DR. BENDER *GmbH*
Innovative Power Tools

Operating Manual
Powerbox PB RX / SX 12
HF III

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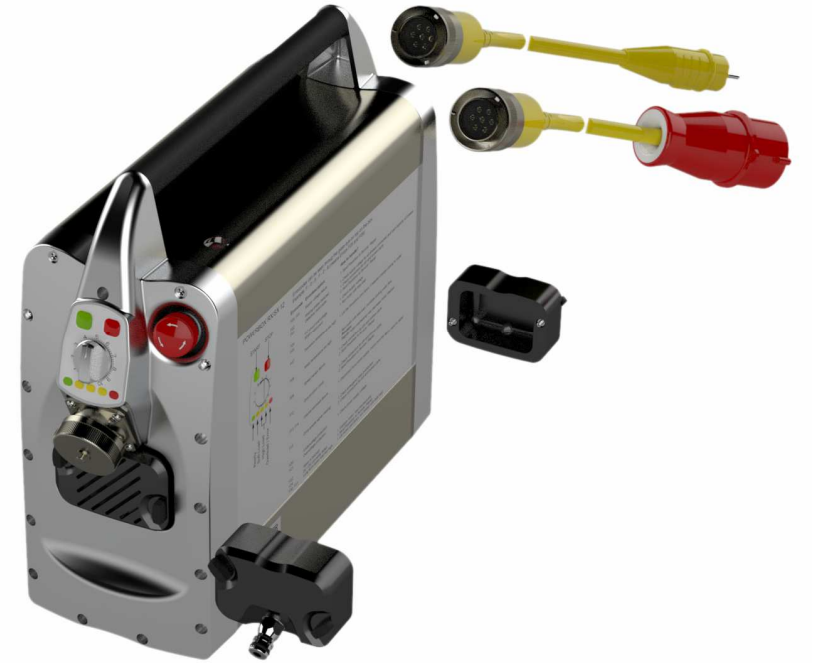

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Declaration of conformity

DR.BENDER *GmbH*

Innovative Power Tools

EC – Declaration of conformity for machines (EC-RL 2006/42/EC)

Herewith, the manufacturer,

Dr. BENDER GmbH
Industriestrasse 22
75382 Althengstett

declares that the machine

PB RX / SX 12

conforms with the aforementioned Directive and the following Directives

- Electromagnetic compatibility (EMC) (2004/108/EC)
- Low Voltage Directive (2006/95/EC)

The following harmonised standards have been used for assessment of the appliance:

EN 50144-1
EN 50144-2-1
EN 55014-1
EN 61000-3-2
EN 61000-3-3
EN 55014-2
EN 61029-1

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Althengstett, 30.07.2018

Min Wei, Managing Director

This Declaration does not include Assurance of Product Properties.
The Safety Instructions of the enclosed Product Documentation have to be respected.

Contents

Attention

The safety instructions included in this operating manual must be followed!

Custom models and design variants may deviate from the basic type in technical details. In the event of any discrepancies, we recommend that you contact DR.BENDER GmbH urgently. Always give the machine type and machine number in any correspondence.

1.0 Symbol and pictogram description

Warning

Indicates instructions which may endanger your health or the functionality of the unit if they are not followed. The warranty shall become null and void if you cause defects to the unit by non-compliance with these instructions.

Warning

Warning of dangerous electrical voltage.
Before work is performed in this specially marked section, the installation of the device must be separated completely from current (voltage) and must be secured against unintentional power ON.
Disregard can lead to severe or deadly injuries.

Recycling

Please direct waste to recycling.

Disposal

The customary and regional laws shall be observed for disposal.

Safety signs on the machine

Wear safety shoes

Wear gloves

Wear a safety helmet

Wear protective goggles

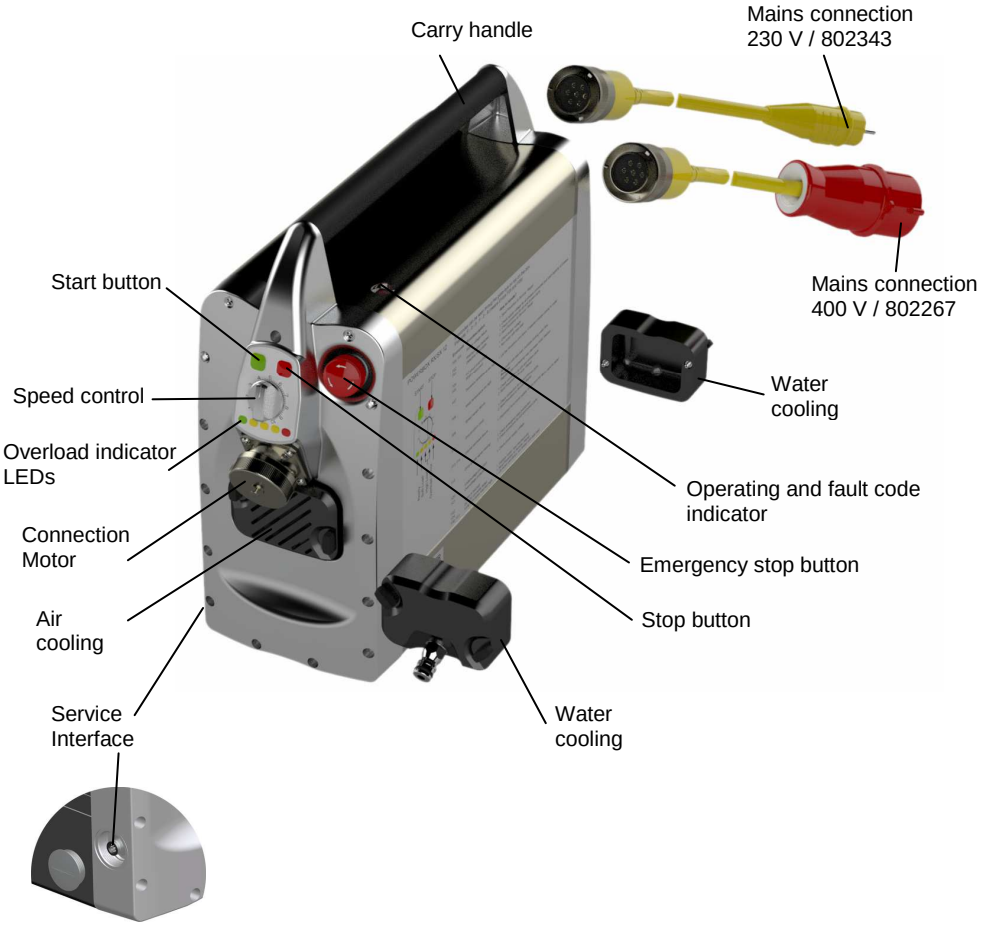
Wear ear protection

Wear a breathing mask

Pull the power plug before work on the device

Read the instructions

1.1 Function description



2.0 General instructions

2.1 Technical description

The BELUGA SXM with the Powerbox PB RX/SX12 represents a whole new generation of drive units for stone cutting. The exceptionally comprehensive modular system offers the flexibility needed today when performing cutting work in concrete and stone. To achieve this, newly developed high-frequency motor parts are used in the motor. The frequency range is controlled by the frequency converter from 0 - 1000 Hz integrated into the Powerbox. At 1000 Hz, the rotor reaches a speed of 30.000 min^{-1}. A major benefit lies in the exceptional weight / power ratio (motor power output = 8 kW / weight = 6.5 kg -> 1.2). Using conventional technology e.g. type BBM33extra (motor power output = 2.4 kW / weight = 13.5 kg -> 0.17) It means that the weight of the machine has been reduced sevenfold using the high frequency technology. We have succeeded in running the Powerbox as well as the drive units on a 230V single phase network or on a 400 V three-phase network. This means that only one piece of equipment is needed for use on both voltage sources. Further benefits lie in the stepless speed control. This enables the best speed to be assigned to each tool diameter, in order to attain the best possible cutting speed on the tool. During work, the speed can be steplessly reduced if you come up against steel reinforcements and thus can be optimised according to the progress of the work. Here, you can run the unit at much higher cutting speeds (Attention! depends on the tool) and in doing so, the progress of the job can be speeded up by up to 150%. With conventional machines, the torque drops very sharply at the higher speeds. Therefore, this advantage does not apply to conventional machines.

2.2 Applications

The drive units and the related Powerboxes can be used according to the data attached to the information plate. If you are using custom-built machines, the details on the quotation and the order confirmation also apply.

The drive units and Powerboxes are essentially Class I appliances, this is only guaranteed by the full high-quality protection of the residual current circuit breaker.

If suitable saw blades and drill bits are used, a wide range of materials can be cut:

- Concrete (even with strong reinforcement)
- Sandstone and limestone
- All building materials for solid walls
- Asphalt road surfacing

The machine must

- *when operating at 230 V:*
  Be used with an upstream, all-current-sensitive residual current circuit breaker or safety transformer in order to guarantee the safety of the operator.

- *when operating at 400 V:*
  Be connected to a properly earthed CEE plug socket (CEE 5 pin, 3P+PE 32A 6h – 400V). The neutral wire is not required.
  Be used with an upstream, all-current-sensitive residual current circuit breaker or safety transformer in order to guarantee the safety of the operator.

2.3 Safety

Warning

Before commissioning, check that the mains voltage and frequency match the data given on the information plate. ± 5 % voltage and/or ± 2 % frequency deviation are permitted. Repairs may only be performed by suitably qualified staff based on their training and experience.

In performing repairs, pay particular attention to:

- the technical data and information on the permitted use (commissioning, standard operating conditions), which are included e.g. in the catalogue, the operating manual, the information plate details, and other product information.
- the relevant accident prevention regulations
- the correct use of tools
- the use of personal protective equipment
- Powerboxes which are not defective and have not been modified must conform to the relevant standards and adhere to all required limits with respect to EMC (electromagnetic interference and interference resistance). The allowed electromagnetic fields are still emitted. Electromagnetic fields may interfere with the operation of critical electronic devices (e.g. pacemakers). Wearers of pacemakers should therefore consult their doctor.
- if a generator is used, proper earthing must be guaranteed.
- in the event of use in “sensitive areas” such as airports, hospitals, or public service broadcast facilities, the technical management on site must be informed of the use of a frequency-controlled unit.

3.0 Transport and storage

3.1 Transport

Warning

The Powerbox must be inspected for transport damage after receipt. Any damage present must be recorded in writing.

3.2 Storage

The storage location should be dry, clean, and at a constant temperature wherever possible.

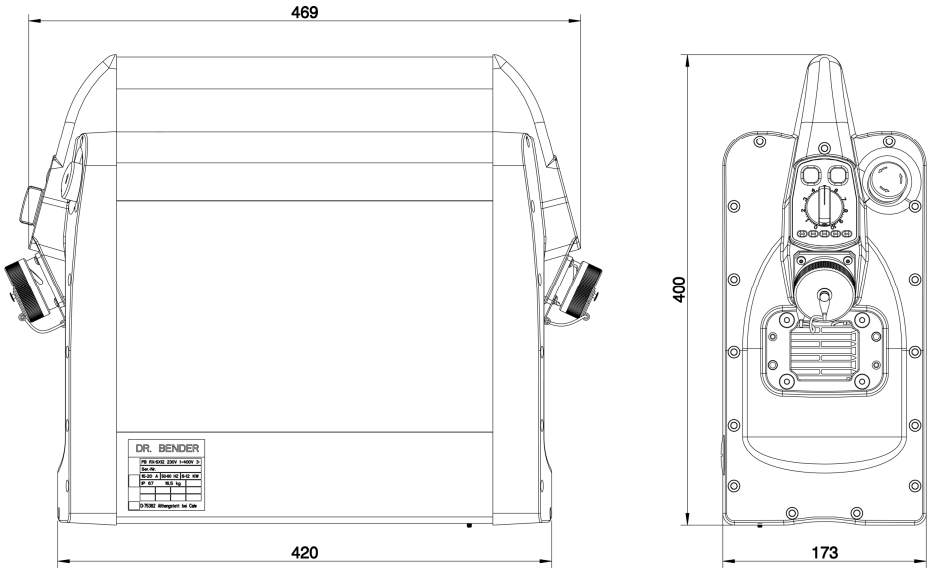
3.3 Service Interface

The Powerbox can communicate with a computer by means of the service interface. New software updates can be imported. Operating parameters can be displayed.

Please read the separate user manual for details.

4.0 Main dimensions and technical data

4.1 Dimensions



4.2 Technical data

230 V 1~	Rated voltage	230	*V*
	Current rating	16	*A*
	Power consumption	3,700	*W*
400 V 3~	Rated voltage	400	*V*
	Current rating	15	*A*
	Power consumption	12,000	*W*
	Frequency	50 – 60	*Hz*
	Degree of protection	IP 67	-
	Cooling medium	Air / Water	-
	Weight	16.5	*kg*

4.3 Operating temperatures

If the system is cooled by water, the Powerbox attains the cooling water temperature. In the air cooled version, the housing may attain temperatures of up to 45°C. This is normal and is not a cause for concern. Therefore, always hold the Powerbox by the carry handle provided.

5.0 Commissioning

5.1 Setting up

Set up the Powerbox at a distance suitable for your work on a level surface, so that you can work comfortably without the risk of tripping over the Powerbox.

5.2 Mains connection

Attention

Check whether the mains voltage matches the voltage given on the information plate.

Remove the protective covers on the plug sockets. These protective covers are designed to protect the socket against the ingress of water when the plug is not connected. This significantly increases the service life of the high-quality cable sockets.
First connect the electrical connection cable to the flange socket found on the front of the Powerbox. Check that the connection cable is properly connected. Only this will give you the required IP 67 protection. The connection cable used (400 V 3~ or 230 V 1~) determines whether the Beluga drive unit operates at 230 V, 1~, 4,000W or at 400 V, 3~, 8,000 W. Connect the Powerbox PB RX / SX 12 to the mains via an upstream, all-current-sensitive residual current circuit breaker or safety transformer and coded CEE plug 6 h.
Only use extension cables with earth conductors and of sufficient diameter. If the diameter is too small, this may lead to excessive power loss and to overheating of the motor and cable. An extension cable must be protected by an overload switch. Recommended wire diameters:

Rated current = 15 / 20 A							
Cable length	m	7.5	15	25	30	45	60
Wire diameter:	mm^2	4	4	4	4	6	6

5.3 Powerbox water connection

The Powerbox can be operated air-cooled as well as water-cooled. The air connection normally suffices for the 8 kW drive units. The water must first flow through the Powerbox, then through the drive unit and only then to the saw blade or the drill bit. Therefore, connect the water supply to the water line (with tap) provided on the Powerbox. The water outlet of the Powerbox is connected to the water inlet of the drive unit.
Attention: If possible do not exceed maximum water pressure of 3 bar
During operation, always supply sufficient cold cooling water (cooling water should not exceed 30 °C). The machine must be operated during full load operation with at least 1/2 litre of water per minute. Only use clean tap water, no contaminated or waste water, since otherwise the heat transfer to the cooling surfaces is no longer guaranteed and the motor may suffer irreparable damage.

5.4 Operating the Powerbox

After applying the voltage when the motor is connected, the Powerbox reads the motor type as well as the input voltage and configures the drive system accordingly. As soon as this action is completed, the Powerbox will switch to standby, which is indicated by a flashing green LED on the control panel of the Powerbox.
The green start button can now be pressed. The Powerbox switches to operating mode and indicates this in turn by a permanently lit green LED.
By preselecting a speed in the middle of the control panel, the maximum speed of the motor can be set to 0 - 100% of the rated speed of the motor. The maximum speed is reached when the hand wheel is turned all the way to the right. This setting defines the range from zero to the final speed. This speed range is then available to you on the start switch on the handle of the unit. The connected motor can now be operated using its controls.

During operation, the three yellow LEDs indicate the load condition of the motor. After work and during breaks, the Powerbox is switched off by pressing the red stop button. This prevents the motor from accidentally restarting.

Green LED

Green LED flashes = standby
Green LED lit= machine on
Switch the Powerbox to operating mode with the green start button on the Powerbox.

Green LED

Green LED = O. K.
The three yellow LEDs indicate the load condition of the motor. The left-hand LED starts to light up at 60 % of the rated current of the motor. The two right-hand LEDs light up from 80 % of the rated current. You can work permanently in the yellow zone, this will not damage the machine.

Red LED

Red LED flashes / is lit = fault (fault code can be read in the inspection glass on the top of the Powerbox).
If the red LED comes on, the machine has exceeded the temperature range. The drive unit then shuts down. Wait until the drive unit has cooled and restart the drive unit with the green button on the Powerbox
The red LED also comes on if there is a fault existing, the drive unit then shuts down. This mainly happens due to a sudden, very high overload (motor seized). The drive unit is then switched off for your safety. When the unit is switched on again with the green button, the red LED goes out and the green LED indicates standby mode again (reset function).

If the red LED does not go out and the green LED is not lit, there is a fault on the Powerbox or the drive motor. In this case, contact an authorised service centre.

Emergency stop button

If sudden danger occurs, the system can be shut down by pressing the emergency stop button on the front of the Powerbox. This action can also be performed by a third person. It is therefore important to always set up the Powerbox at some distance from the work area.
When you have finished your work, switch off the system with the red stop button.

5.5 Reversing the rotation of the motor

Using motors for hands-free saw applications (e.g. SXM), the rotation can be reversed for flush cuts.
To do so, proceed as follows:

The Powerbox must be in standby mode (green LED flashes).
Keep the red stop button pressed. At the same time, press the green start button for approx. two seconds until all LEDs are lit on the Powerbox control panel.
Release the green and the red button again.

The rotation of the motor has been reversed.

Follow the steps above to restore the previous direction of rotation. This setting is retained until the Powerbox is disconnected from the mains.

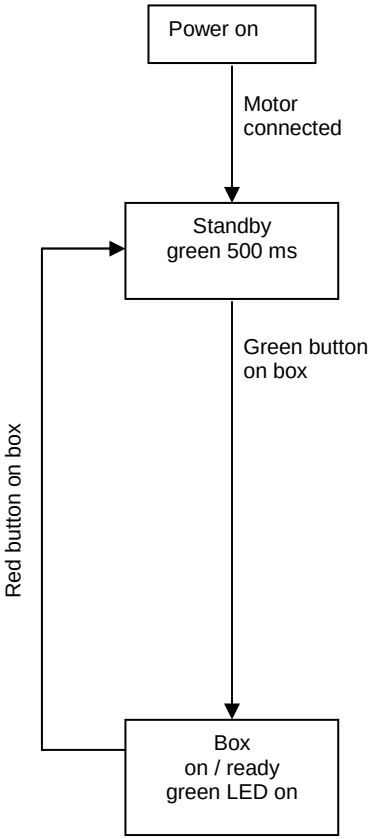
5.6 Acknowledge a fault

In the event of a fault, this is indicated by a flashing red LED on the control panel of the Powerbox. The fault code / codes can then be read through the round inspection glass on the top of the Powerbox.
The fault codes are indicated in sequence, digit by digit.

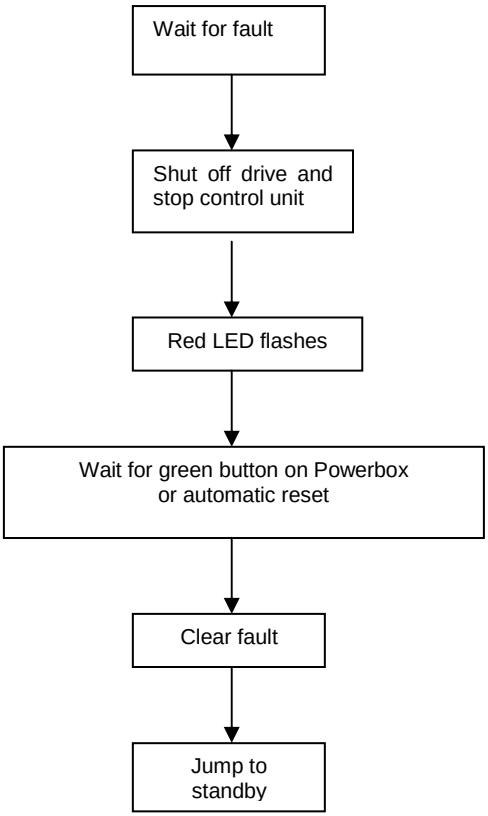
Example:
F-0-5-F-0-9 means fault 05 and fault 09 have occurred.

After the cause of the fault has been rectified, the fault can be acknowledged by pressing the green start button. The Powerbox is in standby mode again.

5.7 Powerbox operating concept.



5.8 Powerbox fault processing



5.9 Fault codes

Fault code	Fault description	Troubleshooting
F00, F01	Power supply fault	1. Bring box for repair
F02	Phase failure	1. Check power supply for: - completeness of phases - load capacity of phases
F03	Open circuit on motor	1. Check the motor connectors for dirt and damage 2. Bring box for repair
F04	Overvoltage in DC link	1. Check power supply
F05	Motor overcurrent	1. Run the motor with less power
F07	Powerbox overheating	1. Allow the Powerbox to cool, check the function of the fan, if necessary refit the water cooling circuit
F51	Motor overheating	1. Run motor with less load or increase cooling water flow rate. Attention: Regular overheating in the motor shortens the service life!
F09	Speed sensor fault	1. Check the motor connectors for dirt and damage 2. Bring motor and box for repair
F12	Earth leakage	1. Check the motor connectors for dirt and damage 2. Bring motor for repair
F13, F14	Internal hardware fault	1. Disconnect box from mains, bring box for repair if fault reoccurs
F15	Release fault	1. Check emergency stop 2. Check the motor connectors for dirt and damage
F20	Undervoltage	1. Check power supply
F21	Overvoltage	1. Check power supply
F52	Axis controller watchdog	1. Disconnect the Powerbox from the mains for 10 seconds
F53	Start protection	1. Release handle switch on motor
F62	Safety coupling engaged	1. Restart motor
F63	Motor communication interrupted	1. Check earth conductor 2. Disconnect the Powerbox from the mains for 10 seconds

5.10 Automatic shut-off in the event of overload

As already described under 5.4, the drive unit shuts off in the event of constant overload. The unit is reset by pressing the green button again.

6.0 Safety instructions

Attention

The units must be attended when in use. Disconnect the mains plug and check that the switch is disabled,

- if the units remain unattended
- during assembly and disassembly
- in the case of a voltage dip (below 200V or below 340V),
- if the mains voltage fluctuates (phase imbalance) or in case of interruption of a phase (phase failure),
- For adjusting or fitting an accessory.

Switch the machine off if you stop operation for any reason. This prevents the unit from suddenly starting when unattended.

Do not use the unit when

- a part of the housing is missing or defective,
- there is damage to switches, lines, or plug connections (daily inspection!)
- When operating the units, cooling water must not penetrate the electrical components in whichever location the units are used.
- If water is dripping from the unit, stop work and take the unit to an authorised service centre.
- After a break in operation, only switch on again if the saw blade or drill bit can rotate freely.
- Check the work area with a pipe detector in order to avoid cutting into electrical cables, water pipes, or gas pipes etc.

7.0 Repair and maintenance

Warning

Always disconnect from the mains before starting repair or maintenance work. After any repair, the unit must be checked by a qualified electrician (legal requirement pursuant to VBG4 since 1.1.1990).

7.1 Daily maintenance

Check that no water is leaking out of the unit. This may impair the electrical safety of the unit. In this case, please contact an authorised service centre.
Visual inspection for damage to the switches, the lines, or the plug sockets.
Clean the units after completion of the work.
Check that no water gets into the units during cleaning.
Drain the cooling water after using the machine. To do so, hold the Powerbox at a slight angle without the water lines. The water can then drain out through the connections. Alternatively you can also remove the water line fittings. The cooling circuit then runs faster and is completely empty. It is particularly important to completely drain the water during frost formation in the winter months.

7.2 Quarterly

Have the cables, switches, plugs checked by a qualified specialist (provision pursuant to VBG4) and record this.

8.0 Warranty

Pursuant to our Terms & Conditions of Sale, we offer a warranty of 12 months from the date of purchase. This covers the free repair of material and production defects which are shown to have been caused prior to sale.

An original sales receipt must always be produced when asserting a warranty claim. It must include the full address of the dealer, purchase date, and type code of the product. The user manual for the relevant product as well as the safety instructions must have been followed.
Damage caused by operating errors is not covered by the warranty.

The manufacturer's products are developed and built for specific applications. If the product is used for purposes other than the intended purpose based on the user manual, or in the event of misuse, or if unapproved accessories are used, the warranty shall become null and void.

The products must be regularly maintained and cleaned according to the instructions in the user manual. The warranty shall become null and void in the event of an intervention by third parties (opening the machine).
The warranty does not cover maintenance and cleaning work.

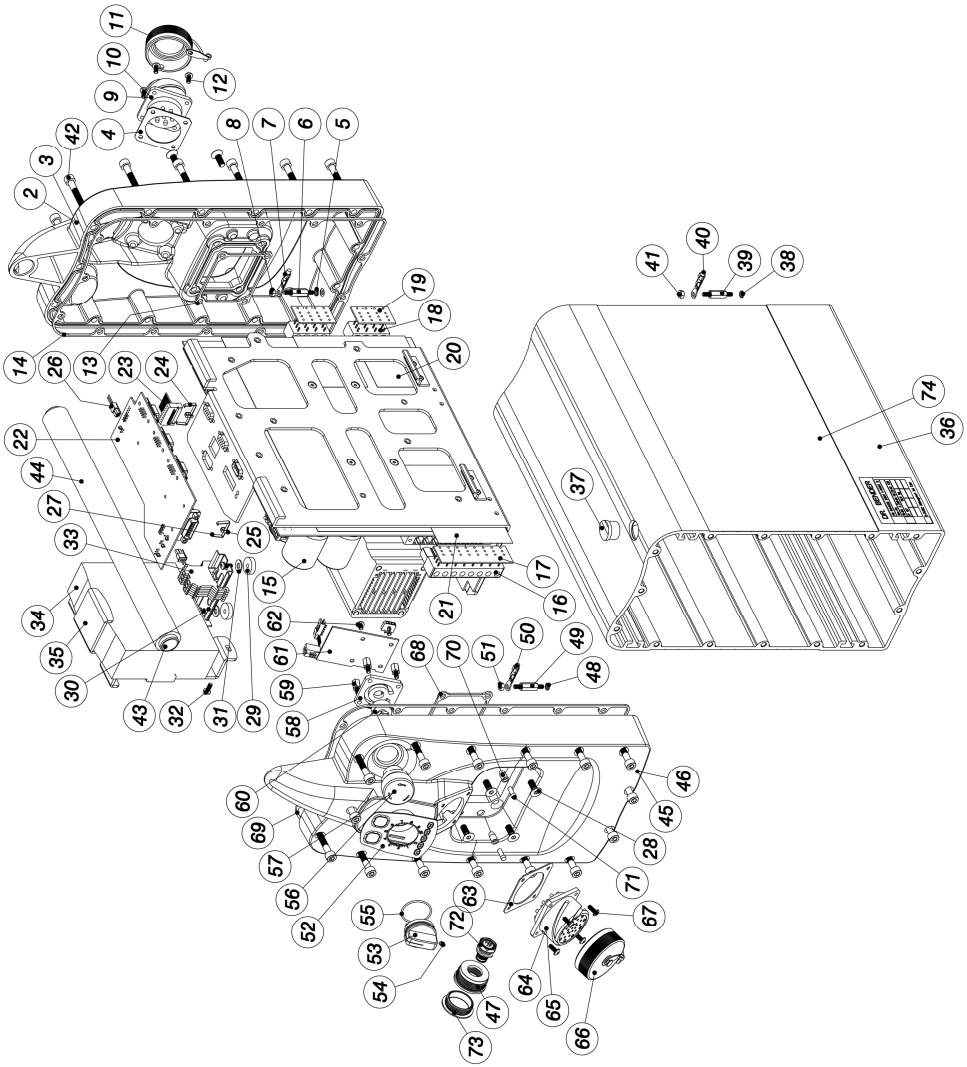
You must ensure that only original spare parts and accessories are used. The products must be purchased from an authorised dealer. If non-original parts are used, this may result in consequential damage and increased risk of accidents. The manufacturer is not liable for such damage. Disassembled, partially disassembled units, and units repaired with third party parts are not covered by the warranty.

Certain parts are subject to normal wear and tear depending on use. These parts include e.g. carbon brushes, ball bearings, switches, mains cables, seals, etc. These consumable parts are not covered by the warranty. Consumable parts are highlighted in the spare parts lists.

9.0 General Safety Instructions

The general safety instructions can be found in the supplied safety instruction booklet.

10.0 Spare parts lists
10.1 Powerbox PB RX/SX 12



Item	Part no.	Description	No.		Item	Part no.		No.
1	102405	Control box	1		53	301509	Switching handle	1
2	102080	Housing plate complete	1		54	901161	Threaded pin	1
3	102081	Housing plate	1		55	800092	O-ring	1 **
4	401743	Seal	1 **		56	802593	Emergency stop button compl.	1
5	800391	Sealing ring	1 **		57	802255	Emergency stop button	1
6	802456	Distance pins	1		58	401708	Plate	1
7	801909	Earth cable complete	1		59	801376	Distance pins	4
8	900252	Hex nut	1		60	802311	Potentiometer	1
9	802423	Cable set complete	1		61	802817	Control board complete	1
10	802261	Raw cable set	1		62	901151	Raised head screw	4
11	802367	Dust cap	1		63	401742	Seal	1 **
12	802055	Raised head screw	4		64	802393	Cable set complete	1
13	802315	Seal	1 **		65	802260	Raw cable set	1
14	802316	Seal	1 **		66	802368	Dust cap	1
15	102334	Frequency inverter unit compl.	1		67	802055	Raised head screw	4
16	802372	Plug connector	1		68	802315	Seal	1 **
17	802467	PCB board	1		69	802316	Seal	1 **
18	802371	Plug connector	2		70	401712	Bushing	2
19	802742	PCB board	2		71	401713	Pin	2
20	401901	Insulation	1		72	802682	Panel plug	1
21	401900	Insulation	1		73	801147	Dummy plugs	1
22	102337	Board complete	1		74	802818	Label	1
23	802580	Cable complete	1					
24	802519	Spring wire clip	1					
25	801893	Cable clip	2 **					
26	802582	Cable assembly	1					
27	801963	Spring wire clip	1					
28	900684	Slotted countersunk head scr.	8					
29	802741	Washer	2					
30	402004	DIN rail	1					
31	800033	Washer	2					
32	802055	Raised head screw	4					
33	802514	Terminal block	3					
34	802740	Switch-mode power supply	1					
35	302105	Power supply housing	1					
36	102076	Housing	1					
37	401780	Sight glass	1					
38	800391	Sealing ring	1 **					
39	802456	Distance pins	1					
40	801909	Earth cable complete	1					
41	900252	Hex nut	1					
42	900312	Allen head screw	30					
43	102051	Handle retainer	1					
44	802257	Soft grip	1					
45	102377	Housing plate complete	1					
46	102376	Housing plate	1					
47	302132	Plug insert	1					
48	800391	Sealing ring	1					
49	802456	Distance pins	1					
50	802457	Earth cable complete	1					
51	900252	Hex nut	1					
52	802746	Membrane keypad	1					

Wearing parts **