# DigiPicco™ Basic I²C
## Capacitive Humidity Module
## With calibrated and linearized I²C output signal

**IST**
INNOVATIVE SENSOR TECHNOLOGY

HUMIDITY

TEMPERATURE

FLOW

CONDUCTIVITY

## Benefits & Characteristic

- Precise humidity and temperature measurement
- Fully calibrated
- Very low drift due to wide sensor area
- Excellent response time
- Integrated Pt1000 temperature sensor and P14 humidity sensor

- Module with external sensor available
- Calibrated humidity and temperature signals on one bus
- PCB moisture protected
- Customer specific module available upon equest

## Illustration[1]
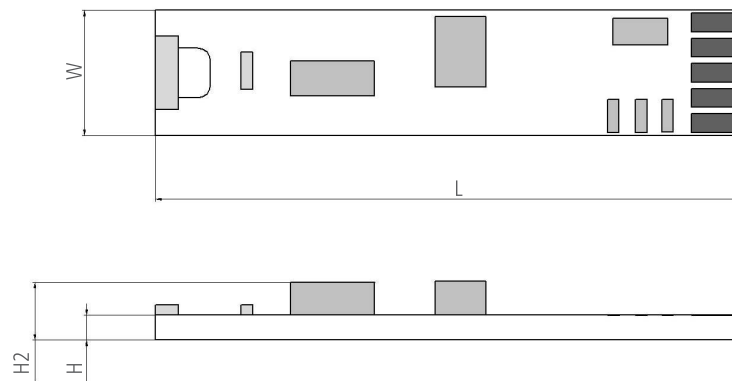


1) For actual size, see dimensions

## Technical Data

| | |
|---|---|
| Dimensions (L x W x H / H2 in mm): | 47 x 10 x 1 / 2.8 |
| Operating humidity range: | 0 % RH to 100 % RH (maximal dew point = +85 °C) |
| Operating temperature range: | -25 °C to +85 °C with external sensor elements, other ranges on request (P14: -50 °C to +150 °C or MK33: -40 °C to +190 °C) |
| Humidity sensor:* | P14 SMD |
| Temperature sensor:* | Pt1000, class B (DIN EN 60751 F0.3) |
| Humidity accuracy: | < ±3 % RH (15 % RH to 85 % RH at +23 °C) <br> < ±5 % RH (0 % RH to 15 % RH and > 85 % RH at +23 °C) |
| Temperature accuracy: | ±0.5 K (-25 °C to +85 °C) |
| Response time $t_{63}$: | < 5 s (50 % RH to 0 % RH) at +23 °C |
| Operating voltage ($V_{CC}$): | 5 $V_{DC}$ |
| Current consumption: | < 3 mA |
| Output signal: | 0x0 to 0x7FFF (0 % RH to 100 % RH) |
| | 0x0 to 0x7FFF (-40 °C to +125 °C) |
| I²C standard address:* | 0x78 |

# DigiPicco™ Basic I²C
## Capacitive Humidity Module
## With calibrated and linearized I²C output signal

| | |
|---|---|
| Connection:* | Soldering pads for $V_{CC}$, clock and data (I²C), GND |
| Storage conditions: | -40 °C to +80 °C at max. 95 % RH non condensing |
| Cable (external sensor version only): | PTFE, 1 m (other lengths on request) |

\* Customer specific alternatives available

## Pin Assignment

| W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 |
|----|----|----|----|----|----|----|----|----|-----|
| | | Clock SCL (I²C) | Data SDA (I²C) | | | | GND | | $V_{CC}+$ |

```
W10  W9  W8  W7  W6
W1   W2  W3  W4  W5
```
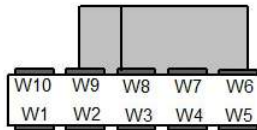
## Order Information - Module

| | |
|---|---|
| | DigiPicco (TM) Basic I2C-G |
| Order code | 150.00015 |

## Order Information - Module with PTFE cable, 1 m

| | |
|---|---|
| | DigiPicco (TM) Basic I2C-G.S |
| Order code | 150.00092 |

## Additional Documents

| | Document name: |
|---|---|
| Application note: | AHLin_Digi_E |

INNOVATIVE SENSOR TECHNOLOGY

Innovative Sensor Technology IST AG, Stegrütistrasse 14, CH-9642 Ebnat-Kappel, Switzerland,
Phone: +41 (0) 71 992 01 00 | Fax: +41 (0) 71 992 01 99 | E-mail: info@ist-ag.com | Web: www.ist-ag.com

All mechanical dimensions are valid at 25 °C ambient temperature, if not differently indicated ● All data except the mechanical dimensions only have information purposes and are not to be understood as assured characteristics ● Technical changes without previous announcement as well as mistakes reserved ● The information on this data sheet was examined carefully and will be accepted as correct; No liability in case of mistakes ● Load with extreme values during a longer period can affect the reliability ● The material contained herein may not be reproduced, adapted, merged, translated, stored, or used without the prior written consent of the copyright owner ● Typing errors and mistakes reserved ● Product specifications are subject to change without notice ● All rights reserved

# Application Note
## Humidity Module - DigiPicco
**Content**

# Application Note
# Humidity Module -  DigiPicco

**HUMIDITY**

**TEMPERATURE**

**FLOW**

**CONDUCTIVITY**

**IST**
INNOVATIVE SENSOR TECHNOLOGY

DigiPicco

## 1.1 About the Sensor

The DigiPicco series provides a Plug&Play module for humidity and temperature measurements.The module is fully calibrated, has a digital output signal and is temperature compensated. Additional software is needed.

The principle of the module is a capacitive change which is transformed in to an electrical signal. The signal is being processed by an integrated component and afterwards put out as a digital output.

The digital DigiPicco module is suitable for applications where a fast, simple and easy to integrate humidity and temperature measurement is needed.

## 1.2 Benefits and Characteristics

The following list showcases the advantages the DigiPicco has. It is not a list of the modules full range of capabilities and should not be seen as such.

- Precise humidity and temperature measurement
- Fully calibrated
- Very low drift due to wide sensor variation
- Excellent response time
- Integrated Pt1000 temperature sensor and P14 humidity sensor

- Module with external sensor available
- Calibrated humidity and temperature signals on one bus
- PCB moisture protected
- Customer specific module available upon request

## 1.3 Application Areas

Among other, the DigiPicco humidity module is suitable for, but not limited to, the following application areas:

- HVAC
- Monitoring

- Home appliances and white goods
- Process and automation

## 1.4 Measurement Principle

The DigiPicco module contains the Innovative Sensor Technology IST AG P14 capacitive humidity sensor. The measuring P14 capacitive RH sensor on the DigiPicco consists of a ceramic substrate on which a thin film of polymer is deposited between two conductive electrodes.

The sensing surface is coated with a micropourous metal electrode, allowing the polymer to absorb moisture while protecting it from contamination and exposure to condensation. As the polymer absorbs water, the dielectric constant changes incrementally and is nearly directly proportional to the relative humidity of the surrounding environment. Thus, by monitoring the change in capacitance, relative humidity can be derived.

The DigiPicco humidity module is available with I²C digital output signal.

**HUMIDITY**

**TEMPERATURE**

**FLOW**

**CONDUCTIVITY**

**IST**

INNOVATIVE SENSOR TECHNOLOGY

## 1.5 Dimensions and Housing

The dimensions of the standard modules are 47 x 10 x 1 / 2.8 (L x W x H / H2 in mm). This does not include housing or connecting wires. The corresponding housings serve as inspiration, only. If you have any questions regarding specific housing possibilities, please contact us to find the best po ible solution for your application.
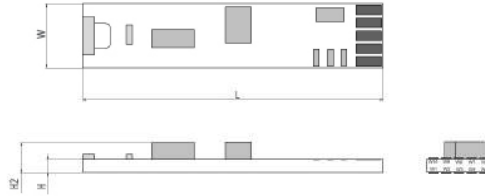


The Digipicco module measures 47 mm (L) x 10 mm (W) x 1 (H) / 2.8 mm (H2)

### DigiPicco in probe

The DigiPicco can be supplied implemented into a probe. The probe measures 88 mm (L) x 18 mm (Ø).



### Connector

It is recommended to use a HARWIN - M22-2020505 - HEADER, VERTICAL, 2ROW, 10WAY connector and a HARWIN - M22-7140542 - SOCKET, VERTICAL, 2ROW, 5WAY as counter piece.

## 1.6 Mounting

The following mounting possibilities serve as inspiration, only. If you have any questions regarding specific mountin possibilities, please contact us to find the best possible solution for  our application.

The red marked zone may not be extrusion-coated or stuck together with a material. The remaining part may be extrusion-coated or stuck together for the assembly, however the material may not be electrically conductive.



The humidity module may not be exposed to any mechanical stress.

## 1.7 Delivery and Content

Upon delivery, the shipment contains a module with a sensor.

## 1.8 Handling

- The active surface of the sensor must not be touched and contamination of the active surface of the sensor must be avoided
- The module must not be cleaned with chemicals regardless of type
- The sensor must not be exposed to any mechanical stress, as bending or touching with sharp objects
- The humidity module must not be laid on conductive surfaces (short-circuit risk)
- The maximum temperature of + 100 °C must not be exceeded
- The humidity module must not be touched, when it is in use

## 1.9 Storage

The module must be stored between -40 °C to +80 °C at maximum 95 % RH - non condensing.

# Application Note
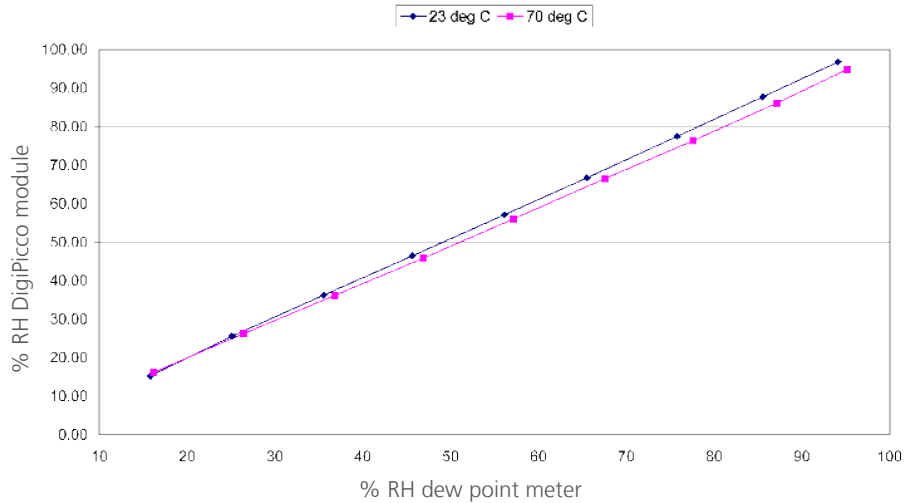# Humidity Module - DigiPicco

**IST**
INNOVATIVE SENSOR TECHNOLOGY

## 1.10 Performance

The following graph illustrate the performance of the DigiPicco. Depending on the application and possible occurring influences, this measu ement might vary.

DigiPicco module - Characteristic curve at + 23 °C and + 70 °C



% RH dew point meter

## 1.11 Influences

The following list illustrates possible influences, however is st ongly dependent upon the application. If you have any questions regarding specific applications and its possible influences, please ntact us to find the best possibl solution for your situation.

Due to high humidity surrounding the module, the risk of creating a microclimate can appear. The microclimate will appear inside the PCB material and can cause misreadings.

To aviod microcliate development Innovative Sensor Technology IST AG recommends implementing a DigiPicco module with external sensor. For more information about the module with external sensor, please contact us.
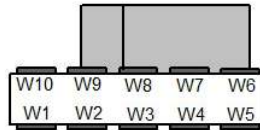
# Application Note
# Humidity Module - DigiPicco

HUMIDITY

TEMPERATURE

FLOW

CONDUCTIVITY

IST
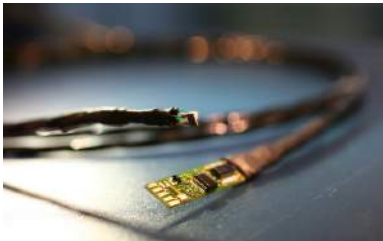
INNOVATIVE SENSOR TECHNOLOGY

## 1.12 Electronics and Circuit Diagram

Pin Assignment

| W10 | W9 | W8 | W7 | W6 |
|-----|----|----|----|-----|
| W1 | W2 | W3 | W4 | W5 |

| W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | W10 |
|----|----|----|----|----|----|----|----|----|-----|
| | | Clock SCL (I²C) | Data SDA (I²C) | | | | GND | | $V_{cc}+$ |

The external microcontroller (master) sends the start condition to the slave (DigiPicco). The master transmits the standard 7 Bit address (0x78) or a factory customizable address. The eight bit (LSB) determines the direction of data flow and has to be set during this operation. Follo  ing, the slave (DigiPicco) acknowledges the receipt of data with the acknowledge condition (SDA kept low during a positive clock cycle). After that, the slave (DigiPicco) outputs the data values. After each data byte the master has to acknowledge the receipt of the data values by the acknowledge condition, except before the stop condition has been sent by the master itself. The humidity and the temperature values have two bytes each. The first two bytes a e the humidity values and the second two bytes are the temperature values, 15 bit each. This sequence is repeated indefinitely until the sto condition has been sent (also refer to diagram below).

Start Condition:
SDA changes from high to low during SCL is in high condition.

Stop Condition:
SDA changes from low to high during SCL is in high condition.
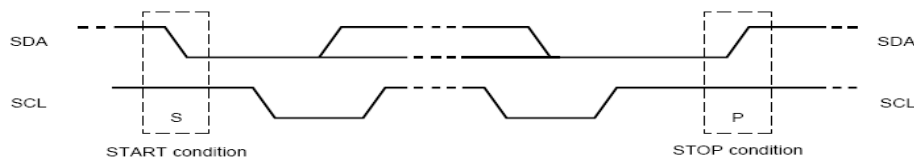


Start and stop conditions
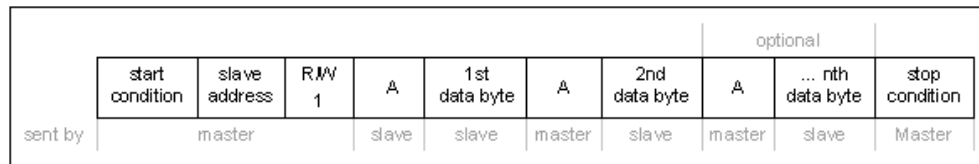


Typical read operation timing sequence

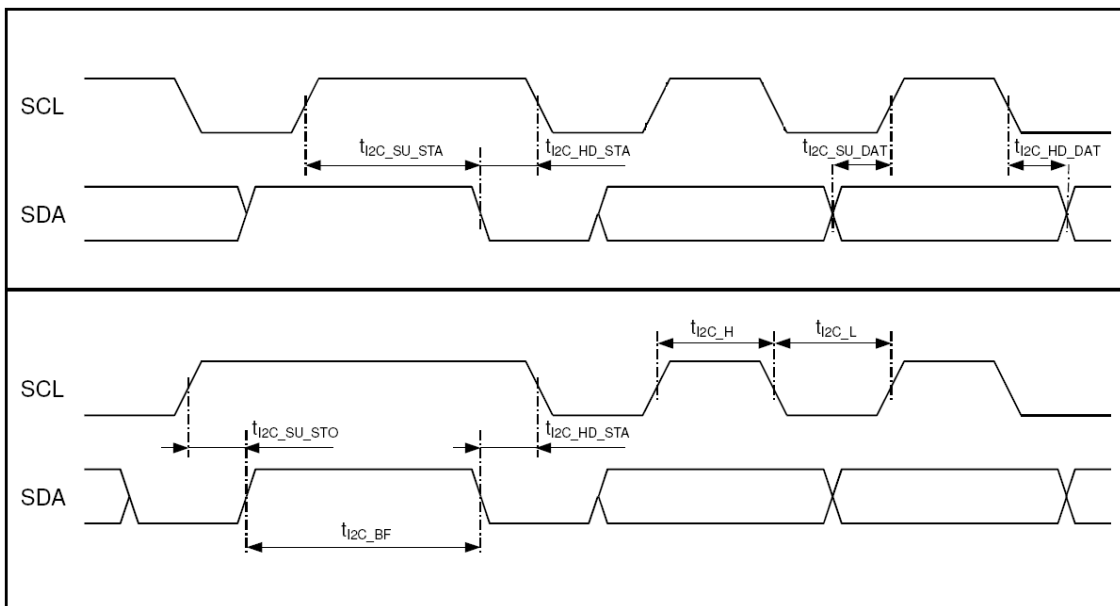| Slave-address: | 0x78 or factory definable customer specific ad   ess |
|----------------|-------------------------------------------------------|
| SCL clock-frequency: | Max. 400 kHz |
| Bus free time between start- and stop condition tI2C_BF: | Min. 1.3 µs |
| Hold delay start condition tI2C_HD-STA: | Min. 0.6 µs |
| Setup time start condition tI2C_SU_STA: | Min. 0.6 µs |
| Setup time stop condition tI2C_SU_STO: | Min. 0.6 µs |
| Data hold time (trigger=data) tI2C_HD_DAT: | 0 µs |

Data setup time tI2C_SU_DAT:        Min. 0.1 µs

Low period SDA/SCL tI2C_L:        Min. 1.3 µs

High period SDA/SCL tI2C_H:        Min. 0.6 µs

Input-high-level:        2.4 V to 3 V

Input-low-level:        0.0 V to 0.6 V

External pull- up resistor:        Min. 2 kΩ

Load capacitance:        Max. 2 nF

General timing diagram

## 2.  Additional doments

Document name:

Data sheets:        DHDigiPicco_E        DHDigiPicco_D