CLR: problem solving in electro-chemical analysis

VOC Emission Test Chambers according to EN ISO 16000-9, UNI CEN/TS 16516, GEV Testing Methods, UNI EN 717-1, ASTM D5116

Company profile

CLR has been established in 1986 by two people having a long term experience in manufacturing pH electrodes, sensors and instruments for electro-chemical analysis. After making its name as the only Italian manufacturer of pH electrodes, CLR has nowadays reached a good deal of experience in producing a wide range of sensors and analysers for pH, ORP, ISE, Dissolved Oxygen, Chlorine, Conductivity, Turbidity.

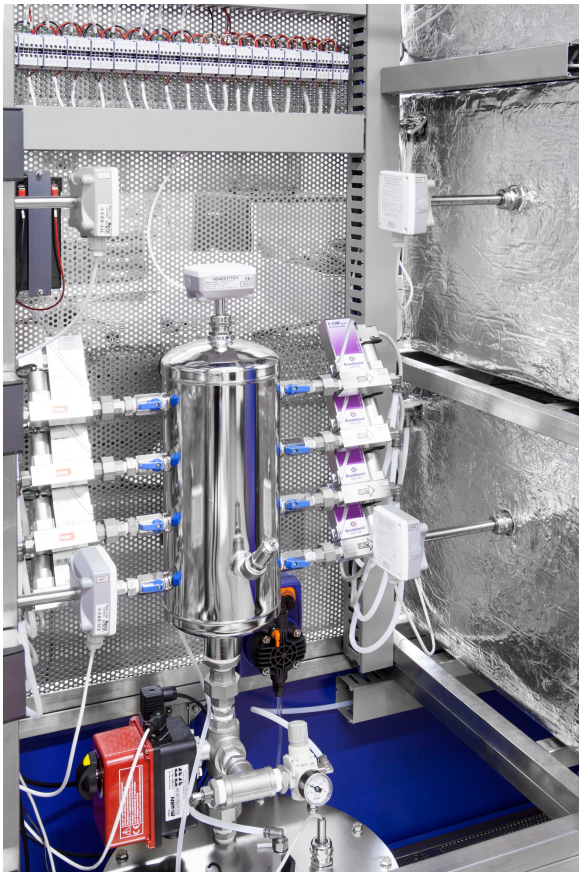
Since 1999 we have designed and manufactured, on Customer request and according to Customer specifications, VOC emission test chambers, mainly for chemical products used in building applications.

All the equipment is designed and produced inside our facility, so that we can directly control the quality of our products all along the manufacturing process, up to the end-product.

The deep knowledge of our products and of their application, developed along years of direct co-operation with our customers, allows us to find answers to the most complex application needs, even when customized solutions are required. Not only we can suggest the best choice among our product range, but also we can design and manufacture dedicated equipment, suitable to solve the most of the application problems of our customers.

We are customer oriented and we usually give pre- and post-sale customer support; our engineers and salesmen always analyse with the customer its process requirements in order to find with her/him the best solution for her/his application needs.

CLR Quality Management System is certified according to UNI EN ISO 9001:2008.



Our References

. **Mapei SpA** (Analytical Laboratory, Milan)
. European Research Centre, **"Centro Comune di Ricerca, Istituto per la Salute e la Protezione del Consumatore, Chemical Assessment and Testing Unit, Ispra "**
. A **Reseach Center** in **Belgium**
. **Centro Tessile Cotoniero e Abbigliamento SpA**, Busto Arsizio (two systems)
. **GFC Chimica Srl**, Ferrara
. **ICA, Industria Chimica Adriatica SpA**
. **Chelab Srl**
. **VITO NV**, a Research Center in **Belgium** specialized in R&D for new materials/new technologies and product emissions competence center (two systems)
. **ICI Paints, AkzoNobel, UK**

VOC emission test chambers: internal equipment detail

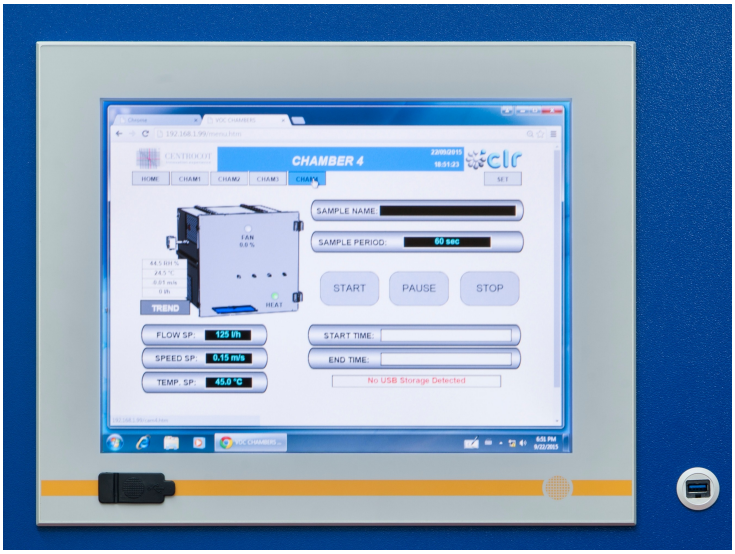
Product and document subject to change without notice.

Chambers for volatile organic compounds (VOC) emission tests from various samples, according to international standards such as ISO 16000-9, UNI CEN/TS 16516, GEV testing methods, UNI EN 717-1, ASTM D5116.

CLR Srl has designed and manufactured a number of systems for VOC emission tests according to emission test chamber method.

We can design and manufacture different systems, according to customer requirements, not only concerning number and dimensions of the chambers, but also regarding the type of measures and controls, thermal isolation, air velocity, relative humidity and temperature adjustment inside the chambers etc.

A "typical" VOC testing system designed and manufactured by CLR includes a number of testing chambers varying from 1 to 8 or more, according to customer specification, having the volume required by the customer, that can range from 50 liters (or less) to 1 cubic meter (or more) (volume also depends on the number of chambers). Test chambers are made of electropolished stainless steel and have wide open ports for easy specimen insertion.
The chambers are assembled on a self-standing chassis, mounted on wheels for easy movement; the chassis also includes all required control instrumentation.
The latest systems we have supplied include air filtration system for carrier gas.
One or more chambers for the carrier gas humidification, with air partialization, humidity generator, and automatic water refilling are supplied with the system. The humidification chamber is connected to a reservoir tank c/w level switch for automatic water refilling through a pump (supplied). The demi water refilling is automatically controlled by the PLC.
Before entering the test chambers the humidified gas passes through a distribution chamber where temperature and relative humidity are measured and recorded on a continuous basis. The measure of RH is used by the PLC for RH control in the carrier gas that is sent to the test chambers.
Air flowrate, temperature, relative humidity and air velocity in each test chamber are measured and recorded on a continuous basis.
Some systems have separate control of temperature in each test chamber. One system has separate control of relative humidity in each test chamber. Air velocity can be separately adjusted in each test chamber.
The measuring and control equipment can include local indication (according to customer request) and gives remote data transmission, analogic or digital type. All the measured values are sent to the control and supervision system, driving all adjustments and recording all parameters during each test. The system produces the test report for each specimen.
Through a proper connection the PLC/PC allows remote control on the system.



Maintenance
The system does not require specific maintenance, except the periodic check of the calibration of the measuring equipment (temperature, air velocity and RH). Once per year (or less frequently, according to needs) may be required to replace the ceramic diaphragm of the ultrasonic humidity generator.
The filters operational life is 2 years.
CLR Srl offers 2 convenient types of service agreement, with special prices, that remain unchanged for 2 years after the first start up.

System 1 Z01-S-027 Main Technical Details

. 8 chambers, 110 L each

. temperature and RH meter in the humidification chamber

. massic flowmeter, T and RH meters in each test chamber

. PLC and Supervisior PC

. Controls:
relative humidity 10%÷90%RH±5% (same for all the chambers)
temperature: no control in 7 chambers, heating in chamber #8 (range: ambient temperature to 50°C)
flowrate: separate adjustement in each chamber

System 1 is presently used on a continuous basis in the test laboratory of a worldwide known manufacturer of chemical products for building.

Main Technical Specifications System 1

Chassis: .....self-standing, stainless steel, on wheels
System dimensions:.....2330 x 1450 x 610 mm (HxWxD)
Chambers:..electropolished stainless steel, with anodized alluminium doors, dimensions 425x460x600mm (HxWxD),
.....volume apprx.110 L

Parameters measured on the mixing chamber, characteristics of the instruments:
Temperature: .....measuring range:-50 ÷ + 200°C; Accuracy:±0,25°C
Relative humidity:....meas. range:0 ÷ 100%; Acc.:±2% between 10 and 90%; ±2,5% in other ranges
Signals Retransmission:
Serial communication:..... RS232C and Multidrop RS485
Analog output:.....4÷20 mA or 0÷20 mA; Load resistance: 500 Ohm max
.....0÷10 Vdc; 2÷10 Vdc; Load resistance 100 KOhm minimum

Parameters measured on the carrier gas at the inlet of each testing chamber, characteristics of the instruments:
Temperature:.....measuring range:-50 ÷ + 200°C; Accuracy:±0,25°C
Relative humidity: Meas.range:0 ÷ 100%; Accuracy:±2% (10 to 90%); ±2,5% in the remaining range
Flowrate:.....through digital flowswitches
.....nominal flowrate range for N_2: 0,2 ÷10 L/min, accuracy ±3% F.S.
Analog output:.....4÷20 mA or 0÷20 mA; Load resistance: minimum 50 Ohm, Max. 600 Ohm
.....1÷5 Vdc; output impedance 1 KOhm

Control ranges of the parameters inside the chambers:
Temperature.....no control on temperature in 7 of the 8 chambers,
.....heating from inlet temperature up to 50°C only in one chamber, accuracy ± 2%
Relative Humidity:.....control of relative humidity in common for all the chambers, (same for all)
.....in the range 10-90% RH accuracy ± 5%
Flowrate:..... can be adjusted through PLC and digital flowswitches
.....nominal flowrate range for N_2: 0,2 ÷10 L/min, accuracy ±3% F.S.

System 2 Z01-S-029 Main Technical Details

. 1 chamber, 1000 L (1 m^3)

. thermally insulated walls

. temperature and relative humidity control system included

. test chamber temperature control: 15°C÷45°C (±1°C)

. test chamber relative humidity control: 20÷90% (±5%)

. temperature/humidity meter in the test chamber

. flowmeter on the carrier gas inlet

. air velocity control in the test chamber through an adjustable speed fan

. PLC and Supervisor PC.

This system has been developed for a Joint Research Center (JRC) of the European Commission, located in Italy. We have presently no data on the kind of samples to be tested.

Main Technical Specifications, System 2

Chassis: .....self-standing, stainless steel, on wheels
System dimensions:.....2350 x 1300 x 1100 mm (HxWxD)
Chamber:.....electropolished stainless steel, with glass door,
.....dimensions 1400x800x900mm (HxWxD), volume apprx.1000 L (1 m^3) (thermally insulated)
Connections for sample withdrawal:.....4 on the crystal port and 6 on the side of the port
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter

Parameters measured in the test chamber, characteristics of the instruments:
Temperature: .....measuring range:-50 ÷ + 200°C; Accuracy:±0,25°C
Relative humidity:.....measuring range:0 ÷ 100%;
.....Accuracy:±2% between 10 and 90%; ±2,5% in the other ranges
Flowrate:...massic flowmeter, range 0 ÷3000 NL/h, accuracy ±3% F.S. self adjusting, driven by PLC

Control ranges of the parameters inside the chamber:
Carrier gas temperature control range inside test chamber .....15÷45°C±1°C
Carrier gas relative humidity control range inside test chamber .....20÷90%RH ±5%RH
Carrier gas flowrate control range inside test chamber.....0÷2400 NL/h

System 3 Z01-S-031 Main Technical Details

. 8 chambers, 85 L each

. temperature and relative humidity control on the carrier gas at the outlet of humidification - mixing chamber

System 3 has been developed for an important scientific research centre in Belgium, who requested a basic facility w/o control instrumentation.

The system assures that at the outlet of the temperature/humidity conditioning unit temperature and relative humidity are measured and controlled on a continuous basis to the following values: temperature control value: 23°C ±2°C; relative humidity control value 50% ±5%.

Main Technical Specifications, System 3

Chassis: .....self-standing, stainless steel,
.....on wheels
System dimensions:.....
.....2300x 1450x610 mm (HxWxD)
Chambers:.....electropolished stainless steel,
.....with anodized alluminium doors
.....dimensions 400x460x600mm (HxWxD),
.....volume apprx.85 L
.....Chambers are not thermally insulated
Connections for sample withdrawal:...1 sampling manifold on each chamber, c/w 4 sampling points, …6,35 mm external diameter, suitable as flexible hose connection or for swagelok connection
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter

Parameters measured at the outlet of the humidification/mixing and temperature conditioning chamber, characteristics of the instruments:
Temperature: .....measuring range:-50 ÷ + 200°C; Accuracy:±0,25°C
Relative humidity:.....measuring range:0 ÷ 100%;
.....Accuracy:±2% between 10 and 90%; ±2,5% in the other ranges

Control range of the parameters at the outlet of the temperature conditioning chamber (following the humidification and mixing chamber):
Carrier gas temperature control range .....23°C ±2°C
.....(only heating system, inlet gas temperature must be lower that 20°C)
Carrier gas relative humidity control range .....50%RH ±5%RH
Control ranges of the parameters inside the chambers: .....according to customer request
.....the system as designed by CLR does not include these controls.

System 4 Z01-S-032 Main Technical Details

. 2 independent chambers, 250 L each

. temperature control at a fixed value

. relative humidity control in a wide range, indipendent for the two chambers

. measure of temperature and RH in each humidification chamber

. measure of gas flowrate, temperature, RH and air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. PLC and Supervisor PC

This system is presently used on a continuous basis by an important research centre operating for textile and clothing industry, in Northern Italy.

Main Technical Specifications, System 4

Complete system dimensions.....h 1950 x w 1500 x d 940 mm
Inner dimensions of each test chamber.....h 600 x w 600 x d 700 mm; volume: 250 L each
Chambers.....AISI 304 stainless steel, electrochemically polished, anodized alluminium ports
Homogeneity of carrier gas distribut. ins. each test chamber:. assured by a cylindric drilled diffuser
Connections for sample withdrawal: 1 sampling manifold on each chamber, c/w 4 sampling points,
.....6 mm external diameter, suitable as flexible hose connection
Auxiliary connections:.....2 auxiliary connections on each port, 1/4" F
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter

Parameters measured in the test chambers, characteristics of the instruments:
Temperature: .....measuring range:-50 ÷ + 200°C; Accuracy:±0,25°C
Relative humidity:.....measuring range:0 ÷ 100%;
.....Accuracy:±2% between 10 and 90%; ±2,5% in the other ranges
Air velocity:meas.range 0,05÷1m/sec, Acc.±(0.06 m/s +3% of the meas.) @ 50% RH and 1013 hPa
Carrier gas flow rate. .....Measuring range 600 NL/h
Accuracy (based on calibration with Air @ 5 bar and T=20°C) .....± 2 % FS including non-linearity

Control ranges for the parameters in each chamber:
Carrier gas temperature control range inside test chamber(*) .....23°C±2°C
. . .Room temperat. and carrier gas temperature at the inlet of the system are required to be 23±1°C
Carrier gas relative humidity control range inside test chamber(*) .....10÷90%RH ±5%RH
(*) Indipendent for each chamber

System 5 Z01-S-033 Main Technical Details

. 8 independent chambers, 110 L each

. control of relative humidity of the carrier gas sent into the 8 chambers

. control of temperature of the carrier gas sent into the 8 chambers to a fixed value

. measure of T and RH in the humidification and mixing chamber

. massic flowmeter, measure of temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. two PLC and a Supervisor PC.

This system is presently used in a well-known Italian laboratory mainly involved in research and developement of coating products, which main activity is the characterization and certification of coatings and paints.

Main Technical Specifications, System 5

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2500 x 1900 x 830 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, anodized alluminium ports,
.....inner dimensions 430x430x600mm (HxWxD), volume approx. 110 L
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Connections for sample withdrawal: 1 sampling manifold on each chamber, c/w 4 sampling points,
.....6 mm external diameter, suitable as flexible hose connection
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷100 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chamber:.....23°C ±2°C
..Room temperature and carrier gas temperature at the inlet of the system is required to be 23±1°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 6 Z01-S-035 Main Technical Details

. 4 independent chambers, 250 L each

. inlet air filtration system

. automatic refilling of demi water into the system

. control of relative humidity of the carrier gas sent into the 8 chambers

. control of temperature of the carrier gas sent into the 8 chambers to a fixed value

. measure of T and RH in the distribution chamber

. measure and recording of flowrate, temperature, relative humidity, air velocity in each chamber

. Separate air flowrate and air velocity adjustment capability for each chamber.

. PLC and Supervisor PC

This system is presently used in a well-known Italian manufacturer of wood coatings.

Main Technical Specifications, System 6

Chassis: ..self-standing, stainless steel, c/w wheels, System dimens.1680x2980x830 mm (HxWxD)
Test chambers:.....electrochemically polished stainless steel, electrochemically polished SS/glass
.....ports,inner dimensions 355 x 1000 x 705 mm (HxWxD), volume approx. 250 L
Carrier air filtration system.....4 filters, installed in series
Connections for sample withdrawal:. 1 sampling manifold on each chamber, c/w 4 sampling points,
.....6 mm external diameter, suitable as flexible hose connection
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Connections for demi water inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at the outlet of the distribution chamber (characteristics of the instruments):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±1,5% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: .range 0.05÷1 m/sec, acc.±(0.06 m/sec + 3% of the reading) @ 50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chamber:.....23°C ±2°C
.....ambient temperature controlled to 23±1°C by the customer
Carrier gas relative humidity control range inside distribution chamber:.....50%RH ±5RH%
.....(RH may slightly differ in the 4 testing chambers, since it depends upon many variables)
Air velocity measure inside the test chamber:.....0,1 ÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 7 Z01-S-036 Main Technical Details

. 8 independent chambers, 110 L each, separately thermally insulated

. inlet air filtration system

. control of relative humidity in the carrier gas sent to the 8 chambers

. separate control of the temperature for each chamber, in the range 23÷50°C ±2°C

. measure and recording of air flowrate, temperature, relative humidity, air velocity in each chamber

. separate control of flowrate, temperature and air velocity for each test chamber

. separate air flowrate and air velocity adjustment capability for each chamber

. two PLCs and a Supervisor PC.

This system is presently used by a worldwide known Swiss manufacturer of sealants, adhesives, additives for building, automotive, marine and many other products.

Main Technical Specifications, System 7

Chassis: self-standing, stainless steel, c/w wheels; System dimens.: 2432x1943x684 mm (HxWxD)
Test chambers: electrochemically polished SS inner dimens.400x460x601mm (HxWxD),Vappr110 L
Homogeneity of carrier gas distribut. ins. each test chamber: assured by a cylindric drilled diffuser
Connections for sample withdrawal:. 1 sampling manifold on each chamber, c/w 4 sampling points,
.....6 mm external diameter, suitable as flexible hose connection, orientable
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter

Parameters measured at the outlet of the distribution chamber (characteristics of the instruments):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits

Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷120 NL/h, accuracy ±1,5% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa

Parameters control range (according to customer request):
Carrier gas temperature, separate control range inside each test chamber:.....23÷50°C ±2°C
Carrier gas relative humidity control range inside distribution chamber:….10%RH ÷90%RH ±5UR%
…….(relative humidity may differ in the 8 testing chambers, since it depends upon many variables)
Air velocity measure inside the test chamber:.....0,1 ÷0,3 m/sec
.....air velocity can be adjusted separately in each chamber by adjusting the fan speed

System 8 Z01-S-039 Main Technical Details

. 8 independent chambers,
6 chambers with 110 L volume each,
2 chambers with 225 L volume each

. air filtration system

. control of relative humidity of the carrier gas sent into the 8 chambers

. control of temperature of the carrier gas sent into the 8 chambers to a fixed value

. measure of T and RH in the distribution chamber

. measure and control of air flow and air velocity, measure of temperature and relative humidity in each chamber

. separate air flowrate and air velocity adjustment capability for each chamber

. PLC and touch screen PC on board.

This system is currently employed by a laboratory that provides analytical services in chemistry, microbiology and biology, specializing in product certification for the food, environmental, pharmaceutical and consumer goods.

Main Technical Specifications, System 8

Chassis: ….self-standing, stainl.steel, c/w wheels; System dimens.2432x2152,5x681 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, stainless steel and glass ports,
Inner dimens.....110 L chambers:400h x460w x600d mm; 225 L chambers: 400h x930w x600d mm
Homogeneity of carrier gas distrib. inside each test chamber:. assured by a cylindric drilled diffuser
Connections for sample withdrawal: 1 sampling manifold on each chamber, c/w 4 sampling points,
.....6 mm external diameter, suitable as flexible hose connection
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at the outlet of the distribution chamber (characteristics of the instruments):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±1% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec +3% of reading) @ 50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chamber:.....23°C ±2°C
…Room temperat. and carrier gas temperature at the inlet of the system are required to be 23±1°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air velocity inside test chamber:..0,1 ÷0,3 m/sec, controlled by PLC through the fan rotation speed

System 9 Z01-S-040 Main Technical Details

. 8 independent chambers, 110 L each

. air filtration system

. control of relative humidity of the carrier gas sent into the 8 chambers

. control of temperature of the carrier gas sent into the 8 chambers to a fixed value

. measure of T and RH in the distribution chamber

. massic flowmeter, measure of temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. PLC and touch screen PC on board.

This system is presently used in a well-known Belgian Research Center mainly involved in research and developement of new materials/new technologies.

Main Technical Specifications, System 9

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2432 x 1895 x 683 mm (HxWxD)
Test chambers:. . .stainless steel, electrochemically polished, anodized alluminium ports, c/w glass .....inspection windows, inner dimensions 400x460x600mm (HxWxD), volume approx. 110 L
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Connections for sample withdrawal: 1 sampling manifold on each chamber, c/w 4 sampling points, ...6 mm external diameter, suitable as flexible hose connection
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chamber:.....23°C ±2°C
. .Room temperature and carrier gas temperature at the inlet of the system is required to be 23±1°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted .....separately in each chamber by adjusting the fan speed

System 10
Z01-S-038 Main Technical Details

. 8 independent chambers, 120 L each

. control of relative humidity of the carrier gas sent into the 8 chambers

. measure of T and RH in the distrib. chamber

. measure of flowrate, temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. separate temperature control in 2 of the 8 test chambers (contr.range 23°C÷50°C ±2°C); temperature in the other 6 chamber controlled to a fixed value (23°C ±2°C)

. a vent system in each test chamber, including flexible hose and manual interception valve

. PLC and touch screen PC on board.

This system is presently used in a worldwide known chemical Company, located in the UK, that produces a broad range of advanced materials, additives and functional products, specialty chemicals, and fibers.

Main Technical Specifications, System 10

Chassis: .....self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2100 x 2073 x 777 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, anodized alluminium ports
..... inner dimensions 310x550x700mm (HxWxD), volume approx. 120 L
Homogeneity of carrier gas distribution ins. each test chamber:.....assured by cylindric drilled diffuser
Connections for sample withdrawal:..... 4 sampling stubs on each port, 6 mm external diameter,
.....5 mm internal diameter, suitable as flexible hose connection, with adjustable insertion depth
Vent system on each test chamber:.....1 stub, a flexible hose and a manual interception valve
.....the 8 vent hoses are fitted into a single hose connection on the rear of the system
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: …….range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chambers CM1,CM2; CM5÷CM8:.....23°C ±2°C
Carrier gas temperature control range inside test chambers CM3 and CM4:.....23÷50°C ±2°C
……Room temperature and carrier gas temperature at the inlet of the system is required to be 23±2°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air flowrate in test chambers:.....0÷300 nL/h, can be separately adjusted in each chamber
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 11 Z01-S-041 Main Technical Details

. 8 independent chambers, 110 L each

. control of relative humidity of the carrier gas sent into the 8 chambers

. measure of T and RH in the distribution chamber

. measure of flowrate, temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. separate temperature control in the 8 test chambers (control range 23°C÷50°C ±2°C)

. PLC and touch screen PC on board.

This system is presently used in a worldwide known chemical Company, located in the UK, that produces a broad range of paints, coatings, advanced products, specialty chemicals for many different applications.

Main Technical Specifications, System 11

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2432 x 1895 x 651 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, anodized alluminium ports
..... inner dimensions 400x460x600mm (HxWxD), volume approx. 110 L
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Connections for sample withdrawal:..... 4 sampling stubs on each port, 6 mm external diameter,
.....5 mm internal diameter, suitable as flexible hose connection, with adjustable insertion depth
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter

Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits

Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa

Parameters control range (according to customer request):
Carrier gas temperature control range inside the 8 test chambers:.....23÷50°C ±2°C
..Room temperature and carrier gas temperature at the inlet of the system is required to be 23±2°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air flowrate in test chambers:.....0÷300 nL/h, can be separately adjusted in each chamber
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 12 Z01-S-042 Main Technical Details

. 4 independent chambers, 250 L each

. control of relative humidity of the carrier gas sent into the 4 chambers

. measure of T and RH in the distribution chamber

. measure of flowrate, temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmet.)

. separate air velocity control for each test chmbr (adjustable speed fan)

. separate temperature control in the 4 test chambers (control range 23°C÷50°C ±2°C)

. PLC and touch screen PC on board.

This system has been developed for the same important research centre operating for textile and clothing industry, in Northern Italy that already purchased System 4.

Main Technical Specifications, System 12

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 1866 x 2200 x 777 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, anodized alluminium ports
..... inner dimensions 600x600x700mm (HxWxD), volume approx. 250 L
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Connections for sample withdrawal:..... 4 sampling stubs on each port, 6 mm external diameter,
.....5 mm internal diameter, suitable as flexible hose connection, with adjustable insertion depth
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside the 8 test chambers:.....23÷50°C ±2°C
..Room temperature and carrier gas temperature at the inlet of the system is required to be 23±2°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air flowrate in test chambers:.....0÷300 nL/h, can be separately adjusted in each chamber
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 13 Z01-S-040(II) Main Technical Details

. 8 independent chambers, 110 L each

. air filtration system

. control of relative humidity of the carrier gas sent into the 8 chambers

. control of temperature of the carrier gas sent into the 8 chambers to a fixed value

. measure of T and RH in the distribution chamber

. massic flowmeter, measure of temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeters)

. separate air velocity control for each test chamber (adjustable speed fan)

. chamber ports internally PTFE lined

. PLC and touch screen PC on board.

This system is presently used by the same Belgian Research Center that already purchased and is using on a continuois basis System 9.

Main Technical Specifications, System 13

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2432 x 1895 x 683 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished,
.....inner dimensions 400x460x600mm (HxWxD), volume approx. 110 L
……anodized alluminium ports (inner part of the ports is PTFE lined), c/w glass inspection windows
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Connections for sample withdrawal:..... 4 sampling stubs on each port, 6 mm external diameter,
…….5 mm internal diameter, suitable as flexible hose connection, with adjustable insertion depth
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside test chamber:.....23°C ±2°C
..Room temperature and carrier gas temperature at the inlet of the system is required to be 23±1°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 14 Z01-S-043 Main Technical Details

. 4 independent chambers, 250 L each

. control of relative humidity of the carrier gas sent into the 4 chambers

. measure of T and RH in distribution ch.

. measure of flowrate, temperature, relative humidity, air velocity in each chamber

. separate inlet air flowrate control for each test chamber (massic flowmeter)

. air purge system in the 4 test chambers, air purge completely automatic in chamber 1, manual in the other chambers

. separate air velocity control for each test chmbr (adjustable speed fan)

. separate temperature control in the 4 test chambers (control range 23°C÷50°C ±2°C)

. a vent system in each test chamber, including flexible hose and manual interception valve

. PLC and touch screen PC on board.

This system has been developed for an important Belgian centre active in scientific and technical research, in supplying technical information, assistance and consultancy in the construction sector.

Main Technical Specifications, System 12

Chassis: .....self-standing, stainless steel, c/w wheels; Syst.Dimens.: 1866 x 2200 x 777 mm (HxWxD)
Test chambers:.....stainless steel, electrochemically polished, anodized alluminium ports
..... inner dimensions 600x600x700mm (HxWxD), volume approx. 250 L
Homogeneity of carrier gas distribution ins. each test chamber:.....assured by cylindric drilled diffuser
Connections for sample withdrawal:..... 4 sampling stubs on each port, 6 mm external diameter,
.....5 mm internal diameter, suitable as flexible hose connection, with adjustable insertion depth
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Vent connection:…on the rear of the system, 1 adjustable orientation push-fit fitting for 8 mm diam. hose
Purge system Test Chamber CM1:.....automatically driven by the PLC; includes a 1000 L/h flowmeter
Purge system Ch. CM2,CM3,CM4:..manual shut off valve+preset flowrate control valve for each test ch.
Parameters measured at outlet of temperature conditioning chamber (characteristics of the instr.):
Temperature measure: .....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH measure:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Parameters measured in each test chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 0 ÷300 NL/h, accuracy ±2% F.S.
Temperature:.....range:-50 ÷ + 200°C; Accuracy:±0,25°C
RH:.....range:0 ÷ 100%RH; Accuracy:±2% between 10 and 90%; ±2,5% out of these limits
Air velocity: .....range 0.05÷1 m/sec, accuracy±(0.06 m/sec + 3% of reading) @50%RH and 1013 hPa
Parameters control range (according to customer request):
Carrier gas temperature control range inside the 8 test chambers:.....23÷50°C ±2°C
.....Room temperature and carrier gas temperature at the inlet of the system is required to be 23±2°C
Carrier gas relative humidity control range inside test chamber:.....50%RH±5RH%
Air flowrate in test chambers:.....0÷300 nL/h, can be separately adjusted in each chamber
Air velocity measure in test chamber:.....0,1÷0,3 m/sec air velocity can be adjusted
.....separately in each chamber by adjusting the fan speed

System 15 Z01-S-044 Main Technical Details

. System to store samples for VOC analysis avoiding cross contamination

. 12 independent chambers, 87,5 L each

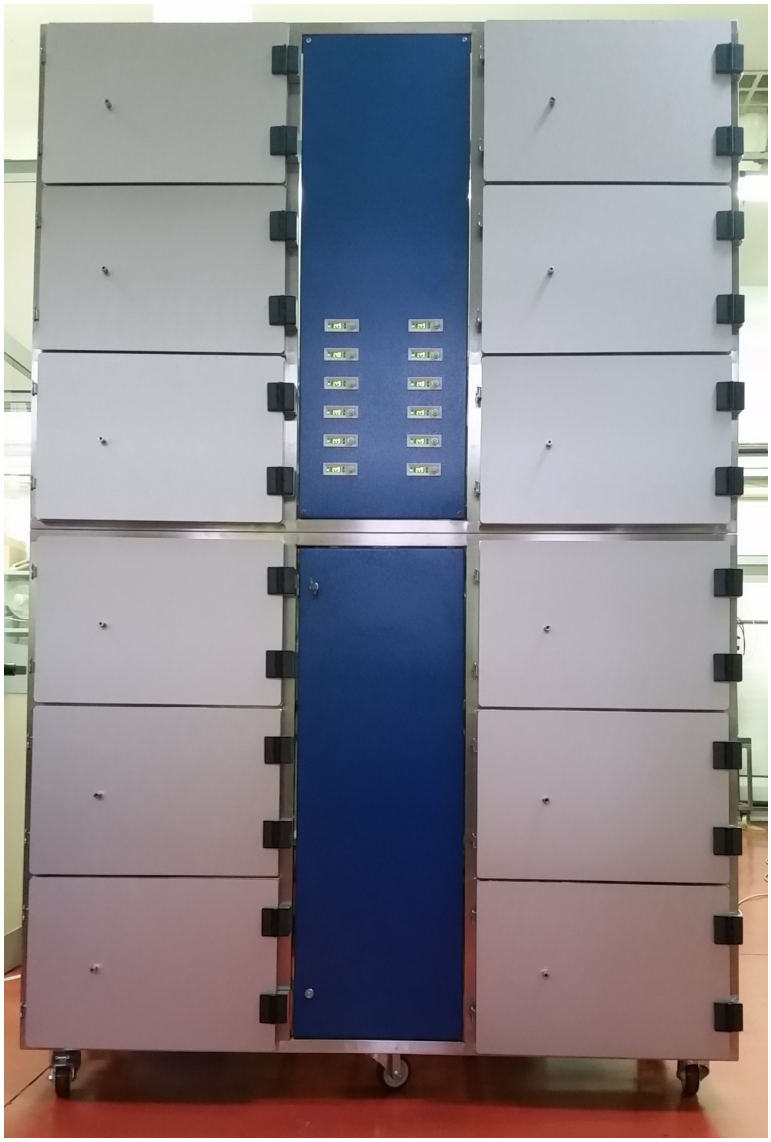
. relative humidity of the carrier gas sent into the 12 chambers is controlled by the Customer

. control of temperature inside the storing chambers is controlled by the Customer

. separate inlet air flowrate control for each test chamber

. massic flowmeters, manually adjustable, with local indication, to control the air flowrate inside each chamber

This system has been designed for a French Company manufacturing flooring and acoustic insulation systems made of PVC.



Main Technical Specifications, System 15

Chassis: self-standing, stainless steel, c/w wheels; Syst.Dimens.: 2438 x 1600 x 670 mm (HxWxD)
Chambers:. .stainless steel, electrochemically polished, inner dimens. 320x500x547mm (HxWxD),
.....volume approx. 87,5 L , anodized alluminium ports
Homogeneity of carrier gas distribution ins. each test chamber: assured by cylindric drilled diffuser
Air outlet point:.....1 on each chamber, compresion lock fittings suitable for stainless steel tubings,
.....6 mm external diameter, 5 mm internal diameter.
Connections for carrier gas inlet.....quick coupling fitting, 8 mm diameter
Parameters measured in each chamber (characteristics of the instruments):
Flowrate:.....massic flowmeter, nominal flowrate range: 12 ÷600 NL/h, accuracy ±2% F.S.
Parameters control range (according to customer request):
Carrier gas temperature and relative humidity: ….controlled by Customer at the inlet of the system.
Air flowrate:.....0,73 L/min

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