ClimaCORR® Cabinet Type CC 1000-TL

VLM GmbH
Business Unit
Corrosion Test Equipment

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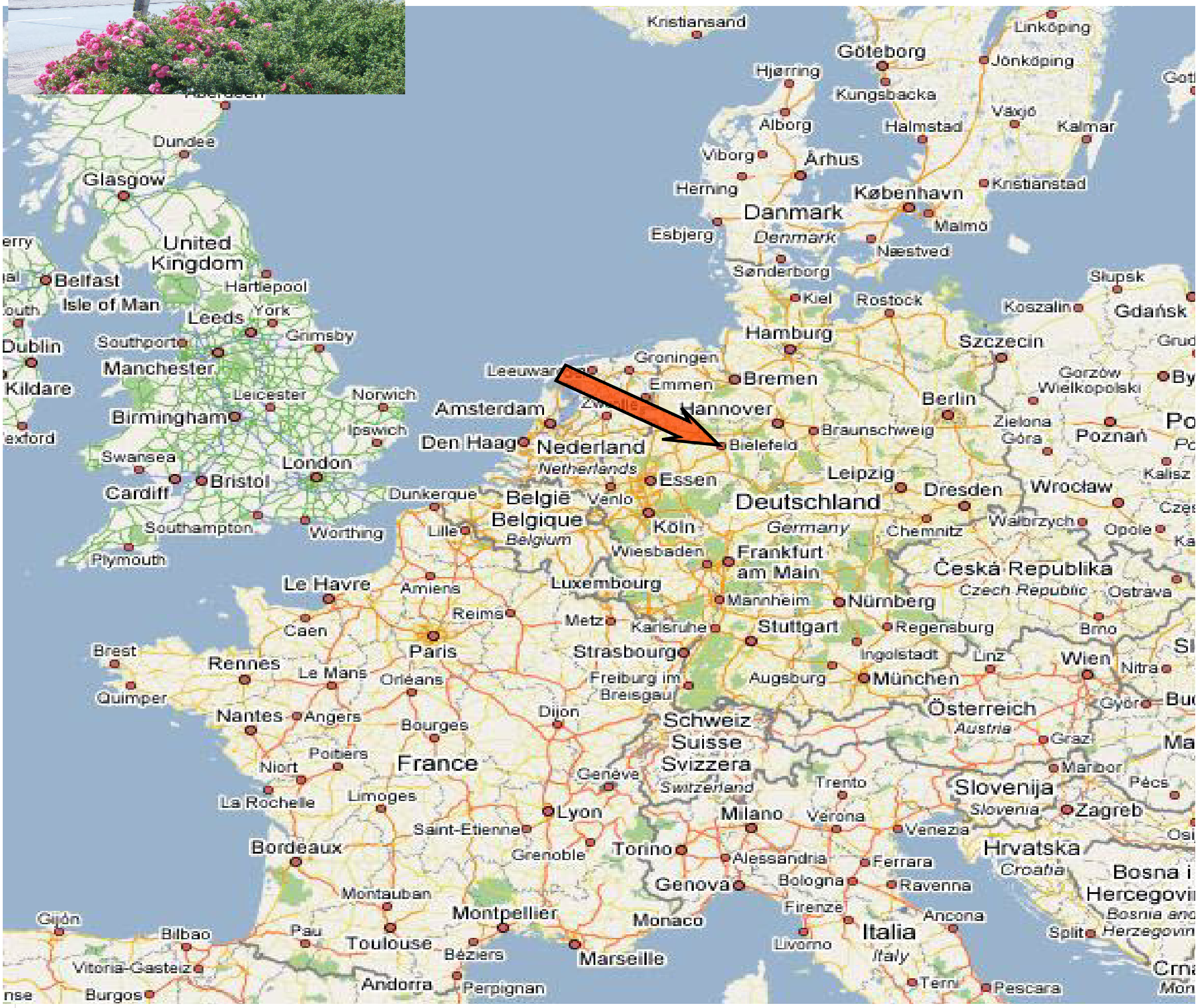
Where is VLM located ?



VLM moved to the city of Bielefeld in June 2007. Bielefeld has 326.000 inhabitants and is located in the north-west part of Germany between Hannover in the East and Dortmund in the West

We have pleasure if you are calling us:

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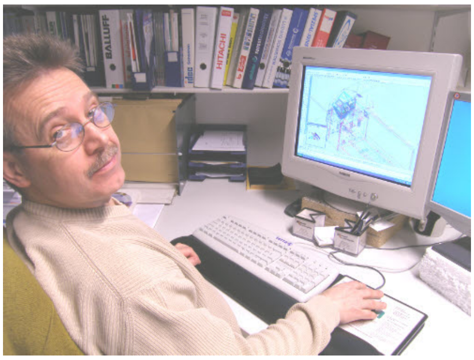
More about VLM



Josef Schubert, Managing Director,


Hans-Ulrich Vogler, Managing Director,


Alexander Schubert, Sales & Logistic

VLM is an independent company founded 1999, privately owned by Josef Schubert and Hans-Ulrich Vogler. Both experts uses their long experiences on developing corrosion testing equipment in order to achieve high performance considering most reproducibility of the testing climates. For that reason the user will benefit from the most reliability of the test results gained with VLM technology .

During the last decade a wide range of bench-top as well as chest designed cabinets has been introduced to the domestic and international markets.

VLM worked hard in order to develop a high sophisticated technology to cover the permanently growing requirements on corrosion testing stipulated in international and corporate standards.

The MultiCORR® and ClimaCORR® lines set new scales of performances and meets particularly the requirements of customers who frequently have to carry out a permanently increasing variety of cyclic corrosion test procedures.

Meanwhile VLM is represented in many countries. Corrosion testing equipment "Made in Germany" has become the most successful core business of VLM.

Additionally VLM offers a wide range of measuring gauges and devices for testing of surfaces, paints and materials as well as laboratory consumables and devices.

Besides corrosion testing equipment VLM makes metalblock thermostats and sample concentrators for laboratory application.

ClimaCORR® Cabinet CC 1000-TL

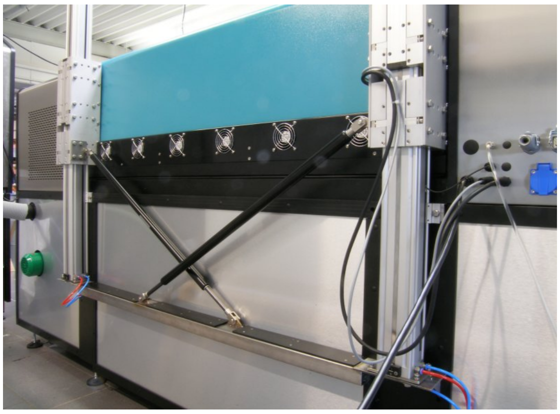
- Chamber capacity : 1000 L
- Temperature Range: - 40 °C to + 80°C
- Controlled Humidity: < 20 % to 98% r.h.

Working Systems:

- Salt spray test acc. to DIN EN ISO 9227, NSS, ESS,
- High Humidity acc. to DIN EN ISO 6270-2 CH, AT, AHT with controlled water condensation (CWC-System)
- Controlled aeration / Forced Air Drying up to + 80° C
- Controlled Humidity: < 20 % to 98%
- Controlled freezing by circulation of cold air down to - 40° C

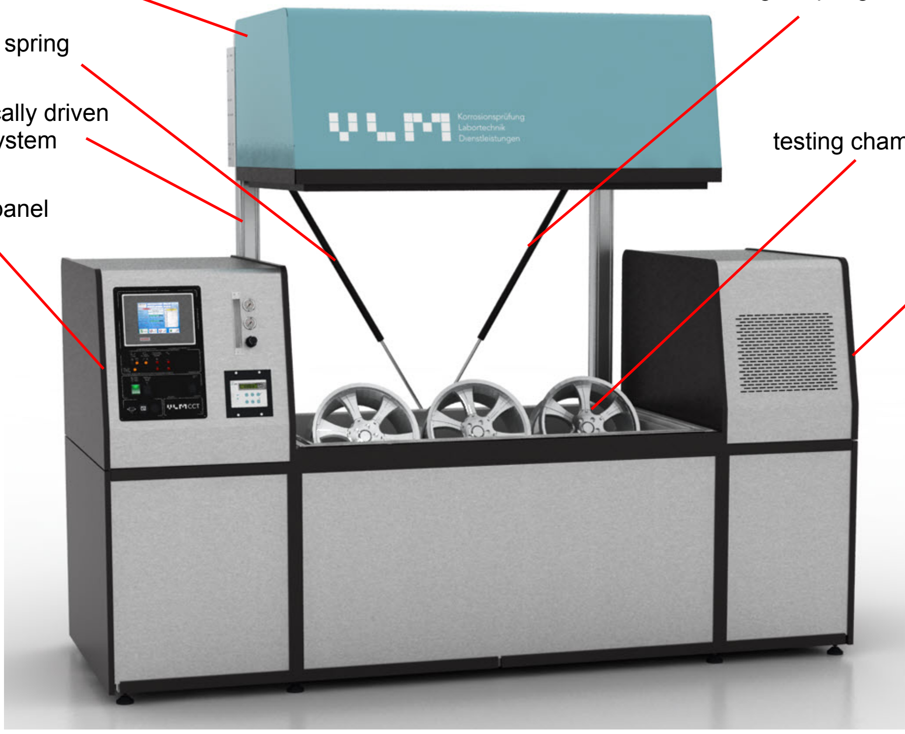
The high flexibility of the MultiCORR® Technology already allows to perform most of the international ISO and corporate standards. However, there are some special corporate standards which requires additional equipment. Moreover individual wishes can be fulfilled by the installation of further optional features:

- spraying of test solution without compressed air (wetting)
- Automatic supply of pollution gases such as sulphur dioxide
- Automatic cleaning of the specimens by spraying of deionised water and forced air drying at the end of a test so the test can be finished if the operater is absent.
- pH value monitoring of the test solution and automatic adjustment
- conductivity of the supplied deionised water, cut off if max. value has been reached. So the humidifyer and steam generator will be prevented from contamination by the fall-out of water hardness minerals.
- Automatic change of the exhaust warm air to circulating air when the set point value of the low humidity has been reached. This feature saves energy.
- additional climate units to supply standard air acc. to DIN 50014 23/50, cooled air required to run tests at 20°C,
- connection to central test solution supply

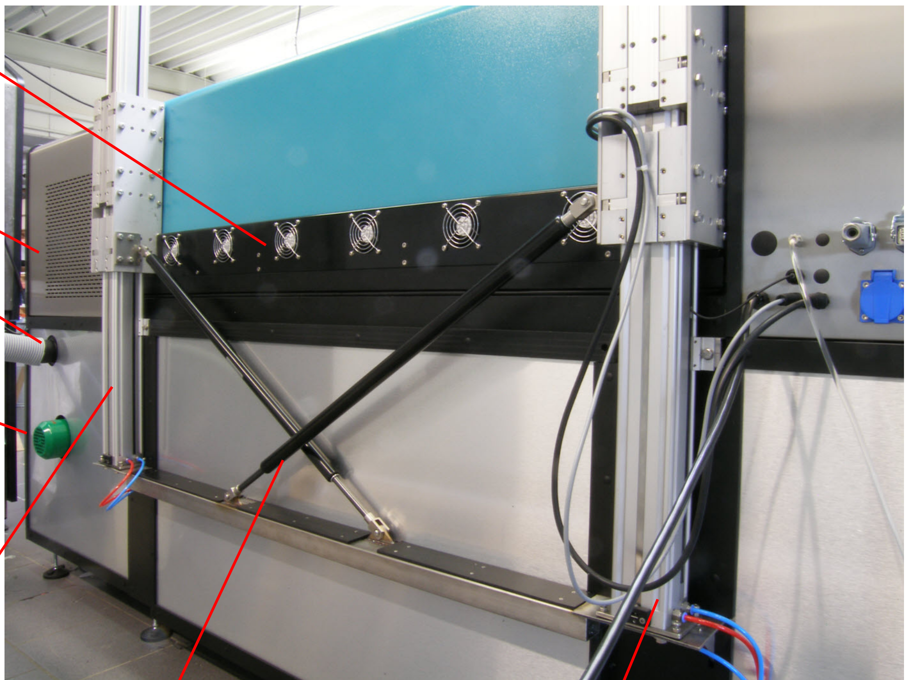


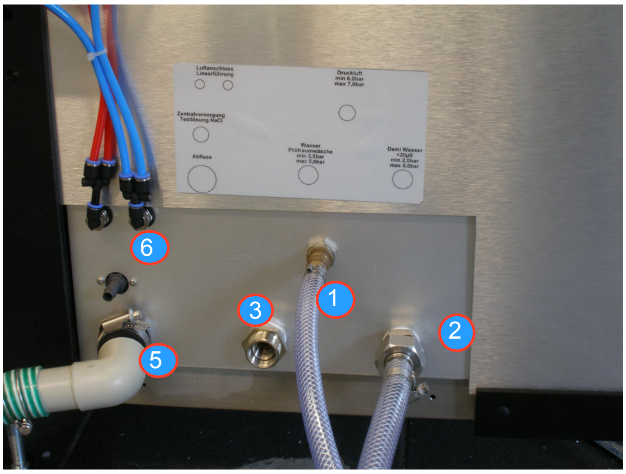
- Corrosion resistant robust stainless steel rim construction of operating and controlling compartment, testing chamber and foot-standing cabinet for ease of transportation
- Outer Dimensions W/D/H: ca. 35000 x 1200 x 1500 mm
- Case made from stainless steel, polyethylene

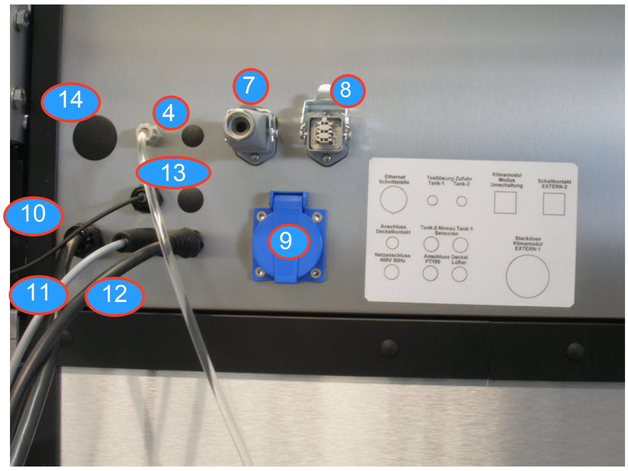
front view



back view







		purity, standard	pressure	connection
1	Compressed air	particle and oillfree acc. to DIN EN ISO 9227	6 - 7 bar	Nippel Size. 5
2	Demineralised water	0,1 - 20 µS/cm acc. to DIN EN ISO 9227	2 - 5 bar	3/4" outer thread
3	Demineralised water (chamber cleaning)	up to 500 µS/cm	3,5 - 5 bar	3/4" outer thread
4	Test solution supplied from external reservoir 1 or 2	acc. to DIN EN ISO 9227	pressure-less	squeeze connection
5	Drain water		pressure-less	PVC hose Ø 32 mm
6	Test solution supplied from external central storage tank	acc. to DIN EN ISO 9227		hose nozzle
7	Socket for power supply of the ext. climate module			Harting plug
8	External switchcontact			Harting plug
9	Socket for power supply of the ext. climate module	230V		standard socket
10	Power connection cable ClimaCORR Truhe	400 V		
11	Temperature sensor lead lid			
12	power supply for lid ventilators (CWC-System)	230 V		
13	Filling level sensor lead Tank 1 /Tank 2			
14	Ethernet-Interface			option connection at the back side
	Exhaust	corrosive !		PU-hose Ø 75 mm

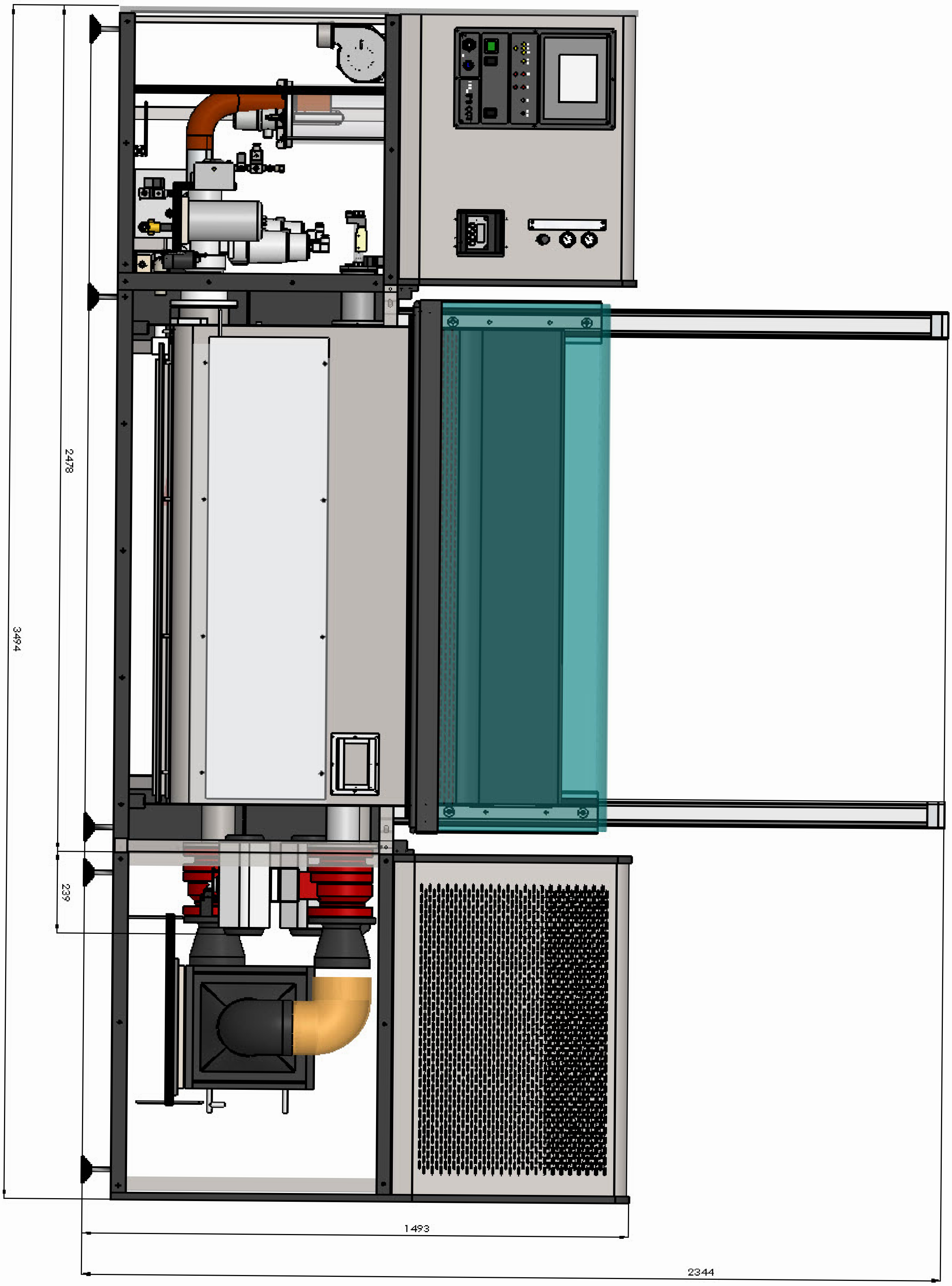
Unique: Temperature sensor positioned in the specimens zone allows highest accuracy and reproducibility of the climate conditions in the testing chambers

Testing Chamber:

- Volume approx. 1000 l
- Dimensions W/D/H ca. 1400 x   800x 790/1060 mm
- Load capacity approx. 400 kg
- Floor, rear wall and roof made from stainless steel coated with ECTFE high resistent to temperature changes and chemicals
- Side walls made from special heat resistant polyethylen with milled holes on 8 levels bearing the specimens supporting rods to obtain a maximum load capacity
- Stainless steel tubes plastic coated for specimen support with high load capacity

- Rapid heat transfer into and out of the chamber
- Double shelled roof for controlled cooling of the upper space of the chamber to achieve a good water condensation
- Corrosion protected interior lightning
- Wall rinsing system for rapid cooling down of the chamber
- Cable entry port closed by water filled siphon, for running devices inside the chamber during the test actuated by the PLC
- 1 rotating nozzle for convenient chamber cleaning

Technical characteristics are subject to amendments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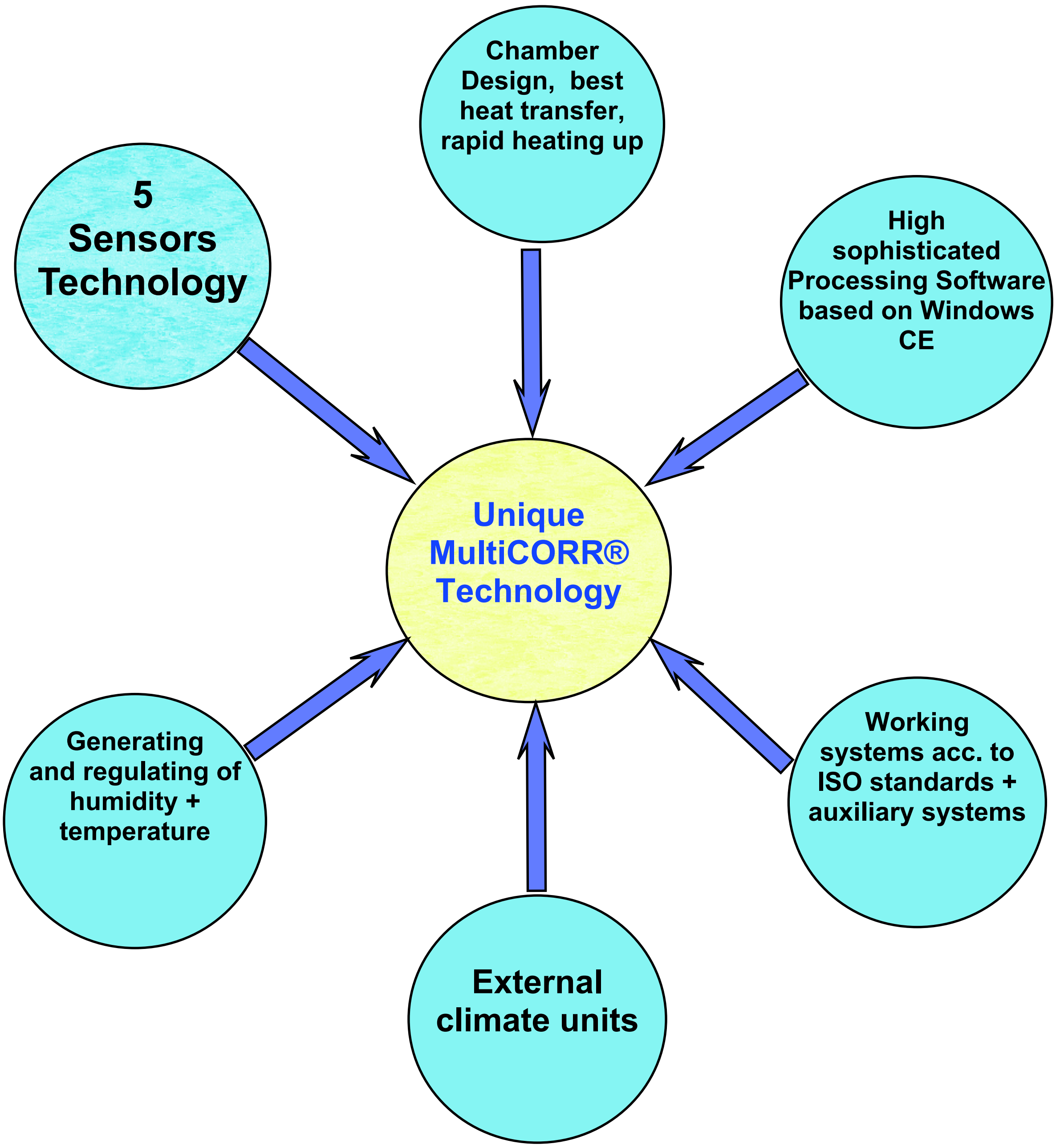
Order No. V.85.372.576	
Housing	Stainless steel rim, modular construction, pneumatically driven lid lift
Outer Dimensions (w x d x h)	ca. 3500 x 1136 x 1500 mm
Weight	ca. 850 kg
Testing Chamber	Stainless steel coated with ECTFE, lid vertically elevated
Internal dimensions (w x d x h)	ca. 1400 x 800 x 790/1060 mm
Max load testing chamber	400 kg
Cable entry port	front 100 x 75 mm
Surface heaters	under the floor and behind the side walls overtemperature protection
Temperature range	-40°C up to 80°C
Temperature sensors	1 above the floor, 1 close to the side wall, 1 under the roof, 1 shiftable in the vicinity of the specimens
Humidity sensor	pneumatically driven into the chamber, can be interchanged by precalibrated new sensor
Advanced PLC	LDC Display, coloured, resolution 0,1 °C, password protected access on 3 graduated authorization levels, menu-guided operating, test segment, basic tests and corporate tests are factory programmed, Interface Ethernet for remote control and data monitoring
Operating voltage	AC 400 V / 50/60 Hz/ 16 A
Max. connected load	ca. 7,5 KW
Pressure of demineralized water supply	2,5 -3,0 bar / chamber cleaning 5 -6 bar
Pressure of compressed air supply	6-8 bar
Exhaust connecting sleeve	Ø 75 mm
Drain connecting sleeve	Ø 32 mm

Technical characteristics are subject to amendments

Unique MultiCORR® Technology

sets new scales on corrosion testing equipment. You will certainly ask "What´s new? What´s different to standard cyclic corrosion cabinets?"

This presentation will make you familiar with this unique technology. We hope that you will be convinced of the outstanding performance of the MultiCORR® front-loading or chest designed cabinets.



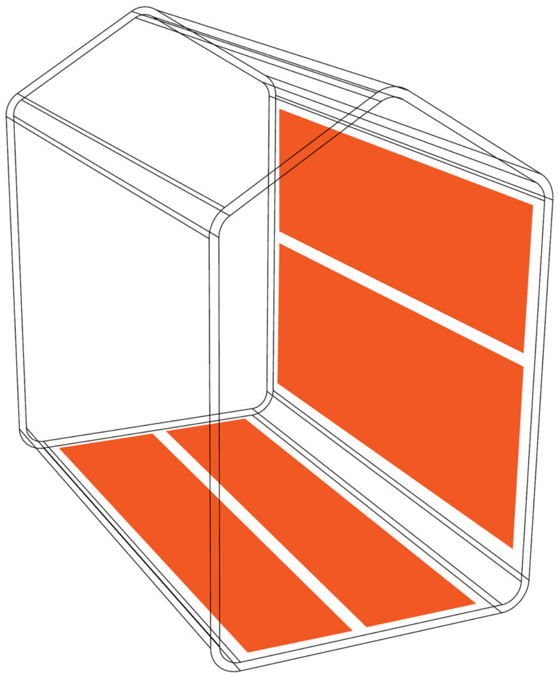
Interconnecting of optimized components

In contrast to standard equipment the performance of MultiCORR® cabinets is based not only on the high sophisticated software but also on the clever interconnection of all components having substantionally affects on the test procedures.

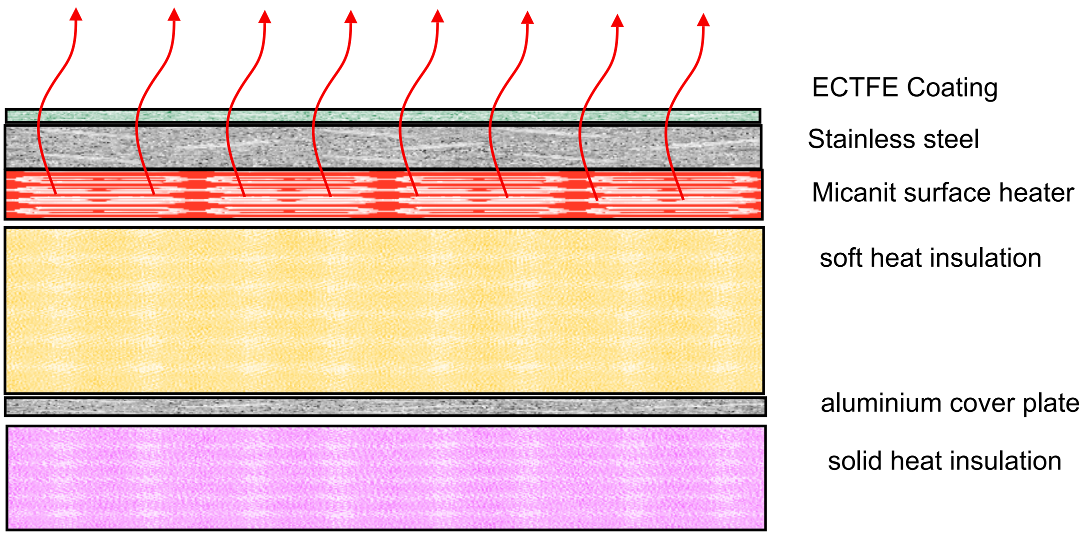
Innovative chamber design Rapid heating up adapted to the actual demand

One of the most important condition of the high performance of the MultiCORR® Technology is the even and rapid heat transfer into the testing chamber. For that reason the MultiCORR® cabinets are equipped with Micanit surface heaters mounted under the bottom and behind the rear wall.

The heaters of MultiCORR® cabinets are actuated automatically depending on the demand. If for instance the testing chamber has to be heated up most rapidly to reach the set-point value in shortest time all heaters are working at full power. During the high humidity test all heaters may be on but the wall heaters will be cut off as soon as the set-point value has been reached in order to allow the desired water condensation.



- bottom, rear wall, roof made of stainless steel coated with ECTFE (Fluorine polymer) for best heat transfer into the chamber
- side walls made of special polyethylene
- Micanit surface heaters under the base and behind the rear wall for uniform heat transfer and rapid heating up of the chamber



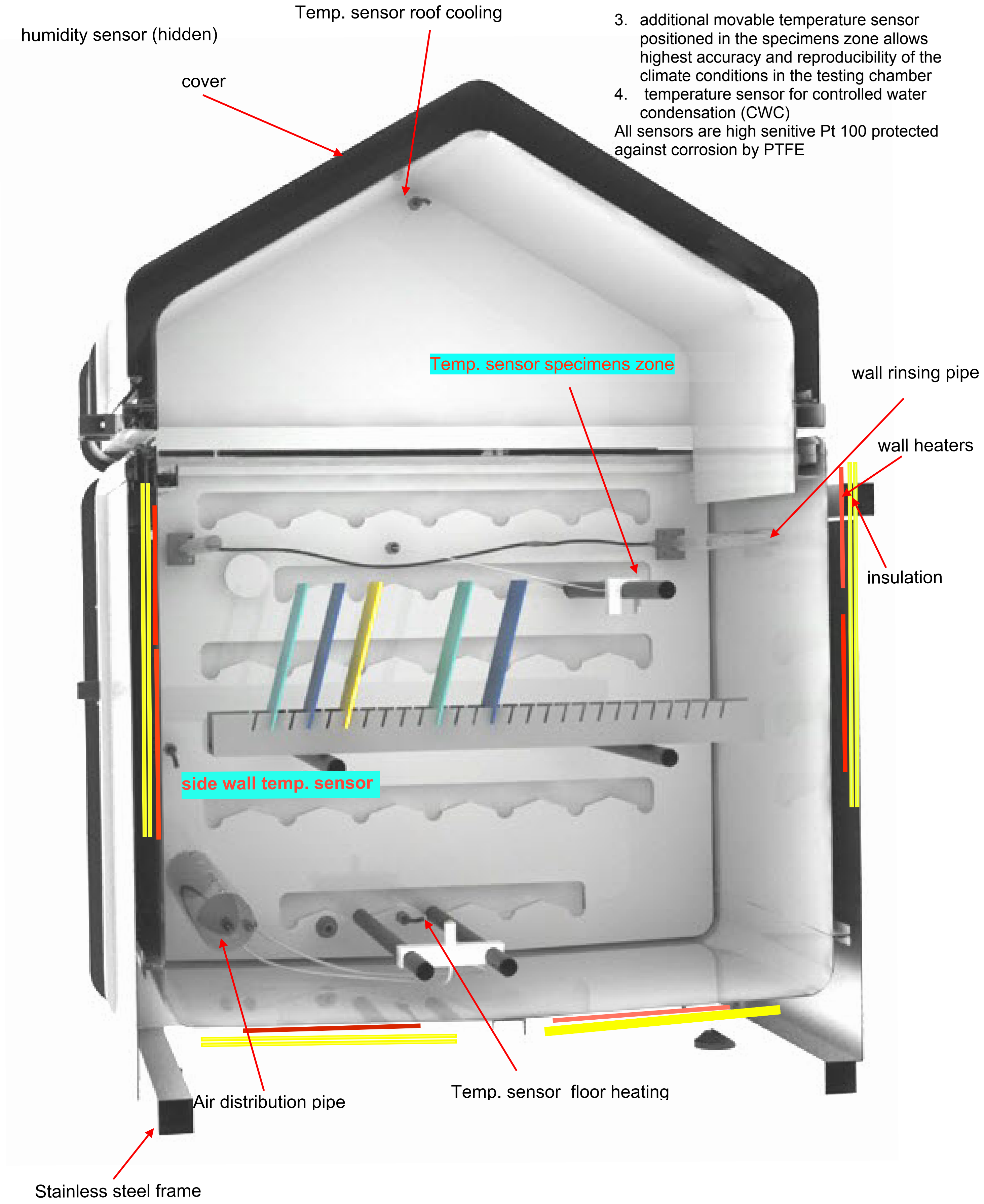
In contrast to standard chambers made from glassfibre reinforced MultiCORR® cabinets offer a particularly most rapid heat transfer from the heaters into the cabinet due to the far better heat conductivity of the coated stainless steel compared to plastic. Moreover this unique heating system guarantees an even distribution of the heat in the chamber in contrast to chambers heated by immersion heaters.

The ClimaCORR® cabinet based on the MultiCORR® technology. The characteristic design is shown below.

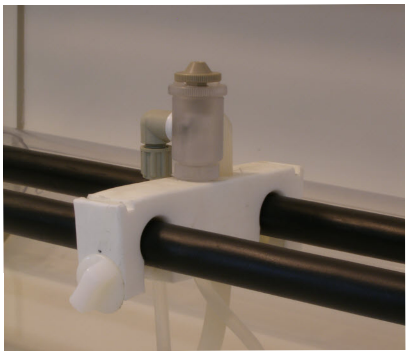
Unique: 5 Sensor technology

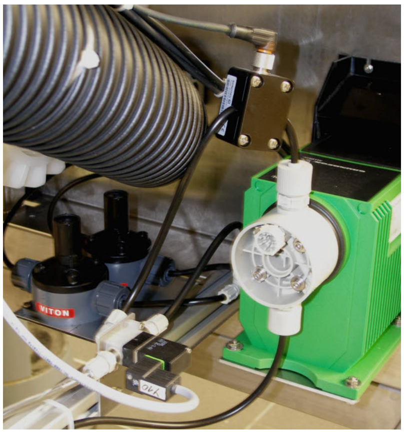
1. temperature sensor for floor heating
2. temperature sensor for side wall heating
3. additional movable temperature sensor positioned in the specimens zone allows highest accuracy and reproducibility of the climate conditions in the testing chamber
4. temperature sensor for controlled water condensation (CWC)

All sensors are high senitive Pt 100 protected against corrosion by PTFE



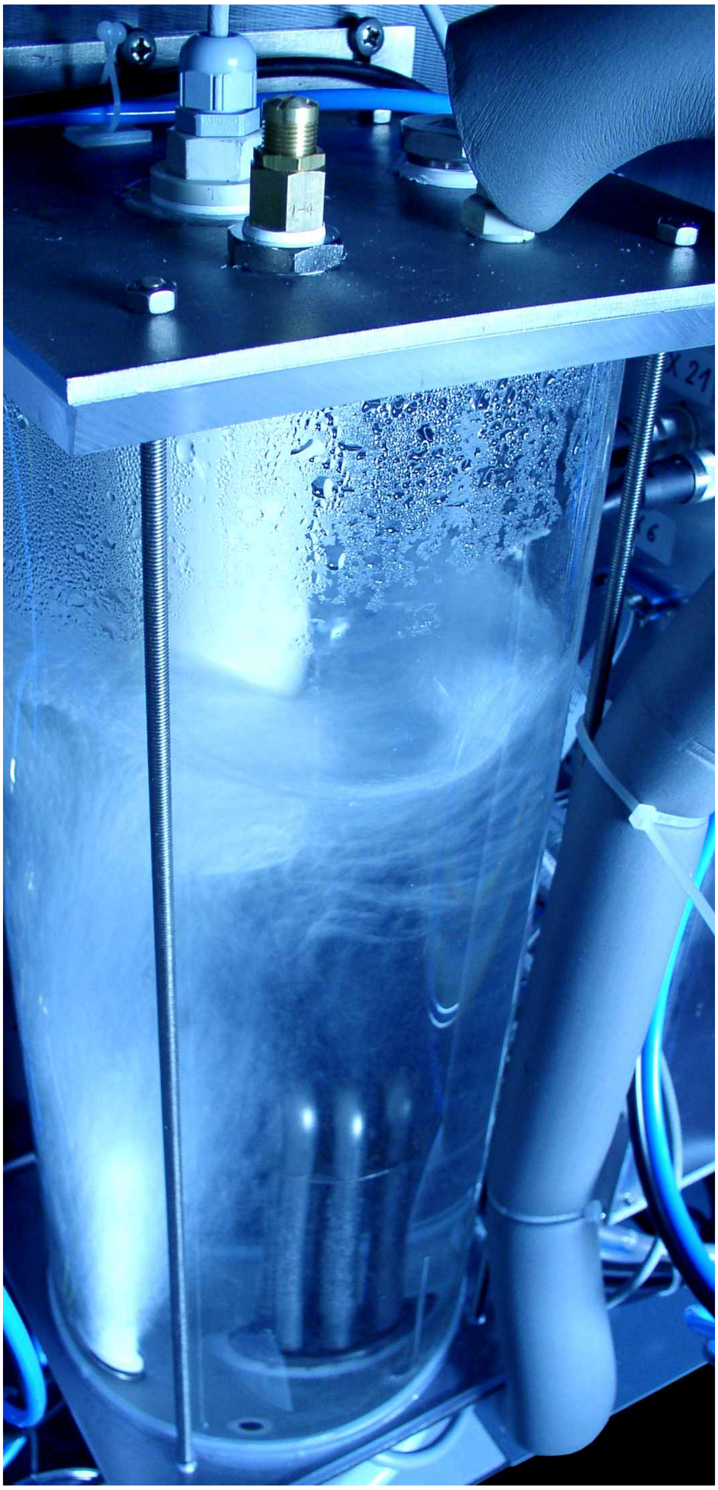
Working system "Salt Spray"





- Shiftable and adjustable spray nozzle, producing fine salt fog well distributed in the chamber
- Electronically controlled diaphragm pump for precise supply of the test solution monitored by an electronic bubble detector
- Monitoring of the flow rate
- 1 adjustable spraying nozzle for generating of a finest spray mist, made from polycarbonate absolutely resistant to corrosion
- Bypass of the humidifier to atomize test solution with dry compressed air at ambient temperature acc. to the Prohesion test
- Accessory testsolution reservoirs of a 210 l volume optional with sensors to indicate filling level on the PLC Screen,
  Option: automatic refill of the 210 l reservoirs from a central storage reservoir alternatively installation of a 10 L built-in tank with automatic refill.
- Easy to change test solution filters connected at the end of the testsolution supply hose
- Wide opening tank cover for convenient measuring of the pH-value and adjusting by adding diluted hydrochloric acid or sodium hydroxide solution
- Option: Direct spraying of test solution on specimens
- High efficient air purge at available air pressure manually and automatically initiated
- Convenient cleaning of the complete system thus the cabinet can be used for NSS and CASS tests.

Working system "Salt Spray"



- High efficient humidifier made from borosilicate glass for convenient inspection after removing of the heat insulation
- Max. Temperature 75°C, overtemperature protection, resetable
- Safety valve to avoid any excess of the max. pressure
- Automatic refill with pure water
- Automatic test stop in case of overfilling and falling below minimum level after a programmed time
- Automatic cut off of the pure water supply in case of normal level has not been reached in a programmed time in order to avoid permanently running of pure water in case of an leakage
- Air filter for forming smallest bubbles to guarantee most saturation of the compressed air, convenient to interchange
- Filtereffect is permanently readable from 2 manometers measuring the pressure of the compressed air before the humidifier and before the spray nozzles.
- The humidifier is also used for supplying of hot water for generating of humidity and also to fill the bottom of the chamber to avoid a temperatur break down during the transition to the water condensation test particularly at higher temperatures

Working system "High humidity"

Fans in the back of the cover for cooling the roof thus the climate conditions inside the chamber allow a constant water condensation rate.

Unique: High sensitive temperature regulating system due to

- best heat conductivity of the stainless steel bottom and walls
- Large surface heaters under the floor, outside the side walls and behind the rear wall for quick and uniform heattransfer
- High sensitive Pt 100 temperature sensors protected by PTFE hoses, one above the floor, one at the side wall, one under the roof (CWC-System) and one in the specimens zone.
- Advanced temperature controllers (PID)
- High accuracy of the temperature controlling < ± 0,5 °C
- Quick and even heating up of the water bath
- Automatic refill of the water bath with pure water maintaning the water level
- Unique: CWC System (patented to VLM) for regulated water condensation to obtain a high reproducibiltiy of the climate conditions. Once the preset temperature of 39 °C measured under the inner roof has been exceeded ambient the fans in the outer shell of the roof start and suck ambient air through the space between the outer and inner roof and duct the heat coming from the chamber to the room.
  Due to this cooling effect there is a constant temperature in the upper part of the chamber and consequently an even water condensation all the time during the high humidity test.

Working system "Aeration / Forced Air Drying"

Air distribution pipes made from heat resistant PVDF for evenly drying of the specimens

- Speed controlled fans for aeration of the testing chamber with filtered ambient air
- Automatically compensation of reduced power due to contaminated filters
- Air distribution pipe (PVDF)resistant to high temperatures for forced air drying up to 80°C
- Heaters for rapid heating up of ambient air for forced air drying, only working if the fans are running at minimum speed, overtemperature protection
- Ball stop cocks made from PVDF to guarantee hermetically closing of the venting system against the testing chamber to avoid any contamination resp. damages by salt spray
- Climate module supplying conditioned ambient air acc. To DIN 50014 23/50 for VW PV 1210
- Combined process cooling and climate module to supply air acc. To DIN 50014 23/50 or cooled dried air for Renault ECC1 or VW PV 1210

Climate module for supplying of standard ambient air according to DIN 50014 and cooled dry air for Renault test ECC1

Working system "Controlled humidity"

Unique: High sensitive humidity regulating system due to

- Self adjusting humidity supplying system according to the requirement
- High sensitive fast reacting humidity sensor, pneumatically driven into the testing chamber only during controlled humidity and aeration/forced air drying mode.
- High constancy of humidity ± 1-3 % rh
- Atomizing of hot water supplying by the humidifier complemented by steam from the steam generator depending on the actual need
- High sensitive temperature regulating system due to the quick and uniform heat transfer into the chamber in small portions
- Advanced temperature controllers (PID)
- High accuracy of the temperature controlling < ± 0,5 °C

Technical characteristics are subject to amendments

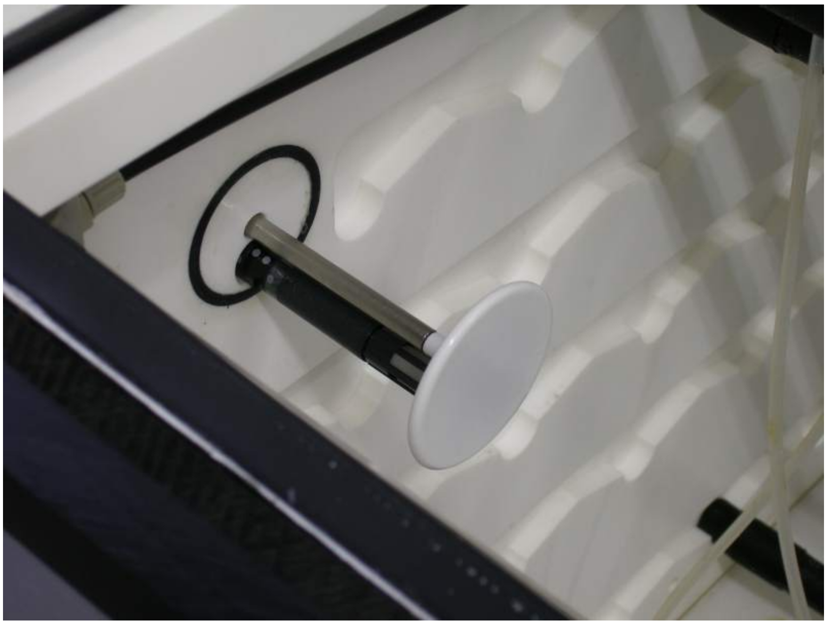
Unique humidity generating system

The aggressive atmosphere of corrosion testing chambers makes the difference of the regulating of the humidity to climate chambers. In contrast to standard chambers the humidity in MultiCORR® cabinets is formed and controlled in a way that guarantees very narrow tolerances over the full range (1-3 % r.H.)

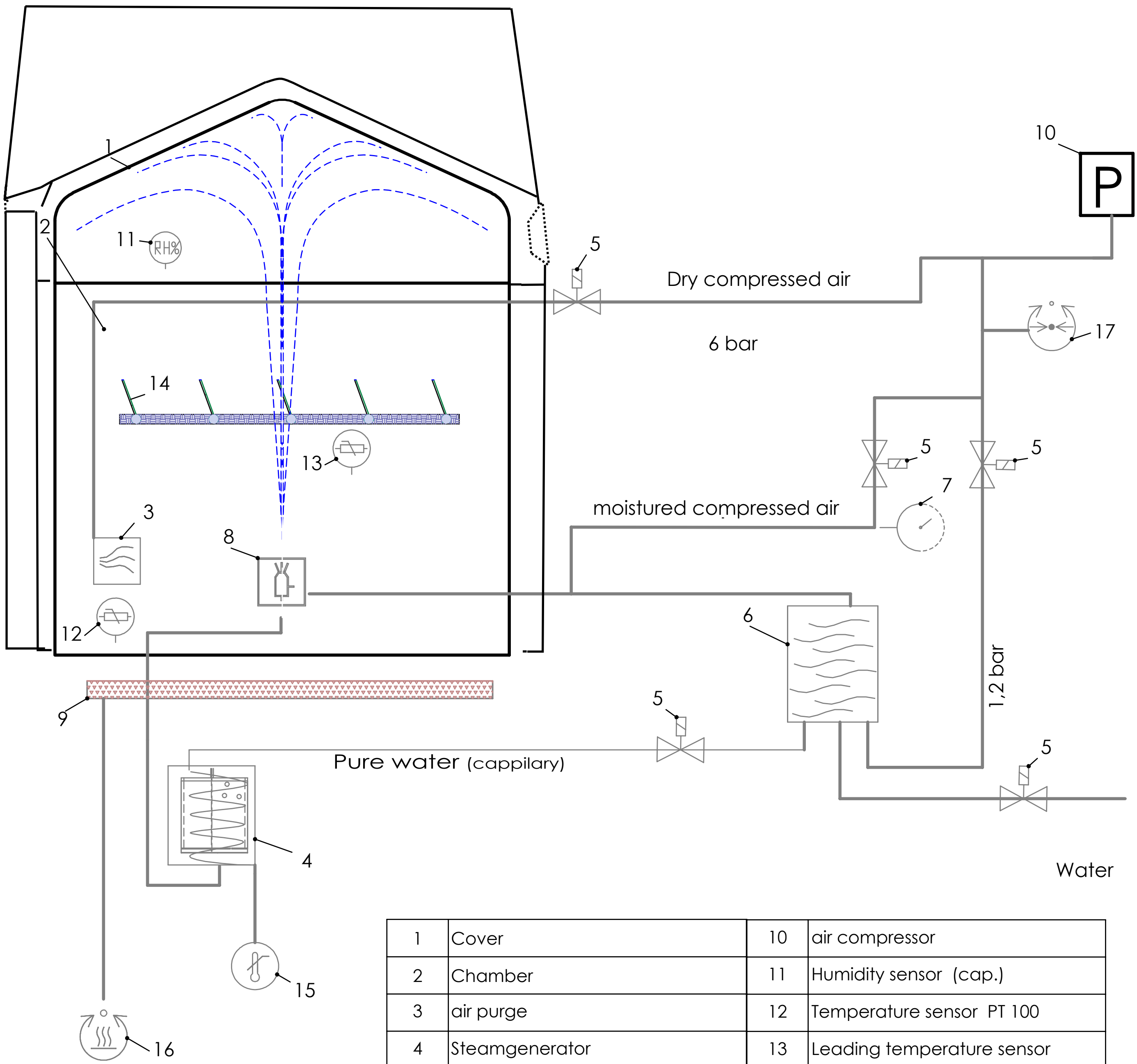
Hot water supplied by the humidifyer is sprayed by compressed air respectively by the salt spray nozzle thus there is an excellent uniform distribution. Changing between "wet" and "dry" spraying in connection with the fast reacting humidity sensor allows controlling the humidity in very narrow tolerances.

If there is a high humidity at high temperature the steam generator will be additionally initiated. Hot water from the humidifyer is lead into the steam generator in short intervals by means of an intermittend working magnetic valve. The instantly steam is shot through a hose in the vicinity of the spray nozzle and immediately distributed in the chamber. The valve is opened accordingly to the demand of humidity - an essential condition to control the humidity over the full range .

Fast reacting capacitve humdity sensor, precalibrated



As the humidity sensor is not protected for instance by PTFE caps to achieve very short response on humidity changes. Due to the distribution by the spray nozzle there is a response of 2 seconds. The sensor will only be pushed pneumatically into the chamber if the humidity has to be controlled between 98% and < 20% or if a low humidity set point has to be reached by forced air drying.



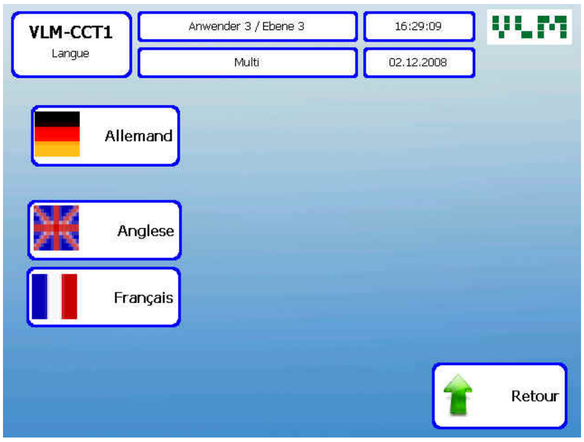
1	Cover	10	air compressor
2	Chamber	11	Humidity sensor (cap.)
3	air purge	12	Temperature sensor PT 100
4	Steamgenerator	13	Leading temperature sensor
5	Valve	14	specimens support
6	Water / humidfyer	15	Thermostat
7	Manometer	16	Heating controller
8	Spray nozzle	17	Pressure regulator
9	Floor heater		

This diagram shows the working system "Controlled humidity" The excellent distribution of the humidity in the chamber is achieved by spraying of pure water coming from the humidifyer via the spray nozzle. Depending on the demand steam is shot by the steam generator in the vicinity of the spray nozzle thus a instant distribution is guaranteed.

Such a change of the actual humidity value is measured by the humidity sensor and indicated on the screen of the PLC after only 2 seconds. The outstandig accuracy of the humidity controlling is furthermore achieved by the high accuracy of the temperature control respectively the unique heat transfer into the chamber.

Advanced process controlling system

Menu-guided PLC



- Based on Windows EC
- Unique software program for automatically running of test procedures allowing a high precision of the repeatablity of the individual test cycles
- LC display, touch screen , resolution of set and actual values 0,1 °C
- Remote control and data monitoring, Ethernet interface
- Temperature constancy <± 0,5 °C
- Humidity constancy ± 1-3 %
- Total working hour counter,
- Total test hour counter, indicated on the screen "Test" indicating as well elapsed time of the running segment and of the complete test
- Convenient and easily operating due to menu-guidance
- Protected access on three various authorized user levels
- Factory programmed basic tests, cyclic corrosion tests as well as test segments for freely programming
- Loop and ramp function for reproducible transition times
- Start delay function for time shifted start of tests
- Diagnosis function for observation of analog values or the state of components (on/off)
- Manually actuating of components to check the function
- Alarm table
- Screen indicating the temperature and humidity diagram
- Programmable actuating of external devices such as a climat module or of devices inside the testing chamber to be tested during running under power

ClimaCORR® - Special features - User´s benefits

The MultiCORR® software has been developed to offer the most flexibility and accuracy to meet most of the international and corporate standards. The test procedures can be programmed by selecting and compiling of factory stored test segments. The test parameters in the segments can be adapted to the stipulated values of the test procedure.

However, to achieve the maximum performance a lot of features have been included in the software.

- automatic chamber cooling by rinsing water of the walls, for instance if the maximum temperature of the salt spray test of 37°C has been exceeded by samples tested in running mode under power automatically the wall rinsing system is actuated thus the temperature of the chamber is cooled down to reach the set point value.

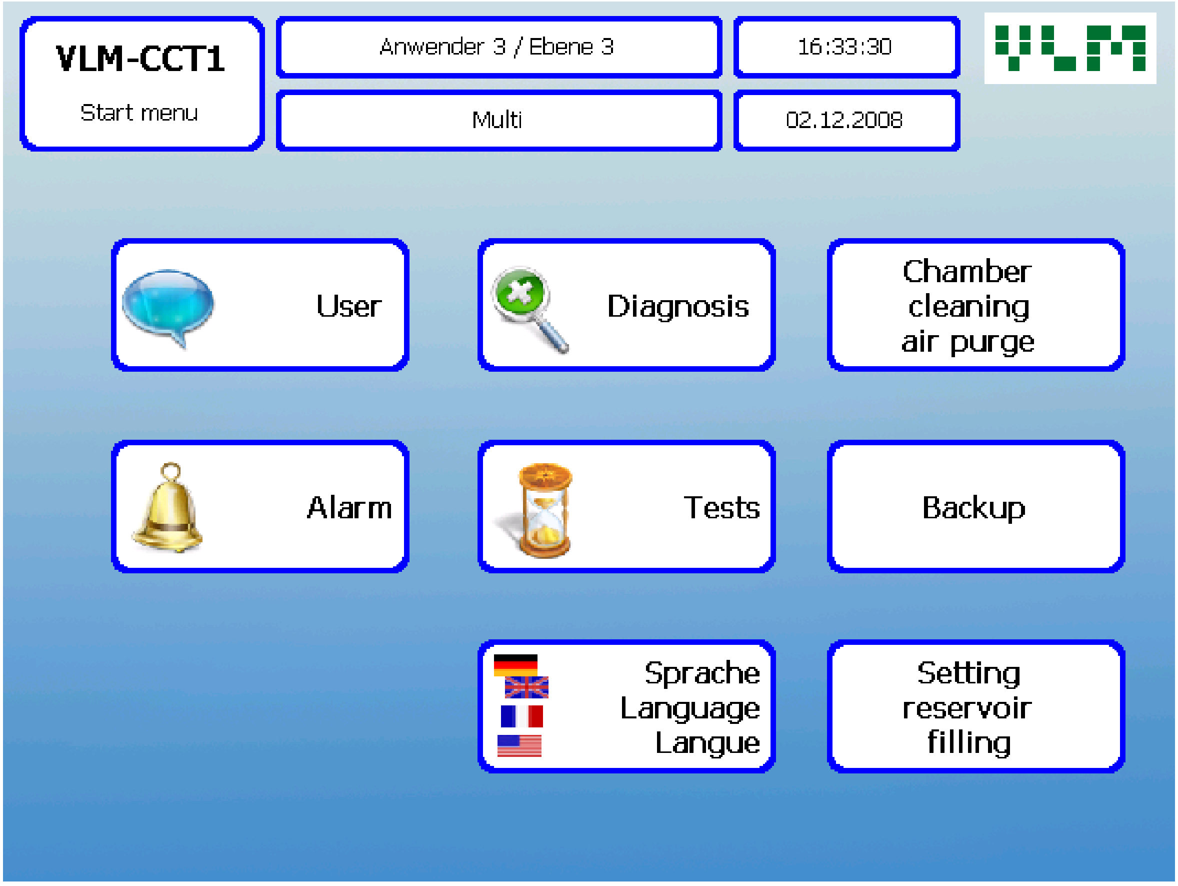
- as the humidifyer is also used as the reservoir of hot water to form humidity thus the water temperature has to be increased up to 75°C. If a salt spray test phase would follow the humidifyer temperature has to be adjusted to the set point value of 50°C. For that reason a certain volume of hot water is lead into the chamber. Cold water will be refilled thus the new set point value is reached in shortest time.

- The demand of humidity varies in a very wide range within the temperature range of 25°C to 80°C and 20% to 98% relative humidity. Primarily the humidity is formed by spraying of demineralised water from the humidifyer with compressed air. At a higher demand of humidity the steam generater will be actuated supplied with water from the humidifyer. The water supply is controlled by opening the valve for a varible time depending on the actual demand of humidity.

- Also depending on the demand the heaters are actuated and cut off to achieve shortest heating up periods or following ramps most accurately.

- The air heater for forced air drying mode absolutely needs a minimum air flow. The software program gives priority to the fan to reach the minimum air flow rate before actuating the air heater. The maximum temperature of the air heater is limited to 20°C above the set point value of the chamber temperature.

The Main Screen

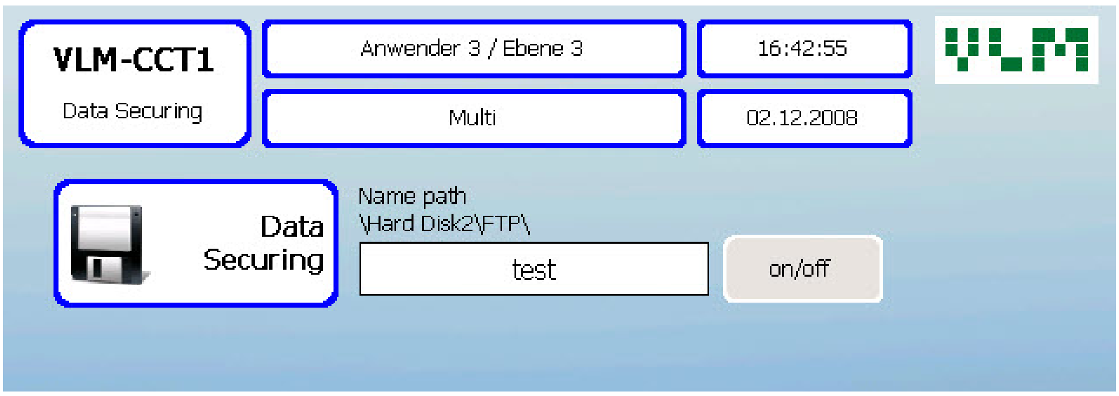


Although the MultiCORR® software is a rather complex system with many automatically initiated features the operating is most convenient. Due to the logical structure of the menu users gets familiar with the conduction of tests and the administration in short time.

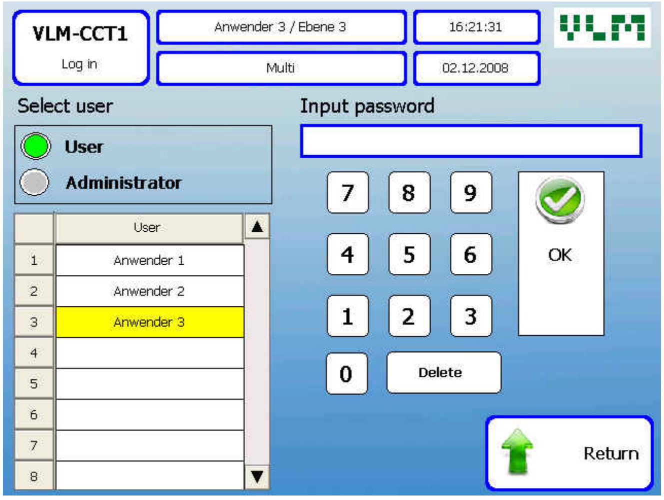
There is always a short way to the main menu so you never will get lost whereever you may are operating.

You will learn more about the characteristic features of the PLC on the following pages.

As the program is based on Windows CE no further software is necessary to transfer the process data to your PC as txt.files so you can evaluate the test procedure by Excel. If you switch the data monitoring on you can set the collection rate. We recommend to store data per minute to ease the handling of the data file. The system creates new files every day which are accesable by FTP address via Ethernet interface.
If you connect the PLC to your intranet you can use the remote control.



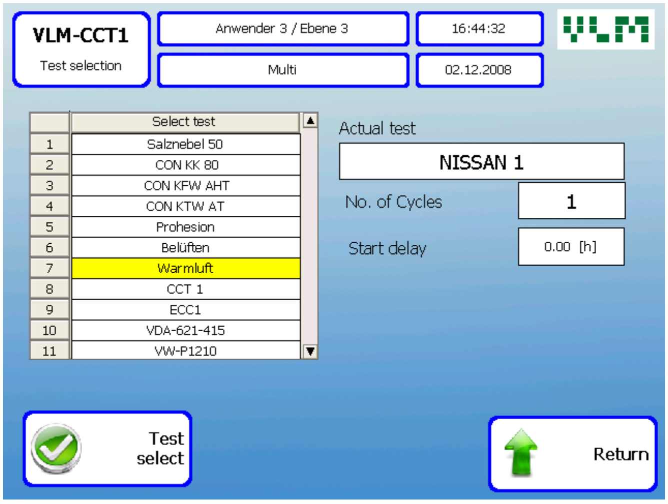
Password protected access on three authorisation levels



There are three different access authorisation levels:

- basic level, only for viewing
- user level, selecting and starting of tests
- administrator level, authorised to select and compile test segments for a new test procedure

Factory storage of basic and cyclic corrosion tests

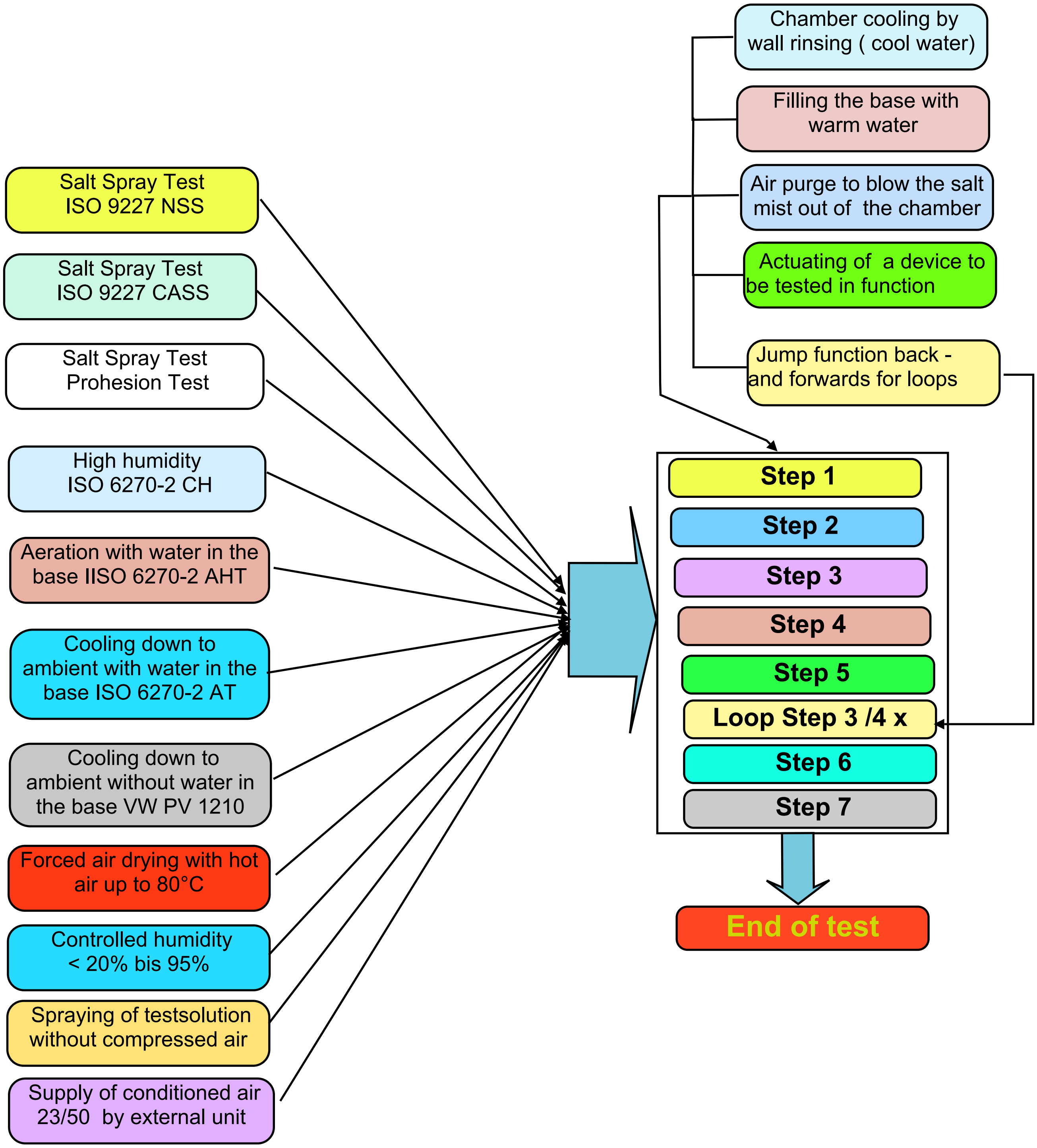


Standard tests as well as most common cycling corrosion tests are already factory stored. These can be complemented by individually compiled tests up to total 50 tests.
Users on level 2 can select the test to be carried out and set the number of cycles.

Test names can be edited only by the administrator.

There is a delay function which allows to start a test for instance at the weekend. This feature saves time in case an equilibration phase has to be performed before the actual test procedure.

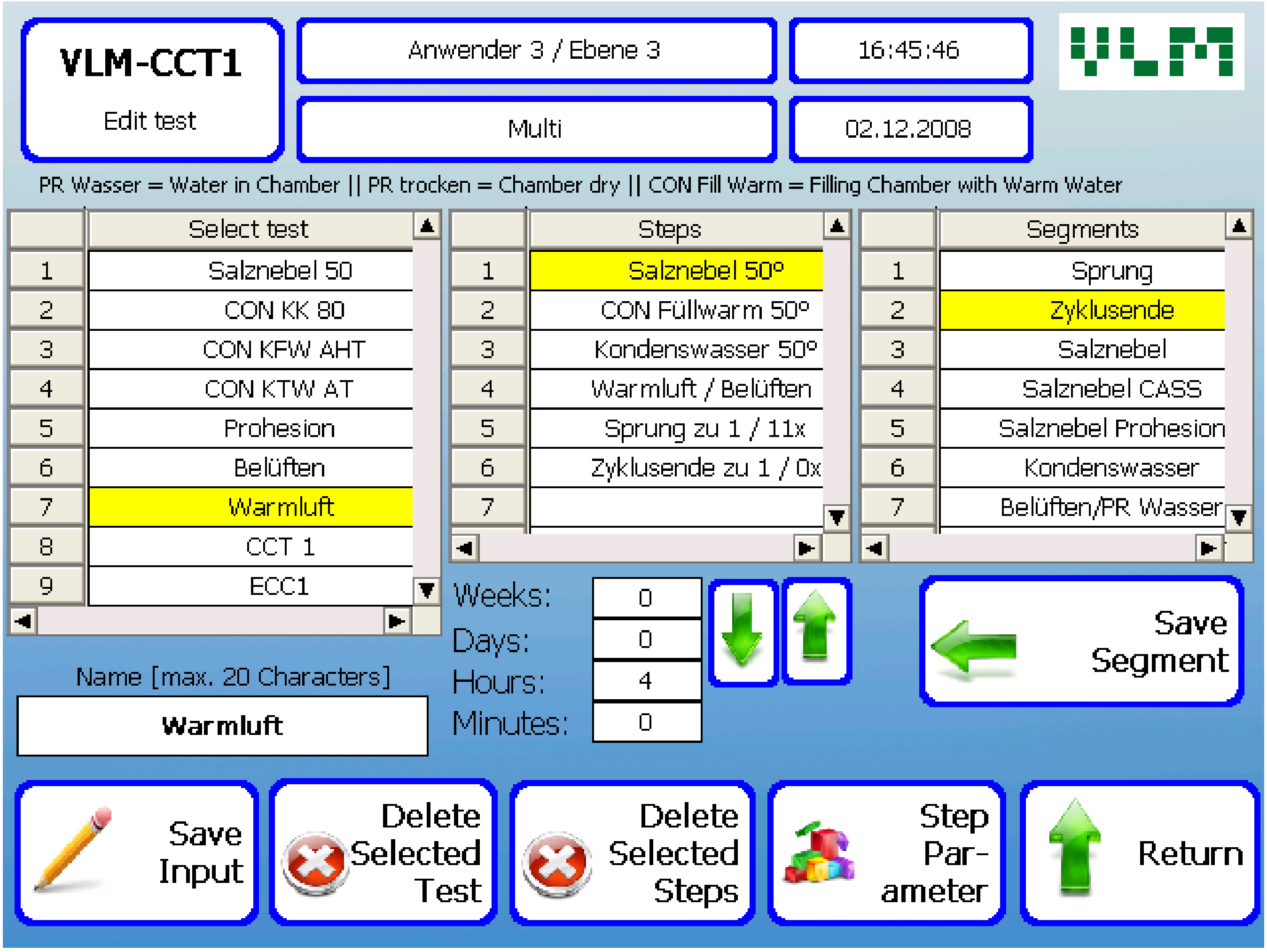
The Principle of compiling of test segments to tests cycles



17 test segments are factory stored but to guarantee the proper function of the cabinet no amendment by the administrator is allowed resp. reserved to VLM.

The cycling corrosion test can be individually compiled by selection of the segment in the right hand table. After pressing the saving key it appears in the centered table as a step of the test procedure. The position can be changed by the green up and down keys.

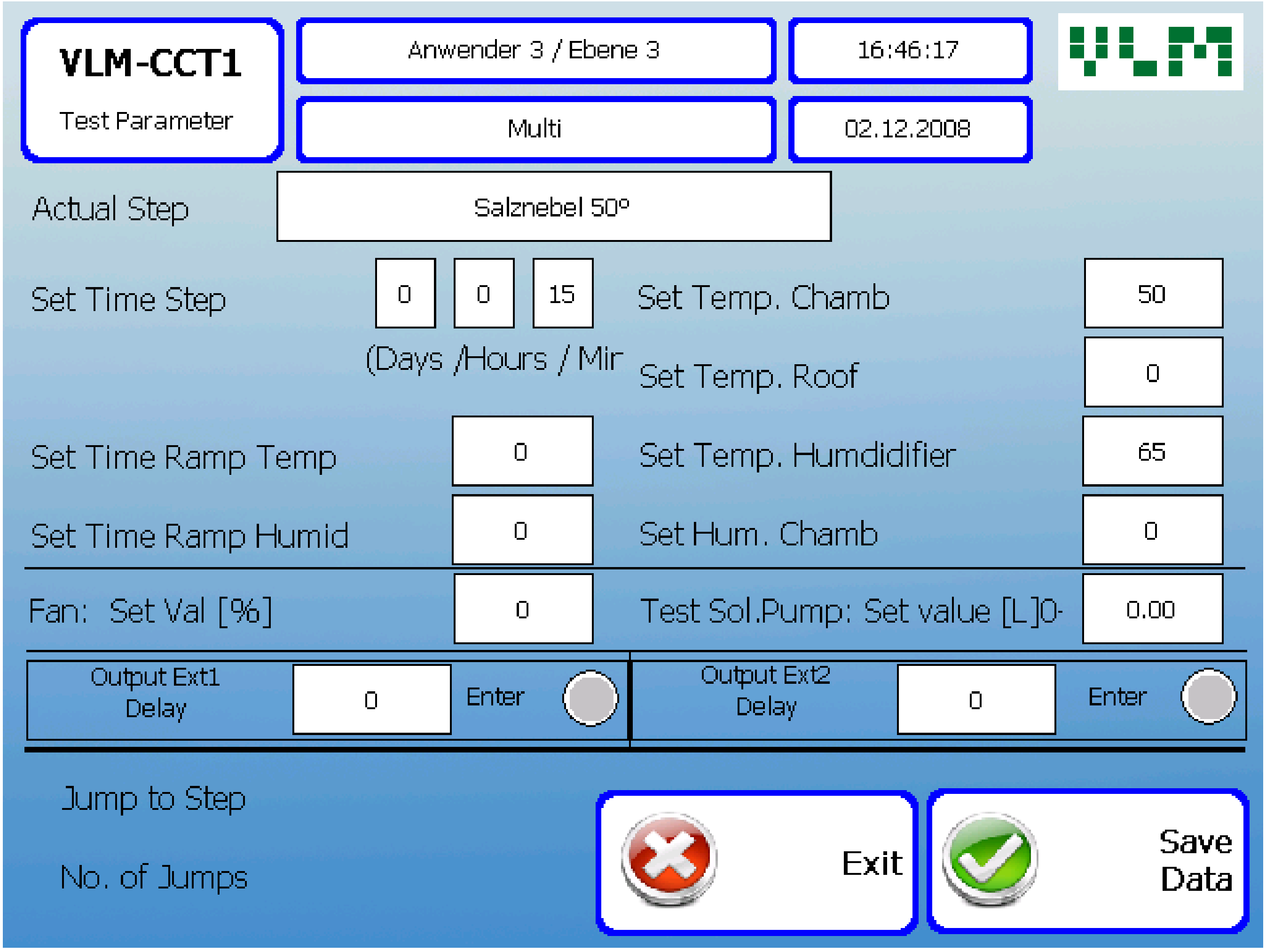
The total test time will be indicated thus the administrator can check if the periods of the steps in total are correct.



Common tests are factory stored so test can be selected from the list on the left table. If a new test has to be programmed a free place has to be ticked on so this field will be highlighted. The name of the test can be keyed in and saved.

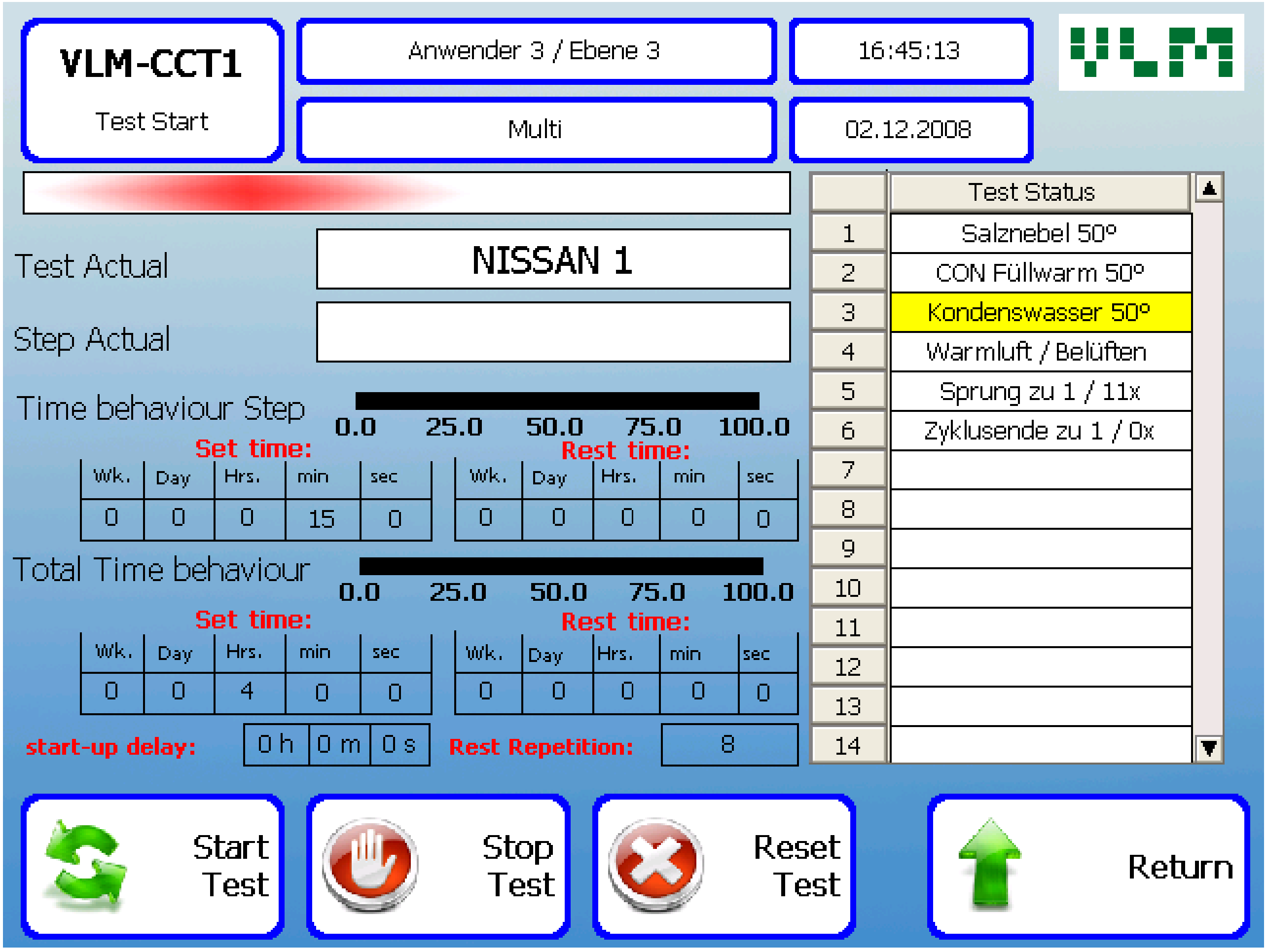
The single steps can be set by copying the suitable segment listed in the right table. The parameter, duration etc. can be set after pressing the "Step Parameter" key thus the screen (next page) occurs. There is a loop function to repeat parts of the test several times. If you have forgotten a segment you can create a gap by the green up and down arrows.

The individual set duration of the segments will be added to the total test time indicates on the left hand side of the green arrow keys. So you can check easily if the compiled segments comply with your standard.



This screen offers the possibilities of

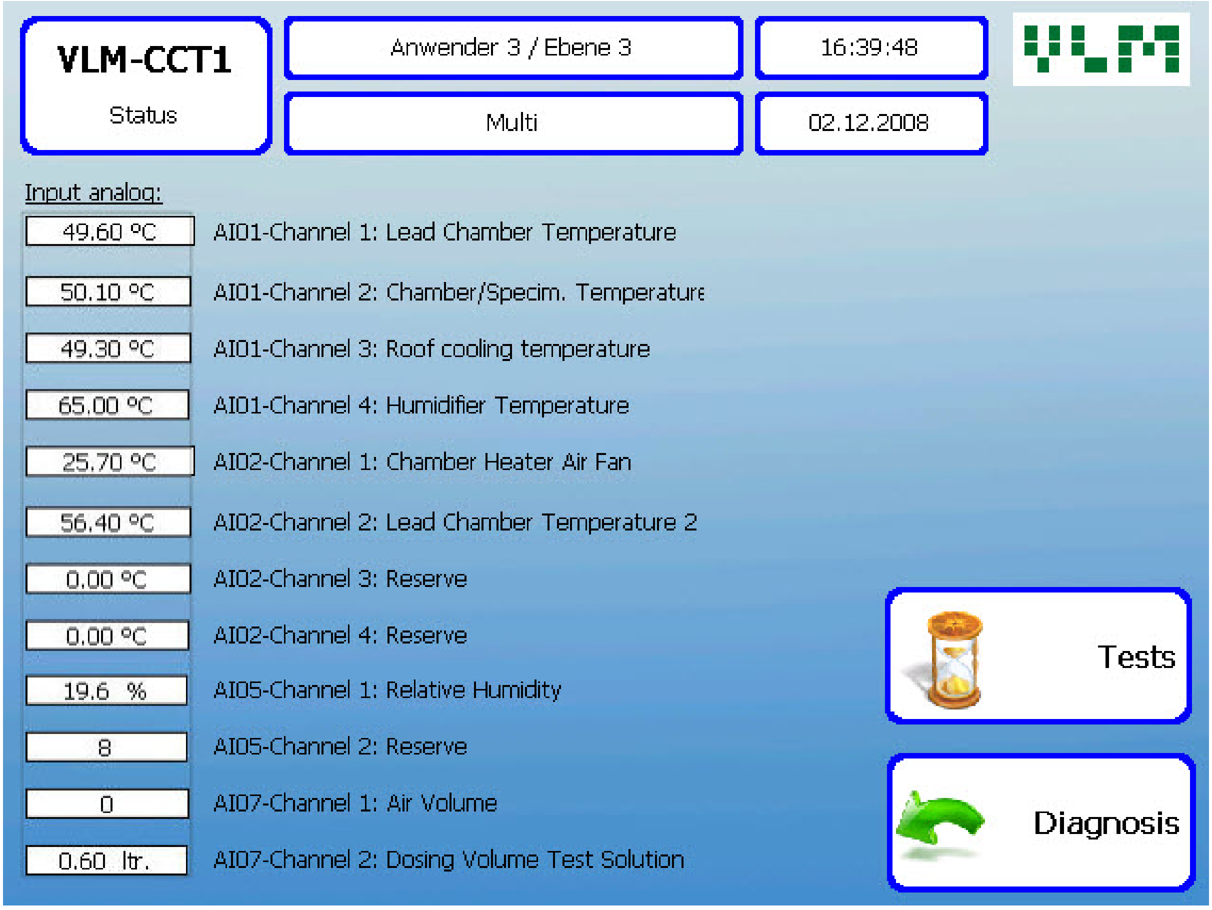
- editing of the test name
- setting of the test step duration
- setting the chamber temperature
- setting the humidifier temperature
- setting the chamber humidity
- setting the flow rate of the test solution
- setting the fan speed /air flow rate
- setting the temperature ramp time
- setting the humidity ramp time
- setting of delay of the outputs 1 or 2 for actuating of external or internal devices



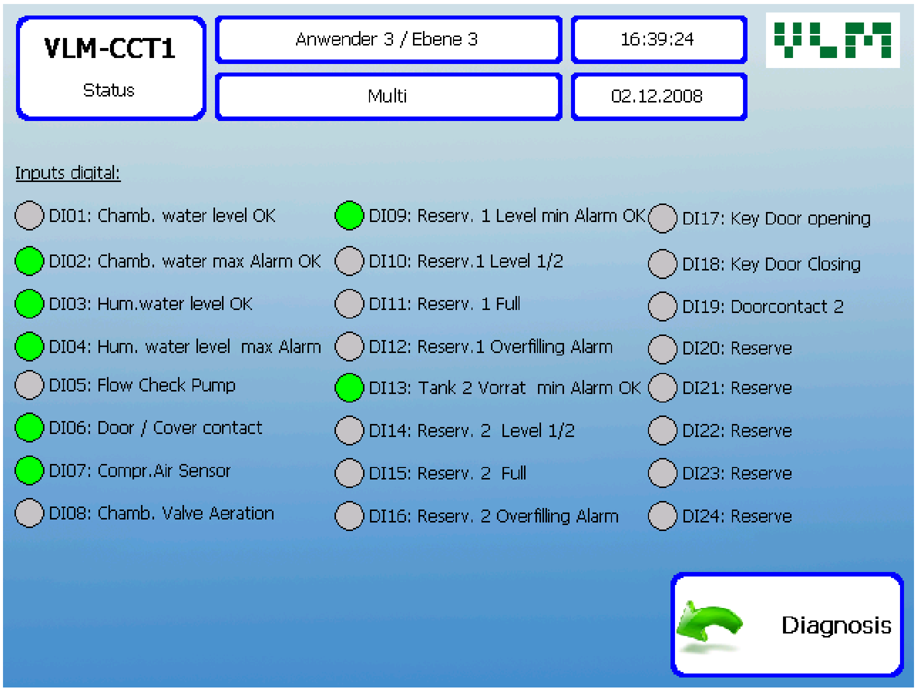
The screen showing the test prodecure includes all information concerning the actual test segment (highlighted when active) as well as the complete test.

The test can be stopped at any time for instance to inspect the specimens. The time counting will be continued if the halt did not last longer than 10 minutes.

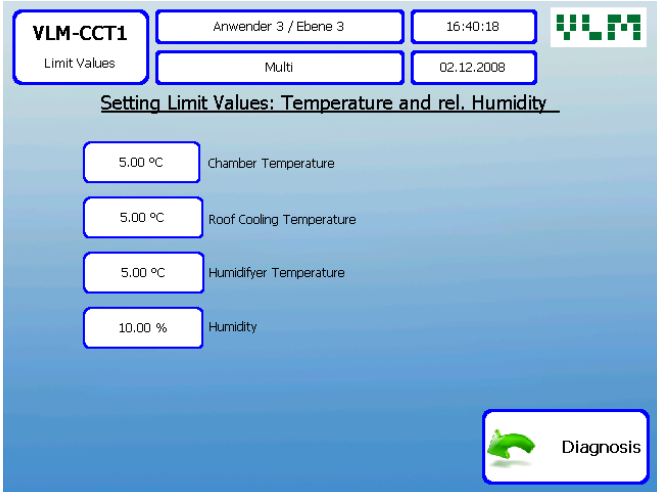
If a test has been finished all has to restartet the previous test has to be ressetted by pressing the reset key for more than 7 seconds. This is to avoid a reset by error.



This screen allows to watch all analog values such as temperatures, humidity, air flow rate, test solution flow rate.

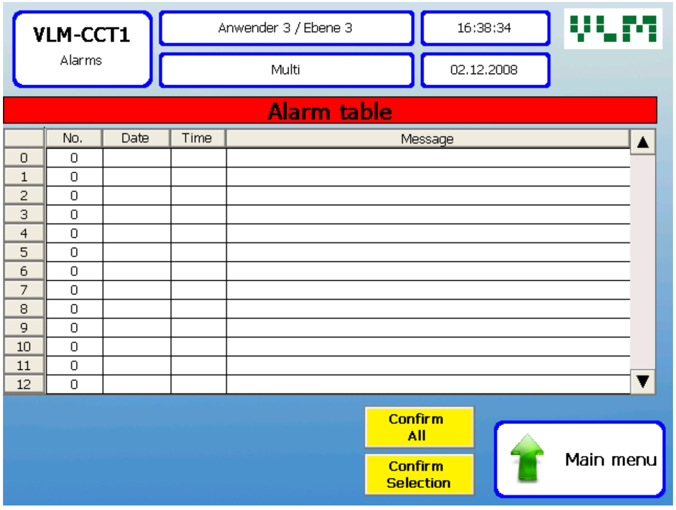


Furthermore all digital inputs can be watched during the test.

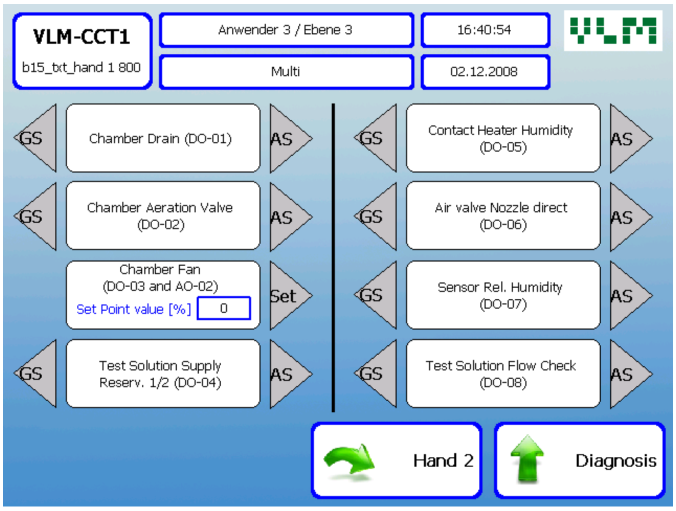


This screen allows setting limit values so there will only occur an alarm message if the actual values has been exceede the limit values beyond the start phase.

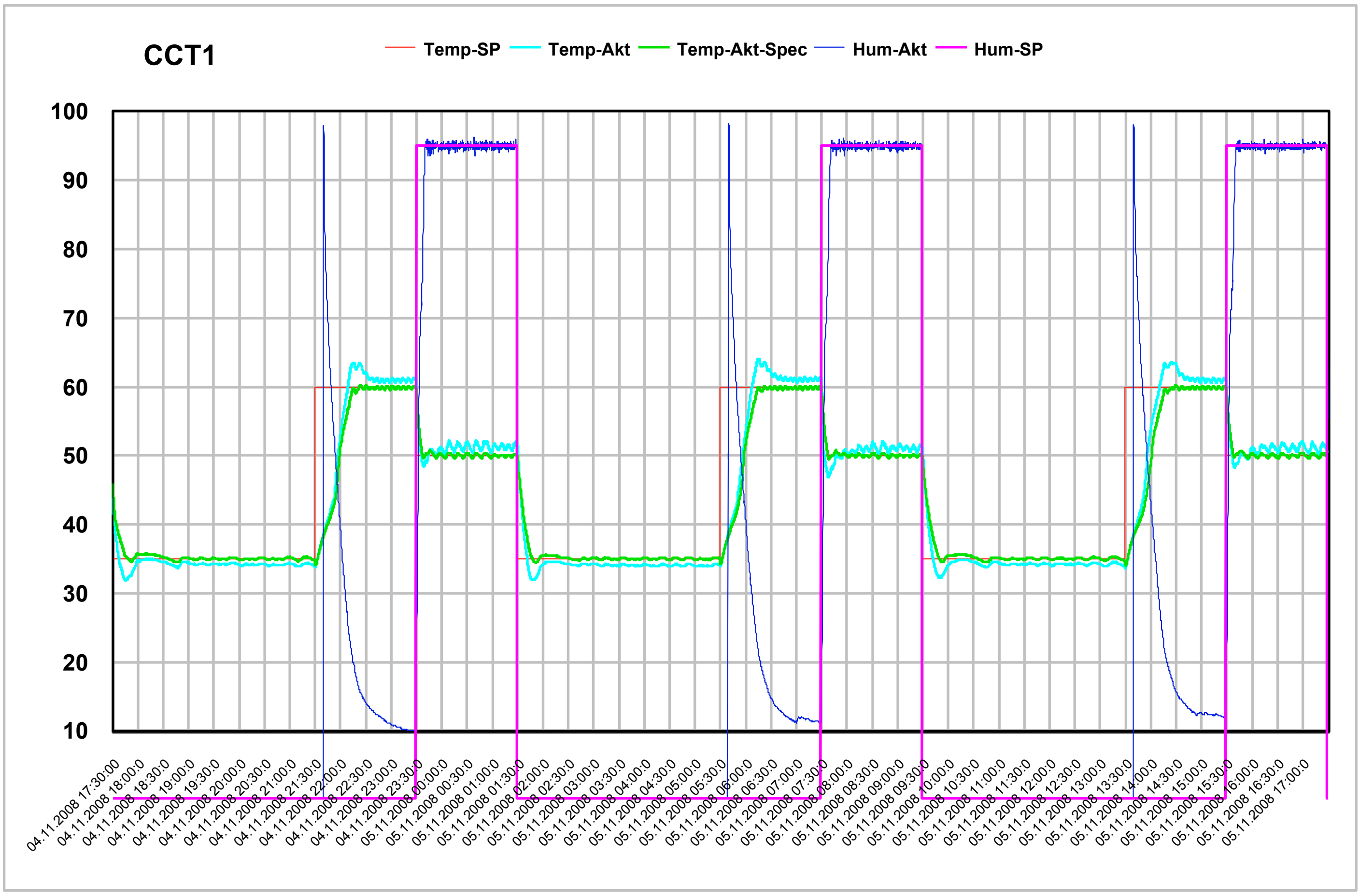
Obviously there are time limits factory set for instance for heating up phases so no alarm message will occur during this stage. However, if the conditions of the start phase are not reached in time the user will be informed by an alarm message.



If there is any deviation of the test conditions such as excess of the temperatures beyond the set tolerances or missing supply of demin. water this event will be stored in the alarm table.



All functions can be actuated manually in order to check the proper function or for instance to change the precalibrated humidity sensor. For that reason the sensor has to be driven into the chamber.

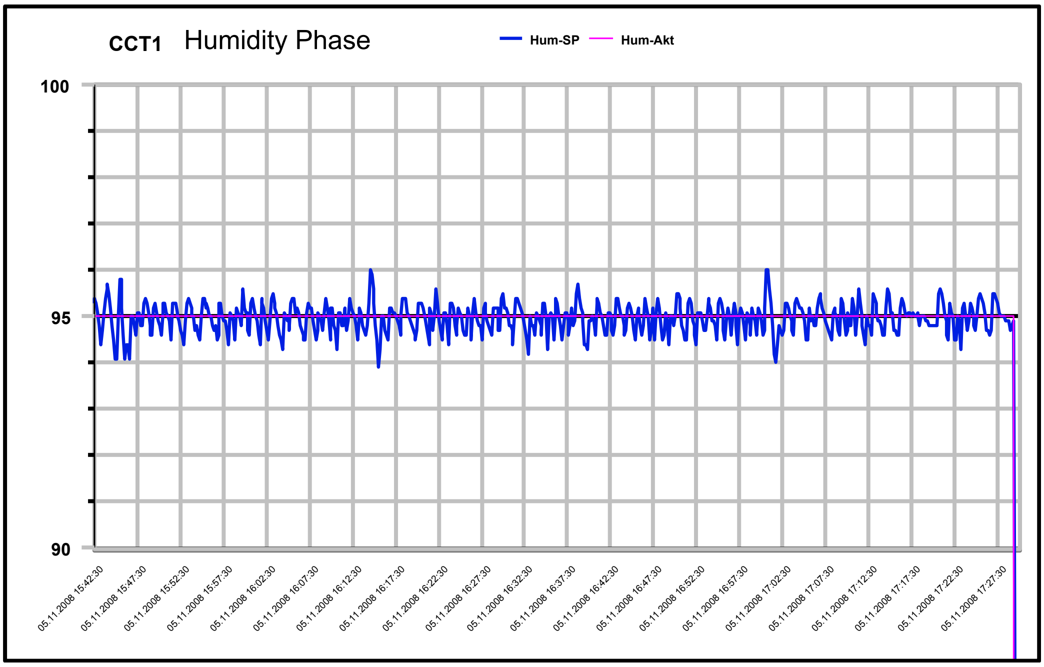


The diagrams of the Nissan Test procedure CCT 1 show impressively the outstanding performance of the MultiCORR® technology. This is the result of the interconnection of

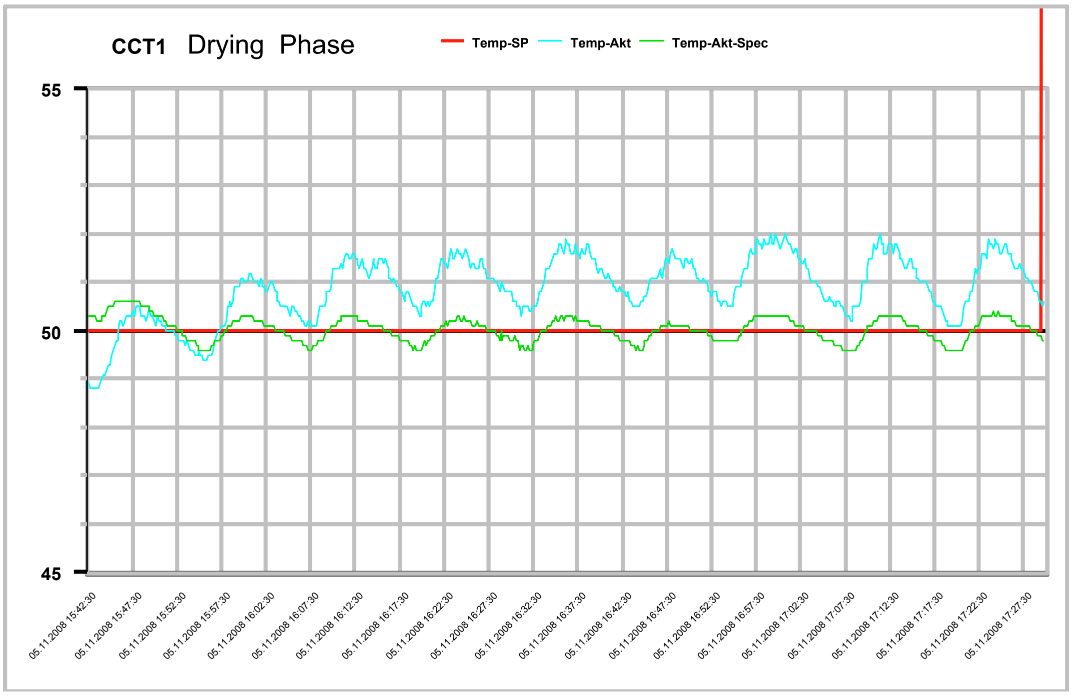
1. fast heat transfer from the surface heaters into the testing chamber due to the goood heat conductivity of the stainless steel bottom, rear wall and roof
2. the high sophisticated software temperature and humidity controller
3. the 5 temperature controller system with the lead sensor in the specimens zone (see green line Temp. -Akt Spec)
4. the short distance between the heaters and the sensors
5. the fast reacting humidity sensor
6. the speed controlled fan
7. the uniform air distribution in the chamber
8. the unique humidity generating system "humidity on demand"
9. the high sophisticated MultiCORR® software

It is a typical characteristic of the MultiCORR® technology that the temperature in the vicinity of the specimens is permanently very close to the set-point line whereas the temperature measured by the sensor above the bottom is higher or lower as the set point.

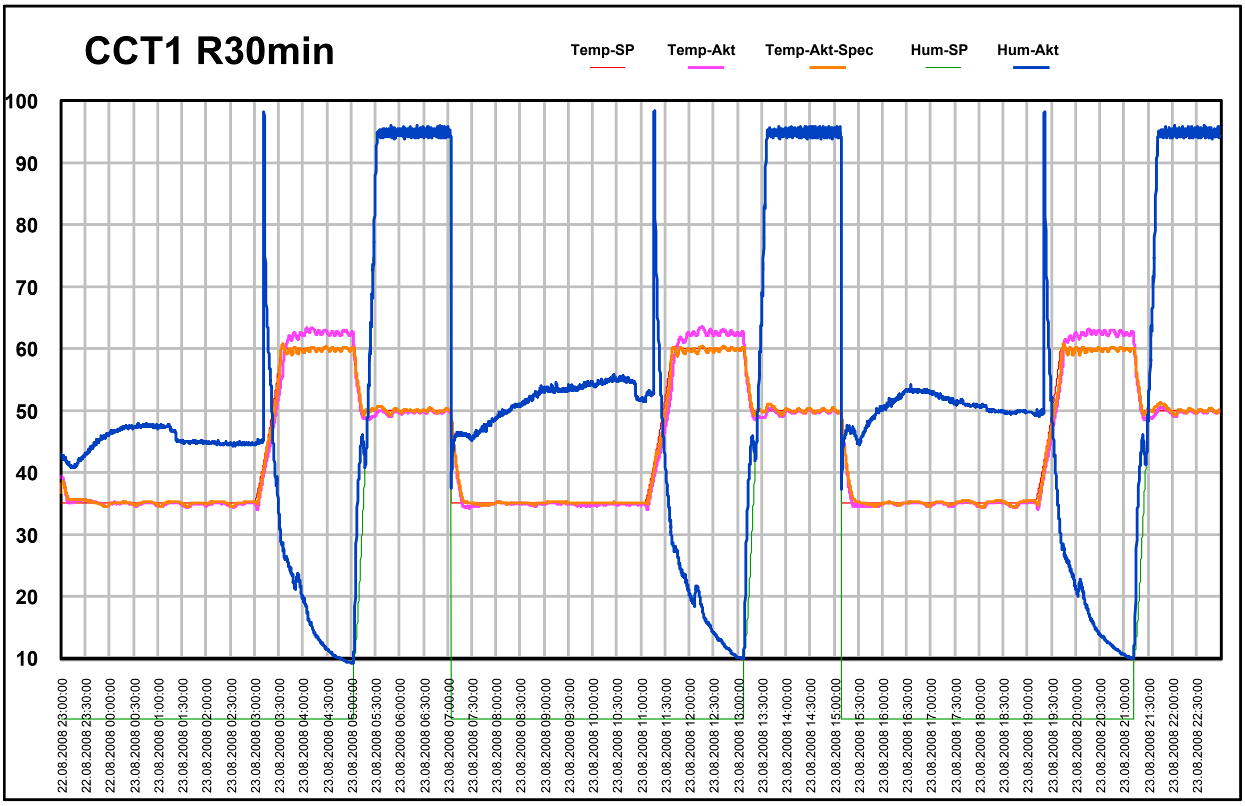
This means that it is impossible to achieve the required accuracy of temperature controlling in narrow tolerances by only one sensor for the temperature offset can be positive or negative.
The controlling of the chamber temperature by the leading sensor in the specimens zone makes the MultiCORR® technology second to none.



This diagramm shows the high performance of the regulating at 95 % rel. humidity within a tolerance of ± 1 % humidity at 50 ° C



The green line shows the actual temperature measured by the leading sensor in the vicinity of the specimens. The blue line shows the temperature measured by the bottom sensor which is higher because of the short distance to the floor heater and to the hot air flow. The advantage of the leading sensor in the specimens zone is impressively proved.



Running temperature-humidity ramps in narrow tolerances require not only high sophisticated software but also high sensitive sensors and quick in- or decrese of temperature and humidity.

This diagram proves the outstanding high performance of the MultiCORR® regulating system. The transition from salt spray mode at 35°C to forced air drying at 60°C is absolutly even cycle by cycle. The diagram also shows the advantage of the actual temperature (orange line) measuring by the leading sensor positioned in the vicinity of the specimens. The temperature measured by the floor sensor (violett line) is higher, because of the short distance to the hot air stream and the assisting floor heater.

The humidity sensor is outside the testing chamber during the salt spray mode but still measuring. The sensor is pushed into the chamber with a delay of 10 minutes to avoid any contamination with salt mist. When it enters the chamber it is cold and so there is an instant peak.

The humidity during the drying phase can be modified by   adjusting of the power of the fan. This performance is maintained by compensation the decrease of the air flow due to contaminated air filters. In case of the presence of polluting gases a additional actived coal filter should be installed.

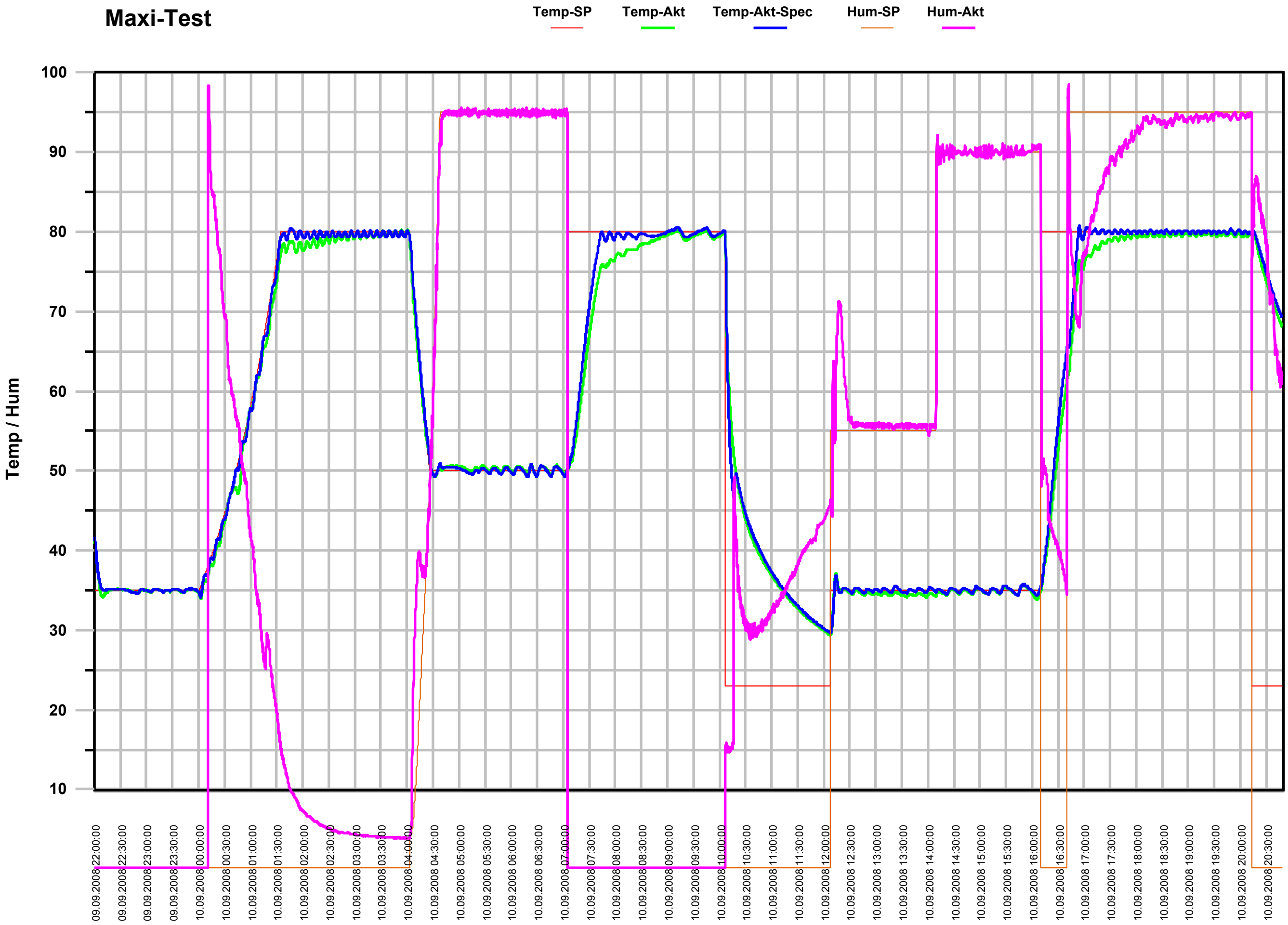
Setting ramps offers the advantage to perform transition times most evenly. So this feature leads to a high grade of reproducibility of the testing cycles.

VLM High Performance Test

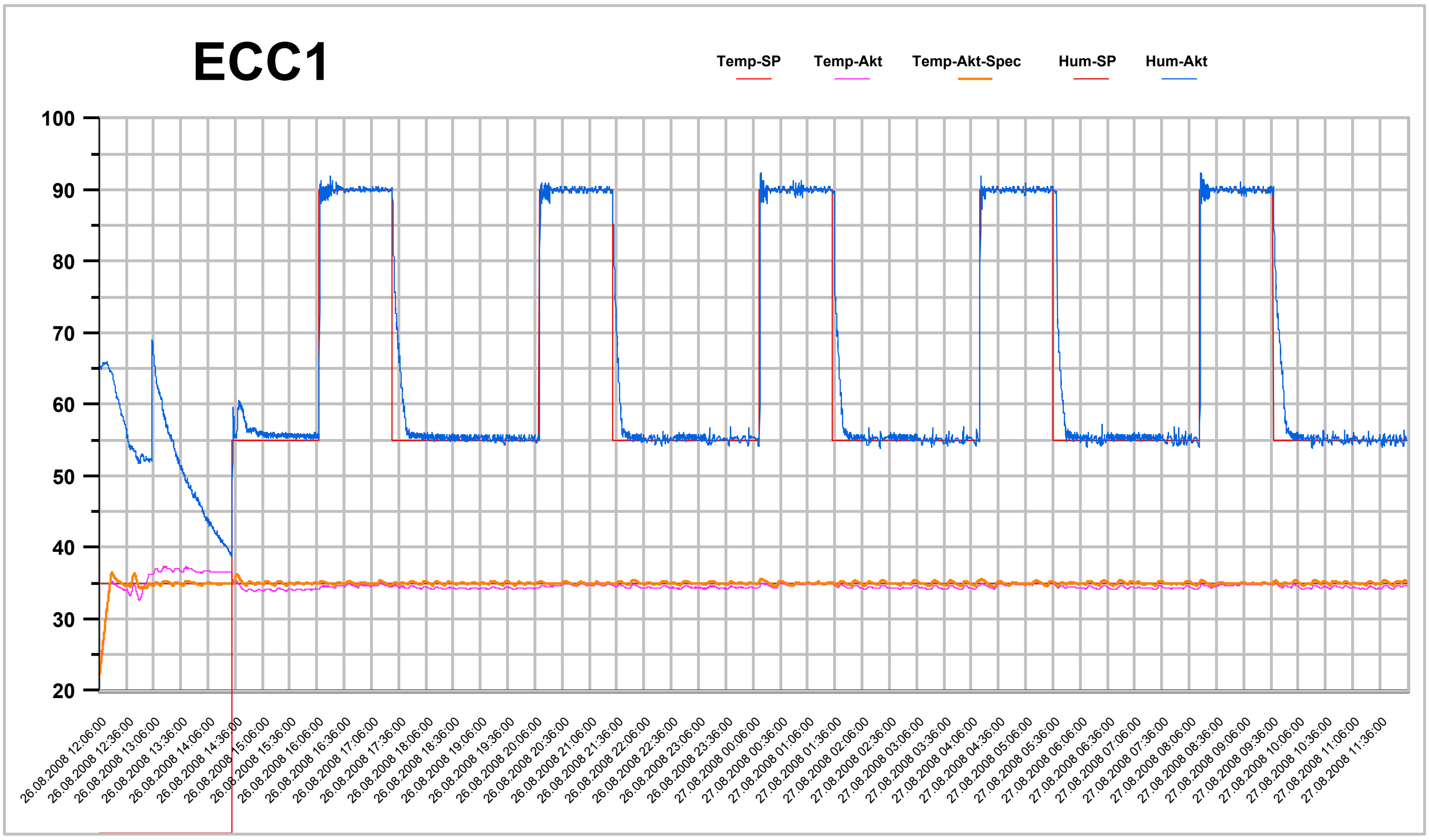
This special procedure called "Maxi Test" with rapidly changing climate conditions has been created not only for development purposes. It has been implemented into the final test each cabinet has to pass before shipment. The diagram shows the outstanding performance concerning the regulating of temperatures and relative humidity as well as the very short transitions times.

	Test segment		**Chamber °C**	**Humidifyer °C**	**Ramp/min target**	**Humi dity % rh**	**Duration Segment**	**Duration Cycle**
1	SAL	Salt Spray ISO 9227	35	50			02h 00m	02h 00m
2	AIR	Forced air drying	80	50			04h 00m	06h 00m
3	Humidity	Controlled Humidity	50	50	30	95	03h 00 m	09h 00m
4	CONFILL	Filling the base with warm water	80				00h 03m	09h 03m
5	CON	High humidity ISO 6270-2	80	50			02h 57m	12h 00m
6	Aeration	Aeration with ambient air	23	50			02h 00m	14h 00m
7	Humidity	Controlled Humidity	35	50		55	02h 00 m	16h 00m
8	Humidity	Controlled Humidity	35	50		90	02h 00m	18h 00m
9	CONFILL	Filling the base with warm water	80				00h 03m	18h 03m
10	CON	High humidity	80	70			00h27m	18h 30m
11	Humidity	Controlled Humidity	80	70		95	03h 30m	22h 00m
12	Cooling down	Cooling down without water in the base	23				02h 00m	24h 00m
13	End of cycle							

If you tell us your specific test procedure and individual requirements we will carry out this test and show you the diagram of the test so you can assess the performance of the cabinet before it leaves the factory. This service allows to meet your actual needs most satisfactory.

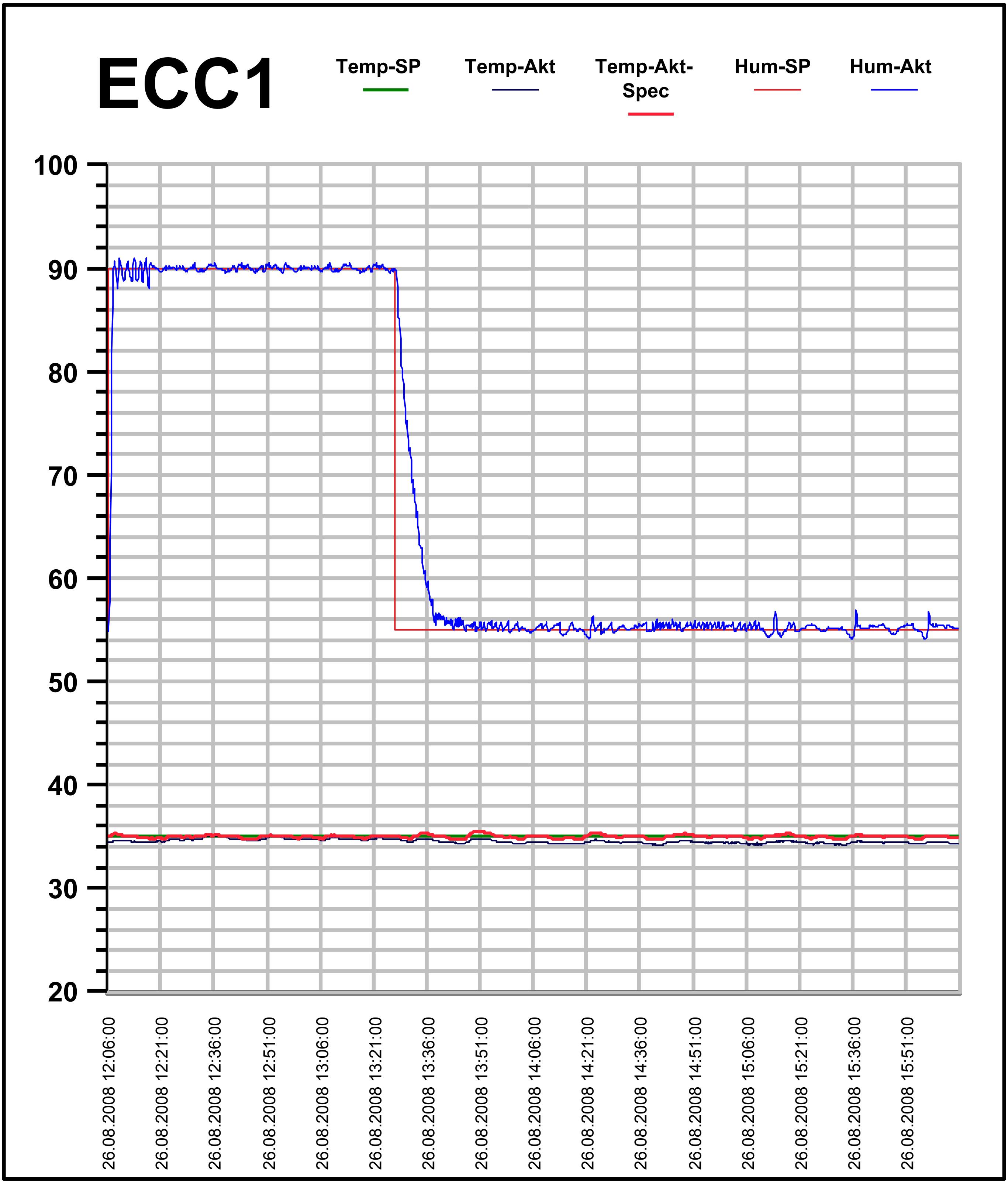


This diagram shows the test procedure according to the table so the user can be convinced of the high performance of the MultiCORR® technology particularly concerning the accuracy, reproducibility and short transition times. Each cabinet has to pass this test before leaving the factory.

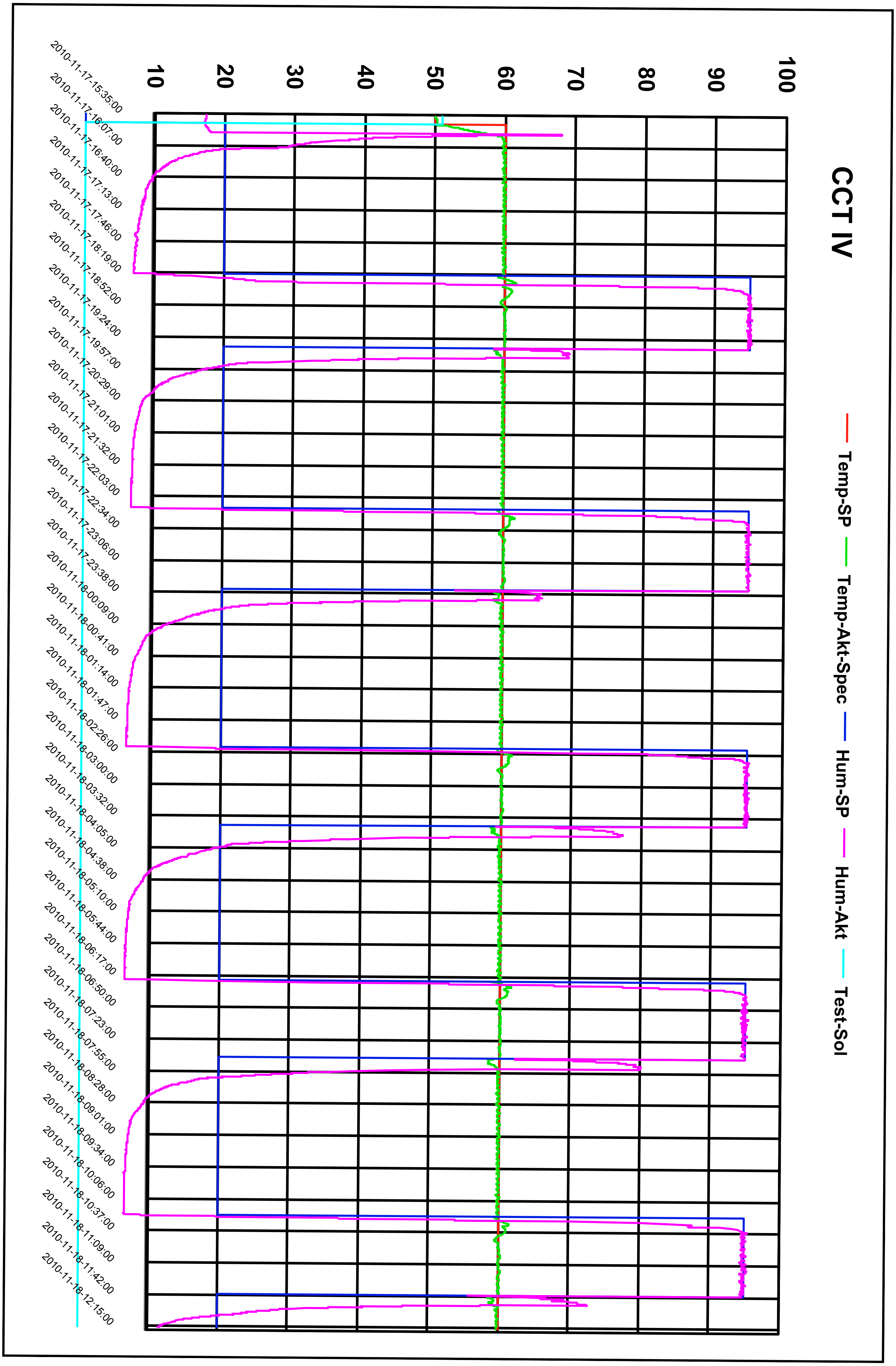


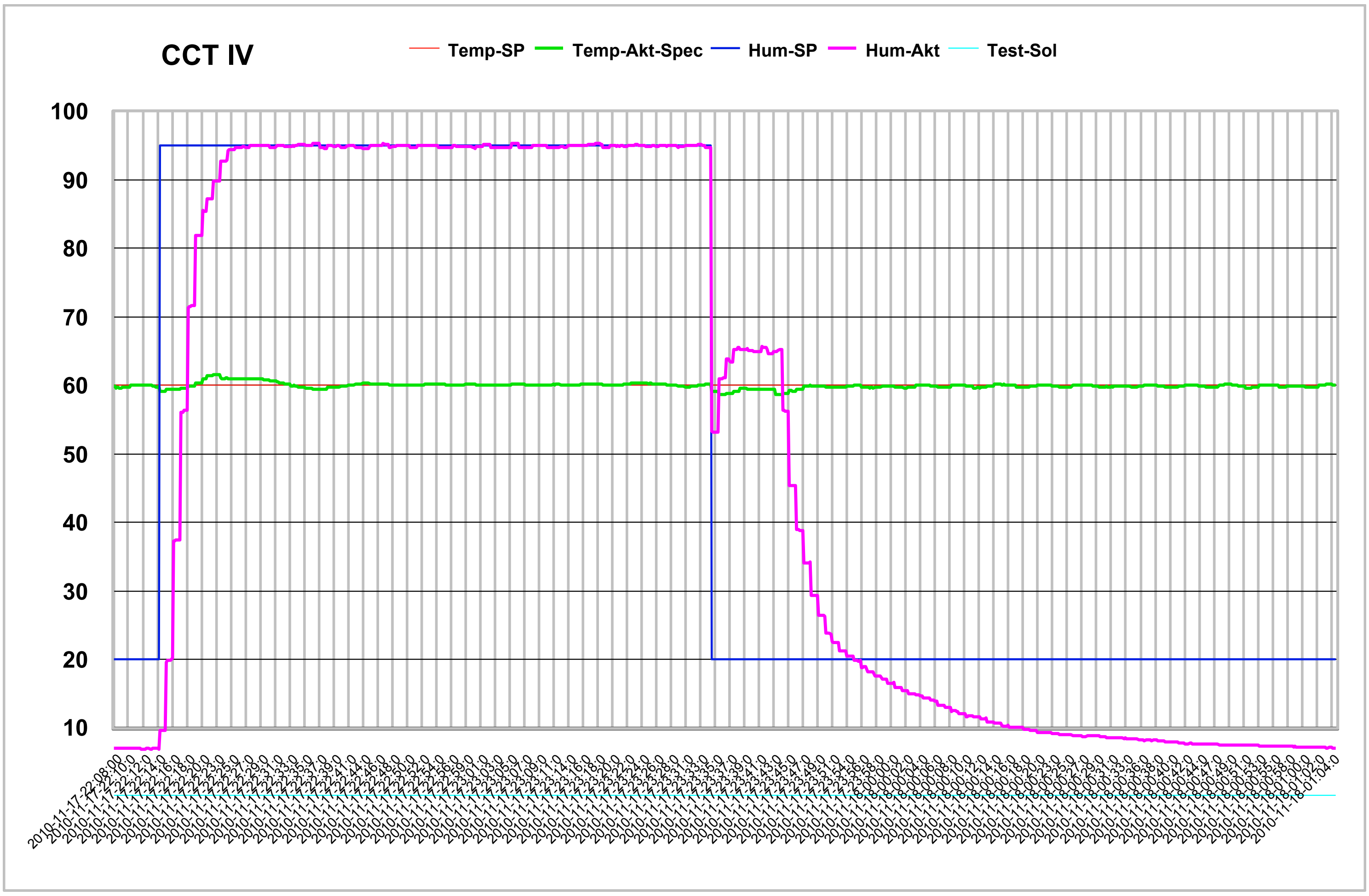
This diagram shows the high constancy of the temperature regulation at 35°C. The temperature measured by the floor sensor is above the set-point during the salt spray mode because the chamber is heated by the floor heater but after the change to the controlled humidity mode the temperature is going under the set point value line for the wall heaters are on.

However, actual temperature (orange line) measured by the leading sensor in the vicinity of the samples is on the set-point line (red) all the time. This example shows that accurate and actual temperature values cannot be achieved if there is only one sensor installed with one fixed offset. The MultiCORR® technology is characterised by a permanent offset and so guarantees actual temperatures in the vicinity of the specimens.



This expanded sector of the diagram shows the outstanding accuracy of the regulating of the temperature and the humidity during the ECC1 test independently from the humidity level. Moreover the high accuracy of the descending humidity within the transition time is most impressive.


CCT IV
Temp-SP
Temp-Akt-Spec
Hum-SP
Hum-Akt
Test-Sol
10
20
30
40
50
60
70
80
90
100
2010-11-17-15:35:00
2010-11-17-16:07:00
2010-11-17-16:40:00
2010-11-17-17:13:00
2010-11-17-17:46:00
2010-11-17-18:19:00
2010-11-17-18:52:00
2010-11-17-19:24:00
2010-11-17-19:57:00
2010-11-17-20:29:00
2010-11-17-21:01:00
2010-11-17-21:32:00
2010-11-17-22:03:00
2010-11-17-22:34:00
2010-11-17-23:06:00
2010-11-17-23:38:00
2010-11-18-00:09:00
2010-11-18-00:41:00
2010-11-18-01:14:00
2010-11-18-01:47:00
2010-11-18-02:26:00
2010-11-18-03:00:00
2010-11-18-03:32:00
2010-11-18-04:05:00
2010-11-18-04:38:00
2010-11-18-05:10:00
2010-11-18-05:44:00
2010-11-18-06:17:00
2010-11-18-06:50:00
2010-11-18-07:23:00
2010-11-18-07:55:00
2010-11-18-08:28:00
2010-11-18-09:01:00
2010-11-18-09:34:00
2010-11-18-10:06:00
2010-11-18-10:37:00
2010-11-18-11:09:00
2010-11-18-11:42:00
2010-11-18-12:15:00

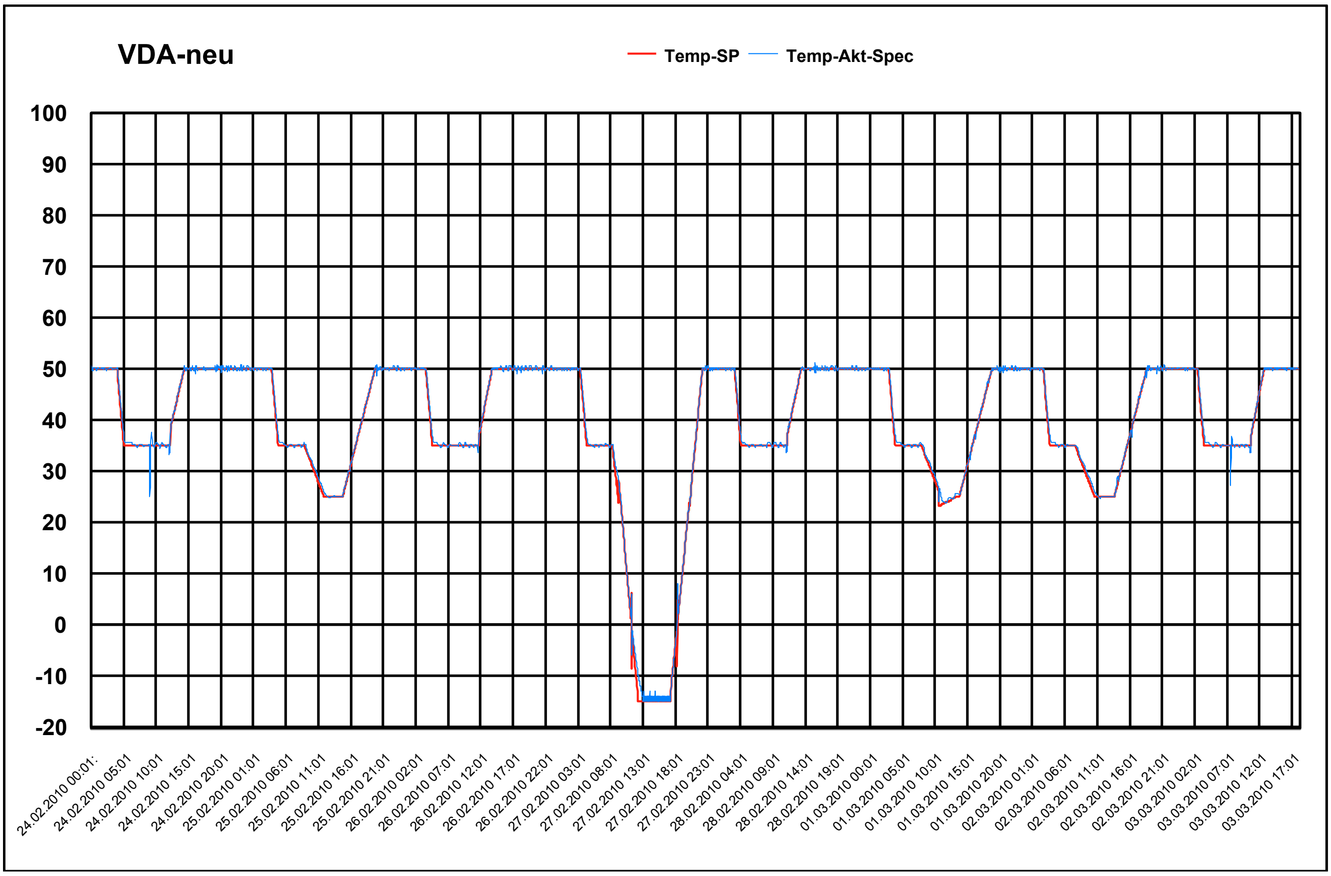


The unique MultiCORR® Technology allows very short transition times. However, if necessary the change from one step to the next can be adapted to the characteristics of standard cabinets for instance in order to achieve comparable test conditions.

The diagrams of the Nissan CCT IV confirms the high performance of the MultiCORR® technology concerning the very short transition from the extremly dried chamber to the stipulated relative humidity of 95% rF within only 10 minutes. Although the set-point value of the humidity is reached very fast there is no overshot and the humidity is controlled within a tolerance of ± 1 %.

The magnified sector of the diagram shows the characteristic of the humidity sensor. After the humidity step the sensor is pulled out of the chamber and will be pushed into the chamber after of 10 minutes. This delay is fixed programmed to make absolutely sure that the sensor will not be affected by salt mist because the prior step might be a salt spray test.

After entering the chamber again the sensor is instantly measuring and adapting to the rapidly drying process at 60°C. Although there is a change of the heating from the surface heaters during the humidty step to the hot air drying only supported by the surface heaters the temperature is all the time within a tolerance of ± 0,5 %.



This diagram shows the excellent accuracy of the temperature ramp controlling particularly during the freezing phase to - 15 °C as stipulated by the VDA New test.