

# Calibration certificates

## Calibration certificates - temperature and pressure - sensor deviation reduced to zero

1 Widerstandsthermometer (Pt100), angeschlossen an 1 Temperaturanzeigergerät  
1 platinum resistance thermometer (PT100), connected with 1 temperature measuring device

st Result	Anzeige Indication °C	Abweichung Deviation K	Messunsicherheit Uncertainty K
Prüf-temperatur Test Temperature °C			0,25
620,00	620,00	0,00	0,25
600,00	600,00	0,00	0,15
550,00	550,00	0,00	0,10
500,00	500,00	0,00	0,08
450,00	450,00	0,00	0,07
400,00	400,00	0,00	0,06
350,00	350,00	0,00	0,06
300,00	300,00	0,00	0,05
250,00	250,00	0,00	0,05
200,00	200,00	0,00	0,04
150,00	150,00	0,00	0,04
		0,00	0,03
		0,00	0,03



The patented ALMEMO® measuring technology from Ahlborn has proved itself many times over in a wide variety of fields; its use in research and development is just one example. Quality assurance, resources monitoring, and calibration systems also constitute a very broad field for ALMEMO® measuring technology.

Wherever measured values must be exactly traceable to a known standard and measuring equipment needs to be thoroughly checked at regular calibration intervals ALMEMO® is the answer - both as the reference device in the cali-

bration laboratory and as a calibratable device for the customer; it is precisely in this context that the quality of AHL-BORN measuring instruments is so decisive.

The measuring chain is corrected by means of a new multi-point adjustment function.

When ALMEMO® measuring equipment is calibrated the sensor deviation is determined at each and every calibration point and then saved as correction value for that calibration point in the patented ALMEMO® connector. The measured values for the sensor obtained using this

multi-point adjustment function are entered in the calibration certificate. Sensor deviations are thus reduced to zero.

Measuring operations within the calibration interval can thus be performed with much less uncertainty. The measured value displayed on the ALMEMO® measuring instrument has already been corrected and can be used directly. Correction of the displayed measured value on the basis of the sensor deviation in the calibration certificate, as would otherwise be the case, is thus no longer necessary.

## Temperature

Calibration certificate for temperature measuring chains consisting of a contact temperature sensor and an instrument (also individual sensors). This calibration can only be performed as an immersion measurement with sensors or sensor + measuring instrument (measuring chain).

Temperature range:	Pt100	-196°, -90° to +660°C
	thermocouples	-196°, -80° bis + 1600°C

### DAkkS Calibration Certificate

**Order no.**

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards. .

Package offer (basic rate + 3 points 0°C, 50°C, 100°C)

**KT9021D**

#### Measuring points, freely selectable

Basic fee per certificate

**KT9001D**

Measuring point fee per sensor, one measuring point

**KT9011D**

Measuring point fee per sensor, one measuring point -196 °C

**KT9012D**

#### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

Package offer (basic rate + 3 points 0°C, 50°C, 100°C)

**KT9021W**

Package offer only for temperature/humidity sensor of type FH XXX6-XX, measuring range temperature (basic rate + 3 points 10°C, 25°C, 40°C)

**KT9041W**

#### Measuring points, freely selectable

Basic fee per certificate, temperature range up to +1300 °C

**KT9001W**

Basic fee per certificate, temperature range up to +1600 °C

**KT9002W**

Measuring point fee per sensor, one measuring point

**KT9011W**

Measuring point fee per sensor, one measuring point -196 °C

**KT9012W**

If ALMEMO® series temperature sensors are used, the sensor deviations that have been determined during the calibration will be stored in the sensor connector as correction values for zero point and slope (gain) before the last measurement is performed. The correction is performed with DAkkS and factory calibrations.

## Calibration certificate - temperature - sensor deviation reduced to zero (see page 17.06)

### Multi-point adjustment for ALMEMO® measuring chains

**Order no.**

(preferably using Pt100 and NTC sensors)

for the measurable variable temperature, for calibration packages and for single points (at least 3 temperature points, temperature point 0 °C obligatory), additional charge per sensor for factory / DAkkS calibration (German calibration service)

**KA9001DW**

Calibration and adjustment of the ALMEMO® measuring chain are performed for the whole of the sensor's measuring range at the points in the calibration package.

Calibration and adjustment of the ALMEMO® measuring chain are performed (preferably using Pt100 and NTC sensors) at at least 3 temperature points (temperature point 0 °C obligatory). Outside the calibrated range (i.e. below the lowest and above the highest calibration points) linear interpolation is performed up to the limits of the device's measuring range (e.g. Pt100 0.01 K from -200 to +400 °C).

When ALMEMO® measuring equipment is calibrated the sensor deviation is determined at each and every calibration point and then saved as correction value for that calibration point in the patented ALMEMO® connector. The measured values for the sensor obtained using this multi-point adjustment function are entered in the calibration certificate. Sensor deviations are thus reduced to zero.

With thermocouples, as is generally the case, the indicated (zero-based) values in the calibration certificate are only valid if the device is in a stationary, thermally steady-state condition.

Only for device types ALMEMO® 2450 (not -L), 2490 (not -L), 2590-2/-3S/-4S, 2690, 2890, 4390, 8590, 8690, 5690 and 5790

These device types as of serial number H0802xxxx incorporate this function as standard; for device types of serial number H0801 and below a device firmware update is possible (noted at incoming inspection as part of the calibration service).

**OA0006U**

#### Advisory note :

On temperature sensors with special linearization or special measuring ranges saved to the ALMEMO® connector (e.g. ALMEMO® connector ZA9040SS3 NTC 0.001K or ALMEMO® connectors with KTY84, YSI400, or customized NTC) multi-point adjustment is not possible..

# Calibration certificates

## Infrared Temperature Measurement

Calibration certificate for temperature measuring chains consisting of an IR temperature sensor and an instrument (also individual sensors).

### DAkkS-Calibration Certificate

### Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

**For IR transmitters MR7838, MR7842, MR78434, Hand-held IR devices MR7811, MR7814, ALMEMO® IR sensor FIAD43**

Package offer: 3 temperature points, 25, 100, 200 °C

**KI9201D**

Calibration in the range -20°C to +550°C in 3 individually selectable measuring points

**KI9168D**

Calibration in the range +550°C to +1600°C in 3 individually selectable measuring points

**KI9178D**

1 additional measuring point, freely selectable, in the range -20 to +1600 °C

**KI9168DP**

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

**For IR transmitters MR7838, MR7842, MR7843, Hand-held IR devices MR7811, MR7814, ALMEMO® IR sensors FIA844, FIAD43**

Package offer 3 temperature points, 25, 100, 200 °C

**KI9201W**

Calibration in the range -20°C to +550°C in 3 individually selectable measuring points

**KI9168W**

Calibration in the range +550°C to +1600°C in 3 individually selectable measuring points

**KI9178W**

1 additional measuring point, freely selectable, in the range -20 to +1600 °C

(but not between 550 and 600 °C)

**KI9168WP**

## Relative Air Humidity for Capacitive Humidity Sensors

Calibration certificate for humidity measuring chains consisting of a capacitive humidity sensor and measuring instrument (also individual sensors).

### DAkkS Calibration Certificate

### Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

Package offer

(Basic rate + 3 humid. points 20%/53%/75% r.H. + 1 temperature point at approx. 25 °C )

**KH9046D**

Package offer

(basic rate + 3 humidity points in the range 20% to 85% r.H.)

**KH9056D**

supplement to KH9056D

(1 further humidity point in the range 20% to 85% r.H.)

**KH9056DP**

### Factory Calibration Certificate

### Order no.

Calibration compares measured values against reference values based on national standards.

Calibration is performed in a humidity generator at an ambient temperature of approx. 25° C.

Package offer

(Basic rate + 3 humidity points 11% / 53% / 75% r.H. + 1 temperature point at approx. 25°C)

**KH9046 W**

Package offer

(Basic rate + 3 humidity points 11% / 53% / 75% r.H.)

**KH9036W**

Package offer

(Basic rate + 3 humidity points in the range 20% to 85% r.H.)

**KH9056W**

Supplement to KH9056W Additional humidity point in the range 20 to 85% RH

**KH9056WP**

For calibration at other temperatures, see below !

## Relative Air Humidity for Psychrometers

Calibration certificate for humidity measuring chains consisting of psychrometer and measuring instrument.

### DAkkS Calibration Certificate

**Order no.**

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

Package offer (basic rate + 2 humidity points 30% / 75% RH + 1 temperature point at approx. 25 °C)

**KH9146D**

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

Calibration is performed in a humidity generator at an ambient temperature of approx. 25 °C.

Package offer (basic rate + 2 humidity points 30% / 75% RH + 1 temperature point at approx. 25 °C)

**KH9146W**

## Relative air humidity at temperatures up to +95 °C

### DAkkS calibration certificate for temperatures up to +95° C

**Order no.**

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

For capacitive humidity sensors and psychrometers. Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards. Calibration is performed in a humidity generator / climate chamber by a DAkkS authorized office.

#### Measuring points, freely selectable

Basic rate

**KH9166D**

Points rate per sensor for 1 climate point

Temperature in the range +10 to +95 °C and humidity in the range 10% to 95% RH

**KH9166DP**

### Factory calibration certificate for temperatures up to +95 °C

For capacitive humidity sensors and psychrometers. Calibration compares measured values against reference values based on national standards. Calibration is performed in a humidity generator / climate chamber.

#### Measuring points, freely selectable

Basic rate

**KH9166W**

Points rate per sensor for 1 climate point

Temperature in the range +10 to +95 °C and humidity in the range 10% to 95% RH

**KH9166WP**

## Relative air humidity, temperature, and atm. pressure for FMA510

### Factory Calibration Certificate

**Order no.**

Calibration compares measured values against reference values based on national standards.

Calibration in a climate chamber at approx. 25 °C

Package offer 1 temperature point at approx. 25 °C 1 humidity point at approx. 50 % RH, 1 absolute pressure measuring point for atmospheric pressure at time of calibration

**KH9246W**

## Dew point

Calibration certificate - for dewpoint sensor only FHA646DTC1 / MT8716DTC1.

### Factory Calibration Certificate

**Order no.**

Factory calibration certificate

Calibration is performed based on measurement comparison at an ambient temperature of approx. 25 °C.

basic rate + 1 dew point in the range -60 to +20 °C dew point

**KH9316W**

Supplement for KH9316W

1 additional dew point in the range -60 to +20 °C dew point

**KH9316WP**

# Calibration certificates

## Pressure

Calibration according to DIN 16005/16086.

This calibration can be performed in 5 or 10 measuring points with pressure transducers or transducer + measuring instrument (measuring chain): to 100bar, medium: gas to 700bar, medium: oil

### DAkkS Calibration Certificate

### Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

Positive overpressure in the range 0 to 700 bar, 10 points

**KD9012D**

Positive and negative overpressure for pressure sensors in the range -1 to 700 bar, 10 points

**KD9014D**

Absolute pressure in the range from 0.03bar to 700bar, 10 points

**KD9112D**

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

Positive overpressure in the range 0 to 700 bar, 10 points

**KD9012W**

Positive overpressure in the range 0 to 700 bar, 5 points

**KD9013W**

Positive and negative overpressure for pressure sensors in the range -1 to 700 bar, 10 points

**KD9014W**

Absolute pressure in the range from 0.03bar to 700bar, 10 points

**KD9113W**

Absolute pressure in the range from 0.03bar to 700bar, 5 points

**KD9112W**

## Calibration certificate - pressure - sensor deviation reduced to zero (see page 17.06)

### Multi-point adjustment for ALMEMO® measuring chains

### Order no.

For the measurable variable pressure, for calibration packages, additional charge per sensor for factory / DAkkS calibration

**KA9001DW**

When ALMEMO® measuring equipment is calibrated the sensor deviation is determined at each and every calibration point and then saved as correction value for that calibration point in the patented ALMEMO® connector. The measured values for the sensor obtained using this multi-point adjustment function are entered in the calibration certificate. Sensor deviations are thus reduced to zero.

For analog pressure sensors, e.g. FDA602Lx, FD8214x.

Not for digital pressure sensors FDAD33x, FDAD35x, FDAD12SA or barometric pressure sensors integrated in the ALMEMO® device or in the ALMEMO® D6 plug

Only for device types ALMEMO® 2450 (not -L), 2490 (not -L), 2590-2/-3S/-4S, 2690, 2890, 4390, 8590, 8690, 5690, 5790

These device types as of serial number H0802xxxx incorporate this function as standard; for device types of serial number H0801 and below a device firmware update is possible (noted at incoming inspection as part of the calibration service).

**OA0006U**

## Absolute pressure for digital atmospheric pressure sensor FDAD12SA

Calibration certificate for barometric pressure sensors integrated in the ALMEMO® device or in the ALMEMO® D6 plug

### DAkkS Calibration Certificate

### Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

Absolute pressure 5 points in the range 700 to 1100 mbar

**KD9213D**

Absolute pressure 10 points in the range 700 to 1100 mbar

**KD9214D**

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

Absolute pressure 5 points in the range 700 to 1100 mbar

**KD9213W**

Absolute pressure 10 points in the range 700 to 1100 mbar

**KD9214W**



## Air Flow

Calibration certificate for rotating vanes, Pitot tubes and thermoanemometers.

### DAkkS Calibration Certificate

**Order no.**

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed in a wind tunnel based on measurement comparison against a laser Doppler anemometer by a DAkkS authorized office.

Package offer (basic rate + 5 points 0,5 m/s / 1 m/s / 2 m/s / 5 m/s / 10 m/s )	<b>KV9025D</b>
Package offer (basic rate + 5 points 2 m/s / 5 m/s / 10 m/s / 15 m/s / 20 m/s )	<b>KV9035D</b>
Package offer (basic rate + 5 points 0,2 m/s / 0,3 m/s / 0,5 m/s / 0,8 m/s / 1 m/s )	<b>KV9065D</b>

### Factory Calibration Certificate

The calibration can be performed with the sensor and the meas. instrument (meas. chain). Calibration in a wind tunnel.

Reference standards: Wind tunnel and reference rotating vanes (calibrated acc. to the laser-Doppler method).

Package offer (basic rate + 3 points 0.5m/s / 5m/s / 10m/s)	<b>KV9025W</b>
Package offer (basic rate + 3 points 5m/s / 10m/s / 19m/s) FVA645TH3: 15m/s	<b>KV9035W</b>
Package offer (basic rate + 3 points 7m/s / 20m/s / 30m/s)	<b>KV9045W</b>
Package offer (basic rate + 3 points 0.5m/s / 1m/s / 1,75m/s)	<b>KV9055W</b>
Package offer (basic rate + 3 points 0.5m/s / 0.8m/s / 1m/s)	<b>KV9065W</b>

### Measuring points, freely selectable

Basic rate	<b>KV9005W</b>
Per measuring point and sensor Meas. range 0.5m/s to 40m/s.	<b>KV9015W</b>

## Flow measurement in liquids

Calibration certificate for turbine flow meters or flow sensors

### Factory Calibration Certificate

**Order no.**

Calibration compares measured values against reference values based on national standards.

Calibration of the volume flow rate in l/min (up to maximum 200 l/min) in the test chamber

Measuring medium: Water

Calibration at 3 measuring points 1 point each at start / middle / end of sensor range	
Package offer	<b>KV9115W</b>
Supplement to KV9115W 1 additional measuring point in the sensor's measuring range	<b>KV9115WP</b>

# Calibration certificates

## Conductivity

Calibration certificate for conductivity measuring chains.

### Factory Calibration Certificate

### Order no.

Calibration in KCl reference solutions. Reference standard: Precision conductivity measurement instrument, which has been calibrated with KCl solutions of the National Institute of Standards and Technology (NIST).

Package offer for conductivity probe FYA641LF /LFP1

(Basic rate + 3 points 0.5mS / 2.77mS / 10mS)

**KY9041W**

(Basic rate + 2 points 2.77mS / 12.8mS)

**KY9044W**

Package offer for conductivity probe FYA641LF2 /LFP2

(Basic rate + 3 points 5μS / 147μS / 190μS)

**KY9042W**

Package offer for conductivity probe FYA641LF3 /LFP3

(Basic rate + 3 points 5mS / 50mS / 111,8mS)

**KY9043W**

## Gas Concentration

Calibration certificate for CO<sub>2</sub>

### Factory Calibration Certificate

### Order no.

Calibration is performed based on measurement comparison against a reference gas specified by the manufacturer.

Package offer for CO<sub>2</sub> probe FYA600CO2

(approx. 10 measuring points)

**KY9620W**

Package offer for CO<sub>2</sub> probe FYAD00CO2B10 (3 measuring points at approx. 1000 / 4000 / 7000 ppm)

**KY9626W**

## Measurable Variables for Optical Radiation

Calibration certificate for broad-band light detectors

### Factory Calibration Certificate

single point calibration of absolute size

**KL9033W**

(not for probes FLA613GS / UVA / UVB / VLM / VLK / UVAK, FLA623x)

Calibration of absolute variable in 3 points

**KL9034W**

(only for probes FLA613GS / UVA / UVB / VLM / VLK / UVAK, FLA623x)

## Optical Speed Sensors

Calibration certificate for contactless tachometers.

### DAkKS Calibration Certificate

### Order no.

DAkKS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkKS authorized office which compares measured values against reference values based on national standards.

Calibration of the optical transducer at 8 measuring points

(not applicable for the tachometer probe FUA919-MF)

**KU9029D**

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

Calibration of the optical transducer at 8 measuring points

(not applicable for the tachometer probe FUA919-MF)

**KU9029W**

## Force

Calibration for tension and compression sensors

### Factory calibration certificate

Order no.

Calibration is performed based on the measurement comparison method for Ahlborn force transducers; (other makes available on request).

4 series of measuring operations upwards and 2 series downwards

3 steps (0%, 20%, 60%, 100% of final value) Tension or compression (indicate direction), up to 1 kN

KK9021W

3 steps (0%, 20%, 60%, 100% of final value) Tension or compression (indicate direction), up to 10 kN

KK9031W

3 steps (0%, 20%, 60%, 100% of final value) Tension or compression (indicate direction), up to 100 kN

KK9041W

3 steps (0%, 20%, 60%, 100% of final value) Tension or compression (indicate direction), up to 1000 kN

KK9051W

## Electrical Calibration of Measuring and Indicating Devices

Calibration certificate for all devices of the THERM and ALMEMO® series.

### DAkkS Calibration Certificate

Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

The calibration is performed at approx. 10 to 20 measuring points.

Calibration for one measuring range

KE9010D

Each further measuring range

KE9020D

Calibration of a measuring chain using ALMEMO® adapter cable ZA9603AKx, AC voltage or ALMEMO® measuring module ZA990xABx, AC / DC voltage, up to 400 V (50 Hz), or AC / DC current, up to 10 A (50 Hz) Package offer, approx. 10 points

KE9030D

### Factory Calibration Certificate

Calibration compares measured values against reference values based on national standards.

The calibration is performed at approx. 10 to 20 measuring points.

Calibration for one measuring range

KE9010W

Each further measuring range

KE9020W

Calibration of a measuring chain using ALMEMO® adapter cable ZA9603AKx, AC voltage or ALMEMO® measuring module ZA990xABx, AC / DC voltage, up to 400 V (50 Hz), or AC / DC current, up to 10 A (50 Hz) Package offer, approx. 10 points

KE9030W

Calibration certificate for all ALMEMO® measuring instruments with interface

### DAkkS calibration certificate

Order no.

DAkkS calibration meets all the requirements regarding test resources laid down in DIN EN ISO/IEC 17025 (inter alia for the monitoring of production processes and the quality assurance applied to products).

Calibration is performed by a DAkkS authorized office which compares measured values against reference values based on national standards.

Full calibration of ALMEMO device in 9 measuring ranges

2.6 V (volt), 55 mV (mV), 26 mV (mV1), 260 mV (mV2), NiCr-Ni (NiCr), Pt100 0.1 K (P104), Pt100 0.01 K (P204), NTC type N (NTC), relative humidity, capacitive (% RH)

Package offer

KE9005D

### Factory calibration certificate

Calibration compares measured values against reference values based on national standards.

Full calibration of ALMEMO device in 9 measuring ranges

2.6 V (volt), 55 mV (mV), 26 mV (mV1), 260 mV (mV2), NiCr-Ni (NiCr), Pt100 0.1 K (P104), Pt100 0.01 K (P204), NTC type N (NTC), relative humidity, capacitive (% RH)

Package offer

KE9005W