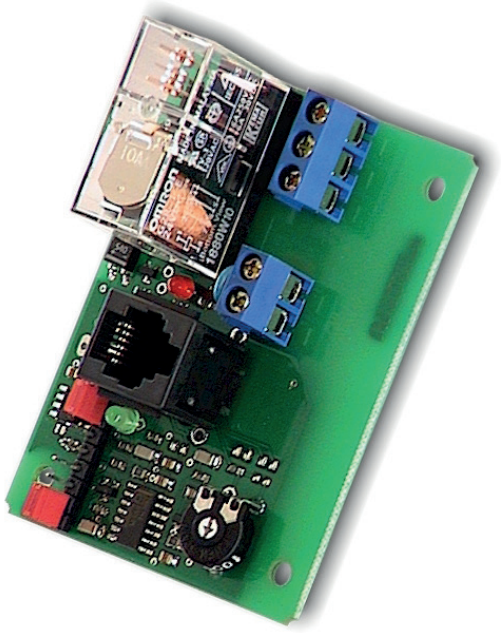
OPERATION MANUAL

Sensor control device with impedance detection

Description



Technical Data

General		
Operating voltage	12V..16V DC 65 mA max. 11V..14V AC 80 mA max. (without probe)	
Input current	Relay open 25 mA Relay closed 80 mA max	
Relay	NO/NC contact	
Load rating NO	240V AC / 3A, resistive load	
Load rating NC	240V AC /3A, resistive load	
Surge suppression	NO with Varistor 390V NC without suppression	
Signal output	5.8 kHz, 5 Vss ,1 kΩ Impedance for passive Piezo-acoustic transducer	
Indicators	Green Red	Operating voltage Relay active
Dimensions	53 mm x 72 mm x 35 mm	
CE-conformance	2004/108/EG	
EMV-noise emission	EN 61000-6-3:2011	
EMV-noise withstanding	EN 61000-6-1:2007	
Sensor side		
AC Impedance input	Series imp. Conductance	10kΩ..50kΩ 30µS..10 µS
Measuring voltage	max. 5 Vss / max. 2.5 Veff	
Measuring current	max. 125 µA	
Measuring frequency	2.8 kHz	

Characteristic features

- Universal, safe operation AC-control unit for electrolytic sensors
- Control unit with 3A, potential free relay contact
- Configurable Output for piezo acoustic transducer
- Operating voltage 12 or 24 V DC/AC

Typical areas of application

- Room humidity controller
- Dew formation switch
- Leakage monitor
- Rain, snow or fog alarm unit
- Humidity monitor for brickwork and wood work
- Control of KFZ-rear window heater

Description

The universal Sensor control module is suitable as a two point controller for a large variety of electrolytic sensors. Typical application areas are conductance & level probes, condensate switches or water/leakage sensor. Especially, the circuit is also suitable for evaluation of dew formation sensor of the series SHS or room humidity sensor of type EFS from our product range.The evaluation of sensor output is done through AC impedance measurement. An AC voltage is constantly applied to the sensor to protect it from electro-corrosion and damage caused due to electrolytic effects. The sensor input is adapted through an RJ12 socket in which all types of standard sensors (accessories) can be plugged in without any trouble of connection joints or soldering.There is a relay on the circuit board suiting to the actual value of sensor output intended for. The relay setting can be adjusted by a potentiometer. The controller does not have any hysteresis effect. The switching behaviour (i.e. choice of relay becoming active above or below the set value) can be configured by jumper connections. The high rating relay has both NO and NC contact. The normally open contact of the relay can switch loads up to 230V/3A and is provided with a varistor for surge suppression. The switching status of the relay and operating voltage are indicated through separate LEDs. An additional oscillator circuit is also available on the circuit board for an external acoustic piezo- transducer, which can also be configured by jumper plugs. The unstabilised operating voltage must lie in the range of 12 to 16 V DC or 11 to 14 V AC. There is a rectifier circuit on the module with a voltage regulator. The supply current of the circuit is approx. 60 - 80 mA, when the relay is in closed position. The PTC-heater of rain sensor, which is available as accessories, additionally needs approx. 150-300 mA.

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Available sensors

The sensors described below are available as accessories. The sensing units have a ready made 1 metre long cable fitted with RJ12-plug.

Dew formation sensor (Condensate monitor)

The dew formation sensor can recognise upcoming dew formation before it originates. The sensing unit has two independent sensor elements for dew formation and condensation, which are integrated together and have such a reliable response pattern that it can also sense already formed condensation. Typical application areas are humidity monitoring for kitchen, bathroom, showers and toilets, monitoring of external walls, cooling ducts and display windows. The range of setting is approximately from 93% to 97% RH.

Room humidity sensor

The instrument is meant for regulation of relative humidity in green houses, fields, sanitary rooms, and switchgear cabinets. The electrolytic humidity sensor embedded inside the sensing unit is protected with a hydrophobic sinter cap. The measuring range is from 35..90 % RH and is not temperature compensated.

Conductance sensor

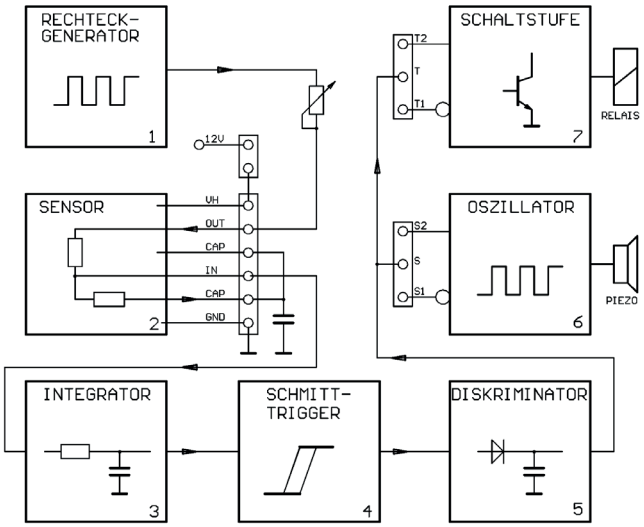
The conductance sensor is intended for monitoring of water quality (ion content), as a level switch or as a foam sensor. Measuring range is right from approx. 10µS to 30µS.

Functional description

The evaluation of sensor output is based on impedance measurement with AC voltage. Due to this special feature, the electronics is suitable for resistive, capacitive and also electrolytic sensors.
The circuit was developed with a main focus on the application area of humidity measurement. With the operating principle of applying AC voltage, it is possible to carry out continuous measurements without any damage to the sensors due to electrochemical process.

Circuit description

An oscillator generates a rectangular wave voltage signal, which feeds the upper node point of sensor system network. Its sensitivity can be adjusted through a potentiometer. The sensor can include several components as per application wherever additional items are required for temperature compensation. The following signal evaluation section reacts to either an increase of the resistance value R or decrease of impedance Z.
The signal evaluation circuit consists of an integrator with a Schmitt-trigger and a discriminator stage. The analysed signal triggers the relay or the oscillator of the acoustic signal generator. The switching behaviour of output stage and also the signal generator can be easily adjusted through jumper plugs.



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Assembly, adjustment and configuration

Safety instructions

Please read these instructions, carefully and completely, before putting the device into operation. Also follow the applicable safety regulations!

The product is to be applied 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 modifications are carried out on the product. The connections with your own sensors will be your own responsibility.

Touching the high voltage parts may lead to fatal dangers. The mounting and maintenance operation should be carried out by only trained personnel, who are authorised on the basis of technical training in this field. Mounting and servicing operation should be carried out only after switching off the voltage.

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.

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. Badly connected leads can come out during operation and cause a serious risk to safety. Due to contact resistance at terminal connections, there can be increased heat generation which can cause fire. Wrongly wired connections can destroy electric components and cause other damages.

Electrical connections

Measurement sensor

The RJ12-plug connector is provided for direct connection of the sensor. The plug connector is led through a gland provided in the housing and properly mounted through PG7 threads. Then the plug is inserted in the socket.

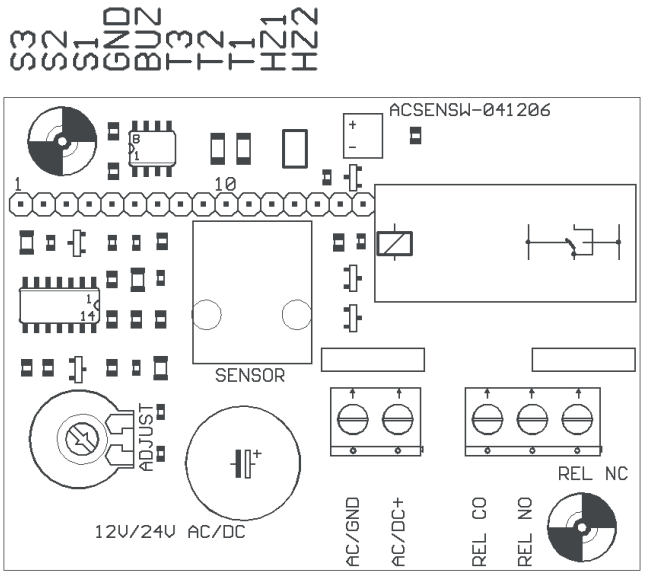
Configuration

The configuration of jumpers for connection of readymade sensors can be carried out as per data sheet of the sensor.

The switching behaviour of relay and signal generator is determined by the position of jumpers in the connection socket. The switching status of the device can be seen on LED. In active condition (= relay closed), the red LED glows.

Switching point adjustment

The adjustment of switching point (set value) is done through a preset potentiometer as per the type of sensor. It is to be noted that the entire rotation angle, as applicable for the connected sensor, should not be consumed.



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Operating voltage

12V/24V-AC/DC model : The operating voltage is to be connected at the terminals “AC/GND“ and “AC/DC+“. The rating of nominal operating voltage is mentioned on the relay and must be maintained as per specifications on the data sheet in order to ensure error free functioning. Too high operating voltage can lead to damage of the device. Extremely low or unstable operating voltage leads to malfunctioning.

Over current prevention should be externally carried out with a suitable protection arrangement.

Function	Description
AC/GND	AC-Connection or Reference potential for DC-supply
AC/DC+.	AC-Connection or positive operating voltage for DC-supply

Load circuit

The protection of load circuit should be externally done with a separate protection (max. 3A). For switching higher currents, suitable switching devices must be used.

The AC contact of the relay is potential free and is brought out on the socket strip. It is connected to the load as per the connection layout. The NO contact of the relay is provided with 390V varistor for surge suppression. The NC contact is not provided with a varistor.

Function	Description
REL CO	Relay middle contact (Base pole)
REL NO	Relay normally open
REL NC	Relay normally closed

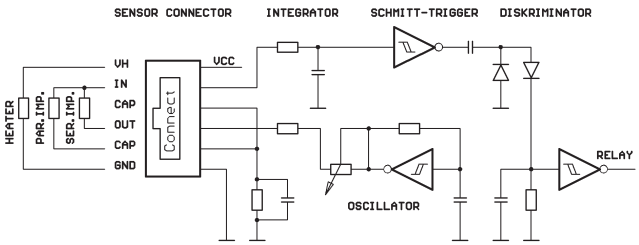
Connection of special sensors

General instructions

The following instructions help in connection of your own sensors at the input socket of the module. 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 is also to be avoided. Electronic components can get damaged due to electrostatic discharge process. ESD protection measures should be duly observed !

Circuit diagram



Functional description

The impedance input is specially suitable for electrolytic type of sensors like conductance and level probes, foam sensor, humidity and dew formation sensors, material moisture content sensor or water/ leakage sensor. The operating principle is based on an AC voltage measurement, that prevents the measuring current from creating electrochemical effects.

The evaluation is done based on the series impedance of a sensor which is connected between OUT and IN terminals, or by the parallel impedance of a sensor (e.g. a interdigital structure) connected between IN and CAP terminals. In such a case, a resistance of 0 to 47k is inserted between the OUT and IN terminals.

The RC-oscillator generates a rectangular voltage waveform of approx. 2.4 kHz frequency. The measuring current is integrated through the preset potentiometer and the sensor placed in series (between AC OUT and SENS IN) and the saw tooth voltage waveform is evaluated at the capacitor with the Schmitt trigger. On exceeding the critical impedance, the oscillation is trimmed at the output of Schmitt trigger. The discriminator controls the inverter and relay.

The switch polarity can be selected by the jumper T1-T2, available on the jumper socket. The switching status of output is indicated through a red LED.

In case of a conductance switch, a fixed resistance (approx. 0 to 47 k) is connected between AC OUT and SENS IN terminals instead of the sensor. In such a case, the sensor is connected between SENS IN and CAP GND terminals and modulated through the capacitive current of signal amplitude. This type of operation is meant for conductance measurement in liquids or for detecting presence of water.

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Pin configuration of RJ12 input

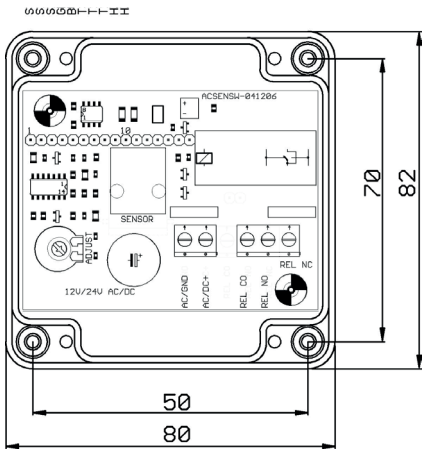
Pin	Function	Description
1	+12/24V	Operating voltage
2	OUT	Output AC
3	CAP	Capacitive ground
4	IN	Evaluation input
5	CAP	Capacitive ground
6	GND	Device ground

Operating voltage connection

A rectified DC operating voltage is available at pin 1 of RJ12 socket to feed supply to external components (e.g. heater of rain sensor). This voltage depends on the device model and module operating voltage is generally between 12V und 35 V DC. The supply is unstabilised and without short circuit protection. The max. current flow should not exceed 200 mA.

Adjustment

The switching point of the impedance can be adjusted with the potentiometer “ADJUST“. The hysteresis margin is not adjustable.
The range of setting for measuring the series impedance is right from 10 kΩ to 50 kΩ. The range of setting for parallel conductance is from 10µS to 30 µS.



Configuration

The module has a ten pole connection strip on which 3 jumpers are placed. The pin configuration is as follows:

Pin		Function	Behaviour
1	S2	Signal generator	Signal generator ON if Z < set value
2	S	Signal generator	Must be linked with pin 1 or 3
3	S1	Signal generator	Signal generator ON if Z > set value
4	GND	Signalgenerator ground	Ground point for external signal generator
5	BUZ	Output for Signalgenerator	Connection for external signal generator
6	T2	Relay output	Relay active if Z > set value
7	T	Relay output	Must be linked with pin 6 or 8
8	T1	Relay output	Relay active if Z < set value
9	VH	Heater for rain sensor	Heater can be switched ON in combination with pin 10
10	VCC	Operating voltage	Can be linked to pin 9

A piezo electric transducer can be connected to pin 4 and 5 as an acoustic signal generator. The active status of the signal generator can be set through pins 1 to 3, i.e. under what condition, the sound signal has to generate. If the jumper is between 1 and 2, the audio signal becomes active if sensor impedance falls below the set value. If the jumper is between 2 and 3, the signal gets active on impedance exceeding the limiting value.The active status of the relay can be defined through a separate adjustment, independent of the signal generator. If the jumper is inserted between pin 6 and 7, the relay closes if the impedance value of sensor is more than the adjusted limiting value. If the jumper position is changed to pin 7 and 8, the switching behaviour of relay gets reversed.With the help of jumper between pin 9 and 10, the heater of rain/snow sensor, available as accessories, can be switched ON or OFF. If the jumper is placed between these two pins, the heater is active. The heating element (PTC) approximately requires an additional 150 – 300 mA current at an operating voltage of 12V.After the jumper plugs are configured according to the desired functions, turn the potentiometer to the middle position, switch on the power supply and put the circuit into operation. The green LED signals the operating status (operating voltage). The red LED glows if the relay is closed.

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Ordering number format

Universal switch module	
with operating voltage 12 V	0557 0002
with operating voltage 24 V	0557 0002-01
Measuring unit with connection cable	**Ordering No.**
Dew formation senso	SENSW-BTF
Conductance sensor	SENSW-LWF
Space humidity sensor	SENSW-RFF
Rain, snow and leakage sensor	H636 0002

The product is supplied in the form of a PCB of size 53 mm x 72 mm without housing or probes. Different type of standard probes, sensors and plastic housing are available as accessories.

Attention

Please avoid extreme mechanical and inappropriate exposure.

The device/product is not suitable for potential explosive areas and medical-technical applications.

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 due to non-compliance of operating instructions, is excluded from this guarantee coverage. Moreover, defective sensors and 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.

Compensation demands on the basis of claim for liability or damages during the guarantee period are excluded and these are, in general, not legally covered.

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