memmert

Performance data

Constant climate chamber

HPPeco

with Performance Option P1

Constant climate chamber HPPeco

PRECISE AND STABLE OVER THE ENTIRE TEST PERIOD

Specifications for measuring performance data[1]

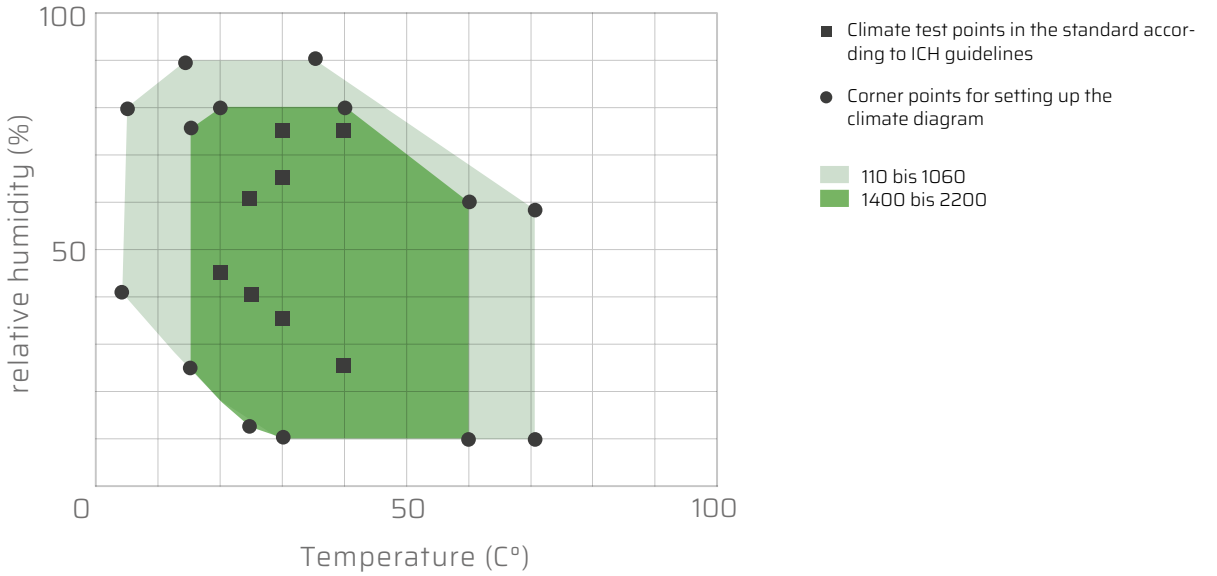
Device specification: Constant climate chamber HPPeco in the standard equipment (without lighting unit, supply voltage 230 V, equipped with stainless steel grids)

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]

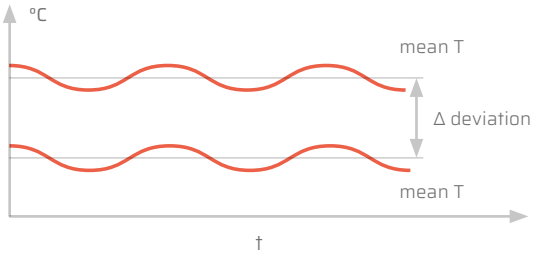
The climate diagram shows the wide range of applications of the Memmert climate chamber series HPPeco. In the case of temperature and humidity combinations (climatic points) within the colored fields, none occurs in the work area or minimal condensation.



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	260[P1]	410[P1]	750[P1]
5°C / 40%rh	0,4	0,9	0,4
5°C / 80%rh	0,4	0,9	0,4
15°C / 90%rh	0,2	0,4	0,2
21°C / 45%rh	0,2	0,2	0,3
25°C / 40%rh	0,2	0,2	0,3
25°C / 60%rh	0,1	0,2	0,3
30°C / 10%rh	0,5	0,6	0,4
30°C / 35%rh	0,3	0,3	0,3
30°C / 65%rh	0,2	0,3	0,2
30°C / 75%rh	0,2	0,2	0,2
35°C / 90%rh	0,2	0,3	0,2
37°C / 80%rh	0,2	0,4	0,3
40°C / 25%rh	0,5	0,5	0,4
40°C / 75%rh	0,3	0,4	0,3
70°C / 10%rh	1,0	2,7	1,2
70°C / 58%rh	0,6	2,4	1,0

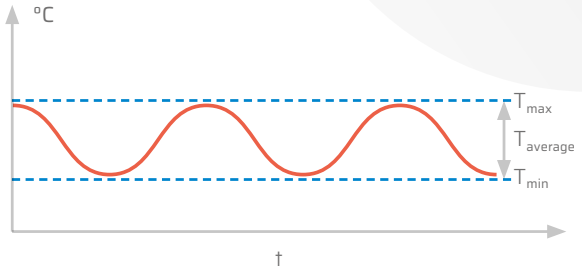
Deviation temperature in [± K]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
5°C / 40%rh	0,1	0,1	0,1
5°C / 80%rh	0,1	0,1	0,1
15°C / 90%rh	0,1	0,1	0,1
21°C / 45%rh	0,1	0,1	0,1
25°C / 40%rh	0,1	0,1	0,1
25°C / 60%rh	0,1	0,1	0,1
30°C / 10%rh	0,2	0,1	0,1
30°C / 35%rh	0,1	0,1	0,1
30°C / 65%rh	0,1	0,1	0,1
30°C / 75%rh	0,1	0,1	0,1
35°C / 90%rh	0,1	0,1	0,1
37°C / 80%rh	0,1	0,1	0,1
40°C / 25%rh	0,1	0,1	0,1
40°C / 75%rh	0,1	0,1	0,1
70°C / 10%rh	0,2	0,2	0,2
70°C / 58%rh	0,1	0,2	0,2

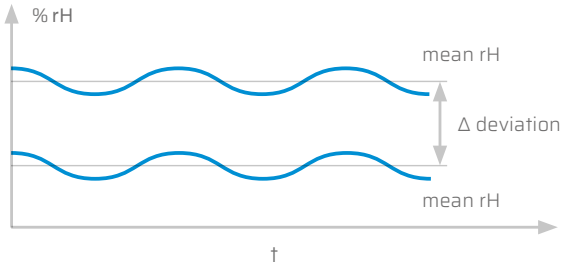
Deviation temperature in [± K]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
5°C / 40%rh	1,0	2,2	1,0
5°C / 80%rh	1,8	4,2	1,8
15°C / 90%rh	0,8	2,1	0,9
21°C / 45%rh	0,3	0,4	0,6
25°C / 40%rh	0,4	0,4	0,6
25°C / 60%rh	0,3	0,5	0,8
30°C / 10%rh	0,3	0,3	0,2
30°C / 35%rh	0,4	0,5	0,5
30°C / 65%rh	0,5	0,8	0,6
30°C / 75%rh	0,5	0,8	0,7
35°C / 90%rh	0,8	1,2	0,9
37°C / 80%rh	0,8	1,4	0,9
40°C / 25%rh	0,6	0,7	0,5
40°C / 75%rh	0,9	1,5	0,9
70°C / 10%rh	0,4	1,2	0,6
70°C / 58%rh	1,3	5,6	2,4

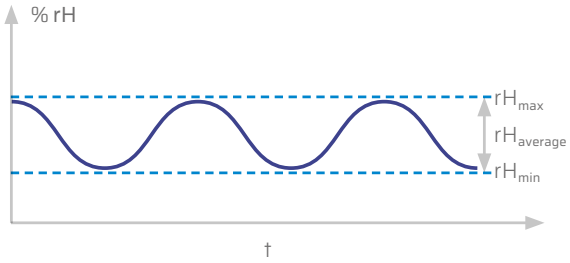
Deviation humidity in [± %rH]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
5°C / 40%rh	0,3	0,4	0,3
5°C / 80%rh	0,6	0,5	0,8
15°C / 90%rh	0,5	0,5	0,7
21°C / 45%rh	0,3	0,4	0,4
25°C / 40%rh	0,3	0,3	0,3
25°C / 60%rh	0,4	0,4	0,5
30°C / 10%rh	0,2	0,4	0,3
30°C / 35%rh	0,2	0,3	0,3
30°C / 65%rh	0,4	0,4	0,5
30°C / 75%rh	0,5	0,4	0,5
35°C / 90%rh	0,5	0,4	0,5
37°C / 80%rh	0,4	0,5	0,5
40°C / 25%rh	0,2	0,2	0,3
40°C / 75%rh	0,5	0,5	0,5
70°C / 10%rh	0,2	0,2	0,2
70°C / 58%rh	0,5	0,5	0,5

Deviation humidity in [± %rH]

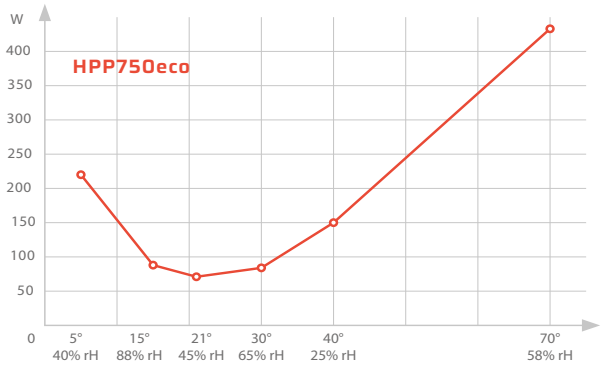
[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
5°C / 40%rh	106	129	217
5°C / 80%rh	98	116	205
15°C / 90%rh	36	42	88
21°C / 45%rh	28	33	71
25°C / 40%rh	27	33	71
25°C / 60%rh	27	32	64
30°C / 10%rh	55	69	116
30°C / 35%rh	41	47	84
30°C / 65%rh	43	52	84
30°C / 75%rh	45	50	81
35°C / 90%rh	74	66	111
37°C / 80%rh	75	80	120
40°C / 25%rh	79	95	150
40°C / 75%rh	87	98	143
70°C / 10%rh	228	253	415
70°C / 58%rh	231	252	411

Specifiations in watts per hour [W]

[P1] Product variant with performance option P1

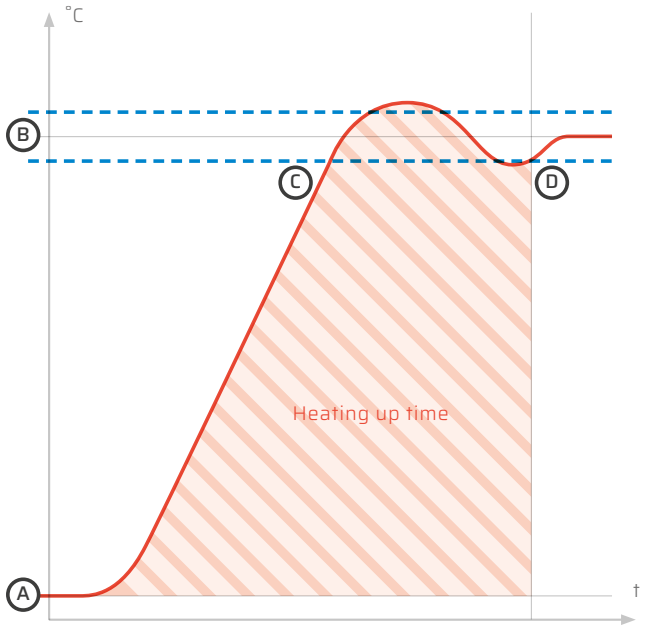
Heating-up, cool down, and recovery time

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	260[P1]	410[P1]	750[P1]
5°C → 37°C	27	33	34
5°C → 70°C	82	102	98
10°C → 37°C	24	28	30
10°C → 70°C	77	97	91

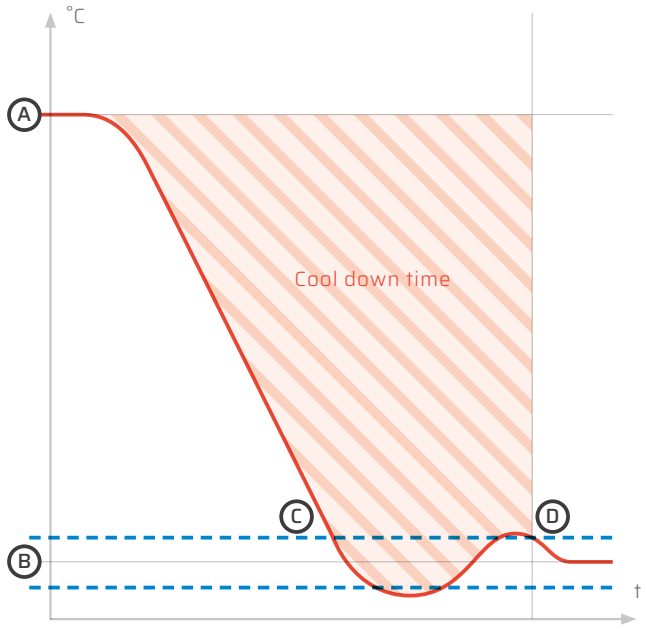
Specifications in minutes [min]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
70°C → 5°C	109	158	139
70°C → 10°C	88	109	99
37°C → 5°C	70	86	80
37°C → 10°C	52	56	55

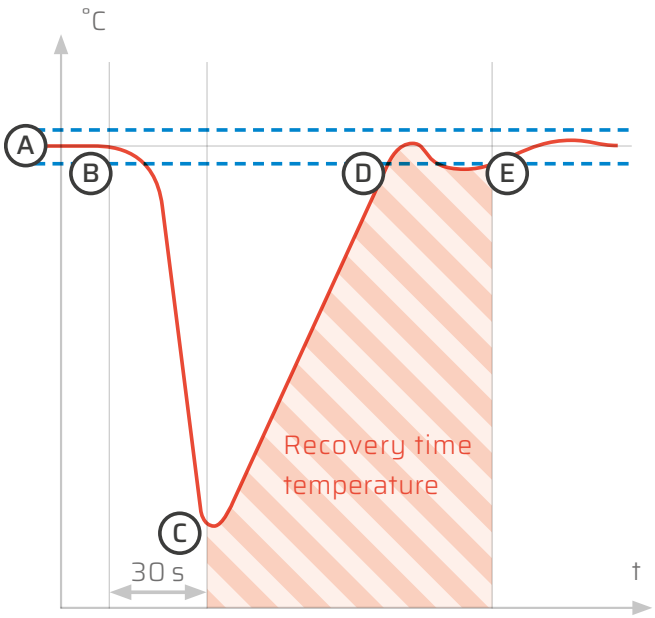
Specifications in minutes [min]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
21°C / 45%rh	1	1	1
25°C / 40%rh	1	1	1
25°C / 60%rh	1	2	1
30°C / 35%rh	3	3	3
30°C / 65%rh	3	4	3
30°C / 75%rh	3	3	3
37°C / 80%rh	4	4	4
40°C / 25%rh	4	5	4
40°C / 75%rh	4	4	4

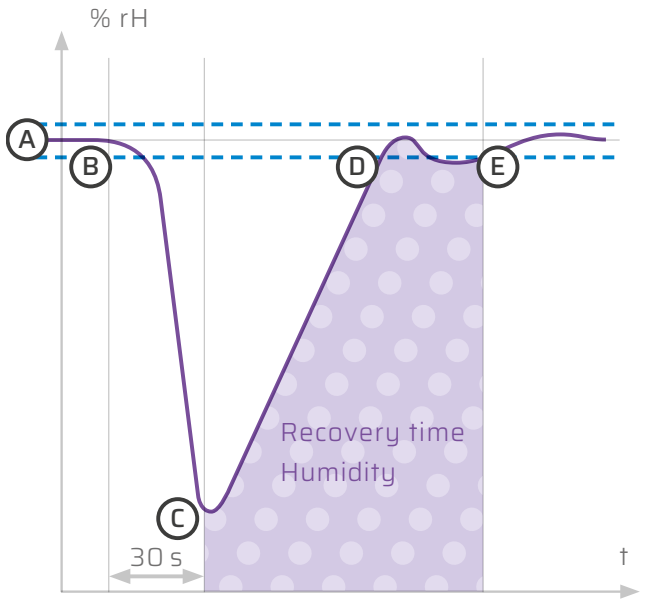
Specifications in minutes [min]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
21°C / 45%rh	7	6	3
25°C / 40%rh	7	5	3
25°C / 60%rh	5	6	4
30°C / 35%rh	6	6	4
30°C / 65%rh	6	6	5
30°C / 75%rh	6	7	7
37°C / 80%rh	6	8	10
40°C / 25%rh	5	5	4
40°C / 75%rh	6	8	11

Specifications in mintues [min]

[P1] Product variant with performance option P1

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	260[P1]	410[P1]	750[P1]
21°C / 45%rh	2	1	47
25°C / 40%rh	2	3	51
25°C / 60%rh	4	5	74
30°C / 35%rh	3	3	55
30°C / 65%rh	6	7	82
30°C / 75%rh	7	8	86
37°C / 80%rh	9	11	95
40°C / 25%rh	3	3	58
40°C / 75%rh	11	14	99

Data in milliliter per day [ml/day]

[P1] Product variant with performance option P1

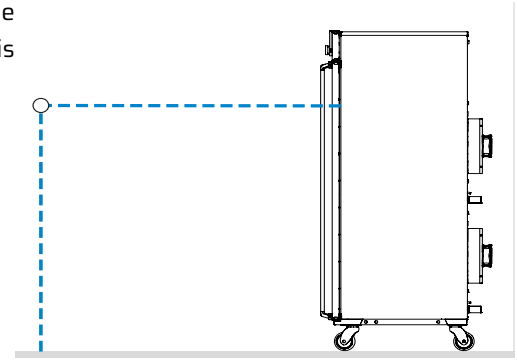
SOUND LEVEL MEASUREMENT

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	260[P1]	410[P1]	750[P1]
5 °C / 50%rh	42	42	49

Data in decibels [dB]

[P1] Product variant with performance option P1

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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