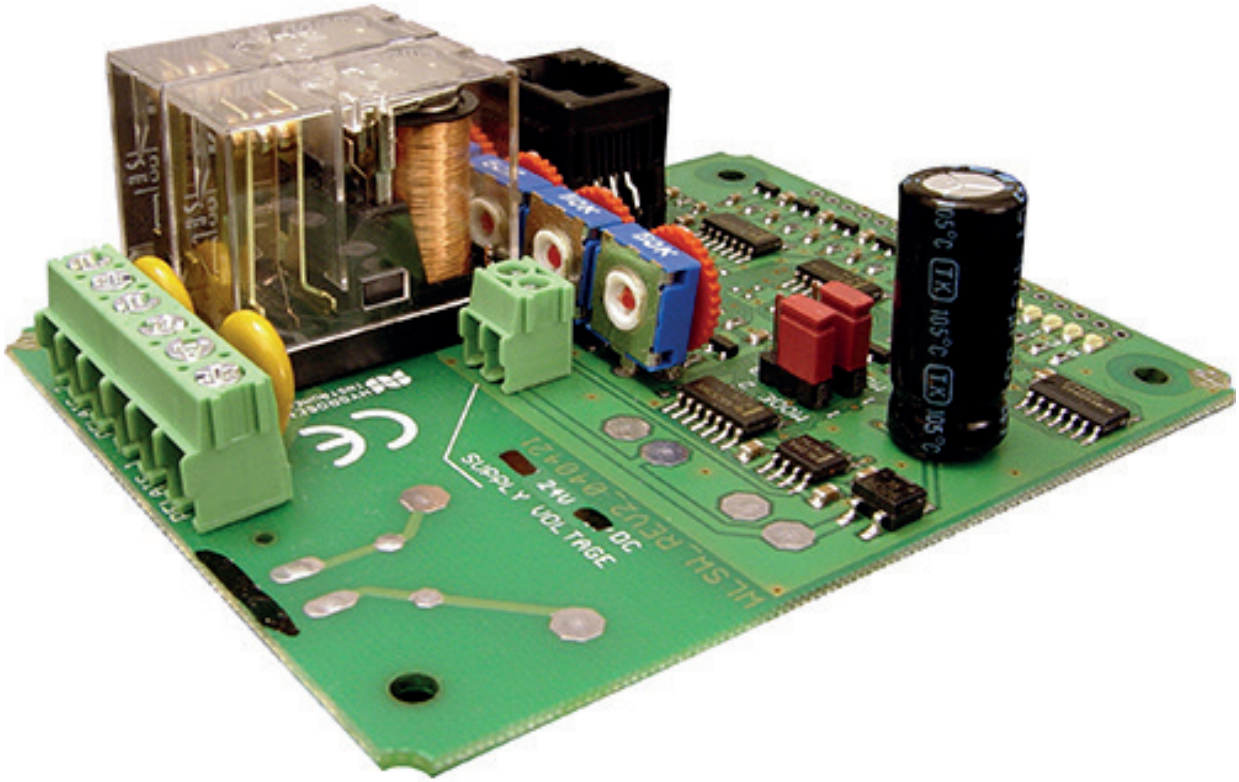
Connection and operation manual

Level controller for conducting liquids
24 V OEM-version without housing



Features

- Level controller for conducting liquids
- Simultaneous monitoring of 4 levels
- Two independent circuits for fill/empty
- Two high rating potential free relays with NO/NC contacts
- Operating voltage depending on model: 24 V AC/DC

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1 General dangers and precautions

1.1 Instructions regarding documentation

Please carefully read the following instructions before putting into operation! The symbols used in the operating manual are to make you careful, before hand, regarding safety considerations and dangers. But, in no way, these symbols can substitute the text of the associated safety instructions. Therefore, the instructions should also be always read in full detail!

This symbol indicates likely danger for persons, material or environment. The information provided in the associated text should be duly followed to avoid any kind of risk.

This symbol refers to important application notes and tips, which are necessary for successful working and should to be absolutely followed to ensure good results.

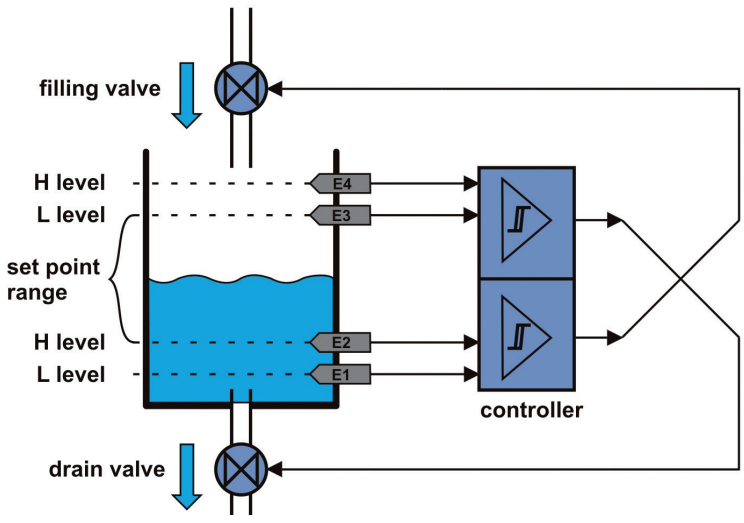
1.2 Safety instructions

Please read these instructions, carefully and completely, before putting the device into operation. Please also comply and follow the safety instructions, specially the safety regulations related to the devices to be operated on mains supply. The product should be installed and used only for the intended applications as described in these instructions. Any other application is not advised and shall lead to loss of guarantee and exclusion from liability. This also applies to any changes or other modifications carried out on the device by the user. Mounting and servicing operation should be carried out only after switching off the voltage.n The product is not meant for controlling electrical systems which perform safety related functions. In normal operation also, there is always a danger of malfunctioning due to failure of any component or any other disturbance. The user has to ensure that there are no consequential damages due to malfunctioning or undefined switching status of the relay. This is all the more possible, if heavy loads like heaters or motors are triggered with the relays. The controller is only suitable for mounting in dry locations. The liquids suitable for application of this device are all types of non-combustible, aqueous, non-corrosive and unpolluted liquids e.g. tap water. The device is not suitable for combustible, non-conducting liquids!

2 Description

2.1 Functional description

The level controller is used for regulating level of conducting liquids like supply line water, rain water or condensate. The measurement of level in the reservoir is done with the help of electrodes, for which either contact surface of the reservoir walls or self made rod type electrodes can be used. With two independent circuits, simultaneous monitoring of both minimum and maximum liquid levels and control of two different actuators are possible, for example, an inlet valve and a pump.



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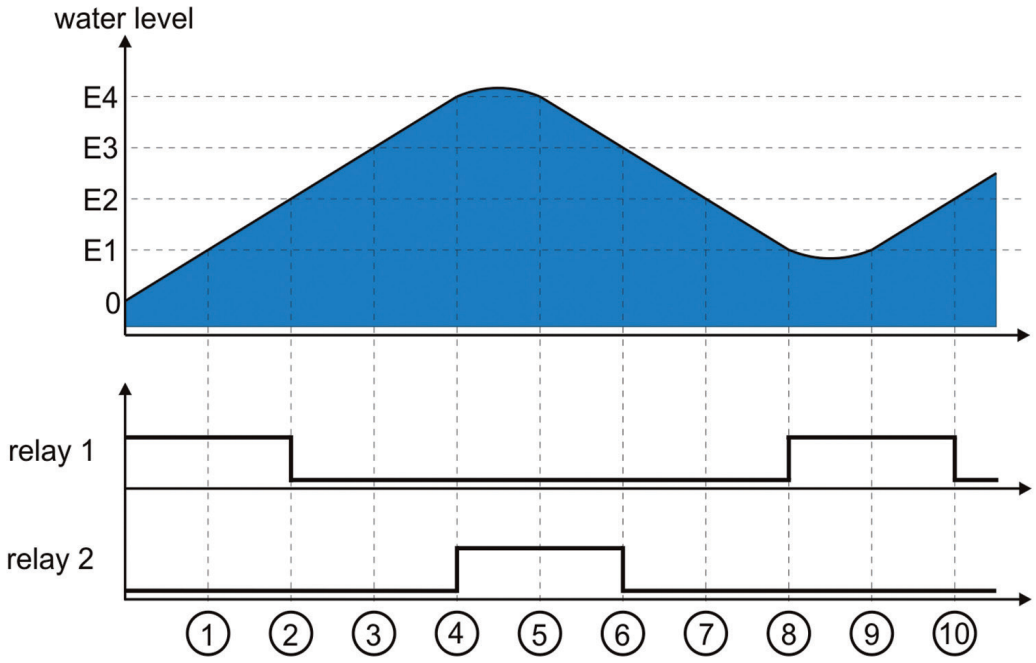
In liquid reservoir, four electrodes (E1..E4) are mounted in the medium, at heights corresponding to the required switching point. A fifth electrode is placed at the bottom of the reservoir (not shown in sketch) which works as the reference electrode.
According to water contact, the fill level is indicated through 4 green LED´s L1 to L4. If the reservoir is completely empty, the red LED glows.
For example, the lower pair of electrodes (E1, E2) can be used to control a filling valve at the inlet. After release of the lowest electrode E1, the filling valve is switched ON and switched OFF again on wetting of the second electrode E2 (Hysteresis).
For example, the upper pair of electrodes can be used to control a drain valve or a pump. During contact with the topmost electrode E4, the drain valve is switched ON and again switched OFF after release of the lower electrode E3 (Hysteresis).
The switching behaviour of the system (Filling/Empty) is to be configured over two jumper plugs. The sensitivity of the electrodes can be adjusted through potentiometers (approx. 15 k...80 kΩ).

2.2 Operating sequence diagram



Initial condition: The reservoir is first empty. ***The electrode E1*** is not in water contact. ***Relay 1*** is in closed position (because of this e.g. the inlet valve is open). The water level rises in the reservoir. Water contact with the lower ***Electrode E1*** (1) does not change the relay status and only when ***Electrode E2*** comes into water contact (2), ***Relay 1*** switches OFF (as an effect e.g. the inlet valve closes).
Upper level: If the level in the reservoir continues to rise further and reaches ***Electrode E3***, ***Relay 2*** still remains in off state. After the water level reaches ***Electrode E4*** (4), ***Relay 2*** is switched ON (and with that e.g. the outflow pump). When the level falls and ***Electrode E4*** is released free (5), the relay remains closed until ***Electrode E3*** is released free. (6). This means that between the upper switching ON point ***E4*** and the lower switching OFF point ***E3***, there is a hysteresis gap.
Lower level: If the level continues to fall, the ***Electrode E2*** becomes free (7). In the reducing level direction, ***Relay 1*** is kept in off state, till ***Electrode E1*** is also out of water contact (8). Only then ***Relay 1*** closes. If again the water level is in rising direction, ***Relay 1*** remains closed even after water contact with ***Electrode E1*** (9). Only if ***Electrode E2*** again comes under water contact, ***Relay 1*** is switched OFF (10). Hence, the lower level also has a provision of hysteresis margin.
The referred appliances “Inlet valve“ or “Pump“ are taken only as examples for illustration of the working principle. What appliances are used finally depends on the application. The switching behaviour of both the relays can be reversed through two jumper connections. The two relay circuits work as level regulators and are independent of each other. Hence, it is not necessary to use both the circuits, the device is also suitable for controlling only one level. For this purpose, only two sensing electrodes and a reference electrode are required. In such a case, the second channel (relay and electrode inputs) is not used.

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2.3 Scope of supply

The 24 V model is supplied as a module (PCB) of size 95 x 75 mm without housing or control panel.

3 Technical data

General	
Operating voltage Type-MODE24V	22...28 V DC max. 45 mA, 15...25 V AC max. 60 mA
Relay	Two relays with changeover contact
Surge suppression	NC contact with varistor VZ 05/390 V
Capacity break contact	230 V AC/ 8 A, 30 V DC / 8 A
Capacity open contact	230 V AC/ 8 A, 30 V DC / 8 A
Dimensions	PCB 95 x 75 x 30mm
CE-conformance	2014/30/EU
EMV-noise emission	EN 61000-6-3:2011
EMV-noise withstanding	EN 61000-6-1:2007
Sensor side	
Switching point impedance	15...80 kΩ, one potentiometer per measuring input
Measuring voltage	max. 5 V_{SS}
Measuring current	< 250 µA

4 Ordering information

Switching device and accessories	Ordering No.
Level controller-PCB, for 12 V DC	WLSW-12V
Level controller-PCB, for 24 V DC	WLSW-24V
Level controller 230 V, in housing with control unit	WLS-GEH230
Housing ET210F	0209 0018-01
Control unit with accessories	H409 0103-10
Sensor with connection lead	**Ordering No.**
Level sensor for a fivefold pendular electrode	ELEKT-PEND
Level sensor for LCE boiler, PU grouted	520 102-PU
Our sensor catalogue is constantly updated. Sensors for special applications are available on request !	

5 Assembly, adjustment and configuration

5.1 Electrical connection

5.1.1 Safety instructions

Due to wrong tightening of screws of the connection terminals or by use of inappropriate tool, the terminals can get damaged because of which the insulation or the contact can get disturbed.
Wrongly wired connections can destroy electric components and cause other damages.

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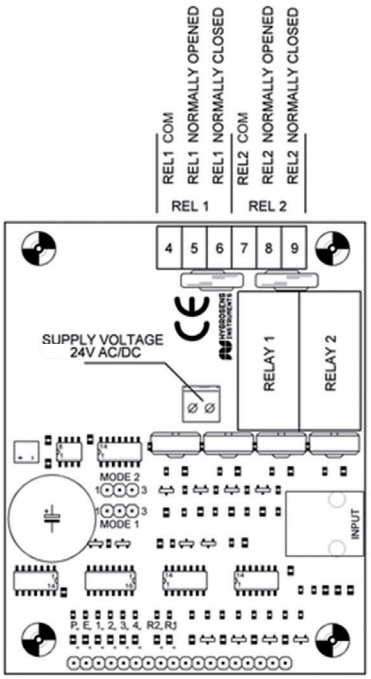
5.1.2 Operating voltage

The operating voltage is connected at the terminals “SUPPLY VOLTAGE“. The rating of nominal voltage is mentioned on the PCB and also on the relay and must be maintained as per specifications on the data sheet in order to ensure an error free functioning. A too high operating voltage can lead to damage of the device. Extremely low or unstable operating voltage leads to malfunctioning.

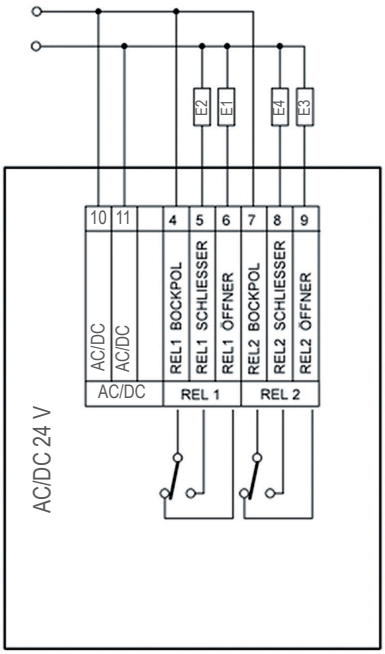
The device has a rectifier bridge after the input supply connection. Hence polarity of input voltage is arbitrary. However, if several devices are connected to the same voltage supply, the connections should be done with same polarity to avoid any potential difference in the medium.



5.1.3 Load circuit

The safety of load circuit, if required, should be taken care of through some external protection arrangement. (max. 5 A NO contact, 2 A NC contact). To switch higher currents, corresponding switching elements should be used.
The NO/NC contacts of both the relays are potential free and are terminated at the connection socket. The connection of load is done as per connector configuration. The NO contact of the relay is provided with a 390 V varistor for surge suppression.

Pin	Description
10	LIVE (only 230 V model)
11	NEUTRAL (only 230 V model)
4	Relay 1 common terminal
5	Relay 1 NO contact
6	Relay 1 NC contact
7	Relay 2 common terminal
8	Relay 2 NO contact
9	Relay 2 NC contact



E1...E4 / electrode

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5.2 Switching point adjustment

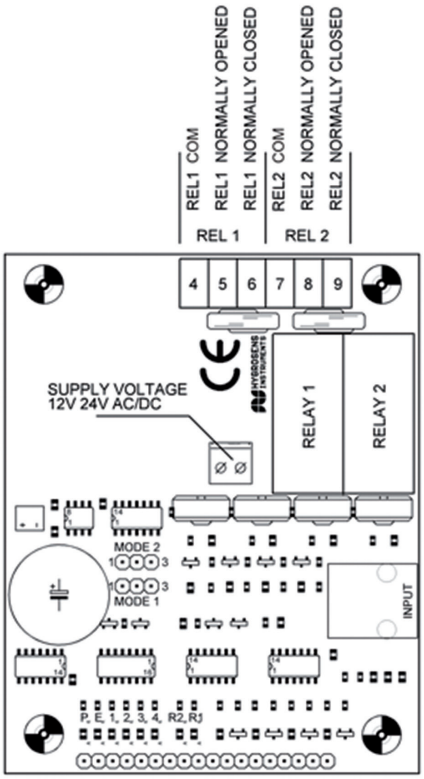
The switching point is adjusted as per conductivity of water with the preset potentio-meters. In normal practice, it is good enough to set the potentiometer in the most sensitive position (right side limit).

This corresponds to a switching point of approx. 12 µS. This works for most of the applications with clean rain water or tap water.

Ex factory the potentiometer is central adjusted.

If required, the sensitivity of each electrode can also be separately adjusted.

By turning the potentiometer in the anti-clockwise direction, the electronics become less sensitive and this gives better results with contaminated water.



In normal practice, all potentiometers should be kept at the same position and only for very diverse conditions of electrodes with respect to the reference electrode or for different lengths of connection lines, it is practically required to separately adjust the sensitivity. After any change in cable length of the connection lines, the adjustment should be checked again.

5.3 Configuration of operating mode

The switching polarity of the relay (Fill/empty) can be adjusted by two jumper plugs. The jumper plug “MODE1“ is meant for Relay 1 (lower level) and jumper plug “MODE2“ is for Relay 2 (upper level).
If connected in position 1-2, the relay switches ON with rising level and in position 2-3, the relay switches ON with falling level.

5.4 Connection of user‘s own sensors

The following details are useful for persons with adequate knowledge of the associated electronics. The applicable safety regulations shall be duly followed! Connection and mounting operations shall be carried out only after switching off the voltage supply. The following instructions help in connection of your own sensors at the input socket of electronics. However, this certainly needs necessary attention as operating voltage is present at the socket also. Sometimes, wrong connection may lead to damage of the components or result in failure of the module itself.

Touching the electronic components in switched off condition should also be avoided. Electronic components can get damaged due to electrostatic discharge process. ESD protection measures should be duly observed!

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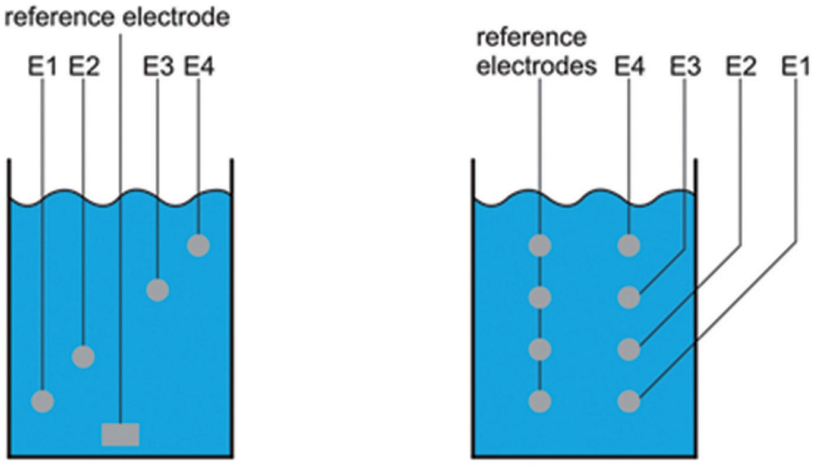
5.4.1 Pin configuration of input socket (RJ12)

Pin	Function	Colour (6 core cable)	Description
1	UB	White	15 V
2	E 4	Brown	Level 4 (E4), highest
3	E 3	Green	Level 3 (E3)
4	E 2	Yellow	Level 2 (E2)
5	E 1	Grey	Level 1 (E1), lowest
6	COM	Pink	Reference electrode
Top view of contacts on the plug!			

5.6 Construction of sensor

The sensor can be constructed in various ways:

- In plastic containers, the electrodes can be fitted in pairs on the container wall. Each pair always consists of a reference electrode and a sensing electrode, which are placed at a distance of approx. 5-15 cm from each other. For liquids of high conductivity, just one electrode at the bottom of the container is also good enough. The reference electrodes are connected together to the terminal COM. Due to contamination deposits on the container walls with time, such constructions are probably not maintenance free. The wall area between the electrodes should be periodically cleaned.



- Electrodes of stainless steel rods, hanged from top into the medium, are ideally suited for this purpose. The reference electrode is in the middle of the 4 diagonally arranged sensing electrodes which are placed in a span of approx. 1-5 cm. The spacing should be wide enough so that no drop of liquid sticks back to the rods when the level falls down. These electrodes are practically maintenance free.
- Cable probes are very simple to manufacture. For this purpose, multi-core silicon cable can be stripped at the end and joined to stainless steel balls which act as weight and also contact surface. The individual weights are lowered in the container up to the desired switching point and then the cable is tied up. For reference electrode, a bare stainless steel rope with weight can be used, which goes up to the bottom of the container. Cable sensing elements are also very reliable and practically maintenance free.
- For applications in condensate tubs and for low liquid levels, the sensing system can be constructed as a PCB which is mounted on the tank wall. Such sensing elements should also be periodically cleaned if the medium is polluted.

6 Guarantee

Hearty congratulations on the purchase of this high quality product! The quality of our products is constantly monitored within the framework of our Quality Management systems as per ISO 9001 standards. Nevertheless, if still there are any reasons for complaint, we are ready to rectify the shortcomings free of charge within the guarantee period of 24 months, if it is evident that the defect is due to some mistake on our part.

Prerequisite for the fulfilment of guarantee service is that the details of defect should be informed to us immediately and within the stipulated guarantee period.

Of course, damages due to unintended use or non-compliance of operating instructions are excluded from this guarantee coverage. Moreover, defective sensors or sensing units and also calibration service are not covered in the guarantee.

The serial number on the product should not be changed, damaged or removed.

Apart from the guarantee service, if any essential repairs are required to be carried out, the service is free. However, further services and also postage and packing expenses are chargeable.

Only repairs and replacements are covered under guarantee and other demands on the basis of liability or damage claims are not included, with the exception that general legal stipulations shall be considered valid.

6.1 Repair services

During the tenure of guarantee period, we are very much at your disposal with our service support. For any malfunctioning, you can simply send back the product to us with a short description of problems observed. Please don't forget to mention your telephone number to enable us to contact for any possible queries.

We shall inform you about the likely amount of repair charges before taking up the repair activity. The cost estimate is provided free. Postage and packing expenses for return are charged but only up to the extent of costs incurred by us.

Service adress:
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