

## Technical Description

### Environmental Testing Cabinet

T 340/-40

Ordering code

67610816



Performance Data  
Dimensions  
Installation Data  
Connections  
Controller  
User Interface

## 1 Main Technical Specification

Test Space Volume	335 L
Test Space Dimension	580 mm (width) 765 mm (depth) 750 mm (height)
Temperature range	-40 °C to +180 °C

## 2 Competitive Edges and Standard Features

Our test chambers are manufactured under utmost care meeting and excelling relevant quality and safety standards. Each chamber goes through a thoroughly documented testing as well as calibration process prior to shipment.

- \* Color touch panel operation and 32-bit control system
- \* Extensive networking capabilities via TCP/IP
- \* 4 potential-free digital switches
- \* Powder-coated housing and stainless steel inner test space
- \* Intelligent airflow for high accuracy at various loads
- \* Air-cooled refrigeration unit
- \* Specimen protection against condensation and over-tempering
- \* Moveable and height adjustable design
- \* 2 standard entry ports (Dia.50mm and Dia.125mm)
- \* 1 insert shelves
- \* 1 year of warranty
- \* Fault diagnosis system for maintenance and repair
- \* Observation window in door including test space light
- \* Air-cooled refrigeration system

### 3 Test Parameters

#### 3.1 Temperature

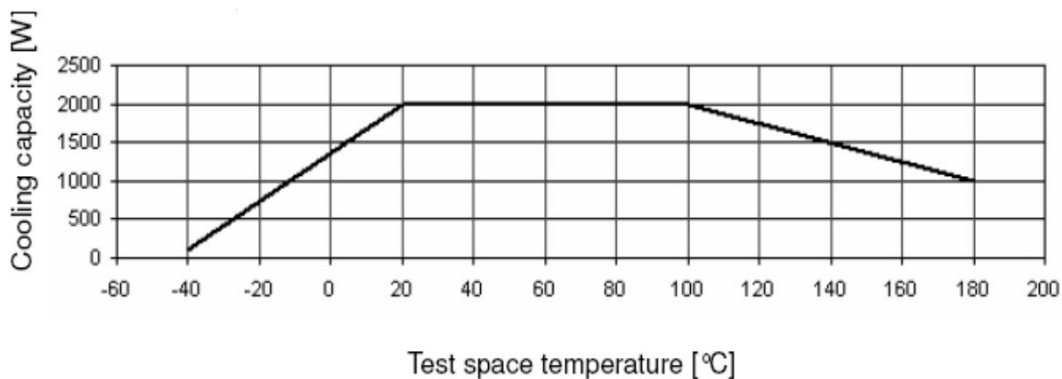
Temperature range	-40 °C to	+180 °C	
Temperature deviation (acc. IEC 60068-3-5)	±0.1 K to	±0.5 K	(in time)
	±0.5 K to	±2.0 K	(in space)

Temperature rate of change (acc. IEC 60068-3-5)	3.2 K/min	(Heating)
	3.5 K/min	(Cooling)

Calibrated values	+23 °C
	+80 °C

Heat compensation at +20°C	2000 W
at -20°C	750 W

Heat compensation diagram



### 4 Chamber Design

#### 4.1 Test Space

Dimensions	580 mm	(width)
	765 mm	(depth)
	750 mm	(height)

Volume	335 L
--------	-------

Material	stainless steel grade 1.4301 (SUS304)
----------	---------------------------------------

Chamber loading	30 kg (per shelf) 80 kg (total all shelves) 60 kg (floor) 140 kg (total)
Shelves	8 max. number
Entry ports	2 ports in total (50 mm LHS, 125 mm RHS)
Window (heated)	450 mm (width) 600 mm (height)
Door	hinged to the left, single-hand operation, lockable



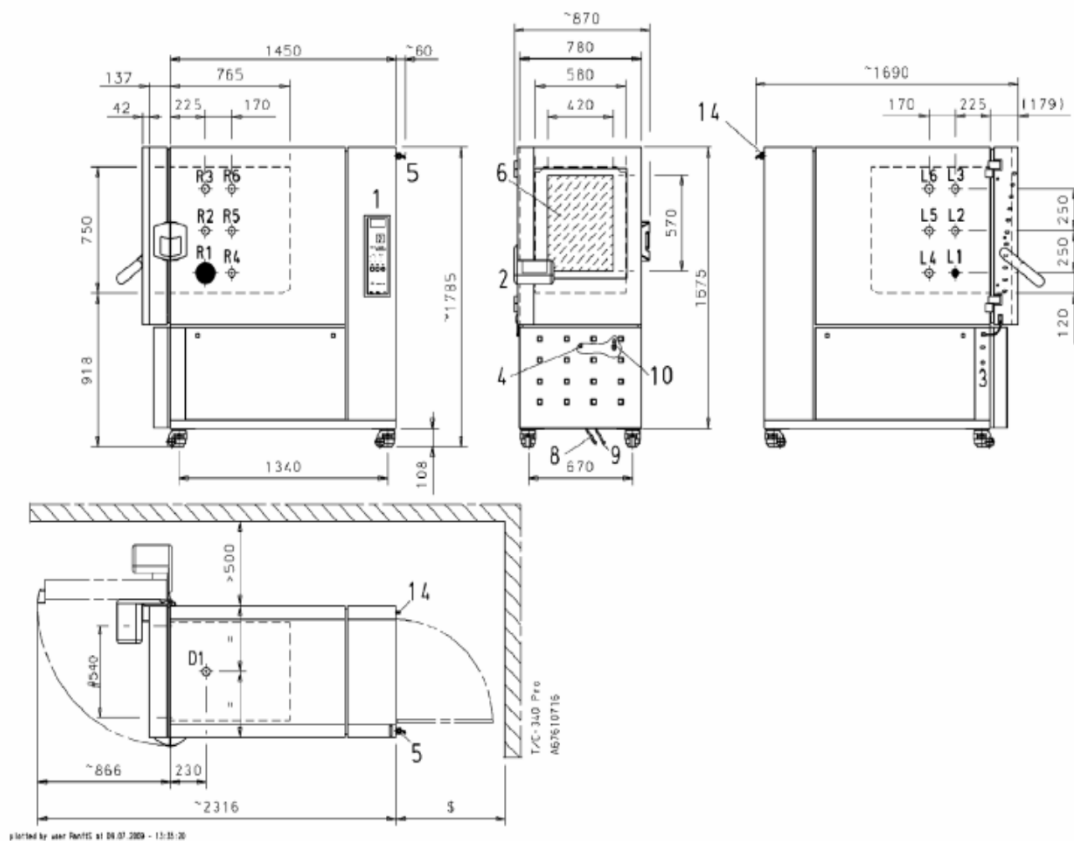
#### 4.2 System & Installation

Cabinet dimensions (incl. touch panel)	870 mm (width) 1790 mm (depth) 1796 mm (height)
Required transportation clearance	1000 mm (width) 1800 mm (depth) 2010 mm (height)
Weight	~475 kg (net)
Sound pressure level	58 dB(A)
Ambient operation conditions	+10 °C to +35 °C Max. 75% r.H

Chamber housing	zinc-coated steel, powder-coated in RAL 9002 (grey-white)
Entry port locations	R1 125 mm (standard) L1 50 mm (standard) R2..n (optional) L2..n (optional) D1 in ceiling (optional)

## Installation Diagram

### T / C 340



Legend	1	Master switch panel
	2	8" control unit
	3	Connector panel
	4	Connection for overflow/condensate drain
	5	Electrical connection, cable length approx. 3.5 m
	6	Door with window
	8	Cooling water inlet <sup>(option)</sup>
	9	Cooling water outlet <sup>(option)</sup>
	10	Connection for demineralised water
	14	Compressed air connection <sup>(option)</sup>

#### 4.3 Supplies & Connections

Nominal voltage	3/N/PE AC 380/400V ± 10%, 50Hz
Nominal power	3.5 KW
Nominal current	12 A
Fuse protection (at site)	16 A slow
Main connection	approx. 3 m connection cable
Drainage	¾" hose connection back-pressure free for condensation water
Refrigeration system	air-cooled mechanical refrigeration system based on Freon R404A/R23 with a ozone depletion potential of zero (ODP = 0.00)



## 5 Control and Programming

### 5.1 Control and Programming with SIMPAC

SIMPAC is a self-monitoring, digital 32 bit measuring and control system and has been designed especially for the use in environmental test systems. Thanks to its computing efficiency SIMPAC excels in process technology requirements and facilitates the input by a color touch panel. SIMPAC handles all the functions necessary for control and programming. In addition to temperature and humidity control it also contains an efficient Software PLC according to IEC 1131 standard, which coordinates, monitors all functions and provides information on operating failure

Program memory	max. 100 programs
Program controller	start parameters for programs: immediately, delayed, real time, pause
PID controller	special control algorithms defined according to test tasks
Segments	max. 100 per/program
Loops	250 (nested)
Program cycles	max. 9999
Switch inputs (digital)	4 (load max. 24 V-DC, approx. 30 mA)
Switch outputs (digital)	4 (load max. 24 V-DC, approx. 0.5A)
Password protection	two levels, to prevent accidental settings
Limit value monitoring system	for temperature and humidity
Diagnostic system	for information on operating times and possible operating failures
Serial interface (Option)	for connection to a host computer system (e.g. Notebook-operating panel or SIMPATI*) or for 3rd party networking
TCP/IP Ethernet interface	for communication via software package SIMPATI*
Connection to building control	Profibus or Interbus via Gateway, other additional systems upon request

## 5.2 Operation with Color Touch Panel

The color touch panel, suitable for graphics with a resolution of 640 x 480 Pixel (VGA), is part of the standard equipment. It allows a convenient input of fixed values and program operation with graphic display of set points and actual values, the operating time and number of remaining cycles etc. including help function. Furthermore, the touch panel has the following special features:

- \* Background-lit display
- \* Operation by slightly touching the function symbols
- \* Graphic symbols for programming functions
- \* Graphic display of actual test data
- \* Menu-guidance
- \* Easy programming of individual test programs
- \* Safe storing of individual programs, which can be activated at any time
- \* Easy activation of stored test programs
- \* Help function
- \* Operation state displayed by means of light diodes
- \* Six languages (switchable) including Chinese, German, English, French, Italian as well as Korean
- \* Standardized display of all parameters (temperature, humidity, digital channels incl. limit values, tolerances etc.)





## **6 Commercial Information**

Please refer to the commercial offer sheet

## **7 Technical Details**

### **7.1 Construction**

The climate test cabinets by WVC are supplied ready for connection. Compact design means a minimum of space is required. Five test cabinets with a volume from 190 to 1540 l are available. All cabinets are designed to be free-standing in one location. The machine section incorporating the refrigeration unit, the water storage tank and the water pump is located below the test chamber. The swing-out switch cabinet is located on the rear of the cabinet. The operating elements and the main switch are located on the right side of the cabinet.

### **7.2 Exterior Housing**

The exterior housing of the unit is made from lightweight corrosion-resistant, self-supporting, galvanized sheet-steel and lacquered in two colors (RAL 7016 anthracite and RAL 9002 grey). The environmental-friendly insulation between test chamber and exterior housing guarantees best insulation values and thus lowest possible operating costs.

### **7.3 Test Chamber**

The test chamber consists of a stainless-steel container and is welded vapor-tight. The test chamber is easy to clean thanks to special welding, smooth surfaces, rounded edges and shelf supports. The rear test chamber wall incorporates an air duct with built-in humidifier tub (C-models), built-in heat exchanger, electric heaters and a recirculating air fan. Air guidance via baffle plates in the test chamber floor and ceiling produces optimum ambient air and temperature distribution.

### **7.4 Test Chamber Door**

The test chamber is completely sealed by a door that is hinged on the left. It is provided with an observation window. The door opens fully for easy access and is equipped with high quality insulation. An optimum seal is guaranteed by special profile seals and a self-tightening locking mechanism which is operable with one hand.

### **7.5 Access Ports**

All cabinets have two access ports (approx. 50 and 125 mm diameter) made of low thermal conductivity material. The ports are in the left and right side walls and can be used for measuring and control wires, other supply connections or accessories.

If not required, these ports are closed with rubber plugs supplied as standard.

#### 7.6 Temperature and Humidity Conditioning

The large axial fan with exterior drive motor draws the air out of the space. This recirculating air then passes a fin-type heat exchanger, which cools the air, if necessary. The special design of the refrigerating system avoids unintended condensation precipitation at the heat exchanger during climatic operation and guarantees highest temperature and humidity constancies in time. An electrical heater, installed in front of the heat exchanger in air direction, is heating-up the recirculating air.

An innovative humidification system allows a high relative humidity even with a heat load (C-models).

#### 7.7 Psychrometric Humidity Measuring (C-models only)

The humidity of the test space air is measured according to the internationally valid psychrometric measuring principle with two resistance thermometers Pt 100 as per DIN IEC 751. Dry and wet bulb sensors are arranged next to each other in the recirculating air flow. Depending on the climate the material of the wet bulb sensor is humidified. The life time is increased considerably due to a self-cleaning mechanism!

#### 7.8 Protection System against Condensation

The protection system consists of a dehumidifying evaporator which prevents condensation forming on the specimens as they heat-up after tests at low temperatures.

The protection system's operating range is -40 to +60 °C.

The protection system against condensation is activated by a digital switch channel. It is possible to switch on the protection system manually or to integrate it into a program.

#### 7.9 Dew Point Extension from +4 °C to -3 °C (C-models only)

In this working range the humidity constancy in time is  $< \pm 5\%$  r.h. The extended working range can be operated at intervals. The max. operation time without defrosting is approx. 24 hrs.

#### 7.10 Additional Safety Devices

##### 7.10.1 Specimen Protection

In addition to the programmable limit value monitoring system of the **SIMPAC**, the climate test cabinet is equipped with a high and low temperature limit controller which can be adjusted digitally (specimen protection with separate sensor) according to EN 60519-2 (1993). The signal is indicated visually and acoustically. A potential-free contact to switch off power supplies is available to the customer.

##### 7.10.2 Permanently Memorized Overheating Safety Thermostat

A steady state overheating safety thermostat is installed that automatically switches off the heater if the test chamber's maximum temperature range is exceeded.

### 7.11 Power Supply

Each functional circuit is equipped with its own safety device, which, in the event of trouble, turns off the affected circuit or the entire cabinet. The nature of the trouble is visually displayed.

Wiring and electrics are governed by the latest technology and strictly conform to safety regulations for electrical installations and materials, as well as to relevant VDE regulations.

The test cabinets are standard-wise equipped with a lockable main switch according to VDE.

## 8 General Statements

In the constant effort to improve our product, we reserve the right to make construction or design changes without prior notice or obligation.

Please note that for installation of the climate test cabinet (for components which jut out, such as: hinges, locks, etc.) the clearance requirements indicated in the technical data must be observed.

The performance data indicated were determined with empty test space and refer to an appliance without additional ports or devices, which represent a thermal load with an ambient temperature of max. +25 °C and with water-cooled refrigeration units (option) to a water temperature of approx. +28 °C.

The cabinet is designed to be installed in normal rooms. The max. admissible ambient temperature for storage and installation is +55 °C (+131 °F).

The admissible ambient temperature for operation of the cabinet is between +10 °C and +35 °C (+50 °F and +95 °F).

Performance data cannot be guaranteed in ambient conditions other than those stated.

Accuracy rates are proven in the test space center, in steady state, without specimens, without radiation and without additional equipment in the test space. The cooling down rate stated refers to the temperature range without controlled humidity.

Noise measurements and sound level data are effected as per DIN 45 635, part 1, accuracy class In case of outgassing or pollution caused by the specimen we recommend regular maintenance of the measuring system. Please keep in mind that outgassing of specimens and connection lines might cause corrosion of components. Corrosive gasses might escape among others from chip boards, cardboard boxes and bandaging materials.

If outgassing is to be expected, we recommend an optional ventilation of the test space with a purge air volume. If outgassing or pollution is expected, we also recommend a regular maintenance of the measuring system.

Measures to be taken regarding a necessary combination with other units have to be approved by the local supervising authorities. The relevant costs are not included in our quotation.

Please note that the sealing material and cable insulation used in our test units and systems contains silicone. If this is a problem for you, please contact us.

The concept and design of the test units and systems are in accordance with the relative safety requirements and regulations of the EC-standards directive for machinery 98/37/EG, EMC Directive 89/336/EWG, 91/263/EWG, 92/31/EWG, Directive for Low Voltage 73/23/EWG, 93/68/EWG and the EC Directive for Pressurized Equipment 97/23/EG.

The above regulations are adhered to when modifications or extensions are performed on site.

The EMC test and the data on the noise emission are in accordance with EN 50 081-1 and EN 61

## Technical Description

### Environmental Testing Cabinet

T 340/-70

Ordering code

67610836



Performance Data  
Dimensions  
Installation Data  
Connections  
Controller  
User Interface

## 1 Main Technical Specification

Test Space Volume	335 L
Test Space Dimension	580 mm (width)
	765 mm (depth)
	750 mm (height)
Temperature range	-70 °C to +180 °C

## 2 Competitive Edges and Standard Features

Our test chambers are manufactured under utmost care meeting and excelling relevant quality and safety standards. Each chamber goes through a thoroughly documented testing as well as calibration process prior to shipment.

- \* Color touch panel operation and 32-bit control system
- \* Extensive networking capabilities via TCP/IP
- \* 4 potential-free digital switches
- \* Powder-coated housing and stainless steel inner test space
- \* Intelligent airflow for high accuracy at various loads
- \* Air-cooled refrigeration unit
- \* Specimen protection against condensation and over-tempering
- \* Moveable and height adjustable design
- \* 2 standard entry ports (Dia.50mm and Dia.125mm)
- \* 1 insert shelves
- \* 1 year of warranty
- \* Fault diagnosis system for maintenance and repair
- \* Observation window in door including test space light
- \* Air-cooled refrigeration system

### 3 Test Parameters

#### 3.1 Temperature

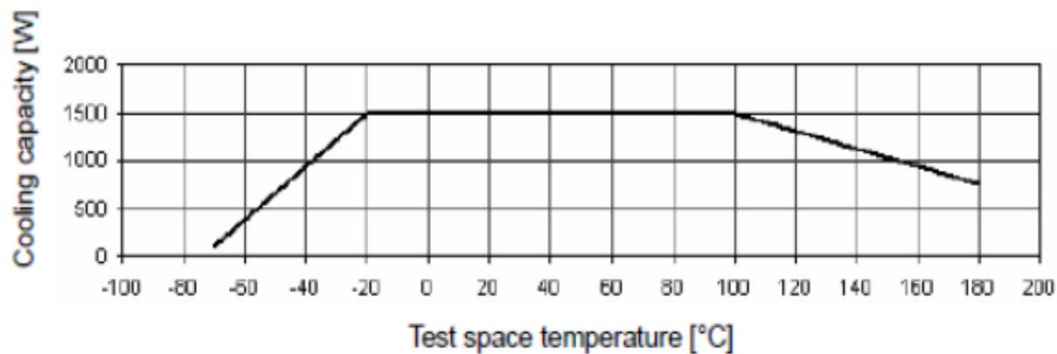
Temperature range	-70 °C to	+180 °C	
Temperature deviation (acc. IEC 60068-3-5)	±0.1 K to	±0.5 K	(in time)
	±0.5 K to	±2.0 K	(in space)

Temperature rate of change (acc. IEC 60068-3-5)	3.0 K/min	(Heating)
	2.7 K/min	(Cooling)

Calibrated values	+23 °C
	+80 °C

Heat compensation at +20°C	1500 W
at -20°C	1500 W

Heat compensation diagram



### 4 Chamber Design

#### 4.1 Test Space

Dimensions	580 mm	(width)
	765 mm	(depth)
	750 mm	(height)

Volume	335 L
--------	-------

Material	stainless steel grade 1.4301 (SUS304)
----------	---------------------------------------

Chamber loading	30 kg (per shelf) 80 kg (total all shelves) 60 kg (floor) 140 kg (total)
Shelves	8 max. number
Entry ports	2 ports in total (50 mm LHS, 125 mm RHS)
Window (heated)	450 mm (width) 600 mm (height)
Door	hinged to the left, single-hand operation, lockable



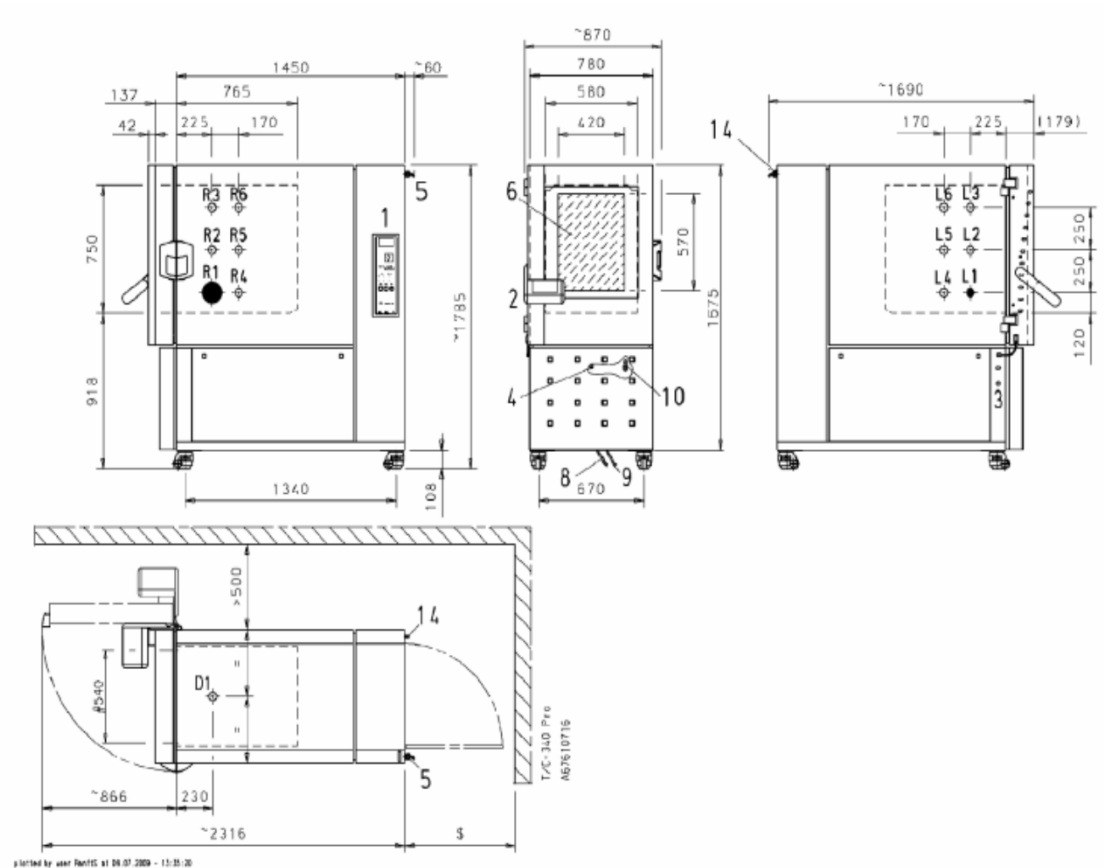
#### 4.2 System & Installation

Cabinet dimensions (incl. touch panel)	870 mm (width) 1790 mm (depth) 1796 mm (height)
Required transportation clearance	1000 mm (width) 1800 mm (depth) 2010 mm (height)
Weight	~520 kg (net)
Sound pressure level	60 dB(A)
Ambient operation conditions	+10 °C to +35 °C Max. 75% r.H

- Chamber housing                      zinc-coated steel, powder-coated in RAL 9002 (grey-white)
- Entry port locations                R1 125 mm (standard)  
L1 50 mm (standard)  
R2..n (optional)  
L2..n (optional)  
D1 in ceiling (optional)

## Installation Diagram

### T / C 340

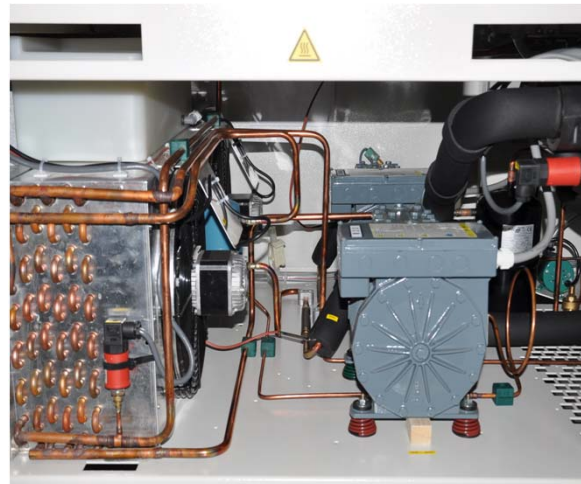


- Legend
- 1     Master switch panel
  - 2     8" control unit
  - 3     Connector panel
  - 4     Connection for overflow/condensate drain
  - 5     Electrical connection, cable length approx. 3.5 m
  - 6     Door with window
  - 8     Cooling water inlet<sup>(option)</sup>
  - 9     Cooling water outlet<sup>(option)</sup>
  - 10    Connection for demineralised water
  - 14    Compressed air connection<sup>(option)</sup>



#### 4.3 Supplies & Connections

Nominal voltage	3/N/PE AC 380/400V ± 10%, 50Hz
Nominal power	4.4 KW
Nominal current	13 A
Fuse protection (at site)	16 A slow
Main connection	approx. 3 m connection cable
Drainage	3/4" hose connection back-pressure free for condensation water
Refrigeration system	air-cooled mechanical refrigeration system based on Freon R404A/R23 with a ozone depletion potential of zero (ODP = 0.00)



## 5 Control and Programming

### 5.1 Control and Programming with SIMPAC

SIMPAC is a self-monitoring, digital 32 bit measuring and control system and has been designed especially for the use in environmental test systems. Thanks to its computing efficiency SIMPAC excels in process technology requirements and facilitates the input by a color touch panel. SIMPAC handles all the functions necessary for control and programming. In addition to temperature and humidity control it also contains an efficient Software PLC according to IEC 1131 standard, which coordinates, monitors all functions and provides information on operating failures.

Program memory	max. 100 programs
Program controller	start parameters for programs: immediately, delayed, real time, pause
PID controller	special control algorithms defined according to test tasks
Segments	max. 100 per/program
Loops	250 (nested)
Program cycles	max. 9999
Switch inputs (digital)	4 (load max. 24 V-DC, approx. 30 mA)
Switch outputs (digital)	4 (load max. 24 V-DC, approx. 0.5A)
Password protection	two levels, to prevent accidental settings
Limit value monitoring system	for temperature and humidity
Diagnostic system	for information on operating times and possible operating failures
Serial interface (Option)	for connection to a host computer system (e.g. Notebook-operating panel or SIMPATI*) or for 3rd party networking
TCP/IP Ethernet interface	for communication via software package SIMPATI*
Connection to building control	Profibus or Interbus via Gateway, other additional systems upon request

## 5.2 Operation with Color Touch Panel

The color touch panel, suitable for graphics with a resolution of 640 x 480 Pixel (VGA), is part of the standard equipment. It allows a convenient input of fixed values and program operation with graphic display of set points and actual values, the operating time and number of remaining cycles etc. including help function. Furthermore, the touch panel has the following special features:

- \* Background-lit display
- \* Operation by slightly touching the function symbols
- \* Graphic symbols for programming functions
- \* Graphic display of actual test data
- \* Menu-guidance
- \* Easy programming of individual test programs
- \* Safe storing of individual programs, which can be activated at any time
- \* Easy activation of stored test programs
- \* Help function
- \* Operation state displayed by means of light diodes
- \* Six languages (switchable) including Chinese, German, English, French, Italian as well as Korean
- \* Standardized display of all parameters (temperature, humidity, digital channels incl. limit values, tolerances etc.)



## **6 Commercial Information**

Please refer to the commercial offer sheet

## **7 Technical Details**

### **7.1 Construction**

The climate test cabinets by WVC are supplied ready for connection. Compact design means a minimum of space is required. Five test cabinets with a volume from 190 to 1540 l are available. All cabinets are designed to be free-standing in one location. The machine section incorporating the refrigeration unit, the water storage tank and the water pump is located below the test chamber. The swing-out switch cabinet is located on the rear of the cabinet. The operating elements and the main switch are located on the right side of the cabinet.

### **7.2 Exterior Housing**

The exterior housing of the unit is made from lightweight corrosion-resistant, self-supporting, galvanized sheet-steel and lacquered in two colors (RAL 7016 anthracite and RAL 9002 grey-white). The environmental-friendly insulation between test chamber and exterior housing guarantees best insulation values and thus lowest possible operating costs.

### **7.3 Test Chamber**

The test chamber consists of a stainless-steel container and is welded vapor-tight. The test chamber is easy to clean thanks to special welding, smooth surfaces, rounded edges and shelf supports. The rear test chamber wall incorporates an air duct with built-in humidifier tub (C-models), built-in heat exchanger, electric heaters and a recirculating air fan. Air guidance via baffle plates in the test chamber floor and ceiling produces optimum ambient air and temperature distribution.

### **7.4 Test Chamber Door**

The test chamber is completely sealed by a door that is hinged on the left. It is provided with an observation window. The door opens fully for easy access and is equipped with high quality insulation. An optimum seal is guaranteed by special profile seals and a self-tightening locking mechanism which is operable with one hand.

### **7.5 Access Ports**

All cabinets have two access ports (approx. 50 and 125 mm diameter) made of low thermal conductivity material. The ports are in the left and right side walls and can be used for measuring and control wires, other supply connections or accessories.

If not required, these ports are closed with rubber plugs supplied as standard.

#### 7.6 Temperature and Humidity Conditioning

The large axial fan with exterior drive motor draws the air out of the space. This recirculating air then passes a fin-type heat exchanger, which cools the air, if necessary. The special design of the refrigerating system avoids unintended condensation precipitation at the heat exchanger during climatic operation and guarantees highest temperature and humidity constancies in time. An electrical heater, installed in front of the heat exchanger in air direction, is heating-up the recirculating air.

An innovative humidification system allows a high relative humidity even with a heat load (C-models).

#### 7.7 Psychrometric Humidity Measuring (C-models only)

The humidity of the test space air is measured according to the internationally valid psychrometric measuring principle with two resistance thermometers Pt 100 as per DIN IEC 751. Dry and wet bulb sensors are arranged next to each other in the recirculating air flow. Depending on the climate the material of the wet bulb sensor is humidified. The life time is increased considerably due to a self-cleaning mechanism!

#### 7.8 Protection System against Condensation

The protection system consists of a dehumidifying evaporator which prevents condensation forming on the specimens as they heat-up after tests at low temperatures.

The protection system's operating range is -40 to +60 °C.

The protection system against condensation is activated by a digital switch channel. It is possible to switch on the protection system manually or to integrate it into a program.

#### 7.9 Dew Point Extension from +4 °C to -3 °C (C-models only)

In this working range the humidity constancy in time is  $< \pm 5\%$  r.h. The extended working range can be operated at intervals. The max. operation time without defrosting is approx. 24 hrs.

#### 7.10 Additional Safety Devices

##### 7.10.1 Specimen Protection

In addition to the programmable limit value monitoring system of the **SIMPAC**, the climate test cabinet is equipped with a high and low temperature limit controller which can be adjusted digitally (specimen protection with separate sensor) according to EN 60519-2 (1993). The signal is indicated visually and acoustically. A potential-free contact to switch off power supplies is available to the customer.

##### 7.10.2 Permanently Memorized Overheating Safety Thermostat

A steady state overheating safety thermostat is installed that automatically switches off the heater if the test chamber's maximum temperature range is exceeded.

#### 7.11 Power Supply

Each functional circuit is equipped with its own safety device, which, in the event of trouble, turns off the affected circuit or the entire cabinet. The nature of the trouble is visually displayed. Wiring and electrics are governed by the latest technology and strictly conform to safety regulations for electrical installations and materials, as well as to relevant VDE regulations. The test cabinets are standard-wise equipped with a lockable main switch according to VDE.

### 8 General Statements

In the constant effort to improve our product, we reserve the right to make construction or design changes without prior notice or obligation.

Please note that for installation of the climate test cabinet (for components which jut out, such as: hinges, locks, etc.) the clearance requirements indicated in the technical data must be observed. The performance data indicated were determined with empty test space and refer to an appliance without additional ports or devices, which represent a thermal load with an ambient temperature of max. +25 °C and with water-cooled refrigeration units (option) to a water temperature of The cabinet is designed to be installed in normal rooms. The max. admissible ambient temperature for storage and installation is +55 °C (+131 °F).

The admissible ambient temperature for operation of the cabinet is between +10 °C and +35 °C (+50 °F and +95 °F).

Performance data cannot be guaranteed in ambient conditions other than those stated.

Accuracy rates are proven in the test space center, in steady state, without specimens, without radiation and without additional equipment in the test space. The cooling down rate stated refers to the temperature range without controlled humidity.

Noise measurements and sound level data are effected as per DIN 45 635, part 1, accuracy class 2.

In case of outgassing or pollution caused by the specimen we recommend regular maintenance of the measuring system. Please keep in mind that outgassing of specimens and connection lines might cause corrosion of components. Corrosive gasses might escape among others from chip boards, cardboard boxes and bandaging materials.

If outgassing is to be expected, we recommend an optional ventilation of the test space with a purge air volume. If outgassing or pollution is expected, we also recommend a regular maintenance of the measuring system.

Measures to be taken regarding a necessary combination with other units have to be approved by the local supervising authorities. The relevant costs are not included in our quotation.

Please note that the sealing material and cable insulation used in our test units and systems contains silicone. If this is a problem for you, please contact us.

The concept and design of the test units and systems are in accordance with the relative safety requirements and regulations of the EC-standards directive for machinery 98/37/EG, EMC Directive 89/336/EWG, 91/263/EWG, 92/31/EWG, Directive for Low Voltage 73/23/EWG, 93/68/EWG and the EC Directive for Pressurized Equipment 97/23/EG.

The above regulations are adhered to when modifications or extensions are performed on site. The EMC test and the data on the noise emission are in accordance with EN 50 081-1 and EN 61