service is required.

- A Pump is running, but does not deliver
- B Pump delivers insufficient flow rate
- C Pump stops during operation
- D Volume flow does not correspond with the indicated characteristic curve

Table 7: Trouble-shooting

A	B	C	D	Possible causes	Remedy
X	-	-	-	No power supply	Check fuses and other protective devices.
-	X	-	-	Fluid level has sunk.	Make sure that the pump is submerged in the fluid handled.
-	-	X	-	Voltage error	Make sure that the voltage matches the voltage indicated on the name plate.
-	-	-	X	Maximum installation height exceeded	Observe the operating limits.
X	-	X	-	Protection against overheating has tripped.	Reset the thermal protection device or wait until the pump has cooled down.
-	X	-	-	Discharge line defective or not connected	Check discharge line connection. Replace, if required.
-	-	-	X	Water inlet filter clogged	Clean the suction filter.
X	-	X	-	Stop caused by level probes	Wait for the water level in the well to rise.
-	-	-	X	Hydraulic system worn	Contact KSB.

9 Related Documents

9.1 General assembly drawing

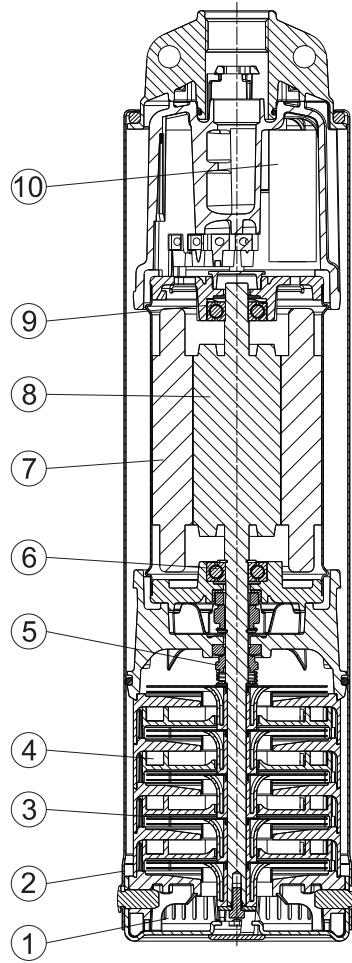


Fig. 6: Sectional drawing

1	Suction casing	2	Pump casing
3	Rotor	4	Diffuser
5	Double mechanical seal	6	Rolling element bearing
7	Stator	8	Motor shaft
9	Rolling element bearing	10	Capacitor

9.2 Exploded view

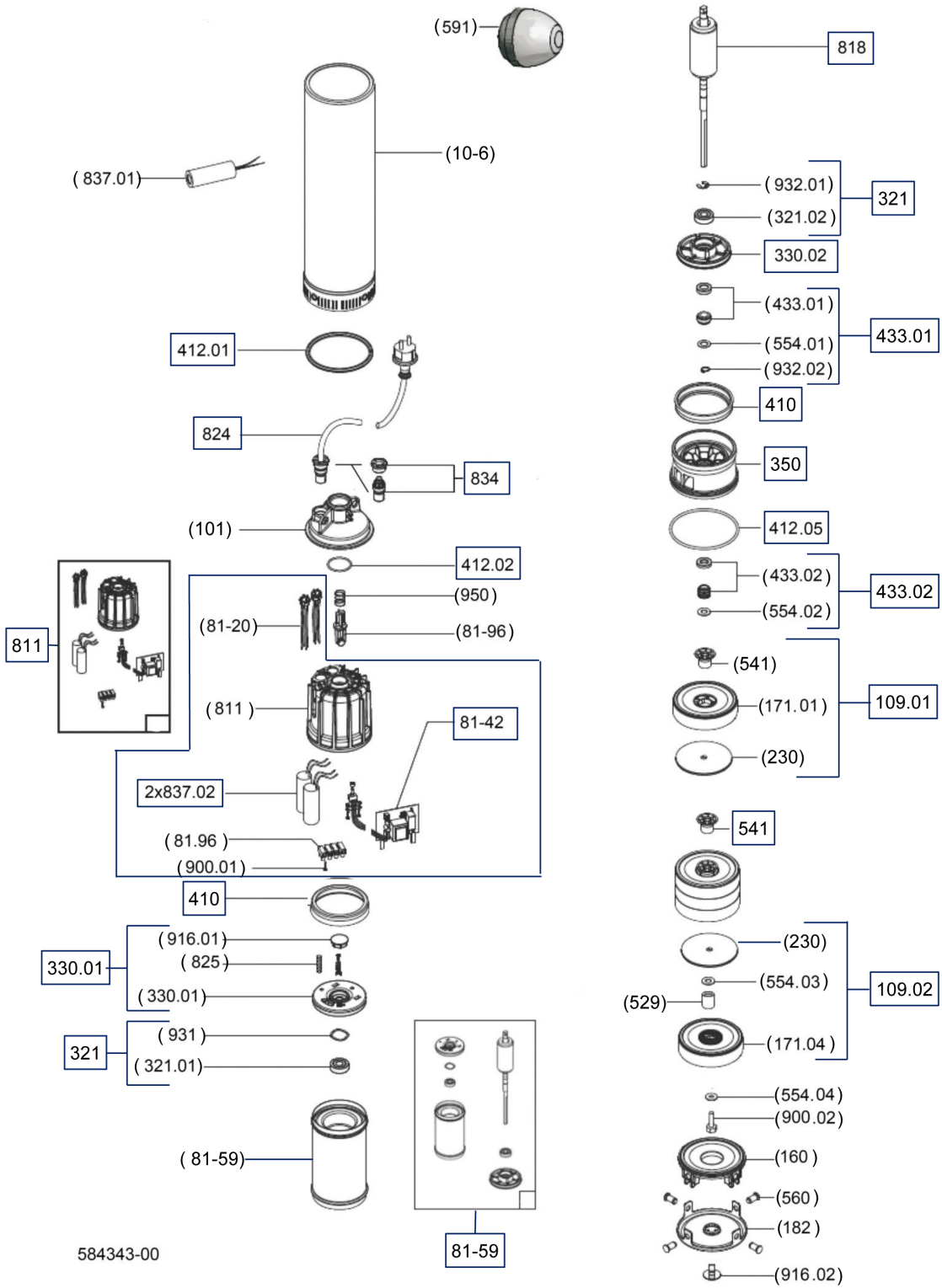


Fig. 7: Exploded view

10 EC Declaration of Conformity

Manufacturer:

KSB S.A.S.
128, rue Carnot,
59320 Sequedin (France)

The manufacturer herewith declares that **the product**:

Ixo-Pro

Serial number:2018w01 - 2019w52

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump set: EC Machinery Directive 2006/42/EC
 - Pump set: Electromagnetic Compatibility Directive 2014/30/EU

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809
 - EN 60034-1, EN 60034-5/A1
 - EN 60335-1/A1, EN 60335-2-41

Person authorised to compile the technical file:

Christian Appel
Head of Product Management Well and Ring-section Pumps
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 1 February 2018



Joachim Schullerer
Head of Product Development Pump Systems and Drives
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal

11 Certificate of Decontamination

Type:

Order number/









Order item number²⁾:

Delivery date:

Field of application:

Fluid handled²⁾:

Please tick where applicable²⁾:

 <input type="checkbox"/> Radioactive	 <input type="checkbox"/> Explosive	 <input type="checkbox"/> Corrosive	 <input type="checkbox"/> Toxic
 <input type="checkbox"/> Harmful	 <input type="checkbox"/> Bio-hazardous	 <input type="checkbox"/> Highly flammable	 <input type="checkbox"/> Safe

Reason for return²⁾:

Comments:

.....

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/ placing at your disposal.

We herewith declare that this product is free from hazardous chemicals, biological and radioactive substances.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of containment shroud leakage, the outer rotor, bearing bracket lantern, leakage barrier and bearing bracket or adapter have also been cleaned.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

- No special safety precautions are required for further handling.
- The following safety precautions are required for flushing fluids, fluid residues and disposal:

We confirm that the above data and information are correct and complete and that dispatch is effected in accordance with the relevant legal provisions.

.....

Place, date and signature	Address	Company stamp
---------------------------	---------	---------------

2) Required fields

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