HUMIDITY

The Right Humidity Sensor for Any Measuring Task

For humidity measurements various methods are used that differ from each other mainly with regard to their accuracy and their suitability for long term measurements and the substance used for the measurement:

- Capacitive Air Humidity Measurement,
- Psychrometric Air Humidity Measurement,
- Hygrometric Air Humidity Measurement,
- Dielectric Measurement of Moisture in Materials,
- Measurement of the Moisture in Materials According to the Principle of Conductivity,
- Dew Point Determination with CCC Dew Point Probes,
- Dew Point Determination with Dew Point Mirrors.

Capacitive Air Humidity Measurement

Capacitive sensors contain a glass substrate with a moisture sensitive polymer layer between two metal layers. By absorption of water, corresponding to the relative humidity, the dielectric constant and, as a result, the capacity of the thin-film capacitor are changing. The measuring signal is directly proportional to the relative humidity and does not depend on the atmospheric pressure.

Advantage:

- maintenance-free measurement over longer periods, can withstand temperatures below 0°C
- atm. pressure-independent, works when pressure is applied
- flexible use of the sensor

Disadvantage:

- limited long term stability
- sensitive to dewing and certain aggressive substances

Psychrometric Air Humidity Measurement

Psychrometers are precision devices containing a dry and a moistened temperature sensor. As a result of the evaporation the humidity sensor cools down, with a wind velocity of a minimum of 2m/s being required for the cool down process. The humidity values are calculated from the temperature difference (psychrometric difference). The calculation formulae for ALMEMO® devices correspond to those used by the German Weather Authority related to 1013mbar. Differences regarding to the atmospheric pressure can be corrected to achieve precise measurements.

Advantage:

- no ageing of the sensor - exception: contamination of the wick
- high accuracy
- high quality regarding the measuring technology
- usable without problems up to 100% r.H. in all substances

Disadvantage:

- long term measurement limited by the required water reserve and wick maintenance
- difficult to use with temperatures below 0°C and with low humidities
- depending on the atmospheric pressure

Hygrometric Air Humidity Measurement

Hygrometric sensors are equipped with a measuring strip, which lengthens or tightens depending on the humidity. The measuring strip consists of many single fibers (measuring harp), which are made from organic or synthetic material.

Advantage:

- simple and low cost measuring technology, also usable for contaminated environments
- easy to clean

Disadvantage:

- limited accuracy
- limited measuring range
- slow measurement

Dielectric Measurement of Moisture in Materials

The measurement of the moisture in materials is performed indirectly via the determination of the dielectric constant. This is performed by using a capacity measurement via a high-frequency electrical field, which penetrates the material without disturbances.

Advantage:

- simple and fast measuring technology
- non-destructive contact measurement
- long term use is possible

Disadvantage:

- limited accuracy

HUMIDITY

Measurement of the Moisture in Materials according to the Principle of Conductivity

The measurement of the moisture in materials is performed indirectly via the determination of the electrical resistance, which depends on the moisture content of the material.

Advantage:

- simple and fast measuring technology

Disadvantage:

- limited accuracy
- probe insertions
- only for short term control measurements
- measured values depend on various material parameters

Dew Point Determination with CCC Dew Point Probes

The dew point sensor is equipped with an integrated sensor chip (CCC dew point principle according to Heinze), which is mounted on a cooling element. The sensor unit is also connected to a control circuit that regulates the operating current of the cooling element so that a defined condensate is established. The resulting dew point temperature will be directly measured within the sensor and can be output in a format, which allows for an evaluation.

Advantage:

- high accuracy, reliability and reproducibility
- wide measuring range

Disadvantage:

- high-sophisticated measuring method
- not suitable for quick control measurements
- cannot be used at temperatures below 0°C

Dew Point Determination with Dew Point Mirrors

An optically monitored mirror is mounted on a cascaded Peltier element. The sensor unit is also connected to a control circuit that regulates the operating current of the cooling element so that a defined condensate is established. The dew point temperature will be directly measured within the sensor and can be output in a format, which allows for an evaluation.

Advantage:

- high accuracy, reliability and reproducibility
- independent from atmospheric pressure
- wide measuring range
- suitable for temperatures below 0°C

Disadvantage:

- high sophisticated measuring method
- high current consumption
- risk of contamination

Small Glossary for Humidity/Moisture Measurement Variables

Absolute Humidity	The absolute humidity indicates the weight of the water vapour contained in one m^3 of a mixture of air and water vapour.
Enthalpy	The enthalpy indicates how much heat is stored within the humid air. This value is important for calculating the cooling and heating performance, e.g. when checking heat exchangers.
Mixture Ratio	The absolute humidity related to 1kg dry air.
Relative Humidity	The relative humidity indicates the percentage of air, which is saturated with water vapour, i.e. how much percent of the maximum possible amount of water vapour is currently contained in the air. Owing to the dependence on temperature the relat. humidity can only ever be indicated for one specific temperature.
Saturation Vap. Pressure	Air can only ever contain a certain maximum amount of water vapour. This is called the saturation vapour pressure, specified as g water vapour per kg of humid air. The saturation vapour pressure strongly depends on the air temperature. At low temperatures it will be low and at high temperatures it will be high. Therefore, warm air can accept large amounts of vapour pressure and cold air only small amounts.
Dew Point	The dew point is the temperature where the relative humidity equals 100%. If the dew point is not reached the water vapour will start condensing.
Water Vap. Partial Press.	The total pressure in the room determined by the water vapour.

Measuring Air Humidity and Moisture in Materials à la ALMEMO®

When using ALMEMO® sensors, important functions for measured values are automatically activated in ALMEMO® devices when humidity measurements are performed. Please ask for our detailed ALMEMO® Manual. It will provide you with valuable tips and a detailed description regarding the measurement of humidity and moisture à la ALMEMO®.

HUMIDITY

Capacitive humidity sensor FHA 646 E1C / E2C / E3C / E1 / -6

Capacitive humidity sensor FHA646ExC

- Sturdy sensor for test measurements and stationary applications up to +80 °C
- Sensor tube made of stainless steel
- Splash-protected screw-fit cable gland
- Active compensation of humidity measurement by means of the integrated temperature sensor (new measuring range for all ALMEMO® devices with effect from 2003)
- Wide operating temperature range
- *New* Option for FHA646ExC
  Sensor coating : Heavily polluted and / or corrosive environments may damage the humidity sensor and cause drift in the measured values. The coating that completely covers the probe head (temperature / humidity sensor element) minimizes the adverse effects of dirty media and much improves long-term stability. Delivery includes protective cap SK6 PTFE sinter filter (instead of standard protective cap SK7 metal-mesh filter)
  Order no. OA9646SC

Capacitive humidity sensor FHA 646 E1

- Handy sensor for test measurements and stationary applications up to +60 °C
- Sensor tube made of plastic

Capacitive humidity sensor FHA 6466

- Compact sensor integrated in ALMEMO® connector

Technical data

Operative range	
FHA 646 E1, FHA 6466	-20 to +60 °C, 5 to 98 % RH
FHA646 E1C/ E2C/ E3C	–20 to +80 °C/ 5 to 98 % RH
Humidity measuring circuit	
Measuring range	0 to 100 % RH
Sensor	capacitive
Accuracy	±2% RH in the range <90% RH at nominal temperature
Reproducibility	<1% RH at nominal temperature
Nominal temperature	25 ±3 °C
Sensor operating pressure	Atmospheric pressure
Response time T_{90}	approx. 10 seconds (without filter) at 5 m/s
Temperature measuring circuit	
Sensor	NTC type N
Accuracy	-20 to 0 °C ±0.4 °C
	0 to +70 °C ±0.1 °C
	+70 to +80 °C ±0.6 °C
Reproducibility	0.1 °C
Mechanical design	
FHA646Ex	
Sensor tube	Diameter 12 mm
FHA 646 E1C	Stainless steel 160 mm long
FHA 646 E2C	Stainless steel 270 mm long
FHA 646 E3C	Stainless steel 530 mm long
FHA 646 E1	Plastic 155 mm long
Protective cap	SK7, metal-mesh filter
Screw-fit cable gland	splash-protected (FHA646xC only)
Cable	1.5 meters long with ALMEMO® connector, longer ALMEMO® cable (up to 30 meters) available on request
FHA 6466	
Slotted case	directly on connector (without cable), plastic 30 x 11 x 7.6 mm without filter

Accessories

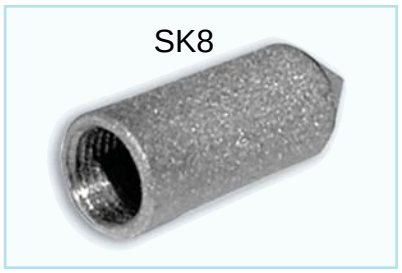
Protective caps, brackets for wall mounting, movable screw fitting and connection flange see page 09.05
Extension cable, 2 meters — Order no. ZA9060VK2
Extension cable, 4 meters — Order no. ZA9060VK4
Intelligent ALMEMO® extension cable, 10 meters long — Order no. ZA9090VKC10
Other lengths 20, 30, 50, 100 meters see page 07.03

Variants including manufacturer's test certificate

Humidity sensor -20 to +80 °C with stainless steel tube 160 mm, cable 1.5 meters	**Order no. FHA646E1C**
Humidity sensor -20 to +80 °C with stainless steel tube 270 mm, cable 1.5 meters	**Order no. FHA646E2C**
Humidity sensor -20 to +80 °C with stainless steel tube 530 mm, cable 1.5 meters	**Order no. FHA646E3C**
Humidity sensor -20 to +60 °C with plastic tube 155 mm, cable 1.5 meters	**Order no. FHA646E1**
Humidity sensor -20 to +60 °C directly on connector (without cable)	**Order no. FHA6466**

HUMIDITY

Protective caps for capacitive humidity sensors FHA 646 E1 / ExC and MH8D 461 Kx

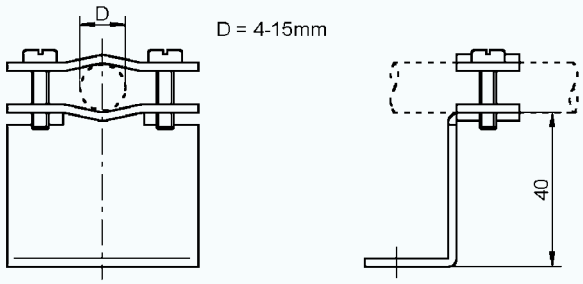


Dimensions : length approx. 33 mm, diameter 12 mm

Types :

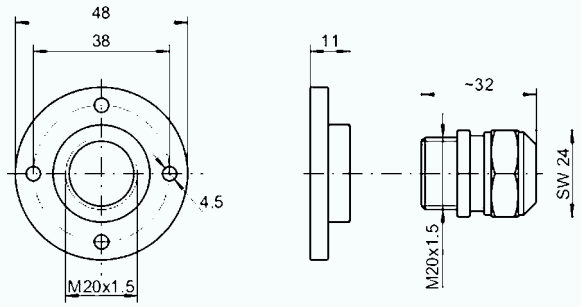
	Designation	Pore-size	Maximum temperature	Typical Application	Type
SK7	Metal-mesh filter in PC-housing	100 µm	120°C	Universal, for medium, contamination, also high humidity	**Order no. ZB9600SK7**
SK6	PTFE-Sinterfilter	50 µm	180°C	High chemical resistance	**Order no. ZB9600SK6**
SK8	Stainless steel sinter filter	10 µm	180°C	For severe mechanical stress, heavy contamination, strong air flow	**Order no. ZB9600SK8**

Brackets for wall mounting



Brackets for wall mounting, distance from wall approx. 40 mm — Order no. : ZB9600W

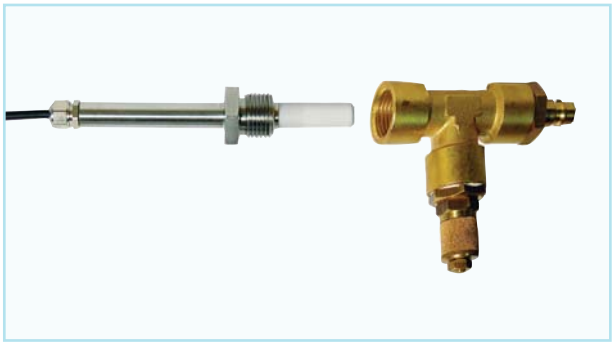
Movable screw fitting for sensor tube diameter 12 mm



Movable brass screw connection with plastic sealing ring — Order no. : ZB9600KV20
Connecting flange for screw connection, hole circle 38 mm Ø — Order no. : ZB9600F20

HUMIDITY

Pressure-sealed humidity sensor FHA 646 E7C



- Compact screw-fit sensor made from stainless steel
- for pressure pipes up to 16 bar
- Splash-protected screw-fit cable gland
- Active compensation of humidity measurement by means of the integrated temperature sensor (new measuring range for all ALMEMO® devices with effect from 2003).

New

Option for FHA646E7C: Sensor coating
Heavily polluted and / or corrosive environments may damage the humidity sensor and cause drift in the measured values. The coating that completely covers the probe head (temperature / humidity sensor element) minimizes the adverse effects of dirty media and much improves long-term stability.

Order no. OA9646SC

Technical data

Operative range	–20 to +80 °C/ 5 to 98 % RH
Humidity measuring circuit	
Measuring range	0 to 100 % RH
Sensor	capacitive
Accuracy	±2% RH in the range <90% RH at nominal temperature
Reproducibility	<1% RH at nominal temperature
Nominal temperature	25 ±3 °C
Sensor operating pressure	up to 16 bar
Response time T90	approx. 8 seconds (without filter)
Temperature measuring circuit	
Sensor	NTC type N
Accuracy	-20 to 0 °C ±0.4 °C
	0 to +70 °C ±0.1 °C
	+70 to +80 °C ±0.6 °C
Reproducibility	0.1 °C
Mechanical design	
Sensor tube	Stainless steel, diameter 12 mm, total length 140 mm
Mounting	Screw thread G1/2" Immersion depth 47 mm
Protective cap	SK7, PTFE sinter filter
Cable connector	1.5 meters, with ALMEMO® Longer ALMEMO® cables (up to 30 meters) on request

Accessories

Adapter for measuring compressed air	Order no. ZB96467AP
Protective caps see page 09.05	
Extension cable, 2 meters	Order no. ZA9060VK2
Extension cable, 4 meters	Order no. ZA9060VK4
Intelligent ALMEMO® extension cable, 10 meters long	Order no. ZA9090VKC10
Other lengths 20, 30, 50, 100 meters see page 07.03	

Variants

(including manufacturer's test certificate and pressure test protocol)

Screw-fit humidity sensor, -20 to +80 °C, total length 140 mm, cable 1.5 meters — **Order no. FHA646E7C**

HUMIDITY

Capacitive humidity sensor FHA 646 R

- Compact sensor with extremely small dimensions
- Wide operating temperature range -30 to +100 °C
- Particularly suitable for measuring operations between PCBs, inside cases, in walls, ceilings, and insulation layers used in the construction industry, and for the protection of listed historic monuments

Accessories

Clamped screw connection with thread adapter for telescopic extension / extension sets (max. 80 °C) Order no. ZV9915KV

Telescope extension
Ø 15 to 24 mm, 330 / 1010 mm Order no. ZV9915TV

Extension set
Ø 15 mm, 4 x 255 mm Order no. ZV9915VR3

Extension cable, 2 meters Order no. ZA9060VK2
Extension cable, 4 meters Order no. ZA9060VK4
Intelligent ALMEMO® extension cable,
10 meters long Order no. ZA9090VKC10

Other lengths 20, 30, 50, 100 meters see page 07.03

Technical data

Operative range	–30 to +100 °C/ 5 to 98 % RH
Humidity measuring circuit	
Measuring range	0 to 100 % RH
Sensor	capacitive
Accuracy	±2% RH in the range <90% RH at nominal temperature
Reproducibility	<1% RH at nominal temperature
Nominal temperature	25 ±3 °C
Response time T_{63}	approx. 10 seconds at 1 m/s
Temperature measuring circuit	
Sensor	NTC type N
Accuracy	-20 to 0 °C ±0.4 °C 0 to +70 °C ±0.1 °C +70 to +100 °C ±0.6 °C
Reproducibility	0.1 °C
Mechanical design	
Sensor tube	nickel-plated, 50 mm long, 5 mm Ø
Protective cap	None
Cable	High-temperature cable (up to 100 °C), 2 meters long, with ALMEMO® connector (No other lengths available)

Variants

Humidity sensor -30 to +100 °C
with sensor tube 50 mm, cable 2 meters Order no. FHA646R

ALMEMO® temperature / humidity sensor in protective all-weather housing FHA 646 AG

Technical data and variants

see Chapter 13, Meteorology, page 13.12

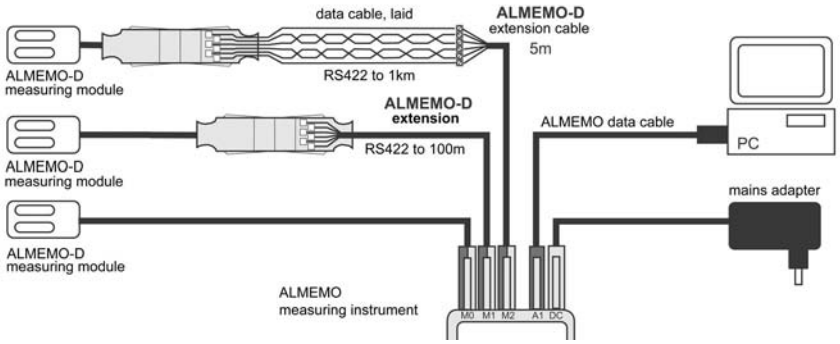
HUMIDITY

Digital sensors

- Digital sensor element. All key sensor characteristics and settings data is stored in the sensor element itself.
- Digital transfer of measured values from the sensor element to the ALMEMO® measuring instrument All risk of error involved in digital-to-analog conversion in the sensor and analog-to-digital conversion in the measuring instrument (as is the case with analog output signals) is excluded.
- A wide variety of connection options

ALMEMO®-D measuring module connected to an ALMEMO® measuring instrument

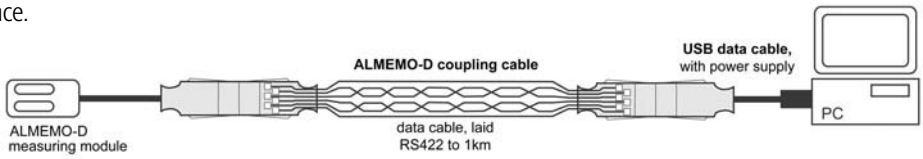
The ALMEMO® D measuring module can - just like any other ALMEMO® sensor - be connected to the input of an ALMEMO® measuring instrument - either directly or via an ALMEMO® D extension cable (RS422, up to 100 meters using our standard cables or over 100 meters using the customer's own cables); the sensor's power supply is provided via the ALMEMO® measuring instrument.



Accessories	ALMEMO®-D extension cable, 5 meters	Order no. ZAD999VK05
	ALMEMO®-D extension cable, 10 meters	Order no. ZAD999VK10
	ALMEMO®-D extension cable, 20 meters	Order no. ZAD999VK20
	ALMEMO®-D extension cable, 40 meters	Order no. ZAD999VK40
	ALMEMO®-D extension cable, 100 meters	Order no. ZAD999VK100

New ALMEMO®-D measuring module connected directly to a PC

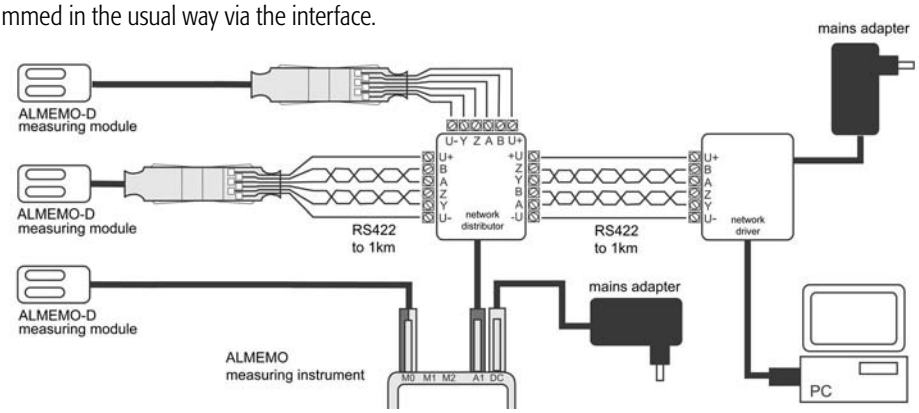
In this arrangement the ALMEMO® D measuring module operates like an ALMEMO® measuring instrument and can be connected directly to a PC via a USB cable with power supply; the sensor's power supply is provided via the PC's USB interface. The device parameters (e.g. device address, baud rate) and sensor parameters (e.g. correction values) are programmed in the usual way via the interface.



Accessories	ALMEMO® socket-to-socket coupling cable, 1 meter	Order no. ZA5099KK
	ALMEMO® USB data cable, with power supply, 1,5 meters	Order no. ZA1919DKUV

New ALMEMO®-D measuring modul connected directly in an RS422 ALMEMO® network

In this arrangement the ALMEMO® D measuring module operates like an ALMEMO® measuring instrument and can be connected directly to the RS422 output of a network distributor; the sensor's power supply is provided via the central supply of the RS422 network distributor). The device parameters (e.g. device address, baud rate) and sensor parameters (e.g. correction values) are programmed in the usual way via the interface.



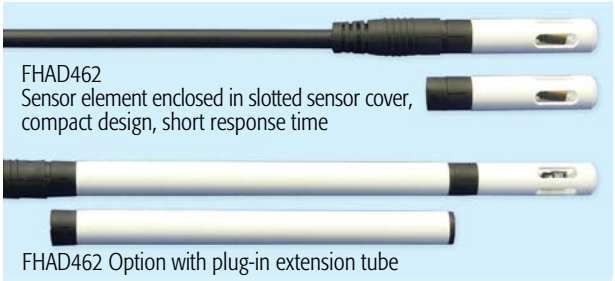
Accessories	ALMEMO® coupling with RS422 driver	Order no. ZA5099FBV

HUMIDITY

Capacitive ALMEMO® D humidity sensor, FHAD 46

FHAD460
Uncovered sensor element: smallest design, short response time

FHAD460 with option W Sensor terminals protected against damp



FHAD462
Sensor element enclosed in slotted sensor cover, compact design, short response time

FHAD462 Option with plug-in extension tube

New FHAD462L00

- Digital sensor element. All key sensor characteristics and settings data is stored in the sensor element itself.
- Plug-in sensor element. Spare elements are inexpensive; a replacement can be inserted quickly and easily on site by virtually anyone; it will be fully accurate and need no prior adjustment.
- Digital transfer of measured values from the sensor element to the ALMEMO® measuring instrument: All risk of error involved in digital-to-analog conversion in the sensor and analog-to-digital conversion in the measuring instrument (as is the case with analog output signals) is excluded.
- ALMEMO® connecting cable with digital ALMEMO® D measuring module Cable extensions up to 100 meters and various connection methods see page 09.08.
- Four climate variables can be displayed, temperature, relative humidity, dew point, and mixture ratio.
- Factory or DKD calibration is performed on the sensor element alone. Fully accurate - irrespective of connecting cable and ALMEMO® measuring instrument
- Operation in sleep mode only possible with devices with sleep delay function (only ALMEMO® 2590-2/3S/4S, 2690-8, 2890-9, 5690, 8590-9, 8690-9A, update may be possible)

Technical data

Field of application	
FHAD460:	-20 to +80 °C; 5 to 98 % RH
FHAD462:	-20 to +60 °C; 5 to 98 % RH
Humidity measuring circuit	
Measuring range	0 to 100 % RH
Sensor	CMOSens® technology
Measuring duration / output period	approx. 3 seconds
Accuracy	±1.8% RH in range 20 to 80% RH at nominal temperature
Hysteresis	±1 % RH
Nominal temperature	25 °C ±2 K
Sensor operating press.	Atmospheric pressure
Response time T63	Typical 10 seconds at 25 °C, 1 m/s
Temperature measuring circuit	
Sensor	CMOSens® technology
Measuring duration / output period	approx. 3 seconds
Accuracy	±0.3 K at 25 °C, ±1 K (±1.2 K) in range -20 to +60 (or +80) °C
Reproducibility	±0.1 K
Response time T63	Typical 10 seconds
Mechanical design	
Dimensions FHAD460: Sensor chip (dimensions over all) approx. 6 x 14 x 3 mm Connection width approx. 7 mm *New* Option W Sensor terminals protected against damp with silicone and shrink-fit sleeve (sensor element cannot be plugged in) Width approx. 8 mm FHAD462: Sensor cover Ø 8 mm, length 36 mm Plug connection Ø approx. 9 mm Extension tube Ø 8 mm, length 97 mm	
Cable	PVC, with ALMEMO D connector (for various lengths, see version data)
New Option OAD946AP	Atmospheric pressure sensor integrated in ALMEMO® connector
Measuring range	700 to 1100 mbar Technical data as for FDAD12SA see page 11.12

Accessories

ALMEMO® extension cable, 2 meters — Order no. ZA9060VK2
ALMEMO® extension cable, 4 meters — Order no. ZA9060VK4
ALMEMO®-D extension cable, USB data cable, RS422 coupling, see page 09.08

Versions including manufacturer's test certificate

ALMEMO® D humidity sensor with plug-in, digital sensor element, without protective cover, including ALMEMO® D connecting cable, length = 2 meters	**Order no. FHAD460**
Same, with ALMEMO® D connecting cable, length = 5 meters	**Order no. FHAD460L05**
Same, with ALMEMO® D connecting cable, length = 10 meters	**Order no. FHAD460L10**
Spare sensor element for FHAD460, digital, adjusted	**Order no. FH0D46**
New Option W Sensor terminals protected against damp (sensor element cannot be plugged in)	**Order no. OAD9460W**
ALMEMO® D humidity sensor with plug-in, digital sensor element, enclosed in slotted sensor cover, including ALMEMO® D connecting cable, length = 2 meters	**Order no. FHAD462**
Same, with ALMEMO® D connecting cable, length = 5 meters	**Order no. FHAD462L05**
Same, with ALMEMO® D connecting cable, length = 10 meters	**Order no. FHAD462L10**
New Same, with total length (incl. sensor element) approx. : 80 mm	**Order no. ZAD9460AKL00**
Extension tube, Ø 8 mm, length 97 mm, plug-in, for FHAD462	**Order no. ZB0D462VR**
Spare sensor element for FHAD462, digital, enclosed in slotted sensor cover, adjusted	**Order no. FH0D462**

HUMIDITY

new!

High-precision humidity sensor FHAD 36 Rx
Wide range of temperatures
ALMEMO® D measuring module for humidity and temperature

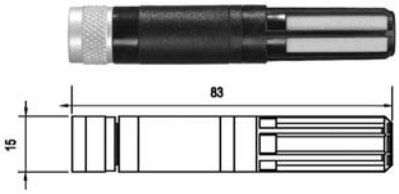
ALMEMO® connecting cable with Sensor (example)

- Capacitive humidity sensor with integrated signal processor, for humidity measurement at the highest accuracy level
- Unique correction and adjustment process
- Digital output, i.e. all correction and sensor data saved in the sensor itself
- ALMEMO® connecting cable with digital ALMEMO® D measuring module. Cable extensions up to 100 meters and various connection methods see page 09.08
- Four climate variables displayed Temperature, relative humidity, dew point, and function channels for mixture ratio, enthalpy
- Factory or DKD calibration is performed on the sensor alone. Fully accurate - irrespective of connecting cable and AMEMO® measuring instrument.
- Operation in sleep mode only possible with devices with sleep delay function (ALMEMO 2590-2/3S/4S, 2690-8, 2890-9, 5690, 8590-9, 8690-9A, with Update)

Common technical data

Operative range	(depending on sensor type)
Humidity measurement	
Sensor	capacitive
Measuring range	0 to 100 % RH
Adjusted	at 23 °C and 10%, 35%, 80% RH
Accuracy at 23 °C	±1.3% RH
Reproducibility	0.5% RH
Long-term stability	<1% RH per year
Temperature measurement	
Sensor	Pt100, 1/3 class B
Measuring range	-100 to +200 °C
Accuracy at 23 °C	±0.2 K
Reproducibility	0,05 °C
Long-term stability	<0,1 °C per year
Operative range of the electronics in the sensor connector	-40 to +100 °C in the grip (of hand-held sensors) -40 to +85 °C
Sensor power supply via the ALMEMO® device, appr. 12 mA	
Sensor connection	on the sensor / sensor cable
Plug connection (Materials: Anticorodal aluminum, anodized) IP65	
ALMEMO® cable	Sensor coupling with cable, Length 2 or 5 meters Materials TPU, -40 to +90 °C fitted with ALMEMO® D plug
New Option OAD936RAP	Atmospheric pressure sensor integrated in ALMEMO® connector
Measuring range	700 to 1100 mbar
Technical data as for FDAD12SA see page 11.12	

Standard temperature / humidity sensor Type FHAD36RS



Technical data

Operative range	-50 to +100 °C
Sensor materials	Polycarbonate
Filter	Polyethylene
Response time	<15 s at typical 1 m/s

Accessories

Brackets for wall mounting (see page 09.05) Order no. ZB9600W

Variants including factory test certificate

Standard temperature / humidity sensor with plug connection including connecting cable with ALMEMO D connector
Connecting cable, length = 2 meters **Order no. FHAD36RS**
same Connecting cable, length = 5 meters **Order no. FHAD36RSL05**

Filter

Variants

Filter cartridge = polycarbonate, filter = polyethylene,
For standard applications, good response time, good protection against fine dust particles **Order no. ZB9636PE**

Filter cartridge = polycarbonate, Filter = stainless-steel wire fabric, Quickest response time, Not suitable for environments that are bioactive or contaminated with fine dust particles (risk of congestion) **Order no. ZB9636WM**

Filter cartridge = polycarbonate, filter = Teflon, Good protection against fine dust particles and salt (maritime environment), Slower response time **Order no. ZB9636TF**

Other variants are available on request

Miniature cable humidity sensor
Diameter: 4 mm, -40 to +85 °C

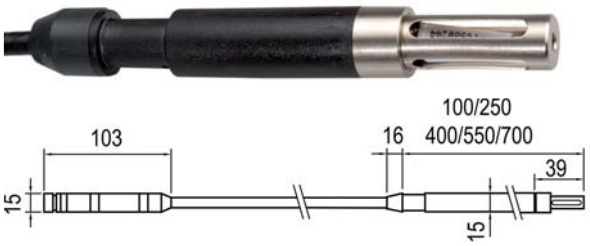
Humidity sensor with round penetrating tip
Diameter 5 / 10 mm For taking measurements in loose bulk materials -40 to +85 °C

Sensor with flat penetrating blade, 22 x 4 mm
For taking measurements in paper or textile stacks -40 to +85 °C

HUMIDITY

new!

Industrial humidity sensors FHAD 36 RIC for temperatures up to +200 °C



Technical data

Operative range	-100 to +200 °C
Sensor length	100 mm (Other lengths 250/400/550/700 mm are available on request.)
Sensor materials	PPS (polyphenylene sulfide)
Filter cartridge Filter	Brass, nickel-plated Stainless-steel wire fabric filter
Response time T_{63}	<10 s at typical 1 m/s, without filter

Accessories

Assembly screw fittings for 15 mm sensor
Brass, nickel-plated Thread M20x1.5
Viton® seal, up to 200 °C
Order no. ZB9636KV

Mounting flange:
steel, nickel-plated, diameter 80 mm
Order no. ZB9636F

Variants including factory test certificate and stainless-steel wire fabric filter

Industrial humidity sensor with high-temperature sensor cable and plug connection including connecting cable with ALMEMO D connector

Sensor cable, length = 2 meters Connecting cable, length = 2 meters	**Order no. FHAD36RIC102**
same Sensor cable, length = 5 meters Connecting cable, length = 2 meters	**Order no. FHAD36RIC105**
same Sensor cable, length = 2 meters Connecting cable, length = 5 meters	**Order no. FHAD36RIC102L05**
same Sensor cable, length = 5 meters Connecting cable, length = 5 meters	**Order no. FHAD36RIC105L05**

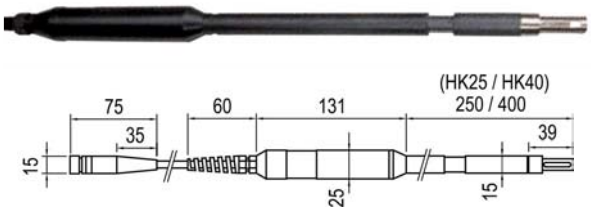
Other variants are available on request

Industrial humidity sensor, stainless steel,
diameter 15 mm -100 to +200 °C

Screw-type humidity sensor, up to 400 bar, stainless steel
Thread G1/2 inch -100 to +200 °C

Hand-held high-temperature sensor FHAD 36 RHK for temperatures up to 200 °C

For mobile test measurements, not for stationary installation



Technical data

Operative range	-100 to +150/200 °C see variants
Operative range of the electronics in the grip:	-40 to +85 °C
Sensor materials	Shaft PPS (polyphenylene sulfide), grip POM (polyoxymethylene)
Filter cartridge Filter	Brass, nickel-plated Stainless-steel wire fabric filter
Response time T63	<10 s at typical 1 m/s, without filter

Variants including factory test certificate and stainless-steel wire fabric filter

Hand-held high-temperature sensor with sensor cable (2 meters) and connecting cable with ALMEMO® D connector

Connecting cable, length = 0.3 meters, Operative range up to +150 °C, Sensor length = 250 mm	**Order no. FHAD36RHK25**
up to +200 °C, Sensor length = 400 mm	**Order no. FHAD36RHK40**

Filter For sensors with filter cartridge
For type FHAD36RIC and type FHAD36RHK

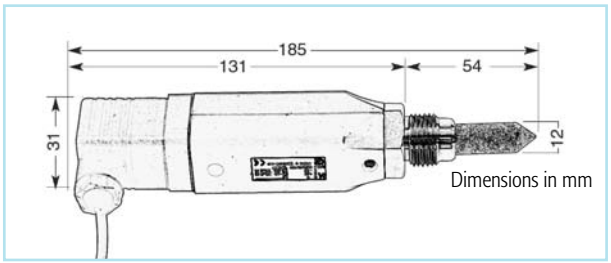
Variants (up to +200 °C)

Filter = stainless-steel wire fabric, Quickest response time, Not suitable for environments that are bioactive or contaminated with fine dust particles (risk of congestion)	**Order no. ZB9636M15**
Stainless-steel sinter filter Best protection in environments heavily contaminated with dust particles Good response time for low humidities (not to be used for high humidities)	**Order no. ZB9636S15**
Filter = Teflon, Good protection against fine dust particles and salt (maritime environment) Slower response time	**Order no.ZB9636T15**

HUMIDITY

ALMEMO® dew-point sensor FHA 646 DTC1
Dew-point transmitter with current output MT8716DTC1

- Especially suitable for monitoring pressurized systems.
- Digital transfer of measured values to the ALMEMO® display section (avoids risk of inaccuracy on the connecting lines or in the display section itself).
- High-level accuracy sustained down to -80 °C.
- High-speed reaction time.
- Displayed variables : temperature, rel. humidity, dew-point.
- Process connection for high pressures (optionally up to 350 bar).



Technical data :

Measuring range	-80 to +20°C dew-point temperature (DT)
Measuring accuracy	± 0.5°C from -10 to +20 °C DT, typical ± 2°C at -40 °C DT
Measuring channels (FHA646DTC1 only)	
Temperature	-20.0 to +70.0 °C
Relative humidity	0 to 98.0% RH
Dew point	-80.0 to +20.0 °C dew-point temperature (DT)
Operating temperature	-20 to +70 °C
Process connection	Screw thread G 1/2", stainless steel
Protective cap	Sintered stainless steel filter
Pressure range	-1 to +50 bar standard
Storage temperature	+40 to +80 °C
FHA646DTC1	
Output	ALMEMO® digital
Power supply	via ALMEMO® connector, approx. 5 mA
Connection	Cable, 1.5 meters, with ALMEMO® connector
MT8716DTC1	
Output	4 to 20 mA / -80 to +20 °C dew-point temperature (DT), 2 wires
Power supply	10 to 30 V DC, load <500 ohm
Connection	Transmitter connector
Housing	
Material	polycarbonate
Protection system	IP65

Option:

Dew-point sensor for
process pressure up to 350 bar — Order no. : OA9646DTCP

Accessories :

Screw-on measuring chamber for connecting a dew-point transmitter to compressed air pipes via a ball valve, up to a maximum of 16 bar, including perforated protective cap

Order no. : ZB9646DTCK

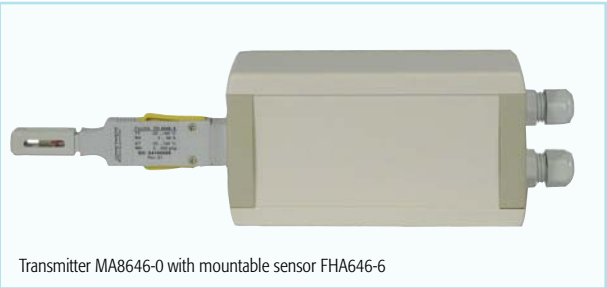
- Advantage :
  high-speed measuring without waiting for installation

Types (including manufacturer's test certificate)

ALMEMO® dew-point sensor with connecting cable, 1.5 meters long, and ALMEMO® connector	**Order no. FHA646DTC1**
Dew-point transmitter with current output, including connector	**Order no. MT8716DTC1**

HUMIDITY

Wall-housing transmitter MA 8646 for capacitive ALMEMO® humidity sensor FHA 646



Transmitter MA8646-0 with mountable sensor FHA646-6

- Twin analog transmitters for capacitive ALMEMO® humidity sensors. (not for dewpoint sensor FHA646DTC1)
- Humidity sensors can be connected, exchanged as and when necessary.
- Analog output range can be scaled on the sensor connector.
- For stationary measuring operations, housing suitable for wall-mounting.
- Versions available for different supply voltages.

Options :

Analog output, 2 x 0 to 20 mA	Order no. : OA8646R3
Analog output, 2 x 4 to 20 mA	Order no. : OA8646R4
Other analog output range, PLEASE SPECIFY WHEN ORDERING ! Programming on the humidity sensor connector	Order no. : OA9000PR
Voltage supply : 13 to 28 V DC not electrically isolated	Order no. : OA8646U0
Voltage supply : 10 to 30 V DC electrically isolated	Order no. : OA8646U
Voltage supply : 110 V AC, 50-60 Hz	Order no. : OA8646U5

Humidity sensors (including manufacturer's test certificate)

Mountable sensor, –20 to +60 °C	Order no. : FHA6466
Plastic tube, with 1.5-meter cable, –20 to +60 °C	Order no. : FHA646E1
Stainless steel tube, with 1.5-meter cable, –20 to +80 °C	Order no. : FHA646E1C
Miniature sensor, with 2-meter cable, -30 to +100 °C	Order no. : FHA646R
up to 16 bar, with 1.5-meter cable, –20 to +60 °C	Order no. : FHA646E7C

Advisory note

Dewpoint sensor FHA646DTC1 cannot be connected.

Technical data :

Operative range :	see humidity sensor
Humidity measuring circuit	
Measuring range :	0 to 100 % r.H. (%rH, HrH, HcrH)
Sensor :	capacitive
Accuracy :	± 2 % r.H. in the range < 90% r.H. at nominal temperature
Reproducibility :	1 % at nominal temperature
Nominal temperature :	+23 ± 3°C
Transmitter, accuracy :	± 0.5 % r.H.
Temperature measuring circuit :	
Measuring range :	-50 to +125 °C
Sensor :	NTC type N
Accuracy :	0 to +70 °C : ± 0.1 K -20 to 0 °C : ± 0.4 K +70 to +100 °C : ± 0.6 K
Reproducibility :	0.1 K
Transmitter, accuracy :	± 0.1 K
Outputs :	2 x 0 to 10 V (load : >100 kohm)
Resolution :	12 bit (4000 digits)
Temperature drift :	± 0.02 % / K
Nominal temperature :	+23 ± 3°C
Option R3 :	2 x 0/4 to 20 mA (burden : <500 ohm)
Output range :	Standard 0 to 100 % r.H., -30 to +70 °C Settable to customer-specific needs either before leaving the factory or programmed on the sensor connector by the user using ALMEMO® device
Power supply :	Mains 230 V +10%/-15%, 50 to 60Hz (Option U5 : 110 V)
Option U :	10 to 30 V DC, electrically isolated
Option U0 :	13 to 28 V DC, not electr. isolated
Current consumption :	approx. 30 mA (no load)
Connections :	screw terminals
Cable bushing :	on the wall side or through grommets (PG) on end of device
Housing :	Wall-housing, plastic 123 x 68 x 49 mm, protection system IP 40
Environmental conditions :	
Operating temperature :	-10 to +60 °C
Storage temperature :	-30 to +70 °C
Ambient relative humidity :	10 to 90 % rH (non-condensing)

Types (including manufacturer's test certificate)

Humidity / temperature transmitter in wall-mounted housing,
Outputs : 2 x 0 to 10 V (equivalent to 0 to 100 % r.H. and -30 to +70 °C)
Supply voltage 230 V AC, including wall unit, **without sensor**

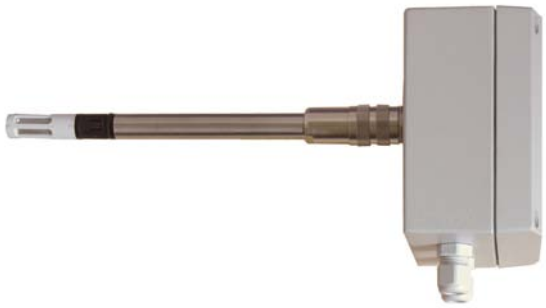
Order no. : MA86460

HUMIDITY

new!

Digital temperature / humidity transmitter MH 8D46 with double analog output V or mA

Transmitter, housing open



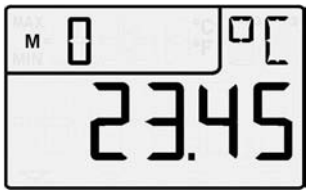
- Digital sensor element: All key sensor characteristics, settings, and adjustment data are stored in the sensor element itself.
- Plug-in sensor element: Spare elements are inexpensive; a replacement can be inserted quickly and easily on site by virtually anyone; it will be fully accurate and need no prior adjustment.
- Digital transfer of measured values from the sensor element to the transmitter.
- Factory or DKD calibration is performed on the sensor element alone. Fully accurate - irrespective of connecting cable and tansmitter.
- Four climate variables can be measured, double analog output for temperature and a humidity variable - relative humidity / dew point / mixture ratio.
- Limit value relay(s) available on request.
- The transmitters can be configured via the internal display and the keypad.
- The analog output type (10 V or 20 mA) can be selected (via the keypad); the analog output range can be programmed.
- Display of measured value, channel, units, humidity range, analog start and analog end, and analog type.
- The sensor tube can be connected either directly on the transmitter itself or via a connecting cable.
- Suitable for conduit mounting or wall mounting.

Technical data

Operative range	Sensor: -20 to +80 °C / 5 to 98 % RH
Electronics:	-10 to +60°C, IP65
Humidity sensor	
Measuring range:	0 to 100 % RH
Sensor:	CMOSens® technology
Measuring duration / output period:	approx. 3 seconds
Accuracy	± 1.8% RH in the range 20 to 80 % RH at nominal temperature
Hysteresis	± 1% RH
Nominal temperature	25 °C ± 2 K
Sensor operating pressure	Atmospheric pressure
Response time T_{63}:	typical 10 seconds at 25 °C and 1 m/s
Temperature sensor	
Sensor	CMOSens® technology
Measuring duration / output period:	approx. 3 seconds
Accuracy:	± 0.3 K at 25 °C, ± 1 K (± 1.2 K) in range -20 to +60 °C (up to +80 °C)
Reproducibility	± 0.1 K
Response time T_{63}:	typical 10 seconds
Outputs	
Double analog output	Digital-to-analog converter (DAC) electrically isolated 0 to 10 V: Load 100 kohms 0 to 20 mA: Load <500 ohms
Output type:	0 to 10 V, 0 to 20 / 4 to 20 mA, selectable
Resolution:	16 bit
Accuracy:	0.1% of final value
Temperature drift:	10 ppm/K
Time constant:	100 µs
Connection:	Cable, via screwless clamp connector with cable bushing Cable diameter 2 to 5 mm
Limit value relay(s)	available on request
Standard equipment	
Display, internal:	2-row LCD, 7 segments, 4½ and 5 characters, 2 digits, 16 segments
Operation, internal:	3 keys
Power supply	
DC:	9 to 30 VDC
Current consumption:	30 mA + 1.2·I_{Out}
Connection:	Cable, via screwless clamp connector with cable bushing Cable diameter 2 to 5 mm
Mechanical design	
Sensor tube:	Stainless steel, diameter 12 mm
Protective cap:	SK7, metal-mesh filter
Connection:	Via plug connection
Housing	Die-cast aluminum, closed cover
Dimensions:	(LxWxH) 100 x 100 x 60 mm
Protection type:	IP65 (with sensor tube or connecting cable plugged in)

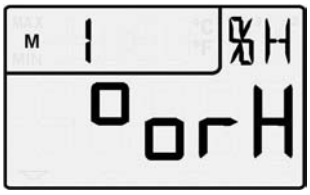
HUMIDITY

Displays for measured values and programming (housing open):

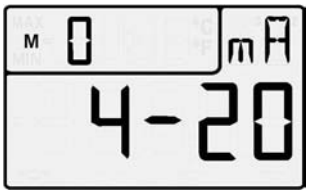


Measured value display, channel M0, temperature

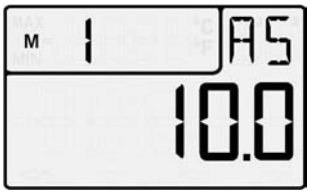
Measured value display, channel M1, humidity variable, e.g. relative humidity



Selecting the humidity variable, e.g. relative humidity, % RH



Selecting the analog output type, e.g. 4 to 20 mA



Programming for the analog start

Programming for the analog end

Accessories

Angle bracket for wall mounting	Order no. ZB8D00W
Rubber gasket (mat) for mounting the housing directly on a conduit wall (immersion depth = sensor length + approx. 42 mm plug length)	Order no. ZB8D00GD
Movable brass screw with plastic sealing ring (page 09.05)	Order no. ZB9600KV20
Connecting flange for screw, pitch circle diameter 38 mm (page 09.05)	Order no. ZB9600F20
Protective caps see page 09.06	
Mains units 230 VAC, 12 VDC, 200 mA	Order no. ZB1012NA1
Connecting cable between sensor tube and transmitter Length = 2 meters	Order no. ZH9D46VK02
same Length = 5 meters	Order no. ZH9D46VK05
same Length = 10 meters	Order no. ZH9D46VK10
Spare sensor, complete Sensor element inside sensor tube, with plug connector, including protective cap SK7, sensor length = 140 mm	Order no. FH9D461K1
same Sensor length = 280 mm	Order no. FH9D461K2
same Sensor length = 540 mm	Order no. FH9D461K3
Spare sensor element, digital, adjusted, plug-in, including protective cap SK7	Order no. FH0D461

Versions including manufacturer's test certificate **:**

Digital transmitter for humidity and temperature
with double analog output, 10 V or 20 mA (selectable via keypad), internal display, 3 keys, aluminum housing, IP65, with plug-in digital sensor, sensor length = 140 mm **Order no. MH8D461K1**
same Sensor length = 280 mm **Order no. MH8D461K2**
same Sensor length = 540 mm **Order no. MH8D461K3**

HUMIDITY

Hand-held psychrometer FNA 846

- Operating range 0 to +60 °C / 10 to 100 % r.H.
- Available values :
  Dry temperature, relative humidity, dew point, mixture ratio, humid temperature, partial vapour pressure.

On these ALMEMO® devices the current atmospheric pressure can be entered or measured using an ALMEMO® pressure measuring connector; the measured humidity value is then adjusted automatically to produce highly precise results.

Accessories:

New ALMEMO® pressure measuring connector for barometric pressure 700 to 1100 mbar, without pressure terminal sleeve (variant with pressure terminal sleeve, see page 11.12) including programming for automatic atmospheric pressure compensation (Designation *P) Technical data see page 11.12
Order no. FDA912SAP

Extension pipe, 200 mm long	Order no. ZB9846VR
Plastic suction hose, 300 mm long	Order no. ZB9846PS
Spare wicks (2 pieces)	Order no. ZB9846ED

Technical Data:

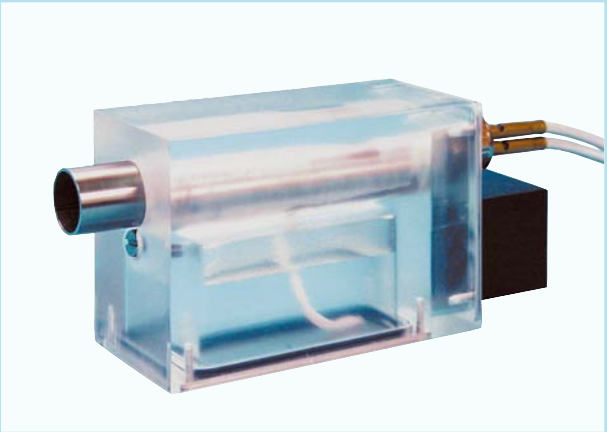
Humidity	
Measuring range:	10 to 100% r.H.
Measuring type:	psychrometric
Accuracy:	±1% r.H. under nominal conditions
Reproducibility:	< 1% r.H.
Nominal conditions:	25°C ±3°C , 1013 mbar, 50% r.H.
Temperature	
Sensor:	2 x NTC type N
Accuracy:	0 to 60°C: ±0.1K
Electrical supply	
Operating voltage:	9 V DC via ALMEMO® device
Current consumption :	approx: 10 mA
Mechanical construction	
Housing:	plastic
Dimensions:	Ø 50 mm, 245 mm long
Weight:	approx. 300 g
Cable :	1.5 m long with ALMEMO® connector

Types:

Hand-held psychrometer, including water bottle, two wicks	**Order no. FNA846**
As above with turn-off motor for WBGT measurement	**Order no. FNA846WB**

HUMIDITY

Psychrometer FNA 8463 / FPA 8363



- Optimized version for long-term measuring operations.
- Especially suitable for high temperatures.
- Operating range 0 to 90 °C / 10 to 100 % r.H.
- Available values :
  Dry temperature, relative humidity, dew point, mixture ratio, humid temperature, partial vapour pressure.

On these ALMEMO® devices the current atmospheric pressure can be entered or measured using an ALMEMO® pressure measuring connector; the measured humidity value is then adjusted automatically to produce highly precise results.

Accessories:

New ALMEMO® pressure measuring connector for barometric pressure 700 to 1100 mbar, without pressure terminal sleeve (variant with pressure terminal sleeve, see page 11.12) including programming for automatic atmospheric pressure compensation (Designation *P) Technical data see page 11.12
Order no. FDA912SAP

Spare wicks (2 pieces) Order no. ZB98462ED

Extension cable for mains supply units with 3-pin bayonet coupling, length : 5 meters Order no. : ZB5090VK05

Technical Data:

Humidity	
Measuring range :	10 to 100 % r.H.
Measuring type :	psychrometric
Accuracy :	±1% r.H. under nominal conditions
Reproducibility :	< 1% r.H.
Nominal conditions :	25 ± 3 °C , 1013 mbar, 50% r.H.
Temperature FNA8463	
Sensor:	2 x NTC type N
Accuracy:	0 to 70°C, ± 0.1K 70 to 90°C, ± 0.4K
Temperature FPA8363	
Sensor:	2 x Pt100
Accuracy:	IEC 751, IEC 751, class B ALMEMO® adjusted
Electrical supply	
Operating voltage :	12 V DC via mains supply unit (cable approx. 2 meters)
Current consumption :	approx. 40 mA
Mechanical construction	
Housing :	plastic polycarbonate
Dimensions :	L 175 x W 50 x H 75
Weight :	approx. 890 g
Cable :	PVC (up to 90°C), 5 m with ALMEMO® connector FNA8463 : 1 cable / 1 connector FPA8363 : 2 cables / 2 connectors

Types:

(including mains supply unit, water bottle, two wicks)

Psychrometer with 2 x NTC sensors including connecting cable (one ALMEMO® connector) **Order no. FNA8463**

Psychrometer with 2 x Pt100 sensors including connecting cable (two ALMEMO® connectors) **Order no. FPA8363**