memmert

Performance data

Constant climate chamber

HPPeco

ADVANCED PELTIER TECHNOLOGY

www.memmert.com

Constant climate chamber HPPeco

Specifications for measuring performance data[1]

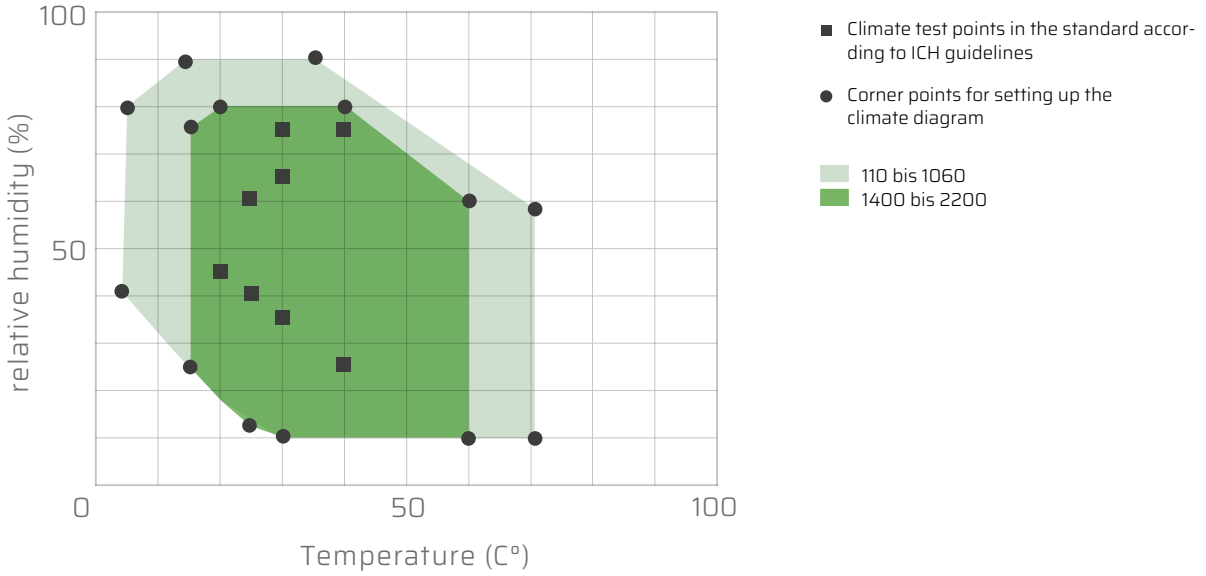
Device specification: Constant climate chamber HPPeco in the standard equipment (without lighting unit, supply voltage 230 V, equipped with stainless steel grids)

Ambient conditions in the test room: temperature 22 ° C + - 3K, humidity 40% rh + - 10% rh

Measurements: spatial temperature-humidity deviation, temporal temperature-humidity fluctuation, heating-up time, cooling-down time, temperature / humidity recovery time, heat emission, sound level, water consumption

CLIMATE CHART [2]

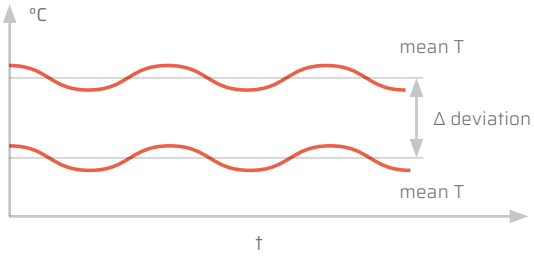
The climate diagram shows the wide range of applications of the Memmert climate chamber series HPPeco. In the case of temperature and humidity combinations (climatic points) within the colored fields, none occurs in the work area or minimal condensation.



Spatial temperature deviation

OBJECT OF MEASUREMENT

In a Memmert constant climate chamber, the spatial homogeneity of the temperature of the entire usable space is reliably kept within the tolerance range. The values for the spatial temperature deviation are determined from the difference between the mean values of the two measuring points with the largest and smallest measured temperature value.



MEASUREMENT SETUP

27 Point measurements with Pt100 sensors, distributed over three levels based on DIN 12880: 2007-05.

RELEVANT CLIMATE POINTS WITHIN THE CLIMATE DIAGRAM (UA ICH DIRECTIVE Q1A)

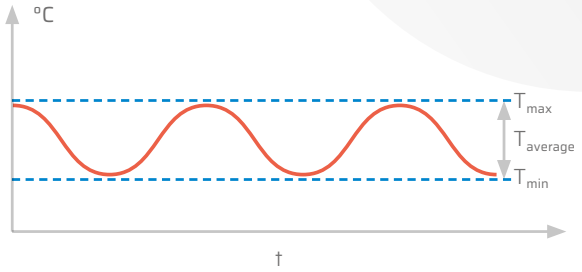
Measuring points	110	260	410	750	1060	1400	2200
5°C / 80%rh	0,6	0,8	1,1	0,5	0,6	-	-
15°C / 25%rh	-	-	-	-	-	0,4	0,4
15°C / 75%rh	-	-	-	-	-	0,4	0,4
20°C / 80%rh	-	-	-	-	-	0,2	0,2
21°C / 45%rh	0,2	0,2	0,2	0,3	0,3	0,2	0,2
25°C / 40%rh	0,2	0,2	0,2	0,3	0,4	0,3	0,2
25°C / 60%rh	0,1	0,2	0,3	0,3	0,4	0,3	0,2
30°C / 35%rh	0,3	0,3	0,7	0,3	0,3	0,4	0,2
30°C / 65%rh	0,2	0,3	0,3	0,3	0,3	0,2	0,2
30°C / 75%rh	0,2	0,3	0,2	0,2	0,3	0,2	0,2
40°C / 25%rh	0,6	0,6	0,9	0,4	0,4	0,6	0,5
40°C / 75%rh	0,4	0,6	0,6	0,3	0,3	0,4	0,4
40°C / 80%rh	-	-	-	-	-	0,4	0,4
60°C / 10%rh	-	-	-	-	-	1,7	1,2
60°C / 60%rh	-	-	-	-	-	1,6	1,1
70°C / 58%rh	1,0	1,8	2,8	2,1	1,0	-	-

Deviation temperature in [± K]

Temporal temperature fluctuation

OBJECT OF MEASUREMENT

The highest possible temporal stability of the temperature is an important measured variable for the performance of a Memmert constant climate chamber HPPeco. The values for the temporal temperature fluctuation result from the greatest deviation from the mean value of all measured values within the measurement period.



MEASUREMENT SETUP

27 Point measurements with Pt100 sensors, distributed over three levels based on DIN 12880: 2007-05.

RELEVANT CLIMATE POINTS WITHIN THE CLIMATE DIAGRAM (UA ICH DIRECTIVE Q1A)

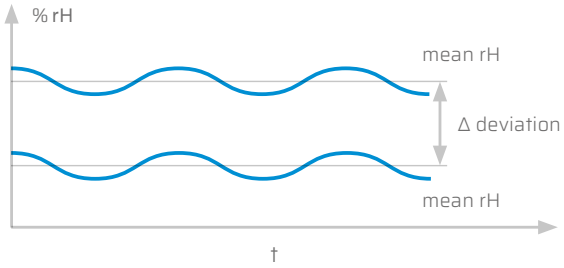
Measuring points	110	260	410	750	1060	1400	2200
5°C / 80%rh	0,1	0,3	0,2	0,3	0,1	-	-
15°C / 25%rh	-	-	-	-	-	0,1	0,1
15°C / 75%rh	-	-	-	-	-	0,1	0,1
20°C / 80%rh	-	-	-	-	-	0,1	0,1
21°C / 45%rh	0,1	0,1	0,1	0,1	0,1	0,1	0,1
25°C / 40%rh	0,1	0,1	0,1	0,1	0,1	0,1	0,1
25°C / 60%rh	0,1	0,1	0,1	0,1	0,1	0,1	0,1
30°C / 35%rh	0,1	0,1	0,2	0,1	0,1	0,1	0,1
30°C / 65%rh	0,1	0,2	0,1	0,1	0,1	0,1	0,1
30°C / 75%rh	0,1	0,1	0,2	0,1	0,1	0,1	0,1
40°C / 25%rh	0,1	0,2	0,1	0,1	0,1	0,1	0,1
40°C / 75%rh	0,1	0,2	0,2	0,1	0,1	0,1	0,1
40°C / 80%rh	-	-	-	-	-	0,1	0,1
60°C / 10%rh	-	-	-	-	-	0,2	0,2
60°C / 60%rh	-	-	-	-	-	0,1	0,2
70°C / 58%rh	0,2	0,3	0,3	0,2	0,2	-	-

Deviation temperature in [± K]

Spatial humidity deviation

OBJECT OF MEASUREMENT

In a Memmert constant climate chamber, the spatial homogeneity of the relative humidity in the entire usable space is reliably kept within the tolerance range. The values for the spatial humidity deviation are determined from the difference between the mean values of the two measuring points with the largest and smallest measured humidity value.



MEASUREMENT SETUP

1 point measurement with capacitive humidity and temperature sensor in the center of the room. The moisture on the other 26 Points is calculated using the associated temperature.

RELEVANT CLIMATE POINTS WITHIN THE CLIMATE DIAGRAM (UA ICH DIRECTIVE Q1A)

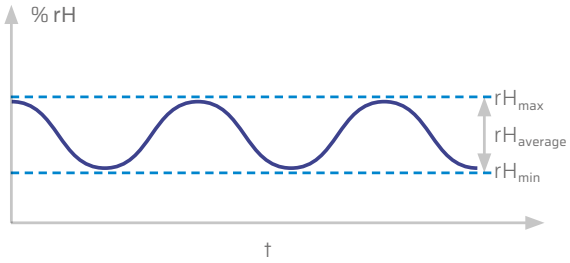
Measuring points	110	260	410	750	1060	1400	2200
5°C / 80%rh	3,0	4,0	5,7	2,5	2,8	-	-
15°C / 25%rh	-	-	-	-	-	0,7	0,5
15°C / 75%rh	-	-	-	-	-	1,7	1,5
20°C / 80%rh	-	-	-	-	-	0,9	0,8
21°C / 45%rh	0,4	0,3	0,4	0,6	0,8	0,6	0,4
25°C / 40%rh	0,4	0,4	0,5	0,6	0,9	0,6	0,3
25°C / 60%rh	0,4	0,5	0,9	1,0	1,4	0,8	0,5
30°C / 35%rh	0,5	0,5	0,7	0,5	0,6	0,8	0,3
30°C / 65%rh	0,7	0,9	1,1	0,7	0,9	0,8	0,5
30°C / 75%rh	0,7	1,0	0,8	0,8	1,0	0,9	0,6
40°C / 25%rh	0,8	0,8	1,2	0,5	0,5	0,8	0,6
40°C / 75%rh	1,3	2,0	2,4	1,2	1,0	1,4	1,4
40°C / 80%rh	-	-	-	-	-	1,5	1,6
60°C / 10%rh	-	-	-	-	-	0,9	0,7
60°C / 60%rh	-	-	-	-	-	4,4	2,9
70°C / 58%rh	2,2	4,2	6,6	5,3	2,4	-	-

Deviation humidity in [± %rH]

Temporal fluctuation in humidity

OBJECT OF MEASUREMENT

The highest possible temporal stability of the humidity is an important measured variable for the performance of a Memmert constant climate chamber HPPeco. The values for the temporal humidity fluctuation result from the greatest deviation from the mean value of all measured values within the measurement period.



MEASUREMENT SETUP

1 point measurement with capacitive humidity and temperature sensor in the center of the room. The moisture on the other 26 Points is calculated using the associated temperature.

RELEVANT CLIMATE POINTS WITHIN THE CLIMATE DIAGRAM (UA ICH DIRECTIVE Q1A)

Measuring points	110	260	410	750	1060	1400	2200
5°C / 80%rh	0,7	2,1	1,8	1,9	1,2	-	-
15°C / 25%rh	-	-	-	-	-	0,4	0,4
15°C / 75%rh	-	-	-	-	-	0,1	0,5
20°C / 80%rh	-	-	-	-	-	0,3	0,5
21°C / 45%rh	0,4	0,4	0,4	0,6	0,7	0,3	0,4
25°C / 40%rh	0,3	0,5	0,4	0,5	0,4	0,2	0,3
25°C / 60%rh	0,4	0,5	0,5	0,5	0,5	0,1	0,4
30°C / 35%rh	0,3	0,4	0,4	0,4	0,4	0,1	0,3
30°C / 65%rh	0,4	0,7	0,5	0,6	0,6	0,1	0,3
30°C / 75%rh	0,4	0,8	0,8	0,6	0,6	0,1	0,4
40°C / 25%rh	0,2	0,3	0,3	0,3	0,3	0,1	0,2
40°C / 75%rh	0,7	0,8	0,7	0,6	0,5	0,1	0,4
40°C / 80%rh	-	-	-	-	-	0,1	0,5
60°C / 10%rh	-	-	-	-	-	0,1	0,1
60°C / 60%rh	-	-	-	-	-	0,1	0,4
70°C / 58%rh	0,6	0,5	0,5	0,6	0,4	-	-

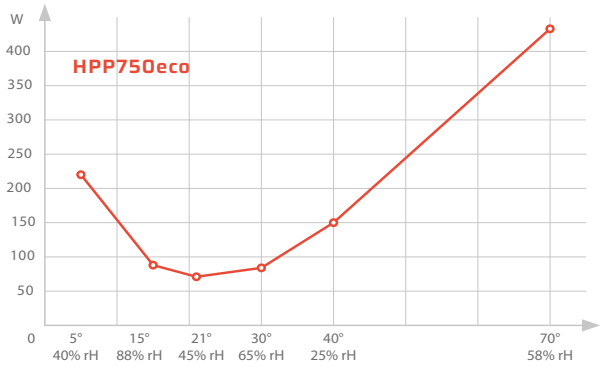
Deviation humidity in [± %rH]

Heat emission

OBJECT OF MEASUREMENT

The high-performance constant climate chamber HPPeco with Advanced Peltier Technology is rightly called eco, because it works around 90% more energy-efficiently than compressor-cooled devices in continuous operation.

The heat output of a climatic chamber to the environment corresponds to the electrical power that is necessary for operation in a steady state in order to maintain a constant actual value.



MEASUREMENT SETUP

The device's power plug is connected to an energy meter. The calculation is carried out using the following formula:

$$\frac{\text{supplied energy [Wh]}}{\text{Measuring time [h]}} = \text{W}$$

RELEVANT CLIMATE POINTS WITHIN THE CLIMATE DIAGRAM (UA ICH DIRECTIVE Q1A)

Measuring points	110	260	410	750	1060	1400	2200
5°C / 80%rh	58	115	132	179	259	-	-
15°C / 25%rh	-	-	-	-	-	137	203
15°C / 75%rh	-	-	-	-	-	119	174
20°C / 80%rh	-	-	-	-	-	80	113
21°C / 45%rh	20	23	30	55	89	84	115
25°C / 40%rh	20	24	27	51	84	79	108
25°C / 60%rh	19	21	31	63	78	74	108
30°C / 35%rh	28	35	40	71	102	118	136
30°C / 65%rh	27	33	44	74	94	106	117
30°C / 75%rh	29	45	47	69	92	107	114
40°C / 25%rh	52	64	79	117	162	218	237
40°C / 75%rh	59	75	84	112	147	205	206
40°C / 80%rh	-	-	-	-	-	210	222
60°C / 10%rh	-	-	-	-	-	447	560
60°C / 60%rh	-	-	-	-	-	440	535
70°C / 58%rh	148	178	201	304	433	-	-

Specifiations in watts per hour [W]

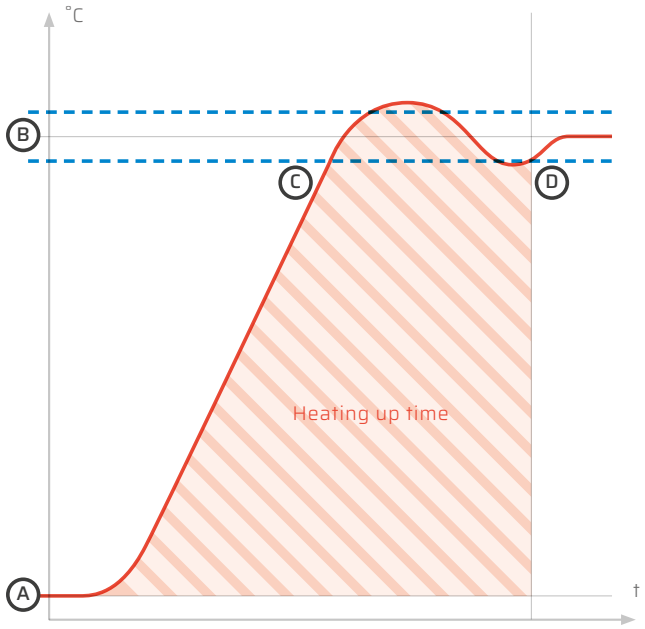
Heating-up, cool down, and recovery time

If the door of a climate control cabinet is opened, the constantly regulated atmosphere escapes from the device. Memmert constant climate chambers HPPeco are designed to reach the set climate points as quickly as possible after closing the door and also to minimize the heating and cooling times.

HEATING-UP TIME

OBJECT OF MEASUREMENT

The heating-up time is the time until the measured actual value exceeds the tolerance band (blue dotted line) around the Temperature setpoint permanently.



A Start at starting temperature
B Target temperature and tolerance band
C Entry into the tolerance band
D Teperature remains in the tolerance band

MEASUREMENT SETUP

1 point measurement with temperature sensor in the center of the room or a work sensor adjusted to the center of the room.

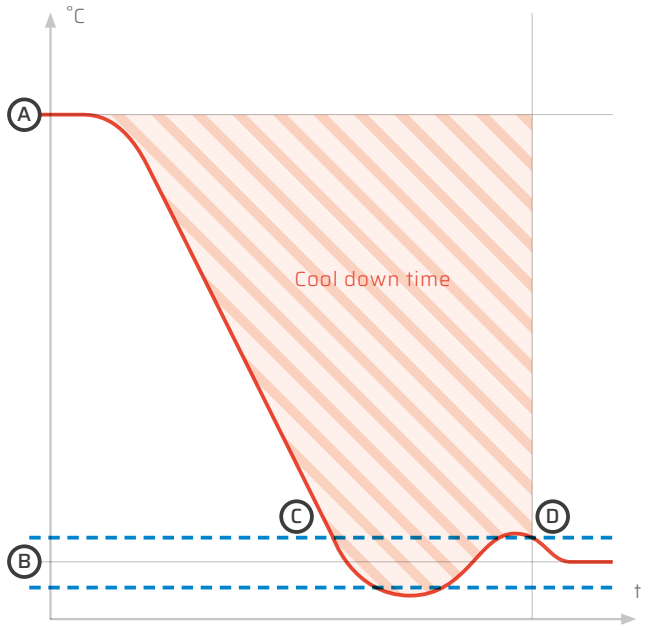
Measuring points	110	260	410	750	1060	1400	2200
5°C → 37°C	28	34	56	52	38	38	37
5°C → 70°C	91	140	210	168	110	140	130
10°C → 37°C	25	-	-	-	34	30	28
10°C → 70°C	87	-	-	-	102	132	117

Specifications in minutes [min]

Cool down time

OBJECT OF MEASUREMENT

The cooling time is the time until the measured actual value exceeds the tolerance band (blue dotted line) around the Temperature setpoint permanently.



A Start at starting temperature
B Target temperature and tolerance band
C Entry into the tolerance band
D Temperature remains in the tolerance band

MEASUREMENT SETUP

1 point measurement with temperature sensor in the center of the room or a work sensor adjusted to the center of the room.

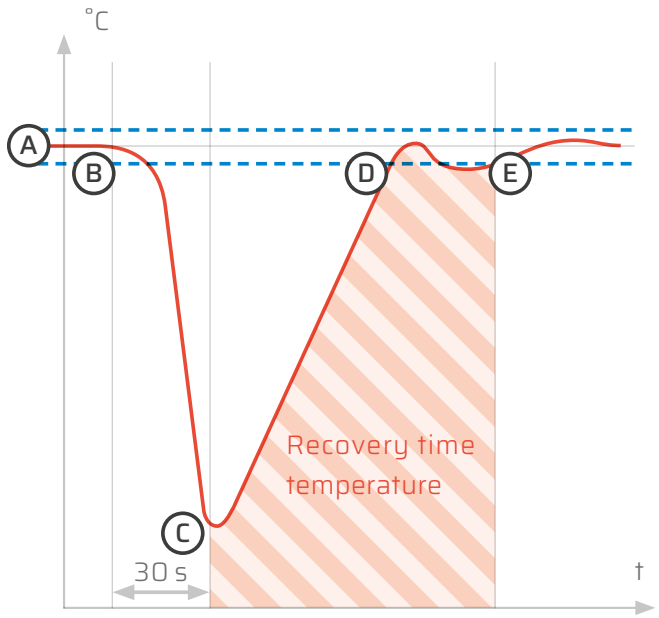
Measuring points	110	260	410	750	1060	1400	2200
70°C → 5°C	129	195	290	241	158	212	202
70°C → 10°C	102	-	-	-	121	193	164
37°C → 5°C	85	134	201	170	96	144	136
37°C → 10°C	61	-	-	-	67	92	97

Specifications in minutes [min]

Recovery time temperature

OBJECT OF MEASUREMENT

After the climatic test point has been reached in the steady state, the glass door of the cabinet is opened for 30 seconds. The time is then measured until the temperature remains in the Tolerance band (blue dashed line) has settled.



A Target temperature and tolerance band
B Door is opened
C Door is closed
D Entry into the tolerance band
E Temperature remains in the tolerance band

MEASUREMENT SETUP

1 point measurement with temperature sensor in the center of the room or a work sensor adjusted to the center of the room. Opening the door for 30 seconds at a 90 ° angle.

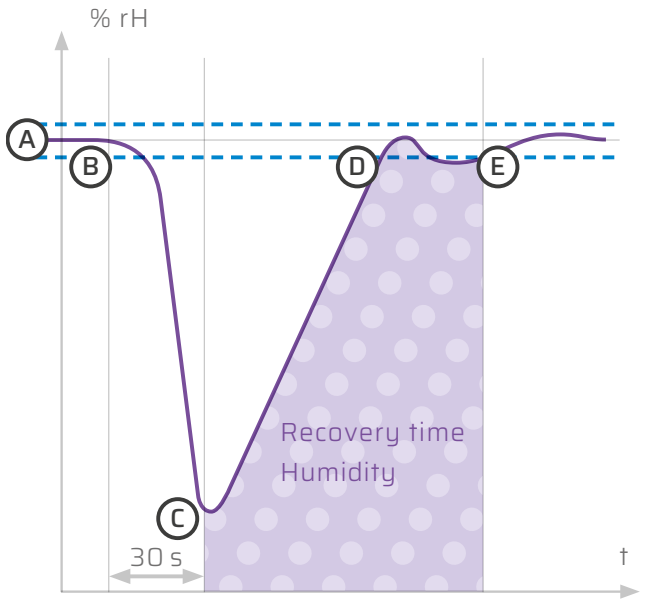
Measuring points	110	260	410	750	1060	1400	2200
21°C / 45%rh	1	1	1	1	1	-	-
30°C / 65%rh	4	3	4	3	3	-	-
40°C / 75%rh	4	5	4	4	4	-	-

Specifications in minutes [min]

Recovery time humidity

OBJECT OF MEASUREMENT

After the climatic test point has been reached in the steady state, the glass door of the cabinet is opened for 30 seconds. Then the time is measured until the humidity remains in the tolerance band (blue dashed Line) has settled.



A Target humidity and tolerance band
B Door is opened
C Door is closed
D Entry into the tolerance band
E Moisture remains in the tolerance band

MEASUREMENT SETUP

1 point measurement with temperature sensor in the center of the room or a work sensor adjusted to the center of the room. Opening the door for 30 seconds at a 90 ° angle.

Measuring points	110	260	410	750	1060	1400	2200
21°C / 45%rh	11	6	10	4	3	-	-
30°C / 35%rh	9	6	6	5	4	-	-
40°C / 75%rh	5	6	8	11	15	-	-

Specifications in mintues [min]

Water consumption

OBJECT OF MEASUREMENT

The hermetically sealed interior of the constant climate chamber HPPeco ensures that the humidity remains in the device and that water consumption can be kept to a minimum.

The water consumption of the device with active humidity control is given in ml /day. The Contents of the water tanks measured before and after the 24-hour test with a calibrated scale.

Measuring points	110	260	410	750	1060	1400	2200
21°C / 45%rh	2	2	1	47	45	46	57
25°C / 40%rh	2	2	3	51	50	37	58
25°C / 60%rh	2	4	5	74	71	87	96
30°C / 35%rh	2	3	3	55	58	58	63
30°C / 65%rh	5	6	7	82	81	90	109
30°C / 75%rh	2	7	8	86	81	97	107
37°C / 80%rh	5	9	11	95	92	106	123
40°C / 25%rh	2	3	3	58	64	72	95
40°C / 75%rh	5	11	14	99	95	124	109

Data in milliliter per day [ml/day]

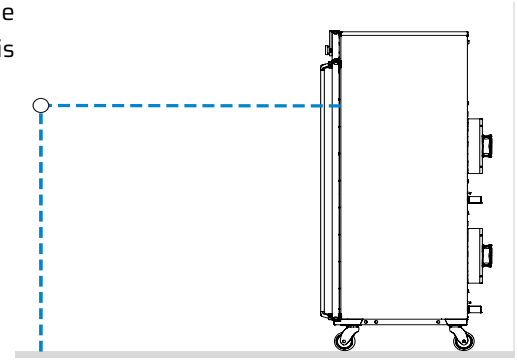
SOUND LEVEL MEASUREMENT

OBJECT OF MEASUREMENT

By using low-noise Peltier technology, the lowest possible noise emission is achieved in the surrounding area of the devices during operation.After the climate test point has reached the steady state, the sound level measurement is started. The measurement is recorded over a period of 10 seconds.

MEASUREMENT SETUP

The dB-value is measured at a distance of 1.5m to the front side of the device at a height of approx. 1.30m.The measurement is recorded inside a closed room without interfering noise.



Measuring points	110	260	410	750	1060	1400	2200
5 °C / 50%rh	39	42	42	49	47	-	-
25 °C / 60%rh	-	-	-	-	-	48	45

Data in decibels [dB]

Applied test standards and guidelines

Guideline, norm	Title	Use
ICH guideline	International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use	Specification of climatic test points, e.g. for temperature / humidity distribution measurements
DIN 12880:2007-05	Electrical laboratory equipment - heating and incubators	Definition of tests for usability
Factory standard	To determine technical data memmert appliances	

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We reserve the right to make technical changes in the interest of further development and progress.

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