

# HUMOR 20

## High-precision Humidity Calibrator

The role of humidity calibrations that are accurate, reproducible, and documentable is becoming more and more important. ISO quality guidelines and regulations according to FDA guidelines in the pharmaceutical industry, etc., require that humidity instruments have a traceable, accurate calibration. The humidity calibrator HUMOR 20 developed by E+E is the ideal reference instrument for these requirements.

The HUMOR 20 can be used in the humidity range of 10-95% RH both for monitoring cylindrical sensors (transmitters, hand-held instruments,...) and also for monitoring instruments with cubic dimensions (data loggers, wall instruments,...). A temperature sensor integrated in the measurement chamber also permits the monitoring of an optional temperature output.

The HUMOR 20 is traceable to international standards and can be delivered with an official, internationally recognised OEKD calibration certificate. Due to its high accuracy, the HUMOR 20 is the basis for accredited calibration laboratories for relative humidity.

Based on its operating principle, the HUMOR 20 can be used under typical conditions in a laboratory climate. This means that expensive, fully air-conditioned rooms are not necessary. For operation HUMOR 20 requires only distilled water, filtered oil-free air with a pressure of 10 bar and a power supply between 90-230V AC. The specimen can be powered by 24V DC that is available directly on the HUMOR 20.



**HUMOR 20**



**Automatic Calibration Module**

### Operation

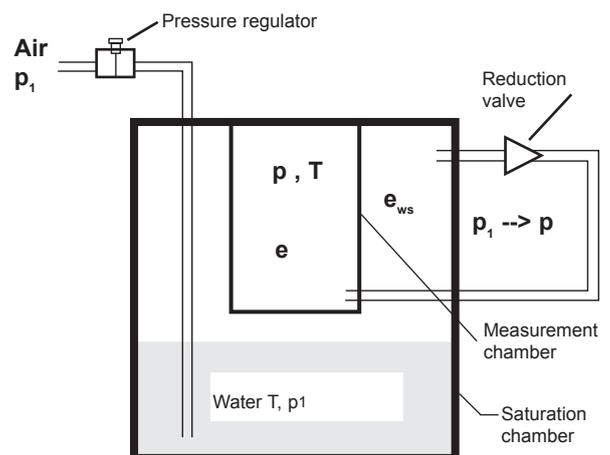
The operation of the HUMOR 20 is based on a fundamental two-pressure process and thus is similar to instruments used in national bureaus for standards. Air or nitrogen at a pressure  $p_1$  is led through a water-filled saturation chamber and saturated to 100% RH at  $p_1$ . By means of a reduction valve, the saturated air is reduced to the ambient pressure  $p$  and fed into the measurement chamber. Due to the construction, the saturation chamber and the measurement chamber are at the same temperature. Under these conditions, the water-vapour partial pressure  $e_{ws}$  is reduced at the same ratio as the total pressure.

Essentially, the following applies:

$$e = e_{ws} \cdot p / p_1$$

From this it follows that:  $RH = e / e_{ws} = p / p_1$

Thus, the generated relative humidity essentially depends on the ratio of the two pressures. Construction-specific deviations from this ratio are corrected during factory adjustments. By adjusting the pressure  $p_1$  the relative humidity is brought to the desired value in the measurement chamber.



Schematic Illustration of a Two-pressure Reactor

## Typical Applications

calibration laboratories  
 reference device  
 bureau of standards  
 manufacturers of measurement instruments

## Features

highest accuracy  
 traceable calibration  
 independent of ambient temperature  
 easy handling  
 traceable to international standards  
 OEKD certificatable

## Automatic Calibration Module

The optional available Automatic Calibration Module enables an automatic set point adjustment of the desired reference humidity. With the software, included in the scope of supply, checkpoints, stabilisation times, etc. can be set. Furthermore the instrument allows for an automatic print out of a calibration protocol for a transmitter with analogue standard interface.

## Calibration and Adjustment using HUMOR 20

24V DC electrical supply for the test sample are provided directly at HUMOR 20.

Furthermore, four inputs for the voltage or current outputs of transmitters are available when using the Automatic Calibration Module for generating calibration protocols.

The software which is included in the scope of supply allows the user to record measurement values in a log file, to print out calibration protocols and to configure or to readjust the HUMOR 20.

### Software - Features:

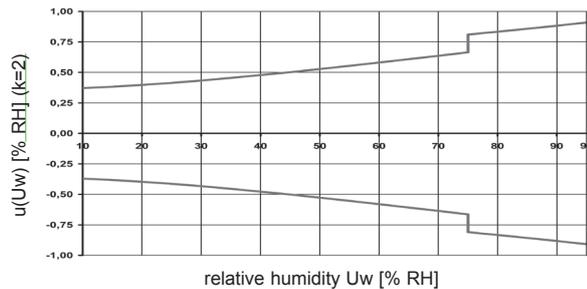
- Freely selectable numbers of measuring points and stabilisation times when using the Automatic Calibration Module
- Creation and print out of professional calibration protocols with:
  - Specimen number
  - Calibration date
  - Reference and actual values
- Temperature display can be switched between °C and °F
- 1-point customer humidity calibration of the HUMOR 20
- 6-point customer humidity calibration of the HUMOR 20
- 1-point customer temperature calibration
- Reset of HUMOR 20 to factory calibration



## Technical Data

### General

|  |                              |
|--|------------------------------|
| Function principle                       | two-pressure-reactor         |
| Working range                            | 10...95% RH                  |
| Protection class                         | I                            |
| Protection type                          | IP40                         |
| Surge voltage category                   | II                           |
| Installation altitude                    | up to 2000 m above sea level |
| Application                              | Indoors                      |
| Accuracy of measurement <sup>1) 2)</sup> |                              |



|   |  |
|---|--|
| Accuracy temperature measurement in measuring chamber <sup>2)</sup> | typ. $\pm 0.3^{\circ}\text{C}$ ( $\pm 0.54^{\circ}\text{F}$ )  |
| Power supply  | 100...230V AC, 50/60Hz, max. 20W   |
| Work equipment  | <ul style="list-style-type: none"> <li>• compressed air, filtered and free of oil or nitrogen <math>\text{N}_2</math> with max. 10bar (145psi)</li> <li>• distilled water</li> </ul> |
| Stabilisation time HUMOR 20   | < 3 min/measuring point  |
| Stabilisation time specimen   | typ. 20 min/Messpunkt  |
| Integrated power supply   | 24V DC, max. 200mA   |
| Number of measuring inputs  | 4 (switchable between 4...20mA / 0...20mA / 0...1V / 0...5V / 0...10V)   |
| Typ. error for display inputs                                       | Voltage measuring: < 5mV<br>Current measuring: < 30 $\mu\text{A}$  |
| Display   | Dot-matrix display with backlight  |
| Gas flow  | 3 l/min or RH > 85% the gas flow is reduced to 1.5 l/min at 95% RH   |
| Recommended interval for recalibration                              | 1 year   |
| Interface for PC connection   | RS232 (COM-Port)   |
| System requirements for software tools                              | MS Windows 2000 mit SP 2 / Windows XP / Windows Vista  |
| Environmental conditions  | temperature: 10...40°C (50...104°F)<br>humidity: 10...80% RH   |
| CE conformity   | EN61000-6-3:2007 EN61326-1:2006<br>EN61000-6-2:2006 EN61010-1:2010   |
| Additional Standards  | EN60068-2-6 EN60068-2-29   |
| Dimensions  | 400 x 260 x 240 mm (15.7 x 10.2 x 9.4")  |
| Weight  | HUMOR 20: about 23kg (51 lbs)<br>HUMOR 20 incl. aluminium transport case: about 36.5kg (80.5 lbs)  |



### Measuring Chamber

The construction of the measuring chamber allows the calibration and adjustment of cylindrical sensor probes with a diameter of 8-25.5mm (0.3-1") (hand-held instruments, duct-mounted versions, ...) as well as of cubic measuring units (room transmitters, data loggers, ...) with maximum dimensions of 100x85x40mm (3.9x3.3x1.6") or 95x95x40mm (3.9x3.9x1.6").

By using the Plexiglas cover (standard supply), it is possible to calibrate and adjust compact room devices (e.g., the EE10) with the HUMOR 20.

The overall accuracy of the calibration is influenced by the absence of the metal cover. The additional error depends on the position of the specimen in the chamber as well as on the relative humidity.

1) The extended inaccuracy of measurement results from the standard inaccuracy increased by a multiplying factor of K=2.

2) Valid for metal covers for the measuring chambers

## Accessories

### Oil-free compressor

#### Technical Data:

|                         |                                    |
|-------------------------|------------------------------------|
| Max. operation pressure | 12bar (174psi)                     |
| Supply voltage          | 230V AC // 50 or 60Hz              |
| Noise level             | 57 dB(A)/1m                        |
| Dimensions (l x w x h)  | 410 x 410 x 500 mm (16 x 16 x 20") |
| Weight                  | 21kg (46lbs)                       |



### Optional covers for the measuring chambers

Various covers for the measuring chamber accommodate probes of all diameters available on the market.

With these covers up to four probes can be calibrated simultaneously.

| SUITABLE FOR                                  | NUMBER OF FEEDTHROUGHS | ORDER-CODE |
|---|------------------------|------------|
| Humor cover 12 - 16mm (0.5 - 0.6") plane      | for 2 Probes           | HA020201   |
| Humor cover 16 - 20.5mm (0.6 - 0.8") plane    | for 1 Probe            | HA020202   |
| Humor cover 20.5 - 25.5mm (0.8 - 1") plane    | for 1 Probe            | HA020203   |
| Humor cover 8 - 12mm (0.3 - 0.5") plane       | for 3 Probes           | HA020204   |
| Humor cover 12 - 13mm (0.5 - 0.52") conic     | for 4 Probes           | HA020205   |
| Humor cover 12 - 16mm (0.5 - 0.6") bevelled   | for 4 Probes           | HA020207   |
| Humor cover 16 - 20.5mm (0.6 - 0.8") bevelled | for 4 Probes           | HA020208   |
| Humor cover 30mm (1.2") plane                 | for 1 Probe            | HA020209   |
| Adapter for EE33 - modell J <sup>1)</sup>     |                        | HA020401   |

1) only useable in combination with HA020204 or HA020201

### Calibration certificate

To meet the requirements of Quality Management Systems such as ISO9001 regarding calibration and certification of measurement and test instrumentation, the HUMOR 20 is available with an official OEKD accredited calibration certificate.



### Automatic Calibration Module

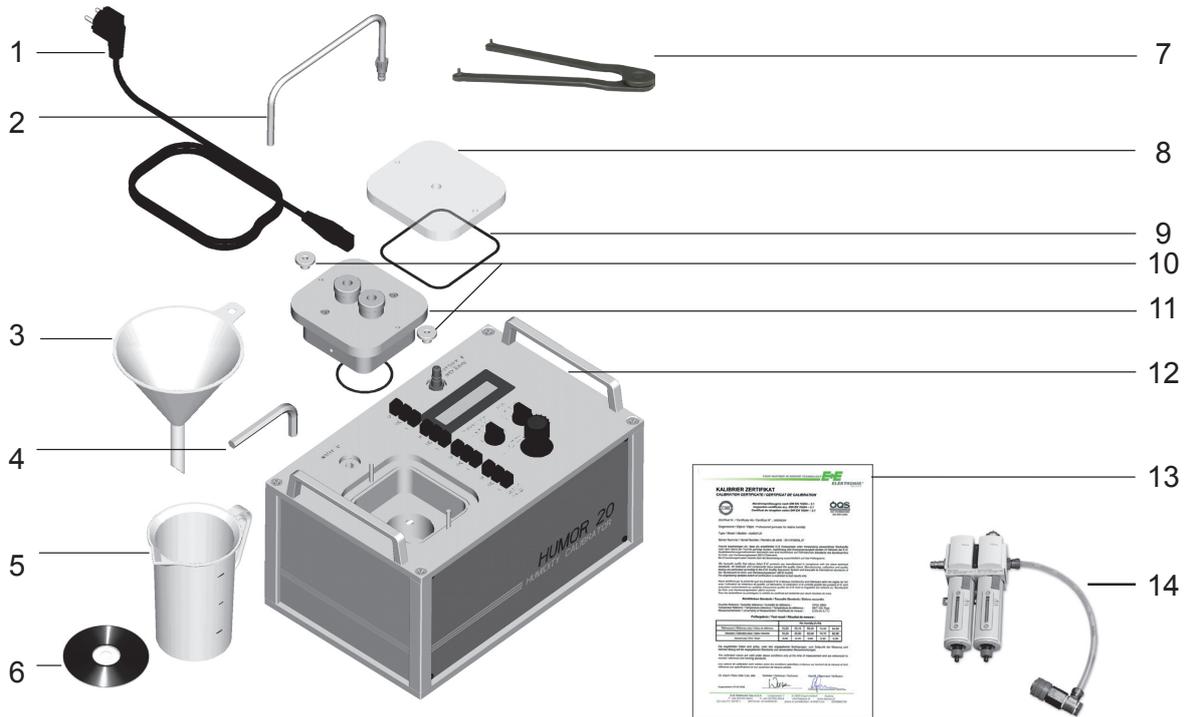
For the fully automatic measurement of the characteristics of a transmitter.

#### Technical Data:

|                        |  |                |
|------------------------|--|----------------|
| Weight                 | - weight of instrument: 9kg (20lbs)<br>- instrument incl. aluminium transport case: 23kg (51lbs)           |                |
| Dimensions             | 260x260x240mm (LxBxH); (10.2"x10.2"x9.4")  |                |
| Supply                 | 100...230V AC, 50/60 Hz max. 15W   |                |
| Interface to PC        | RS232 (COM Port)   |                |
| Compressed air supply  | min. 9.8bar (142psi); max. 12bar (174bar);<br>filtered oil-free compressed air, max. size of particle: 5µm |                |
| Protection type        | IP40   |                |
| Protection class       | I  |                |
| Pollutional index      | 2  |                |
| Surge voltage category | II   |                |
| Installation altitude  | up to 2000 m above sea level   |                |
| Application            | Indoors  |                |
| CE conformity          | EN61000-6-3:2007   | EN61326-1:2006 |
|                        | EN61000-6-2:2006   | EN61010-1:2010 |
| Additional Standards   | EN60068-2-6  | EN60068-2-29   |



## HUMOR 20 - Scope of Supply



- |   |   |    |   |
|---|---|----|---|
| 1 | Power supply cable IEC Europe (230V) + power supply cable IEC Northamerica (110V) | 8  | Plexiglas cover for room transmitter testing  |
| 2 | Water drain pipe with connector   | 9  | O-ring for room transmitter   |
| 3 | Funnel  | 10 | Knurled nut   |
| 4 | Allen key (10mm / 0.4")   | 11 | Cover for measuring chamber (ordering code HA0202xx)<br><i>(not included in the scope of supply HUMOR 20)</i> |
| 5 | Measuring beaker  | 12 | Fixing bracket for filter set (pre-mounted)   |
| 6 | Measuring and calibration software  | 13 | Works certificate acc. DIN EN 10204-3.1   |
| 7 | Face pin wrench   | 14 | Filter set with oil separator   |

## Ordering Information

### HUMIDITY CALIBRATOR

|                              |          |
|------------------------------|----------|
| HUMOR 20                     | HUMOR20  |
| Automatic Calibration Module | HA020301 |

### COVER FOR MEASURING CHAMBER

|   |   |              |          |
|---|---|--------------|----------|
| Humor cover 12 - 16mm (0.5 - 0.6") plane      | - | for 2 Probes | HA020201 |
| Humor cover 16 - 20,5mm (0.6 - 0.8") plane    | - | for 1 Probe  | HA020202 |
| Humor cover 20,5 - 25,5mm (0.8 - 1") plane    | - | for 1 Probe  | HA020203 |
| Humor cover 8 - 12mm (0.3 - 0.5") plane       | - | for 3 Probes | HA020204 |
| Humor cover 12 - 13mm (0.5 - 0.52") conic     | - | for 4 Probes | HA020205 |
| Humor cover 12 - 16mm (0.5 - 0.6") bevelled   | - | for 4 Probes | HA020207 |
| Humor cover 16 - 20,5mm (0.6 - 0.8") bevelled | - | for 4 Probes | HA020208 |
| Humor cover 30mm (1,2") plane                 | - | for 1 Probe  | HA020209 |
| Adapter for EE33 - modell J <sup>1)</sup>     |   |              | HA020401 |

1) only useable in combination with HA020204 or HA020201

### ACCESSORIES

|   |           |
|---|-----------|
| Oil-free compressor for 230V power supply | HA020101  |
| ÖKD-calibration certificate               | OEKD20/xH |
| USB <=> RS232 converter                   | HA020110  |
| Face pin wrench adjustable                | HA020402  |