

SINGLE PUMP CONTROL SYSTEM

User's Manual



The company reserves the right to introduce modifications without prior notification.

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1 Basic Information

The WSP-201 device is intended to control a pump's work, depending on the water level. The main fields of application include:

- Water pumping
- Sewage pumping
- Adjacent sewage pumping stations
- Pressure sewer system

Level can be measured by the use of hydrostatic pressure, sparge pipe, external sensor (4–20mA) or float switches. The pump is turned on directly by a contactor.

States of failure are signalled by the use of three relay contacts, a built-in sound alarm, and a control light on the front panel. The device is set up and operated by the use of keys situated on the front panel.

The design and specification of the device will ensure long and non-failure operation in any conditions. All the components used in the construction of the electronic system have been adjusted to operate in temperatures below zero. As a result, the possibility of parameters going out of adjustment, even in freezing temperatures, has been reduced to a minimum. A high-performance switching power supply has been applied for powering the electronic system, which allows the minimization of the intake of energy required for powering the device from the network. The use of surface assembly technology allowed the creation of a device of compact construction which is highly ergonomic in the course of installation works.

1.1 General properties

- LCD display 2 x 16
- Forced pump operation
- Built-in sound alarm
- Non-potential alarm of high level
- Collective failure signalling: potential and non-potential
- Overload protection
- Dry run protection
- Phase detection sensor
- Pump's current indication
- Indication of water level in the tank
- Pump's work-time meter
- Pump's start up meter
- Saving failure messages after cutting power supply off

1.2 Optional equipment

At the client's request the WSP-201 device can be delivered along with an additional internal level converter. This provides an additional control system in an attractive price. The second measurement of hydrostatic pressure in the tank is made at a height which is not normally reached by the level of water. If the level is exceeded by 10cm, an alarm is activated and the pump is turned on. The pump will be stopped and the alarm will be turned off when the level falls below the emergency value. The additional level converter is always active and independent of the chosen type of first measurement of the level (hydrostatic pressure, sparge pipe, external sensor 4-20mA or float switch).

1.3 Technical specification

| | |
|--|---|
| Power consumption: | 3.5W |
| Overvoltage category: | III |
| Protection rate: | IP 65 |
| Range of work temperatures: | -30°C to +50°C |
| Range of pressure | 0 – 1m of water column |
| Work voltage | |
| - three-phase work: | 3/N/PE AC 400/230V 50Hz |
| - monophase work: | 1/N/PE AC 230V 50Hz |
| Max. switched power AC-3 | |
| - three-phase work: | 4.0kW |
| - monophase work: | 2.2kW |
| Relay contacts load-carrying capacity | |
| - non-potential alarm contacts: | AC1 - 8A / 230V AC; DC1 - 8A / 24V DC |
| - alarm contact 12V DC: | 1.2A |

1.4 Control elements



1.4.1 Control keys





“Manual operation” Key

Turns the pump on no matter what the water level in a tank is. The pump works for 2 minutes in this mode. If you press the key again, the pump will be turned off and switched to the “0” mode. Manual operation mode is not saved. If the pump is started up in this mode, then either after 2 minutes or after cutting power off, the device shall return to the previous mode: “0” or “Automatic Operation”.



“Automatic operation” Key

The pump is controlled automatically depending on the level of water in the tank and the control settings. If you press the key again, the pump will be switched to the “0” mode.



Navigation key “Up”



Acceptance key

Navigation key “Down”

1.4.2 Control lights



Yellow control light – permanently on:

The pump works in either automatic or manual mode.

Yellow control light – flashing:

Additional pump operation after water level in the tank falls below the switch off level. This time is set up in the control menu.

Red control light:

Indication of emergency status. Turned on until the cause for alarm is eliminated.

1.4.3 LCD display

In the normal course of work the upper line of the display shows the level value or status of float switch contacts. If the pump is off, then the down line displays the total time of the pump’s operation. If the pump is on, then the down line displays the motor’s current value. If you press the ▲ navigation key on the display once, then it will display the total number of times the pump has turned on since it was started.

NOTE!

It is impossible to reset the indications of work-time and the number of the pump's starts.

In the case of state of alarm the display will show appropriate messages, alternating with normal indications.

2 Assembly and operation



- The device can be assembled and operated only by a person who possesses appropriate and valid qualifications empowering them to use devices, installations and networks at least in the field of assembly of control-measurement devices, as well as devices and installations of automatic adjustment.
- When connecting the device to the wiring system or introducing any modifications in the connection system, the power supply should be turned off. Power supply can be turned on after connecting the wires and replacing the terminal cover. During operation, employees authorized to operate the device can have access to connection terminals only, or else the power supply will be turned off. Under no circumstances should the insulation outside cover (front panel) of the electronic and electric part be taken off the device.

2.1 Assembly

The device should be assembled in an upright position, in a place free from direct contact with rain or sunlight. Application of an additional protection box is useful. In places where the temperature often falls below -20°C it might be necessary to provide heating.

The casing shall be fixed to a vertical base using three screws or bolts of diameter 4-5mm. The arrangement of fixing bolts is shown on the back wall of the housing. Dependent on the conditions you may use the catch included in the set. First, fix it to the upper part of the casing with enclosed screw. In this case the middle fixing screw must be placed 40 mm higher than the value specified on the casing.

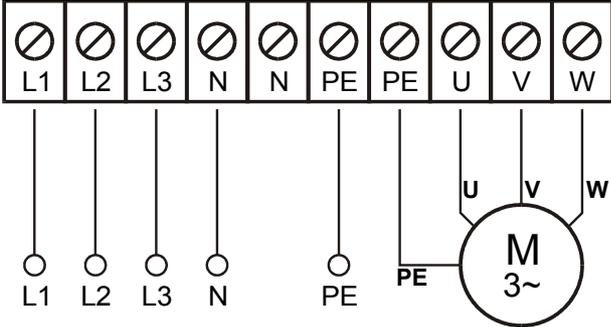
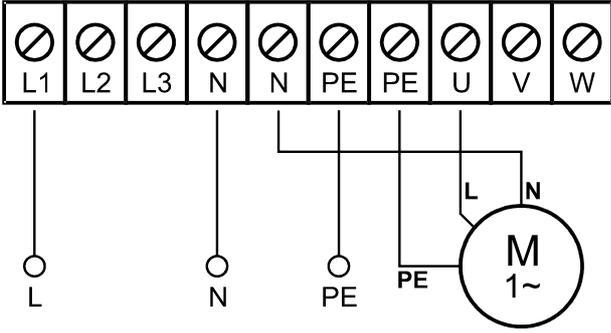
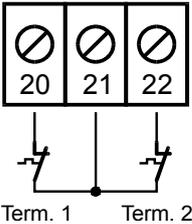


The WSP-201 device has NO anti-explosion protection. Therefore, it can be installed only outside explosion hazard areas.

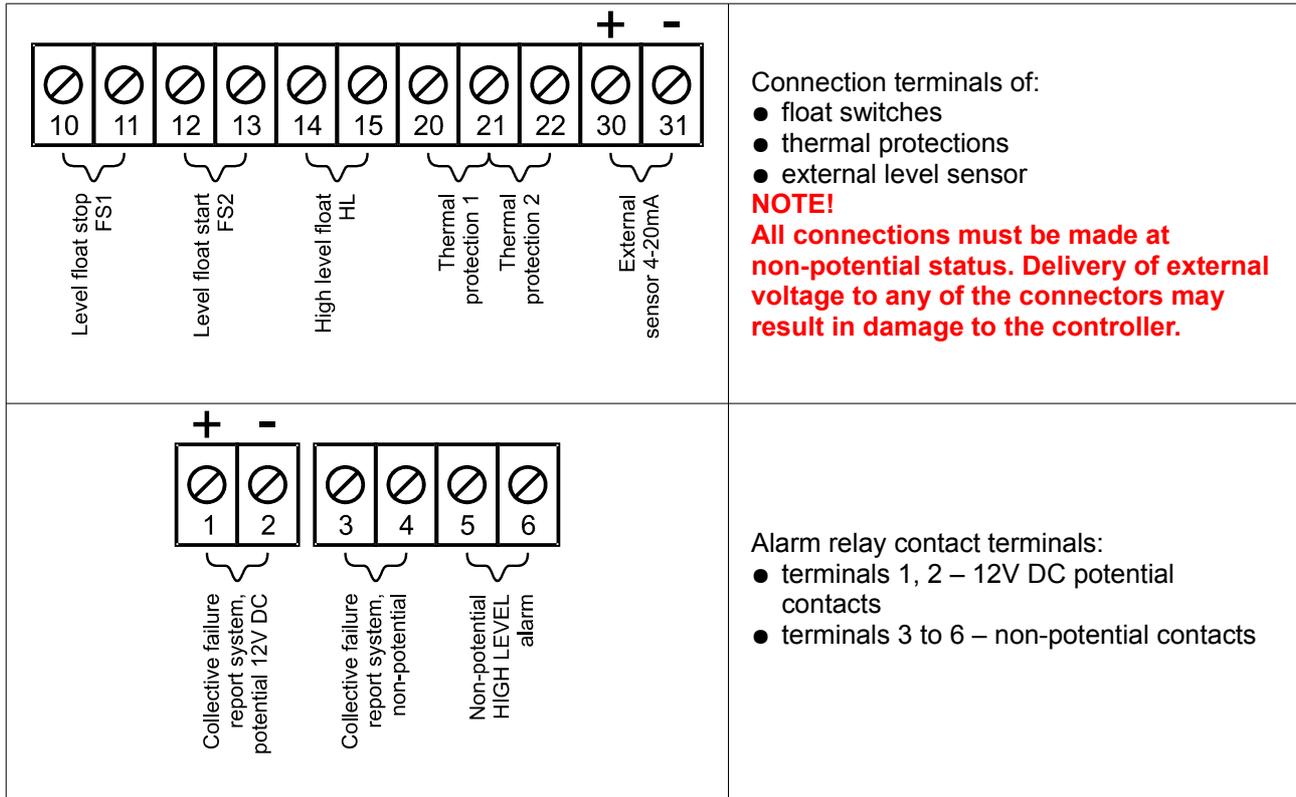
2.2 Wiring

- The type of current and voltage must be identical to data specified on the data plate of the device.
- Protection on behalf of the network must be applied (max. 16A).
- Ground the pump / device according to regulations.
- Let in endings of wires through relevant cable glands in the lower part of the casing and connect them in accordance with markings on the terminal block.

2.2.1 Delivering power to the control and connecting pump

| | |
|---|---|
|  | <p>Three-phase motor wiring</p> |
|  | <p>Single-phase motor wiring</p> |
|  | <p>Term.1 Switches the pump off after exceeding the permissible temperature value. After cooling down the pump is ready to work (chapter 3).</p> <p>Term. 2 Switches the pump off before exceeding the maximum temperature of the motor coil. The pump can be restarted only after the failure has been accepted (chapter 3).</p> |

2.2.2 Control and signal circuit terminals



2.3 Control levels

WSP-201 is equipped with 3 methods for measuring the level of water in the tank. Only one method can be applied at a time (it can be chosen from the menu).

2.3.1 Internal level sensor

Connect pressure line of diameter 8x6 mm to the metal connector on the right of the device. Required pressure can be obtained by use of one of the following methods:

1. Closed cast iron bell hung in the tank.
2. Sparge pipe method: tube or iron bell placed in the tank, supplied with bubbles generated by the membrane pump.

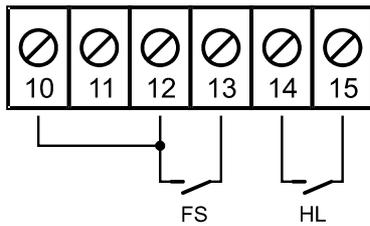
2.3.2 External pressure sensor 4-20mA

External two-wire sensor must be connected to terminals 30 (+) i 31 (-). The sensor is powered by stabilized voltage of 20V. The range of the sensor is 0 - 1m water column which is relevant to the value 4 - 20mA.

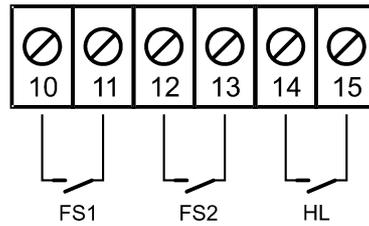
2.3.3 Float switches

All the float switches use a contact which is closed when the float is in its upper position (closing contact).

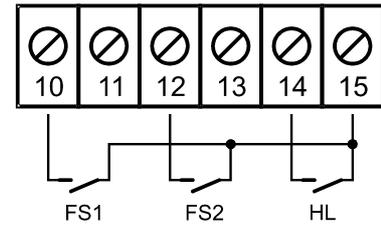
Operation with 2 float switches



Operation with 3 float switches



Operation with 3 float switches on a single wire



2.3.3.1 Work

Choose the “Floats” option from the level measurement menu. The **FS2** float turns the pump on, while **FS1** turns it off. The pump is turned on as long as the **FS1** is closed. If additional work time is set. (“Additional work” option), then the pump works for a specified time after **FS1** is opened. The display shows the status of all three contacts: **FS1**, **FS2**, **HL**.

It is also possible to operate 2 float switches. Then the switches **FS1** and **FS2** are replaced with **FS** and its hysteresis determines the difference between the level of turning the pump on and off.

If an inappropriate status occurs (e.g. **FS1**=0, **FS2**=1), the alarm is turned on and the following message is displayed: “Float switches wrong sequence”. Check the status, remove its cause and accept the alarm. This alarm does not result in blocking the pump’s start and the pump will work despite failures of float switches. The High level float (**HL**) turns the pump on immediately, regardless of floats **FS1** and **FS2**. It must be noted that the high level float switch terminal is always active, even if another method of level measurement has been chosen from the menu.

2.4 Test run without pump

To check working of the control system with no pump connected, proceed in accordance with the following instructions:

1. Turn the power supply on (it is enough to connect L1, N, PE).
2. From the menu set “Maximum current” to 0.0A. Otherwise an alarm will occur and the message “No load” will be displayed..
3. From the menu turn off the “Therm.protect1”. Otherwise an alarm will occur and the message “Thermal fault 1” will be displayed.
4. Close terminals 21, 22. Otherwise an alarm will occur and the message “Thermal fault 2” will occur.

2.5 Settings

To display menu options use navigation keys ▲ and ▼. The upper line of the each display shows the name of the option, while the lower line shows its settings which can be modified. In order to change a settings press ↵. The current name of the option will start to flash. This allows to set up parameters with navigation keys ▲ and ▼. If you hold one of the keys pressed for longer, the value being set will change more rapidly. If you press the key ↵ again, the new value will be saved. If no key is pressed, then after 15 seconds the menu will be closed and the value will not be saved.

The table below displays all the menu options along with explanations.

| Menu level | Upper line of display | Range of settings | Explanation |
|------------|-----------------------|-------------------|---|
| 1 | Level measurm. | internal sensor | Water level measured with hydrostatic pressure or sparge pipe. |
| | | 4-20mA sensor | Water level measured with external sensor (4-20mA). |
| | | float switches | Water level measured with float switches. |
| 2 | STOP level | 0 – 94 cm | Level at which the pump is turned off. |
| 3 | START level | 3 – 97 cm | Level at which the pump is turned on. |
| 4 | High level | 6 – 100 cm | When the set level value is exceeded relay contacts of the collective failure report system and high level relay are switched on. |
| 5 | Minimum current | 0 – 12 A | When the pump's current falls below the set value, the message "Dry run" will be displayed, and after the expiration of adjusted time ("Dry run time"), the device will turn the pump off and report a failure. The pump can be turned on again after the failure is deleted with the \leftarrow key. Current of the pump decrease if there is no water in the tank or if the delivery pipeline is clogged. |
| 6 | Maximum current | 0 – 12 A | If the pump's current exceeds the set value, the message "Overcurrent" will be displayed. If this state remains unchanged for a specified period of time, the device turns the pump off and reports a failure. The pump can be started again after acceptance is made with the \leftarrow key. |
| 7 | Dry run time | 5 – 180 s | Indicates how long the pump is going to work after the pump's current falls below the set value of "Minimum current". After this period of time there will be a break in the pump's work, or it will be stopped in failure mode. |
| 8 | Pause time | 5 – 15 min | The time of the break in the pump's work after it is stopped as a result of a dry run. The time remaining till the end of the break will be displayed. No break occurs if the value of the setting "Dry run cycles" is 1. |
| 9 | Dry run cycles | 1 – 5 | Number of work cycles at the dry run state, after which the pump is stopped and the failure is reported. |
| 10 | Start delay | 0 – 240 s | Delay of pump's start up after the power supply voltage decays – the pump can be turned on after a specified period of time. The display shows the time, which remains to the pump's start up. This setting is to prevent pumps in units situated next to each other from simultaneous startup after decay of voltage. |
| 11 | Additional work | 0 – 120 s | After the water level falls below the set value "STOP Level", the pump will work for a period of time specified here. |
| 12 | 24h-5s work | enabled | After 24 hours standby the pump is automatically turned on for 5 seconds in order to lubricate bearings. |
| | | disabled | |
| 13 | Sound alarm | enabled | Failure is reported by an internal sound signalling device. |
| | | disabled | |

| Menu level | Upper line of display | Range of settings | Explanation |
|------------|-----------------------|-------------------|---|
| 14 | Pulsing alarm | enabled | The failure report relay is turned on every second. It can be used for supplying power to an external signal lamp. |
| | | disabled | In the case of failure the relay is switched on permanently. |
| 15 | Therm.protect1 | enabled | Set to "disabled" if thermal protection contacts have not been connected to terminals 20, 21. |
| | | disabled | |
| 16 | Work waterless | allowed | The pump can be started even if the water level in the tank is below the value at which the pump is turned off. |
| | | disallowed | The pump cannot be started if the water level in the tank is below the value at which the pump is turned off. This parameter should be set in case of hazard of explosion. |
| 17 | Phase control | enabled | The phase monitoring system protects the pump against non-uniform voltage or incorrect order of phases, and detects contactor failure. In the case of a single-phase pump, set to "disabled". |
| | | disabled | |

2.6 Additional information

2.6.1 Setting level values

The software of WSP-201 prevents the setting of unacceptable values, e.g. the value of the level at which the pump is turned off higher than the respective level of turning it on. Minimum difference between level settings is 3 cm, considering the following sequence:

1. STOP level: 0 – 94cm
2. START level: 3 – 97cm
3. High level: 6 – 100cm

Setting one of the values above will automatically change the values of the others so that the property described above is preserved.

2.6.2 Setting current values

As with level settings, the software prevents the setting of unacceptable values (minimum current value higher than maximum current value).

2.6.3 LCD contrast setting

The default contrast setting is optimum, and there is usually no need to change it. However, if such a necessity occurs, the following action should be taken:

1. Turn off the device.
2. Press and hold the keys "Manual operation" and "Automatic operation" at the same time.
3. Turn on the device – the message "Contrast" will be displayed.
4. Set required value with navigation keys.
5. Release the pressed keys "Manual operation" and "Automatic operation".

2.6.4 Calibration of internal level sensor

After long use the indications of the internal level converter may stop being accurate. In such a case, even if there is no pressure, indication of level may be other than zero. In order to calibrate the converter proceed as follows:

1. Turn off the device.
2. Press and hold the keys “Manual operation” and “Automatic operation” at the same time.
3. Turn on the device – the message “Contrast” will be displayed.
4. Press the acceptance key \leftarrow - the message “Int.converter calibrated” will be displayed.
5. Release the pressed keys “Manual operation” and “Automatic operation”.

It is recommended to calibrate the converter at each technical review.

NOTE!

Before you start to calibrate the level converter raise the bell over the water surface.

3 Troubleshooting

| Displayed message | Additional information | Cause | Solution |
|-------------------------------|---|--|--|
| High level | <ul style="list-style-type: none"> ● Signal of failure ● High level relay turned on ● Automatic deletion of the state of failure after the water level falls | Level of water in the tank exceeded value set in menu. | Check if the device works in automatic mode or if the pump is not turned off as a result of over temperature, overcurrent or a dry run. After all, check if the delivery pipeline is clogged. |
| Float switch high level | <ul style="list-style-type: none"> ● Signal of failure ● High level relay turned on ● Automatic deletion of the state of failure after the water level falls | Level of water in the tank caused switching on the high level float. | If the float switch has been connected as additional protection to the standard control system, check if the message “High level” is displayed at the same time. If not, check how high the float is hung in the tank. In other cases proceed as in the case of “High level” status. |
| Float switches wrong sequence | <ul style="list-style-type: none"> ● Signal of failure ● State of failure saved | Float switches work in the wrong sequence. | Check float connection, then check how high they are hung in the tank and if they are tangled. Check if they are not damaged and if they switch on correctly. Delete failure with the \leftarrow key. |
| Sensor 4-20mA disconnected | <ul style="list-style-type: none"> ● Signal of failure ● Automatic deletion of the state of failure after the sensor is connected | External sensor current is lower than 3mA. | Check external sensor and its connecting wire. |
| Overcurrent | <ul style="list-style-type: none"> ● A message displayed ● The pump works | Pump current is higher than the value set for “Maximum current”. | Turn off the pump, check the value of “Maximum current” and look for the cause of the overcurrent. |

| Displayed message | Additional information | Cause | Solution |
|------------------------|--|---|---|
| Overcurrent | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped ● State of failure saved | The value of “Maximum current” has been exceeded for a long time and resulted in turning the pump off. | After the cause is removed, press the ⏪ key. The pump is ready to work again. |
| No load | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped ● State of failure saved | Pump disconnected. | After the cause is removed, press the ⏪ key. The pump is ready to work again. |
| Dry run | <ul style="list-style-type: none"> ● A message displayed ● The pump works | Pump current is lower than the value set for “Minimum current”. It means that the pump is working with no water or that the delivery pipeline is clogged. | Check the value of the “Minimum current” setting. Check the level in the tank. Check if the delivery pipeline is clogged. |
| Dry run | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped ● State failure saved | Pump’s work-time at too low current exceeded value set for the “Dry run time” and the pump has been turned off. | After the cause is removed, press the ⏪ key. The pump is ready to work again. |
| Thermal fault 1 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped ● After the fault is removed the state of failure is deleted automatically | Acceptable temperature for the pump has been exceeded – contacts of thermal protection connected to terminals 20, 21 are open. | Find and remove the cause. If no thermal protection is connected to terminals 20, 21, from the menu switch off “Therm.protect1”. NOTE! After the pump is cooled down, the fault is automatically reset and the pump is ready to work again. |
| Thermal fault 2 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped ● State failure saved | Acceptable temperature for the pump has been exceeded – contacts of thermal protection connected to terminals 21, 22 are open. | After the cause is removed and the pump is cooled down, press the ⏪ key. The pump is ready to work again. If no thermal protection is connected to terminals 21, 22, the terminals shall be bridged. |
| Low voltage L1 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phase L1 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L2 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phase L2 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L3 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phase L3 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L1, L2 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phases L1 and L2 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L2, L3 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phases L2 and L3 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L1, L3 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in phases L1 and L3 falls below 190V. | After the cause is gone, the pump is ready to work. |
| Low voltage L1, L2, L3 | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Voltage in all phases falls below 190V. | After the cause is gone, the pump is ready to work. |

| Displayed message | Additional information | Cause | Solution |
|-------------------------|--|---|--------------------------------------|
| 3 phases wrong sequence | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Wrong sequence of all phases. | Swap supply lines. |
| Contactors fault | <ul style="list-style-type: none"> ● Signal of failure ● The pump is stopped | Failure of one or more contacts of the contactor. | Have the failure removed in service. |

If you press the  key in a state of failure, the sound alarm will be turned off and the relay contacts of the collective alarm system will return to their normal state. The failure will be completely deleted after its causes are removed and the  key is pressed once again.

4 Servicing and maintenance

In order to protect the device from moisture and dust keep the door and the terminal cover closed.

It is recommended that the following checks at intervals of 6-month:

1. Check the state of electrical connections and, if necessary, tight connection terminals.
2. Check the state and sealing of the pressure line.
3. If a sparge pipe compressor is used, check visually how it works.
4. Check the state of the bell in the tank and clean it if necessary.
5. Check indication of zero level at emerged bell. If it is different from zero, check carefully that the bell is not clogged and calibrate in accordance with the description included in chapter 2.6.4.
6. If the float switches are applied, check that they are clean and not tangled.
7. If you are used the 4-20mA level sensor, make sure it is not too much polluted, which can cause incorrect measurement.

5 Warranty

The WSP-201 device is covered under warranty for a period of 24 months. During that period any hidden faults and defects due to the manufacturer's fault shall be rectified free of charge.

The warranty does not cover:

1. Mechanical damage
2. Damage due to repairs carried out by unauthorized persons.
3. Damage due to power line overvoltage.

Any traces of interference, seal or mechanical damage that may cause moisture and other impurities to enter the interior of the device shall result in the warranty becoming void.

6 Information on regulations

6.1 Disposal of used equipment



This symbol on the package of a product means that the product must not be disposed of along with other communal waste. The user is responsible for the delivery of the used device to a specified place where used electrical and electronic devices are collected. Separate collection and recycling of this sort of waste plays a major role in natural resource protection and safety for health, and the natural environment. Further information on the disposal of used devices can be obtained from appropriate local authorities, in companies responsible for waste disposal, or at the place of purchase.

6.2 Declaration of conformity

We hereby certify that the product:

Single pump control system

Model: WSP-201

is compliant with the following norms:

- PN-EN 60730-1:2002
Automatic electrical controls for household and similar use – Part 1: General requirements.
- PN-EN 60730-2-16:2003
Automatic electrical controls for household and similar use – Part 2 – 16: Particular requirements for automatic electrical water level controls of the float type for household and similar applications.

This product is compliant with requirements provided by directives EMC 2004/108/WE and Low Voltage Directive 2006/95/EWG, and it was awarded a CE mark.