HUMIDITY

TEMPERATURE

FLOW

CONDUCTIVITY

LinPicco™ Axxx Basic

Capacitive Humidity Module

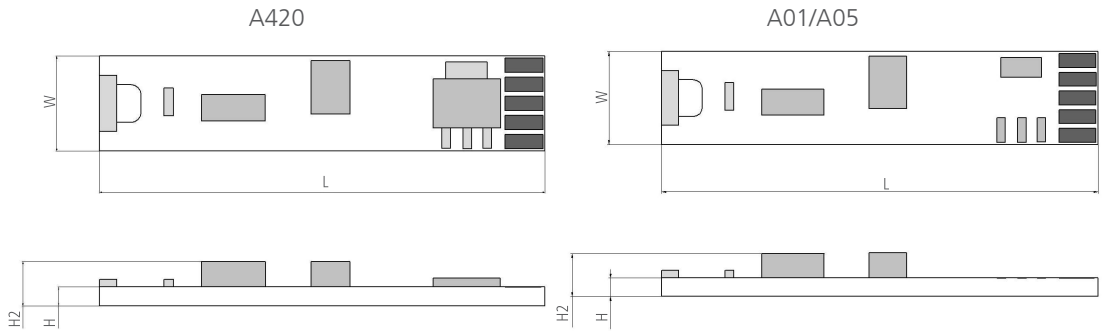
With calibrated and linearized analog output signal

INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- Precise humidity measurement
- Fully calibrated
- Very low drift due to wide sensor area
- Various analog output signals
- Easy to integrate
- Module with external sensor available
- PCB moisture protected
- Customer specific module available upon request

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 or Pt100, class B (DIN EN 60751 F0.3), loop-through
Accuracy:	< ±3 % RH (15 % RH to 85 % RH at +23 °C) < ±5 % RH (0 % RH to 15 % RH and >85 % RH at +23 °C)
Response time t_{63}:	< 5 s (50 % RH to 0 % RH) at +23 °C
Storage conditions:	-40 °C to +80 °C at max. 95 % RH non condensing
Cable (external sensor version only):*	PTFE, 1 m

	A420	A01	A05
Operating voltage (V_{CC}):	8 to 10 V_{DC} (max. load resistor 300 Ω)	7 to 32 V_{DC} (recommended 7 V to 9 V)	7 to 32 V_{DC} (recommended 7 V to 9 V)
Current consumption:	4 mA to 20 mA (two wire operation)	< 3 mA	< 3 mA
Output signal (0 % to 100 % RH):	4 mA to 20 mA	0 V to 1 V	0 V to 5 V

* Customer specific alternatives available

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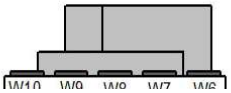
Capacitive Humidity Module

With calibrated and linearized analog output signal

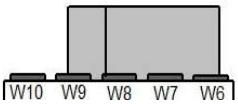
INNOVATIVE SENSOR TECHNOLOGY

Pin Assignment

A420



A01/A05



	W5[1)]	W6[1)]	W7	W8	W9	W10
A420	Pt1000 / Pt 100	Pt1000 / Pt 100	Current loop return			Current loop V_{CC}+
A01	Pt1000 / Pt 100	Pt1000 / Pt 100		GND	Analog output	V_{CC}+
A05	Pt1000 / Pt 100	Pt1000 / Pt 100		GND	Analog output	V_{CC}+

1) Does not apply for module with cable and external sensor

Order Information - Module

	A420	A01	A05
Nominal resistance: 100 Ω at 0 °C			
Order code	LinPicco (TM) Basic A420-G 150.00016	LinPicco (TM) Basic A01-G 150.00029	LinPicco (TM) Basic A05-G 150.00018
Nominal resistance: 1000 Ω at 0 °C			
Order code	LinPicco (TM) Basic A420-G 150.00010	LinPicco (TM) Basic A01-G 150.00007	LinPicco (TM) Basic A05-G 150.00008

Order Information - Module with PTFE cable, 1m

	A420	A01	A05
Nominal resistance: 1000 Ω at 0 °C			
Order code	LinPicco (TM) Basic A420-G.S 150.00091	LinPicco (TM) Basic A01-G.S 150.00031	LinPicco (TM) Basic A05-G.S 150.00090

INNOVATIVE SENSOR TECHNOLOGY
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HUMIDITY

TEMPERATURE

FLOW

CONDUCTIVITY

DigiPicco™ Basic I²C

Capacitive Humidity Module

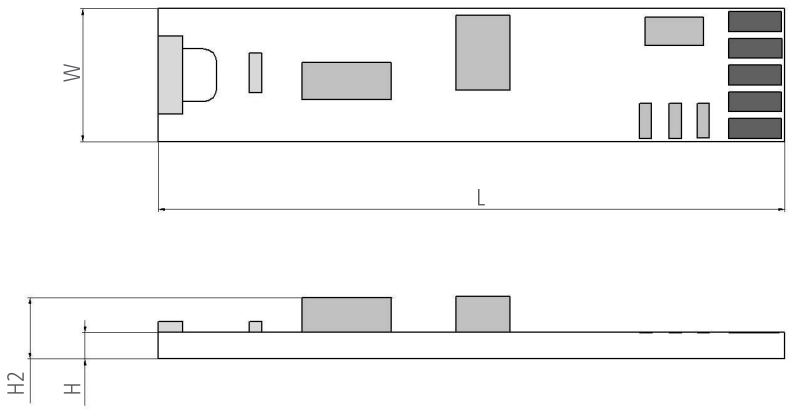
With calibrated and linearized I²C output signal

INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- 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 request

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) < ±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

HUMIDITY

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CONDUCTIVITY

DigiPicco™ Basic I²C

Capacitive Humidity Module

With calibrated and linearized I²C output signal

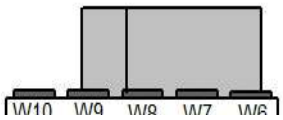
INNOVATIVE SENSOR TECHNOLOGY

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}+



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

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Application Note
Humidity Module - LinPicco and DigiPicco

HUMIDITY

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Application Note

Humidity Module - LinPicco and DigiPicco

INNOVATIVE SENSOR TECHNOLOGY

Content

Application Note
Humidity Module - LinPicco and DigiPicco

1 LinPicco

1.1 About the Sensor

The LinPicco series provides a Plug&Play module for humidity and temperature measurements.The module is fully calibrated, has an analoge output signal and is temperature compensated. Additionally, no extra 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 an analoge output.

The analoge LinPicco 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 LinPicco has. It is not a list of the modules full range of capabilities and should not be seen as such.

- Precise humidity measurement
- Fully calibrated
- Easy to integrate
- Various analog output signals
- Very low drift due to wide sensor variation
- Module with external sensor available
- PCB moisture protected
- Customer specific module available upon request

1.3 Application Areas

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

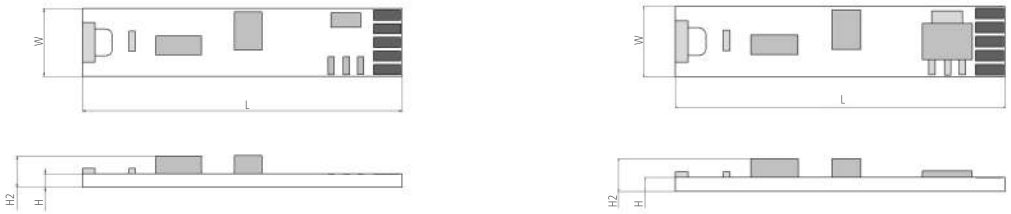
The sensing surface is coated with a micropourous metal electrode, allowing the polymer to absorb moisture while protecting it from contamination and exposure to condensation. As the polymer absorbs water, the dielectric constant changes incrementally and is nearly directly proportional to the relative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

The LinPicco humidity module is available with three output signals, A420 (4mA to 20 mA), A01 (0V to 1 V) and A05 (0 V to 5V).

Application Note
Humidity Module - LinPicco and DigiPicco

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 possible solution for your application.



LinPicco in probe

The LinPicco 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 mounting possibilities, please contact us to find the best possible solution for your 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.

Application Note
Humidity Module - LinPicco and DigiPicco

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

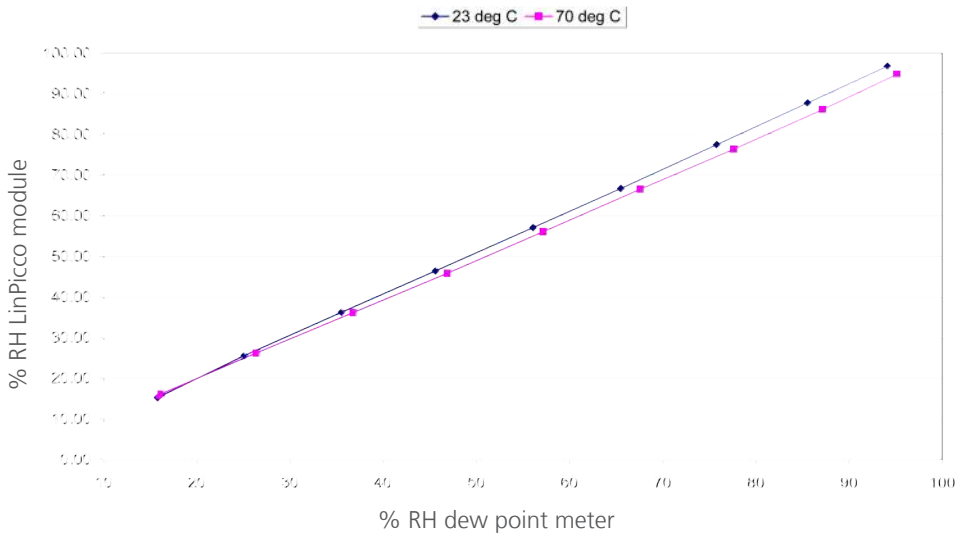
1.9 Storage

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

1.10 Performance

The following graph illustrate the performance of the LinPicco. Depending on the application and possible occurring influences, this measurement might vary.

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



Application Note
Humidity Module - LinPicco and DigiPicco

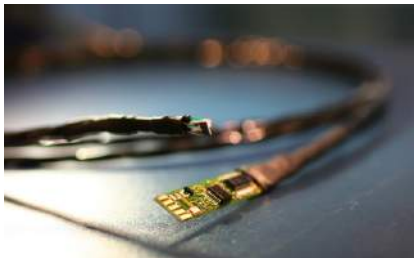
1.11 Influences

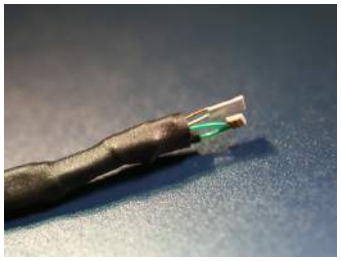
The following list illustrates possible influences, however is strongly dependent upon the application. If you have any questions regarding specific applications and its possible influences, please contact us to find the best possible solution for your situation.

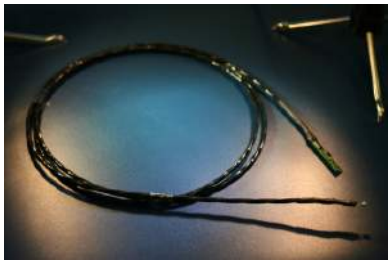
Microclimate

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 microclimate development, Innovative Sensor Technology IST AG recommends implementing a LinPicco module with external sensor. For more information about the module with external sensor, please contact us.



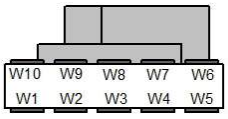




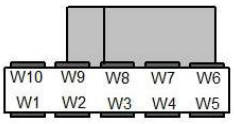
1.12 Electronics and Circuit Diagram

Pin Assignment

A420



A01/A05



	W5[1)]	W6[1)]	W7	W8	W9	W10
A420	Pt1000 / Pt 100	Pt1000 / Pt 100	Current loop return			Current loop V_{CC}+
A01	Pt1000 / Pt 100	Pt1000 / Pt 100		GND	Analog output	V_{CC}+
A05	Pt1000 / Pt 100	Pt1000 / Pt 100		GND	Analog output	V_{CC}+

1) Does not apply for module with cable and external sensor

2 DigiPicco

2.1 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.

2.2 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

2.3 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

2.4 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.

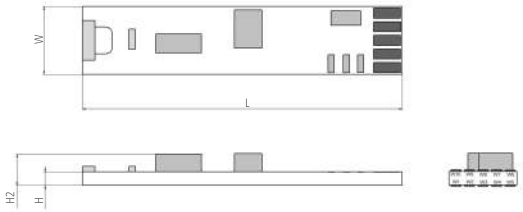
The sensing surface is coated with a micropourous metal electrode, allowing the polymer to absorb moisture while protecting it from contamination and exposure to condensation. As the polymer absorbs water, the dielectric constant changes incrementally and is nearly directly proportional to the relative 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.

Application Note
Humidity Module - LinPicco and DigiPicco

2.5 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 possible 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.

Application Note
Humidity Module - LinPicco and DigiPicco

2.6 Mounting

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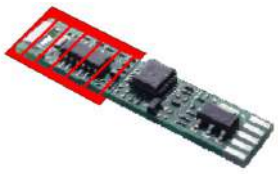

The humidity module may not be exposed to any mechanical stress.

2.7 Delivery and Content

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

2.8 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

2.9 Storage

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

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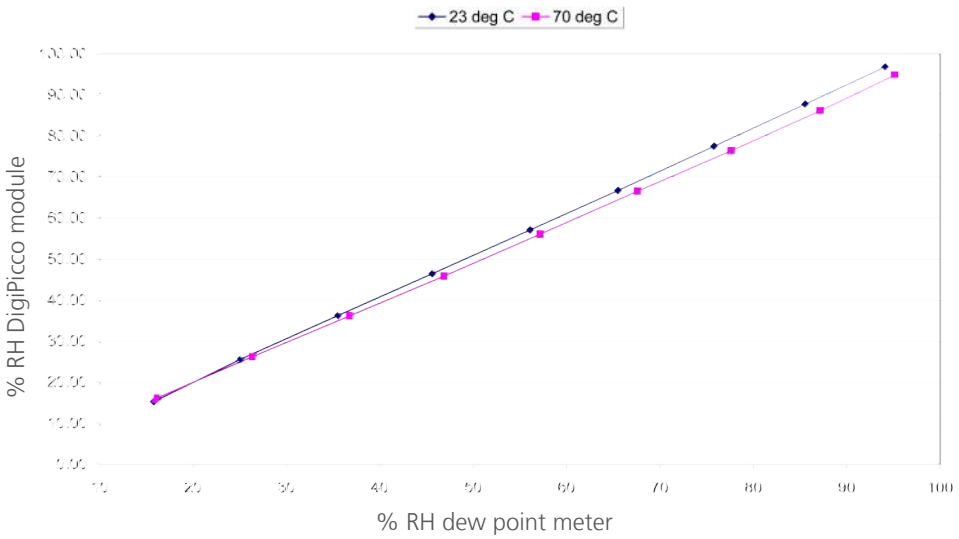
Application Note
Humidity Module - LinPicco and DigiPicco

INNOVATIVE SENSOR TECHNOLOGY

2.10 Performance

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

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

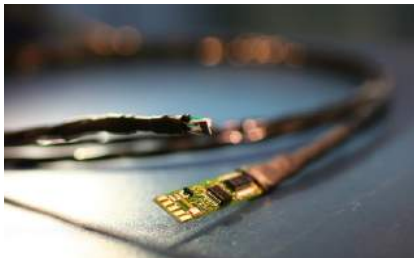


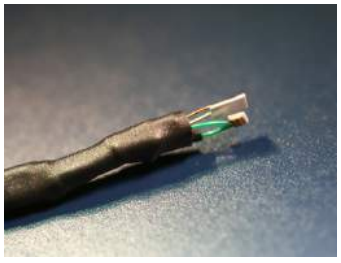
2.11 Influences

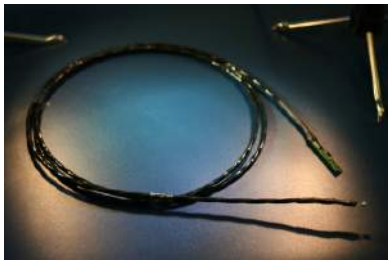
The following list illustrates possible influences, however is strongly dependent upon the application. If you have any questions regarding specific applications and its possible influences, please contact us to find the best possible solution for your situation.

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 - LinPicco and DigiPicco

2.12 Electronics and Circuit Diagram

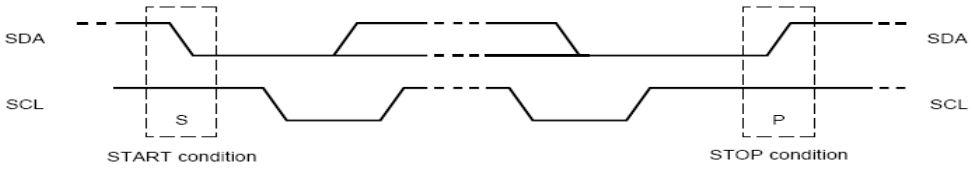
Pin Assignment

W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
		Clock SCL (I^2C)	Data SDA (I^2C)			GND			V_{CC}+

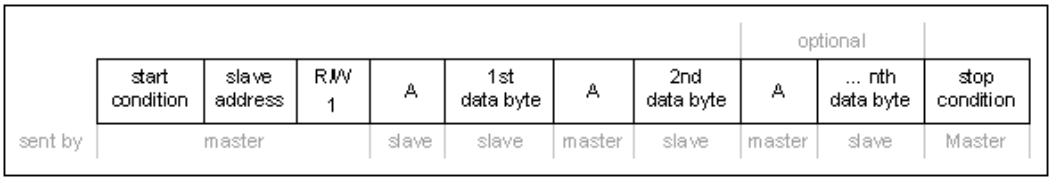
The external microcontroller (master) sends the start condition to the slave (DigiPicco). The master transmits the standard 7 Bit address (0x78) or a factory customizable address. The eight bit (LSB) determines the direction of data flow and has to be set during this operation. Following, the slave (DigiPicco) 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 are the humidity values and the second two bytes are the temperature values, 15 bit each. This sequence is repeated indefinitely until the stop 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

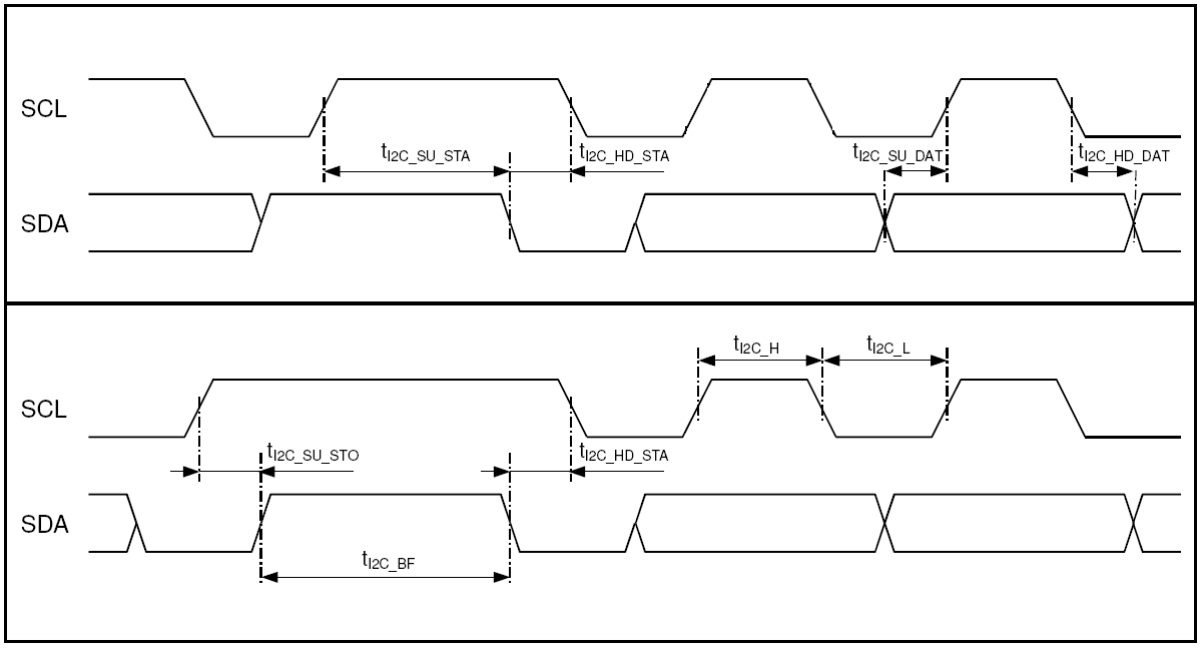


Typical read operation timing sequence

Slave-address:	0x78 or factory definable customer specific address
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

Application Note
Humidity Module - LinPicco and DigiPicco

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