Manual

Miniature - Sensors ASY

with analogue / digital output

REINHARDT System- und Messelectronic GmbH

Bergstr. 33, D-86911 Dießen-Obermühlhausen

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Temperature
analogue

Wind speed
Pulse output

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Precipitaion
Pulse output

Temperature & Humidity
analogue

Clouds sensor
(old Version)

Global solar radiation sensor
(old Version)

Rain detector - Rain sensor
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1 Caution

1.1 Intended Use

REINHARDT Weather stations and sensors are exclusively built for measuring climatic parameters.

The operating temperature range is between -40°C ... +60°C.

Any use other than described above may cause damage of the product or lead to other dangers.

Do not mount the weather station in reach of children and pets.

Carefully read the complete operating manual. It contains important information about the installation and operation.

1.2 Safety Regulations

The instruments are manufactured according to modern technical standards and can be operated without danger when used as directed.

Damage caused by non-observance of this operating manual can lead to forfeiture of warranty. We shall not assume any liability for subsequent damage.

We shall not assume any liability for damage of items or persons caused by improper handling or non-observance of the safety instructions! In such cases any guarantee claims shall become null and void.

Dear customer, the following safety and hazard notices not only serve the protection of your health but also the protection of the appliance. Please read the following points carefully.

The supply voltage is converted by isolated transformers into voltages of maximum 30VDC. Please do only use the supplied power supply units.

Do not leave the packaging material lying around. These parts are dangerous toys in the hands of children.

Handle the product with care. Blows or impact, or dropping it even from a small heigth will damage it.

The supply voltage must be in the range from 8 to 30VDC. The sensors will be permanently damaged in case of polarity reversal or when a voltage higher than 30VDC is applied.

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1.3 Mounting

The sensors are mounted on a bracket fitting to M18 thread. (Old sensors M8 Thread)

These sensors are designed to measure Global radiation (solar energy) in W/m², Light intensity in lux, Ultraviolet radiation, Temperature, Humidity and for detecting precipitation and clouds.

These sensors are either connected to a Reinhardt weather station as additional sensor or to any other measuring system which measures analog / digital parameters.
When connected to a Reinhardt weather station, the interpolation is performed by the weather station. When connected to any other instrument, the interpolation has to be done by the customer with the enclosed calibration protocols.

2 Commissioning

2.1 Hardware Installation

Mount the sensor's thread on a suitable bracket and fix it with it's nut.

Then adjust the sensor into the desired direction. the detector for precipitation should be mounted vertical.

The sensors are supplied with 2m cable either with an 8-pole Binder-plug for connecting it to a Reinhardt weather station or with open cable tails.

After connected to a Reinhardt weather station or any other measuring system the sensors now will start measuring.

SAFETY HINT
The supply voltage must be within 8 and 30 VDC. The best voltage is 18 VDC!

2.2 Installation of Software

When the sensors are connected to a Reinhardt weather station you'll find the necessary software on the supplied Weather USB-stick.
Insert the into an USB-port.
Start STARTER.EXE in the root-directory of the WetterStick.

If you don't connect these sensors to a Reinhardt weather station you don't need a software from the WetterStick. In this case you need own software or measuring system.

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3 The Sensors

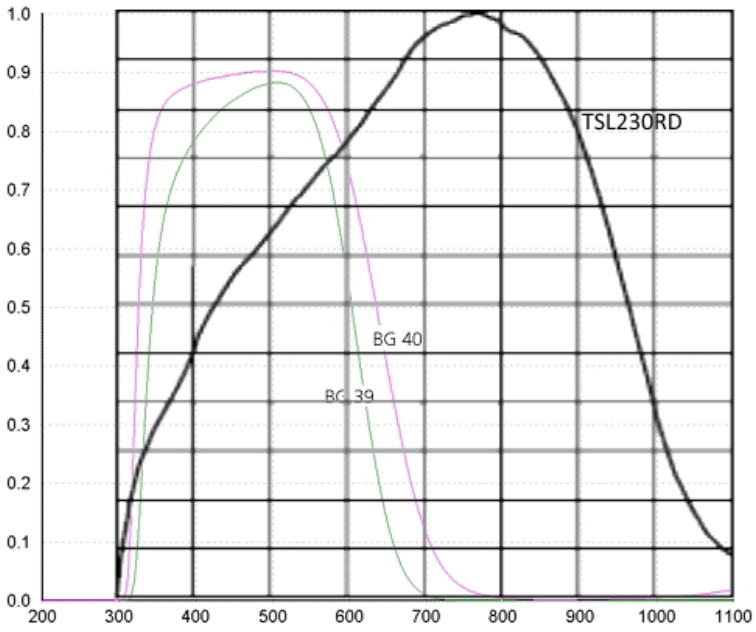
3.1 Global radiation sensor GS-ASY

The global radiation sensor measures the global radiation in the spectrum range from 305nm to 2400nm. The measuring range is between 0 and 1300 W/m².
Accuracy is +/- 40W/m² in the temperature range from +5°C to +40°C.
The output is 0 to 4VDC.
The exact values you'll find on the calibration sheet supplied with each sensor.

3.2 Light intensity sensor HK-ASY

The light intensity sensor measures the intensity of visible light in the spectrum range from 370nm to 680nm. The measuring range is between 0 and 150.000 lux.
Accuracy is +/- 6 %.
The output is 0 to 4VDC.
The exact values you'll find on the calibration sheet supplied with each sensor.

The spectral response of the sensor TSL230RD and the optical transmission of BG-39 filter you can see below.



This sensor can be orded with frequency output (TTL) as well.

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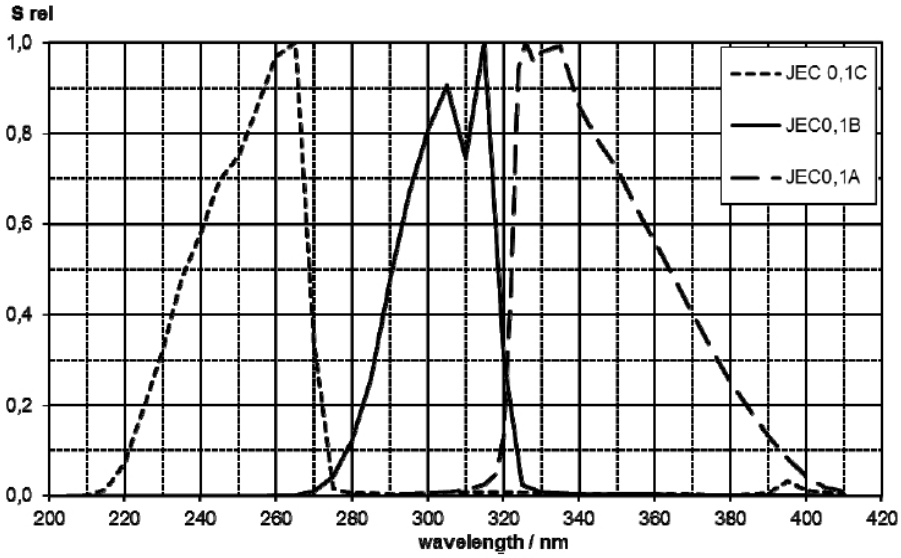
3.3 Ultraviolet sensor (UV-Sensor) UV-ASY

The UV-sensor sensor measures ultraviolet radiation in the spectrum range from 320nm to 395nm.
The measuring range is between 0 and 50.000 mW/m².
Accuracy is +/- 10 %.
The output is 0 to 4VDC.
The exact values you'll find on the calibration sheet supplied with each sensor.

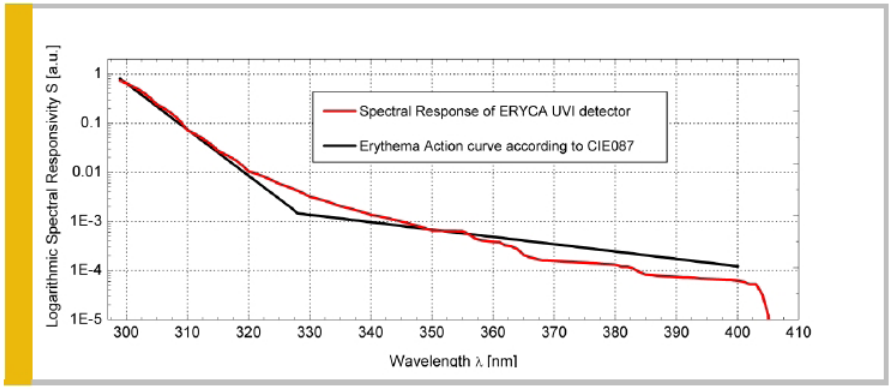
The spectral response of the sensor is displayed below. It's the curve of JEC 0.1!



3.31 UV-Index sensor (UVI-Sensor) UVI-ASY

The UV-Index sensor directly measures the UV-Index (erythemal action spectrum) with the maximum at 297nm. The measuring range is between 0 and 12 UVI.
Accuracy is +/- 0.5 UVI.
The output is 0 to 2.4VDC.
The exact values you'll find on the calibration sheet supplied with each sensor.

The spectral response of the sensor is displayed below.



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3.4 Cloudssensor WK-ASY

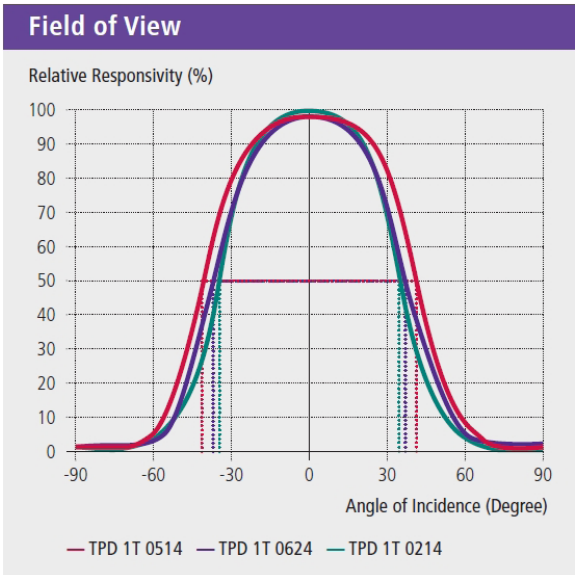
The cloudssensor detects if the sky is covered by clouds or not with a thermopile.
If clouds are detected, the sensor switches to 5 VDC, if no clouds are detected it switches to 0VDC.
In addtion there is a second signal (analog) with allows to calculate the cloud base using a special formula.
When using this sensor as an additional sensor at one of our Micro Controller weather stations, the cloud base can be directly calculated by the enclosed software and displayed as a virtual sensor.
The formula is: $T(h) = T_0 - h * y$, where T(h) is the cloud's temperature, T_0 the ambient temperature, h is the altitude and y is the temperature gradient in [K/m].
The temperature gradient y is the cooling down in [K] per metre altitude. The value of this gradient is depending on the humidity of the air (dry adiabatic lapse rate or wet-adiabatic lapse rate).
The wet-adiabatic lapse rate is app. $5*10^{-3}$ Km^{-1}, the dry adiabatic lapse rate is app. 10^{-2} Km^{-1}.
For the exact weather conditions in the athmospere are mostly not known, meteorologists calculate with an average value of $6.5*10^{-3}$ Km^{-1}, this means a cooling down of app. 6.5°C per kilometer.
The calculation of the cloud base by this formula can be faulty due to influences caused by different weather situations and must not be used for security-related measurements, (i.e. air traffic, ...)!
If you don't use this sensor as additional sensor within a REINHARDT weather station, you need to calculate the measured values with the delivered calibration sheet.
The sensor has got 3 outputs:
ZA: Signal of the thermopile with an offset due to temperature coefficient. This offset is listed in the calibration sheet for different temperatures and has to be subtracted from the measured values on outputZA.
This output can be used to calculate the cloud base.
Example:
ZA (Signal of thermopile) = 2500mV
Offset at ambiet temperature(ZC) = 255mV
Sensitivity: 355mV / 6.5K (=1000m altitude)

Cloud base = (ZA - Offset) / Sensitivity = (2500mV - 255mV) / 344mV/km = 6.5km

ZB: Digital output 0 or 5VDC. 0V (lo) means, there is no cloud detected within the area detected by the sensor, 5V (hi) means that there are clouds detected.

ZC: Temperaturesensor-output. This output measures ambient temperature with an accuracy of +/- 1°C. It is used to perform the compensation for the offset of the signal at output ZA.

The field of view of the thermal column detector used is shown on the right.
We use the TPD 1T 0514 or the TPD 1T 0214.



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3.5 Preciptiation detector RDM-ASY

The precipitation detector switches to 5 VDC when a drop falls onto the sensor. When this happens, the internal heating is activated to dry the sensor as fast as possible. The heating also is activated when the temperature drops below app. 3°C to keep the sensor free from ice. This allows the detection of snow as well.
If the sensor is dry it switches to 0 VDC.

This sensor is NOT available for 5V supply voltage!!

3.6 Preciptiation sensor radar RDR-ASY

is a maintenance free detector using a 24GHz Doppler-Radar for detecting rain and hail.
To avoid errors in detecting the sensor must have free sight at the top.
Caution: very light drizzle and snow cannot be detected reliable. This is caused by too small content of water, droplet size and drop speed reflecting the radar signal not sufficient enough.

The RDR-ASY detects direct and passing drops. The clear distinction between raindrops and other objects causing a similar radar reflection is difficult. So the RDR-ASY must be mounted distantly enough to moving objects like trees, streets, persons i.e.
The sensor also must not be mounted near neon tubes, HID-lamps and other systems using 24GHz frequency.

To avoid detection in error caused by a single event (spurious pulse, insects, birds or contaminants carried by the air) the first pulse is blocked for app. 1.5 seconds. After this time the detection is enabled for app. 1 minute and sets the sensor RA to high when another detection happens within this time.
After being set to high the sensor's output stays high for app. 2 minutes. When a new detection is performed within these 2 minutes this countdown is restarted (retriggered).

3.7 Temperature sensor TE-ASY

is a temperature sensor with analogue output and radiation shield.
This sensor uses an highly integrated temperature sensor MCP9700A (Microchip).
The accuracy is +/- 0.5°C.

3.8 Temperature & humidity sensor TEFE-ASY

is a temperature and humidity sensor with analogue outputs and radiation shield.
This sensor uses a combined sensor element SHT31-ARP-B (Sensirion) for measuring temperature and humidity with high accuracy.
The accuracy of temperature measurement is +/- 0.5°C.
The accuracy of humidity measurement is +/- 2.5%.

3.9 Rain sensor with TTL-Output RM-TTL

The RM-TTL measures the amount of rain with a teflon coated seesaw with a magnet detcted by a hall sensor. Each time the seesaw tilts a pulse (negative pulse TTL with app. 10ms width) is sent at the output.
This sensor cannot be equipped with a heating device.
If you need a precipitation sensor with heating the RMS 55-TTL would be the recommended solution.

3.10 Wind speed sensor with pulse output WG-TTL

The WG-TTL measures the wind speed with a 3 cups anamometer via a hybrid light barrier.
At a wind speed of 10 km/h the sensors has got an output frquency of app. 459 Hz (one pulse each 2.18 ms).
This sensor cannot be equipped with a heating device.

3.20 Cloudssensor (old version)

The cloudssensor detects if the sky is covered by clouds or not with a thermopile.
If clouds are detected, the sensor switches to 5 VDC, if no clouds are detected it switches to 0VDC.
In addtion there is a second signal (analog) with allows to calculate the cloud base using a special formula.
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The sensor has got 3 outputs:
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3.21 Global radiation sensor

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3.22 Preciptiation detector (old version)

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If the sensor is dry it switches to 0 VDC.

Supply current is app. 4mA, with active heating app. 76mA.
Heating power is calculated as follows:: P = (VCC-5V) * 0.072A.

This sensor is NOT available for 5V supply voltage!!

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4 Technical appendix

4.1 Connection as single sensor with one output signal

When used as single sensor with one output signal and open wire ends there is the following cable assignment:

Temperature, Light intensity, global solar radiation, precipitation TTL, ...
brown - VCC 18VDC (possible voltage 8..28V)
blue - Signal (0..4.095V or TTL-pulses)
black - GND

4.2 Connection as sensor with more output signals

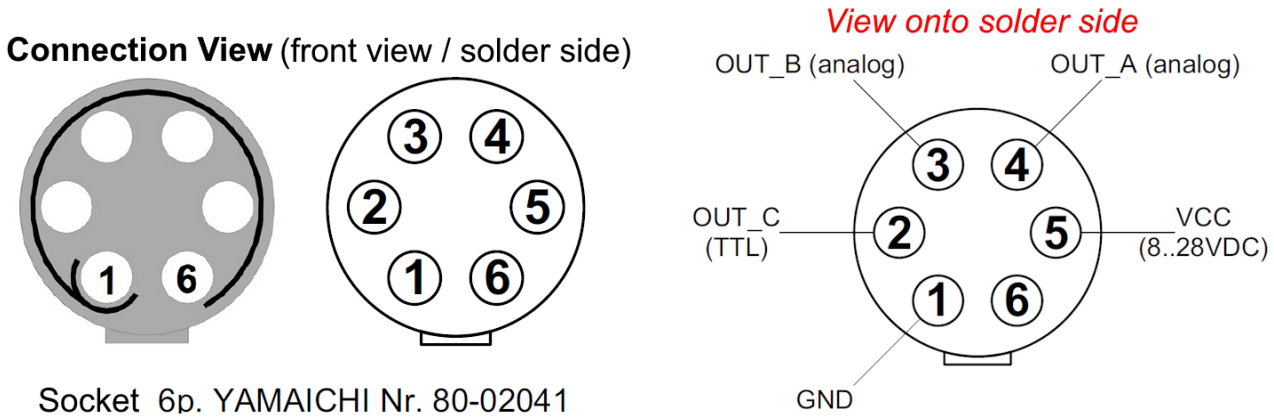
Sensors with more than one output signal have got the follwing cable assignments:

Clouds sensor (WK-ASY):
pink - VCC 18VDC (possible voltage 8..28V)
green - WKS analog (Signal for calculating the clouds base)
white - WKS digital (0V: no clouds, 5V: clouds detected)
yellow - Temperature of the sensor
grey - GND

Temperature & humidity (TEFE-ASY):
pink - VCC 18VDC (possible voltage 8..28V)
green - Temperature
yellow - Humidity
grey - GND

Rain radar sensor (RDR-ASY):
pink - VCC 18VDC (possible voltage 8..28V)
green - RDR active (high when rain is detected)
white - RDR pulses (active when rain is detected)
yellow - RDR analog (intensity (size of drops))
grey - GND

4.3 Socket Sensors ASY



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4.4 Connection as additional sensor

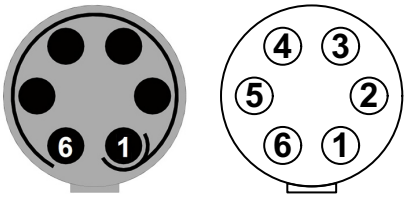
26.09.2024

ASY-Connection cable YAMAICHI

Straight cable plug 6 pole

PUSH-PULL Y-CIRC P, PB, Series: T (IP68)

contact view (connection-side/solder side)

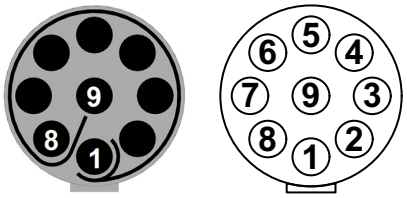


Plug 6p. YAMAICHI
Nr. 80-05781 (AWG 24, cable-Ø 4,5-5,1)
Nr. 80-06221 (AWG 24, cable-Ø 4,0-4,6)

Straight cable plug 9 pole

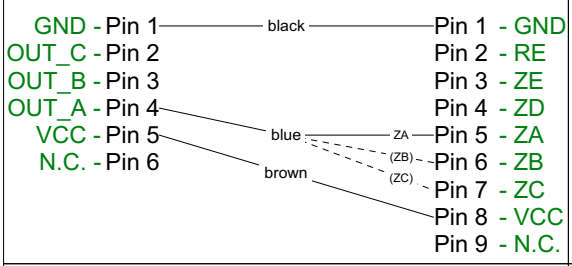
PUSH-PULL Y-CIRC P, PB, Series: T (IP68)

contact view (connection-side/solder side)

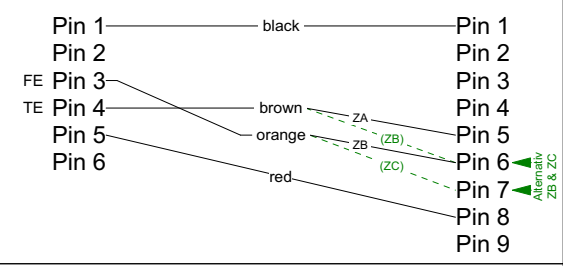


Plug 9p. YAMAICHI
Nr. 80-05873 (AWG 24, cable-Ø 4,5-5,1)
Nr. 80-06223 (AWG 24, cable-Ø 4,0-4,6)

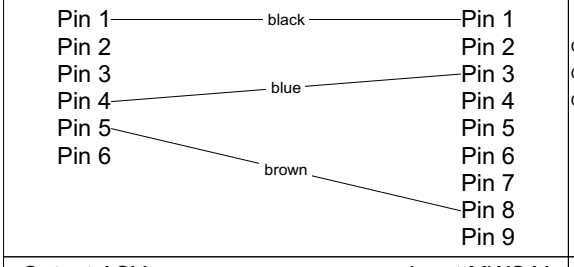
ZA (ZB) (ZC) — 2m (3-pole)



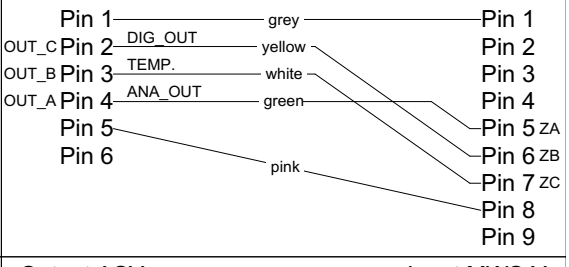
TEFE-ASY — 2m (4-pole)



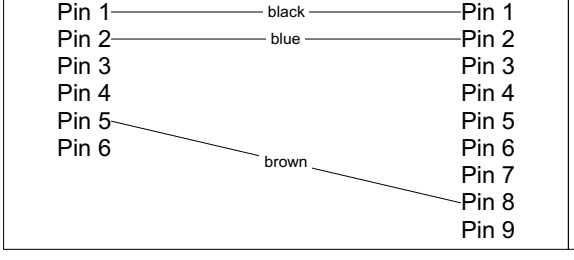
SO / ZE — 2m (3-pole)



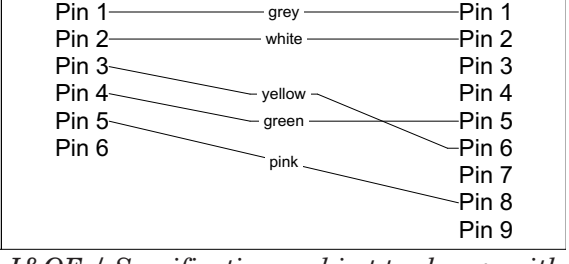
WK-ASY — 2m (6-pole)



RE-TTLY — 2m (3-pole)



RDR-ASY — 2m (6-pole)



I&OE / Specifications subject to change without prior notice !
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