

SB series Submersible Drainage Pumps

Original Instruction
2022 | 1



Read this instruction manual carefully,
before you install and operate the pump



Pump models:

SB2(E)-22

SB3(E)-22

SB2(E)-37

SB3(E)-37

SB4(E)-37

SB4-55

SB4-75

SB6-75

SB6-110



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EU DECLARATION OF CONFORMITY 01/EU/SUB/2022

Series:

SG...; SPT...; SK...; SF...; SFA...; SB...; SBA...

Manufactured for:

Tapflo AB

Filaregatan 4

442 34 Kungälv, Sweden

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of declaration: **SUBMERSIBLE SINGLE-STAGE CENTRIFUGAL PUMPS**

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

- Directive 2006/42/EC of European Parliament and of the Council of 17 May 2006 on machinery, amending Directive 95/16/EC;
- Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast);
- Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits;

Mr Michał Śmigiel is authorized to compile the technical file.

Tapflo Sp. z o.o.
ul. Czatkowska 4b
83-110 Tczew



Signed for and on behalf of Tapflo AB

A handwritten signature in purple ink, appearing to read 'Håkan Ekstrand', is written over a horizontal line.

Håkan Ekstrand

Managing director
Kungälv, 14.02.2022

0. GENERAL

0. General

0.1. Introduction

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



WARNING: Read this manual carefully before installing and using the product. Improper use of the product can cause death, personal injury and damage to property and may void the warranty.

NOTICE:

Save this manual for future reference and keep it readily available at the location of the unit.

0.2. Safety symbols and terminology

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

Hazard levels

| Hazard level | Indication |
|--------------------|---|
| DANGER | A hazardous situation which, if not avoided, will result in death or serious injury |
| WARNING | A hazardous situation which, if not avoided, could result in death or serious injury |
| CAUTION | A hazardous situation which, if not avoided, could result in minor or moderate injury |
| NOTICE: | A potential situation which, if not avoided, could result in undesirable conditions. A practice not related to personal injury. |

Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols. Electrical hazards are indicated by the following specific symbol:

0. GENERAL



Electrical hazard:

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

0.3. **Safety**



WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- Pump must not be used if people are in water
- Leakage of pump lubricants may cause water pollution
- Proper plug must be provided according to local and national standards
- Never operate the pump suspended in air. The recoil may result in serious injury or death
- Do not use the pump in explosion hazard zones.
- Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
- Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by the manufacturer. If there is a question regarding the intended use of the equipment, please contact the manufacturer representative before proceeding.
- This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
- Do not change the service application without the approval of an authorized Tapflo representative.
- In case any instructions in this manual are unclear or any information is lacking, please contact Tapflo before handling the pump.



CAUTION: You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays

0.4. **User safety**

General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapours in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

NOTICE: Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

0. GENERAL

Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

Hazardous liquids

SB pumps are designed for pumping liquids that can be hazardous to your health. In the event of contact with the liquid, follow national and local safety rules or MSDS (material safety data sheet).

0.5. Environmental safety

The work area

Always keep the station clean to spot oil leakage and avoid oil pollution.

Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Dispose appropriately of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean all leakages in accordance with safety and environmental procedures.
- Report all environmental pollution to the appropriate authorities.

Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

Recycling guidelines

Always recycle according to the guidelines listed below:

- Follow local laws and regulations regarding recycling if the pump or parts are accepted by an authorized recycling company.
- If the first guideline is not applicable, then return the unit or parts to the nearest Tapflo representative.

0.6. Qualification and training of personnel

The personnel in charge of installation, operation and maintenance of the pumps we produce must be qualified to carry out the operations described in this manual. Tapflo shall not be held responsible for the training level of personnel and for the fact that they are not fully aware of the contents of this manual.

1. PRODUCT DESCRIPTION

1. Product description

1.1. Intended use

The pumps are intended to operate either completely or partially submerged in the pumped liquid. The pumps are constructed for particular applications. Do not use the pump on applications different from that for which it was sold without consulting us to ascertain its suitability.



WARNING:

- The pumps are not allowed to operate in explosive environments and used for pumping flammable liquids.
- Do not use the pump for corrosive liquid.

1.2. Pump design

| | | |
|------------------------|------------------|--|
| Fluid | Type | Water with solids |
| | temperature | 0 to 40°C |
| Pump | Type | Submersible |
| | Impeller | Semi-open (high chrome alloy) |
| | Casing | Cast Iron |
| | Suction cover | Ductile Iron |
| | Shaft seal | Double mechanical seal (SiC-SiC/Carbon-SiC ¹ or SiC-SiC/SiC-SiC ²) |
| | Bearing | Sealed ball bearing |
| Motor | Type | Dry type submersible induction motor |
| | Poles | 2 |
| | Voltage | 400V, 3ph (±5% continuous operation; ±10% intermittent operation) |
| | Frequency | 50 Hz |
| | Insulation | Class F |
| | Motor protection | Circle thermal protector (build-in) ³ ; intelligent control (build-in) ⁴ |
| Sealings | Lubricant | Turbine oil VG32 |
| | O-rings | NBR |
| | Gaskets | NBR |
| Max allowable pressure | | See chapter 3.2 <i>maximum allowable operating pressure</i> |
| Discharge connection | | Hose coupling / BSPP female thread ⁵ |

1) SB(...)-22 - SB(...)-55; 2) SB(...)-75 - SB(...)-110

3) SBA(...) pumps; 4) SBA(...)E pumps (see chapter 1.8. *SBA(...)E technical data and fuction*)

5) only 2" and 3" models

1.3. Technical data

| Model | Motor power | Rated current | Rated capacity | | Rated head | Max capacity | | Max head | Impeller passage |
|-----------|-------------|---------------|-------------------|-------|------------|-------------------|-------|----------|------------------|
| | kW | | m ³ /h | l/min | m | m ³ /h | l/min | | |
| SB2(E)-22 | 2.2 | 5.0 | 18 | 300 | 20 | 33 | 550 | 26 | 8.5 |
| SB3(E)-22 | 2.2 | 5.0 | 36 | 600 | 11 | 55 | 920 | 19 | 8.5 |
| SB2(E)-37 | 3.7 | 7.7 | 12 | 200 | 30 | 33 | 550 | 34 | 8.5 |
| SB3(E)-37 | 3.7 | 7.7 | 30 | 500 | 20 | 55 | 920 | 29 | 8.5 |
| SB4(E)-37 | 3.7 | 7.7 | 60 | 1000 | 11.5 | 90 | 1 500 | 18.5 | 8.5 |
| SB4-55 | 5.5 | 11.4 | 60 | 1000 | 16 | 105 | 1 750 | 23 | 8.5 |
| SB4-75 | 7.5 | 15 | 48 | 800 | 30 | 84 | 1 400 | 40 | 11.5 |
| SB6-75 | 7.5 | 15 | 90 | 1 500 | 15 | 124.8 | 2 080 | 31 | 19.5 |
| SB6-110 | 11 | 22 | 102 | 1 700 | 22 | 147 | 2 450 | 32 | 19.5 |

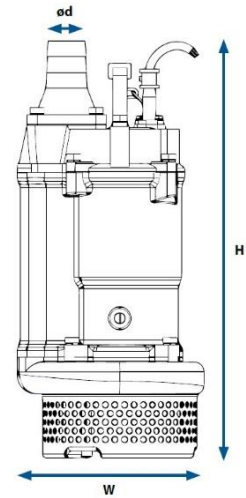
1. PRODUCT DESCRIPTION

1.4. Dimensions and weight

| Model* | Height (H) | Width (W) | Weight (net) | Outlet (ød) | Outlet (ød)** |
|-----------|------------|-----------|--------------|-------------|---------------|
| | mm | mm | kg | mm | in |
| SB2(E)-22 | 505 (582) | 235 (235) | 39 (44) | 50 | 2 |
| SB3(E)-22 | 505 (582) | 235 (235) | 39 (44) | 80 | 3 |
| SB2(E)-37 | 629 (707) | 283 (283) | 63 (71) | 50 | 2 |
| SB3(E)-37 | 629 (707) | 283 (283) | 63 (71) | 80 | 3 |
| SB4(E)-37 | 629 (707) | 283 (283) | 63 (71) | 100 | - |
| SB4-55 | 590 | 283 | 77 | 100 | - |
| SB4-75 | 676 | 330 | 106 | 100 | - |
| SB6-75 | 676 | 330 | 108 | 150 | - |
| SB6-110 | 695 | 373 | 139 | 150 | - |

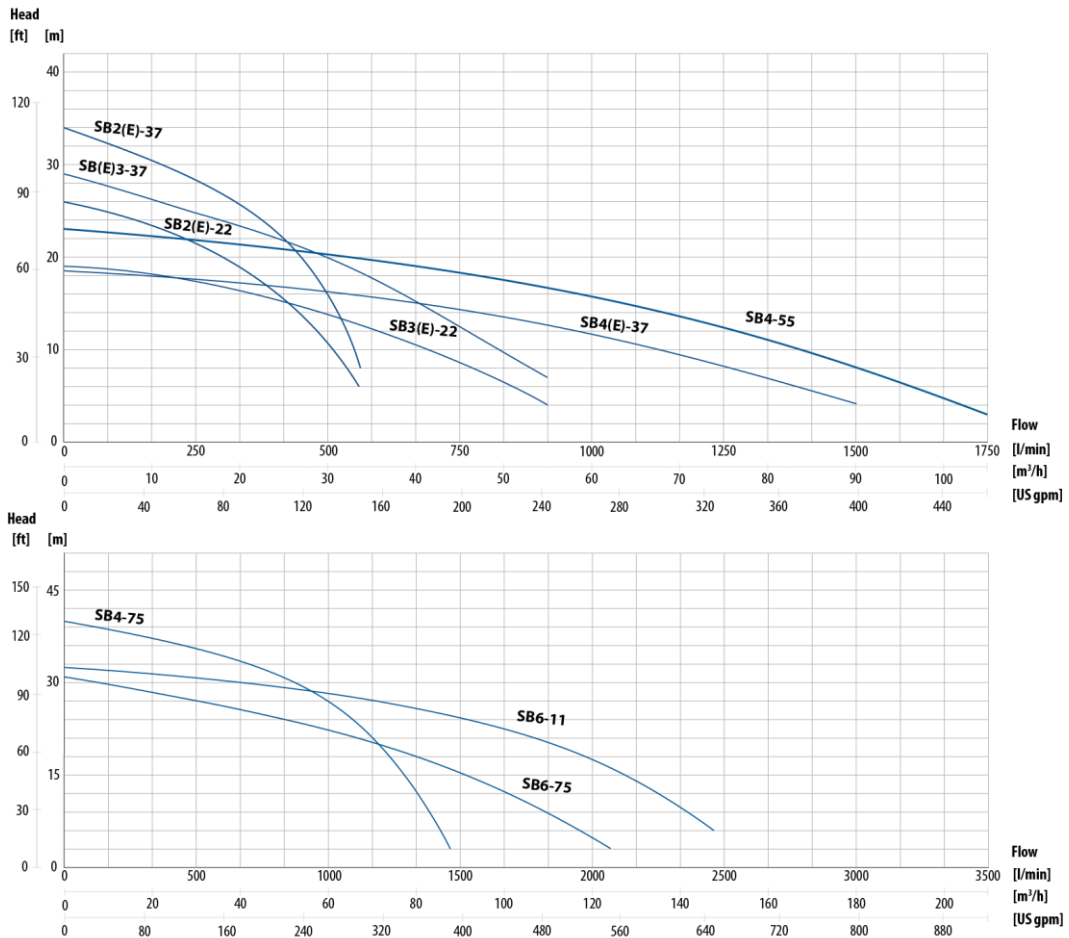
*dimensions in brackets refers to pump with optional level sensor

**pump is assembled with hose connection but there is included optional BSPP female thread connection (only 2" and 3" models) in the pump package



1.5. Pump curves

Performace curves SB dewatering pumps
50 Hz, 2850 rpm



1. PRODUCT DESCRIPTION

1.6. Pump nameplate

Tapflo AB, www.tapflo.com
 Filaregatan 4 | S-442 34 Kungälv, Sweden

Submersible Pump

S/N 1 Model 2

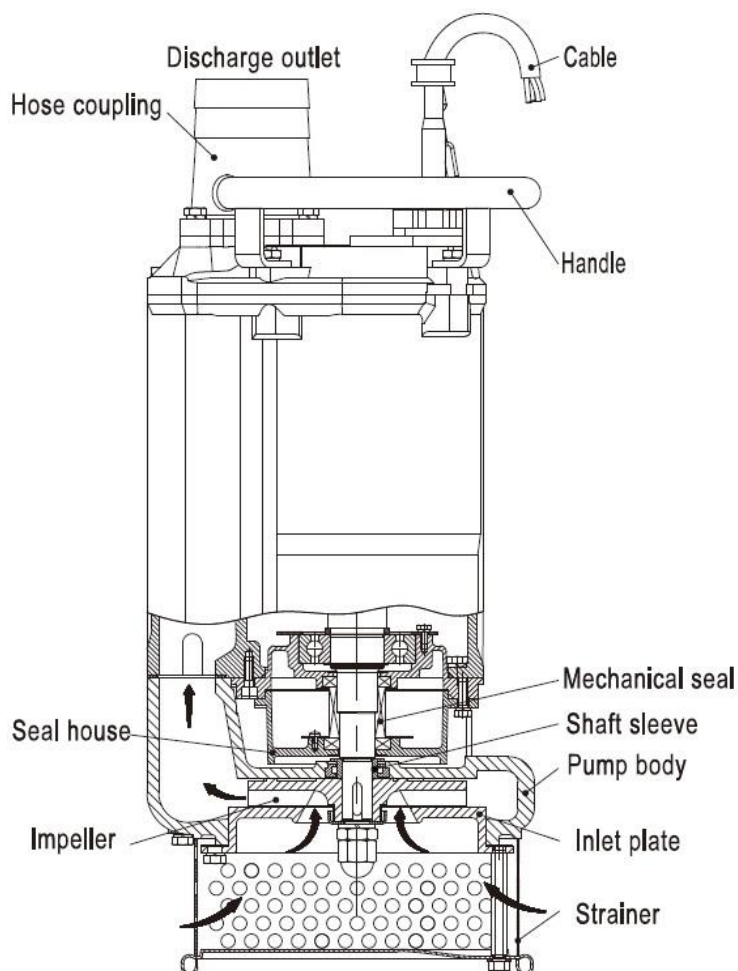
Qmax [m³/h] Hmax [m] Tmax [°C] IP68 [m]
 3 4 5 6

[V] [A] [Hz] [rpm]
 7 8 9 10

[~] P [kW] Ins. cl. [kg]
 11 12 13 14

| No. | Description | No. | Description |
|-----|---------------------|-----|------------------|
| 1 | Serial number | 8 | Rated current |
| 2 | Pump model | 9 | Frequency |
| 3 | Max capacity | 10 | Motor speed |
| 4 | Max head | 11 | No of phases |
| 5 | Max temperature | 12 | Power |
| 6 | Max immersion depth | 13 | Insulation class |
| 7 | Voltage | 14 | Weight |

1.7. Pump parts names



NOTICE:

This is a general drawing showing a typical model. The external appearance and the internal construction may vary depending on particular model.

1. PRODUCT DESCRIPTION

1.8. SB(...)E technical data and function

| No | Category | Set value | Actuation time (s) | Recovery time (s) | Recovery mode (s) |
|----|---------------------------|---|--------------------|-------------------|---|
| 1 | Phase loss | - | 2 | - | Manual recovery (Manually turn off the power, then correct the power and turn on the power) |
| 2 | Impeller jam | Double rated current | 0.1 | - | Manual recovery (Manually turn off the power, then solve the problem and turn on the power) |
| 3 | Phase sequence protection | With power line input errors, the pump won't work | - | - | Manual recovery (Manually turn off the power, then switch the input wire and turn on the power) |
| 4 | Over-current protection | ≥ 1.2 times rated current | 30 | 300 | Automatic recovery |
| 5 | Low-voltage protection | $\leq 323V$ | 5 | 300 | Automatic recovery |
| 6 | Overvoltage protection | $\geq 460V$ | 5 | 300 | Automatic recovery |
| 7 | Temperature protection | Winding $\geq 125 \pm 5^{\circ}C$ | 0.1 | - | Automatic recovery (Winding $\leq 80 \pm 10^{\circ}C$) |
| 8 | Water level control | As per below description | | | |

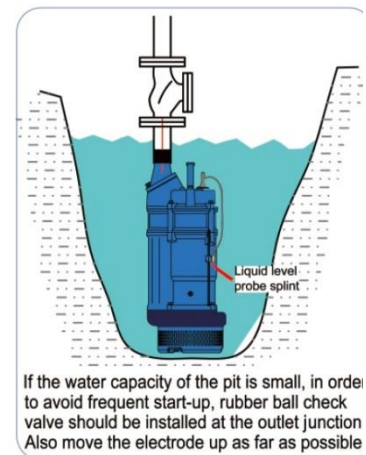
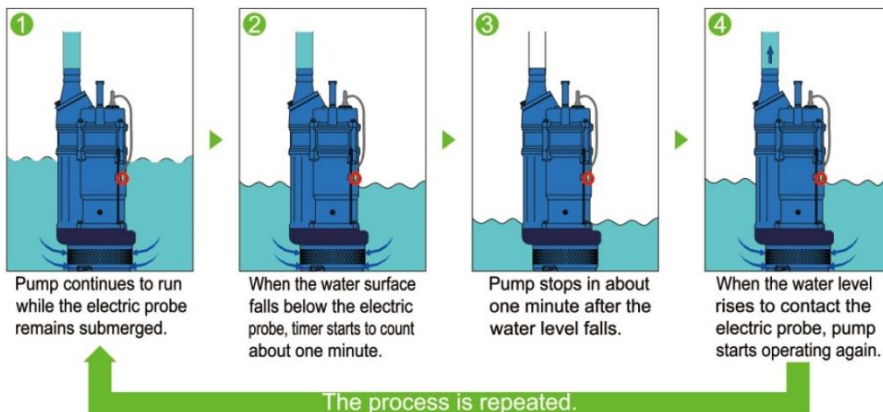
NOTICE:

SB(...)E water level sensor probe is ON when touching the water, OFF when leaving water.

SB(...)E automatic water-level control function

- Pump starts to work when the pump power is on, and water-level sensor is ON.
- During pump operation if water-level sensor is OFF, pump will continue to work for 60s and stop. But if water-level sensor is ON again during this 60s, the pump will continue to operate without stop.
- When the pump is stopped due to low water-level, it will not start again within 60s even if water-level sensor is ON, unless pump is powered off and on again.

Automatic control



2. PRIOR TO USE

2. Prior to use

2.1. Receiving inspection

Although precaution is taken by us when packing and shipping, we urge you to carefully check the shipment on receipt. Make sure that all parts and accessories listed on the packing list are accounted for. Immediately report any damage or shortage to the transport company and to us. Verify that bolts and nuts have not loosened.

2.2. Specification inspection

Check the nameplate of the pump unit to verify that it is the product that you have ordered. Pay particular attention to its voltage and frequency specifications.

NOTICE: If you find any damage or discrepancy, contact Tapflo.



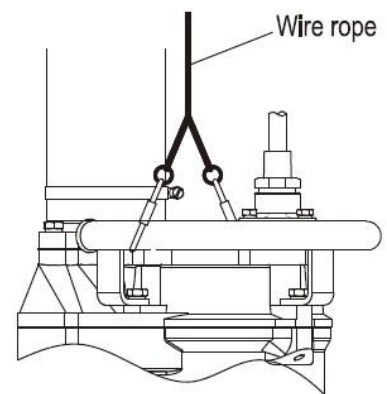
WARNING: Do not use the product under conditions other than those specified. Doing so may lead to short, electrical shock, or fire, or might inhibit the product from attaining its full capabilities.

2.3. Lifting and transportation



WARNING:

- Before handling the pump check the weight of the pump on the nameplate. Refer to Your local standards on how to handle the pump. If the weight is excessive to transport by hand it must be lifted using slings and a suitable lifting device e.g. a crane or forklift.
- Always use at least two slings and make sure they are secured in such a way to prevent the pump from slipping and that the pump unit is hanging straight.
- Never lift the pump with only one sling. Incorrect lifting can cause serious injury and/or damage to the pump.
- Always lift the pump by handles.
- Never lift the pump under pressure.
- Be careful that nobody passes under the pump when lifted.
- Always disconnect electrical power before handling the pump.



CAUTION:

- Never lift the pump by the electric cable. Doing so may cause a short, electrical shock, or fire.
- Pay special attention to the electric cable during transport so that it does not get jammed and get pulled.

2.4. Storage

If the equipment is to be stored prior to installation, place it in a clean location. The pump should be stored in an ambient temperature of 15°C (59°F) to 25°C (77°F). It should not be exposed to any heat source e.g. radiator, sun as this could result in a negative way on the tightness of the pump. Cover the pump strainer and discharge connection to keep pump internals free of debris. Clean the pump thoroughly before installation. See also chapter 5.3. *Storage after operation.*

3. Installation

3. Installation

3.1. Precautions



DANGER:

Disconnect and lock out electrical power before installing or servicing the unit.



WARNING:

- Do not install the pump in an explosion hazard zones.
- Make sure that the unit cannot roll or fall over and injure people, or damage property.



WARNING:

Electrical shock hazard. Check that, the cable and cable gland have not been damaged during transport before installing the pump.

NOTICE: Never force piping to make a connection with a pump.

These requirements apply:

- Use the pump dimensional drawing in order to ensure proper installation.
- Provide a suitable barrier around the work area, for example, a guard rail.
- Remove all debris from the pump inlet before you install the pump.
- Always check the impeller rotation before submerging the pump into liquid.



CAUTION:

- The supply voltage variation:
 - continuous running: max±5% of the rated voltage.
 - intermittent running: max±10% of the rated voltage.
- Pump should operate in water temperature between 0°C and 40°C.
- The pump should be used only for pumping plain water. The pump should not be used to pump fluids such as oil, saltwater, or organic solvents.
- The pump must not be used in a partially disassembled state.
- Do not use the pump in an area where the water pressure exceeds the given values (see chapter 3.2. *Maximum allowable operating pressure and maximum immersion depth*), as it may damage the pump, or cause a short or electrical shock.

3.2. Maximum allowable operating pressure and maximum immersion depth

| Pump models | Maximum allowable operating pressure |
|--------------------------|--|
| SB(...)-22 | 5 bar (72.5 PSI) total, immersion combined with discharge pressure |
| SB(...)-37 - SB(...)-55 | 5 bar (72.5 PSI) total, immersion combined with discharge pressure |
| SB(...)-75 - SB(...)-110 | 5 bar (72.5 PSI) immersion + discharge head |

Maximum allowable operating pressure defines maximum immersion depth. For more information contact Tapflo.

3. Installation

3.3. Preparation for installation

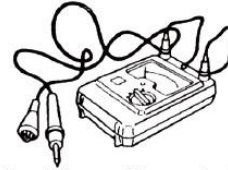
Below listed tools and measuring devices that are required to install the pump



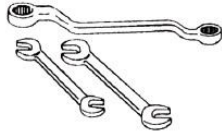
AC voltmeter (tester)



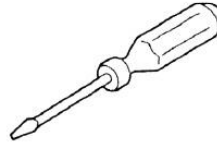
AC ammeter (clamp)



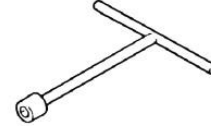
Insulation resistance tester (megger tester)



Wrenches for fastening bolts and nuts



Wrenches for connecting the power supply (a screwdriver or a box wrench)



Pre-installation check

Measure the resistance between each of the core wires and the ground wire (yellow/green) to verify the insulation resistance of the motor.

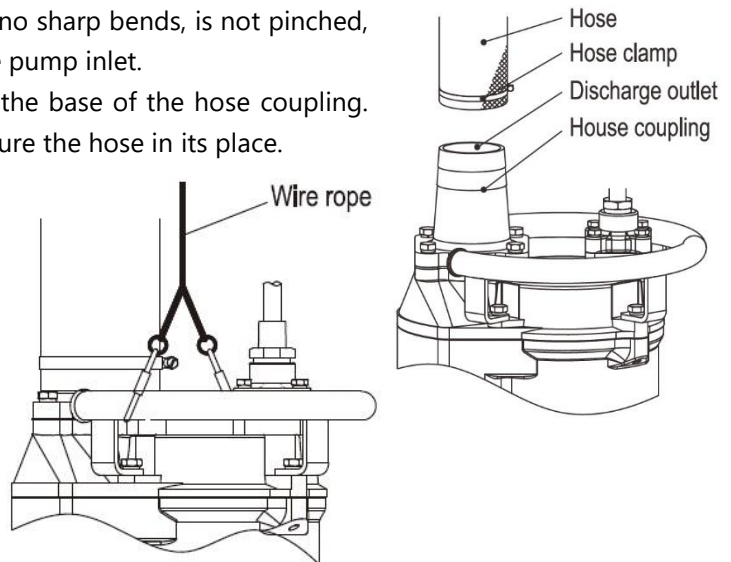
NOTICE:

Insulation resistance reference value $>30M\Omega$.

3.4. Pump installation

The pump is transportable and intended to operate either completely or partially submerged in the pumped liquid. The pump is equipped with a connection for hose or pipe (BSPP thread – only models with 2" and 3" connection).

1. Route the cable so that it has no sharp bends, is not pinched, and cannot be sucked into the pump inlet.
2. Push the hose all the way to the base of the hose coupling. Tighten the hose clamp to secure the hose in its place.
3. Handle the pump carefully. When suspending the pump to raise or to lower it, attach a wire rope or a chain to the pump's handle.



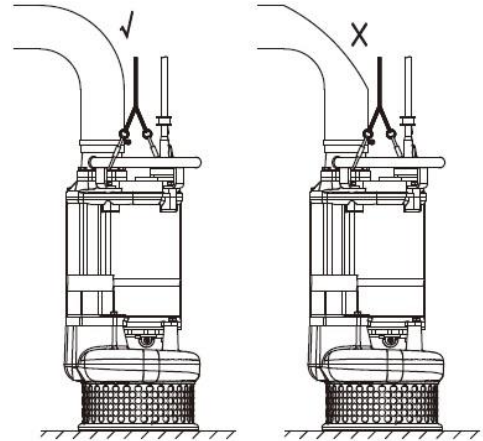
4. Install the pump only in an area that can maintain a proper water level or use SB(...)*E* pumps with automatic water-level control 1 (see chapter 1.8. *SB(...)*E* technical data and function*).

NOTICE:

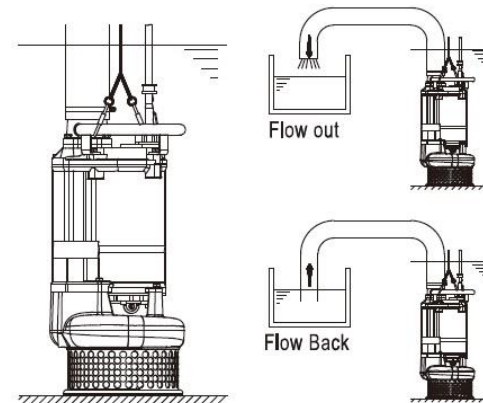
For details on the water level necessary for pump operation, see chapter 4.6. *Water level during operation*.

3. Installation

5. The discharge hose can be routed vertically or horizontally but must be without sharp bends.



6. Use the shortest possible length of discharge hose or piping and minimize the number of bends. Make sure that the end of the hose (discharge side) is lifted above the water surface. If the hose ending is submerged in water, it may cause the water to flow back when the pump is stopped. If the end of the hose is located at lower level than the source water surface, water may continue to flow out even after the pump is stopped.



WARNING:

If an excessive amount of sediment is drawn into the pump, it may cause the pump to wear, which can lead to current leakage or electrical shock.

NOTICE:

Appropriate hose or pipe materials must be provided by the user, for more information contact Tapflo.

7. During operation the pump must be placed upright position. If there is a risk that the pump could be buried under the sediment, place the pump on a base, e.g. concrete blocks.

3.5. Electrical connections



ELECTRICAL HAZARD:

- A certified electrician must supervise all electrical work. Follow the national and local regulations.
- Before starting to work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.
- Leakage into the electrical parts can damage it or blow the fuse. Keep the end of the motor cable out of the water.
- Make sure that all unused conductors are insulated.
- There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out or if product is damaged.

3. Installation

Requirements

These general requirements apply for electrical installation:

- The main voltage and frequency must comply with the specifications on the pump nameplate.
- The fuses and circuit breakers must have the proper rating.
- Pump overload protection and short circuit (motor protection circuit breaker) must be connected and set to the rated current according to the nameplate and, if applicable, the extension cable specification. The starting current in DOL (Direct On Line) motor start can be up to six times higher than the rated current.
- The fuse rating and the cables must be in accordance with the local rules and regulations.
- If intermittent operation is prescribed, then the pump must be provided with monitoring equipment supporting such operation.

3.6. Grounding



Electrical hazard:

- All electrical equipment have to be grounded. This applies to the pump equipment, the driver, and any monitoring equipment. Test the ground lead to verify that it is connected correctly.
- If the motor cable is jerked loose by mistake, the ground conductor should be the last conductor to come loose from its terminal. Make sure that the ground conductor is longer than the phase conductors. This applies to both ends of the motor cable.
- Risk of electrical shock or burn. You must connect an additional ground fault protection device to the grounded connectors if persons are likely to come into physical contact with the pump or pumped liquids.



WARNING:

- To prevent damaging the pump and causing current leakage, which may lead to electrical shock, be sure to install the ground wire securely.
- To prevent electrical shock caused by improper grounding, do not connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire.

3.7. Cable connection

These are the requirements to follow when you install cables:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The cable entry seal sleeve and washers must conform to the outside diameter of the cable.
- The minimum bending radius must not be below the accepted value.
- If using a cable which has been used before, a short piece must be peeled off when refitting it so that the cable entry seal sleeve does not close around the cable at the same point again. Replace the cable if the outer cable sheath is damaged. Contact Tapflo for service.
- The voltage drop in long cables must be taken into account. The drive unit's rated voltage is the voltage measured at the cable connection point in the pump.

3. Installation




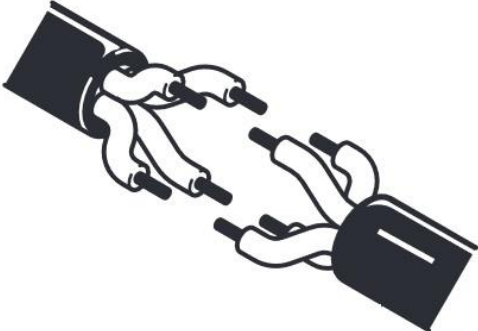

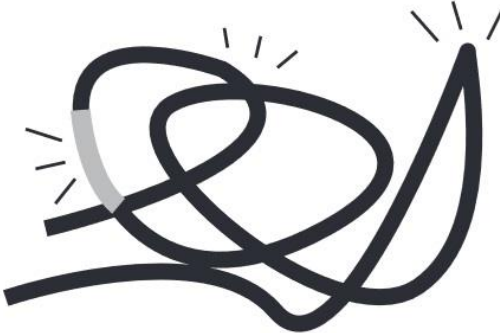
WARNING:

Before connecting the cable to the terminal board, make sure that the power supply (i.e. circuit breaker) is properly disconnected. Failure to do so may lead to electrical shock, short, or injury caused by the unintended pump start.



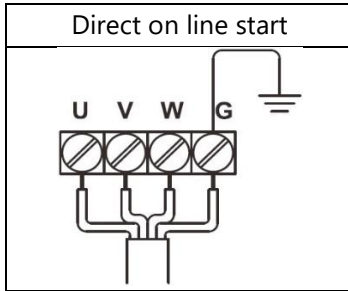
CAUTION:

- If the cable must be extended, use an extension cable with the same or larger core size as that of the cable that is provided with the pump. Using a cable of proper size will prevent the motor from attaining its full capabilities or may cause the cable to overheat, which may lead to fire, current leakage, or electrical shock.
- If a cable with a cut or damaged sheath is submerged in water, the water may enter the pump and cause the motor to short. This will damage the pump, which may lead to current leakage, or electrical shock, or burn-out.
- To prevent the cable from cuts or twists, which will damage the pump and may lead to current leakage, electrical shock, or fire, make sure that the tires of vehicles do not run over the cable.
- If the cable must be submerged in water, make sure to use extension method providing proper IP (Ingres Protection) rating. Failure to do so may lead to current leakage, electrical shock, or burn-out.

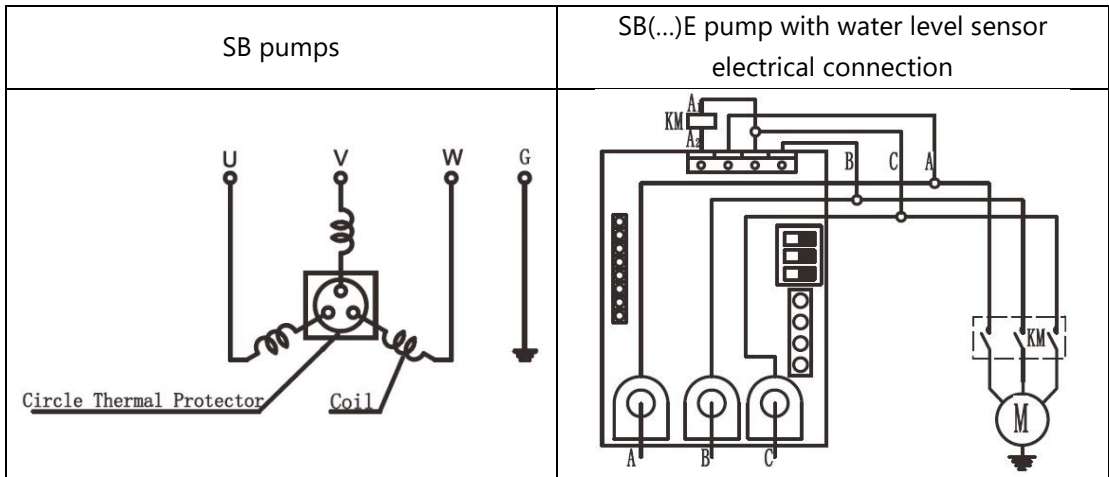
| | |
|--|---|
| <p>Never submerge cable end in water.</p> | <p>If the cable must be extended, use an extension cable with the same or larger core size as that of the cable that is provided with the pump.</p> |
|  |  |
| <p>To prevent water from leaking inside the cable, make sure to securely maid the cable connection part.</p> | <p>To avoid cable damage, route the cable so that the cable is not bent, kinked, or pressed against anything.</p> |
|  |  |

3. Installation

Terminal board connection



Electric circuit diagrams



4. Operation

4. Operation

4.1. Precautions



DANGER:

If you need to move or service the pump, make sure that it is isolated from the power supply and cannot be energized.



WARNING:

- Never operate the pump without safety devices installed.
- Never operate the pump with the discharge hose blocked, or the discharge valve closed.
- Make sure you have a clear retreat path.
- Never work alone.
- There is a risk of sudden restart in SB(...E pumps which are equipped automatic level control



Distance in wet areas



Electrical hazard:

- Risk of electrical shock. Make sure no one gets closer than 20 m to the unit when being in contact with the pumped or mixed liquid.
- Risk of electrical shock, this unit has not been investigated for use in swimming pools. If used in connection with swimming pools special safety regulations apply.

4.2. Before operation



CAUTION:

Improper voltage and frequency of the power supply will prevent the pump from attaining its full capabilities, and may also lead to current leakage, electrical shock, or fire

1. Once again, check the pump nameplate to verify that its voltage and frequency are correct.
2. Check the wiring, power supply voltage, the capacity of the ground leakage circuit breaker, and the insulation resistance of the motor.

NOTICE:

Insulation resistance reference value $\geq 30M\Omega$. See chapter 3.3. *Preparation for installation* for the test method.

3. Adjust the setting of the overflow protector (i.e. circuit breaker) to the pump's rated current

NOTICE:

Verify the rated current on the pump's nameplate

4. When using a generator, as much as possible avoid operating the pump in conjunction with other types of equipment

4. Operation

4.3. Trial operation



WARNING:

- Make sure that the unit cannot roll or fall over and injure people or damage property.
- In some installations, the pump and the surrounding liquid may be hot. Bear in mind the risk of burn injuries.
- Never start the pump while it is suspended, as the pump may jerk and cause serious accident.
- Make sure nobody is close to the unit when it is started. The unit will jerk in the opposite direction of the impeller rotation.



CAUTION:

Make sure to check the pump's direction of rotation when the pump is exposed to atmosphere. Operating the pump in reverse while it is submerged in water will damage the pump, which may lead to current leakage, electrical shock, or fire.

NOTICE:

- Inspect the pump. Check that there is no physical damage to the pump or cables.
- Check the oil level in the oil housing (see chapter 5.4. *Oil inspection and change*).
- Remove the fuses or open the circuit breaker, and check that the impeller can be rotated freely.
- Check that the monitoring equipment (if any) works properly.

1. Operate the pump for a short time (1 to 2 seconds), and then check the correct pump rotation.



WARNING:

Before changing the connections to reverse rotation, make sure that the power supply (i.e. circuit breaker) is properly disconnected and that the impeller has stopped completely. Failure to observe this may lead to serious accidents, including electrical shock, short, or injury.

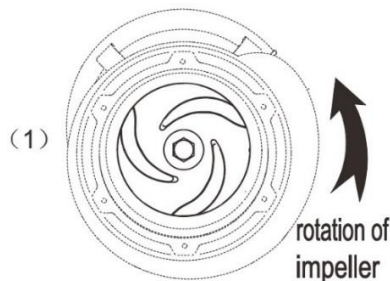
Use a phase rotation indicator to check the correct pump rotation.

NOTICE:

When using a phase rotation indicator, read carefully it's the operation manual.

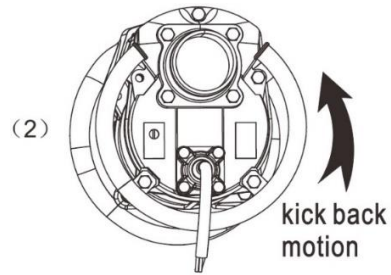
Two ways to check the correct pump rotation

By looking at the impeller; the rotation of the impeller should be counter clockwise as shown in the picture (1).



4. Operation

By looking from the top of the pump. Because the impeller cannot be seen in this position, the best way to check the rotation is check the kick back motion of the pump when the pump just starts. The kick back motion of the pump should be counter clockwise as shown in the picture (2).



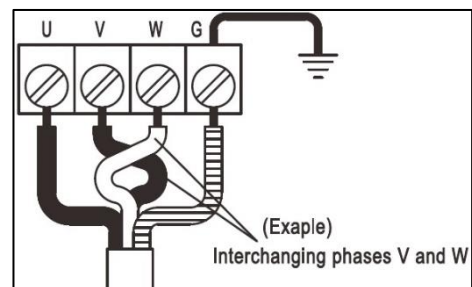
NOTICE:

For the SB(...)E... pump, you should use a screwdriver metal body so that the water level sensor probe and guide rod are connected, otherwise the pump cannot start (see chapter 1.8. SB(...)E technical data and function).

To reverse the rotation, the following countermeasure must be taken.

COUNTERMEASURE:

Interchange two of the three wires designated U, V, and W, respectively.



2. Operate the pump for a short time (≤ 1 minute) and perform the following checks:

- Operating current: use an AC ammeter (clamp), measure the current at the phase U, V, and W that are connected to the terminal board.
- Operation voltage: use an AC voltmeter (tester) to measure the voltage at the terminal board.
- Power supply voltage tolerance: within $\pm 10\%$ of the rated voltage (see chapter 1.2. Pump design)
- Vibrations



CAUTION:

If the pump generates a considerable amount of vibration, noise, or smell, disconnect the power supply immediately and contact Tapflo for further support.

3. Continue operations if no abnormal conditions are found during the trial operation.

4.4. Operation



WARNING:

- The pump may be extremely hot during operation. To prevent burns, do not touch the pump with bare hands.
- Do not insert your finger or any object into the pump's inlet opening. Doing so may cause injury, electrical shock, short, or fire.
- When the pump is not used for a long time, make sure that the power supply (such as a breaker) is properly disconnected. If the wiring insulation deteriorates with the power supply connected, it may cause current leakage, electrical shock, or fire.

4. Operation



WARNING:

- During inspection and repair, disconnect the power supply to avoid starting the pump unintentionally. Failure to disconnect the power supply may lead to serious accidents including electrical shock, short, and injury.
- During a power outage, disconnect the power supply to the pump. Unintentional operation of the pump after power resumption would be extremely dangerous to people around the pump.



CAUTION:

Do not operate the pump at unusually low head, or when the strainer is clogged with debris. Doing so will prevent the pump from attaining its full capabilities, and may also generate abnormal noise and vibration and cause damage to the pump, which may lead to current leakage, electrical shock, and fire.

It is the best for pump lifetime to operate at rated capacity and head.

4.5. Motor protection

Circle thermal protector

SB pumps are equipped with an internal motor protective equipment - circle thermal protector. To protect the motor, if a current overload occurs in the motor or if the motor overheats under the conditions given below, the pump will stop automatically, regardless of the water level during operation.

- Extreme fluctuation of power supply voltage.
- Pump operated under overload condition.
- Pump operated at open phase or binding condition.

SB(...)*E* pumps are not equipped with circle thermal protector, instead they have different protection system, extended with additional features. For more information see chapter 1.8 *SB(...)*E* technical data and functions*.



CAUTION:

Unless the cause of a problem is removed, the pump will repeat the stop-and-go cycle, eventually resulting in damage to the pump, and causing current leakage and electrical shock. Therefore, after verifying that the power supply is disconnected, find and correct the cause of the problem through inspection and repair.

4. Operation

4.6. Water level during operation

Pay attention to the water level during the pump operation. The pump will be damaged if operating dry.



CAUTION:

Do not operate the pump below Continuous running Water Level (C.W.L), as doing so will damage the pump, causing current leakage and electrical shock

Continuous running Water Level

| Pump models | C.W.L. | |
|--------------------------|---------------------|--|
| SB(...)-22 | 120 mm (4,72 in) | |
| SB(...)-37 - SB(...)-55 | 150 mm (5,9 in) | |
| SB(...)-75 - SB(...)-110 | 190 mm (7,48 in) | |

5. Maintenance and inspection

5. Maintenance and inspection

Regular maintenance and inspection are required for proper pump operation. If any abnormal conditions are observed, refer to chapter 6. Troubleshooting and take corrective action immediately

5.1. Precautions



DANGER:

Disconnect and lock out electrical power before installing or servicing the unit.

WARNING:

- Always follow safety guidelines when working on the product.
- Make sure that the unit cannot roll or fall over and injure people or damage property.
- Rinse the unit thoroughly with clean water before working on the unit.
- Rinse the components in water after dismantling.

Make sure that you follow these requirements:

- Check the explosion risk before you use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

Washing the pump

Remove any debris attached to the pump's outer surface, and wash the pump with tap water. Pay particular attention to the impeller area, and completely remove any debris from the impeller.

Inspecting the Pump Exterior

Verify that the paint is not peeled, that there is no damage, and that the bolts and nuts have not loosened. If the paint has peeled, allow the pump to dry and apply touch-up paint.

NOTICE:

Touch-up paint must be provided by the user. If the pump must be disassembled due to damage or loose bolts or nuts, contact Tapflo.

5.2. Inspection and service intervals

| Interval | Inspection and maintenance subject |
|----------|--|
| Monthly | <p>Isolation resistance measure</p> <ul style="list-style-type: none"> ➤ Cold insulation resistance reference value $\geq 20M\Omega$ ➤ Heated insulation resistance reference value $\geq 1M\Omega$ <p>NOTICE: The motor must be inspected if the insulation resistance is considerably lower than that obtained during the last inspection.</p> |
| | <p>Loaded current measure</p> <ul style="list-style-type: none"> ➤ To be within the rated current (see pump nameplate) |
| | <p>Power supply voltage measure</p> <ul style="list-style-type: none"> ➤ Power supply voltage tolerance |

5. Maintenance and inspection

| | |
|-------------------------|---|
| | <ul style="list-style-type: none"> ➤ continuous running: max $\pm 5\%$ of the rated voltage ➤ intermittent running: max $\pm 10\%$ of the rated voltage |
| | Impeller inspection <ul style="list-style-type: none"> ➤ If the performance level has decreased considerably, the impeller may be worn |
| Semi-annually | Lifting chain or rope inspection |
| | Oil inspection (see chapter 5.4. <i>Oil inspection and change</i>) |
| Yearly | Oil change (see chapter 5.4. <i>Oil inspection and change</i>) |
| | Mechanical seal replacement NOTICE: Contact Tapflo for mechanical seal replacement. |
| Once every 2 to 5 years | Overhaul <ul style="list-style-type: none"> ➤ The pump must be overhauled even if the pump appears normal during operation. The pump may need to be overhauled earlier if it is used continuously or repeatedly. NOTICE: Contact Tapflo for pump overhaul. |

5.3. Storage after operation

If the pump will not be operated for a long period of time, pull the pump up, allow it to dry, and store it indoors. For storage recommendations see chapter 2.4. *Storage*.

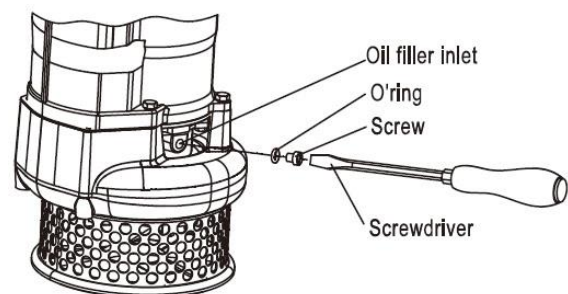
NOTICE: Be sure to perform a trial operation before reinstalling the pump. If the pump remains immersed in water, operate the pump on a regular basis (i.e. once a week) to prevent the impeller from seizing due to rust.

5.4. Oil inspection and change

Oil inspection

- Designated oil: Turbine oil VG32
- Oil volume: specified volume
- Inspection interval: every 3000 hours or 6 months, whichever comes first.
- Changing interval: every 6000 hours or 12 months, whichever comes first.

Remove the oil plug and take out a small amount of oil. The oil can be extracted easily by tilting the pump so that the oil plug faces downward. If the oil appears discolored or intermixed with water, a likely cause is a broken or worn mechanical seal, which requires that the pump be disassembled and repaired.



Oil change

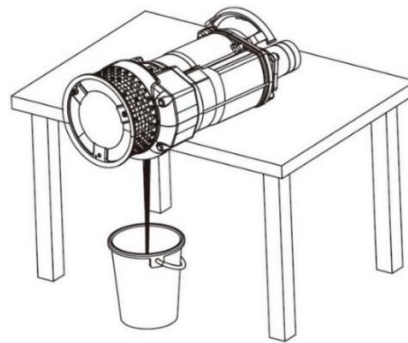
Remove the oil plug and drain the oil completely. Pour a specified oil volume into the oil filler inlet.

5. Maintenance and inspection

NOTICE:

- The drained oil must be disposed according to national and local regulations.
- The gasket and the O-ring for the oil filler plug must be replaced with a new part at each oil inspection and change.

| Model | Oil volume |
|--------------------------|------------|
| SB(...)-22 | 620 ml |
| SB(...)-37 - SB(...)-55 | 1100 ml |
| SB(...)-75 - SB(...)-110 | 800 ml |



5.5. Disassembly and reassembly procedure



DANGER:

Disconnect and lock out electrical power before installing or servicing the unit



WARNING:

Make sure to perform a trial operation when starting the pump after a reassembly. If the pump was assembled improperly, it may leakage abnormal operation or electrical shock.



CAUTION:

Wear protective gloves. A worn impeller and/or pump housing can have very sharp edges.

5.5.1. SB(...)-22 – SB(...)-55 disassembly procedure

NOTICE:

- Before disassembling, make sure to drain the oil from the pump.
- Below exploded view is based on SB(...)-22 which is designed with the shaft sleeve [13] but SB(...)-37 and SB(...)-55 are designed without it.
- Mechanical seal should be replaced only when broken or worn (see chapter 5.4. *Oil inspection and change*).

1. Strainer [3] disassembly

Remove the nut [1], the washer [2] and remove the strainer [3].

2. Suction cover [6] disassembly

Remove the bolt and nut [except SB(...)-22], the stud bolt [4] and plain washer [5]. Remove the suction cover [6] and the gasket [7].

3. Impeller [11] disassembly

Using a socket key, remove the doomed nut [8], spring washer [9], and impeller thread cover [10]; then remove the impeller [11], impeller adjusting shim [12] and shaft sleeve [13] (except SB(...)-37 and SB(...)-55) from the main shaft.

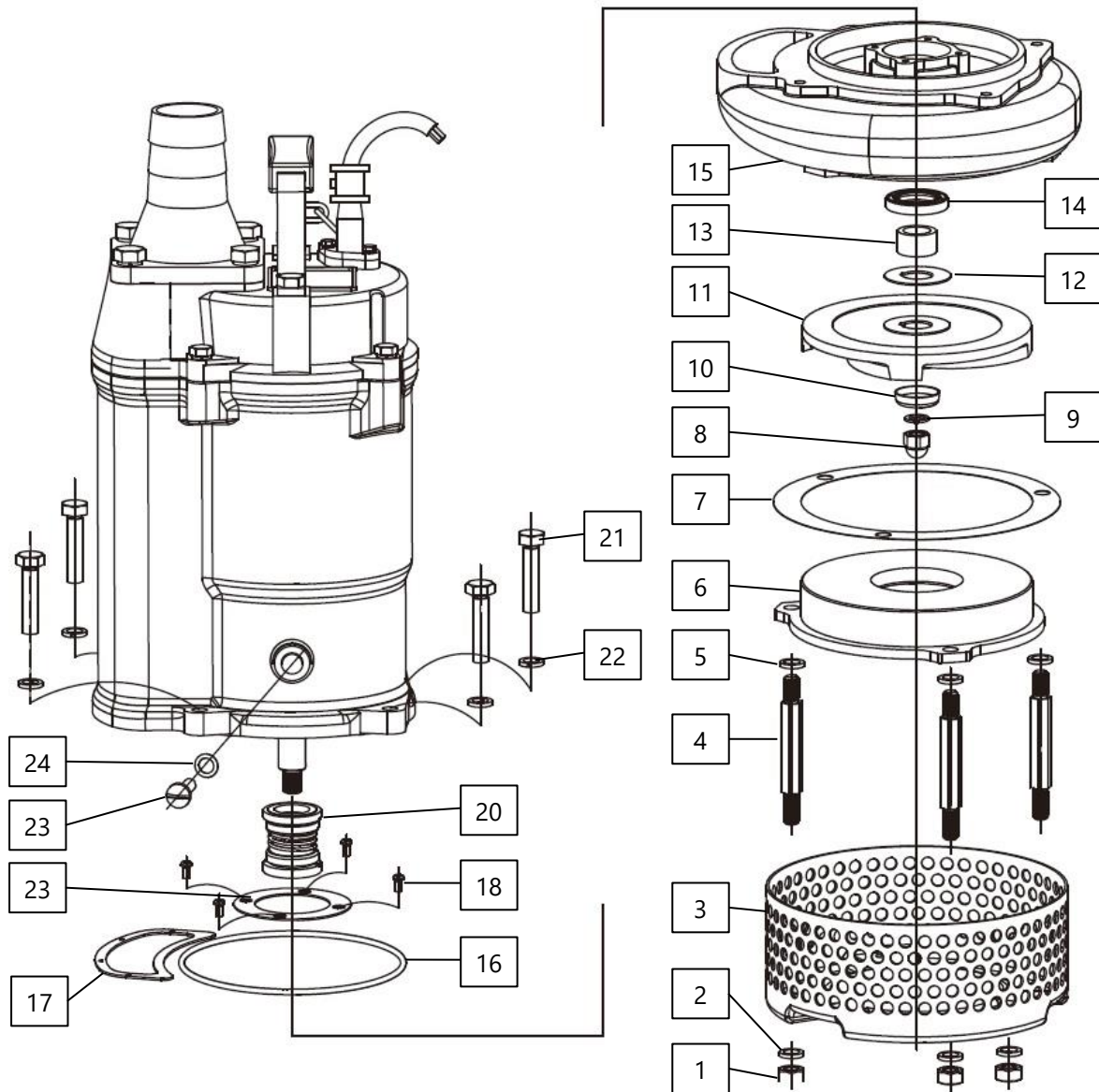
4. Pump casing [15] and mechanical seal [19] disassembly

After removing the screw [21] and spring washer [22], remove the pump casing [15] (when doing this, be careful not to damage sealing face of the mechanical seal [19]), oil seal [14], casing O-ring [16] and gasket [17]. Remove the mechanical seal from the main shaft.

NOTICE: Mechanical seal replacement must be handled by the qualified staff, contact Tapflo for more information.

5. Maintenance and inspection

5.5.2. SB(...)-22 – SB(...)-55 exploded view



5.5.3. SB(...)-22 – SB(...)-55 Parts list

| No. | Part name | Material | Q-ty |
|-----|-----------------------|-------------------|------|
| 1 | Nut | AISI 304 | 3 |
| 2 | Washer | AISI 304 | 3 |
| 3 | Suction strainer | Steel | 1 |
| 4 | Stud bolt | AISI 420 | 3 |
| 5 | Washer | AISI 304 | 3 |
| 6 | Suction cover | Ductile iron | 1 |
| 7 | Gasket | NBR | 1 |
| 8 | Doomed nut | AISI 304 | 1 |
| 9 | Spring washer | AISI 304 | 1 |
| 10 | Impeller thread cover | AISI 420 | 1 |
| 11 | Impeller | High chrome alloy | 1 |
| 12 | Impeller shim | AISI 304 | 1 |

| No. | Part name | Material | Q-ty |
|-----|------------------------------|----------------------|------|
| 13 | Shaft sleeve | AISI 420 | 1 |
| 14 | Lip seal | NBR | 1 |
| 15 | Pump casing | Cast iron | 1 |
| 16 | O-ring | NBR | 1 |
| 17 | Gasket | NBR | 1 |
| 18 | Screw | AISI 304 | 4 |
| 19 | Mechanical seal fixing plate | | |
| 20 | Mechanical seal | Sic-Sic / Carbon-Sic | 1 |
| 21 | Screw | AISI 304 | 4 |
| 22 | Spring washer | AISI 304 | 4 |
| 23 | Screw | AISI 304 | 1 |
| 24 | O-ring | NBR | 1 |

5. Maintenance and inspection

5.5.4. SB(...)-75 – SB(...)-110 disassembly procedure

NOTICE:

- Before disassembling, make sure to drain the oil from the pump.
- Mechanical seal should be replaced only when broken or worn (see chapter 5.4. *Oil inspection and change*).

1. Bottom plate [3] and suction strainer [4] disassembly

Remove the nut [1] and the washer [2], then remove the bottom plate [3] and strainer [4].

2. Suction cover [9] disassembly

After removing the stud bolt [5], washer [6], screw [7] and washer [8]; remove the suction cover [9] and the gasket [10].

3. Impeller [15] disassembly

Using a socket key, remove the doomed nut [11], nut [12], spring washer [13] and the impeller thread cover [14]; then remove the impeller [15], the impeller adjusting shim [16] and the neck ring [17] from the main shaft.

4. Pump casing [20] disassembly

After removing the screw [18], spring washer [19], screw [30] and spring washer [31], remove the pump casing [20], shaft sleeve [21] and the gasket [22].

5. Oil casing [25] and mechanical seal [31] disassembly

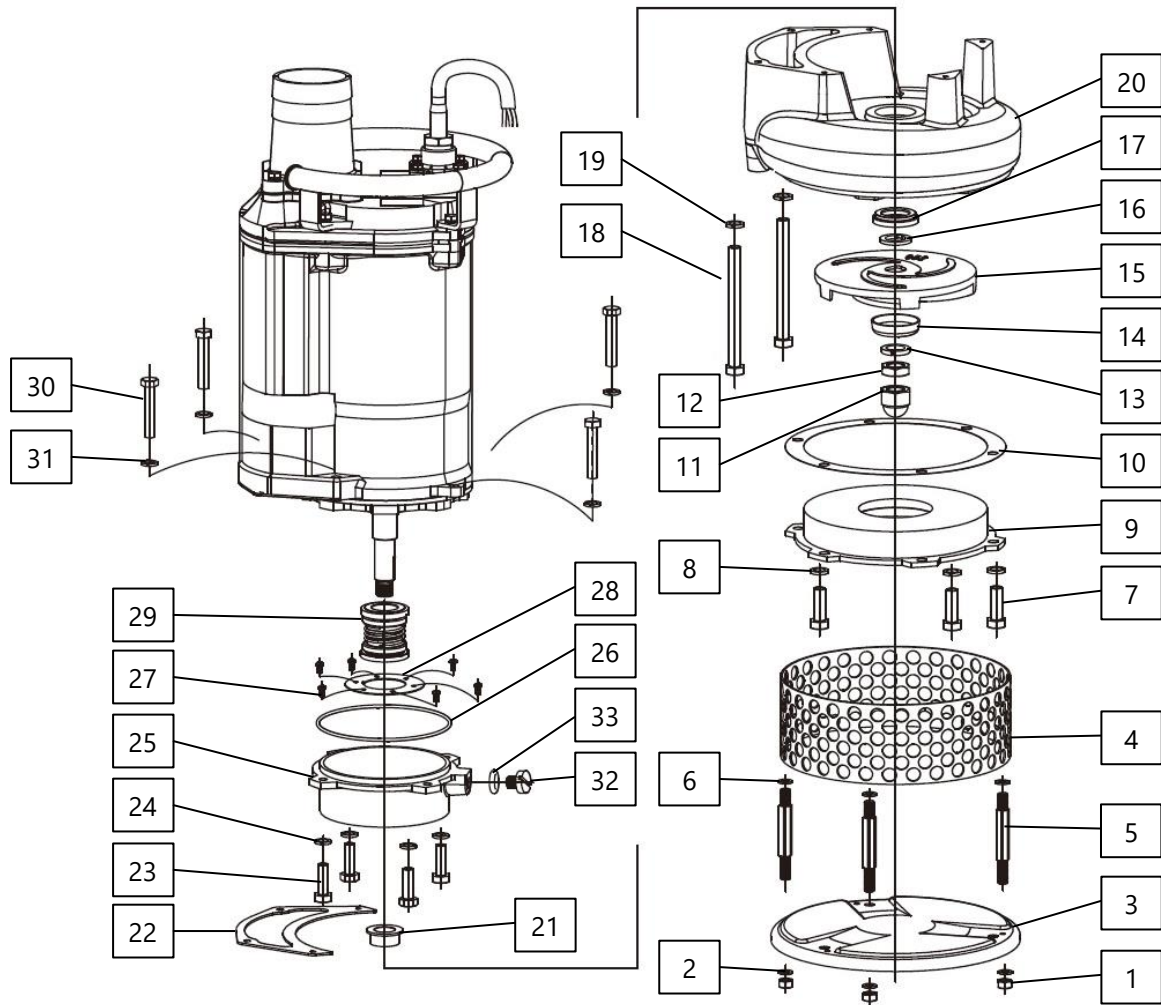
After removing the screw [23] and spring washer [24], remove the oil casing [25] (when doing this be careful not to damage sealing face of the mechanical seal [29]) and O-ring [26].

NOTICE:

Mechanical seal replacement must be handled by the qualified staff, contact Tapflo for more information.

5. Maintenance and inspection

5.5.5. SB(...)-75 – SB(...)-110 exploded view



5.5.6. SB(...)-75 – SB(...)-110 parts list

| No. | Part name | Material | Q-ty |
|-----|-----------------------|-------------------|------|
| 1 | Nut | AISI 304 | 3 |
| 2 | Washer | AISI 304 | 3 |
| 3 | Bottom plate | Steel | 1 |
| 4 | Suction strainer | Steel | 1 |
| 5 | Stud bolt | AISI 420 | 3 |
| 6 | Washer | AISI 304 | 3 |
| 7 | Screw | AISI 304 | 3 |
| 8 | Washer | AISI 304 | 3 |
| 9 | Suction cover | Ductile iron | 1 |
| 10 | Gasket | NBR | 1 |
| 11 | Doomed nut | AISI 304 | 1 |
| 12 | Nut | AISI 304 | 1 |
| 13 | Spring washer | AISI 304 | 1 |
| 14 | Impeller thread cover | AISI 420 | 1 |
| 15 | Impeller | High chrome alloy | 1 |
| 16 | Impeller shim | AISI 304 | 1 |

| No. | Part name | Material | Q-ty |
|-----|------------------------------|-----------------|------|
| 17 | Neck ring | AISI 304 | 1 |
| 18 | Screw | AISI 304 | 2 |
| 19 | Spring Washer | AISI 304 | 2 |
| 20 | Pump casing | Cast iron | 1 |
| 21 | Shaft sleeve | AISI 420 | 1 |
| 22 | Gasket | NBR | 1 |
| 23 | Screw | AISI 304 | 4 |
| 24 | Spring washer | AISI 304 | 4 |
| 25 | Oil casing | Cast iron | 1 |
| 26 | O-ring | NBR | 1 |
| 27 | Screw | AISI 304 | 6 |
| 28 | Mechanical seal fixing plate | | 1 |
| 29 | Mechanical seal | SiC-SiC/SiC-SiC | 1 |
| 30 | Screw | AISI 304 | 4 |
| 31 | Spring washer | AISI 304 | 4 |
| 32 | Screw | AISI 304 | 1 |
| 33 | O-ring | NBR | 1 |

5. Maintenance and inspection

5.5.7. SB(...)-22 – SB(...)-110 reassembly procedure

1. For reassembly procedure follow the disassembly procedure in reverse sequence. Nevertheless there are a few things that you have to remember in order to assemble the pump correctly.

NOTICE:

- The gaskets and O-rings must be replaced with new ones. Also replace any parts that are worn or damaged.
- After complete reassemble, keep in mind to pour the specified amount of oil into the pump.

2. Wipe and degrease the mechanical seal sealing faces. Lubricate the outer circumference of the mechanical seal to facilitate insertion.

NOTICE:

- For further details on how to install the mechanical seal, refer to the "Mechanical seal assembly procedure" that comes with the mechanical seal that is sold separately as a spare part.
- For cleaning use dust-free material e.g. blue towel TORK 1230081.

3. After complete reassemble check that the impeller rotates smoothly and that it does not come in contact with the suction cover.

4. To make sure that the pump operates normally, perform a trial operation before placing the pump back into service.

5.5.8. SB(...)-22 – SB(...)-110 Wearing parts replacement condition

| Part name | Pump model | Replacement condition |
|-------------------|--------------------------------------|---|
| Mechanical seal | All | Lubrication oil discoloured |
| Gasket and O-ring | All | Each disassembly or inspection |
| Lip seal | SB(...)-22–SB(...)-55 | Each disassembly or inspection, or if the sealing lip is worn |
| Neck ring | SB(...)-75–SB(...)-11 | When worn |
| Shaft sleeve | All except SB(...)-37 and SB(...)-55 | When worn |

5.6. How to order spare parts

When ordering spare parts for Tapflo pumps, let us know what is the **model** and **serial number** from the pump nameplate. Then just indicate the part numbers from the spare parts list and quantity of each item.

6. Trouble shooting

6. Trouble shooting



DANGER:

Personal injury hazard. Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician. Failure to follow these instructions will result in serious personal injury, death, and/or property damage.



WARNING:

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Read this manual carefully before requesting repair. After re-inspecting the pump, if it does not operate normally, contact Tapflo.

| Symptom | Possible cause | Countermeasure |
|--|---|--|
| Pump fails to start | No power is supplied (i.e. power outage) | Contact the electric power company or an electrical repair shop |
| | Open circuit or poor cable connection | Check if there is an open circuit in the cable or wiring |
| | The impeller is blocked | Inspect the pump and remove the obstruction |
| Pump starts but stops immediately causing the motor protector to actuate | The impeller is blocked | Inspect the pump and remove the obstruction |
| | Voltage drop | Correct the voltage to the rated voltage or use an extension cable that meets the standard |
| | Circle thermal protector or protective device failure | Replacement or adjustment |
| | A 50 Hz model is operated at 60 Hz | Check the nameplate and replace the pump or the impeller |
| | The strainer is obstructed, and the pump was operated dry for long time | Remove the obstruction. |
| | Broken motor | Repair the motor or replace with a new motor |
| | Low head and high liquid density | Check motor power consumption |
| | The pump is picking up too much sediment | Place a concrete block under the pump to prevent the pump from picking up sediment |
| The pump's head and capacity decreased | The impeller or suction cover is worn | Replace |
| | The hose may be kinked or clogged | Minimize the number of bends in the hose (in an area with a large amount of debris, use the pump in a meshed basket) |
| | The pump submerge depth is too shallow, the air enters the pump | Adjust the submerge depth until the pump is submerged. |
| | The valve on discharge line is closed | Open the valve |
| | The strainer is obstructed or buried | Remove the obstruction; place a concrete block under the pump to prevent the pump from picking up sediment |
| | The motor rotates in reverse direction | Interchange the power supply terminal connection |
| The pump generates noise or vibration | The bearing of the motor may be damaged | Replace the bearing, contact Tapflo |
| | The shaft is bent | Contact Tapflo |

7. WARRANTY

7. WARRANTY

7.1. Warranty form

| | |
|--|---|
| Company: _____ | |
| Telephone: _____ | Fax: _____ |
| Address: _____ | |
| Country: _____ | Contact Name: _____ |
| E-mail: _____ | |
| Delivery Date: _____ | Date of pump installation: _____ |
| Pump type: _____ | |
| Serial No (see name plate or stamped on pump housing): _____ | |
| Description of the fault: _____ | |
| _____ | |
| _____ | |
| The installation: | |
| Liquid: _____ | |
| Temperature [°C]: _____ | Viscosity [cPs]: _____ Spec grav. [kg/m ³]: _____ pH-value: _____ |
| Content of particles: _____ % of max size [mm]: _____ | |
| Flow [l/min]: _____ | Duty [h/day]: _____ No of starts per day: _____ |
| Discharge head [mWC]: _____ | Suction head / lift [m]: _____ |
| Air pressure [bar]: _____ | Quality of the air (filter, micron, lubrication): _____ |
| Other: _____ | |
| _____ | |
| Place for sketch of installation: | |
| | |

7. WARRANTY

7.2. Returning parts

When returning parts to Tapflo please follow this procedure:

- Consult Tapflo for shipping instructions.
- Cleanse or neutralize and rinse the part/pump. Make sure the part/pump is completely empty from liquid.
- Pack the return articles carefully to prevent any damage during transportation.

Goods will not be accepted unless the above procedure has been complied with.

7.3. Warranty

Tapflo warrants products under conditions as stated below for a period of not more than 2 years from installation.

1. The following terms and conditions apply to the sale of machinery, components and related services and products, of Tapflo (hereinafter "the products").
2. Tapflo (the manufacturer) warrants that:
 - a. its products are free of defects in material, design and workmanship at the time of original purchase;
 - b. its products will function in accordance with Tapflo operative manuals; Tapflo does not guarantee that the product will meet the precise needs of the Customer, except for those purposes set out in any invitation to render documents or other documents specifically made available to Tapflo before entering into this agreement;
 - c. high quality materials are used in the construction of the pumps and that machining and assembly are carried out to the highest standards.

Except as expressly stated above, Tapflo makes no warranties, express or implied, concerning the products, including all warranties of fitness for a particular purpose.

3. This warranty shall not be applicable in circumstances other than defects in material, design, and workmanship. In particular warranty shall not cover the following:
 - a. Periodic checks, maintenance, repair and replacement of parts due to normal wear and tear (seals, O-rings, rubber items, impeller, mechanical seals etc.);
 - b. Damage to the product resulting from:
 - b.1. Tampering with, abuse or misuse, including but not limited to failure to use the product for its normal purposes as stated at the time of purchase or in accordance with Tapflo instructions for use and maintenance of the product, or the installation, or use of the product in a manner inconsistent with the technical or safety standard in force;
 - b.2. Repairs performed by non-skilled personnel or use of non-original Tapflo parts;
 - b.3. Accidents or any cause beyond the control of Tapflo, including but not limited to lightning, water, fire, earthquake, and public disturbances, etc.;
4. The warrantee shall cover the replacement or repairing of any parts, which is documented faulty due to construction or assembling, with new or repaired parts free of charges delivered by Tapflo. Parts subjected to normal tear and wear shall not be covered by the warranty. Tapflo shall decide as to whether the defective or faulty part shall be replaced or repaired.

7. WARRANTY

5. The warrantee of the products shall be valid for a period in accordance to the current law from the date of delivery, under the condition that notice of the alleged defect to the products or parts thereof be given to Tapflo in written within the mandatory term of 8 days from the discovery. Repair or replacement under the terms of this warranty shall not give a right to an extension to, or a new commencement of, the period of warranty.
6. Repair or replacement under the terms of this warranty shall not give a right to an extension to, or a new commencement of, the period of warranty. Repair or replacement under the terms of this warranty may be fulfilled with functionally equivalent reconditioned units. Tapflo qualified personnel shall be solely entitled to carry out repair or replacement of faulty parts after careful examination of the pump. Replaced faulty parts or components will become the property of Tapflo.
7. The products are built in accordance with standard CE normative and are tested (where applicable) by Tapflo. Approval and tests by other control authority are for the customer's account. The products shall not be considered defective in materials, design or workmanship if they need to be adapted, changed or adjusted to conform to national or local technical or safety standards in force in any country other than that for which the unit was originally designed and manufactured. This warranty shall not reimburse such adaptations, changes or adjustments, or attempt to do so, whether properly performed or not, nor any damage resulting from them, nor any adaptation, change or adjustments to upgrade the products from their normal purpose as described in the products operative manual without the prior written consent of Tapflo.
8. Installation, including electric and other connections to utility mains according to Tapflo drawings, is for the cost and responsibility of the customer, unless otherwise agreed in writing.
9. Tapflo will not be liable on any claim, whether in contract, tort, or otherwise, for any indirect, special, incidental, or consequential damages, caused to the customer or to third parties, including loss of profits, arising by any possible infringement of par. 3 above or by the customer or third parties being in the impossibility of using the products.

Steady the above, Tapflo liability to the customer or third parties from any claim, whether in contract, tort, or otherwise, shall be limited to the total amount paid by the customer for the product that caused the damages.

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Tapflo products and services are available in 75 countries on 6 continents.

Tapflo is represented worldwide by own Tapflo Group Companies and carefully selected distributors assuring highest Tapflo service quality for our customers' convenience.

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