Calibration System for Thermo Hygrometers with Climatic Chamber
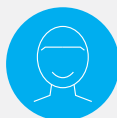
Climatic chamber-based calibration system for big probes and classic instruments by direct comparison

Climatic chamber and reference thermo hygrometer

On-line calculation of measurement uncertainty

Complete calibration system including calibration software and database

Very easy to use & labor-saving automatic calibration with IMS4 CalibLab software

Design based on experience from ISO / IEC 17025 accredited laboratory

We customize the solution per your needs & budget

The system can be used to calibrate electronic thermo hygrometers, hair hygrometers, thermographs, hygrographs and psychrometers. A climatic chamber creates a homogenous temperature and humidity field. Within this field instruments are compared to a reference thermo hygrometer. A dew point mirror is used as a reference.

We automate the calibration process where possible. The software controls the chamber temperature and relative humidity and takes readings from the reference thermo hygrometer.

Electronic thermo hygrometers can be calibrated automatically. Multiple instruments connect to a multimeter via channel switch – Matrix. The system can handle up to 45 instruments at a time. Actual maximum number of instruments depends on their size and the size of the chamber.

Instruments without electronic output can be calibrated too – the reading is taken manually by operator and entered to software.

The chambers come in several sizes. To choose the right size, consider the size of your instruments and the batch

size. The bigger the chamber, the bigger the price. Big chambers are also heavy. Think if the chamber you choose fits through the door to the lab. Note, that bigger chambers require 3-phase power.

Climatic chambers – standard meteorological range from -40 °C

Parameter	KK-50 CHLT	KK-105 CHLT	KK-190 CHLT	KK-340 CHLT	KK-500 CHLT	KK-1000 CHLT
External dimensions (mm)	570 x 1035 x 645	725 x 1560 x 845	834 x 1675 x 930	835 x 1895 x 1115	1035 x 1810 x 1270	1235 x 1930 x 1495
Internal dimensions (mm)	400 x 375 x 350	490 x 498 x 430	600 x 610 x 510	600 x 830 x 685	800 x 800 x 800	1000 x 1000 x 1000
Volume (l)	~ 50	~ 105	~ 190	~ 340	~ 500	~ 1000
Temperature range (°C)	-40 to +180	-40 to +180	-40 to +180	-40 to +180	-40 to +180	-40 to +180
Heat up rate (°C/min)	5.3	3	1.7	2.4	3	3
Cool down rate (°C/min)	2.1	1,7	3,2	2,1	1,2	1,8
t. Display resolution (°C)	0,1	0,1	0,1	0,1	0,1	0,1
t. Set resolution (°C)	0,1	0,1	0,1	0,1	0,1	0,1
Temperature fluctuation @ -40 °C (°C)	0,2	0,4	0,5	0,5	0,5	0,5
Temperature fluctuation @ 50 °C, 50 %RH	0.05	0.08	0.08	0.08	0.06	0.05
Temperature non-homogeneity @ -40 °C	2.2	1.5	1.5	1.5	0.5	0.5
Temperature non-homogeneity @ 50 °C, 50 %RH	0.4	0.3	0.6	0.34	0.3	0.4
Relative humidity range (%RH)	10 to 98	10 to 98	10 to 98	10 to 98	10 to 98	10 to 98
Relative humidity set resolution (%RH)	1	1	1	1	1	1
Relative humdity stability @ 50 °C, 50 %RH (%RH)	0,5	0,5	0,5	0,5	0,5	0,5
Temperature control	PID	PID	PID	PID	PID	PID
Power supply voltage (V)	230	230	230	230	3x400	3x400
Power supply frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Wattage (W)	2300	3200	3600	3600	9000	12000
Interface	RS-232	RS-232	RS-232	RS-232	RS-232	RS-232
Shelve	1 (max 6)	1 (max 6)	1 (max 8)	1 (max 6)	1 (max 6)	1 (max 8)
Shelve capacity (kg)	25	25	35	35	50	50
Max capacity (kg)	30	60	80	100	150	200
Access port diameter (mm)	40	40	40	40	40	40
Noise (dBA) @ 1 m distance	58	58	60	60	62	65
Weight (kg)	125	238	278	324	435	604

Ultra-cool climatic chambers – temperature from -75 °C

Parameter	KK-105 CHULT	KK-190 CHULT	KK-340 CHULT	KK-500 CHULT	KK-1000 CHULT
External dimensions (mm)	850 x 1715 x 1100	940 x 1830 x 1125	940 x 2052 x 1310	1165 x 1985 x 1640	1375 x 2070 x 1900
Internal dimensions (mm)	530 x 500 x 460	620 x 590 x 515	620 x 810 x 690	870 x 800 x 800	1070 x 1000 x 1000
Volume (l)	~ 105	~ 190	~ 340	~ 500	~ 1000
Temperature range (°C)	-75 to +180	-75 to +180	-75 to +180	-75 to +180	-75 to +180
Heat up rate (°C/min)	2.6	2.2	2.3	2.3	2.3
Cool down rate (°C/min)	2.4	4.9	2.9	1.2	1.2
t. Display resolution (°C)	0.1	0.1	0.1	0.1	0.1
t. Set resolution (°C)	0.1	0.1	0.1	0.1	0.1
Temperature fluctuation @ -75 °C (°C)	1	1.2	1.2	1	1
Temperature fluctuation @ 50 °C, 50 %RH	0.08	0.08	0.08	0.1	0.1
Temperature non-homogeneity @ -75 °C	1.5	1.5	1.5	1.5	1
Temperature non-homogeneity @ 50 °C, 50 %RH	0.5	0.5	0.5	0.5	0.5
Relative humidity range (% RH)	10 to 98	10 to 98	10 to 98	10 to 98	10 to 98
Relative humidity set resolution (% RH)	1	1	1	1	1
Relative humdity stability @ 50 °C, 50 %RH (% RH)	0.5	0.5	0.5	0.5	0.5
Temperature control	PID	PID	PID	PID	PID
Power supply voltage (V)	3 x 400	3 x 400	3 x 400	3 x 400	3 x 400
Power supply frequency (Hz)	50/60	50/60	50/60	50/60	50/60
Wattage (W)	5500	6500	7500	13000	13000
Interface	RS-232	RS-232	RS-232	RS-232	RS-232
Shelve	1 (max 6)	1 (max 8)	1 (max 6)	1 (max 6)	1 (max 8)
Shelve capacity (kg)	25	35	35	50	50
Max capacity (kg)	60	80	100	150	200
Access port diameter (mm)	40	40	40	40	40
Noise (dBA) @ 1 m distance	58	60	60	62	65
Weight (kg)	238	278	324	435	604

Reference thermo hygrometer

The reference thermo hygrometer is a precise dew point mirror. It measures dew point and air temperature. Relative humidity is calculated from these values and shown on display.

The reference is traceable, with an accredited certificate. The reference communicates via RS-232 port.

Reference thermo hygrometer parameters

Dew point measurement principle	optical detection of condensate layer on chilled mirror surface
Temperature measuring range	-50 °C to +100 °C (optionally -100 °C to +100 °C)
Frost / Dew point measuring range	-20 °C to +70 °C
Measuring range relative humidity	5 %RH to 99 %RH
Frost / Dew point accuracy	≤ ± 0.1 °C
Temperature accuracy	≤ ± 0.07 °C
Frost / Dew point Reproducibility	≤ ± 0.05 °C

Temperature reproducibility	≤ ± 0.05 ℃
Calibration	accredited
Temperature calibration uncertainty (k = 2)	0.02 ℃
Dew point calibration uncertainty (k = 2)	0.05 ℃
Communication interface	RS-232

Channel switch parameters

Number of 4-wire input channels	45
Number of 4-wire output channels	3
Maximum switched voltage	20 V
Maximum switched current	20 mA
Contact resistance	less than 200 mOhm
Communication interface	RS-232

Example uncertainty calculation

Chamber KK105 CHLT at 50 ℃, 50 %RH

Uncertainty budget - temperature

Value Xi	Standard uncertainty u(xi)	Distribution	Sensitivity coefficient	Uncertainty ui(y)
tS (R) temperature fluctuation	0.08 ℃	normal	1	0.08 ℃
δtF chamber non-homogeneity	0.065 ℃	normal	1	0.065 ℃
δt1 reference calibration	0.01 ℃	normal	1	0.01 ℃
δtD reference repeatability	0.03 ℃	rectangular	1	0.03 ℃
Standard uncertainty tX				0.11 ℃
Expanded uncertainty (k = 2)				**0.22 ℃**

Uncertainty budget – relative humidity

Value Xi	Standard uncertainty u(xi)	Distribution	Sensitivity coefficient	Uncertainty ui(y)
RHS relative humidity fluctuation	0.15 %RH	normal	1	0.15 %RH
δRHS1 reference calibration	0.2 %RH	normal	1	0.2 %RH
δRHD reference repeatability	0.2 %RH	normal	1	0.2 %RH
δtF relative humidity non-homogeneity	0.41 %RH	rectangular	1	0.41 %RH
Standard uncertaintyRHX				0.52 %RH
Expanded uncertainty (k = 2)				**1.04 %RH**

Calibration software IMS4 CalibLab

The software guides the user through the calibration setup in several steps. The software can read serial numbers from certain (digital) sensor types. Preconfigured sensor types include specific calculation of uncertainty, corrections and other formulas. Graphic user interface (GUI) allows the user to configure a new type of sensor. A list of setpoints can be edited, saved or loaded. The fully automated calibration process follows the setpoint list, sets the chamber relative humidity, temperature and scans the readings from all thermo hygrometers. The system evaluates the readings for stability, calculates mean values and uncertainty. In case of any problem, error is readily indicated by a sound alarm. After the process goes through all setpoints, the results are stored

in a database. You can generate certificates for all thermo hygrometers by one click. The certificate is generated from a template. You can freely edit the template to fit your needs. The database of calibrations holds the history of calibrations from whole calibration laboratory at one place. You can browse it by quantity, year, sensor type, serial number etc. Looking for calibration history of a certain instrument is a brief. The built-in database browser allows on-line tabular and graphical view of multiple certificates. The software supports export to .csv, .odt, .xml and .pdf formats. Whole database can be backed-up or restored by simple click of a button. There is also provision of automatic periodic back-up.

Reference thermo hygrometer

CalibLab software features:

- Support for calibration of temperature, pressure, relative humidity and other quantities
- Graphical user interface
- Multiple step wizard for easy setup of calibration
- Automated instrument serial readout (if supported by instrument)
- Simultaneous calibration of multiple instruments
- User defined sensor types
- Automated calibration controller
- User defined calibration process (setpoint list)
- Support of saving / loading of setpoint list
- On-line graphing of read values, chart zooming
- On-line calculation of statistics and uncertainty

- On-line display of elapsed time and time estimate until the end
- Display of preliminary results during calibration
- Possibility to stop, pause or restart the calibration process
- Detection of sensor fault, automatic kick-out or wait until the problem is solved
- Indication of errors, sound alarm
- Generation of calibration certificates from template document
- Database of calibrations, filtering, graphing, export to .csv, .pdf, .odt, .xml
- Database backup / restore from file, automatic backup scheduler