Environmental Conditions for the Schleibinger Slabtester / Aufstellbedingungen Slabtester mit R290

Min. room temperature: 10 °C
Max. room temperature +40°C
Max. rel. humidity: 40%

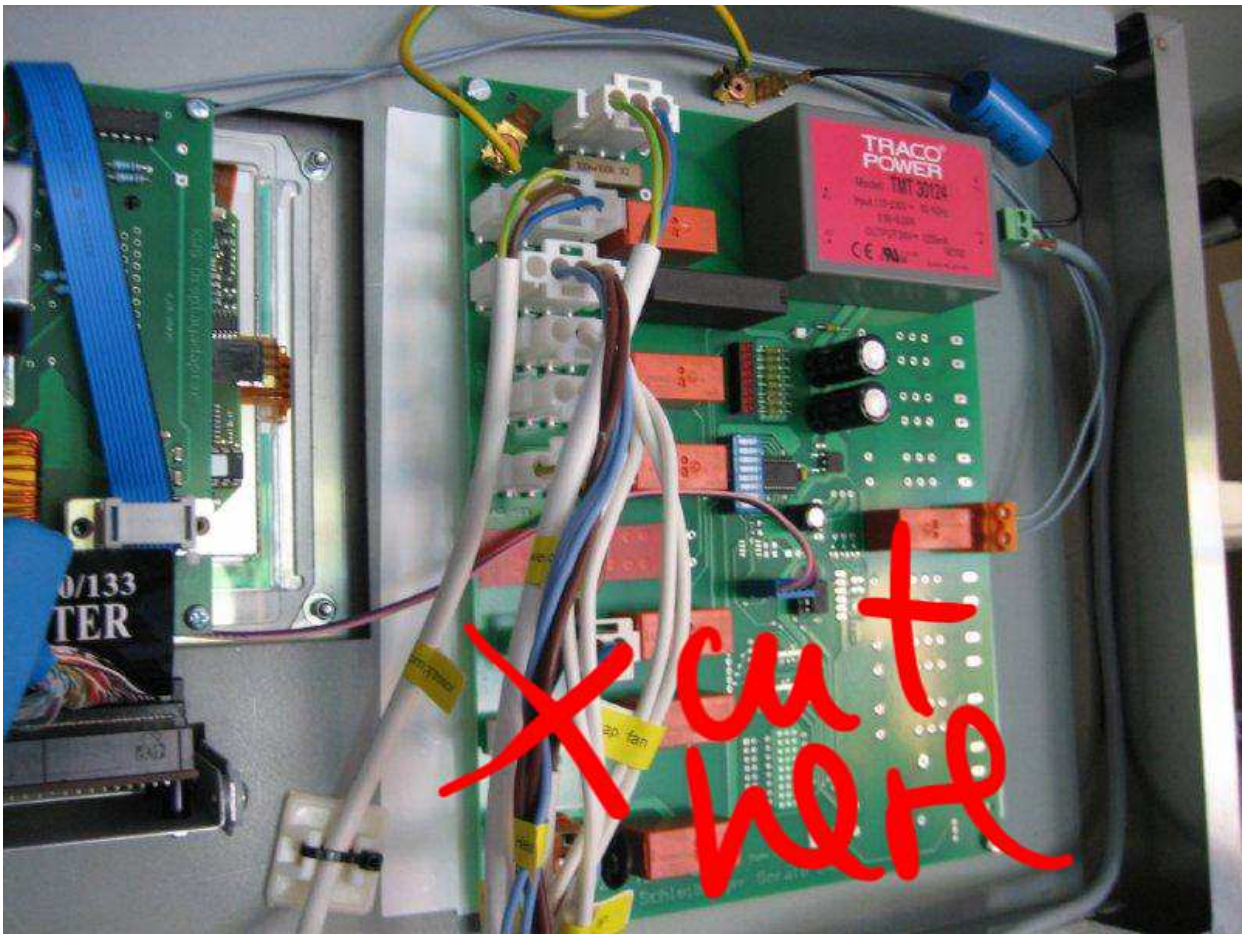
At higher room temperatures the cooling power will decrease.
At higher humidity there my by condense water at the Slabtester housing.

Min. room volume (acc. to EN 378): 13 m³
Min gap size between Slabtester and room ceiling: 30 cm

Slabtester- How to replace the heather rod in the evaporator

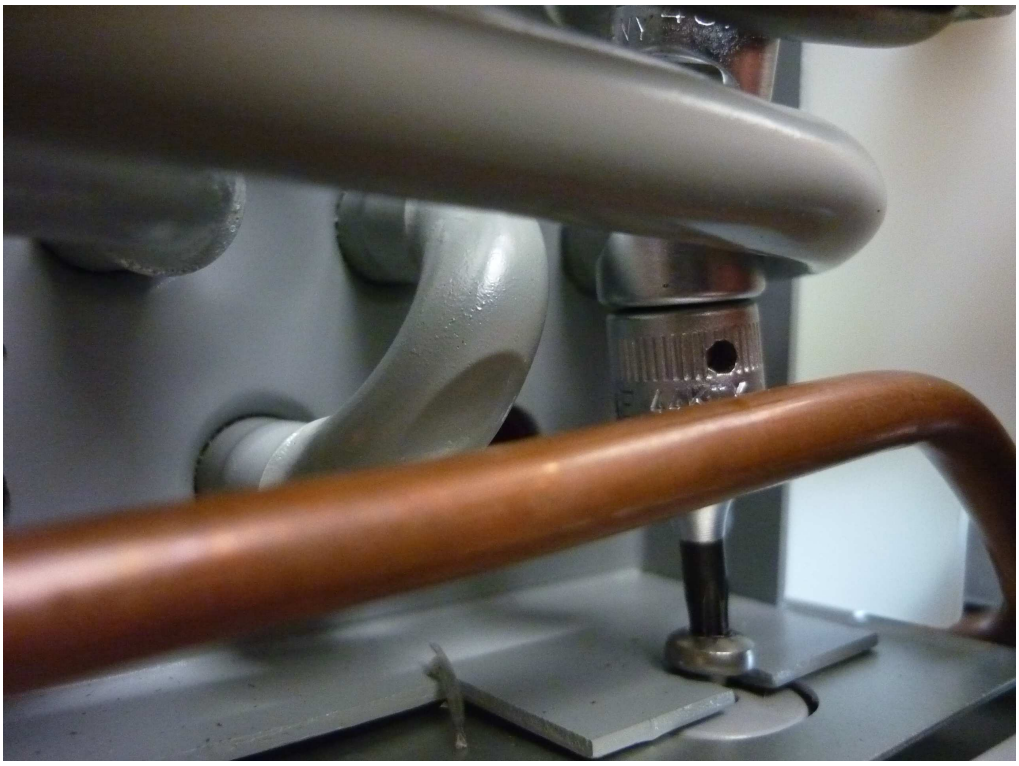
Tools you need:
Torx TX15 screwdriver (best with a joint, see picture)

1. remove the white cover of the evaporator, open the front panel and cut the two brown wires close to the white connector

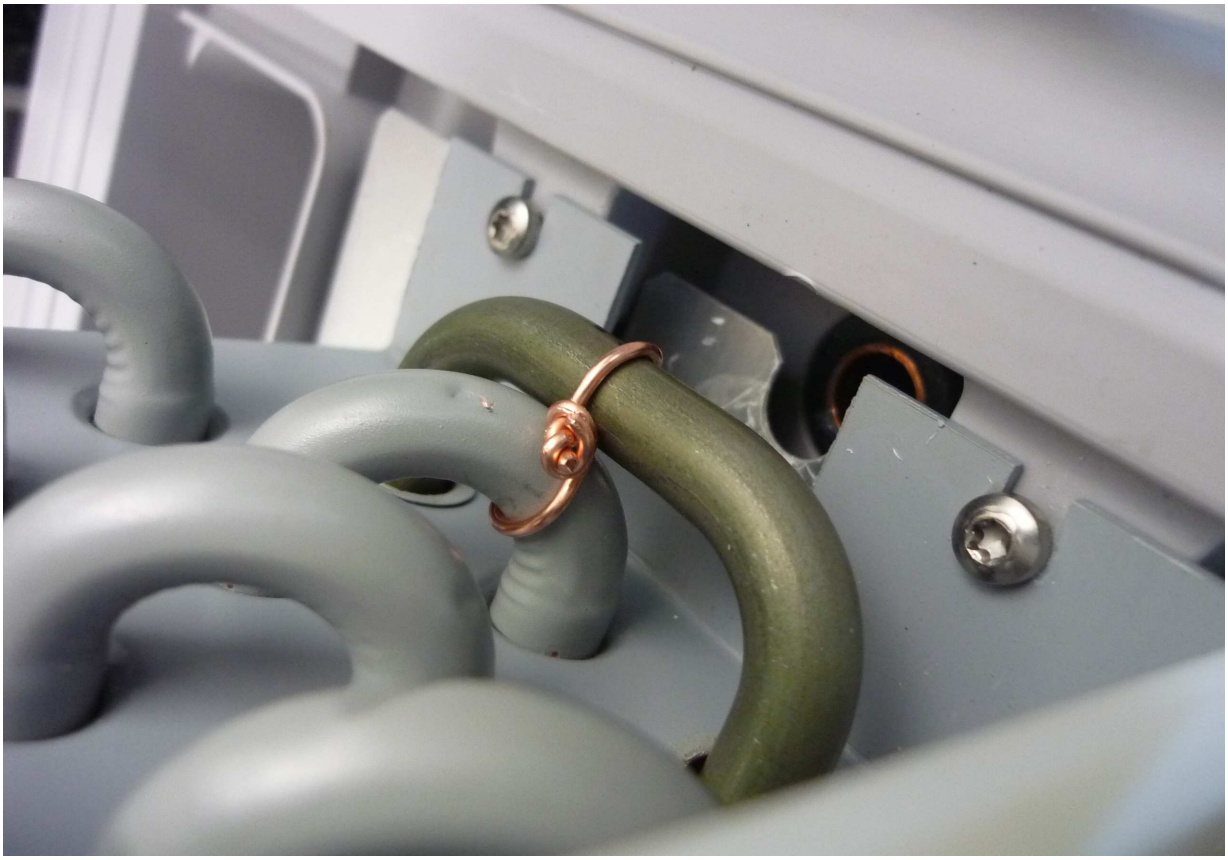


2. pull the brown wires to back to the evaporator; open all cable ties
3. remove the two screws completely on the right side of the evaporator (view from the back side)

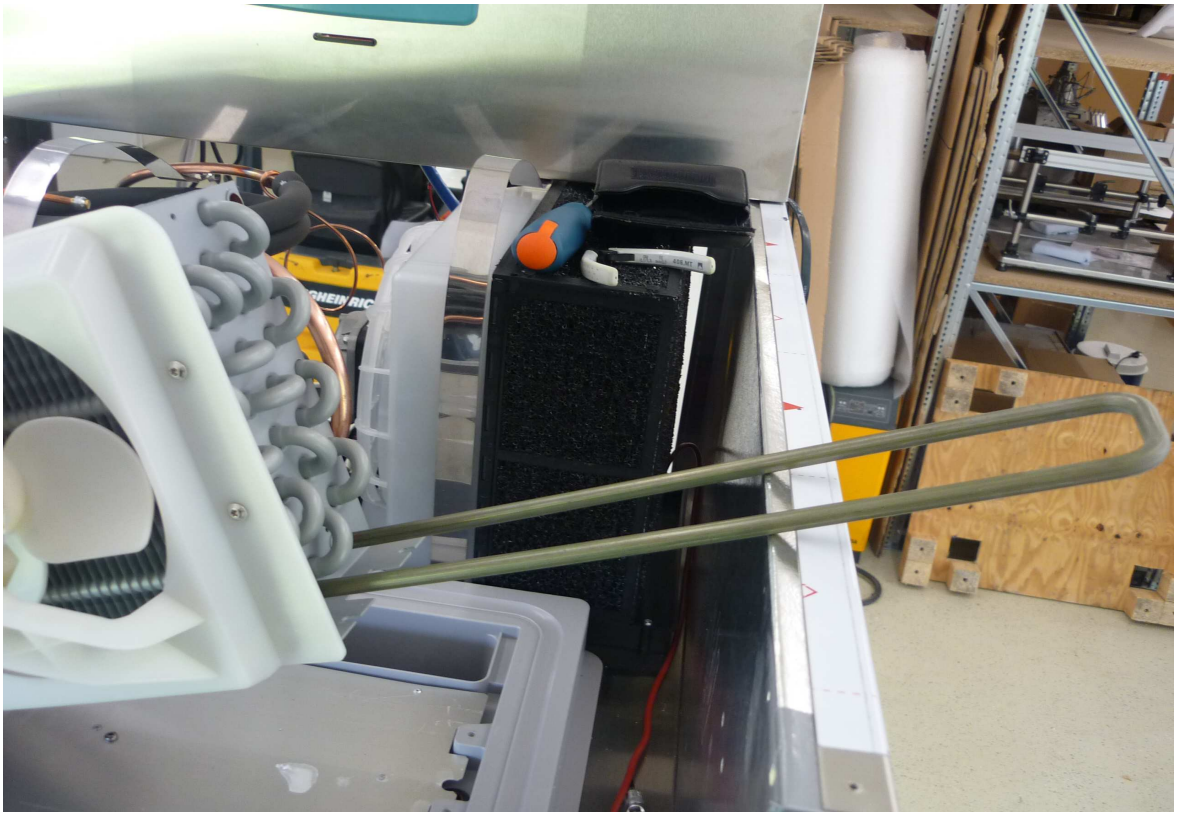
4. on the left side remove the two screws only a litte bit



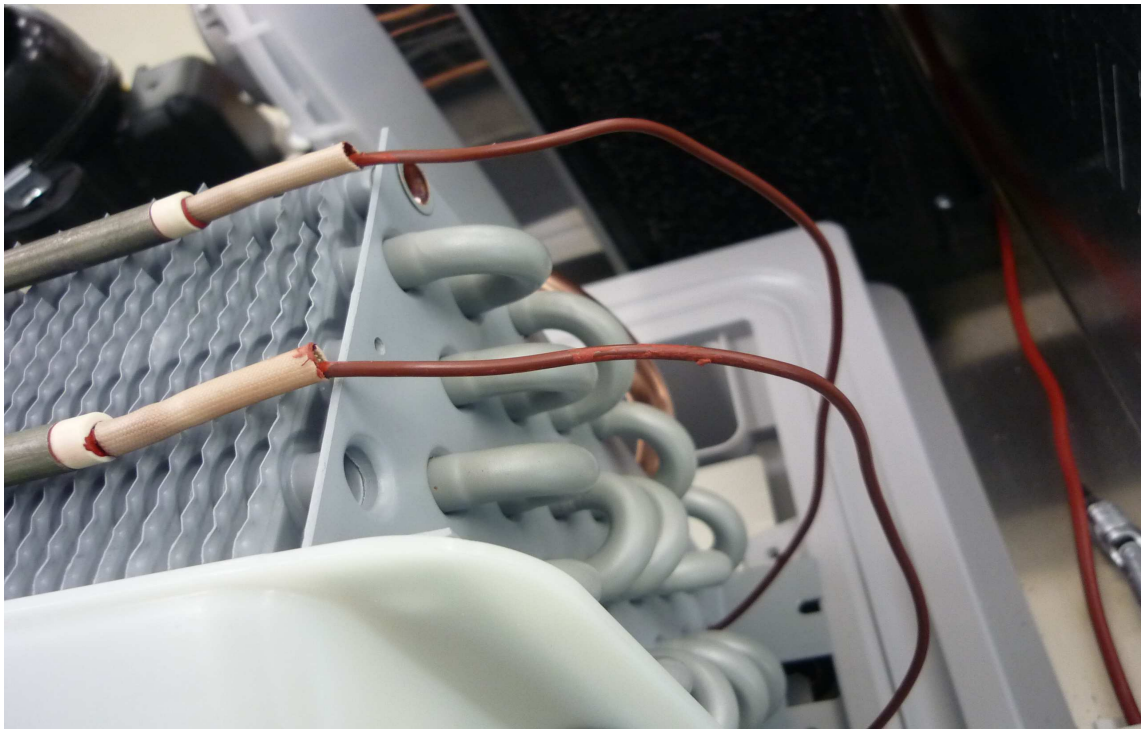
5. on the right side open the wire loop (if used)



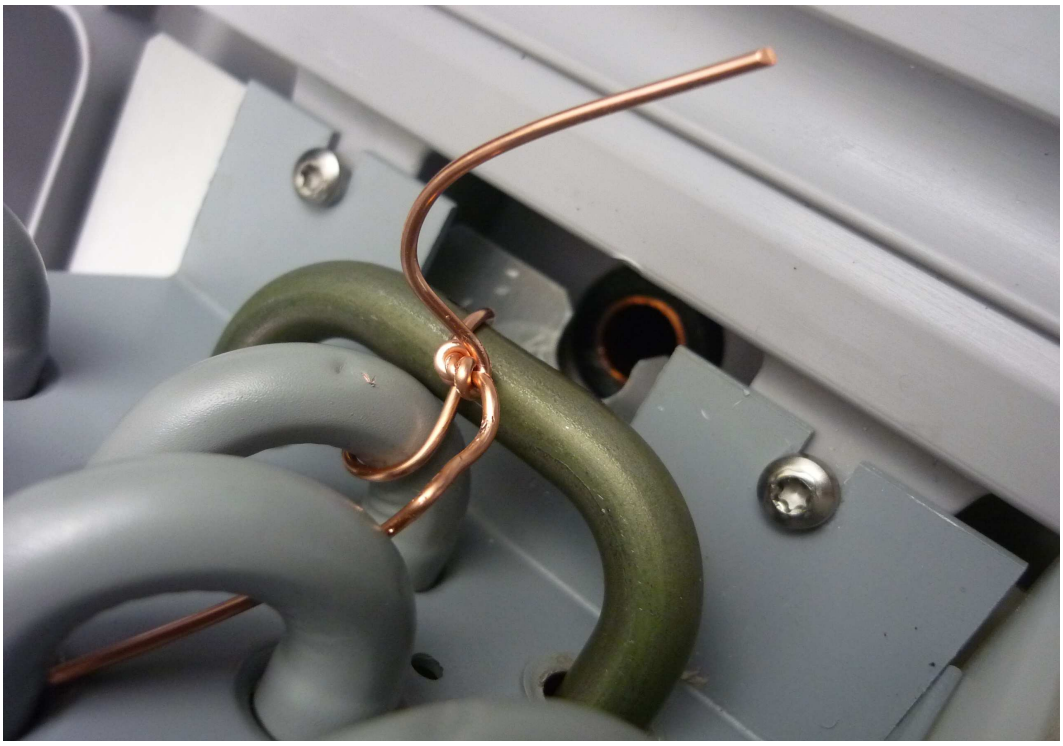
6. pull the heather rod from the evaporator and to remove the long rod completely, pull up the whole evaporator unit. The cooper pipes are flexible, but be careful



7. prepare the new rod to insert into evaporator by indenting the wires in the two pipes on the bottom of the evaporator



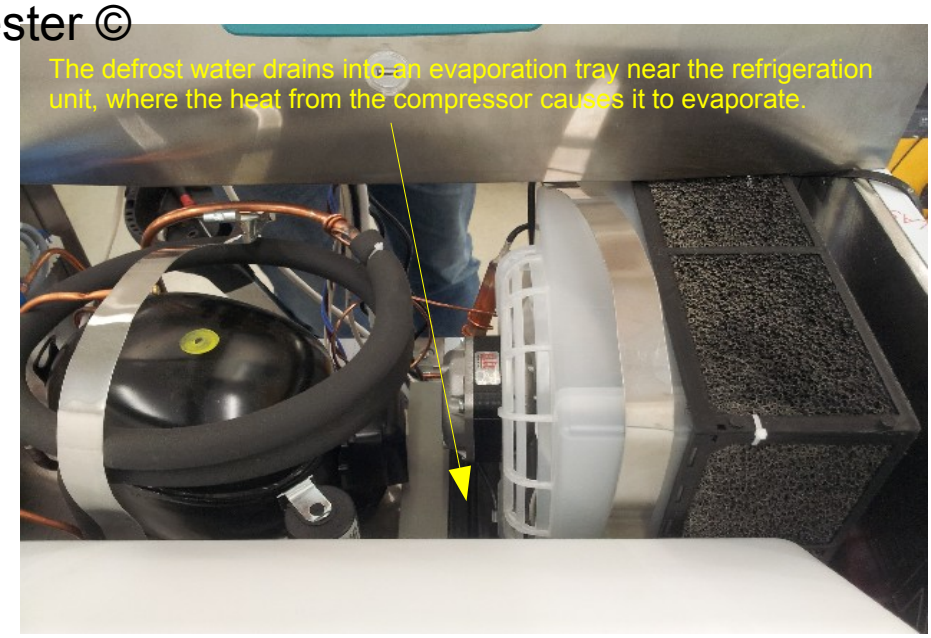
8. and insert the heather rod into the evaporator
9. fix the rod with a blank cooper wire to avoid it is moving

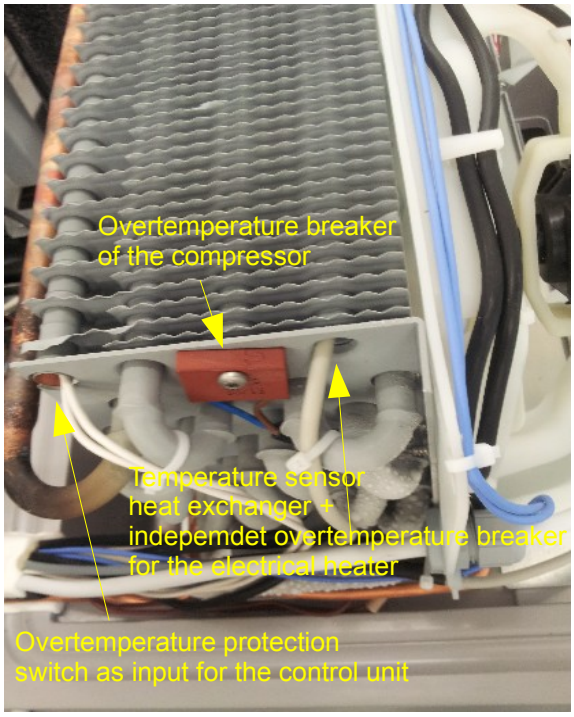


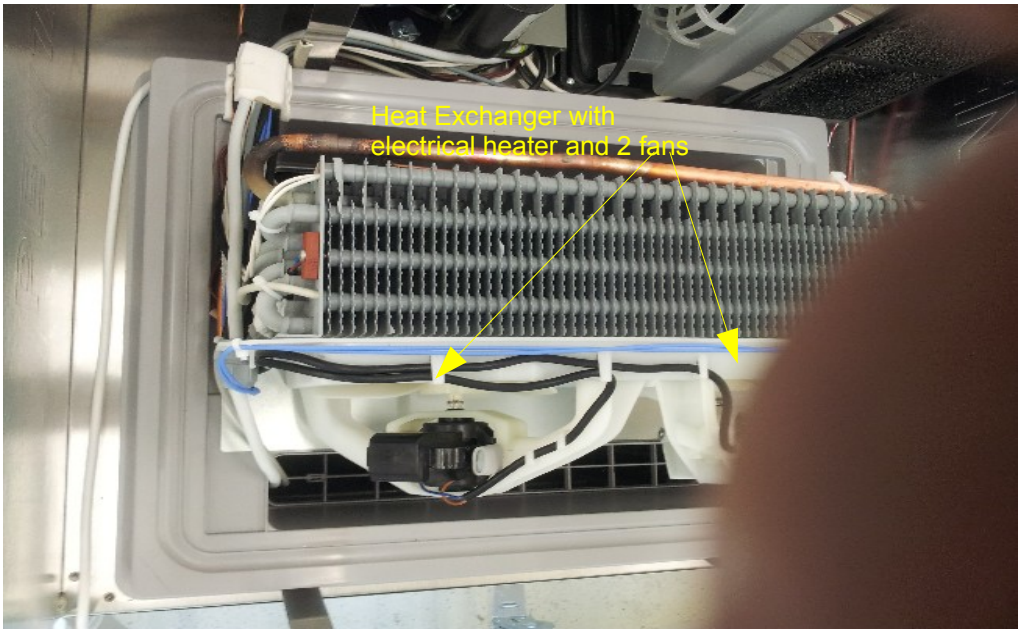
10. lay the brown wires outside the evaporator to relay board and connect them to the cutted wire which comes from the white connector (see picture in the step nr. 1)
11. before closing the evaporator you can test the heather by switching via software or DIP

Schleibinger Slabtester Main Electrical Components

Schleibinger Slabtester ©
Cooling machine







How to update the Slabtester?

With this detailed description you will learn, how to update the Slabtester firmware:

What do you need:

1. FTP client

FTP-client is a small program to transfer data between a local computer (your PC) and a remote device (data logger). You can use any FTP-client.
On the delivered CD-ROM in the subdirectory **Beck_chiptool** you can find the program **chiptool** (freeware). The CHIPtool software allows configuration of the IPC@CHIP® controller used in the Schleibinger devices within the network and includes also a FTP and a Telnet client.
The following description is made for the **chiptool** program, other clients like FileZila or WS_FTP are handled similarly.

What has to be done?

Attention: Save all measurement data! Otherwise all measurement data and all setting on all channels will be lost!

1. Download the new Slabtester Firmware from http://www.schleibinger.com/software/Slabtester/httpd.tar.gz

2. Unzip this file into an empty subdirectory. The top folder will be SLABTESTER, below there is the folder HTTPD.

3. If you are not able to unpack tar.gz files. Install WinRAR from https://rarlab.com/ its free for 40 days of use. You may also use 7-zip which totally free. See: https://www.7-zip.org/

4. Now you have 2 options:

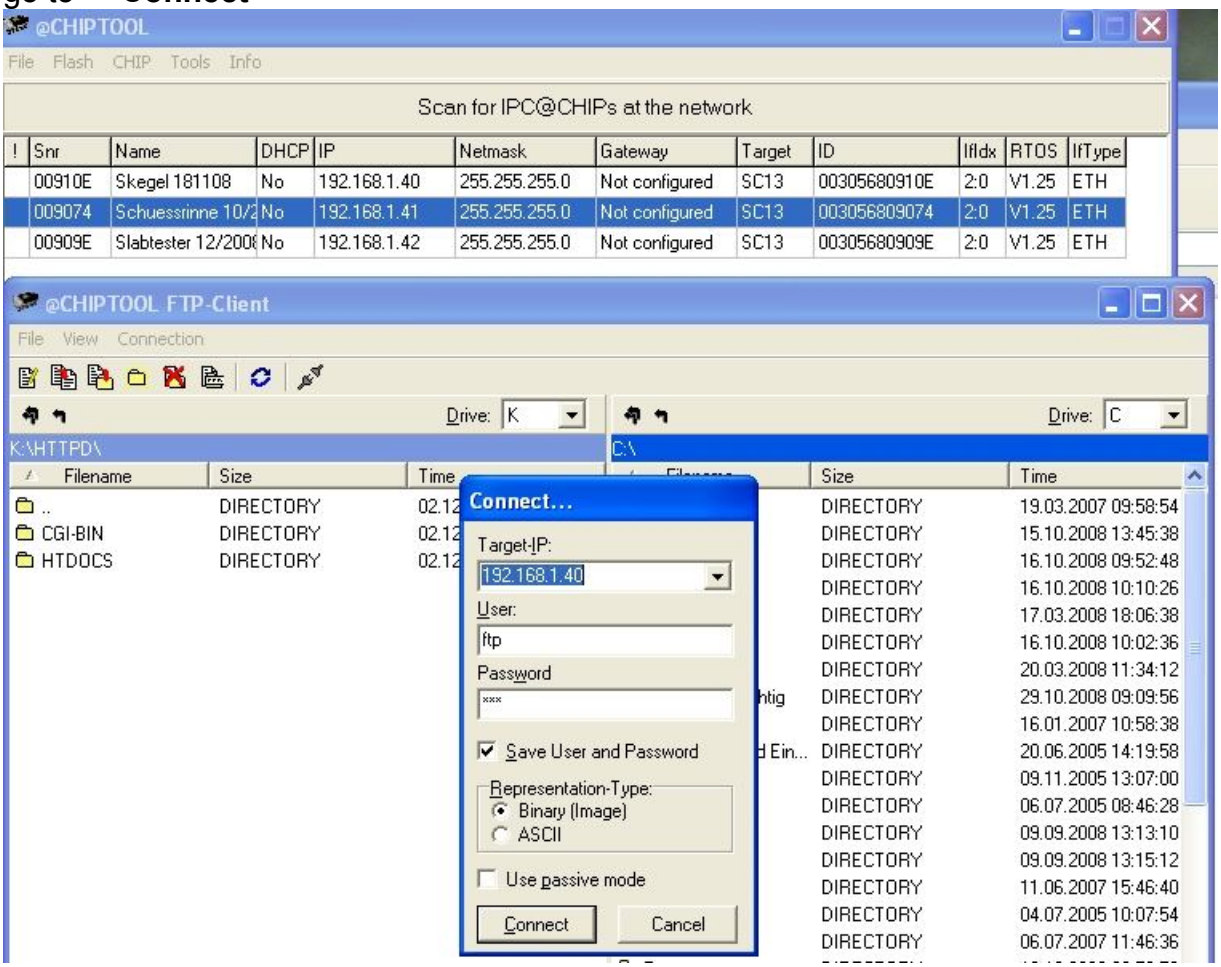
    1. PREFERRED WAY: Copy the content of the HTTPD sub-directory including all subdirectories to an empty SD card. Use a max. 4 GByte card. The root directory must be HTTPD. Replace the SD card in the Slabtester and then go on with item 13.

    2. Or follow the next steps.

5. Run the **chiptool** program

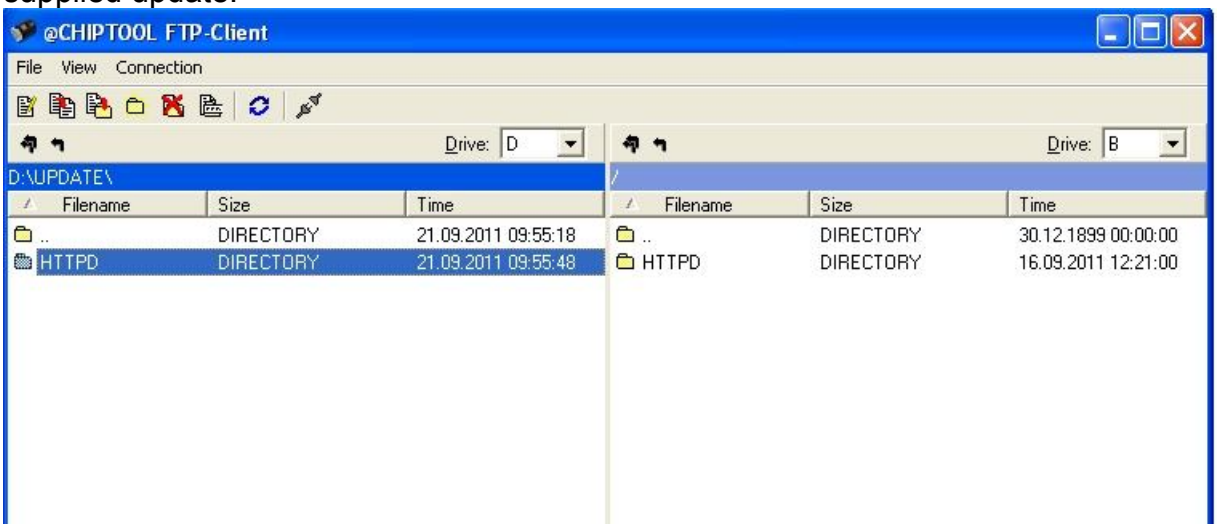
6. The data logger should be appears in the overview table. Go to **Tools->FTP-Client**

7. Another window appears, please fill in the IP-Address of Slabtester to the field "**Target-IP**" (for Example 192.168.1.40)
   user: **ftp** and password: **ftp**
   go to >>**Connect**<<

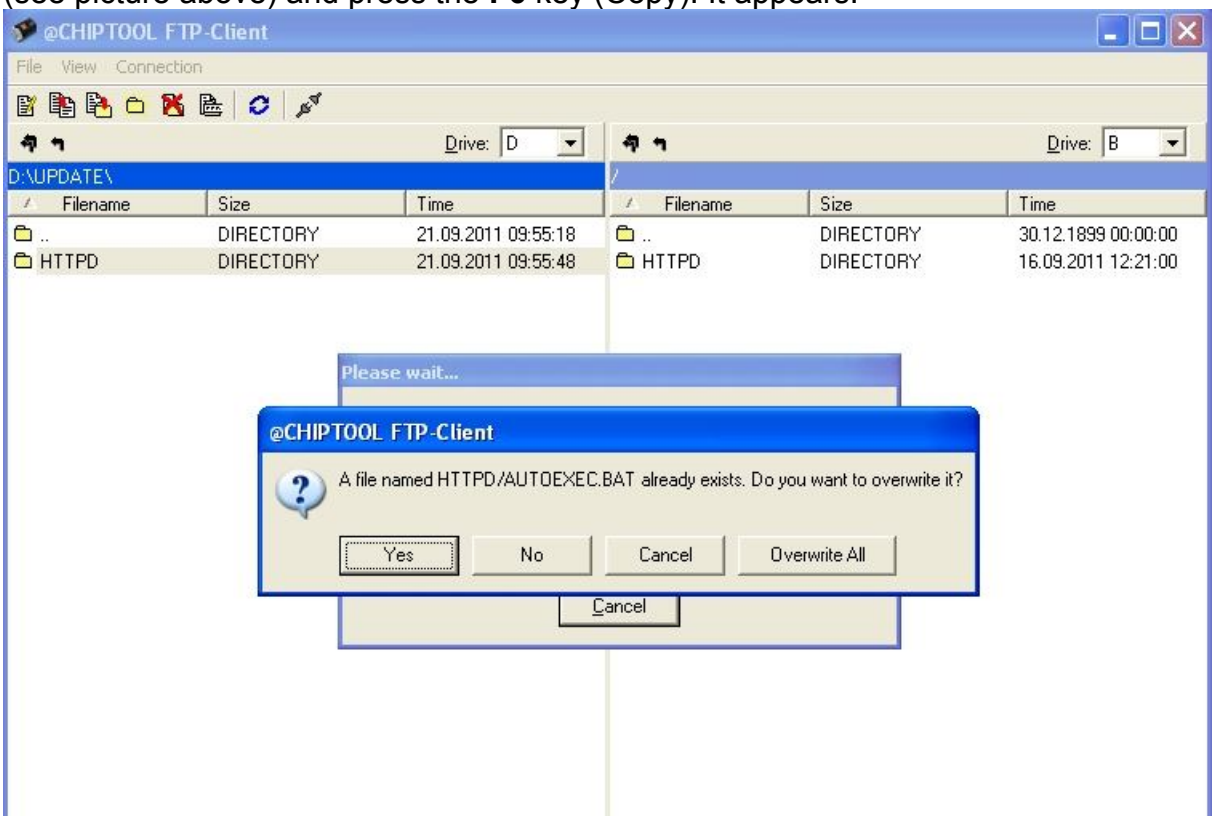


8. A ftp-connection will be established
   The right window shows the file system of the Slabtester. Drive A is the internal memory of the control chip.
   Go to **Drive:B;** it's the internal SD flash card memory as a drive.

9. In the left window (of your local PC) find the HTTPD subdirectory with the supplied update.



10. Copy the directory **HTTPD** from the delivered CD-ROM (directory UPDATE) to the B-drive of the data logger by choosing the **HTTPD** folder in the left window (see picture above) and press the **F6** key (Copy). It appears:



11. Confirm the overwrite of the all data files with >>**Overwrite All**<<

12. Depending from the configuration of the data logger the data transfer can be several minutes. After the successful data transfer disconnect the connection with **Connection :close**

13. Now copy the files CHIP.INI, EXTUSB.EXE EXTSD.EXE and AUTOEXEC.BAT from the subdirectory SLABTESTER to **drive A:** of the Slabtester as described in the items 5 to 12 above. The drive A: is mapped to the internal flash memory of the controller chip

14. The network settings are, beneath others, defined in the CHIP.INI. So please reconfigure your network after copying the the CHIP.INI, ore edit the CHIP.INI text file at configure your network settings.

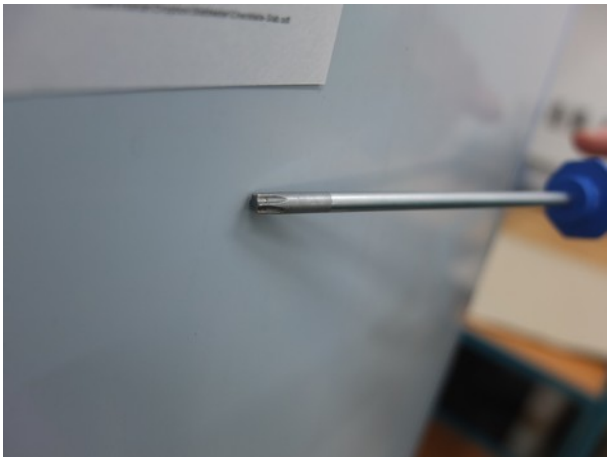
15. Start the Slabtester again (switch off and after ca. 5 seconds switch on again) and amend the settings as needed to meet your requirements.

16. Some software features may be still locked. So please input in the Cycle Time menu a value of:
    `1.234` hours.
    Then go back into the main menu and restart the Slabtester again as described in item 15.

Please ask your local network administrator, if you have any problems with the ftp-connection

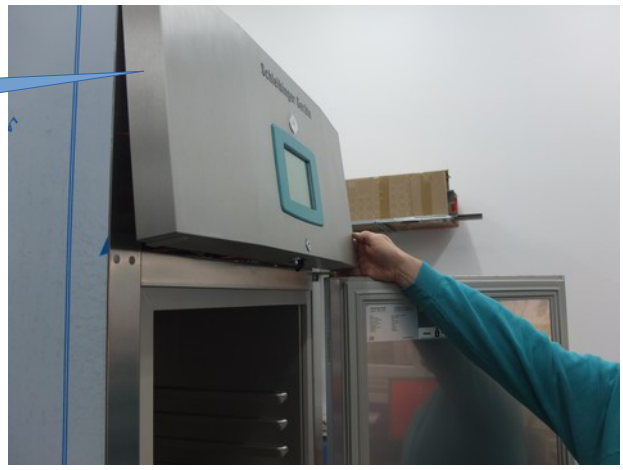
Replacing the SD card of the Schleibinger Slabtester

Take a TX 20 Torx screw driver

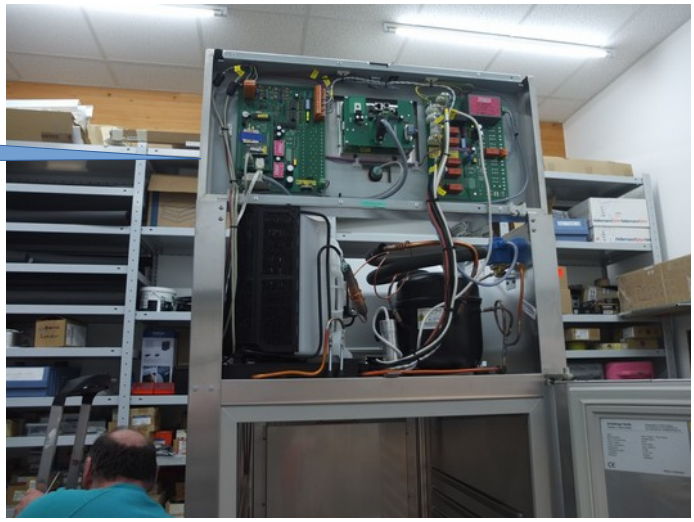


Open the screw of the lid

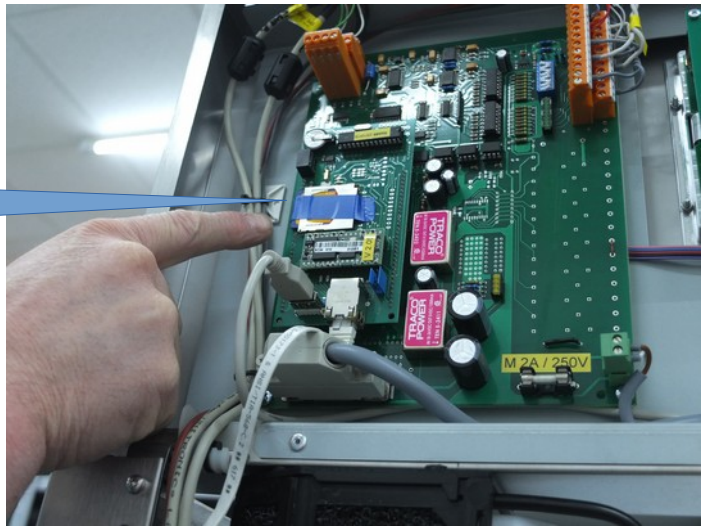
Open the lid



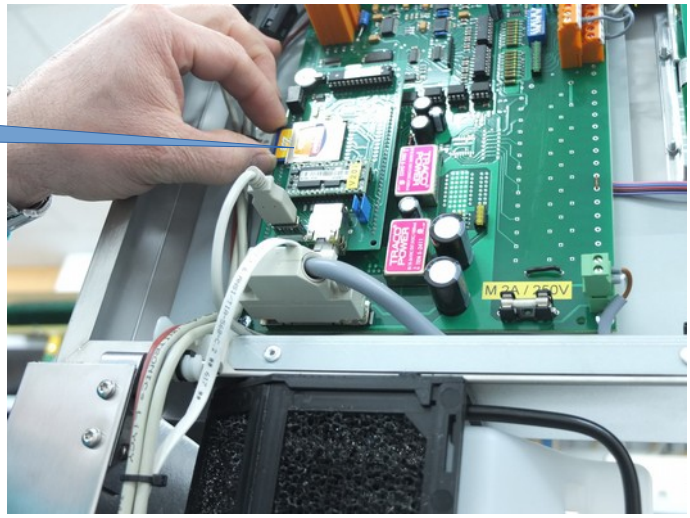
If the lid is open
take a stair



The SD card is on
the left side.
It is fastened with adh. tape.



Replace the SD card.



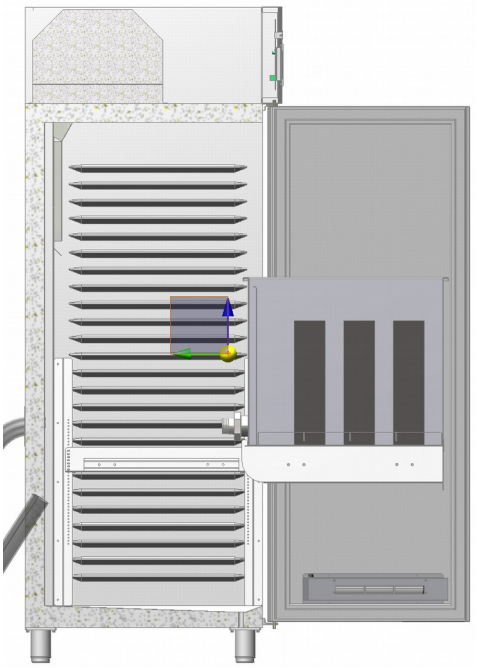
Slabtester with Circulation

CEN 15177 and similar:

Probekörper 100x100x400 mm, Mindesabstand zur Wand und zwischen den Probekörpern erlaubt maximal 6 Probekörper.

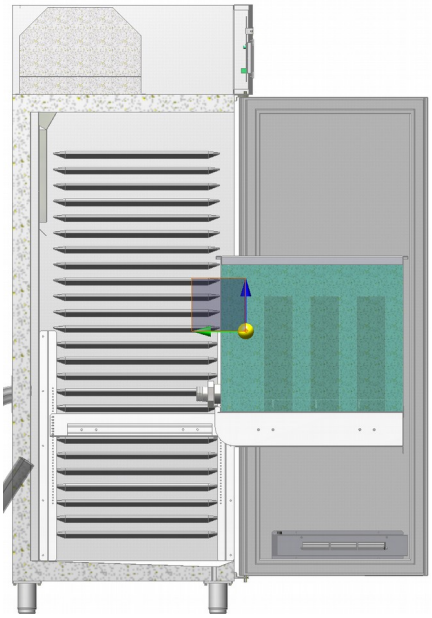
Auszug offen ohne Flutung:Der Schwerpunkt liegt innerhalb der Standfläche.

With 6 specimen 100 x 100 x 400 mm and **without water** is the main emphasis inside the footprint.



Wird während der Flutung die Wanne herausgezogen, liegt der Schwerpunkt außerhalb der Standfläche.

If you pullout the drawer during flooding the main emphasis will be outside the footprint. The cabinett will tilt.



Blindnietmuttern in 0,8 mm Blech / Max. load for a blind rivet nut

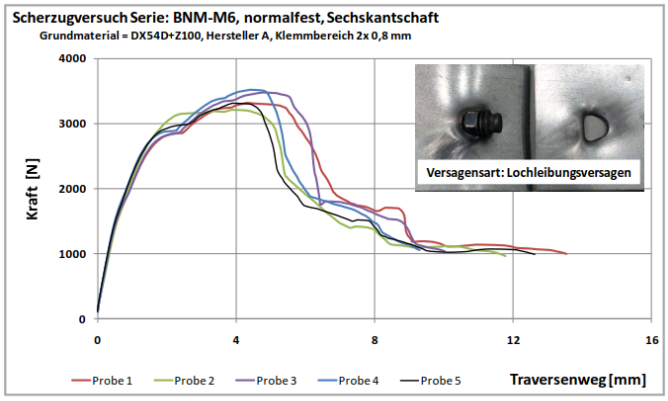
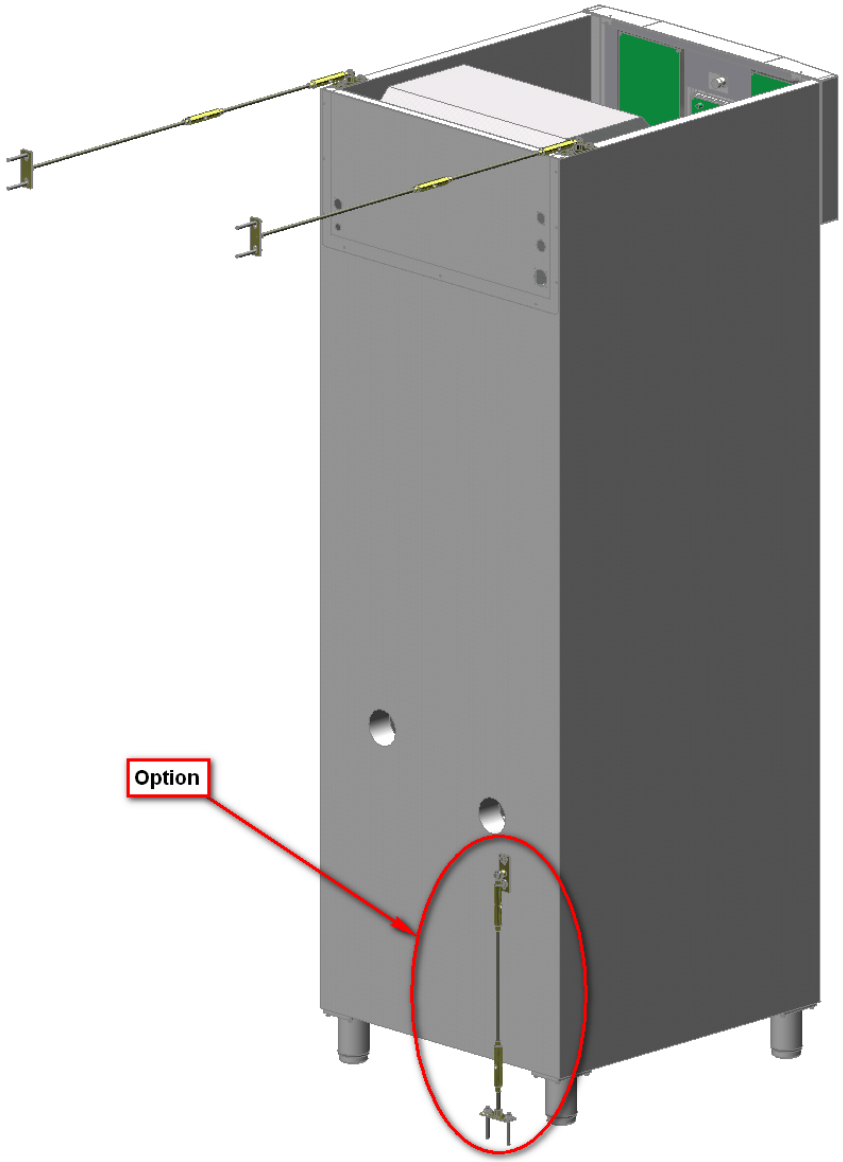
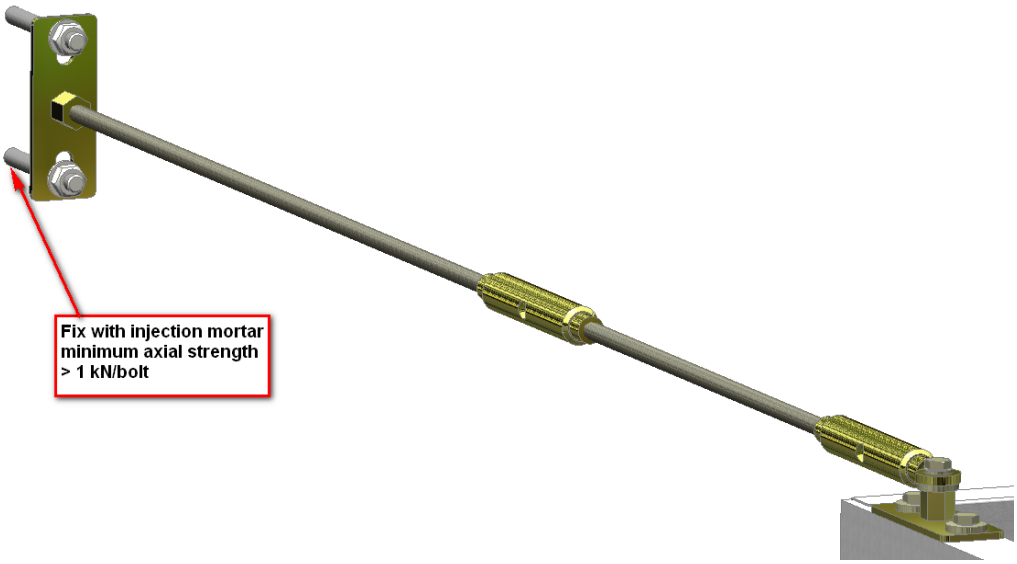
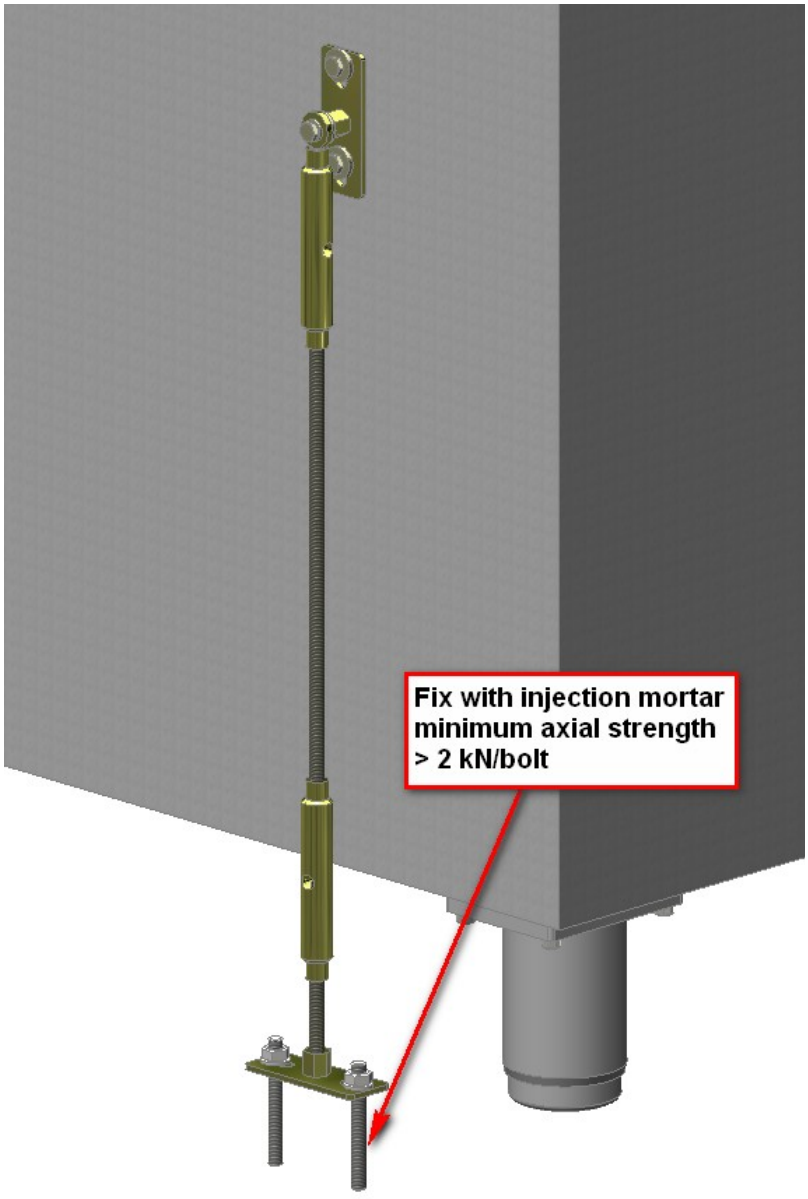


Abbildung 14: Quasistatische Scherzugversuche für normalfeste M6-BNM und Versagensbild

The holding armis are included with the circulation option. The customer is responsible for setting the appropriate dowels!




Fix with injection mortar
minimum axial strength
> 1 kN/bolt


Fix with injection mortar
minimum axial strength
> 2 kN/bolt

Overtemperature monitoring in a Slabtester

1. **Monitoring based on temperature measurement**

   The currently measured value of the Tevap (Sensor located in the evaporator, the value on the display appears under "**thawing:**") is compared with the Tmax (System → Diverse → Tmax - default value is + 40 ° C).
   If Tmax is exceeded, the heating is blocked by software but only until the measured temperature in the evaporator is higher (+ hysteresis).
   F-Ü appears in the status line at the top of the left window

2. **Monitoring based on digital input Nr. 4**

   (In devices up to the year 2008 an adjustable thermostat was connected here.)
   Causes immediate shutdown (also via Atmel) of all units, there is an error message on the display and entry "Overtemp 2" in the Fehler.txt file.
   Continue operation after overtemperature switch (thermostat) has closed again (no over temperature) only after switching the unit off and on (Atmel remembers the error that occurred until his reset)

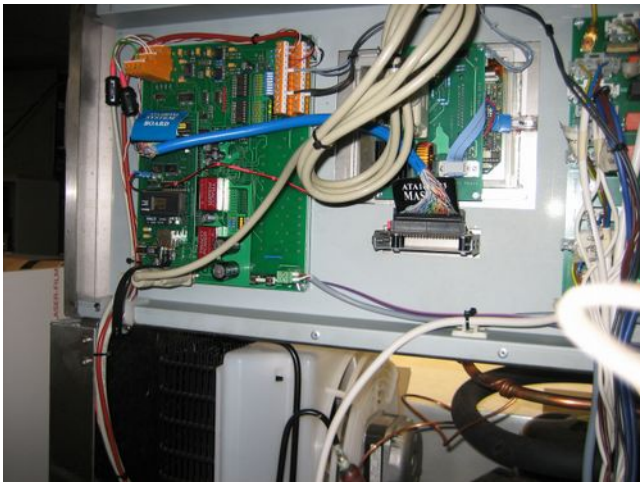
3. **Monitoring based on digital input input Nr. 6**

   (In devices up to the year 2008 an Klixon switch was connected here.)
   Causes instantaneous shutdown of the heater via Atmel.
   There is no error message and no entry in the Fehler.txt file.
   Beck (main controller) does not evaluate the situation!
   Further heating operation only after switching off and on (Atmel reset)

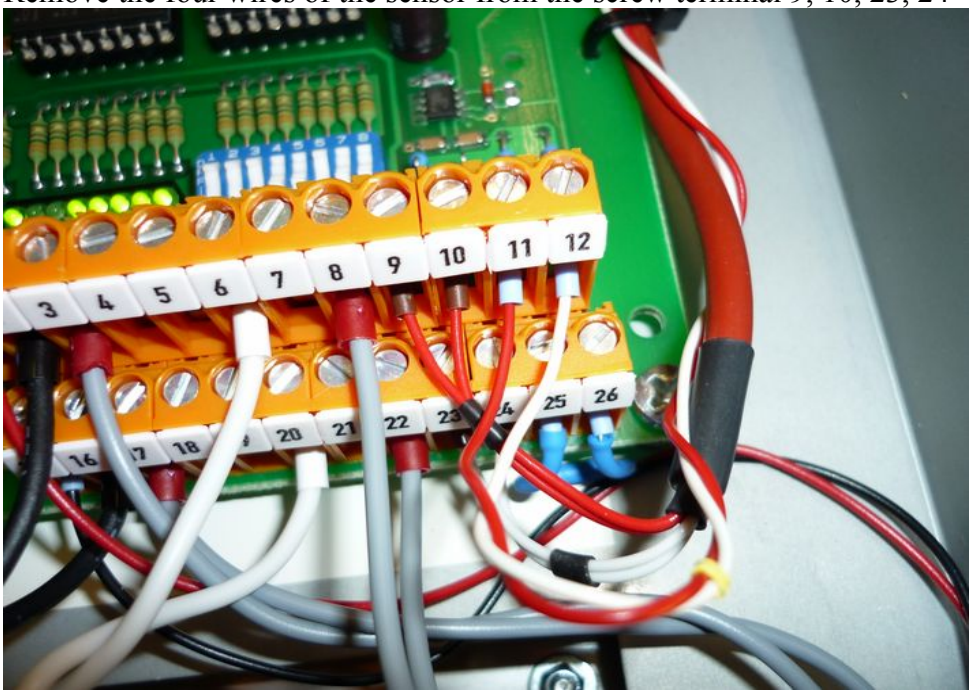
Slabtester from year of manufacturing 2008 - How to replace a specimen sensor

Tools: Crosshead screwdriver
slotted screwdriver
torx screwdriver
wire cutter
ladder

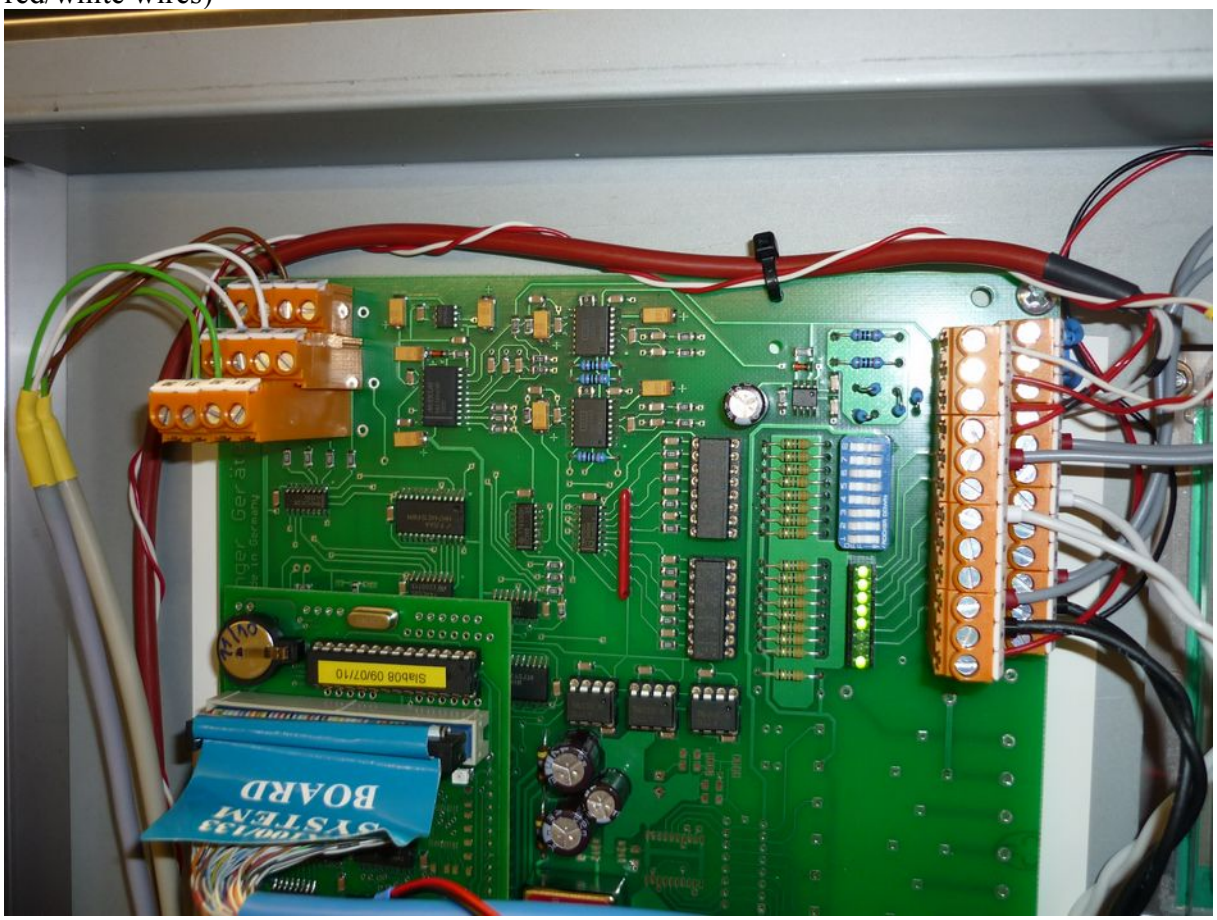
1. pull out the mains plug.
2. Open the door and at the bottom of the front panel release the screw securing it (torx or croshead screw)
3. open the front panel



4. Remove the four wires of the sensor from the screw terminal 9, 10, 23, 24



5. open the cable tie and carefully unwind the drilled wire pair of the air sensor (thin, red/white wires)



6. release the specimen sensor cable from the socket

7. and pull it into the cabinet

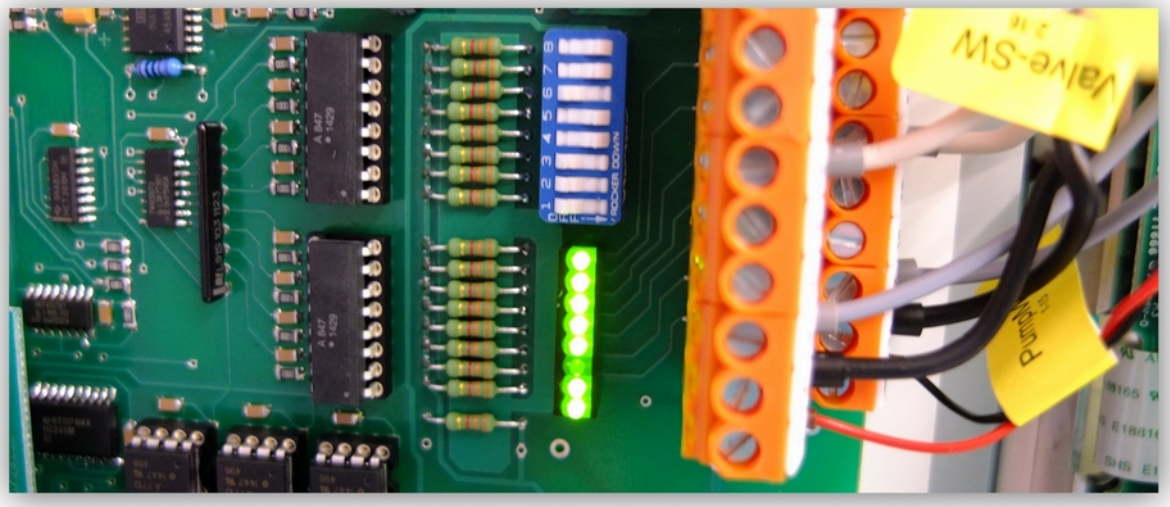
8. The cable of the spare sensor through the hole on the top of the cabinet back up and connect to the screw terminal o the controller board.
   Pay attention to the fully open screw terminal cages. Insert and tighten the cable ends provided with end sleeves in the terminal cages.

Screw terminal #	wire (colour)
9	PT100 / red
10	PT100 / red
23	Compensation loop / white
24	Compensation loop / white

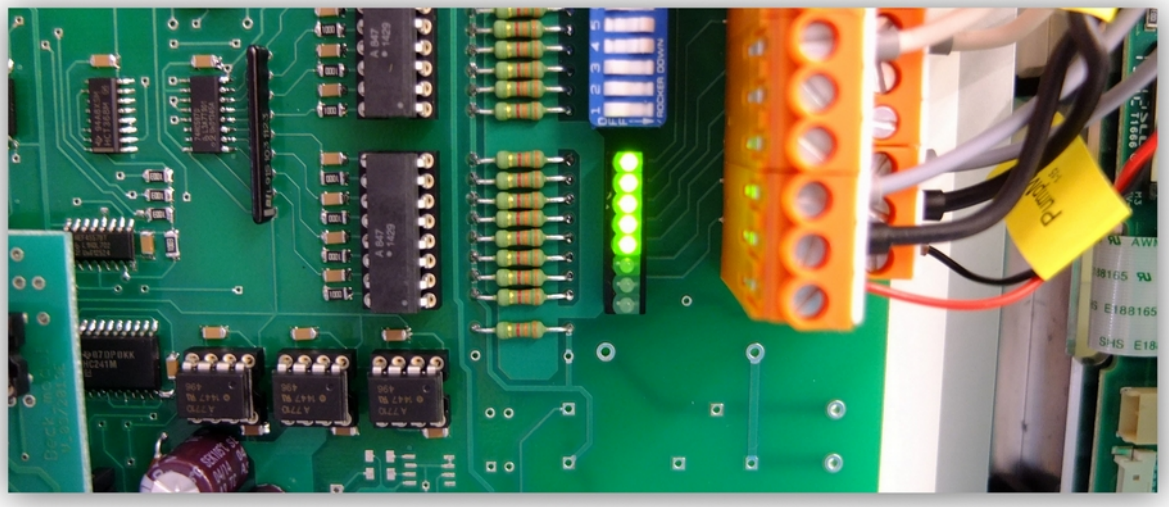
9. Lay cable and fix it
10. Fold down front panel carefully, push in the door switch here or open the door before.

11. Insert the locking screw of the front panel and tighten

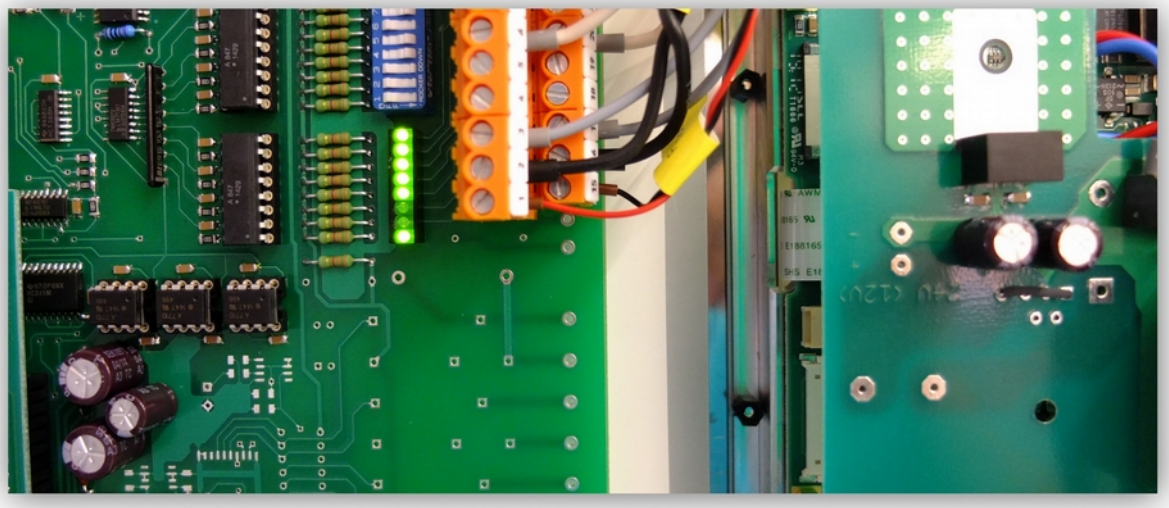
Testing flooding



Normal state: pump off (no current to the pump measured), valve closed. The 3rd LED , seen from the button, must be allways off.



Valve open, pump running



Valve open, pump off

Temperature Measurement and Control with the Schleibinger Slabtester

The Schleibinger Slabtester is a temperature test chamber for test of building or constructing materials. The Slabtester is suitable for tests according to the following standards:

CEN/TS 12390-9:2006 (former prEN 12390-9)
(Testing hardened concrete - Freeze-thaw resistance - Scaling)

EN 1340
(Concrete kerb units - Requirements and test methods)

EN 1339
(Concrete paving flags - Requirements and test methods)

EN 1338
(Concrete paving blocks - Requirements and test methods; German version EN 1338:2003)

EN 1367-1
Tests for thermal and weathering properties of aggregates - Determination of resistance to freezing and thawing

EN 1367-6:2008
Tests for thermal and weathering properties of aggregates. Determination of resistance to freezing and thawing in the presence of salt (NaCl)

DIN V 18004
Use of building products in construction works - Test methods for aggregates according to DIN V 20000-103 and DIN V 20000-104

EN 12371
Natural stone test methods - Determination of frost resistance

EN 1348:2007
EN 1348: Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives

Önorm B3303
2002-09-01
Titel (German): Betonprüfung
Titel (English): Testing of concrete
Test of XF2 and XF4 durability

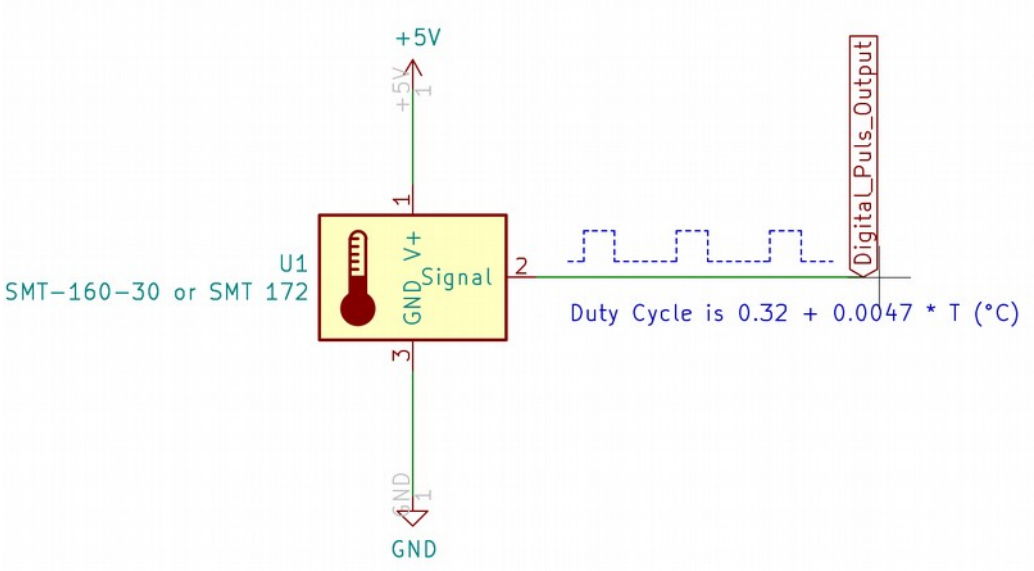
Temperature Sensors

Each Slabtester has 4 temperature sensors:

Temperature sensor for measuring the temperature in the heat exchanger and additional sensor in the test chamber:

Typ: SMT160
Absolute accuracy ± 0.7 °C
Linear output within 0.2 °C
Resolution better then 0.005 °C
Duty Cycle output
Calibrated on chip
Temperature range 175 °C (-45 to +130 °C)

This is a digital sensor with a puls output. Temperature is encoded in the duty cycle of the pulse signal. The sensor is supplied with 3.3.. 5.0V DC.
Sensor can’t be measured with an Ohm meter.



Temperature sensor for measuring the air leaving the heat exchanger:

Typ RTD PT100
2 wire connection
Absolute accuracy ± 0.9 °C
Linear output within 0.5 °C
Resolution better then 0.05 °C
Temperature range 310 °C (-50 to +260 °C)

Reference Sensor for measuring the specimen temperature and controlling it:

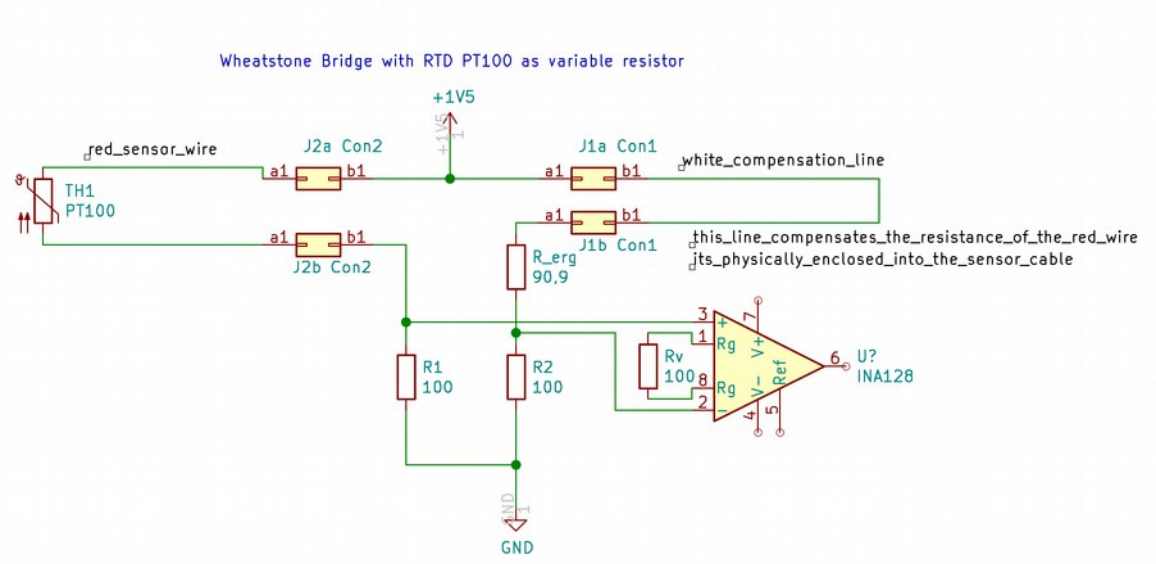
Type RTD PT100
Wheatstone connection (2 wires + 2 compensation wires)
Absolute accuracy 1/10 Class B according to IEC 60751(2007):
dT = ± 1/10 (0.30 °C + 0.005 |T|)
Linear output within 0.2 °C
Resolution better then 0.015 °C
Sensor ceramic 1.6mm x 20mm
Housing 6x6x50 mm stainless steel
Cable 4x0.22mm FEP
Temperature range 225 °C (-45 to +180 °C)

For the accuracy of the test result only the reference sensor is important.

Measurement Amplifier:

Theory of operation:

The RTD and its cable are one leg of a high accurate Wheatstone bridge. The second parallel leg is a high precision resistance and two extra wires in the sensor cable, which are shortened near the sensor. The other 2 legs are two extra high precision resistors inside the electronic. The voltage at the midpoints of the bridge is amplified by a difference amplifier by 101. The A/D converter has a range of ± 2.048 V and, a resolution of 1mV and and an accuracy of better ± 2mV. The linearizion of the bridge voltage and the temperature values is done by two different 4th order equations for temperatures above and below 0.0°C. All calculation are done in single precision floating point format.
The following picture shows the wiring. **Please note: It is not a classical 4-wire connection, but a Wheatstone bridge with a compensation line.**



Absolute accuracy of the measurement chain for the reference probe

The absolute accuracy is better ±0.5K in the range of -20...+20°C . On customer request an extra calibration can be done (Order code C0155: calibration at -15° C and +15° C. Other temperatures on request). As reference a calibrated measurement setup is used which ensures the traceability to national and international standards. This instrument has the Calibration mark 0566 DKD-K-06701-2010-05, certified by the Deustche Kalibrierdienst an national body.

Buchbach, 08/17/19 M. Greim

/linuxserver2/tesisneu/combit/literatur/manuals/English/Slabtester/slabtestersensor.odt

Slabtester - Temperature Sensors

In the Slabtester, we use two species of temperature sensors.
- resistance sensors based on PT100 for the specimen as a reference sensor in the chamber with a red cable and the air temperature (located in the cooling aggregate at the cooling air input)
- digital sensors with a duty-cycle output (PWM) for the evaporator (located inside the heat exchanger at the cooling aggregate) and max 3 additional sensors (located in the chamber, grey cables).

The specific heat capacity of air is quite low. So even if we are using 3 fans in the Slabtester there is always a temperature difference between the coolest location at the heat exchanger and the other places in the chamber.
The control algorithm compares the set or target temperature with the temperature at the reference sensor. If the temperature at the reference sensor is too high the cooling machine starts and cool air is blowing down into the test chamber. If the temperature is too low, a heating unit also located at the heat exchanger is blowing warm air into the test chamber.

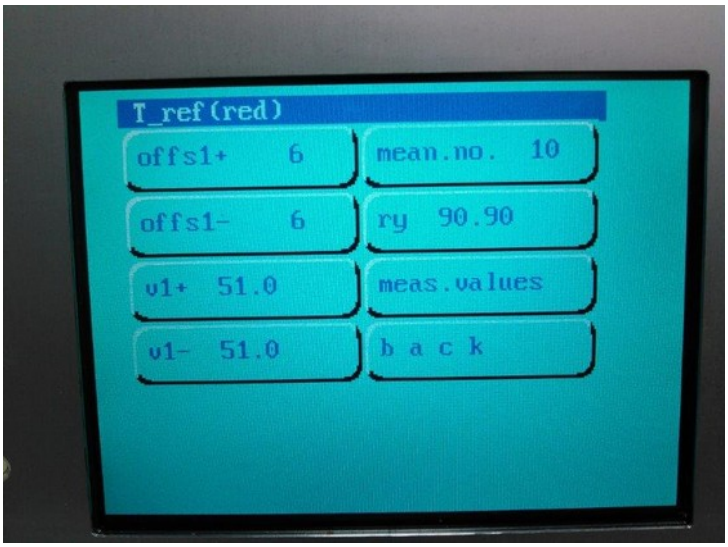
If the reference sensor is applied to a concrete beam, the time behaviour of the sensor will be dominated by the thermal capacity of the specimen. So even if the air temperature is changing, the temperature at the reference sensor will follow the air temperature with a big delay, depending on the volume of the specimen.

If the Slabtester is flooding (with the flooding option) the temperature was dominated by the water temperature. So in the moment of flooding the temperatures in the Slabtester will suddenly change to the water temperature. Its not possible to cool down, or heat up the water in the test chamber by the cooling aggregate. By default the reference sensor is then switched from the read cable sensor to the first add. Sensor (grey cable). This “sensor switching” may be disabled in the software.

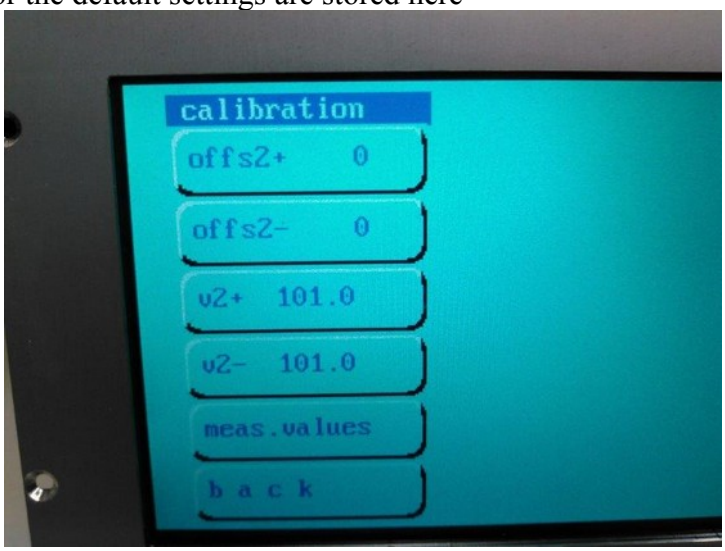
Troubleshooting

A failed sensor may also affect other sensors.
Corrupted calibration values may also affect the calculation and display of temperatures.
Signal processing of all temperature sensors is performed by a coprocessor (Atmel) therefore is a perfect function of the coprocessor and his communication with the main processor indispensable.

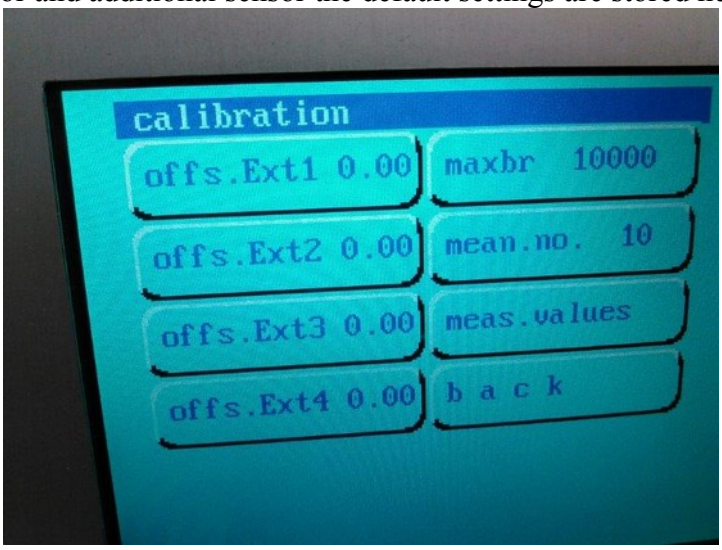
Settings for the temperature calculation
- in the main menu go to **setup** –> **system menu** (code: 2603) **temp-preas.**
    a.) for the reference sensor (specimen / red cable) the default settings are stored here



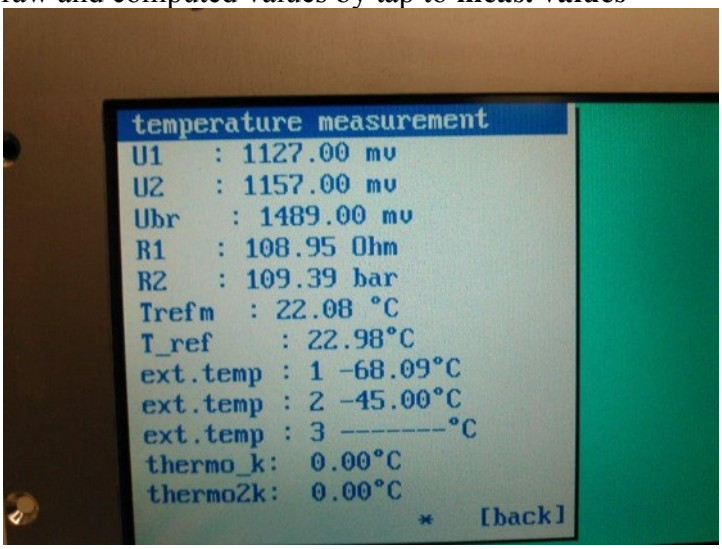
b.) for the air sensor the default settings are stored here



c.) for the evaporator and additional sensor the default settings are stored here



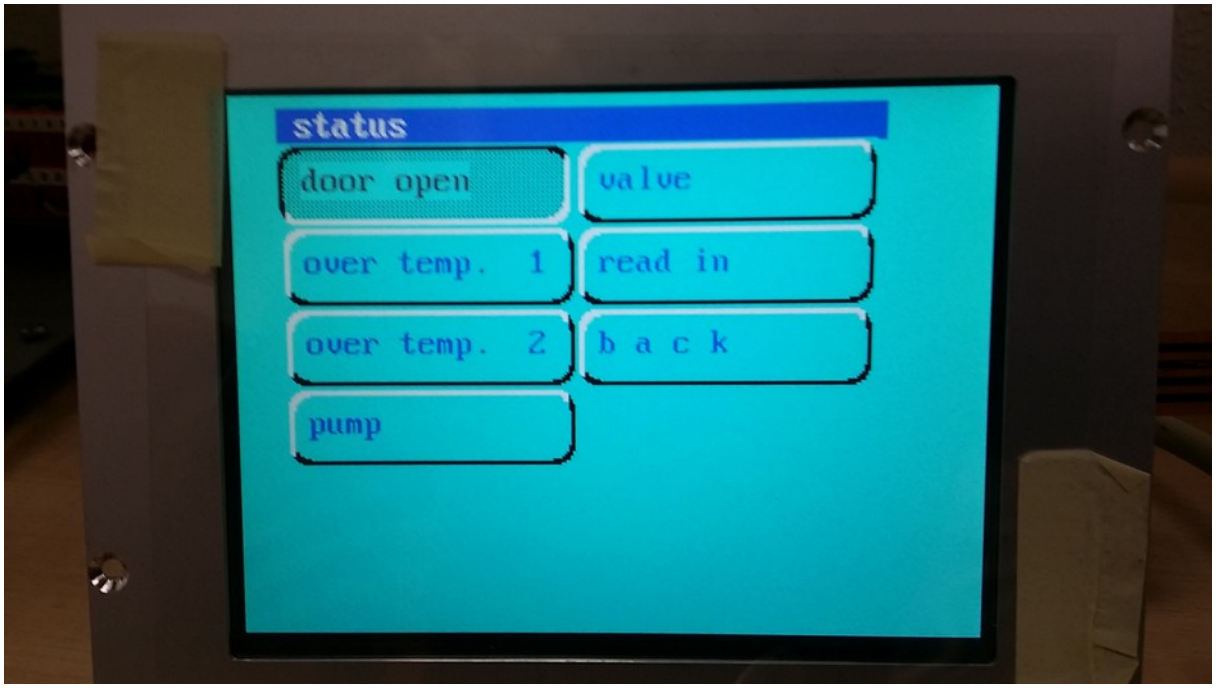
You can check the raw and computed values by tap to **meas. values**



Ref.	Description	Range
U1	Input voltage specimen sensor	~ +1120 mV @ 22°C ~ +209 mV @ -15°C
U2	Input voltage air sensor	~ +1150 mV @ 23°C ~ -514V @ -15°C
Ubr	Bridge excitation voltage	1450..1490 mV hardware problem if this voltage is out of range!
R1	Resistance of T_specimen in Ohm	92.16 Ohm @ -20°C 107.79 Ohm @ +20°C 111,67 Ohm @ +30°C
R2	Resistance of T_air in Ohm	Same as R1

Functional check of the coprocessor and communication with the main processor
When the calibrations values are ok, you can check the communication with the coprocessor.

1. in the main menu go to **status** -> **Switcher Inp.**
- if you open the door of the chamber and tap to **read in**, the background of the **door open button** has to change to the dark
- if you close the door and tap to **read in** again, the background of the **door open button** has to change back to the clear



2. you can also test the outwards communication
- in the main menu go to **setup** – **system menu** (code: 2603) –**manual**
If you tap to a button, you should hear a click by a relay and the corresponding unit.

How to find a fault temperature sensor
When the calibration values and the communication with the coprocessor work fine, you can try to find a defective sensor. The temperatures recorded in the file data1.txt could also give an indication.

When several sensors provide dubious values, the best way is the following procedure

- disconnect both digital sensors and observe if anything changes
- if yes, connect one of the sensors to the evaporator channel. If the evaporator temperature is ok, the additional digital sensor is probably broken. You can connect it to the evaporator channel or you can connect the evaporator sensor to the Tadd channel for the functional check.
  The additional sensor is necessary only in the flooding version of the Slabtester. If necessary, you can replace the broken evaporator sensor by the Tadd sensor. Do not forget to reconnect the cable at 30-34-38 and 31-35-39
- if no change is observed, replace the specimen sensor Tref (first only the red wires pair connected to 9 and 10) by a resistor with a fixed value of 100 Ohm (correspond to 0,0°C) and check the Tref.
  If no change is observed furthermore, replace the compensation loop connected to the terminal 23 and 24 = white wires pair by a piece of cable.
  If the value for the Tref is now about 0,0°C and the Tair is about the ambient temperature, the reference sensor is broken.
- The last sensor is the air sensor connected to the terminal 11 and 12. You can also replace it by a resistor with a fixed value of 100 Ohm (correspond to 0,0°C) and check the Tair.
  If the value for the Tair is now about 0,0°C and the Tref is about the ambient temperature, the air sensor is broken.

Temperature sensors –overview and order numbers

Description	Location	Type	Schleibinger Order Number
Reference (specimen)	Chamber	WT WA 64.9-X (PT100)	C65
Air	cooling outlet	WK63.4-X (PT100)	C0156
Evaporator	evaporator	SMT172	SMT172-TO92-740
Additional	chamber	SMT172	SMT172-TO92-740