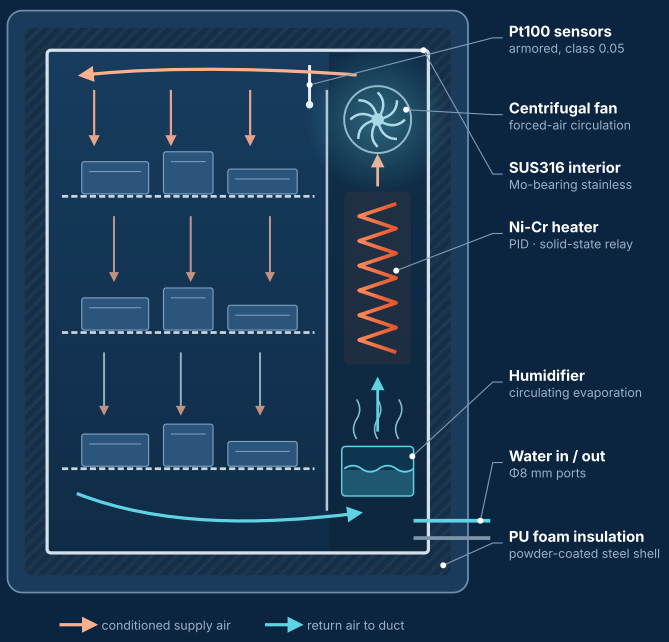
DAMP HEAT · STEADY STATE · 85/85 · 95/95

Damp Heat Test Chamber

HWS-H Series · 150 · 250 · 500 · 1000 L

A high-temperature, high-humidity chamber built for one job — and built to do it for weeks. It holds **60–100 °C** at **80–98 %RH**, the region where Double 85 and Double 95 endurance tests live, inside a **SUS316 stainless interior** with a water-recirculating humidifier.



Section view, schematic — continuous air loop through the dedicated side duct

85/85 °C / %RH **95**/95 °C / %RH

Both reference points sit inside the working envelope.

60–100 °C	80–98 %RH	≤ ±0.5 °C	≤ 2 °C	≤ ±3 %RH	0.01 °C
TEMPERATURE RANGE	HUMIDITY RANGE	TEMPERATURE FLUCTUATION	TEMPERATURE UNIFORMITY	HUMIDITY DEVIATION	SETTING RESOLUTION

FOUR SIZES, ONE SPECIFICATION

Interior / external W × D × H, mm

	HWS-150H 150 L	HWS-250H 250 L	HWS-500H 500 L	HWS-1000H 1000 L
Interior	600 × 405 × 620	600 × 500 × 830	800 × 700 × 900	1000 × 1000 × 1000
External	870 × 810 × 1500	870 × 900 × 1720	1060 × 1120 × 1730	1250 × 1410 × 1820
Max. power	1.5 kW	1.5 kW	2.5 kW	2.5 kW

DESIGNED & BUILT TO

GB/T 10586 · GB/T 2423.3 · IEC 60068-2-78 · IEC 60068-2-30 · IEC 60068-3 · JESD22-A101 · IEC 61215 / 61730 · MIL-STD-810*

2-year warranty
major defects: refund or replacement

Free DDP delivery
duties & taxes included

On-site setup
assembly, commissioning, acceptance

220 V or 110 V
supply versions

TEST PURPOSE

01 Made for Double 85 and Double 95

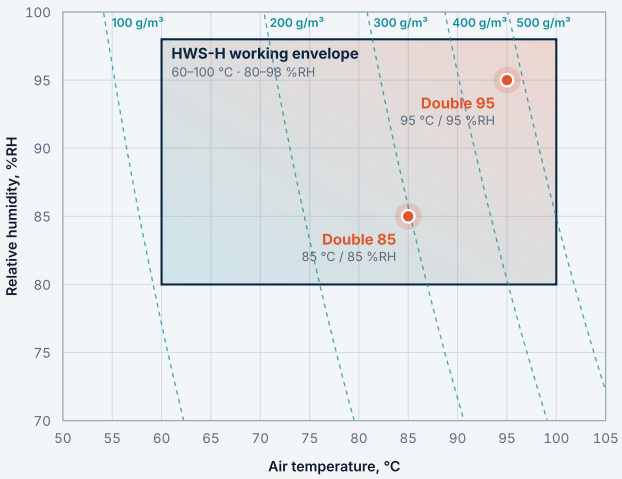
Double 85 (85 °C / 85 %RH) and Double 95 (95 °C / 95 %RH) are reliability and accelerated-ageing tests used throughout electronics, photovoltaics and automotive parts.

Heat accelerates chemical reactions; humidity drives moisture into seals, laminates and packages. Together they reveal **corrosion, delamination and insulation failure** in weeks — failures that might otherwise take years to appear in the field.

The HWS-H is not a general-purpose climate chamber stretched to its limit. It is dedicated to the 60–100 °C, 80–98 %RH window and designed to hold it without a break.

- **Heat** raises reaction rates — oxidation, hydrolysis, ion migration.
- **Moisture** permeates polymers, adhesives and encapsulants.
- **Time** at constant stress turns latent defects into measurable failures.

Fig. 1 Operating envelope with Double 85 / Double 95 test points and lines of constant absolute humidity



The physics of a saturated test space

Calculated psychrometric state at the reference points

Condition	Set point	p_{sat} (kPa)	p_{H_2O} (kPa)	Dew point	Condensation margin	Absolute humidity
Double 85	85 °C / 85 %RH	57.9	49.2	80.9 °C	**4.1 K**	298 g/m³
Double 95	95 °C / 95 %RH	84.6	80.4	93.6 °C	**1.4 K**	473 g/m³
Envelope min.	60 °C / 80 %RH	19.9	16.0	55.3 °C	**4.7 K**	104 g/m³
Envelope max.	100 °C / 98 %RH	101.4	99.4	99.4 °C	**0.6 K**	577 g/m³

Calculated with the Hyland–Wexler saturation vapour-pressure formulation over water; absolute humidity at chamber air temperature. For comparison, laboratory air at 23 °C / 50 %RH carries ≈ 10 g/m³ of water vapour. Reference values only — not measured chamber data.

ENGINEERING CONSEQUENCE

At 95 °C / 95 %RH the dew point is **93.6 °C** — only **1.4 K** below the air. Any surface cooler than that condenses, and the air holds roughly 46× the water vapour of laboratory air. This is why the HWS-H **heats its door frame**, circulates air through a **continuous loop with no dead corners**, and lines the work space with **molybdenum-bearing SUS316** stainless steel.

Built to run for weeks

A typical damp-heat endurance test: 1000 h, non-stop

0 h · start of exposure — **1000 h ≈ 41.7 days**

week 1 168 h | week 2 336 h | week 3 504 h | week 4 672 h | week 5 840 h

Power-failure recovery resumes the profile after an outage, with run-wait, stop and maintenance modes.

Water recirculation reuses humidifier water; refills are rare over a long run.

Low-water protection guards the humidifier if the supply runs short.

DESIGN

02 Engineered for long, saturated runs

SUS316 stainless interior
Molybdenum-bearing 316 stainless steel for a long life in hot, saturated air.

Anti-condensation door frame
A heated door frame keeps the seal dry and the door closing tight.

Pt100 class 0.05 sensors
Armored platinum resistance sensors for temperature and humidity.

Touch-screen controller
Set to 0.01 °C and 0.1 %RH, with full curve display and guided setup.

Self-calibration
Correct the temperature and humidity reference points from the controller.

Power-failure recovery
Resumes after a power cut, with run-wait, stop and maintenance modes.

Water recirculation
A circulating water-evaporation humidifier reuses its water, so refills are rare.

Three adjustable shelves
Stainless steel grid racks, each carrying more than 30 kg.

WORKING PRINCIPLE

03 Even conditions on every shelf

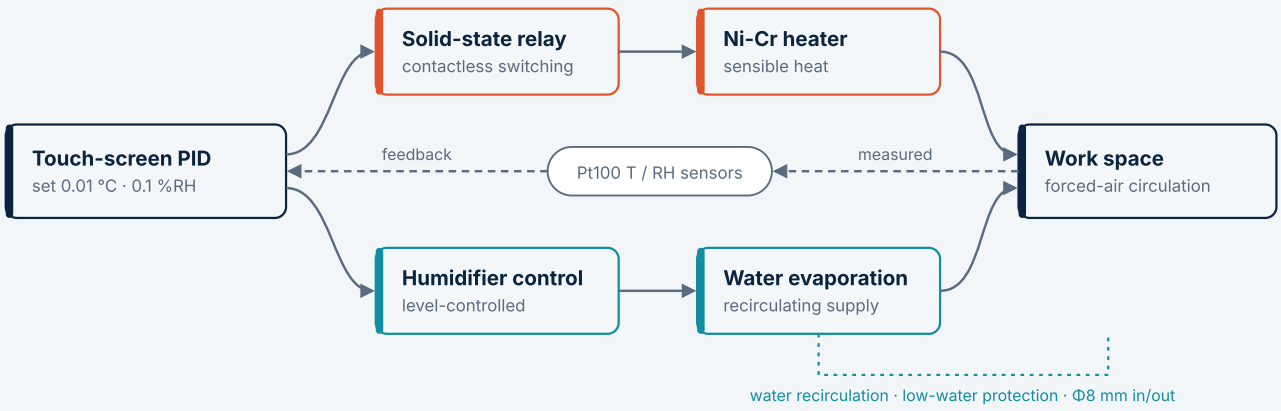
A **dedicated air duct** at one end of the work space houses the centrifugal fan, the nickel-chromium heater and the humidifier inlet. Air is drawn in at the bottom, conditioned, and blown evenly across the samples. It then returns to the duct in a **continuous loop** — no dead corners (see the section view on the cover).

- ✓ **Fluctuation ≤ ±0.5 °C · uniformity ≤ 2 °C**
- ✓ **Humidity deviation ≤ ±3 %RH**
- ✓ **Setting resolution 0.01 °C · 0.1 %RH · 1 min**

Armored **Pt100 class 0.05** sensors feed the touch-screen controller. Its PID algorithm drives the heater through a **solid-state relay** — contactless switching suited to the fine, frequent power modulation that steady-state control demands.

Moisture comes from a **circulating water-evaporation humidifier** fed by a recirculated, level-controlled water loop with low-water protection.

Fig. 2 Closed-loop control of temperature and humidity (functional diagram)



HOW PERFORMANCE IS EXPRESSED

Fluctuation — variation of the temperature at one point in the work space over time, in steady state.

Uniformity — largest difference between points in the work space at the same moment.

Deviation — difference between the set point and the actual value in the work space.

TECHNICAL DATA

04 Specifications

Models & dimensions

All dimensions W × D × H, mm

Model	Volume	Interior (W × D × H)	External (W × D × H)	Max. power
HWS-150H	150 L	600 × 405 × 620	870 × 810 × 1500	1.5 kW
HWS-250H	250 L	600 × 500 × 830	870 × 900 × 1720	1.5 kW
HWS-500H	500 L	800 × 700 × 900	1060 × 1120 × 1730	2.5 kW
HWS-1000H	1000 L	1000 × 1000 × 1000	1250 × 1410 × 1820	2.5 kW

Common specifications

Apply to all four models

PERFORMANCE

Temperature range	60 °C to +100 °C
Temperature fluctuation	≤ ±0.5 °C
Temperature deviation	≤ ±2 °C
Temperature uniformity	≤ 2 °C
Heating rate	3 °C in ≤ 1 min
Humidity range	80 %RH to 98 %RH
Humidity deviation	≤ ±3 %RH
Control method	Forced-air circulation, balanced temperature and humidity control

CONTROLLER

Type	Touch-screen temperature & humidity controller
Indication accuracy	0.1 °C · 0.1 %RH
Setting / display resolution	0.01 °C · 0.1 %RH · 1 min
Functions	Curve display, guided setup, self-calibration of T/RH reference points, power-failure recovery (run-wait, stop, maintenance modes)

ELECTRICAL

Power supply	220 V or 110 V (specify at order)
Air switch capacity	25 A (220 V)
Maximum power	1.5 kW (150 L, 250 L) · 2.5 kW (500 L, 1000 L)

CHAMBER CONSTRUCTION

Structure	Integrated, one-piece
Exterior	Cold-rolled steel, powder-coated
Interior	High-quality SUS316 stainless steel
Insulation	Rigid polyurethane foam
Door	Single hinged door, anti-condensation heater in door frame
Shelves	3 adjustable stainless steel grid racks, welded round bar; > 30 kg each
Water ports	1 inlet + 1 outlet, Φ8 mm

AIR-CONDITIONING SYSTEM

Air circulation	Centrifugal fan
Heating	Nickel-chromium wire heater, PID control, solid-state relay
Humidification	Circulating water-evaporation humidifier with water recirculation
Temperature sensor	Armored Pt100, class 0.05
Humidity sensor	Armored Pt100, class 0.05

SAFETY PROTECTIONS

Alarms	Chamber over-temperature; chamber over-humidity
Electrical	Structural safety grounding; heater short-circuit; blower over-current; phase-sequence protector
Water	Humidifier low-water protection

Specifications are subject to change without notice for product improvement. Design standards: GB/T 10586, GB/T 2423.3, IEC 60068-2-78, IEC 60068-2-30, IEC 60068-3, JESD22-A101, IEC 61215 / IEC 61730, and the relevant clauses of MIL-STD-810 — see page 5.

WHERE IT IS USED

05 Applications

Semiconductors & components
Double 85 and steady-state temperature–humidity life tests.
JESD22-A101

Photovoltaic modules
Damp-heat qualification and safety testing.
IEC 61215 · IEC 61730

Batteries & power electronics
Moisture resistance of housings, seals and insulation.
Damp heat

Polymers & plastics
Fading, shrinkage, loss of strength and ageing under heat and humidity.
Material ageing

Aerospace & instruments
Humidity resistance to the relevant MIL-STD-810 clauses.
MIL-STD-810

Automotive parts & building chemicals
Double 85 and Double 95 ageing of parts, coatings, adhesives and materials.
85/85 · 95/95

Design standards

Designed and built to

GB/T 10586	Specifications for damp heat chambers
GB/T 2423.3	Environmental testing — Test Cab: Damp heat, steady state
IEC 60068-2-78	Environmental testing — Test Cab: Damp heat, steady state
IEC 60068-2-30	Environmental testing — Test Db: Damp heat, cyclic
IEC 60068-3	Environmental testing — Supporting documentation and guidance
JESD22-A101	Steady-state temperature–humidity bias life test
IEC 61215	Terrestrial PV modules — Design qualification and type approval
IEC 61730	PV module safety qualification
MIL-STD-810	Environmental engineering considerations and laboratory tests (relevant clauses)

Before testing, confirm that the profile required by the chosen standard falls within the chamber's 60–100 °C, 80–98 %RH envelope.

Safety protections

Seven protection functions

- Over-temperature alarm
- Over-humidity alarm
- Structural safety grounding
- Heater short-circuit protection
- Humidifier low-water protection
- Blower over-current protection
- Phase-sequence protector

Choosing the right LORDERAN chamber

When the test leaves the damp-heat window

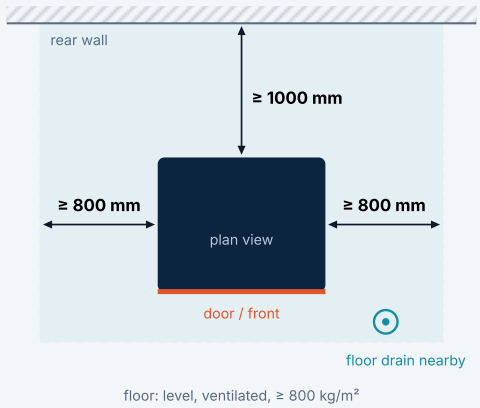
Chamber	Temperature	Humidity	Interior	Sizes	Best for
HWS-H damp heat chamber	60 to 100 °C	80 to 98 %RH	SUS316	150–1000 L	Long, steady 85/85 and 95/95 endurance
Climate chamber −40 °C	−40 to 150 °C	20 to 98 %RH	SUS304	100–1000 L	Wide-range temperature–humidity tests
Climate chamber −70 °C	−70 to 150 °C	20 to 98 %RH	2 mm stainless	100–1000 L	Wide range incl. deep cold

Testing below 60 °C or under 80 %RH is outside the HWS-H envelope — choose a LORDERAN climate chamber for those conditions.

PLANNING YOUR LAB

06 Installation requirements

Fig. 3 Minimum clearances (plan view)



Power	220 V or 110 V; 25 A air switch (220 V)
Floor	Level, well ventilated, load rating ≥ 800 kg/m²
Drainage	Floor drain close to the chamber
Clearance	≥ 1000 mm at the rear, ≥ 800 mm at each side
Ambient temperature	5 to 35 °C
Ambient humidity	≤ 85 %RH
Atmospheric pressure	86 to 106 kPa
Environment	Away from strong vibration, strong electromagnetic fields, flammable, explosive or corrosive substances, and dust

✕ DO NOT TEST

- Explosive or flammable substances
- Corrosive substances
- Samples exceeding the permitted heat load

FROM ORDER TO ACCEPTANCE

07 Delivery, warranty & ordering

Free DDP delivery
Duties and taxes paid; some international restrictions apply. Ship date confirmed in the order acknowledgement.

On-site setup
Assembled on site, commissioned and accepted at your facility.

Documentation
Supplied with a user manual and a maintenance manual.

2-year warranty
Major defects covered by full refund or replacement.

30-day money back
On most new, unopened items.

Frequently asked questions

Quick answers for test planning

Q What is a Double 85 test?
A damp-heat test at 85 °C / 85 %RH, commonly run for 1000 h on electronics, PV modules and similar products. It sits inside the HWS-H range.

Q What is a Double 95 test?
A more severe damp-heat test at 95 °C / 95 %RH — a standard reliability test in electronics, PV and automotive. Also inside the range.

Q How does it differ from a climate chamber?
It is focused on holding high heat and humidity steadily over long tests, with a SUS316 interior for corrosion resistance. Climate chambers cover wider ranges.

Q Can it test below 60 °C or under 80 %RH?
No. For wider ranges choose a LORDERAN climate chamber: −40 °C or −70 °C to 150 °C, 20–98 %RH.

Q How often must water be added?
Rarely. The recirculating humidifier has level control and low-water protection, with Φ8 mm ports; a nearby floor drain is recommended.

Q Which standards is it built to?
GB/T 10586, GB/T 2423.3, IEC 60068-2-78 / -2-30 / -3, JESD22-A101, IEC 61215 / 61730 and relevant MIL-STD-810 clauses.

ORDERING INFORMATION EXAMPLE

Specify the **model** and the **supply voltage** when ordering.

HWS-**500**H — **220 V**

model · volume in litres supply: 220 V or 110 V

LORDERAN

Laboratory & environmental test equipment

— www.lorderan.com

For quotations, application questions and test-method advice, contact LORDERAN through the website.