Operating Manual

CORROSION TEST CABINET FOR SALT SPRAY

Type SAL 400-FL

Issue: 15.06.2012

VLM GmbH - Business Unit Corrosion Test Equipment

p: +49 5205 87 9630 | f: +49 5205 87 96350 | e: info@vlmgmbh.de | www.vlmgmbh.de

Heideblümchenweg 50 | D-33689 Bielefeld | Germany

Contents

1. Introduction

1.1. Purpose of this document

This operating manual introduces the users/ operator of the VLM Corrosion Test Cabinet with:

- the working principle of the test device
- the operation of the cabinet
- safety instructions
- maintenance

The operation manual should be always at hand.

This type of the corrosion test cabinets have been developed to carry out salt spray tests according to ISO 9227 as well as for condensed water tests pursuant to ISO 6270-2 part 1 CH and further comparable international standards. Please see further details in the corresponding standard specifications.

Please read this operation manual thoroughly before starting using the unit.

The operating manual instructs the operator to handle this test cabinet with safety and only for the purpose it is designed for. Knowledge of the relevant chapters is an imperative for the safe and correct use. For this reason operators are obliged to get familiarized with the safety instructions and operating conditions in order to avoid personal injury and material damage. All claims and liabilities will be rejected if their cause is incorrect operation and/or incorrect use.

Necessary maintenance works may only be carried out by personnel of VLM or their representatives. Otherwise all claims and liabilities will be rejected.

Our indications are based on the state of our current knowledge.

The information in this manual is subject to technical alterations!

1.2. Operators

VLM corrosion testing instruments may only be operated by personnel instructed and authorized by the owner.

1.3. Note to the Reader

Dear reader,

Our operating instructions are updated regularly. You will find the latest version on our website www.vlmgmbh.de. You help us with your suggestions for improvement to form a most user-friendly operating manual.

Let us know your suggestions by e-mail info@vlmgmbh.de or fax +49 5205 87 963-50.

2. Basic Safety Instructions

2.1. Safety Symbols

The following designations and symbols are used for safety indications throughout this manual:

DANGER!
Immediate danger to life and health of persons. Ignoring these indications can result in severe health hazards.

WARNING!
Possibly dangerous situation. Ignoring these signs may result in slight injuries or causes material damages.

IMPORTANT!
Important indications for the correct use of the unit and other useful information. Ignoring these signs may result in material or surrounding damages.

2.2. Obligations and liabilities

Please observe the indications in this operating manual!

A precondition for the safe and trouble-free use of the VLM corrosion testing instrument is the knowledge of the basic safety instructions. This operating manual, especially the safety indications, have to be followed by all persons who work with this unit. Furthermore, the local regulations and instructions of accident prevention apply as well.

2.3. Safety First

The devices are equipped with electrical and mechanical protectors. They were subjected to a strict safety rules and they all passed acceptance test.

However, incorrect use can:

- threaten life and body of the operator
- damage the instrument and the operator´s property
- diminish the instrument´s operating efficiency

All persons concerned with the installation, commissioning, operation, maintenance and repair of the instrument must:

- be appropriately qualified
- respect follow the rules and instructions provided in this manual

Please resolve any problem that can affect the safety immediately.

2.4. Correct Use

The unit is intended exclusively for the performance of salt spray tests (DIN EN ISO 9227) as well as condensed water test according to DIN EN ISO 6270-2 part 1 Constant Water Condensation.

The instrument was specifically developed for this purpose and must not be operated in a manner in which it was not intended to be used.

Important!
The conditions mentioned in this manual concerning operation and maintenance must be strictly obeyed.

2.5. Authorized Operators

- Only approved persons are allowed to operate the instrument
- The minimum age of operators is 18
- The operator is responsible for third parties within working area
- The areas of responsibility for the different activities in the relation with the instrument must be clearly defined and observed. Ambiguous areas of competence are a safety risk

The owner of the test device must:

- Make this manual accessible to the operator
- Check that the operator has read and understood this manual
- Provide the necessary personal protective equipment
- Make sure that the operating manual is kept nearby the test unit at all times
- The general as well as the local regulations for accident prevention must be accessible and followed
- All safety and danger instructions must be kept nearby the test unit in a readable condition and renewed if necessary

2.6. Protective Equipment

The unit has the following protective equipment:

- Lockable testing chamber door
- Main switch with thermal overcurrent protection

The protective equipment:

- has been installed for the safety of the operator in the surrounding area
- must, under no circumstances, be changed, removed or by-passed as a result of changes to the instrument

Important: Attention is drawn to the possible existence of additional local statutory requirements of national institutions responsible for the health and safety of the operators

Figure 2 Air purge switch

Should the door of the test chamber not be closing properly please check if the test chamber is fully aligned and in the horizontal position

Avoid any contamination of the lab atmosphere by salt fog from the test chamber. When using hazardous chemicals in tests (e.g. SO_2) please pay attention to the guidelines concerning the protection of the health of the lab personal. Always

Figure 1 Evacuate salt spray or SO_2 before opening the door

use the Air Purge function on the control panel before opening the test chamber immediately after the salt spray test has been performed.

Please avoid adjusting the hinges of the door or slots without assistance of VLM personnel (authorized partners).

2.7. Conduct in the Event of Emergency

In case of emergency turn the main switch immediately to the O setting and disconnect the mains plug.

3. Transport

VLM corrosion test cabinets and accessories are put into fumigated wooden crates thoroughly protected against damages.

Nevertheless check the outer packaging if there are damages such as scratches, cracks, holes which may indicate an impact on the goods. If so accept the consignment only under protest.

Be careful, when you take the cabinet and accessories out of the crate. If you use a fork lifter you can take the cabinet from the front side as the forks are longer than the depths of the cabinet (Figure 3).

Figure 3 Transport with a fork lift

However, if you want to transport the cabinet through narrow doors you should take it from the left hand (heavier) side. In this case we strongly recommend to use wooden bars transversely to the longitudinal axis of the cabinet protect the bottom of the cabinet.

If the cabinet shall be stored for a while make sure that the room is dry (Figure 4). The temperature should not fall below 0°C.

Important!

Remove all packaging materials such as foam particles from all inlets and outlets. Be aware of all components under the bottom of the cabinet when you transport the cabinet by a forklifting or hand pallet truck.

Figure 4 Dry storage

4. Technical Description

4.1. Operating Range

Temperature range:

+5°C > ambient > + 55°C

Relevant Test Standards

DIN EN ISO 9227, SS ESS CASS

DIN 50942, DIN 53 167
ASTM B 117-73
ASTM B 287-74
ASTM B 368-68
ISO 7253 ISO 3678
BS 1224, BS 2011, BS3900 F4
BS 3900 F12
BS 5466 Part I
BS 5466 Parts 2 + 3
NFX 41002,
AS 21331 Section 3.1
SIS 1841190
JIS Z 2371
Corporate Standards such as
VW, GM 44, AUDI, BMW,
Toyota, Nissan, Honda,
Jaguar, Rover

Literature:
Standards are available from:

Beuth Verlag GmbH,
Burggrafenstr. 6,
10787 Berlin

ASTM International, 100 Barr Harbor Drive,
PO Box C700, West Conshohocken,
PA 19428-2959
United States
Annual Book of ASTM Standards Vol 03.02

4.2. Standard Salt Spray Test Procedure

A specially designed movable spray nozzle made of polycarbonate is placed at the bottom of the test chamber. The nozzle generates a fine fog by spraying the mixture of the compressed air and the test solution. The most commonly used standards such as the DIN EN ISO 9227 or the ASTM B117-73 usually prescribe 5% sodium chloride solution.

The test solution is stored in a separate reservoir on castors inside the lower part of the cabinet. An electronically controlled diaphragm dosing pump is pumping the solution to the spray nozzle at constant flow rate.

The nozzle produces a fine moist fog by mixing the solution with clean compressed air (0,8 - 1,0 bar) which is saturated with humidity. The humidity is added to the compressed air in the humidifier at 50 °C before entering the nozzle.

Finally, the salt spray in a form of fine moist fog condensates on test specimens inside the test chamber and causes corrosion.

4.3. Benefits of the VLM Technology

In conventional test chambers the salt solution is sucked out of constant level vessels by the compressed air. The size of the droplets depends of the pressure of the compressed air.

VLM salt spray cabinets are equipped with an advanced diaphragm pump which allows a very accurate control of the solution flow rate. In this case the flow rate of the test solution does not depend on the pressure of the compressed air. Moreover, the flow rate and air pressure can be controlled independently. This technique allows the maximum reproducibility of the size of the droplets in the mist which guaranties the reproducibility of the salt spray test.

4.4. The Principle of Operation of the Salt Spray Test Cabinet

In Figure 5 on the following page the principle of the basic operation of the salt spray test cabinet is shown.

Sodium chloride solution (5 %) is supplied by an electronically controlled diaphragm dosing pump at a flow rate of approx. 0,3 l/h to a spray nozzle (atomizer) mounted in the center of the test chamber. As the flow rate can be accurately set independently from the compressed air pressure the SAL Cabinet provides a high reproducibility of the test conditions.

The test solution is sprayed by means of compressed air (0,8 - 1 bar) which is saturated with humidity by passing through the humidifier. In this way the decrease of the NaCl concentration is avoided.

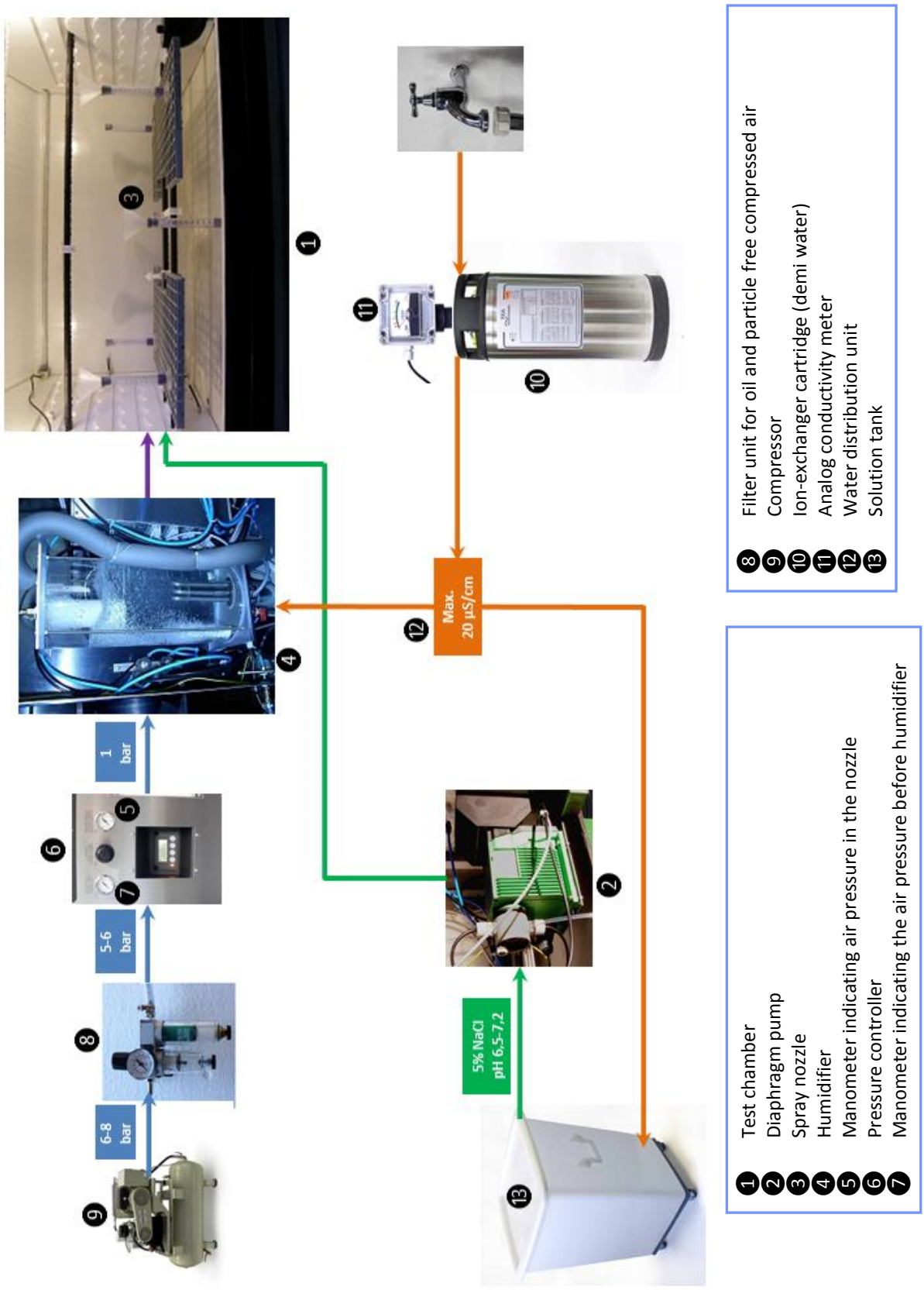


Figure 5 The basic operation of a salt spray cabinet

The water temperature inside the humidifier has to be adjusted to 15°C above the chamber temperature in order to reach the chamber temperature after leaving the spray nozzle. This is essential because the compressed air cools down when it expands.

The fine salt fog condensates continuously on the surfaces of the test specimens and causes corrosion depending on the resistance of the coatings. The fall-out rate has to be determined according to ISO 9227-2 by collecting funnels and measuring cylinders.

The ISO 9227-2 stipulates the determination of the corrosivity of the chamber. We strongly recommend to carry out this check. You will find all the necessary equipment in the chapter “Accessories”

4.5. Front View SAL 400-FL

Figure 6 shows the front view of the cabinet.

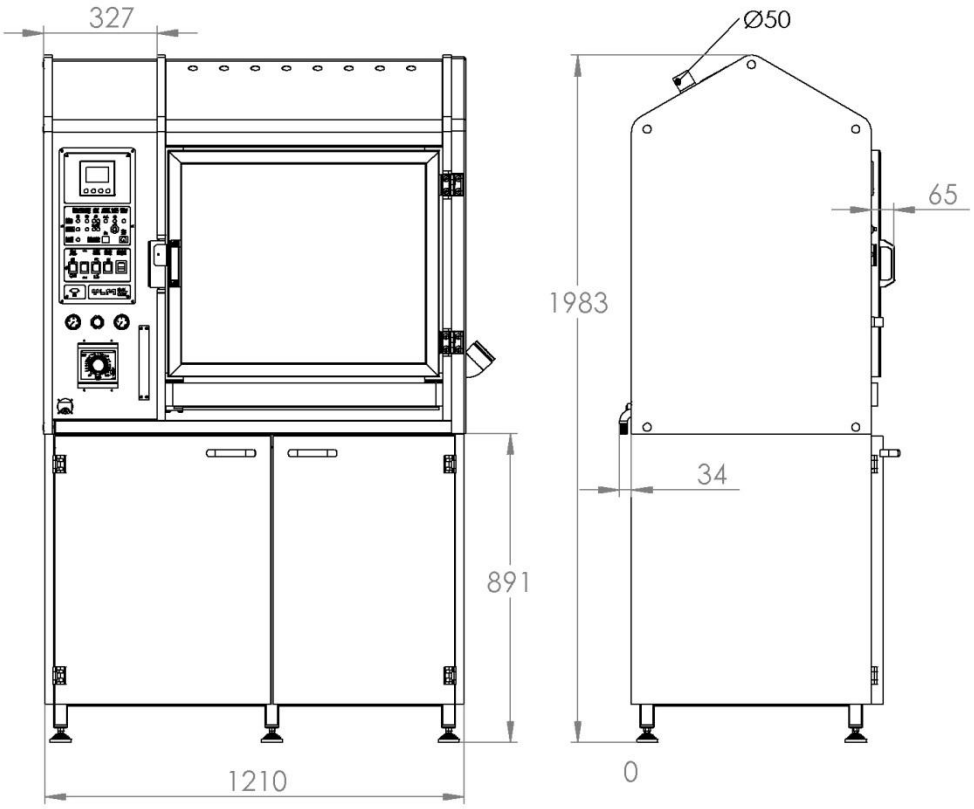
Figure 6 Front view SAL 400-FL test cabinet

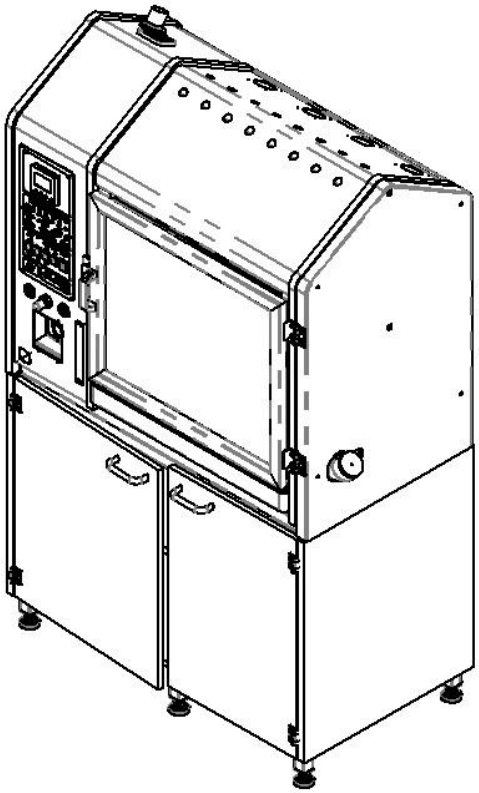
1. Test chamber
2. Pivoting chamber door
3. Control panel
4. Test solution pump
5. Pressure regulator with manometers
6. Bench with adjustable feet
7. Compartment for the standard test solution tank
8. Compartment for the water purification unit

4.6. Technical Specification

Model	SAL 400-FL front loading test cabinet
Chamber capacity	400 liter
Chamber dimensions W/D/H1/H2	800 x 605 x 920/733 mm
Materials	stainless steel coated with Halar® (ECTFE) Polyethylen
Door opening dimensions WxH	inner pane made from security glass, outer pane made from Polycarbonate 740 x 643 mm
Specimens capacity, max. load	6 x 26 Standard panels in standard racks or 6 x 36 in special holders, stainless steel rods coated with plastic max. load ca. 20 kg per rod Total specimens load: 200 kg
Interior lightning	standard: 1 corrosion protected lamp
Cable entry port	option: 100 ml diameter, closed by a syphon
Operating systems	"Salt Spray acc. to DIN EN ISO 9227 NSS, ESS, CASS" Option: Extension to conduct intermittent or Prohesions® salt spray tests
Working temperature	5°C > ambient up to + 55°C, over temperature protection
Temperature Controller	Jumo dTRON, user friendly PID controller, display resolution 0,1 °C
Temperature sensor type	Pt 100 PTFE coated
Temperature stability	± 0,5 °C
Communication interface	RS 232 (optional)
Heaters	Chamber: 2 Micanite surface heaters Humidifier: 1 immersion heater 1000 W (Over temperature protection)
Electrical supply /Connected load	230 V 50/60 Hz approx. 1800 kVA
Compressed Air	purity acc. to ISO 9227 oil and particle free, filter unit required, connected pressure 5 -7 bar, quick connector plug size 5
Water supply	Demineralized water, conductivity max. 20 µS/cm, pressure min. 2 bar, automatically refill, Consumption humidifier: ca. 1 L /day
Exhaust pipe outer diameter	hose ID 50 mm
Test solution capacity	200 L reservoir on castors, consumption: ca. 0,6 L/h
Total weight including the bench	256 Kg
Case	robust stainless steel frame, stainless steel /polyethylene walls
Case outer dimensions W/D/H	test cabinet (including bench): 1210 x 922 x 1983 mm
Technical Data are subject to amendments!	

4.7. Technical Drawings with Dimensions





4.8. Control Panel

1. Main power switch
2. Switch interior lighting
3. Chamber cleaning (option)
4. switch toggle between: a) start salt spray, b) stop salt spray, c) air purge
5. pilot lamp overtemp. chamber
6. pilot lamp overtemp. humidifier
7. pilot lamp compressed air
8. pilot lamp chambers heater
9. pilot lamp humidifier heater
10. switch chamber door
11. JUMO dTRON controller
12. communication interface RS 232 (optional)

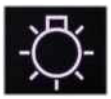
Control Panel /Symbols

Temperature control (chamber)

Temperature peak limitation, over temperature protection

Evacuation of the salt spray from the chamber

Prepress pressure of the compressed Air at the nozzle

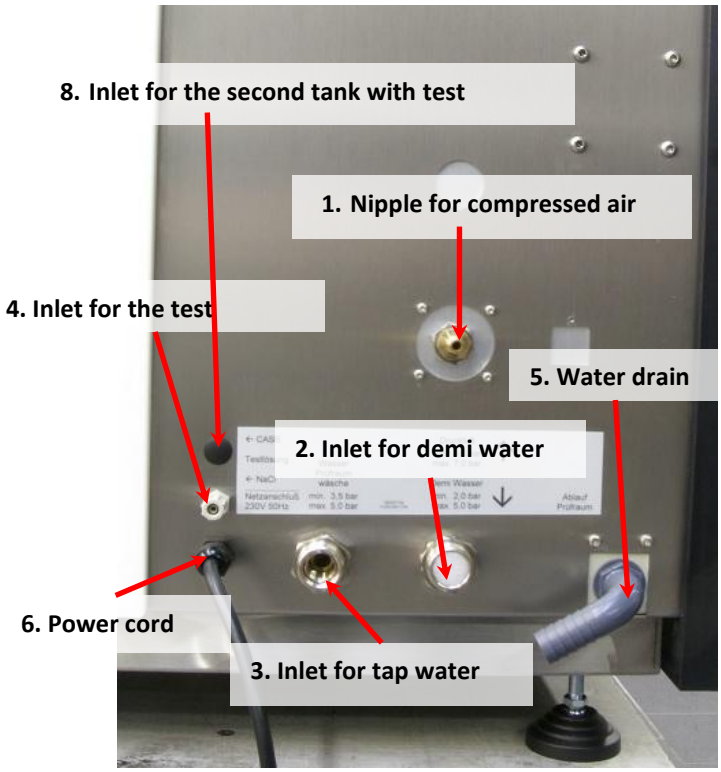


Interior lighting

Salt spray

4.9. Inlet and Outlet Connectors

All inlets for electricity (mains, control), fluids (purified water and compressed air supply) as well as the water drain and air exhaust are located at the rear side of test cabinet.



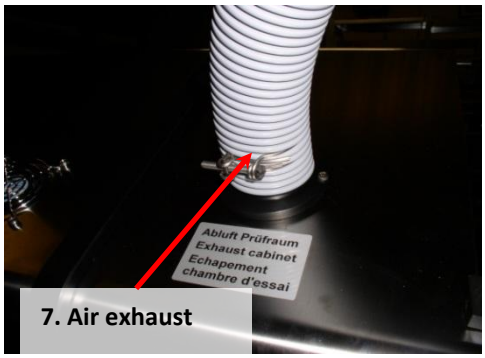


Figure 7 Connections at the rear panel of the test chamber

Air Exhaust

The exhaust of salt spray cabinets is highly corrosive! Therefore a plastic pipe of 50 mm diameter has to be installed preferably leading directly to outdoors.

It is recommended to install the plastic pipe in the vicinity of the cabinet so the delivered 2 m exhaust hose (standard accessories) will not droop and consequently be blocked by condensate. Do not connect the hose of the exhaust to a laboratory exhaust system. In this case an atmospheric equilibration has to be provided by inserting of the 50 mm pipe into the pipe leading to the vent system. This means that there is no risk that the fog will be sucked out of the cabinet.

Table 1 Legend

		Standard	Pressure	Connection
1	Nipple for compressed air	Particle and oil-free (DIN EN ISO 9227)	6-7 bar	Nipple size. 5
2	Demineralized water	0,1 - 20 µS/cm (DIN EN ISO 9227)	2-5 bar	¾" male thread
3	Demineralized or tap water (chamber flushing	< 500 µS/cm	3,5 – 5 bar	¾" male thread
4	Test solution from Tank 1	gem. DIN EN ISO 9227	No pressure	compression fitting
5	Water drain		No pressure	PVC hose Ø 20 mm
6	Power cord	230 V		
7.	Air exhaust			PU hose Ø 50 mm
8.	Free opening for connecting second tank with test solution	gem. DIN EN ISO 9227	No pressure	compression fitting

4.10. Key System Components

The spray nozzle is mounted in the middle of the two lowest bars in the test chamber. Make sure that the nozzle is tight fastened and that it sprays in the vertical direction.

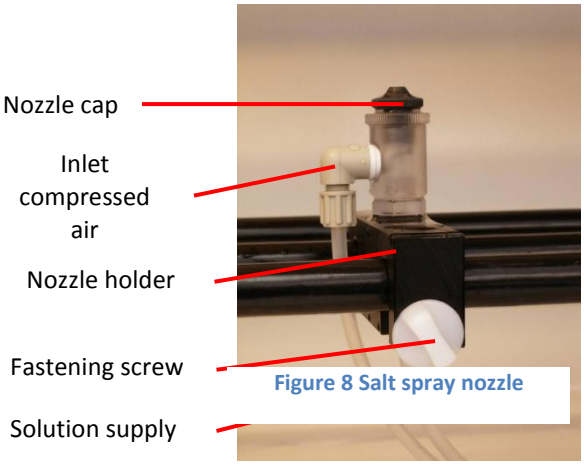


Figure 8 Salt spray nozzle

The diaphragm pump (Figure 10) is furnished with a head made from polypropylene thus it is resistant to corrosion.

If the pump head is empty or if there are air bubbles the pump may not be able to press the liquid through the valve. In this case the venting screw has to be opened and the pump should be operating for a short period of time so that the air can escape through the transparent PVC venting hose. When the water starts coming out of the venting hose the venting screw should be tightened again. The pump is now ready for normal operation.

Please note that the control wheel on the front side should not be manually operated (Figure 9). In the normal operation the pump is controlled by the controller.

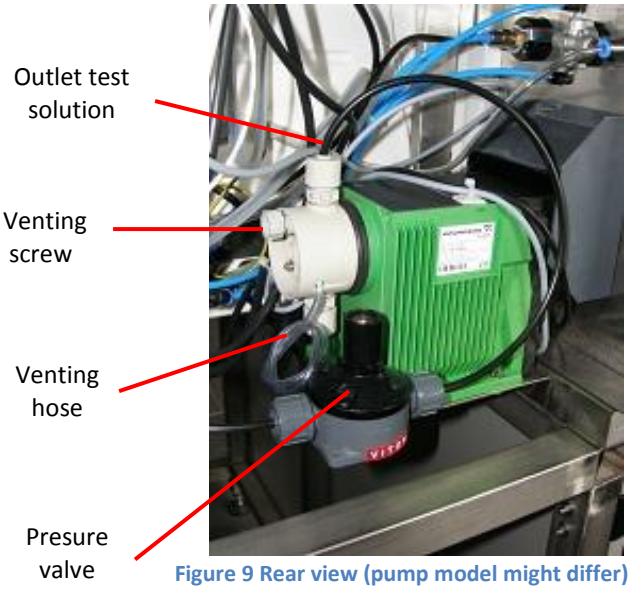


Figure 9 Rear view (pump model might differ)

Figure 10 Front view of the DDE pump model

Figure 11 Front view control panel

According to ISO 9227 the compressed air has to be saturated with moisture. For this reason the air is introduced into the humidifier filled with

demineralized water (Figure 12). The air is distributed by the filter with 5µm pores thus small bubbles are formed. If the air or the water purity does not comply with the ISO 9227 the filter will be blocked very soon. In this case the pressure on the manometer “Humidifier” will increase. If the difference to the pressure on the manometer “Nozzle” is more than 0,6 bar, the filter has to be renewed. This can be done by local personnel as described in the chapter service and maintenance.

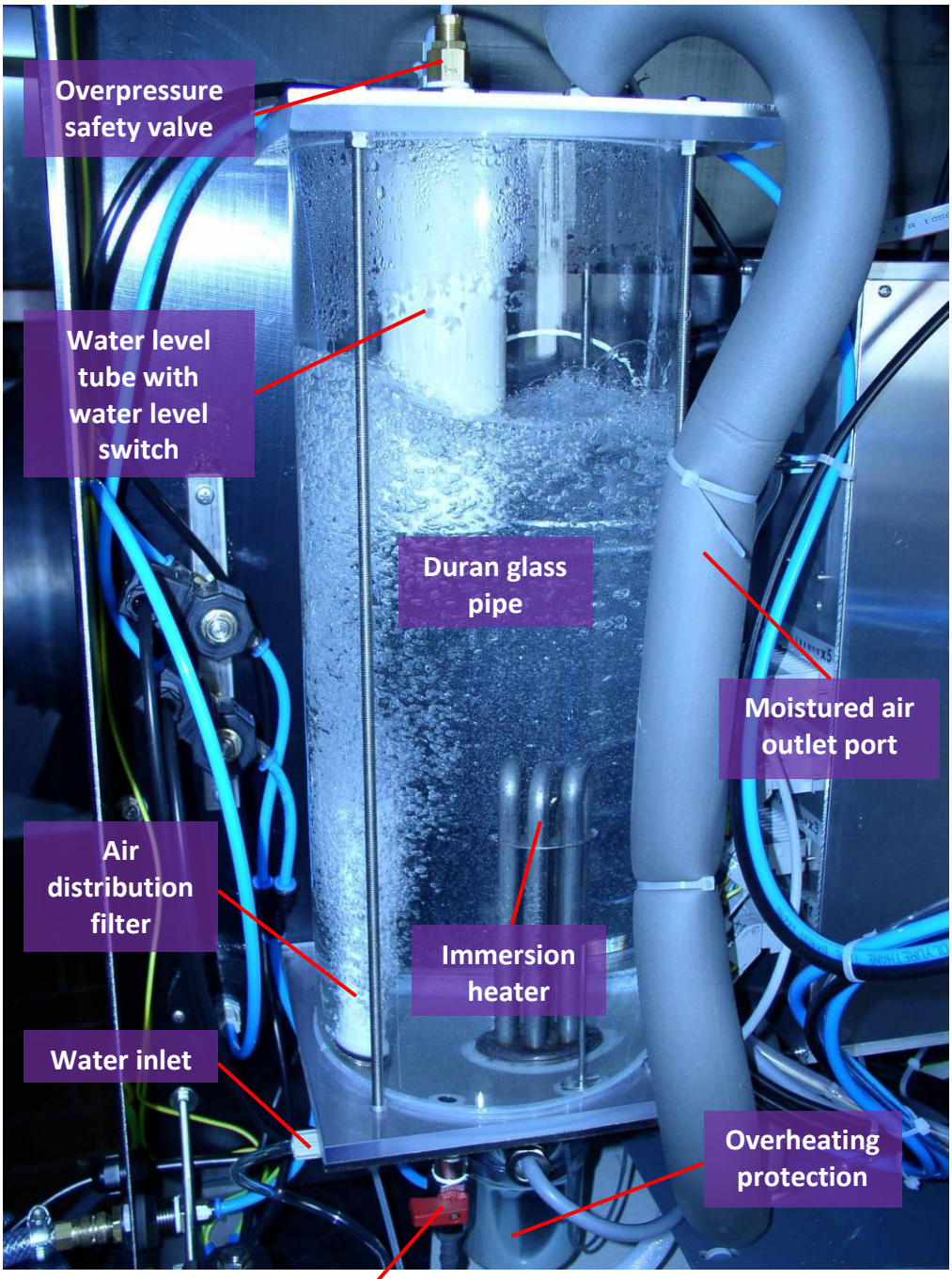


Figure 12 Humidifier and its components

According to ISO 9227 the compressed air has to be saturated with moisture. For this reason the air is introduced into the humidifier filled with demineralized water. The air is distributed by the filter with 5µm pores thus small bubbles are formed. If the air or the water purity does not comply with the ISO 9227 the filter will be blocked very soon. In this case the pressure on the manometer “Humidifier” will increase. If the difference to the pressure on the manometer “Nozzle” is more than 0,6 bar, the filter has to be renewed. This can be done by local personnel as described in the chapter service and maintenance.

Note that the conductivity of the supplied demineralized water must not exceed 20µS/cm. Otherwise hardness builder will fall out and contaminate the humidifier. For proper function watch the conductivity meter on the ion-exchanger cartridge and interchange it in time.

There is only a low consumption of demineralized water (0,5 - 1 liter per 24 h). However if there is no water supply the water level switch indicates low level and the salt spray working system will be cut off.

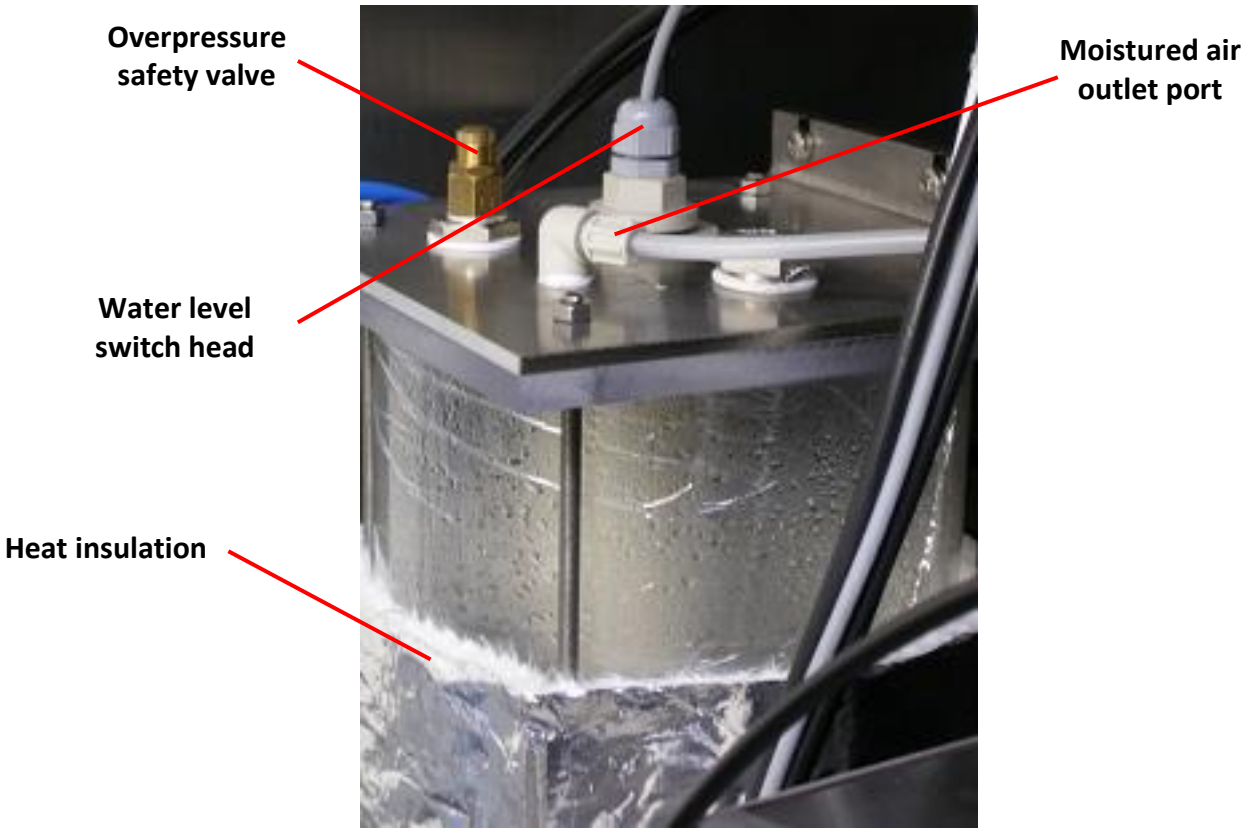


Figure 13 Humidifier - top view

The humidifier heater over temperature switch is accessible by dismounting the upper part of the heater housing (Figure 14). In case of over temperature the spring will jump in the upper position. After cooling down the spring can be pressed down to the normal position (Figure 15).

Figure 14 Heater housing located below the humidifier

Do not turn the screw for adjusting the humidifier temperature!

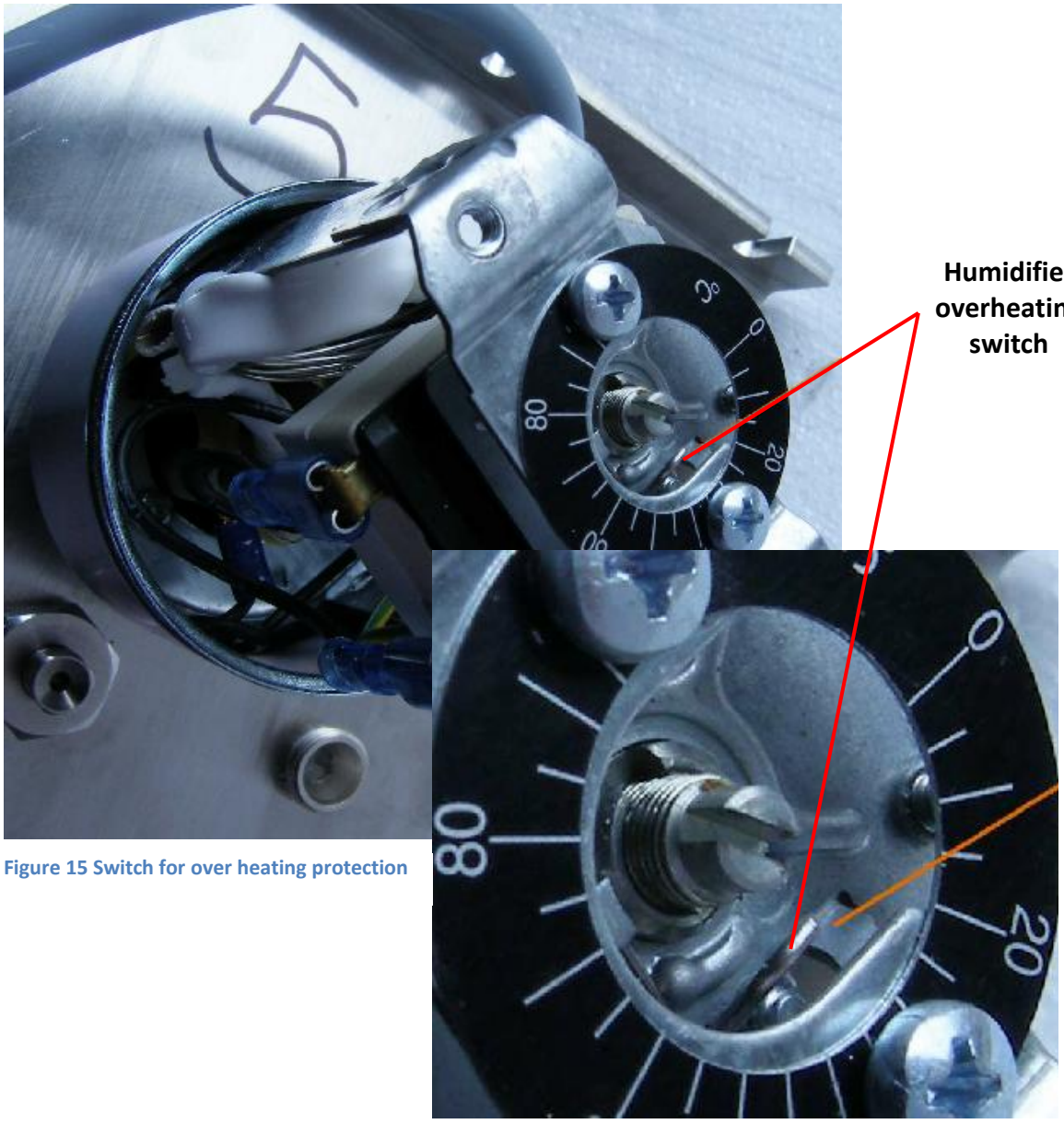


Figure 15 Switch for over heating protection

Figure 16 shows the control panel of the Jumo controller.

Figure 16 Jumo controller

1 Display Actual/Set Value Temperature Chamber °C
2. Set value
3. Display Actual/Set Value Temperature humidifier °C
4. Programming Key, up and down key, exit key
5. Indicating active components
   - 2 = *Spraying salt solution*
   - 3 = *Heater chamber on (blinking)*
   - 4 = *Heater humidifyer (blinking)*
6. Segment-Display for the unit = °C

Attention:

In the event of overfilling of the humidifier "FULL" appears in the green display. The cabinet will be switched off.

4.11. Setting Controller Parameters for SAL Mode

The Test chamber operates in one mode - SAL. The default set values for the temperatures in the chamber and for the humidifier are already stored in the controller. These values are as follows::

SAL Mode

The default temperatures are (factory setting):

- Test chamber: 35 °C
- Humidifier: 50 °C

Important Note: ***For technical reasons the temperature of the humidifier should be in most cases 15 °C higher than the temperature of the test chamber. For safety reasons the control program requires only the temperature difference (ΔT=15 °C) which is stored in the controller as a parameter (SPbE) and should not be changed by the operator (should this be the case please contact VLM). This implies that the operator can/should change only the set temperature in the test chamber and the temperature in the humidifier will automatically follow and keep the difference of 15 °C.***

Should these values be changed (e.g. in case of a CASS test where test chamber temperature should be 50 °C the corresponding humidifier temperature is automatically set to 65 °C) the procedure described below should be followed.

There are two ways to set the operating temperatures of the test chamber and humidifier. The first one is in the so called **User** mode of the controller and the second one is in the **Program** (Pro) mode of the controller.

User mode:

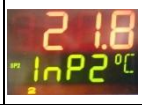
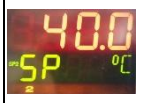
This is an easier to use mode since the Jumo dTRON controller has all parameters for standard SAL test already preconfigured. The set value of the temperature is shown on the LED display of the controller.

In this mode the time of the test duration cannot be set and the test will run as long as the operator does not stop the test manually. In case the test parameters (chamber temperature) should be changed the operator must do it manually. There is no time display showing either how long has the test been active or how much time until the end of the test.

During the normal operation of the test chamber the orange pilot lamps are illuminated and blinking.

Table 2 on the next page describes the procedure necessary to program the controller in the user mode.

Table 2 Programming procedure

Step	Mode	Press PGM	Press ▼	Display indicator	Meaning	
1	SAL	**PGM**		User	Name of the controller mode	
2	SAL	**PGM**		InP2	Actual humidifier temperature	
3	SAL		▼	SP1	Set chamber temperature in SAL mode (*press PGM and then* ▼ or ▲ *to change the set value SP1*)	
4	SAL		▼	SP	Control of the temperature set point for the SAL mode	
5	SAL		▼	tres	In the User mode this display shows 00:00. In the Program mode this display shows the remaining test time.	
6	SAL		▼	SPbE	Set temperature difference between the chamber and humidifier (normally is this parameter 15°C; press PGM and then ▼ or ▲ to change the set value SPbE). Only for SAL mode	

Program (Pro) mode:

In this mode the test can be run according to a user defined program. Both the chamber temperature and the duration of a test phase (segment) can be programmed. In this mode the time elapsed from the beginning of the test is displayed in the main screen (green LED display).

Once the program has been configured it can be started by pressing the upper arrow ▲ on the controller. The double point on the green part of the display will start blinking indicating that the time runs. The program can be stopped by pressing the same button on the controller once again.

Table 3 on the next page shows how to access the Program mode and how to define / configure a new program. Each program can contain up to 8 segments with various chamber set temperatures and various durations.

Table 3 Configuration of the Program mode

Step	Mode	Press PGM	Press ▼	Display indicator	Meaning	
1	SAL	**PGM**		User	Name of the controller mode	
2	SAL		2x▼	Pro	Name of the controller mode (Program)	
3	SAL	**PGM**		SPP1	Set Point Program 1 for chamber temperature in CON/SAL mode (*press PGM and then* ▼ or ▲ *to change the set value SPP1*)	
4	SAL		▼	tP1	Set Time Program 1 defines the time duration for SPP1 temperature in CON/SAL mode (*press PGM and then* ▼ or ▲ *to change the set value tP1*)	
5	SAL		▼	SPP2	Set Point Program 2.	
6	SAL		▼	tP2	Set Time Point 2.	
7	SAL		▼	SPP3	Idem	
8	SAL		▼	tP3	idem	

Once the program has been configured it can be started by pressing the upper arrow ▲ on the controller. The double point on the green part of the display will start blinking indicating that the test (time) runs. The program can be stopped by pressing the same button on the controller once again.

5. Requirements for Installing the Test Chamber

5.1. Aligning of the Cabinet

Follow the following procedure for aligning the cabinet:

1. Align the cabinet that way that there is a downward slope towards the drain. This will allow the condensate to flow freely and completely out of the test chamber. This should be done by adjusting the height of the feet (Figure 17).
2. Close the drain by a rubber stopper.
3. Put water into the chamber so the base is covered. Pull the stopper out of the drain outlet. Watch the water if it is running evenly and completely off the base to the drain. If necessary adjust the feet.
4. The test cabinet frame is mounted on the bench by 4 screws (Figure 18). If the cabinet has to be transported separately it has to be fixed again after putting on the bench.

Make sure, that the cabinet is placed tension free.

Figure 18 Fixing the cabinet to the lower bench

Figure 17 Adjusting the length of feet

5.2. Demineralized Water Supply

Figure 19 Leakage safety unit

Connection to the cabinet: 3/4” (outer thread)

Water purity: max. 20 µS/cm

If there is no central supply of demineralised water an ion-exchanger cartridge has to be installed (Figure 20). The water pressure must be at least 2 bar in order to be able to fill the humidifier. For this purpose a stop cock (with ¾” male thread) for the fresh water supply should be installed in the vicinity of the test cabinet / chest. If there is no floor drain a leakage safety unit (Figure 19) has to be installed in order to avoid flooding in case of a break of the tubing

A 230 V socket has to be installed in the vicinity.

It is recommend to always have a spare ion-exchanger cartridge at hand with a quick coupling system. This will prevent interruption of tests when the exhausted cartridge requires replacement.

Figure 20 Ion-exchanger cartridge

Very Important!

Any connection pipe or hose between the water purification plant and the corrosion test cabinet must either be made of stainless steel or plastic for demineralised water is very aggressive to brass, iron or copper and would cause a failure of the humidifier due to contamination by those metal oxides.

Check if all parts are delivered before starting the installation of the water purification plant. Pay attention to the instruction manual of the manufacturer of the ion-exchanger cartridges.

Figure 23 Purified water splitter

Figure 21 Analog conductivity meter

Figure 22 Digital conductivity meter

Important!

If there is no drain in the floor a leakage water safety unit (Figure 19) has to be installed to prevent any damages caused by flooding. In case of a leakage or burst of the hoses the sensor to be placed on the floor will immediately give a signal to the magnetic valve to installed at the water tap thus this will be actuated and close.

1. Mount the delivery unit at the wall thus it is convenient to be operated
2. Mount the quick connector nipples on the ¾“ threads of the outlet / inlet of the cartridge

3. Connect the plastic nipple with the female quick connector and the other side with the hose. Press this female connector on the nipple of the freshwater inlet of the cartridge (indicated on the cartridge)
4. Connect this hose with the fresh water tap resp. to the safety unit
5. Screw the second female quick connector on the plastic double-nipple and the conductivity meter on the other side. Press this unit on the pure water outlet of cartridge (indicated on the cartridge). Connect this unit with the delivery unit by a hose.
6. Connect the delivery unit with the water inlet of the cabinet with a hose.
7. Mount the stop-cock at the delivery unit and push a PVC hose on the outlet of the stop cock
8. Put the plug of the conductivity meter into a socket (230 V).

Figure 24 Ion-exchange cartrige

Important!
Note, that the actual conductivity will only be indicated when the water is flowing. Conductivity meters are shown in Figure 21 and Figure 22

Once you put an ion exchanger cartridge Figure 24 into use pay attention to the fact that the air will be completely displaced by the water. Open the venting screw at the top of the cartridge thus the air can escape. Close this screw after there is only water coming out of the cartridge.

5.3. Drain

The waste water is leaded into a siphon by a plastic hose with 20 inner diameter. In case of CASS solutions regional environmental protection regulations have to be taken into account.

If there is no sufficient downward slope we offer a sewage water pumping system (Figure 25).

Figure 25 Drain water pump

5.4. Compressed Air

According to the standard ISO 9227 the compressed air has to be oil and particle free. For this purpose a maintenance unit has to be installed and connected to the cabinet (Figure 27). There is an inlet nipple of size no. 5.

In case there is no permanent supply of compressed air it is recommended to use a low noise screw compressor (Figure 26).

Figure 26 Air compressor

5.5. Electrical Power Supply

The cabinet is equipped with 2m electrical cord with a plug. For more information please refer to the table with technical data.

Voltage: 230 V, frequency: 50-60 Hz, fault-current circuit breaker,

Recommendation: pursuant to the requirement 3-5 sockets

Figure 27 Water and oil filter for compressed air

5.6. Compressed Air Supply

The pressure of the compressed air should be between 5 and 7 bar which is required for the air purge in order to disperse lace the salt mist in short time.

Make sure that the compressed air entering the cabinet complies with the requirements of the ISO 9227 and is oil free (0,2 mg/m³) and particle free < 5 µm.

Be aware of shavings in case new pipes have been installed. These particles may enter the inlet valve and block it.

We strongly recommend the installation of a compressed air maintenance unit (Figure 29) which is available as an accessory.

There is a female connector Size 5 to connect the hose (Figure 28).

In case there is no clean compressed air available VLM can supply silent compressors fit to the salt spray cabinets.

Figure 28 Compressed air inlet

Figure 29 Compressed air filter

5.7. Air Pressure Regulators (Control Panel)

Figure 31 shows the part of the control panel with air pressure control. The air pressure in the humidifier and spray nozzle will be regulated by turning the black knob clockwise to increase the pressure and vice versa. We recommend to run salt spray tests at 1.0 bar in the spray nozzle. The cabinet has been calibrated and tested in the factory at this pressure in the nozzle.

Figure 30 Air filter (humidifier)

The manometers (Figure 31) indicate the pressure in the nozzle and before the humidifier. With a new air filter (Figure 30) in the humidifier there is only a small pressure difference of +/-0,2 bar. However in the course of time and depending of the purity of the compressed air the ability of the filter to pass compress air will deteriorate. It is recommended to change the air filter in the humidifier if a pressure difference indicated by two manometers exceeds 0.6 bars.

Figure 31 Air pressure control on the control panel

Never adjust the air pressure before the humidifier to above 1.6 bar otherwise the cap of the filter may be shot off the filter and the safety valve will be activated.

Besides the manometers the compressed air pressure is monitored by the pressure inlet switch and indicated green pilot lamp provided the minimum pressure of 2 bars are exceeded.

If there is no compressed air or does not reach the absolutely minimum of 2.5 bar the test procedure will be automatically stopped.

5.8. Exhaust

The exhaust hose should be connected to a plastic pipe d=50 mm which should be led through the wall into the open air (Figure 32). Please mind that there is no counter-pressure from outside.

Please avoid connect the hose directly to the laboratory air conditioning system while the highly corrosive salt fog can spread throughout the building and damage equipment. Also do not connect it to any drainage pipe system because the climate inside the testing chamber could be affected by under- or overpressure.

Figure 32 Properly connected exhaust

During the installation fill the gaps inside the spiral hose with silicon adhesive to seal it in order to prevent the condensed liquid to contaminate the case with salt. Pull the end of the hose over the exhaust pipe of the cabinet and fix it with the clamp. Fix the other end in the same way and make sure that the hose will not form a curve which could get blocked with the condensate (Figure 33).

When installing the exhaust piping between the exhaust outlet of the cabinet and the outdoor environment please make sure that there is no segment in the piping which forms siphon effect (Figure 33)

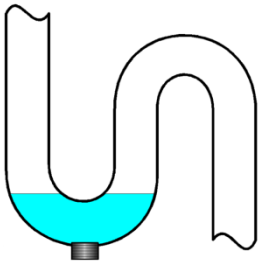


Figure 33 Siphon effect

Should there be no other choice than connecting the exhaust to the laboratory air conditioning system please make sure that the exhaust hose coming from the cabinet has smaller diameter (d=5 mm) than the diameter of the venting pipe (d=50 mm). Slide the hose approximately 20 mm into the venting pipe. In this case the venting pipe will suck only ambient air and will not affect the ambient in the test chamber (Figure 34).

Attention: The exhaust air of the cabinet may cause corrosion of the cabinet and other equipment if it enters the room.

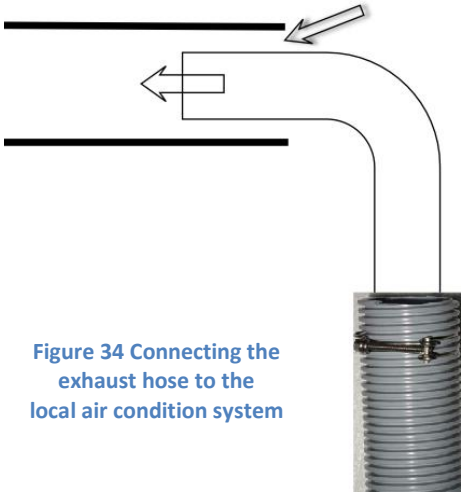


Figure 34 Connecting the exhaust hose to the local air condition system

5.9. The Salt Solution Reservoir

Make sure that the reservoir for solution is clean, otherwise the salt solution filter will be blocked in short time. Always cover the tank with the lid.

Figure 35 Solution filter

Test the function of the cabinet with pure demineralised water instead with the salt solution and adjust the salt spray system (the fall-out rate) to be in compliance with the standard. For this purpose fill the reservoir with ±30 litre demineralised water.

In case of a dual reservoir plant connect the second hose as shown in Figure 36 below. Make sure that the screws are tight to avoid any air entering the hose while the solution is being sucked by the diaphragm pump.

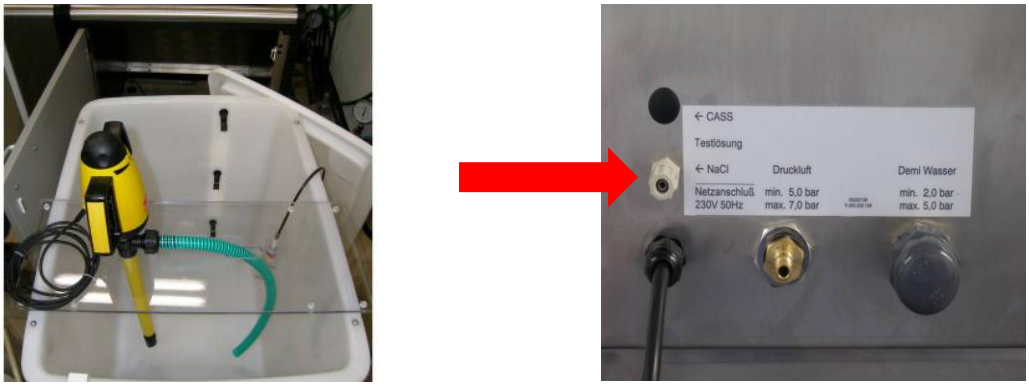


Figure 36 Connect the reservoir to the solution inlet at the back of the cabinet

In this case (dual reservoir) the plug of the automatic switch-over sensor should be plugged into the socket installed at reservoirs.

Note that the red LED is illuminated according to the active reservoir.

5.10. Sewage Water

The drain pipe should have downward slope in order to allow a free flow of the run-off water. Should this not be possible (e.g. the siphon is on a higher level than the test chamber) it is recommended to install a sewage water pump which is available as an accessory (Figure 37).

Moreover, make sure that over pressure or under pressure will not occur when connecting to the sewage system since this might affect the climate conditions in the testing chamber.

Figure 37 Drain pump

5.11. Power Supply

Make sure that there are enough sockets to connect the cabinet and the conductivity meter (if a water purification unit is installed). The electrical installation may only be carried out by an expert. The rated voltage of the unit has to be corresponding to the mains voltage. In order to reach the maximum electrical safety a current-operated earth-leakage protection/tripping current 30 mA is recommended.

6. Commissioning

6.1. Preparation for Tests

Important!

Make sure, that all supplying or waste tubes have been connected properly and the fresh water tap is open.

Figure 38 Main switch

Press the green main switch (Figure 38):

- The diaphragm pump is running
- The humidifier is being filled with water

Figure 39 Humidifier

Pay attention to:

- The air purge switch is in the top position “Spraying”
- The door is tightly closed
- The green pilot lamp is illuminated and the manometer “nozzle” indicates the pressure of the compressed air at 1.0 bar

Once the humidifier is filled up to the top level the heater is switched on. This is indicated by the orange pilot lamp as well as by appearing of “3” underneath on the display.

The chamber heater is on indicated by the orange pilot lamp as well as by appearing of “2” underneath on the display.

If the test cabinet has not been working for a long time it might be necessary to bleed the diaphragm pump for the test solution. In order to perform the bleeding the pump should be operating and the air relief screw should be slightly opened. This procedure is recommended in order to get the air out of the tubing system in the shortest possible time. When all air from the tubing is escaped and only water start coming out the screw should be closed again.

Figure 40 Control panel with the diaphragm pump

In order to measure the fall-out distribution in the test chamber pursuant to the ISO standard 9227 the salt spray test should be running and the measuring cylinders (Figure 41) should be carefully placed in the test chamber (in the middle of the areas on the right and left hand side besides the spray nozzle).

Figure 41 Measuring cylinders

If the fall-out rate is out of the range of 1,0 - 2,0 ml/h after at least 16 hours or shows big differences among the cylinders you should check the pressure of the compressed air. Lower pressure will increase the share of bigger droplets. Preferably the pressure should set at 1,0 bar in order to produce a fine salt mist.

If the fall-out rate is less than 1 ml/hour the flow rate you should be increased by turning the control button on the operating panel of the pump.

Only if these optimising measurements are not sufficient the spray nozzle has to be adjusted.

Attention:

Do not open the chamber door before the salt mist has been evacuated. The escaping salt spray may cause corrosion on surfaces of other devices, furniture or electronic boards. Use the air purge.

Note that the condensate has to be lead to the drain. It must not be reused.

Purity of the water

Do not use fresh water, neither for the preparation of the test solution nor for the humidifier. Stick to the specification indicated in the standards, such as the ISO 9227.

We strongly recommend to use the ion exchange cartridges as a reliable pure water source. Always watch the conductivity on the measuring gauge and timely replace the cartridge by a regenerated one.

Regard and treat this cabinet as a testing device. Keep it clean and make sure, that it will be serviced within the set intervals.

Note that the inside of the test chamber is coated with ECTFE (Halar®) which may only be cleaned by a soft cloth and non abrasive cleaning agent.

Remove any salt residues on the outer case with a wet cloth.

Protect the surfaces by applying cleaning and protecting sprays.

General Test Procedure

Never put specimens directly on the floor of the chamber.

Place specimens in the testing chamber in accordance with the ISO 9227. Specimen racks with slits of an angle of 20° for test panels are available as standard accessories. Moreover VLM offers a variety of specimen holders for special parts such as very small specimens, disc brakes, or wheels.

Place the specimens in the testing chamber as stipulated in the ISO 9227 so that they will not affect each other. Make sure that no condensate can rinse or drop from one specimen to another one below. Note that no test solution will accumulate in the cavities of specimens.

A variety of Stylus tools for applying cuts on coated surfaces are available as accessories.

Attention:

- ***Check if there is enough test solution in the reservoir to run the test.***
- ***Make sure that the compressed air at the required pressure is permanently available.***
- ***Check if the fresh water tap is open and the pure water supply is guaranteed all the time***

6.2. Starting the Salt Spray Test

Figure 42 Solution reservoir

Before starting the test make sure that:

1. There is sufficient test solution in the reservoir
2. The fresh water tap is open
3. The distribution of the salt solution from the reservoir to the inlet of the cabinet is properly done
4. The door of the chamber has been closed tightly

Starting the test:

1. Press the green main switch
2. Press the purge switch to top position (Spraying Symbol)

Figure 43 Main switch

Check if:

Figure 44 Manometer

1. The correct flow rate is indicated on control button of the pump (not all provided pump models have digital display)
2. The inspection tube is full of test solution
3. The manometer indicates the correct pressure of 1.0 bar and the green pilot lamp on the panel is permanently illuminated
4. The set value of the chamber temperature has been set to 35,0 °C and the orange pilot lamp is blinking
5. The set value of the humidifier is set to +15 °C > chamber temperature and the orange pilot lamp is blinking

6.3. Preparation of the Test Solution

Figure 45 Reservoir with circulation pump

Read the ISO 9227 to be well informed about the stipulated specification of the preparation of the test solution.

As impurities of sodium chloride, such as anti-caking compounds, have a more or less impact on the chemical reactions on the surface of the specimen we strongly recommend to use SaliCORR® suitable for corrosion tests.

Note that the concentration is indicated weight /weight. If you want to make 100 kg test solution you have to solve 5000 g NaCl in 95 kg demineralised water.

Weigh the exact quantity of high pure NaCl on a suitable balance or take a pre-packed bag of SaliCORR® (Figure 46).

Pour it slowly into the test solution reservoir and simultaneously demineralised water so most of the NaCl will be solved during the filling of the reservoir.

It is recommended to use a circulation pump and immerse the hose with demi water into the water thus no carbon dioxide will be introduced into the solution while refilling.

Mix the solution after a little while again and check the concentration by a refractometer (Figure 47, see Accessories) and the pH value with a pH measuring gauge (Figure 48).

Figure 46 SaliCORR

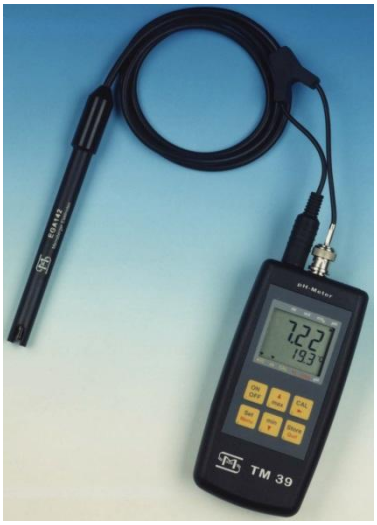


Figure 48 pH meter

Check the pH value by an electronic pH meter.

Adjust the pH value by adding of sodium hydroxide solution (10% conc.) resp. hydrochloric acid (10% conc.) thus the pH range of 6,5 - 7,2 is guaranteed.

Figure 47 Refractometer

6.4. SaliCORR® Sodium Chloride for Corrosion Tests

According to the standards impurities of the applied sodium chloride must not exceed 0,3 %. Particularly the content of sodium iodide must not more than 0,1 % and that of copper and nickel not more than 0,001%. The special quality of sodium chloride offered by VLM complies with the requirements described in the standards

Important: Do not use sodium chloride commonly used in the food industry or technical applications. Those kind of salt often contents anti caking substances such as calcium carbonate which inhibits the corrosion process and affects the function of the function of the cabinet.

Another method to prevent sodium chloride from caking is spraying with potassium hexacyanoferrate solution. However, it has been proved by scientists of the university of Graz (Austria) that this compound has an accelerating effect as a catalyst on the corrosion process on metal surfaces.

We certify that our sodium chloride is free of Hexacyanoferrate.

Sample

Quality Certificate

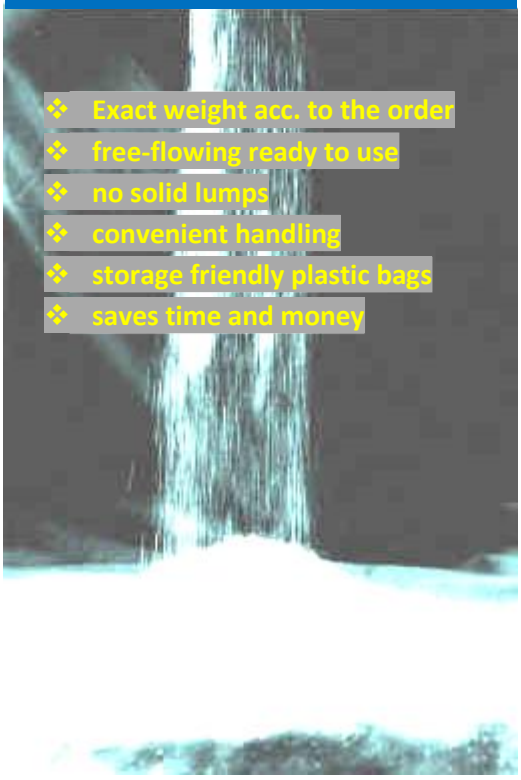
SaliCORR® Sodium Chloride, NaCl Special quality for Salt Spray Tests acc. to EN ISO 9227, ASTM B117, NASM1312-1

Batch: V-AP 32204600-12.07	Batch values
Assay (argentometric; calculated on dried substance)	100.0 %
Identity	passes test
Appearance of solution	passes test
Acidity or alkalinity	passes test
pH-value (5 % Water)	6.5
Bromide (Br)	≤ 0,005 %
Nitrite (NO_2)	passes test
Hexacyanoferrate ($Fe(CN)_6$)	≤ 0,0001 %
Iodide (I)	≤ 0,001 %
Phosphate (PO_4)	≤ 0,0025 %
Sulphate (SO_4)	≤ 0,01 %
Nickel (Ni)	≤ 0,0005 %
Copper (Cu)	≤ 0,0005 %
Barium (Ba)	passes test
Calcium (Ca)	≤ 0,002 %
Iron (Fe)	≤ 0,0002 %
Potassium (K)	≤ 0,003 %
Ammonium (NH_4)	≤ 0,002 %
Magnesium, Earth alkali metals (as Ca)	≤ 0,01 %
Loss on drying (130°C)	< 0,1 %

Hans-Ulrich Vogler
Managing Director

33689 Bielefeld, 2010, 02.19

Ready to use sodium chloride without anticaking compounds



6.5. Determination of Corrosivity

VLM provides test panels, devices and other materials as well as complete sets for the evaluation of the corrosivity of corrosion test chambers acc. to ISO 9227: 2006

Figure 50 Test specimens

Figure 49 Various material for tests

Article Nr.	Description
V.852.000.502	Test panels, made from steel CR4 , for testing of the corrosivity of salt spray test cabinets in accordance with the EN ISO 9227, Dimensions L/W 150 x 70 mm, Thickness 1 ± 0,2 mm, pre cleaned, corrosion protected, individually packed in plastic foil
V.852.100.513	Adhesive Tape, width 75 mm, Roll with 66 m
V.852.000.504	Standard test panels made from Zinc for testing of salt spray cabinets in accordance with DIN EN ISO 9227, Annex B, L 100 mm. W 50mm , Thickness 1 mm, Impurities < 0,1 %.
V.852.100.512	Adhesive Tape, width 50 mm, Roll with 66 m
A.0761.2500	Petroleum benzene 80-110°C for cleaning of the test panels
A.5007.2500	Ethanol 99%,denaturated, for drying of the test panels
A.3998.1000	Hydrochloric acid 20% with Hexamethylentetramine
A.1667.1000	di-Ammoniumhydrogencitrate analytical grade , 1 kg-Pack
A.1377.0500	Glycine analytical grade, for cleaning of the Zinc test panels
V.851.210.030	Test panel holder for exposure of the test panels acc. to EN ISO 9227, Length 550 mm, 21 Slots, 3,5 mm, 20 °
V.851.210.130	Test panel holder for exposure of the test panels acc. to EN ISO 9227, Length 650 mm, 26 Slots, 3,5 mm, 20 °
112111653	Beaker, 800 ml, tall shape
330502100	Crucible tong, Length 200 mm
V.852.100.510	Brush for cleaning of the test panels
V.1.117.200. 003 or 004	Chemical protection gloves (Nitrile), Pack with 50 pcs. Size L or XL
V.852.100.550	Drying box made from PC for storing of the test panels
KE.EG-220-3NM	Precise balance for weighing of the test panels
V.852.100.552	Complete set for the evaluation of the corrosivity, incl. 10 test panels made from steel CR 4
V.852.100.553	Complete set for the evaluation of the corrosivity, incl. 10 test panels made from zinc

7. Maintenance and Troubleshooting

7.1. Maintenance

What ?	When ?	Who?
Cleaning the testing chamber, but do not scratch the ECTFE coated base.	monthly	Operator
Checking the door sealing for leakage and if necessary changing it	monthly	Operator
Checking the salt solution filter in the reservoir, if necessary changing it	monthly	Operator
Checking the filter of the humidifier by reading the difference of the pressure of the compressed air before the humidifier and before the nozzle, change it, if the difference is > 0,6 bar	monthly	Operator
Checking the filter of the pure water inlet port and change it if necessary	quarterly	Operator
Checking the filter of the filter unit for clean compressed air, change it if necessary	quarterly	Operator
Cleaning the drain system by rinsing water through the drain port in the base.	monthly	Operator
Cleaning and polishing the case	monthly	Operator
Determination of the corrosivity of the chamber according to ISO 9227	Six monthly	Operator

In the course of time the elasticity of the silicon foam seal can decrease. Consequently there may be not enough even surface pressure against the door so the chamber will not be hermetically closed anymore.

In this case adjust the strike to increase so there is enough even surface pressure again.

If the seal has been damaged for chemical or mechanical reasons it has to be replaced. There the seal can be removed very easily as it is not fixed in the gap by adhesives.

Figure 51 The detail of the door

7.2. Consumables

Order-No.	Description Consumables
V.424.013.120	Air filter for the humidifier (Figure 54)
V.852.221.000	Filter for the salt solution tank (Figure 53)
	Filter for purified water inlet port
V.241.231.000	Spray jet nozzle (Figure 52)

Figure 52 Spray nozzle

Figure 54 Air filter

Figure 53 Solution filter

7.3. Adjustment of the Spray Nozzle

Attention:

The cabinet has already been optimised for conducting salt spray test pursuant to ISO 9227 and thoroughly checked. Therefore do not alter the adjustments if you are not sure how what are you doing.

Fill the test solution reservoir with 30-40 litre demineralised water, to avoid any contamination of the laboratory with salt spray.

After opening the door press the key “Air purge” just to the opposite position of “Salt Spray”. The working system salt spray will be active for ca. 1 minute to allow the adjustment of the spray nozzle (Figure 55). If necessary press the key twice.

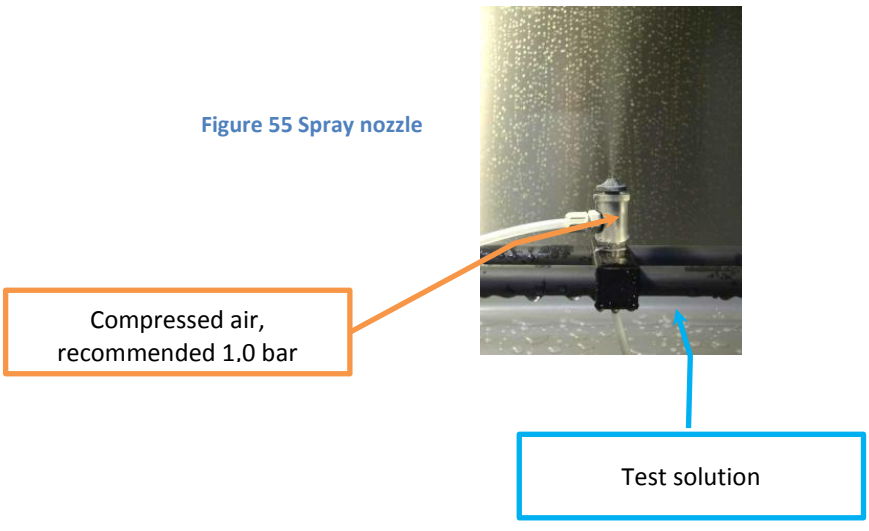
Adjust the flow rate to 0,58 l /h by turning the control button on the control panel of the diaphragm pump left or right

- Adjust the air pressure to 1,0 bar
- Open the door and bridge the door sensor by the service tool, so the cabinet keeps running
- Loose the check disc of the nozzle by turning counter clockwise.
- Now you can turn the cap of the nozzle clock wise or counter clockwise so that a narrow cone of spray is formed. You will hear an even sound of the escaping compressed air out of the orifice of the nozzle
- Do not forget to fix the position of the cap by turning the lock disc clockwise

Warning:

Never apply power when turning the cap of the spray nozzle in the “close” direction! You will damage the inner plastic cone so the nozzle will no longer produce the desired fine mist.

Figure 55 Spray nozzle



7.4. How to replace the filter of the humidifier

Although a filter unit is provided to secure a clean compressed air in compliance with the standards such as DIN EN ISO 9227 or ASTM B117-73 the pores of the air filter inside the humidifier may be blocked over a period of time.

An indication of a blocked air filter is the difference between the pressure of the compressed air before the humidifier and the air pressure in the nozzle exceeds 0,7 bar. In this situation the filter has to be replaced. For this maintenance job the control compartment has to be opened and the humidifier approached from underneath. The only tool you will need is a box spanner No. 30.

- Press the main switch of the cabinet on “0” (switch off the device)
- Wait a while thus the water in the humidifier is cooled down to < 40°C (Figure 57)
- Push a hose on the spout and place a bucket on the floor below the humidifier
- Open the stop cock (Figure 56) by turning the red lever downwards so the water will rinse out of the humidifier
- Pull off the blue plastic hose of the compressed air supply (Figure 58) after pushing the blue ring of the connector back thus the hose get loose.
- Loose the (biggest!) screw (Figure 59) of the filter unit with the box spanner
- Replace the filter (Figure 60) and screw the unit into the threaded hole again. Make sure that the connection is tight.
- Push the blue plastic hose into the connector
- Set the cabinet in working mode thus the humidifier will be refilled with pure water

Figure 57 Humidifier

Figure 56 Stop cock

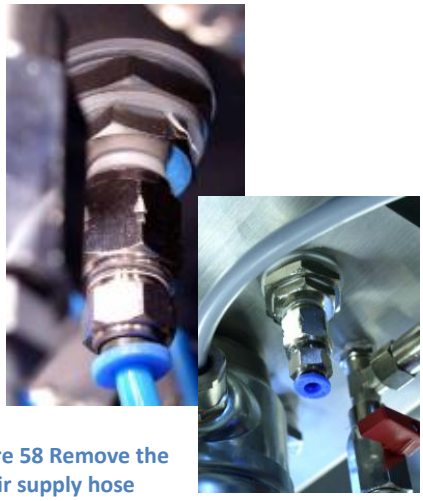


Figure 58 Remove the air supply hose

Figure 59 Loose the biggest screw

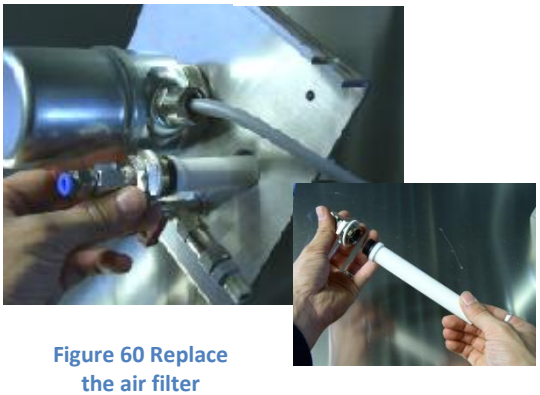


Figure 60 Replace the air filter

It is strongly recommend to mount an air filter (Figure 61) unit to guarantee the supply of oil free and particle free compressed air as stipulated in the ISO 9227.

Figure 61 Air filter unit

7.5. Troubleshooting

General:

Check that all controller, manometer, pilot lamps are running properly indicating normal values and conditions.

Problem: No salt fog

Please check:

1. if the air switch is on the position “Nozzle” ?
2. if the door is properly closed?
3. if there is enough salt solution available?
4. if the salt solution filter is contaminated (blocked)?
5. if the salt solution hose is blocked?
6. if the water tap is opened?
7. is there air in the diaphragm pump?
8. is there any dirt inside the spray nozzle?

Figure 62 Salt spray switch

Problem: Incorrect Salt Solution Fallout Collection Rates

Please check:

1. is the correct flow rate being pumped ?
2. is the spray jet nozzle air pressure is set correctly?
3. is the spray jet nozzle positioned central ?
4. is the spray jet nozzle blocked or partially blocked?
5. If the salt solution fallout rates are evenly distributed but either high or low in collection adjust the pump speed by increasing or decreasing accordingly.
6. If the salt solution collection rates are satisfactory but the distribution is uneven
   a) If there are high collection rates in the centre of the test chamber but low collection rates in the outer edges increase spray jet nozzle pressure
   b) If there are low collection rates in the centre of the test chamber and high collection rates on the outer edges decrease spray jet nozzle pressure

Figure 63 Measuring cylinders

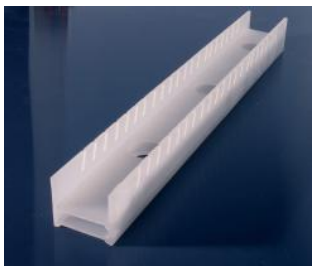
8. Spare Parts and Consumables

8.1. Spare Parts List

Article Nr.	Description	Description in the circuit diagram
V.272.202.710	Main switch 12 A	Q1
V.272.202.610	Switch air purge / spraying	S2
V.272.102.002	Switch lightning	S1
V.277.017.404	Clip connector 2 poles	X2-X11
V.277.017.434	Clip Connector 5 poles	X2-X11
V.277.017.473	Connector pin block 12 poles	X2/X3/X5/X11
V.277.017.414	Clip connector 3 poles	X2/X3/X5/X11
V.277.017.424	Clip connector 4 poles	X2/X3/X5/X11
V.282.412.000	Temperature controller JUMO dTRON 304	D1A/D1B/D1C
V.271.103.004	Pilot lamp green (pressure/ air	H 13
V.271.103.002	Pilot lamp yellow (heating/ventilation)	H1/H2
V.271.103.003	Pilot lamp red (over temperature/low level.	H3/H4
V.287.500.010	Filter for controller and timer	Z1
V.273.231.010	Relais	K5/K8
V.273.231.012	Relais	K2
V.285.110.020	Solid State Relais (ELR/SSR)	V1/V2
V.275.402.033	Compact fluorescent lamp	E2
V.475.111.005	Heater testing chamber	E1
V.576.100.000	Temperature sensor testing chamber Pt 100	B1

8.2. Accessories for Placing the Specimens

Article No.	Accessories	
V.851.210.300	Specimen rack 20° acc. To ISO 9227, 26 slits gap 3,5 mm, length 550 mm	1 Pc
V.851.210.100	Specimen rack 15° acc. To ISO 6270-2 (High Humidity CH Constant Humidity, 26 slits gap 3,5 mm, length 550 mm	11 Pc
V.851.212.000	S-hooks straight (10 Pcs/Unit)	1 U
V.851.212.001	S-hooks twisted by 90° (10 Pcs/Unit)	1 U
V.851.200.820	Specimen support rods	1 Pc
V.851.200.010	Cross connector	1 Pc.
V.851.220.000	Special specimen holder for steel-discs	1 Pc.
	Specimen holder for very small specimens	-
	Further individual holder, hooks upon request	
	Accessories	1 Pc



8.3. Other Accessories

Order-No.	Test solution
V.1.06400.5000	Sodiumchloride NaCl Purity acc. to DIN EN ISO 9227 PE Bags á 5000g, further packages upon request
	Reagents for CASS Test upon request
V.852.220.000	PH-Meter Set for testing the NaCl-solution and fall-out
	Reagents for adjusting the pH-value upon request
V.852.000.610	Fall-out rate measuring set (2 Cylinders, stoppers and funnels
V.852.270.000	Chloride Test + Accessories
V.852.220.000	PE-Reservoir on castors 130 L with hoses and filter
V.852.221.130	PE-Reservoir 130 L
V.852.225.130	Container pump for convenient solving of the NaCl
V.852.000.620	Duct for even distribution of fine mist
	Water purification plant
V.852.250.028	Ion exchanger stainless steel cartridge DI 2800
V.852.250.020	Ion exchanger stainless steel cartridge DI 2000
V.852.250.1500	Adapter for quick release coupling Pack. 2 Pc.
V.852.250.1506	Quick release coupling Pack. 2 Pc.
V.852.250.1601	Conductivity meter, analog mountable on top of the cartridge
V.852.250.1805	Conductivity meter, digital, mountable on the wall
V.852.250.1402	Distribution unit 1 inlet port 3 outlet ports
V.852.250.1400	Stop cock straight, plastic
V.852.901.000	Hose 1,50 m length with 3/4” connectors
V.852.901.001	Hose 2,00 m length with 3/4” connectors
V.852.901.005	Extension hose 2,00 m
	Compressed Air Supply
V.852.211.101	Screw compressor
V.852.211.000	Laboratory compressor
V.852.211.100	Capsuled laboratory compressor
	Coupling No. 5
	Plastic hose
V.852.210.100	Purification unit for oil- and particle free clean air
V.852.221.003	GFK Grid to protect the base











SaliCORR® Sodium Chloride for Corrosion Tests

Sample

Quality Certificate

SaliCORR® Sodium Chloride, NaCl Special quality for Salt Spray Tests acc. to EN ISO 9227, ASTM B117, NASM1312-1

Batch: V-AP 32204600-12.07	Batch values
Assay (argentometric; calculated on dried substance)	100.0 %
Identity	passes test
Appearance of solution	passes test
Acidity or alkalinity	passes test
pH-value (5 % Water)	6.5
Bromide (Br)	≤ 0,005 %
Nitrite (NO_2)	passes test
Hexacyanoferrate ($Fe(CN)_6$)	≤ 0,0001 %
Iodide (I)	≤ 0,001 %
Phosphate (PO_4)	≤ 0,0025 %
Sulphate (SO_4)	≤ 0,01 %
Nickel (Ni)	≤ 0,0005 %
Copper (Cu)	≤ 0,0005 %
Barium (Ba)	passes test
Calcium (Ca)	≤ 0,002 %
Iron (Fe)	≤ 0,0002 %
Potassium (K)	≤ 0,003 %
Ammonium (NH_4)	≤ 0,002 %
Magnesium, Earth alkali metals (as Ca)	≤ 0,01 %
Loss on drying (130°C)	< 0,1 %

Hans-Ulrich Vogler
Managing Director

33689 Bielefeld, 2010, 02.19

Ready to use sodium chloride without anticaking compounds

9. Declaration of Conformity

EG – Konformitätserklärung
EC - Declaration of conformity

Manufacturer:	VLM GmbH, D-33689 Bielefeld, Heideblümchenweg 50, Deutschland / Germany
Produkte:	Korrosions-Prüfschränke Typ SAL 1000-FL
Products:	Corrosion Test Cabinets Type SAL 1000-FL

Die bezeichneten Produkte sind in Übereinstimmung mit folgenden Richtlinien und Normen hergestellt worden:

The products in question have been manufactured in accordance with the following guidelines and standards:

73/23/EWG abgeändert durch 93/68/EWG,
89/336/EWG abgeändert durch 92/31/EWG und 93/68/EWG,EN 61010-1, EN 61010-2
73/23/EWG amended by 93/68/EWG,
89/336/EWG amended by 92/31/EWG and 93/68/EWG,EN 61010-1, EN 61010-2

Bielefeld, den 07.05.2010

(Josef Schubert)
Geschäftsführer / Managing Director