RELATIVE HUMIDITY SENSOR

Description D0381bt

Figure 1. The Relative Humidity Sensor

Short description

The Relative Humidity Sensor can be used to measure relative humidity in the air as part of a weather station, or to

- optimise conditions in a greenhouse or terrarium;
- determine the good days for electric demonstrations;
- determine when static electrical discharges will be a problem;
- study transpiration rates of plants by monitoring relative humidity in sealed jars containing plants.

The Relative Humidity Sensor is delivered with a BT plug and can be connected to the following interfaces:

- UIA/UIB boards through the Measuring Console (via 0520 adapter)
- CoachLab
- CoachLab II
- SMI (via 0520 adapter)
- Texas Instruments CBL™ data-logger.

There is an adapter (art. 0520) to connect sensors with BT plugs to the 4-mm inputs.

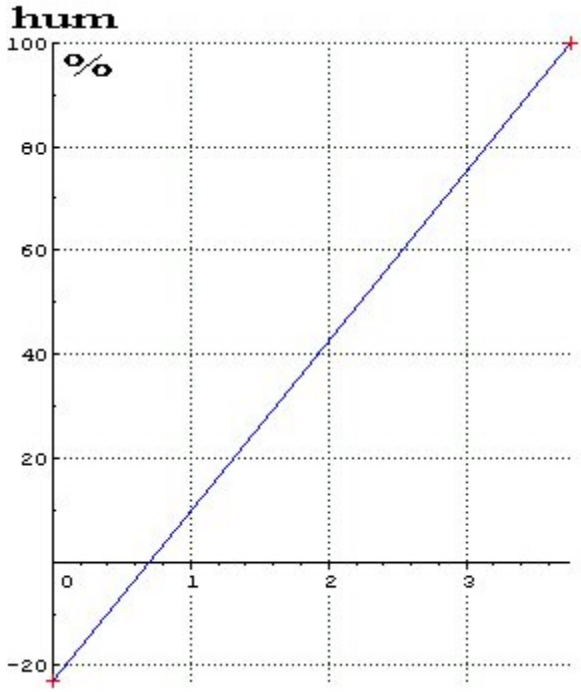
The Relative Humidity Sensor consists of an integrated circuit (Hy-Cal Engineering IH-3602-L), which uses a capacitive polymer to sense humidity. The integrated circuit then produces an output voltage, which varies with relative humidity. The sensor is placed in the black box. The holes in the box are to provide air circulation. The response time of the unit in moving air is much shorter then in the still air. In some cases you may want to create air currents (by moving the sensor, or using the fan) to speed up the response of the sensor.
The Integrated Circuit Humidity Sensor is housed inside the small, black, plastic box. This box not only protects the sensor, but also shields it from light. The sensor is slightly light sensitive if the light strikes it in just the right way. The box housing is designed to minimise the amount of light that can penetrate the sensor openings.
The calibration of the sensor is somewhat affected by temperature. This effect is negligible at the low relative humidity readings, but increases at high humidities. If you want to correct for this error, you can create different calibration files for different temperatures. In most cases, this is unnecessary.

Calibration

For greatest accuracy the Relative Humidity Sensor has to be calibrated. Calibration can be done by comparison to another instruments that measures relative humidity (hygrometer or psychrometer). Another way is to use saturated salt solutions. The salt solutions are used to maintain environments with different known relative humidities. If you place moist salts in a sealed container, the air above it will reach a known relative humidity. A table of values is shown below. The relative humidity above the salt depends slightly on the temperature, so the table lists also temperature.

Step-by-step calibration procedure:

- Place a handful of salt in the bottom of a jar (250 cc - 1000 cc);
- Add a little water to the jar so that the salt is wet. The goal is to end up with wet salt, not to totally dissolve the salt.
- Place the humidity sensor in a jar. Do not get the salt or salt solution on the sensor.
- Seal the jar. You can use the plastic wrap or rubber bands.
- It takes time (2 tot 6 hours) for the air inside the sensor to reach the proper relative humidity level.
- Determine the output voltage in the measurement program and write down this value. Make note about the relative humidity for the salt you used as determined from the table.
- Repeat above procedure for the second calibration point using a different salt. Be sure to allow enough time for the Relative Humidity Sensor to adjust for the change in humidity.



Calibration graph of the Relative Humidity Sensor – example.

Here are the relative humidity readings to use when calibrating with salts. These numbers were taken from Hy-Cal Engineering IH-3602-L *data sheet*). Even though none of the salts listed here is especially dangerous, use normal cautions with these chemicals.

All data in %	**15 °C**	**20 °C**	**25 °C**	**30 °C**	**35 °C**
Lithium Bromide	6.86	6.61	6.37	6.16	5.97
Lithium Chloride	11.3	11.31	11.3	11.28	11.25
Potassium Acetate	23.40	23.11	22.51	21.61	–
Magnesium Chloride	33.3	33.07	32.78	32.44	32.05
Potassium Carbonate	43.15	43.16	43.16	43.17	–
Magnesium Nitrate	55.87	54.38	52.89	51.4	49.91
Potassium Iodine	70.98	69.90	68.86	67.89	66.96
Sodium Chloride	75.61	75.47	75.29	75.09	74.87
Ammonium Sulphate	81.70	81.34	80.99	80.63	80.27
Potassium Chloride	85.92	85.11	84.34	83.62	82.95
Potassium Nitrate	95.41	94.62	93.58	92.31	90.79

The name of the relative humidity sensor in the sensor library of Coach 5 program is **Humidity sensor (0381&BT) CMA.**

Technical data

Range Resolution using 12 bit 5 V AD converter	0 - 100% 0.04 % RH *(RH = Relative Humidity)*	
Power	5V; 200 µA	
Response time (time for 90% change in reading)	In still air: With vigorous air movement:	60 min 40 s (typical)
Specification for the IH-3602-L Integrated Circuit Humidity Sensor at 25°C and 5 VDC		
Total accuracy (with saturated salt calibration)	±2% RH	
Total accuracy (with standard calibration)	±10% RH	
Operating temperature range	0 - 85 °C	
Temperature effect on 0% RH voltage	±0,07% RH/°C (negligible)	
Temperature effect on 50% RH voltage	-0,11% RH/°C	
Temperature effect on 95% RH voltage	-0,22% RH/°C	
Connection	 BT (British Telecom) plug	

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